SECTION 11.
RF SYNTHESIZER MODULE (A9)

11.1 GENERAL

The RF Synthesizer module consists of 6 sub-modules:

- Reference and Control Board (A9A1)
- 310 to 440-MHz Loop Board (A9A2)
- Synthesizer Output Board (A9A3)
- 60.5-MHz Loop Board (A9A4)
- GHz Loop Board (A9A5)
- 640-MHz Loop Board (A9A6)

plus the Synthesizer Motherboard (A9A7). The 6 sub-modules, which are arranged three per side on the Synthesizer Motherboard, are individually covered to provide EMI shielding.

A block diagram of the RF Synthesizer board is shown at the end of this section in Figure 11-1, and the locations of the 6 sub-modules are shown with the assembly and parts list in Figure 11-2.

The RF Synthesizer module provides RF frequencies from 10 kHz to 1 GHz in 100-Hz steps at the output port. The Synthesizer module is the primary signal source for the system's generator output and the local-oscillator source for the system's receive function; it also provides the 10-MHz TTL reference signal required by the system. The reference signal for the RF Synthesizer is provided by the system's 10-MHz master oscillator.

Programming control of the Synthesizer module is via four serial data busses with common clock and latch lines. The system processor provides the programming signals.

11.2 THEORY OF OPERATION

The 310 to 440-MHz Loop board (A9A2) provides synthesized frequencies between 310 and 440 MHz in 125-kHz steps, as programmed by the system processor. That signal is mixed with the divide-by-two signal from the 500 to 1000-MHz voltage-controlled oscillator (VCO) on the GHz Loop board (A9A5). The resulting difference frequency is compared to the 60.5-MHz (±125 kHz) output from the 60.5-MHz Loop board (A9A4).

The output of the 60.5-MHz Loop board is programmable from 60.375 MHz to 60.625 MHz in 50-Hz steps. The error signal resulting from the frequency comparison drives the 500 to 1000-MHz VCO so that the divide-by-two output is equal to the 310 to 440-MHz frequency, plus or minus the 60.5 ±0.25-MHz frequency. The plus or minus condition is selected by the processor during the programming process and involves changing the sense of the 500 to 1000-MHz loop.

The net result of the process is 1) an output from the 500 to 1000-MHz VCO that covers the range from 500 to 1000-MHz in 100-Hz steps, and 2) an output from the divide-by-two which covers the range from 250 to 500 MHz in 50-Hz steps. The 50-Hz increment is not allowed by the system processor, however, so the operator will only have 100-Hz increments in this range.

For output frequencies below 250 MHz, the output of the 500 to 1000-MHz VCO is mixed with a fixed 640-MHz signal from the 640-MHz Loop board (A9A6). The 500 to 1000-MHz output is programmed so that the difference between it and 640 MHz is equal to the desired output frequency. A select switch on the Synthesizer Output board (A9A3) chooses the appropriate signal path to the output port, depending on the desired output frequency.

The Reference and Control board (A9A1) provides the reference frequencies required by the other Synthesizer boards and the rest of the system, and provides data-buffering and level-shifting for the programming information from the processor.

The Synthesizer Motherboard (A9A7) interconnects signals and power-supply voltages between the Synthesizer's 6 sub-modules and the System Motherboard (A19).

11.2.1 REFERENCE AND CONTROL BOARD (A9A1)

11.2.1.1 General

The Reference and Control board provides the four necessary interface functions between the RF Synthesizer and the System Analyzer: 1) sinewave-to-TTL-level translation of the system's 10-MHz reference, 2) derivation of reference signals needed by other RF Synthesizer sub-modules, 3) filtering of the +33V input, and 4) serial-to-parallel conversion of Synthesizer control data.

Block diagrams of the Reference and Control board are shown at the end of the section in Figures 11-3a and b, a schematic in Figure 11-4, and the printed wiring board assembly and parts list in Figure 11-5.

11.2.1.2 Theory of Operation

The system's 10-MHz standard is converted from a sinewave to two TTL-compatible signals by Q1, Q2, Q3, and U2. One of the TTL 10-MHz signals is sent out to the Receiver board (A8) and the Processor Interface board (A11). The other is divided-down to provide 1-MHz references for the 310 to 440-MHz

Loop board (A9A2) and the 60.5-MHz Loop board (A9A4). The 1-MHz signal is further divided to 50 kHz, and then is mixed with 1 MHz to provide the 1.05-MHz reference for the 24-MHz loop on A9A4.

The +33V filter, shown in Figure 11-3a, provides isolation between the system's +33V line and the submodules in the RF Synthesizer where +33V is used.

Figure 11-3b shows the level translator (U9) and the shift register (U10). The level translator converts three serial-data inputs, plus the clock input and the latch input (all of which come from A9, the Processor Interface board), as well as one of the Synthesizer's control bits (5V, 300 to 350 clamp) from a logic of 0 to +5V to a logic of 0 to +8V. These 0 to +8V logic levels are required by the 310 to 440-MHz Loop board (A9A2), the 60.5-MHz Loop board (A9A4), and the GHz Loop board (A9A5).

Serial-to-parallel conversion of eight bits of Synthesizer control data is done by shift register U10. The serial input comes from the Processor Interface board (A11). The eight output bits are used by the RF Synthesizer to produce the desired output frequency.

11.2.2 310 TO 440-MHz LOOP BOARD (A9A2)

11.2.2.1 General

The 310 to 440-MHz Loop board provides RF frequencies between 310 and 440 MHz in 125-kHz steps. This output is used as the translation frequency in the GHz Loop board (A9A5).

Also, the 310 to 440-MHz Loop board contains circuitry which selects Synthesizer modulation and modulation sense. The selected modulation goes to the 60.5-MHz Loop board (A9A4).

Frequency programming and modulation selection are controlled by data, clock, and latch lines which come from the Reference and Control board (A9A1).

A block diagram of the 310 to 440-MHz Loop board is shown at the end of the section in Figure 11-6, a schematic in Figure 11-7, and the printed wiring board assembly and parts list in Figure 11-8.

11.2.2.2 Theory of Operation

The 310 to 440-MHz Loop board consists of two main sections: the 310 to 440-MHz loop and the circuitry for selecting modulation. The 310 to 440-MHz loop consists of the reference divider and the phase detector (U1), the loop filter (U2), the voltage-controlled oscillator (VCO) (Q1), the RF amplifier (Q2), the two-modulus divider (U3 and U4), the divide-by-N and divide-by-A counters and the counter control logic (U1).

The reference divider divides the 1-MHz reference frequency by eight. The resulting 125-kHz signal is compared by the phase detector to the divided-down VCO output coming from the divide-by-N. The phase detector then generates an output that locks the phase of the VCO output to the phase of the 125-kHz reference. That phase-detector output drives the loop filter. The loop filter sets the bandwidth and stability of the loop and attenuates the reference-frequency components coming from the phase detector. The output of the loop filter tunes the VCO frequency to the required value to maintain phase-lock. Following the VCO is an RF amplifier which provides a nominal power of +7 dBm to the RF output. A small portion of this output is used to drive the two-modulus divider. When the modulus control line is low, the modulus is 41; when high, the modulus is 40. The output of the two-modulus divider feeds the divide-by-A and divide-by-N counters. The 8V, 310 to 440 DATA line programs the values of N and A, depending upon the desired output frequency —

$$f_{310\ to\ 440} = 125\ kHz\ (N\ 40+A).$$

The counter control logic coordinates the operation of the divide-by-A counter, the divide-by-N counter, and the two-modulus divider to achieve the proper division of the VCO frequency.

11.2.3 OUTPUT BOARD (A9A3)

11.2.3.1 General

The Output board provides a combination of switching, filtering and mixing to generate the Synthesizer's 0.01 to 1000-MHz output. This board also controls the output level for frequencies below 1 MHz.

A block diagram of the Output board is shown at the end of the section in Figure 11-9, a schematic in Figure 11-10, and the printed wiring board assembly and parts list in Figure 11-11.

11.2.3.2 Theory of Operation

The Output board provides its 10-kHz to 1-GHz frequency range in four bands: Band A–10 kHz to 249.9999 MHz; Band B–250 to 349.9999 MHz; Band C–350 to 499.9999 MHz; and Band D–500 to 1000 MHz. Comparators U6 and U7 control pin diodes, which, in turn, control band switching.

11.2.3.2.1 Band A

The 10-kHz to 249.9999-MHz band is provided by mixing the 640-MHz Loop board's output with the GHz Loop board's output of 500 to 1000 MHz (f_{GHz}). For a particular output frequency, f_o, the GHz loop is programmed to $f_{GHz} = f_o + 640$ MHz. The resulting difference frequency at the output of mixer (U2) is then equal to f_o.

Pin diode CR4 switches the 500 to 1000-MHz input to the input of amplifier U5. The output of U5 drives the L.O. port of mixer U2. The 640-MHz input drives the RF port of mixer U2. By controlling the current

through pin diodes CR17 and CR18, voltage-to-current converter Q1 controls the level of the 640-MHz drive (and thus the level of the 10-kHz to 249.9999-MHz output). The input of Q1 is driven by the 0.01 to 1 AGC signal from the Wideband Amplifier (A17A2).

In addition to the desired difference frequency, other signals are contained in the output of mixer U2. These signals include 640-MHz and f_{GHz} feedthrough, the sum frequency, and higher-order mixer products. Microstrip traps, which are tuned by C4 and C5, attenuate 640-MHz and f_{GHz} feedthrough. A low-pass filter (L1, L2, C7 and C8) attenuates the sum frequency and higher-order mixer products, as well as 640-MHz and f_{GHz} feedthrough. R49 and C6 improve gain-flatness-with-frequency by providing frequency compensation. After filtering and compensation, the 10-kHz to 249.9999-MHz signal is amplified by U3, switched through relay K1, and amplified by U4.

11.2.3.2.2 Bands B and C

The 50 to 349.9999-MHz and 350 to 499.999-MHz bands are provided by filtering harmonics from the GHz Loop board's 250 to 500-MHz output. For operation from 250 to 349.9999 MHz, pin diodes CR12 and CR13 steer the 250 to 500-MHz input through a 350-MHz low-pass filter (C38, C39, C40, L11 and L12). For operation from 350 to 499.9999 MHz, pin diodes CR10 and CR11 steer the 250 to 500-MHz input through a 500-MHz low-pass filter (C34, C35, C36, L8, and L9). For either band, pin diode CR15 steers the low-pass filter's output to amplifier U4. For operation in other bands, pin diode CR14 isolates the 250 to 500-MHz input from the SYNTH RF output.

11.2.3.2.3 Band D

The 500 to 1000-MHz band is provided by frequency-compensating the GHz Loop board's 500 to 1000-MHz output. Pin diodes CR5, CR7, and CR9 steer that input through frequency-compensation circuits R31, C54, R33, and C30 and then to amplifier U4. For operation in other bands, pin diodes CR6 and CR8 isolate the 500 to 1000-MHz input from the SYNTH RF output.

11.2.4 60.5-MHz LOOP BOARD (A9A4)

11.2.4.1 General

The 60.5-MHz Loop board provides an output frequency (variable in 50-Hz steps over a range of 60.5 $\pm$0.25 MHz) to the GHz Loop board. In addition, the 60.5 MHz Loop board provides the modulation and sweep capability for the Synthesizer.

A block diagram of the 60.5-MHz Loop board is shown at the end of the section in Figure 11-12, a schematic in Figure 11-13, and the printed wiring board assembly and parts list in Figure 11-14.

11.2.4.2 Theory of Operation

The 60.5-MHz Loop board consists of three sections:

1. A translation loop, comprising a phase-locked-loop (PLL) IC (U9), a loop filter (U1, U10, U11), a VCO (Q3, Q4), a buffer amplifier (Q5, Q6), a translation mixer (U14), a filter amplifier (Q7), and a two-modulus pre-scaler (Q8, U12, U13).
2. A modulation control circuit (U3).
3. An offset loop, consisting of a PLL IC (U6), a loop filter (U7), a VCO (Q1), a buffer amplifier (Q2), and a pre-scaler (U8).

The PLL ICs (U6, U9) provide digital dividers, control functions, and the phase detector on one IC. The reference input is divided by 1000 and applied to the on-chip phase detector, where it is compared against the reference divider's output.

The phase detector's output in each loop is applied to the loop filter, which sets the bandwidth and stability of the loop and attenuates reference-frequency components coming from the phase detector.

Modulation and spurious requirements cause the translation loop filter to be considerably more complex than the offset loop filter. In addition to the standard filter amplifier, the translation loop filter includes bandwidth switching and an elliptic low-pass filter. Bandwidth switching prevents the translation loop from tracking-out sweep modulation.

In each loop, the loop filter's output tunes the VCO output, putting the phase detector's inputs in phase.

The proper frequency for the offset loop is determined by the values programmed into the N and A registers of U6 —

$$f_{OFF} = 1.05\ \text{kHz}\ (N_{OFF}\ 64 + A_{OFF}).$$

The output frequency of the translation loop is determined by the programmed values of N and A in the registers of U9 and the frequency of the offset loop —

$$f_{\bar{T}} = 1\ \text{kHz}\ (N_T 128 + A_{\bar{T}}) - f_{OFF}.$$

Mixer U14 sums the output frequencies of both loops. The output of U14 is filtered by the filter amplifier (Q7) and is then applied to Q8, U12 and U13, which form a divide-by-28/129, two-modulus divider.

For modulation control, the switch outputs of U6 and U9 control an analog multiplexer (U3). R13 controls the modulation sensitivity. To adjust R13, refer to Section 3 on alignment.

11.2.5 GHz LOOP BOARD (A9A5)

11.2.5.1 General

The GHz Loop board provides RF outputs of 500 to 1000-MHz and 250 to 500 MHz. It obtains these outputs by using the output of the 60.5-MHz Loop board (A9A4) as a reference frequency and by using the output of the 310 to 440-MHz Loop board (A9A2) as a translation frequency. The reference, f_{60}, can be programmed in the range of 60.5 $\pm$0.125 MHz in 50-Hz

steps, while the translation frequency, f_{34}, can be programmed from 310 to 440 MHz in 0.125-MHz steps. Since a mixer-phase detector and a frequency-translation mixer are used in the loop, two lock-points exist for each combination of f_{34} and f_{60}.

When the loop is locked in the positive sense,

$$f_2 = f_{34} + f_{60},$$

and when it is locked in the negative sense,

$$f_2 = f_{34} - f_{60}.$$

With the proper control, therefore, f_o may be programmed in the range of 500 to 1000 MHz in 100-Hz steps, and f_2 may be programmed in the range of 250 to 500 MHz in 100-Hz steps.

A block diagram of the GHz Loop board is shown at the end of the section in Figure 11-15, a schematic in Figure 11-16, and a printed wiring board assembly and parts list in Figure 11-17.

11.2.5.2 Theory of Operation

11.2.5.2.1 GHz Loop

U1 compares the GHz loop's reference signal (a phase-shifted version of f_{60}) to a frequency which equals the difference between f_{34} and f_2. During phase-lock, the phase detector generates an error signal which keeps the difference frequency phase-locked to f_{60}. This error signal drives the loop filter (U2) which, in turn, drives the switched VCOs (Q1-Q6). The switched VCOs then drive an RF amplifier (U3), the output of which is split between the 500 to 1000-MHz output and the divide-by-2 input. The divide-by-2 (U10) has two outputs. One off these provides the 250 to 500 MHz output. The other output drives an RF amplifier (U9), which, in turn, drives the RF port of the translation mixer (U8).

The frequency of the signal out of U8 during phase-lock equals f_{60}. This signal drives the bandpass amplifier (Q7 and Q8). The phase of the inverting output of the bandpass amplifier is compared to the phase-shifted version of f_{60}. The non-inverting output of the bandpass amplifier drives the L.O. port of the lock-detect mixer (U7). When the loop is locked in the positive sense, the lock-detector voltage is positive; however, if the loop is locked in the negative sense, the lock-detector voltage is negative. When the loop is unlocked, the lock-detector voltage is zero.

11.2.5.2.2 Acquisition Circuit

Another important part of the GHz loop is the acquisition circuit. This circuit helps the loop acquire the lock point and ensures that the loop locks in the desired sense. When the loop is unlocked, a current is applied to the loop filter, which causes the VCO control voltage, and thus the VCO frequency, to sweep. When the loop acquires a lock point, the lock detector will indicate the sense of the lock point. If the desired lock point has been acquired, the sweep circuit will turn off, allowing the loop to remain locked. If, however, the undesired lock point has been acquired, the bonker circuit will turn on, force the VCO frequency to its maximum or minimum point, and turn off. As the VCO sweeps back in the opposite direction, it will encounter the desired lock point first.

Correct operation of the acquisition circuit depends on proper phasing of the inputs of the lock detector (U7). With the loop in lock and no applied loop stress (i.e. the slew and the bonk are turned off and there is no frequency modulation on the reference), the magnitude of the lock-detector voltage should be at its maximum. The relative phase of the lock detector's input is adjusted by a variable capacitor (C24) in the phase-shift network.

11.2.6 640-MHz LOOP BOARD (A9A6)

11.2.6.1 General

The 640-MHz Loop board provides a 640-MHz signal to the Output board where it is used to mix-down the 500 to 1000-MHz output to between 10 kHz and 250 MHz.

A block diagram of the 640-MHz Loop board is shown at the end of the section in Figure 11-18, a schematic in Figure 11-19, and the printed wiring board assembly and parts list in Figure 11-20.

11.2.6.2 Theory of Operation

The 640-MHz Loop board provides a 640-MHz signal to the Synthesizer Output board (A9A3) where it is used to mix down the 500 to 1000-MHz output of the GHz Loop board (A9A5) to between 10 kHz and 250 MHz.

The 10-MHz reference feeds a power splitter formed by T2 and R35. One half of the reference power is sent to the Reference and Control board. The other half of the power drives crystal filter FL1, which removes noise picked up between the Frequency-Standard Interface board (A16) and the RF Synthesizer module (A9). The phase of the divided-down 640-MHz output from U1 (divide-by-64) is compared to the phase of the filtered reference by the phase detector (U2), an analog-multiplier IC.

Since U2 does not detect the frequency difference when the loop is out of phase-lock, an acquisition-assist circuit (Q1, R10, R12, R13, and C12) is required. R10 offsets the phase detector's output when the loop is disabled, forcing the loop filter's output voltage low. When the 640-MHz output is enabled, a beat frequency (the difference in frequency between the 10-MHz reference and the output of U1) is detected at the output of the phase detector by Q1. Q1 then applies this signal to the inverting input of the loop-filter amplifier (U3), forcing its output voltage, and hence

the VCO frequency, to increase. As the phase-locked-loop comes within pull-in range of the lock point, it snaps into lock and drives the beat frequency to zero. When this happens, Q1, which is biased Class C, loses its drive signal and shuts off, effectively disconnecting the acquisition circuit from the loop filter. The loop then begins normal operation.

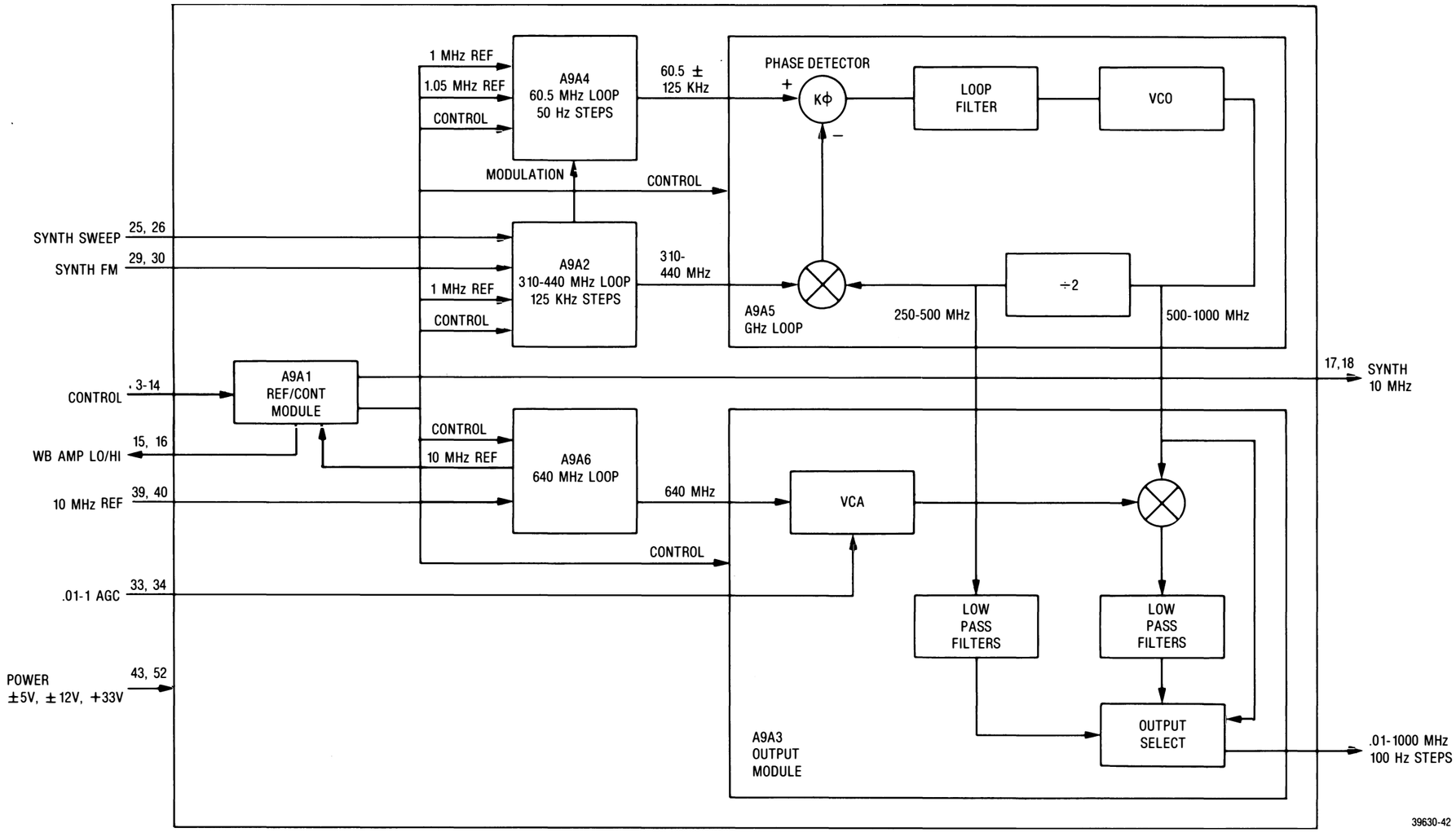
Loop-filter amplifier U3 drives the voltage-controlled oscillator, Q2, which is a Colpitts-type oscillator. The VCO tuning curve is controlled by the length of L8. A resistive pad (R23, R25, and R41) and isolation amplifier U4 buffer the VCO output from the module output. Part of the VCO output is tapped by a resistor pad (R24, R39, R40) and fed back to the divide-by-64 (U1) input. The high-pass filter formed by C33, C34, and L12 prevents the divider from contaminating the VCO output.

The board is controlled by switching off the −8V supply via Q3. This is done by raising the reference voltage of U6 (the −8V regulator) to +1.2V, thus forcing the regulator output to zero volts.

11.3 SYNTHESIZER MOTHERBOARD (A9A7)

Figure 11-21 at the end of the section shows the printed wiring board assembly and parts list for the Synthesizer Motherboard.

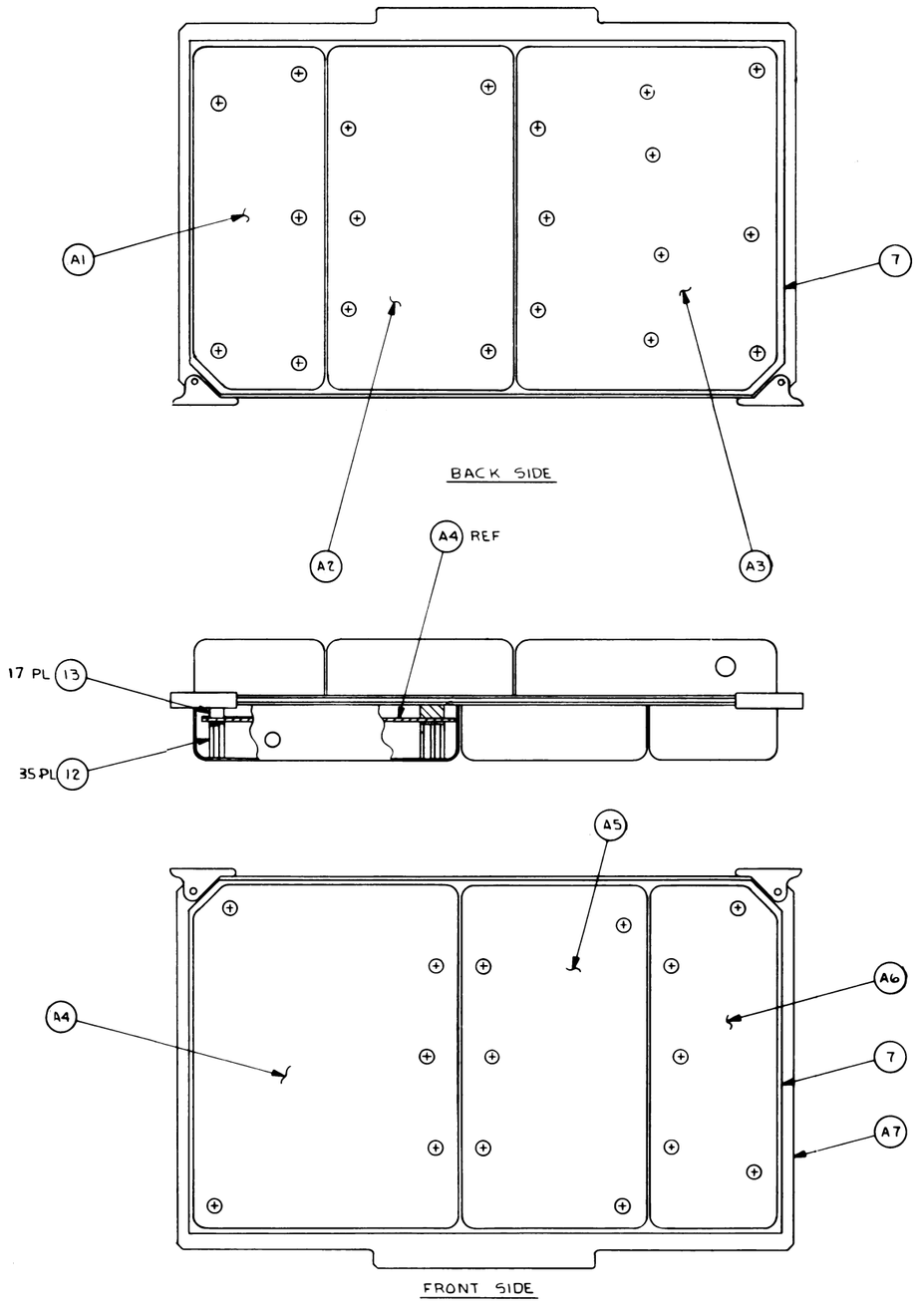
Figure 11-1. Block Diagram



RF SYNTHESIZER MODULE (A9)

(RTC-1007A)

Figure 11-2. Assembly and Parts List



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RF SYNTHESIZER MODULE (A9)
RTC-1007A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
007	2	32-80342B93	GASKET,EMI	
012	35	43-80343B70	SPACER	1/4" HEX
013	17	43-80343B72	SPACER	1/4" ROUND
A 001	1	RTC-4039A	REF & CONTROL ASSY(A9A1)	
A 002	1	RTC-4040A	310-440 MHZ LP ASSY(A9A2)	
A 003	1	RTC-4041A	SYNTH OUTPUT ASSY(A9A3)	
A 004	1	RTC-4042A	60.5 MHZ LOOP ASSY(A9A4)	
A 005	1	RTC-4043A	PRINTED WIRING BOARD ASSY	.5-1GHZ LOOP (A9A5)
A 006	1	RTC-4044A	640 MHZ LOOP ASSY(A9A6)	
A 007	1	RTC-4045A	SYNTH.MOTHERBD ASSY(A9A7)	

Figure 11-3a. and b. Block Diagram

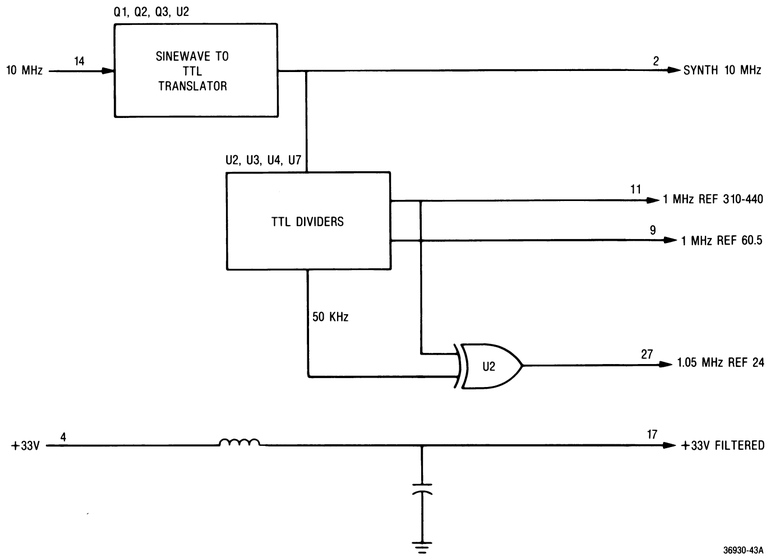


Figure 11-3a. Reference and Control Board (A9A1) — Block Diagram (Sheet 1 of 2)

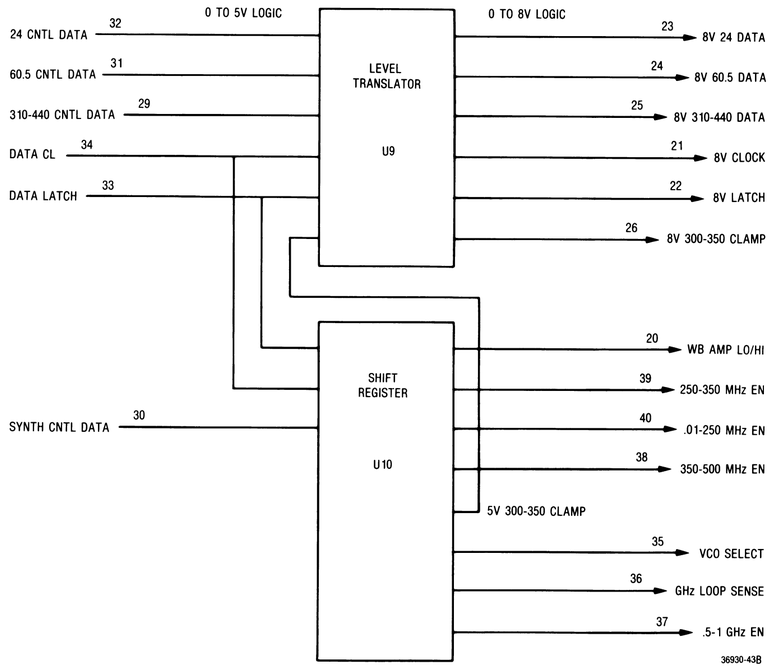
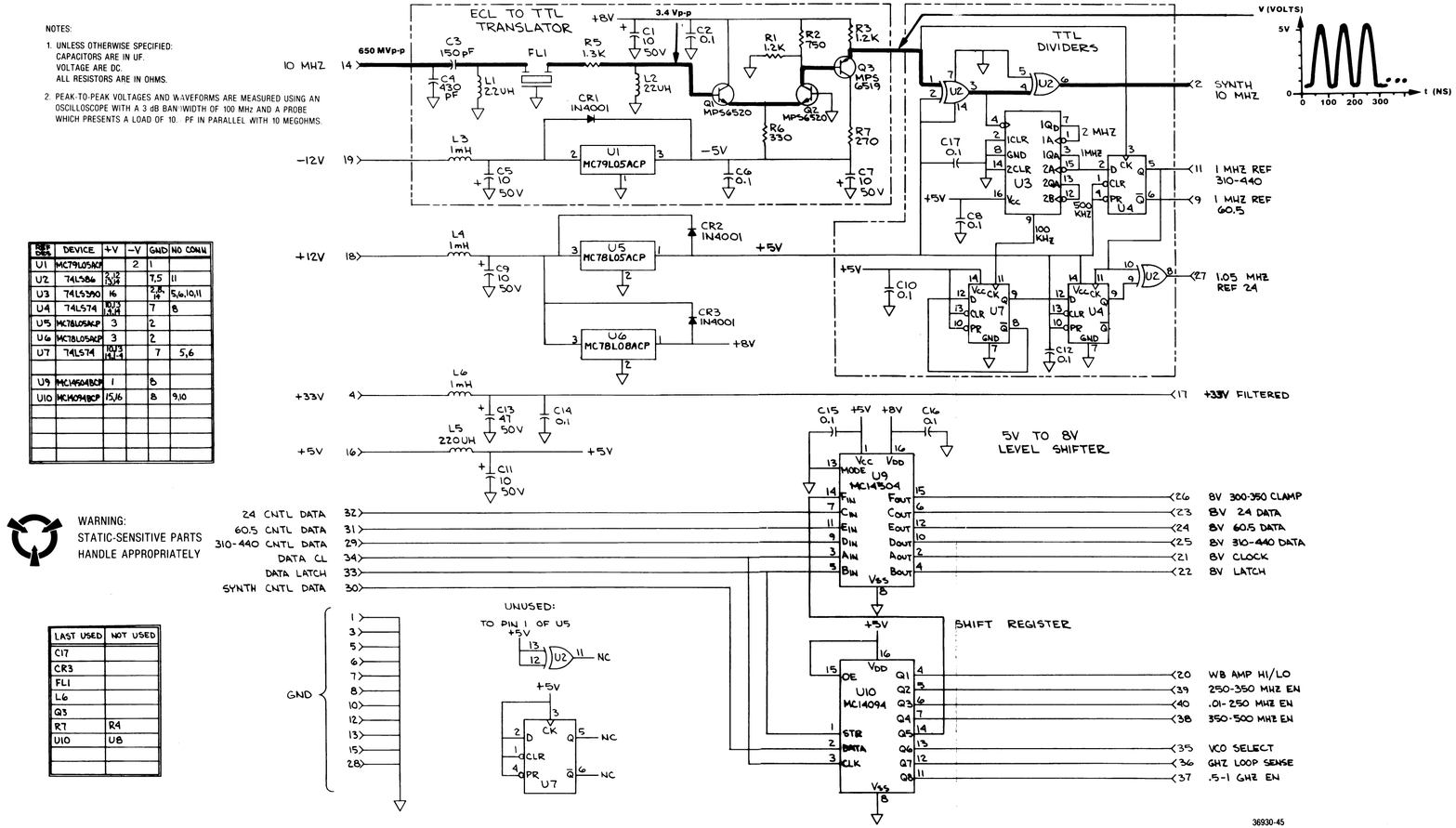


Figure 11-3b. Reference and Control Board (A9A1) — Block Diagram (Sheet 2 of 2)

REFERENCE AND CONTROL BOARD (A9A1)

(RTC-4039A)

Figure 11-4. Schematic



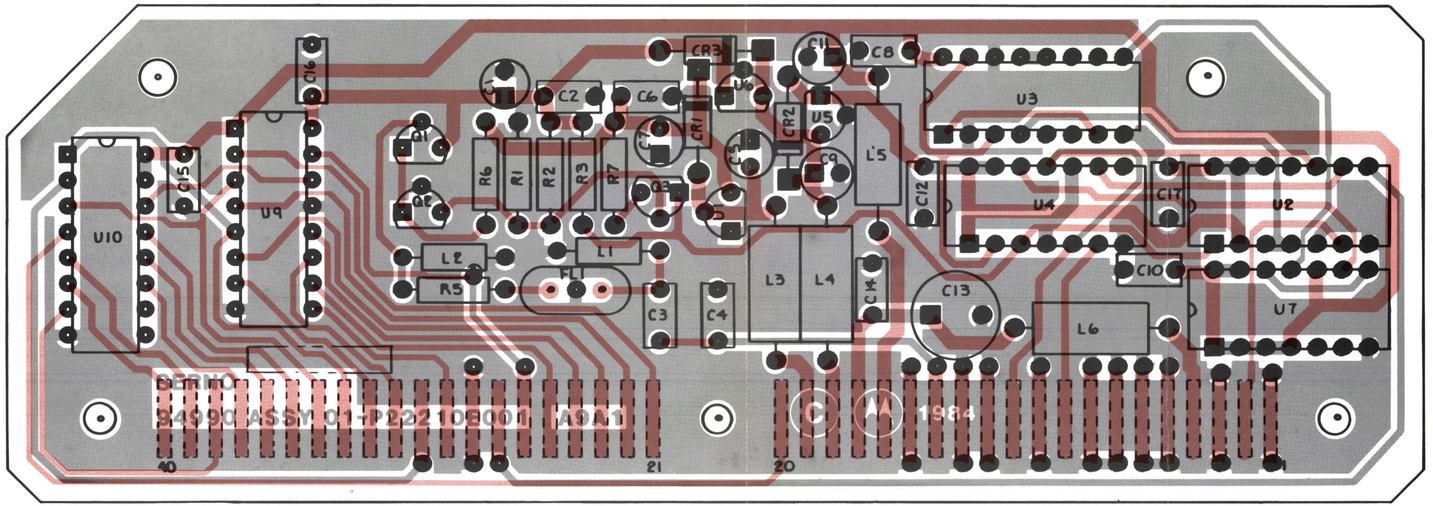
REF DES	DEVICE	+V	-V	GND	NO CONN
U1	MC79L05ACP		2	1	
U2	74LS86	7,12 14,14		7,5	11
U3	74LS390	16		2,8, 13	5,6,10,11
U4	74LS74	10,13 14,14		7	8
U5	MC78L05ACP	3		2	
U6	MC78L08ACP	3		2	
U7	74LS74	10,13 14,14		7	5,6
U9	MC14504BCP	1		8	
U10	MC14094BCP	15,16		8	9,10

LAST USED	NOT USED
C17	
CR3	
FL1	
L6	
Q3	
R7	R9
U10	U8

REFERENCE AND CONTROL BOARD (A9A1)

(RTC-4039A)

Figure 11-5. Printed Wiring Board Assembly and Parts List



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COMPONENTS AND COMPONENT SIDE TRACK SHOWN IN BLACK.

SOLDER-SIDE TRACK SHOWN IN ORANGE

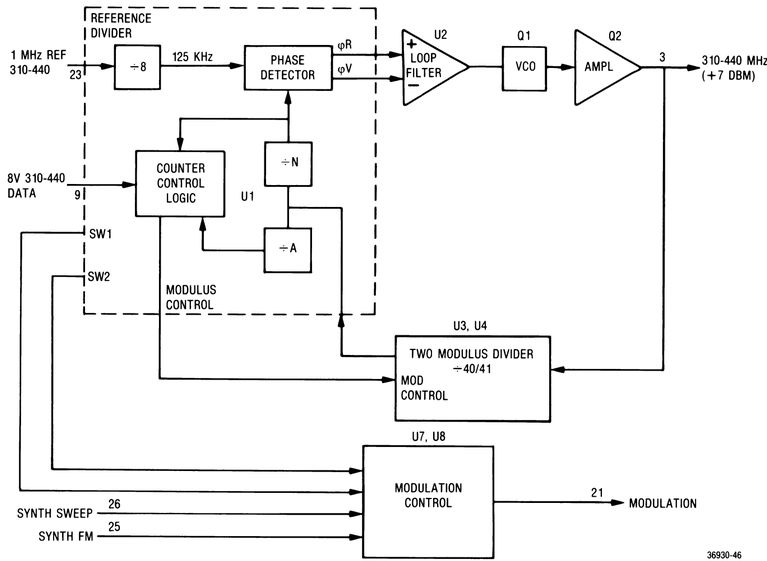
REFERENCE AND CONTROL BOARD (A9A1)
RTC-4039A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
C 001	1	23-80341B15	CAPACITOR	10UF-20-50
C 002	1	21-80342B10	CAPACITOR	.1UF-20-50
C 003	1	21-80341B54	CAPACITOR	150PF-5-50
C 004	1	21-80341B80	CAPACITOR	430PF-5-50
C 005	1	23-80341B15	CAPACITOR	10UF-20-50
C 006	1	21-80342B10	CAPACITOR	.1UF-20-50
C 007	1	23-80341B15	CAPACITOR	10UF-20-50
C 008	1	21-80342B10	CAPACITOR	.1UF-20-50
C 009	1	23-80341B15	CAPACITOR	10UF-20-50
C 010	1	21-80342B10	CAPACITOR	.1UF-20-50
C 011	1	23-80341B15	CAPACITOR	10UF-20-50
C 012	1	21-80342B10	CAPACITOR	.1UF-20-50
C 013	1	23-80341B18	CAPACITOR	47UF-20-50
C 014	1	21-80341B97	CAPACITOR	.1UF-20-100
C 015	1	21-80342B10	CAPACITOR	.1UF-20-50
C 016	1	21-80342B10	CAPACITOR	.1UF-20-50
C 017	1	21-80342B10	CAPACITOR	.1UF-20-50
CR001	1	48-82466H13	DIODE	
CR002	1	48-82466H13	DIODE	
CR003	1	48-82466H13	DIODE	
FL001	1	48-80346A08	CRYSTAL FILTER	10MHZ-2-POLE
L 001	1	24-80369A32	COIL	2.2UH
L 002	1	24-80369A31	COIL	22UH
L 003	1	24-80369A42	COIL	1000UH
L 004	1	24-80369A42	COIL	1000UH
L 005	1	24-80369A38	COIL	220UH
L 006	1	24-80369A42	COIL	1000UH
Q 001	1	48-80340B86	TRANSISTOR	MPS6520
Q 002	1	48-80340B86	TRANSISTOR	MPS6520
Q 003	1	48-80340B85	TRANSISTOR	MPS6519
R 001	1	06-11009C51	RESISTOR	1.2K-5-1/4
R 002	1	06-11009C46	RESISTOR	750-5-1/4
R 003	1	06-11009C51	RESISTOR	1.2K-5-1/4
R 005	1	06-11009C52	RESISTOR	1.3K-5-1/4
R 006	1	06-11009C37	RESISTOR	330-5-1/4
R 007	1	06-11009C35	RESISTOR	270-5-1/4
U 001	1	51-82609M20	INTEGRATED CIRCUIT	
U 002	1	51-82609M79	INTEGRATED CIRCUIT	
U 003	1	51-82609M68	INTEGRATED CIRCUIT	74LS390 SCREENED
U 004	1	51-83627M93	INTEGRATED CIRCUIT	
U 005	1	51-05469E01	INTEGRATED CIRCUIT	
U 006	1	51-05683H01	INTEGRATED CIRCUIT	
U 007	1	51-83627M93	INTEGRATED CIRCUIT	
U 009	1	51-83627M88	INTEGRATED CIRCUIT	
U 010	1	51-83627M42	INTEGRATED CIRCUIT	

310 TO 440-MHz LOOP BOARD (A9A2)

(RTC-4040A)

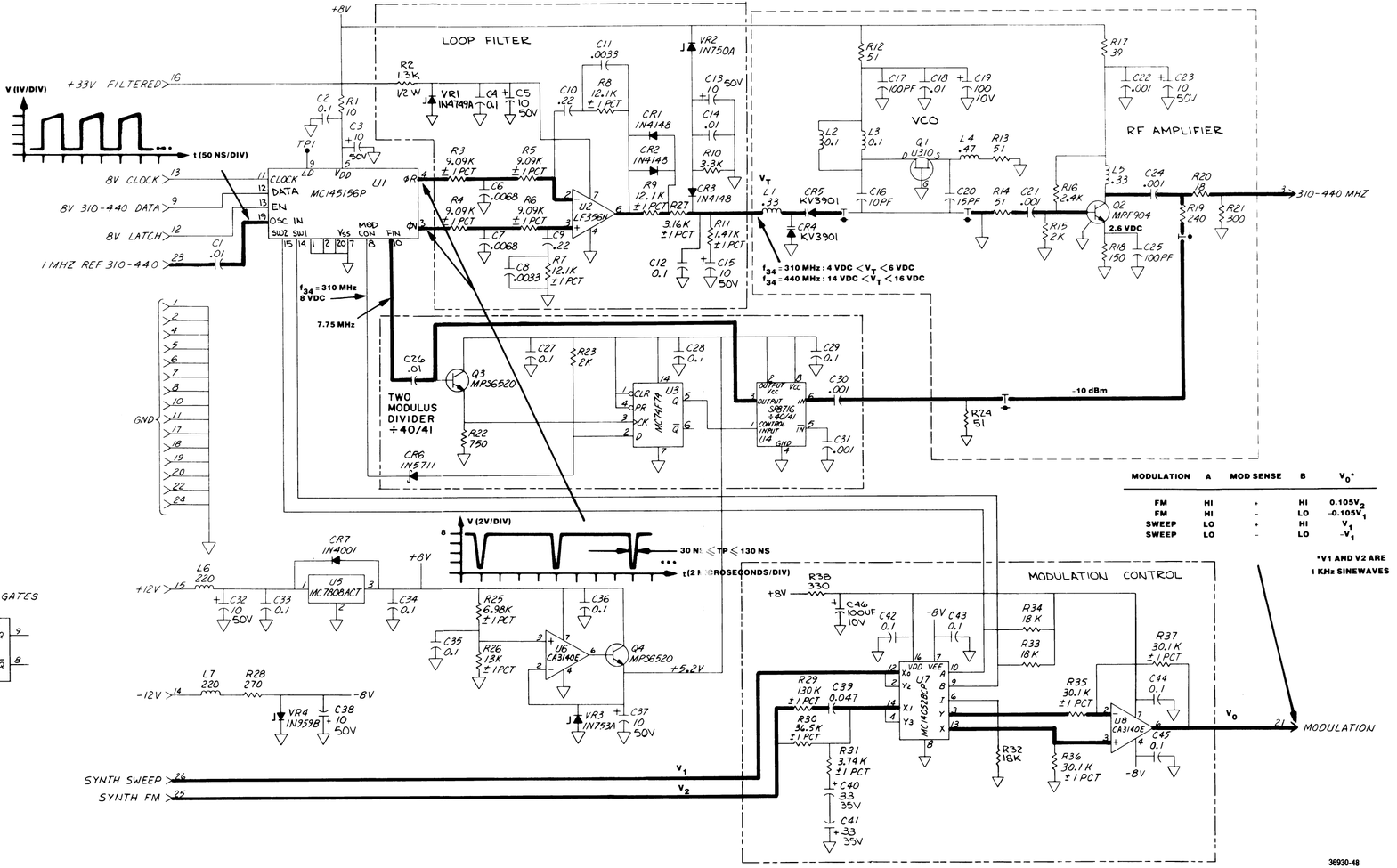
Figure 11-6. Block Diagram



310 TO 440-MHz LOOP BOARD (A9A2)

(RTC-4040A)

Figure 11-7. Schematic



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS.
   ALL CAPACITORS ARE IN UF;
   ALL COILS ARE IN UH;
   ALL VOLTAGES ARE DC.
2. WAVEFORMS ARE MEASURED USING AN OSCILLOSCOPE WITH A 3 dB BANDWIDTH OF 100 MHz AND A PROBE WHICH PRESENTS A LOAD OF 10.5 PF IN PARALLEL WITH 10 MEGOHMS.
3. POWER LEVELS ARE MEASURED WITH AN HP 436A POWER METER.

IC'S						
REF DES	DEVICE TYPE	NO CONNECTION	V_{CC}	V_{DD}	V_{EE}	V_{SS}
U1	MC145156	6, 16, 17, 18		5		7
U2	LF356	1, 5, 8	7	—	4	—
U3	MC74F74	6, 8, 9	14	—	7	—
U4	SP8716	7	2,8	—	4	—
U5	MC7808ACT	—	—	—	—	—
U6	CA3140E	1, 5, 8	7	—	4	—
U7	MC14052BCP	1, 5, 11, 15	—	16	7	8
U8	CA3140E	1, 5, 8	7	—	4	—

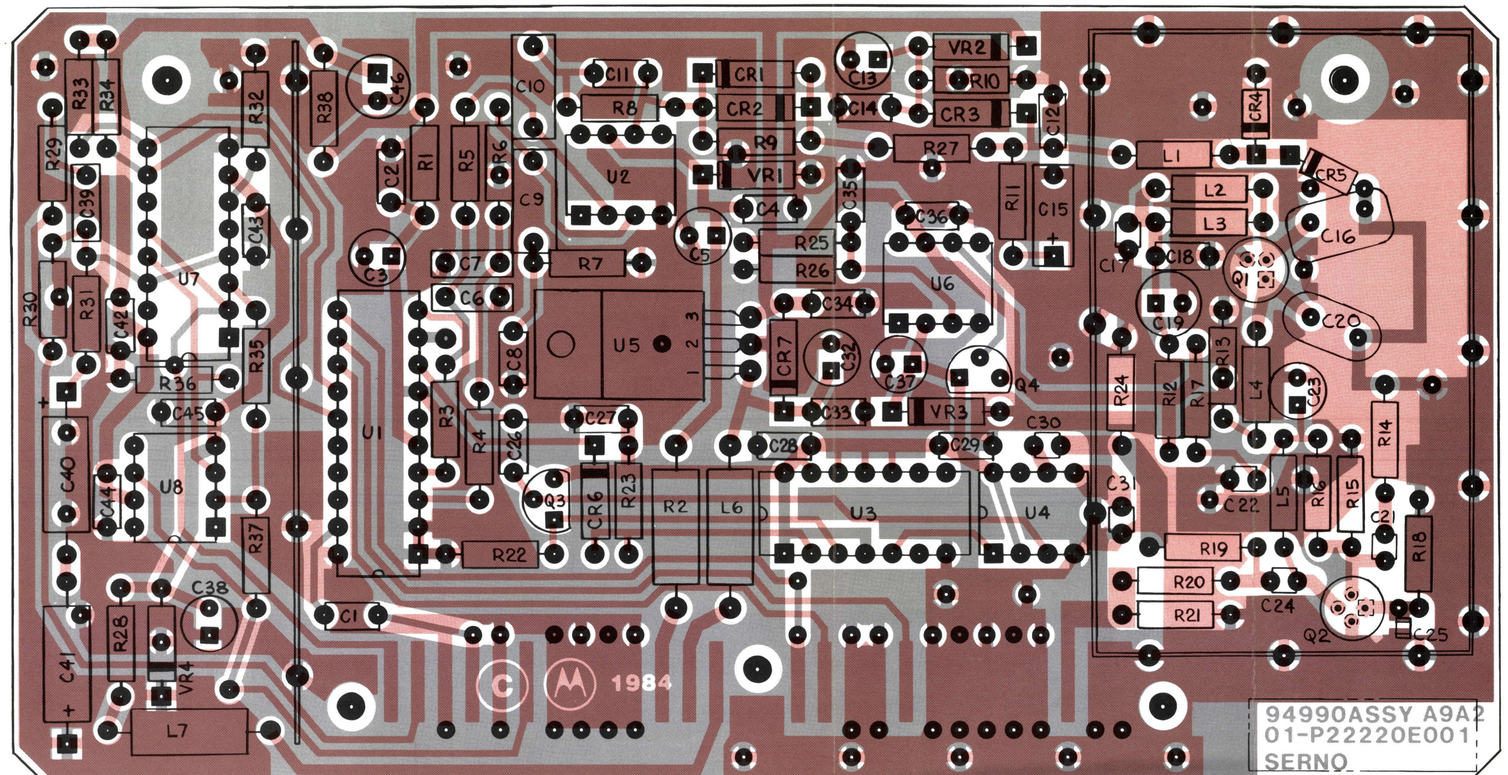
REFERENCE DESIGNATORS	
HIGHEST NO. USED	NOT USED
C46	
CR7	
L7	
Q4	
R38	
TP1	
U8	
VR4	

WARNING:
STATIC-SENSITIVE PARTS
HANDLE APPROPRIATELY

310 TO 440-MHz LOOP BOARD (A9A2)

(RTC-4040A)

Figure 11-8. Printed Wiring Board Assembly and Parts List



COMPONENTS AND COMPONENT SIDE TRACK SHOWN IN BLACK.
SOLDER-SIDE TRACK SHOWN IN ORANGE

310 TO 440-MHz LOOP BOARD (A9A2)
RTC-4040A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
C 001	1	21-80342B09	CAPACITOR	.01UF-20-50
C 002	1	21-80342B10	CAPACITOR	.1UF-20-50
C 003	1	23-80341B15	CAPACITOR	10UF-20-50
C 004	1	21-80342B10	CAPACITOR	.1UF-20-50
C 005	1	23-80341B15	CAPACITOR	10UF-20-50
C 006	1	21-80342B40	CAPACITOR	.0068UF-5-50
C 007	1	21-80342B40	CAPACITOR	.0068UF-5-50
C 008	1	21-80341B71	CAPACITOR	.0033UF-5-50
C 009	1	08-80343B15	CAPACITOR	.22UF-5-100
C 010	1	08-80343B15	CAPACITOR	.22UF-5-100
C 011	1	21-80341B71	CAPACITOR	.0033UF-5-50
C 012	1	21-80341B96	CAPACITOR	.1UF-10-100
C 013	1	23-80341B15	CAPACITOR	10UF-20-50
C 014	1	21-80342B09	CAPACITOR	.01UF-20-50
C 015	1	23-80340B34	CAPACITOR	10UF-10-35
C 016	1	21-00859934	CAPACITOR	10PF-.5PF-500
C 017	1	21-80339B63	CAPACITOR	100PF-10-200
C 018	1	21-80342B09	CAPACITOR	.01UF-20-50
C 019	1	23-80341B07	CAPACITOR	100UF-20-10
C 020	1	21-00858936	CAPACITOR	15PF-5-500
C 021	1	21-80339B72	CAPACITOR	.001UF-10-200
C 022	1	21-80339B72	CAPACITOR	.001UF-10-200
C 023	1	23-80341B15	CAPACITOR	10UF-20-50
C 024	1	21-80339B72	CAPACITOR	.001UF-10-200
C 025	1	21-80370A21	CAPACITOR	100PF-20-100
C 026	1	21-80342B09	CAPACITOR	.01UF-20-50
C 027	1	21-80342B10	CAPACITOR	.1UF-20-50
C 028	1	21-80342B10	CAPACITOR	.1UF-20-50
C 029	1	21-80342B10	CAPACITOR	.1UF-20-50
C 030	1	21-80339B72	CAPACITOR	.001UF-10-200
C 031	1	21-80339B72	CAPACITOR	.001UF-10-200
C 032	1	23-80341B15	CAPACITOR	10UF-20-50
C 033	1	21-80342B10	CAPACITOR	.1UF-20-50
C 034	1	21-80342B10	CAPACITOR	.1UF-20-50
C 035	1	21-80342B10	CAPACITOR	.1UF-20-50
C 036	1	21-80342B10	CAPACITOR	.1UF-20-50
C 037	1	23-80341B15	CAPACITOR	10UF-20-50
C 038	1	23-80341B15	CAPACITOR	10UF-20-50
C 039	1	08-80343B18	CAPACITOR	.047-10-63
C 040	1	23-80343B88	CAPACITOR	33-10-15
C 041	1	23-80343B88	CAPACITOR	33-10-15
C 042	1	21-80342B10	CAPACITOR	.1UF-20-50
C 043	1	21-80342B10	CAPACITOR	.1UF-20-50
C 044	1	21-80342B10	CAPACITOR	.1UF-20-50
C 045	1	21-80342B10	CAPACITOR	.1UF-20-50
C 046	1	23-80341B07	CAPACITOR	100UF-20-10
CR001	1	48-84463K02	DIODE	
CR002	1	48-84463K02	DIODE	
CR003	1	48-84463K02	DIODE	
CR004	1	48-80339B95	DIODE	
CR005	1	48-80339B95	DIODE	
CR006	1	48-87643C01	DIODE	
CR007	1	48-82466H13	DIODE	
L 001	1	24-80369A26	COIL	.33UH
L 002	1	24-80369A19	COIL	.1UH
L 003	1	24-80369A19	COIL	.1UH
L 004	1	24-80369A27	COIL	.47UH
L 005	1	24-80369A26	COIL	.33UH
L 006	1	24-80369A38	COIL	220UH
L 007	1	24-80369A38	COIL	220UH
Q 001	1	48-00869933	TRANSISTOR	FET U310
Q 002	1	48-00869949	TRANSISTOR	
Q 003	1	48-80340B86	TRANSISTOR	MPS6520
Q 004	1	48-80340B86	TRANSISTOR	MPS6520
R 001	1	06-11009C01	RESISTOR	10-5-1/4
R 002	1	06-1045A52	RESISTOR	1.3K-5-1/2
R 003	1	06-10621C87	RESISTOR	9.09K-1-1/4
R 004	1	06-10621C87	RESISTOR	9.09K-1-1/4
R 005	1	06-10621C87	RESISTOR	9.09K-1-1/4
R 006	1	06-10621C87	RESISTOR	9.09K-1-1/4
R 007	1	06-10621C99	RESISTOR	12.1K-1-1/4
R 008	1	06-10621C99	RESISTOR	12.1K-1-1/4
R 009	1	06-10621C99	RESISTOR	12.1K-1-1/4
R 010	1	06-11009C61	RESISTOR	3.3K-5-1/4
R 011	1	06-10621C11	RESISTOR	1.47K-1-1/4
R 012	1	06-11009C18	RESISTOR	51-5-1/4
R 013	1	06-11009C18	RESISTOR	51-5-1/4
R 014	1	06-11009C18	RESISTOR	51-5-1/4
R 015	1	06-11009C56	RESISTOR	2K-5-1/4
R 016	1	06-11009C58	RESISTOR	2.4K-5-1/4
R 017	1	06-11009C15	RESISTOR	39-5-1/4
R 018	1	06-11009C29	RESISTOR	150-5-1/4
R 019	1	06-11009C34	RESISTOR	240-5-1/4
R 020	1	06-11009C07	RESISTOR	18-5-1/4

310 TO 440-MHz LOOP BOARD (A9A2) (Cont)

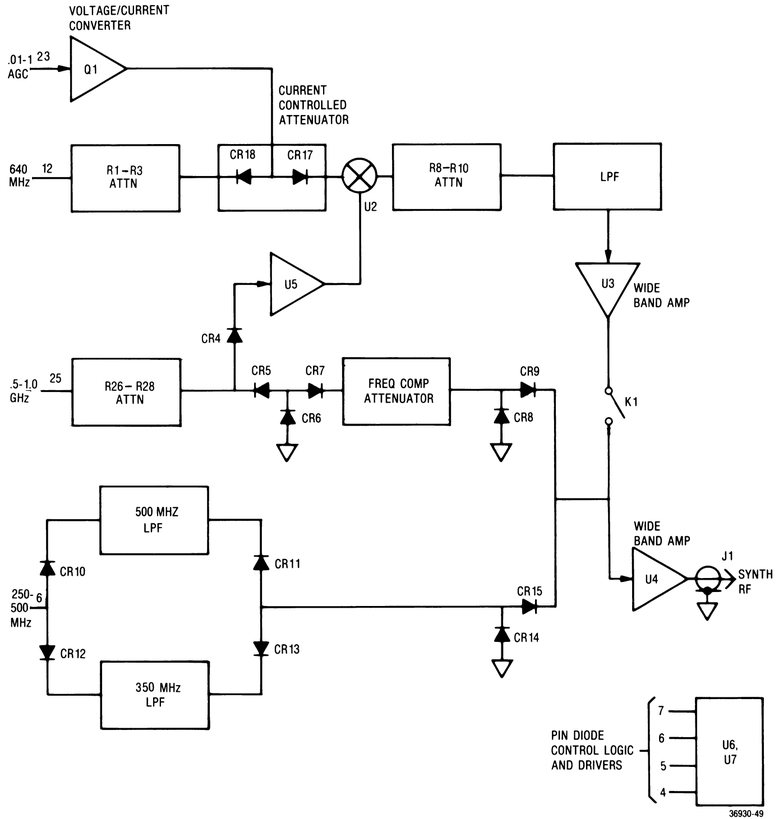
RTC-4040A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
R 021	1	06-11009C36	RESISTOR	300-5-1/4
R 022	1	06-11009C46	RESISTOR	750-5-1/4
R 023	1	06-11009C56	RESISTOR	2K-5-1/4
R 024	1	06-11009C18	RESISTOR	51-5-1/4
R 025	1	06-10621C76	RESISTOR	6.98K-1-1/4
R 026	1	06-10621D03	RESISTOR	13K-1-1/4
R 027	1	06-10621C43	RESISTOR	3.16K-1-1/4
R 028	1	06-11009C35	RESISTOR	270-5-1/4
R 029	1	06-10621D99	RESISTOR	130K-1-1/4
R 030	1	06-10621D46	RESISTOR	36.5K-1-1/4
R 031	1	06-10621C50	RESISTOR	3.74K-1-1/4
R 032	1	06-11009C79	RESISTOR	18K-5-1/4
R 033	1	06-11009C79	RESISTOR	18K-5-1/4
R 034	1	06-11009C79	RESISTOR	18K-5-1/4
R 035	1	06-10621D38	RESISTOR	30.1K-1-1/4
R 036	1	06-10621D38	RIGISTOR	30.1K-1-1/4
R 037	1	06-10621D38	RESISTOR	30.1K-1-1/4
R 038	1	06-11009C37	RESISTOR	330-5-1/4
U 001	1	51-83625M62	INTEGRATED CIRCUIT	
U 002	1	51-80339B97	INTEGRATED CIRCUIT	
U 003	1	51-80340B23	INTEGRATED CIRCUIT	
U 004	1	51-80343B26	INTEGRATED CIRCUIT	SP8716 SCREENED
U 005	1	51-80340B26	INTEGRATED CIRCUIT	
U 006	1	51-80345A01	INTEGRATED CIRCUIT	CA3140E SCREENED
U 007	1	51-82884L59	INTEGRATED CIRCUIT	
U 008	1	51-80345A01	INTEGRATED CIRCUIT	CA3140E SCREENED
VR001	1	RG-1N4749A	DIODE,ZENER	24V-5-1
VR002	1	48-80342B22	DIODE,ZENER	4.7V-5-.5
VR003	1	48-83461E36	DIODE,ZENER	6.2V-5-.5
VR004	1	48-83461E32	DIODE,ZENER	8.2V-5-.5

SYNTHESIZER OUTPUT BOARD (A9A3)

(RTC-4041A)

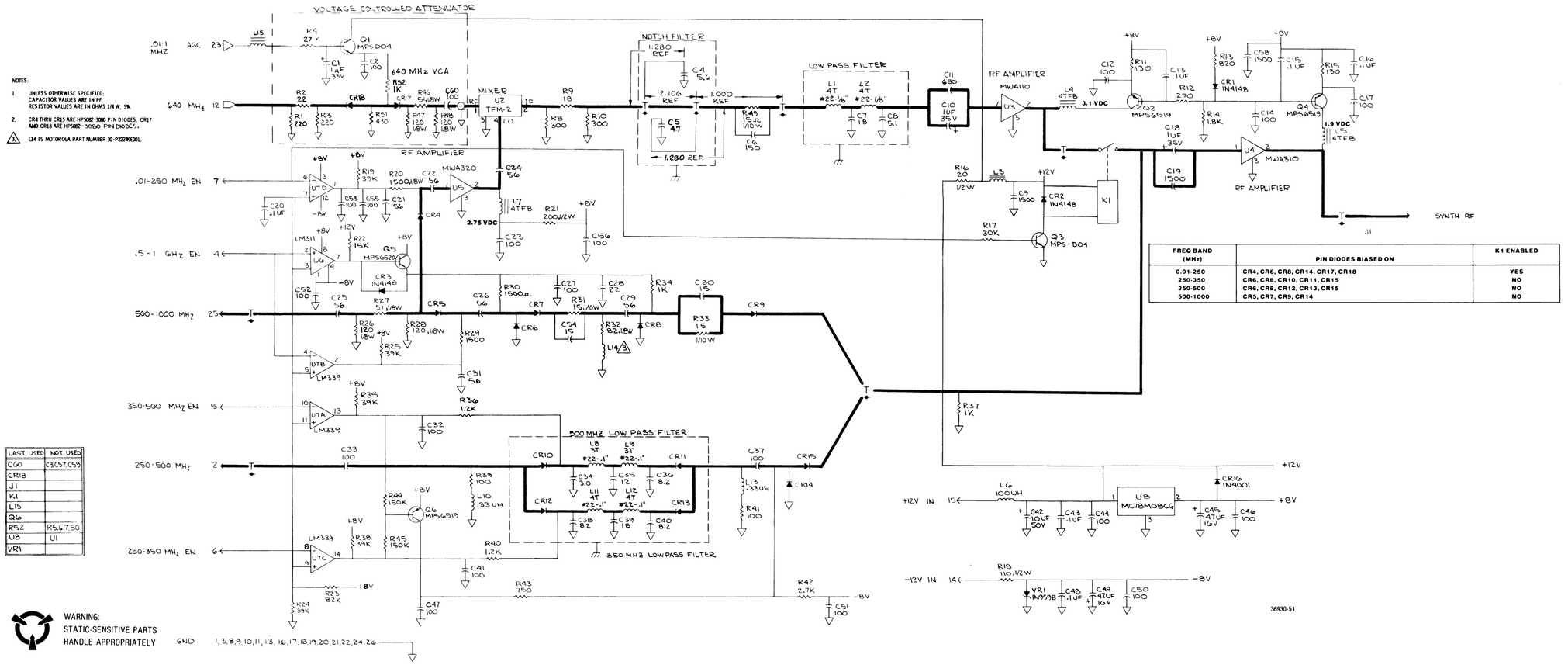
Figure 11-9. Block Diagram



SYNTHESIZER OUTPUT BOARD (A9A3)

(RTC-4041A)

Figure 11-10. Schematic



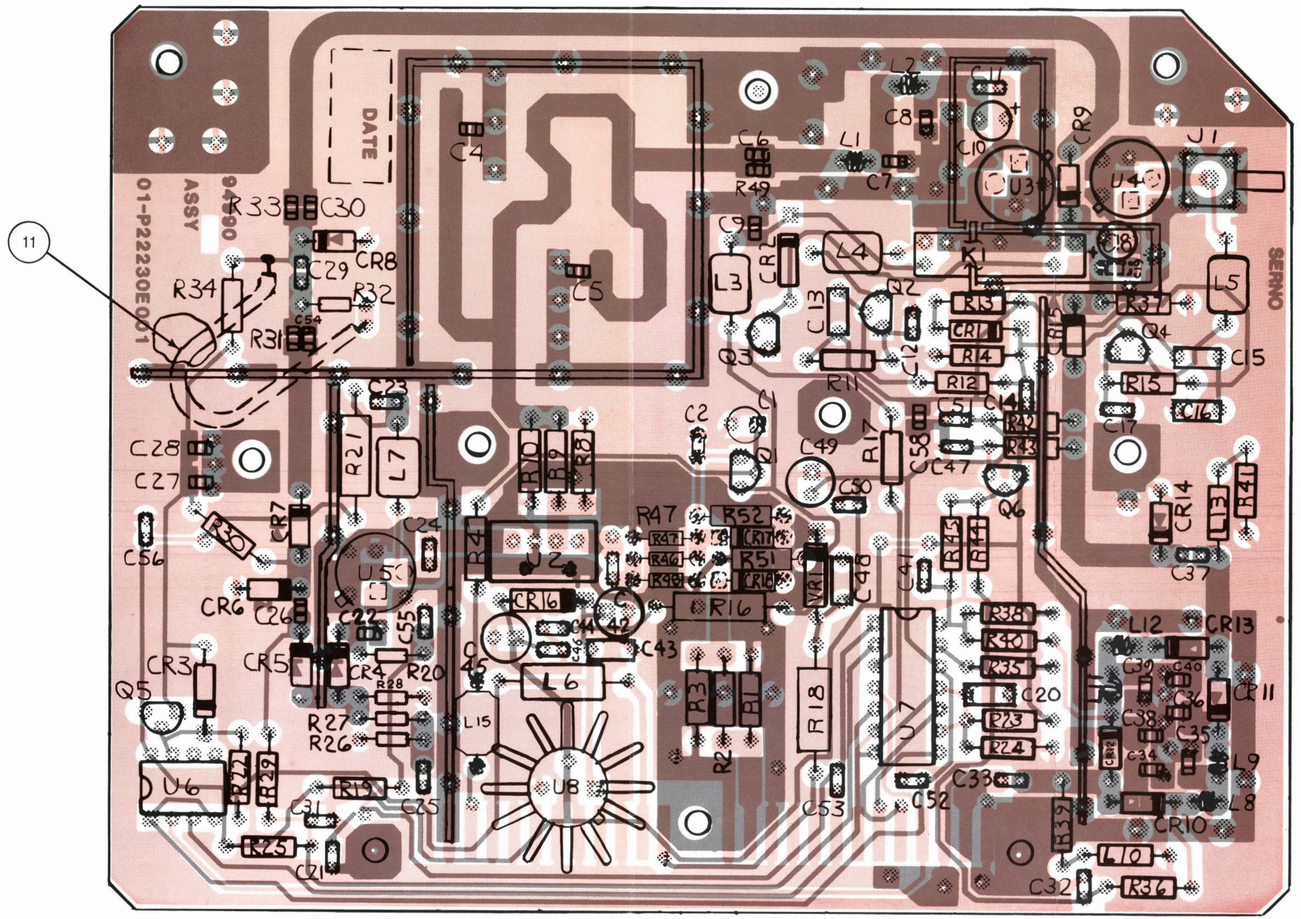
FREQ BAND (MHz)	PIN DIODES BIASED ON	K1 ENABLED
0.01-250	CR4, CR6, CR8, CR14, CR17, CR18	YES
250-350	CR6, CR8, CR10, CR11, CR15	NO
350-500	CR6, CR8, CR12, CR13, CR15	NO
500-1000	CR5, CR7, CR9, CR14	NO

LAST USED	NOT USED
C60	C3,C57,C59
CR18	
U1	
K1	
L15	
Q6	
R52	R54,T50
U8	U1
VR1	

SYNTHESIZER OUTPUT BOARD (A9A3)

(RTC-4041A)

Figure 11-11. Printed Wiring Board Assembly and Parts List



COMPONENTS AND COMPONENT SIDE TRACK SHOWN IN BLACK.
SOLDER-SIDE TRACK SHOWN IN ORANGE

36930-50

SYNTHESIZER OUTPUT BOARD (A9A3)
RTC-4041A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
011	1	30-80344B02	CABLE	L14
C 001	1	23-83441B15	CAPACITOR	1.0UF-20-35
C 002	1	21-80339B63	CAPACITOR	100PF-10-200
C 004	1	21-80370A20	CAPACITOR	5.6PF+-.25PF-100
C 005	1	21-80370A19	CAPACITOR	4.7PF+.5PF-.5PF-100
C 006	1	21-80344B39	CAPACITOR	150PF-5-100
C 007	1	21-80370A13	CAPACITOR	18PF-5-100
C 008	1	21-80344B40	CAPACITOR	5.1PF+.5PF-.5PF-100
C 009	1	21-80344B41	CAPACITOR	1500PF-10-100
C 010	1	23-83441B15	CAPACITOR	1.0UF-20-35
C 011	1	21-80339B69	CAPACITOR	680PF-10-100
C 012	1	21-80339B63	CAPACITOR	100PF-10-200
C 013	1	21-80342B10	CAPACITOR	.1UF-20-50
C 014	1	21-80339B63	CAPACITOR	100PF-10-200
C 015	1	21-80342B10	CAPACITOR	.1UF-20-50
C 016	1	21-80342B10	CAPACITOR	.1UF-20-50
C 017	1	21-80339B63	CAPACITOR	100PF-10-200
C 018	1	23-83441B15	CAPACITOR	1.0UF-20-35
C 019	1	21-80344B41	CAPACITOR	1500PF-10-100
C 020	1	21-80342B10	CAPACITOR	.1UF-20-50
C 021	1	21-80339B67	CAPACITOR	56PF-10-200
C 022	1	21-80344B42	CAPACITOR	56PF-10-100
C 023	1	21-80339B63	CAPACITOR	100PF-10-200
C 024	1	21-80339B67	CAPACITOR	56PF-10-200
C 025	1	21-80339B67	CAPACITOR	56PF-10-200
C 026	1	21-80344B42	CAPACITOR	56PF-10-100
C 027	1	21-80370A21	CAPACITOR	100PF-20-100
C 028	1	21-80370A14	CAPACITOR	22PF-5-100
C 029	1	21-80339B67	CAPACITOR	56PF-10-200
C 030	1	21-80370A12	CAPACITOR	15PF-5-50
C 031	1	21-80339B67	CAPACITOR	56PF-10-200
C 032	1	21-80339B63	CAPACITOR	100PF-10-200
C 033	1	21-80339B63	CAPACITOR	100PF-10-200
C 034	1	21-80370A17	CAPACITOR	3.9PF+-.25PF-100
C 035	1	21-80370A11	CAPACITOR	12PF-5-100
C 036	1	21-80344B43	CAPACITOR	8.2PF+.5PF-.5PF-100
C 037	1	21-80339B63	CAPACITOR	100PF-10-200
C 038	1	21-80344B43	CAPACITOR	8.2PF+.5PF-.5PF-100
C 039	1	21-80370A13	CAPACITOR	18PF-5-100
C 040	1	21-80344B43	CAPACITOR	8.2PF+.5PF-.5PF-100
C 041	1	21-80339B63	CAPACITOR	100PF-10-200
C 042	1	23-80341B15	CAPACITOR	10UF-20-50
C 043	1	21-80342B10	CAPACITOR	.1UF-20-50
C 044	1	21-80339B63	CAPACITOR	100PF-10-200
C 045	1	23-80341B11	CAPACITOR	47UF-20-16
C 046	1	21-80339B63	CAPACITOR	100PF-10-200
C 047	1	21-80339B63	CAPACITOR	100PF-10-200
C 048	1	21-80342B10	CAPACITOR	.1UF-20-50
C 049	1	23-80341B11	CAPACITOR	47UF-20-16
C 050	1	21-80339B63	CAPACITOR	100PF-10-200
C 051	1	21-80339B63	CAPACITOR	100PF-10-200
C 052	1	21-80339B63	CAPACITOR	100PF-10-200
C 053	1	21-80339B63	CAPACITOR	100PF-10-200
C 054	1	21-80370A12	CAPACITOR	15PF-5-100
C 055	1	21-80339B63	CAPACITOR	100PF-10-200
C 056	1	21-80339B63	CAPACITOR	100PF-10-200
C 058	1	21-80344B41	CAPACITOR	1500PF-10-100
C 060	1	21-80339B63	CAPACITOR	100PF-10-200
CR001	1	48-84463K02	DIODE	
CR002	1	48-84463K02	DIODE	
CR003	1	48-84463K02	DIODE	
CR004	1	48-80343B24	DIODE	
CR005	1	48-80343B24	DIODE	
CR006	1	48-80343B24	DIODE	
CR007	1	48-80343B24	DIODE	
CR008	1	48-80343B24	DIODE	
CR009	1	48-80343B24	DIODE	
CR010	1	48-80343B24	DIODE	
CR011	1	48-80343B24	DIODE	
CR012	1	48-80343B24	DIODE	
CR013	1	48-80343B24	DIODE	
CR014	1	48-80343B24	DIODE	
CR015	1	48-80343B24	DIODE	
CR016	1	48-82466H13	DIODE	
CR017	1	48-80343B24	DIODE	
CR018	1	48-80343B24	DIODE	
J 001	1	09-80344B23	RF CONNECTOR	
K 001	1	80-80342B52	RELAY	REED-12V SPST
L 001	1	24-80342B69	COIL,RF	4T-#22-1/8IN.ID.
L 002	1	24-80342B69	COIL,RF	4T-#22-1/8IN.ID.
L 003	1	24-83961B01	CHOKE	
L 004	1	24-83961B01	CHOKE	
L 005	1	24-83961B01	CHOKE	
L 006	1	24-80369A37	COIL	100UH

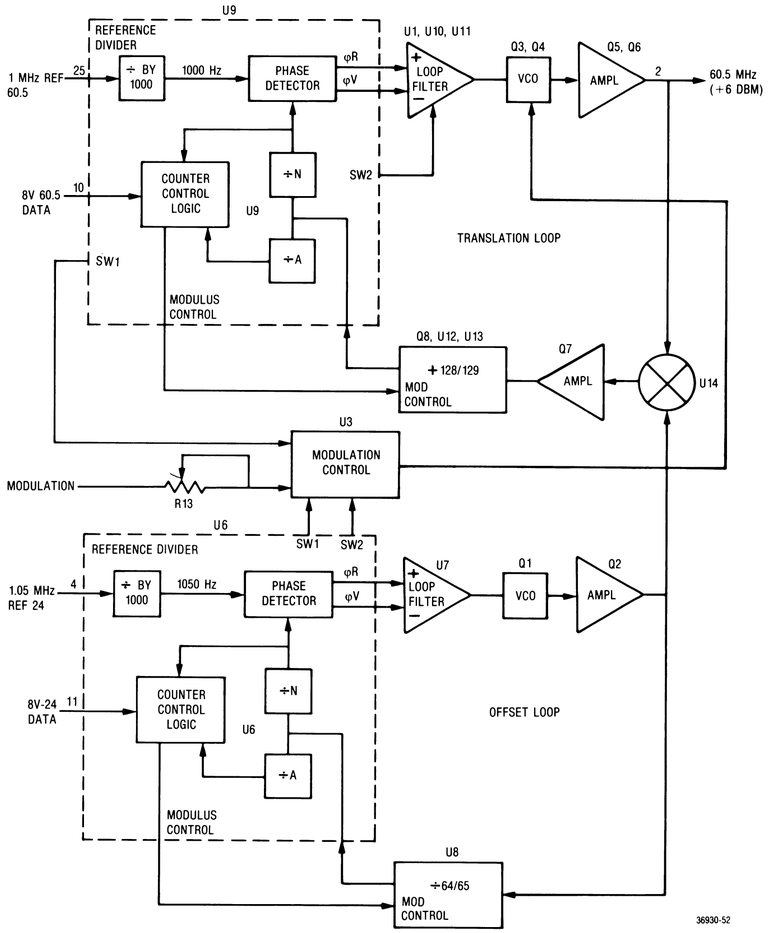
SYNTHESIZER OUTPUT BOARD (A9A3) (Cont)
RTC-4041A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
L 007	1	24-83961B01	CHOKE	
L 008	1	24-80342B67	COIL,RF	3T-#22-.100IN.ID.
L 009	1	24-80342B67	COIL,RF	3T-#22-.100IN.ID.
L 010	1	24-80369A26	COIL	.33UH
L 011	1	24-80342B68	COIL,RF	4T-#22-.100IN.ID.
L 012	1	24-80342B68	COIL,RF	4T-#22-.100IN.ID.
L 013	1	24-80369A26	COIL	.33UH
L 015	1	24-83961B01	CHOKE	
Q 001	1	48-80340B45	TRANSISTOR	
Q 002	1	48-80340B85	TRANSISTOR	MPS6519
Q 003	1	48-80340B45	TRANSISTOR	
Q 004	1	48-80340B85	TRANSISTOR	MPS6519
Q 005	1	48-80340B86	TRANSISTOR	MPS6520
Q 006	1	48-80340B85	TRANSISTOR	MPS6519
R 001	1	06-11009C33	RESISTOR	220-5-1/4
R 002	1	06-11009C09	RESISTOR	22-5-1/4
R 003	1	06-11009C33	RESISTOR	220-5-1/4
R 004	1	06-11009C83	RESISTOR	27K-5-1/4
R 008	1	06-11009C36	RESISTOR	300-5-1/4
R 009	1	06-11009C07	RESISTOR	18-5-1/4
R 010	1	06-11009C36	RESISTOR	300-5-1/4
R 011	1	06-11009C28	RESISTOR	130-5-1/4
R 012	1	06-11009C35	RESISTOR	270-5-1/4
R 013	1	06-11009C47	RESISTOR	820-5-1/4
R 014	1	06-11009C55	RESISTOR	1.8K-5-1/4
R 015	1	06-11009C28	RESISTOR	130-5-1/4
R 016	1	06-11045A08	RESISTOR	20-5-1/2
R 017	1	06-11009C84	RESISTOR	30K-5-1/4
R 018	1	06-11045A26	RESISTOR	110-5-1/2
R 019	1	06-11009C87	RESISTOR	39K-5-1/4
R 020	1	06-11041C69	RESISTOR	1.5K-5-1/8
R 021	1	06-11045A32	RESISTOR	200-5-1/2
R 022	1	06-11009C77	RESISTOR	15K-5-1/4
R 023	1	06-11009C95	RESISTOR	82K-5-1/4
R 024	1	06-11009C87	RESISTOR	39K-5-1/4
R 025	1	06-11009C87	RESISTOR	39K-5-1/4
R 026	1	06-11041C43	RESISTOR	120-5-1/8
R 027	1	06-11041A34	RESISTOR	51-5-1/8
R 028	1	06-11041C43	RESISTOR	120-5-1/8
R 029	1	06-11009C53	RESISTORS	1.5K-5-1/4
R 030	1	06-11009C53	RESISTORS	1.5K-5-1/4
R 031	1	06-80340B15	RESISTOR	15-5-1/10
R 032	1	06-11041C39	RESISTOR	82-5-1/8
R 033	1	06-80340B15	RESISTOR	15-5-1/10
R 034	1	06-11009C49	RESISTOR	1K-5-1/4
R 035	1	06-11009C87	RESISTOR	39K-5-1/4
R 036	1	06-11009C51	RESISTOR	1.2K-5-1/4
R 037	1	06-11009C49	RESISTOR	1K-5-1/4
R 038	1	06-11009C87	RESISTOR	39K-5-1/4
R 039	1	06-11009C25	RESISTOR	100-5-1/4
R 040	1	06-11009C51	RESISTOR	1.2K-5-1/4
R 041	1	06-11009C25	RESISTOR	100-5-1/4
R 042	1	06-11009C59	RESISTOR	2.7K-5-1/4
R 043	1	06-11009C46	RESISTOR	750-5-1/4
R 044	1	06-11009D02	RESISTOR	150K-5-1/4
R 045	1	06-11009D02	RESISTOR	150K-5-1/4
R 046	1	06-11041A34	RESISTOR	51-5-1/8
R 047	1	06-11041C43	RESISTOR	120-5-1/8
R 048	1	06-11041C43	RESISTOR	120-5-1/8
R 049	1	06-80340B15	RESISTOR	15-5-1/10
R 051	1	06-11009C40	RESISTOR	430-5-1/4
R 052	1	06-11009C49	RESISTOR	1K-5-1/4
U 002	1	51-80346A05	MIXER	DOUBLE BALANCED
U 003	1	51-80340B61	INTEGRATED CIRCUIT	
U 004	1	51-80340B63	INTEGRATED CIRCUIT	
U 005	1	51-80340B64	INTEGRATED CIRCUIT	
U 006	1	51-80347A38	INTEGRATED CIRCUIT	
U 007	1	51-83629M71	INTEGRATED CIRCUIT	
U 008	1	51-05698H01	INTEGRATED CIRCUIT	
VR001	1	48-83461E32	DIODE,ZENER	8.2V-5-.5

60.5-MHz LOOP BOARD (A9A4)

(RTC-4042A)

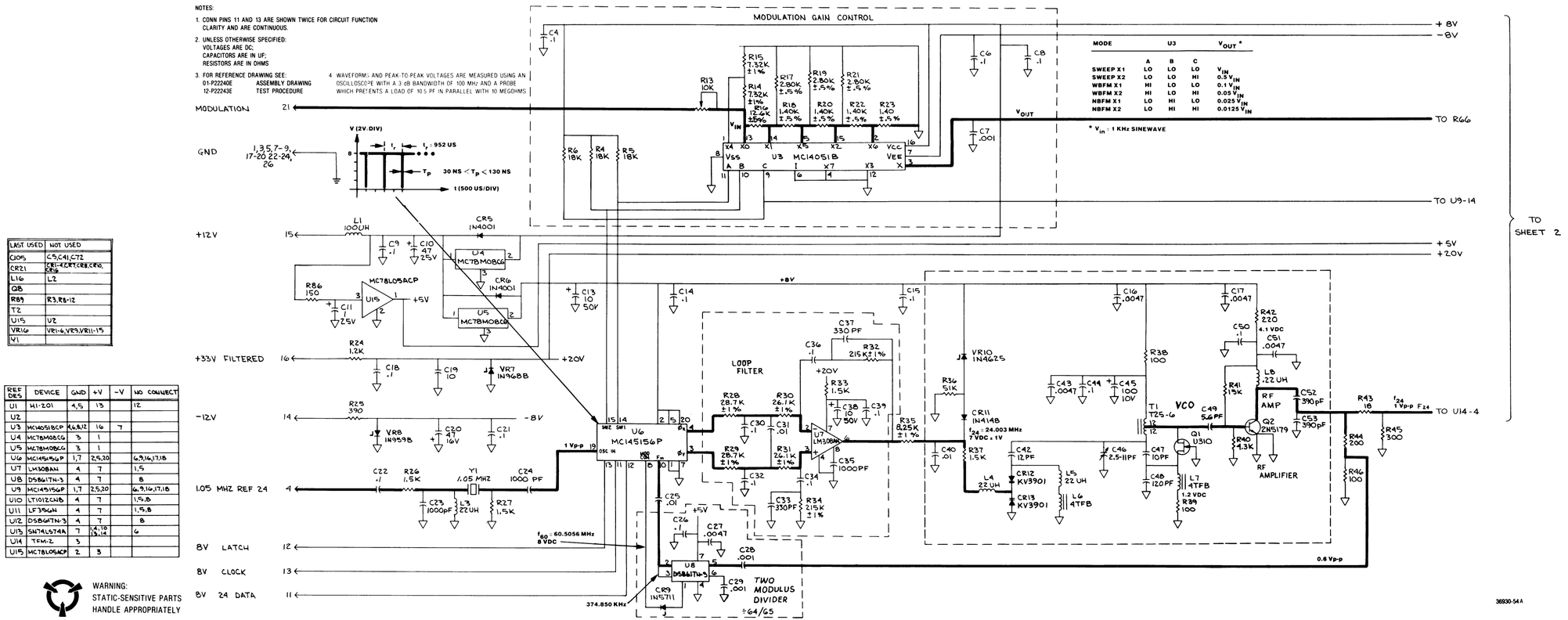
Figure 11-12. Block Diagram



60.5-MHz LOOP BOARD (A9A4)

(RTC-4042A)

Figure 11-13a. Schematic (Sheet 1 of 2)



LAST USED	NOT USED
C105	C5,C41,C72
CR21	CR1-4,CR7,CR8,CR10, CR18
L16	L2
Q8	
R89	R3,R8-12
T2	
U15	U2
VR16	VR1-6,VR9,VR11-15
Y1	

REF DES	DEVICE	GND	+V	-V	NO CONNECT
U1	H11-201	4,5	13		12
U2					
U3	MC14051BCP	7,6,8,12	16	7	
U4	MC78M08CG	3	1		
U5	MC78M08CG	3	1		
U6	MC145156P	1,7	2,5,20		4,9,16,17,18
U7	LM308AN	4	7		1,5
U8	DS8617N-3	4	7		8
U9	MC145156P	1,7	2,5,20		4,9,16,17,18
U10	LT1012CN8	4	7		1,5,8
U11	LF356N	4	7		1,5,8
U12	DS8617N-3	4	7		8
U13	SN74LS74A	7	14,10 13,14		6
U14	TFM-2	3			
U15	MC78L05ACP	2	3		

WARNING:
STATIC-SENSITIVE PARTS
HANDLE APPROPRIATELY

Figure 11-13b. Schematic (Sheet 2 of 2)

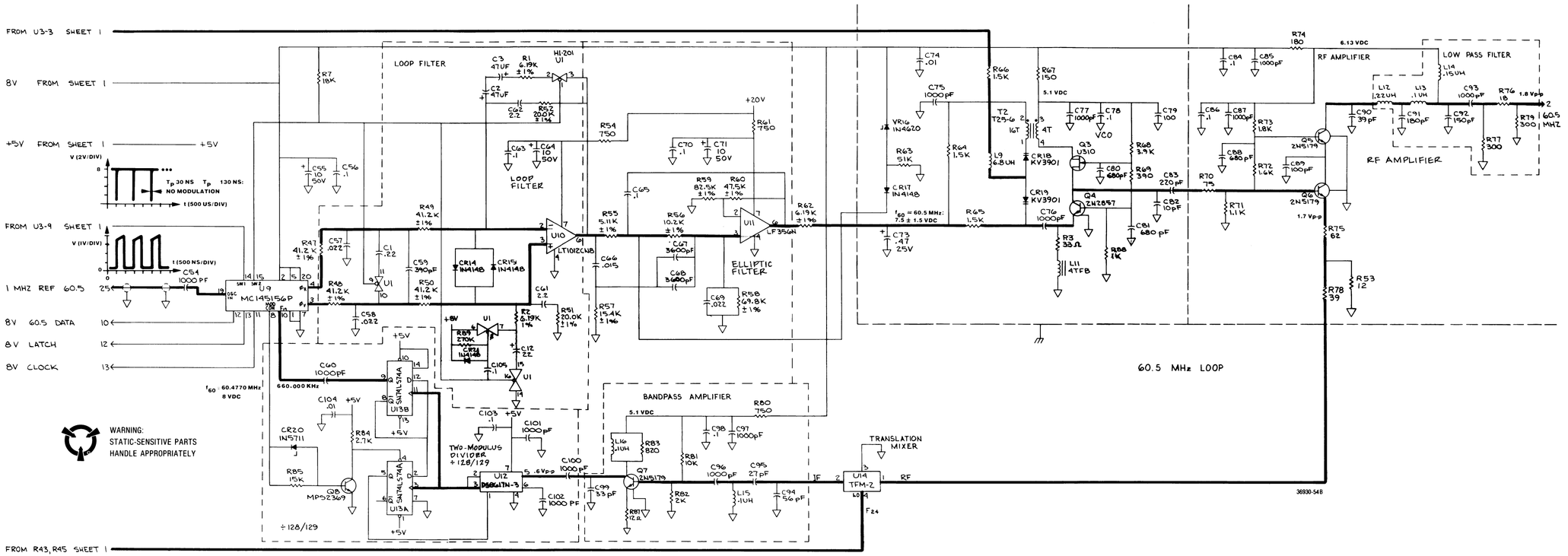
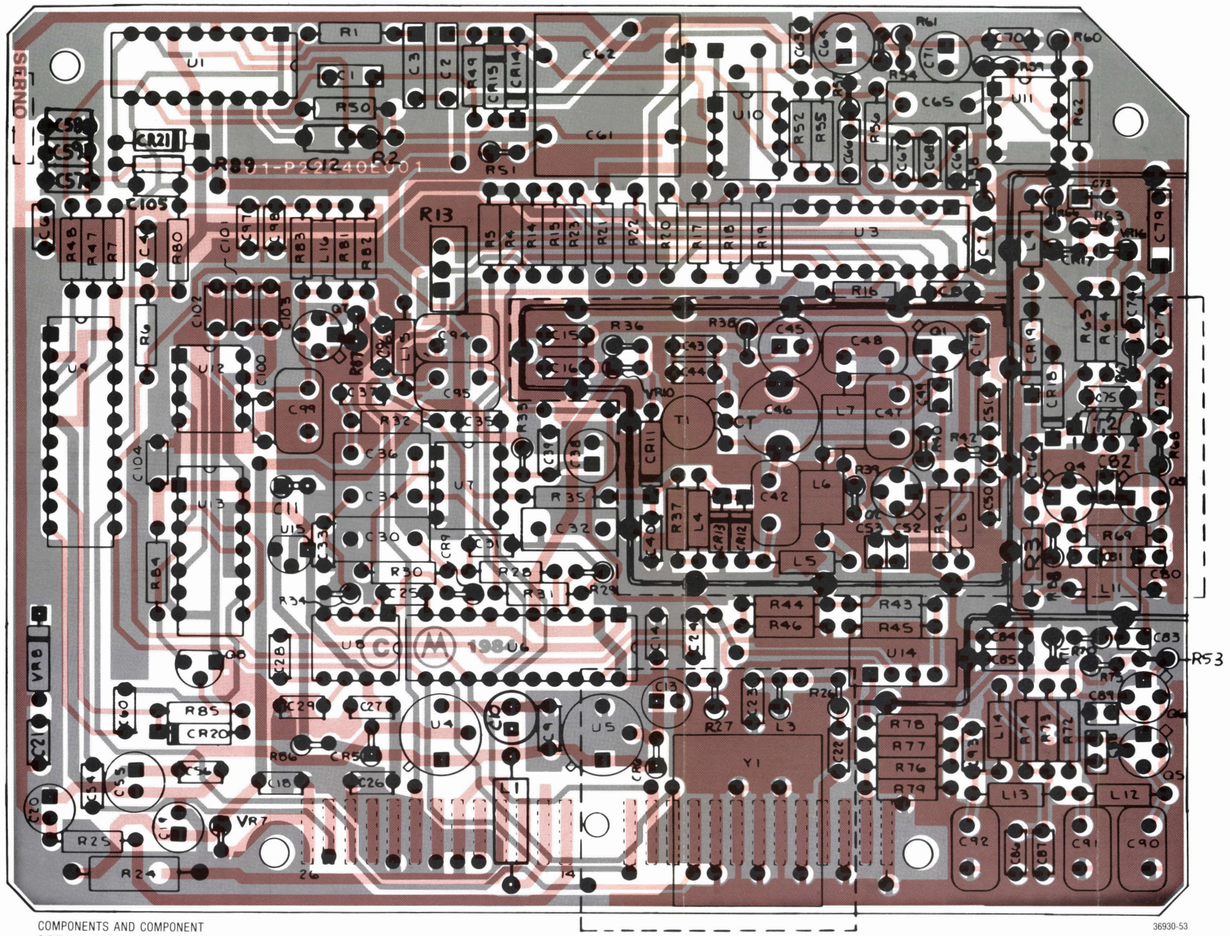


Figure 11-14. Printed Wiring Board Assembly and Parts List



COMPONENTS AND COMPONENT SIDE TRACK SHOWN IN BLACK.

SOLDER-SIDE TRACK SHOWN IN ORANGE

60.5-MHz LOOP BOARD (A9A4)
RTC-4042A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
C 001	1	21-80342B42	CAPACITOR	.22-10-100
C 002	1	23-80340B33	CAPACITOR	47UF-10-20
C 003	1	23-80340B33	CAPACITOR	47UF-10-20
C 004	1	21-80342B10	CAPACITOR	.1UF-20-50
C 006	1	21-80342B10	CAPACITOR	.1UF-20-50
C 007	1	21-80341B92	CAPACITOR	1000PF-10-100
C 008	1	21-80342B10	CAPACITOR	.1UF-20-50
C 009	1	21-80342B10	CAPACITOR	.1UF-20-50
C 010	1	23-80341B13	CAPACITOR	47UF-20-25
C 011	1	23-80340B96	CAPACITOR	1.0UF-20-25
C 012	1	23-80340B36	CAPACITOR	22UF-10-15
C 013	1	23-80341B15	CAPACITOR	10UF-20-50
C 014	1	21-80342B10	CAPACITOR	.1UF-20-50
C 015	1	21-80342B10	CAPACITOR	.1UF-20-50
C 016	1	21-80342B06	CAPACITOR	4700PF-20-100
C 017	1	21-80342B06	CAPACITOR	4700PF-20-100
C 018	1	21-80342B10	CAPACITOR	.1UF-20-50
C 019	1	23-80341B15	CAPACITOR	10UF-20-50
C 020	1	23-80341B11	CAPACITOR	47UF-20-16
C 021	1	21-80342B10	CAPACITOR	.1UF-20-50
C 022	1	21-80342B10	CAPACITOR	.1UF-20-50
C 023	1	21-80341B46	CAPACITOR	1000PF-5-50
C 024	1	21-80341B93	CAPACITOR	1000PF-20-100
C 025	1	21-80342B09	CAPACITOR	.01UF-20-50
C 026	1	21-80342B10	CAPACITOR	.1UF-20-50
C 027	1	21-80342B06	CAPACITOR	4700PF-20-100
C 028	1	21-80341B93	CAPACITOR	1000PF-20-100
C 029	1	21-80341B93	CAPACITOR	1000PF-20-100
C 030	1	08-80343B12	CAPACITOR	.1UF-10-100
C 031	1	21-80341B94	CAPACITOR	.01UF-10-100
C 032	1	08-80343B12	CAPACITOR	.1UF-10-100
C 033	1	21-80341B70	CAPACITOR	330PF-10-50
C 034	1	08-80343B12	CAPACITOR	.1UF-10-100
C 035	1	21-80341B93	CAPACITOR	1000PF-20-100
C 036	1	08-80343B12	CAPACITOR	.1UF-10-100
C 037	1	21-80341B70	CAPACITOR	330PF-10-50
C 038	1	23-80341B15	CAPACITOR	10UF-20-50
C 039	1	21-80342B10	CAPACITOR	.1UF-20-50
C 040	1	21-80341B94	CAPACITOR	.01UF-10-100
C 042	1	21-80339B12	CAPACITOR	12PF-5-500
C 043	1	21-80341B84	CAPACITOR	.0047UF-10-050
C 044	1	21-80342B10	CAPACITOR	.1UF-20-50
C 045	1	23-80341B07	CAPACITOR	100UF-20-10
C 046	1	20-80343B36	CAPACITOR	2.5 TO 11PF-350-NPO
C 047	1	21-00859934	CAPACITOR	10PF-.5PF-500
C 048	1	21-80339B25	CAPACITOR	120PF-5-500
C 049	1	21-80339B62	CAPACITOR	5.6PF-10-200
C 050	1	21-80342B10	CAPACITOR	.1UF-20-50
C 051	1	21-80342B06	CAPACITOR	4700PF-20-100
C 052	1	21-80339B66	CAPACITOR	390PF-5-100
C 053	1	21-80339B66	CAPACITOR	390PF-5-100
C 054	1	21-80341B93	CAPACITOR	1000PF-20-100
C 055	1	23-80341B15	CAPACITOR	10UF-20-50
C 056	1	21-80342B10	CAPACITOR	.1UF-20-50
C 057	1	21-80342B39	CAPACITOR	.022UF-5-50
C 058	1	21-80342B39	CAPACITOR	.022UF-5-50
C 059	1	21-80341B79	CAPACITOR	390PF-10-50
C 060	1	21-80341B93	CAPACITOR	1000PF-20-100
C 061	1	08-80343B16	CAPACITOR	2.2UF-5-100
C 062	1	08-80343B16	CAPACITOR	2.2UF-5-100
C 063	1	21-80342B10	CAPACITOR	.1UF-20-50
C 064	1	23-80341B15	CAPACITOR	10UF-20-50
C 065	1	08-80343B12	CAPACITOR	.1UF-10-100
C 066	1	21-80342B34	CAPACITOR	.015UF-5-50
C 067	1	21-80341B73	CAPACITOR	3600PF-5-50
C 068	1	21-80341B73	CAPACITOR	3600PF-5-50
C 069	1	21-80342B39	CAPACITOR	.022UF-5-50
C 070	1	21-80342B10	CAPACITOR	.1UF-20-50
C 071	1	23-80341B15	CAPACITOR	10UF-20-50
C 073	1	23-80341B01	CAPACITOR	47UF-5-25
C 074	1	21-80342B09	CAPACITOR	.01UF-20-50
C 075	1	21-80341B46	CAPACITOR	1000PF-5-50
C 076	1	21-80341B46	CAPACITOR	1000PF-5-50
C 077	1	21-80341B46	CAPACITOR	1000PF-5-50
C 078	1	21-80342B10	CAPACITOR	.1UF-20-50
C 079	1	23-80340B32	CAPACITOR	100UF-10-20
C 080	1	21-80339B69	CAPACITOR	680PF-10-100
C 081	1	21-80339B69	CAPACITOR	680PF-10-100
C 082	1	21-80339B60	CAPACITOR	10PF-10-200
C 083	1	21-80339B61	CAPACITOR	220PF-10-100
C 084	1	21-80342B10	CAPACITOR	.1UF-20-50
C 085	1	21-80341B93	CAPACITOR	1000PF-20-100
C 086	1	21-80342B10	CAPACITOR	.1UF-20-50

60.5-MHz LOOP BOARD (A9A4) (Cont)

RTC-4042A

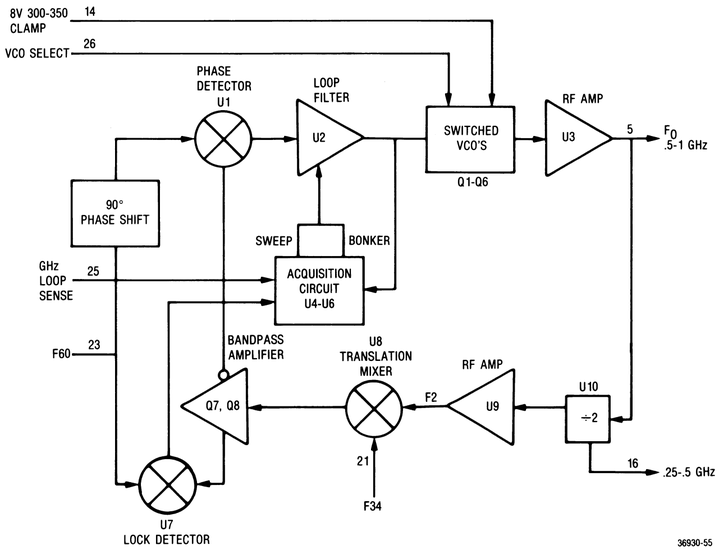
Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
C 087	1	21-80341B93	CAPACITOR	1000PF-20-100
C 088	1	21-80339B69	CAPACITOR	680PF-10-100
C 089	1	21-80339B63	CAPACITOR	100PF-10-200
C 090	1	21-80339B15	CAPACITOR	39PF-5-500
C 091	1	21-80369A95	CAPACITOR	180PF-5-500
C 092	1	21-80369A94	CAPACITOR	150PF-5-500
C 093	1	21-80341B46	CAPACITOR	1000PF-5-50
C 094	1	21-80339B17	CAPACITOR	56PF-5-500
C 095	1	21-80369A89	CAPACITOR	27PF-5-500
C 096	1	21-80341B46	CAPACITOR	1000PF-5-50
C 097	1	21-80341B93	CAPACITOR	1000PF-20-100
C 098	1	21-80342B10	CAPACITOR	.1UF-20-50
C 099	1	21-80369A90	CAPACITOR	33PF-5-500
C 100	1	21-80341B46	CAPACITOR	1000PF-5-50
C 101	1	21-80341B93	CAPACITOR	1000PF-20-100
C 102	1	21-80341B93	CAPACITOR	1000PF-20-100
C 103	1	21-80342B10	CAPACITOR	.1UF-20-50
C 104	1	21-80342B09	CAPACITOR	.01UF-20-50
C 105	1	21-80342B10	CAPACITOR	.1UF-20-50
CR005	1	48-82466H13	DIODE	
CR006	1	48-82466H13	DIODE	
CR009	1	48-87643C01	DIODE	
CR011	1	48-84463K02	DIODE	
CR012	1	48-80339B95	DIODE	
CR013	1	48-80339B95	DIODE	
CR014	1	48-84463K02	DIODE	
CR015	1	48-84463K02	DIODE	
CR017	1	48-84463K02	DIODE	
CR018	1	48-80339B95	DIODE	
CR019	1	48-80339B95	DIODE	
CR020	1	48-87643C01	DIODE	
CR021	1	48-84463K02	DIODE	
L 001	1	24-80369A37	COIL	100UH
L 003	1	24-80369A31	COIL	22UH
L 004	1	24-80369A31	COIL	22UH
L 005	1	24-80369A31	COIL	22UH
L 006	1	24-83961B01	CHOKE	
L 007	1	24-83961B01	CHOKE	
L 008	1	24-80369A25	COIL	.22UH
L 009	1	24-80369A28	COIL	6.8UH
L 011	1	24-83961B01	CHOKE	
L 012	1	24-80369A25	COIL	.22UH
L 013	1	24-80369A19	COIL	.1UH
L 014	1	24-80369A23	COIL	.15UH
L 015	1	24-80369A19	COIL	.1UH
L 016	1	24-80369A19	COIL	.1UH
Q 001	1	48-00869933	TRANSISTOR	J-FET
Q 002	1	48-00869776	TRANSISTOR	
Q 003	1	48-00869933	TRANSISTOR	J-FET
Q 004	1	48-80342B48	TRANSISTOR	
Q 005	1	48-00869776	TRANSISTOR	
Q 006	1	48-00869776	TRANSISTOR	
Q 007	1	48-00869776	TRANSISTOR	
Q 008	1	48-80340B46	TRANSISTOR	
R 001	1	06-10621C71	RESISTOR	6190-1-1/4
R 002	1	06-10621C71	RESISTOR	6190-1-1/4
R 003	1	06-11009C13	RESISTOR	33-5-1/4
R 004	1	06-11009C79	RESISTOR	18K-5-1/4
R 005	1	06-11009C79	RESISTOR	18K-5-1/4
R 006	1	06-11009C79	RESISTOR	18K-5-1/4
R 007	1	06-11009C79	RESISTOR	18K-5-1/4
R 013	1	18-80343B79	RESISTOR,VARIABLE	10K
R 014	1	06-10621C78	RESISTOR	7.32K-1-1/4
R 015	1	06-10621C78	RESISTOR	7.32K-1-1/4
R 016	1	06-80340B73	RESISTOR	12.6K-.5-1/10
R 017	1	06-11040C38	RESISTOR	2.80K-.5-1/10
R 018	1	06-11040C09	RESISTOR	1.40K-.5-1/10
R 019	1	06-11040C38	RESISTOR	2.80K-.5-1/10
R 020	1	06-11040C09	RESISTOR	1.40K-.5-1/10
R 021	1	06-11040C38	RESISTOR	2.80K-.5-1/10
R 022	1	06-11040C09	RESISTOR	1.40K-.5-1/10
R 023	1	06-11040C09	RESISTOR	1.40K-.5-1/10
R 024	1	06-11009C51	RESISTOR	1.2K-5-1/4
R 025	1	06-11009C39	RESISTOR	390-5-1/4
R 026	1	06-11009C53	RESISTOR	1.5K-5-1/4
R 027	1	06-11009C53	RESISTOR	1.5K-5-1/4
R 028	1	06-10621D36	RESISTOR	28.7K-1-1/4
R 029	1	06-10621D36	RESISTOR	28.7K-1-1/4
R 030	1	06-10621D32	RESISTOR	26.1K-1-1/4
R 031	1	06-10621D32	RESISTOR	26.1K-1-1/4
R 032	1	06-10621E21	RESISTOR	215K-1-1/4
R 033	1	06-11009C53	RESISTOR	1.5K-5-1/4

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
R 034	1	06-10621E21	RESISTOR	215K-1-1/4
R 035	1	06-10621C83	RESISTOR	8.25K-1-1/4
R 036	1	06-11009C90	RESISTOR	51K-5-1/4
R 037	1	06-11009C53	RESISTOR	1.5K-5-1/4
R 038	1	06-11009C25	RESISTOR	100-5-1/4
R 039	1	06-11009C25	RESISTOR	100-5-1/4
R 040	1	06-11009C64	RESISTOR	4.3K-5-1/4
R 041	1	06-11009C77	RESISTOR	15K-5-1/4
R 042	1	06-11009C33	RESISTOR	220-5-1/4
R 043	1	06-11009C07	RESISTOR	18-5-1/4
R 044	1	06-11009C32	RESISTOR	200-5-1/4
R 045	1	06-11009C36	RESISTOR	300-5-1/4
R 046	1	06-11009C25	RESISTOR	100-5-1/4
R 047	1	06-10621D51	RESISTOR	41.2K-1-1/4
R 048	1	06-10621D51	RESISTOR	41.2K-1-1/4
R 049	1	06-10621D51	RESISTOR	41.2K-1-1/4
R 050	1	06-10621D51	RESISTOR	41.2K-1-1/4
R 051	1	06-10621D21	RESISTOR	20K-1-1/4
R 052	1	06-10621D21	RESISTOR	20K-1-1/4
R 053	1	06-11009C03	RESISTOR	12-5-1/4
R 054	1	06-11009C46	RESISTOR	750-5-1/4
R 055	1	06-10621C63	RESISTOR	5.11K-1-1/4
R 056	1	06-10621C92	RESISTOR	10.2K-1-1/4
R 057	1	06-10621D10	RESISTOR	15.4K-1-1/4
R 058	1	06-10621D73	RESISTOR	69.8K-1-1/4
R 059	1	06-10621D80	RESISTOR	82.5K-1-1/4
R 060	1	06-10621D57	RESISTOR	47.5K-1-1/4
R 061	1	06-11009C46	RESISTOR	750-5-1/4
R 062	1	06-10621C71	RESISTOR	6.19K-1-1/4
R 063	1	06-11009C90	RESISTOR	51K-5-1/4
R 064	1	06-11009C53	RESISTOR	1.5K-5-1/4
R 065	1	06-11009C53	RESISTOR	1.5K-5-1/4
R 066	1	06-11009C53	RESISTOR	1.5K-5-1/4
R 067	1	06-11009C29	RESISTOR	150-5-1/4
R 068	1	06-11009C63	RESISTOR	3.9K-5-1/4
R 069	1	06-11009C39	RESISTOR	390-5-1/4
R 070	1	06-11009C22	RESISTOR	75-5-1/4
R 071	1	06-11009C50	RESISTOR	1.1K-5-1/4
R 072	1	06-11009C54	RESISTOR	1.6K-5-1/4
R 073	1	06-11009C55	RESISTOR	1.8K-5-1/4
R 074	1	06-11009C31	RESISTOR	180-5-1/4
R 075	1	06-11009A20	RESISTOR	62-5-1/4
R 076	1	06-11009C07	RESISTOR	18-5-1/4
R 077	1	06-11009C36	RESISTOR	300-5-1/4
R 078	1	06-11009C15	RESISTOR	39-5-1/4
R 079	1	06-11009C36	RESISTOR	300-5-1/4
R 080	1	06-11009C46	RESISTOR	750-5-1/4
R 081	1	06-11009C73	RESISTOR	10K-5-1/4
R 082	1	06-11009C56	RESISTOR	2K-5-1/4
R 083	1	06-11009C47	RESISTOR	820-5-1/4
R 084	1	06-11009C59	RESISTOR	2.7K-5-1/4
R 085	1	06-11009C77	RESISTOR	15K-5-1/4
R 086	1	06-11009C29	RESISTOR	150-5-1/4
R 087	1	06-11009C03	RESISTOR	12-5-1/4
R 088	1	06-11009C49	RESISTOR	1K-5-1/4
R 089	1	06-11009D08	RESISTOR	270K-5-1/4
T 001	1	25-80342B77	TRANSFORMER	
T 002	1	25-80342B80	TRANSFORMER	
U 001	1	51-80345A05	INTEGRATED CIRCUIT	HI-201-5 SCREENED
U 003	1	51-05596E06	INTEGRATED CIRCUIT	
U 004	1	51-05698H01	INTEGRATED CIRCUIT	
U 005	1	51-05698H01	INTEGRATED CIRCUIT	
U 006	1	51-83625M62	INTEGRATED CIRCUIT	
U 007	1	51-80365A27	INTEGRATED CIRCUIT	
U 008	1	51-80339B82	INTEGRATED CIRCUIT	
U 009	1	51-83625M62	INTEGRATED CIRCUIT	
U 010	1	51-80340B07	INTEGRATED CIRCUIT	
U 011	1	51-80339B97	INTEGRATED CIRCUIT	
U 012	1	51-80339B82	INTEGRATED CIRCUIT	
U 013	1	51-83627M93	INTEGRATED CIRCUIT	
U 014	1	51-80346A05	MIXER	
U 015	1	51-05469E01	INTEGRATED CIRCUIT	
VR007	1	48-82256C39	DIODE,ZENER	20V-5-1/2
VR008	1	48-83461E32	DIODE,ZENER	8.2V-5-.5
VR010	1	48-82256C15	DIODE,ZENER	5.1V-5-1/4
VR016	1	48-83461E03	DIODE,ZENER	3.3V-5-1/4
Y 001	1	91-80342B86	FILTER	1.05MHZ

GHz LOOP BOARD (A9A5)

(RTC-4043A)

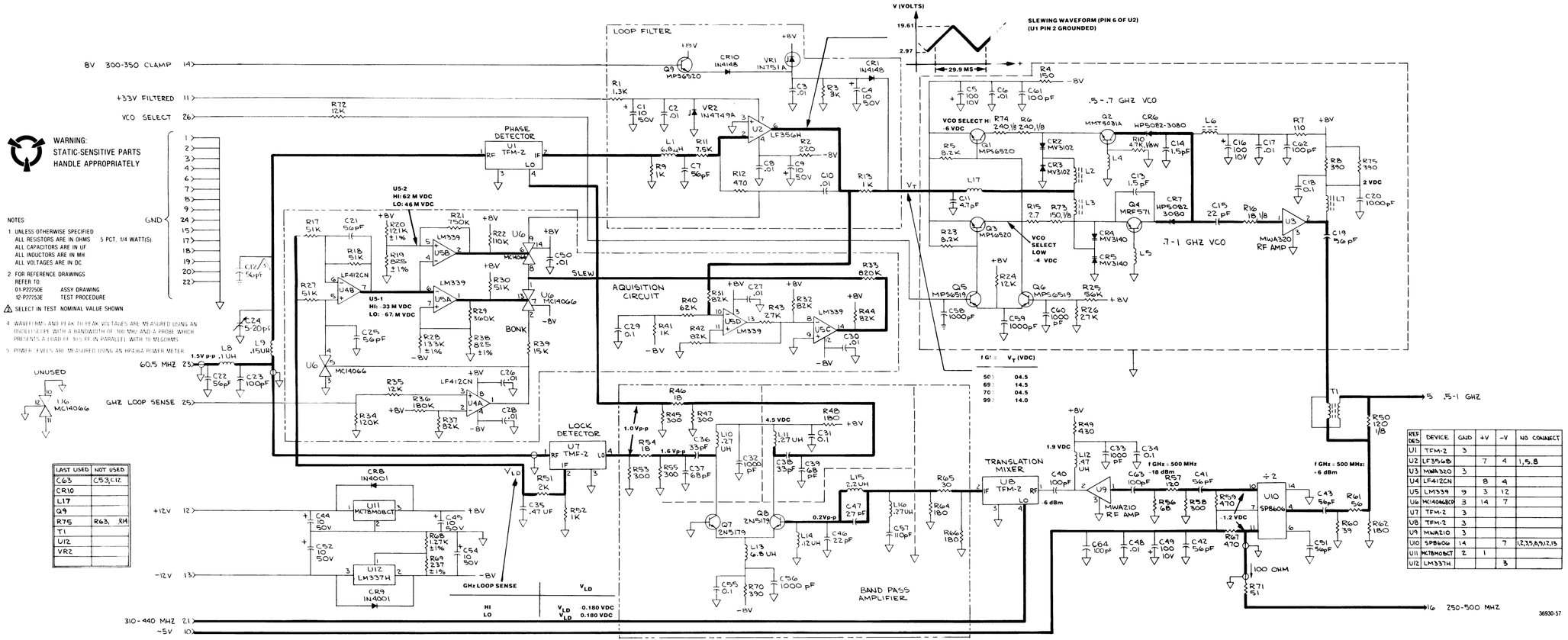
Figure 11-15. Block Diagram



GHz LOOP BOARD (A9A5)

(RTC-4043A)

Figure 11-16. Schematic



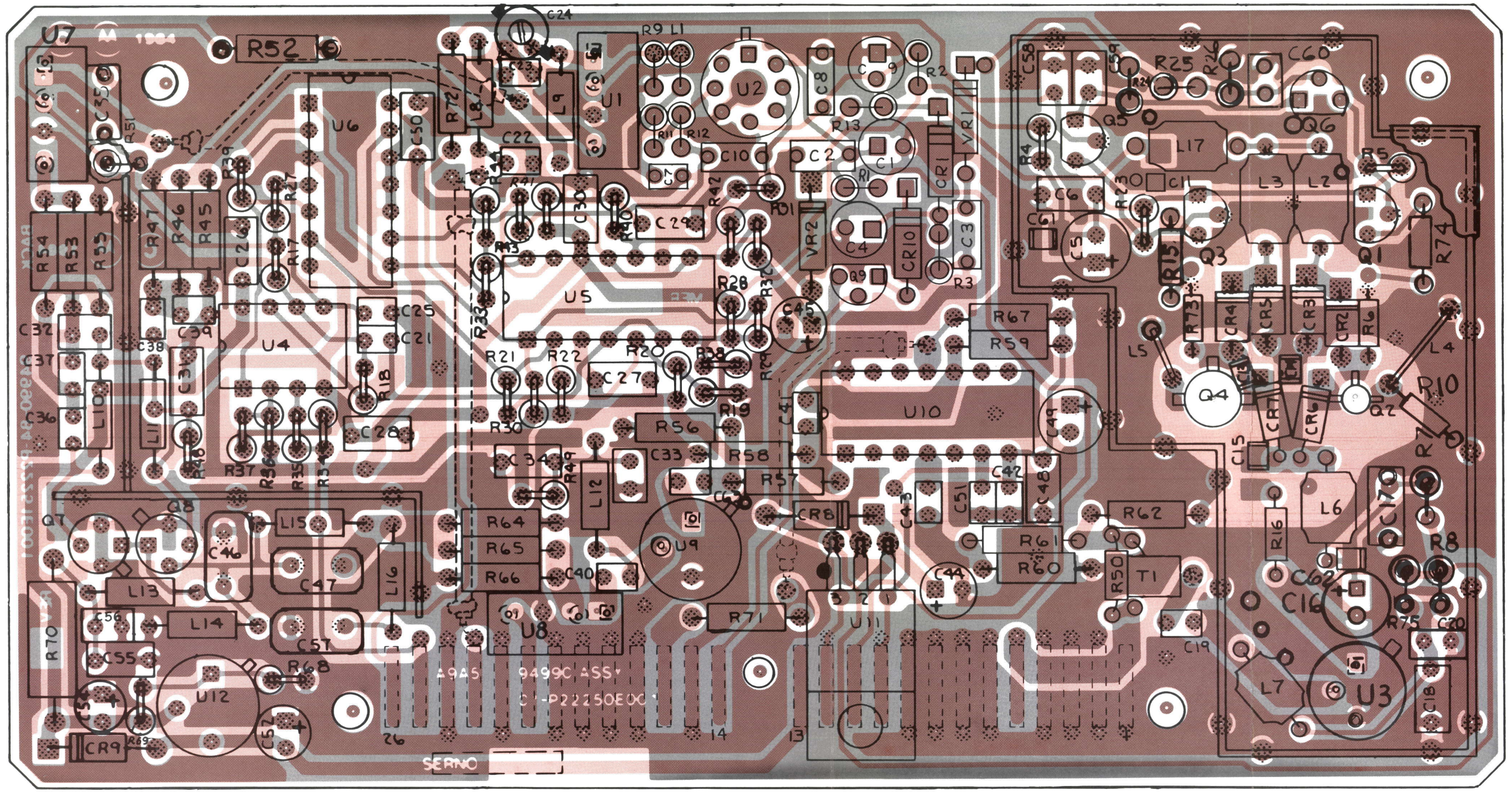
LAST USED	NOT USED
C63	C53,C12
CR10	
L17	
Q9	
R75	R63, R14
T1	
U12	
VR2	

REF DES	DEVICE	GND	+V	-V	NO CONNECT
U1	TFM-2	3			
U2	LF356B		7	4	1,5,8
U3	MWA320	3			
U4	LF412CN		8	4	
U5	LM339	9	3	12	
U6	MC14066BCP	3	14	7	
U7	TFM-2	3			
U8	TFM-2	3			
U9	MWA210	3			
U10	SP8606	14		7	12,13,8,9,12,13
U11	MC78M08CT	2	1		
U12	LM337H			3	

GHz LOOP BOARD (A9A5)

(RTC-4043A)

Figure 11-17a. Printed Wiring Board Assembly and Parts List



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COMPONENTS AND COMPONENT SIDE TRACK SHOWN IN BLACK.

SOLDER-SIDE TRACK SHOWN IN ORANGE

GHz LOOP BOARD (A9A5)
RTC-4043A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
C 001	1	23-80341B15	CAPACITOR	10UF-20-50
C 002	1	21-80342B09	CAPACITOR	.01UF-20-50
C 003	1	21-80342B09	CAPACITOR	.01UF-20-50
C 004	1	23-80341B15	CAPACITOR	10UF-20-50
C 005	1	23-80341B07	CAPACITOR	100UF-20-10
C 006	1	21-80342B09	CAPACITOR	.01UF-20-50
C 007	1	21-80339B67	CAPACITOR	56PF-10-200
C 008	1	21-80342B09	CAPACITOR	.01UF-20-50
C 009	1	23-80341B15	CAPACITOR	10UF-20-50
C 010	1	21-80342B32	CAPACITOR	.01UF-5-50
C 011	1	21-80370A19	CAPACITOR	4.7PF-.5PF-100
C 012	1	21-80344B29	CAPACITOR	56PF-5-100 NOMINAL
C 012	S01	21-80344B28	CAPACITOR	47PF-5-100
C 012	S01	21-80344B30	CAPACITOR	68PF-5-100
C 012	S01	21-80344B31	CAPACITOR	82PF-5-100
C 013	1	21-80370A09	CAPACITOR	1.5PF-.5PF-100
C 014	1	21-80370A09	CAPACITOR	1.5PF-.5PF-100
C 015	1	21-80370A14	CAPACITOR	22PF-5-100
C 016	1	23-80341B07	CAPACITOR	100UF-20-10
C 017	1	21-80342B09	CAPACITOR	.01UF-20-50
C 018	1	21-80342B10	CAPACITOR	.1UF-20-50
C 019	1	21-80339B67	CAPACITOR	56PF-10-200
C 020	1	21-80339B72	CAPACITOR	.001UF-10-200
C 021	1	21-80339B67	CAPACITOR	56PF-10-200
C 022	1	21-80339B67	CAPACITOR	56PF-10-200
C 023	1	21-80339B63	CAPACITOR	100PF-10-200
C 024	1	20-80344B33	CAPACITOR, VARIABLE	5-20PF
C 025	1	21-80339B67	CAPACITOR	56PF-10-200
C 026	1	21-80342B09	CAPACITOR	.01UF-20-50
C 027	1	21-80342B09	CAPACITOR	.01UF-20-50
C 028	1	21-80342B09	CAPACITOR	.01UF-20-50
C 029	1	21-80342B10	CAPACITOR	.1UF-20-50
C 030	1	21-80342B09	CAPACITOR	.01UF-20-50
C 031	1	21-80342B10	CAPACITOR	1UF-20-50
C 032	1	21-80339B72	CAPACITOR	.001UF-10-200
C 033	1	21-80339B72	CAPACITOR	.001UF-10-200
C 034	1	21-80342B10	CAPACITOR	.1UF-20-50
C 035	1	21-80342B14	CAPACITOR	.47UF-20-50
C 036	1	21-80339B65	CAPACITOR	33PF-10-200
C 037	1	21-80339B68	CAPACITOR	68PF-10-200
C 038	1	21-80339B65	CAPACITOR	33PF-10-200
C 039	1	21-80339B68	CAPACITOR	68PF-10-200
C 040	1	21-80339B63	CAPACITOR	100PF-10-200
C 041	1	21-80339B67	CAPACITOR	56PF-10-200
C 042	1	21-80339B67	CAPACITOR	56PF-10-200
C 043	1	21-80339B67	CAPACITOR	56PF-10-200
C 044	1	23-80341B15	CAPACITOR	10UF-20-50
C 045	1	23-80341B15	CAPACITOR	10UF-20-50
C 046	1	21-80369A88	CAPACITOR	22PF-5-500
C 047	1	21-80369A89	CAPACITOR	27PF-5-500
C 048	1	21-80342B09	CAPACITOR	.01UF-20-50
C 049	1	23-80341B07	CAPACITOR	100UF-20-10
C 050	1	21-80342B09	CAPACITOR	.01UF-20-50
C 051	1	21-80339B67	CAPACITOR	56PF-10-200
C 052	1	23-80341B15	CAPACITOR	10UF-20-50
C 054	1	23-80341B15	CAPACITOR	10UF-20-50
C 055	1	21-80342B10	CAPACITOR	.1UF-20-50
C 056	1	21-80339B72	CAPACITOR	.001UF-10-200
C 057	1	21-80339B24	CAPACITOR	110PF-5-500
C 058	1	21-80339B72	CAPACITOR	.001UF-10-200
C 059	1	21-80339B72	CAPACITOR	.001UF-10-200
C 060	1	21-80339B72	CAPACITOR	.001UF-10-200
C 061	1	21-80370A21	CAPACITOR	100PF-20-100
C 062	1	21-80370A21	CAPACITOR	100PF-20-100
C 063	1	21-80339B63	CAPACITOR	100PF-10-200
C 064	1	21-80370A21	CAPACITOR	100PF-20-100
CR001	1	48-84463K02	DIODE	
CR002	1	48-82190H47	DIODE	
CR003	1	48-82190H47	DIODE	
CR004	1	48-82190H37	DIODE	
CR005	1	48-82190H37	DIODE	
CR006	1	48-80339B87	DIODE	
CR007	1	48-80339B87	DIODE	
CR008	1	48-82466H13	DIODE	
CR009	1	48-82466H13	DIODE	
CR010	1	48-84463K02	DIODE	
L 001	1	24-80369A28	COIL	6.8UH
L 002	1	24-83961B01	CHOKE	
L 003	1	24-83961B01	CHOKE	
L 004	1	24-80342B73	COIL	
L 005	1	24-80342B72	COIL	
L 006	1	24-83961B01	CHOKE	
L 007	1	24-83961B01	CHOKE	
L 008	1	24-80369A19	COIL	.1UH
L 009	1	24-80369A23	COIL	.15UH

GHz LOOP BOARD (A9A5)

(RTC-4043A)

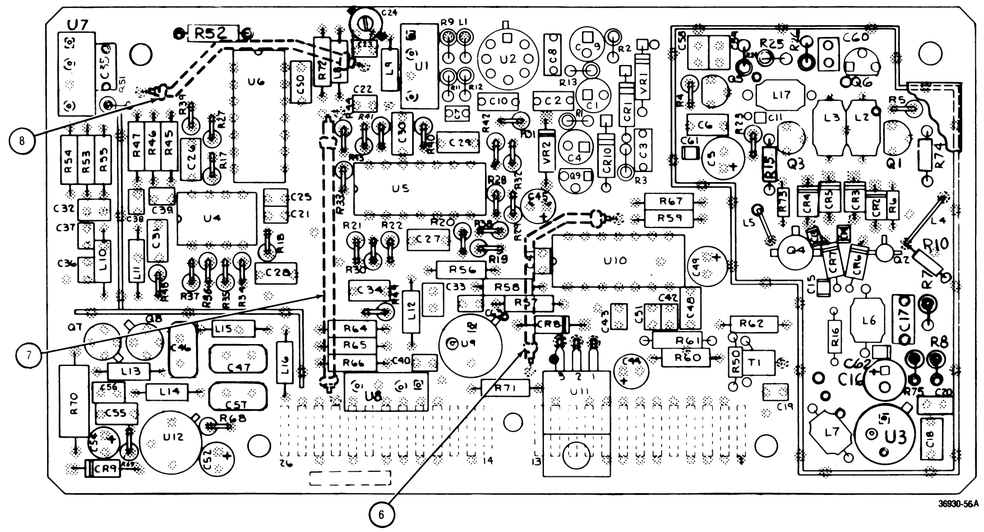
Figure 11-17b. Printed Wiring Board Assembly and Parts List

GHz LOOP BOARD (A9A5) (Cont)
RTC-4043A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
L 010	1	24-80340B51	COIL	.27UH
L 011	1	24-80340B51	COIL	.27UH
L 012	1	24-80369A27	COIL	.47UH
L 013	1	24-80369A28	COIL	6.8UH
L 014	1	24-80340B50	COIL	.12UH
L 015	1	24-80369A32	COIL	2.2UH
L 016	1	24-80340B51	COIL	.27UH
L 017	1	24-83961B01	CHOKE	
Q 001	1	48-80340B86	TRANSISTOR	MPS6520
Q 002	1	48-80345A47	TRANSISTOR	
Q 003	1	48-80340B86	TRANSISTOR	MPS6520
Q 004	1	48-80340B48	TRANSISTOR	
Q 005	1	48-80340B85	TRANSISTOR	MPS6519
Q 006	1	48-80340B85	TRANSISTOR	MPS6519
Q 007	1	48-00869776	TRANSISTOR	
Q 008	1	48-00869776	TRANSISTOR	
Q 009	1	48-80340B86	TRANSISTOR	MPS6520
R 001	1	06-11009C52	RESISTOR	1.3K-5-1/4
R 002	1	06-11009C33	RESISTOR	220-5-1/4
R 003	1	06-11009C60	RESISTOR	3K-5-1/4
R 004	1	06-11009C29	RESISTOR	150-5-1/4
R 005	1	06-11009C71	RESISTOR	8.2K-5-1/4
R 006	1	06-11041C50	RESISTOR	240-5-1/8
R 007	1	06-11009C26	RESISTOR	110-5-1/4
R 008	1	06-11009C39	RESISTOR	390-5-1/4
R 009	1	06-11009C49	RESISTOR	1K-5-1/4
R 010	1	06-00185A65	RESISTOR	4.7K-5-1/8
R 011	1	06-11009C70	RESISTOR	7.5K-5-1/4
R 012	1	06-11009C41	RESISTOR	470-5-1/4
R 013	1	06-11009C49	RESISTOR	1K-5-1/4
R 015	1	06-11041A03	RESISTOR	2.7-5-1/8
R 016	1	06-11041A23	RESISTOR	18-5-1/8
R 017	1	06-11009C90	RESISTOR	51K-5-1/4
R 018	1	06-11009C90	RESISTOR	51K-5-1/4
R 019	1	06-10621B86	RESISTOR	825-1-1/4
R 020	1	06-10621C99	RESISTOR	121K-1-1/4
R 021	1	06-11009D19	RESISTOR	750K-5-1/4
R 022	1	06-11009C98	RESISTOR	110K-5-1/4
R 023	1	06-11009C71	RESISTOR	8.2K-5-1/4
R 024	1	06-11009C75	RESISTOR	12K-5-1/4
R 025	1	06-11009C91	RESISTOR	56K-5-1/4
R 026	1	06-11009C83	RESISTOR	27K-5-1/4
R 027	1	06-11009C90	RESISTOR	51K-5-1/4
R 028	1	06-10621E01	RESISTOR	133K-1-1/4
R 029	1	06-11009D11	RESISTOR	360K-5-1/4
R 030	1	06-11009C90	RESISTOR	51K-5-1/4
R 031	1	06-11009C95	RESISTOR	82K-5-1/4
R 032	1	06-11009C95	RESISTOR	82K-5-1/4
R 033	1	06-11009D20	RESISTOR	820K-5-1/4
R 034	1	06-11009C99	RESISTOR	120K-5-1/4
R 035	1	06-11009C75	RESISTOR	12K-5-1/4
R 036	1	06-11009D04	RESISTOR	180K-5-1/4
R 037	1	06-11009C95	RESISTOR	82K-5-1/4
R 038	1	06-10621B86	RESISTOR	825-1-1/4
R 039	1	06-11009C77	RESISTOR	15K-5-1/4
R 040	1	06-11009C92	RESISTOR	62K-5-1/4
R 041	1	06-11009C49	RESISTOR	1K-5-1/4
R 042	1	06-11009C95	RESISTOR	82K-5-1/4
R 043	1	06-11009C83	RESISTOR	27K-5-1/4
R 044	1	06-11009C95	RESISTOR	82K-5-1/4
R 045	1	06-11009C36	RESISTOR	300-5-1/4
R 046	1	06-11009C07	RESISTOR	18-5-1/4
R 047	1	06-11009C36	RESISTOR	300-5-1/4
R 048	1	06-11009C31	RESISTOR	180-5-1/4
R 049	1	06-11009C40	RESISTOR	430-5-1/4
R 050	1	06-11041C43	RESISTOR	120-5-1/8
R 051	1	06-11009C56	RESISTOR	2K-5-1/4
R 052	1	06-11009C49	RESISTOR	1K-5-1/4
R 053	1	06-11009C36	RESISTOR	300-5-1/4
R 054	1	06-11009C07	RESISTOR	18-5-1/4
R 055	1	06-11009C36	RESISTOR	300-5-1/4
R 056	1	06-11009C21	RESISTOR	68-5-1/4
R 057	1	06-11009C27	RESISTOR	120-5-1/4
R 058	1	06-11009C36	RESISTOR	300-5-1/4
R 059	1	06-11009C41	RESISTOR	470-5-1/4
R 060	1	06-11009C15	RESISTOR	39-5-1/4
R 061	1	06-11009C19	RESISTOR	56-5-1/4
R 062	1	06-11009C31	RESISTOR	180-5-1/4
R 064	1	06-11009C31	RESISTOR	180-5-1/4
R 065	1	06-11009C12	RESISTOR	30-5-1/4
R 066	1	06-11009C31	RESISTOR	180-5-1/4
R 067	1	06-11009C41	RESISTOR	470-5-1/4
R 068	1	06-10621C05	RESISTOR	1.27K-1-1/4
R 069	1	06-10621B34	RESISTOR	237-1-1/4
R 070	1	06-11045A39	RESISTOR	390-5-1/2
R 071	1	06-11009C18	RESISTOR	51-5-1/4
R 072	1	06-11009C75	RESISTOR	12K-5-1/4
R 073	1	06-00185A29	RESISTOR	150-5-1/8
R 074	1	06-11041C50	RESISTOR	240-5-1/8
R 075	1	06-11009C39	RESISTOR	390-5-1/4
T 001	1	25-80342B53	TRANSFORMER ASSY	2T #32 ON 3B BEAD
U 001	1	51-80346A05	MIXER	
U 002	1	51-80339B96	INTEGRATED CIRCUIT	
U 003	1	51-80340B64	INTEGRATED CIRCUIT	
U 004	1	51-80339B99	INTEGRATED CIRCUIT	
U 005	1	51-83629M71	INTEGRATED CIRCUIT	
U 006	1	51-82884L71	INTEGRATED CIRCUIT	
U 007	1	51-80346A05	MIXER	
U 008	1	51-80346A05	MIXER	
U 009	1	51-80346A54	INTEGRATED CIRCUIT	
U 010	1	51-80340B90	INTEGRATED CIRCUIT	
U 011	1	51-05292H02	INTEGRATED CIRCUIT	
U 012	1	51-80340B04	INTEGRATED CIRCUIT	
VR001	1	48-82256C51	DIODE,ZENER	5.1V-5-.5
VR002	1	RG-1N4749A	DIODE,ZENER	24V-5-1
006	1	30-80344B03	CABLE,JUMPER NO.1	
007	1	30-80344B04	CABLE,JUMPER NO.2	
008	1	30-80344B05	CABLE,JUMPER NO.3	

Transformer Assembly
25-80342B53

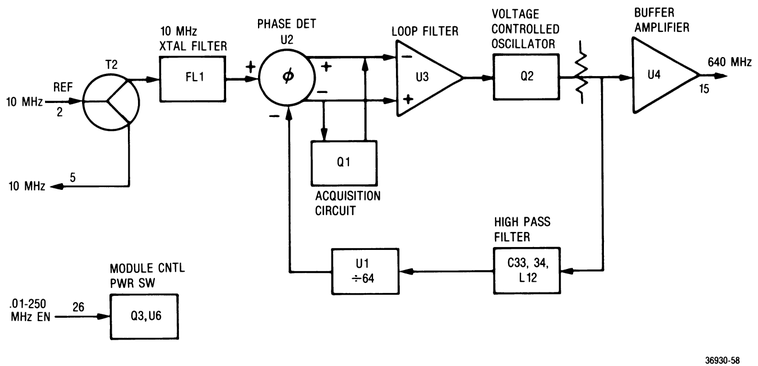
Find No.	Qty. Req.	Part No.	Nomenclature
T001			
001	1	74-15169A01	BEAD



640-MHz LOOP BOARD (A9A6)

(RTC-4044A)

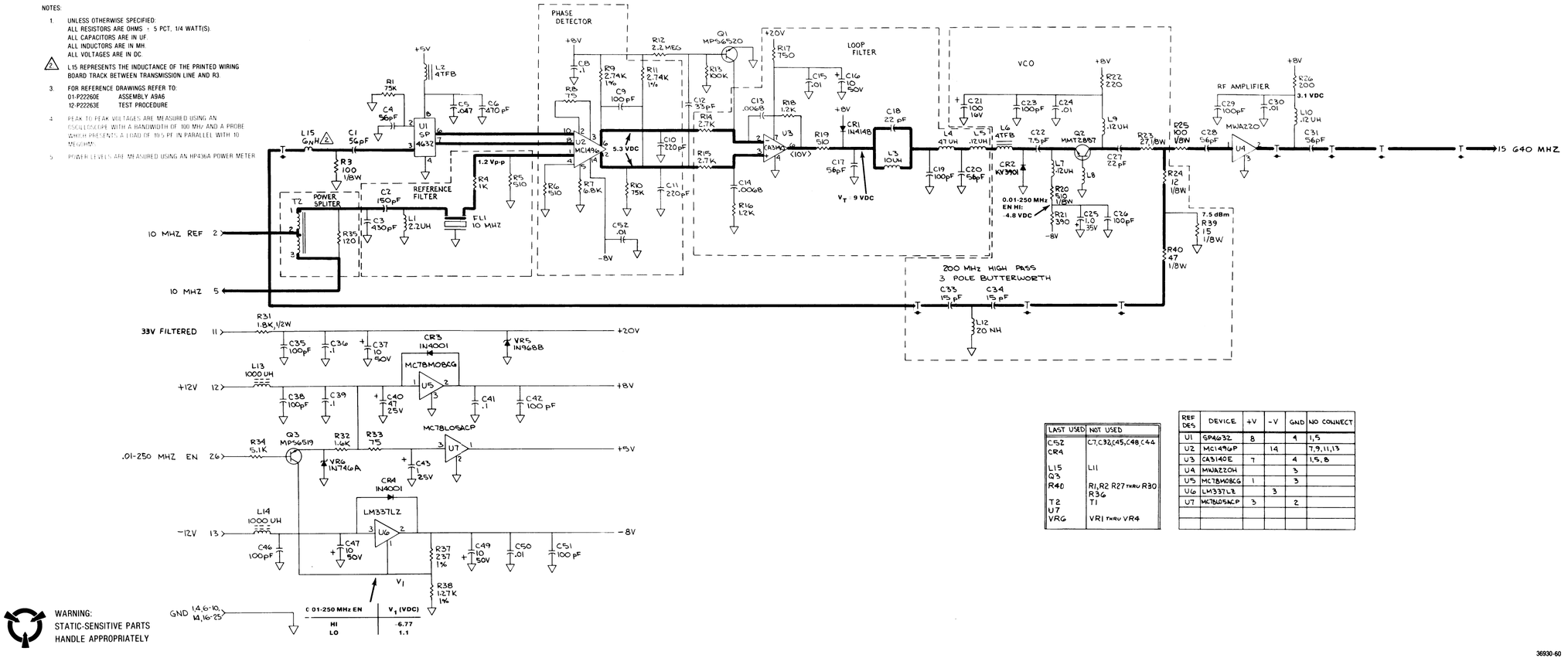
Figure 11-18. Block Diagram



640-MHz LOOP BOARD (A9A6)

(RTC-4044A)

Figure 11-19. Schematic



LAST USED	NOT USED
C52	C7,C32,C45,C48,C44
CR4	
L15	L11
Q3	
R40	R1,R2 R27 THRU R30 R36
T2	T1
U7	
VR6	VR1 THRU VR4

REF DES	DEVICE	+V	-V	GND	NO CONNECT
U1	SP4632	8		4	1,5
U2	MC1496P		14		7,9,11,13
U3	CA3140E	7		4	1,5,8
U4	MWA220H			3	
U5	MC78M08CG	1		3	
U6	LM337LZ		3		
U7	MC78L05ACP	3		2	

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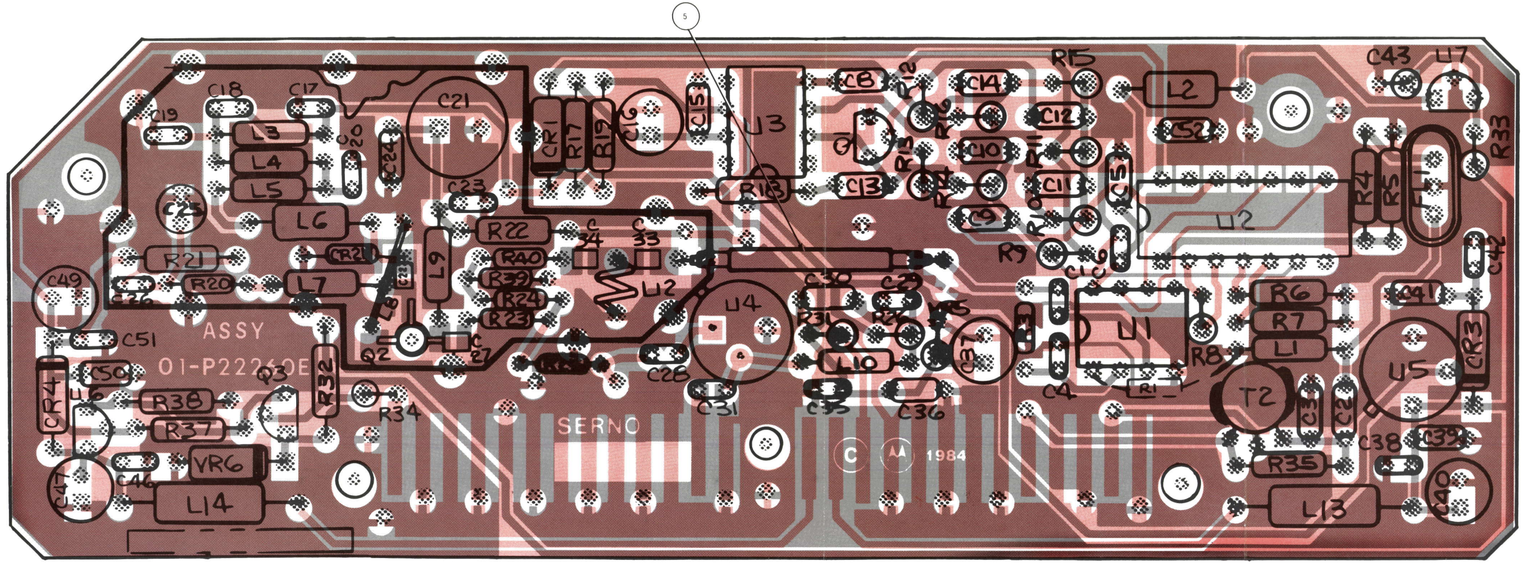
640-MHz LOOP BOARD (A9A6)

(RTC-4044A)

Figure 11-20. Printed Wiring Board Assembly and Parts List



COMPONENTS AND COMPONENT SIDE TRACK SHOWN IN BLACK.
SOLDER-SIDE TRACK SHOWN IN ORANGE.

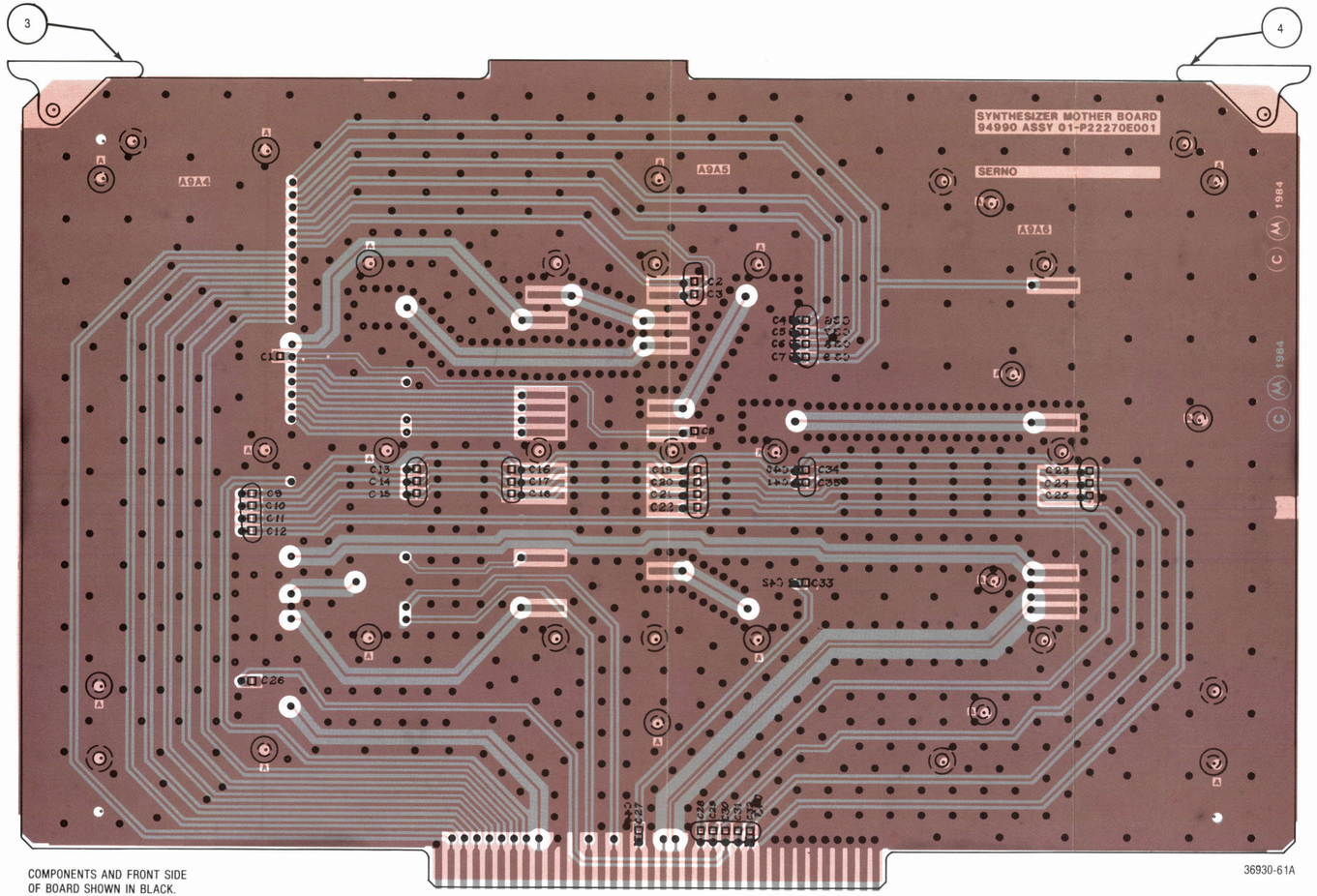
640-MHz LOOP BOARD (A9A6)
RTC-4044A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
005	1	30-80343B95	JUMPER,COAX	
C 001	1	21-80339B67	CAPACITOR	56PF-10-200
C 002	1	21-80341B54	CAPACITOR	150PF-5-50
C 003	1	21-80341B80	CAPACITOR	430PF-5-50
C 004	1	21-80339B67	CAPACITOR	56PF-10-200
C 005	1	21-80342B13	CAPACITOR	.047UF-20-50
C 006	1	21-80339B79	CAPACITOR	470PF-10-200
C 008	1	21-80342B10	CAPACITOR	.1UF-20-50
C 009	1	21-80341B45	CAPACITOR	100PF-5-50
C 010	1	21-80341B60	CAPACITOR	220PF-5-50
C 011	1	21-80341B60	CAPACITOR	220PF-5-50
C 012	1	21-80341B68	CAPACITOR	33PF-5-50
C 013	1	21-80342B08	CAPACITOR	.0068UF-10-100
C 014	1	21-80342B08	CAPACITOR	.0068UF-10-100
C 015	1	21-80342B09	CAPACITOR	.01UF-20-50
C 016	1	23-80341B15	CAPACITOR	10UF-20-50
C 017	1	21-80339B67	CAPACITOR	56PF-10-200
C 018	1	21-80344B32	CAPACITOR	22PF-10-100
C 019	1	21-80339B63	CAPACITOR	100PF-10-200
C 020	1	21-80339B67	CAPACITOR	56PF-10-200
C 021	1	23-84665F26	CAPACITOR	100UF-20-16
C 022	1	21-80344B44	CAPACITOR	7.5PF-.5-100
C 023	1	21-80339B63	CAPACITOR	100PF-10-200
C 024	1	21-80342B09	CAPACITOR	.01UF-20-50
C 025	1	23-83441B15	CAPACITOR	1.0UF-20-35
C 026	1	21-80339B63	CAPACITOR	100PF-10-200
C 027	1	21-80370A14	CAPACITOR	22PF-5-100
C 028	1	21-80339B67	CAPACITOR	56PF-10-200
C 029	1	21-80339B63	CAPACITOR	100PF-10-200
C 030	1	21-80342B09	CAPACITOR	.01UF-20-50
C 031	1	21-80339B67	CAPACITOR	56PF-10-200
C 033	1	21-80370A12	CAPACITOR	15PF-5-100
C 034	1	21-80370A12	CAPACITOR	15PF-5-100
C 035	1	21-80339B63	CAPACITOR	100PF-10-200
C 036	1	21-80342B10	CAPACITOR	.1UF-10-50
C 037	1	23-80341B15	CAPACITOR	10UF-20-50
C 038	1	21-80339B63	CAPACITOR	100PF-10-200
C 039	1	21-80342B10	CAPACITOR	.1UF-20-50
C 040	1	23-80341B13	CAPACITOR	47UF-20-25
C 041	1	21-80342B10	CAPACITOR	.1UF-20-50
C 042	1	21-80339B63	CAPACITOR	100PF-10-200
C 043	1	23-80340B96	CAPACITOR	1.0UF-20-25
C 046	1	21-80339B63	CAPACITOR	100PF-10-200
C 047	1	23-80341B15	CAPACITOR	10UF-20-50
C 049	1	23-80341B15	CAPACITOR	10UF-20-50
C 050	1	21-80342B09	CAPACITOR	.01UF-20-50
C 051	1	21-80339B63	CAPACITOR	100PF-10-200
C 052	1	21-80342B09	CAPACITOR	.01UF-20-50
CR001	1	48-84463K02	DIODE	
CR002	1	48-80339B95	DIODE	
CR003	1	48-82466H13	DIODE	
CR004	1	48-82466H13	DIODE	
FL001	1	48-80346A08	CRYSTAL FILTER	10MHZ-2-POLE
L 001	1	24-80369A32	COIL	2.2UH
L 002	1	24-83961B01	CHOKE	
L 003	1	24-80369A29	COIL	10UH
L 004	1	24-80369A33	COIL	47UH
L 005	1	24-80340B50	COIL	.12UH
L 006	1	24-83961B01	CHOKE	
L 007	1	24-80340B50	COIL	.12UH
L 008	1	24-80342B71	COIL	
L 009	1	24-80340B50	COIL	.12UH
L 010	1	24-80340B50	COIL	.12UH
L 012	1	24-80342B66	COIL	
L 013	1	24-80369A42	COIL	1000UH
L 014	1	24-80369A42	COIL	1000UH
Q 001	1	48-80340B86	TRANSISTOR	MPS6520
Q 002	1	48-00869824	TRANSISTOR	
Q 003	1	48-80340B85	TRANSISTOR	MPS6519
R 003	1	06-11041C41	RESISTOR	100-5-1/8
R 004	1	06-11009C49	RESISTOR	1K-5-1/4
R 005	1	06-11009C42	RESISTOR	510-5-1/4
R 006	1	06-11009C42	RESISTOR	510-5-1/4
R 007	1	06-11009C69	RESISTOR	6.8K-5-1/4
R 008	1	06-11009C22	RESISTOR	75-5-1/4
R 009	1	06-10621C37	RESISTOR	2.74K-1-1/4
R 010	1	06-11009C94	RESISTOR	75K-5-1/4
R 011	1	06-10621C37	RESISTOR	2.74K-1-1/4
R 012	1	06-80344B24	RESISTOR	2.2M-5-1/4
R 013	1	06-11009C97	RESISTOR	100K-5-1/4
R 014	1	06-11009C59	RESISTOR	2.7K-5-1/4
R 015	1	06-11009C59	RESISTOR	2.7K-5-1/4
R 016	1	06-11009C51	RESISTOR	1.2K-5-1/4
R 017	1	06-11009C46	RESISTOR	750-5-1/4

640-MHz LOOP BOARD (A9A6) (Cont)

RTC-4044A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
R 018	1	06-11009C51	RESISTOR	1.2K-5-1/4
R 019	1	06-11009C42	RESISTOR	510-5-1/4
R 020	1	06-11041C58	RESISTOR	510-5-1/8
R 021	1	06-11009C39	RESISTORS	390-5-1/4
R 022	1	06-11009C33	RESISTOR	220-5-1/4
R 023	1	06-11041C27	RESISTOR	27-5-1/8
R 024	1	06-11041A19	RESISTOR	12-5-1/8
R 025	1	06-11041C41	RESISTOR	100-5-1/8
R 026	1	06-11009C32	RESISTOR	200-5-1/4
R 031	1	06-11045A55	RESISTOR	1.8K-5-1/2
R 032	1	06-11009C54	RESISTOR	1.6K-5-1/4
R 033	1	06-11009C22	RESISTOR	75-5-1/4
R 034	1	06-11009C66	RESISTOR	5.1K-5-1/4
R 035	1	06-11009C27	RESISTOR	120-5-1/4
R 037	1	06-10621B34	RESISTOR	237-1-1/4
R 038	1	06-10621C05	RESISTOR	1.27K-1-1/4
R 039	1	06-11041A21	RESISTOR	15-5-1/8
R 040	1	06-11041A33	RESISTOR	47-5-1/8
T 002	1	25-80342B75	TRANSFORMER	
U 001	1	51-80340B89	INTEGRATED CIRCUIT	
U 002	1	51-83222M02	INTEGRATED CIRCUIT	
U 003	1	51-80345A01	INTEGRATED CIRCUIT	CA3140E SCREENED
U 004	1	51-80340B62	INTEGRATED CIRCUIT	
U 005	1	51-05698H01	INTEGRATED CIRCUIT	
U 006	1	51-80340B05	INTEGRATED CIRCUIT	
U 007	1	51-05469E01	INTEGRATED CIRCUIT	
VR005	1	48-82256C39	DIODE,ZENER	20V-5-1/2
VR006	1	48-83461E03	DIODE,ZENER	3.3V-5-.5



COMPONENTS AND FRONT SIDE OF BOARD SHOWN IN BLACK.
INNER LAYER OF BOARD SHOWN IN ORANGE.

36930-61A

SYNTHESIZER MOTHERBOARD (A9A7)
RTC-4045A

Find No.	Qty. Req.	Part No.	Nomenclature	Part Value
003	1	45-80339B28	CARD EJECTOR	
004	1	45-80339B42	CARD EJECTOR	MARKED
C 001	1	21-80370A21	CAPACITOR	100PF-20-100
C 002	1	21-80370A21	CAPACITOR	100PF-20-100
C 003	1	21-80370A21	CAPACITOR	100PF-20-100
C 004	1	21-80370A21	CAPACITOR	100PF-20-100
C 005	1	21-80370A21	CAPACITOR	100PF-20-100
C 006	1	21-80370A21	CAPACITOR	100PF-20-100
C 007	1	21-80370A21	CAPACITOR	100PF-20-100
C 008	1	21-80370A21	CAPACITOR	100PF-20-100
C 009	1	21-80370A21	CAPACITOR	100PF-20-100
C 010	1	21-80370A21	CAPACITOR	100PF-20-100
C 011	1	21-80370A21	CAPACITOR	100PF-20-100
C 012	1	21-80370A21	CAPACITOR	100PF-20-100
C 013	1	21-80370A21	CAPACITOR	100PF-20-100
C 014	1	21-80370A21	CAPACITOR	100PF-20-100
C 015	1	21-80370A21	CAPACITOR	100PF-20-100
C 016	1	21-80370A21	CAPACITOR	100PF-20-100
C 017	1	21-80370A21	CAPACITOR	100PF-20-100
C 018	1	21-80370A21	CAPACITOR	100PF-20-100
C 019	1	21-80370A21	CAPACITOR	100PF-20-100
C 020	1	21-80370A21	CAPACITOR	100PF-20-100
C 021	1	21-80370A21	CAPACITOR	100PF-20-100
C 022	1	21-80370A21	CAPACITOR	100PF-20-100
C 023	1	21-80370A21	CAPACITOR	100PF-20-100
C 024	1	21-80370A21	CAPACITOR	100PF-20-100
C 025	1	21-80370A21	CAPACITOR	100PF-20-100
C 026	1	21-80370A21	CAPACITOR	100PF-20-100
C 027	1	21-80370A21	CAPACITOR	100PF-20-100
C 028	1	21-80370A21	CAPACITOR	100PF-20-100
C 029	1	21-80370A21	CAPACITOR	100PF-20-100
C 030	1	21-80370A21	CAPACITOR	100PF-20-100
C 031	1	21-80370A21	CAPACITOR	100PF-20-100
C 032	1	21-80370A21	CAPACITOR	100PF-20-100
C 033	1	21-80370A21	CAPACITOR	100PF-20-100
C 034	1	21-80370A21	CAPACITOR	100PF-20-100
C 035	1	21-80370A21	CAPACITOR	100PF-20-100
C 036	1	21-80370A21	CAPACITOR	100PF-20-100
C 037	1	21-80370A21	CAPACITOR	100PF-20-100
C 038	1	21-80370A21	CAPACITOR	100PF-20-100
C 039	1	21-80370A21	CAPACITOR	100PF-20-100
C 040	1	21-80370A21	CAPACITOR	100PF-20-100
C 041	1	21-80370A21	CAPACITOR	100PF-20-100
C 042	1	21-80370A21	CAPACITOR	100PF-20-100
C 043	1	21-80370A21	CAPACITOR	100PF-20-100
C 044	1	21-80370A21	CAPACITOR	100PF-20-100

SYNTHESIZER MOTHERBOARD (A9A7)

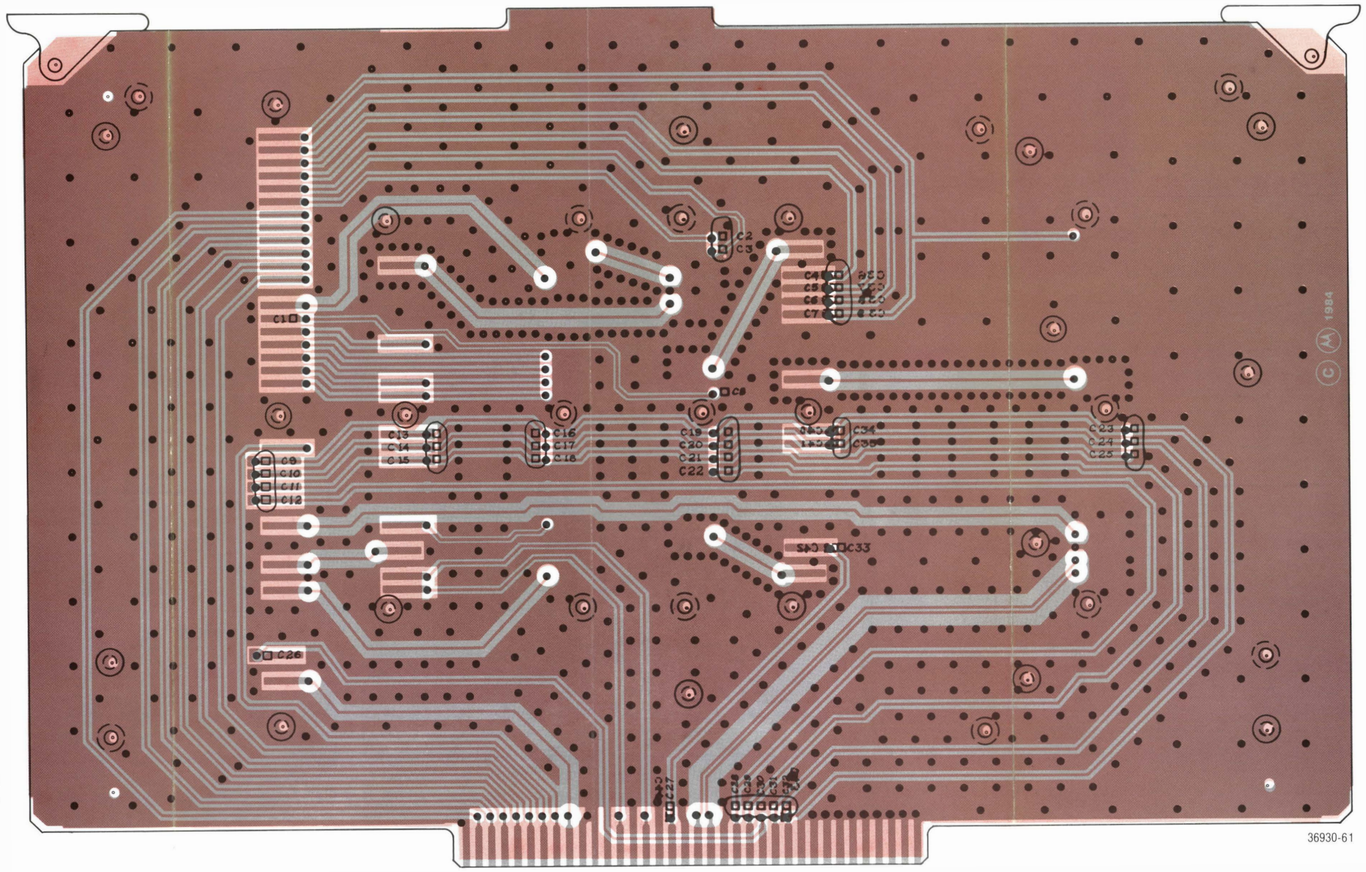
(RTC-4045A)

Figure 11-21a. Printed Wiring Board Assembly and Parts List (Sheet 1 of 2)

SYNTHESIZER MOTHERBOARD (A9A7)

(RTC-4045A)

Figure 11-21b. Printed Wiring Board Assembly and Parts List (Sheet 2 of 2)



COMPONENTS AND BACKSIDE OF BOARD SHOWN IN BLACK.
INNER LAYER OF BOARD SHOWN IN ORANGE

(See Sheet 1, p. 11-35, for Parts List)