II THEORY OF OPERATION

2-1 INTRODUCTION

In this section the basic operation of the Model 743 Function Generator is presented from a block diagram point of view. Several of the more unique blocks are explored in detail and related to the schematic diagrams as an aid to servicing the generator.

2-2 BASIC CIRCUIT OPERATION

The Main Oscillator

The basic block diagram of the Model 743 Function Generator is shown in Fig. 2-2-1. The heart of the circuit is the main oscillator which consists of the Current Switch, the Integrating Capacitor, the High Impedance Buffer, the Schmitt Trigger, the High Frequency Compensation network, plus an isolation emitter follower (EF) and an inversion stage.

The Current Switch is an electronic current reversing switch which transmits its input current i (t) directly to the output when a voltage more negative than -5V is applied at its control input and which transmits the negative of the input current -i (t) to the output when a voltage more positive than -5V is applied at its control input. The Current Switch drives the Integrating Capacitor which develops a positive or negative voltage ramp depending on the sign of the input current. This voltage is then passed through two stages of isolation (the High Impedance Buffer and an emitter follower) and applied to the input of the Schmitt Trigger which has been designed to have a large amount of hysteresis and thus two widely separated switching levels.

Specifically the Schmitt Trigger is adjusted (by means of the two potentiometers P25 and P26 shown in Fig. 2-2-1) to switch states when the oscillator output (which is proportional to the Schmitt Trigger input) reaches +5V and to return to its original state when the oscillator output reaches -5V.

The Schmitt Trigger output is then passed through an inverter and applied to the control input of the current switch in such a fashion that when the Schmitt Trigger switches states, the output of the current switch reverses.

HIGH Output of the Generator. Set the FREQUENCY at 1 kHz, the

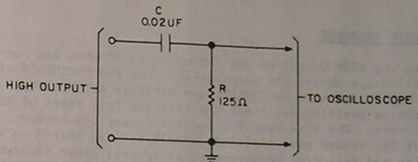

Fig. 6-4-1 Differentiating Network

FUNCTION selector on TRIANGLE, the variable ATTENUATOR in its full clockwise (minimum attenuation) position, and observe the output of the differentiating network on the oscilloscope. Vary the frequency slightly until the output square wave has a 200 mV amplitude as shown in Fig. VI-4-1. Now verify that V_1 and V_2 are

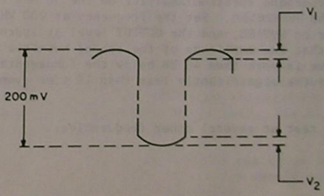

Fig. 6-4-2 Output of Differentiating Network

both less than 4 mV which insures a triangle non-linearity of less than 1%.

To check the triangle linearity at other frequencies between

1 Hz and 100 kHz, change the capacitor in the differentiating network to C' where

$$C' = \frac{(0.02uF)\ (1\ kHz)}{f}$$

and f is the new frequency of interest and then repeat the procedure.

6-5 SQUARE WAVE RESPONSE

Terminate the HIGH Output of the Generator in 50 ohms and connect the oscilloscope across the termination. Set the FREQUENCY at 1 MHz, the FUNCTION selector on SQUARE, the variable ATTENUATOR in its full clockwise position and check the rise and fall times of the output SQUARE wave. The time required for the transition between 10% and 90% of the square wave amplitude should be less than 75 n sec. Repeat the rise and fall time measurements at several other frequencies. (Be sure to consider the oscilloscope rise time in making this measurement. Unless it is below 10 n sec it should be subtracted out so that

$$T_{actual} = \sqrt{\left[T_{measured}\right]^2 - \left[T_{oscilloscope}\right]^2}$$

Note aberrations of the square wave at several frequencies. (be sure the oscilloscope square wave response is not affecting the observation). Neither the overshoot nor the tilt should exceed 2% of the peak to peak square wave amplitude.

6-6 SQUARE WAVE SYMMETRY

Place the broadband spectrum analyzer on the 50 ohm terminated HIGH Output of the Generator. Set the frequency at 200 kHz, the FUNCTION selector on SQUARE, and the OUTPUT level at approximately 5V p-p. Verify that the amplitude of the second harmonic of the output square wave is more than 40 dB below the fundamental component. This insures significantly less than 1% time symmetry error.

Repeat this test at several other frequencies.

6-7 TONE BURST

Apply 6V p-p, 1 kHz square wave via a telephone plug to the TONE BURST input on the rear panel. Set the Generator to have its maximum TRIANGLE output at a setting of 9.5 kHz. Observe the HIGH Output on the oscilloscope and adjust the BASE LINE potentiometer to center the base line between the peaks of the triangle. When centered verify that the output wave form agrees with that shown in Fig. 6-4-3.

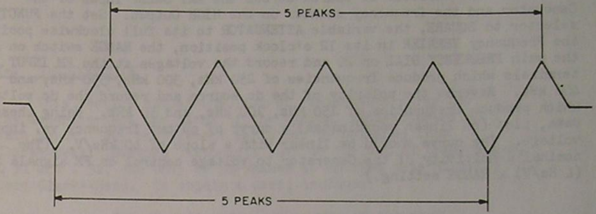

Fig. 6-4-3 Tone Burst Output

Scale the frequency of both the input square wave and the range of the Generator by factors of 1/1000, 1/100, 1/10, 10, and 100 and verify that the form of the output remains unchanged.

6-8 SYNCHRONIZATION

Apply a 500 kHz, 10 V p-p sinewave via a telephone plug to the SYNC input on the rear panel. Set the main FREQUENCY DIAL at 5, the RANGE switch at 100 k, the FUNCTION selector on SINE, and the variable ATTENUATOR in its full clockwise position. Form a Lissajous pattern between the HIGH Output of the Generator and the external synchronizing signal. A stationary pattern should result indicating synchronization. Vary the main FREQUENCY DIAL both clockwise and counterclockwise and note the dial settings where synchronization is lost. The difference between these DIAL settings should exceed 3.

Now terminate the Generator in a 50 ohm resistive load and measure the total harmonic distortion. The distortion should not increase by more than 2 dB over the non-synchronized case.

Repeat the above procedure at several different frequencies with different RANGE settings. On the lowest range an increase in output distortion with synchronization may be observed. This distortion can be reduced by lowering the level of the synchronizing signal.

6-9 EXTERNAL FREQUENCY CONTROL

Place the variable dc source across the EXT SWEEP input of the Generator and the frequency counter on the HIGH Output. Set the FUNCTION selector to SQUARE, the variable ATTENUATOR to its full clockwise position, the Frequency VERNIER in its 12 o'clock position, the RANGE switch on 10k, the main FREQUENCY DIAL on 20 and record the voltages at the FM INPUT terminals which produce frequencies of 250 kHz, 300 kHz, 350 kHz, and 400 kHz. Reverse the polarity of the dc source and record the dc voltages which produce frequencies of 150 kHz, 100 kHz, and 50 kHz. Using these data, plot (on linear coordinates) a curve of output frequency vs. input voltage. The curve should be linear with a slope of 40 kHz/V. (The nominal sensitivity of the Generator to voltage control or FM signals is (4 Hz/V) x RANGE setting.)

normally generating a triangular wave across C 23 which starts at V_B (the voltage across a capacitor cannot change instantaneously). If now the Tone Burst input returns to zero, v (t) drops to its negative value and D 112 becomes forward biased. If the capacitor voltage $v_c(t)$ is greater than V_B during this transition D 111 also becomes forward biased and $v_c(t)$ is quickly returned to V_B. If however $v_c(t)$ is less than V_B during the transition D 111 remains reverse biased until $v_c(t) = V_B$ and thus a complete cycle of the triangular wave is obtained as shown in Fig. 2-2-2. This is the desired mode of operation; hence the duration of the pulse at the Tone Burst input must be adjusted to terminate with the triangular wave below its base line.*

When the telephone plug is removed from the Tone Burst input jack v (t) remains at 11 V and the Tone Burst circuit has no effect on the main oscillator.

2-3 DESCRIPTION OF SPECIALIZED CIRCUITRY

In this section some of the specialized circuits contained within the Model 743 Function Generator are discussed. All circuit references are found in Fig. 8-1-2.

Current Switch

The current switch consists of a precision current inverter (Q 33 and Q 34), a differential amplifier (Q 31 and Q 32) biased by the current inverter, and a second precision current inverter (Q 20, Q 21, and Q 22) in the collectors of Q 31. The collector of Q 32 and the output of the second current inverter comprise the output of the current switch. The control input of the Current Switch is applied at the base of Q 31 which switches the bias current for the differential pair (which is equal in magnitude to the input current) alternately through Q 31 and Q 32. The path through Q 31 results in a current inversion at the switch output.

Voltage Controlled Current Source

The combination of the integrated circuit u702C and Q 1 comprise the voltage controlled current source. The u702C high gain operational amplifier drives the base of Q 1 to develop a collector current proportional to the input voltage. Feedback from the emitter of Q 1 to the input of the operational amplifier insures the stability and linearity of the voltage controlled current source.

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*At the output of the generator all waveforms have experienced an inversion.

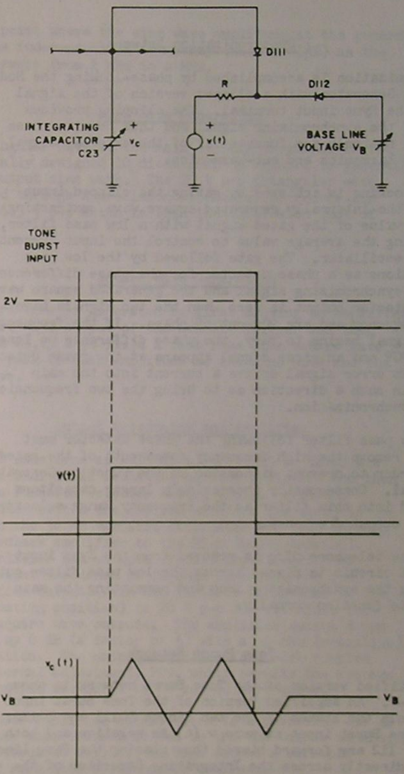

Figure 2-2-2. Simplified Tone Burst Network

Synchronization Network

Synchronization is accomplished by phase-locking the Model 743 Function Generator with a clipped version of the signal applied at the Sync input terminal. The clipping provides harmonics of the synchronizing signal and thus permits phase locking with not only the fundamental of the external signal but also its harmonics and sub-harmonics.

Phase locking is achieved by gating the clipped input signal with the internally generated square wave, extracting the average value of the gated signal with a low pass filter, and then using the average value to control the input current to the main oscillator. The gate followed by the low pass filter functions as a phase detector for the phase difference between the synchronizing signal and the generated square wave. The phase detector output is zero when the two signals have the same frequency and are 90° out of phase. If the frequency of either signal begins to vary, the phase difference no longer remains at 90° and an error signal appears at the phase detector output. This error signal drives a current into the main oscillator in such a direction as to bring the two frequencies back into synchronization.

The low pass filter following the phase detector must effectively remove the high frequency components of the gated signal in order to prevent distortion in the Function Generator output signal. Consequently increasingly larger capacitors are switched into this filter as the Frequency Range selector reduces the output frequency.

When the telephone plug is removed from the Sync input jack a short circuit is placed across the low pass filter output thus opening the synchronizing loop and permitting the main oscillator to function normally.

Tone Burst Network

A simplified version of the Tone Burst network is shown in Fig. 2-2-2. An amplified version of the Tone Burst input v (t) controls the states of the two diodes D 111 and D 112. With the Tone Burst input at zero, v (t) is negative and both D 111 and D 112 are forward biased thus placing the Base Line voltage V_B directly across the Integrating Capacitor of the main oscillator and preventing oscillations. When however the Tone Burst input increases beyond +2 V, v (t) increases to 11 V which reverse biases D 111 and D 112 and disconnects the Tone Burst network from the main oscillator. With the Tone Burst network disconnected the main oscillator functions

C-22) to the point where the sine wave amplitude at the generator output remains independent of frequency (within ±1½%) as the frequency is swept from 1 kHz to 4 MHz.

Sine Wave Generation

The triangular wave at the main oscillator output is fed into an optimally designed 10 diode shaping network to generate a 6.3 V p-p output sine wave. The 10 V p-p triangular wave is also passed through a precision attenuator to reduce its amplitude to 6.3 V p-p which is then identical with that of the sine wave.

Square Wave Generation

The square wave is generated by first driving an amplifier with the square wave output of the Schmitt Trigger and then clipping it at ±3.15 V to yield a fast rise time square wave with the same peak to peak amplitude as the sine wave and the triangular wave.

Output Attenuator and Amplifier

All three waveforms as well as a zero volt dc level are passed through individual isolating emitter followers and then applied to the Function selector switch (S81). From the Function selector switch the desired waveform (or zero) is passed through the 30 dB variable Attenuator and then through the output feedback amplifier to the High Output terminal. The output amplifier has an open circuit amplification of -3.2 and an output impedance of 50 ohms such that the open circuit amplifier output (with the variable Attenuator in its minimum attenuation position) is 20 V p-p for the sine, triangular, and square wave outputs. The amplifier output drops (undistorted) by 6 dB (a factor of ½) with a 50 ohm (resistive) output termination. The output amplifier is direct coupled and has an internal adjustment, P89, which permits the average value of the output waveforms to be set to zero volts.*

At the power amplifier output there is a precision -30 dB fixed attenuator whose output is fed to the Low Output terminal. With the Low Output as well as the High Output a variable attenuation of more than 60 dB may be obtained.

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*Because each waveform is generated with an average value of zero volts and then passed through identical circuitry to the output, adjusting the "zero" output to zero insures that the average value of the other waveforms is well within ±100 mV (±½% of maximum p-p value) of zero.

It follows therefore that if initially the Current Switch is in its normal position and i (t) = I_o (a constant current) a positive voltage ramp with slope I_o/C appears both across the Integrating Capacitor and at the main oscillator output. When the ramp at the oscillator output reaches +5V the Schmitt Trigger switches states, the current switch output switches to $-I_o$ and the oscillator output transitions smoothly to a negative voltage ramp with slope $-I_o/C$. When the oscillator output reaches -5V the Schmitt Trigger switches to its original state and the cycle repeats itself. Hence the oscillator output has the form of a triangle wave with a peak to peak output of 10V and with a period of $T = (2)(10V)(C)/I_o$ or equivalently with a frequency of

$$f = I_o/(20V)C.$$

With C = 1uF a current of 4mA produces a frequency of 200Hz.

The combination of an operational amplifier and a transistor current source in a feedback amplifier provides the highly temperature stable, highly linear voltage controlled current source which supplies the drive for the main oscillator. The input to the current source is the summation of the voltages from the Main Frequency dial potentiometer, the Frequency Vernier potentiometer, and the FM Input; hence the main oscillator output frequency is the linear superposition of the Main Frequency dial setting, the Frequency Vernier setting and the instantaneous value of the voltage at the FM Input terminals. In the Model 743 Function Generator the circuit parameters are adjusted such that the maximum setting on the Main Frequency dial results in a current of slightly over 4mA into the Current Switch, such that full variation of the Frequency Vernier results in a current variation of approximately 40uA into the Current Switch (±½% of the full scale Main Frequency Dial value), and such that ±5V at the FM input terminals results in slightly more than ±4mA into the Current Switch. The dynamic range of the voltage controlled current source is between 0 and 8.2mA; hence no combination of inputs can increase the main oscillator output frequency above twice the maximum Main Frequency dial setting and no combination of inputs can result in a negative output frequency.

High Frequency Compensation

At high frequencies there is a tendency for the loop delay to cause the current switching to occur after the output triangle has passed through its ±5 V levels with the result that the triangle amplitude becomes an increasing function of frequency. This effect is compensated for by placing the High Frequency Compensation network (which is a variable lead network) at the Schmitt Trigger input. This network is adjusted (by adjusting

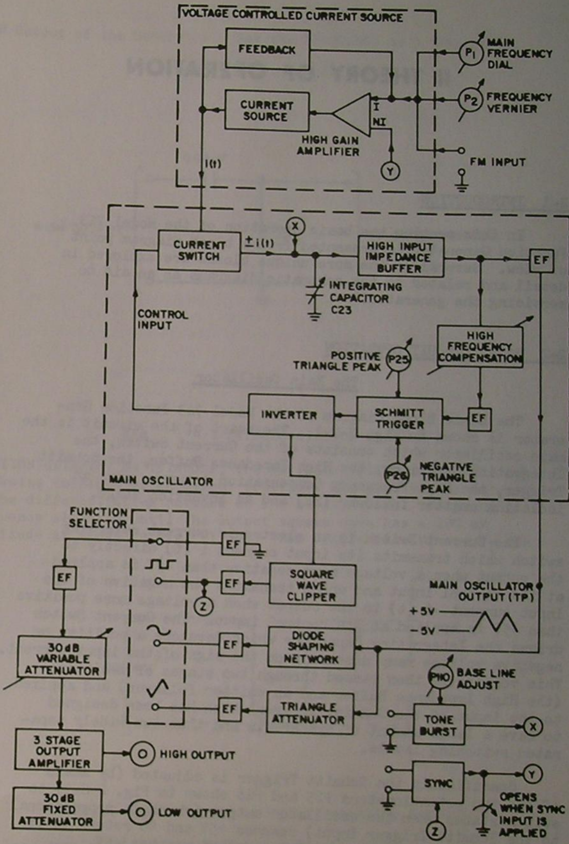

Figure 2-2-1. Model 743 Function Generator Block Diagram

V CALIBRATION PROCEDURE

5-1 INTRODUCTION

In this section, the adjustments of the internal controls which are required to bring the Model 743 Function Generator into specification are discussed. Each generator has been calibrated and factory inspected before shipment and therefore requires no internal calibration before being put into service, or during normal usage. The generator should only require recalibration if for some reason an internal repair or modification must be made. For all of the following adjustments, the OUTPUT OFFSET control should be kept in its OFF position.

5-2 CALIBRATION EQUIPMENT REQUIRED

The following test equipment, along with the special circuit of Fig. 5-3-1, is required to calibrate the Model 743 Function Generator.

1. Voltmeter, dc, 1mV resolution, ±2% accuracy.
2. Voltmeter, ac, 50mV resolution, ±2% accuracy.
3. Oscilloscope, 15MHz bandwidth or greater, 5mV/cm sensitivity.
4. Frequency Counter, 5 digit resolution, 0.001 Hz to 4 MHz.
5. Distortion Analyzer, 10Hz to 500kHz tuning range.
6. Sine wave/Square wave Generator,-Model 743, 748, 750 or equivalent.
7. One 50ohm resistive termination.
8. Wide band spectrum or wave analyzer 100kHz to 10MHz tuning range.
9. Variable dc source, 0-10V range.

5-3 CALIBRATION PROCEDURE

Output Zero Adjustment (P89)

After power has been applied and the Model 743 Function Generator has been allowed to reach operating temperature within its case for at least 15 minutes, slide generator partially from its case* to the point where P89 on printed circuit board #2

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*The case of the Model 743 Function Generator may be removed by merely removing the two screws from the left and right hand sides of the rear panel and firmly pushing the rear panel inward while holding the case. Care should be exercised when removing the case to avoid scratching the vinyl paint on the inside surface.

S81 - THE FUNCTION SELECTOR SWITCH.

This switch is a simple one deck, one pole, four position rotary switch that connects the three wave shapes from board #1 and the ZERO output from board #2 to the power amplifier input on board #2.

S12 - LOW FREQUENCY RANGE EXPANSION.

This single pole, single throw slide switch enables the low frequency expansion circuitry when S21R1 is also closed (only on the x 1 position).

S121 - POWER SWITCH

This single throw, double pole switch supplies ac power to the transformer and pilot light when closed. The pilot light dropping resistor R121 is mounted within the metal switch cover. With this switch "off" the only uncovered "hot" terminal within the Generator should be the rear mounted fuse holder.

4-13 NO SINE OR TRIANGLE WAVE OUTPUT - SQUARE WAVE OUTPUT EXISTS

If both the SINE and TRIANGLE waves do not reach the output, then the compound emitter follower Q61 - Q73 is suspect. Check both transistors and replace if necessary.

4-15 SWITCH CONNECTIONS AND FUNCTIONS

One possible source of trouble in any piece of electronic equipment is a dirty or faulty switch contact.

All of the switch functions in the Generator are straightforwardly indicated on the circuit schematics.

This section merely summarizes the switch functions in order to ease any switch-related trouble shooting problem.

S21 - THE FREQUENCY RANGE SWITCH.

This rotary switch has six positions, two decks and four poles. One pole on the front deck, S21F2, connects the range tuning capacitors (C24 - C28) in parallel with x 100 k RANGE capacitor C23. The highest frequency position of this section has no connection to it. The second section of the front deck is S21F1, a single pole switch that should only close on the x 100 k position. The purpose of this switch is to ground the junction of R12 and R14 thus connecting the high frequency compensation network in parallel with R8.

The rear deck of S21 provides a physical ground termination for C24 - C27 as well as containing S21R2, the sychronization filter capacitor selector, and S21R1, a series AND section of the LOW FREQUENCY RANGE EXPANSION switching function.

The sychronization filter capacitor selector, S21R2 has no connections on the x 100 k or x 10 k positions. On the x 1 k and x 100 positions it connects C153 in parallel with C152 while on the x 10 and x 1 positions it connects C154 in parallel with C152.

S21R1 is a single pole switch that should only be closed on the x 1 position. This switch is directly in series with the rear mounted LOW FREQUENCY RANGE EXPANSION slide switch, S12.

4-7 SYNCHRONIZATION NOT POSSIBLE

If synchronization is not possible first check to see if a square wave at the frequency of the Generator DIAL setting appears at the base of Q143. If it does then either Q143 is defective or D152, D153 or D154 has been shorted because of an extreme overload at the SYNC input. If no square wave appears at the base of Q143 go to item 4-11.

4-8 NO SINE WAVE OUTPUT - ALL OTHER WAVEFORMS EXIST

If no SINE WAVE appears at the output but all other waveforms exist, the SINE WAVE lead between board #1 and S81 should be checked for continuity. If this is not the trouble then the emitter follower Q72 should be checked and replaced if necessary.

4-9 DISTORTED SINE WAVE OUTPUT - ALL OTHER WAVEFORMS ARE UNDISTORTED

If SINE WAVE distortion exists the most probable cause is the failure of the ± 2.7 V supplies and item 4-2 should be consulted. The next most probable cause is failure of one or more of the diodes in the shaping network (D61, D62, D63, D64, D66, D69 and D70). To check the diodes observe the waveforms at the common junctions of D61 - D52, D63 - D64, D65 - D66, D67 - D68, and D69 - D70. If any of these waveforms are non-symmetric then one of the diodes at that junction is defective.

4-11 NO TRIANGLE WAVE OUTPUT - ALL OTHER WAVEFORMS EXIST

If no TRIANGLE wave appears at the output but all other waveforms exist, the triangle lead between board #1 and S81 should be checked for continuity. If this is not the trouble then the emitter follower Q71 should be checked and replaced if necessary.

4-12 NO SQUARE WAVE OUTPUT - ALL OTHER WAVEFORMS EXIST

If no SQUARE wave appears at the output but all other waveforms exist the square wave lead between board #1 and S81 should be checked for continuity. If this is not the trouble observe the waveform at the collector of Q141. If a square wave exists then Q151 is the probable culprit. If it does not exist check Q141 and replace it, if necessary.

4-4 NO OUTPUT - NO TRIANGLE EXISTS AT THE COLLECTOR OF Q73 CHANGES OUTPUT dc LEVEL

If no output exists but the BASE LINE control on the rear panel changes the output dc level then the trouble lies in the TONE BURST circuitry. Check D111, Q111, Q112, and the contact on J111.

4-5 NO OUTPUT - NO TRIANGLE EXISTS AT THE COLLECTOR OF Q73

If no triangle exists at the collector of Q73, trouble is indicated in the main oscillator loop. To locate exactly where the trouble lies place the RANGE switch on its 100 k position and externally drive the gate of Q29 with a 5 V p-p sinewave from a low impedance, Zero average value generator. If the signal appears at the base of Q28 attenuated by approximately 4 dB then the High Impedance Buffer (Q29 and Q39) is functioning properly. If not check both Q29 and Q39 and replace if defective.

Now increase the drive at the gate of Q29 to exceed 16 V p-p and verify that an asymmetric square wave with transitions between -5.5 V and -3.9 V exists at the base of Q31. If the square wave does not exist the trouble lies in the Schmitt Trigger circuitry (Q23, Q25, Q28, Q35, Q36, Q37).

If the square wave does exist place a 5.1 kohm resistor from the base of Q34 to ground, remove the drive from the gate of Q29 and observe the collector of Q73 . If a triangle wave now exists, the difficulty lies in the uA702 -Q1 voltage controlled current source combination. Check both components and replace if defective.

If the triangle still does not exist at the test point TP (with the 5.1 kohm resistor in place) trouble lies in the Current Reversing Switch (Q20, Q21, Q22, Q31, Q32, Q33, Q34). Q20, Q21, Q22; Q31, Q32 and Q33, Q34; are matched sets of transistors and should be reordered from the manufacturer (see Parts List).

4-6 TONE BURST INOPERATIVE

The entire TONE BURST circuit consists of Q111, Q112, Q113, D111, D112 and the associated bias circuitry. If BASE LINE control is lost then the culprit is most likely Q113 or D112. If no TONE BURST operation at all is possible then Q111, Q112, and D111 should be checked and replaced if necessary.

marked terminals of printed circuit board #1 and board #2. The acceptable tolerances on each supply voltage are given in Table 4-1. The voltages should be measured on both board #1 and board #2 and if a discrepancy exists the power harness should be checked for continuity.

The ± 2.6V is developed on Board #1 and can be obtained at the emitters of Q12 and Q2 respectively. The emitter of Q12 is common with the junction of D62 and R70b while the emitter of Q2 is common with the junction of D61 and R70a. These junctions are more readily accessible than the corresponding emitters.

Table 4-1 Supply Voltage Tolerances

NOMINAL SUPPLY VOLTAGE	UPPER LIMIT	LOWER LIMIT
21.3V	22.7 V	20.2 V
11 V	11.6 V	10.4 V
2.6V	ADJUSTABLE	

If any of the supply voltages should not fall within the required tolerance range, disconnect the leads bringing the ± 11 V power from board #2 to board #1. If the problem disappears, the trouble exists on board #1. If not then the power supply itself is at fault.

If either the positive or negative 2.6 V supply is the only defective supply then in all probability one of the components Q2, Q12, C50 or C51 is defective and should be replaced.

If both the positive (or negative) 11 V and 2.6V supplies are defective then most probably the u 723-2 or Q132 (u 723-1 or Q122) is defective and should be replaced.

If all positive (or negative) supplies fall out of specification then C122 or Q131 (C123 or Q121) are the probable culprits.

IN SECTIONS 4-3 THROUGH 4-12 THE OUTPUT SHOULD BE TAKEN FROM THE 50 OHM OUTPUT TERMINAL

4-3 NO OUTPUT - TRIANGLE EXISTS AT COLLECTOR OF Q73

If a TRIANGLE wave exists at the collector of Q73 but no output is available at either the HIGH or the LOW Output terminals, then the defect exists in the power amplifier (or the FUNCTION selector switch is set on ZERO). First check to see if any signal reaches the arm of the variable ATTENUATOR P88. If it does not then the problem is an open lead from S81 or P88 or a problem with Q81.

If a signal does exist at the arm of P88 and not at the output, open the feedback resistor R86 of the output feedback amplifier and trouble shoot the amplifier stage by stage. Keep the FUNCTION selector on SINE and the variable ATTENUATOR in its full counterclockwise position to avoid overdriving the amplifier which has an open loop amplification in excess of 40 dB.

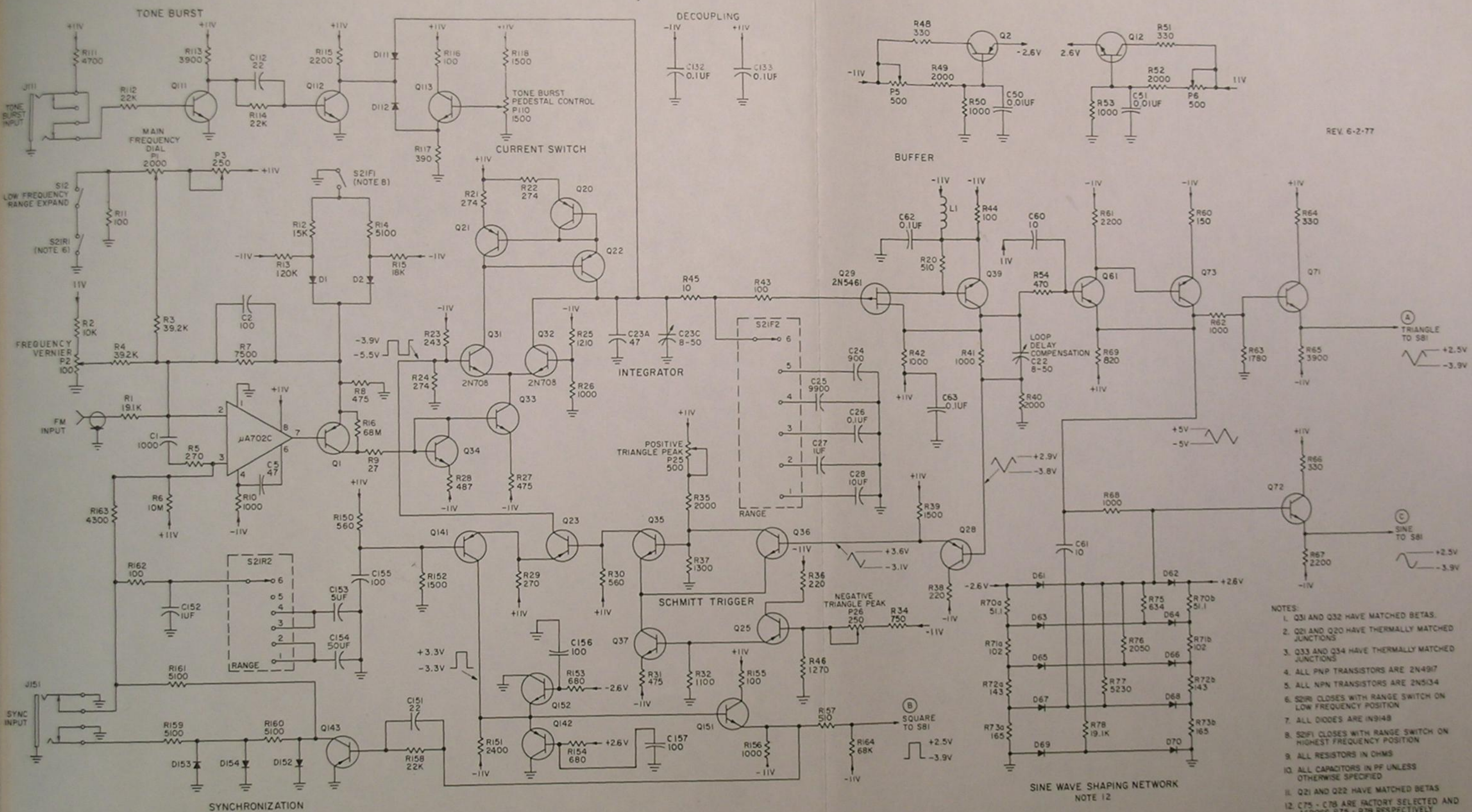
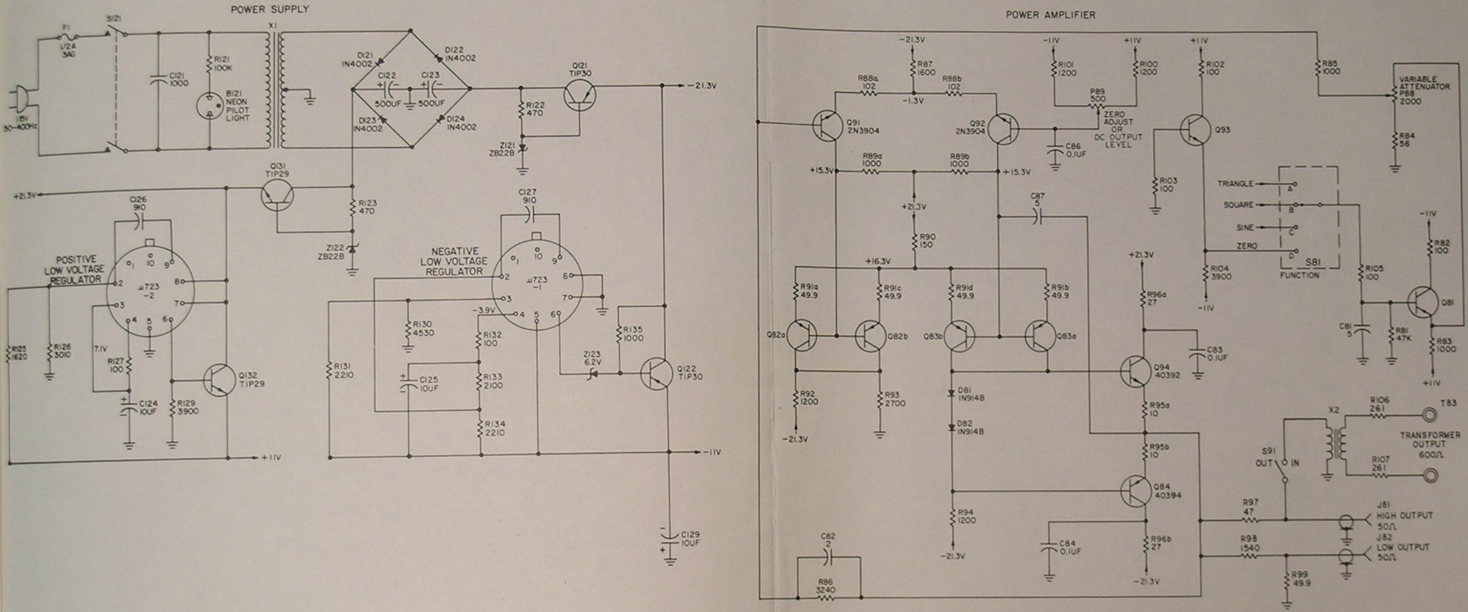


Figure 8-1-2. Schematic Diagram of Board #1 and Its Associated Circuitry



NOTES:

1. ALL UNSPECIFIED PNP TRANSISTORS ARE 2N4917
2. ALL UNSPECIFIED NPN TRANSISTORS ARE 2N5134
3. DC VOLTAGES ARE MEASURED WITH FUNCTION SWITCH IN ZERO POSITION AND ATTENUATOR AT ITS MAXIMUM ATTENUATION SETTING.

Figure 8-1-3. Schematic Diagram of Board #2 and Its Associated Circuitry