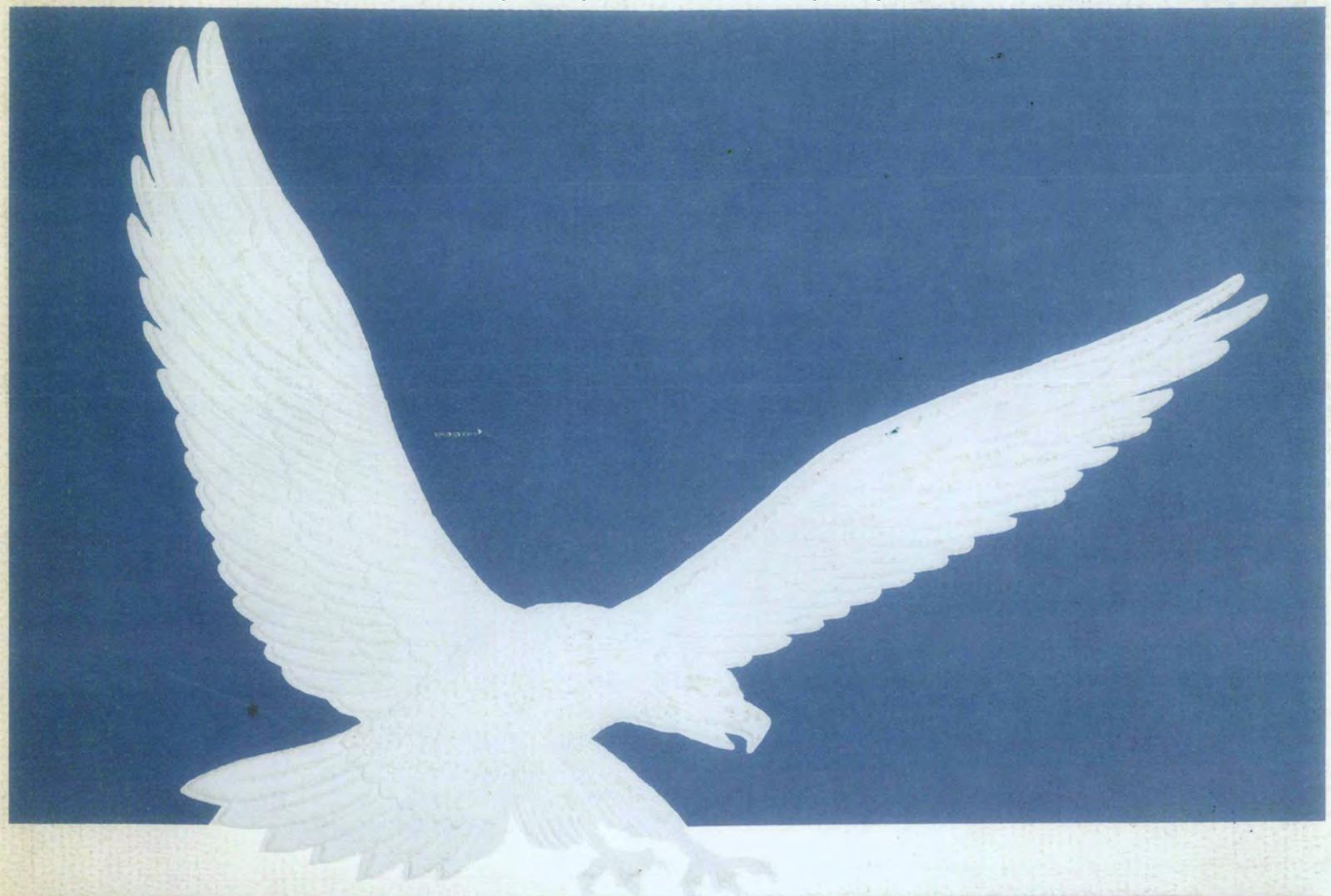

INSTRUCTION MANUAL

MODEL DNC-301

PREDETECTION DOWN CONVERTER

AND

MODEL UPC-301

PREDETECTION UP CONVERTER

DEI

PRODUCERS OF NEMS CLARKE EQUIPMENT

48867

NEMS CLARKE
EQUIPMENT

INSTRUCTION MANUAL

●

MODEL DNC-301

PREDETECTION DOWN CONVERTER

AND

MODEL UPC-301

PREDETECTION UP CONVERTER

May 1966

Defense Electronics, Inc.
PRODUCERS OF
DEI AND NEMS-CLARKE
EQUIPMENT

DEI
RESEARCH
DEVELOPMENT
MANUFACTURING

Rockville, Maryland 20854

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SCHEMATIC DIAGRAM

Change: R21 Resistor, from 180Ω, to 150Ω
R22 Resistor, from 100Ω to 75Ω

Model: UPC-301	Date: 10 April 1968

SECTION 1. GENERAL INFORMATION

1.1 Introduction.

The predetection down converter DNC-301 and the predetection up converter UPC-301 are designed for installation in the R-1037, R-2074 and the R-1070 series multirange telemetry receivers.

The predetection down converter is used to convert the IF signal of the receiver to a frequency suitable for recording on magnetic tape. The predetection up converter is used to reconnect the tape recorded signal to the original receiver IF for playback demodulation.

1.2 Electrical Characteristics.

The electrical characteristics for the down converter DNC-301 and the up converter UPC-301 are listed in table 1-1 and table 1-2, respectively.

TABLE 1-1. ELECTRICAL CHARACTERISTICS FOR PREDETECTION DOWN CONVERTER DNC-301

Input Center Frequency	Same as second IF frequency of associated receiver
Input Impedance	50 ohms resistive
Input Level	100 mv maximum, approximately 30 mv required for 1 volt rms output
Output Center Frequency	112.5 kc to 4.0 mc determined by crystal accessible through top of module
Output Impedance	75 ohms
Output Level	1 volt rms into 75 ohms
Frequency Response	37.5 kc to 4.75 mc, ±2 db for any 1.5 mc segment
Envelope Distortion	Less than 3% at 1 volt rms output
Spurious Output (Including LO and Input Signal)	Greater than 30 db down at 1 volt rms output
Environmental	0°C to 60°C. 0 to 90% relative humidity. Vibration exceeds requirements of MIL-STD-167
Power Requirements	+12.5 vdc @75 ma and -12.5 vdc @75 ma

TABLE 1-2. ELECTRICAL CHARACTERISTICS FOR PREDETECTION UP-CONVERTER UPC-301

Input Center Frequency	112.5 kc to 900 kc determined by plug-in crystal accessible through top of module
Input Impedance	75 ohms resistive
Input Level	0.5 volts peak-to-peak to 10 volts peak-to-peak automatically accommodated by self AGC
Output Center Frequency	10.0 mc, optional 10.035 or 10.7 mc determined by plug-in crystal
Output Impedance	50 ohms resistive
Output Level	100 mv into 50 ohms, less than 2 db change in output for input levels 0.5 v p-p to 10 v p-p
Frequency Response	37.5 kc to 1.5 mc ±2 db
Spurious Output (Including LO and Input Signal)	Greater than 30 db down when used with Receiver (Demodulator) with bandwidth not greater than 1-1/3 times input center frequency
Power Requirements	+12.5 vdc @ 75 ma and -12.5 vdc @ 75 ma
Environmental	0°C to 60°C. 0 to 90% relative humidity. Vibration exceeds requirements of MIL-STD-167
Low Frequency AM Rejection	10 db AM rejection for frequency 250 cps or lower, 30% AM, AGC operating

SECTION 2. THEORY OF OPERATION

2.1 General.

This section describes the theory of operation of the DNC-301 down converter and the UPC-301 up converter. These converters can be used in conjunction with the R-1037, R-2074 and R-1070 series multi-range telemetry receivers.

The down converter DNC-301 converts the receiver IF frequency to a frequency suitable for recording on magnetic tape. This is accomplished by mixing the receiver IF with a selected oscillator frequency and then using the difference frequency for the recording operations.

The up converter UPC-301 restores the magnetic tape predetection signals of the receiver to the original receiver IF for playback. This is accomplished by mixing the recorded signals with a selected oscillator frequency to obtain a difference frequency equal to the receiver IF. The restored IF is then returned to the receiver for demodulation.

2.2 Circuit Description of Predetection Down Converter DNC-301.

The down converter DNC-301 is shown in the schematic diagram of figure 5-2.

The 10 mc IF signal from the receiver is applied to the variable attenuator which provides the proper output level for recording purposes. The output from the attenuator is applied to the mixer. The mixer compares the receiver IF from the attenuator with the signal from the selected oscillator and produces a tape reproducible video carrier frequency.

The mixer, essentially a balanced modulator, suppresses the IF frequency while developing the sum and difference frequencies of the IF and selected oscillator frequency. The sum frequency is suppressed by the following amplifier stage and filter.

The difference frequency is routed through the amplifier stage to a low-pass filter. This filter eliminates the local oscillator frequency and any remaining higher order by-products resulting from the mixing of the two frequencies.

The low frequency output from the filter is then coupled to a final amplifier stage to obtain the required output level and impedance match.

The down converter receives the receiver second IF signal at approximately 30 mv rms. The IF signal is applied through A6 of P2 to the input level potentiometer R5. This potentiometer, shunted by resistor R6, provides an impedance of approximately 50 ohms. The output from R5 is connected to the secondary of transformer T1 at center tap 6. The transformer and diodes CR1 and CR2 form a balanced modulator which mixes the received IF from the receiver with the output from the local oscillator.

Transistor circuit Q1 forms a modified Pierce oscillator which operates at the crystal frequency Y1. The output from the oscillator is applied to the primary of transformer T1 where it is mixed with the IF signal from the receiver to produce sum and difference frequencies. In the process, the IF frequency is suppressed.

Transistors Q2 and Q3 comprise a wideband video amplifier. The balanced modulator difference frequency output is coupled to the base of Q2 through capacitor C8. Part of the output from Q3 is feedback to the emitter Q2. This feedback provides the proper frequency response for the two stages.

The amplified difference frequency at the collector of Q3 is coupled through C12 and the low pass filter network to the base of emitter follower Q4. The filter circuit removes the local oscillator frequency and any remaining high frequency components from the amplified signal.

The output from the emitter of Q4 is coupled through capacitor C22 to the base of Q5. Transistor Q5 amplifies the difference frequency. Its collector output is direct coupled to the base of Q6. Driver stage Q6 supplies the necessary level for push-pull operation of complimentary symmetry output stage Q7 and Q8. AC and dc stability are provided by feedback resistors R27 and R29.

The output from the push-pull amplifier is coupled through capacitor C24 to A4 of P2.

2.3 Circuit Description of Predetection Up-Converter UPC-301.

The predetection up-converter UPC-301 is shown in the schematic diagram of figure 5-1.

The up-converter restores the magnetic tape recorded predetection signals of a receiver to the original receiver IF for playback. This is accomplished by mixing the recorded signals with a local oscillator frequency to obtain a difference frequency equal to the receiver IF. The restored IF signal is then returned to the receiver for demodulation.

The up-converter receives magnetic tape recorded signal at levels from .5 v to 10 v p-p. The input is applied through A6 of P1 to resistor R1. R1, R2 and R3 provide the required 75 ohms impedance. Resistors R4 through R5, capacitors C1 and C2 and diodes CR1A and CR1B form a variable attenuator which maintains a constant input signal for its AGC amplifier Q2 and Q3. Since diodes CR1A and CR1B are shunt paths for its ac input signal, the attenuator is therefore a function of diode current.

Transistors Q2 and Q3 form a high gain wide band amplifier. The base circuit of Q2 receives its input from the attenuator network through capacitor C3. The amplified output from Q2 is coupled through capacitor C5 to the base of Q3 for additional amplification. Resistors R11 and R12 form a voltage divider which develops a feedback voltage from the collector of Q3 to the base of Q2. The feedback voltage taken from the junction of R11 and R12 is coupled through R8 to the base of Q2.

The collector output from Q3 is applied through C9 and R21 to the primary of transformer T1 and through C12 and R20 to the junction of diodes CR3 and CR4.

The diodes CR3 and CR4 form a half wave rectifier doubler which senses the peak ac output from the collector of Q3. The output from the rectifier is a dc signal proportional to its peak video signal, and is applied through resistor R17 to the base of the dc amplifier Q4.

The collector output current which is a function of the dc input signal is applied through resistor R10 to the base of Q1. The dc input signal to the base of Q1 controls the emitter current of Q1 which in turn controls the diode current of CR1A and CR1B. This subsequently controls the amount of signal applied to the base of Q2.

Transistor Q5 forms a modified Pierce oscillator that operates at the crystal frequency of Y1. The output from the collector of Q5 is coupled through capacitor C18 to the base of Q6. Transistor Q6 isolates the oscillator from the load and supplies additional current gain.

The output from the emitter of Q6 is coupled through capacitor C20 to the center tap of the secondary of transformer T1.

Transformers T1, T2, diodes CR2A, CR2B, CR5A, and CR5B and resistors R29 and R30 form a balanced mixer.

The mixer accepts the video signal at the primary of T1 and combines it with the signal from the local oscillator received at the center tap of T1 and produces sum and difference frequencies. Potentiometers R29 and R30 are used to balance the local oscillator signal and suppress it in the output. The double sideband signal which appears at T2 of the mixer circuit is coupled through capacitor C25 to the base of emitter follower Q7. The output from the collector of Q7 is direct coupled to the base of an emitter follower, Q8. The output from the emitter of Q8 is coupled through C23 and R39 to A4 of P1. Resistor R39 provides the necessary 50 ohm output impedance. Inductor L31 and capacitors C31 and C32 constitute a 20 mc trap to eliminate 20 mc frequencies which may appear in the output.

SECTION 3. ADJUSTMENT AND ALIGNMENT PROCEDURES

3.1 General.

When plug-in crystal Y1 of either UPC-301 or DNC-301 is interchanged with a crystal having a different resonant frequency, each of the units requires adjustment as explained in the following paragraphs.

3.2 Required Test Equipment.

Test fixture having the following:

ground, +12.5 vdc @ 75 ma, -12.5 vdc @ 75 ma, and 75 ohm load

Ballentine VTVM Model 317

Tektronic 541A Oscilloscope

Hewlett-Packard Signal Generator Model 606

Hewlett-Packard Frequency Counter 5245A

Univerter

3.3 Predetection Up-Converter UPC-301 – Adjustment and Alignment Procedure.

Refer to schematic diagram, figure 5-1.

1. Insert crystal Y1 having desired frequency into UPC-301.
2. Connect UPC-301 to test fixture and apply proper voltages (paragraph 3.2).
3. Connect oscilloscope to junction of resistor R26 and emitter follower Q6. Connect counter to vertical output of scope. Adjust trimmer capacitor C14 for the crystal frequency, as observed on counter – check the voltage at T1 Pin 6 for minimum 1.0 v peak-to-peak.
4. Calibrate signal generator for recording center frequency as required by application and connect it to the univerter. Connect the univerter output, having a level of 0.5 v peak-to-peak to the input terminal P1 A6.
5. Connect VTVM and oscilloscope to output. Adjust potentiometers R29 and R30 for balance output of crystal frequency as required by application.

3.4 Predetection Down Converter DNC-301 - Adjustment Procedure.

Refer to schematic diagram, figure 5-2.

1. Insert crystal Y1 having the desired frequency into the DNC-301.
2. Connect DNC-301 to test fixture and apply the proper voltages (paragraph 3.2).
3. Connect oscilloscope to primary of transformer T1 Pin 1. Connect counter to vertical output of scope. Adjust trimmer capacitor C1 for the crystal frequency, as observed on counter. Check the voltage at T1 Pin 1 for required minimum of 0.2 v peak-to-peak.
4. With no IF input connect VTVM. Adjust trimmer capacitor C17 for a minimum crystal frequency leakage.
5. Calibrate signal generator output to the same frequency as the receiver's second IF (10.0, 10.035, or 10.7 mc). Connect signal generator to input terminal A6. Adjust signal generator for 40 mv rms output level. Check the voltage at output (with 75 ohm load) for required minimum of 1.0 v rms, adjusting potentiometer R5 for maximum output indication on VTVM.
6. Connect frequency counter to output terminal A4 to measure the recording center frequency accuracy.

SECTION 4. PARTS LIST

4.1 General.

When ordering replacement parts give the equipment name and model number, and the reference designation number and description of each item ordered.

TABLE 4-1. PREDETECTION DOWN CONVERTER, DNC-301 (201190-90D)

Reference Designation	Name and Description	Part Number Vitro	Part Number Vendor
C1	CAPACITOR, Variable: 2-8 pf	90950143	Erie 53800089R
C2	CAPACITOR: 1.0 mfd, ±20%, 25 v	90901910	Sprague 5C13
C3	CAPACITOR: 120 pf, ±5%, 500 v	90921213	Elmenco DM15F121J
C4	CAPACITOR: 220 pf, ±5%, 500 v	90921231	Elmenco DM15F221J
C5	CAPACITOR: .001 mfd, ±20%, 500 v	90901641	EIA R2CC60Z5U102M
C6	CAPACITOR: 27 pf, ±5%, 500 v	90921173	Elmenco DM15E270J03
C8	Same as C2		
C9	CAPACITOR: 47 mfd, ±20%, 20 v	90930021	Sprague 150D476X0020R2
C10, C11, C12	Same as C2		
C13	Same as C9		
C14	CAPACITOR: 27 pf, 2%, 500 v	90921170	Elmenco DM15E2706
C15	CAPACITOR: 4.0 pf, ±.25 pf, 500 v	90900363	EIA R1CC22C0H409C
C16	CAPACITOR: 100 pf, ±1%, 500 v	90921210	Elmenco DM15F101F
C17	Same as C1		

TABLE 4-1. PREDETECTION DOWN CONVERTER, DNC-301 (Cont)

Reference Designation	Name and Description	Part Number Vitro	Vendor
C18	CAPACITOR: 51 pf, ±1%, 500 v	90921189	Elmenco DM15E510F
C19	CAPACITOR: 3.3 pf, ±.25 pf, 500 v	90900313	EIA R1CC22C0H339C
C20	CAPACITOR: 130 pf, ±1%, 500 v	90921226	Elmenco DM15F131F
C21	CAPACITOR: 9.1 pf, ±.25%, 500 v	90900636	EIA R1CC22C0H919C
C22	Same as C2		
C23, C24	CAPACITOR: 2.2 mfd, ±20%, 25 v	90901940	Sprague 5C15
C25	CAPACITOR: 150 pf, ±1%, 500 v	90921219	Elmenco DM151F151F
C26	Same as C2		
C27	CAPACITOR, Tantalum: 4.7 mfd, 20 v	90930077	162D475X9020BA2
C28, 31, 32	CAPACITOR: .01 mfd, +80%, -20%, 500 v	90901758	Sprague 19C214
C29, C30	CAPACITOR: 18 pf, ±5%, 500 v	90921165	Elmenco DM15E180J03
C33	CAPACITOR: 10 pf, ±5%, 500 v	90921152	Elmenco DM15F100J03
CR1, CR2	DIODE	91600137	CBS 1N277
CR3, CR4	DIODE	91600222	Sylvania 1N816
P1	CONNECTOR, Plug	91370523	Cannon DCM-13W6P
L1	CHOKE: 1000 μh, 5%	91150240	Nytronics WE 1000
L2	CHOKE, RF, 56 μh, ±5%	91150057	Wilco
L3	INDUCTOR: 5.48 μh	102958-90	
L4	INDUCTOR: 5.16 μh	102959-90	
L5	INDUCTOR: 5.21 μh	102959-91	
L7	Same as L1		
R1	RESISTOR, Fixed Composition: 1.8 k, ±5%, 1/4 w MIL-R-11	93530550	RC07GF182J

TABLE 4-1. PREDETECTION DOWN CONVERTER, DNC-301 (Cont)

Reference Designation	Name and Description	Part Number Vitro	Vendor
R2	RESISTOR, Fixed Composition: 100 ohm, ±5%, 1/4 w MIL-R-11	93530250	RC07GF101J
R3	RESISTOR, Fixed Composition: 3.3 k, ±5%, 1/4 w. MIL-R-11	93530610	RC07GF332J
R4	RESISTOR, Fixed Composition: 270 ohm, ±5%, 1/4 w MIL-R-11	93530350	RC07GF271J
R5	RESISTOR, Variable: WW, 100 ohms ±10%, 1 w	93140064	Beckman 55P
R6	Same as R2		
R7, R8	RESISTOR, Fixed Composition: 470 ohms, ±5%, 1/4 w MIL-R-11	93530410	RC07GF471J
R9	RESISTOR, Fixed Composition: 5.6 k, ±5%, 1/4 w MIL-R-11	93530670	RC07GF562J
R10	RESISTOR, Fixed Composition: 12 k, ±5%, 1/4 w MIL-R-11	93530750	RC07GF123J
R11	Same as R2		
R12	RESISTOR, Fixed Composition: 1.5 k, ±5%, 1/4 w MIL-R-11	93530530	RC07GF152J
R13	Same as R3		
R14	RESISTOR, Fixed Composition: 300 ohms, ±5%, 1/4 w MIL-R-11	93530360	RC07GF301J
R15	Same as R3		
R16	RESISTOR, Fixed Composition: 22 k, ±5%, 1/4 w MIL-R-11	93530810	RC07GF223J
R17	RESISTOR, Fixed Composition: 1 k, ±5%, 1/4 s MIL-R-11	93530490	RC07GF102J
R18	RESISTOR, Fixed Composition: 150 ohms, ±5%, 1/4 w MIL-R-11	93530290	RC07GF151J
R19, R20	RESISTOR, Fixed Composition: 33 ohms, ±5%, 1/4 w MIL-R-11	93530035	RC07GF330J
R21	Same as R7		
R22	RESISTOR, Fixed Composition: 220 ohms, ±5%, 1/4 w MIL-R-11	93530330	RC07GF221J

TABLE 4-1. PREDETECTION DOWN CONVERTER, DNC-301 (Cont)

Reference Designation	Name and Description	Part Number Vitro	Vendor
R23	Same as R17		
R24	Same as R12		
R25	Same as R17		
R26	RESISTOR, Fixed Composition: 330 ohms, ±5%, 1/4 w MIL-R-11	93530370	RC07GF331J
R27	RESISTOR, Fixed Composition: 68 ohms, ±5%, 1/4 w MIL-R-11	93530190	RC07GF680J
R28	Same as R17		
R29	RESISTOR, Fixed Composition: 2.2 k, ±5%, 1/4 w	93530570	RC07GF222J
R30, R31	RESISTOR, Fixed Composition: 22 ohms, ±5%, 1/4 w MIL-R-11	93530025	RC07GF220J
R32	RESISTOR, Fixed Composition: 75 ohms, ±5%, 1/4 w MIL-R-11	93530220	RC07GF750J
R33	Same as R2		
R34	Same as R12		
T1	TRANSFORMER	93500005	Aladdin 65-122-03
A4, A6	CONNECTOR, Terminal	91371415	Cannon DM537405008
Q1, Q2, Q3, Q4	TRANSISTOR	95350100	2N708
Q5	TRANSISTOR	95354055	2N3136
Q6, Q7	Same as Q1		
Q8	Same as Q5		
Y1	CRYSTAL Quartz frequency specified on Customers order		CR69/U
XY1	CRYSTAL, HOLDER	94440021	Augat 8000-1G7

TABLE 4-2. PREDETECTION UP CONVER TER, UPC-301 (201192-90B)

Reference Designation	Name and Description	Part Number Vitro	Vendor
C1	CAPACITOR: 1.0 mfd, ±20%, 25 v	90901910	Sprague 5C13
C2, C3	CAPACITOR: 0.1 mfd, ±20%, 25 v	9091810	Sprague 3C21
C4	Same as C1		
C5	CAPACITOR: .01 mfd +80% -20%, 50 v	90901758	Sprague 19C214
C6	CAPACITOR: .0047 mfd GMV, 500 v	90901725	Sprague 20C8
C7	CAPACITOR: 0.15 mfd, ±20%, 25 v	90901902	Sprague 4C38
C8	CAPACITOR: 2.2 mfd, ±20%, 25 v	90901940	Sprague 5C15
C9	Same as C1		
C10	Same as C5		
C11, C12	Same as C2		
C13	Same as C5		
C14	CAPACITOR: 2-8 pf	90950143	Erie 538.00089R
C15	Same as C5		
C16	CAPACITOR: 120 pf, ±5%, 500 v	90921213	Elmenco DM15F1213
C17	CAPACITOR: 220 pf, ±5%, 500 v	90921231	Elmenco DM15221J
C18	CAPACITOR: .001 mfd, ±20%, 500 v	90901641	R2CC60Z5U102M
C19, C20, C21, C22, C23, C24, C25	Same as C5		
C26	CAPACITOR: 27 pf, ±5%, 500 v	90921173	Elmenco DM15E270
C27	Same as C1		
C28, C29	Same as C5		

TABLE 4-2. PREDETECTION UP CONVERTER, UPC-301 (Cont)

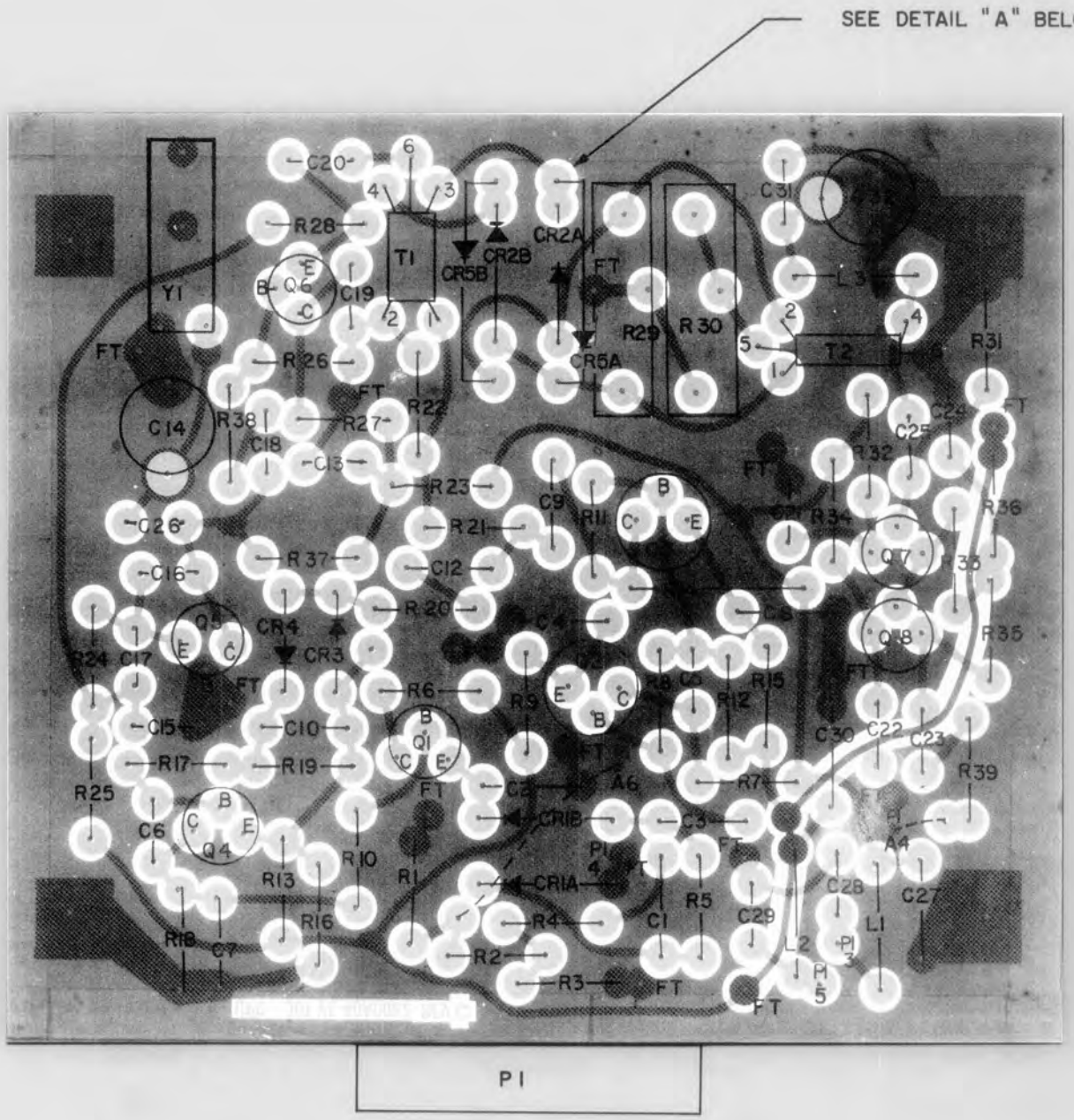
Reference Designation	Name and Description	Part Number Vitro	Vendor
C30	Same as C1		
C31	CAPACITOR: 10.0 pf, ±5%, 500 v	90921163	Elmenco DM-15C100J
C32	CAPACITOR: 5.5 - 18.0 pf	90950272	Erie 538-002-COPO92R
CR1,2	DIODE	91600287	Fairchild FA-2000
CR3,4	DIODE	91600137	CBS 1N277
CR5	Same as CR1		
L1,2	CHOKE, RF 1000 μh, ±5%	91150240	Nytronics
L3	CHOKE, RF 2.2 μh, 10%	91150068	Nytronics
P1	CONNECTOR	91370523	Cannon DCM-13W6P
R1	RESISTOR, Fixed Composition: 82 ohms, ±5%, 1/4 w, MIL-R-11	93530230	A. Bradley RC07GF820J
R2	RESISTOR, Fixed Composition: 470 ohms, ±5%, 1/4 w, MIL-R-11	93530410	A. Bradley RC07GF471J
R3	RESISTOR, Fixed Composition: 100 ohms, ±5%, 1/4 w, MIL-R-11	93530250	A. Bradley RC07GF101J
R4	RESISTOR, Fixed Composition: 2.2 k, ±5%, 1/4 w, MIL-R-11	93530570	A. Bradley RC07GF222J
R5	RESISTOR, Fixed Composition: 47 ohms, ±5%, 1/4 w, MIL-R-11	93530170	A. Bradley RC07GF470J
R6	RESISTOR, Fixed Composition: 820 ohms, ±5%, 1/4 w, MIL-R-11	93530570	A. Bradley RC07GF821J
R7	Same as R4		
R8	RESISTOR, Fixed Composition: 4.7 k, ±5%, 1/4 w, MIL-R-11	93530650	A. Bradley RC07GF472J
R9	RESISTOR, Fixed Composition: 1 k, ±5%, 1/4 w, MIL-R-11	93530490	A. Bradley RC07GF102J
R10	RESISTOR, Fixed Composition: 3.3 k, ±5%, 1/4 w, MIL-R-11	93530610	A. Bradley RC07GF332J

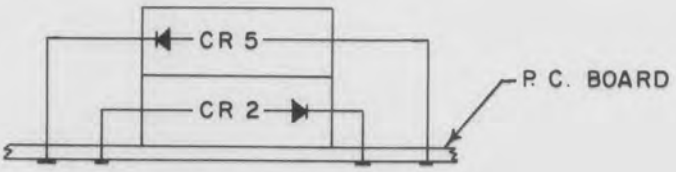
TABLE 4-2. PREDETECTION UP CONVERTER, UPC-301 (Cont.)

Reference Designation	Name and Description	Part Number Vitro	Vendor
R11	RESISTOR, Fixed Composition: 10 k, ±5%, 1/4 w, MIL-R-11	93530730	A. Bradley RC07GF103J
R12	RESISTOR, Fixed Composition: 18 k, ±5%, 1/4 w, MIL-R-11	93530790	A. Bradley RC07GF183J
R13	RESISTOR, Fixed Composition: 2 k, ±5%, 1/4 w, MIL-R-11	93530560	A. Bradley RC07GF202J
R14	RESISTOR, Fixed Composition: 1 k, ±5%, 1/2 w, MIL-R-11	93550620	A. Bradley RC20GF102J
R15	RESISTOR, Fixed Composition: 220 ohms, ±5%, 1/4 w, MIL-R-11	93530330	A. Bradley RC07GF221J
R16	RESISTOR, Fixed Composition: 1.3 k, ±5%, 1/4 w, MIL-R-11	93530515	A. Bradley RC07GF132J
R17	RESISTOR, Fixed Composition: 1.5 k, ±5%, 1/4 w, MIL-R-11	93530530	A. Bradley RC07GF152J
R18	RESISTOR, Fixed Composition: 15 k, ±5%, 1/4 w, MIL-R-11	93530770	A. Bradley RC07GF153J
R19	Same as R12		
R20	Same as R8		
R21	RESISTOR, Fixed Composition: 180 ohms, ±5%, 1/4 w, MIL-R-11	93530315	A. Bradley RC07GF181J
R22, 23	Same as R3		
R24	RESISTOR, Fixed Composition: 1.8 k, ±5%, 1/4 w, MIL-R-11	93550550	RC07GF182J
R25	Same as R3		
R26	Same as R17		
R27	RESISTOR, Fixed Composition: 330 ohms, ±5%, 1/4 w, MIL-R-11	93530370	RC07GF331J
R28	Same as R9		
R29	RESISTOR, Variable: 500 ohm, ±10%, 1/2 w	93140058	Beckman 55P
R30	RESISTOR, Variable WW: 20 ohms, ±10%, 1/2 w	93140057	Beckman 55P

TABLE 4-2. PREDETECTION UP CONVERTER, UPC-301 (Cont.)

Reference Designation	Name and Description	Part Number Vitro	Vendor
R31	Same as R9		
R32	Same as R27		
R33	Same as R9		
R34	Same as R27		
R35	Same as R2		
R36	Same as R3		
R37	Same as R17		
R38	Same as R24		
R39	Same as R5		
T1, T2	TRANSFORMER	95300005	Aladdin 64-122-03
A4-A6	CONNECTOR, Terminal	91371415	Cannon DM53740-5008
Q1	TRANSISTOR	95350510	2N1991
Q2, Q3	TRANSISTOR	95350709	2N2218
Q4, Q5 Q6, Q7, Q8	TRANSISTOR	95350101	2N708
Y1	CRYSTAL QUARTZ - type CR69/U with HC-25/U holder - .040 dia. pins x. 250 long. Crystal freq. to be determined by customer order.		
XY1	CRYSTAL HOLDER	94440021	Augat 8004-167





DETAIL "A"

Figure 4-1. Predetection Up Converter UPC-301 Component Location (201192B)

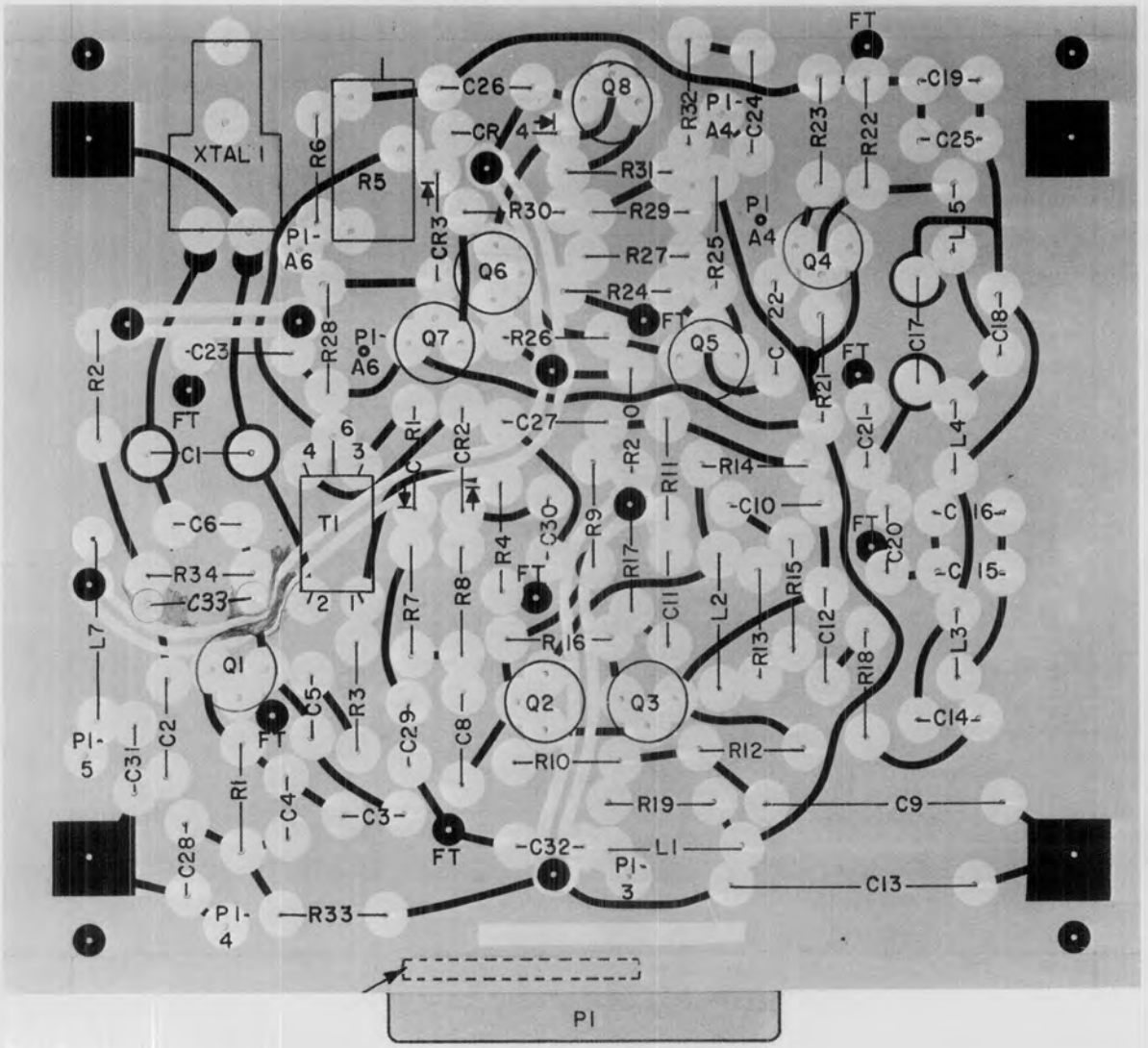
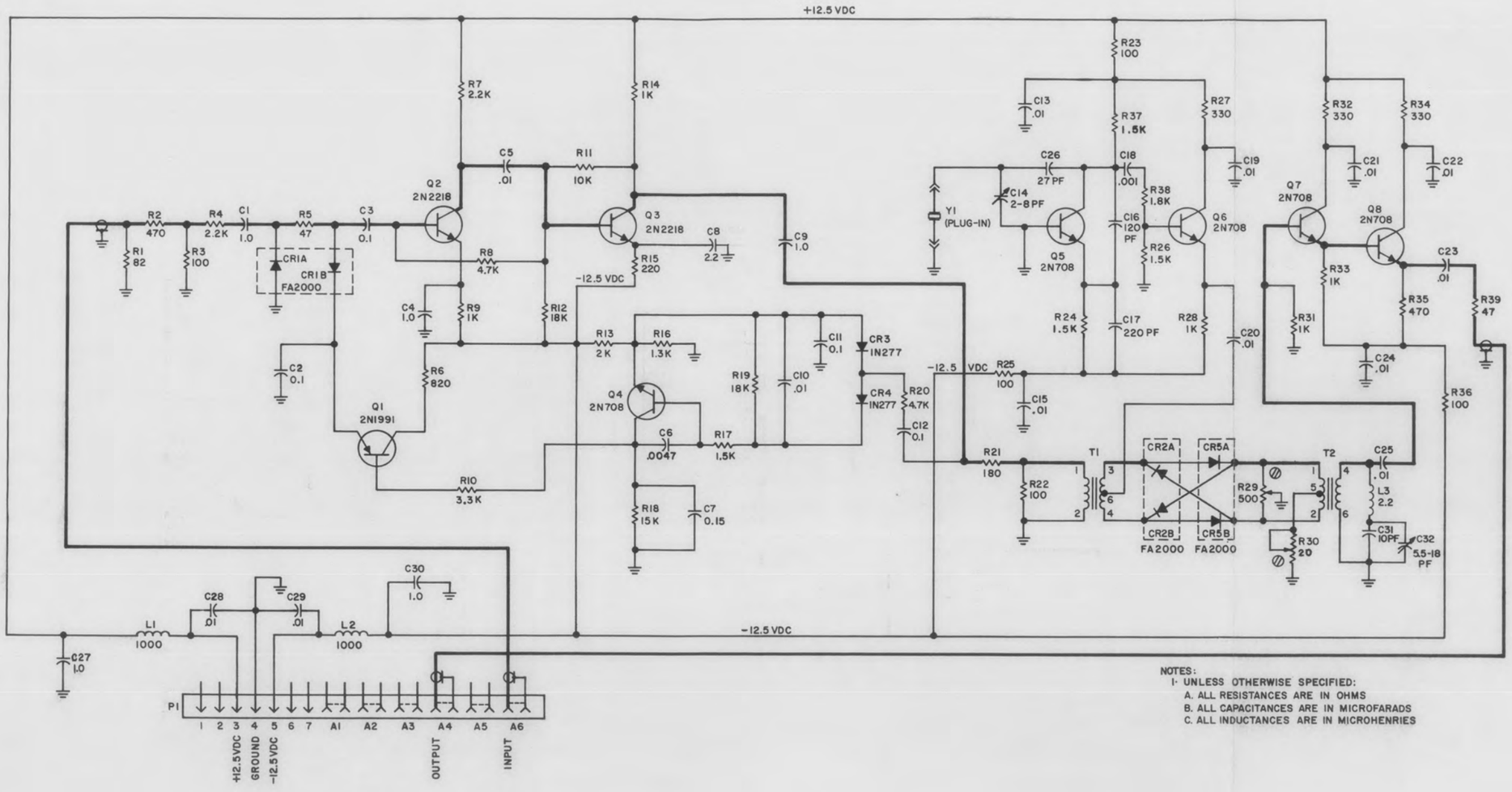


Figure 4-2. Predetection Down Converter DNC-301 Component Location (201190D)

SECTION 5. SCHEMATIC DIAGRAMS

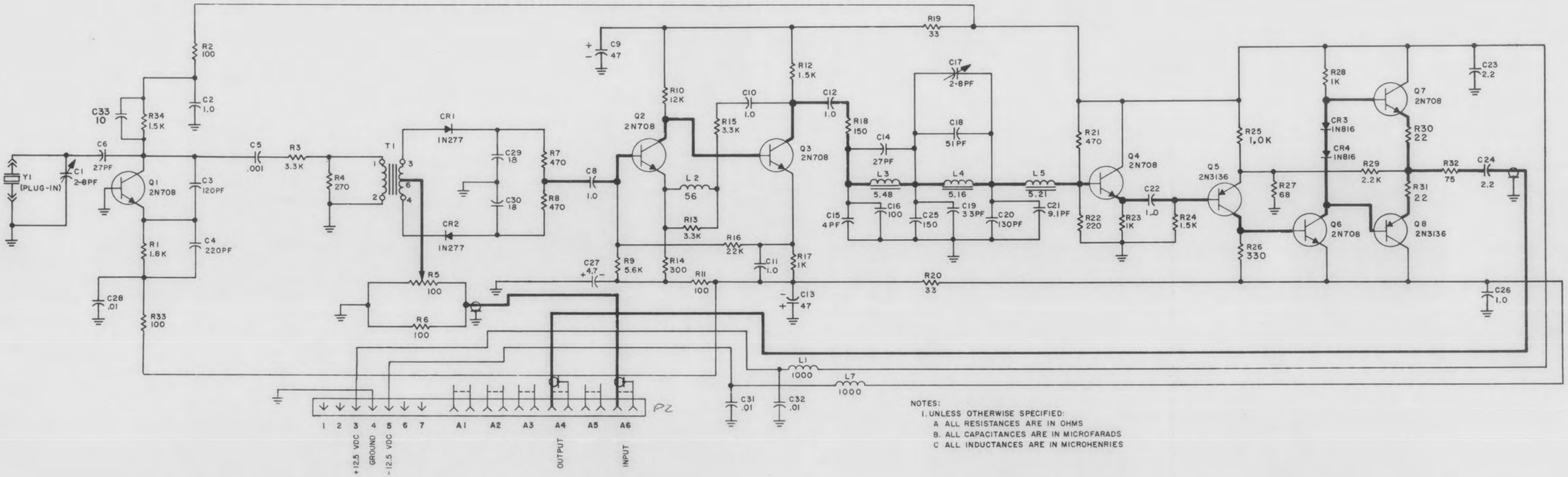
5.1 General.

This section contains schematic diagrams of the Predetection Up Converter, UPC-301 and the Predetection Down Converter, DNC-301.



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTANCES ARE IN OHMS
   B. ALL CAPACITANCES ARE IN MICROFARADS
   C. ALL INDUCTANCES ARE IN MICROHENRIES

Figure 5-1. Predetection Up Converter UPC-301 Schematic Diagram, 300888A



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A ALL RESISTANCES ARE IN OHMS
   B. ALL CAPACITANCES ARE IN MICROFARADS
   C ALL INDUCTANCES ARE IN MICROHENRIES

Figure 5-2. Predetection Down Converter
DNC-301 Schematic Diagram, 300869D

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- Analog Recording Systems
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