LBI-31587C
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MAINTENANCE MANUAL
440-470 MHz SYNTHESIZER/INTERCONNECT BOARD
19D901205G4 16 WIDEBAND

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DESCRIPTION

The 440-470 MHz Synthesizer/Interconnect board for PSX-200 two-way radio is microcomputer controlled. A phase locked loop synthesizer generates the transmitter and receiver frequencies in a common voltage controlled oscillator (VCO). The frequency range of the VCO is 146.666-171.666 MHz. The frequencies are tripled on the transmit/receive board. The microcomputer also controls the generation of Channel Guard tones and provides the carrier control timer when in the transmit mode.

The Synthesizer/Interconnect board also contains interface circuitry for voltage protection and level shifting, an audio processor, a microcomputer, a frequency synthesizer, a microphone preamplifier, and an electrically erasable PROM (EEPROM). The EEPROM stores the binary data for the transmit and receive frequencies, Channel Guard tones and the CCT delay on a per channel basis. Four addresses of the 16 x 16 EEPROM are used for each receive and transmit channel which will include synthesizer, channel guard, and CCT code. A block diagram of the Synthesizer/Interconnect board is shown in Figure 1.

NOTE

The EEPROM provides the user with the capability to reprogram the radio to meet changing system requirements.

Programming for the EEPROM is accomplished by using the Ericsson GE universal radio programmer TQ2310. The radio is programmed using the Phoenix part of the TQ2310 and limiting the file to 2 channels. Digital Channel Guard is not available in the PSX-200 and will not function if programmed by the TQ2310.

Programming information for the EEPROM is included in the instruction manual for the Programmer.

In addition to providing the normal radio functions, the microcomputer has the ability to execute a maintenance diagnostic instruction set to aid in troubleshooting the radio. Further details are included in the Service Section of this manual.

CIRCUIT ANALYSIS

CHANNEL SELECT

Frequency selection is controlled by MODE A/B switch S601 in the receive circuit on the Tx/Rx board. When pressed, A- is applied to microcomputer U801-37 causing the microcomputer to select channel.

When the mode switch is released (Out), the microcomputer applies +5 VDC to the EEPROM through Q802. The frequency bit code corresponding to the channel 1 is then loaded into the synthesizer.

Option indicator H2 is controlled by the CAS line and is turned on when the selected channel is busy.

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Printed in U.S.A.

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MODE A/B

Mode A/B switch S601, located on the transmit/receive board, provides the channel selection capability of the radio and may be used to provide mobile-to-mobile communications through an intermediate repeater (repeated path) or direct mobile-to-mobile communications. For example: channel 1 (Mode A) maybe programmed for the repeater frequency (repeated path) while channel 2 (Mode B) would be programmed for the mobile receive frequency (direct path). Judicious programming will allow selection of repeated or direct communication paths on selected channels.

MICROCOMPUTER CONTROL SYSTEM

The microcomputer responds to the manually initiated functions of Push-to-talk, and Mode A/B. All other operations occur automatically and are controlled by the microcomputer.

When the PTT switch is pressed A- is applied to microcomputer U801-38 from J911-2. The microcomputer immediately mutes the receiver by turning on Q807 which provides a low level to J903-4 to mute the receiver. The microcomputer then delays 10 milliseconds before loading the synthesizer with the transmit bit code. This allows the audio amplifier to he turned off before the synthesizer frequency is changed. After this delay the microcomputer turns on PROM power switch Q802, applying +5V to EEPROM U806. The transmit bit code is then loaded in parallel from the PROM into the microcomputer and then serially into the frequency synthesizer over the clock and data input lines.

Once the bit stream is loaded into the synthesizer an enable pulse and a 10 millisecond channel change pulse is provided to allow the synthesizer to generate the correct RF frequency. The microcomputer immediately begins monitoring the LOCK DET line to verify that the synthesizer is "on" frequency. If the synthesizer is not locked on the correct frequency negative pulses will be present on the LOCK DET line and the microcomputer will reload the synthesizer in an attempt to lock it on frequency. If the synthesizer is locked on the correct frequency, the microcomputer will key the transmitter by pulling the input line to inverter U804A low. This allows the output of U804A to rise to +8.5 VDC, forward biasing transmit select diode D105, permitting the synthesizer generated RF frequency to pass through to the exciter through P151. Minimum RF output level at this point is 8.0 dBm. Typical attack time of the transmitter is 50 milliseconds.

At the same time transistor Q806 is turned on, applying DPTT to audio switch Q301. Q301 is also turned off, removing the "short" from amplifier U301A and enabling the audio processor.

WATCHDOG TIMER

The watchdog timer consisting of reset switch Q803 and timer U802, monitors the operation of the microcomputer and generates a reset pulse in the unlikely condition that the microprocessor fails to function properly.

When the microcomputer is operating properly, reset pulses from U801-35 are applied to the base of reset switch Q803 through delay network R836 and C805. Q803 turns on, grounding the clock timer input which, in turn, holds the microcomputer RESET input high.

When the microcomputer is not functioning properly, the reset pulses will not be present. Q8O3 will turn off and the timer will generate a square wave to reset the microcomputer.

FREQUENCY SYNTHESIZER

The frequency synthesizer generates the transmit and receive frequencies for all channels under control of the microcomputer. The frequency synthesizer consists of a reference oscillator Y201, synthesizer IC U101, bilateral switch U103, low pass filter, VCO Q105, buffers Q106 and Q107, and high speed dual modulus prescaler U102.

Reference Oscillator

The reference oscillator consists of Y201, a junction FET Q201, varicap D201, tuned coil L201, and associated circuitry. The 5 PPM Colpitts oscillator operates at a frequency of 13.2 MHz. Voltage is provided by the 8.5V continuous supply. A temperature compensation network consisting of R201 thru R206, provides a temperature compensated voltage to varicap D201 to maintain the correct frequency. The temperature compensator, utilizing an inverse DC S-curve output characteristic, varies the output voltage to the varicap as a function of temperature. The temperature compensation network maintains frequency over a temperature range of -30°C to +60°C (-22°F to +140°F). The varicap is also used to modulate the oscillator.

Diode D202 produces a negative DC level at the gate of FET Q201 depending on the amplitude of the oscillations. This, in effect, produces a negative feedback, RF to DC, and prevents the oscillator from going into limiting. Slug tuned coil L201 sets the frequency of the oscillator. Modulation voltage from the audio modulator is applied to the reference oscillator through R214. Modulation is adjusted by R212 and applied to varicap D201 through C201 and R209. R212 adjusts the deviation. Refer to the service section for adjustment procedures.

The synthesizer IC contains three dividers, a phase detector, two shift registers, and a lock detect circuit. When the PTT switch is pressed (transmit), released (receive), or a different channel selected, new frequency data is received on the clock, data, and enable lines and the synthesizer immediately begins generating the new RF frequency. This serial data determines the VCO frequency by setting the internal dividers. The reference oscillator frequency applied to the programmable divide by R counter is divided down to some lower frequency as indicated by the input data and applied to the internal phase detector.

The phase detector compares this signal with the output of the internal - N counter. The output of the ÷ N counter is a function of the RF frequency which is divided down by the dual modulus prescaler and the ÷ N counter. When operating on the correct frequency the inputs to the phase detector are identical and the output voltage of the phase detector is constant. Under these conditions, the VCO is stabilized or locked on frequency. If the compared frequencies (phases) differ a ± error voltage is generated and applied to Q102. This error voltage is then supplied to the VCO through the frequency acquisition circuit and low pass filter. The capacitance of varicap D102 varies in accordance with the applied error voltage, thereby resetting the VCO to the correct frequency. Capacitor C104 is a holding capacitor to store the "hold" voltage for the phase detector/sample and hold circuit. C105 is a ramp capacitor which also is part of the sample and hold circuit. The value of C105 determines the rate of charge of the ramp.

The lock detect line provides lock status information to the microcomputer through a one shot FF (part of U802).

Acquisition and Low Pass Filter

The output of the synthesizer is applied through driver Q102 and high current buffers Q103 and Q104 to the low pass filter. The low pass filter consisting of R109-R111, and C106-C108 eliminates undesired pulses on the VCO error control line to provide a constant DC level to frequency adjusting varicaps D102 and D104.

When a channel change pulse is received bilateral switch U103 is turned on to bypass the low pass filter effectively increasing the bandwidth and decreasing channel acquisition time. The channel change pulse is 10 milliseconds wide.

Voltage Controlled Oscillator VCO

The VCO is a wide range JFET oscillator with an operating range of 134. 33-185.66 MHz. The divided down reference frequency is 4.1666 kHz. VCO frequency is controlled by an error control voltage from the synthesizer and set by varicap D102. Frequency range centering is provided by L102. Audio modulation is provided by the audio processor and applied to the VCO through C138 and R116.

The output of the VCO is taken from the source of Q105 and applied to RF output buffers Q106 and Q107. These buffers provide drive for receiver injection, transmitter exciter, and feedback buffers Q108 and Q109.

Transmit and Receive Switch

A transmit/receive PIN diode switch, D105 and D106 directs the RF output to the transmitter or receiver. The switch is control led by the DPTT signal from the microcomputer. When DPTT is high, D105 conducts and RF is fed to the transmitter and to the receiver when DPTT is low, allowing D106 to conduct.

Dual Modulus Counter

The VCO frequency is fed back to dual modulus prescaler U102, through buffers Q108 and Q109. The counter divides the VCO frequency by 64 or by 65 depending on the status of the modulus control line. The divided down reference frequency is 4.16 kHz.

The output of the dual modulus counter is applied to the ÷N counter in the synthesizer. It is then divided down and compared in frequency and phase with the divided down frequency from the reference oscillator. The ÷N count is set by the microcomputer.

MICROPHONE PREAMPLIFIER

A preamplifier stage (Q901 and associated circuitry) is provided for the standard electret microphone without a built-in preamplifier.

With this microphone, MIC HI is coupled through J911-5 to the preamplifier stage. The amplified output is coupled through C312 and R301 to the audio processor.

For optional microphones with a built-in preamplifier, audio is coupled through J911-4, bypassing MIC PRE AMP Q901.

Mic bias is provided by the 8.5V CONT Source through bias network R904-906.

AUDIO PROCESSOR

The audio processor provides audio pre-emphasis with amplitude limiting and post limiter filtering. A total gain of approximately 24 dB is realized through the audio processor. 20 dB is provided by U301B and 4 dB by U301A.

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CIRCUIT ANALYSIS

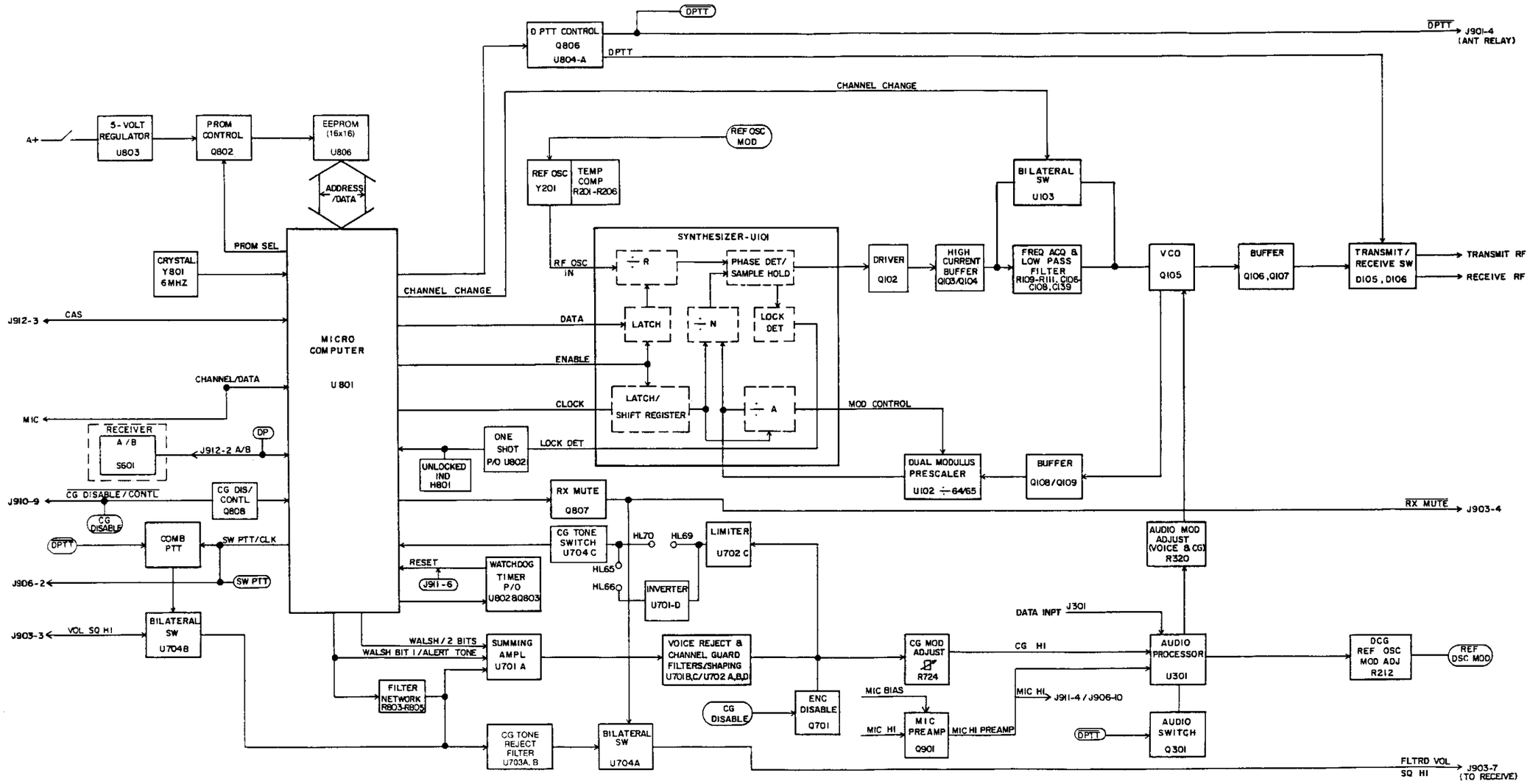

Figure 1 - Synthesizer/Interconnect Board

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The 8.5 Volt regulator powers the audio processor and applies regulated +8. 5V through J903-2 to a voltage divider consisting of R306 through R309. The +4.25V output from the voltage divider at the junction of R307 and R308 establishes the operating reference point for both operational amplifiers. C305 provides an AC ground at the summing input of both operational amplifiers.

Audio direct from the microphone is coupled to the audio processor through C312 and R301 to the input of operational amplifier U301B-6.

When the input signal to U301B-6 is of a magnitude such that the amplifier output at U301B-7 does not exceed 4 volts P-P, the amplifier provides a nominal 20 dB gain. When the audio signal level exceeds 4 volts peak-to-peak, diodes D301 and D302 conduct on the positive and negative half cycles providing 100% negative feedback to reduce the amplifier gain to 1. This limits the audio amplitude at U301B-7 to 5 volts peak-to-peak.

Resistors R303, R304, R305, and capacitor C302 comprise the audio pre- emphasis network that enhances the signal to noise ratio. R304 and C302 control the pre-emphasis curve below limiting. R305 and C302 control the cut-off point for high frequency pre-emphasis. As high frequencies are attenuated, the gain of U301B is increased.

The amplified output of U301B is coupled through C307, R313 and R314 to a second operational amplifier U307A.

The Channel Guard tone inputs are applied to U301A-2. The CG tone is then combined with the microphone audio.

A post limiter filter consisting of R314, R313, R315, C308 and C309 provide 12 dB per octave roll-off. R313 and C307 provide an additional 6 dB per octave roll-off for a total of 18 dB.

SERVICE NOTE

R313-R315 are 1% resistors. This tolerance must be maintained to assure proper operation of the post limiter filter. Use exact replacements.

The audio processor output is coupled through the audio and REF OSC modulation controls to the transmitter. R212 and R320 set the modulation sensitivity for the VCO and reference oscillator.

Shorting switch Q301 is turned on in the receive mode (DPTT is high) to short out U301-A and prevent any interference from the transmit audio circuits.

CHANNEL GUARD

Channel Guard provides a means of restricting calls to specific radios through the use of a continuous tone coded squelch system (CTCSS). Tone frequencies range from 71.9 Hz to 210.7 Hz.

The microcomputer selects the assigned tone information from the EEPROM memory for each channel, transmit and receive, and generates the Channel Guard signal. This signal is applied as Walsh Bit l and 2 to summing amplifier U701A. These two bits are summed together and filtered to provide a smooth sine wave for tone Channel Guard.

The switched volume/squelch Hi signal to the summing amplifier is controlled by bilateral switch U704B. In the encode mode $\overline{\text{COMB}}$ $\overline{\text{DPTT}}$ is low turning U704B off and preventing any input from the SW Vol/Sq Hi line from interfering with the encoding signal.

The output of summing amplifier U701A is applied to buffer/amplifier U702B through a two-pole active voice reject filter consisting of U701B and C and U702A and D. The active filter shunts all frequencies above 300 Hz to ground, thereby preventing those frequencies from interfering with the encoded signal. The output of U702B is the assigned CG tone signal. This signal is applied to the audio processor through CG deviation control R724. Channel Guard deviation is set for 0.75 kHz.

CG Decode

In the decode mode $\overline{\text{COMB}}$ $\overline{\text{DPTT}}$ is high, U704B is turned on and audio from the SW Vol/Sq Hi line is applied to summing amplifier U701A through bilateral switch U704B. This signal is amplified and filtered by U701A, B, C and U702A, B and D, so that only the CG signal (if present) is applied to hard limiter U702C. The CG signal is squared up for comparison by the microcomputer to determine if the CG signal is correct. If the microcomputer determines the CG signal to be correct, RX Mute transistor Q807 is turned off. The RX Mute line is pulled high by pull up resistor R715 through D819. This turns on bilaterial switch U704A and allows the audio on the FLTRD VOL/SQ HI line to pass through to the receiver.

CHANNEL GUARD (CG) DISABLE

The CG DIS line has a double function. It can disable the encode or the decode CG function. The encode disable function is controlled by the PTT switch while the decode function is disabled within the microcomputer software. To disable the decoder, the CG DIS/CONTL line should be grounded. The microcomputer will detect that the line is low, and turn RX MUTE transistor Q807 off. The decode filter/limiter circuit is not affected, it continues to operate. The detection software also does not stop working. This allows the off hook STE to function.

When the CG DIS line is pulled high (>8.5V), the microcomputer does not sense any changes. Channel Guard disable transistor Q701 will turn on when the CG DIS line goes above 8.5 V and shorts the output of the filter to ground. This disables the encoder by preventing any signal from going out on CG HI and will also disable the decoder since no limited CG tone will go to the microcomputer. The receiver will be muted since no CG is decoded. Disabling the decoder this way will never allow the audio to open up, while taking the radio off hook (pulling CG DIS low) will always make the radio open up. Turning CG Disable transistor Q701 on causes the DC bias to change. It will take 2 or 3 seconds for the bias to restore itself after the encoder is disabled.

SQUELCH TAIL ELIMINATION (STE)

STE eliminates squelch tails when the radio is on hook or off hook. When Channel Guard is disabled (off hook) the decoder is still looking at the received signal. The RX MUTE line is high, as would be normally expected. The Channel Guard decoder is looking for the STE burst (phase reversal in tone Channel Guard). If an STE burst is detected, the RX MUTE line will go low for about 200 ms. This will prevent the squelch tail from being heard. After 200 ms, the RX MUTE line will go high again; by now the transmission has ended and the squelch will hold the audio closed. The off hook STE does not affect the operation of the Channel Guard while on hook. Another way of looking at it: the radio will go quiet for 200 ms any time STE is detected. If it was on hook it will stay quiet after the 200 ms, if it was off hook it will revert to noise squelch operation. STE operates only on the tone the radio is programmed to receive. If the signal has a Channel Guard tone the radio is not programmed to receive and the microphone is off-hook, STE will not be active.

CARRIER CONTROL TIMER

The Carrier Control Timer (CCT) is contained within and controlled by the microcomputer. Each time the PTT switch is activated an internal counter begins to count down. If the counter times out, the transmitter is unkeyed and a 100 mV rms l kHz tone is sounded until the microphone is unkeyed. The CCT is set for l minute.

SYNTHESIZER/INTERCONNECT BOARD
19D901205G4 440-470 MHz (Tin Contacts)
19D901205G16 440-470 MHz (Gold Contacts)

SYMBOL	PART NO.	DESCRIPTION
		NOTE: WHEN REPLACING BOARDS, CARE SHOULD BE TAKEN TO ASSURE THAT BOARDS WITH OLD CONTACTS ARE NOT INTERMIXED WITH BOARDS HAVING TIN CONTACTS. REPLACE THE BOARD ONLY WITH ONE HAVING THE SAME GROUP NUMBER AS THE ORIGINAL.
		SYNTHESIZER
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C101 and C102	19A703314P2	Tantalum: 220 µF, -10+50%, 10 VDCW.
C103	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C104	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C105	19A702061P91	Ceramic: 1800 pF ± 5%, 50 VDCW, temp coef 0 ± 30 PPM.
C106	19A700004P8	Metallized polyester: 1 µF ± 10%, 63 VDCW.
C107	T644ACP333K	Polyester: .033 µF ±10%, 50 VDCW.
C108	19A702250P111	Polyester: .047 µF ±10%, 50 VDCW.
C109 and C110	19A703314P2	Tantalum: 220 µF, -10+50%, 10 VDCW.
C111	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C112	19A702061P65	Ceramic: 150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C113	19A702236P38	Ceramic: 33 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C114	19A702236P36	Ceramic: 27 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C115	19A702236P7	Ceramic: 1.2 pF ± .25 pF, 50 VDCW, temp coef 0 ± 30 PPM.
C116	19A702236P19	Ceramic: 5.6 pF ±.5 pF, 50 VDCW, temp coef 0 ±30 PPM/°C.
C117	19A702236P23	Ceramic: 8.2 pF ±.25 pF, 50 VDCW, temp coef 0 ±30 PPM.
C118	19A702236P6	Ceramic: 1.0 pF ±.25 pF, 50 VDCW, temp coef 0 ±30 PPM/°C.
C119 and C120	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C121	19A702052P20	Ceramic: 0.033 µF ± 10%, 50 VDCW.
C122	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C123 thru C126	19A702061P65	Ceramic: 150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C127	19A702236P10	Ceramic: 2.2 pF ±2.5 pF, 50 VDCW, temp coef 0 ±30 PPM/°C.
C128	19A702236P38	Ceramic: 33 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C129 thru C131	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C132 and C133	19A702061P65	Ceramic: 150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C134 and C135	19A702052P20	Ceramic: 0.033 µF ± 10%, 50 VDCW.
C136 and C137	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C138	19A701534P8	Tantalum: 22 µF ±20%, 16 VDCW.
C139	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
D101	19A700028P1	- - - - - - - - - - DIODES - - - - - - - - - - Silicon: 75 mA, 75 PIV; sim to 1N4148.
D102	19A700085P3	Silicon, capacitive.
D103	19A700047P2	Silicon, 100 maw, continuous dissipation; sim to DO-15.
D104	19A700085P3	Silicon, capacitive.
D105 and D106	19A116925P1	Silicon.
D107	19A700025P6	Silicon, zener: 400 mW max; sim to BZX55-C5V1.
J101	19A703248P7	- - - - - - - - - - JACKS - - - - - - - - - - Post: Tin Plated, 14 mm length. (Used in G4).
J101	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
L101	H343CLP10022	- - - - - - - - - - INDUCTORS - - - - - - - - - - Coil, Fixed: 10 µH ± 10%.
L102	19A705315G1	COIL, RF
L103 thru L105	H343CLP12922	Coil, RF: 1.2 µH ±10%.
L106	19A700024P4	Coil, RF: 180 nH ± 10%.
L107	H343CLP12922	Coil, RF: 1.2 µH ±10%.
P151	19A701785P3	- - - - - - - - - - PLUGS - - - - - - - - - - Contact, electrical. (Used in G4).
P151	19A701785P13	Contact, electrical. (Used in G16).
Q102 thru Q104	19A700059P2	- - - - - - - - - - TRANSISTORS - - - - - - - - - Silicon, PNP: sim to MMBT3906, low profile.
Q105	19A702524P2	N-Type, field effect; sim to MMBFU310.
Q106 and Q107	19A701808P2	Silicon, NPN; sim to MPS 6595.
Q108 and Q109	19A700023P2	Silicon, NPN: sim to 2N3904.
R101	19B800607P220	- - - - - - - - - - RESISTORS - - - - - - - - - - Metal film: 22 ohms ±5%, 1/8 w.
R102	19B800607P224	Metal film: 220K ohms ±5%, 1/8 w.
R103	19A702931P388	Metal film: 80.6K ohms ±1%, 200 VDCW, 1/8 w.
R105 and R106	19B800607P122	Metal film: 1.2K ohms ±5%, 1/8 w.
R107	19B800607P560	Metal film: 56 ohms ±5%, 1/8 w.
R108	19B800607P100	Metal film: 10 ohms ±5%, 1/8 w.
R109	19B800607P105	Metal film: 1M ohms ±5%, 1/8 w.
R110	19B800607P273	Metal film: 27K ohms ±5%, 1/8 w.
R111	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R112	19B800607P560	Metal film: 56 ohms ±5%, 1/8 w.
R113	19B800607P220	Metal film: 22 ohms ±5%, 1/8 w.
R114	19A702931P388	Metal film: 80.6K ohms ±1%, 200 VDCW, 1/8 w.
R115	19B800607P680	Metal film: 68 ohms ±5%, 1/8 w.
R116 and R117	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R118 thru R120	19B800607P222	Metal film: 2.2K ohms ±5%, 1/8 w.
R121	19B800607P151	Metal film: 150 ohms ±5%, 1/8 w.
R122 and R123	19B800607P681	Metal film: 680 ohms ±5%, 1/8 w.
R124	19B800607P100	Metal film: 10 ohms ±5%, 1/8 w.
R125 thru R129	19B800607P562	Metal film: 5.6K ohms ±5%, 1/8 w.
R130	19B800607P680	Metal film: 68 ohms ±5%, 1/8 w.
R131 thru R133	19B800607P222	Metal film: 2.2K ohms ±5%, 1/8 w.
R134	19B800607P221	Metal film: 220 ohms ±5%, 1/8 w.
R135	19B800607P820	Metal film: 82 ohms ±5%, 1/8 w.
R136	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R137	19B800607P820	Metal film: 82 ohms ±5%, 1/8 w.
R138	19B800607P221	Metal film: 220 ohms ±5%, 1/8 w.
U101	19B800902P1	- - - - - - - - INTEGRATED CIRCUITS - - - - - - - Synthesizer: CMOS, Serial Programming; sim to MC145159P.
U102	19A703091P1	Digital: /64, /65 Prescaler; sim to MC12017P.
U103	19A700029P44	Digital: BILATERAL SWITCH.
		REFERENCE OSCILLATOR
C201	19A703314P4	- - - - - - - - - - CAPACITORS - - - - - - - - - Electrolytic: 47 µF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.
C202	19A702248P304	Ceramic: 39 pF ±5%, 50 VDCW, N470 ±60 PPM.
C203	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C204	19A702061P43	Ceramic: 43 pF ± 5%, 50 VDCW, temp coef 0 ± 30 PPM.
C205	19A702061P73	Ceramic: 330 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C208	19A702061P57	Ceramic: 82 pF ± 5%, 50 VDCW, temp coef 0 ± 30 PPM.
C209	19A702052P20	Ceramic: 0.033 µF ± 10%, 50 VDCW.
C210	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C213	19A702061P61	Ceramic: 100 pF ± 5%, 50 VDCW, temp coef 0 ± 30 PPM.
D201	19A700085P3	- - - - - - - - - - DIODES - - - - - - - - - - Silicon, capacitive.
D202	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
L201	19B801161P2	- - - - - - - - - - INDUCTORS - - - - - - - - - - Coil, RF: sim to Standex EF-247.
L202	19A700024P29	Coil, RF: 22 µH ± 10%.
Q201	19A700060P3	- - - - - - - - - - TRANSISTORS - - - - - - - - - N-Type, field effect; sim to J310.
R201	19A701250P354	- - - - - - - - - - RESISTORS - - - - - - - - - - Metal film: 35.7K ohms ±1%,250 VDCW, 1/4 w.
R202	19A701250P288	Metal film: 8060 ohms ±1%, 250 VDCW, 1/4 w.
R203 and R204	19A703813P1	Thermal: 5K ohms ±2%; sim to Midwest Components P1H-502.
R205	19A701250P193	Metal film: 909 ohms ±1%, 250 VDCW, 1/4.
R206	19A703813P2	Thermal: 20K ohms ±2%; sim to Midwest Components P1H-203.
R207	19A702931P317	Metal film: 14.7K ohms ±1%, 200 VDCW, 1/8 w.
R208	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R209	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R210	19B800607P122	Metal film: 1.2K ohms ±5%, 1/8 w.
R211	19B800607P181	Metal film: 180 ohms ±5%, 1/8 w.
R212	19B800784P106	Variable: 5K ohms ±20%, 1/2 w.
R213	19B800607P100	Metal film: 10 ohms ±5%, 1/8 w.
R214	19B800607P222	Metal film: 2.2K ohms ±5%, 1/8 w.
XY201	19A702742P1	- - - - - - - - - - SOCKETS - - - - - - - - - - Crystal socket.
Y201	19A703049G1	- - - - - - - - - - CRYSTALS - - - - - - - - - Quartz: 13.200 MHz.
		TRANSMIT AUDIO
C301	19A700235P16	- - - - - - - - - - CAPACITORS - - - - - - - - Ceramic: 18 pF ±5%, 50 VDCW.
C302	19A702250P211	Polyester: 0.47 µF ±5%, 50 VDCW.
C303 and C304	19A703314P10	Electrolytic: 10 µF -10+50%, 50 VDCW; sim to Panasonic LS Series.
C305	19A701534P8	Tantalum: 22 µF ±20%, 16 VDCW.
C306	19A702250P212	Polyester: 0.68 µF ±5%, 50 VDCW.
C307	19A703314P10	Electrolytic: 10 µF -10+50%, 50 VDCW; sim to Panasonic LS Series.
C308	T644ACP268J	Polyester: .0068 µF ±5%, 50 VDCW.
C309	T644ACP210J	Polyester: .0010 µF ±5%, 50 VDCW.
C310 and C311	19A700233P2	Ceramic: 150 pF ±20%, 50 VDCW.
C312	T644ACP315K	Polyester: .015 µF ±10%, 50 VDCW.
C313	T644ACP322K	Polyester: .022 µF ±10%, 50 VDCW.
D301 and D302	19A700028P1	- - - - - - - - - - DIODES - - - - - - - - - - Silicon: 75 mA, 75 PIV; sim to 1N4148.
J301	19A703248P7	- - - - - - - - - - JACKS - - - - - - - - - - Post: Tin Plated, 14 mm length. (Used in G4).
J301	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
J302	19A703248P7	Post: Tin Plated, 14 mm length. (Used in G4).
J302	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
P301	19A701785P3	- - - - - - - - - - PLUGS - - - - - - - - - - Contact, electrical. (Used in G4).
P301	19A701785P13	Contact, electrical. (Used in G16).
Q301	19A700023P2	- - - - - - - - - - TRANSISTORS - - - - - - - - - Silicon, NPN: sim to 2N3904.
R301	H212CRP322C	- - - - - - - - - - RESISTORS - - - - - - - - - - Deposited carbon: 22K ohms ±5%, 1/4 w.
R302	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.
R303	H212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R304	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R305	19A701250P369	Metal film: 51.1K ohms ±1%, 1/4 w.
R306	19A701250P303	Metal film: 10.5K ohms ±1%, 1/4 w.
R307 and R308	19A701250P278	Metal film: 6.34K ohms ±1%, 1/4 w.
R309	19A701250P303	Metal film: 10.5K ohms ±1%, 1/4 w.
R310	19A143400P38	Deposited carbon: 1.3K ohms ± 5%, 1/4 w.
R311	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.
R312	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R313	19A701250P330	Metal film: 20K ohms ±1%, 1/4 w.
R314	19A701250P310	Metal film: 12.4K ohms ±1%, 1/4 w.
R315	19A701250P350	Metal film: 32.4K ohms ±1%, 1/4 w.
R317	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R319	19B800607P273	Metal film: 27K ohms ±5%, 1/8 w.
R320	19B800784P106	Variable: 5K ohms ±20%, 1/2 w.
R321	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
U301	19A700086P4	- - - - - - - - INTEGRATED CIRCUITS - - - - - - - Linear: Dual Op Amp; sim to 4558.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	PART NO.	DESCRIPTION
		CHANNEL GUARD
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C701	19A703314P4	Electrolytic: 47 µF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.
		- - - - - - - - - - DIODES - - - - - - - - - -
D701	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q701	19A700023P2	Silicon, NPN: sim to 2N3904.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C702	19A703314P4	Electrolytic: 47 µF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.
C703	19A703314P10	Electrolytic: 10 µF -10+50%, 50 VDCW; sim to Panasonic LS Series.
C704	T644ACP368J	Polyester: .068 µF ±5%, 50 VDCW.
C705	T644ACP333J	Polyester: .033 µF ±5%, 50 VDCW.
C706	19A701534P2	Tantalum: 0.22 µF ±20%, 35 VDCW.
C707	T644ACP333J	Polyester: .033 µF ±5%, 50 VDCW.
C708	T644ACP368J	Polyester: .068 µF ±5%, 50 VDCW.
C709 and C710	T644ACP310J	Polyester: .010 µF ±5%, 50 VDCW.
C711 and C712	T644ACP333J	Polyester: .033 µF ±5%, 50 VDCW.
C713	19A702250P113	Polyester: 0.1 µF ±10%, 50 VDCW.
C714	19A703314P4	Electrolytic: 47 µF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.
C715 thru C717	T644ACP310J	Polyester: .010 µF ±5%, 50 VDCW.
C718	19A703314P4	Electrolytic: 47 µF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.
C719	19A703314P5	Electrolytic: 22 µF -10+50% tol, 25 VDCW; sim to Panasonic LS Series.
		- - - - - - - - - - DIODES - - - - - - - - - -
D702 thru D704	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q702	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R701	19A702931P358	Metal film: 39.2K ohms ±1%, 200 VDCW, 1/8 w.
R702	19B800607P272	Metal film: 2.7K ohms ±5%, 1/8 w.
R703	19A702931P358	Metal film: 39.2K ohms ±1%, 200 VDCW, 1/8 w.
R704	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R705	19B800607P154	Metal film: 150K ohms ±5%, 1/8 w.
R706	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R707	19A702931P388	Metal film: 80.6K ohms ±1%, 200 VDCW, 1/8 w.
R708	19A702931P358	Metal film: 39.2K ohms ±1%, 200 VDCW, 1/8 w.
R709	19A702931P383	Metal film: 71.5K ohms ±1%, 200 VDCW, 1/8 w.
R710	19A702931P384	Metal film: 73.2K ohms ±1%, 200 VDCW, 1/8 w.
R711	19A702931P383	Metal film: 71.5K ohms ±1%, 200 VDCW, 1/8 w.
R712	19A702931P391	Metal film: 86.6K ohms ±1%, 200 VDCW, 1/8 w.
R713	19B800607P272	Metal film: 2.7K ohms ±5%, 1/8 w.
R714	19B800607P182	Metal film: 1.8K ohms ±5%, 1/8 w.
R715	19B800607P473	Metal film: 47K ohms ±5%, 1/8 w.
R716	19B800607P681	Metal film: 680 ohms ±5%, 1/8 w.
R717	19A702931P325	Metal film: 17.8K ohms ±1%, 200 VDCW, 1/8 w.
R718	19A702931P383	Metal film: 71.5K ohms ±1%, 200 VDCW, 1/8 w.
R719	19A702931P382	Metal film: 69.8K ohms ±1%, 200 VDCW, 1/8 w.
R720	19A702931P383	Metal film: 71.5K ohms ±1%, 200 VDCW, 1/8 w.
R721	19A702931P350	Metal film: 32.4K ohms ±1%, 200 VDCW, 1/8 w.

SYMBOL	PART NO.	DESCRIPTION
R722	19B800607P471	Metal film: 470 ohms ±5%, 1/8 w.
R723	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R724	19B800784P108	Variable: 10K ohms ±20%, 1/2 w.
R725	19A702931P388	Metal film: 80.6K ohms ±1%, 200 VDCW, 1/8 w.
R726	19A702931P358	Metal film: 39.2K ohms ±1%, 200 VDCW, 1/8 w.
R727	19A702931P317	Metal film: 14.7K ohms ±1%, 200 VDCW, 1/8 w.
R728	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R729	19B800607P122	Metal film: 1.2K ohms ±5%, 1/8 w.
R730	19B800607P681	Metal film: 680 ohms ±5%, 1/8 w.
R736	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R737	19A702931P317	Metal film: 14.7K ohms ±1%, 200 VDCW, 1/8 w.
R738	19A702931P321	Metal film: 16.2K ohms ±1%, 200 VDCW, 1/8 w.
R739	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R740	19A702931P305	Metal film: 11K ohms ±1%, 200 VDCW, 1/8 w.
R741	19A702931P322	Metal film: 16.5K ohms ±1%, 200 VDCW, 1/8 w.
R742	19B800607P473	Metal film: 47K ohms ±5%, 1/8 w.
R743	19A702931P284	Metal film: 7320 ohms ±1%, 200 VDCW, 1/8 w.
R744	19A702931P317	Metal film: 14.7K ohms ±1%, 200 VDCW, 1/8 w.
R745	19A702931P151	Metal film: 332 ohms ±1%, 250 VDCW, 1/8 w.
R746	19A702931P309	Metal film: 12.1K ohms ±1%, 200 VDCW, 1/8 w.
R747	19A702931P289	Metal film: 8250 ohms ±1%, 200 VDCW, 1/8 w.
R748	19A702931P358	Metal film: 39.2K ohms ±1%, 200 VDCW, 1/8 w.
		- - - - - - - - - - TEST POINTS - - - - - - - - -
TP703 thru TP705		Part of printed circuit board.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U701 and U702	19A701789P1	Linear: Quad Op Amp; sim to LM324.
U703	19A700086P2	Linear: Dual Op Amp; sim to 1458.
U704	19A700029P44	Digital: Bilateral Switch.
		- - - - - - - - - - CABLES - - - - - - - - - -
W701	H212CRP910C	Deposited carbon: 1 ohm ±5%, 1/4 w.
		SYSTEM CONTROL
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C801	19A700235P15	Ceramic: 15 pF ± 5%, 50 VDCW.
C802	19A703314P5	Electrolytic: 22 µF -10+50% tol, 25 VDCW; sim to Panasonic LS Series.
C803	19A701534P3	Tantalum: 0.47 µF ± 20%, 35 VDCW.
C804	19A701534P4	Tantalum: 1 µF ± 20%, 35 VDCW.
C805	T644ACP310K	Polyester: .010 µF ±10%, 50 VDCW.
C806	19A703314P4	Electrolytic: 47 µF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.
C807	19A702052P3	Ceramic: 470 pF ± 10%, 50 VDCW.
C808	19A700235P9	Ceramic: 4.7 pF ±0.25 pF, 50 VDCW, temp coef N150 PPM/°C.
C809	19A702052P3	Ceramic: 470 pF ± 10%, 50 VDCW.
C810 and C811	19A702052P20	Ceramic: 0.033 µF ± 10%, 50 VDCW.
C812	19A702052P3	Ceramic: 470 pF ± 10%, 50 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
D801 thru D808	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
D813 thru D816	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
D817	19A700025P6	Silicon, zener: 400 mW max; sim to BZX55-C5V1.
D818	19A700025P3	Silicon, zener: 400 mW max; sim to BZX55-C3V3.
D819	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - JACKS - - - - - - - - - -
J806	19A703248P7	Post: Tin Plated, 14 mm length. (Used in G4).
J806	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
J810 thru J812	19A703248P7	Post: Tin Plated, 14 mm length. (Used in G4).
J810 thru J812	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q803	19A700023P2	Silicon, NPN: sim to 2N3904.
Q806 thru Q808	19A700023P2	Silicon, NPN: sim to 2N3904.
Q812	19A700022P2	Silicon, PNP: sim to 2N3906.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R801	19A702931P325	Metal film: 17.8K ohms ±1%, 200 VDCW, 1/8 w.
R803	19B800607P222	Metal film: 2.2K ohms ±5%, 1/8 w.
R804	19B800607P473	Metal film: 47K ohms ±5%, 1/8 w.
R805	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R807	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R808 thru R810	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R811	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R812	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R813	19B800607P471	Metal film: 470 ohms ±5%, 1/8 w.
R816	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R820	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R822	19B800607P122	Metal film: 1.2K ohms ±5%, 1/8 w.
R823	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R826 thru R833	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R836	19B800607P272	Metal film: 2.7K ohms ±5%, 1/8 w.
R837	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R838	19B800607P122	Metal film: 1.2K ohms ±5%, 1/8 w.
R840	19A702931P317	Metal film: 14.7K ohms ±1%, 200 VDCW, 1/8 w.
R841	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R842	19B800607P122	Metal film: 1.2K ohms ±5%, 1/8 w.
R843	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R844	19B800607P471	Metal film: 470 ohms ±5%, 1/8 w.
R853	19B800607P562	Metal film: 5.6K ohms ±5%, 1/8 w.
R854	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R861	19B800607P562	Metal film: 5.6K ohms ±5%, 1/8 w.
R862	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R863	19B800607P471	Metal film: 470 ohms ±5%, 1/8 w.
R864	19B800607P472	Metal film: 4.7K ohms ±5%, 1/8 w.
R866	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U801	19A703244P40	Microcomputer: HNOS, 8-bit. (Used in radios without Dual Priority Scan).
U801	19A703754G4	Microcomputer: HNOS, 8-bit. (Used in radios with Dual Priority Scan).
U802	19A116968P3	Linear: Dual Timer; sim to Signerics SA556N.
U803		Part of Heat sink Assembly 19B801346G1.
U804	19A116180P33	Digital: Hex Inverter/Driver with OC outputs; sim to 7416.
U806	19A704032P1	Digital: 16 x 16 bit RAM; sim to XICOR Part No. X2444P.
		- - - - - - - - - - CABLES - - - - - - - - - -
W801	H212CRP910C	Deposited carbon: 1 ohm ±5%, 1/4 w.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XU801	19A700156P5	Socket, IC: 40 Pins, Tin Plated.
XU806	19A700156P15	Socket, IC: 8 Pins, Tin Plated.
		- - - - - - - - - - CRYSTALS - - - - - - - - -
Y801	19A702511G3	Quartz: 6.000000 MHz.
		SYSTEM
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C901	19A701225P3	Electrolytic: 220 µF, -10+50%, 25 VDCW.
C902	19A703314P4	Electrolytic: 47 µF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.
C903	19A700233P6	Ceramic: 680 pF ±20%, 50 VDCW.
C904 and C905	19A703314P5	Electrolytic: 22 µF -10+50% tol, 25 VDCW; sim to Panasonic LS Series.
C906	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C907 thru C914	19A702052P3	Ceramic: 470 pF ± 10%, 50 VDCW.
C915 and C916	19A702061P99	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
		- - - - - - - - - - DIODES - - - - - - - - - -
D901 and D902	T324ADP1041	Silicon: Rectifier; sim to 1N4004.
		- - - - - - - - - - LEDS - - - - - - - - - -
H902	19A134354P9	Optoelectronic, yellow; sim to Hew. Packard LMP4719. Part of 19A701522G9 & G10.
H903	19A134354P3	Optoelectronic, green; sim to New Packard 5082-4955. Part of 19A701522G9 & G10.
		- - - - - - - - - - JACKS - - - - - - - - - -
J901	19J706214P4	Connector: 4 contacts rated @ 7 amps; sim to Molex 09-67-1042. (Used in G4).
J901	19A116659P185	Connector: 4 contacts rated @ 7 amps; sim to Molex 09-80-1045. (Used in G16).
J903	19J706214P7	Flat wafer: 7 contacts rated @ 7 amps; sim to Molex 09-67-1072. (Used in G4).
J903	19A116659P186	Connector: 7 contacts rated @ 7 amps; sim to Molex 09-80-1075. (Used in G16).
J904	19A703248P7	Post: Tin Plated, 14 mm length. (Used in G4).
J904	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
J905	19A703248P7	Post: Tin Plate, 14 mm length. (Used in G4).
J905	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
J906	19A703248P5	Post: Tin Plated, 21 mm length. (Used in G4).
J906	19A703248P15	Post: Gold Plated, 21 mm length. (Used in G16).
J910	19A116659P184	Connector, printed wiring, 11 contacts; sim to Molex 09-75-1116.
J911	19A116659P183	Connector, printed wiring, 8 contacts; sim to Molex 09-75-1086.
J912	19J706214P4	Connector: 4 contacts rated @ 7 amps; sim to Molex 09-67-1042. (Used in G4).
J912	19A116659P185	Connector: 4 contacts rated @ 7 amps; sim to Molex 09-80-1045. (Used in G16).
J920	19A703248P7	Post: Tin Plated, 14 mm length. (Used in G4).
J920	19A703248P17	Post: Gold Plate, 14 mm length. (Used in G16).
J921	19A703248P7	Post Tin Plated: 14 mm length. (Used in G4).
J921	19A703248P17	Post: Gold Plated, 14 mm length. (Used in G16).
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L901	H343CLP12922	Coil, RF: 1.2 µH ±10%.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P907	19A700102P10	Printed wire: 3 contacts; sim to Molex 09-52-3032.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q901	19A116774P3	Silicon, NPN: sim to 2N5210.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R901	19B800607P561	Metal film: 560 ohms ±5%, 1/8 w.
R902	19B800607P122	Metal film: 1.2K ohms ±5%, 1/8 w.
R904	19A702931P350	Metal film: 32.4K ohms ±1%, 200 VDCW, 1/8 w.
R905	19A702931P358	Metal film: 39.2K ohms ±1%, 200 VDCW, 1/8 w.
R906	19B800607P562	Metal film: 5.6K ohms ±5%, 1/8 w.
R907	19B800607P222	Metal film: 2.2K ohms ±5%, 1/8 w.
R908	19B800607P561	Metal film: 560 ohms ±5%, 1/8 w.
R909	19B800607P471	Metal film: 470 ohms ±5%, 1/8 w.
R910	19B800607P221	Metal film: 220 ohms ±5%, 1/8 w.
R911	H212CRP122C	Deposited carbon: 220 ohms ±5%, 1/4 w.
R912	19B800607P681	Metal film: 680 ohms ±5%, 1/8 w.
R914	19B800607P681	Metal film: 680 ohms ±5%, 1/8 w.
R915	19B800607P562	Metal film: 5.6K ohms ±5%, 1/8 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W901 thru W903	19A700184P1	Jumper.
W904 thru W911	H212CRP910C	Deposited carbon: 1 ohm ±5%, 1/4 w.
		HEAT SINK ASSEMBLY 19B801346G1
U803	19A704970P1	Linear: 5 Volt regulator with Reset Output; sim to SGS L387.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
4	19A700068P1	Insulator, bushing. (Used in G1).
5	19A700115P3	Insulator, plate. (Used in G1).
6	19A702364P208	Machine screw: TORX Drive, M2.5 - 0.45 x 8. (Used in G1).
7	19B800952P1	Support. (Used in G1).
8	19A134717P1	Linear: 5 Volt Regulator; sim to MC7805CT. (Used in G1).
15	19A700033P3	Lockwasher, external tooth: M2.5. (Used in G1).
16	19A700034P3	Hex nut, metric: M2.5 x 0.45. (Used in G1).
17	19A701312P3	Flatwasher, metric: No. 2.5MM. (Used in G1).

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 s tamped on the unit includes all previous revisions. Refer to the Parts List for the descriptions of parts affected by these revisions.

REV. A - SYNTHESIZER/INTERCONNECT BOARD 19D901205G4
To correct parts list. Changed D817, D818, R863 and R864. Deleted D809. Added Q812 and R866.

D817 was 19A700025P3 - Silicon, zener; sim to BZX55-C3V3.
D818 was 19A700025P8 - Silicon, zener; sim to BZX55-C6V8.
R863 was 19B800607P122 - Metal Film: 1.2K ohms ±5% 1/8 w.
R864 was 19B800607P122 - Metal Film: 1.2K ohms ±5% 1/8 w.
D809 was 19A700028P1 - Silicon; sim to Type 1N4148.

REV. A - SYNTHESIZER/INTERCONNECT BOARD 19D901205G16
To correct parts list. Changed R863 and R864. Deleted D809. Added R714, C807, Q812 and R866.

R863 was 19B800607P122 - Metal Film: 1.2K ohms ±5% 1/8 w.
R864 was 19B800607P122 - Metal Film: 1.2K ohms ±5% 1/8 w.
D809 was 19A700028P1 - Silicon; sim to Type 1N4148.

Rev. B - SYNTHESIZER/INTERCONNECT BOARD 19D901205G4 & G16
To improve regulator operation. Added D107.

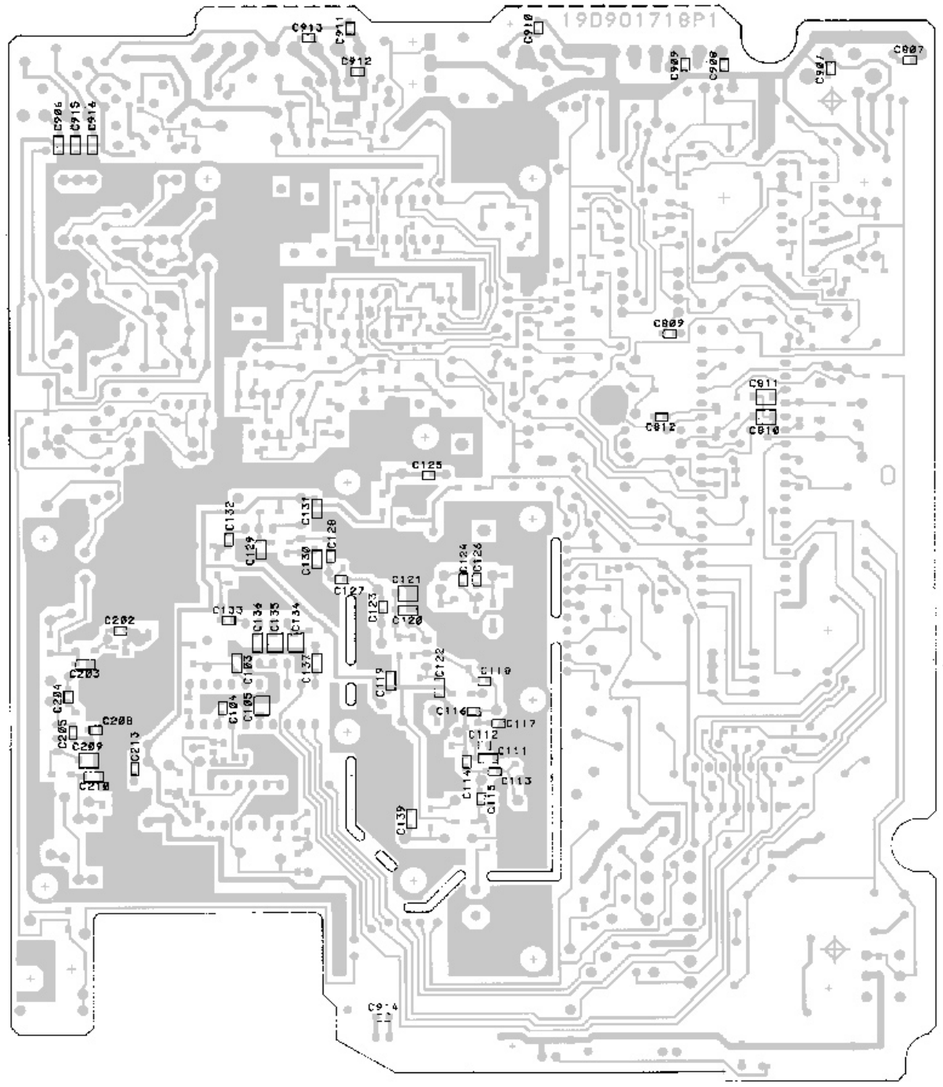
REV. C - SYNTHESIZER/INTERCONNECT BOARD 19D901205G4
To reduce the transmitter audio sensitivity to a nominal 80 mV level. Changed C313 and R302.

C313 was T644ACP310K - Polyester: .010 µF ±10%, 50 VDCW.
R302 was H212CRP356C - Deposited carbon: 56K ohms ±5%.

REV. C - SYNTHESIZER/INTERCONNECT BOARD 19D901205G16
To reduce the transmitter audio sensitivity to a nominal 80 mV level. Changed C313, R302, D817 and D818.

C313 was T644ACRP310k - Polyester: 010 µP ±10%, 50 VDCW.
R302 was H212CRP356C - Deposited carbon: 56K ohms ±5%.
D817 was 19A700025P3 - Silicon, zener; sim to BZX55-C3V3.
D818 was 19A700025P8 - Silicon, zener; sim to BZX55-C6V8.

CHIP CAPACITOR LOCATIONS

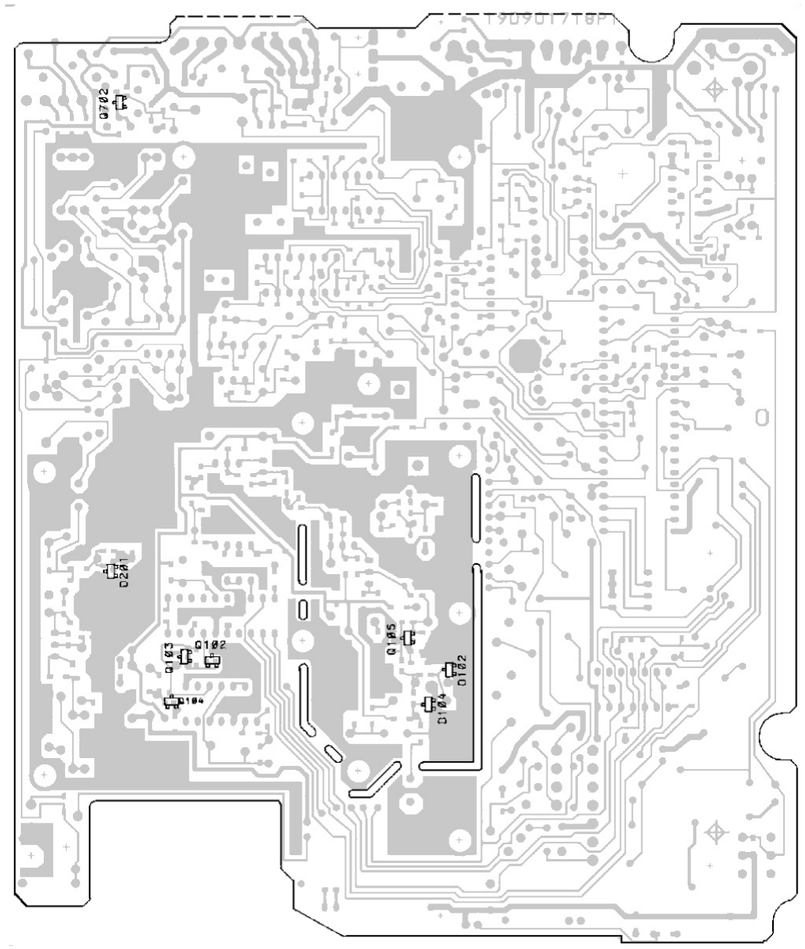


BACK VIEW OF COMPONENT BOARD

(19D901205, Sh. 6, rev. 0)
(19A704836, Sh. 3, Rev. 0)

CHIP COMPONENT LOCATION

CHIP TRANSISTOR DIODE LOCATIONS

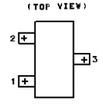


BACK VIEW OF COMPONENT BOARD

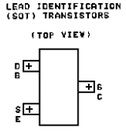
(19D901205, Sh. 7, Rev. 0)
(19A704836, Sh. 3 & 4)

CAUTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES

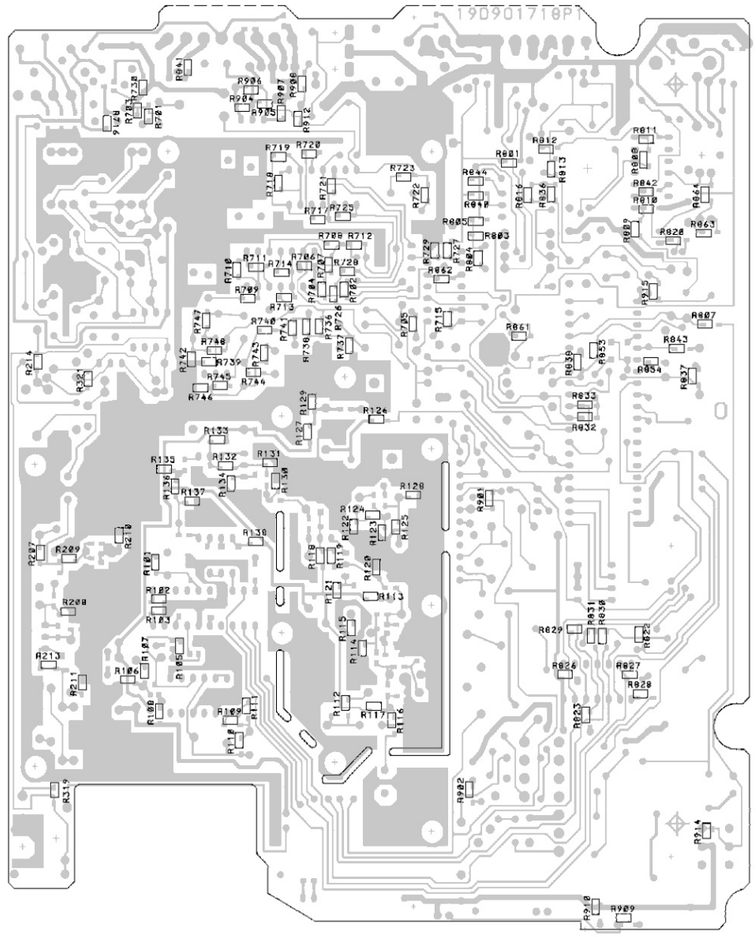
LEAD IDENTIFICATION FOR (SOT) DIODES



LEAD IDENTIFICATION FOR (SOT) TRANSISTORS



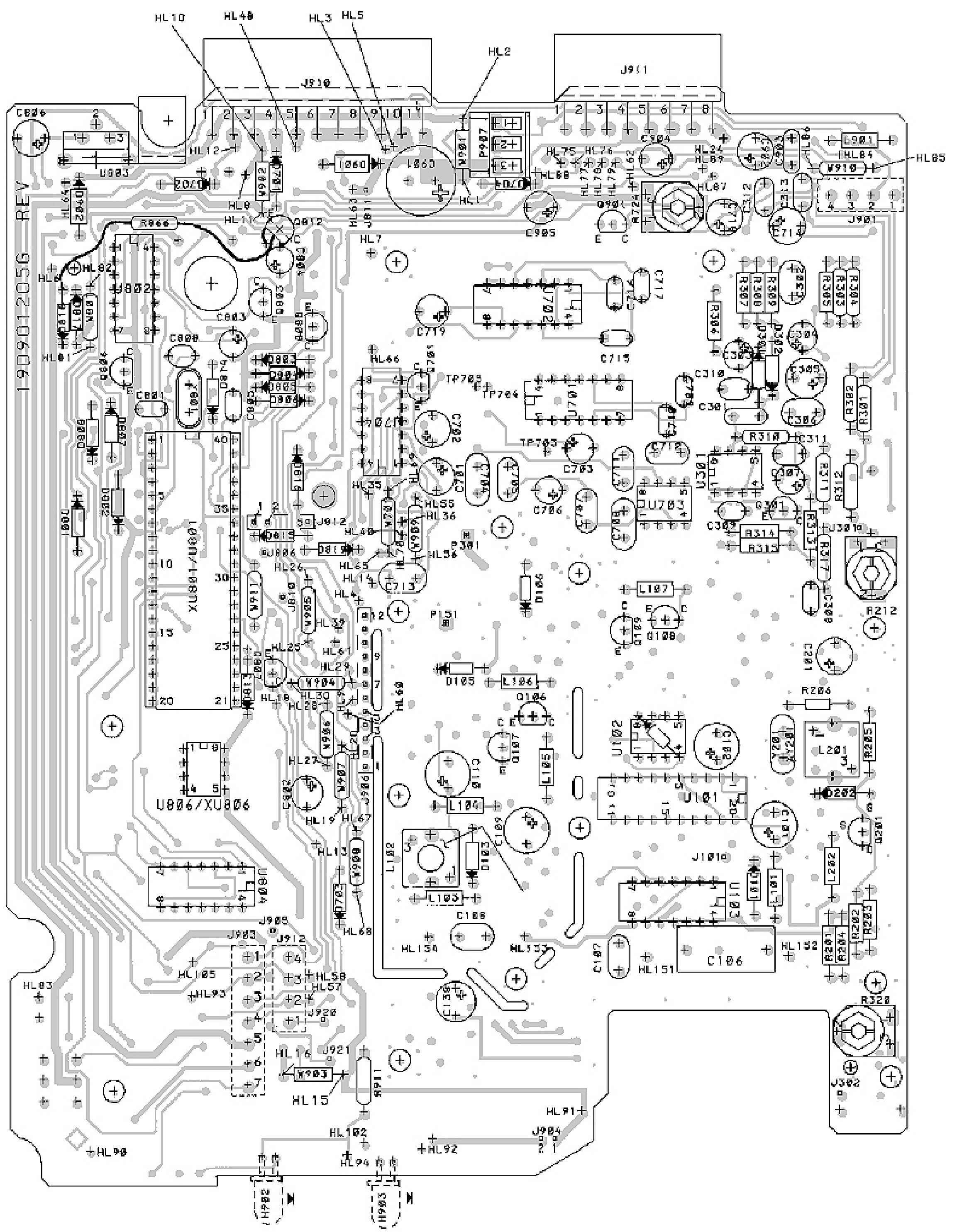
CHIP RESISTOR LOCATIONS



BACK VIEW OF COMPONENT BOARD

(19D901205, Sh. 8, Rev. 0)
(19A704836, Sh. 3 & 4)

COMPONENT SIDE



(19D901205, Sh. 5, Rev. 4)
(19A704836, Sh. 1, Rev. 1)

SYNTHESIZER/INTERCONNECT BOARD
LEGEND INFORMATION

TABLE OF CONTENTS

(19D90179, Sh. 1, Rev. 3)

DEVICE	5V PIN NO	GND PIN NO	8.5V CONT PIN NO	8.5V SYN PIN NO
U103		1,7,10,12,13		14
U301		4	8	
U701		11	4	
U702		11	4	
U703		4	8	
U704		7,10,12	14	
U804	14	7		

SPARE IC FUNCTION

DEVICE	INPUT PIN NO	OUTPUT PIN NO	CONTROL PIN NO
U103-A	1	2	13
U103-D	10	11	12
U704-D	10	11	12

ALL CHIP RESISTORS ARE 1/8 WATT.
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k, OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER u, n OR, p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m, n OR u.

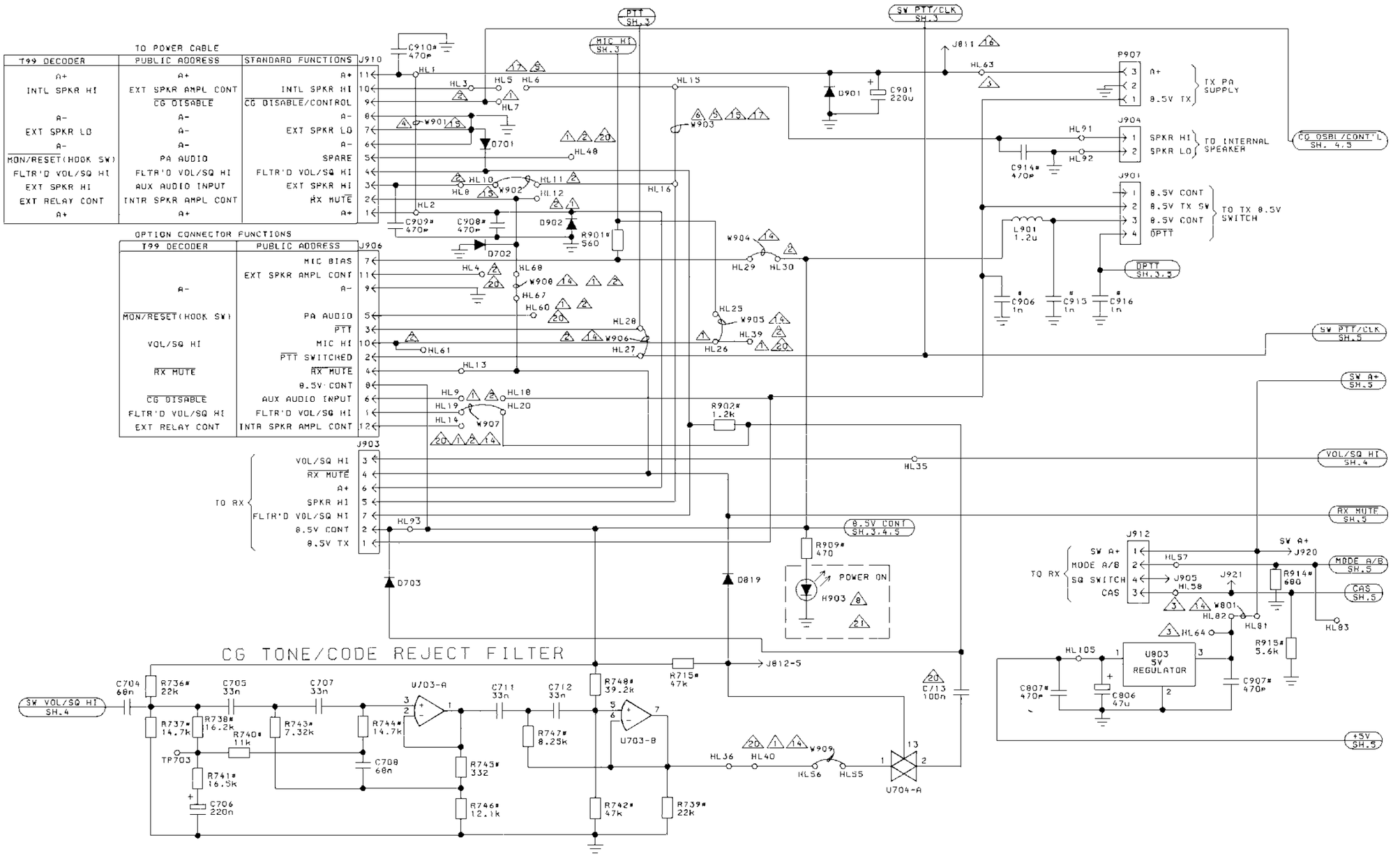
MODEL NO.	DESCRIPTION	REV. LTR
19D90120G64	440-470 MHZ WB	C
19D901205G16	440-470 MHZ WB (GOLD CONTACTS)	C

NOTES:

1. FOR T99 DECODER, ADD JUMPERS HL7 TO HL9, HL12 TO HL14, HL39 TO HL40, HL48 TO HL60, HL19 TO HL55. OMIT JUMPERS W905, W909, W908, W907.
2. FOR PUBLIC ADDRESS OPTION, ADD JUMPERS HL60 TO HL48, HL3 TO HL4, HL8 TO HL9, HL12 TO HL14. OMIT JUMPERS W902, W906, W904, W908. MIC WITHOUT PREAMP REQUIRES HL61 TO HL62 JUMPER AND DELETE W905.
3. FOR CHANNEL MEMORY (200 MA MAXIMUM CONTINOUS BATTERY DRAIN) WHEN USING UV ERASABLE U801 (8749) ADD INSULATED JUMPER HL63 TO HL64 AND OMIT W801.
4. FOR IGNITION SWITCH CONTROL, REMOVE JUMPER W901.
5. FOR SPEAKER MUTE FUNCTION WITH THE UNIVERAL TONE CABLE OPTION WITHOUT PA OPTION, OMIT JUMPER W903, ADD JUMPER HL5 TO HL6 (NOT COMPATIBLE WITH INTERNAL/EXTERNAL SPEAKER). WITH PA OPTION, OMIT W903 ONLY.
6. FOR EXTERNAL SPEAKER OPTION, REMOVE JUMPER W903 TO DISABLE THE INTERNAL SPEAKER.
8. PRESENT FOR UNITS WITHOUT MULTI-FREQ DISPLAY.
10. FOR 2.5 PPM OPERATION, REPLACE Y201 WITH 19A703049G7.
11. # DENOTES CHIP COMPONENTS (EXAMPLE R1#) WHICH ARE LOCATED ON SOLDER SIDE OF PWB.
12. ⏚ DENOTES A- COMMON TO CHASSIS.
13. TO INVERT DIGITAL CHANNEL GUARD DECODE POLARITY, REMOVE W701 AND ADD A JUMPER FROM HL66 TO HL65.
14. THE FOLLOWING JUMPERS ARE IMPLEMENTED USING ONE OHM RESISTORS. W701, W801, W904, W905, W906, W907, W908, W909, W910 AND W911. CLIP BOTH LEADS TO REMOVE JUMPER.
15. THE FOLLOWING JUMPERS ARE IMPLEMENTED USING ZERO OHM "RESISTORS", W901, W902, AND W903. CLIP BOTH LEADS TO REMOVE JUMPER.
16. FOR CHANNEL MEMORY (15 MA CONTINUOUS BATTERY DRAIN) ONLY WITH MASKED VERSION (8049) OF U801 CONNECT A901, A902, A903-J4 TO J810 AND A901 A902, A903-J3 TO J811 AND REMOVE W911.
17. FOR INTERNAL/EXTERNAL SPEAKER OPTION WITH SWITCH (EXTERNAL TO RADIO) DELETE W903 AND ADD JUMPER HL5 TO HL6.
18. FOR UNITS WITH T99 OPTION OR PUBLIC ADDRESS OPTION WITH MULTI-FREQ DISPLAY, REMOVE R911 AND R8.
19. FOR PSLM OPTION C106 AND C108 ARE REPLACED WITH NEW PARTS SUPPLIED IN PSLM MOD KIT FOR IMPROVED SYNTHESIZER SWITCHING PERFORMANCE.
20. FOR PHOENIX INTERNATIONAL, ADD JUMPERS HL24 TO HL60, HL40 TO HL39, HL4 TO R302, HL14 TO HL48, REMOVE W905, D918 AND C713.
21. PART OF HARDWARE KIT 19A701522.

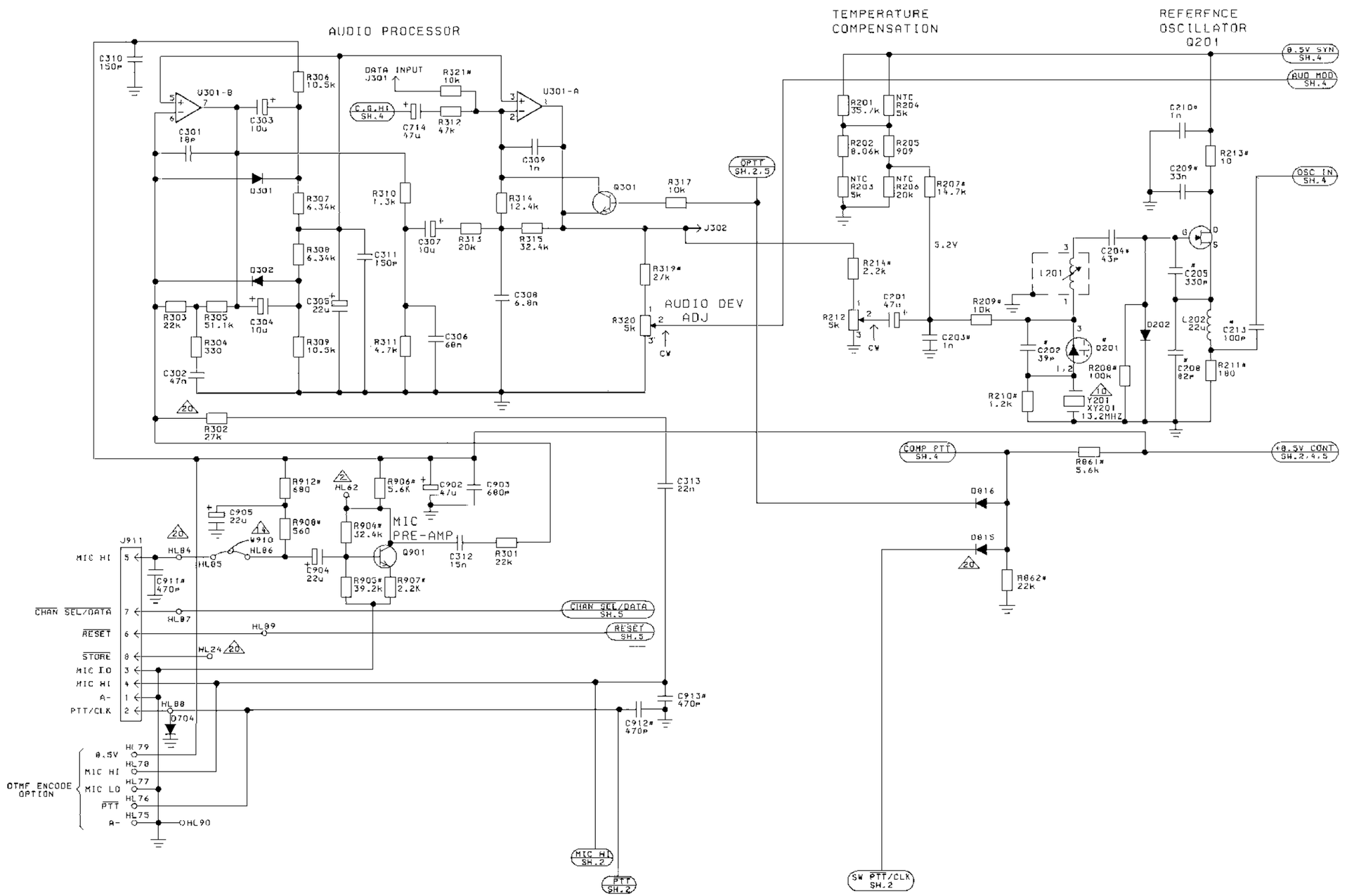
SYNTHESIZER/INTERCONNECTION DIAGRAM INTERFACE AND CHANNEL GUARD FILTER

(19D901719, Sh. 2, Rev. 0)



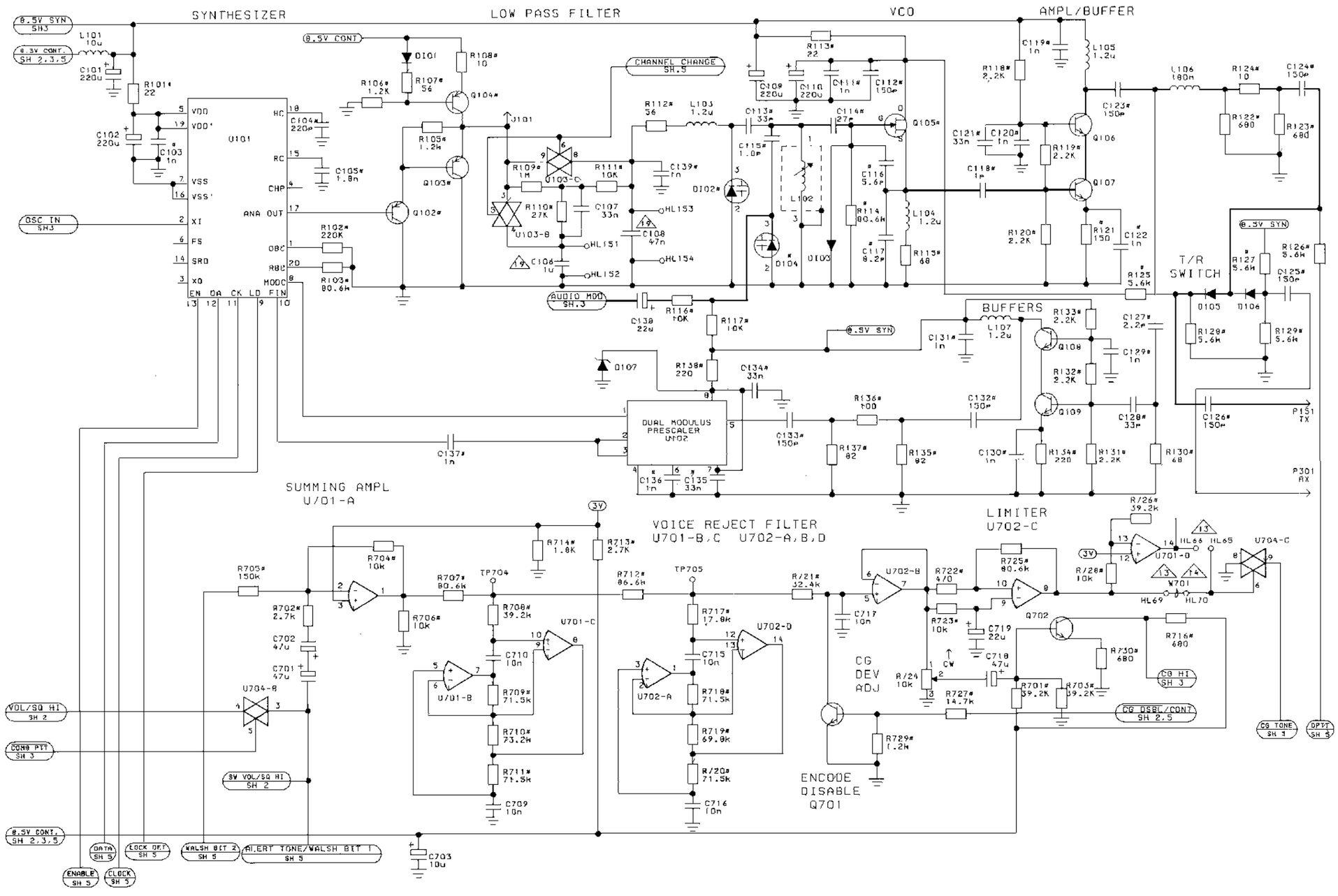
SYNTHESIZER/INTERCONNECTION BOARD
TRANSMITTER AUDIO AND REFERENCE OSCILLATOR

(19D901719, Sh. 3, Rev. 1)



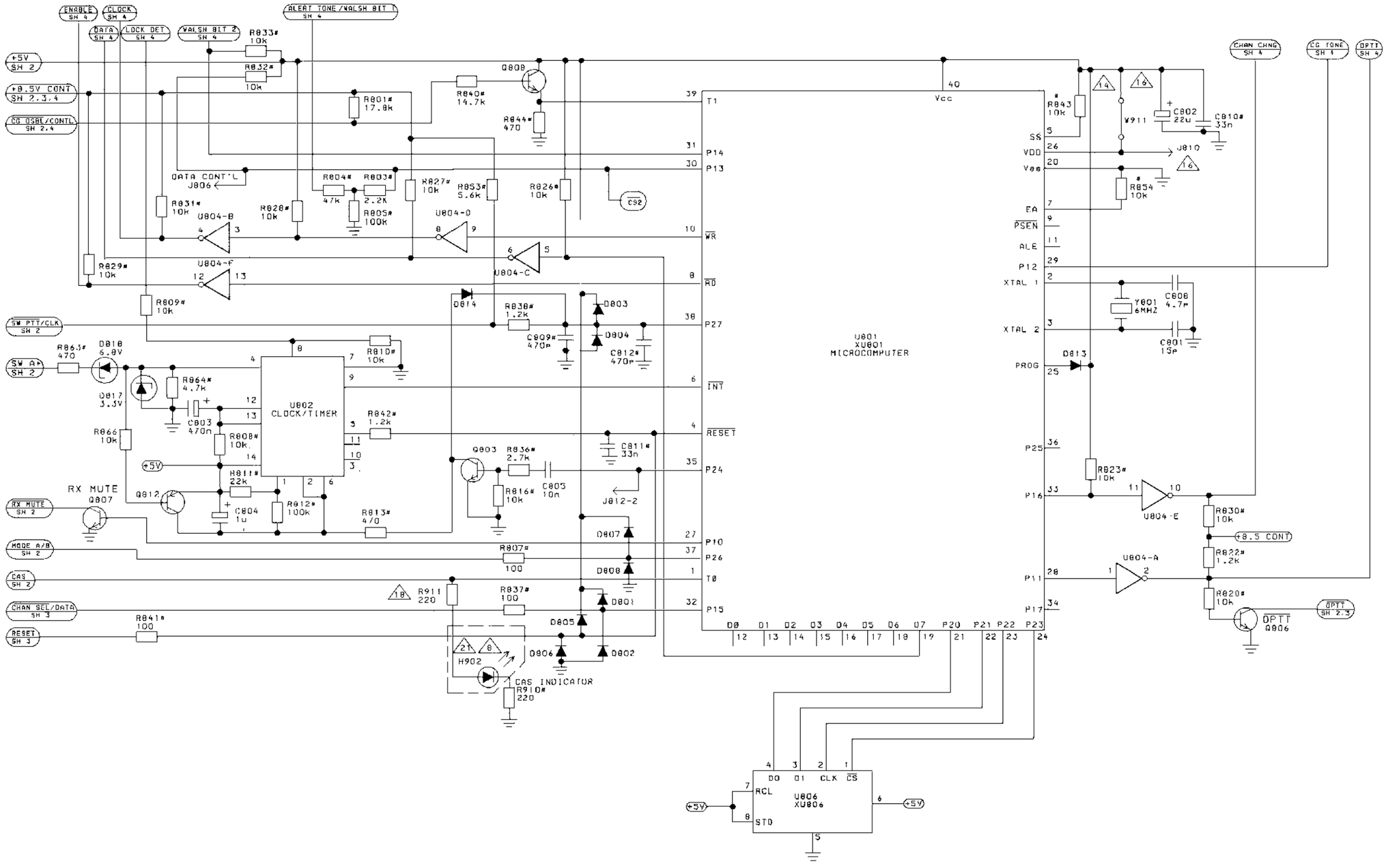
SYNTHESIZER/INTERCONNECTION BOARD
FREQUENCY SYNTHESIZER AND CHANNEL GUARD

(19D901719, Sh. 4, Rev. 1)



SYNTHESIZER/INTERCONNECTION BOARD
SYSTEM CONTROL

(19D901719, Sh. 5, Rev. 1)


ENABLE SH 4
CLOCK SH 4
DATA SH 4
LOCK DET SH 4
WALSH BIT 2 SH 4
ALERT TONE/WALSH BIT 1 SH 4
+5V SH 2
+8.5V CONT SH 2,3,4
CG OSBL/CONTL SH 2,4
SW PTT/CLK SH 2
SW A+ SH 2
RX MUTE SH 2
MODE A/B SH 2
CAS SH 2
CHAN SEL/DATA SH 3
RESET SH 3
CHAN CHNG SH 4
CG TONE SH 4
OPTT SH 4
+8.5 CONT
OPTT SH 2,3
DATA CONT'L J806
CAS INDICATOR
U801 XU801 MICROCOMPUTER
U802 CLOCK/TIMER
U804-A
U804-B
U804-C
U804-D
U804-E
U804-F
U806 XU806
H902
Y801 6MHZ
J810
J812-2
Q807
Q808
Q812
Q803
Q806
D801
D802
D803
D804
D805
D806
D807
D808
D813
D814
T1
P14
P13
WR
RD
P27
INT
RESET
P24
P10
P26
T0
P15
P12
XTAL 1
XTAL 2
PROG
P25
P16
P11
P17
EA
PSEN
ALE
SS
VDD
Vss
Vcc
DO
DI
CLK
CS
RCL
STD