TECHNICAL MANUAL

OPERATION, MAINTENANCE, INSTALLATION INSTRUCTIONS AND ILLUSTRATED PARTS BREAKDOWN

HF DSP RECEIVER
MODEL RX-330A

TEN-TEC, INC.
1185 DOLLY PARTON PARKWAY
SEVIERVILLE, TN 37862

THIS MANUAL WAS PREPARED IN ACCORDANCE WITH MIL-M-7298C

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RECORD OF CHANGES

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WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions.
Learn the areas containing high voltage within the equipment.
Be careful not to contact high voltage connections when installing,
operating or maintaining this equipment.
Before working inside the equipment, turn power off
and ground points of high potential before touching them.

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INTRODUCTION

This technical manual provides operation and maintenance instructions for the RX-330A HF DSP Receiver. The manual was prepared in accordance with MIL-M-7298C, "Manuals, Technical: Commercial Equipment". This manual is organized into nine chapters along with a Table of Contents and lists of tables and illustrations.

Chapter 1 presents general information about the Receiver, which includes functional capabilities, performance specifications, and physical dimensions. Chapter 2 provides information concerning the unpacking and initial installation of the receiver. A general theory of operation is provided in Chapter 3 which describes the functioning of the Receiver's individual circuit boards. Chapter 4 contains information on operation of the multi-drop RS 232 Interface and the parallel data output.

Chapter 5 provides information on maintenance and troubleshooting measures to be employed at the user's level. Instructions pertaining to the reshipment or long term storage are provided in Chapter 6. A detailed list of unique single source parts is provided in Chapter 7. In addition, Chapter 7 contains a list of manufacturers for these parts and their addresses. Chapter 8 provides a listing of replaceable modules and parts. Chapter 9 contains detailed parts lists for each of the replaceable modules. Chapter 9 also contains schematic diagrams for the electronic circuits.

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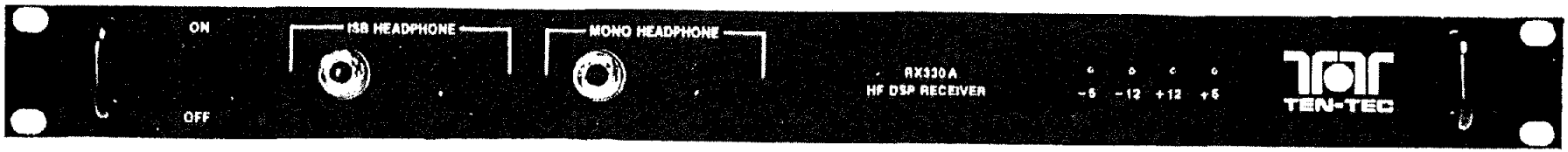

FIGURE I. RX-330A FRONT VIEW

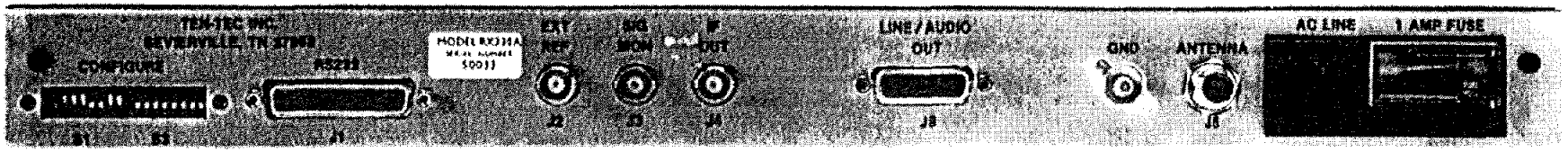

FIGURE II. RX-330A REAR VIEW

CHAPTER 1

GENERAL INFORMATION

1-1 PURPOSE AND FUNCTION: The TEN-TEC RX-330A is a remotely controlled Monitor Receiver capable of tuning the .5 to 30 MHz HF range in 1 Hz steps. The Control Interface is Multi-drop RS-232, allowing multiple receivers to be addressed on one RS-232 line. Available detection modes are: USB, LSB, ISB, CW, AM, Synchronous AM, and FM. IF Bandwidth is selectable in 57 steps from 100 Hz to 16 KHz. Manual (MAGC) and automatic (AGC) gain control modes are selectable. In CW mode, the adjustable BFO has a range of ± 8000 Hz. In CW, LSB and USB modes, a passband tuning function allows simultaneous adjustment of BFO and receiver tuning over a ± 2000 Hz range. Three Audio and two IF outputs are provided.

1-2 SPECIFICATIONS

Power Supply:

Internal, accepts 48-440 Hz line power, 120/240 VAC, rear panel selectable. 30 watts nominal.

Frequency tuning system:

Tuning Range: 500 KHz to 30 MHz. Tunable to 0 MHz with degraded performance.

Tuning Increment: 1 Hz minimum.

Synthesizer lock time: 10 mS nominal.

BFO: Tunable in CW mode only, ± 8 KHz, 10 Hz steps. Fixed frequency in SSB and ISB modes, disabled in AM and FM modes.

Accuracy: All internal oscillators can be locked to either internal or external frequency standards. The internal reference is adjustable by a continuously variable trimmer to allow calibration to any desired accuracy.

Stability (internal standard): ± 1 ppm per degree C within the operating range of 0 to 50 degrees C. An optional TCVCXO provides ± 1 ppm over entire range (0 to 50 degrees C).

External Frequency Standard: 1, 2, 5, or 10 MHz ± 1 ppm, 200 mV p-p, high impedance load. The receiver automatically detects and uses the external standard upon application, at power-up, or after any serial link activity. If the external standard input slews far outside the ± 1 ppm specified, the internal circuitry will lose lock until the input returns to within spec, or will re-lock at the next power-up or serial activity if the input is within specification at a valid reference frequency (1, 2, 5, or 10 MHz). A frequency-out-of-lock condition is always reported over the serial link. Removal of the external frequency standard input immediately returns the receiver to the internal standard.

Tuning Method: Remote control via multi-drop RS-232.

Frequency Indication: None visible. Frequency status reported by the RS-232 serial link.

Interface connections:

RF Input:

Impedance:	50 Ohms, nominal.
VSWR:	2.5 : 1 maximum in preselector passband.
Connector:	rear panel BNC.
Protection:	internal surge protector.

Audio Outputs:

Two 600 Ohm lines

Level:	0 dBm nominal, center-tapped, ungrounded.
Connector:	3 pins of rear panel DA-15 connector, each line.
Function:	Upper and lower sideband audio on separate lines in ISB mode. Same signal on both lines in other modes.

Stereo Headphone:

Level:	10 mW maximum into 600 Ohm load. Front panel volume control.
Connector:	Front panel 1/4" stereo phone jack.
Function:	Upper and lower sidebands in ISB mode. Monaural output in other modes.

Single-ended Audio:

Level:	10 mW maximum into 600 Ohm load.

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Connector: 2 pins of rear panel DA-15 connector, one grounded
Function: Upper, lower, or both sidebands in ISB mode, software configured.

Mono Headphone:
Level: 10 mW maximum into 600 Ohm load. Front panel volume control.
Connector: Front panel 1/4" mono phone jack.
Function: Upper, lower, or both sidebands in ISB mode, software configured.

Signal Monitor:
Frequency: 455 KHz center.
Bandwidth: 16 KHz (-6 dB).
Level: -10 dBm nominal. AGC delayed 40 dB.
Impedance: 50 ohms nominal.
Connector: Rear panel BNC.

IF Output:
Frequency: 455 kHz center.
Bandwidth: Determined by IF filter selection.
Level: -10 dBm nominal (AGC leveled).
Impedance: 50 ohms nominal.
Connector: Rear panel BNC.

Sensitivity:

Noise Figure: 10 dB typical, 14 dB maximum - preamp on.
18 dB typical, 20 dB maximum - preamp off.

Spurious Responses: All spurious less than -19 dBm equivalent input - preamp on.

Control Interface:
Standard: Multi-drop RS-232.
Config: Dipswitch programmable, 300 to 19200 baud, 7 or 8 data bits, even, odd, or no parity.
Connector: DB-25 female.

Gain Characteristics:

Gain control:
The receiver can operate in automatic (AGC) or manual (MAGC) gain control modes. Manual gain control reduces receiver gain and increases the AGC threshold by up to 120 dB.

AGC:
Range: 90 dB minimum
Threshold: 3 uV typical
Attack Time: 15 mS typical
Release Time:
Fast 25 mS
Medium .5 second
Slow 4 seconds

MAGC:
Range: 120 dB. Controlled through the RS-232 interface.
Attack/Release Times: Limited only by RS-232 serial transfer rate.

Sensitivities by mode:

	BW	SINAD	PREAMP OFF TYP	PREAMP OFF MAX	PREAMP ON TYP	PREAMP ON MIN/MAX
AM: (50% Mod @ 400 Hz)	6 kHz	10 dB	-100 dBm 2.25 uV	-98 dBm/ 2.8 uV	-112dBm/ 0.56 uV	-108dBm/ 0.9 uV
FM: (6 kHz dev @ 1 kHz)	16 kHz	16 dB	-99 dBm/ 2.5 uV	-97 dBm/ 3.2 uV	-108dBm/ 0.9 uV	-104dBm/ 1.4 uV
USB/LSB/ISB:	3.2 kHz	10 dB	-109 dBm/ 0.8 uV	-107 dBm/ 1.0 uV	-119dBm/ 0.25 uV	-115dBm/ 0.4 uV
CW:	300 Hz	16 dB	-113 dBm/ 0.5 uV	-111 dBm/ 0.63 uV	-124dBm/ 0.14 uV	-120dBm/ 0.22 uV

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Signal handling characteristics: - preamp off

Image Rejection: 90 dB typical, 70 dB minimum (all mixers).

IF Rejection: 90 dB typical, 80 dB minimum (all IFs).

Third order intercept point: 30 dBm typical, 25 dBm minimum.

Second order intercept point: +75 dBm, typ, 60 min.

Selectivity: 57 bandwidths selectable from 0.1 to 16 kHz. Shape factor better than 1.5:1 (6 to 60 dB): 100, 120, 150, 170, 200, 220, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900 Hz, 1, 1.1, 1.2, 1.3,1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.4, 3.6, 3.8, 4.0, 4.4, 4.8, 5.2, 5.6, 6.0, 6.4, 6.8, 7.2, 7.6, 8.0, 8.8, 9.6, 10.4, 11.2, 12.0, 12.8, 13.6, 14.4, 15.2, 16.0 KHz. The receiver automatically selects the best match greater than or equal to the requested bandwidth.

Blocking on tune: <5% THD: 0dBm input 30% AM 1 KHz

Blocking off tune: 200 KHz offset. 15dBm typ. 10 dBm min for 3 dB desense

Ultimate Rejection: Greater than 70 dB regardless of filter selected.

Group Delay: No more than .1 ms variation over entire passband.

Lo Phase noise: -120 dBc/Hz @ 20 KHz offset, typ. -110 dBc/Hz max.

1-3 ENVIRONMENTAL CONDITIONS

Normal Operating:

Temperature: 0 to 50 deg C (32-122F)
Humidity: Up to 95% Rel, non-cond.
Altitude: Up to 10,000 feet MSL
Shock: Not applicable
Vibration: Not applicable

Storage/Transport:

Temperature: -46 to 71 deg C (-50-160F)
Humidity: Up to 95% Rel, non-cond.
Altitude: Up to 15,000 feet MSL
Shock: 10 G, 11 mS duration
Vibration: 1-1/2 G, 5 to 200 Hz

1-4 MECHANICAL

Size: 1.75H x 19W x 21.31D inches
44.45H x 482.6W x 541.4D mm

Weight: 12.2 lbs. (5.53 kg)

Cooling: Air convection cooled within fan ventilated rack cabinet. Units are directly stackable with no fillers required between chassis.

Mounting: Model RX-330A conforms to EIA standard 19 inch rack mount panel space and is 1 U (1.75) high. Slide mechanism attachment points (10-32 thread) are compatible with Jonathan slide type 375 QD.

Cable connectors Rear panel:

Receiver RF input: BNC female
IF output 455 kHz: BNC female
Signal Monitor: BNC female
External Reference: BNC female
Remote Control: (Multi-drop RS-232) DB 25, female
Main Power: Detachable 3 conductor ac cord
Line Audio: 15 pin D connector, female

Front Panel:

Mono headphone: 1/4" mono jack
Stereo headphone: 1/4" stereo jack

1-5 EQUIPMENT/PARTS SUPPLIED

1 HF DSP RECEIVER MODEL RX-330A
1 AC POWER CORD
1 FUSE - 1A SLO-BLOW MDL 1
1 TECHNICAL MANUAL

Specifications subject to change without notice.

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CHAPTER 2

PREPARATION FOR USE AND INSTALLATION

2-1 UNPACKING AND INSPECTION: Examine the shipping carton for damage before unpacking the unit. If the carton is damaged, open the carton in the presence of an agent of the shipping carrier if possible. If the carton is not damaged, retain the carton and packing materials for inspection if damage is found after the unit is unpacked.

Open the carton and remove the foam packing materials on top of the unit. Lift the unit free of the carton. No packing materials are required or provided inside the unit. Replace the foam packing material in the carton. The carton may be saved for possible reshipment if required.

Upon unpacking, inspect the unit for obvious external damage. Pay particular attention to dents or bent sheet metal. If damage is evident, remove the top cover of the unit and inspect for further damage such as damaged circuit boards. Do not attempt to operate the unit if such damage is noted until further checks are made.

2-2 MOUNTING: RX-330A is designed for EIA standard 19 inch panel space rack. Slide mechanism attachment points (10-32 thread) are compatible with Jonathan slide type 375QD.

2-3 POWER: The RX-330A is designed to operate from either 120 or 240 VAC. A small pc board located in the power entry module can be removed and reinserted to select proper ac voltage.

2-4 ANTENNA: Connect the antenna to the BNC connector on the RX-330A labeled antenna (shown in Figure II).

2-5 IF OUT: A 455 KHz signal with bandwidth dependent on filter selected (shown in Figure II).

2-6 SIG MON: A 455 KHz signal with a fixed bandwidth of 16 KHz (shown in Figure II).

2-7 EXT REF: Automatically turns off the internal 10 MHz reference if a 1 MHz, 2 MHz, 5 MHz or 10 MHz 200 mV p-p signal is applied (shown in Figure II).

2-8 RS-232: The RS-232 will accept a standard DB-25 connector (shown in Figure II).

2-9 LINE A: Provides a 600 Ω balanced center tapped output (shown in Figure II).

2-10 LINE B: Provides a 600 Ω balanced center tapped output (shown in Figure II).

2-11 AUDIO: Provides a 600 Ω unbalanced output (shown in Figure II).

2-12 MONO HEADPHONE: Provides a 600 Ω unbalanced output controlled by a front panel volume control (shown in Figure I).

2-13 ISB HEADPHONE: Provides both sidebands controlled by front panel volume control (shown in Figure I).

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CHAPTER 3

GENERAL THEORY OF OPERATION

3-1 INTRODUCTION: The TEN-TEC Model RX-330A receiver combines a high dynamic range front end with a versatile DSP back end to provide extraordinary performance and flexibility. Refer to the overall block diagram Figure 9-1 and interconnect diagram Figure 3-2.

The RF signals applied to the receiver Antenna Input (J5) are bandpass filtered in one of eight bands of approximately one-half octave bandwidth. Balanced amplifiers and high level first mixer stages preserve the second and third order intercept points during conversion to the first IF of approximately 45.105 MHz. Two 2-pole crystal filters provide first IF selectivity to reject 1st mixer spurious products and the 2nd mixer image (at -910 KHz).

After conversion to the second IF of approximately 455 KHz in the second mixer stage, the signal is bandpass filtered to 16 KHz bandwidth and applied to an AGC'd 2nd IF amplifier with up to 80 dB gain. After post-filtering (again 16 KHz bandwidth), the signal is made available at the Signal Monitor output (J3) and also applied to the third mixer stage.

The third mixer converts the signal to a center frequency of 16 2/3 KHz where it is low pass filtered and applied to an analog to digital converter. The A/D converter produces a serial data stream at a 66 2/3 KHz sample rate for input to the Digital Signal Processor.

Serial data from the DSP at a 133 1/3 KHz sample rate is applied to a digital to analog converter. The D/A output samples are time de-multiplexed into two or three output channels, depending on the mode selection. Half of the D/A output time is devoted to the DSP'd IF output which is first converted back to 455 KHz by mixing with the third LO, then bandpass filtered to 16 KHz bandwidth, and finally made available at the IF Output connector (J4).

The other half of the D/A bandwidth is separated into USB and LSB audio channels in Independent Sideband mode, or into a single audio channel in all other modes.

3-2 PRESELECTOR (81727): Eight bandpass filters covering the frequency range of 500 KHz to 30 MHz are controlled by the DSP/CPU Board (81721). A six FET push-pull amplifier makes up for loss in the bandpass filter.

3-3 PREAMP/ATTN: Refer to Preselector schematic diagram Fig. 9-6. The normal signal path is through pin diode D19 and D20. For weak signal reception, diodes D17 and D18 and preamplifier Q7 may be enabled. For very strong signals, a 15 dB attenuator may be inserted in the signal path by diodes D21 and D22.

3-4 FIRST MIXER (81728): The input signal passes through a 30 MHz low pass filter to a diode mixer and mixes with the amplified first LO to produce an IF frequency of 45.105 MHz. The signal is applied to a six FET push-pull amplifier, then a 2 pole 45.105 MHz crystal filter. A second amplifier and 2 pole 45.105 MHz crystal filter produce an overall 4 pole response at the 1st IF to reject the 2nd mixer image. The 45.105 MHz signal is amplified again for use in the second mixer.

3-5 SECOND MIXER / 3RD LO (81729): The 2nd mixer / 3rd LO board handles the conversion of the first IF of approximately 45.105 MHz to the second and third IFs of 455 KHz and 16 2/3 KHz respectively. It provides outputs to the Signal Monitor connector (J3 #56), the A/D converter (#51), AGC (#16), and LO3 (#52). Required inputs are: 1st IF (#54), LO2 (#55), 10 MHz reference (#57), PLL data (#12), MAGC (#17), and power of ±5 (#20) and +12V (#23).

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The 1st IF input (45.105 MHz) is applied to a high level diode ring mixer along with the amplified 2nd LO (44.6-44.7 MHz) from Q1. The mixer output at 455 KHz is buffered, bandpass filtered and then amplified by controlled-gain IF amplifier U1. The IF amplifier output is post-filtered and then splits three ways: (1) AGC detector Q2/Q3 pulls the IF amplifier gain control pins 9 & 16 low at a rate of 31.25 mV per dB when the output signal exceeds a threshold set by AGC ADJ pot R64. (2) Opamp U2a buffers the IF output and applies it to Signal Monitor connector J3. (3) The IF output is applied to third mixer U3 along with the 471 2/3 KHz 3rd Local Oscillator signal from U4b to produce the third IF of 16 2/3 KHz.

The 3rd IF signal from U3 passes through anti-aliasing lowpass filter U5 to the IF3 output connector #51. DC OSET pot R50 nulls any DC offset at the A/D input (connector #51).

The AGC voltage on IF amplifier pins 9 & 16 is buffered by opamp U2b and output to AGC connector #16. Opamp U6 provides a means for setting the IF gain externally via MAGC connector #17. A current-sink type D/A converter connected to MAGC pulls the IF amplifier gain control pins low, overriding the AGC detector, and reducing IF gain at a rate of 32 dB/Volt.

Phase locked loop U7, charge pump and VCO transistors Q4-Q8, and divider U8/U4 develop the third Local Oscillator frequency of 471 2/3 KHz. This signal drives the third mixer U3 and the 3rd LO output connector #52. The PLL is fixed programmed by the CPU at power-up for a reference frequency of 66 2/3 KHz and a VCO frequency of 37 11/15 MHz.

3-6 CONVERTER-I/O BOARD (81730): The Converter-I/O board contains the main A/D and D/A converters that provide the interface to the Digital Signal Processor, timing and multiplexing circuits that separate D/A data into the various audio and IF channels, and analog reconstruction filters and audio drivers that form the final audio outputs of the receiver. This board also contains the mixer and filter used to convert baseband IF signals back to 455 KHz for the DSP'd IF output.

Refer to the Converter Board schematic diagram Fig. 9-14. Connectors #4, #5 and #64 carry the serial data to and from the DSP. Word framing signals for the A/D and D/A converters (CVST and LDAC), and timing signals for the analog switch de-multiplexers (AF, IF, USB, and LSB) are formed by the dividers and combinational logic circuits U1-U5. Refer to the timing diagram part of Fig. 9-1 for the timing relationships between the converters and de-multiplexers.

The 3rd IF signal at 16 2/3 KHz is applied to the sampling input of A/D converter U7. On command of CVST from U4b, the analog input voltage is converted to a serial bit stream and transferred to the DSP via connector #4.

Serial data from the DSP is transferred to D/A converter U8 via connectors #5 and #64, and, under control of LDAC from U4a, output as discrete voltage samples at V out. Each voltage sample from the D/A converter is steered to the proper audio or IF channel by analog switch de-multiplexers U9 and U10, timed by AF/IF and USB/LSB signals from U4c, d and U5b, c.

Reconstruction filters U11-U14 attenuate the sample clock frequencies (66 2/3 or 33 1/3 KHz) and present a smoothed analog voltage to mode switches U9z and U10z or, in the case of the IF channel, to switching mixer U14b/U15x. The 471 2/3 KHz LO3 from connector #52 mixes with the 16 2/3 KHz baseband IF signal in section x of U15 to produce a 455 KHz component. This component is selected by 16 KHz wide bandpass filter FL1, buffered by opamp U18b, and output to connector #53 and the DSP'd IF Output connector J4.

Based on the mode selected by the CPU/DSP via connector #5, the z sections of U9 and U10 connect the appropriate reconstruction filter outputs to the audio and line drivers U16 and U17. Connector #8 carries both audio channels to the front panel

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ISB level control and stereo phone jack J6. Connector #9 supplies transformer coupled audio to the 600 Ohm line connections on rear panel J8.

Controlled by SB select lines from connector #18, U15 sections y and z connect either one or both audio channels to the monaural audio driver U18a and to audio connectors #7, 10 and 34, rear panel J8, CPU/DSP Board and front panel mono level control and phone jack J7.

3-7 FIRST LO (81731): The first conversion oscillator VCO is split into four ranges to cover the 45.6-75.1 MHz spectrum. The VCO output is buffered by a J310 amplifier before being passed through a bandpass filter and on to the First Mixer (81714). An additional J310 amplifier isolates the VCOs from the MC145170P PLL Frequency Synthesizer IC. The MC145170P develops the reference frequency, accepts frequency information from the microprocessor and outputs a voltage that drives the loop filter and VCOs. Pin 11 of the MC145170P provides a lock detect signal to the CPU/DSP Board (81726).

3-8 SECOND LOCAL OSCILLATOR (81732): The second LO board contains both 2nd LO and Reference frequency synthesizers. The 2nd LO synthesizer develops the second local oscillator injection frequency of 44.6 to 44.7 MHz in 1 KHz steps. The Reference synthesizer locks the 10 MHz internal reference oscillator to an optional external frequency standard.

Refer to 2nd LO schematic Fig. 9-25. The 2nd LO synthesizer is a two loop architecture. PLL chip U1 and charge pump U13 steer VCO Q1/D5/D6 over a range of 60 to 80 MHz in 200 KHz steps. The VCO output is buffered by Q2 and then divided by 200 in counters U2 and U3 to produce a tuning loop output of 300 to 400 KHz in 1 KHz steps for input to the mixing loop phase detector U6.

Phase detector U6, charge pump U7, VCO Q5, and mixer U4 form a mixing loop which translates the tuning loop output to the LO2 frequency range of 44.6 to 44.7 MHz, while preserving the 1 KHz tuning resolution.

The 45 MHz translation frequency required by the mixing loop is developed by first dividing the 10 MHz reference by 2 in U5 to produce a 5 MHz square wave, and then selecting the 9th harmonic with 45 MHz monolithic filter FL1. The resulting 45 MHz sine wave is applied to active mixer U7 along with a sample of the 2nd LO output to produce a 300 to 400 KHz intermediate frequency in the mixing loop.

Differential amplifier Q7/Q8 presents a high impedance to external reference input connector #63 and J2. A sample of Q8's output is detected by diode D13 and compared to a threshold voltage by U9b. When the external reference amplitude exceeds the threshold set by U9b, transistors Q9-Q11 change state, allowing the gate of FET switch Q12 to pull high. This condition connects the output of PLL U8, filtered by U9a, to VCO tuning diode D14, completing the loop and locking the VCXO Y1/Q13 to 10 MHz.

When no external reference is applied to J2, transistors Q9-Q11 conduct, holding the gate of FET switch Q12 low. In this condition the bias on tuning diode D5 is set by trimpot R1, and crystal Y1 is the frequency standard for the receiver.

3-9 DSP/CPU (81726): The DSP/CPU board consists of two separate processor systems; the MAIN CPU (U1) which controls the RX330A's interface and the DSP CPU (U22) which performs signal processing functions. The two system busses integrate together through parallel latches U5-U8. Communication between the MAIN CPU and DSP CPU is handled by a combination of hardware and software, providing bidirectional data capability.

The MAIN CPU system consists of CPU (U1), latch (U2),ROM (U3) and battery backed RAM (U4). Latches U23 and U24 buffer rear panel switch settings while IC's U9 and U10 are for address control. Three Serial/Parallel converters

(U11-U12) add additional output capability to the system. Converter U12 provides VCO selection signals to the FIRST LO BOARD, converter U11 provides audio controls to the CONVERTER BOARD. RS-232 interface controller chip (U15) handles buffering and level translation for the MULTI-DROP network. This is a special RS-232 IC that allows its output to be completely turned off when not active. It is this feature of IC15 that permits multiple connects to a common RS-232 bus. Audio output levels are also monitored by U1 via an internal A/D converter.

U25,U26 and U27 process the DSP digital output. A Programmable Logic device U25 converts the DSP serial output data to a dual byte parallel output and creates the HIBYTE/LOWBYTE, STROBE, IFAF and USB/LSB control signals. U26 and U27 provide output buffering for the data and control signals. In addition, U26 & U27 add tristate capability to the interface with output enabled by software via U11.

The DSP system core consists of the DSP PROCESSOR (U22), ROMs (U21 & U22), AGC A/D (U18), manual AGC DAC (U14), and latch (U19). The DSP system is connected to the CONVERTER BOARD via connectors 4,5,18 and 64. Serial data travels from the CONVERTER BOARD to the DSP/CPU at a 66 2/3 KHz sample rate. After signal processing serial data travels to the CONVERTER BOARD at twice the input rate or 133 1/3 KHz. The DSP output data is multiplexed to provide AUDIO and IF data to the CONVERTER BOARD which demultiplexes the data and directs it to the proper output. Front end AGC levels are monitored by AGC A/D (U18).

3-10 POWER SUPPLY (81733): 120VAC or 240VAC to the input of the power supply is selected by a small pc board in the power entry module. The secondaries of transformer T1 are wired in series to provide 16VAC to a full wave bridge rectifier. The secondaries of transformer T2 are wired the same as T1 and applied to a separate bridge rectifier. The output of both bridges are connected together and filtered by a 4700mf capacitor. This voltage is applied to a chassis mounted 7812 for regulation. The center taps of T1 and T2 are connected together and filtered by a 4700µf capacitor. Regulation is then achieved by a chassis mounted 7805. The secondaries of transformer T3 are wired in series to provide 16VAC to a full wave bridge rectifier. The negative output of the bridge is filtered by a 1000µf capacitor and applied to a chassis mounted 7912 for regulation. The center tap of transformer T3 is filtered by a 470µf capacitor and regulated by a chassis mounted 7905 regulator.

3-11 LED BOARD (81720): Voltage from the four chassis mounted regulators is applied to four individual LEDs. These LEDs offer a visual indication that the power supply is operating.

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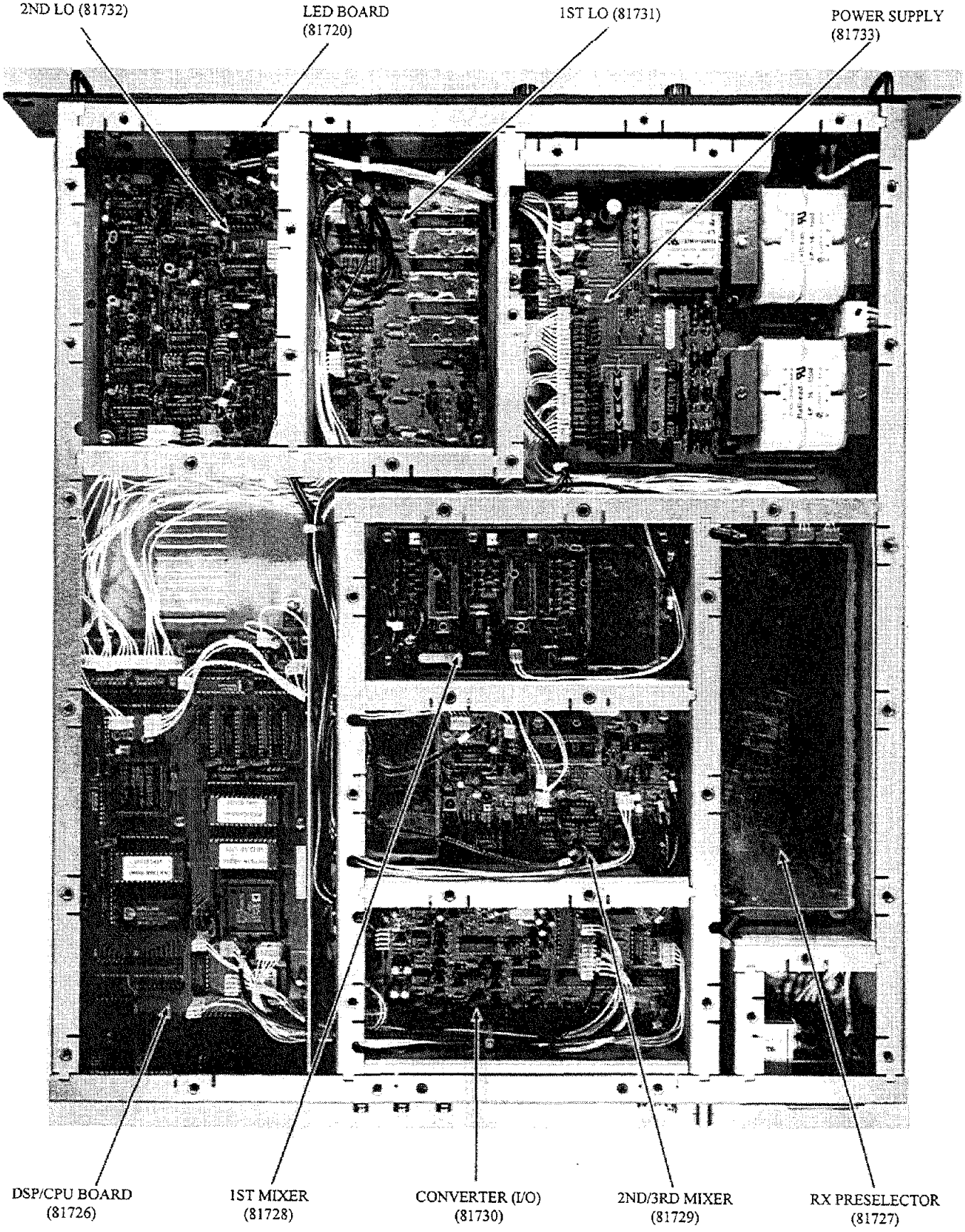

FIGURE 3-1 RX-330A TOP VIEW

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CHAPTER 4

DETAILED OPERATING INSTRUCTIONS

4-1 MULTI-DROP NETWORK: The RX-330A has no front panel operating controls and thus must be controlled remotely via its MULTI-DROP RS-232 interface. A Personal Computer or similar controller may be used to control the receiver. It will be necessary to acquire or design control software appropriate to the intended application of the receiver. The RX-330A Interface is based on plain text (ASCII) codes and strings which reduces the software design burden. An ASCII based interface allows an operator to exercise the RX-330A via a simple terminal or PC running terminal emulation software. In this way, software designers can quickly become familiar with commands and responses of the RX-330A.

The first step in hooking up the RX-330A to a controller is to construct or purchase the proper cable. The RX-330A receiver has been designed as a DCE device for serial interface applications. A 3 wire interface is required to connect the RX-330A to the proper controller (TXDATA, RXDATA and GND). When connecting multiple RX-330's to a single controller, all units are wired in a parallel fashion to the cable. In this way, all receivers share a single TXDATA line, RXDATA line and GND line. See figure 4-1.

After the receivers have been wired, they must be configured. Dipswitches S1 and S2 located on the rear panel allow users to set serial interface parameters and receiver addresses. Dip switch S1 is used to select serial interface parameters (see figure 4-2). Dip switch S2 is used to set the receivers address (range 0 to 127). Switch S2-1 is not used for address selection and should be left in the down position for normal operation. This switch is used to activate a FACTORY TEST/SERVICE MODE which is explained later.

The RX-330A receiver is interfaced to a PC or other suitable controller via a multi-drop serial network. Signal levels for the network are RS-232 compatible. However, unlike conventional RS-232 systems which allow only a single connection, the RX-330A has been designed to allow multiple connections. While any number of receivers may be interconnected at one time, the number of simultaneous connections is limited by line capacitance. Total capacitance should not exceed 2500 pF. However, the Baud rate and RS-232 drive delay may be adjusted to allow operation with a less than perfect installation.

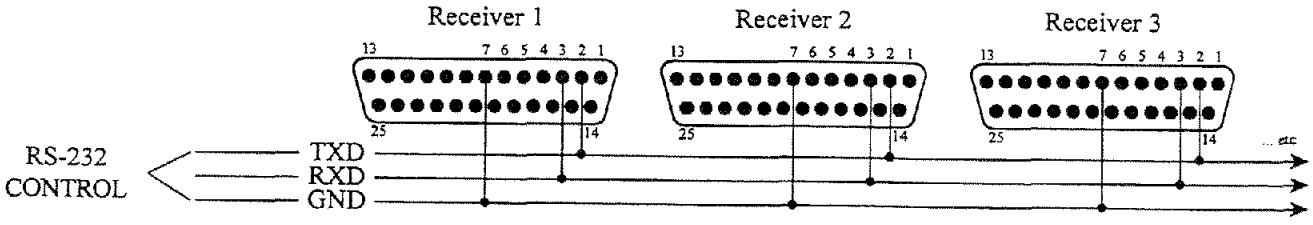

FIGURE 4-1 CONNECTION DIAGRAM

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4-2 RECEIVER CONTROL: Control of the RX 330 is achieved through plain text (ASCII) command codes. The command codes are sent to a receiver from a remote PC or other control unit. Command codes provide control of Frequency, Mode, etc. as well as others such as B.I.T.E. (Built In Test Equipment) and memory functions. All command codes are a single ASCII letter. The comma (,) and dollar sign ($) are also used in receiver addressing operations. In addition to a command code letter, many commands require that additional information be provided immediately following the command code (see specific codes). All command strings must be terminated by a carriage return ASCII 13 (hex 0D) and only capital letters are allowed in command strings.

Before commands can be issued to a receiver, or group of receivers, the receiver(s) must first be selected or addressed. Dipswitch S2 provided on the rear panel of each receiver, allows a receiver's address to be set from 0 to 127 (see figure 4-2). In order for a receiver to be selected it must be sent a $ (dollar sign) followed by its particular address. For example: to select a receiver that has its address set to 15, $15 would be sent over the interface. Likewise, multiple receivers may be addressed by listing more than one receiver in the command line separating each address by a "," comma. For example, to select receiver 15, receiver 9 and receiver 22 the command would be $15,9,22. Receivers remain addressed until another addressing command is issued.

Once a receiver(s) is addressed, additional receiver commands may be sent to control Frequency, Mode, etc. Some receiver commands are single character, such as "X" which causes a receiver to return current signal level. Others require that additional information follow the command code such as "F10.12345" to set frequency or "D3" to set detection mode to CW. It is important for receiver operation, that proper syntax be followed for these commands. Receiver's that are not addressed will ignore commands intended for other receivers. An error in a command sent to a receiver(s) will cause the receiver to ignore the command and de-select itself as a safegaurd against data errors.

Multiple addressing and mutiple receiver commands may be placed in the same command string as long as the total command string length does not exceed 256 characters (including terminating carriage return). For example, $0,2F10.D1M4A100 <CR> would command receivers #0 and #2 to tune to 10.1 mHz, AM detection mode, Manual AGC with attenuation set to 100 dB.

4-3 RECEIVER RESPONSE: Some commands result in a receiver sending information back to the controller. This response will generally follow a format that is much like the format for issuing a command. For example: if a receiver is asked to tell its current operating frequency, it will respond with the format "F10.12345". In addition, whenever a receiver sends information, a status code is appended to the end of each response. The status code is the letter S followed by a number such as "S1" which indicated that the receiver is operating in remote mode (which is always true of the RX-330A). The status number is encoded as follows:

1	Receiver is in remote control mode
2	Synthesizer is out of lock
4	not used
8	last string had character transmission error
16	last string had data error
32	last string had lost data
64	external reference applied

With a properly operating receiver and interface a receiver would have a status code of 'S1' or 'S65' if using an external reference. A receiver response will be terminated with a carriage return ASCII 13 (hex 0D). **NOTE:** Any command that would generate a response from a receiver will be ignored if multiple receivers have been addressed. In order for these commands to operate properly a single receiver must be selected.

4-4 RECEIVER CONTROL COMMANDS: The group of receiver control commands consists of commands that affect the operating status of the receiver. Commands to control frequency,

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mode and filter selection fall into this group. All commands in this group require that additional data follow a command code to complete the operation. If a command code is sent to a receiver without the proper data the receiver will ignore the command code and become deselected. The receiver will then ignore any characters until it receives a carriage return (ASCII 13) at which point it may again be re addressed.

The following text describes individual commands and the type and range of data that is to follow any given command. The format description for a command, such as Fnn.nnnnnn for example, describes a command, in this case the set frequency command, which is to be followed by up to 2 digits, a decimal point and then 6 digits. In most commands, a decimal point is required and any exceptions are noted below.

4-5 RX-330A RECEIVER CONTROL COMMAND SET: (Listed in Alphabetical Order)

COMMAND	DESCRIPTION	VALID RANGE
Annn	**MANUAL AGC ATTENUATION** Selects the amount of AGC Attenuation to use when in manual AGC mode. Setting covers 120 dB range. Attenuation may be set anytime but will only be used when receiver is in Manual AGC mode. Example: A30 (Set Attenuation to 30 dB)	0 - 120 dB
B+n.nnn **(B-n.nnn)**	**BFO FREQUENCY** +/- 8000 Hz Allows setting the receiver BFO frequency when receiver is in CW mode. BFO is fixed in sideband modes and not operational in others. In CW mode, BFO frequencies are relative to receiver tuned frequency which is also passband center if passband tuning is off. Example: B200 (Set BFO to 200 Hz) B-2000 (Set BFO to -2000 Hz)	+/- 8000 Hz
Dn	**DETECTION MODE** This command allows setting of the receiver detection mode. Detection mode designators are: 1 AM 2 FM 3 CW (with variable BFO) 4 CW1 (BFO fixed at 0 Hz) 5 ISB 6 LSB 7 USB 8 SAM (Synchronous AM) Example: D3 (Set receiver to CW mode) D1 (Set receiver to AM mode)	1 - 8

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E[U,L,B]

AUDIO / IF SELECT

E, U or B

Allows AUDIO / IF Selection in Independent Sideband Mode (ISB). Affects the IF output and MONO AUDIO outputs only in ISB mode. Either Upper, Lower or both ISB audio channels may be selected for output. Either Upper or Lower IF may be selected for output. If BOTH is selected IF selection remains at last setting.

Example: EU (Select Upper IF and Upper AUDIO)
ELEB (Select Lower IF and Both AUDIO)

Fnn.nnnnnn

FREQUENCY

0 - 30 MHz

0 - 30 MHz This command allows setting of the receiver frequency to a resolution of 1 Hz. Least Significant digits may be dropped (assumed 0). A decimal point is required except when frequency is 0 Hz, in which case it is not necessary to have any frequency data in the command string. Receiver tuned frequency is suppressed carrier frequency in sideband modes and passband center in all other modes.

Example: F14.123456 (set frequency to 14.123456 MHz)
F14.1 (set frequency to 14.100000 MHz)
F<CR> (set frequency to 0 Hz)

Hnnn

SET RS-232 DELAY

0 - 255 ms

Controls the time between tx output enable and the occurrence of the first transmitted bit on the RS-232 transmit line. This command may be used to overcome an RS-232 controller with a slow response. Units are milliseconds.

Example: H40 (Set delay to 40 Milliseconds)

Inn.nn

IF FILTER

.1 - 16 KHz
(FM .6 - 16 KHz)

This command selects the IF filter bandwidth. Bandwidths allowed are 100 Hz to 16 KHz in all detection modes except FM in which 500 Hz is the narrow filter limit. If an operator selects a that is not available the receiver will use a close but wider filter. Units are in KHz.

Example: I3.2 (Set IF Bandwidth to 3.2 KHz)
I0.5 (Set IF Bandwidth to 500 Hz)

Kn

PRE-AMP/ATTENUATOR

Allows control of pre-amp and attenuator

1 Normal - Preamp off, attenuator off
2 Preamp on, attenuator off
3 Attenuator on, preamp off

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Mn

AGC OPERATING MODE — 1 - 4

Selects the AGC operating mode. Where n is one of the following:

1 Fast AGC
2 Medium AGC
3 Slow AGC
4 Manual AGC

Example: M1 (Set Fast AGC mode)
M4 (Set Manual AGC mode)

Nnn.nnn

NOTCH FREQUENCY — +/- 2000 Hz (around passband center)

Allows tuning of the receiver's Notch Filter. (Around passband center) The Notch filter is operational in CW,CW1,LSB and USB modes for IF Filter Bandwidths of 4 KHz or less. The Notch filter may be tuned +/- 2 KHz. A notch frequency of 0 Hz effectively turns the notch filter off. The frequency data indicates the audio tone to be notched. Notch frequencies are relative to BFO frequency.

Example: N500 (Notch 500 Hz Audio Tone)
N1000 (Notch 1000 Hz Audio Tone)

Onn

NOISE BLANKER WIDTH — N/A

Allows setting of the Noise Blanker Width. Range is 0 (off) to 10 ms in 1 ms increments.

Example: 05 (Set Blanker width to 5 ms)
00 (Set Blanker to OFF)

NOTE!!

This command is provided here for reference only and will be a future option to the RX-330A. While the current version of RX-330A firmware will accept and reapportion the parameter it will not affect receiver operations.

Pnn.nnn

PASS BAND TUNING — +/- 2000 Hz

Allows setting of the pass band tuning feature. This feature is available in CW and SSB modes. Passband tuning shifts passband center frequency without affecting receiver tuned frequency or BFO. The effective SSB BFO offset may be adjusted with this command.

Example: P2.20 (Shift passband 2.2 KHz)
P-1.0 (Shift passband - 1 KHz)

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Qnnn — **SQUELCH** — 0 - 120 dB

Allows setting of the FM squelch control. Allowable range is 0 (off) to 120 covering a range of 0-120 dB.

Example: Q50 (Set Squelch to 50 dB)

Un — **DIGITAL DSP INTERFACE CONTROL**

Allows setting operational status of DSP digital output.

1 Interface off
2 Interface on - no control flags in serial data
3 Interface on - control bits included in serial data

Z — **MASTER RESET**

This command forces all receiver parameters back to factory default conditions. All memories are cleared. The receiver requires about 3 seconds to complete the process.

4-6 RX-330A RECEIVER MEMORY COMMAND SET

The RX-330A command set provides two commands that access the 100 memories contained in the receiver. The 100 memories are stored in the battery backed ram contained in the receiver and will remain stored during power down and storage. A master reset however, will clear any stored memories.

Wnn — **WRITE MEMORY** — 0 - 99

Write current operating parameters to memory number nn. Memory channels 00-99 may be used. The memory will contain all receiver settings such as frequency, mode, filter selection, etc.

Example: W20 (Write parameters to memory # 20)

Rnn — **RECALL MEMORY** — 0 - 99

Recall memory nn to main operating parameters. Memory channels 00-99 may be used.

Example: R20 (recall memory # 20)

4-7 RX-330A RECEIVER QUERY COMMAND SET

Some commands result in a receiver sending information back to the controller. This response will generally follow a format that is much like the format for issuing a command. For example: if a receiver is asked to tell its current operating frequency, it will respond with the format "F10.12345". In addition, whenever a receiver sends information, a status code is appended to the end of each response. The status code is the letter S followed by a number such as "S1" which indicates that the receiver is operating in remote mode (which is always true of the RX-330A). The status number is encoded as follows:

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1 Receiver is in remote control mode
2 Synthesizer is out of lock
4 not used
8 last string had character transmission error
16 last string had data error
32 last string had lost data
64 external reference applied

With a properly operating receiver and interface a receiver would have a status code of "S1". A receiver response will be terminated with a carriage return ASCII 13 (hex 0D).

G

REPORT STATUS

Receiver responds with all operating parameters relevant to the current operating mode. Parameters that are OFF or are not relevant to the current mode will not be included in the response. See also command "J".

Example:

Command: G
Response: F15.010000D2B-1800...etc...<CR>

Tx(xxx)

REPORT SPECIFIC STATUS

The receiver responds with the operating data as specified along with the command.

Example:

Command: TF - Request receiver operating frequency.
Response: F15.0100000 <CR>
For: frequency = 15.01 MHz

Command: TFBNX - Request F,B,N settings and S-meter level
Response: F15.010000B-1800N0.00X020 <CR>
For: frequency = 15.01 MHz
BFO = -1800 Hz
Notch = 0.00 Hz (OFF Position)
S-meter = 20 db Signal

X

REPORT SIGNAL LEVEL

This command forces the receiver to report the signal level or S-meter reading. Range is 0-120 covering the 120 dB range of the receiver.

Example:

Command: X - request S-meter reading.
Response: X015
For: S-meter = 15 dB signal level

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V

REPORT FIRMWARE REVISION NUMBER
The receiver will respond with a number indicating the revision level of the firmware.

Example:

Command:	V - Request firmware revision number.
Response:	V1.90
For:	Firmware revision number of 1.90

J

REPORT ALL OPERATING PARAMETERS
The receiver responds with all operating parameters regardless of their current use or relation to the current operating modes. See command G for additional information.

4-8 RX-330A RECEIVER B.I.T.E. (Built in test equipment)

The TEN-TEC model RX330A Receiver contains BITE firmware routines to assist in field level troubleshooting and repair. Three levels of testing are provided. Although each level executes the identical test routines the data is interpreted and processed differently. Accordingly, each BITE LEVEL has its own particular responses. BITE LEVEL 1 provides a simple PASS/FAIL response. BITE LEVEL 2 provides a BOARD LEVEL diagnosis and responds with one or more RX330A sub-assembly numbers representing likely failures. BITE LEVEL 3 provides PASS/FAIL results on individual internal tests.

Control codes to initiate the different levels of BITE are:

S3 - Initiate LEVEL 1 BITE
Responses:
A LEVEL 1 BITE will respond with either PASS or FAIL.

S4 - Initiate LEVEL 2 BITE
Responses:
A LEVEL 2 BITE will respond with PASS or FAIL followed by one or more of the following sub-assembly numbers:

81726	81728
81729	81730
81731	81732

S5 - Initiate LEVEL 3 BITE
Responses:
A LEVEL 3 BITE will respond with PASS or FAIL followed by two decimal numbers separated by a colon. For example: 127:64. These numbers represent the individual test results encoded into two bytes. The 8 bits of each byte represent different BITE tests. If the bit is set (1) the corresponding BITE test failed. A clear bit (0) indicates that the particular test has passed. The two bytes are encoded as follows:

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First byte:

- d0 Generate Audio Tone and Measure with CPU A/D
- d1 Check LO1 Lock Status
- d2 Check LO2 Lock Status
- d3 Check LO3 Lock Status
- d4 Check REF Lock Status
- d5 Check LO1 Loop Lock Time
- d6 Check LO2 Loop Lock Time
- d7 Check Last Power Up For Battery Failure

Second byte:

- d0 Check CPU/DSP Interface
- d1 Check I.F. for high noise level
- d2 Check I.F. for normal signal levels
- d3 Check S-Meter Level
- d4 Apply Manual AGC and Measure
- d5 Remove Manual AGC and Measure
- d6 DSP RESET FAILURE FLAG
- d7 not assigned

4-9 FACTORY SERVICE/FIELD TEST MODE

The RX-330A firmware also contains a special program for FACTORY/FIELD testing of the receiver. In this mode, the RX-330A runs an internal program in which i will directly control a dumb terminal and most receiver functions are available through on-screen controls. A PC running a terminal emulation program provides easy access to the FACTORY/FIELD test features. It is required that the Terminal or Terminal Emulation Software be capable of emulating a WYSE 50 terminal.

While the FACTORY/FIELD TEST MODE is a powerful testing tool, it is also simple to use. Keys for each function are designated by a single character contained in brackets, such a (I) for IF Bandwidth selection. Two other keys have meaning in this mode. Pressing 'Z' will initiate a MASTER RESET while pressing 'V' will cause the program to be restarted.

To enter FACTORY/FIELD TEST MODE set dipswitch S2-1 to the up position before applying power to the receiver. When the receiver is turned on, it will begin displaying information on the terminal. To exit FACTORY/FIELD TEST MODE, return S2-1 to its down position and cycle the power.

CAUTION!!! FACTORY/FIELD TEST MODE is intended to be used in a one receiver setup. It is not possible to operate multiple receivers in FACTORY/FIELD TEST MODE at once.

4-10 DSP DATA OUTPUT

The RX-330A receiver contains a digital output interface providing POST DSP I.F. & A.F. data from the Digital Signal Processor. This output may be interfaced with user supplied equipment for additional signal processing. Signal quality between the RX-330A and external devices is maintained since D/A and A/D stages are eliminated. In addition, the data streams may be turned on or off as needed by remote command.

Since the RX-330A provides both audio and I.F. outputs, the data streams available have control signals associated with each. As the Serial and Parallel interfaces are implemented quite differently, the control signals associated with each are also quite different.

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The SERIAL INTERFACE provides SERIAL CLOCK, SERIAL DATA and FRAME START signals. The SERIAL DATA output provides a 14 bit signed sample. Additional control signals are provided to indicate the origin of the sample. The IF/AF line indicates if a sample is I.F. DATA or A.F. DATA. The U/L line indicates if the A.F. sample is from the UPPER SIDEBAND or LOWER SIDEBAND. In all receiver modes except ISB the UPPER and LOWER samples will be the same. When in ISB mode UPPER and LOWER samples can be selected by remote commands.

The PARALLEL DATA stream consists of a 14 bit signed sample embedded in a 16 bit word with the upper two bits providing additional information about the sample. These two bits are encoded to indicate the origin of the sample. Bit 15 indicates if the sample is an I.F. or A.F. sample. If bit 15 indicates an A.F. sample, bit 14 will indicate either UPPER SIDEBAND or LOWER SIDEBAND sample. In all modes except ISB the UPPER SIDEBAND and LOWER SIDEBAND samples will be the same. When in ISB mode, UPPER SIDEBAND and LOWER SIDEBAND samples can be controlled by remote commands. Also the control bits (bits 14 & 15) can be turned off (forced to logic 0) by remote command.

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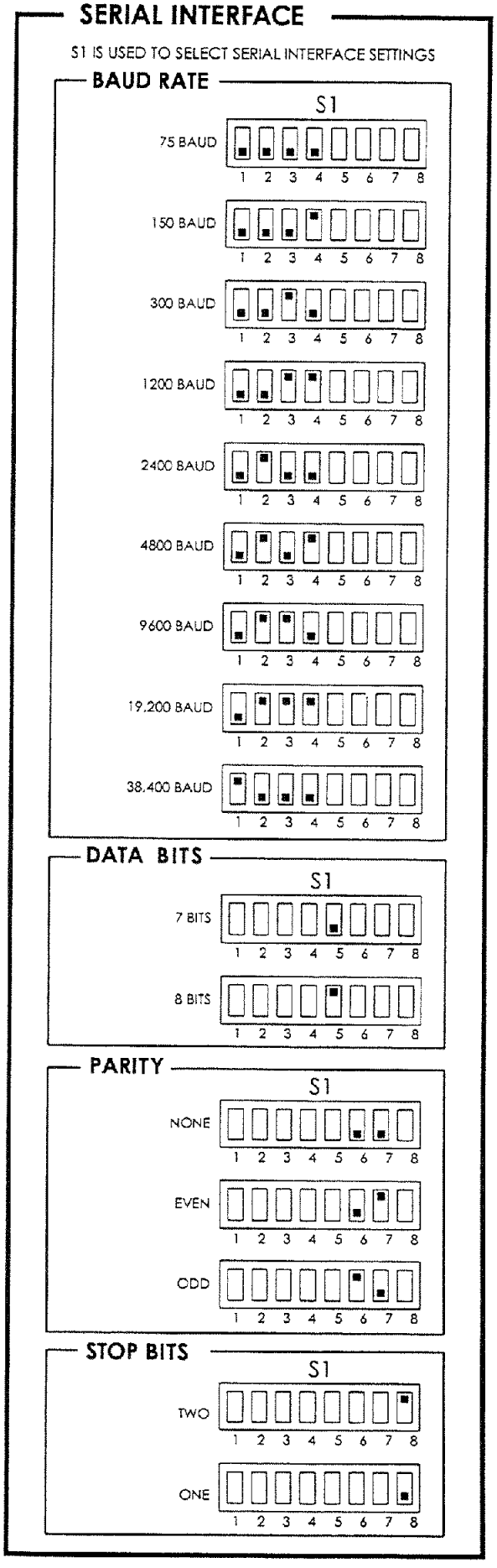

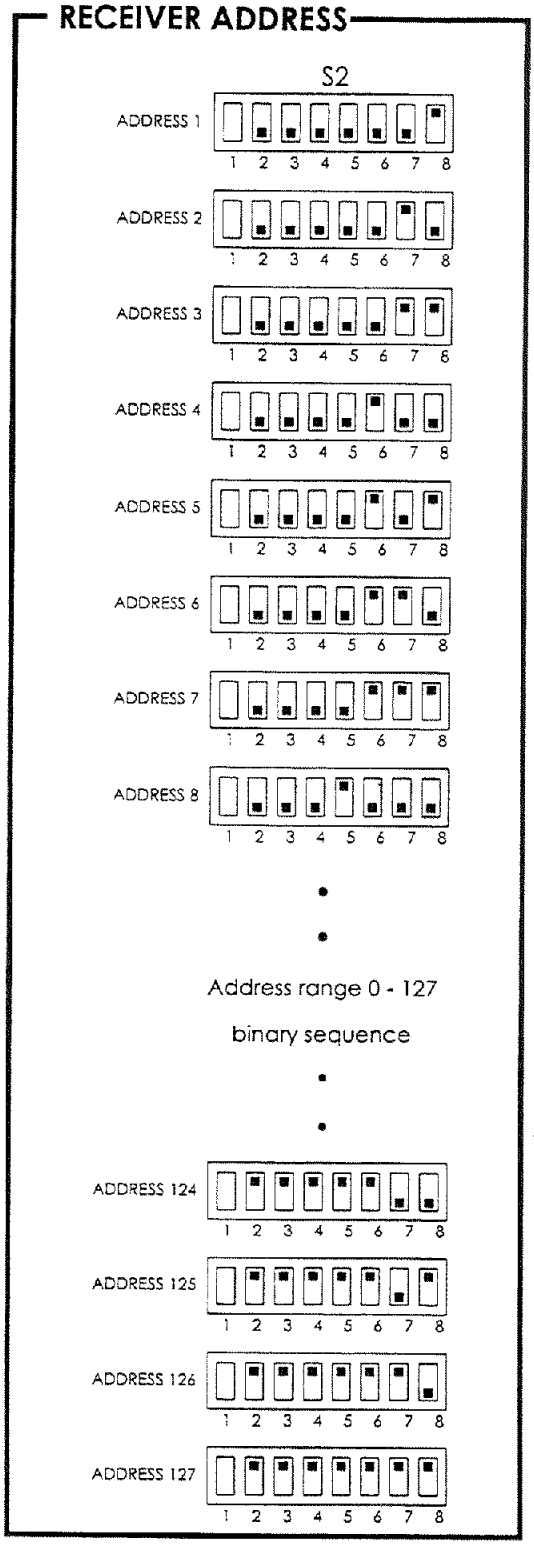

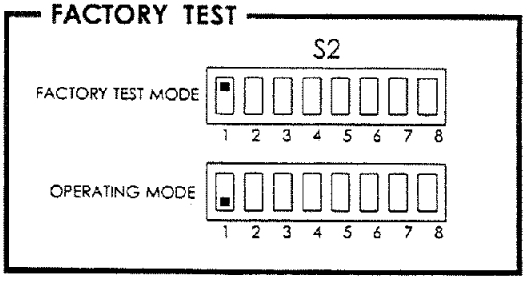

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FIGURE 4-2 CONFIGURATION DIAGRAM

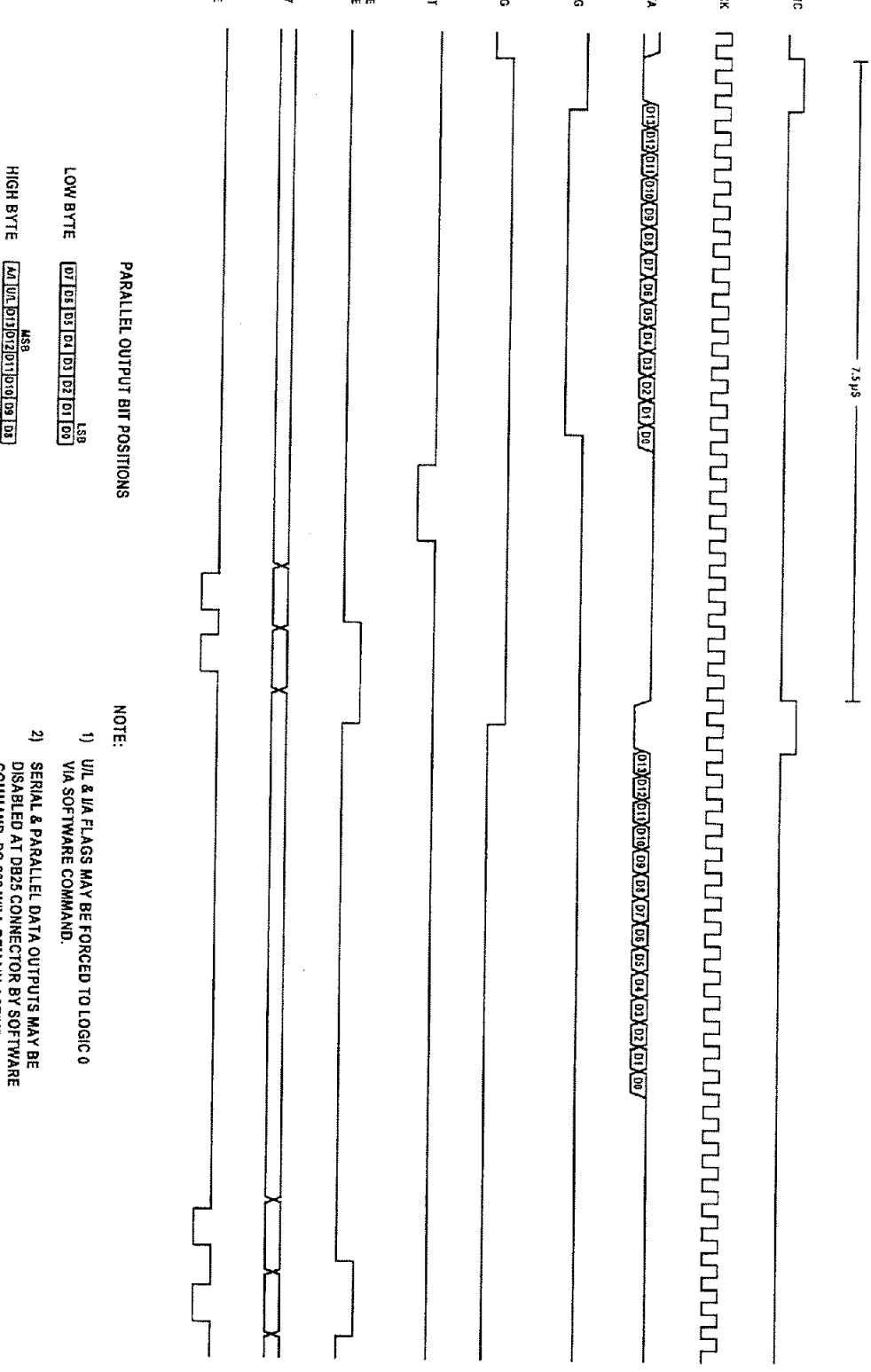

FIGURE 4-3 RX330A SERIAL/PARALLEL INTERFACE

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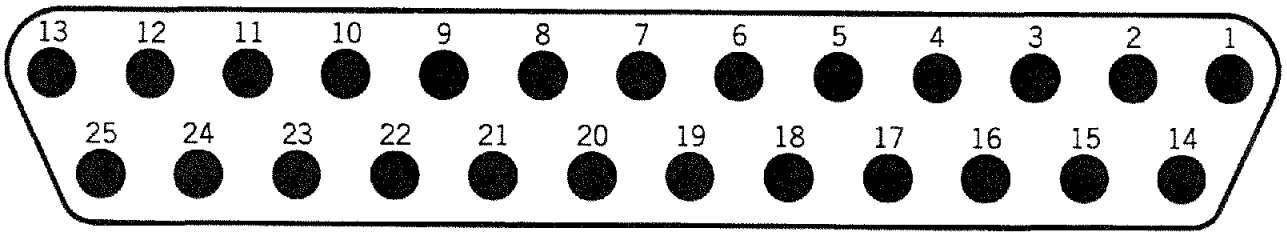

1	GND		14	DSP SERIAL	FRAME SYNC
2	RS232 TXO		15	DSP SERIAL	SERIAL DATA
3	RS232 RXO		16	DSP SERIAL	SERIAL CLOCK
4	DSP PARALLEL	HI/LO BYTE INDICATOR	17	DSP PARALLEL	DATA D1
5	DSP PARALLEL	DATA D0	18	DSP PARALLEL	DATA D3
6	DSP PARALLEL	DATA D2	19	DSP PARALLEL	DATA D4
7	GND		20	DSP PARALLEL	DATA D6
8	DSP PARALLEL	DATA D5	21	GND	
9	DSP PARALLEL	DATA D7	22	NO CONNECTION	
10	NO CONNECTION		23	DSP PARALLEL	DATA STROBE
11	GND		24	GND	
12	DSP PARALLEL	IF/AF INDICATOR	25	DSP PARALLEL	U/L INDICATOR
13	GND				

FIGURE 4-4 RX330A DB25 PIN ASSIGNMENTS

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CHAPTER 5

MAINTENANCE INSTRUCTIONS

WARNING
HIGH VOLTAGE

is used in the operation of this equipment
DEATH ON CONTACT
may result if personnel fail to observe safety precautions.
Learn the areas containing high voltage within the equipment.
Be careful not to contact high voltage connections when installing, operating or maintaining this equipment.
Before working inside the equipment, turn power off and ground points of high potential before touching them.

5-1 INTRODUCTION: To perform maintenance tasks on the Model RX-330A the technician shall identify faulty modules or subassemblies. The faulty module or subassembly shall be replaced with a known good one.

5-2 CLEANING AND LUBRICATION: There are no cleaning or lubrication requirements for the Model RX-330A.

5-3 TROUBLESHOOTING: Troubleshooting the Model RX-330A consists of identifying faulty modules or subassemblies by the symptom of the fault. Table 5-1 lists symptoms and the probable module or modules associated with the fault.

5-4 INSPECTION: There are no parts in the Model RX-330A that are subject to wear. Rear panel connectors should be inspected for damage whenever the unit is removed.

5-5 PERFORMANCE VERIFICATION TEST FOR MODEL RX-330A: The following performance verification tests may be performed if there is a suspected failure. Perform the verification tests in the order listed, as previous tests may contain test setup procedures required for succeeding tests. The technician will need the following test equipment to perform the verification tests.

5-5.1 TEST EQUIPMENT REQUIRED FOR MODEL RX-330A:

- Signal generator, HP8656A or equivalent.
- Signal generator, HP8640B or equivalent (16 MHz phase noise less than -130 dBc @ 10 KHz offset), or 16.208 MHz crystal oscillator with +15 dBm output level.
- RF Two-Tone test setup consisting of generators above, hybrid combiner (Anzac HH-107 or equivalent) and fabricated lowpass filters, amplifiers and pads to provide two 0 dBm tones at 16.208 and 16.308 MHz and at 16.208 and 16.2085 MHz with all intermodulation and harmonic outputs less than -80 dBm.
- Audio analyzer, HP8903B or equivalent: AC Level, SINAD, and %THD capabilities.
- Audio spectrum analyzer, HP141T/8852B/8553B or equivalent.
- Step attenuator, 10 dB steps, 0-120 dB, HP355B or equivalent.
- Step attenuator, 1 dB steps, 0-12 dB, HP355C or equivalent.
- Directional coupler, 20 dB, Anzac CD-920-4 or equivalent.
- Computer terminal with RS-232 interface, Wyse 50 or equivalent.

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5-5.2 FUNCTIONAL TESTS FOR MODEL RX-330A:

Specification	Test Setup	TYP.	MIN/MAX
SENSITIVITY Preamp Off Attenuator Off	Connect a signal generator to the receiver RF input. Connect an audio analyzer with SINAD measurement capability to the Mono Audio output. Set receiver tuned frequency to 15.01 MHz, preamp off.		
(Noise Fig. 18 dB typ. 20 dB max.)	USB MODE: IF BW 3.2 KHz MAGC = 0. Apply -109 dBm, 15.011 MHz. Adjust level for 10 dB SINAD.	-109 dBm	-107 dBm MAX
	CW MODE: IF BW 300 Hz. BFO -1000. Apply -113 dBm, 15.01 MHz. Adjust level for 16 dB SINAD.	-113 dBm	-111 dBm MAX
	AM MODE: IF BW 6 KHz Apply -100 dBm, 15.01 MHz, 50% modulation @ 400 Hz. Adjust level for 10 dB SINAD.	-100 dBm	-98 dBm MAX
	FM MODE: IF BW 16 KHz Apply -99 dBm, 15.01 MHz, 6 KHz Peak Deviation @ 1 KHz Adjust level for 16 dB SINAD.	-99 dBm	-97 dBm MAX
Preamp on (Noise Fig. 10 dB typ. 14dB max.)	USB MODE: Preamp ON IF BW 3.2 KHz MAGC = 0 Apply -119 dBm, 15.011 MHz Adjust level for 10 dB SINAD.	-119 dBm (.25 uV)	-115 dBm MAX
IMAGE REJ. (90 dB typ. 70 dB min.)	FIRST MIXER: Receive frequency 15.01 MHz., preamp OFF USB Mode IF BW 3.2 KHz BFO -1800 Hz		

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Specification	Test Setup	TYP.	MIN/MAX
	MAGC = 0 Apply 105.189 MHz, -50 dBm Increase level for 10 dB SINAD.	>10 dBm	-39 dBm MIN
	SECOND MIXER: Receive frequency 15.01 MHz. USB Mode IF BW 3.2 KHz BFO -1800 Hz MAGC = 0 Apply 15.923 MHz, -50 dBm Increase level for 10 dB SINAD.	-19 dBm	-39 dBm MIN
IF REJECTION (90 dB typ. 80 dB min.)	FIRST IF: Receive frequency 29.995 MHz, preamp OFF USB Mode IF BW 3.2 KHZ BFO -1800 Hz MAGC = 0 Apply 45.104 MHz, -50 dBm Increase level for 10 dB SINAD.	>10 dBm	-29 dBm MIN
	SECOND IF: Receive frequency 0.505 MHz. Apply 456 KHz -50 dBm Increase level for 10 dB SINAD.	>10 dBm	-29 dBm MIN
3RD ORDER INTERCEPT POINT (+30 dBm typ. +25 dBm min.)	Configure the two-tone test set to produce a lowpass filtered 16.208 MHz. / 16.308 MHz two-tone output with each tone at 0 bBm. Third order products and harmonics at the combiner output must be less than -80 dBm. Connect the two-tone output through a 1 dB step attenuator to the receiver RF input. Receive frequency 16.1072 MHz, preamp OFF Set MAGC to 65 dB Note audio output level in dBv. Reduce the two-tone level by 3 dB and observe a 9 dB drop in IF output. Remove the two-tone generator and step attenuator. Connect a 16.1082 MHz. generator to RF input. Adjust generator level for the same audio level noted above. Generator level should be:	-60 dBm	-50 dBm MAX

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Specification	Test Setup	TYP.	MIN/MAX
SECOND ORDER INTERCEPT POINT (+75 dBm typ. +60 dBm min.)	Receive frequency 26.005 MHz, preamp OFF. MAGC = 0. Set generator to 22.547 MHz. Connect sufficient lowpass filtering to generator output to reduce 2nd harmonic to -100 dBc at -30 dBm output. Connect filtered generator to RF input. Adjust generator level for 10 dB SINAD. Generator level should be:	-17 dBm	-25dBm MIN
INBAND IMD (-55 dB typ. -50 dB max.)	Configure the two-tone test set to produce a lowpass filtered 16.208/16.2085 MHz two-tone with each tone at -16 dBm (-10 dBm PEP). Third order products and harmonics must be less than -80 dBm Connect the two-tone to the receiver RF input. Receive frequency 16.207 MHz, USB, AGC=SLOW, preamp OFF. Send a status request command to the receiver and note the received signal level. Add 10 to the signal level, enter Manual Gain mode, and set the Manual Gain to this number. Connect the audio spectrum analyzer to the MONO AUDIO output. Analyzer settings: 1250 Hz CF 30 Hz RBW 10 Hz VBW 200 Hz/div 0 dBm Input Level 20 dBm Log Reference 1 sec/div Scan Time Adjust Display Reference to place each tone at -6 dB. Third order products should be:	-55 dB	-50 dB MAX
	Turn attenuator ON Each tone should drop to:	-20 dB	+/- 3 dB
LO PHASE NOISE @ 20 KHz offset	Connect a 16.208 MHz. / 15 dBm crystal oscillator thru 10 dB and 1 dB step attenuators to RF in. Connect audio analyzer to MONO AUDIO output. Receive frequency 16.227 MHz, USB, preamp OFF.		

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Specification	Test Setup	TYP.	MIN/MAX
	Set attenuator to 80 dB		
(120 dB/Hz typ.	MAGC = 20.		
-110 dB/Hz max.)	Note audio noise level in dBm.		
	Decrease attenuator setting for a 10 dB rise in noise level.		
	Attenuator setting should be:	39 dB	49 dB MAX

Note: 10 dB rise above typical receiver noise floor of -119 dBm/3.2 KHz is -144 dBm/Hz. Subtract RF input level from this to obtain dBc/Hz phase noise. Phase noise of the xtal oscillator or signal generator used must be at least 20 dB better than the expected measurement.

BLOCKING	AM Mode, 6 KHz BW.		
ON TUNE	Receive frequency 15.01 MHz, preamp OFF.		
	Connect signal generator to RF input.		
	Set signal generator to 15.01 MHz, 30% AM/		
(<5% THD:	1 KHz, 0 dBm		
0 dBm input	MAGC = 0.		
30% AM 1 KHz,	AGC Mode = Slow.		
	Set audio analyzer to read % distortion.		
	Distortion should be less than:	2.5%	5% MAX
BLOCKING	Receive frequency 16.408 MHz, preamp OFF.		
OFF TUNE	Connect a +15 dBm 16.208 MHz crystal oscillator through a step attenuator to a directional coupler input.		
	Connect the direct output of the directional		
(200 KHz offset	coupler to the receiver RF input.		
15 dBm typ.	Terminate the forward port of the coupler.		
10 dBm min.)	Connect a -40 dBm, 16.408 MHz, 30% AM/		
	1 KHz, signal generator to the reverse port of the directional coupler.		
	Set step attenuator to 50 dB		
	Set audio analyzer to read AC Level in dBm.		
	Increase MAGC setting until the AC Level reading drops by 10 dBm		
	Reduce attenuator setting until blocking begins (3 dB drop in AC Level).		
	RF input level should be:	> 15 dBm	10 dBm MIN

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CHAPTER 6

PREPARATION FOR SHIPMENT OR STORAGE

6-1 PREPARATION FOR RESHIPMENT: If the Model RX-300 ever needs to be packaged for reshipment, it is recommended that the following steps be taken.

1. Remove all cords or cables attached to the unit.
2. Ensure that there is sufficient foam packing material in the shipping carton to protect the unit from any hard impact that may occur during shipment.
3. Place the unit in the center of the shipping carton.
4. Cover the unit with foam packing material.
5. If using a cardboard packing carton, securely tape the seams of the carton's top cover, bottom cover and side flaps with reinforced tape.
6. Fasten labels or stamp with indelible ink the word FRAGILE on the top, bottom, and all sides of the carton.

6-2 PREPARATION FOR STORAGE: If the Model RX-330A is not going to be used for a long period of time, it should be stored in its shipping case or some other suitable carton. The unit is rated for storage at temperatures from -50° F to 160° F. To prepare the unit for storage perform the following steps.

1. Remove all cords or cables attached to the unit.
2. Ensure that there is sufficient foam packing material in the container.
3. Place the unit in the center of the packing container.
4. Cover the unit with foam packing material.
5. If using a cardboard packing carton, securely tape the container with reinforced packing tape.
6. Fasten labels or stamp with indelible ink the word FRAGILE on the top, bottom, and all sides of the container.
7. Write the Model No. and quantities in large characters on top of the carton.

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CHAPTER 7

SINGLE SOURCE PARTS LIST

7-1 INTRODUCTION: Table 7-1 is a listing of all the parts available from only one unique manufacturer or source. The table lists the Sub-Assembly Number, component ID, Manufacturer Part Numer, Manufacturer Code, Part Description, and the Ten-Tec Part Number.

TABLE 7-1 MODEL RX-330A SINGLE SOURCE PARTS LIST

S/A NO.	MFGR. PART No.	MFGR. CODE	DESCRIPTION	TEN-TEC PART No.
81727	UCN5895A	ALLEGRO	IC-8 CHANNEL SERIAL DRIVER	25344
81727	KS4522	FSI	DIODE-PIN-25 WATTS	28103
81727	85413-1	TT	COIL-RF 5 TURNS #28 BIFILAR ON 21167	85413-10
81727	85413-1	TT	COIL-RF 5 TURNS #28 BIFILAR 5 TURNS #24 ON 21037 AND 21167	85413-11
81728	2SC1971	MITI	VHF TRANSISTOR	25337
81728	09-9001-1-03	CONCORD	PCJACK FOR .40 PIN	35054
81728	K24C/M	VECTOR	CONTACT PIN .041 DIAMETER	41009
81728	7MM	AURA	SHIELD CAN-COIL, 7MM NI PLATED	38131
82718	45.03 MHz HC 45	IFCP	CRYSTAL 45.03 MHz, FUND HC45	48173
81728	45.18 MHz HC 45	IFCP	CRYSTAL 45.18 MHz, FUND HC45	48174
81728	BLBC-2TX2-4P	CTC	TRANSFORMER-BIFILAR BALUN	21152
81728	BLBC-2TX3-4P	CTC	TRANSFORMER-TRIFILAR BALUN	21153
81728	85134	TT	TRANSFORMER-TRIFILAR	85134
81728	85149	TT	TRANSFORMER-RF 1:1 BALUN	85149

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TABLE 7-1 MODEL RX-330A SINGLE SOURCE PARTS LIST (cont.)

S/A NO.	MFGR. PART NO.	MFGR. CODE	DESCRIPTION	Ten-Tec PART NO.
81728	85413-08	TT	COIL - 7 1/2 TURNS #30 BIFILAR ON 91566	85413-08
81728	85413-09	TT	COIL - 17 3/4 TURNS #30 ON 91566	85413-09
81728	5082-2835	HP	DIODE - HOT CARRIER	28013
81728	91744	TT	VCO - ENCLOSURE	91744
81729	BLBC-2TX2-4P	CTC	TRANSFORMER - BIFILAR BALUN	21152
81729	BLBC-2TX3-4P	CTC	TRANSFORMER - TRIFILAR BALUN	21153
81729	MCI2019P	RCA	IC ÷20/21 PRESCALER	25354
81729	2SC1971	MITI	VHF TRANSISTOR	25337
81729	MC145170P	MOT	IC - DUAL AMPLIFIER	25296
81729	AD600JN	AD	IC - DUAL AMPLIFIER	25322
81729	7MM	AURA	SHIELD CAN-COIL, 7MM NI PLATED	38131
81729	85413-03	TT	COIL - 12 TURNS #30 BIFILAR ON 21175	85413-03
81729	160-0021-020	DAYSTAR	PRINTED CIRCUIT BOARD TERMINAL	41003
81729	85413-12	TT	COIL - 9 TURNS #30 TRIFILAR ON 21175	85413-12
81729	MBD301	MOT	DIODE - HOT CARRIER	28110
81729	CFW455D	MURATA	455 KHz FILTER	48203
81731	BLBC-2TX2-4P	CTC	TRANSFORMER - BIFILAR BALUN	21152
81731	BLBC-2TX3-6P	CTC	TRANSFORMER - TRIFILAR BALUN	21153
81731	MC145170P	MOT	PLL FREQUENCY SYNTHESIZER SERIAL INTERFACE	25296
81731	BAT41	CFS	DIODE - SCHOTTKY	28071
81731	KV3902	FSI	DIODE - VARACTOR	28075
81731	CA3096E	RCA	IC - TRANSISTOR ARRAY	25345
81731	85120	TT	TRANSFORMER - RF BILIFAR	85120
81731	85413-04	TT	COIL 10 3/4 TURNS #30 ON 91566 FORM	85413-04

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TABLE 7-1 MODEL RX-330A SINGLE SOURCE PARTS LIST (cont.)

S/A NO.	MFGR. PART NO.	MFGR. CODE	DESCRIPTION	TEN-TEC PART NO.
81731	85413-05	TT	COIL 12 3/4 TURNS #30 ON 91566 FORM	85413-05
81731	85413-06	TT	COIL 15 3/4 TURNS #30 ON 91566 FORM	85413-06
81731	85413-07	TT	COIL 15 3/4 TURNS #36 ON 91566 FORM	85413-07
81731	91744	TT	ENCLOSURE - VCO	91744
81731	91745	TT	ENCLOSURE - COVER	91745
81732	BLBC-2TX2-4P	CTC	TRANSFORMER - BIFILAR BALUN	21152
81732	BLBC-2TX3-4P	CTC	TRANSFORMER - TRIFILAR BALUN	21153
81732	TE7730	TEMEX	MONOLYTHIC FILTER 45 MHz	48202
81732	MC175170P	MOT	PLL FREQUENCY SYNTHESIZER SERIAL INTERFACE	25296
81732	MBD301	MOT	DIODE - HOT CARRIER	28110
81732	NE612AN	SG	IC - MIXER	25319
81732	KV3902	FSI	DIODE - VARACTOR	28075
81732	CA3096E	HARRIS	IC - TRANSISTOR ARRAY	25345
81732	10 MHz HC 18 32P	FM	CRYSTAL 10 MHz .002% HC 18 32 PF	48112
81732	85413-01	TT	COIL 14 1/2 TURNS #24 ON 91566 FORM	85413-01
81732	85413-02	TT	COIL 10 1/2 TURNS #24 ON 91566 FORM	85413-02
81733	LP16-1500	SIGNAL	TRANSFORMER 16VCT 1.5A PC BOARD MOUNT	21168
81733	LP16-150	SIGNAL	TRANSFORMER .15A PC BOARD MOUNT	21184
81726	98343	TT	IC - PROGRAMMED	98343
81726	98344	TT	IC - PROGRAMMED	98344
81726	98345	TT	IC - PROGRAMMED	98345
81726	98350	TT	IC-PROGRAMMED	98350
81726	DS1220Y	DALLAS	IC - RAM WITH BATTERY	25311
81726	DSP-2101-KP80	AD	IC - DSP PROCESSOR	25330

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TABLE 7-1 MODEL RX-330A SINGLE SOURCE PARTS LIST (cont.)

S/A NO.	MFGR. PART NO.	MFGR. CODE	DESCRIPTION	TEN-TEC PART NO.
81726	80C552	PHILLIPS	IC - MICROPROCESSOR	25331
81726	MAX242CPN	MAX	IC - RS232 DRIVER	25343
81730	42XLO16	MOUSER	TRANSFORMER 600Ω CT.	21185
81730	AD7872JN	AD	IC - ANALOG TO DIGITAL CONVERTER	25348
81730	AD7840JN	AD	IC - DIGITAL TO ANALOG CONVERTER	25349
81730	CFU455D2	MURATA	455 KHz FILTER	48198

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TABLE 7-2 PART MANUFACTURER'S INFORMATION

MFGR'S CODE	MANUFACTURER NAME AND ADDRESS
AD	ANALOG DEVICES INC., ONE TECHNOLOGY WAY, PO BOX 9106, NORWOOD, MA 02060-9106
ALLEGRO	ALLEGRO MICROSYSTEMS INC., 115 NORTHEAST CUTOFF BOX 15036, WORCESTER, MA 01615
AURA	AURA MRG. COMPANY, 50 MC DERMATT RD., NORTH HAVEN, CT 06473
CONCORD	CONCORD ELECTRONICS, 35 GREAT JONES ST., NEW YORK, NY 10012
CSF	TOMPSON-CSF COMPONENTS CORPORATION, SEMICONDUCTOR DIVISION 6660 VARIEL AVE., CANOGA PARK, CA 91303
CTC	CTC COILS LTD FLAT L-M, 141 F HARIBEST IND'L BLDG., 45-47 AU PUI, WAM STREET FO-TAN, SHATIN, NT HONG KONG
DALLAS	DALLAS SEMICONDUCTOR CORP., 4401 SOUTH BELTWOOD PARKWAY, DALLAS, TX 75244-3292
DAYSTAR	DAYSTAR MFG. INC., 11535 FRANKLIN AVE, FRANKLIN PARK, IL 60131
FSI	FREQUENCY SOURCES INC., SEMICONDUCTOR DIVISION, 16 MAPLE RD, CHELMS FORD, MA 01824
HARRIS	HARRIS CORP, SEMICONDUCTOR PRODUCTS DIV., PO BOX 883, MELBOURNE, FL 32902
HP	HEWLETT PACKARD CO., PO BOX 10301, PALO ALTO, CA 94303-0890
IFCP	INNOVATIVE FREQUENCY CONTROL PRODUCTS, 451 LINCOLN ST., CARLISLE, PA 17013
MAX	MAXIM INTEGRATED PRODUCTS INC., 120 SAN GABRIEL DR., SUNNYVALE, CA 94086
MITI	MITSUBISHI ELECTRONICS AMERICA, INC. 1050 EAST ARQUES AVENUE, SUNNYVALE, CA 94086
MOT	MOTOROLA SEMICONDUCTOR PRODUCTS INC., 3501 ED BLUESTEIN BLVD., AUSTIN, TX 78721
MOUSER	MOUSER ELECTRONICS INC., 1175 N.E. 24 STREET, PO BOX 5727 FORT LAUDERDALE, FL 33310
MURATA	MURATA ERIE NORTH AMERICA INC., 1148 FRANKLIN RD S.E., MARIETTA, GA 30067

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TABLE 7-2 PART MANUFACTURER'S INFORMATION (cont.)

MFGR'S CODE	MANUFACTURER NAME AND ADDRESS
PHILLIPS	SIGNETICS/PHILLIPS SEMICONDUCTORS, 811 EAST ARQUES AVE, SUNNYVALE, CA 94088-3409
RCA	RCA/HARRIS CORP. SEMICONDUCTOR PRODUCT DIV., PO BOX 883 MELBOURNE, FL 32902
FM	FREQUENCY MANAGEMENT, 15302 BOLSA CAICA ST., HUNGTINGTON BEACH, CA 92649
SG	SIGNETICS/PHILIPS SEMICONDUCTORS, 811 EAST ARQUES AVE, SUNNYVALE, CA 94088-3409
TT	TEN-TEC, INC., 1185 DOLLY PARTON PARKWAY, SEVIERVILLE, TN 37862
TEMEX	TEMEX ELECTRONICS, INC., 3030 W. DEER VALLEY RD., PHOENIX, AZ 85027
VECTOR	VECTOR ELECTRONICS COMPANY, 12462 GLADESTONE AVE., SYLMAR, CA 91342

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CHAPTER 8

FINAL ASSEMBLY

8-1 INTRODUCTION: Table 8-1 is a listing of all the modules in the RX-330A that can be replaced in corrective maintenance procedures. Figure 3-1 illustrates where the modules are located in the chassis. Table 8-2 is a listing of additional small parts which may need to be replaced if the receiver has been damaged.

TABLE 8-1 RX-330A MODULES

DESCRIPTION	TT PART NO.
RX PRESELECTOR	81727
1ST MIXER	81728
2ND MIXER/3RD LO	81729
1ST LO	81731
2ND LO	81732
POWER SUPPLY	81733
LED BOARD	81720
DSP/CPU BOARD	81726
CONVERTER (I/O)	81730

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TABLE 8-2 FINAL ASSEMBLY REPLACEABLE PARTS	
DESCRIPTION	**TT PART NO.**
IC-7905CT, -5V REGULATOR	25353
IC-MC7805CT, 5V REGULATOR	25095
IC-LM7812CT, 12V REGULATOR	25232
IC-7912CT, -12V REGULATOR	25352
FUSE, 1A SLO-BLOW MDL1	27028
RES-VAR 1K LIN	30087
RES-VAR 1K DUAL GANGED	30621
SWITCH DPDT	32087
JACK - PHONE 1CKCT	35008
BNC CONNECTOR CHASSIS MOUNT	35134
JACK - PHONE STEREO	35144
POWER ENTRY MODE	35278
DUST COVER MTA 156 4 POS	35281
EMI/RFI GASKET FOR DB-25	35282
WASHER - SHOULDER NYLON #4XI	38068
INSULATOR SIL-PAD	38176
D-CONNECTOR 15 PIN	35287
1.5" RACK HANDLES, 3/16" DIA	38213
FERRULE, FOR HANDLES, 3/16" DIA	38214
DETACHABLE AC CORD/3COND.	46138
SHIELD 1	93168-1
SHIELD 2	93168-2
SHIELD 3	93168-3
SHIELD 4	93168-4
SHIELD 5	93168-5
SHIELD 6	93168-6
SHIELD 7	93168-7
SHIELD 8	93168-8
SHIELD 9	93168-9
SHIELD 10	93168-10
SHIELD 11	93168-11
SHIELD 12	93168-12
SHIELD 13	93168-13
SHIELD 14	93168-14
CHASSIS	93163-IA
TOP	93165
LEFT SIDE	93166
RIGHT SIDE	93167
SUB-PANEL	93169
FRONT PANEL	93164-CN1A
ADDRESS/DATA COVER	93170
KNOB ASSEMBLY .250 ID	81724

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CHAPTER 9

ILLUSTRATIONS

9-1 INTRODUCTION: This chapter contains the detailed illustrations for the manual. This includes the block and schematic diagrams, parts lists, component location illustrations, and in some cases circuit board trace views.

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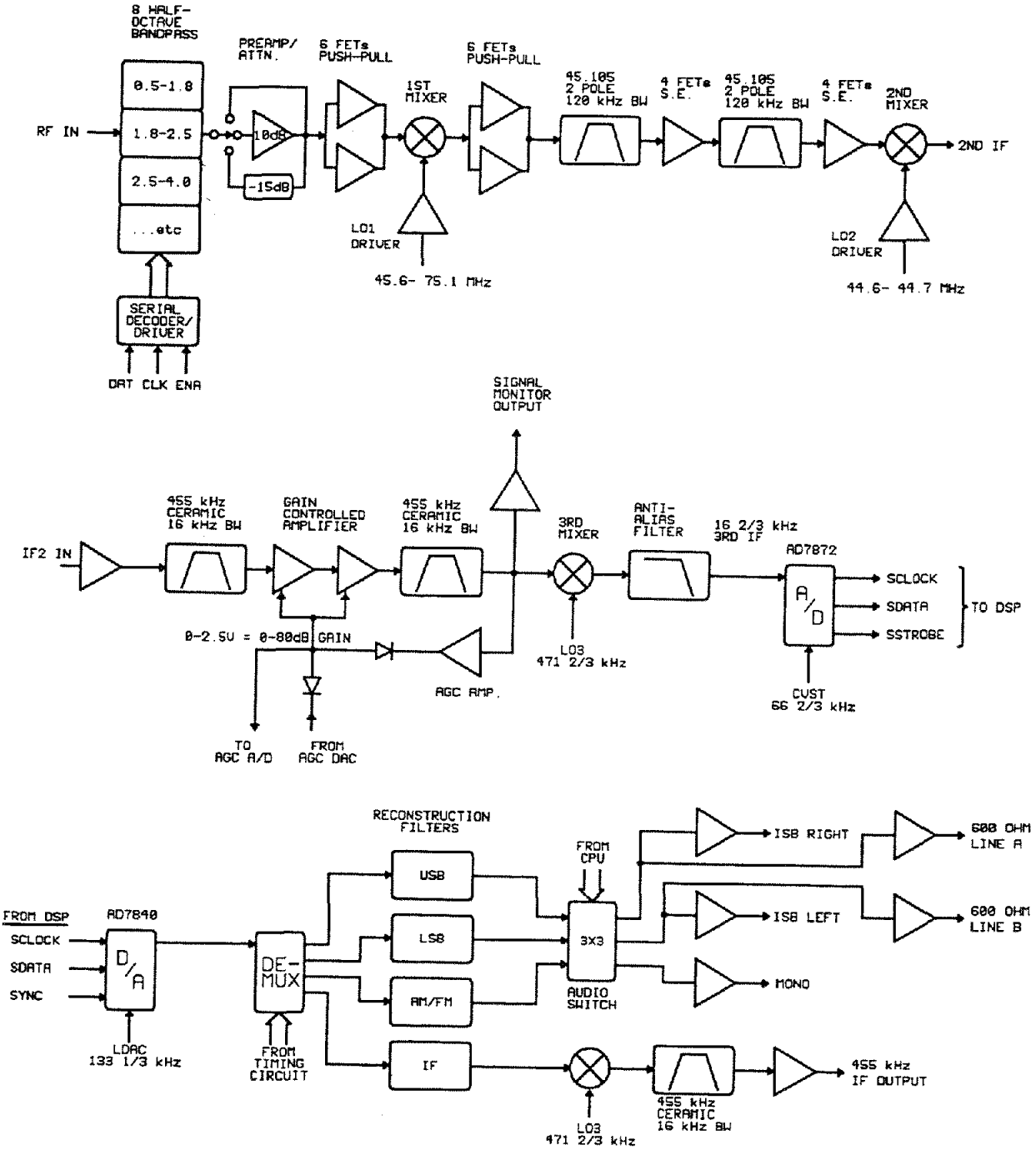

FIGURE 9-1. MODEL RX-330A BLOCK DIAGRAM

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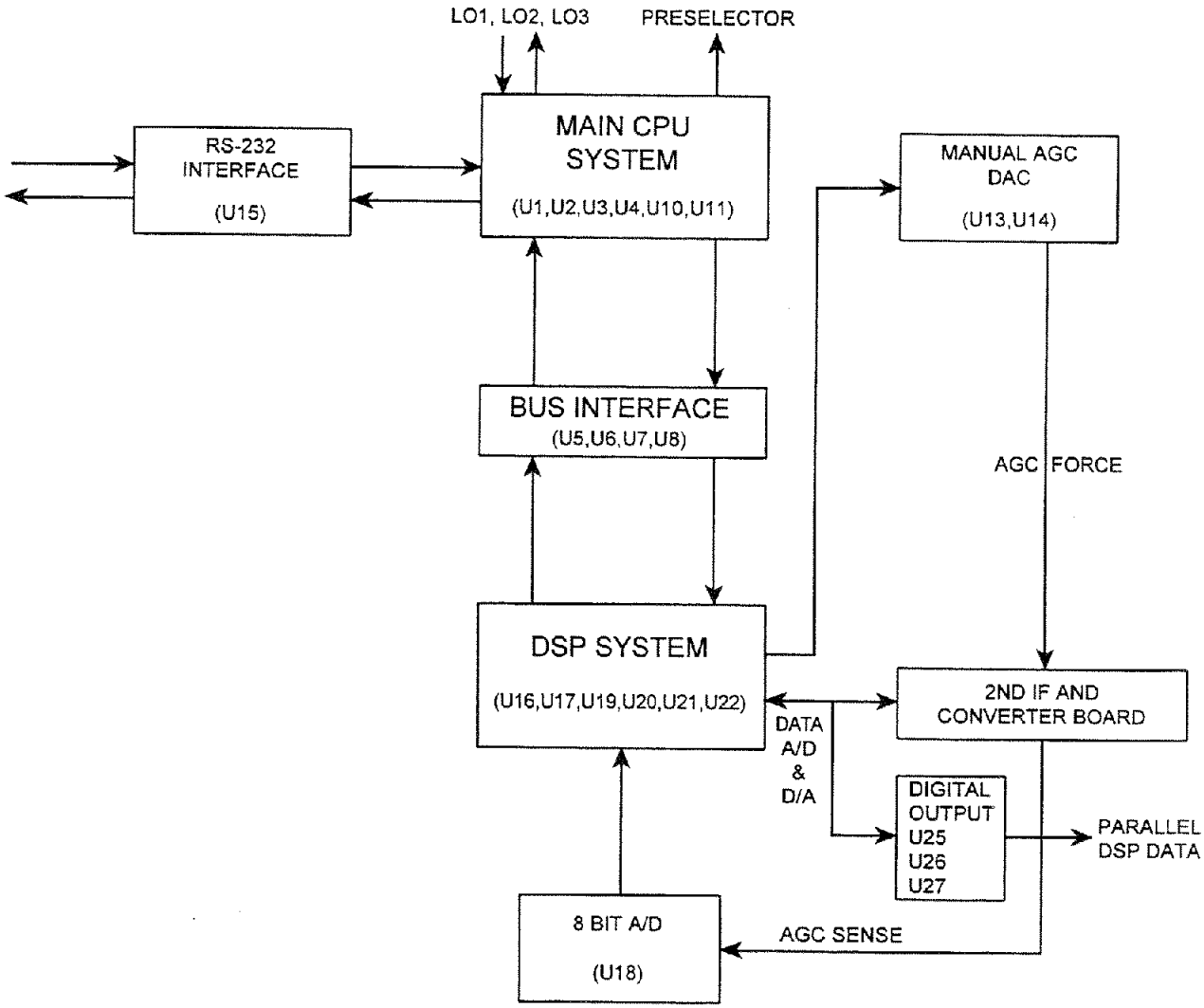

FIGURE 9-2 LOGIC BOARD BLOCK DIAGRAM

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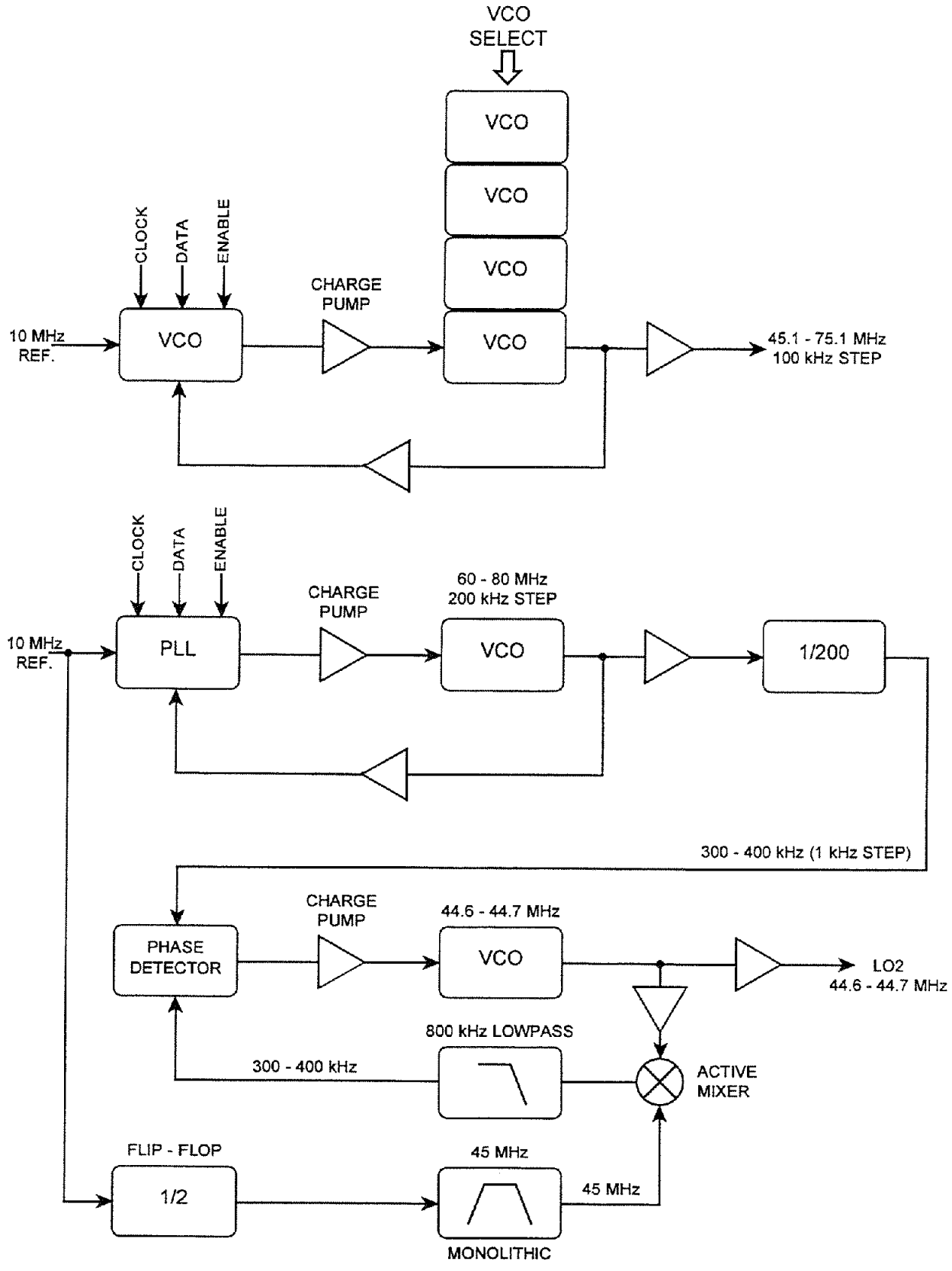

FIGURE 9-3 SYNTHESIZER BLOCK DIAGRAM

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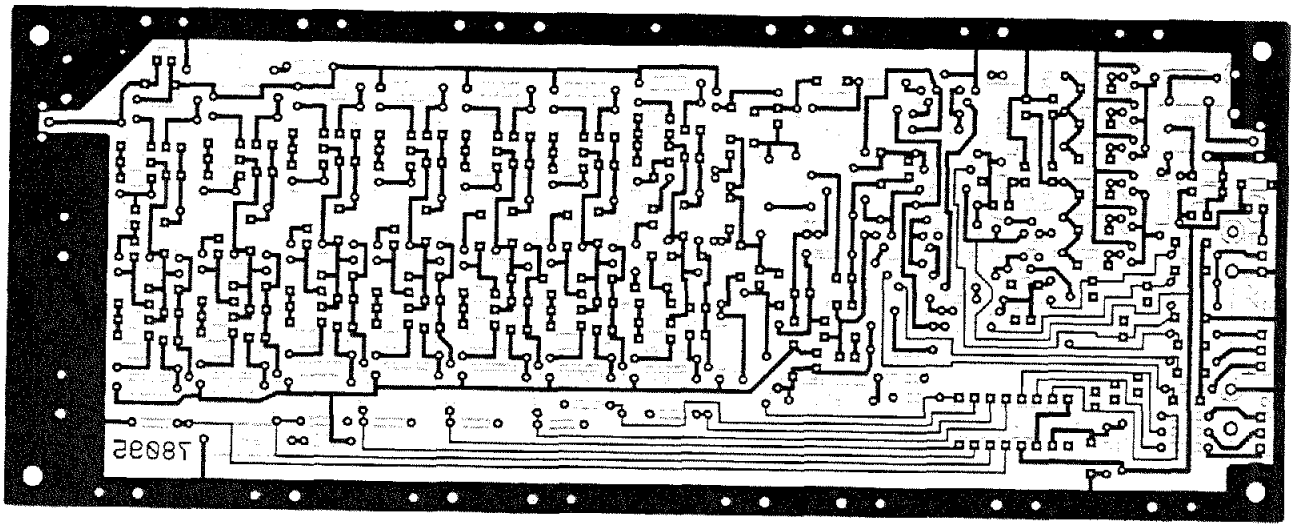

FIGURE 9-4. 81727 CIRCUIT TRACE

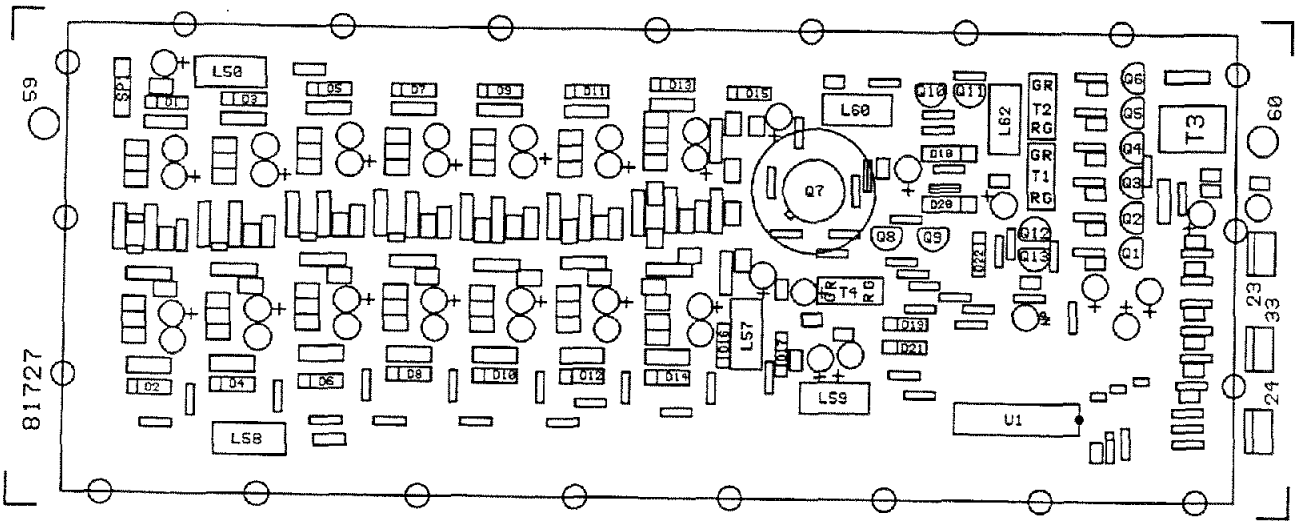

FIGURE 9-5. 81727 RX PRESELECTOR COMPONENT LAYOUT

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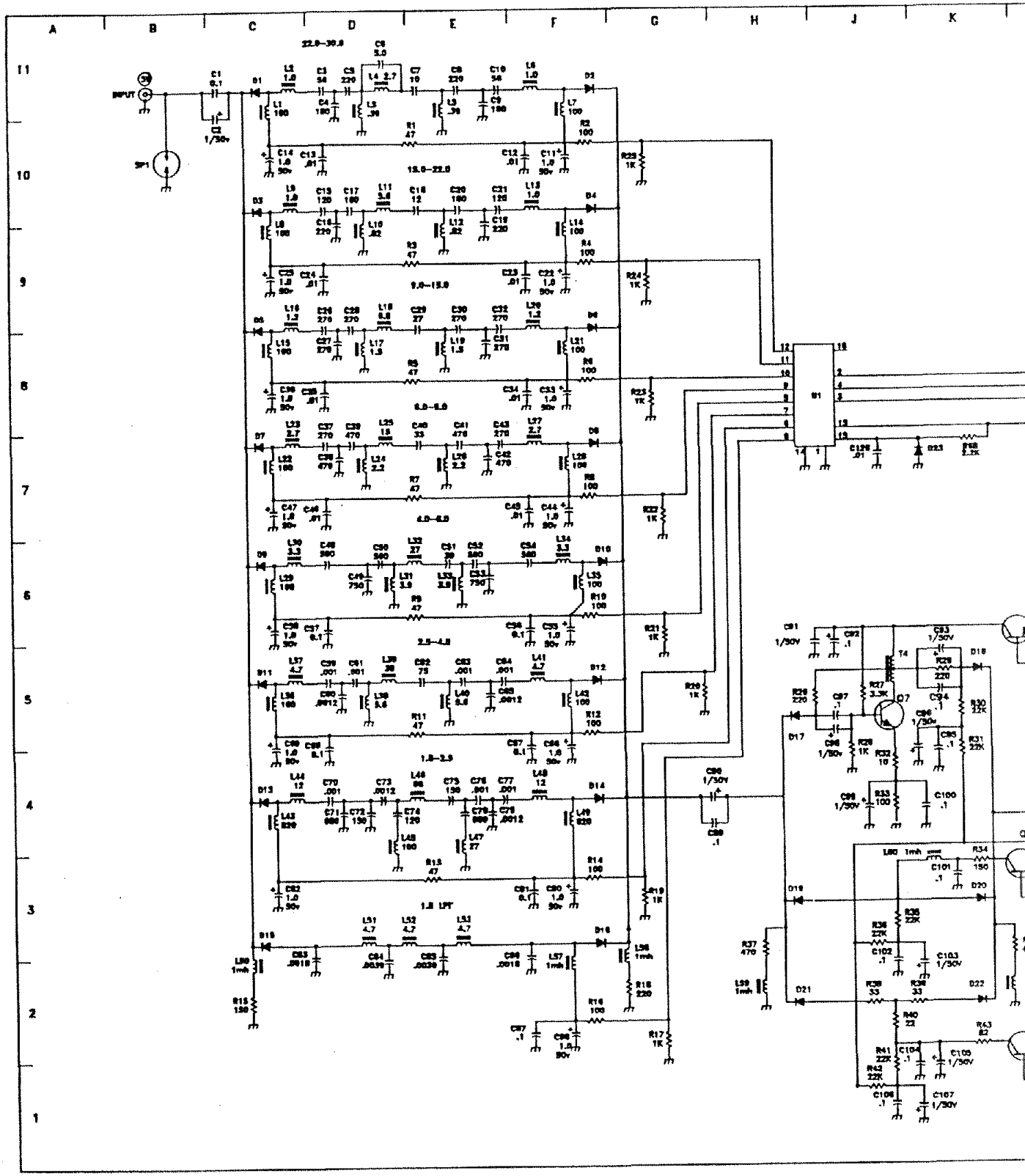

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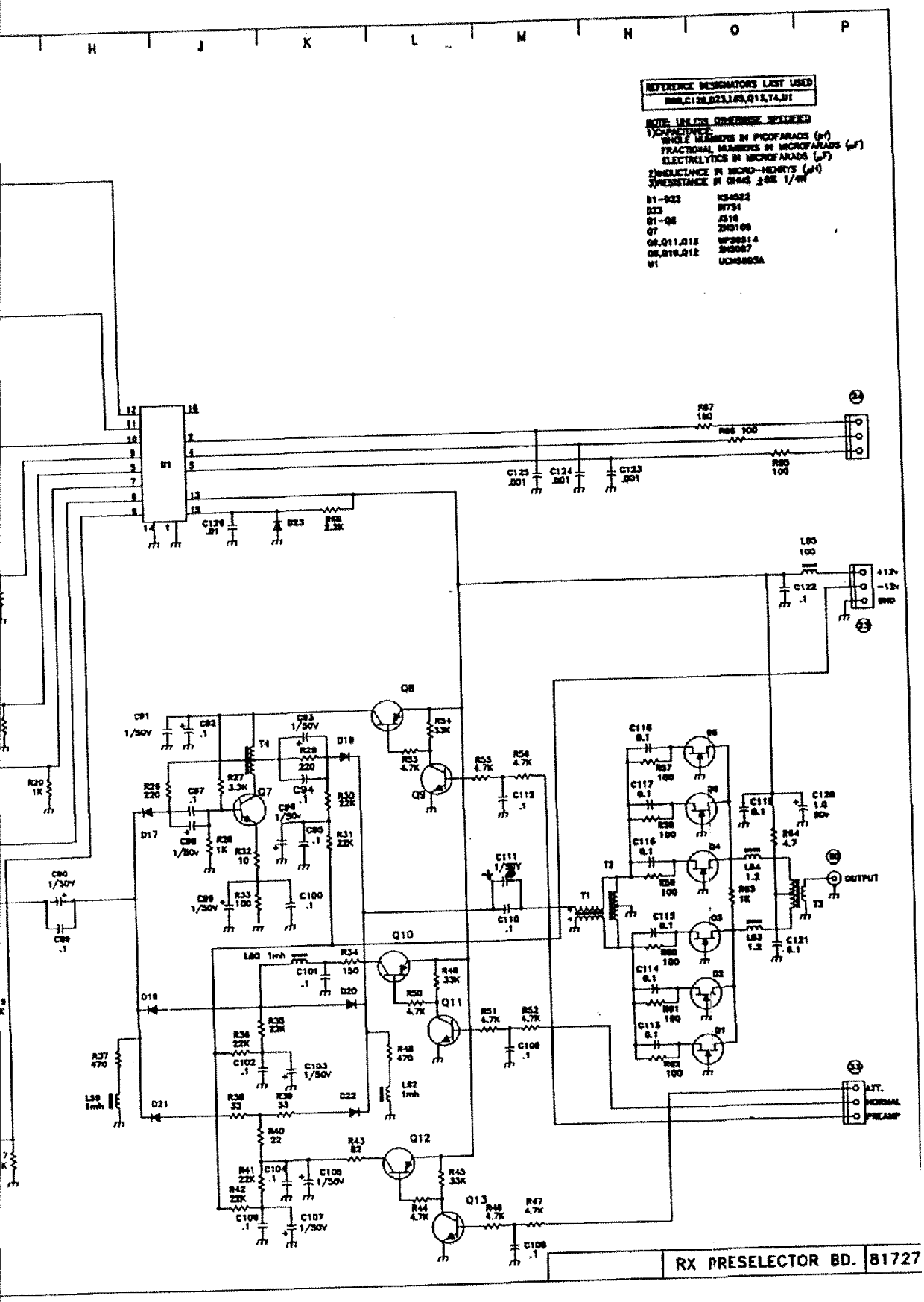
FIGURE 9-6. 81727 RX PRESELECTOR SCHEMAT



E 9-6. 81727 RX PRESELECTOR SCHEMATIC

9-7/9-8 BLANK

TABLE 9-1. 81727 RX PRESELECTOR PARTS LIST

ID	Description	Part No.
R1	47	30289
R2	100	30309
R3	47	30289
R4	100	30309
R5	47	30289
R6	100	30309
R7	47	30289
R8	100	30309
R9	47	30289
R10	100	30309
R11	47	30289
R12	100	30309
R13	47	30289
R14	100	30309
R15	150	30438
R16	100	30309
R17	1K	30333
R18	220	30290
R19	1K	30333
R20	1K	30333
R21	1K	30333
R22	1K	30333
R23	1K	30333
R24	1K	30333
R25	1K	30333
R26	220	30290
R27	3.3K	30294
R28	1K	30333
R29	220	30290
R30	22K	30298
R31	22K	30298
R32	10	30314
R33	100	30309
R34	150	30438
R35	22K	30298
R36	22K	30298
R37	47Q	30291
R38	33	30434
R39	33	30434
R40	22	30433
R41	22K	30298
R42	22K	30298
R43	82	30437

ID	Description	Part No.
R44	4.7K	30305
R45	33K	30299
R46	4.7K	30305
R47	4.7K	30305
R48	47Q	30291
R49	33K	30299
R50	4.7K	30305
R51	4.7K	30305
R52	4.7K	30305
R53	4.7K	30305
R54	33K	30299
R55	4.7K	30305
R56	4.7K	30305
R57	100	30309
R58	100	30309
R59	100	30309
R60	100	30309
R61	100	30309
R62	100	30309
R63	1K	30333
R64	4.7	30624
R65	100	30309
R66	100	30309
R67	100	30309
R68	2.2K	30293
C1	0.1	23261
C2	1/50V	23264
C3	56	23379
C4	180	23389
C5	220	23396
C6	5.0	23249
C7	10	23251
C8	220	23396
C9	180	23389
C10	56	23379
C11	1.0/50V	23264
C12	.01	23260
C13	.01	23262
C14	1.0/50V	23264
C15	120	23386
C16	220	23396
C17	180	23389
C18	12	23370

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TABLE 9-1. 81727 RX PRESELECTOR PARTS LIST (continued)

ID	Description	Part No.
C19	220	23396
C20	180	23389
C21	120	23386
C22	1.0/50V	23264
C23	.01	23260
C24	.01	23260
C25	1.0/50V	23264
C26	270	23397
C27	270	23397
C28	270	23397
C29	27	23303
C30	270	23397
C31	270	23397
C32	270	23397
C33	1.0/50V	23264
C34	.01	23260
C35	.01	23260
C36	1.0/50V	23264
C37	270	23397
C38	470	23400
C39	470	23400
C40	33	23246
C41	470	23400
C42	470	23400
C43	270	23397
C44	1.0/50V	23264
C45	.01	23260
C46	.01	23260
C47	1.0/50V	23264
C48	560	23401
C49	750	23148
C50	560	23401
C51	39	23377
C52	560	23401
C53	750	23148
C54	560	23401
C55	1.0/50V	23264
C56	0.1	23261
C57	0.1	23261
C58	1.0/50V	23264
C59	.001	23282
C60	.0012	23283
C61	.001	23282

ID	Description	Part No.
C62	75	23382
C63	.001	23282
C64	.001	23282
C65	.0012	23283
C66	1.0/50V	23264
C67	0.1	23261
C68	0.1	23261
C69	1.0/50V	23264
C70	.001	23245
C71	680	23402
C72	150	23388
C73	.0012	23282
C74	120	23386
C75	150	23388
C76	.001	23245
C77	.001	23245
C78	680	23402
C79	.0012	23283
C80	1.0/50V	23264
C81	0.1	23261
C82	1.0/50V	23264
C83	.0018	23285
C84	.0039	23334
C85	.0039	23334
C86	.0018	23285
C87	.1	23262
C88	1.0/50V	23264
C89	.1	23261
C90	1.0/50V	23264
C91	1.0/50V	23264
C92	.1	23261
C93	1.0/50V	23264
C94	.1	23261
C95	.1	23261
C96	1.0/50V	23264
C97	.1	23261
C98	1.0/50V	23264
C99	1.0/50V	23264
C100	.1	23261
C101	.1	23261
C102	.1	23261
C103	1.0/50V	23264
C104	.1	23261

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-1. 81727 RX PRESELECTOR PARTS LIST (continued)

ID	Description	Part No.
C105	1.0/50V	23264
C106	.1	23261
C107	1.0/50V	23264
C108	.1	23261
C109	.1	23261
C110	.1	23261
C111	1.0/50V	23264
C112	.1	23261
C113	.1	23261
C114	.1	23261
C115	.1	23261
C116	.1	23261
C117	.1	23261
C118	.1	23261
C119	.1	23261
C120	1.0/50V	23264
C121	.1	23261
C122	.1	23261
C123	.001	23282
C124	.001	23282
C125	.001	23282
C126	.01	23260
D1	KS4522	28103
D2	KS4522	28103
D3	KS4522	28103
D4	KS4522	28103
D5	KS4522	28103
D6	KS4522	28103
D7	KS4522	28103
D8	KS4522	28103
D9	KS4522	28103
D10	KS4522	28103
D11	KS4522	28103
D12	KS4522	28103
D13	KS4522	28103
D14	KS4522	28103
D15	KS4522	28103
D16	KS4522	28103
D17	KS4522	28103
D18	KS4522	28103
D19	KS4522	28103
D20	KS4522	28103
D21	KS4522	28103

ID	Description	Part No.
D22	KS4522	28103
D23	IN751	28041
L1	100	21060
L2	1.0	21112
L3	.39	21107
L4	2.7	21117
L5	.39	21107
L6	1.0	21112
L7	100	21060
L8	100	21060
L9	1.0	21112
L10	.82	21111
L11	5.6	21121
L12	.82	21111
L13	1.0	21112
L14	100	21060
L15	100	21060
L16	1.2	21113
L17	1.5	21114
L18	6.8	21122
L19	1.5	21114
L20	1.2	21113
L21	100	21060
L22	100	21060
L23	2.7	21117
L24	2.2	21116
L25	15	21126
L26	2.2	21116
L27	2.7	21117
L28	100	21060
L29	100	21060
L30	3.3	21118
L31	3.9	21119
L32	27	21129
L33	3.9	21119
L34	3.3	21118
L35	100	21060
L36	100	21060
L37	4.7	21120
L38	5.6	21121
L39	39	21159
L40	5.6	21121
L41	4.7	21120

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-1. 81727 RX PRESELECTOR PARTS LIST (continued)

ID	Description	Part No.
L42	100	21060
L43	820	21095
L44	12	21125
L45	100	21164
L46	58	21162
L47	27	21129
L48	12	21125
L49	820	21095
L50	1mh	21007
L51	4.7	21120
L52	4.7	21120
L52	4.7	21120
L53	4.7	21120
L54	NOT USED	
L55	NOT USED	
L56	NOT USED	
L57	1mh	21007
L58	1mh	21007
L59	1mh	21007
L60	1mh	21007
L61	NOT USED	
L62	1mh	21007

ID	Description	Part No.
L63	1.2	21113
L64	1.2	21113
L65	100	21060
T1	TOROID	85414-11
T2	TOROID	85414-10
T3	TOROID	85414-10
T4	TOROID	85414-10
Q1	J310	25115
Q2	J310	25115
Q3	J310	25115
Q4	J310	25115
Q5	J310	25115
Q6	J310	25115
Q7	2N5109	25079
Q8	2N5087	25001
Q9	MPS6514	25054
Q10	2N5087	25001
Q11	MPS6514	25054
Q12	2N5087	25001
Q13	MPS6514	25054
U1	UCN5895A	25344

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

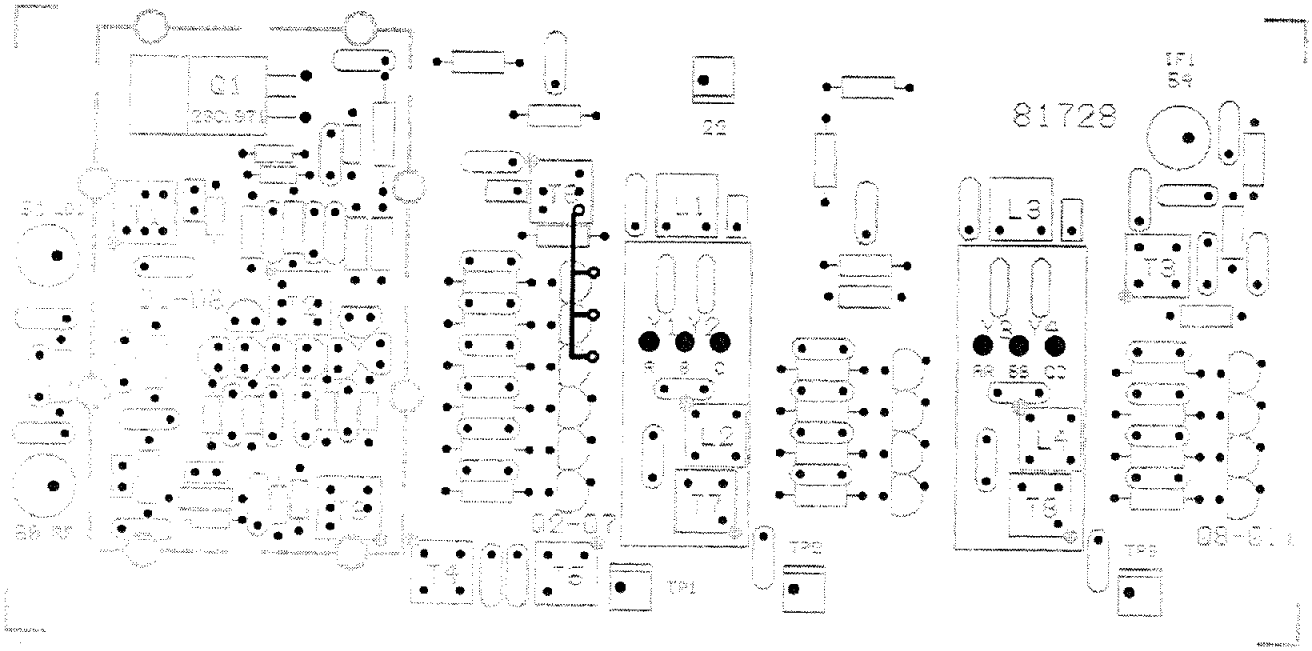


FIGURE 9-7. 81728 TOP CIRCUIT TRACE

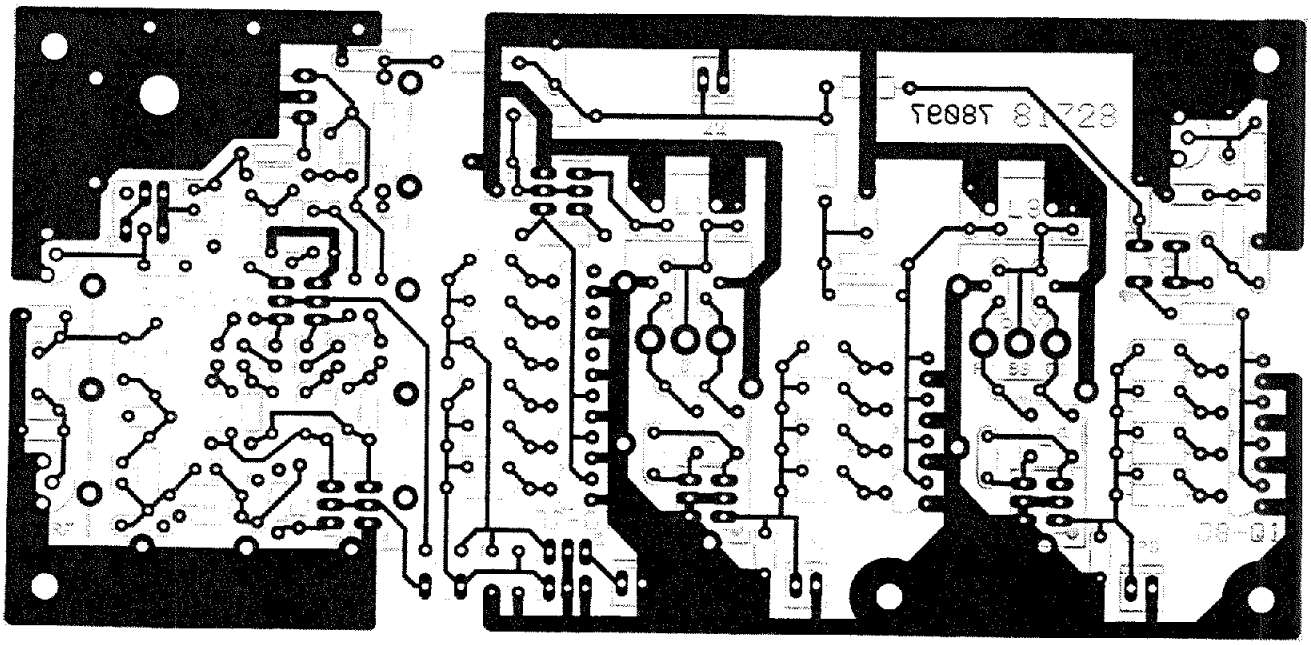


FIGURE 9-8. 81728 BOTTOM CIRCUIT TRACE

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

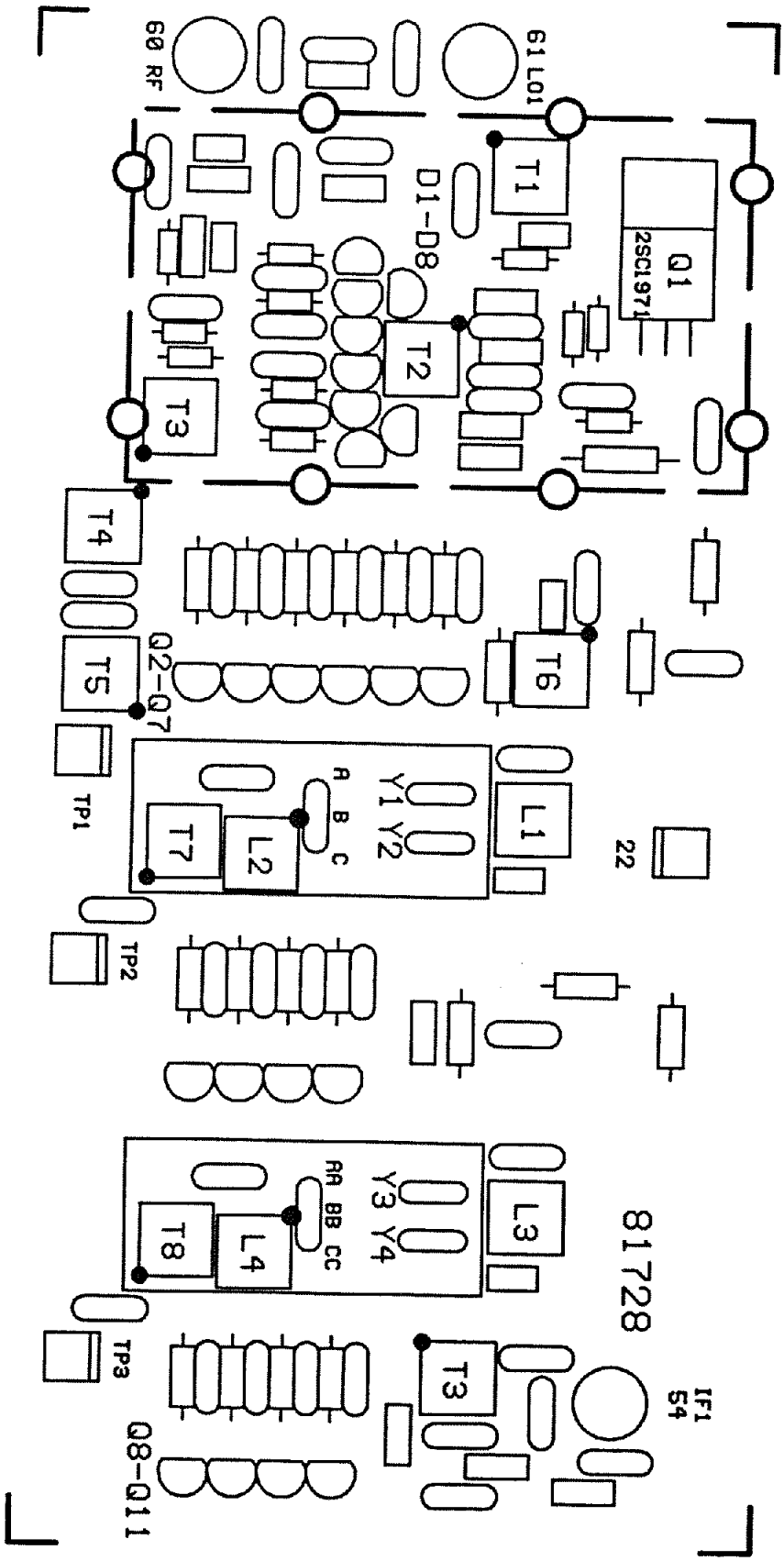


FIGURE 9-9. 81728 1st MIXER COMPONENT LAYOUT

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

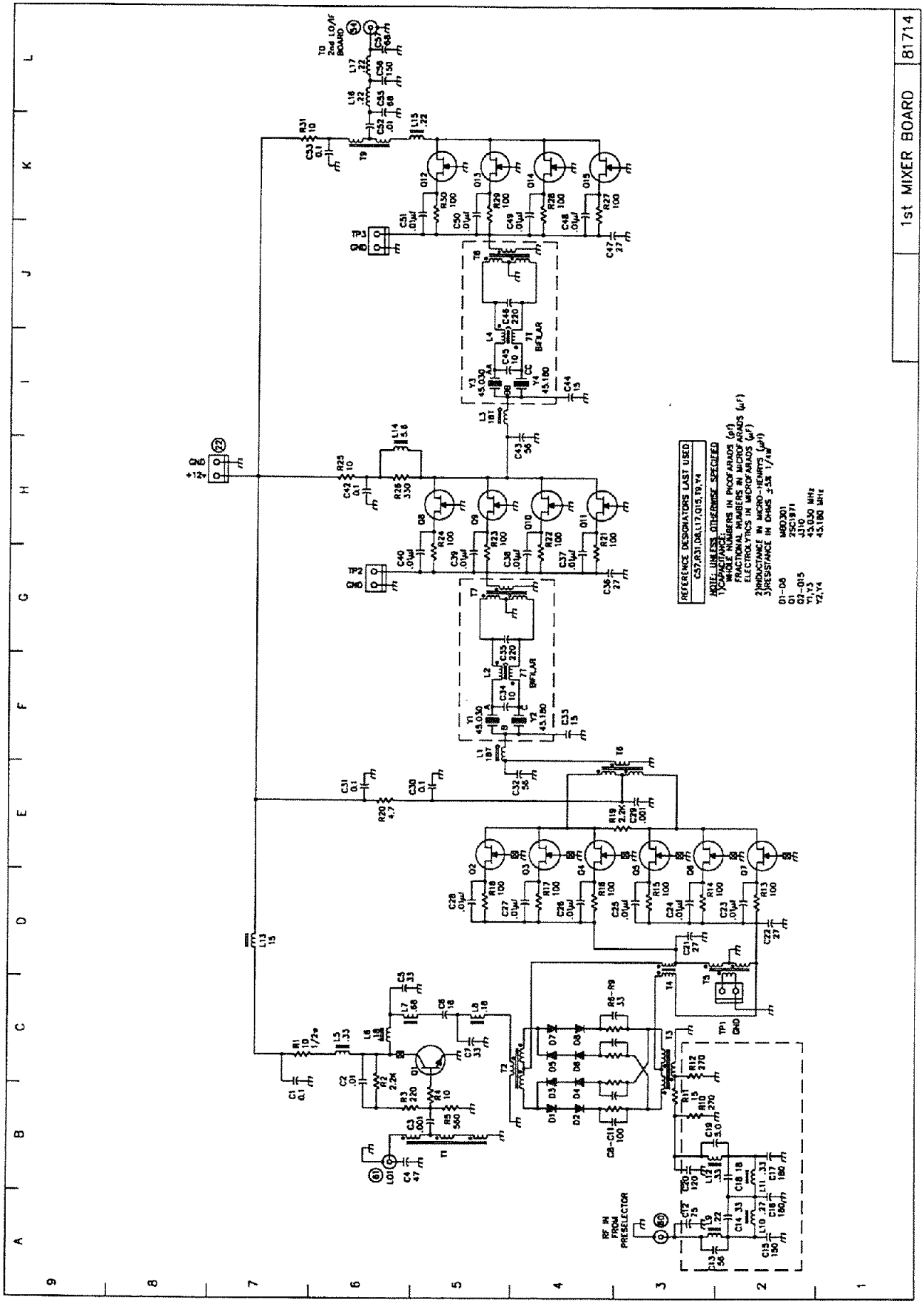


FIGURE 9-10. 81728 1st MIXER SCHEMATIC

TABLE 9-2. 81728 1st MIXER PARTS LIST

ID.	Description	Part No.
R1	10/½W	30022
R2	2.2K	30293
R3	220	30290
R4	10	30115
R5	560	30440
R6	33	30434
R7	33	30434
R8	33	30434
R9	33	30434
R10	330	30316
R11	15	30431
R12	330	30316
R13	100	30126
R14	100	30126
R15	100	30126
R16	100	30126
R17	100	30126
R18	100	30126
R19	2.2K	30142
R20	4.7	30111
R21	100	30126
R22	100	30126
R23	100	30126
R24	100	30126
R25	10	30115
R26	330	30132
R27	100	30126
R28	100	30126
R29	100	30126
R30	100	30126
R31	10	30115
C1	0.1	23261
C2	.01	23260
C3	.001	23245
C4	47	23378
C5	33	23376
C6	18	23373
C7	33	23376
C8	.01	23260
C9	.01	23260
C10	.01	23260
C11	.01	23260
C12	75	23382

ID.	Description	Part No.
C13	56	23379
C14	33	23376
C15	150	23388
C16	180	23389
C17	180	23389
C18	18	23373
C19	5.0	23249
C20	120	23386
C21	27	23375
C22	27	23375
C23	.01µF	23260
C24	.01µF	23260
C25	.01µF	23260
C26	.01µF	23260
C27	.01µF	23260
C28	.01µF	23260
C29	.001	23245
C30	0.1	23261
C31	0.1	23261
C32	56	23379
C33	15	23253
C34	10	23371
C35	220	23396
C36	27	23375
C37	.01µF	23260
C38	.01µF	23260
C39	.01µF	23260
C40	.01µF	23260
C41	NOT USED	
C42	0.1	23261
C43	56	23379
C44	15	23253
C45	10	23371
C46	220	23396
C47	27	23375
C48	.01µF	23260
C49	.01µF	23260
C50	.01µF	23260
C51	.01µF	23260
C52	.01µF	23260
C53	O.1	23261
C54	NOT USED	
C55	68	23381

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-2. 81728 1st MIXER PARTS LIST (continued)

ID.	Description	Part No.
C56	100	23385
D1	HP5082-2835	28013
D2	HP5082-2835	28013
D3	HP5082-2835	28013
D4	HP5082-2835	28013
D5	HP5082-2835	28013
D6	HP5082-2835	28013
D7	HP5082-2835	28013
D8	HP5082-2835	28013
L1	18T	85413-09
L2	7T BIFILAR	85413-08
L3	18T	85413-09
L4	7T BIFILAR	85413-08
L5	.33	21106
L6	.18	21103
L7	.68	21110
L8	.18	21103
L9	.22	21104
L10	.27	21105
L11	.33	21106
L12	.33	21106
L13	15	21126
L14	5.6	21121
L15	.22	21104
L16	.22	21104
L17	15	21126
T1	TRIFILAR	85134

ID.	Description	Part No.
T2	TRIFILAR	85134
T3	TOROID	85414-11
T4	1:1 BALUN	85149
T5	TRIFILAR	85134
T6	TRIFILAR	85134
T7	TRIFILAR	85134
T8	TRIFILAR	85134
T9	BIFILAR	21152
Q1	2SC1971	25337
Q2	J310	25115
Q3	J310	25115
Q4	J310	25115
Q5	J310	25115
Q6	J310	25115
Q7	J310	25115
Q8	J310	25115
Q9	J310	25115
Q10	J310	25115
Q11	J310	25115
Q12	J310	25115
Q13	J310	25115
Q14	J310	25115
Q15	J310	25115
Y1	45.030	48173
Y2	45.180	48174
Y3	45.030	48173
Y4	45.180	48174

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

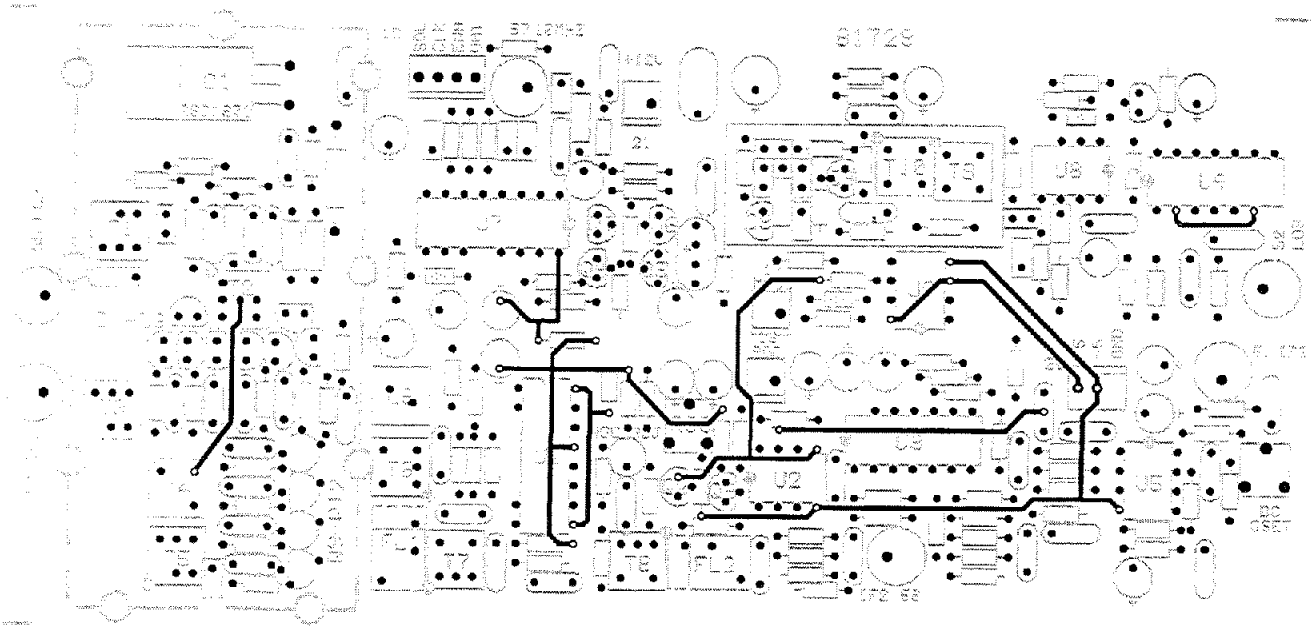


FIGURE 9-11. 81729 TOP CIRCUIT TRACE

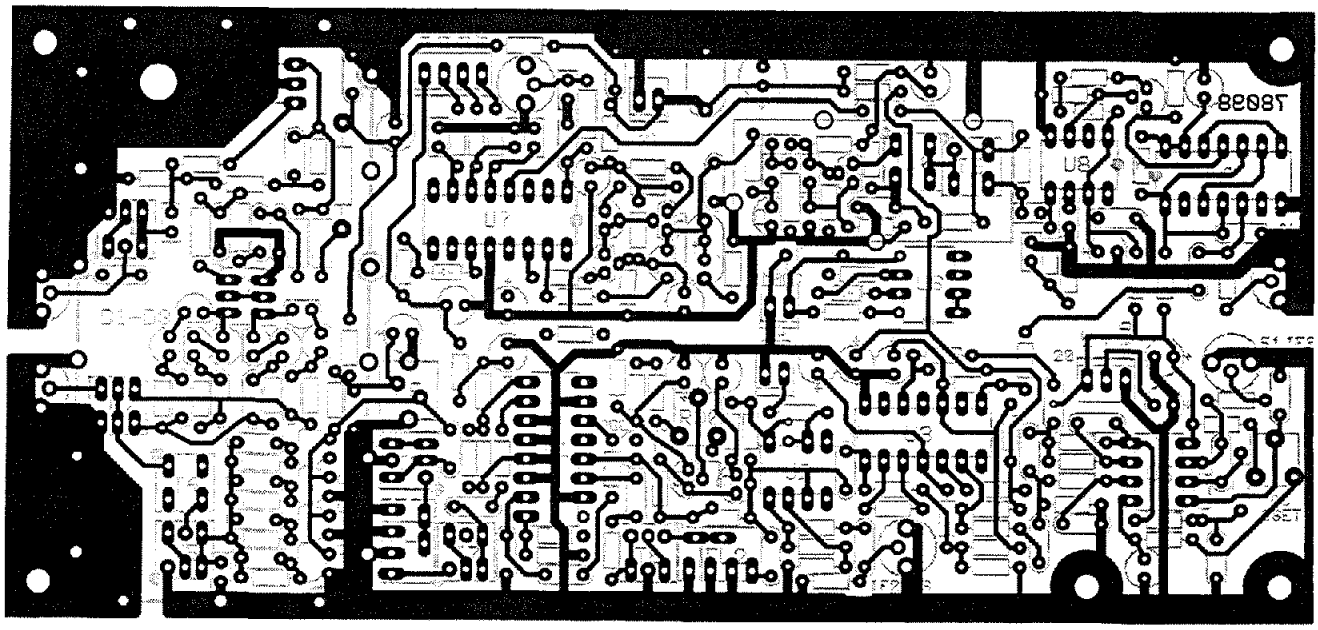


FIGURE 9-12. 81729 BOTTOM CIRCUIT TRACE

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

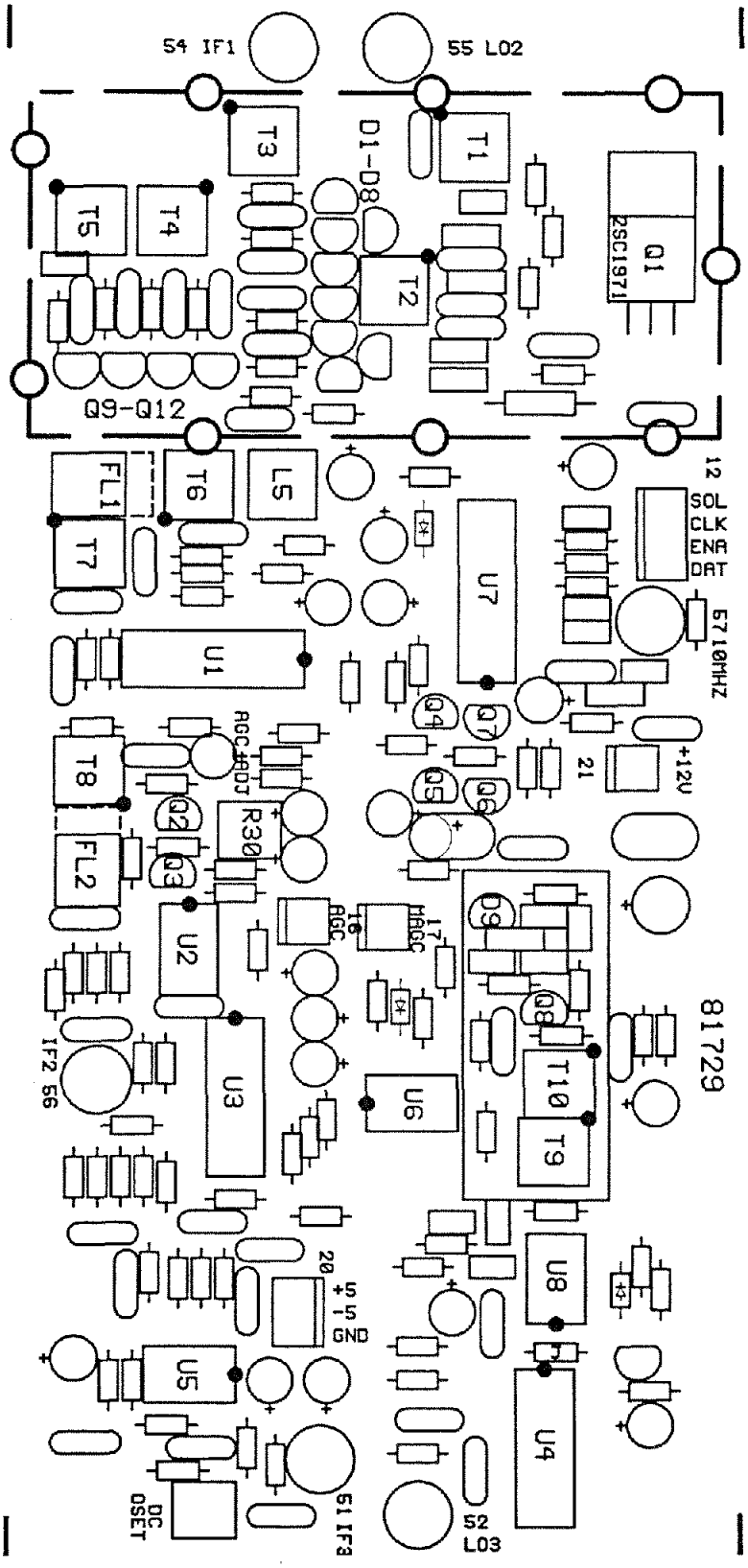
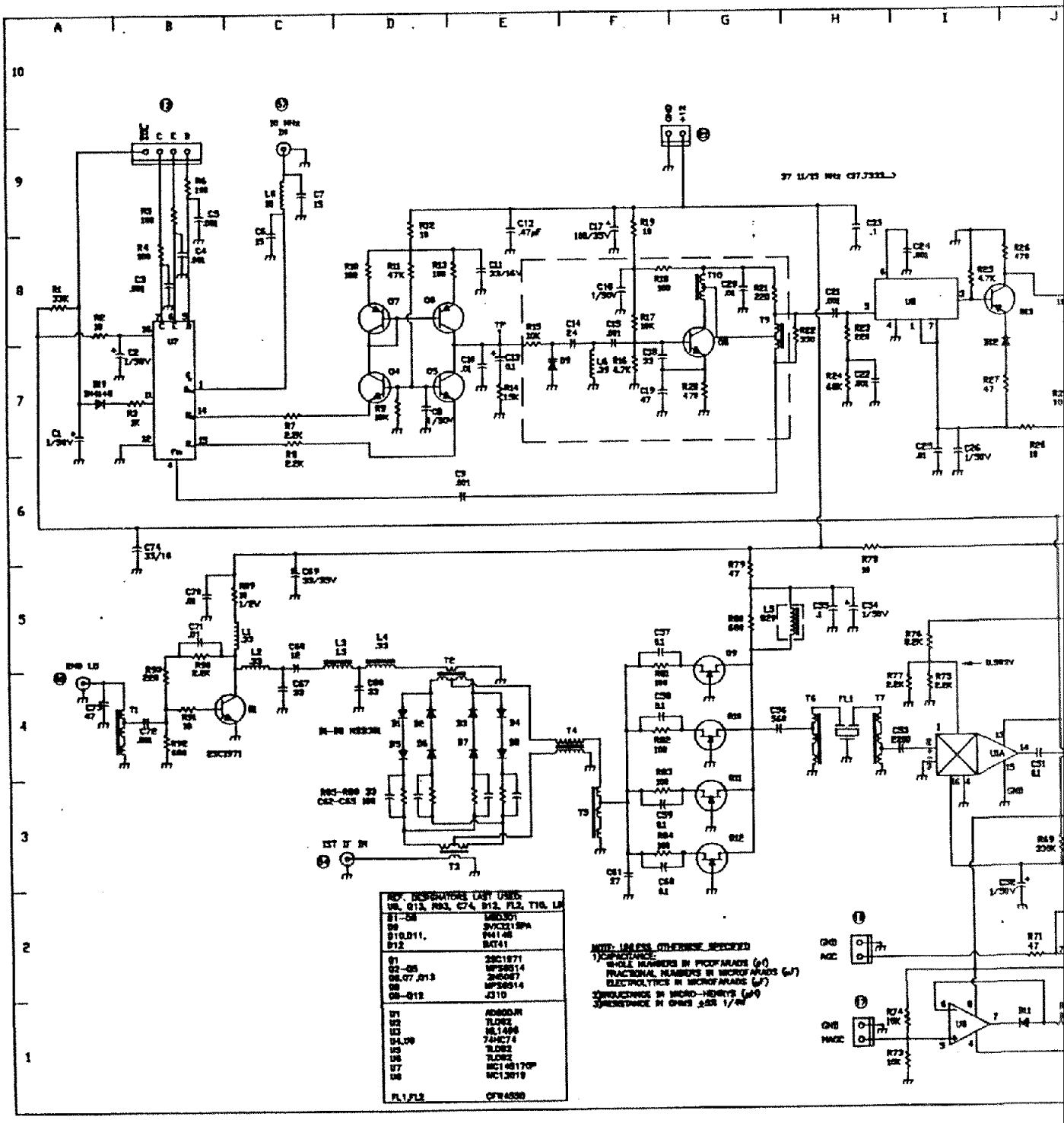


FIGURE 9-13. 81729 2nd MIXER / IF COMPONENT LAYOUT

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.



Part No. 74249
2nd Printing 10/96
Printed in the U.S.A.

FIGURE 9-14. 81729 2nd MIXER/IF SCHEM

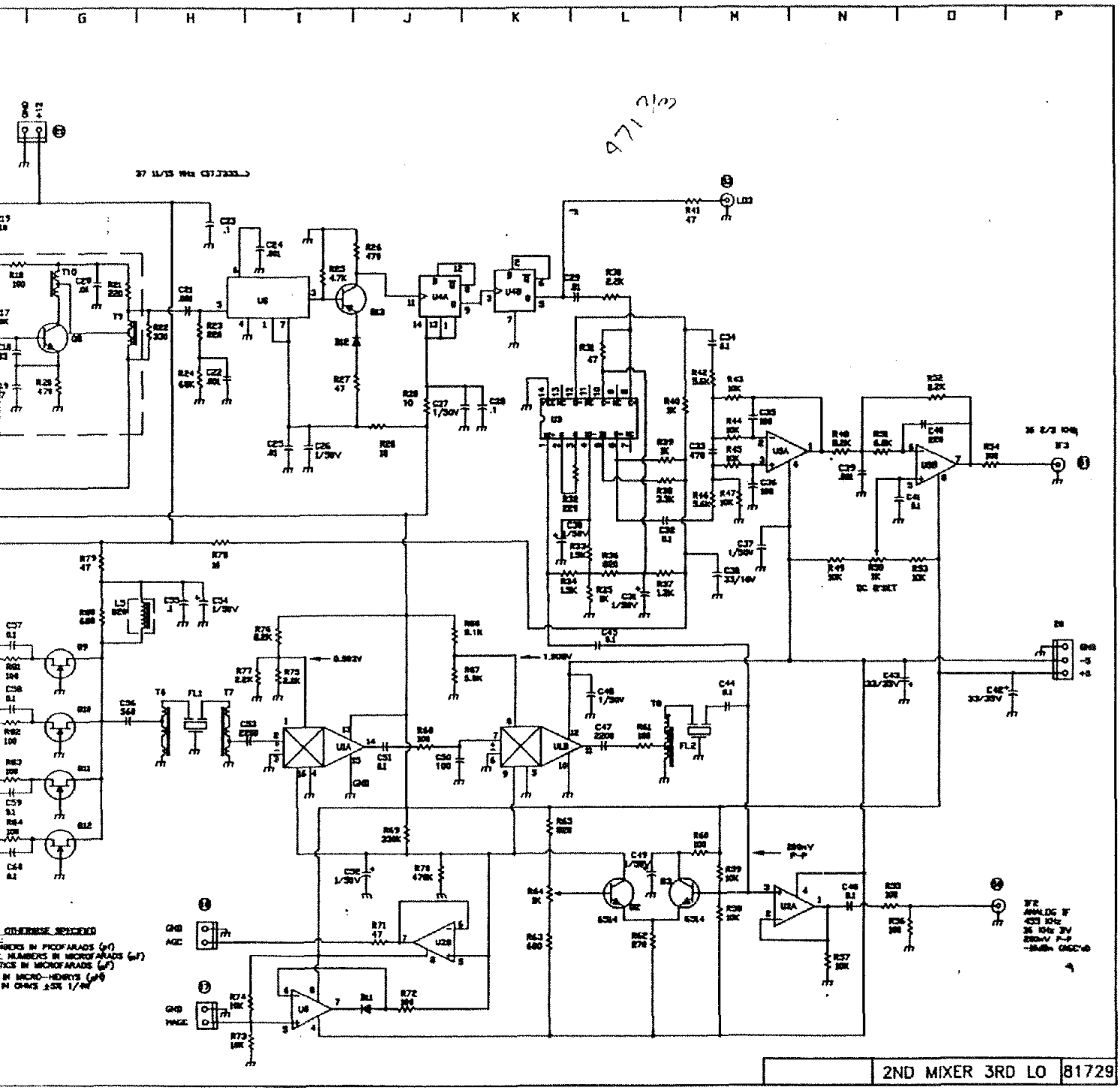


FIGURE 9-14. 81729 2nd MIXER/IF SCHEMATIC

9-21/9-22 BLANK

TABLE 9-3. 81729 3RD LO/2ND MIXER PARTS LIST

ID.	Description	Part No.
R1	33K	30299
R2	10	30314
R3	1K	30333
R4	100	30309
R5	100	30309
R6	100	30309
R7	2.2K	30293
R8	2.2K	30293
R9	10K	30296
R10	100	30309
R11	47K	30300
R12	10	30314
R13	100	30309
R14	15K	30297
R15	10K	30296
R16	4.7K	30305
R17	10K	30296
R18	100	30309
R19	10	30314
R20	470	30291
R21	220	30290
R22	330	30316
R23	220	30290
R24	68K	30303
R25	4.7K	30305
R26	470	30291
R27	47	30298
R28	10	30314
R29	10	30314
R30	2.2K	30293
R31	47	30289
R32	220	30290
R33	1.5K	30322
R34	1.5K	30322
R35	1K	30333
R36	820	30442
R37	1.2K	30623
R38	3.3k	30294
R39	1K	30333
R40	1K	30333
R41	47	30298
R42	5.6K	30295
R43	10K	30296

ID.	Description	Part No.
R44	10K	30296
R45	10K	30296
R46	5.6K	30295
R47	10K	30296
R48	8.2K	30402
R49	10K	30296
R50	1K	30333
R51	6.8K	30332
R52	8.2K	30402
R53	10K	30296
R54	100	30309
R55	100	30309
R56	100	30309
R57	10K	30296
R58	10K	30296
R59	10K	30296
R60	100	30309
R61	100	30309
R62	270	30131
R63	680	30292
R64	1K	30333
R65	820	30442
R66	9.1K	30622
R67	5.6K	30295
R68	100	30309
R69	330K	30302
R70	470K	30448
R71	47	30289
R72	100	3039
R73	10K	30296
R74	10K	30296
R75	2.2K	30293
R76	8.2K	30402
R77	2.2K	30293
R78	10	30314
R79	47	30289
R80	680	30292
R81	100	30309
R82	100	30309
R83	100	30309
R84	100	30309
R85	33	30434
R86	33	30434

Part No. 74249
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TABLE 9-3. 81729 3RD L0/ 2ND MIXER PARTS LIST (continued)

ID.	Description	Part No.
R87	33	30434
R88	33	30434
R89	10½W	30022
R90	2.2K	30293
R91	10	30314
R92	680	30292
R93	220	30290
C1	1/50V	23264
C2	1/50V	23254
C3	.001	23245
C4	.001	23245
C5	.001	23245
C6	15	23372
C7	15	23253
C8	1/50V	23264
C9	.001	23282
C10	.01	23340
C11	33/16V	23308
C12	.47µF	23330
C13	0.1	23328
C14	24	23255
C15	.001	23245
C16	1/50V	23264
C17	100/35V	23189
C18	33	23246
C19	47	23257
C20	.01	23260
C21	.001	23245
C22	.001	23245
C23	.1	23261
C24	.001	23245
C25	.01	23260
C26	1/50V	23264
C27	1/50V	23264
C28	.1	23361
C29	.01	23260
C30	1/50V	23264
C31	1/50V	23264
C32	0.1	23261
C33	470	23400
C34	0.1	23261
C35	100	23385
C36	100	23385

ID.	Description	Part No.
C37	1/50V	23264
C38	33/16V	23308
C39	.001	23282
C40	220	23396
C41	0.1	23261
C42	33/16V	23308
C43	33/16V	23308
C44	0.1	23261
C45	0.1	23261
C46	1/50V	23264
C47	2200	23286
C48	0.1	23261
C49	1/50V	23264
C50	100	23385
C51	0.1	23261
C52	1/50V	23264
C53	220	23286
C54	1/50V	23264
C55	.1	23261
C56	560	23401
C57	0.1	23261
C58	0.1	23261
C59	0.1	23261
C60	0.1	23261
C61	27	23303
C62	100	23385
C63	100	23385
C64	100	23385
C65	100	23385
C66	33	23376
C67	33	23376
C68	12	23370
C69	33/16V	23308
C70	.01	23260
C71	.01	23260
C72	.001	23245
C73	47	23378
C74	33/16V	23308
D1	MBD301	28110
D2	MBD301	28110
D3	MBD301	28110
D4	MBD301	28110
D5	MBD301	28110

Part No. 74249
2nd Printing - 10/96
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TABLE 9-3. 81729 3RD LO / 2ND MIXER PARTS LIST (continued)

ID.	Description	Part No.
D6	MBD301	28110
D7	MBD301	28110
D8	MBD301	28110
D9	SVX321SPA	28099
D10	IN4148	28001
D11	IN4148	28001
D12	BAT41	28071
L1	.33	21106
L2	.33	21106
L3	1.5	21114
L4	.33	21106
L5	820	21095
L6	.39	21107
T1	TRIFILAR	21153
T2	TRIFILAR	21153
T3	TRIFILAR	21153
T4	COIL	85413-03
T5	TRIFILAR	21153
T6	TOROID	85413-12
T7	TOROID	85413-12
T8	TOROID	85413-12
T9	BIFILAR	21152
T10	BIFILAR	21152
Q1	2SC1971	25337

ID.	Description	Part No.
Q2	MPS6514	25054
Q3	MPS25054	25054
Q4	MPS25054	25054
Q5	MPS6514	25054
Q6	2N5087	25001
Q7	2N5087	25001
Q8	MPS6514	25054
Q9	J310	25115
Q10	J310	25115
Q11	J310	25115
Q12	J310	25115
Q13	2N5087	25001
U1	AD600JN	25322
U2	TL082	25321
U3	ML1496	25047
U4	74HC74	25178
U5	TL082	25321
U6	TL082	25321
U7	MC145170P	25296
U8	MC12019	25354
U9	74HC74	25178
FL1	CFW455D	48203
FL2	CFW455D	48203

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

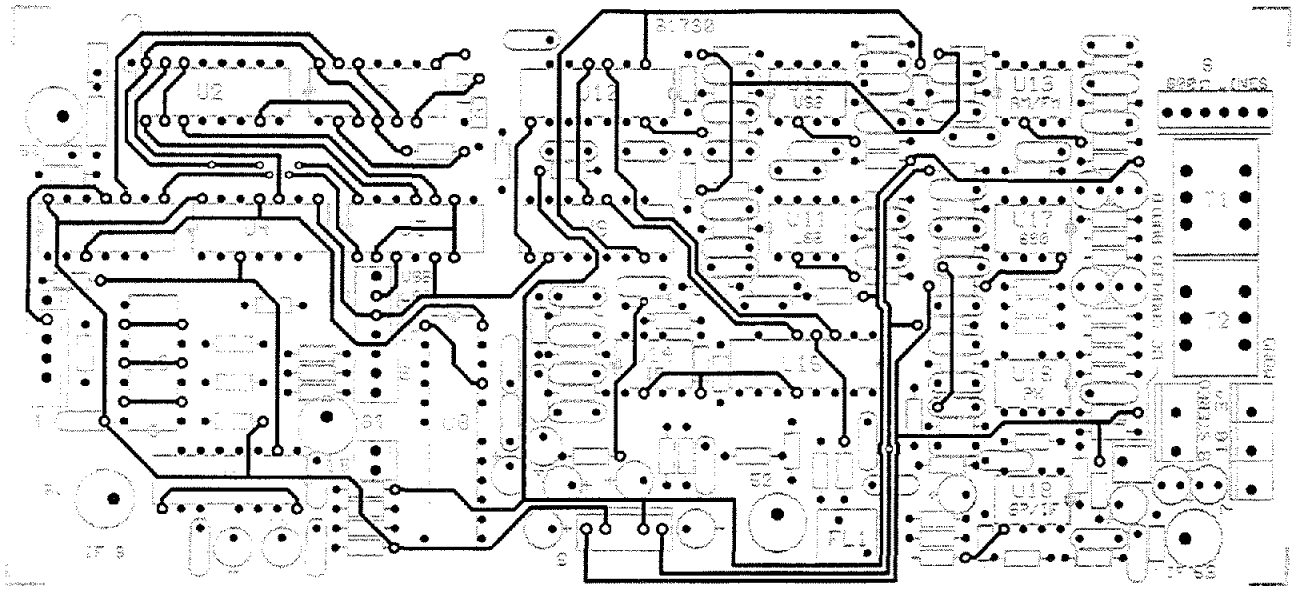


FIGURE 9-15. 81730 TOP CIRCUIT TRACE

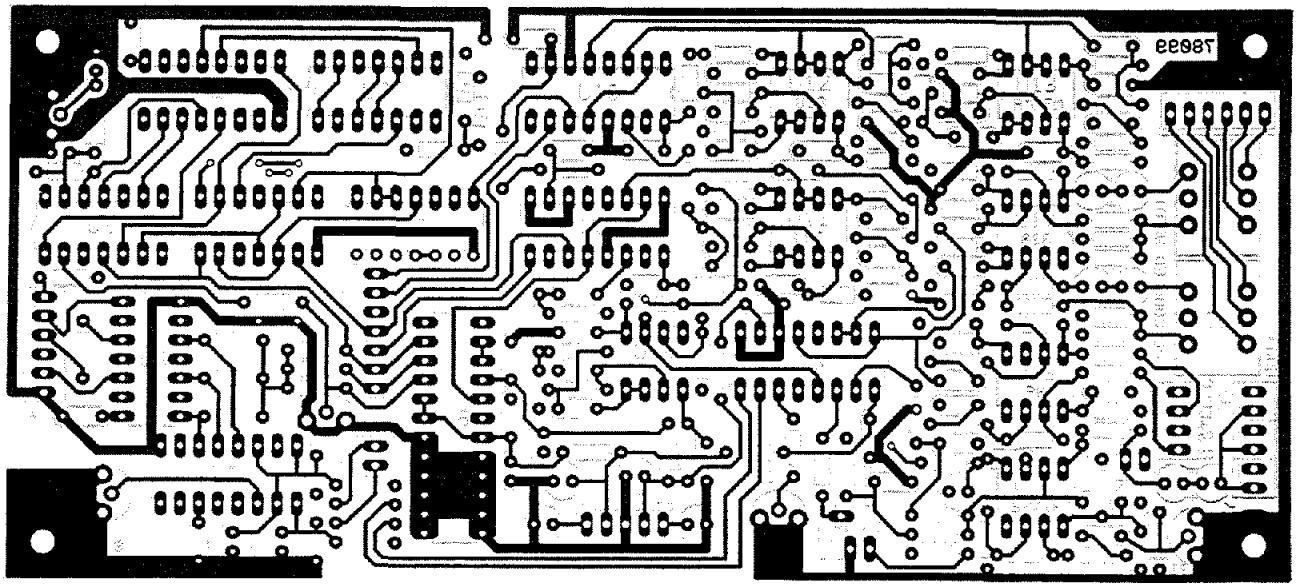


FIGURE 9-16. 81730 BOTTOM CIRCUIT TRACE

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

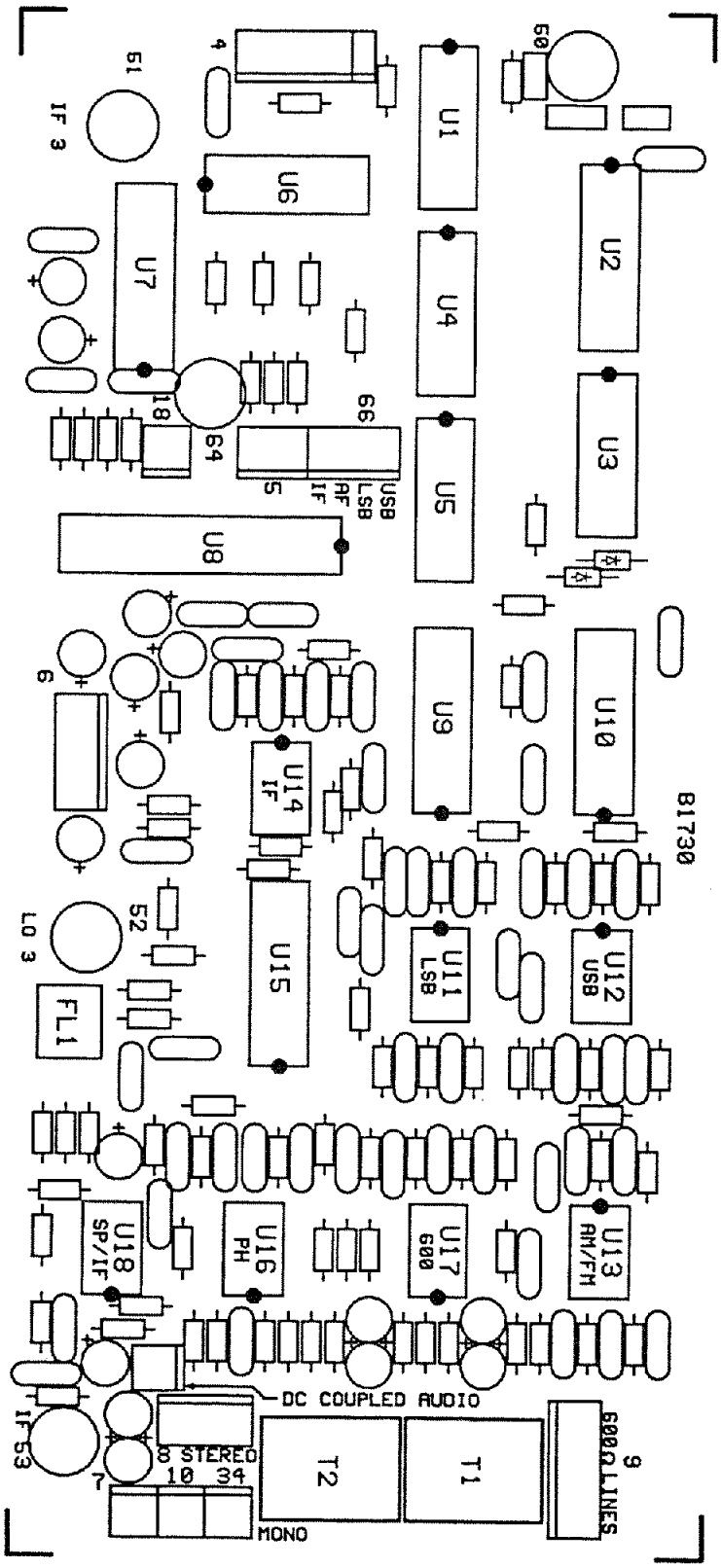
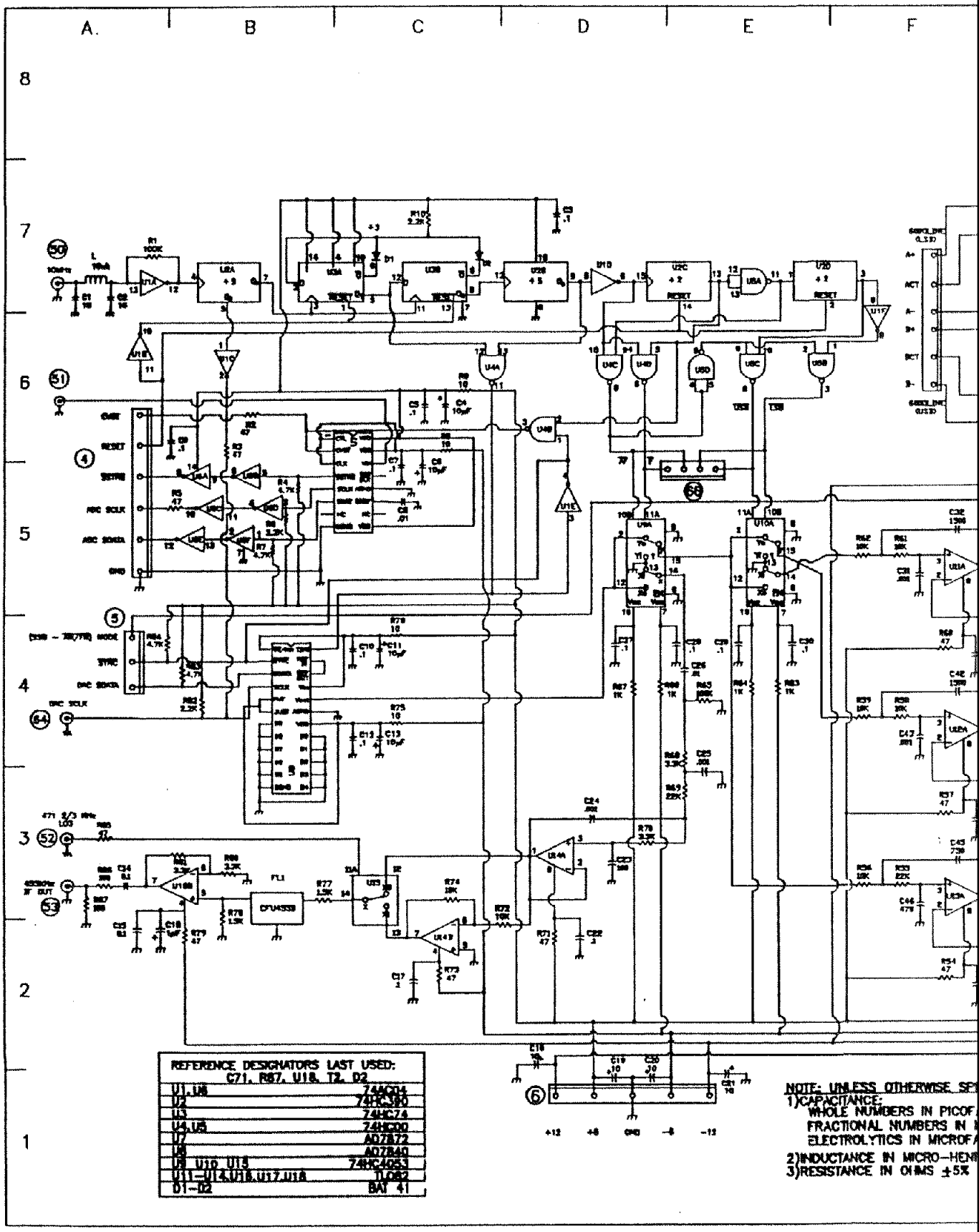


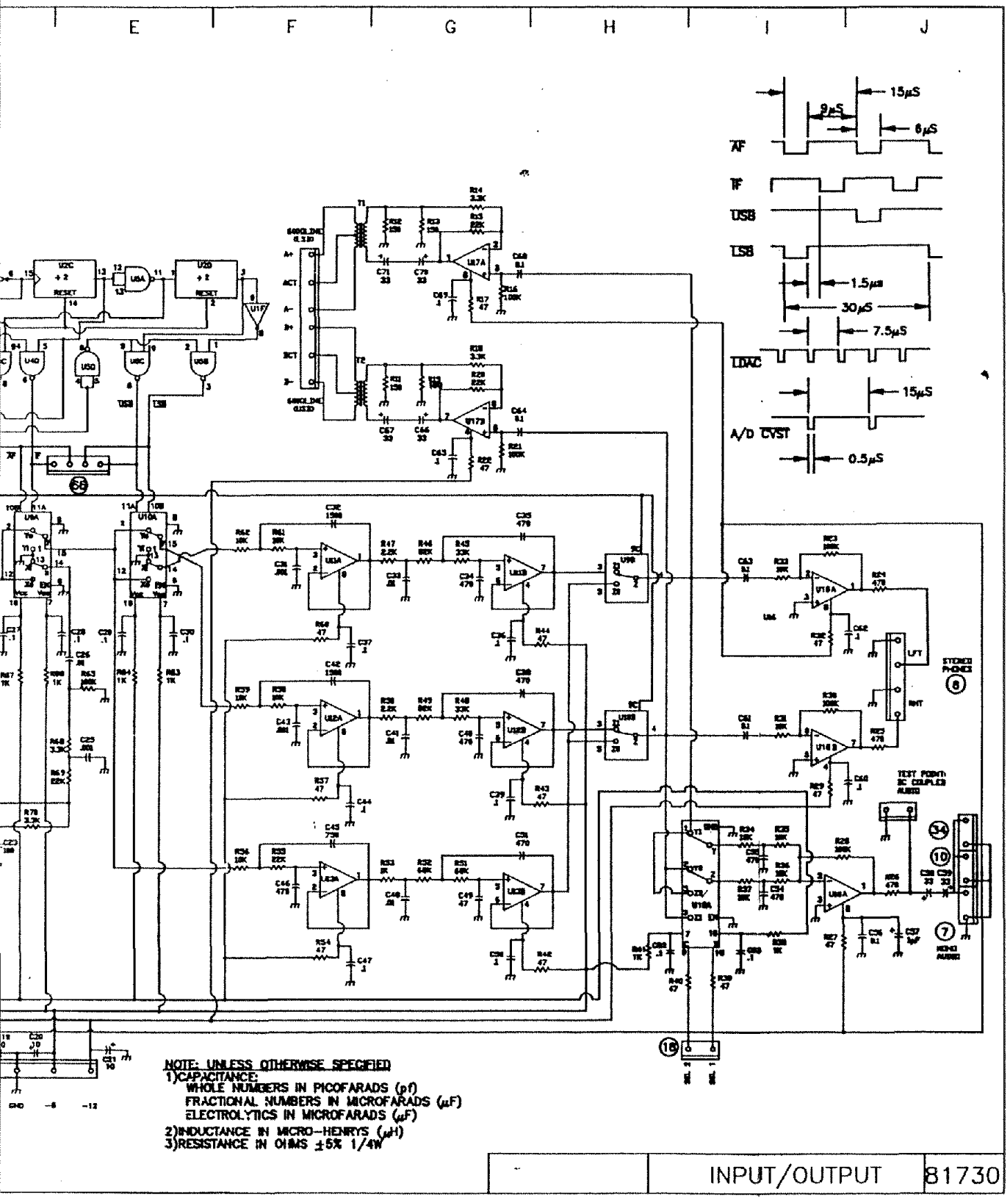
FIGURE 9-17. 81730 CONVERTER-I/O BOARD COMPONENT LAYOUT

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.



Part No. 74249
2nd Printing 10/96
Printed in the U.S.A.

FIGURE 9-18. 81730 CONVERSION-I/O BOARI



RE 9-18. 81730 CONVERSION-I/O BOARD SCHEMATIC

TABLE 9-4. 81730 CONVERTER-I/O BOARD PARTS LIST

ID.	Description	Part No.
R1	100K	30301
R2	47	30298
R3	47	30289
R4	4.7K	30305
R5	47	30289
R6	2.2K	30293
R7	4.7K	30305
R8	10	30314
R9	10	30314
R10	2.2K	30293
R11	150	30438
R12	150	30438
R13	150	30438
R14	3.3K	30294
R15	22K	30298
R16	100K	30301
R17	47	30289
R18	3.3K	30294
R19	150	30438
R20	22K	30298
R21	100K	30301
R22	47	30289
R23	100K	30301
R24	470	30291
R25	470	30291
R26	470	30291
R27	47	30289
R28	100K	30301
R29	47	30289
R30	100K	30301
R31	10K	30296
R32	47	30289
R33	10K	30296
R34	10K	30296
R35	10K	30296
R36	10K	30296
R37	10K	30296
R38	1K	30333
R39	47	30289
R40	47	30289
R41	1K	3033
R42	47	30289
R43	47	30289
R44	47	30289
R45	33K	30299

ID.	Description	Part No.
R46	82K	30446
R47	2.2K	30293
R48	33K	30299
R49	82K	30446
R50	2.2K	30293
R51	68K	30303
R52	68K	30303
R53	1K	30333
R54	47	30289
R55	22K	30298
R56	10K	30296
R57	47	32089
R58	10K	30296
R59	10K	30296
R60	47	30289
R61	10K	30296
R62	10K	30296
R63	1K	30333
R64	1K	30333
R65	100K	30301
R66	1K	30333
R67	1K	30333
R68	3.3K	30294
R69	22K	30298
R70	3.3K	30294
R71	47	30289
R72	10K	30296
R73	47	30289
R74	10K	30296
R75	10	30314
R76	10	30314
R77	1.5K	30322
R78	1.5K	30322
R79	47	30289
R80	3.3K	30294
R81	3.3K	30294
R82	2.2K	30293
R83	4.7K	30305
R84	4.7K	30305
R85	47	30289
R86	100	30309
R87	100	30309
C1	15	23253
C2	15	23253
C3	.1	23261

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-4. 81730 CONVERTER-I/O BOARD PARTS LIST (continued)

ID.	Description	Part No.
C4	10µF	23266
C5	.1	23261
C6	10µF	23266
C7	.1	23261
C8	.01	23340
C9	.1	23261
C10	.1	23261
C11	10µF	23266
C12	.1	23261
C13	10µF	23266
C14	0.1	23382
C15	0.1	23261
C16	1µF	23264
C17	.1	23261
C18	10µF	23266
C19	10µF	23266
C20	10µF	23266
C21	10µF	23266
C22	.1	23261
C23	100	23385
C24	.001	23282
C25	.001	23282
C26	.01	23340
C27	.1	23261
C28	.1	23261
C29	.1	23261
C30	.1	23261
C31	.001	23282
C32	1500	23284
C33	.01	23340
C34	470	23400
C35	470	23400
C36	.1	23261
C37	.1	23261
C38	470	23400
C39	.1	23261
C40	470	23400
C41	.01	23340
C42	1500	23284
C43	.001	23282
C44	.1	23261
C45	750	23403
C46	470	23400
C47	.1	23261
C48	.01	23340

ID.	Description	Part No.
C49	47	23378
C50	.1	23261
C51	470	23400
C53	.1	23261
C54	470	23400
C55	470	23400
C56	0.1	23261
C57	1µF	23264
C58	33	23308
C59	33	23308
C60	.1	23261
C61	0.1	23261
C62	.1	23328
C63	0.1	23328
C64	0.1	23328
C65	.1	23261
C66	33	23308
C67	33	23308
C68	0.1	23328
C69	.1	23261
C70	33	23308
C71	33	23308
D1	BAT41	28071
D2	BAT41	28071
T1	CT-600CT	21185
T2	CT-600CT	21185
U1	74AC04	25340
U2	74HC390	25347
U3	74HC74	25178
U4	74HC00	25161
U5	74HC00	25161
U6	74AC04	25340
U7	AD7872	25348
U8	AD7840	25349
U9	74HC4053	25350
U10	74HC4053	25350
U11	TL082	25321
U12	TL082	25321
U13	TL082	25321
U14	TL082	25321
U15	74HC4053	25321
U16	TL082	25321
U17	TL082	25321
U18	TL082	25321

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

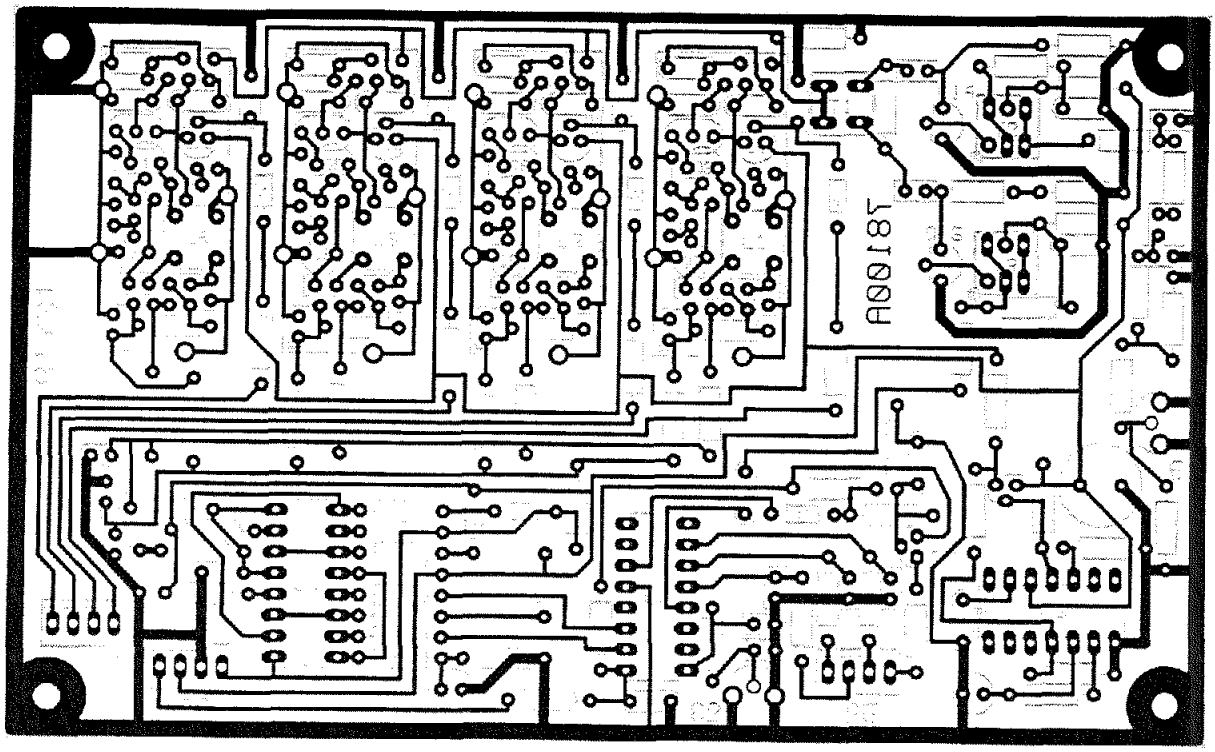


FIGURE 9-19. 81731 CIRCUIT TRACE

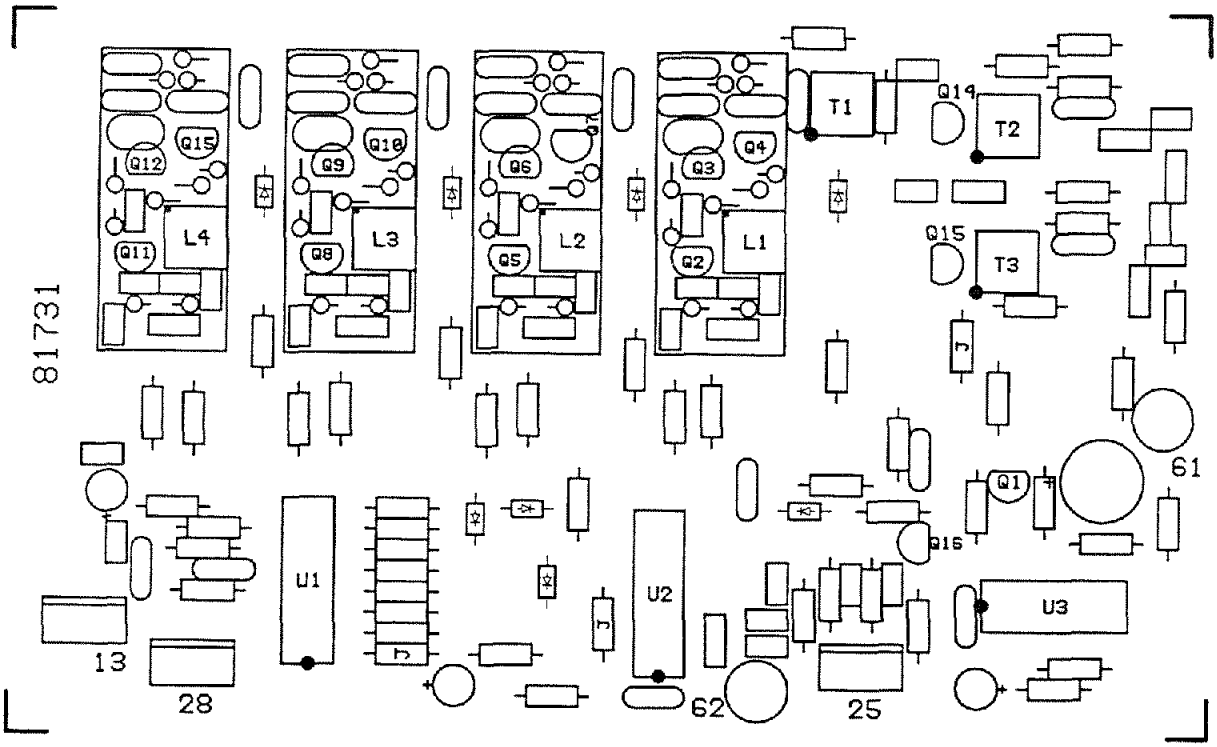


FIGURE 9-20. 81731 1ST LO BOARD COMPONENT LAYOUT

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

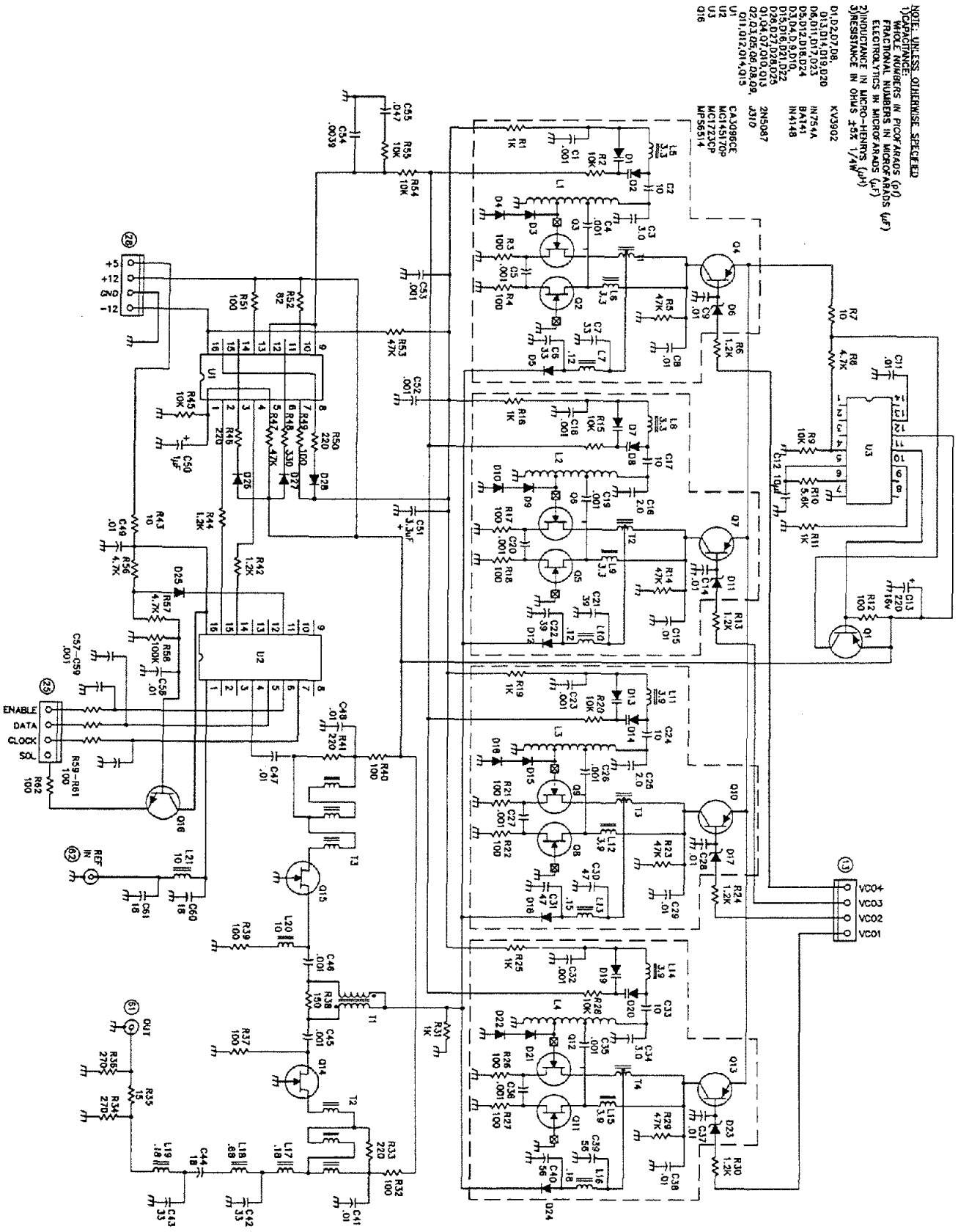


FIGURE 9-21. 81731 1ST LO BOARD SCHEMATIC

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-5. 81731 1ST LO BOARD PARTS LIST

ID.	Description	Part No.
R1	1K	30138
R2	10K	30150
R3	100	30126
R4	100	30126
R5	47K	30157
R6	1.2K	30139
R7	10	30115
R8	4.7K	30146
R9	10K	30150
R10	5.6K	30147
R11	1K	30138
R12	100	30126
R13	1.2K	30139
R14	47K	30157
R15	10K	30150
R16	1K	30138
R17	100	30126
R18	100	30126
R19	1K	30138
R20	10K	30150
R21	100	30126
R22	100	30126
R23	47K	30157
R24	1.2K	30139
R25	1K	30138
R26	100	30126
R27	100	30126
R28	10K	30150
R29	47K	30157
R30	1.2K	30139
R31	1K	30138
R32	100	30126
R33	220	30130
R34	270	30131
R35	15	30117
R36	270	30131
R37	100	30126
R38	150	30128
R39	100	30126
R40	100	30126
R41	220	30130
R42	1.2K	30139
R43	10	30115

ID.	Description	Part No.
R44	1.2K	30139
R45	10K	30150
R46	220	30130
R47	47K	30157
R48	330	30132
R49	100	30126
R50	220	30130
R51	100	30126
R52	82	30125
R53	47K	30157
R54	10K	30150
R55	10K	30150
R56	4.7K	30146
R57	4.7K	30146
R58	100K	30161
R59	100	30126
R60	100	30126
R61	100	30126
R62	100	30126
C1	.001	23245
C2	10	23251
C3	3.0	23248
C4	.001	23245
C5	.001	23245
C6	33	23376
C7	33	23376
C8	.01	23260
C9	.01	23260
C10	NOT USED	
C11	.01	23260
C12	10µF	23266
C13	220/16V	23202
C14	.01	23260
C15	.01	23260
C16	2.0	23301
C17	10	23251
C18	.001	23245
C19	.001	23245
C20	.001	23245
C21	39	23377
C22	39	23377
C23	.001	23245
C24	10	23251

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-5. 81731 1ST LO BOARD PARTS LIST (continued)

ID.	Description	Part No.
C25	2.0	23301
C26	.001	23245
C27	.001	23245
C28	.01	23260
C29	.01	23260
C30	47	23378
C31	47	23378
C32	.001	23245
C33	10	23251
C34	3.0	23248
C35	.001	23245
C36	.001	23245
C37	.01	23260
C38	.01	23260
C39	56	23379
C40	56	23379
C41	.01	23260
C42	33	23246
C43	33	23246
C44	18	23302
C45	.001	23245
C46	.001	23245
C47	.01	23260
C48	.01	23260
C49	.01	23260
C50	1µF	23264
C51	3.3µF	23265
C52	.001	23245
C53	.001	23245
C54	.0039	23334
C55	.047	23291
C56	.01	23260
C57	.001	23245
C58	.001	23245
C59	.001	23245
C60	18	23302
C61	18	23302
D1	KV3902	28075
D2	KV3902	28075
D3	IN4148	28001
D4	IN4148	28001
D5	BAT41	28071
D6	IN754A	28006

ID.	Description	Part No.
D7	KV3902	28075
D8	KV3902	28075
D9	IN4148	28001
D10	IN4148	28001
D11	IN754A	28006
D12	BAT41	28071
D13	KV3902	28075
D14	KV3902	28075
D15	IN4148	28001
D16	IN4148	28001
D17	IN754A	28006
D18	BAT41	28071
D19	KV3902	28075
D20	KV3902	28075
D21	IN4148	28001
D22	IN4148	28001
D23	IN754A	28006
D24	BAT41	28071
D25	IN4148	28001
D26	IN4148	28001
D27	IN4148	28001
D28	IN4148	28001
L1	COIL	A5413-04
L2	COIL	A5413-05
L3	COIL	A5413-06
L4	COIL	A5413-07
L5	3.3	21118
L6	3.3	21118
L7	.12	21101
L8	3.3	21118
L9	3.3	21118
L10	.12	21101
L11	3.9	21119
L12	3.9	21119
L13	.15	21102
L14	3.9	21119
L15	3.9	21119
L16	.18	21103
L17	.18	21103
L18	.68	21110
L19	.18	21103
L20	10	21124
L21	10	21124

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-5. 81731 1ST LO BOARD PARTS LIST (continued)

ID	Description	Part No.
T1	BIFILAR	21152
T2	TRIFILAR	21153
T3	TRIFILAR	21153
Q1	2N5087	25001
Q2	J310	25115
Q3	J310	25115
Q4	2N5087	25001
Q5	J310	25115
Q6	J310	25115
Q7	2N5087	25001
Q8	J310	25115

ID	Description	Part No.
Q9	J310	25115
Q10	2N5087	25001
Q11	J310	25115
Q12	J310	25115
Q13	2N5087	25001
Q14	J310	25115
Q15	J310	25115
Q16	MPS6514	25054
U1	CA3096	25345
U2	MC145170P	25296
U3	MC1723CP	25050

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

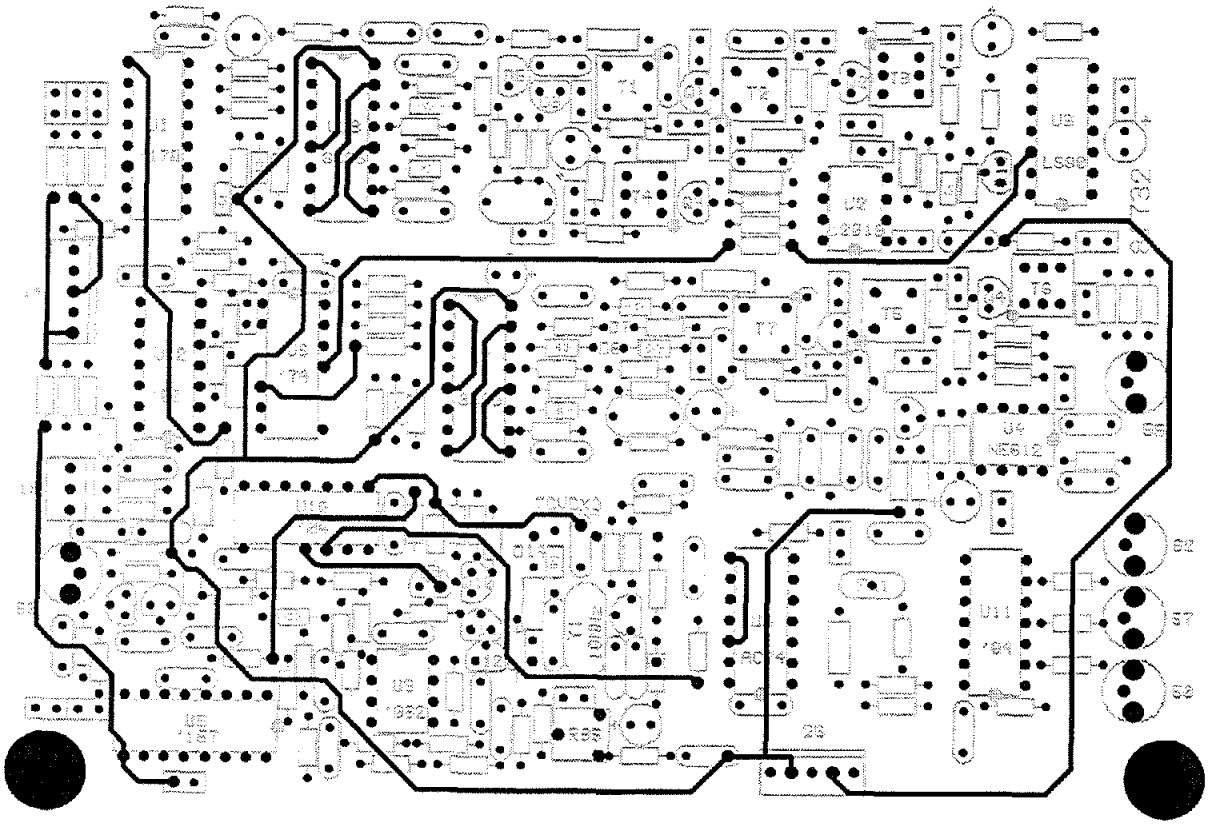


FIGURE 9-22. 81732 TOP CIRCUIT TRACE

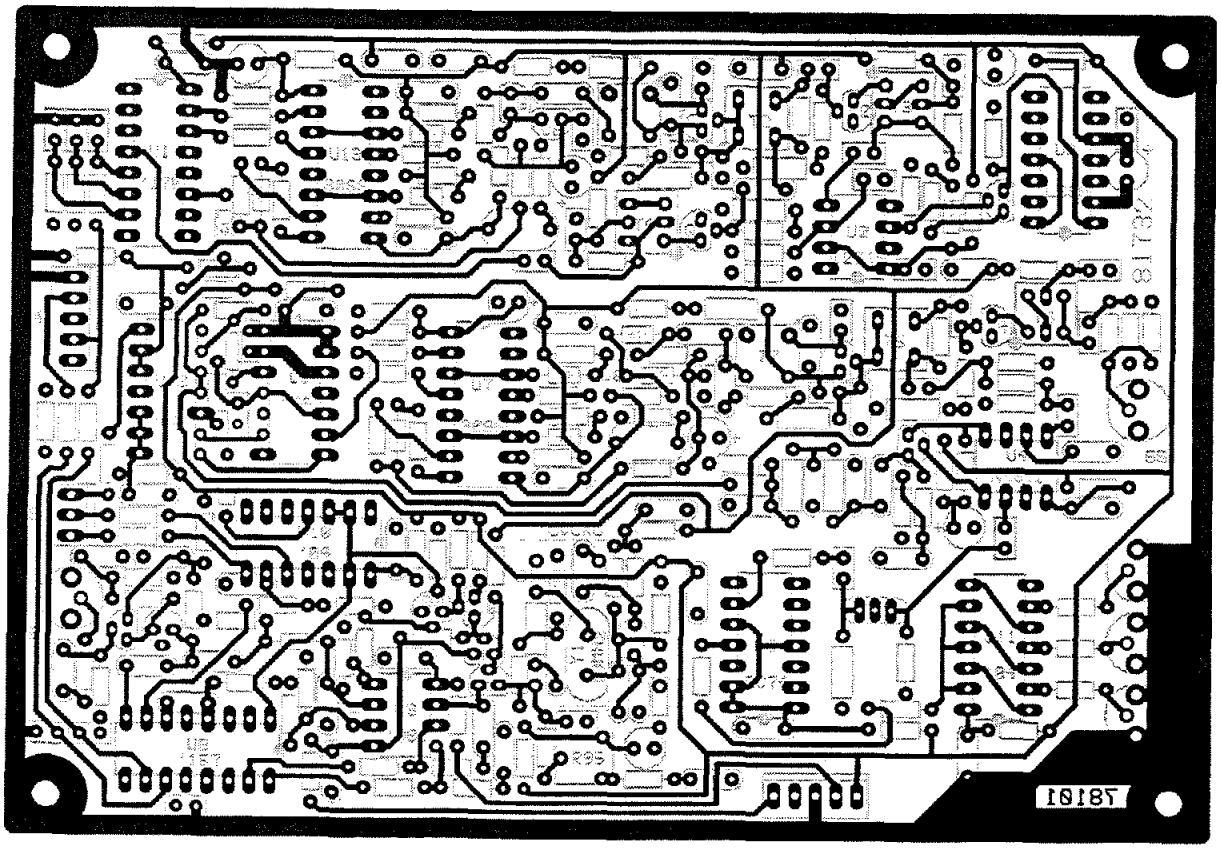


FIGURE 9-23. 81732 BOTTOM CIRCUIT TRACE

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

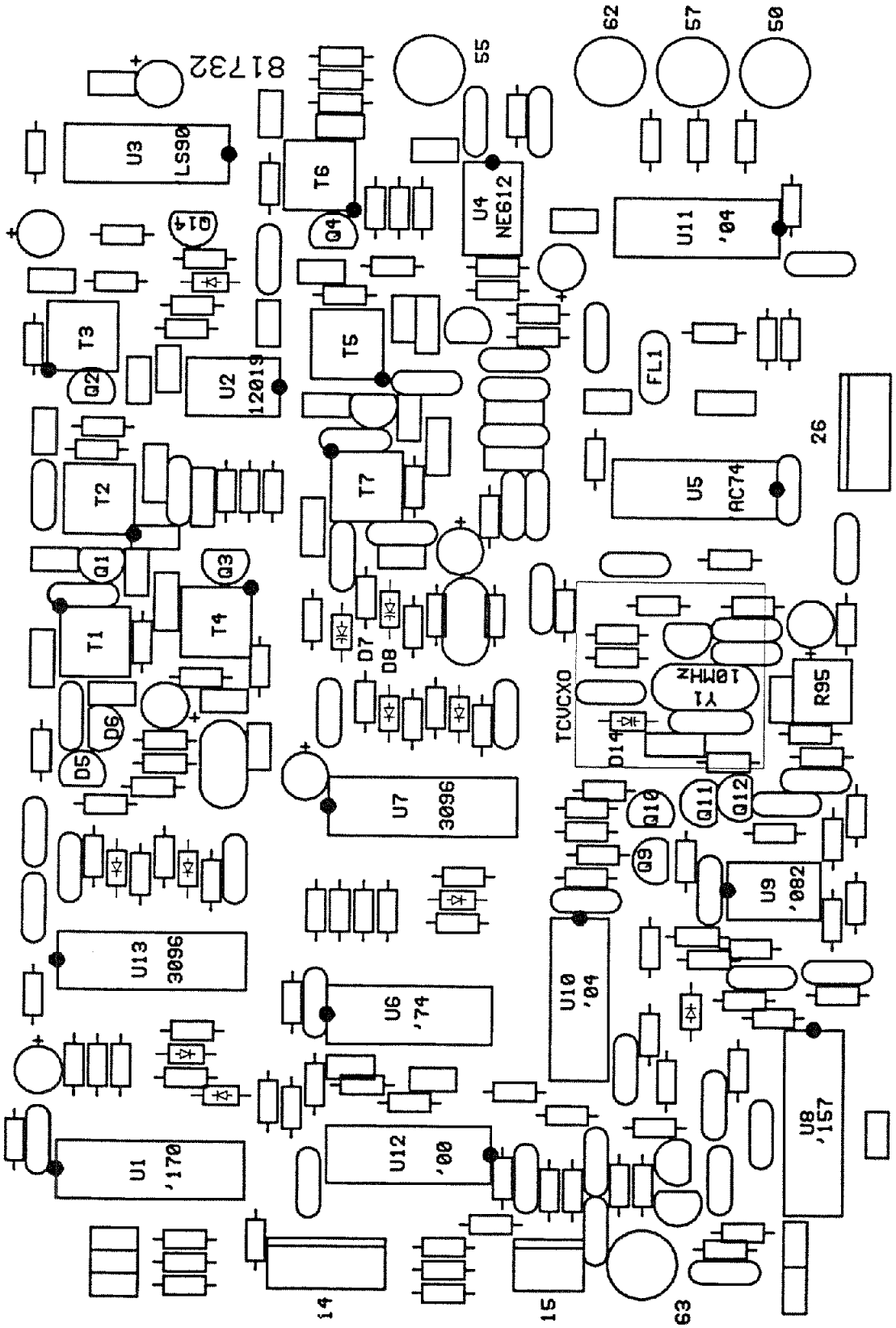
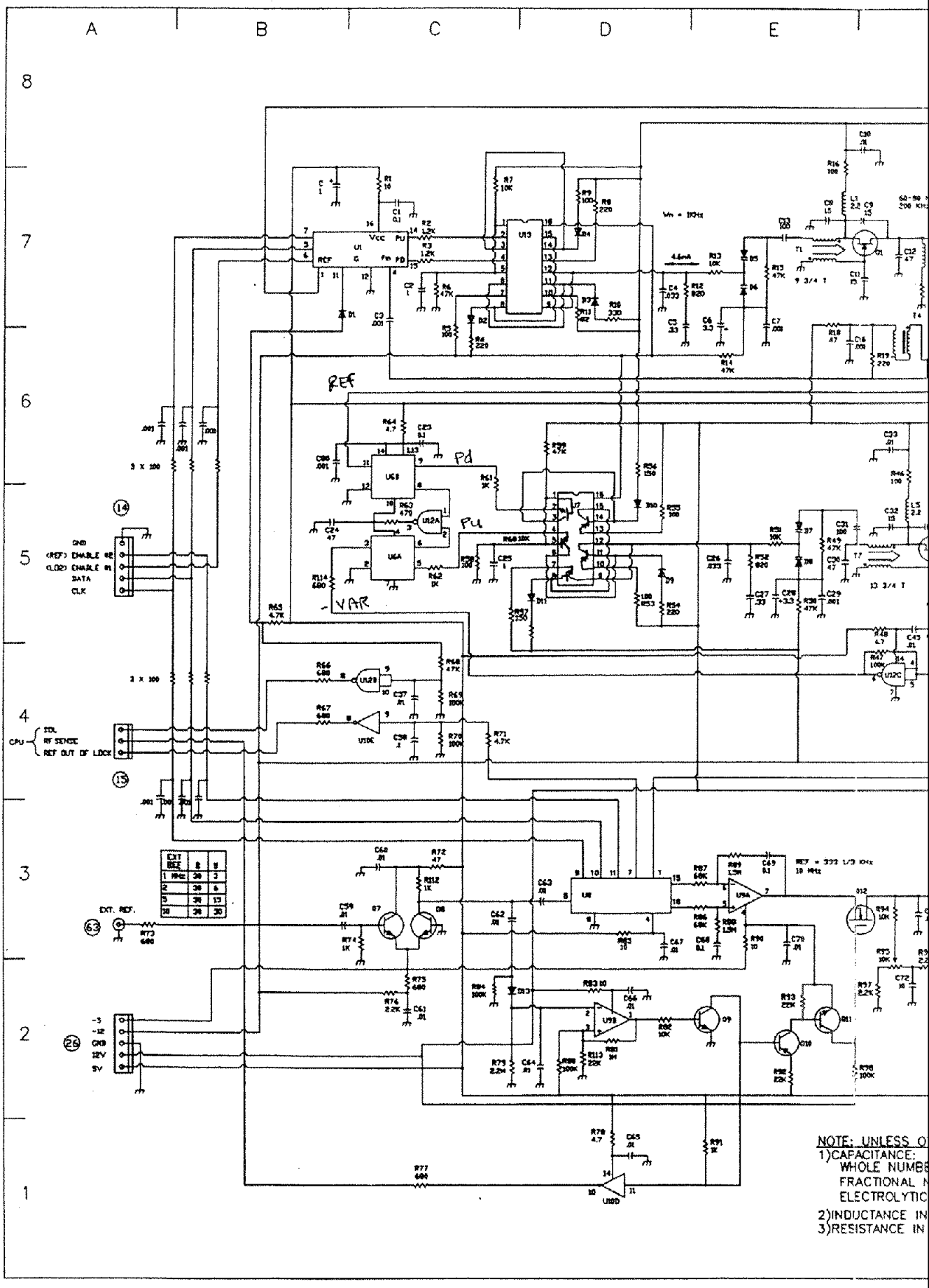


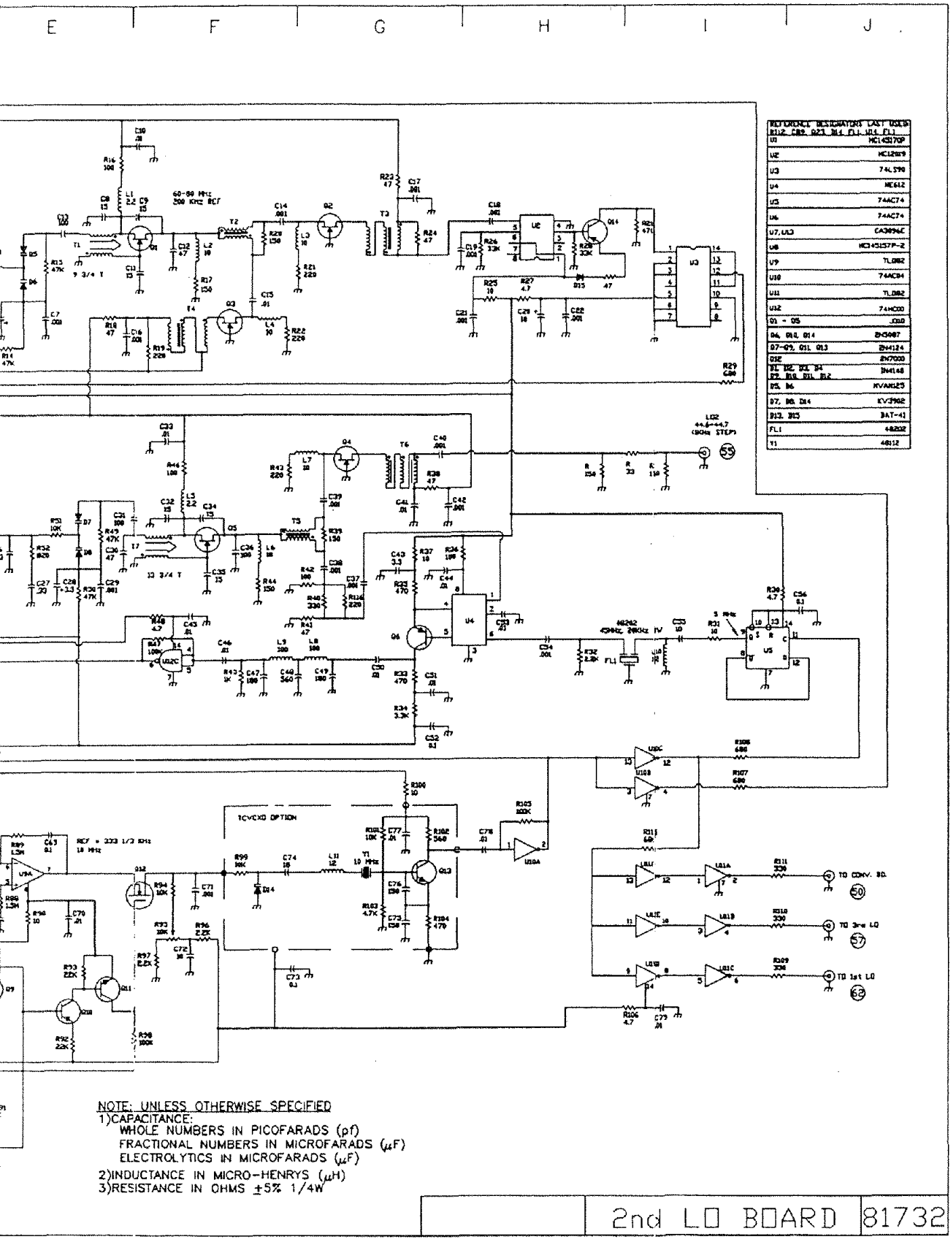
FIGURE 9-24. 81732 2ND LO COMPONENT LAYOUT

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.



Part No. 74249
2nd Printing 10/96
Printed in the U.S.A.

FIGURE 9-25. 81732 2nd I



NOTE: UNLESS OTHERWISE SPECIFIED
1)CAPACITANCE:
WHOLE NUMBERS IN PICOFARADS (pf)
FRACTIONAL NUMBERS IN MICROFARADS (μF)
ELECTROLYTICS IN MICROFARADS (μF)
2)INDUCTANCE IN MICRO-HENRYS (μH)
3)RESISTANCE IN OHMS ±5% 1/4W

	2nd LO BOARD	81732

-25. 81732 2nd LO SCHEMATIC

9-41/9-42 BLANK

TABLE 9-6. 81732 2ND LO BOARD PARTS LIST

ID.	Description	Part No.
R1	10	30314
R2	1.2K	30623
R3	1.2K	30623
R4	47K	30300
R5	100	30309
R6	220	30290
R7	10K	30296
R8	220	30290
R9	100	30309
R10	330	30316
R11	82	30437
R12	820	30442
R13	10K	30296
R14	47K	30300
R15	47K	30300
R16	100	30309
R17	150	30438
R18	47	30289
R19	220	30290
R20	150	30438
R21	220	30290
R22	220	30290
R23	47	30289
R24	47	30289
R25	10	30314
R26	33K	30299
R27	4.7	30624
R28	47	30289
R29	470	30291
R30	4.7K	30624
R31	680	30292
R32	150	30438
R33	33	30434
R34	150	30438
R35	4.7	30624
R36	10	30314
R37	22K	30293
R38	100	30309
R39	47	30289
R40	10	30314
R41	470	30291
R42	470	30291
R43	3.3K	30294

ID.	Description	Part No.
R44	NOT USED	
R45	330	30316
R46	47	30289
R47	150	30438
R48	220	30290
R49	100	30309
R50	150	30438
R51	1K	30333
R52	100K	30301
R53	4.7	30624
R54	100	30309
R55	47K	30300
R56	47K	30300
R57	10K	30296
R58	820	30442
R59	220	30298
R60	100	30309
R61	100	30309
R62	150	30428
R63	47K	30300
R64	1K	30333
R65	100	30309
R66	150	30438
R67	10K	30296
R68	1K	30333
R69	470	30291
R70	4.7	30624
R71	680	30292
R72	4.7K	30305
R73	100	30309
R74	100	30309
R75	100	30309
R76	100	30309
R77	100	30309
R78	100	30309
R79	680	30292
R80	680	30292
R81	47K	30300
R82	100K	30301
R83	100K	30301
R84	4.7K	30305
R85	680	30292
R86	1K	30333

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-6. 81732 2ND LO BOARD PARTS LIST (continued)

ID.	Description	Part No.
R87	47	30289
R88	1K	30333
R89	680	30292
R90	2.2K	30293
R91	680	30292
R92	2.2m	30625
R93	100K	30301
R94	100K	30301
R95	22K	30298
R96	1m	30360
R97	4.7	30624
R98	1K	30333
R99	10K	30296
R100	10	30314
R101	10	30314
R102	68K	30303
R103	68K	30303
R104	1.5m	30626
R105	10	30314
R106	1.5m	30626
R107	22K	30298
R108	22K	30298
R109	100K	30301
R110	22K	30293
R111	10K	30619
R112	10K	30296
R113	2.2K	30293
R114	10K	30296
R115	10K	30296
R116	10	30314
R117	560	30440
R118	4.7K	30305
R119	470	30291
R120	100K	30301
R121	680	30292
R122	4.7	30624
R123	330	30316
R124	330	30316
R125	330	30316
R126	680	30292
R127	680	30292
C1	.001	23245
C2	.001	23245

ID.	Description	Part No.
C3	.001	23245
C4	1	23264
C5	0.1	23261
C6	.001	23245
C7	1	23264
C8	.033	23290
C9	.33	23329
C10	3.3	23265
C11	.001	23245
C12	100	23385
C13	15	23372
C14	.01	23260
C15	15	23253
C16	15	23253
C17	.001	23245
C18	47	23257
C19	.01	23260
C20	.001	23245
C21	.001	23245
C22	.001	23245
C23	.001	23245
C24	.001	23245
C25	10	23266
C26	.001	23245
C27	0.1	23261
C28	10	23251
C29	.001	23245
C30	.01	23260
C31	0.1	23261
C32	.01	23260
C33	.01	23260
C34	.01	23260
C35	3.3	23265
C36	.001	23245
C37	.01	23260
C38	.001	23245
C39	.001	23245
C40	.001	23245
C41	180	23389
C42	560	23401
C43	180	23389
C44	.01	23260
C45	.001	23245

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-6. 81732 2ND LO BOARD PARTS LIST (continued)

I.D.	Description	Part No.
C46	100	23385
C47	15	23253
C48	15	23253
C49	15	23372
C50	.01	23260
C51	.01	23260
C52	100	23385
C53	47	23378
C54	.001	23245
C55	3.3	23265
C56	.33	23329
C57	.033	23290
C58	1	23264
C59	0.1	23261
C60	.001	23245
C61	47	23257
C62	.01	23260
C63	.1	23261
C64	.001	23245
C65	.001	23245
C66	.001	23245
C67	.01	23260
C68	.01	23260
C69	.01	23260
C70	.01	23260
C71	.01	23260
C72	.01	23260
C73	.01	23260
C74	.01	23260
C75	.01	23260
C76	0.1	23328
C77	0.1	23328
C78	.01	23260
C79	10	23266
C80	.001	23245
C81	18	23444
C82	0.1	23261
C83	.01	23260
C84	150	23388
C85	150	23388
C86	.01	23260
C87	.01	23260
C88	.01	23260

I.D.	Description	Part No.
C89	.01	23260
D1	IN4148	28001
D2	IN4148	28001
D3	IN4148	28001
D4	IN4148	28001
D5	KVAM125	28116
D6	KVAM125	28116
D7	KV3902	28075
D8	KV3902	28075
D9	IN4148	28001
D10	IN4148	28001
D11	IN4148	28001
D12	BAT41	28071
D13	KV3902	28075
D14	NOT USED	
D15	BAT41	28071
L1	2.2	21116
L2	10	21124
L3	10	21124
L4	10	21124
L5	2.2	21116
L6	10	21124
L7	10	21124
L8	100	21164
L9	100	21164
L10	1.2	21113
L11	12	21125
Q1	J310	25115
Q2	J310	25115
Q3	J310	25115
Q4	J310	25115
Q5	J310	25115
Q6	2N5087	25001
Q7	2N4124	25258
Q8	2N4124	25258
Q9	2N4124	25258
Q10	2N5087	25001
Q11	2N4124	25258
Q12	2N7000	25321
Q13	2N4124	25258
Q14	2N5087	25001
T1	COIL	85413-01
T2	BIFILAR	21152

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-6. 81732 2ND LO BOARD PARTS LIST (continued)

ID	Description	Part No.
T3	TRIFILAR	21153
T4	TRIFILAR	21153
T5	BIFILAR	21152
T6	TRIFILAR	21153
T7	COIL	85413-02
U1	MC145170P	25296
U2	MC12019	25354
U3	74LS90	25176
U4	NE612	25319
U5	74AC74	25346

ID	Description	Part No.
U6	74HC74	25178
U7	CA3096E	25345
U8	MC145157P-2	25213
U9	TL082	25321
U10	74AC04	25340
U11	74AC04	25340
U12	74HC00	25161
U13	CA3096E	25345
FL1	FILTER	48202
Y1	XTAL	48112

Part No. 74249
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Printed in U.S.A.

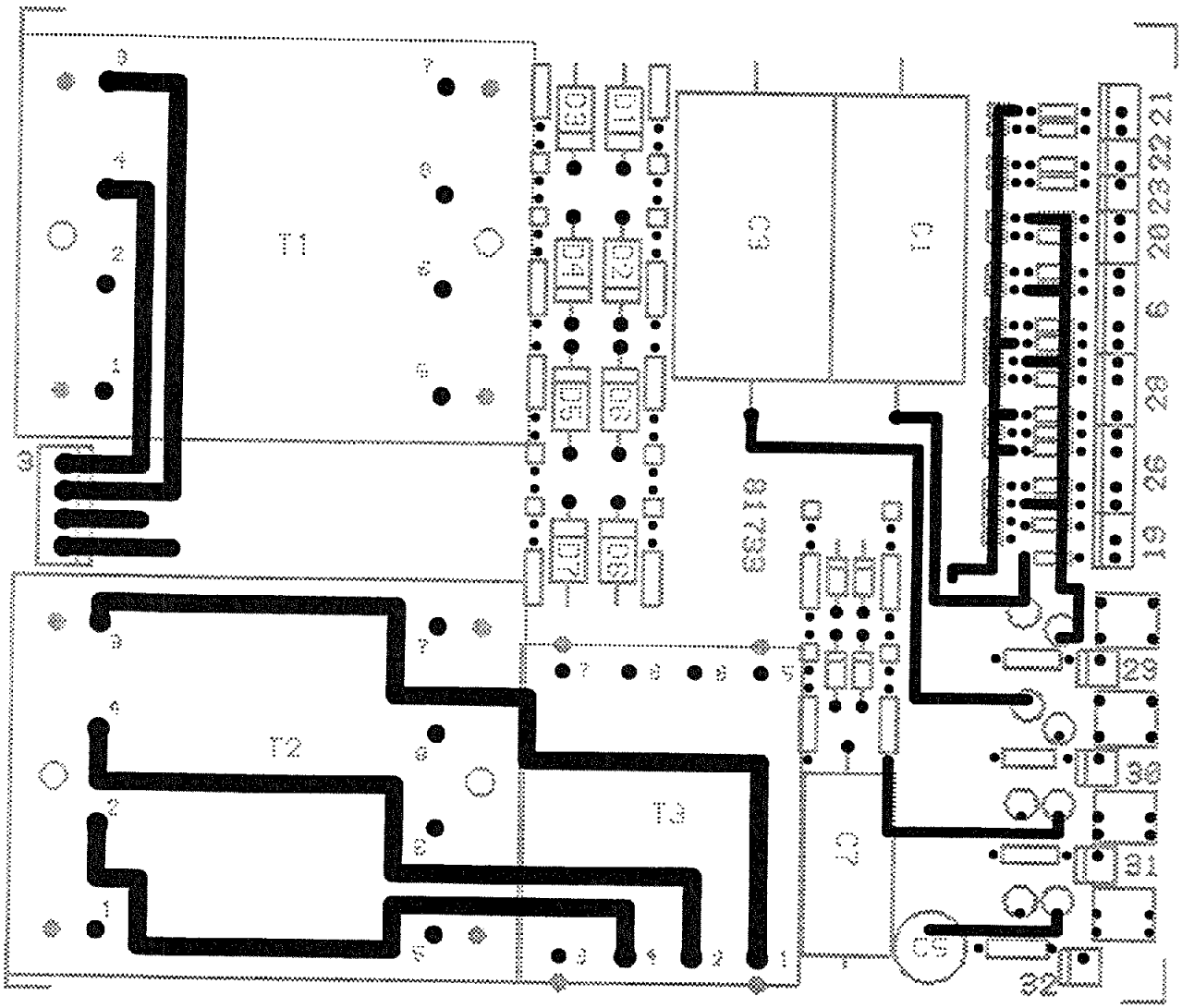


FIGURE 9-26. 81733 TOP CIRCUIT TRACE

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

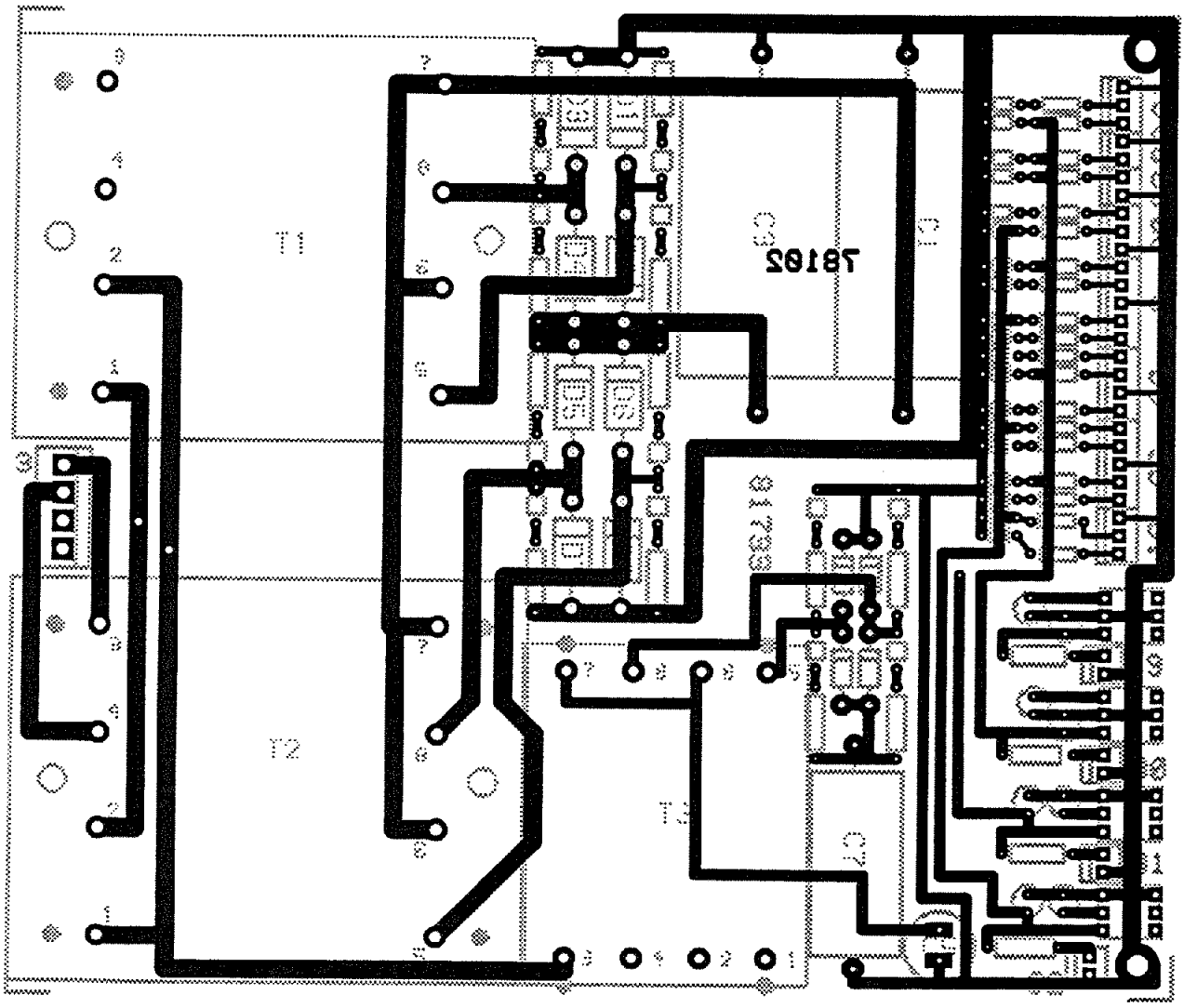


FIGURE 9-27. 81733 BOTTOM CIRCUIT TRACE

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

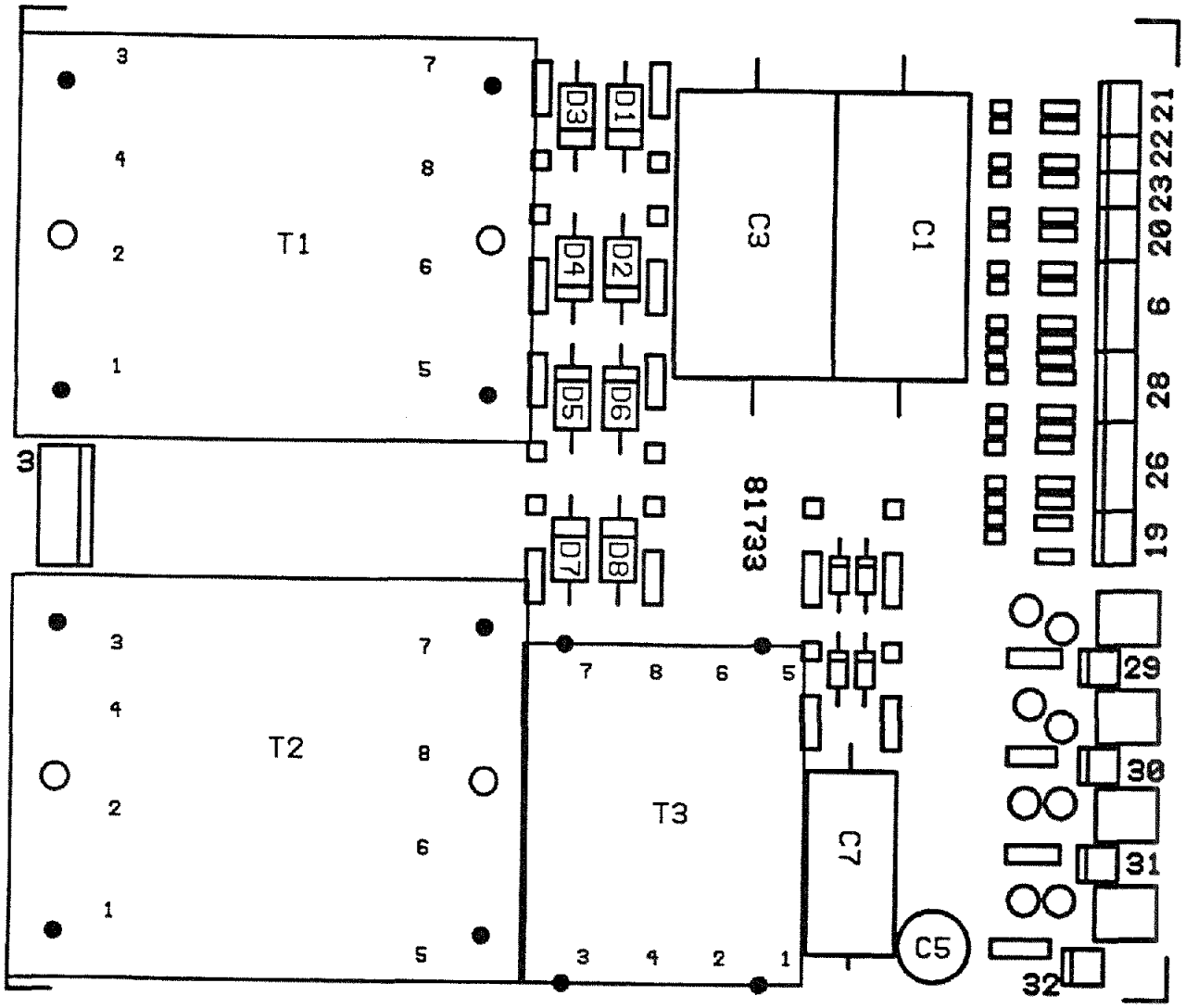


FIGURE 9-28. 81733 POWER SUPPLY COMPONENT LAYOUT

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

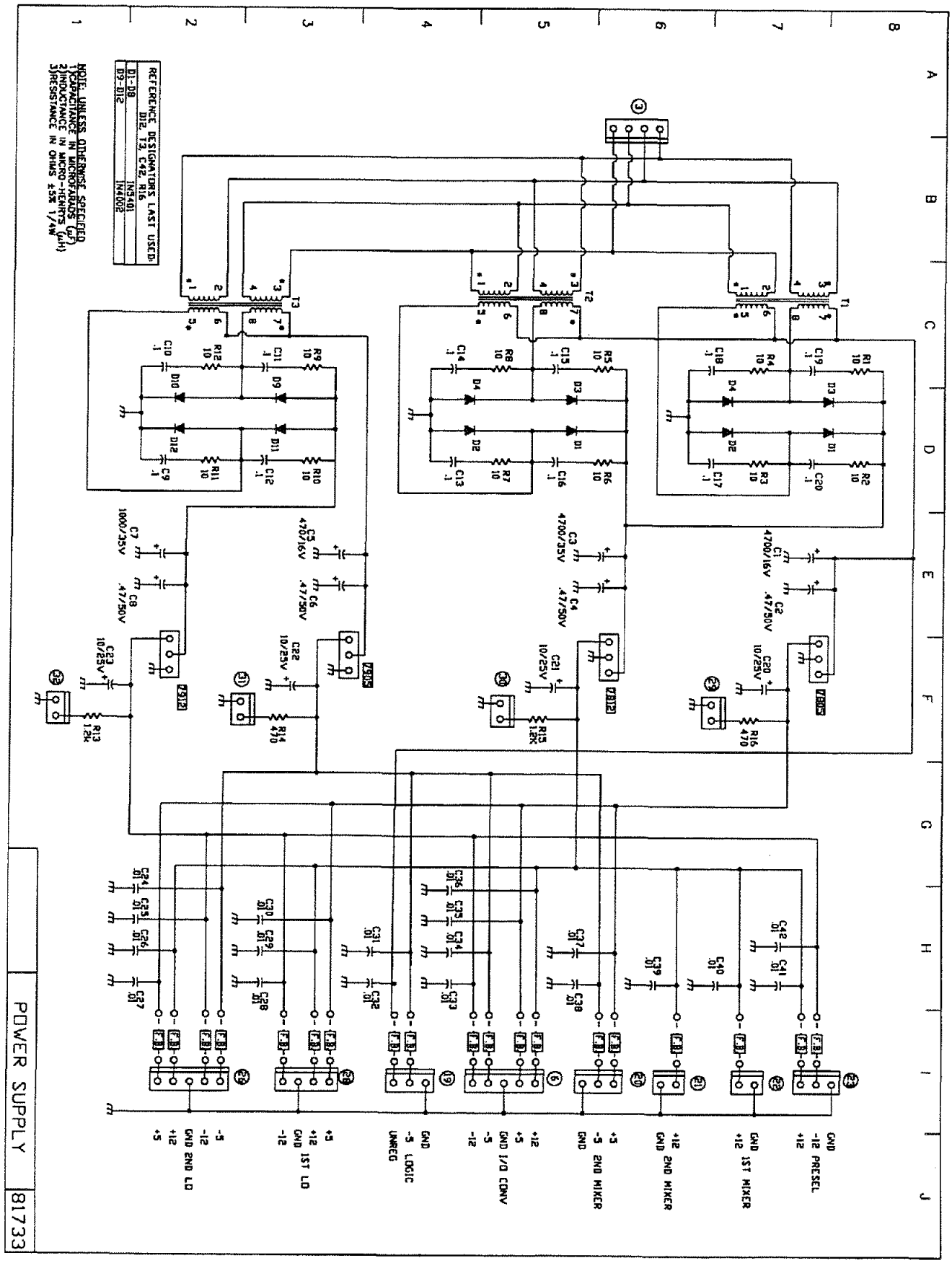


FIGURE 9-29. 81733 POWER SUPPLY SCHEMATIC

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-7. 81733 POWER SUPPLY PARTS LIST

ID.	Description	Part No.
R1	10	30115
R2	10	30115
R3	10	30115
R4	10	30115
R5	10	30115
R6	10	30115
R7	10	30115
R8	10	30115
R9	10	30115
R10	10	30115
R12	10	30115
R13	470	30134
R14	1.2K	30139
R15	1.2K	30139
R16	470	30134
C1	4700\16V	23320
C2	.47\50V	23263
C3	4700\35V	23191
C4	.47\50V	23263
C5	470\16V	23228
C6	.47\50V	23263
C7	1000\35V	23042
C8	.47\50V	23263
C9	.1	23261
C10	.1	23261
C11	.1	23261
C12	.1	23261
C13	.1	23261
C14	.1	23261
C15	.1	23261
C16	.1	23261
C17	.1	23261
C18	.1	23261
C19	.1	23261
C20	.1	23261
C21	10\25V	23266
C22	10\25V	23266

ID.	Description	Part No.
C23	10\25V	23266
C24	10\25V	23266
C25	.01	23260
C26	.01	23260
C27	.01	23260
C28	.01	23260
C29	.01	23260
C30	.01	23260
C31	.01	23260
C32	.01	23260
C33	.01	23260
C34	.01	23260
C35	.01	23260
C36	.01	23260
C37	.01	23260
C38	.01	23260
C39	.01	23260
C40	.01	23260
C41	.01	23260
C42	.01	23260
C43	.01	23260
D1	IN5401	28047
D2	IN5401	28047
D3	IN5401	28047
D4	IN5401	28047
D5	IN5401	28047
D6	IN5401	28047
D7	IN5401	28047
D8	IN5401	28047
D9	IN4002	28000
D10	IN4002	28000
D11	IN4002	28000
D12	IN4002	28000
T1	XFMR	21168
T2	XFMR	21168
T3	XFMR	21184

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

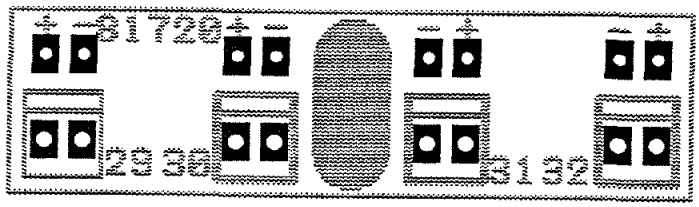


FIGURE 9-30. 81720 TOP CIRCUIT TRACE *

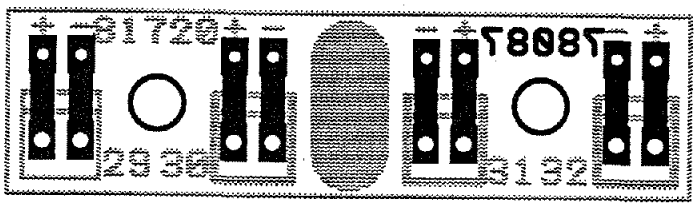


FIGURE 9-31. 81720 BOTTOM CIRCUIT TRACE *

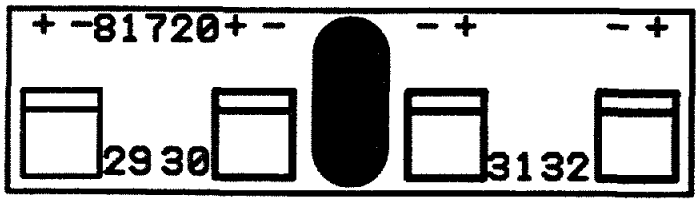


FIGURE 9-32. 81720 LED BOARD COMPONENT LAYOUT *

* Drawing is magnified twice the original size

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

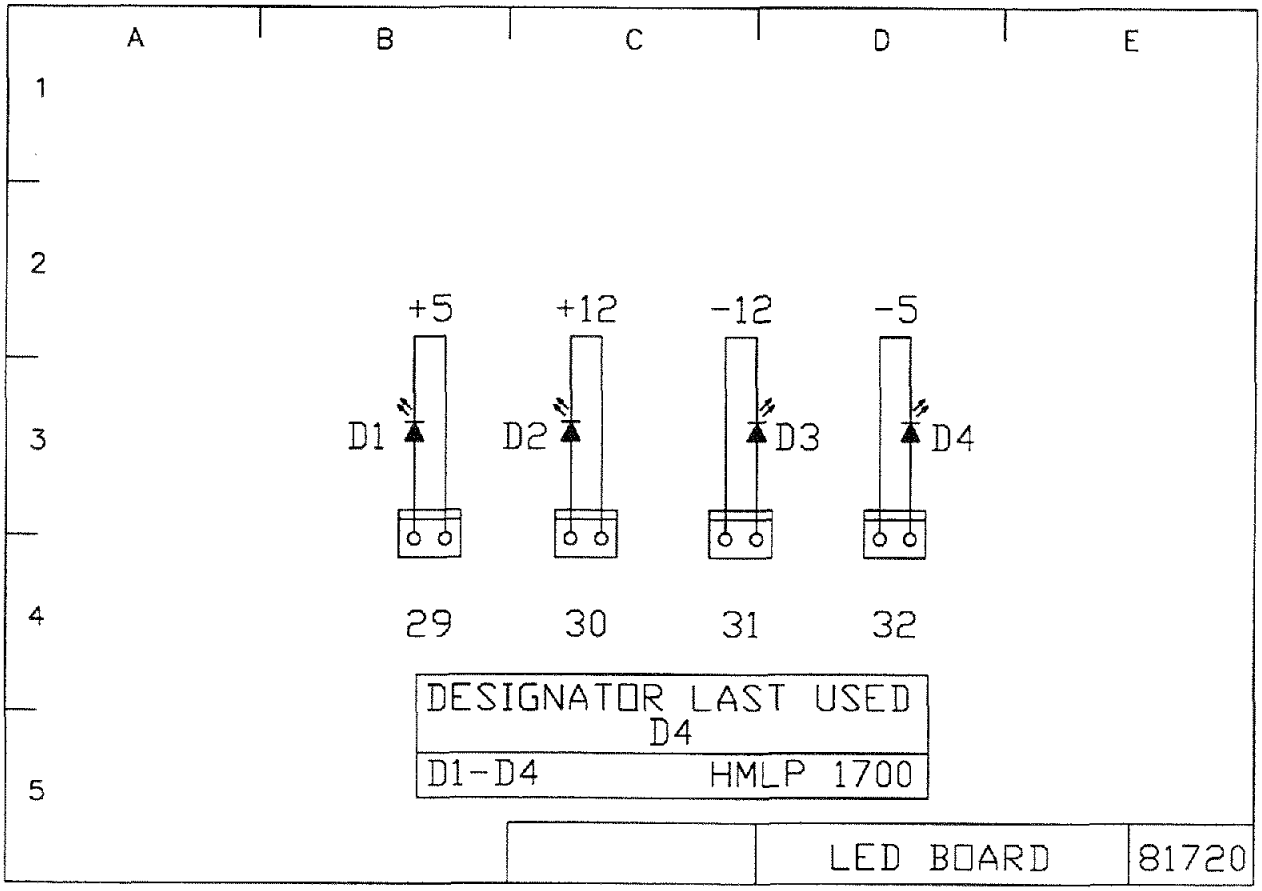


FIGURE 9-33. 81720 LED BOARD SCHEMATIC

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

TABLE 9-8. 81720 LED BOARD PARTS LIST

ID.	Description	Part No.
D1	HMLP 1700	28066
D2	HMLP 1700	28066
D3	HMLP 1700	28066
D4	HMLP 1700	28066

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

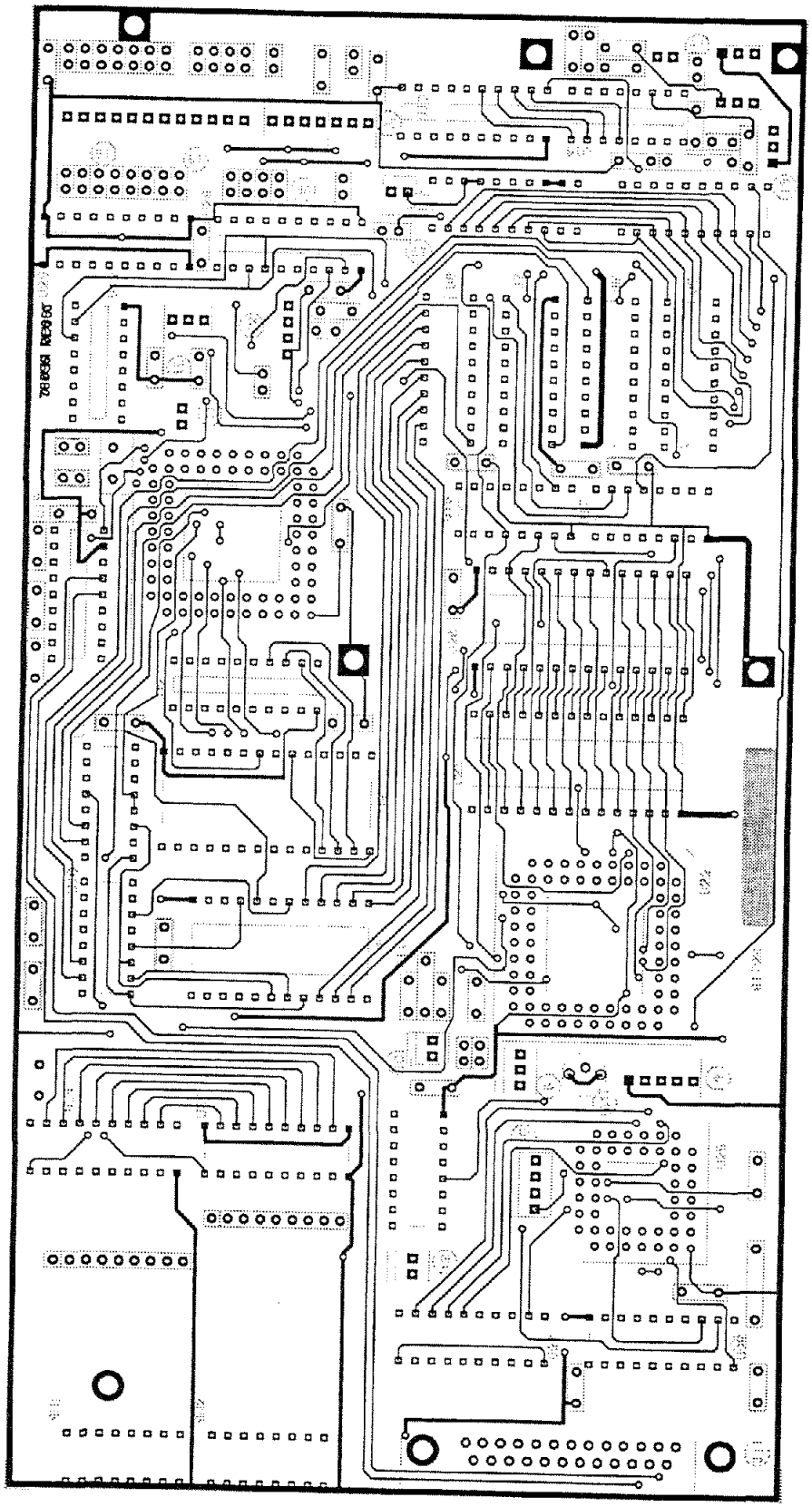


FIGURE 9-34. 81726 TOP CIRCUIT TRACE

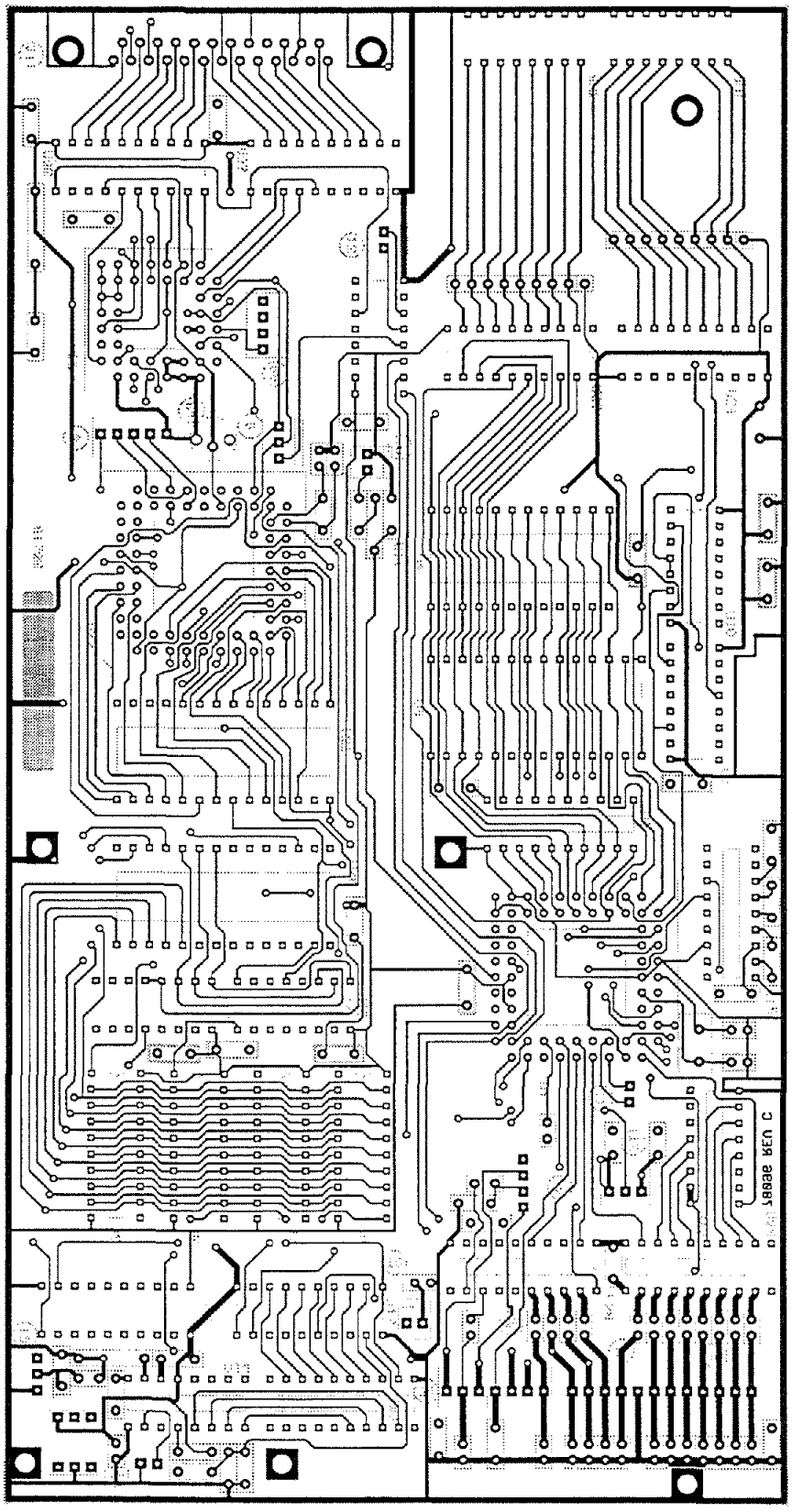


FIGURE 9-35. 81726 BOTTOM CIRCUIT TRACE

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.

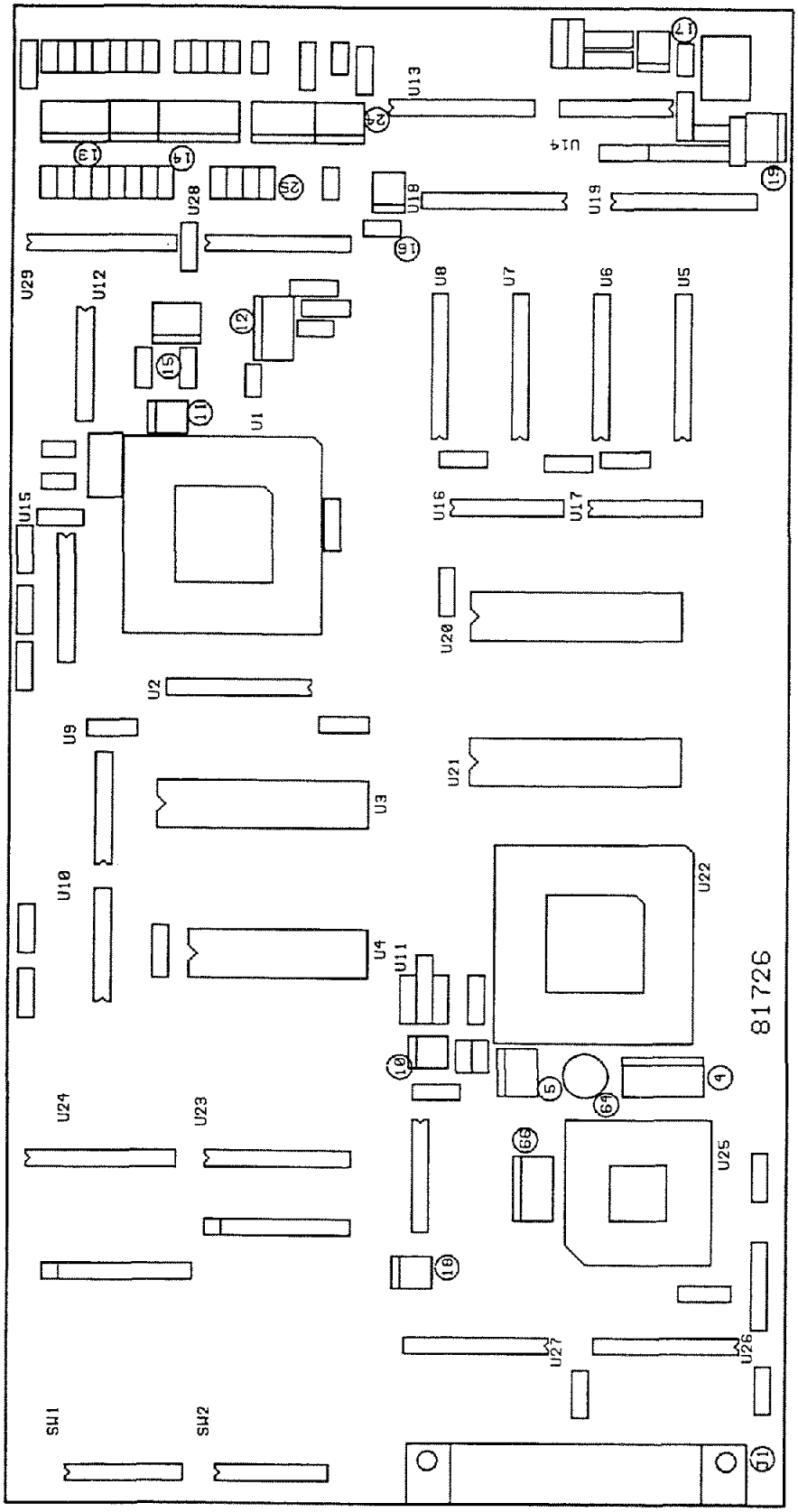
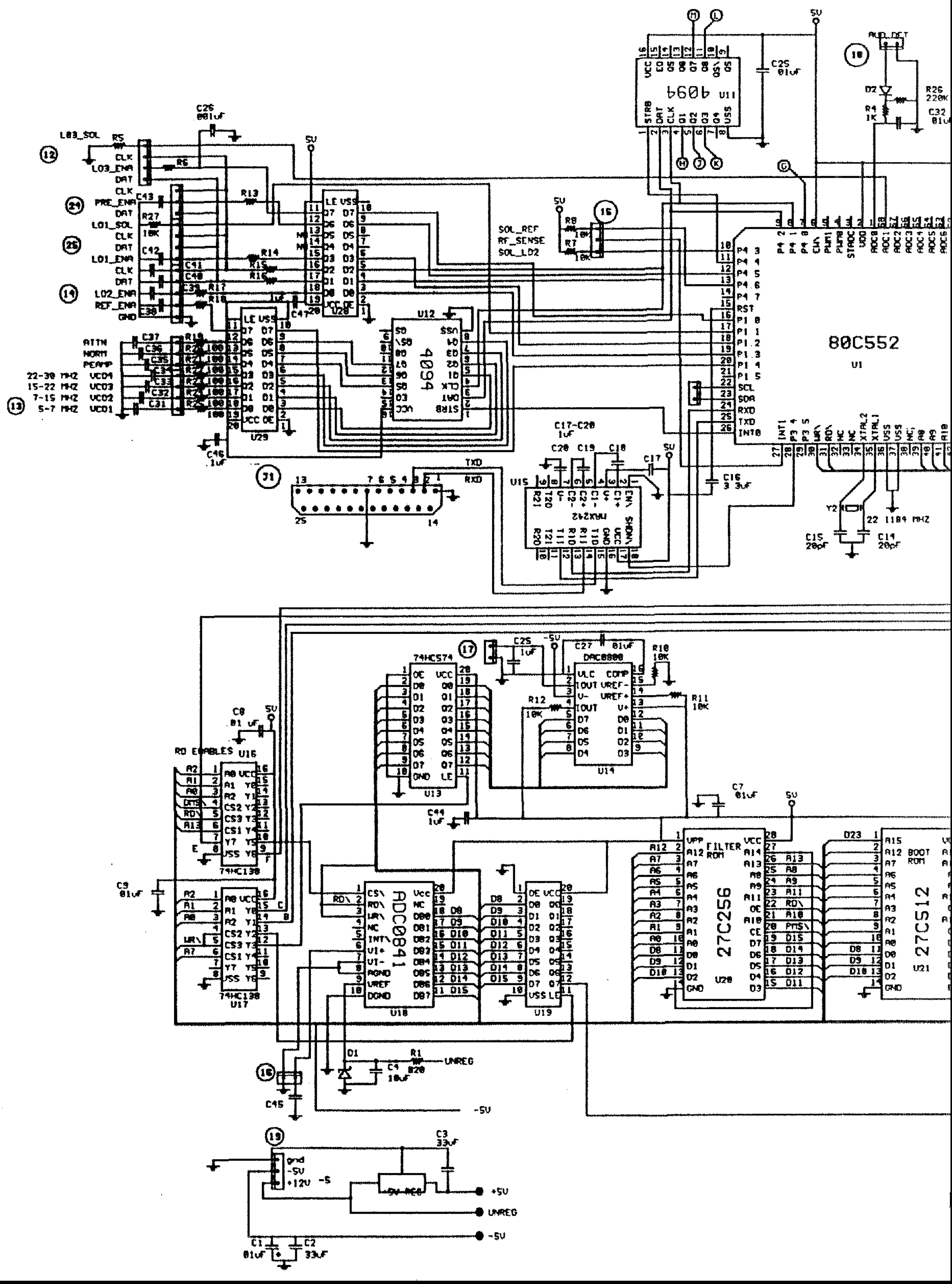


FIGURE 9-36. 81726 DSP/CPU COMPONENT LAYOUT

Part No. 74249
2nd Printing - 10/96
Printed in U.S.A.



80C552
U1
4094
U11
4094
U12
U28
U29
MAX242
U15
74HC574
U13
DAC0800
U14
74HC138
U16
U17
ADC0841
U18
U19
27C256
FILTER ROM
U20
27C512
BOOT ROM
U21
RD ENABLES
SOL_REF
RF_SENSE
SOL_LO2
AUD_DET
LO3_SOL
LO3_ENA
PRE_ENA
LO1_SOL
LO1_ENA
LO2_ENA
REF_ENA
ATTN
NORM
PEAMP
22-30 MHZ VCO4
15-22 MHZ VCO3
7-15 MHZ VCO2
5-7 MHZ VCO1
TXD
RXD
22 1184 MHZ
5V REG
+5V
UNREG
-5V

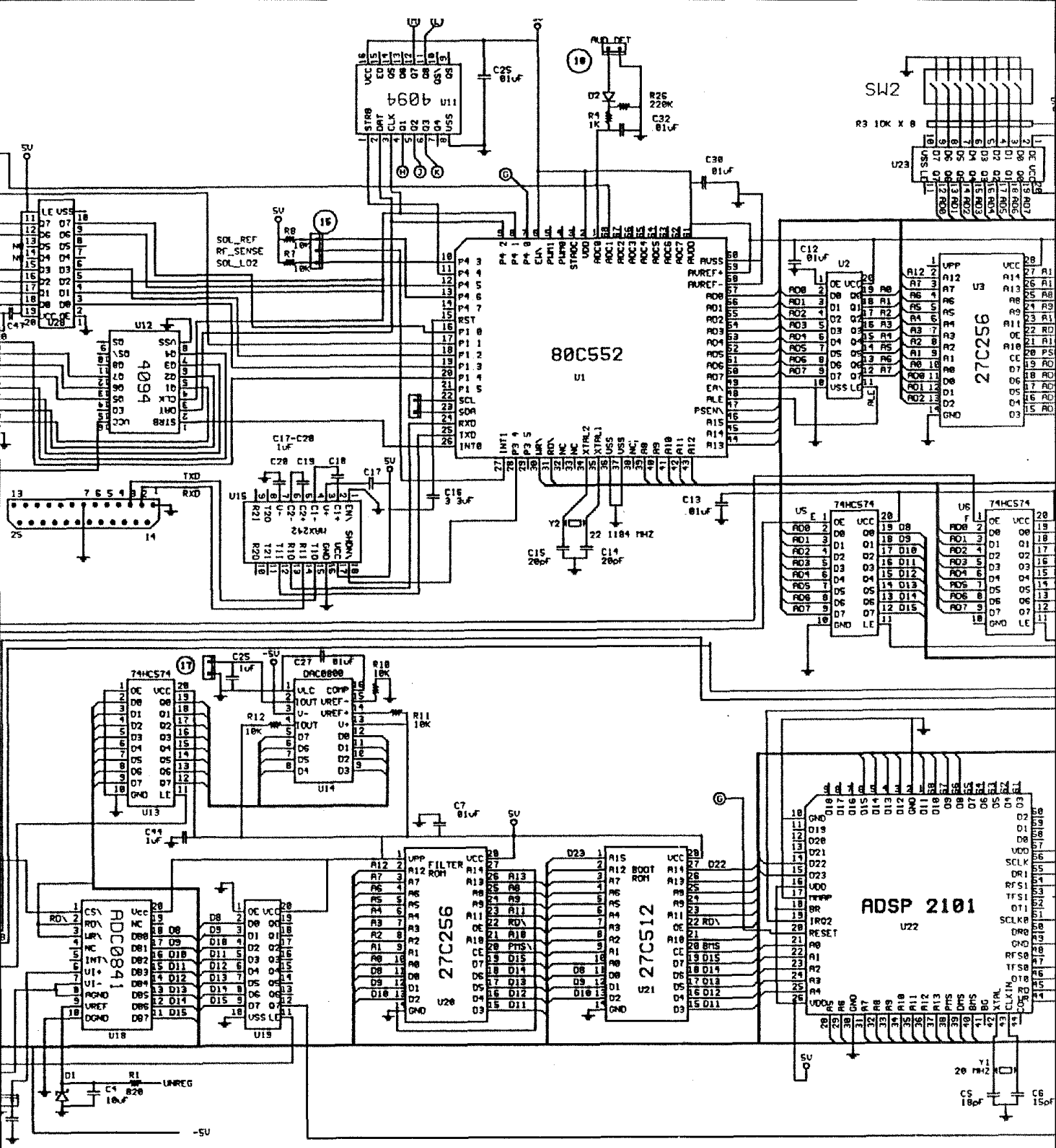
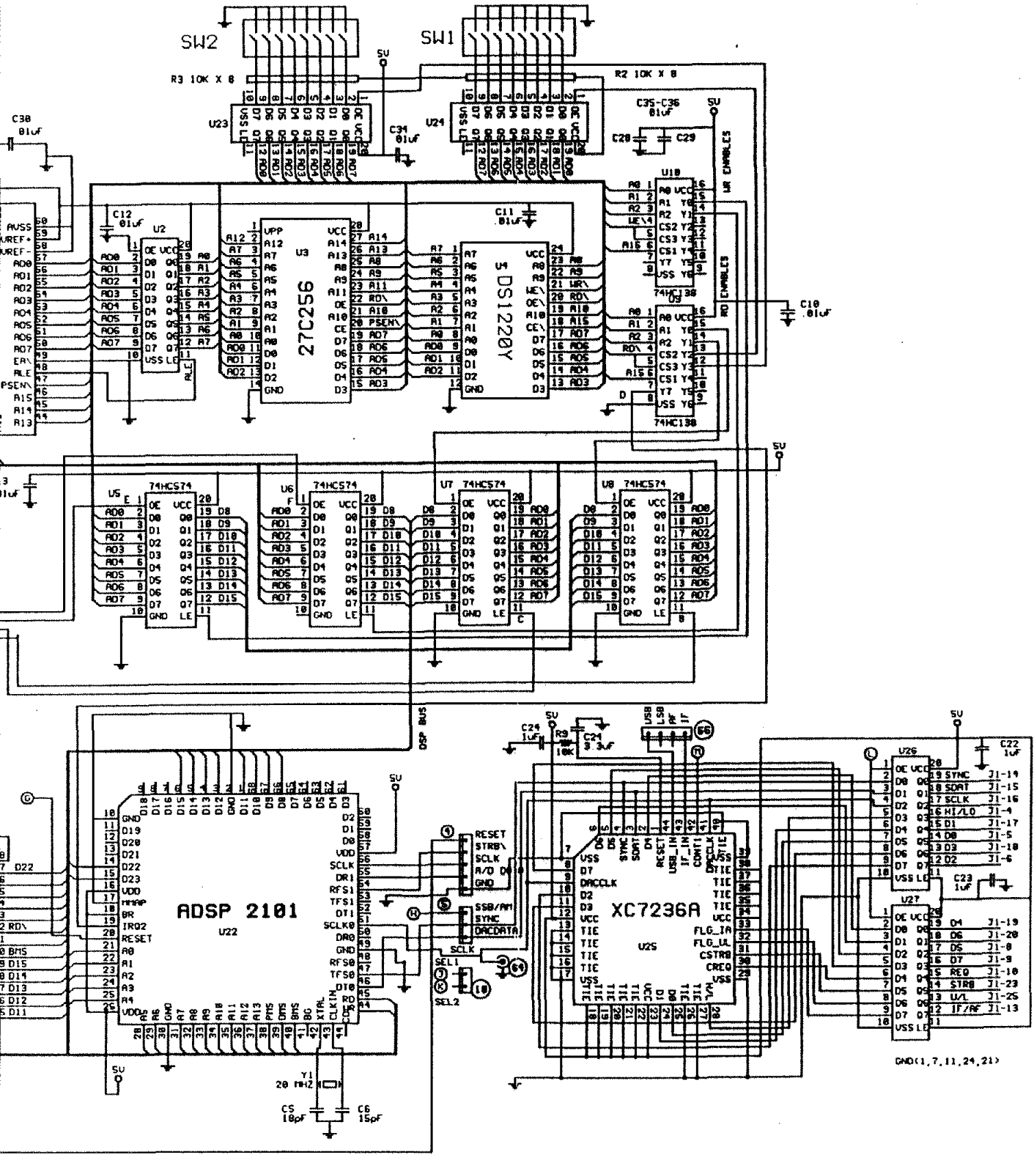


FIGURE 9-37. 81726 DSP/CPU SCHE



GURE 9-37. 81726 DSP/CPU SCHEMATIC

TABLE 9-9. 81726 DSP/CPU BOARD PARTS LIST

I.D.	Description	Part No.
R1	820	30137
R2	10K X8	30404
R3	10K X 8	30404
R4	1K	30138
R5	100	30126
R6	100	30126
R7	10K	30150
R8	10K	30150
R9	10K	30150
R10	10K	30150
R11	10K	30150
R12	10K	30150
R13	100	30126
R14	100	30126
R15	100	30126
R16	100	30126
R17	100	30126
R18	100	30126
R19	100	30126
R20	100	30126
R21	100	30126
R22	100	30126
R23	100	30126
R24	100	30126
R25	100	30126
R26	220K	30077
R27	10K	30150
C1	.1uF	23261
C2	33uF	23308
C3	33uF	23308
C4	10uF	23266
C5	18pF	23302
C6	18pF	23302
C7	.1uF	23261
C8	.1uF	23261
C9	.1uF	23261
C10	.1uF	23261
C11	.1uF	23261
C12	.1uF	23261
C13	.1uF	23261
C14	20pF	23254
C15	20pF	23254
C16	3.3uF	23265

I.D.	Description	Part No.
C17	.1uF	23261
C18	.1uF	23261
C19	.1uF	23261
C20	.1uF	23261
C21	3.3uF	23265
C22	.1uF	23261
C23	.1uF	23261
C24	.1uF	23261
C25	.1uF	23261
C26	.001uF	23245
C27	.1uF	23261
C28	.1uF	23261
C29	.1uF	23261
C30	.1uF	23261
C31	.001uF	23245
C32	.001uF	23245
C33	.001uF	23245
C34	.001uF	23245
C35	.001uF	23245
C36	.001uF	23245
C37	.001uF	23245
C38	.001uF	23245
C39	.001uF	23245
C40	.001uF	23245
C41	.001uF	23245
C42	.001uF	23245
C43	.001uF	23245
C44	.1uF	23261
C46	.1uF	23261
C47	.1uF	23261
D1	1N4148	28001
D2	5.1V ZENER	28041
U1	80C552	25331
U2	74HC573	25158
U3	MAIN ROM	98326
U4	DS1220Y	25311
U5	74HC574	25333
U6	74HC574	25333
U7	74HC574	25333
U8	74HC574	25333
U9	74HC138	25190
U10	74HC138	25190
U12	MC14094	25267

Part No. 74249
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TABLE 9-9. 81726 DSP/CPU BOARD PARTS LIST

ID	Description	Part No.
U15	MAX242	25343
U16	74HC138	25190
U17	74HC138	25190
U18	ADC0841	25332
U19	74HC574	25333
U20	FILTER ROM	98328
U21	DSP ROM	98327
U22	ADSP2101	25330
U23	74HC573	25158

ID	Description	Part No.
U24	74HC573	25158
U25	XC7236A	25359
U26	74HC573	25158
U27	74HC573	25158
Y1	22.1184 XTAL	48201
Y2	20 mHz XTAL	48180
SW1	8 POS DIP SW	32107
SW2	8 POS DIP SW	32107

Part No. 74249
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