MAINTENANCE MANUAL
136-174 MHz SYNTHESIZER/INTERCONNECT BOARD
19D900961G1, 3 WIDEBAND

TABLE OF CONTENTS

DESCRIPTION

The Synthesizer/Interconnect board for the Phoenix-SX 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 VCO frequency range is approximately 136-174 MHz for transmit, 181-219 MHz for receive.

NOTE

In earlier model radios, the frequency synthesizer was used in the 450-470 MHz range.

The microcomputer also controls the generation of Channel Guard tones and codes and provides the carrier control timer in the transmit mode.

It 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 (EE PROM). The EE PROM stores the binary data for the transmit and receive frequencies, Channel Guard tones and codes, and the CCT delay on a per channel basis. A block diagram of the Synthesizer/Interconnect board is shown in Figure 1.

NOTE

The EE PROM provides the user with the capability to reprogram the EE PROM to meet changing individual system requirements.

Programming for the EE PROM is accomplished by connecting the PROM Programmer to the rear radio connector. The PROM can then be read or programmed as desired.

Programming information for the EE PROM 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 channel select switch S1. When pressed, A- is applied to microcomputer U801-32 (P15 = port 1 bit 5), causing the microcomputer to advance through the selected channels at the rate of 3 Hz until the switch is released. If the switch is pressed for less than 650 ms the channel selected is advanced by one. After the channel displayed reaches the maximum number of channels programmed in the radio (8 maximum), it will automatically roll over the next channel displayed will be 1.

When the channel select switch is released, the microcomputer applies +5 VDC to the EE PROM through Q802. The frequency bit code corresponding to the channel displayed is then loaded into the synthesizer. If the channel select switch is pressed while the transmit-

ter is keyed, the microcomputer will unkey the transmitter until the channel select switch is released.

CHANNEL BUSY INDICATOR

Channel Busy Indicator H2 is controlled by the CAS line and is turned on when the selected channel is busy. Hole HL94 is provided to allow the option indicator to be controlled by an alternate signal.

MODE A/B

Mode A/B switch S601 doubles the channel selection capability of the radio. S601 is located on the transmit/receive board.

Eight address locations are used in the EE PROM for each transmit and receive frequency. The display is capable of displaying channels one through eight. By operating the A/B pushbutton switch the user can select two independent transmit and receive frequencies per channel displayed, providing the radio with up to 16 independent transmit and receive frequencies.

Mode B is indicated by an illuminated decimal point on the 7 segment display. 8.5V CONT is applied to the Tx/Rx board.

The Mode A/B switch 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 may be programmed for the repeater frequency (repeated path) while channel 1 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.

In single frequency radios the MODE A/B switch is not provided. When the condition exists R914 holds the MODE A/B input to the microcomputer low, preventing it from selecting any other channel. In two frequency radios with MODE A/B switch, the level of the MODE A/B input is controlled by the MODE A/B switch located on the transmit/receive board.

MICROCOMPUTER CONTROL SYSTEM

The microcomputer responds to the manually initiated functions of Push-to-talk, Channel Select, 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 be turned off before the synthesizer frequency is changed. After this delay the microcomputer turns on PROM power switch Q802, applying +5V to EE PROM U805. 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 +8.5VDC, forward biasing transmit select diode D104, permitting the synthesizer generated RF frequency to pass through to the exciter through P151. 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. Q803 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 Y101, synthesizer IC U101, bilateral switch U102, low pass filter, VCO -Q103, and -Q108, buffers -Q104, -Q107, and high speed dual modulus counter U103.

Reference Oscillator

The reference oscillator consists of Y101, a junction FET Q101, varicap D101, tuned coil L101, 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 R101 thru R106, provides a temperature compensated voltage to varicap D101 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 D108 produces a negative DC level at the gate of FET Q101 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 L101 sets the frequency of the oscillator. Modulation voltage for the reference oscillator is adjusted by R316 in the audio processor and applied to varicap D101 through C101 and R109. R316 adjusts the deviation. Refer to the service section for adjustment procedures.

The synthesizer 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 varicaps D106 and D109 vary in accordance with the applied error voltage thereby resetting the VCO to the correct frequency. Capacitor C116 is a holding capacitor to store the 'hold' voltage for the phase detector/sample and hold circuit. C117 is a ramp capacitor which also is part of the sample and hold circuit. The value of C117 determines the rate of charge of the ramp.

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

Acquisition and Low Pass Filter

The output of the synthesizer is applied through buffer Q102 too the low pass filter. The low pass filter consisting of R118-R120, and C119-C121 eliminates undesired pulses on the VCO error control line to provide a constant DC level to frequency adjusting varicaps D106 and D109.

When a channel change pulse is received bilateral switch U102 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 136-219 MHz. The frequencies for VHF are 136-174 MHz in transmit and 181-219 MHz in receive. At UHF the transmit frequencies are 150-156.66 MHz with receive frequencies of 165-171.666 MHz. The divided down reference frequencies are 4.1666 kHz (UHF) and 5 kHz (VHF). A simplified diagram of the VCO is shown in Figure 2. It consists of Q103, Q108, L104, L103, L111, D106, D107, and D109 and associated circuitry. VCO frequency is controlled by an error control voltage from the synthesizer and varicaps D106, D107 and D109. Frequency range centering is provided by L104. Audio modulation is provided by the audio processor and applied to the VCO through C122.

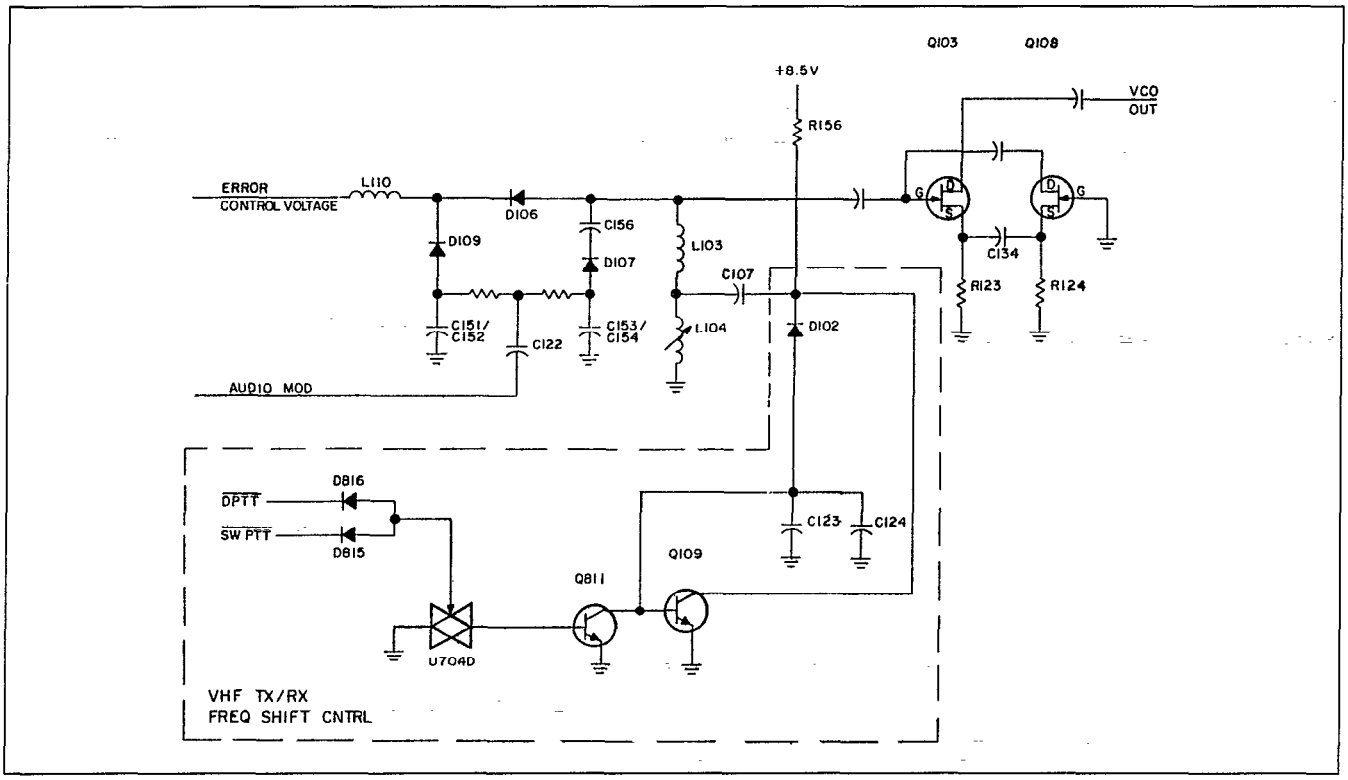

Figure 1 - VCO Simplified Diagram

The output of the VCO is taken from the drain of Q103 and applied to RF output buffers Q104 and Q105. These buffers provide drive for receiver injection, transmitter exciter, and feedback buffers Q106 and Q107.

A transmit/receive PIN diode switch, D104 and D105, directs the RF output to the transmitter or receiver. The switch is controlled by the DPTT signal from the microcomputer. When DPTT is high, D104 conducts and RF is fed to the transmitter and to the receiver when DPTT is low allowing D105 to conduct.

Dual Modulus Counter

The VCO frequency is fed back to dual modulus counter, U103, through buffers Q107 and Q106. 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 for radios operating in the 450-470 MHz band and 5.0 kHz when operating in the 136-174 MHz band.

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.

VHF Transmit/Receive Frequency Shift

In VHF radios the VCO frequency is shifted approximately 45 MHz between the transmit and receive modes. The frequency shift is controlled by the PTT circuits. In the transmit mode the VCO operates between 136-174 MHz, while in the receive mode it operates between 181-219 MHz. The Tx/Rx frequency shift circuit is comprised of bilateral switch U704D, Q811, Q109, and diode switch D102. This circuit is operable in VHF radios only and is disabled by removing cable W802 connected between H21 and H22.

In the receive mode the PTT circuits are inactive. U704D is on, Q8911 is off, and Q109 is on. Diode switch D102 is forward biased connecting capacitors C123 and C124 across tunable coil L104. These two capacitors provide an AC short across L104, electrically removing it from the circuit and shifting the VCO operating range to 181-219 MHz.

In the transmit mode the PTT lines are low. U704D is off, Q811 is on, and Q109 is off. Diode switch D102 is reverse biased, electrically disconnecting the AC shorting capacitors (C124 and C123) from across tunable coil L104. This lowers the VCO operating frequency to the 136-174 MHz range.

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.

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 J301B and 4 dB by U301A.

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 C313 and R302 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, R 313 and R314 to a second operational amplifier U307A.

The Channel Guard tone and data inputs are applied to U301A-2. The CG tone (or data) 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 J302 to the transmitter. R316 and R320 are output level adjustment controls to 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) or a continuous digital coded system (CDCSS) Tone frequencies range from 71.9 Hz to 210.7Hz. There are 83 standard programmable digital codes. The Channel Guard tone frequencies and digital codes are software programmable. Both tone frequencies and digital codes may be used simultaneously. These codes and frequencies are listed in the Programmers Manual.

The microcomputer selects the assigned code/tone information from the EE PROM memory for each channel, transmit and receive, and generates the Channel Guard signal. This signal is applied as Walsh Bit 1 and 2 to summing amplifier U701A. These two bits are summed together an filtered to provide a smooth sine wave for tone Channel Guard. For CDCSS Channel Guard units, walsh bit 2 is used to generate squarewaves.

The switched volume/squelch Hi signal to the summing amplifier is controlled by bilateral switch U704B. In the encode mode COMB 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 or digital 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, $\overline{\text{COMB DPTT}}$ is high. U704B is turned on the 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. This turns on bilateral 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/SER 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 line is pulled high (8.5V), the microcomputer does not sense any changes. It is buffered by protection diode D810. 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, STE tone in Digital 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, if it was off hook it will revert to noise squelch operation. STE operates only on the tone the radio is programmed to receive and the microphone is off-hook, STE will not be active. CDCSS STE works regardless of the code.

DATA POLARITY INVERSION

In some instances it is necessary to invert the polarity of the digital Channel Guard signal to enhance system compatibility. Inverted polarity normally results in a wrong code or one that cannot be used. When this occurs, restrap jumper cable W701 connected between HL70 and HL69 to HL70 and HL66.

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, 1 kHz tone is sounded until the microphone is unkeyed. The CCT is set for 1 minute.

CHANNEL MEMORY

In radios without Dual Priority Scan using a 19A703244P5 microcomputer, an additional 5-Volt regulator (U2) on display board A901 supplies the channel memory. The Synthesizer/Interconnect board is modified by connecting A901-J3 to J811, A901-J4 to J810, and removing R802 and jumper W911. These modifications provide a continuous channel memory supply with only 15 milliamperes battery drain.

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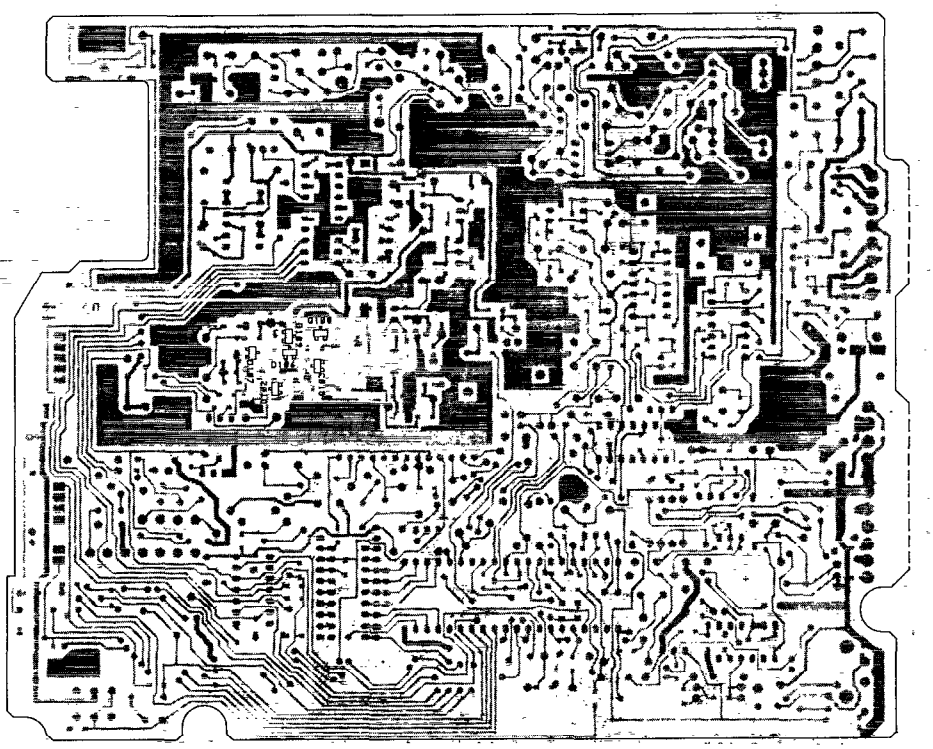
Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg, Virginia 24502

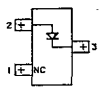
Printed in U.S.A.



(19D900961, Sh. 3, Rev. 3)
(19A703226, Sh. 2, Rev. 5)

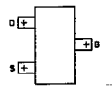
LEAD IDENTIFICATION FOR (SOT) DIODES

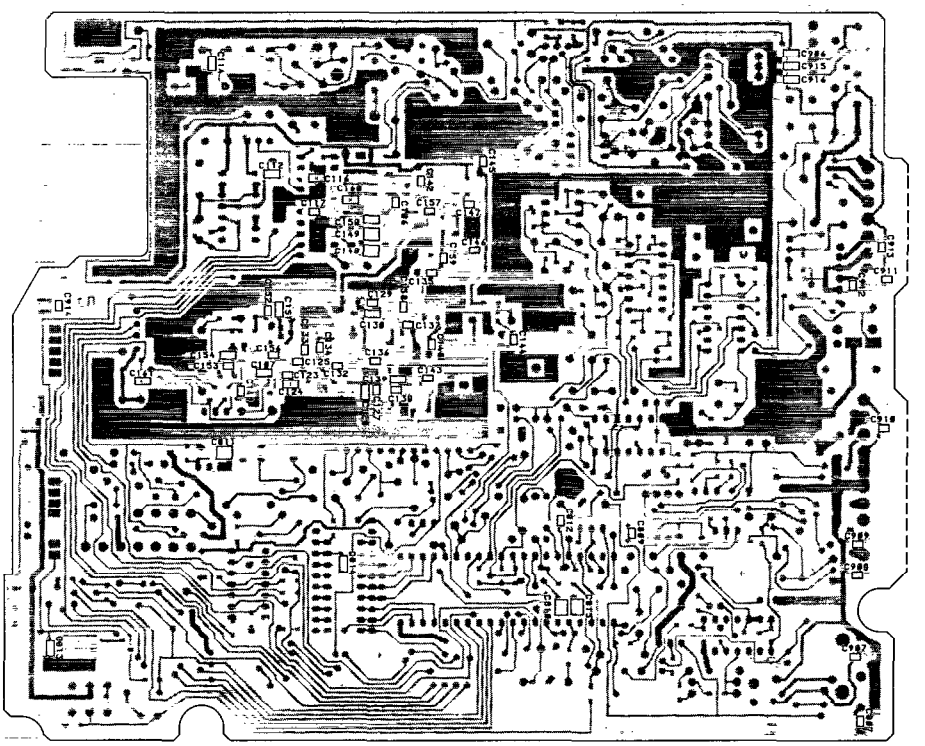
(TOP VIEW)



LEAD IDENTIFICATION FOR (SOT) TRANSISTORS

(TOP VIEW)

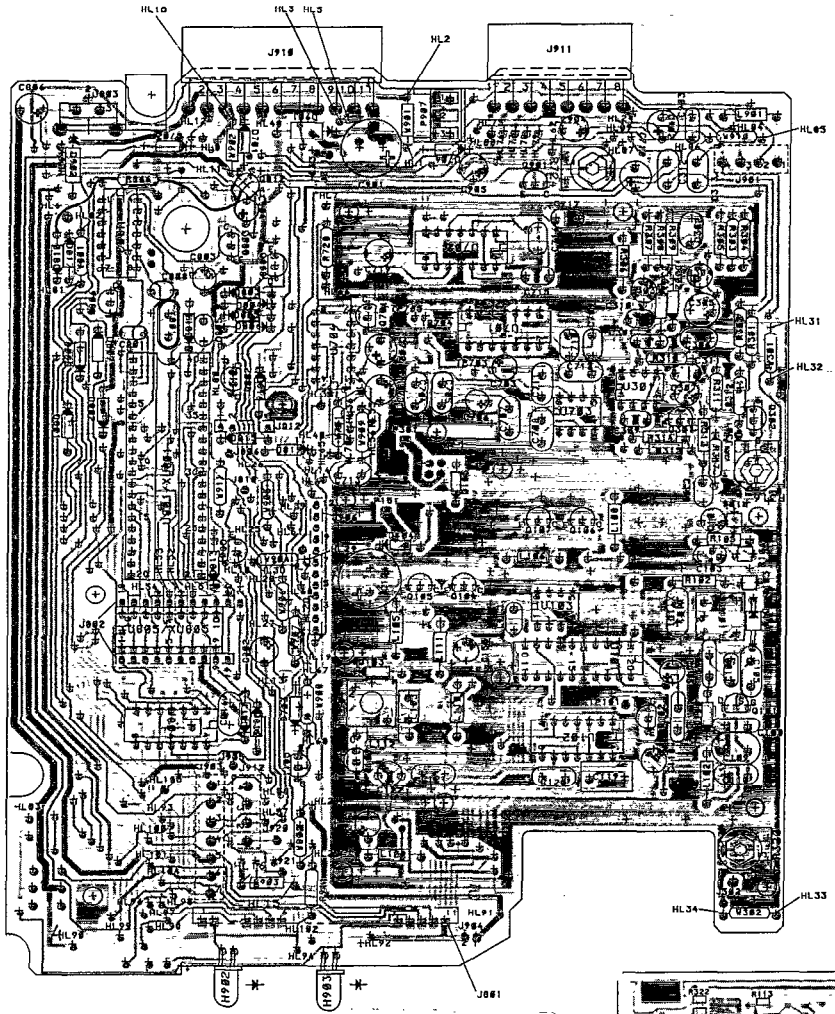




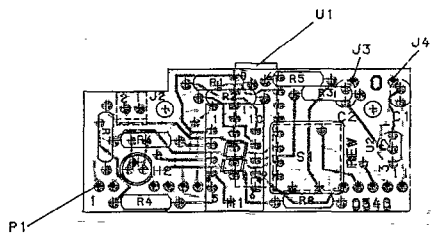
BACK VIEW OF COMPONENT BOARD

(19D900961, Sh. 2, Rev. 10)
(19A703226, Sh. 2, Rev. 5)

WIDEBAND SYNTHESIZER/INTERCONNECT BOARD



DISPLAY BOARD



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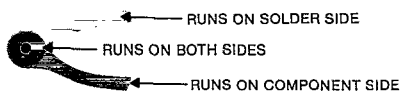
(19A703382, Sh. 1, Rev. 0)
(19A703382, Sh. 2, Rev. 0)

CAUTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES



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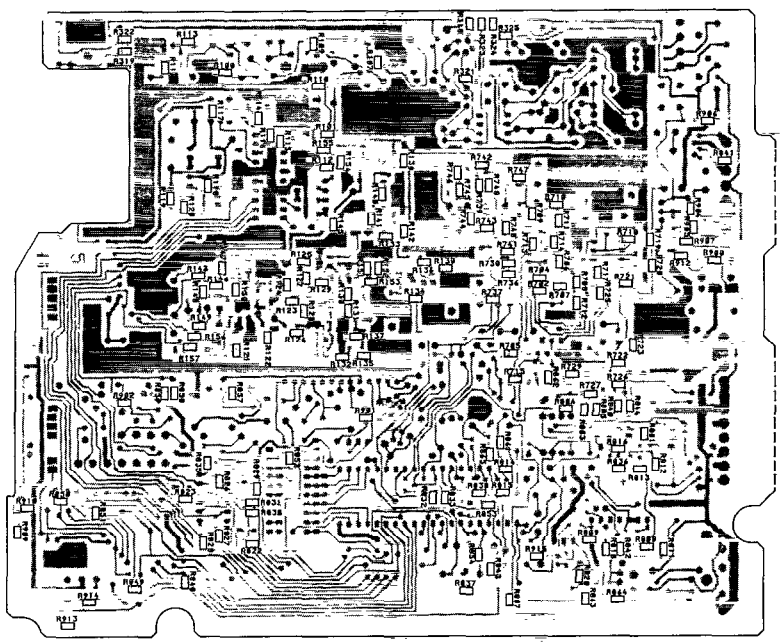
(19A703226, Sh. 1, Rev. 5)
(19A703226, Sh. 2, Rev. 5)



WIDEBAND SYNTHESIZER/INTERCONNECT BOARD

(19D900961, Sh. 4, Rev. 11)
(19A703226, Sh. 2, Rev. 5)

SYNTHESIZER/INTERCONNECT BOARD LEGEND INFORMATION

(19D900964, Sh. 1, Rev. 20)

TABLE OF CONTENTS

△COMPONENT IDENTIFICATION		
	GP1 & GP4	GP3 & GP6
PART	150-174 MHZ 450-470 MHZ	136-153 MHZ
C125	150P	27P

DEVICE	5V PIN NO	8.5V CONT PIN NO	8.5V SYN PIN NO	GND PIN NO
U102			14	7
U301		8		4
U701		4		11,12,13
U702		4		11
U703		8		4
U704		14		7
U804	14			7

SPARE IC FUNCTION

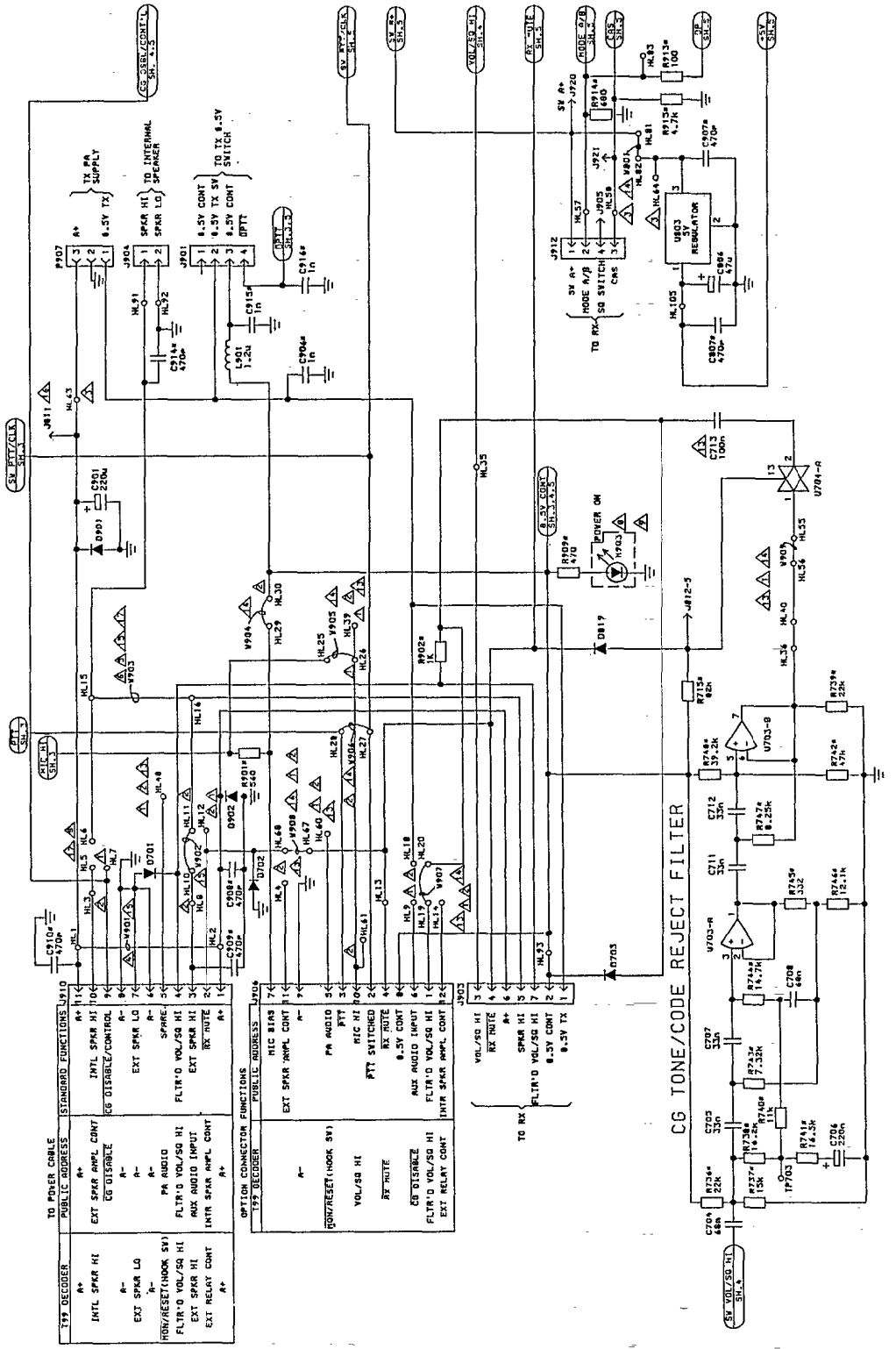
DEVICE	INPUT PIN NO	OUTPUT PIN NO
U701-D	12,13	14

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.	REV. LETTER
19D900961G1	T
19D900961G3	N
19D900961G4	C
19D900961G4	D
19D901054G1	

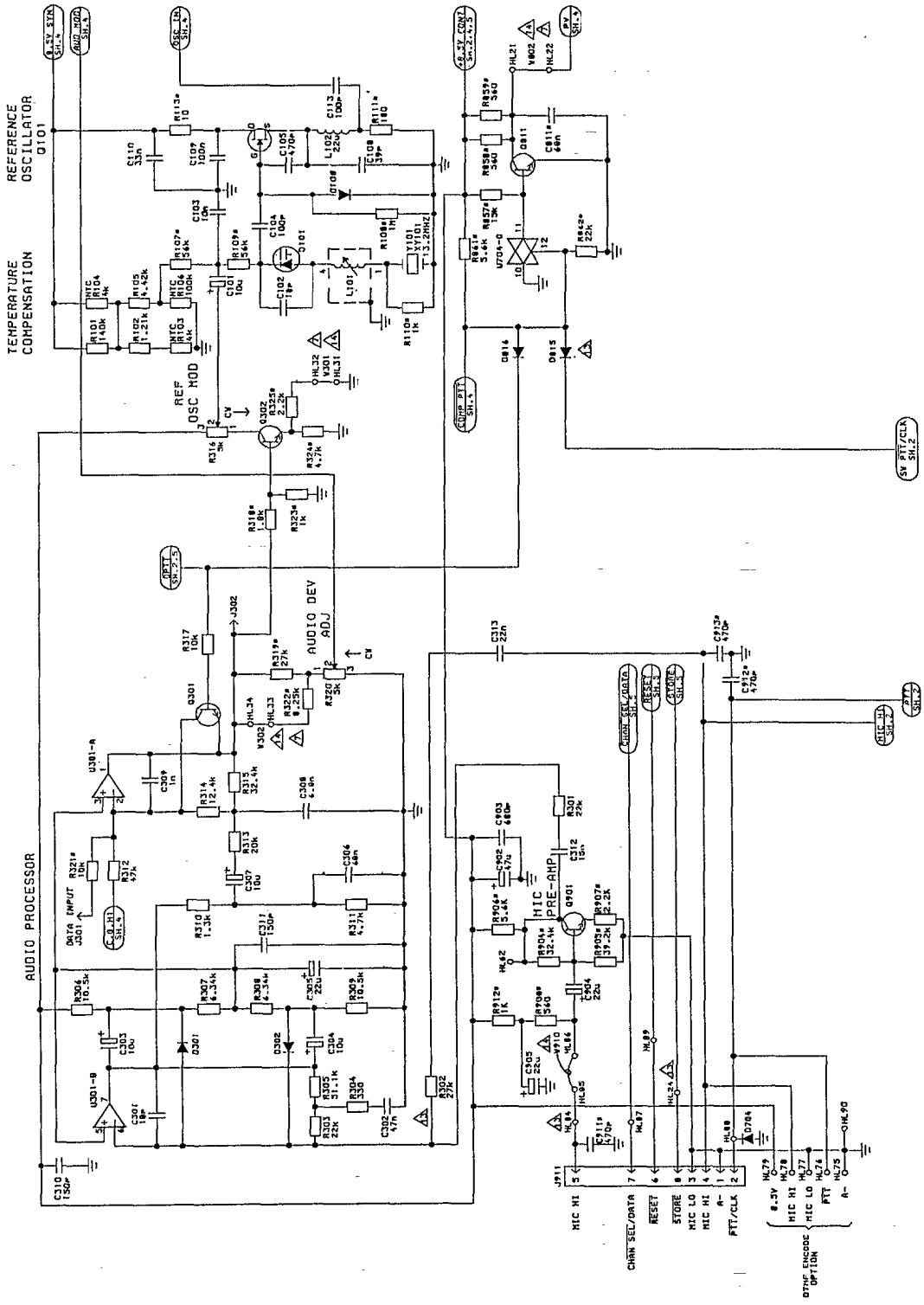
NOTES:

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.
7. CUT OUT W301, W302 AND W802 FOR UHF.
8. PRESENT FOR UNITS WITHOUT MULTI-FREQ DISPLAY.
9. PART OF KIT PL19A701522.
10. PWB HAS PROVISION FOR MOUNTING COMPONENTS SHOWN DASHED.
11. * DENOTES CHIP COMPONENTS (EXAMPLE R1*), WHICH ARE LOCATED ON SOLDER SIDE OF PWB.
12. DENOTES ⏚ COMMON TO CHASSIS.
13. FOR PHOENIX INTERNATIONAL, ADD JUMPERS HL24 TO HL60, HL40 TO HL39, HL4 TO R302, HL14 TO HL48. REMOVE W905, D815 AND C713.
14. THE FOLLOWING JUMPERS ARE IMPLEMETED USING ONE OHM RESISTORS. W301, W302, W701, W801, W802, 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. WHEN T99 OPTION OR PUBLIC ADDRESS OPTION ARE PRESENT WITH MULTI-FREQ DISPLAY, REMOVE R911 AND R8.



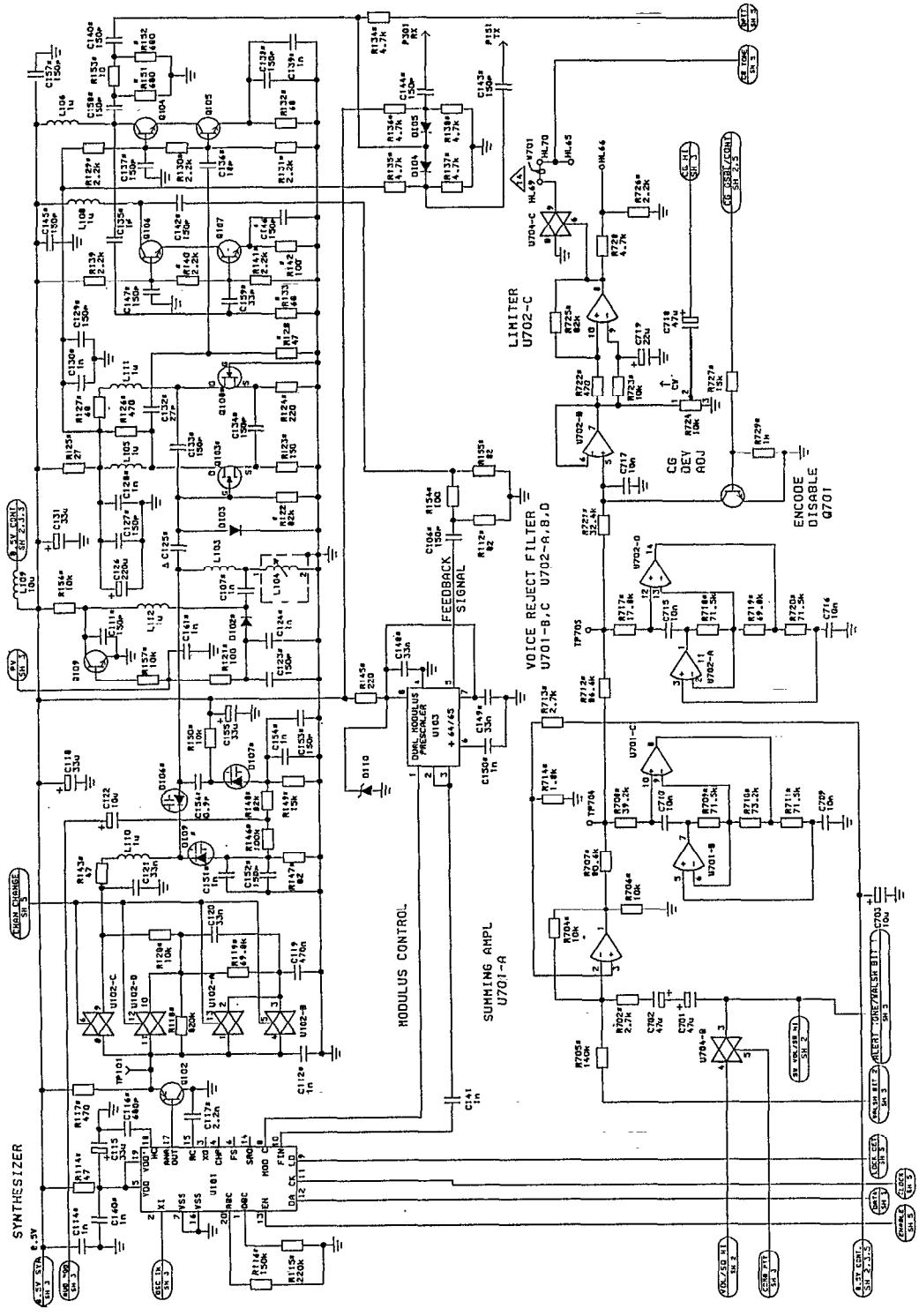
SYNTHESIZER/INTERCONNECTION DIAGRAM INTERFACE AND CHANNEL GUARD FILTER

(19D900964, Sh. 2, Rev. 8)



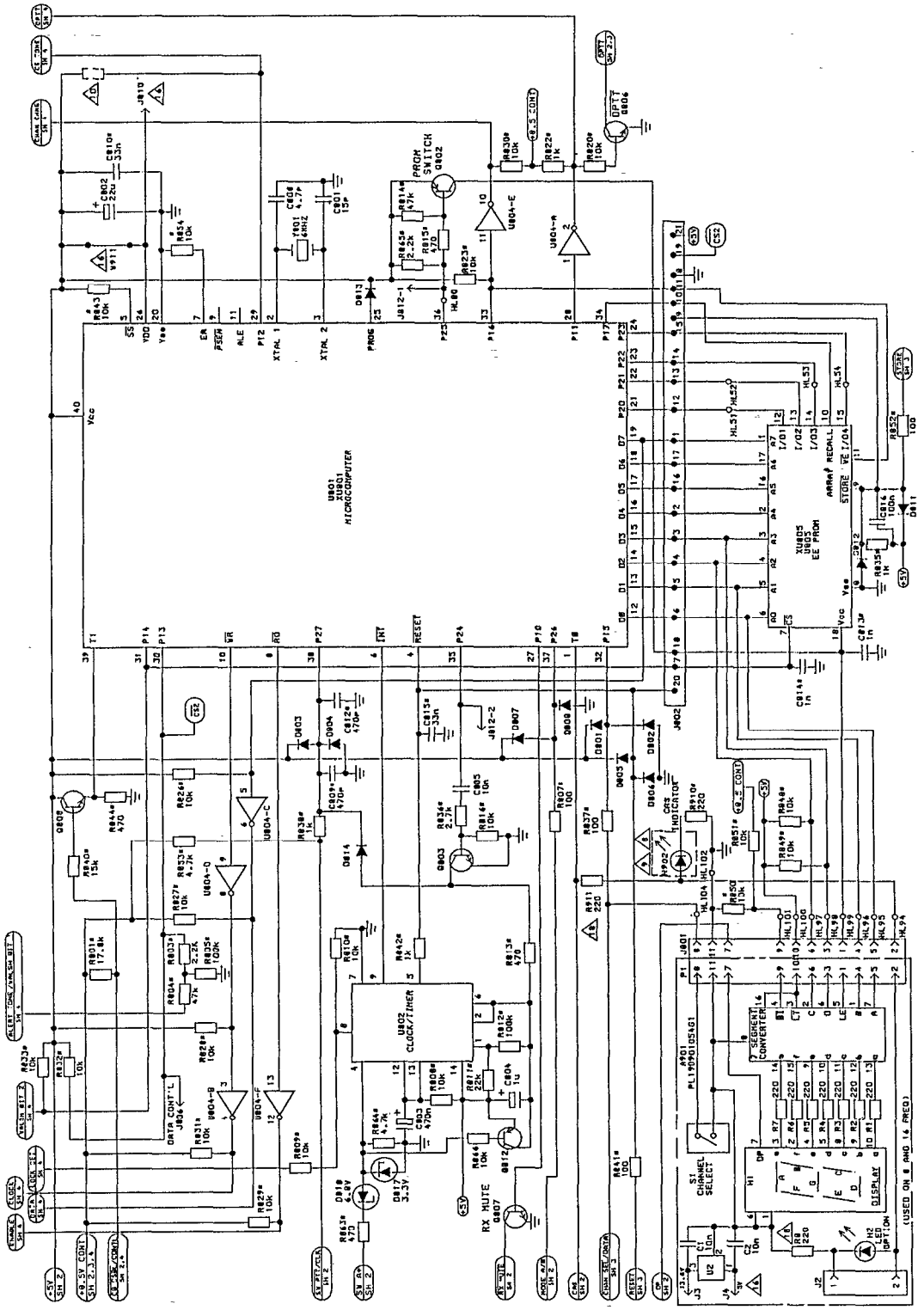
SYNTHESIZER/INTERCONNECT BOARD TRANSMITTER AUDIO AND REFERENCE OSCILLATOR

(19D900964, Sh. 3, Rev. 9)



SYNTHESIZER/INTERCONNECT BOARD FREQUENCY SYNTHESIZER AND CHANNEL GUARD

(19D900964, Sh. 4, Rev. 16)



SYNTHESIZER/INTERCONNECT BOARD
SYSTEM CONTROL

(19D900964, Sh. 5, Rev. 14)

DISPLAY BOARD
19D901054G1

SYMBOL	PART NO.	DESCRIPTION
		---------- CAPACITORS ---------
C1 and C2	19A700121P6	Ceramic: 0.1 µF ±20%, 50 VDCW.
		---------- LEDS ----------
H1	19A134712P5	Display, LED: Green, 7-Segment; sim to HOSP 3603.
H2	19A134354P9	Optoelectronic: Yellow; sim to HP HLMP4719.
		---------- JACKS ----------
J2	19A700072P28	Printed wire: 2 contacts rated @ 2.5 amps; sim to Molex 22-27-2021.
J3 and J4	19A703248P1	Post: Tin Plated, 10 mm length.
		---------- PLUGS ----------
P1	19A703248P3	Post: Tin Plated, 16 mm length.
		---------- RESISTORS ----------
R1 thru R8	H212CRP122C	Deposited carbon: 220 ohms ±5%, 1/4 w.
		---------- SWITCHES ---------
S1	19A701324P2	Push: sim to IEE/Schadow Series MDP Module.
	19C850665P1	Pushbutton.
		-------- INTEGRATED CIRCUITS -------
U1	19A700029P204	Digital: BCD-To-Seven Segment Latch/Decoder/Driver; sim to 4511B.
U2	19J706031P1	Linear: POSITIVE VOLTAGE REGULATOR.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

WIDEBAND SYNTHESIZER/INTERCONNECT BOARD
19D900961G1 150-174 MHz
19D900961G3 136-153 MHz
19D900961G4 150-174 MHz (GOLD CONTACTS)
19D900961G6 136-153 MHZ (GOLD CONTACTS)

SYMBOL	PART NO.	DESCRIPTION
		NOTE:WHEN ORDERING REPLACEMENT BOARDS, CARE SHOULD BE TAKEN TO ASSURE BOARDS WITH GOLD CONTACTS ARE NOT INTERMIXED WITH BOARDS HAVING TIN CONTACTS. REPLACE BOARDS ONLY WITH ONE HAVING THE SAME GROUP NUMBER AS THE ORIGINAL.
A901		Synthesizer/Interconnect Board
		---------- CAPACITORS ---------
C101	19A703314P10	Electrolytic:10 µF -10+50%, 50 VDCW; sim to Panasonic LS Series.
C102	19A700235P16	Ceramic:18 pF ±5%, 50 VDCW.
C103	T644ACP310K	Polyester:.010 µF ±10%, 50 VDCW.
C104	19A700235P25	Ceramic:100 pF ±5%, 50 VDCW.
C105	5490008P43	Silver mica:470 pF ± 5%, 300 VDCW, sim. to Electro Motive Type DM-15.
C106	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C107	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C108	19A700235P20	Ceramic:39 pF ±5%, 50 VDCW.
C109	19A702250P113	Polyester:0.1 µF ±10%, 50 VDCW.
C110	T644ACP333K	Polyester:.033 µF ±10%, 50 VDCW.
C111	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C112	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C113	19A700235P25	Ceramic:100 pF ±5%, 50 VDCW.
C114	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C115	19A703314P3	Electrolytic:33 µF -10+50% tol, 15 VDCW; sim to Panasonic LS Series.
C116	19A702061P95	Ceramic:680 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C117	19A702052P7	Ceramic:2200 pF ± 10%, 50 VDCW.
C118	19A703314P3	Electrolytic:33 µF -10+50% tol, 15 VDCW; sim to Panasonic LS Series.
C119	19A700004P6	Metallized polyester:0.47 µF ±10%, 63 VDCW.
C120 and C121	T644ACP333K	Polyester:.033 µF ±10%, 50 VDCW.
C122	19A703314P10	Electrolytic:10 µF -10+50%, 50 VDCW; sim to Panasonic LS Series.
C123	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C124	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C125	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C. (Used in G1 and G4).
C125	19A702061P33	Ceramic:27 pF ±5%, 50 VDCW, temp coef 0 + or - 30 PPM/°C. (Used in G3 and G6).
C126	19A134730P2	Electrolytic:220 µF +100 -10%, 25 VDCW.
C127	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C128	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C129	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C130	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C131	19A703314P3	Electrolytic:33 µF -10+50% tol, 15 VDCW; sim to Panasonic LS Series.
C132	19A702061P33	Ceramic:27 pF ±5%, 50 VDCW, temp coef 0 + or - 30 PPM/°C.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NO.	DESCRIPTION
C133 and C134	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 and ±30 PPM/°C.
C135	19A702061P901	Ceramic:1 pF ±0.25 pF, 50 VDCW, temp coef 0 ±250 PPM/°C.
C136	19A702061P25	Ceramic:18 pF ±5%, 50 VDCW, temp coef 0 + or - 30 PPM/°C.
C137 and C138	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C139	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C140	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C141	T644ACP210K	Polyester:.0010 µF ±10%, 50 VDCW.
C142 thru C147	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 thru±30 PPM/°C.
C148 and C149	19A702052P20	Ceramic:0.033 µF ± 10%, 50 VDCW.
C150 and C151	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C152 and C153	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C154	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C155	19A703314P3	Electrolytic:33 µF -10+50% tol, 15 VDCW; sim to Panasonic LS Series.
C156	19A702236P5	Ceramic:0.9 pF ±.1 pF, 50 VDCW, 0 + or -30 PPM/°C.
C157 and C158	19A702061P65	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 and ±30 PPM/°C.
C159	19A702061P37	Ceramic:33 pF ±5%, 50 VDCW, temp coef 0 + or - 30 PPM/°C.
C160 and C161	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
		---------- DIODES ----------
D101	19A700073P1	Silicon; sim to BB409.
D102	19A702525P2	Silicon, PIN:sim to MMBV3401.
D103	19A700047P2	Silicon, 100 mW, continuous dissipation; sim to DO-15.
D104 and D105	19A116925P1	Silicon.
D106 and D107	19A700085P2	Silicon; sim to MMBV109.
D108	19A700028P1	Silicon:75 mA, 75 PIV; sim to 1N4148.
D109	19A700085P2	Silicon; sim to MMBV109.
D110	19A700025P6	Silicon, zener:400 mW max; sim to BZX55-C5V1.
		---------- INDUCTORS ----------
L101	19A703311P3	Coil, RF:sim to TOKO American KRNA-K6571BA.
L102	19A700024P29	Coil, RF:22 µH ± 10%.
L103	19B800891P2	Coil, RF Choke:sim to Paul Smith SK-890-1. (Used in G1 and G4).
L103	19B800937P3	Coil, RF:0.033 nH; sim to Paul Smith SK-887-1. (Used in G3 and G6).
L104	19B800962P111	Coil, RF, variable:sim to Paul Smith SK-767-1. (Used in G1 and G4).
L104	19B800962P112	Coil, RF:sim to Paul Smith SK767-1. (Used in G3 and G6).
L105 and L106	H343CLP10922	Coil, RF:1.0 µH ±10%.
L108	H343CLP10922	Coil, RF:1.0 µH ±10%.
L109	H343CLP10022	Coil, Fixed:10 µH ± 10%.
L110 thru L112	H343CLP10922	Coil, RF:1.0 µH ±10%.
		---------- PLUGS ----------
P151	19A701785P3	Contact, electrical. (Used in G1 and G3).
P151	19A701785P13	Contact, electrical. (Used in G4 and G6).
		---------- TRANSISTORS ---------
Q101	19A700060P3	N-Type, field effect; sim to J310.
Q102	19A700022P2	Silicon, PNP:sim to 2N3906.
Q103	19A702524P2	N-Type, field effect; sim to MMBFU310.
Q104 thru Q107	19A701808P2	Silicon, NPN; sim to MPS 6595.
Q108	19A702524P2	N-Type, field effect; sim to MMBFU310.
Q109	19A700023P2	Silicon, NPN:sim to 2N3904.
		---------- RESISTORS ----------
R101	19A702931P415	Metal film:140K ohms ±1%, 200 VDCW, 1/8 w.
R102	19A701250P209	Metal film:1.21K ohms ±1%, 1/4 w.
R103 and R104	19A702161P1	Thermistor:3300 ohms ±5%, sim to Philips 2322-642-12332.
R105	19A701250P263	Metal film:4.42K ohms ±1%, 1/4 w.
R106	19A702161P2	Composition:12K ohms ±5%, 1/4 w.
R107	19B800607P563	Metal film:56K ohms ±5%, 1/8 w.
R108	19B800607P105	Metal film:1M ohms ±5%, 1/8 w.
R109	19B800607P563	Metal film:56K ohms ±5%, 1/8 w.
R110	19B800607P102	Metal film:1K ohms ±5%, 1/8 w.
R111	19B800607P181	Metal film:180 ohms ±5%, 1/8 w.
R112	19B800607P820	Metal film:82 ohms ±5%, 1/8 w.
R113	19B800607P100	Metal film:10 ohms ±5%, 1/8 w.
R114	19B800607P470	Metal film:47 ohms ±5%, 1/8 w.
R115	19B800607P224	Metal film:220K ohms ±5%, 1/8 w.
R116	19B800607P154	Metal film:150K ohms ± 5%, 1/8 w.
R117	19B800607P471	Metal film:470 ohms ±5%, 1/8 w.
R118	19B800607P824	Metal film:820K ohms ±5%, 1/8 w.
R119	19A702931P382	Metal film:69.8K ohms ±1%, 200 VDCW, 1/8 w.
R120	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R121	19B800607P101	Metal film:100 ohms ±5%, 1/8 w.
R122	19B800607P823	Metal film:82K ohms ±5%, 1/8 w.
R123	19B800607P151	Metal film:150 ohms ±5%, 1/8 w.
R124	19B800607P221	Metal film:220 ohms ±5%, 1/8 w.
R125	19B800607P270	Metal film:27 ohms ±5%, 1/8 w.
R126	19B800607P471	Metal film:470 ohms ±5%, 1/8 w.
R127	19B800607P680	Metal film:68 ohms ±5%, 1/8 w.
R128	19B800607P470	Metal film:47 ohms ±5%, 1/8 w.
R129 thru R131	19B800607P222	Metal film:2.2K ohms ±5%, 1/8 w.
R132 and R133	19B800607P680	Metal film:68 ohms ±5%, 1/8 w.
R134 thru R138	19B800607P472	Metal film:4.7K ohms ±5%, 1/8 w.
R139 thru R141	19B800607P222	Metal film:2.2K ohms ±5%, 1/8 w.
R142	19B800607P101	Metal film:100 ohms ±5%, 1/8 w.
R143	19B800607P470	Metal film:47 ohms ±5%, 1/8 w.
R145	19B800607P221	Metal film:220 ohms ±5%, 1/8 w.
R146	19B800607P104	Metal film:100K ohms ±5%, 1/8 w.

SYMBOL	PART NO.	DESCRIPTION
R147	19B800607P820	Metal film:82 ohms ±5%, 1/8 w.
R148	19B800607P823	Metal film:82K ohms ±5%, 1/8 w.
R149	19B800607P153	Metal film:15K ohms ±5%, 1/8 w.
R150	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R151 and R152	19B800607P681	Metal film:680 ohms ±5%, 1/8 w.
R153	19B800607P100	Metal film:10 ohms ±5%, 1/8 w.
R154	19B800607P101	Metal film:100 ohms ±5%, 1/8 w.
R155	19B800607P820	Metal film:82 ohms ±5%, 1/8 w.
R156 and R157	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
		----------TEST POINTS---------
TP101		##MAKE FROM ITEM 19/32
		--------INTEGRATED CIRCUITS-------
U101	19B800902P4	Digital:Synthesizer, CMOS Serial Input.
U102	19A700029P44	Digital:BILATERAL SWITCH.
U103	19A703091P1	Digital:/64, /65 Prescaler; sim to MC12017P.
		----------SOCKETS----------
XY101		##MAKE FROM ITEM 22
		----------CRYSTALS ---------
Y101		Quartz:13.200 MHz. 19A703049G1
		---------MISCELLANEOUS---------
1	19B800957G1	##XTAL (Used in G1).
		----------CAPACITORS ---------
C301	19A700235P16	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.
		----------DIODES ----------
D301 and D302	19A700028P1	Silicon:75 mA, 75 PIV; sim to 1N4148.
		----------JACKS----------
J301 and J302		##MAKE FROM ITEM 19/32
		----------PLUGS----------
P301	19A701785P3	Contact, electrical. (Used in G1 and G3).
P301	19A701785P13	Contact, electrical. (Used in G4 and G6).
		----------TRANSISTORS---------
Q301 and Q302	19A700023P2	Silicon, NPN:sim to 2N3904.

SYMBOL	PART NO.	DESCRIPTION
		----------RESISTORS----------
R301	H212CRP322C	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.
R316	19B800784P106	Variable:5K ohms ±20%, 1/2 w.
R317	H212CRP310C	Deposited carbon:10K ohms ±5%, 1/4 w.
R318	19B800607P182	Metal film:1.8K ohms ±5%, 1/8 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.
R322	19A702931P289	Metal film:8250 ohms ±1%, 200 VDCW, 1/8 w.
R323	19B800607P102	Metal film:1K ohms ±5%, 1/8 w.
R324	19B800607P472	Metal film:4.7K ohms ±5%, 1/8 w.
R325	19B800607P222	Metal film:2.2K ohms ±5%, 1/8 w.
		--------INTEGRATED CIRCUITS-------
U301	19A700086P4	Linear:Dual Op Amp; sim to 4558.
		----------CABLES ----------
W301 and W302	H212CRP910C	Deposited carbon:1 ohm ±5%, 1/4 w.
		----------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.

SYMBOL	PART NO.	DESCRIPTION
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.
		----------RESISTORS----------
R702	19B800607P272	Metal film:2.7K ohms ±5%, 1/8 w.
R704	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R705	19A702931P415	Metal film:140K ohms ±1%, 200 VDCW, 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	19B800607P823	Metal film:82K 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.
R722	19B800607P471	Metal film:470 ohms ±5%, 1/8 w.
R723	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R724	19B800784P106	Variable:10K ohms ±20%, 1/2 w.
R725	19B800607P823	Metal film:82K ohms ±5%, 1/8 w.
R726	19B800607P222	Metal film:2.2K ohms ±5%, 1/8 w.
R727	19B800607P153	Metal film:15K ohms ±5%, 1/8 w.
R728	H212CRP247C	Deposited carbon:4.7K ohms ±5%, 1/4 w.
R729	19B800607P102	Metal film:1K ohms ±5%, 1/8 w.
R736	19B800607P223	Metal film:22K ohms ±5%, 1/8 w.
R737	19B800607P153	Metal film:15K ohms ±5%, 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 PWB
		--------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.
		----------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	19A702052P20	Ceramic:0.033 µF ± 10%, 50 VDCW.
C811	19A702052P24	Ceramic:0.068 µF ± 10%, 50 VDCW.
C812	19A702052P3	Ceramic:470 pF ± 10%, 50 VDCW.
C813 and C814	19A702061P99	Ceramic:1000 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C815	19A702052P20	Ceramic:0.033 µF ± 10%, 50 VDCW.
C816	T644ACP410K	Polyester:0.1 µF ±10%, 50 VDCW. (Used in G1, G3 and G4).
		----------DIODES----------
D801 thru D806	19A700028P1	Silicon:75 mA, 75 PIV; sim to 1N4148.
D811 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.
		----------JACKS----------
J801		##CALLED FOR AT HIGHER LEVEL
J802		##MAKE FROM ITEM 19/32
J806		##MAKE FROM ITEM 19/32
J810 thru J812		##MAKE FROM ITEM 19/32
		----------TRANSISTORS---------
Q802	19A700022P2	Silicon, PNP:sim to 2N3906.
Q803	19A700023P2	Silicon, NPN:sim to 2N3904.
Q806 thru Q808	19A700023P2	Silicon, NPN:sim to 2N3904.
Q811	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.

SYMBOL	PART NO.	DESCRIPTION
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.
R814	19B800607P473	Metal film:47K ohms ±5%, 1/8 w.
R815	19B800607P471	Metal film:470 ohms ±5%, 1/8 w.
R818	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R820	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R822	19B800607P102	Metal film:1K 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.
R835	19B800607P102	Metal film:1K 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	19B800607P102	Metal film:1K ohms ±5%, 1/8 w.
R840	19B800607P153	Metal film:15K ohms ±5%, 1/8 w.
R841	19B800607P101	Metal film:100 ohms ±5%, 1/8 w.
R842	19B800607P102	Metal film:1K 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.
R848 thru R851	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R852	19B800607P101	Metal film:100 ohms ±5%, 1/8 w.
R853	19B800607P472	Metal film:4.7K ohms ±5%, 1/8 w.
R854	19B800607P103	Metal film:10K ohms ±5%, 1/8 w.
R857	19B800607P153	Metal film:15K ohms ±5%, 1/8 w.
R858 and R859	19B800607P561	Metal film:560 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.
R865	19B800607P222	Metal film:2.2K ohms ±5%, 1/8 w.
R866	H212CRP310C	Deposited carbon:10K ohms ±5%, 1/4 w.
		--------INTEGRATED CIRCUITS-------
U801		##CALLED FOR ON INDEX
U802	19A116968P3	Linear:Dual Timer; sim to Signetics SA556N.
U803		##ASMHT SK/ 19B801346G1
		---------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).
U804	19A116180P33	Digital:Hex Inverter/Driver with OC outputs; sim to 7416.
U805	19A703072P2	Digital:sim to XICOR X2212DI.
		----------CABLES----------
W801 and W802	H212CRP910C	Deposited carbon:1 ohm ±5%, 1/4 w.

SYMBOL	PART NO.	DESCRIPTION
		----------SOCKETS----------
XU801	19A700156P5	Socket, IC:40 Pins, Tin Plated.
XU805	19A700156P11	Socket, IC:18 Pins, Tin Plated.
		----------CRYSTALS---------
Y801		Quartz:6.000000 MHz. 19A702511G3
		---------MISCELLANEOUS---------
1	19B801193G1	##XTAL,UNIT (Used in G3).
		----------ASSEMBLIES---------
A901		##CALLED FOR ON INDEX
		----------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 and 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 and H903		##PART OF NEXT HIGHER ASM
		----------JACKS----------
J901	19J706214P4	Connector:4 contacts rated @ 7 amps; sim to Molex 09-67-1042. (Used in G1 and G3).
J901	19A116659P185	Connector:4 contacts rated @ 7 amps; sim to Molex 09-80-1045. (Used in G4 and G6).
J903	19A116659P186	Connector:7 contacts rated @ 7 amps; sim to Molex 09-80-1075. (Used in G4 and G6).
J903	19J706214P7	Flat wafer:7 contacts rated @ 7 amps; sim to Molex 09-67-1072. (Used in G1 and G3).
J904 and J905		##MAKE FROM ITEM 19/32
J906		##MAKE FROM ITEM 20/33
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 G1 and G3).
J912	19A116659P185	Connector:4 contacts rated @ 7 amps; sim to Molex 09-80-1045. (Used in G4 and G6).
J920 and J921		##MAKE FROM ITEM 19/32
		----------INDUCTORS----------
L901	H343CLP12922	Coil, RF:1.2 µH ±10%.
		----------PLUGS----------
P907	19A700102P10	Printed wire:3 contacts; sim to Molex 09-52-3032.

PRODUCTION CHANGES (Continued)

REV. T - Synthesizer/Interconnect Board 19D900961G1
REV. N - Synthesizer/Interconnect Board 19D900961G3
REV. C - Synthesizer/Interconnect Board 19D900961G4
REV. D - Synthesizer/Interconnect Board 19D900961G6
To enchance transmitter operation. Changed C313 and R302.

REV. L - Synthesizer/Interconnect Board 19D900961G3
REV. B - Synthesizer/Interconnect Board 19D900961G6
To improve VCO operation. Changed L103.

REV. S - Synthesizer/Interconnect Board 19D900961G1
REV. M - Synthesizer/Interconnect Board 19D900961G3
REV. B - Synthesizer/ Interconnect Board 19D900961G4
REV. C - Synthesizer/Interconnect Board 19D900961G6
To improve regulator operation. Added D110.

REV. R - Synthesizer/Interconnect Board 19D900961G1
REV. K - Synthesizer/Interconnect Board 19d900961G3
REV. A - Synthesizer/Interconnect Board 19D900961G4
REV. A - Synthesizer/Interconnect Board 19D900961G6

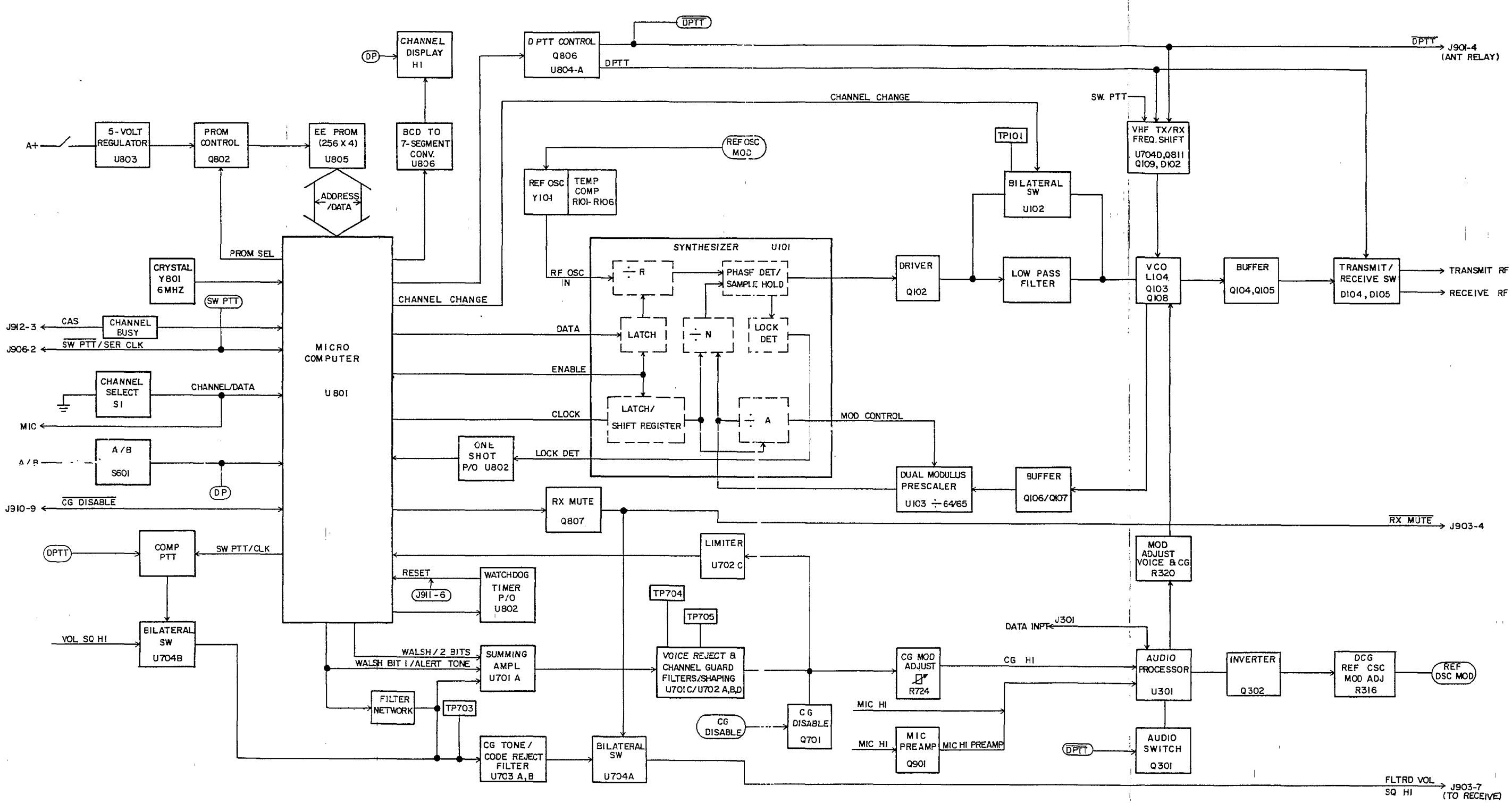


Figure 2 - Synthesizer/Interconnect Board