

Instruction Booklet

MODEL 20-1100 SERIES
PREDETECTION UP CONVERTERS

July 1974

TRADE SECRETS

The information contained in/on this document constitutes trade secrets of Microdyne Corporation and, therefore, the user of this information covenants and agrees that he/it will not, nor will he/it cause others to copy or reproduce said information, either in whole or in part, or manufacture, produce, sell or lease any product copied from or essentially based upon the information contained herein without prior written approval of Microdyne Corporation.

MICRODYNE
Corporation

POST OFFICE BOX 1527 ROCKVILLE, MD. 20850
Telephone (301) 762-8500

MODEL 20-1100 SERIES PREDETECTION UP CONVERTERS

GENERAL

The Model 20-1100 Series Predetection Up Converters consist of seven modules designed primarily for use in the Model 1100-R/1100-AR Telemetry Receivers. The modules function to up convert a video record carrier frequency to 50 MHz for injection into the receiver first IF signal path. Six of the modules are employed to up convert video carrier signals to 6.8 MHz; each of the six modules accepts a specific input frequency for conversion to 6.8 MHz. The seventh module converts the 6.8 MHz signal to 50 MHz. For complete predetection playback operation, the receiver must be equipped with the 6.8 MHz to 50 MHz converter and the applicable video to 6.8 MHz converter. Selection of the video up converter is dependent upon the video carrier input. Model numbers and the corresponding input frequencies are given below:

<u>Model</u>	<u>Input</u>
20-1100 (112.5)	112.5 kHz
20-1100 (225)	225 kHz
20-1100 (450)	450 kHz
20-1100 (600)	600 kHz
20-1100 (800)	800 kHz
20-1100 (900)	900 kHz

The specifications for the 20-1100 series converters are given in table 1.

Table 1. Specifications

Input Impedance	50 ohms.
Input Level	1 to 10V p-p.
Output Center Frequency	50 MHz.
Local Oscillator Rejection	40 dB minimum.
Image Rejection	30 dB minimum.
Local Oscillator Stability	±0.005%.
Data Bandwidth (±1 dB):	
20-1100 (112.5)	150 kHz
20-1100 (225)	300 kHz
20-1100 (450)	600 kHz
20-1100 (600)	800 kHz
20-1100 (800)	1400 kHz
20-1100 (900)	1200 kHz.

INSTALLATION

The units are plugged into parent unit spaces which have been prewired for them and must be installed in the correct sequence. For example, in the 1100-R series telemetry receivers, the video to 6.8 MHz converter must be installed in A18A and the 6.8 MHz to 50 MHz converter must be installed in A18B. The modules are held in place in the receivers by module retaining clips.

OPERATION

There are no operating procedures applicable to the 20-1100 series converters.

THEORY OF OPERATION

The following description is divided into two parts: that for the video to 6.8 MHz converters, and that for the 6.8 to 50 MHz converter. Refer to figures 3 and 4 during the following discussions.

VIDEO TO 6.8 MHz CONVERTERS. There are six video to 6.8 MHz converters in the 20-1100 series, each of which converts a specific video record carrier to a 6.8 MHz carrier. Since the modules operate in an identical manner, the following circuit description is applicable to all. Figure 3 is a schematic diagram of the 900 kHz to 6.8 MHz converter and is typical of the remaining five modules.

Each module is composed of input amplifier Q7, video amplifier and AGC detector A1, AGC element Q1, video amplifier Q5-Q6, mixer A2, local oscillator Q2, oscillator control circuit Q3, oscillator amplifier Q4, and output elliptic function filter L13-L14-L15. See figure 3.

The video carrier input from the recording device is applied through P1-A3, attenuated by approximately 30 dB, and coupled to amplifier Q7 which, in turn, drives video amplifier/AGC detector A1. The input signal is applied to pin 9 of A1 and fed through a Darlington pair to the element output at pin 1. From pin 1, the video signal is applied to pin B of the mixer via a two-stage video driver circuit composed of Q5 and Q6.

A sample of the signal, appearing at the collectors of the Darlington pair, is fed to the AGC detector portion of A1. The DC output of this circuit is taken from pin 8 and applied to the AGC element Q1. This transistor functions as a variable resistance with the AGC control applied to the gate. As the input signal level increases, so does the positive AGC from A1 which decreases the source/drain resistance of Q1 causing a larger portion of applied signal to be shunted out of the signal path. Control of the input signal level is necessary to maintain a -5 dBm input to the mixer for proper rejection of undesired signals in the passband.

In the mixer, the video signal from Q6 is heterodyned with an input from the local oscillator to produce a 6.8 MHz output. This signal is filtered by a lowpass, elliptic function filter composed of L13, L14, L15, and associated components. The cutoff frequency of this filter is

dependent upon the data bandwidth associated with each video carrier input. These cutoff frequencies for the six standard up converters are:

<u>Module (input)</u>	<u>Cutoff</u>
20-1100 (112.5)	6.875 MHz
20-1100 (225)	6.950 MHz
20-1100 (450)	7.100 MHz
20-1100 (900)	7.400 MHz
20-1100 (600)	7.200 MHz
20-1100 (800)	7.500 MHz

The output from the elliptic filter is coupled through a 200 to 50 ohms impedance matching network (L7-C30-C31) to the module output at P1-A1. The output level at P1-A1 is approximately -33 dBm.

The local oscillator signal applied to pin A of the mixer is generated by oscillator Q2. This stage is energized when the parent unit operate mode switch is set to the PBK (playback) position and supplies a crystal-controlled output ranging from 6.9225 MHz to 7.7 MHz depending on the module provided. In order to generate an extremely constant output, the current flow through Q2 is controlled by Q3 which functions as a variable resistance. Thus, the gain of Q2 is controlled by utilizing the output signal level to either increase or decrease the resistance of Q3. Output from the oscillator is amplified by Q4 and applied to the mixer at a level of +2 dBm.

6.8 to 50 MHz CONVERTER. The 6.8 to 50 MHz converter consists of amplifier A1, mixer A2, amplifier Q1, and oscillator Q2. See figure 4.

The 6.8 MHz input from the companion video to 6.8 MHz up converter is coupled through P1-A1 to amplifier A1. In A1, the signal is amplified to a level of -3 dBm and coupled to pin A of mixer A2. Inductors L1 and L3 form a double-tuned circuit centered at 6.8 MHz for one of the amplifier stages in A1.

In the mixer, the 6.8 MHz video carrier input is heterodyned with a 56.8 MHz local oscillator signal generated by Q2. This signal is coupled to pin W of A2 at +2 dBm via amplifier Q1. The resultant 50 MHz output of the mixer is coupled through a filter to the module output at P1-A3 at a level of approximately -13 dBm.

MAINTENANCE

No preventive maintenance procedures are applicable to the 20-1100 series up converters. When a malfunction occurs, the problem should first be isolated to either the video converter or 6.8 to 50 MHz converter. Once the defective module is determined, the malfunctioning stage within that module should be isolated. This may be accomplished using normal signal injection and signal tracing methods. Voltage charts are provided in tables 2 and 3 to aid in isolating defective components. The location of components on the printed circuit cards contained within the module housings are shown in figures 1 and 2.

Table 2. Video to 6.8 MHz Converter DC Voltages

<u>Device</u>	<u>D</u>	<u>S</u>	<u>G</u>									
Q1	0V	1	- 2.4 V									
	<u>E</u>	<u>B</u>	<u>C</u>									
Q2	-14 mV	- 0.4 V	+ 14.0 V									
Q3	0 V	+ 37 mV	- 1.1 V									
Q4	-10.2 V	- 10.8 V	-300 mV									
Q5	- 2.0 V	- 1.4 V	+ 9.7 V									
Q6	+ 9.0 V	+ 9.6 V	+ 14.6 V									
Q7	- 0.85 V	-230 mV	+ 9.5 V									
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
A1	-1.4V	-0.6V	0V	0V	+10.4V	+0.68V	0V	+30 mV	0V	-15.0V	+3.6V	+3.6V

Table 3. 6.8 MHz to 50 MHz Converter DC Voltages

<u>Device</u>	<u>D</u>	<u>S</u>	<u>G</u>							
Q1	-6.4 V	-7.1 V	+ 4.8 V							
Q2	-0.1 V	-0.2 V	+12.5 V							
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
A1	+8.8V	+9.5V	+12.2V	+11.4V	+14.1V	+5.1V	+4.4V	+11.4V	-10.0V	+15.0V

ALIGNMENT

The following procedures are recommended for realigning the various modules in the 20-1100 series converters. Because of the interaction between modules, both the video to 6.8 MHz and the 6.8 to 50 MHz modules must be aligned together. To properly perform the alignment, the following equipment should be employed:

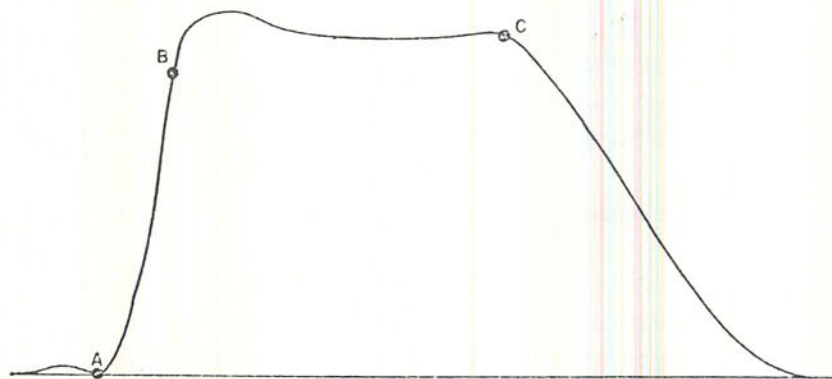
Extender Modules	300-355
Sweep Generator	Texscan VS-80
Signal Generator	HP651A
Oscilloscope	HP1200A
VTVM	HP414A
Spectrum Analyzer	HP8551B

OSCILLATOR ADJUSTMENT. The oscillators of both modules are adjusted in an identical manner. If the oscillator in either module has been repaired, it is only necessary to adjust that stage. Do not adjust the tuned circuits unless absolutely necessary.

- a. Remove the cover and install the module into the receiver using the extender module.
- b. Connect the HP414A to the emitter of the oscillator transistor.
- c. Adjust the oscillator coil for a meter null.
- d. Disconnect the meter.

TUNED CIRCUIT ADJUSTMENT.

- a. Remove the covers and install the modules into the receiver using the extender modules.
- b. Connect the RF output of the VS-80 sweep generator to TP1 on the video converter.
- c. Connect the output of the 6.8 to 50 MHz converter to the VIDEO IN connector of the VS-80.
- d. Connect the vertical and horizontal outputs of the VS-80 to the corresponding inputs of the oscilloscope.
- e. Set the VS-80 for a 6.8 MHz output.
- f. Adjust the VS-80 output level and the oscilloscope controls for a convenient display.
- g. Adjust coils L13, L14, and L15 on the video converter, and coils L1, L3, L6, L7, L8, and L9 on the 50 MHz converter for the response depicted below. The frequencies of the three reference points are dependent on the video module installed and are listed beneath the illustration.



Converter	A	B	C
112.5 kHz	6.91 MHz	6.837 MHz	6.762 MHz
225 kHz	7.02 MHz	6.95 MHz	6.65 MHz
450 kHz	7.250 MHz	7.1 MHz	6.5 MHz
600 kHz	7.4 MHz	7.2 MHz	6.4 MHz
800 kHz	7.6 MHz	7.5 MHz	6.2 MHz
900 kHz	7.7 MHz	7.3 MHz	6.2 MHz

- h. Disconnect the sweep generator and oscilloscope.
- i. Connect the output of the HP651A to the input of the video converter. This connection can be made using the receiver rear apron video input.
- j. Connect the input of the spectrum analyzer to the output of the 50 MHz converter.
- k. Set the HP651A for an output frequency corresponding to the low end frequency of the data bandwidth. For example, the 20.1100 (900) data bandwidth is 1200 kHz or ± 600 kHz on either side of the 900 kHz center frequency. Subtracting 600 kHz from 900 kHz, the low end frequency is 300 kHz. Set the output level of the HP651A to 2V RMS.
- l. Note the amplitude of the main signal compared to the amplitude of the adjacent responses. The spurious response should be at least 35 dB below the main signal amplitude.
- m. Vary the frequency of the HP651A over the data bandwidth and note that all spurious responses remain 35 dB down.
- n. Reset the generator to the low end frequency.
- o. Vary the input level from 0.35V RMS to 3.1 RMS, and note that the main signal spike varies less than 2 dB.
- p. Disconnect all test equipment and replace the cover.

REPLACEMENT PARTS LIST

6.8 - 50 MHz CONVERTER

<u>Reference Designation</u>	<u>Description</u>
A1	Integrated Circuit, RCA CA3018A
A2	Mixer, Lorch FC-200R
C1	Capacitor, ceramic, 0.01 μ F $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C2	Capacitor, ceramic, 0.01 μ F $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C3	Capacitor, ceramic, 56 pF $\pm 5\%$, 100V, Erie 8131-100-COG-560J
C4 thru C6	Capacitor, ceramic, 0.01 μ F $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C7	Capacitor, ceramic, 39 pF $\pm 5\%$, 100V, Erie 8121-100-COG-390J
C8	Capacitor, ceramic, 0.01 μ F $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C9	Capacitor, ceramic, 47 pF $\pm 5\%$, 100V, Erie 8131-100-COG-470J
C10	Capacitor, ceramic, 47 pF $\pm 5\%$, 100V, Erie 8131-100-COG-470J
C11	Capacitor, ceramic, 0.01 μ F $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C12	Capacitor, ceramic, 110 pF $\pm 5\%$, 100V, Erie 8121-100-COG-111J
C13	Capacitor, ceramic, 33 pF $\pm 5\%$, 100V, Erie 8121-100-COG-330J

Replacement Parts List - 6.8 - 50 MHz Converter, continued

<u>Reference Designation</u>	<u>Description</u>
C14	Capacitor, ceramic, 33 pF $\pm 5\%$, 100V, Erie 8121-100-COG-330J
C15	Capacitor, ceramic, 6.8 pF ± 0.25 pF, 100V, Erie 8101-100-COG-689C
C16	Capacitor, ceramic, 33 pF $\pm 5\%$, 100V, Erie 8121-100-COG-330J
C17	Capacitor, ceramic, 33 pF $\pm 5\%$, 100V, Erie 8121-100-COG-330J
C18	Capacitor, ceramic, 4.7 pF ± 0.25 pF, 100V, Erie 8101-100-COG-479C
C19	Capacitor, ceramic, 33 pF $\pm 5\%$, 100V, Erie 8121-100-COG-330J
C20	Capacitor, ceramic, 33 pF $\pm 5\%$, 100V, Erie 8121-100-COG-330J
C21	Capacitor, ceramic, 6.8 pF ± 0.25 pF, 100V, Erie 8101-100-COG-689C
C22	Capacitor, ceramic, 110 pF $\pm 5\%$, 100V, Erie 8121-100-COG-111J
C23	Capacitor, ceramic, 0.001 μ F $\pm 20\%$, 100V, Erie 8111-100-X5R-102M
C24	Capacitor, ceramic, 0.001 μ F $\pm 20\%$, 100V, Erie 8111-100-X5R-102M
C25	Capacitor, ceramic, 68 pF $\pm 5\%$, 100V, Erie 8131-100-COG-680J
C26	
thru C28	Capacitor, ceramic, 0.001 μ F $\pm 20\%$, 100V, Erie 8111-100-X5R-102M
C29	Not Assigned
C30	Capacitor, ceramic, 62 pF $\pm 5\%$, 100V, Erie 8131-100-COG-620J
C31	
thru C35	Capacitor, ceramic, 0.001 μ F $\pm 20\%$, 100V, Erie 8111-100-X5R-102M
C36	Capacitor, ceramic, 13 pF $\pm 5\%$, 100V, Erie 8111-100-COG-130J
C37	Capacitor, ceramic, 13 pF $\pm 5\%$, 100V, Erie 8111-100-COG-130J
L1	Inductor, 10 μ H, Cambion 7107-25
L2	Inductor, 120 μ H, Jeffers 1315-14J
L3	Inductor, 10 μ H, Cambion 7107-25
L4	Inductor, 27 μ H, Jeffers 4455-2J
L5	Inductor, 20 μ H, Jeffers 4445-6J
L6	Inductor, 0.33 μ H, Cambion 7107-1
L7	Inductor, 0.47 μ H, Cambion 7107-09
L8	Inductor, 0.47 μ H, Cambion 7107-09
L9	Inductor, 0.33 μ H, Cambion 7107-07
L10	Inductor, 6.8 μ H, Jeffers 4435-2K
L11	Inductor, 0.56 μ H, Jeffers 4425-3K
L12	Inductor, 6.8 μ H, Jeffers 4435-2K
L13	Inductor, 0.15 μ H, Jeffers 4415-1M
L14	Inductor, 0.47 μ H, Cambion 7107-09
L15	Inductor, 6.8 μ H, Jeffers 4435-2K
L16	Inductor, 6.8 μ H, Jeffers 4435-2K
Q1	Transistor, npn, RCA 2N5181
Q2	Transistor, npn, RCA 2N5182

Replacement Parts List - 6.8 - 50 MHz Converter, continued

<u>Reference Designation</u>	<u>Description</u>
P1	Connector, Cannon DBM-13W3P
R1	Resistor, fixed composition, 5.1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5125
R2	Resistor, fixed composition, 1.8K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1825
R3	Resistor, fixed composition, 7.5K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB7525
R4	Resistor, fixed composition, 2.7K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB2725
R5	Resistor, fixed composition, 10 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CE1005
R6	Resistor, fixed composition, 510 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5115
R7	Resistor, fixed composition, 100 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1015
R8	Resistor, fixed composition, 20K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB2035
R9	Resistor, fixed composition, 10K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1035
R10	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R11	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R12	Resistor, fixed composition, 39 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3905
R13	Resistor, fixed composition, 51 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5105
R14	Not Assigned
R15	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R16	Resistor, fixed composition, 11 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1105
R17	Resistor, fixed composition, 6.2K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB6225
R18	Resistor, fixed composition, 9.1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB9125
R19	Resistor, fixed composition, 330 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3315
R20	Resistor, fixed composition, 620 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB6215
R21	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CE1025
R22	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R23	Resistor, fixed composition, 4.3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB4325
R24	Resistor, fixed composition, 1.2K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1225
Y1	Crystal, 56.8 MHz, Piezo CR-76A/U

900 kHz UP CONVERTER

<u>Reference Designation</u>	<u>Description</u>
A1	Integrated Circuit, RCA CA3018A
A2	Mixer, Lorch FC-200R
C1	Capacitor, ceramic, 0.22 μ F \pm 20%, Erie 8133-000-250-224M
C2	Capacitor, ceramic, 0.22 μ F \pm 20%, Erie 8133-000-250-224M
C3	Capacitor, ceramic, 1.0 μ F, 35V, Sprague 150D105X9035A2
C4	
thru	Capacitor, ceramic, 0.01 μ F \pm 20%, 100V, Erie 8121-100-X5V-103M
C7	

Replacement Parts List - 900 kHz Up Converter, continued

<u>Reference Designation</u>	<u>Description</u>
C8	Capacitor, ceramic, 180 pF $\pm 5\%$, 100V, Erie 8121-100-COG-181J
C9	Capacitor, ceramic, 18 pF $\pm 5\%$, 100V, Erie 8111-100-COG-180J
C10	Capacitor, ceramic, 390 pF $\pm 5\%$, 100V, Erie 8121-100-COG-391J
C11	
thru C14	Capacitor, ceramic, 0.01 μF $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C15	Capacitor, ceramic, 0.22 μF $\pm 20\%$, Erie 8133-000-250-224M
C16	Capacitor, ceramic, 0.22 μF $\pm 20\%$, Erie 8133-000-250-224M
C17	Capacitor, ceramic, 51 pF $\pm 5\%$, 100V, Erie 8131-100-COG-510J
C18	Capacitor, ceramic, 0.22 μF $\pm 20\%$, Erie 8133-000-250-224M
C19	Capacitor, ceramic, 0.01 μF $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C20	Capacitor, tantalum, 47 μF , 20V, Kemet T362C476M020AS
C21	Capacitor, ceramic, 0.01 μF $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C22	Capacitor, ceramic, 0.01 μF $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C23	Capacitor, ceramic, 2 pF ± 0.1 pF, 100V, Erie 8101-100-COG-209B
C24	Capacitor, ceramic, 0.01 μF $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C25	Not Assigned
C26	Not Assigned
C27	Not Assigned
C28	Not Assigned
C29	Capacitor, ceramic, 0.01 μF $\pm 20\%$, 100V, Erie 8121-100-X5V-103M
C30	Capacitor, ceramic, 270 pF $\pm 5\%$, 100V, Erie 8121-100-COG-271J
C31	Capacitor, ceramic, 130 pF $\pm 5\%$, 100V, Erie 8121-100-COG-131J
C32	Not Assigned
C33	Capacitor, tantalum, 47 μF , 20V, Kemet T362C476M020AS
C34	Not Assigned
C35	Capacitor, ceramic, 0.22 μF $\pm 20\%$, Erie 8133-000-250-224M
C36	Capacitor, ceramic, 0.22 μF $\pm 20\%$, Erie 8133-000-250-224M
C37	Capacitor, tantalum, 10 μF , 20V, Kemet T362B106M020AS
C38	Capacitor, ceramic, 360 pF $\pm 5\%$, 100V, Erie 8121-100-COG-361J
C39	Capacitor, ceramic, 300 pF $\pm 5\%$, 100V, Erie 8121-100-COG-301J
C40	Capacitor, ceramic, 220 pF $\pm 5\%$, 100V, Erie 8121-100-COG-201J
C41	Capacitor, ceramic, 56 pF $\pm 5\%$, 100V, Erie 8131-100-COG-560J
C42	Capacitor, ceramic, 82 pF $\pm 5\%$, 100V, Erie 8131-100-COG-820J
C43	Capacitor, ceramic, 100 pF $\pm 5\%$, 100V, Erie 8131-100-COG-101J
C44	Capacitor, ceramic, 430 pF $\pm 5\%$, 100V, Erie 8121-100-COG-431J
L1	Inductor, 120 μH , Jeffers 1315-14J
L2	Inductor, 120 μH , Jeffers 1315-14J
L3	Inductor, 120 μH , Jeffers 1315-14J
L4	Inductor, 0.56 μH , Jeffers 4425-3K
L5	Inductor, 2.2 μH , Cambion 7107-17
L6	Inductor, 120 μH , Jeffers 1315-14J

Replacement Parts List - 900 kHz Up Converter, continued

<u>Reference Designation</u>	<u>Description</u>
L7	Inductor, 3.3 μ H, Jeffers 4425-12K
L8	Not Assigned
L9	Not Assigned
L10	Not Assigned
L11	Not Assigned
L12	Inductor, 4.7 μ H, Jeffers 4425-14K
L13	Inductor, 1.5 μ H, Coil Craft Q21.5
L14	Inductor, 2.7 μ H, Coil Craft Q22.7
L15	Inductor, 1.8 μ H, Coil Craft Q21.8
Q1	Transistor, FET, Union Carbide 2N4416
Q2	Transistor, npn, RCA 2N5182
Q3	Transistor, pnp, Motorola 2N3251
Q4	Transistor, npn, RCA 2N5181
Q5	Transistor, npn, Motorola 2N3947
Q6	Transistor, npn, Motorola 2N3947
Q7	Transistor, npn, Sprague 2N4384
P1	Connector, Cannon DBM-13W3P
R1	Resistor, fixed composition, 75 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB7505
R2	Resistor, fixed composition, 1.3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1325
R3	Resistor, fixed composition, 51 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5105
R4	Resistor, fixed composition, 5.1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5125
R5	Resistor, fixed composition, 510K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5145
R6	Resistor, fixed composition, 10K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1035
R7	Resistor, fixed composition, 100K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1045
R8	Resistor, fixed composition, 51K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5135
R9	Resistor, fixed composition, 51K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5135
R10	Resistor, fixed composition, 200 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB2015
R11	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R12	Resistor, fixed composition, 100K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1045
R13	Resistor, fixed composition, 100K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1045
R14	Resistor, fixed composition, 56K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5635
R15	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R16	Resistor, fixed composition, 11 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1105
R17	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R18	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R19	Resistor, fixed composition, 4.3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB4325
R20	Resistor, fixed composition, 3.3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3325
R21	Resistor, fixed composition, 33 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3305
R22	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R23	Resistor, fixed composition, 6.2K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB6225

Replacement Parts List - 900 kHz Up Converter, continued

<u>Reference Designation</u>	<u>Description</u>
R24	Resistor, fixed composition, $3K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CE3025
R25	Resistor, fixed composition, $3.9K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB3925
R26	Resistor, fixed composition, $11\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1105
R27	Resistor, fixed composition, $1K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1025
R28	Resistor, fixed composition, $1.2K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1225
R29	Resistor, fixed composition, $10K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CE1035
R30	Resistor, fixed composition, $1K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1025
R31	Resistor, fixed composition, $100\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1015
R32	Resistor, fixed composition, $1K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1025
R33	Resistor, fixed composition, $39\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB3905
R34	Resistor, fixed composition, $2.4K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CE2425
R35	Resistor, fixed composition, $22\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB2205
R36	Resistor, fixed composition, $3K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB3025
R37	Resistor, fixed composition, $120\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1215
R38	Resistor, fixed composition, $75\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB7505
R39	Resistor, fixed composition, $51\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB5105
R40	Resistor, fixed composition, $150\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1515
R41	Not Assigned
R42	Resistor, fixed composition, $22\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB2205
R43	Resistor, fixed composition, $100\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CE1015
Y1	Crystal, 7.70 MHz, Piezo CR-60/U

450 kHz UP CONVERTER

<u>Reference Designation</u>	<u>Description</u>
A1	Integrated Circuit, RCA CA3018A
A2	Mixer, Lorch FC-200R
C1	Capacitor, ceramic, $0.22 \mu F \pm 20\%$, Erie 8133-000-250-224M
C2	Capacitor, ceramic, $0.22 \mu F \pm 20\%$, Erie 8133-000-250-224M
C3	Capacitor, ceramic, $1.0 \mu F$, 35V, Sprague 150D105X9035A2
C4	
thru C7	Capacitor, ceramic, $0.01 \mu F \pm 20\%$, 100V, Erie 8121-100-X5V-103M
C8	Capacitor, ceramic, $180 pF \pm 5\%$, 100V, Erie 8121-100-COG-181J
C9	Capacitor, ceramic, $18 pF \pm 5\%$, 100V, Erie 8111-100-COG-180J
C10	Capacitor, ceramic, $390 pF \pm 5\%$, 100V, Erie 8121-100-COG-391J
C11	
thru C14	Capacitor, ceramic, $0.01 \mu F \pm 20\%$, 100V, Erie 8121-100-X5V-103M

Replacement Parts List - 450 kHz Up Converter, continued

<u>Reference Designation</u>	<u>Description</u>
C15	Capacitor, ceramic, 0.22 μ F \pm 20%, Erie 8133-000-250-224M
C16	Capacitor, ceramic, 0.22 μ F \pm 20%, Erie 8133-000-250-224M
C17	Capacitor, ceramic, 51 pF \pm 5%, 100V, Erie 8131-100-COG
C18	Capacitor, ceramic, 0.22 μ F \pm 20%, Erie 8133-000-250-224M
C19	Capacitor, ceramic, 0.01 μ F \pm 20%, 100V, Erie 8121-100-X5V-103M
C20	Capacitor, tantalum, 47 μ F, 20V, Kemet T362C476M020AS
C21	Capacitor, ceramic, 0.01 μ F \pm 20%, 100V, Erie 8121-100-X5V-103M
C22	Capacitor, ceramic, 0.01 μ F \pm 20%, 100V, Erie 8121-100-X5V-103M
C23	Capacitor, ceramic, 2 pF \pm 0.1 pF, 100V, Erie 8101-100-COG-209B
C24	Capacitor, ceramic, 0.01 μ F \pm 20%, 100V, Erie 8121-100-X5V-103M
C25	Not Assigned
C26	Not Assigned
C37	Not Assigned
C28	Not Assigned
C29	Capacitor, ceramic, 0.01 μ F \pm 20%, 100V, Erie 8121-100-X5V-103M
C30	Capacitor, ceramic, 270 pF \pm 5%, 100V, Erie 8121-100-COG-271J
C31	Capacitor, ceramic, 130 pF \pm 5%, 100V, Erie 8121-100-COG-121J
C32	Not Assigned
C33	Capacitor, tantalum, 47 μ F, 20V, Kemet T362C476M020AS
C34	Not Assigned
C35	Capacitor, ceramic, 0.22 μ F \pm 20%, Erie 8133-000-250-224M
C36	Capacitor, ceramic, 0.22 μ F \pm 20%, Erie 8133-000-250-224M
C37	Capacitor, tantalum, 10 μ F, 20V, Kemet T362B106M020AS
C38	Capacitor, ceramic, 360 pF \pm 5%, 100V, Erie 8121-100-COG-361J
C39	Capacitor, ceramic, 300 pF \pm 5%, 100V, Erie 8121-100-COG-301J
C40	Capacitor, ceramic, 270 pF \pm 5%, 100V, Erie 8121-100-COG-271J
C41	Capacitor, ceramic, 130 pF \pm 5%, 100V, Erie 8121-100-COG-131J
C42	Capacitor, ceramic, 100 pF \pm 5%, 100V, Erie 8131-100-COG-101J
C43	Capacitor, ceramic, 100 pF \pm 5%, 100V, Erie 8131-100-COG-101J
C44	Capacitor, ceramic, 430 pF \pm 5%, 100V, Erie 8121-100-COG-431J
L1	Inductor, 120 μ H, Jeffers 1315-14J
L2	Inductor, 120 μ H, Jeffers 1315-14J
L3	Inductor, 120 μ H, Jeffers 1315-14J
L4	Inductor, 0.56 μ H, Jeffers 4425-3K
L5	Inductor, 2.2 μ H, Cambion 7107-17
L6	Inductor, 120 μ H, Jeffers 1315-14J
L7	Inductor, 3.3 μ H, Jeffers 4425-12K
L8	Not Assigned
L9	Not Assigned
L10	Not Assigned
L11	Not Assigned
L12	Inductor, 4.7 μ H, Jeffers 4425-14K

Replacement Parts List - 450 kHz Up Converter, continued

<u>Reference Designation</u>	<u>Description</u>
L13	Inductor, 1.5 μ H, Coil Craft Q21.5
L14	Inductor, 2.7 μ H, Coil Craft Q22.7
L15	Inductor, 1.8 μ H, Coil Craft Q21.8
Q1	Transistor, FET, Union Carbide 2N4416
Q2	Transistor, npn, RCA 2N5182
Q3	Transistor, pnp, Motorola 2N3251
Q4	Transistor, npn, RCA 2N5181
Q5	Transistor, Motorola 2N3947
Q6	Transistor, Motorola 2N3947
Q7	Transistor, Sprague 2N4383
P1	Connector, Cannon DEM-13W3P
R1	Resistor, fixed composition, 75 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB7505
R2	Resistor, fixed composition, 1.3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1325
R3	Resistor, fixed composition, 51 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5105
R4	Resistor, fixed composition, 5.1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5125
R5	Resistor, fixed composition, 510K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5145
R6	Resistor, fixed composition, 10K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1035
R7	Resistor, fixed composition, 100K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1045
R8	Resistor, fixed composition, 51K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5135
R9	Resistor, fixed composition, 51K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5135
R10	Resistor, fixed composition, 200 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB2015
R11	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R12	Resistor, fixed composition, 100K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1045
R13	Resistor, fixed composition, 100K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1045
R14	Resistor, fixed composition, 56K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB5635
R15	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R16	Resistor, fixed composition, 11 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1105
R17	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R18	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R19	Resistor, fixed composition, 4.3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB4325
R20	Resistor, fixed composition, 3.3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3325
R21	Resistor, fixed composition, 33 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3305
R22	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R23	Resistor, fixed composition, 6.2K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB6225
R24	Resistor, fixed composition, 3K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3025
R25	Resistor, fixed composition, 3.9K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB3925
R26	Resistor, fixed composition, 24 Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB2405
R27	Resistor, fixed composition, 1K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1025
R28	Resistor, fixed composition, 1.2K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1225
R29	Resistor, fixed composition, 10K Ω \pm 5%, $\frac{1}{4}$ w, Allen Bradley CB1035

Replacement Parts List - 450 kHz Up Converter, continued

<u>Reference Designation</u>	<u>Description</u>
R30	Resistor, fixed composition, $1K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1025
R31	Resistor, fixed composition, $100\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1015
R32	Resistor, fixed composition, $1K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1025
R33	Resistor, fixed composition, $39\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB3905
R34	Resistor, fixed composition, $2.4K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB2425
R35	Resistor, fixed composition, $22\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB2205
R36	Resistor, fixed composition, $3K\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB3025
R37	Resistor, fixed composition, $120\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1215
R38	Resistor, fixed composition, $75\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB7505
R39	Resistor, fixed composition, $51\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB5105
R40	Resistor, fixed composition, $150\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1515
R41	Not Assigned
R42	Resistor, fixed composition, $22\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB2205
R43	Resistor, fixed composition, $100\Omega \pm 5\%$, $\frac{1}{4}w$, Allen Bradley CB1015
Y1	Crystal, 7.250 MHz, Piezo CR-60/U

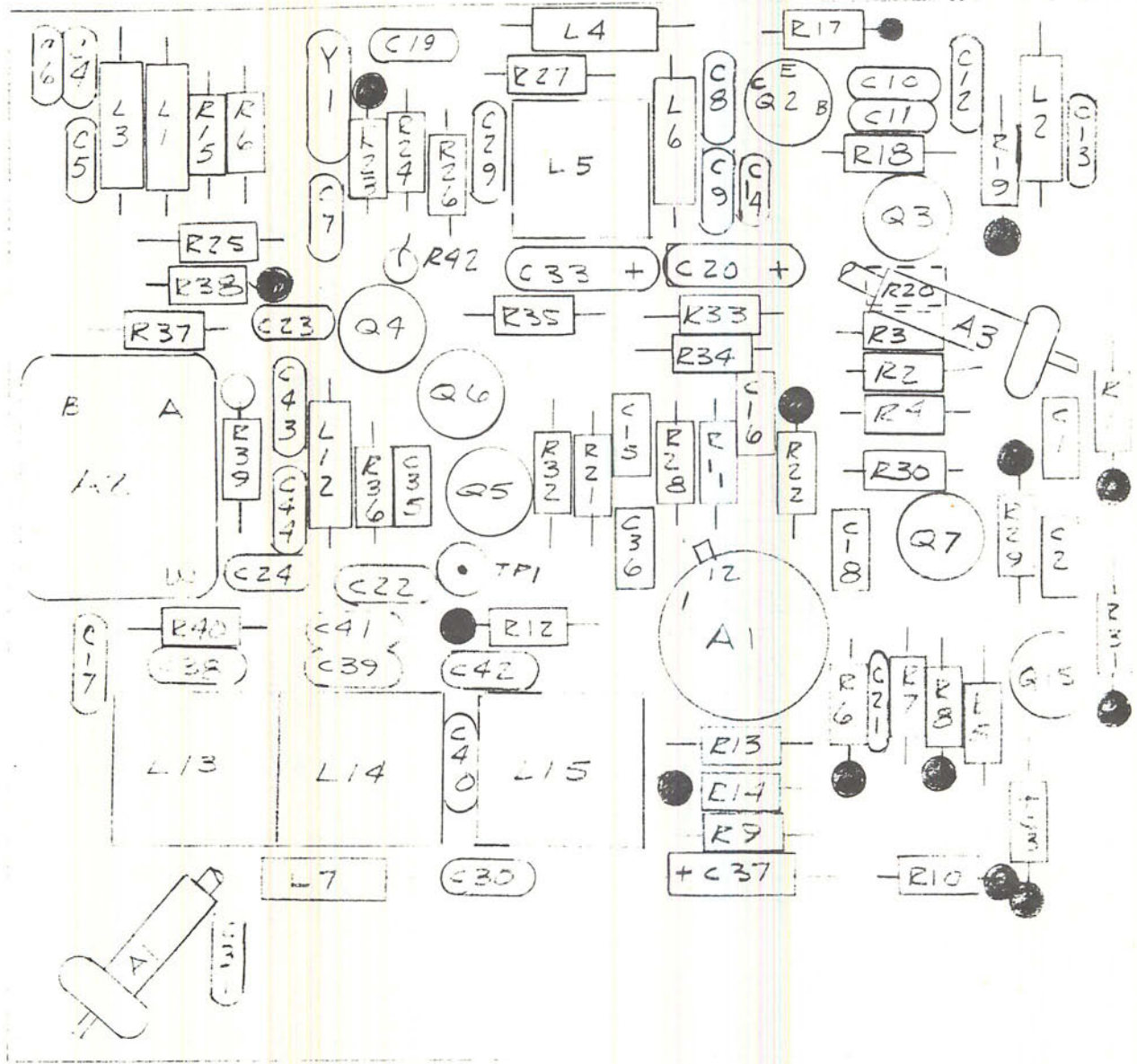


Figure 1. Video to 6.8 MHz Up Converter, Component Location (Typical)

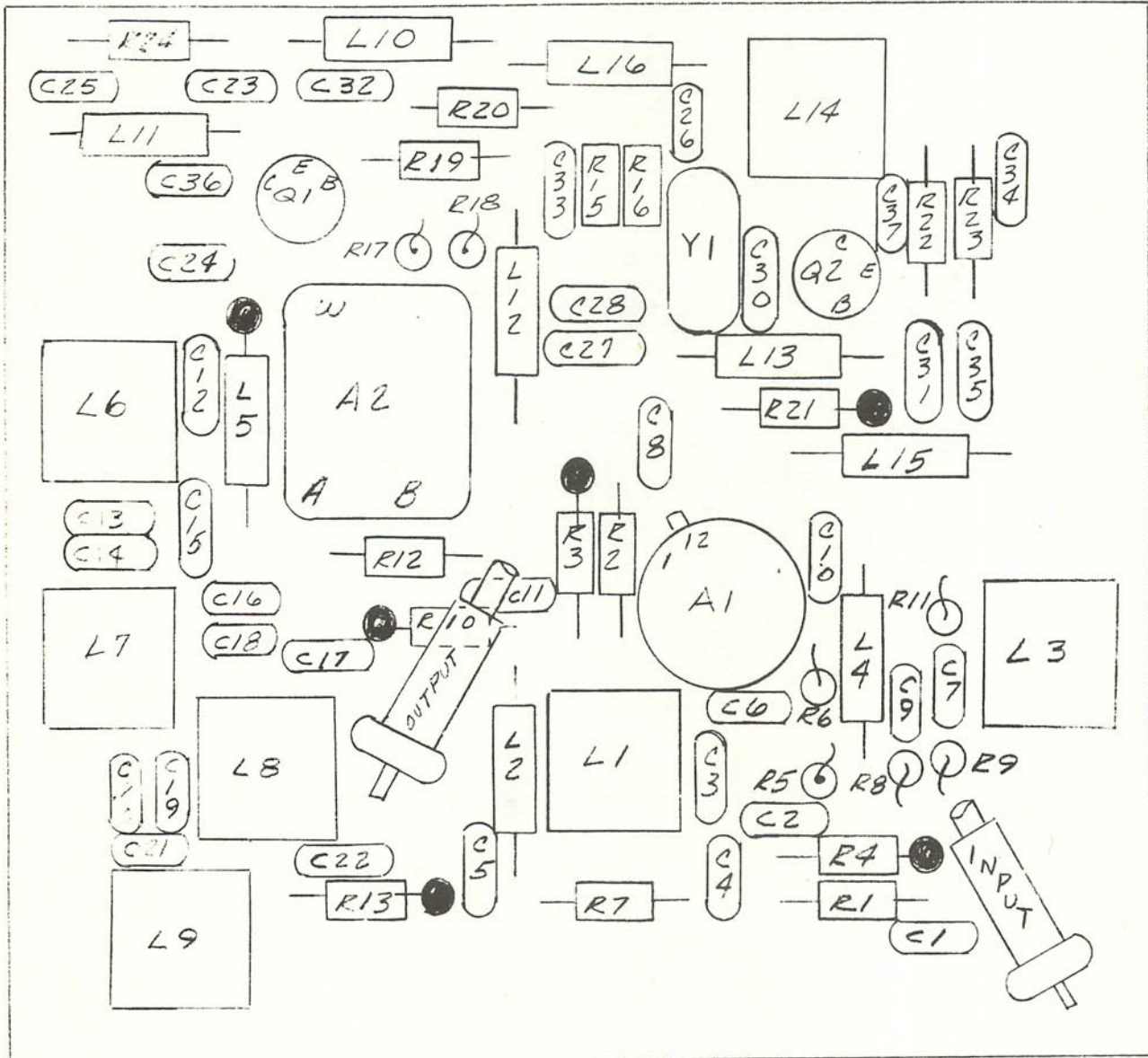


Figure 2. 6.8 to 50 MHz Up Converter, Component Location

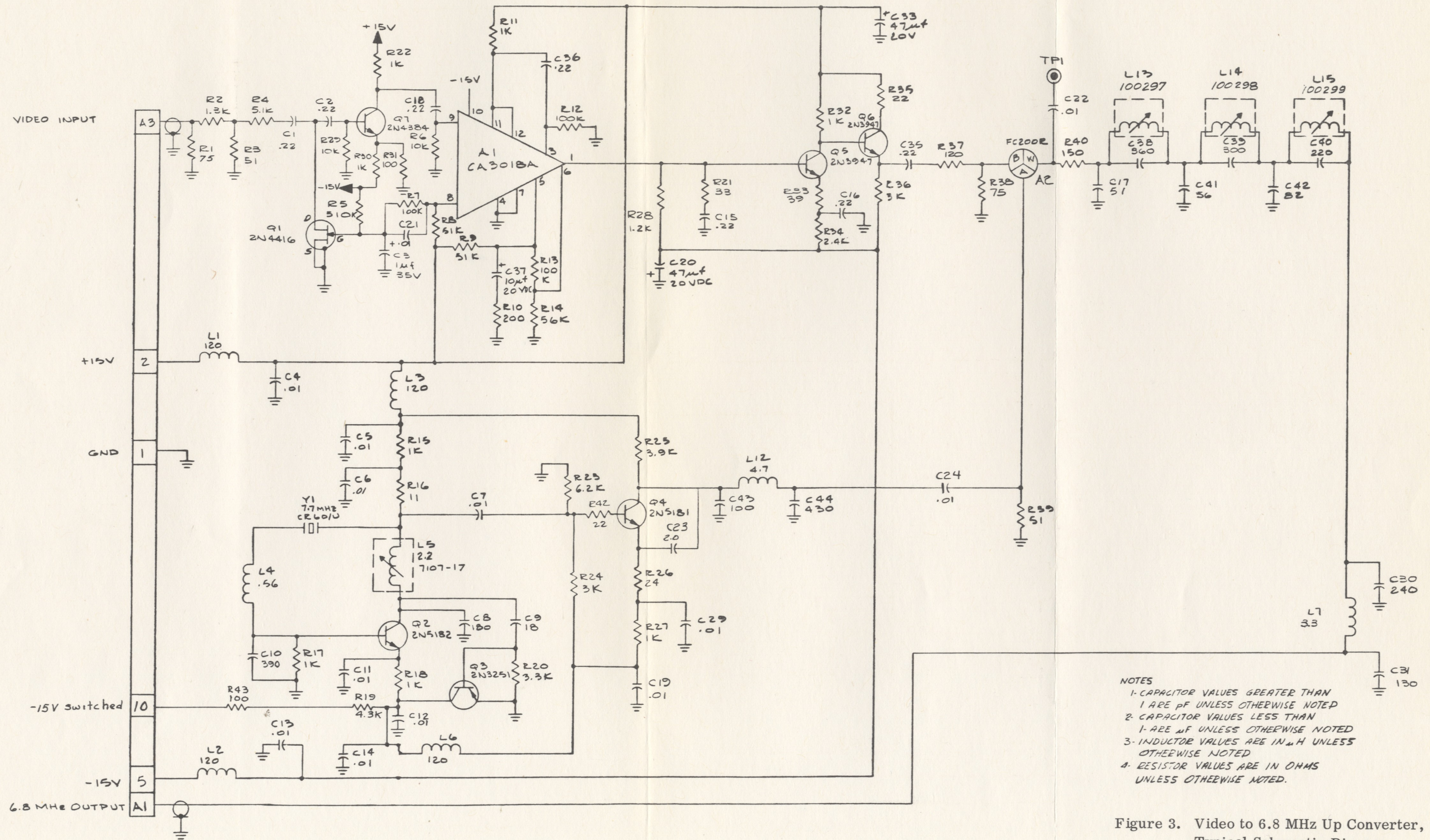
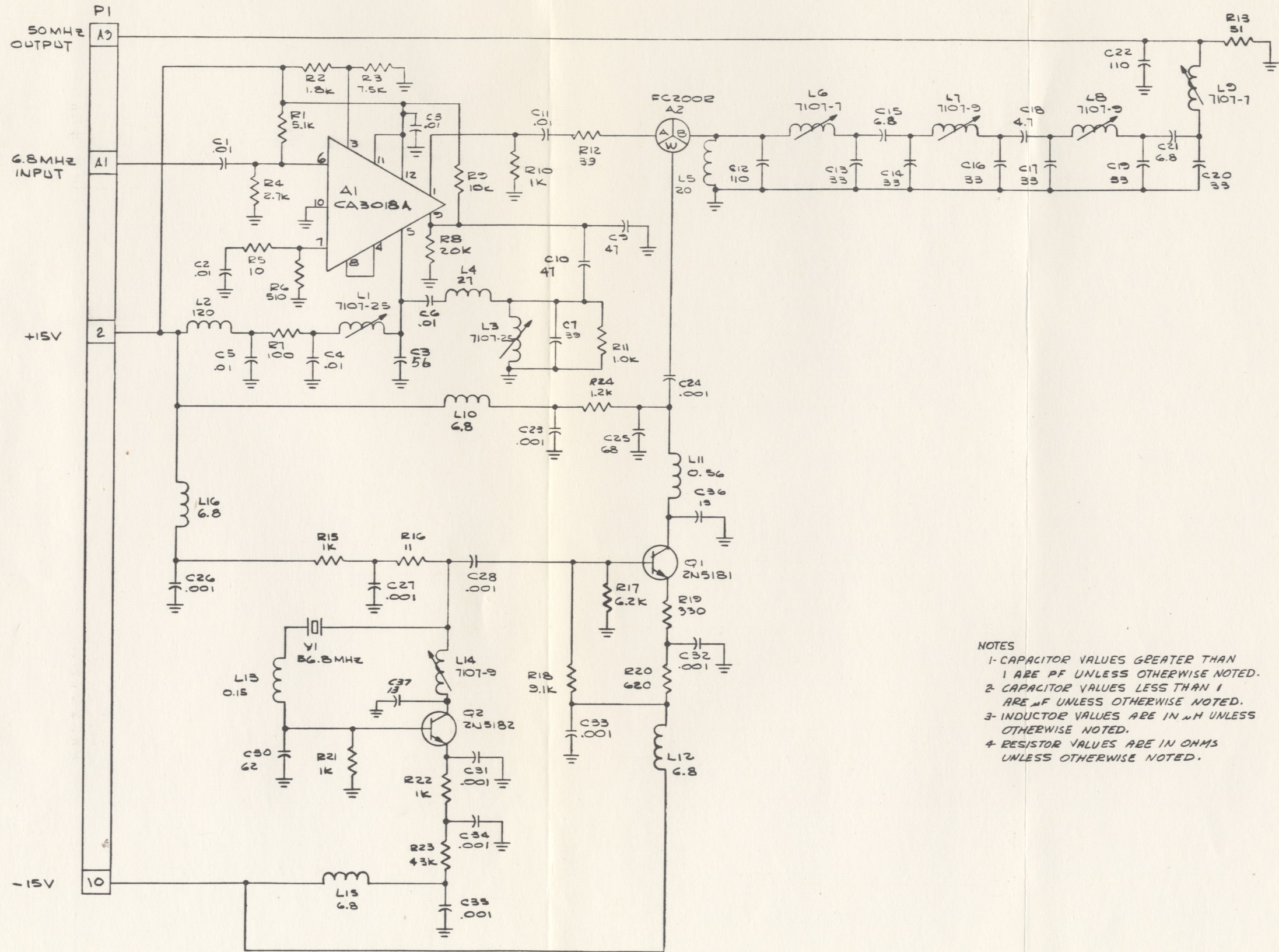


Figure 3. Video to 6.8 MHz Up Converter, Typical Schematic Diagram



NOTES
 1- CAPACITOR VALUES GREATER THAN 1 ARE PF UNLESS OTHERWISE NOTED.
 2- CAPACITOR VALUES LESS THAN 1 ARE μ F UNLESS OTHERWISE NOTED.
 3- INDUCTOR VALUES ARE IN μ H UNLESS OTHERWISE NOTED.
 4- RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

Figure 4. 6.8 MHz to 50 MHz Up Converter, Schematic Diagram 400-252