

OPERATION AND MAINTENANCE MANUAL

AILTECH 7175 GAS TUBE TRIGGERABLE POWER SUPPLY



PRINTED IN U.S.A.

EAT•N Advanced
Electronics

Eaton Corporation
Electronic Instrumentation Division
City of Industry, California 91748

WARRANTY

This instrument is protected by a full one year warranty against defects in workmanship and materials, except for fuses, which carry no warranty. Eaton Corporation, in connection with equipment sold, agrees to correct any defect in workmanship or material which may develop during the period of one year from the date of shipment under proper or normal use and not in excess of the original manufacturer's life expectancy ratings, by its option to repair or replace, FOB point of shipment, the defective part or parts. Such correction shall constitute a fulfillment of all Eaton Corporation liabilities in respect to said instrument.

PROPRIETORIAL

This document involves CONFIDENTIAL proprietary design rights of Eaton Corporation and all design, manufacturing, reproduction, use and sale rights regarding the same are expressly reserved. It is submitted under a confidential relationship for a specified purpose and recipient, by accepting this document, assumes custody and control and agrees: (a) that this document will not be copied or reproduced in whole or in part, nor its contents revealed in any manner or to any person, except to meet the purposes for which it was delivered, and (b) that any special features peculiar to this design will not be incorporated in other projects.

SERVICE

Additional service information can be made available by calling Eaton Corporation, Electronic Instrumentation Division.

PRODUCT OF :

CITY OF INDUSTRY OPERATION • 19535 East Walnut Drive • City of Industry, Ca. 91748 • Telephone : (213) 965-4911
LONG ISLAND OPERATION • 2070 Fifth Avenue • Ronkonkoma, N.Y. 11779 • Telephone : (516) 588-3600
LOS ANGELES OPERATION • 5340 Allia Road • Los Angeles, Ca. 90066 • Telephone : (213) 822-3061
FRANCE • La Garenne — Colombes • Telephone : (01) 780-73-73
UNITED KINGDOM • Crowthorne • Telephone : Crowthorne 5777 (Area 3446)
GERMANY • Munich • Telephone : (089) 5233023-24
HOLLAND • Rozenburg N-H • Telephone : (02977) 29376

TABLE OF CONTENTS

	<u>Page</u>
CHAPTER I - GENERAL INFORMATION	
1-1. Introduction	1-1
1-3. General Description	1-1
1-6. Safety Precautions	1-1
1-9. Technical Specifications	1-3
1-11. Functional Description	1-5
1-12. General	1-5
1-14. The 7175 in a Typical Application	1-5
1-17. Options	1-6
1-19. Accessories	1-6
1-20. Noise Generators	1-6
1-21. Test Equipment	1-6
CHAPTER II - INSTALLATION	
2-1. Introduction	2-1
2-3. Unpacking, Inspection and Damage Claims	2-1
2-5. Ancillary Items	2-1
2-7. Rack Mounting	2-2
2-9. Preparation for Use	2-2
2-11. Initial Checkout	2-3

	<u>Page</u>
2-14. General	2-3
2-16. Checkout Procedures	2-4
 CHAPTER III - OPERATING INSTRUCTIONS	
3-1. General	3-1
3-3. Description of Operating Controls, Indicators and Connectors	3-1
3-5. Setup Procedures	3-1
3-7. Interconnections	3-1
3-11. Operation	3-4
 CHAPTER IV - THEORY OF OPERATION	
4-1. Introduction	4-1
4-4. Circuit Description	4-2
4-6. Local Clock	4-2
4-10. Input Mode Switch	4-2
4-11. +15 V Power Supply	4-2
4-12. 300 V Power Supply	4-3
4-14. Ignition Circuit	4-3
4-17. Firing Circuit	4-3
 CHAPTER V - MAINTENANCE AND ADJUSTMENTS	
5-1. General	5-1
5-3. Performance Verification	5-1
5-6. LOCAL Mode Operation	5-1
5-7. REMOTE Mode Operation	5-3

	<u>Page</u>
5-9. Troubleshooting Procedure	5-5
5-11. Resistance Check	5-5
5-13. Power Supplies	5-5
5-16. Internal Clock	5-6
5-23. Remote Input Operation	5-7
5-28. Factory Service	5-9
 CHAPTER VI - PARTS LIST	
6-1. Recommended Spare Parts	6-1
6-2. Replaceable Spare Parts	6-1

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1-1	AILTECH 7175 Gas Tube Triggerable Power Supply	1-2
1-2	Outline Dimensions, AILTECH 7175	1-2
1-3	Typical Noise Figure Measurement Using The AILTECH 7175 Gas Tube Triggerable Power Supply	1-5
2-1	AC Input Receptacle and Fuse Assembly	2-3
3-1	Controls, Indicators, Connectors and Cables	3-2
3-2	Typical Noise Figure Measurement using The AILTECH 7175 Gas Tube Triggerable Power Supply	3-4
4-1.	Overall Functional Block Diagram	4-1
5-1	7175 Gas Tube Triggerable Power Supply Board Locations	5-2
5-2	Block Diagram - LOCAL Mode Operation	5-4
5-3	Block Diagram - REMOTE Mode Operation	5-4
5-4	Waveform at Gate of SCR 1	5-8
5-5	Waveform at Anode of SCR 1	5-8
5-6	Component Layout, Main Board	5-10
5-7	Schematic Diagram, 7175 Gas Tube Triggerable Power Supply	5-11

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1-1	Technical Specifications	1-3
1-2	Applicable Noise Generators	1-4
1-3	Recommended Test Equipment	1-6
3-1	AILTECH 7175 Gas Tube Triggerable Power Supply Controls, Indicators and Connectors	3-3
5-1	Test Equipment For Performance Verification and Troubleshooting Procedures	5-3
5-2	Power Supply Specifications	5-6
5-3	DC Voltage Measurements	5-7



CHAPTER I

GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This Instruction Manual is for the AILTECH 7175 Gas Tube Triggerable Power Supply (Figure 1-1), and contains physical and functional descriptions, installation and inspection procedures, operating and maintenance instructions and a parts list. All schematics, electrical and assembly drawings are included. The only option available is Option 11, which is Rack Mount Angle Brackets.

1-3. GENERAL DESCRIPTION

1-4. The AILTECH 7175 Gas Tube Triggerable Power Supply is an instrument that provides the high voltage necessary to fire argon gas-discharge tubes. The output discharge current from these tubes can be adjusted to 250 mA. This unit can be triggered by any AILTECH 73XX or 75XX Noise Instrument, or operate "Stand Alone" for manual noise measurement.

1-5. The AILTECH 7175 is approximately 17 inches (43 cm) wide and 13 inches (33 cm) deep (see Figure 1-2). Optional rack mount angle brackets (Option 11) are required for rack installation. This instrument will fit into a standard 5-1/4 inch (13.3 cm) panel opening.

1-6. SAFETY PRECAUTIONS

1-7. WARNING

This unit produces a 5000 V spike to fire the gas tubes. It is produced from a 300-V DC power supply. After turning off AC power, wait 30 seconds for all capacitors to discharge below 30 volts. These instruments should be serviced by technically qualified personnel only.



FIGURE 1-1. AILTECH 7175 GAS TUBE TRIGGERABLE POWER SUPPLY

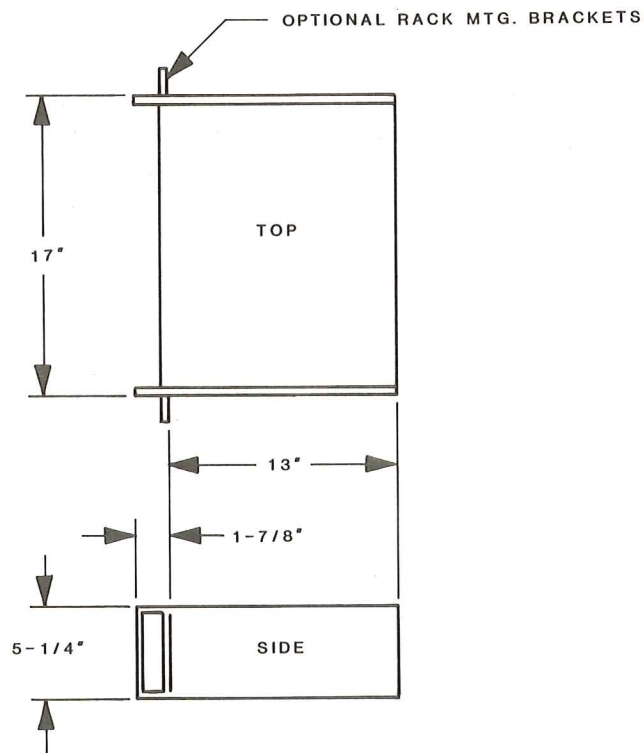


FIGURE 1-2. OUTLINE DIMENSIONS, AILTECH 7175

1-8. A standard three-wire, polarized line cord is supplied with the instrument, and mates with an internationally accepted EMI/RFI line filter. The connector complies with all current and proposed domestic and international requirements for commercial test equipment. Two six-foot cables are also supplied to connect the AILTECH 7175 to AILTECH 70XX Noise Generators.

1-9. TECHNICAL SPECIFICATIONS

1-10. A listing of technical specifications is provided in Table 1-1. Outline illustrations are provided in Figure 1-2.

TABLE 1-1. TECHNICAL SPECIFICATIONS

Trigger Rate	50 Hz - 2000 Hz
Input Trigger Voltage	+25 V - 30 V: On 0 V: Off
Output	Spike voltage: 5000 V (nominal) Discharge current variable to 250 mA.
Duty	Continuous for all currents to 250 mA.
Input Power	115/230 VAC \pm 15%, 2A/1A, 50-400 Hz
Dimensions	5-1/4" H x 17" W x 13-1/4" D (less handles) (13.3 cm x 43.2 cm x 33.7 cm) See Figure 1-2.
Weight	20 lb. (9.1 kg) Net 25 lb. (11.4 kg) Shipped

TABLE 1-2. APPLICABLE NOISE GENERATORS

Part Number*	<u>7052</u>	<u>7091</u>	<u>7053</u>	<u>7096</u>	<u>7010</u>	<u>7012</u>
Frequency Range (GHz)	8.2-12.4	12.4-18.0	18.0-26.5	26.5-40.0	0.2-2.6	2-5
Excess Noise Ratio Tube Only (dB)	15.75	16.15	16.15	16.3	15.6	15.65
Anode Current (mA)	175	150	150	100	175	175
Noise Output Connections	UG-39/U	UG-419/U	UG-425/U	UG-495/U	Type N	Type N
Unfired SWR	1.3	1.3	1.35	1.3	1.3	2.0
Fired SWR	1.2	1.2	1.35	1.2	1.15	1.5
Maximum Unfired Insertion Loss (dB)	0.5	1	1	1	1.7	1.7
Minimum Fired Insertion Loss (dB)	20	12	15	15	11	11
Termination Power Rating (watts)	4	1.5	0.5	-	-	-
Length	18" (45.7 cm)	15-11/16" (40.5 cm)	15-1/4" (38.7 cm)	13-1/2" (34.3 cm)	6" (15.24 cm)	16" (40.6 cm)
Weight	4 lb. (1.81 kg)	4 lb. (1.81 kg)	3 lb. (1.37 kg)	4 lb. (1.81 kg)	5 lb. (2.25 kg)	2.5 lb. (1.13 kg)

*Part number indicates waveguide size.

Note: The excess noise ratios listed herein are only for the noise tubes. The tube manufacturer's production tolerance is ± 0.25 dB. To this must be added the comparison tolerance of his calibration equipment--typically, ± 0.15 dB, and the uncertainty of the excess noise ratio of his National Bureau of Standards calibrated standard, ± 0.1 dB. The absolute accuracy of the excess noise ratios listed then, is about ± 0.5 dB.

1-11. FUNCTIONAL DESCRIPTION

1-12. General

1-13. The 7175 Gas Tube Triggerable Power Supply is designed for field and production applications that evaluate the noise performance of amplifiers, receivers, and receiver systems. The AILTECH 70XX Waveguide and Coaxial Noise Generators from .2 GHz to 40 GHz are capable of being driven by the 7175.

1-14. The 7175 in a Typical Application

1-15. In a typical measurement setup for transistors, amplifiers, mixers, receivers, etc., such as those shown in Figure 1-3, the 7175 furnishes modulated firing voltage and discharge current to the noise source, derived from the 73XX/75XX Noise Instrument clock. This clock provides the alternating noise-on and noise-off periods to the unit under test.

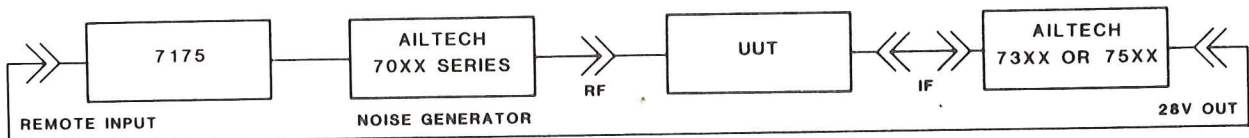


FIGURE 1-3. TYPICAL NOISE FIGURE MEASUREMENT USING THE AILTECH 7175 GAS TUBE TRIGGERABLE POWER SUPPLY

1-16. An intermediate frequency (IF) is derived either internal to the unit, in the case of a complete transceiver, or externally by means of added downconverters. This signal, which consists of periods of IF noise from the unit alone, alternating with periods of UUT noise, plus that added by the noise source, is applied to the

73XX/75XX Noise Monitor. The difference between the two detected levels derived from the IF signal is related to the noise performance of the UUT. This difference is synchronously detected and displayed directly as noise figure by the Monitor.

1-17. OPTIONS

1-18. Only Option 11, Rack Adapter Brackets, which permit mounting the AILTECH 7175 Gas Tube Triggerable Power Supply into a standard 19-inch rack is offered.

1-19. ACCESSORIES

1-20. Noise Generators. The 7175 drives all AILTECH 70XX Series Noise Generators. Table 1-2 lists all applicable AILTECH Noise Sources.

1-21. TEST EQUIPMENT

1-22. Table 1-3 lists the test equipment recommended for use in testing, adjusting, and servicing the Triggerable Power Supply.

TABLE 1-3. RECOMMENDED TEST EQUIPMENT

<u>Description</u>	<u>Recommended Manufacturer and Model</u>
Gas Discharge Noise Generator	AILTECH 70XX
Noise Meter	AILTECH 73XX or 75XX
Dual Trace Oscilloscope	Tektronix 475A
Digital Voltmeter 0-350 V DC, 3-1/2 Digit	Data Precision 1350

CHAPTER II

INSTALLATION

2-1. INTRODUCTION

2-2. This chapter describes unpacking, inspection, preparation for use and initial checkout of the AILTECH 7175 Gas Tube Triggerable Power Supply.

2-3. UNPACKING, INSPECTION AND DAMAGE CLAIMS

2-4. No special instructions or precautions are necessary for unpacking the Power Supply; the instrument is ready for use immediately upon receipt. The following checks should be made to insure that no damage has occurred during shipment.

- a. Inspect the shipping container prior to acceptance from the carrier. Note any damage to the shipping container on the carrier's receipt.
- b. Inspect the instrument for damage. Check for dents, scratches, broken switches, connectors, etc.
- c. Remove the top and bottom covers, and inspect for broken components and loose hardware.
- d. If damage is not apparent until after the instrument has been accepted, file a claim for concealed damage with the carrier within 5 days after receipt. All packaging material must be kept for inspection by the carrier's agent. A copy of the claim must be forwarded to AILTECH.

2-5. ANCILLARY ITEMS

2-6. Each 7175 Power Supply is accompanied by a mating line

cord, two six-foot cables attached to the rear panel, and one instruction manual. Before discarding the shipping container, make sure these items are removed.

2-7. RACK MOUNTING

2-8. Rack Mounting Adapter Kit, Option 11, is required to secure the AILTECH 7175 in a standard 19-inch rack. The kit consists of two right-angle brackets which bolt to the side of the unit. Complete assembly instructions are provided with the kit.

2-9. PREPARATION FOR USE

2-10. Prior to shipment from the factory, the line voltage adapter on the rear panel is set to the value appropriate for the shipping destination. However, it is good practice to check this setting prior to operating the instrument (see Figure 2-1). The correct value for the line voltage selected:

230 VAC: F1 - 1.0 amp

115 VAC: F1 - 2.0 amp

- a. If it is necessary to change the line voltage setting:
 1. Disconnect the power cord from the instrument.
 2. Slide the plastic cover to the left to gain access to the full assembly. Using the fuse extractor that is part of the assembly, remove the fuse.
 3. Remove the voltage-select card that is located directly below the fuse holder, inside the assembly. Reinsert the card such that the proper line voltage is on the upper left side of the card. (See Figure 2-1.)
 4. Insert the proper fuse, and slide the plastic cover back over the fuse.

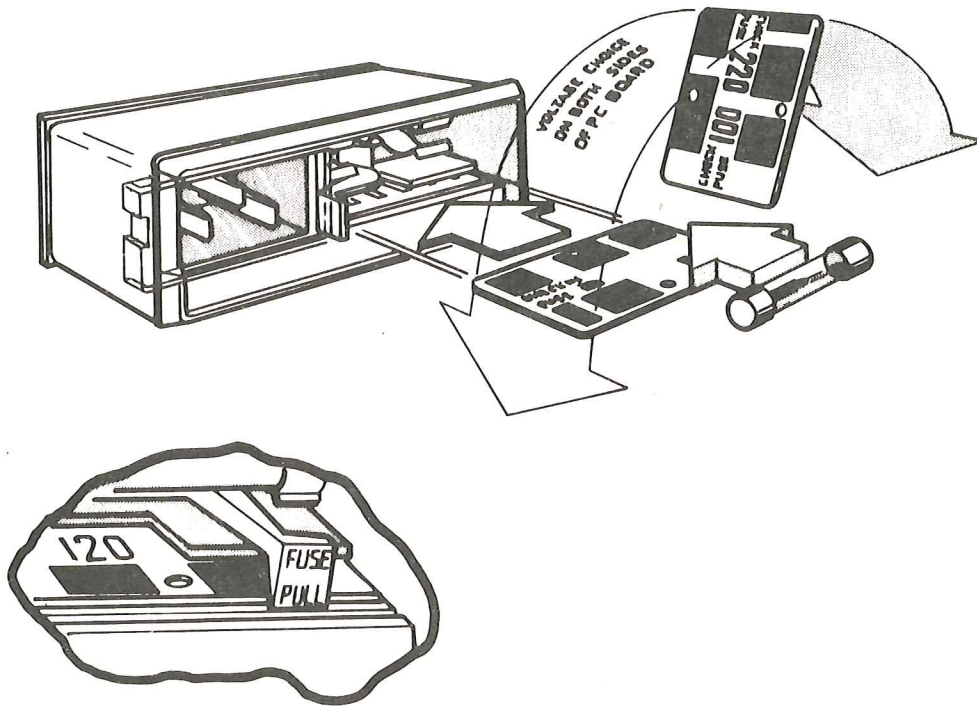


FIGURE 2-1. AC-INPUT RECEPTACLE AND FUSE ASSEMBLY

2-11. INITIAL CHECKOUT

2-12. This operational checkout is a preliminary test, and is not intended to validate performance standards. (For complete Validation Procedure, refer to Chapter V.) Figure 3-1 and Table 3-1 locate and describe the function of the controls, indicators, and connectors referenced below.

2-13. The equipment required for initial operational checkout is as follows:

- a. Noise Generator - AILTECH 70XX Series

2-14. General

2-15. Perform the procedures detailed in paragraph 2-10.

(Set power ON/OFF switch to OFF position.) Connect the line cord to the appropriate AC Power Supply.

WARNING

The 7175 produces a 5000 V spike to fire the gas tubes. Only qualified technical personnel should service this instrument.

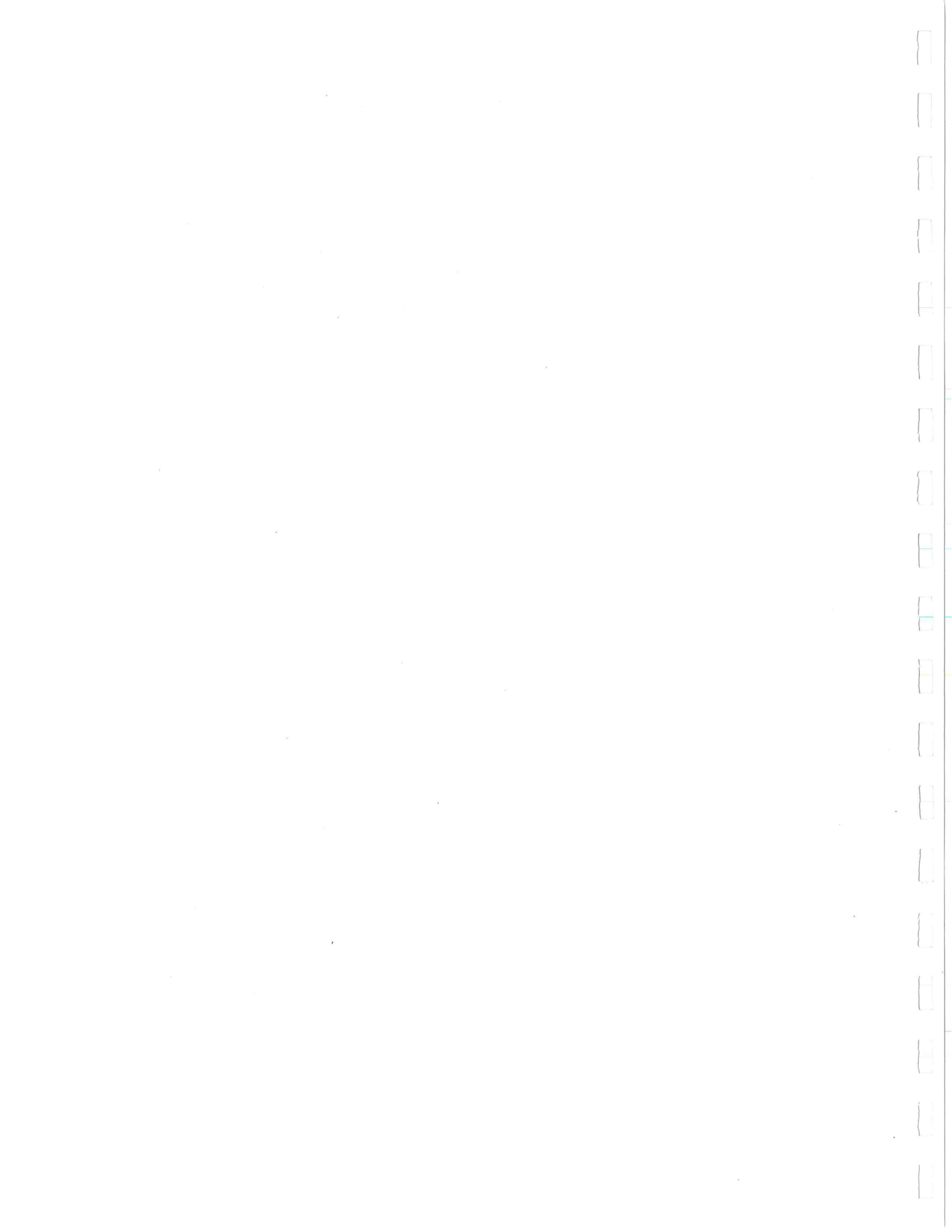
2-16. Checkout Procedures

- a. Connect the cathode connector to the cathode end of the 70XX Series Noise Generator being used. Insert the cathode connector in line with the axis of the noise generator. To prevent damage to the noise lamp, be sure that the pins line up with the connector. The nut retaining spring must sit flush against the connector mount, without excessive pressure, before the locknut is tightened.
- b. Push the anode connector into position at the anode end of the noise generator.
- c. Push front panel switch for LOCAL input OFF mode.
- d. Turn Generator Current control to 0 position.
- e. Set the Power ON/OFF switch to ON.
- f. Current reading on the meter should remain at 0, as the Generator Current knob is rotated clockwise to 10.
- g. Return Generator Current control to 0 position.
- h. Push front panel switch to the ON mode.
- i. Slowly increase the Generator Current control until the discharge tube fires. This is indicated by the generator current meter. Adjust the Generator Current control to the proper setting for the particular Noise Generator being used. (This information is given in the Instruction Manual for the Noise Generator.)
- j. Push the front panel switch to REMOTE input. The

meter should read 0 again.

NOTE

If the instrument fails any portion of the checkout procedure, it requires adjustment or repair. Refer to Chapter V for adjustment and troubleshooting instructions. If the unit is still under warranty, see section 5-28 Factory Service.



CHAPTER III
OPERATING INSTRUCTIONS

3-1. GENERAL

3-2. This Chapter provides a description of the 7175 Gas Tube Triggerable Power Supply operating controls, indicators and connectors, and typical operating procedures.

3-3. DESCRIPTION OF OPERATING CONTROLS, INDICATORS
AND CONNECTORS

3-4. The front and rear panel controls, indicators and connectors are listed in Table 3-1, and illustrated in Figure 3-1.

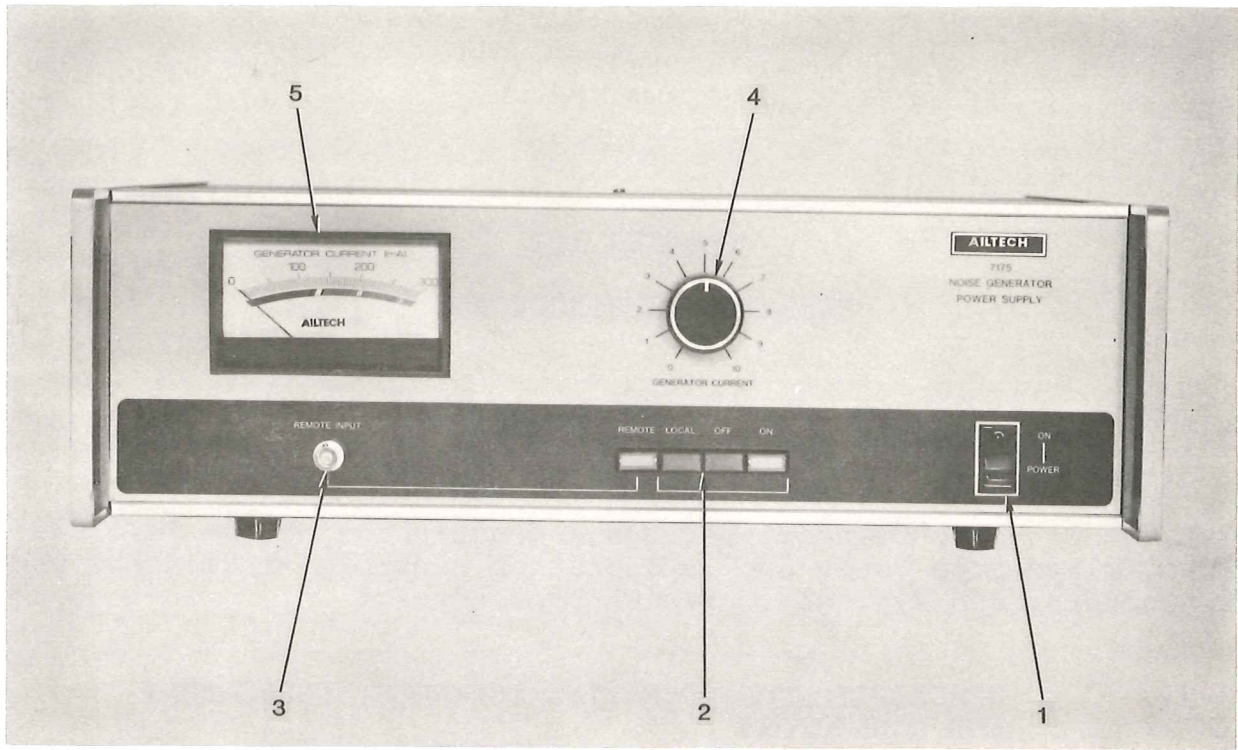
3-5. SETUP PROCEDURES

3-6. The AILTECH 7175 Gas Tube Triggerable Power Supply will drive all AILTECH 70XX Series Noise Generators. Care must be taken not to jar the 70XX Series Noise Generators, as they encase fragile glass tubes.

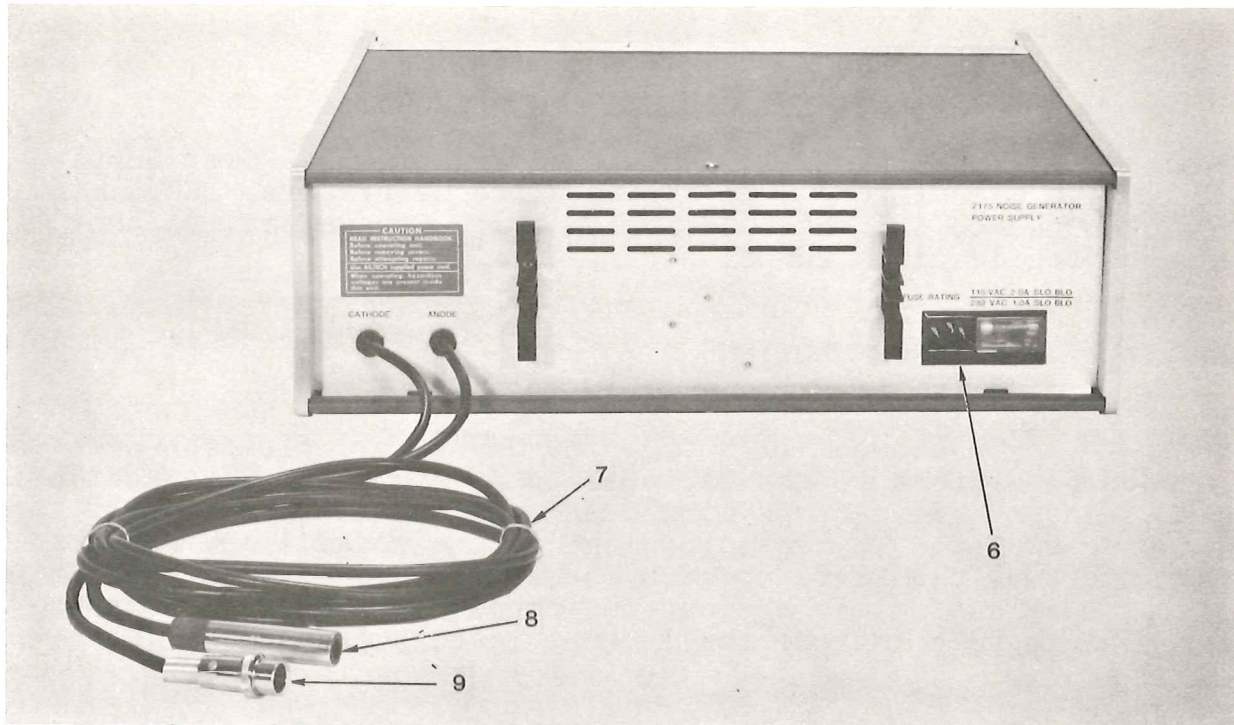
3-7. INTERCONNECTIONS

3-8. To connect 7175 to Noise Generator, first connect the cathode connectors to the cathode end of the Noise Generator being used. Insert the cathode connector in line with the axis of the Noise Generator. To prevent damage to the noise lamp, be sure that the tube pins line up with the connector. The nut retaining spring must seat flush against the connector mount, without excessive pressure, before the locknut is tightened.

3-9. Push the anode connector into position at the anode end of the Noise Generator.



a. Front Panel



b. Rear Panel

FIGURE 3-1. CONTROLS, INDICATORS, CONNECTORS AND CABLES

TABLE 3-1. AILTECH 7175 GAS TUBE TRIGGERABLE POWER SUPPLY CONTROLS, INDICATORS AND CONNECTORS

Key (Figure 3-1)	Title	Reference Designation	Function
1	ON/OFF Switch	S1	Lever switch controls application of AC power.
2.	INPUT/MODE Switch	S2-S5	Push switch that selects local or remote clock and ON/OFF mode for local operation.
3	REMOTE INPUT	J4	BNC female connector for application of external clock.
4	GENERATOR CURRENT	R30	Variable resistor that controls noise generator discharge current.
5	CURRENT METER	M1	Analog meter that displays discharge current.
6	AC INPUT	J1	Recessed plug for application of primary AC input with fuse and AC input voltage selector.
7	Cables	-	Two six-foot cables that mate to AILTECH 70XX Noise Generator.
8	Anode Connector	-	Cable connector that mates with anode of 70XX.
9	Cathode Connector	-	Cable connector that mates with cathode of 70XX.

3-10. If an external clock is to be used to trigger the 7175, connect this signal to the REMOTE input connector.

3-11. OPERATION

3-12. The basic operating procedures are as follows:

- a. Mate output cables with 70XX as described in paragraphs 3-8 and 3-9.
- b. A typical setup is shown in Figure 3-2.
- c. In the LOCAL input mode, set unit to the ON mode, and adjust the Generator Current control to the proper setting for the particular Noise Generator being used. (This information is given in the Instruction Manual for the Noise Generator.)
- d. Set unit back to REMOTE input mode.
- e. Operate 73XX or 75XX Noise Instruments as described in their respective manuals.
- f. Manual Y-factor or automatic noise figure measurements can be made with the AILTECH 7175.

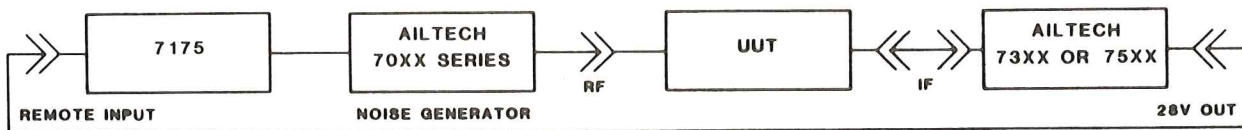


FIGURE 3-2. TYPICAL NOISE FIGURE MEASUREMENT USING THE AILTECH 7175 GAS TUBE TRIGGERABLE POWER SUPPLY

CHAPTER IV
THEORY OF OPERATION

4-1. INTRODUCTION

4-2. This Chapter contains an overall block diagram description of the AILTECH 7175, and detailed individual circuit descriptions.

4-3. Figure 4-1 illustrates the functional block diagram of the 7175.

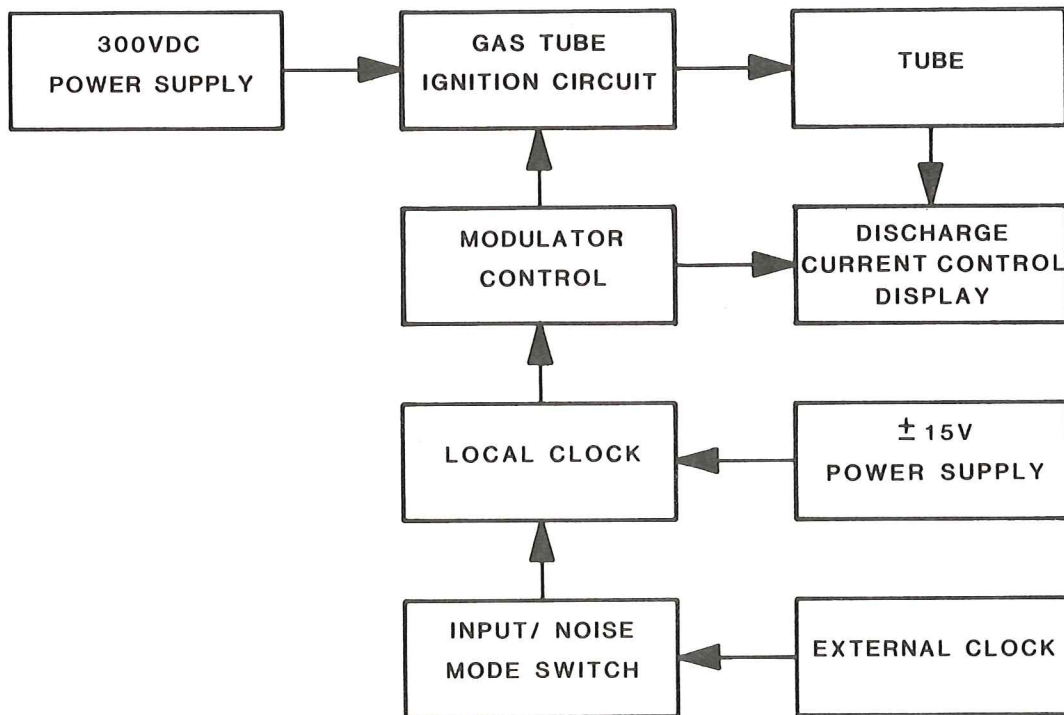


FIGURE 4-1. OVERALL BLOCK DIAGRAM, 7175

4-4. CIRCUIT DESCRIPTION

4-5. The following paragraphs describe the operation of the circuits within the Triggerable Power Supply. Schematics will be found in Chapter V, Maintenance and Adjustments. The diagrams are on fold-out sheets so they can be followed simultaneously with the circuit descriptions.

4-6. Local Clock. The clock consists of U1, and timing components R18, R17, and C7. The output of U1 is used to trigger the firing circuit through R22 and Q5. After the tube has fired, Q4 turns on, thereby preventing the clock from retriggering the firing circuit.

4-7. In the LOCAL input mode, and in the OFF mode, the reset input to U1 is held logic low at ground. This disables U1, and thereby keeps the gas tube from being driven ON. Q8 is also turned on, which removes the biasing to Q1 and Q2, through which all tube discharge current must pass.

4-8. In the LOCAL input mode, and in the ON mode, the reset is held logic high at the plus voltage, and U1 is allowed to free run. In this mode, U1 will continually trigger the firing circuit until the tube fires. If the tube somehow turns off, U1 will automatically sense this and retrigger the firing circuit to again turn on the gas tube.

4-9. In the REMOTE input mode, the ON or OFF mode switches are disabled. The remote input forces the U1 output to follow its waveform by resetting U1, and charging C7 (the timing capacitor) through Q3.

4-10. Input Mode Switch. These four front panel switches are used to control the gas tube firing on the 7175. They consist of two separately ganged sets of switches (S2 and S3), that determine LOCAL or REMOTE input mode of operation, and S4 and S5 that determine ON or OFF mode in the LOCAL input position.

4-11. +15 V Power Supply. The power to operate the internal clock circuit, modulation circuit, and discharge current display circuit is derived from T2. This voltage is rectified by CR4, and regulated by R8 and CR2 for +15 volts, and R11 and CR1 for -15 volts.

4-12. 300 V Power Supply. The primary AC voltage is transformed to approximately 250 volts AC by transformer T1.

4-13. The AC voltage is full-wave rectified by CR1, and filtered by capacitor C1. The resulting 200 volts DC is applied to the Gas Discharge Noise Generator anode connector through R2, CR2, and R30. R30 is the generator control resistor that is used to adjust the tube discharge current. R2 and R30 are used as current limiting resistors.

4-14. Ignition Circuit. The ignition circuit generates the pulse necessary to ignite the Gas Discharge Noise Generator (typically 5000 volts).

4-15. The 300 volts DC is used to charge C2 to the full supply voltage. When a trigger pulse is received from Q6, SCR1 conducts, and causes C2 to discharge through the primary of T3. The heavy current surge through T3 causes a high voltage pulse to be generated in the secondary winding, which is coupled to the anode cable through diode CR3.

4-16. Diode CR2 is used to isolate the 300 volt DC power supply from the high voltage pulse. Diode CR7 removes the 0.5 volt bias from the SCR1 gate. R24 is used with CR7 to insure that the bias on the gate of the SCR is below 0 volts. C3 and CR8 are used to limit the voltage ringing, to prevent exceeding the dV/dT of the SCR and turning it on.

4-17. Firing Circuit. The firing circuit consists of three sections: the charging circuit that fires the SCR, the current display circuit, and the modulator enable circuits.

4-18. Q5, Q6, R22, R25, and C12 comprise the charging circuit. When Q5 is biased off, the voltage on the gate of Q6 begins to rise with the time constant determined by R23 and C12. This time constant delays Q6 from firing for approximately 75 microseconds from the U1 clock transition edge.

4-19. When the positive-going ramp on the gate of unijunction Q6 exceeds its firing voltage, a positive trigger voltage is produced across R25 from the stored charge in C12. This pulse is coupled through CR7 to the gate of SCR1, and fires SCR1.

4-20. The display circuitry consists of Q1, Q2, R6, R7, and M1 (meter). All of the discharge current must pass through Q1 and Q2. If these are biased off, then the noise generator has no current path, and the tube extinguishes.

4-21. The tube discharge current is divided into two parts by R6 and R7. The small portion then passes through M1, which then displays the total discharge current. The current display will then show the correct total discharge current in the LOCAL mode. However, in the REMOTE mode the current displayed will be dependent upon the duty cycle of the instrument supplying the drive.

4-22. The enable modulator circuitry consists of Q7, Q8, and Q4. In the LOCAL input mode, if the OFF mode is selected, Q8 is biased on, and it pulls the bases of Q1 and Q2 low, thereby biasing them off. In the LOCAL input ON mode, Q8 is biased off, so that R14 biases Q1 and Q2 on, which provides the discharge path for the noise tube.

4-23. The output clock of U1 is coupled through R11 and biases Q5 on, which resets the ramp for the next clock trigger edge. After the tube ignites, a voltage is produced across R5. This voltage is filtered and used to bias Q4 on. When Q4 is biased on, the clock U1 output is effectively disabled by pulling the base of Q5 to ground, which prevents unijunction Q6 from refiring.

CHAPTER V
MAINTENANCE AND ADJUSTMENTS

5-1. GENERAL

5-2. This Chapter contains performance verification procedures, troubleshooting procedures, printed circuit board component locations (Figure 5-6), and schematic diagram (Figure 5-7). Spares and replaceable parts are in Chapter VI.

5-3. PERFORMANCE VERIFICATION

5-4. The following procedures (recommended at 90-day intervals) are designed to insure the AILTECH 7175 is operating within its specifications. If the following tests cannot be satisfied, refer to Troubleshooting Section at the end of this Chapter. Figure 5-1 shows board and selected component locations.

WARNING

This unit produces a 5000-V spike to fire the gas tubes. It is produced from a 300-V DC power supply. After turning off AC power, wait 30 seconds for all capacitors to discharge below 30 volts. These instruments should be serviced by technically qualified personnel only.

5-5. Table 5-1 lists the test equipment required for performance verification and troubleshooting procedures.

5-6. LOCAL Mode Operation. This procedure verifies correct operation of the 7175 as a stand-alone power source for powering argon gas-discharge tubes.

- a. Connect equipment as shown in Figure 5-2.
- b. Apply AC power, set front panel power switch to

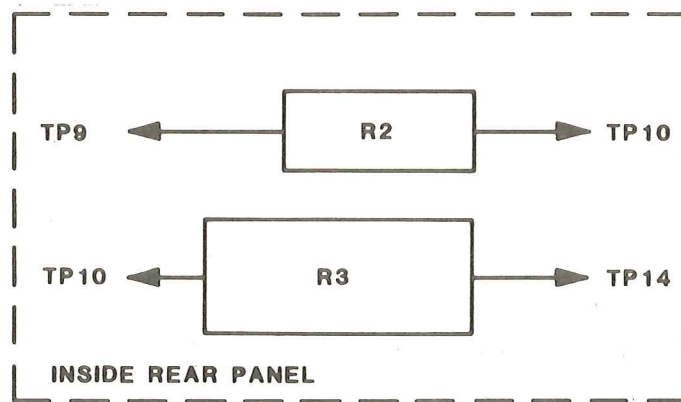
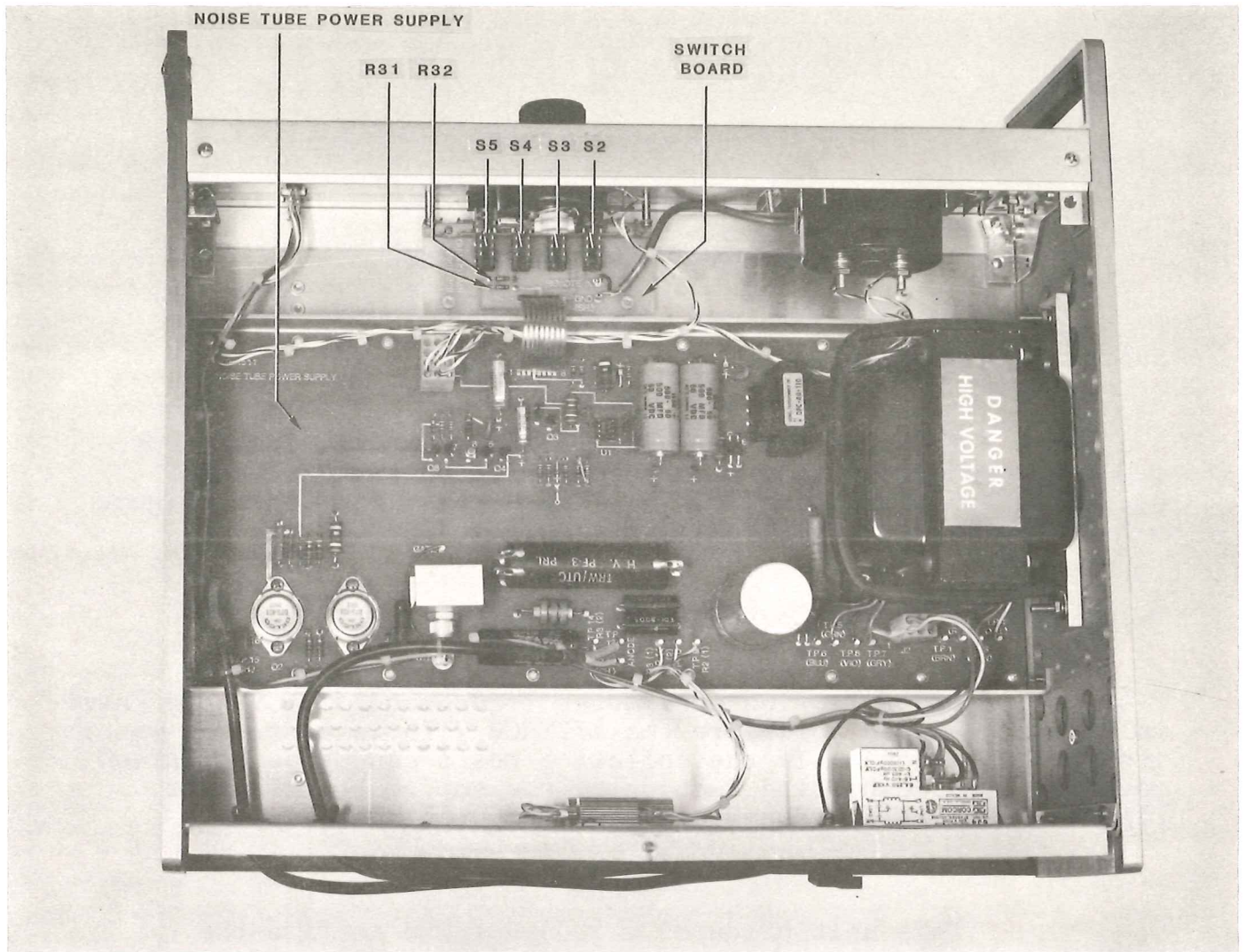


FIGURE 5-1. 7175 GAS TUBE TRIGGERABLE POWER SUPPLY BOARD LOCATIONS

- ON position, function switches to LOCAL-OFF position, generator current knob fully counterclockwise.
- c. Note that current meter reads 0 milliamps.
 - d. Set function switches to LOCAL-ON position. Note current indication is above 0 milliamps.
 - e. As the generator current knob is rotated clockwise, note that the current indication increases.
 - f. LOCAL mode verification is complete. Set power switch to OFF position.

TABLE 5-1. TEST EQUIPMENT FOR PERFORMANCE VERIFICATION AND TROUBLESHOOTING PROCEDURES

<u>Description</u>	<u>Recommended Manufacturer and Model</u>
Gas Discharge Noise Generator	AILTECH 70XX
Noise Meter	AILTECH 73XX or 75XX
Dual Trace Oscilloscope	Tektronix 475A
Digital Voltmeter 0-350 V DC, 3-1/2 Digit	Data Precision 1350
Miscellaneous Cables and Connectors	

5-7. REMOTE Mode Operation. This procedure verifies correct operation of the 7175 when controlled by an external device such as the 75XX or 73XX Noise Meters.

- a. Connect equipment as shown in Figure 5-3.
- b. Apply AC power to equipment. Set the front panel power switch on the 7175 to the ON position, the function switches to REMOTE position, and the generator current knob fully counterclockwise.
- c. Set the 73XX or 75XX front panel power switch to ON position, function controls to MANUAL-OFF position. (Refer to appropriate Noise Meter operating manual to perform this step and steps e and f.)

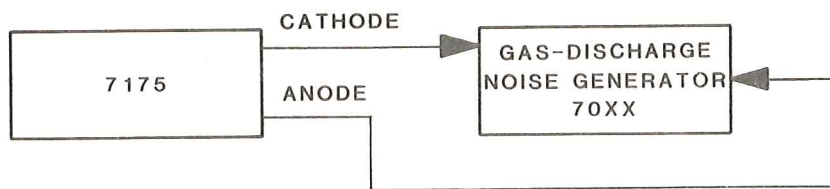


FIGURE 5-2. BLOCK DIAGRAM - LOCAL MODE OPERATION

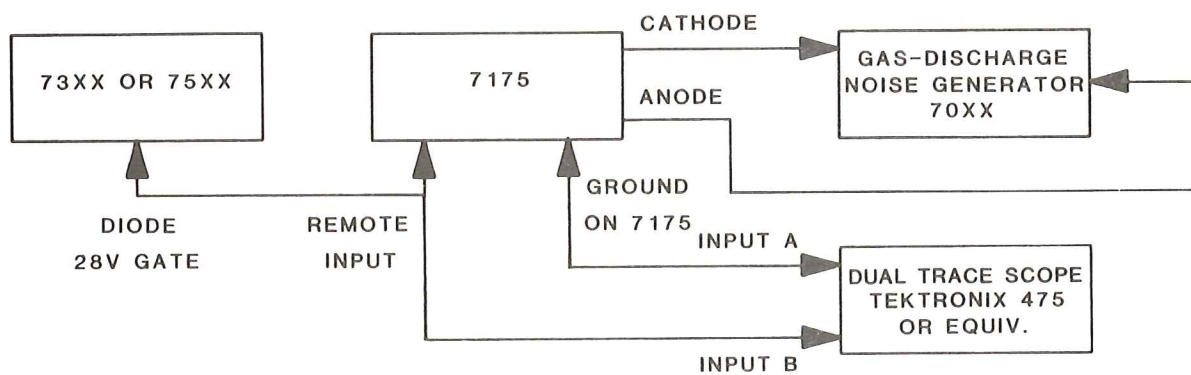


FIGURE 5-3. BLOCK DIAGRAM - REMOTE MODE OPERATION

- d. Note that current indication is "0" milliamps.
- e. Set the Noise Meter controls to MANUAL-ON, and adjust generator current knob for required current of gas-discharge noise generator.
- f. Set the Noise Meter controls for AUTO mode operation. Note that the generator indication reads between 10 and 50% of MANUAL-ON reading.
- g. Connect one input of the dual-trace scope to the 28-V diode connector, and the other input to a convenient ground on the 7175. (See Figure 5-3.)
- h. Synchronize the scope to the leading edge of the 28-V square wave, and note that a short duration spike is displayed approximately 60 microseconds later by the probe connected to the 7175's ground. See Figure 5-3. (Note: The grounded probe input must be set to the more sensitive ranges.)
- i. REMOTE mode verification is complete.

5-8. If difficulties occur in the preceding verifications, and the malfunction appears to be within the 7175, refer to the following troubleshooting section of this manual.

5-9. TROUBLESHOOTING PROCEDURE

5-10. The following section will aid in isolating and correcting malfunctions in the 7175. It provides troubleshooting procedures by means of circuit verifications which are meant to be used as guidelines for logical signal tracing techniques.

5-11. Resistance Check

5-12. Remove AC power and verify that no DC shorts exist between the center conductors and shields of the cathode and anode cables.

5-13. Power Supplies

5-14. Three power supplies, +15 V, -15 V, and +300 V, are contained in the 7175. Table 5-2 shows typical performance levels for these supplies (the following tests are made with equipment connected as shown in Figure 5-2).

TABLE 5-2. POWER SUPPLY SPECIFICATIONS

<u>Supply</u>	<u>Test Location</u>	<u>Voltage</u>	<u>AC Ripple</u>
+15 V	Cathode VR-2	15 \pm 2V	250 mV
-15 V	Anode VR-1	15 \pm 2V	50 mV
+300 V	T. P. 9	350 \pm 35V	16 V (tube fired) 1 V (tube unfired)

5-15. If power supply voltages in Table 5-2 are not satisfied, check associated components and wiring. The following list indicates the priority of major component testing.

- a. AC line fuse
- b. Diode bridges CR1, CR4 (if defective, check filter capacitors for shorts).
- c. Zener diodes VR1, VR2.
- d. Filter capacitors C1, C4, C5, C13.

5-16. Internal Clock

5-17. With equipment connected as shown in Figure 5-2, and no power applied, remove anode cable from gas-discharge tube. Set front panel function switch to LOCAL-ON position. Apply AC power.

5-18. Verify that a 13-17 volt square wave of approximately 200 Hz is at pin 3 of U1. If not, check the following components.

- a. U1 - 555 Timer
- b. Q3 - 2N4123 Transistor
- c. Associated resistors, capacitors and traces

5-19. Verify that a 0.8 V square wave of approximately 200 Hz is at collector of Q4. If not, check Q4, Q5, associated components, and traces.

5-20. Verify that the square wave shown in Figure 5-4 is at the gate of SCR1. If not, check SCR1, CR7, Q6, Q5, associated components and traces.

5-21. Verify that waveform shown in Figure 5-5 is present at anode of SCR1. (Heatsink is anode.) If not, check SCR1, associated components, and traces.

WARNING

SCR Anode (heatsink is at +350 volts DC.

5-22. With equipment connected as described in Paragraph 5-15, make the DC voltage measurements shown in Table 5-3.

TABLE 5-3. DC VOLTAGE MEASUREMENTS

<u>Component</u>	<u>Manual On</u>	<u>Manual Off</u>
Q7 - Base	+0.7 V	+0.2 V
Q7 - Collector	+0.2 V	+0.7 V
Q8 - Collector	+1.8 V	+0.1 V
Q1 - Base	+2.0 V	+0.1 V
Q2 - Base	+2.0 V	+0.1 V

5-23. Remote Input Operation

5-24. With no AC power applied, connect equipment as shown in Figure 5-3. (Dual trace scope not connected.)

5-25. Apply AC power. Set the Noise Meter for AUTO mode operation, and set the 7175 function switches for REMOTE operation.

5-26. Verify that the 28-V square wave is at junction of C8 and R19, and that the square wave (approximately 1/2 amplitude) is at U1, pin 4. If not, check associated components, wiring and traces.

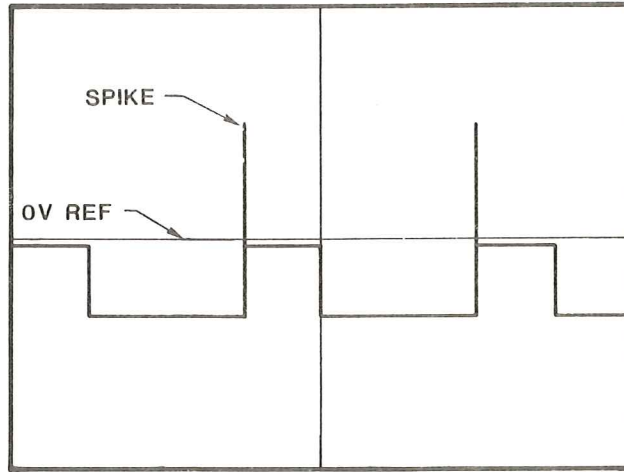


FIGURE 5-4. WAVEFORM AT GATE OF SCR 1

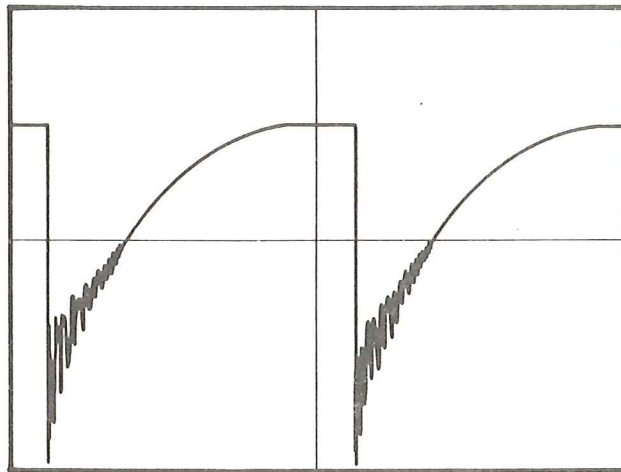


FIGURE 5-5. WAVEFORM AT ANODE OF SCR 1

5-27. This completes the troubleshooting procedure for the AILTECH 7175.

5-28. FACTORY SERVICE

5-29. In the event a difficult service problem occurs, contact your nearest Eaton Corporation Regional Office or Sales Representative by letter, TWX or phone. Please indicate the model number, serial number, and specific details of the difficulty involved, with as much additional information as you consider necessary to aid in pinpointing the cure to the problem.

5-30. Should it be necessary to return the equipment for repair or recalibration, please contact Eaton Corporation or an authorized Sales Representative in your area before shipping a unit. In your communication arranging for a return, please be sure to include model number, serial number, date of purchase, and specific details concerning the problem (in the event of failure), or service desired (in the event of recalibration).

5-31. When an instrument is returned for service, we will proceed to work on the instrument until the charges reaches \$100. If the total charges exceed \$100., an estimate of such charges will be submitted for approval.

5-32. When spare parts are ordered, please indicate a description of the part as well as its part number, and also include the model number and serial number of the instrument being repaired.

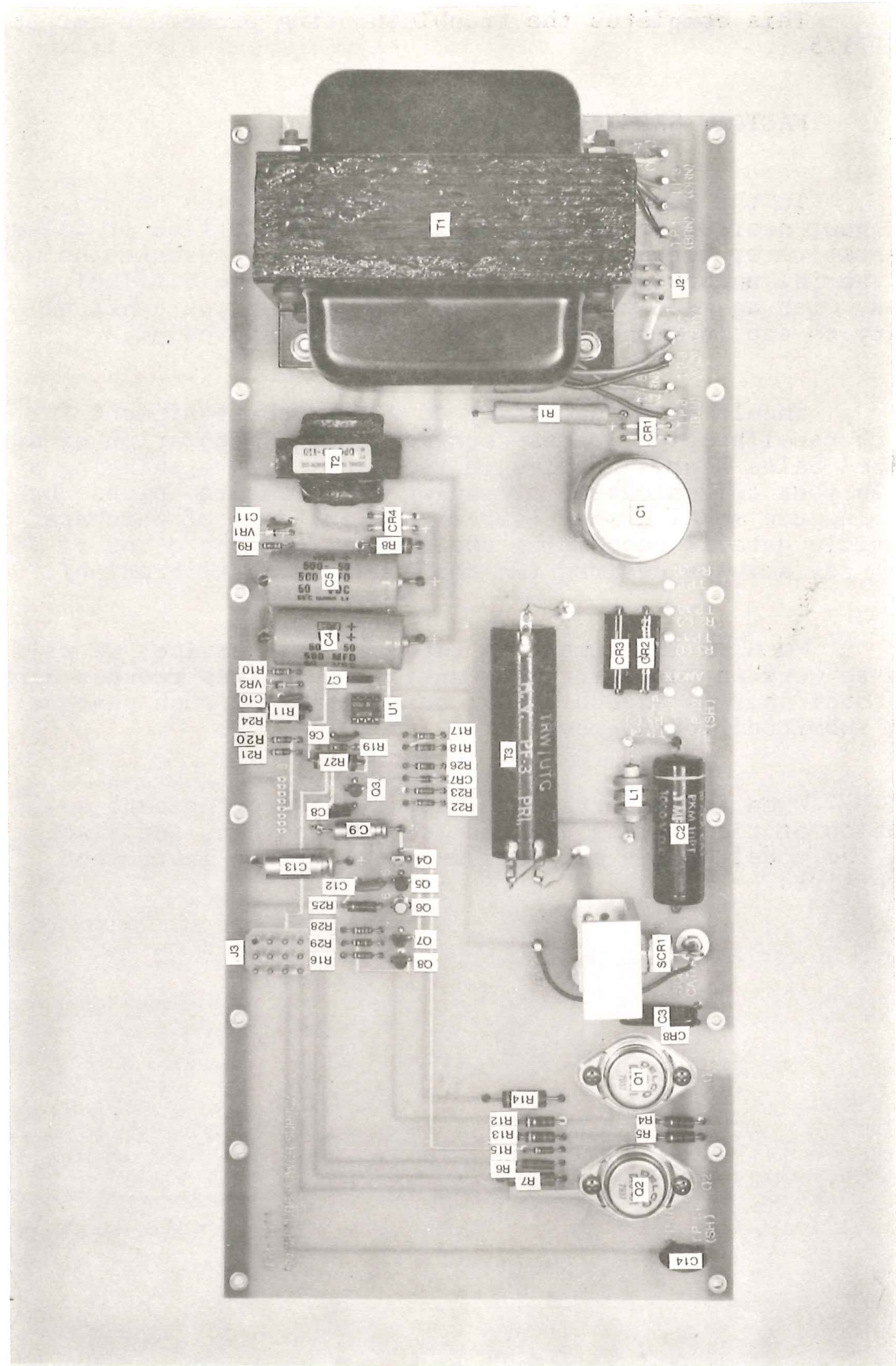


FIGURE 5-6. COMPONENT LAYOUT, MAIN BOARD

CHAPTER VI

PARTS LIST

6-1. RECOMMENDED SPARE PARTS

<u>Symbol</u>	<u>Description</u>	<u>Part No.</u>	<u>Mfr.</u>
CR1,4	Bridge Rectifier	MDA-820-A8	Motorola
CR2	Diode	8523	EDI
CR3	Diode	BCD-12	EDI
CR7,8	Diode	1N4005	Com'l
VR1,2	Diode, Zener	1N4744	Com'l
DS1	LED	RL-5054-2	Litronix
F1	Fuse, 2A, Slo-Blo or, 1A, Slo-Blo	3AG-313-002 3AG-313-001	Littelfuse Littelfuse
M1	Meter <i>(100 ya f.s)</i>	B856-5483	AILTECH
Q1,2	Transistor	DTS-401	Delco
Q3,4, 7,8	Transistor	2N4123	Com'l
Q5	Transistor	2N4401	Com'l
Q6	Transistor	2N2646	Com'l
SCR1	SCR, 600 V, 10 A	SG210M	RCA
T2	Transformer	DPC-40-110	Signal
T3	Transformer	PF3	UTC
U1	Integrated Circuit	μ A555	Signetics

6-2. REPLACEABLE SPARE PARTS

<u>Symbol</u>	<u>Description</u>	<u>Part No.</u>	<u>Mfr.</u>
C1	Cap., 100 μ F, 450 V	TVL 1750	Sprague
C2	Cap., 0.1 μ F, 1 kV	PKM10P1	CDE
C3	Cap., .047 μ F, 400 V	DPMS-4S47	CDE

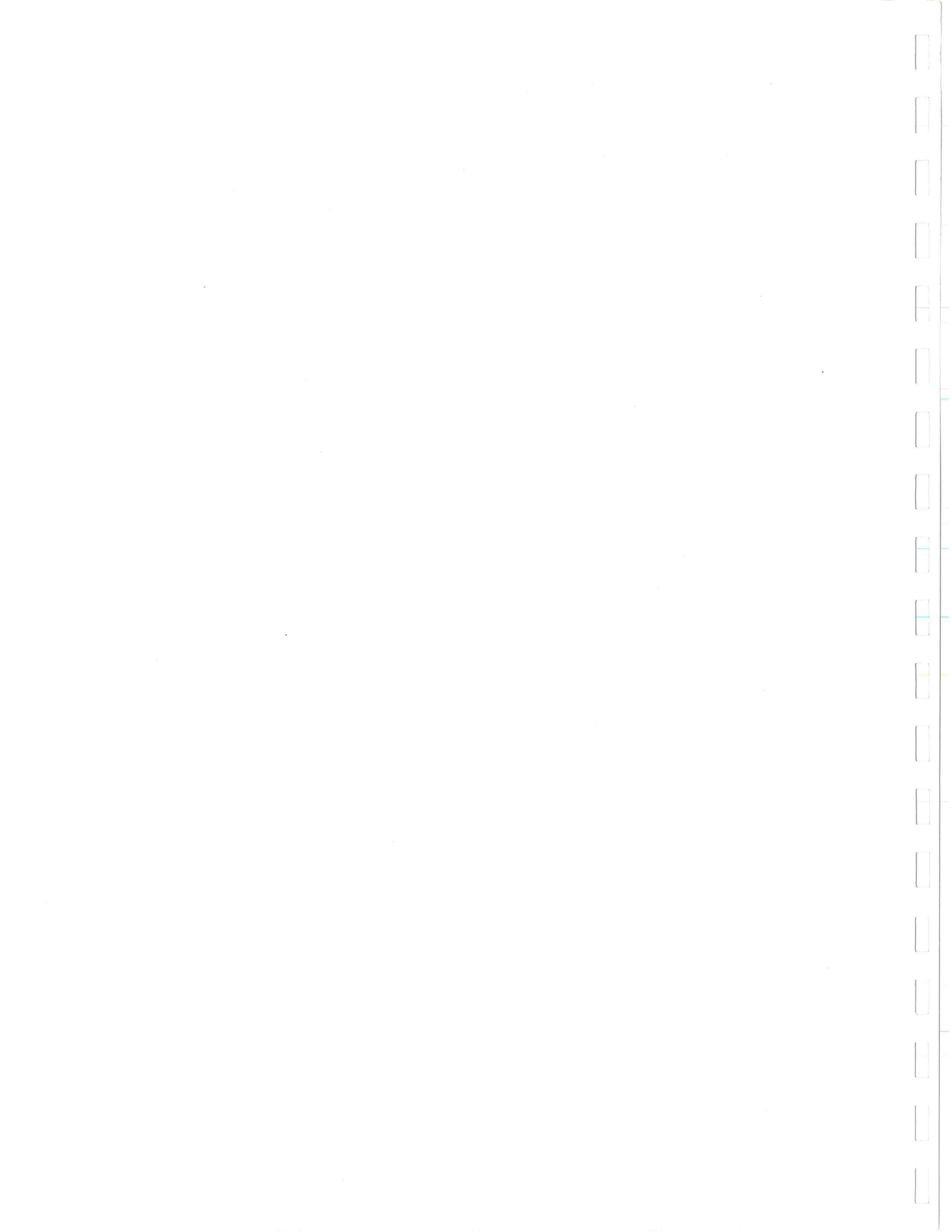
REPLACEABLE SPARE PARTS (Continued)

<u>Symbol</u>	<u>Description</u>	<u>Part No.</u>	<u>Mfr.</u>
C4,5	Cap., 500 μ F, 50 V	WBR-500-50	CDE
C6	Cap., .01 μ F, 100 V	TGS-10	Sprague
C7,8	Cap., 0.1 μ F, 100 V	CK06BX104K	Com'l
C9	Cap., 15 μ F, 25 V	TE-1205	Sprague
C10,11	Cap., .01 μ F, 100 V	TGS-10	Sprague
C12	Cap., .05 μ F	TGS-50	Sprague
C13	Cap., 100 μ F, 25 V	TE-1211	Sprague
C14	Cap., .01 μ F	CK63AW103M	Com'l
CR1	Bridge Rectifier	MDA-920-A8	Motorola
CR2	Diode	8522	EDI
CR3	Diode	BCD-12	EDI
CR4	Bridge Rectifier	MDA-920-A8	Motorola
CR7,8	Diode	1N4005	Com'l
DS1	LED	RL-5054-2	Litronix
F1	Fuse, 2A, Slo-Blo or, 1A, Slo-Blo	3AG-313-002 3AG-313-001	Littelfuse Littelfuse
J1	Recep., Power Line	6J4	Corcom
P2	Harness	B852-1573	AILTECH
P3	Harness	B852-1574	AILTECH
L1	Inductor, 750 μ H	4651	Miller
M1	Meter	B856-5483	AILTECH
Q1,2	Transistor	DTS-401	Delco
Q3,4	Transistor	2N4123	Com'l
Q5	Transistor	2N4401	Com'l
Q6	Transistor	2N2646	Com'l
Q7,8	Transistor	2N4123	Com'l
R1	Res., 47 k, 4 W	4MOL	Mallory
R2	Res., 500 Ω , 50 W	RH50-500 Ω	Dale
R3	Res., 5 k, 25 W	RH25-5k Ω	Dale
R4,5	Res., 20 Ω , 1/2 W, 5%	RC20GF200J	Com'l
R6	Res., 4 Ω , 1 W, 1%	RS-1A	Dale
R7	Res., 10.5 k, 1 W, 1%	RN65C1052K	Com'l
R8	Res., 75 Ω , 1 W, 5%	RC32GF750J	Com'l
R9,10	Res., 4.7 k, 1/4 W, 5%	RC07GF472J	Com'l
R11	Res., 150 Ω , 1 W, 5%	RC32GF151J	Com'l
R12,13	Res., 51 Ω , 1/2 W, 5%	RC20GF510J	Com'l
R14	Res., 390 Ω , 1 W, 5%	RC07GF391J	Com'l
R15,16	Res., 2.2 k, 1/4 W, 5%	RC07GF222J	Com'l

6-2.

REPLACEABLE SPARE PARTS (Continued)

<u>Symbol</u>	<u>Description</u>	<u>Part No.</u>	<u>Mfr.</u>
R17	Res., 27 k, 1/4 W, 5%	RC07GF273J	Com'1
R18	Res., 1 k, 1/4 W, 5%	RC07GF102J	Com'1
R19,20, 21	Res., 20 k, 1/4 W, 5%	RC07GF203J	Com'1
R22	Res., 11 k, 1/4 W, 5%	RC07GF113J	Com'1
R23	Res., 750 Ω , 1/4 W, 5%	RC07GF751J	Com'1
R24	Res., 2.2 k, 1/4 W, 5%	RC07GF222J	Com'1
R25	Res., 20 Ω , 1/2 W, 5%	RC20GF200J	Com'1
R26	Res., 100 Ω , 1/4 W, 5%	RC20GF101J	Com'1
R27	Res., 390 Ω , 1/4 W, 5%	RC07GF391J	Com'1
R28	Res., 27 k, 1/4 W, 5%	RC07GF273J	Com'1
R29	Res., 6.8 k, 1/4 W, 5%	RC07GF682J	Com'1
R30	Rheostat, 1 k, 50 W	0326	Ohmite
R31	Res., 10 k, 1/4 W, 5%	RC07GF103J	Com'1
R32	Res., 1 k, 1/4 W, 5%	RC07GF102J	Com'1
S1	Switch	7101-J62ZQ22	Com'1
S2-5	Switch Ass'y., 4-Position	B856-5489	AILTECH
SCR1	SCR, 600 V, 10 A	SG210M	RCA
T1	Transformer	C212243	AILTECH
T2	Transformer	DPC-40-110	Signal
T3	Transformer	PF3	UTC
U1	Integrated Circuit	μ A555	Signetics
VR1,2	Diode, Zener	1N4744	Com'1



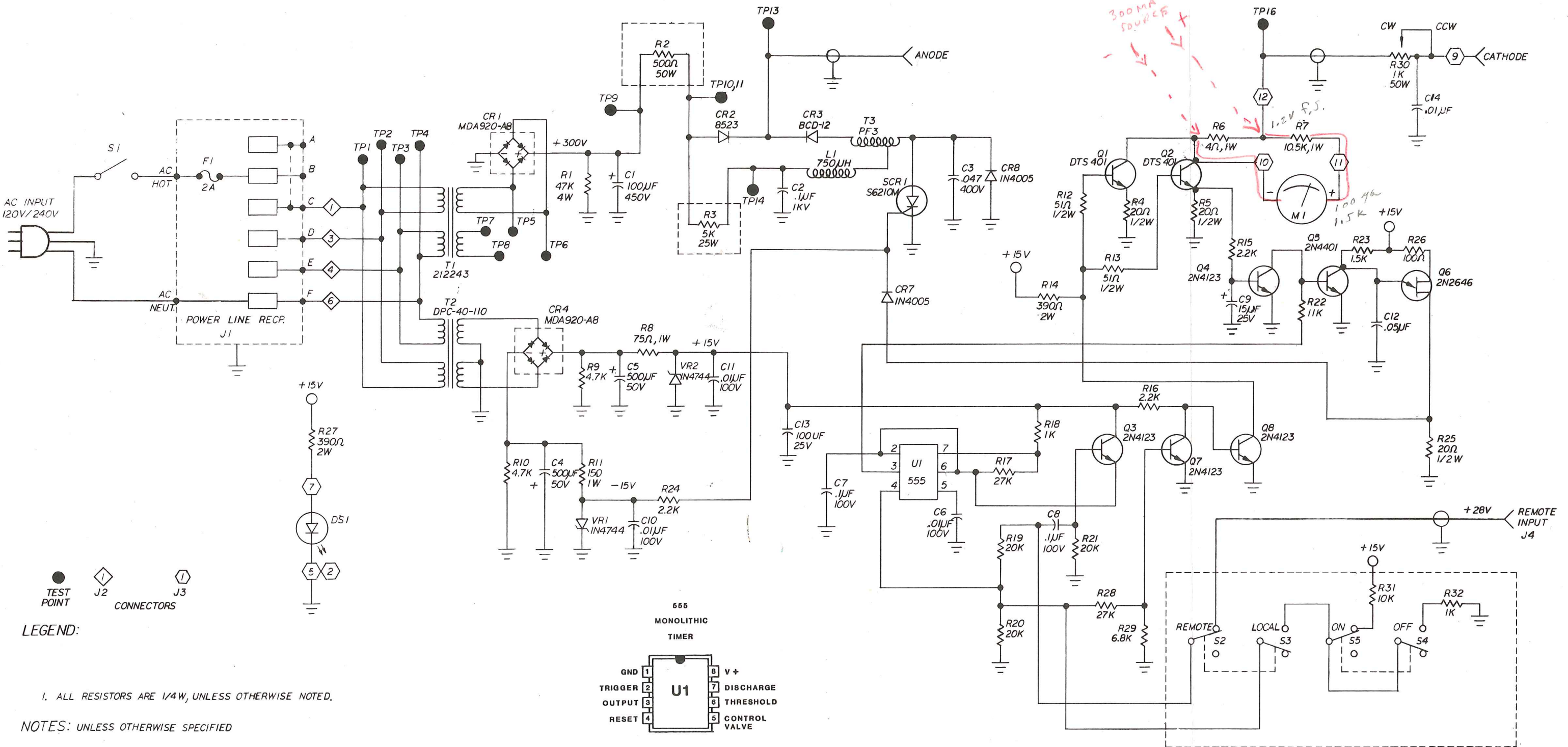


FIGURE 5-7. SCHEMATIC DIAGRAM, 7175 GAS TUBE TRIGGERABLE POWER SUPPLY