SECTION 6
TROUBLESHOOTING

6.1 FACTORY REPAIR

Wavetek maintains a factory repair department for those customers not possessing the necessary personnel or test equipment to maintain the instrument. If an instrument is returned to the factory for calibration or repair, a detailed description of the specific problem should be attached to minimize turnaround time.

6.2 TROUBLESHOOTING CHARTS

Troubleshooting charts are given in figures 6-1 thru 6-9. The charts do not cover every possible trouble, but will be an aid in systematically isolating faulty components.

Figure 6-1. Initial Checks, Generator Board
Figure 6-2. Generator Loop Checks, Generator Board
Figure 6-3. VCG Checks, Generator Board
Figure 6-4. Generator Output Checks
Figure 6-5. Trigger and Gate Mode Checks, Trig/Pulse Board
Figure 6-6. Power Supply Checks, Trig/Pulse Board
Figure 6-7. Generator Input and Output Checks
Figure 6-8. Pulse Mode Checks, Trig/Pulse Board
Figure 6-9. Pulse Generator Checks, Trig/Pulse Board

6.3 TROUBLESHOOTING INDIVIDUAL COMPONENTS

6.3.1 Transistor

1. A transistor is defective if more than one volt is measured across its base emitter junction in the forward direction.

2. A transistor when used as a switch may have a few volts reverse bias voltage across base-emitter junction.

3. If the collector and emitter voltages are the same, but the base emitter voltage is less than 500 mV forward voltage (or reversed bias), the transistor is defective.

4. A transistor is defective if its base current is larger than 10% of its emitter current (calculate currents from voltage across the base and emitter series resistors).

5. In a transistor differential pair (common emitter stages), either their base voltages are the same in normal operating condition, or the one with less forward voltage across its base emitter junction should be off (no collector current); otherwise, one of the transistors is defective.

6.3.2 Diode

1. A diode is defective if there is greater than one volt (typically 0.7 volt) forward voltage across it.

6.3.3 Operational Amplifier (e.g., 741, 1458)

1. The "+" and "–" inputs of an operational amplifier will have less than 15 mV voltage difference when operating under normal conditions.

2. When the output of the amplifier is connected to the "–" input (voltage follower connection), the output should be the same voltage as the "+" input voltage, otherwise, the operational amplifier is defective.

6.3.4 Capacitor

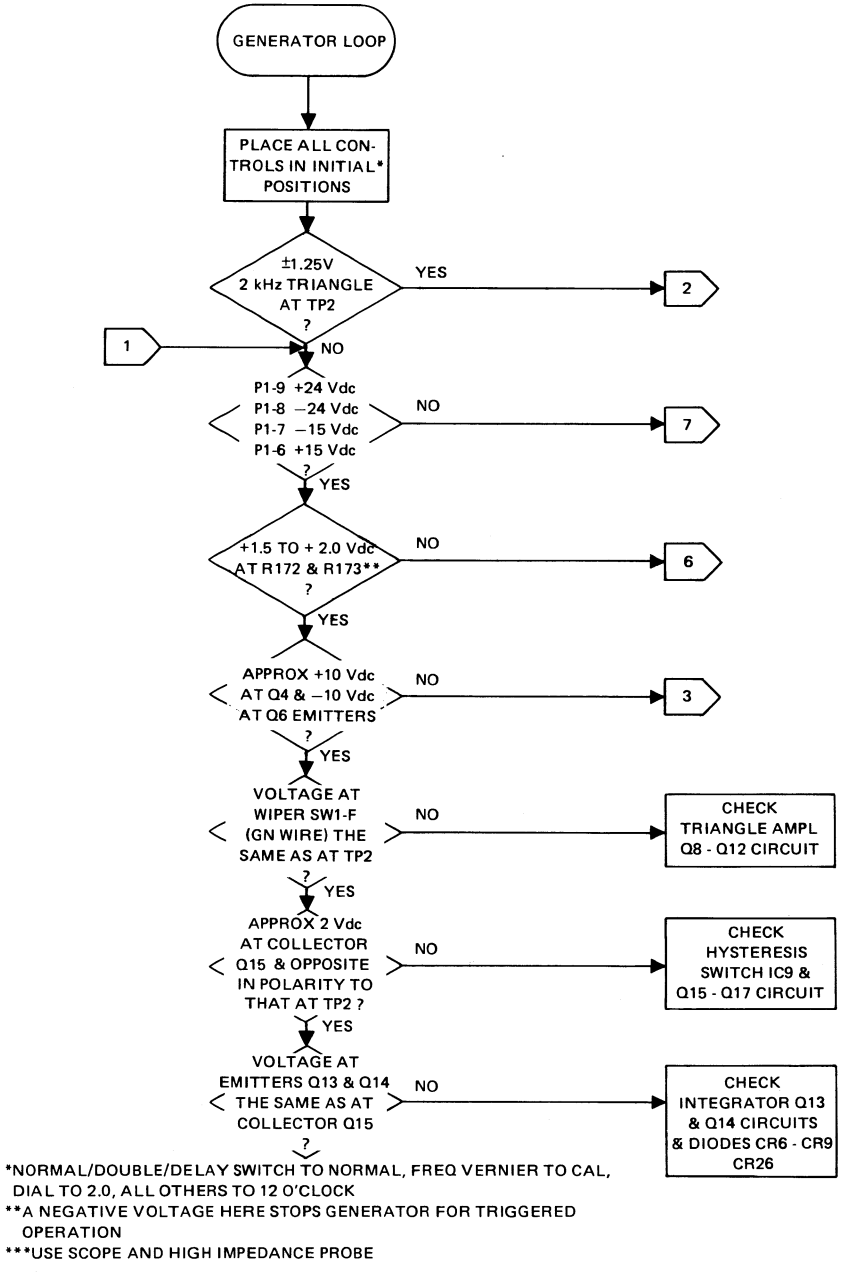
1. Shorted capacitors have zero volts across their terminals.

2. Opened capacitor can be located (but not always) by using a good capacitor connected in parallel with the capacitor under test and observing the resulting effect.

6.3.5 Digital TTL IC's (e.g. 7400 Series)

1. The device is operating correctly if the output high state is $> +2.4V$ and low state is $< +0.5V$.

2. The input must show the same two levels as in step 1. If the levels are between +0.8V and +2.0V, the connection to the driving circuit output is open.



*NORMAL/DOUBLE/DELAY SWITCH TO NORMAL, FREQ VERNIER TO CAL, DIAL TO 2.0, ALL OTHERS TO 12 O'CLOCK

**A NEGATIVE VOLTAGE HERE STOPS GENERATOR FOR TRIGGERED OPERATION

***USE SCOPE AND HIGH IMPEDANCE PROBE

Figure 6-2. Generator Loop Checks, Generator Board

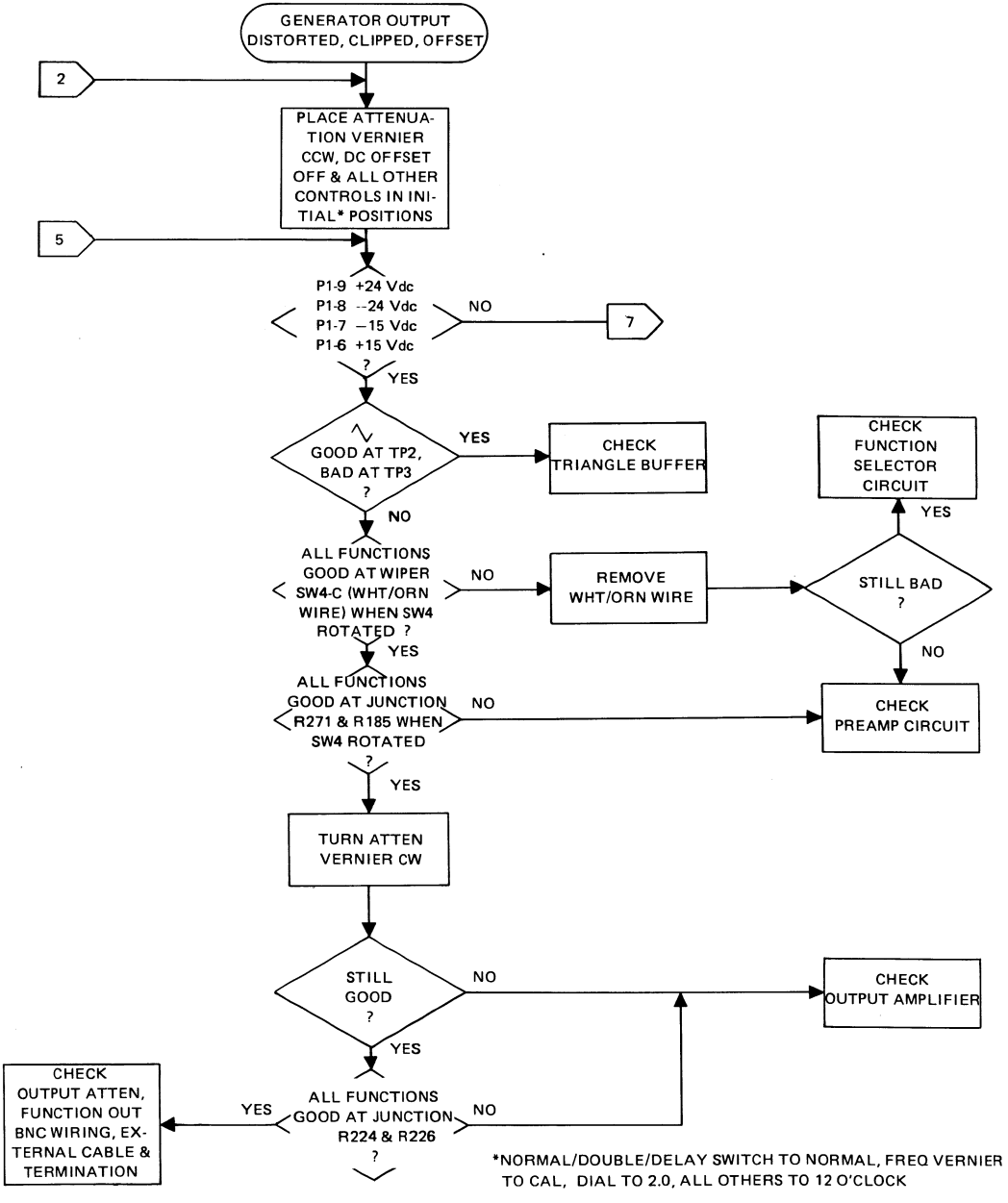


Figure 6-4. Generator Output Checks, Generator Board

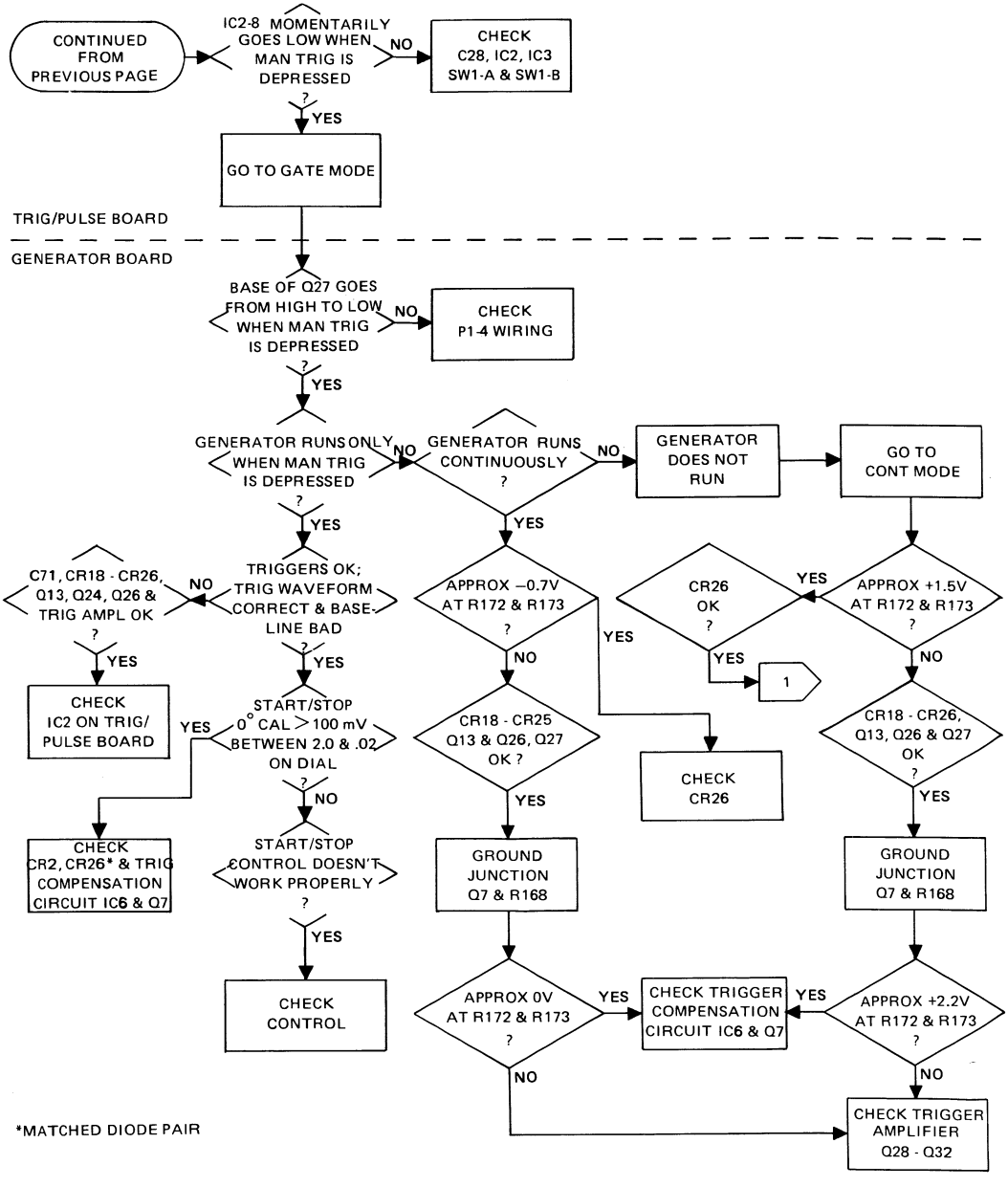


Figure 6-5. Trigger and Gate Mode Checks, Trig/Pulse Board (Page 2 of 2)

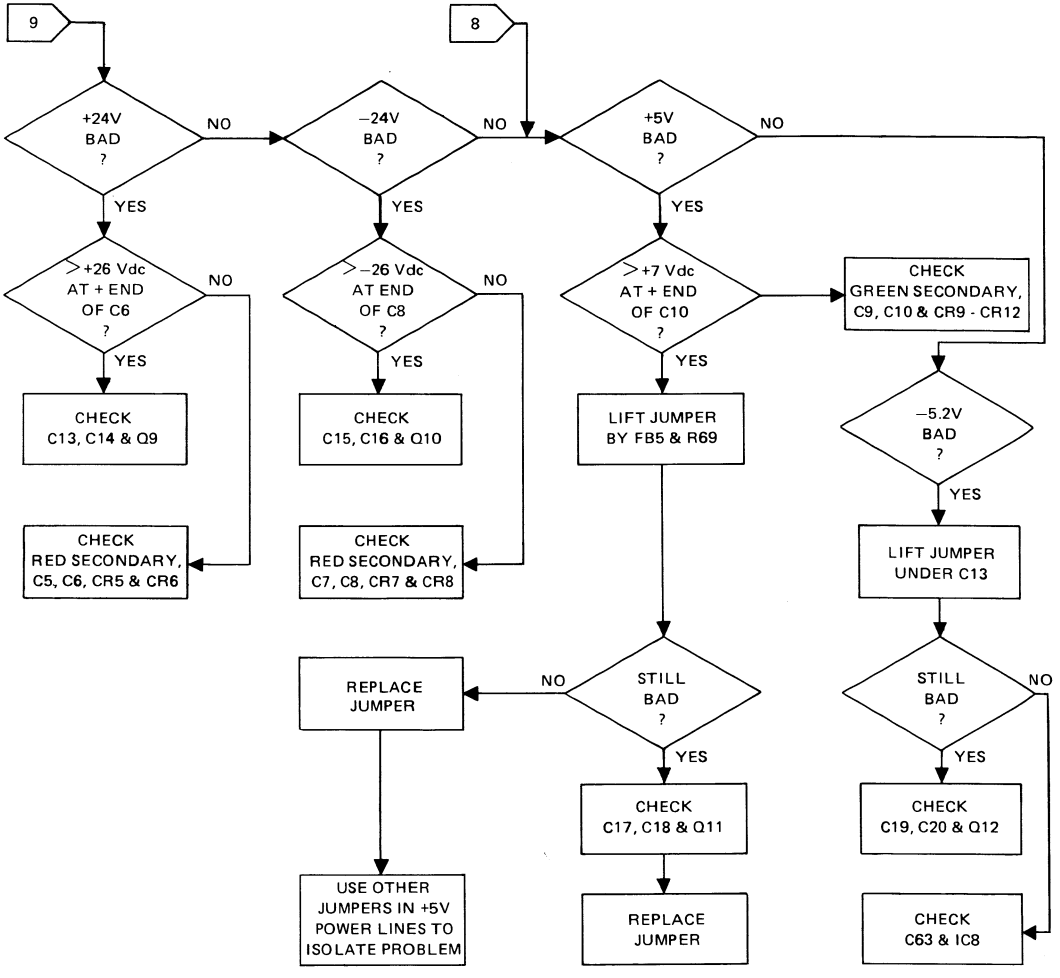


Figure 6-6. Power Supply Checks, Trig/Pulse Board (Page 2 of 2)

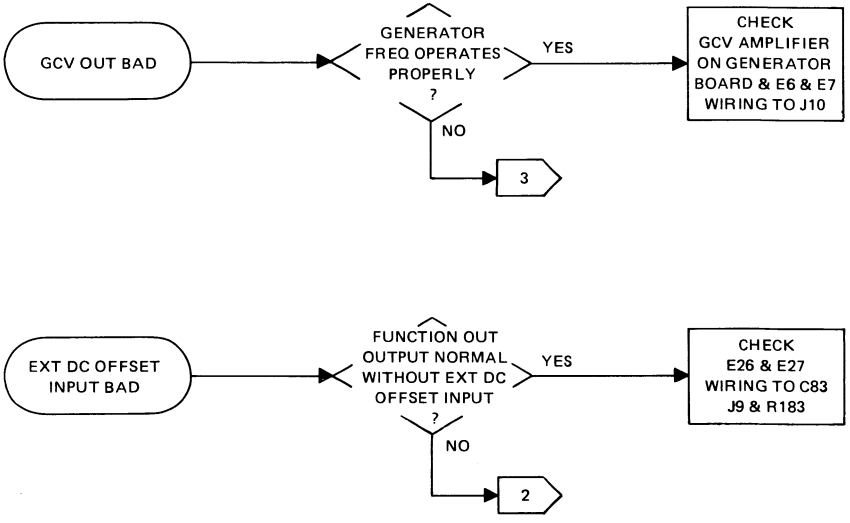


Figure 6-7. Generator Input and Output Checks (Page 2 of 2)

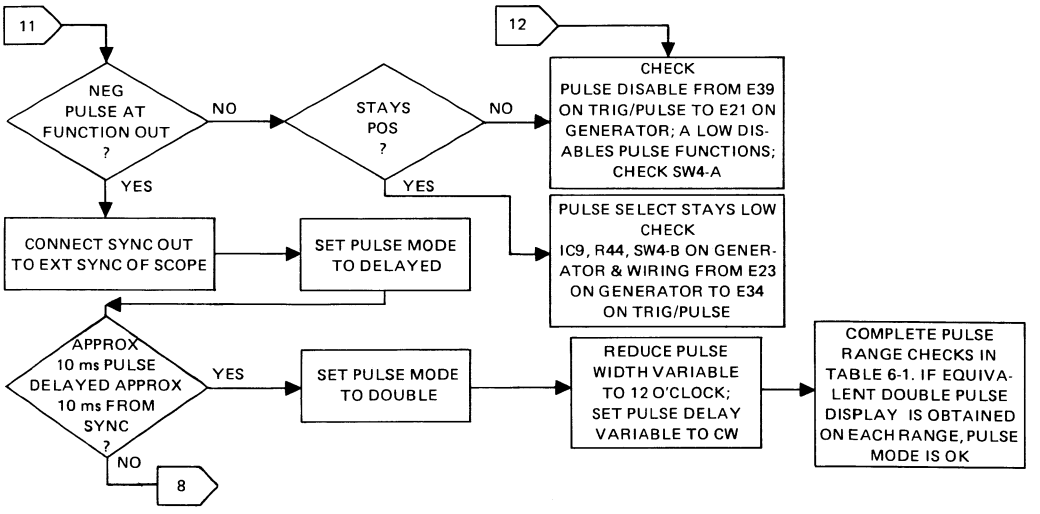


Figure 6-8. Pulse Mode Checks, Trig/Pulse Board (Page 2 of 2)

Table 6-1. Pulse Ranges

Pulse Width	Ranging Components	Pulse Delay	Ranging Components	Pulse Period	Scope Horizontal
OFF	IC5, SW3-A	NA	NA	NA	NA
25 ns ▮ 100 ns	C55, Q19, Q20, SW3-B	50 ns ▮ 100 ns	C40, Q16, Q17, SW2-B	> 0.5 μs	0.05 μs/div
100 ns ▮ 1 μs	C56, CR29, CR30	100 ns ▮ 1 μs	C41, CR19, CR20	> 5 μs	0.5 μs/div
1 μs ▮ 10 μs	C57, CR31, CR32	1 μs ▮ 10 μs	C42, CR21, CR22	> 50 μs	5 μs/div
10 μs ▮ 100 μs	C58, CR33, CR34	10 μs ▮ 100 μs	C43, CR23, CR24	> 0.5 ms	50 μs/div
100 μs ▮ 1 ms	C59, CR35, CR36	100 μs ▮ 1 ms	C44, CR25, CR26	> 5 ms	0.5 ms/div
100 μs ▮ 1 ms	C59, CR35, CR36	1 ms ▮ 10 ms†	C45, CR27, CR28	> 5 ms	0.5 ms/div
⎍	IC4 - IC6, SW3-A	NA	NA	0.5 ms	0.5 ms/div

†Rotate PULSE DELAY VERNIER ccw for proper display

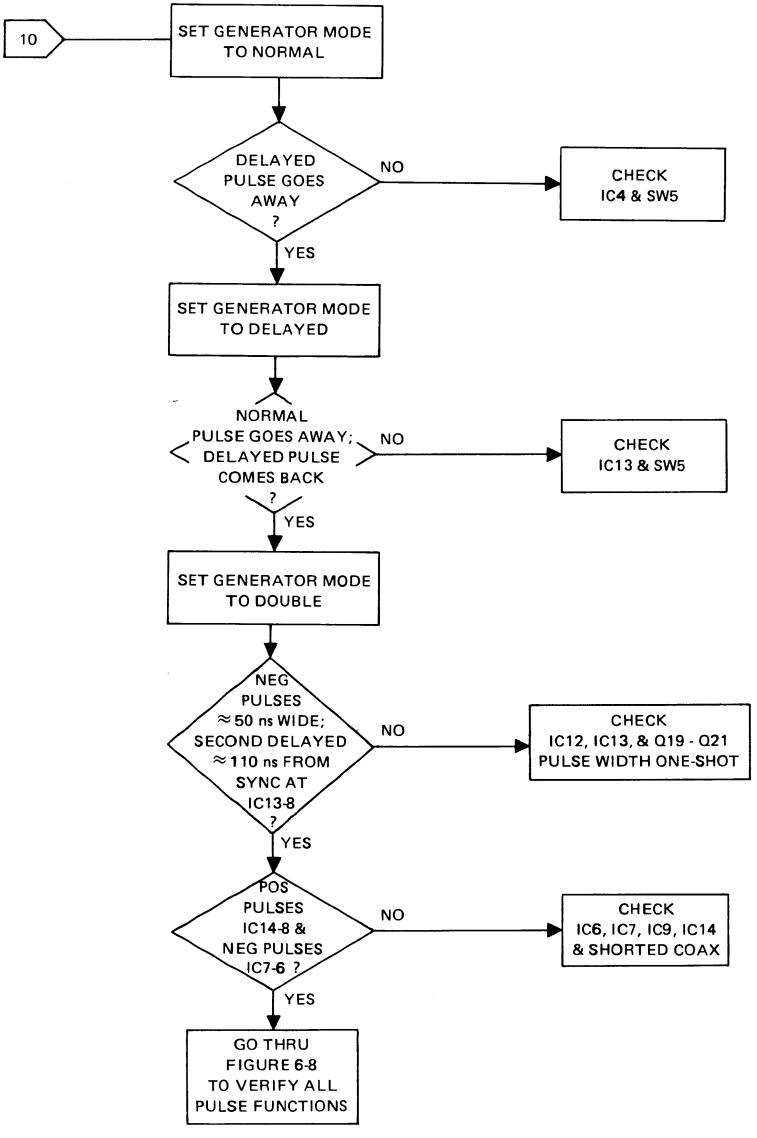


Figure 6-9. Pulse Generator Checks, Trig/Pulse Board (Page 2 of 2)

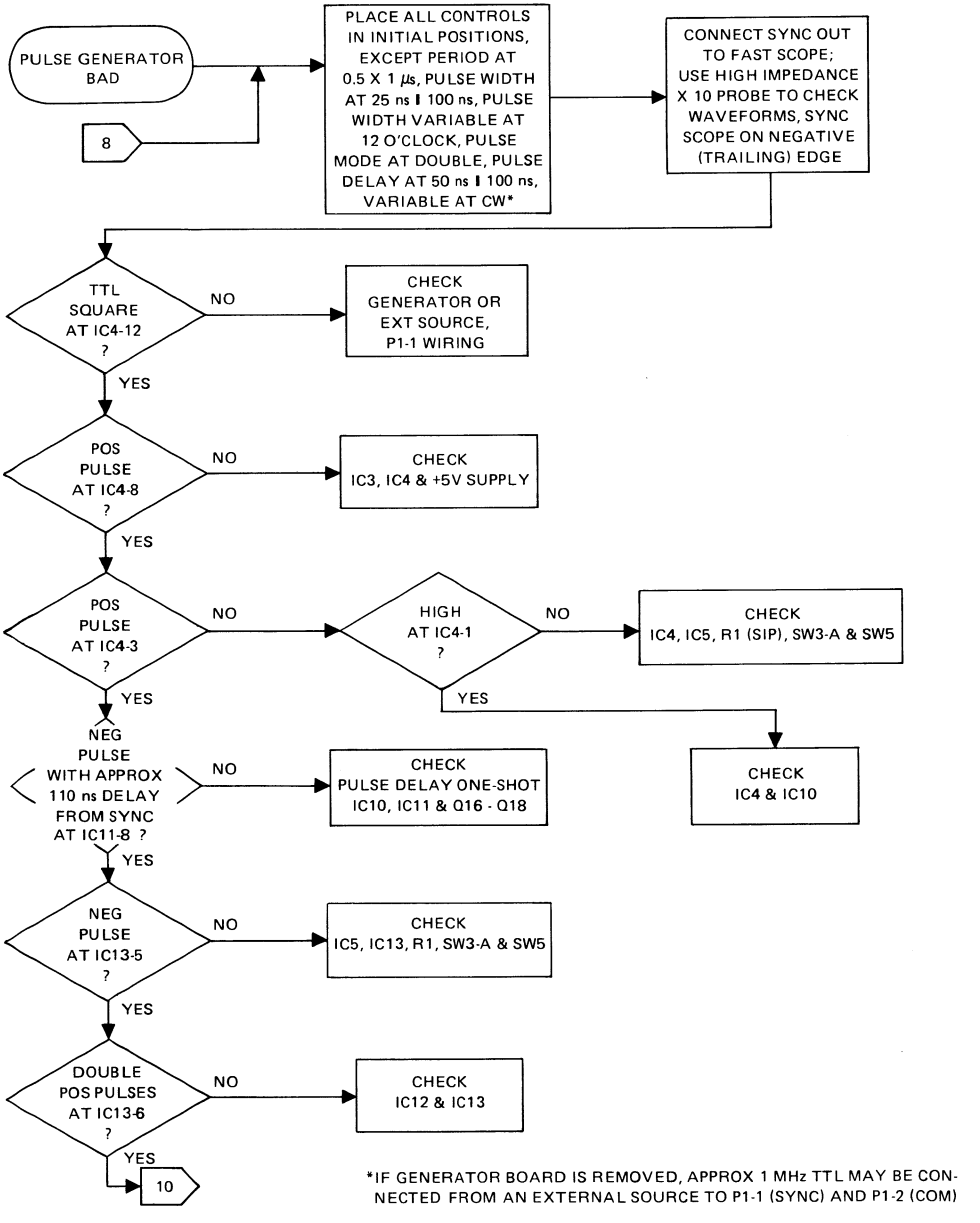


Figure 6-9. Pulse Generator Checks, Trig/Pulse Board (Page 1 of 2)

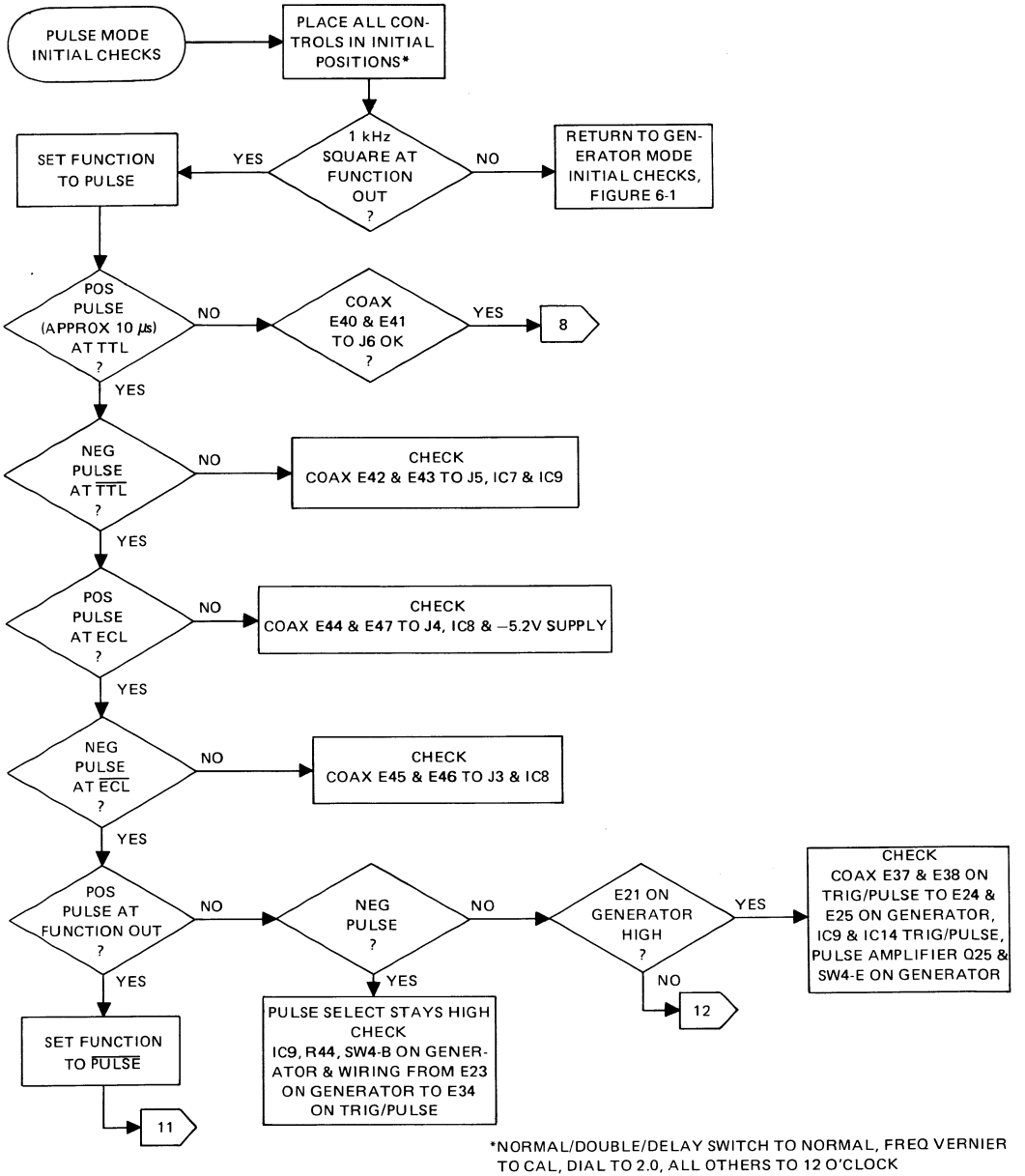


Figure 6-8. Pulse Mode Checks, Trig/Pulse Board (Page 1 of 2)

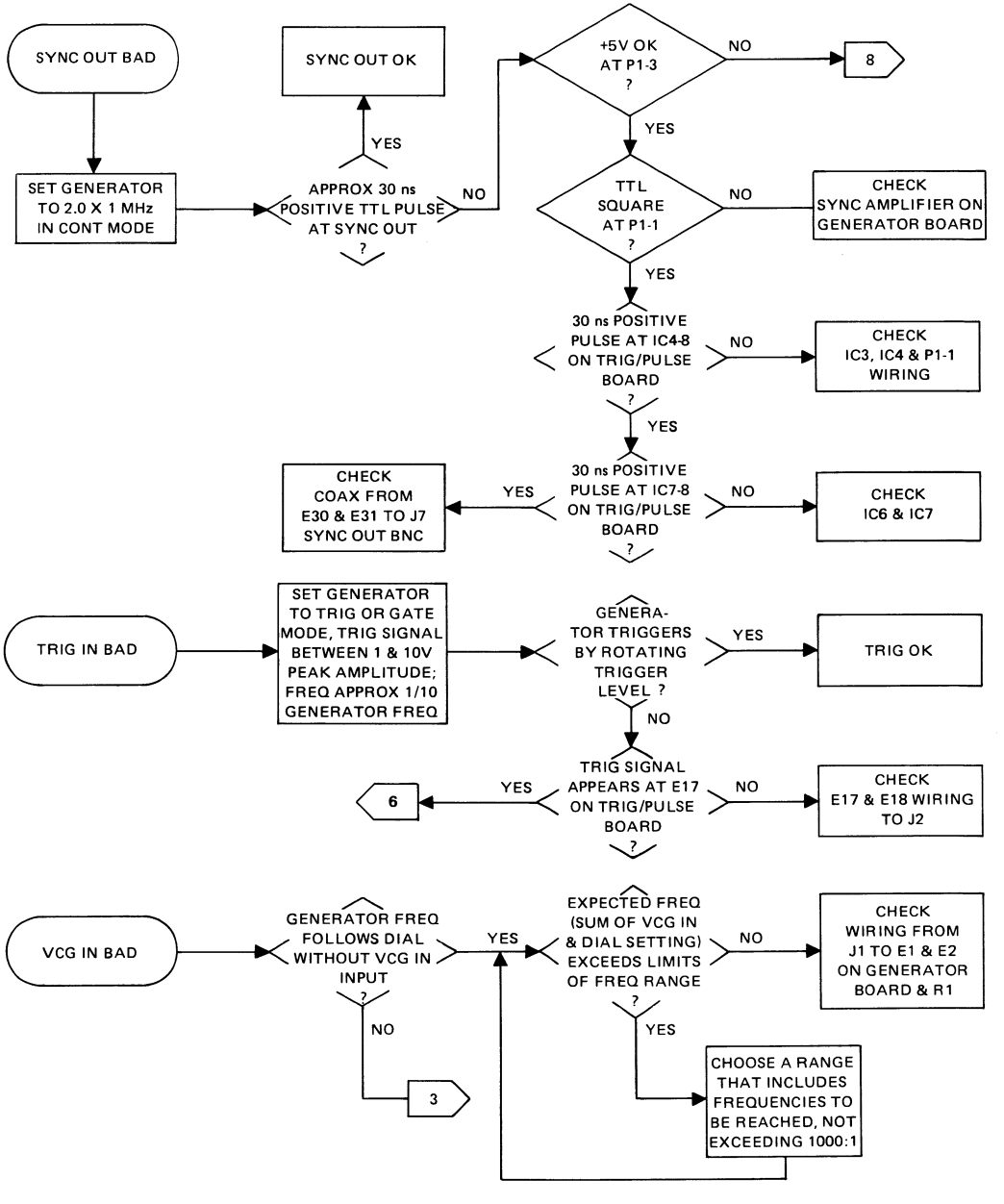


Figure 6-7. Generator Input and Output Checks (Page 1 of 2)

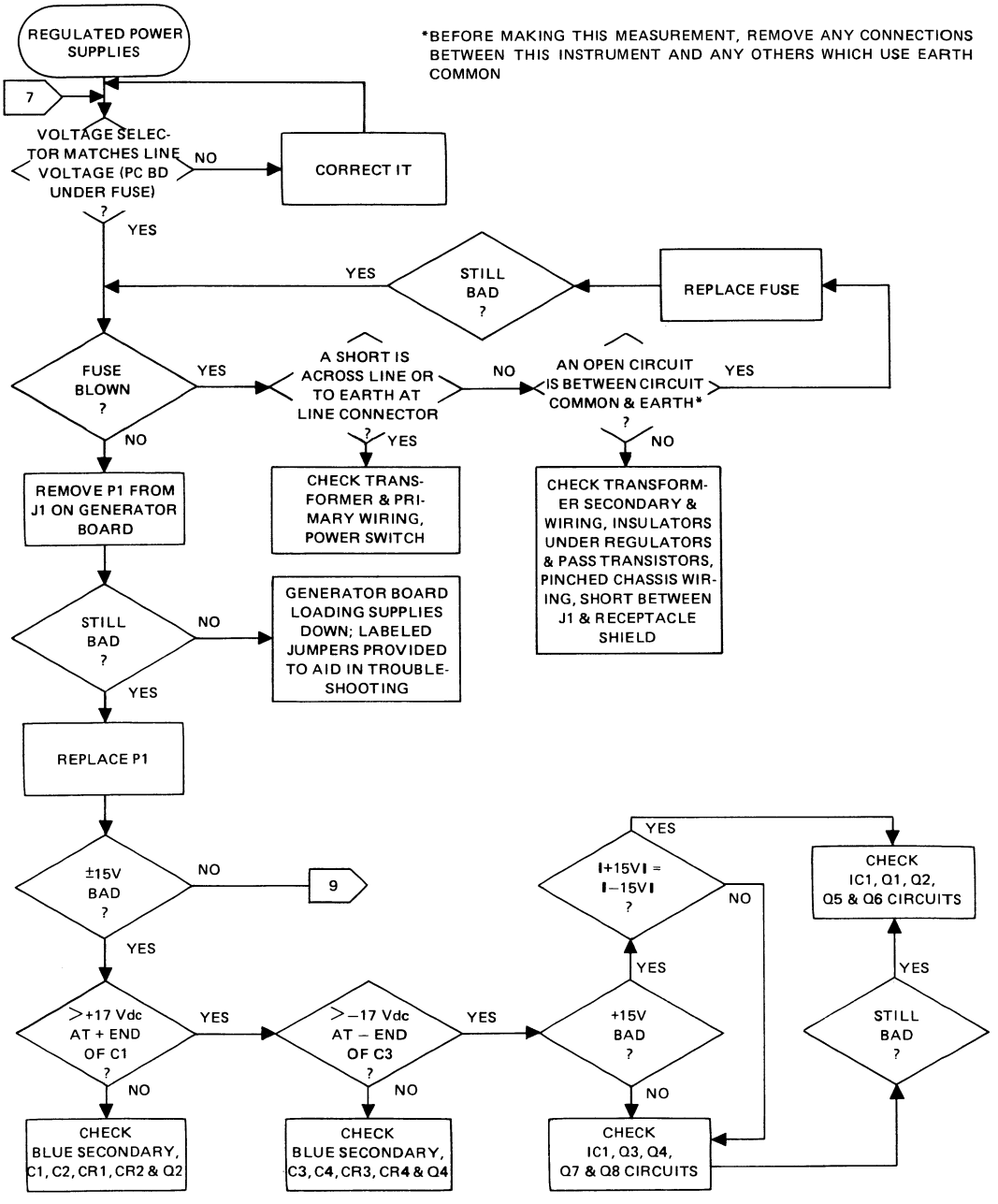
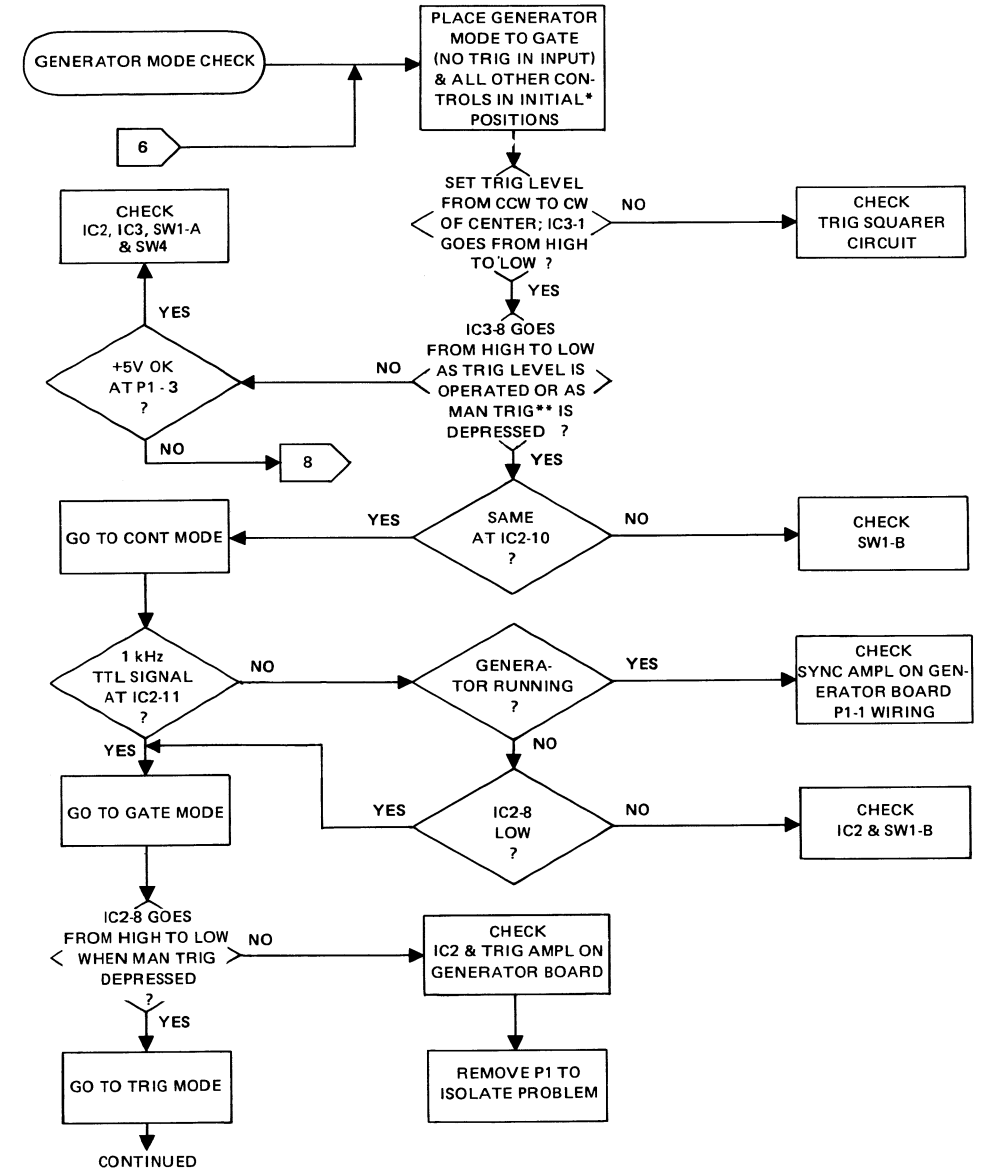


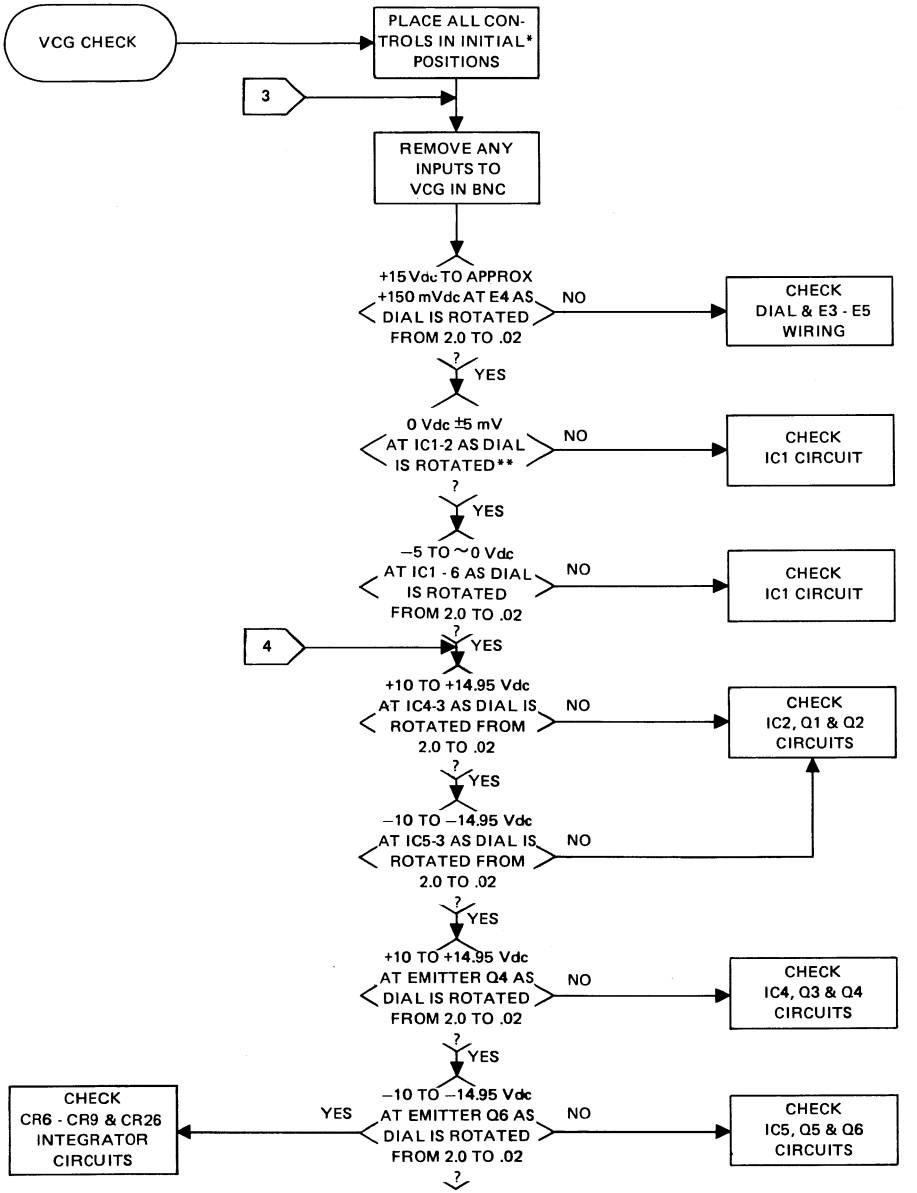
Figure 6-6. Power Supply Checks, Trig/Pulse Board (Page 1 of 2)



*NORMAL/DOUBLE/DELAY SWITCH TO NORMAL, FREQ VERNIER TO CAL, DIAL TO 2.0, ALL OTHERS TO 12 O'CLOCK

**RETURN TRIG LEVEL CCW TO OPERATE MANUAL TRIGGER

Figure 6-5. Trigger and Gate Mode Checks, Trig/Pulse Board (Page 1 of 2)



*NORMAL/DOUBLE/DELAY SWITCH TO NORMAL, FREQ VERNIER TO CAL, DIAL TO 2.0, ALL OTHERS TO 12 O'CLOCK

**USE SCOPE AND HIGH IMPEDANCE PROBE FOR THIS AND SUBSEQUENT VCG MEASUREMENTS

Figure 6-3. VCG Checks, Generator Board

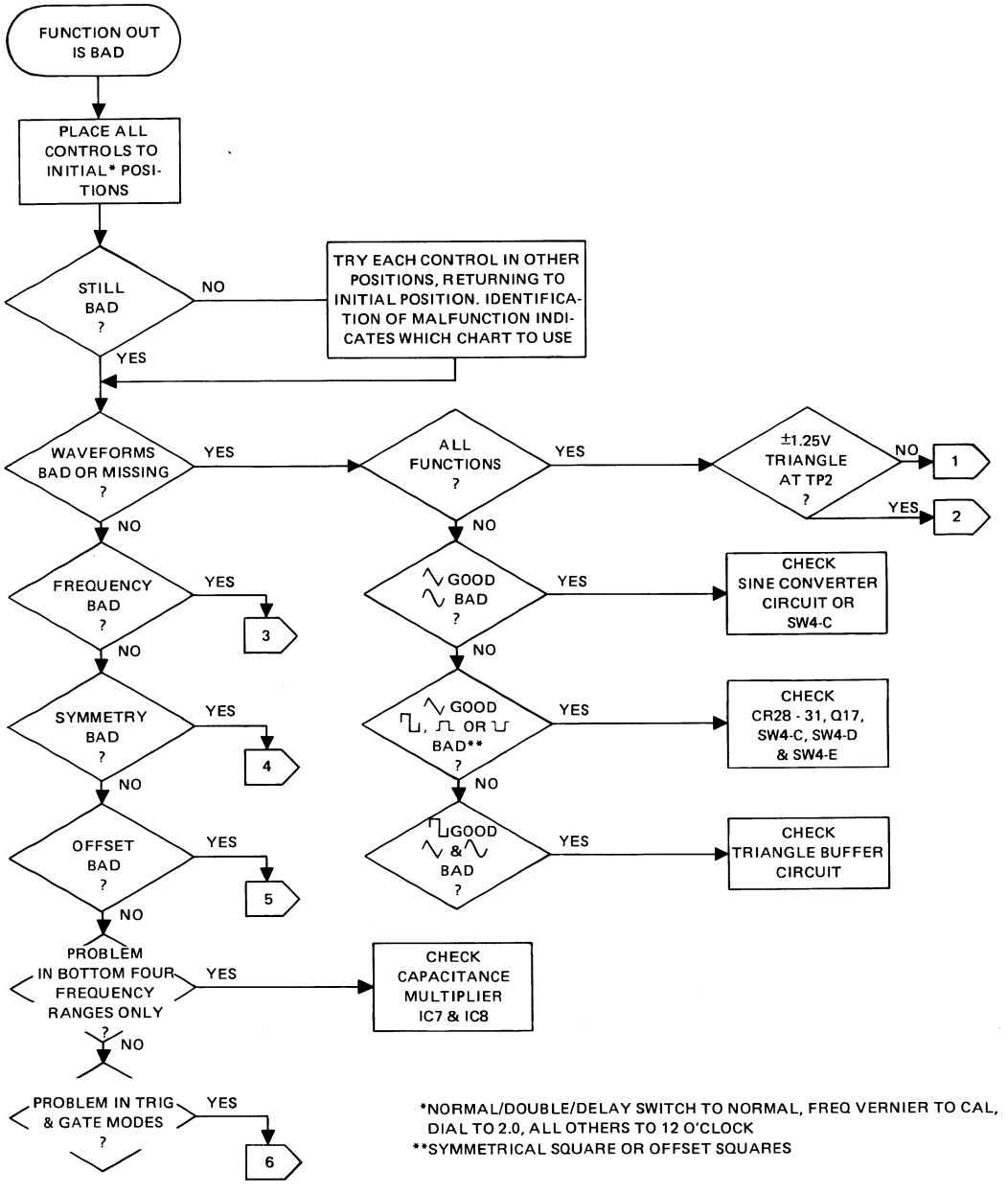


Figure 6-1. Initial Checks, Generator Board