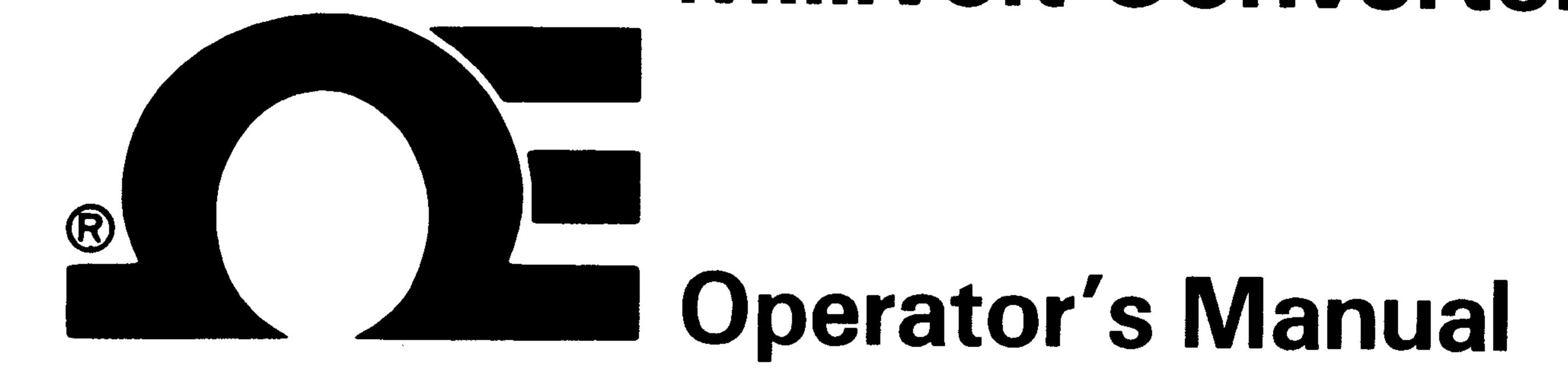


An OMEGA Technologies Company



Model TAC80/TAC81 I Thermocouple to Millivolt Converter





WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of 13 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

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To avoid processing delays, also please be sure to include:

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- 2. Model and Serial numbers.
- 3. Repair instructions.

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SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

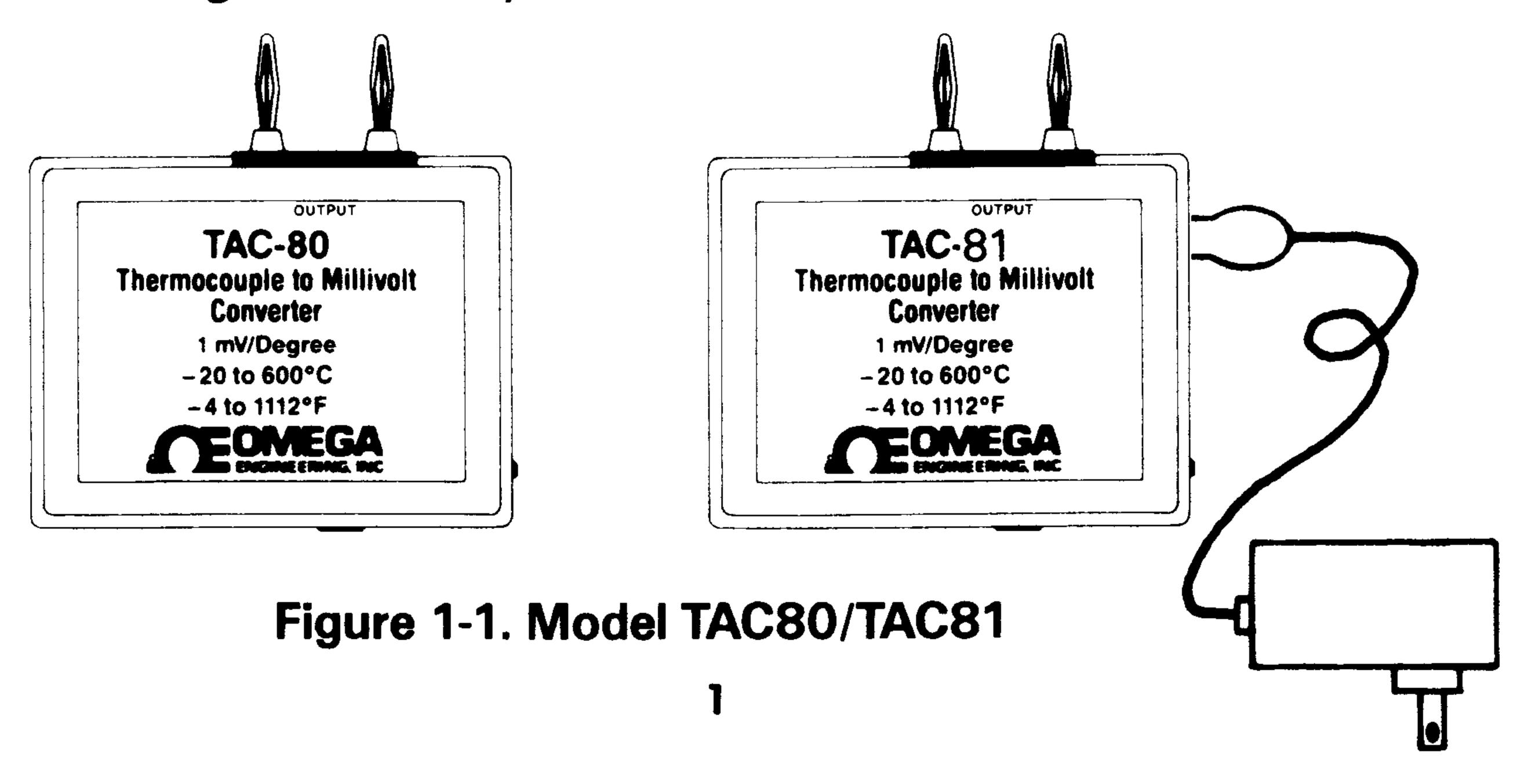
The OMEGA® TAC 80/81 can turn any chart recorder or analog or digital voltmeter into an accurate, wide-range temperature measuring instrument. The TAC80 uses a 9 Vdc "transistor radio" battery. The TAC81 is supplied with a 110 Vac adapter. It does not work on batteries. See Figure 1-1.

The TAC 80/81 is a universal thermocouple amplifier and linearizer which provides a precision 1 mV/°C or °F signal for type J, K, or T thermocouples. Cold junction compensation is standard.

1.2 FEATURES

A few of the many features of this versatile instrument are:

- J, K, or T thermocouple input
- Linearized 1 mV/°C or 1 mV/°F output
- Rugged completely portable
- Long-life battery (TAC80-J, K or T)



SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the packing list and check off actual equipment received. If there are any questions about the shipment please call OMEGA Customer Service Department at (203) 359-1660.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material in the event reshipment is necessary.

2.2 INSTALLATION

- 1. Plug the TAC 80/81 into the strip chart recorder or meter. The HI plug connects to HI (+) receptacle and the LO plug to the LO (-) receptacle.
- 2. Plug the thermocouple into the SMP socket on the TAC80/81. See the *OMEGA Complete Temperature Measurement Handbook and Encyclopedia* for a complete selection of thermocouples.

CAUTION

For the TAC80, the battery voltage (9 V) is applied to the output when the unit is in the TEST position. Since you must pass through the TEST position when switching from °F to °C or °C to °F (see Figure 3-1), the power must be turned OFF **before** switching. The test function does not apply to the TAC81 and is inoperative for the AC powered units.

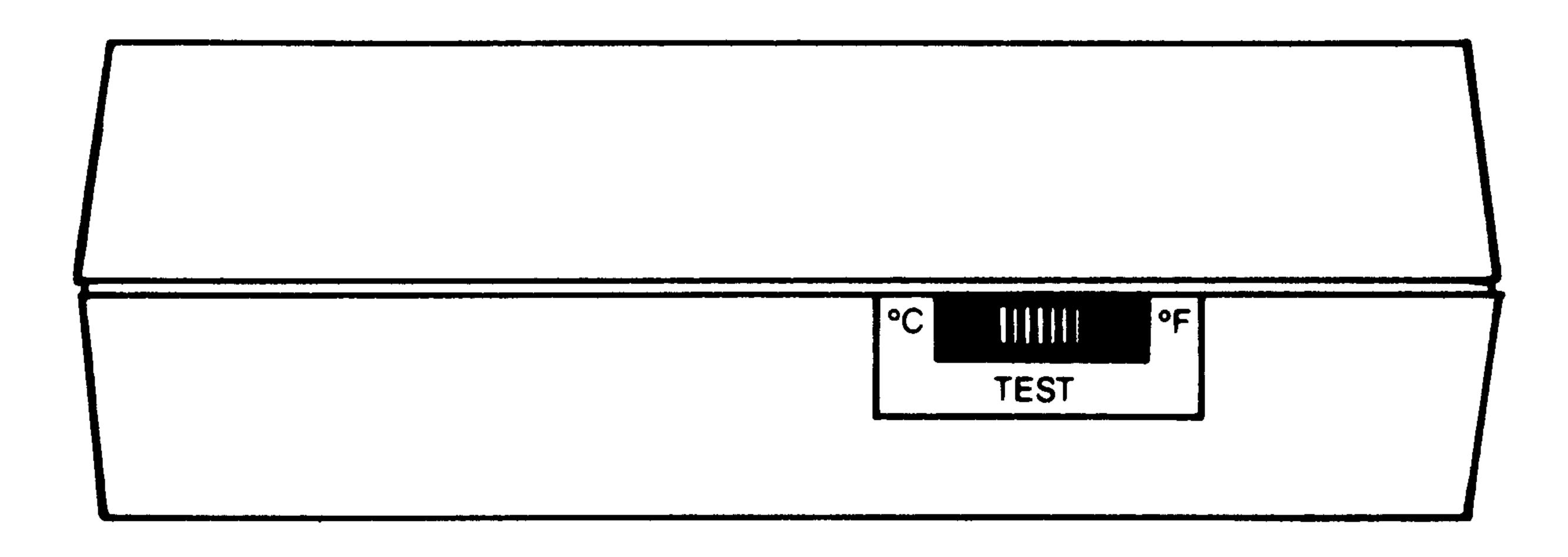


Figure 3-1. °C/°F Switch

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3.1 OPERATING INSTRUCTIONS

3.1.1 Multimeter Use

- 1. For temperatures less than 200°C, set the multimeter range to 200 mV.
- 2. For temperatures greater than 200°C, set the multimeter range to 2 V.

Temperature is recorded directly on the multimeter in °C; the TAC 80/81 converts the mV or V signal into a temperature measurement recorded as °C.

3.1.2 Strip Chart Recorder Use

To use the TAC 80/81 with a strip chart recorder, simply set the recorder span to the mV range that corresponds to the mV output at that temperature range. For example, to read between 50°C and 150°C, set the range to 100 mV in the CALIBRATE modes and suppress the zero by 50 mV.

NOTE

Output is 1 mV per °C or 1 mV per °F.

SECTION 4 CALIBRATION

4.1 EQUIPMENT REQUIRED

4.1.1 Thermocouple Models

- 1. 3½ or 4½ Digital Multimeter, ±0.1% Accuracy
- 2. Stable Voltage Source
- 3. OMEGA® TRC III Ice Point Cell
- 4. OMEGA® TRP (J, K, T) Reference Probe
- 5. Precision Mercury Thermometer

4.2 MODEL TAC 80/81-J

4.2.1 °C Adjustment

- 1. Set up the equipment as shown in Figure 4-1.
- 2. Set the Function Switch to "°C" position.
- 3. Turn power on.

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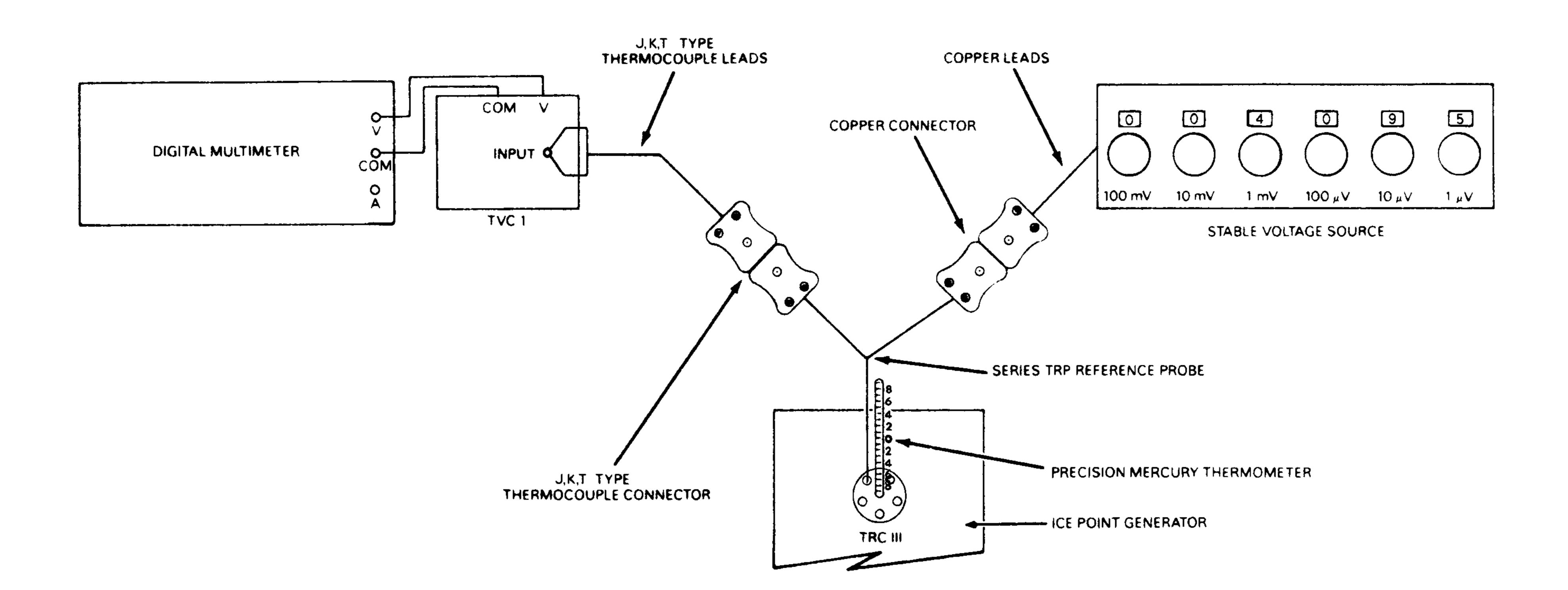


Figure 4-1. Calibration Set-Up

- 4. Set the voltage source to 0.000 mV and adjust P1 on the TVA-1A Board for a reading of 00.00mV on the digital multimeter.
- 5. Set the voltage source to 33.213 mV and adjust P2 on the TVC-1B Board for a reading of 602.0mV on the digital multimeter.

NOTE: The TAC output is actually millivolts which then equates to degrees °C or °F.

4.2.2 °F Adjustment

- 1. Set the Function Switch to the "oF" position.
- 2. Set the voltage source to 0.000 mV and adjust P4 on the TVC-1A Board for a reading of 32.00mV on the digital multimeter.
- 3. Set the voltage source to 32.804 mV and adjust P3 on the TVC-1B Board for a reading of 1103.0mV on the digital multimeter.
- 4. Repeat steps 2 and 3 until both readings are correct.

4.3 MODEL TAC 80/81-K

4.3.1 °C Adjustment

- 1. Set up the equipment as shown in Figure 4-1.
- 2. Set the Function Switch to "°C" position.
- 3. Turn the power on.
- 4. Set the voltage source to 0.000 mV and adjust P1 on the TVC-1A Board for a reading of 00.00mV on the digital multimeter.
- 5. Set the voltage source to 37.325 mV and adjust P2 on the TVC-1B Board for a reading of 900.0mV on the digital multimeter.

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4.3.2 °F Adjustment

- 1. Set the Function Switch to "oF" position.
- 2. Set the voltage source to 0.000 mV and adjust P4 on the TVC-1A Board for a reading of 32.00mV on the digital multimeter.
- 3. Set the voltage source to 37.325 mV and adjust P3 on the TVC-1B Board for a reading of 1652.0mV on the digital multimeter.
- 4. Repeat steps 2 and 3 until both readings are correct.

4.4 MODEL TAC 80/81-T

4.4.1 °C Adjustment

- 1. Set up equipment as shown in Figure 4-1.
- 2. Set the Function Switch to "°C" position.
- 3. Turn on power.
- 4. Set the voltage source to 0.000 mV and adjust P1 on the TVC-1A Board for a reading of 00.00mV on the digital multimeter.
- 5. Set the voltage source to 14.860 mV and adjust P2 on the TVC-1B Board for a reading of 300.0mV on the digital multimeter.

4.4.2 °F Adjustment

- 1. Set the Function Switch to "oF" position.
- 2. Set the voltage source to 0.000 mV and adjust P4 on the TVC-1A Board for a reading of 32.0mV on the digital multimeter.
- 3. Set the voltage source to 14.860 mV and adjust P3 on the TVC-1B Board for a reading of 572.0mV on the digital multimeter.
- 4. Repeat steps 2 and 3 until both readings are correct.

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SECTION 5 SPECIFICATIONS

5.1 SPECIFICATIONS

RANGES:

Type J: -4° to 1112°F (-20°

to 600°C)

Type K: -4° to 1832°F (-20°

to 1000°C)

Type T: -4° to 572°F (-20°

to 300°C)

SPECIFICATIONS (con't)

OPERATING TEMPERATURE: 0° to 50°C

POWER: 9 V alkaline

INPUT CONNECTION: SMP connector

OUTPUT CONNECTION: Standard banana plug STORAGE TEMPERATURE: 14° to 122°F (-10° to

+50°C)

OUTPUT: 1 mV per °C or °F

ACCURACY: Type J: ± 2.6 °C, ± 4.3 °F

Type K: $\pm 3.6^{\circ}$ C, $\pm 6.1^{\circ}$ F Type T: $\pm 1.8^{\circ}$ C, $\pm 3.0^{\circ}$ F

DIMENSIONS: H: 2½" (63 mm) x W: 3" (76

mm) x D: 1" (25 mm)

COLD JUNCTION

COMPENSATION: 0.05°C/°C

5.2 PARTS LIST

Resistors

Component Number	80-K	80-J	80-T
R1	470Ω 1%	470Ω 1%	470Ω 1%
R2	47kΩ 5%	47kΩ 5%	680kΩ 5%
R3	10kΩ 5%	10kΩ 5%	10kΩ 5%
R4	10.7kΩ 1%	8.25kΩ 1%	10kΩ 1%
R5	470Ω 1%	470kΩ 1%	470kΩ 1%
R6	15kΩ 1%	15kΩ 1%	12.7kΩ 1%

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PARTS LIST (Continued) Component		Resistors		
Number	80-K	80-J	80-T	
R7	4.32kΩ 1%	274Ω 1%	3.48kΩ 1%	
R8	6.49kΩ 1%	243Ω 1%	1.0kΩ 1%	
R9	10kΩ 5%	10kΩ 5%	1.0kΩ 5%	
R10			6.98kΩ 1%	
R11			1.5kΩ 1%	
R12	34.8kΩ 1%	71.5Ω 1%	2.49kΩ 1%	
R13	499kΩ 1%	309kΩ 1%	143kΩ 1%	
R14	SHORT	SHORT	SHORT	
R15	23.2kΩ 1%	10kΩ 5%	1.0kΩ 5%	
R16	30.1kΩ 1%		 	
R17	18.7kΩ 1%			
R18	499kΩ 1%	412kΩ 1%	200kΩ 1%	
R19	SHORT	SHORT	SHORT	
R20	10kΩ 5%	10kΩ 5%	$4.7k\Omega 5\%$	
R21	10kΩ 1%	10kΩ 1%	10kΩ 1%	
R22	$7.32k\Omega$ 1%	7.32kΩ 1%	7.32kΩ 1%	
R23	22kΩ 5%	22kΩ 5%	22kΩ 5%	
R24	22kΩ 5%	22kΩ 5%	22kΩ 5%	
R25	1kΩ 5%	1.2kΩ 5%	$4.7k\Omega 5\%$	
R26	18kΩ 1%	34.8kΩ 1%	18kΩ 1%	
R27	30.1kΩ 1%	28kΩ 1%	30.1kΩ 1%	
R28	10kΩ 5%	15kΩ 5%	10kΩ 5%	
R29	10.7kΩ 1%	11kΩ 1%	10.7kΩ 1%	
R30	25.5kΩ 1%	20kΩ 1%	25.5kΩ 1%	
R31	470kΩ 1%	470Ω 1%	470Ω 1%	
R32	10kΩ 1%	100kΩ 1%	39.2kΩ 1%	
R33	10kΩ 1%	34.8kΩ 1%	43kΩ 1%	

PARTS LIST (Continued)

Variable Resistors (15-turn pots)

80-K	80-J	80-T	
100kΩ	100kΩ	10kΩ	
1κΩ	1kΩ	1kΩ	
1kΩ	1kΩ	1kΩ	
10kΩ	10kΩ	1kΩ	
	Transistor	'S	
80-K	80-J	80-T	
MTS105	MTS105	MTS105	
	Capacitors		
80-K	80-J	80-T	
$0.1 \mu / 50 V$	$0.1\mu/50$ V	$0.1 \mu / 50 V$	
$0.1\mu/50$ V	$0.1\mu/50$ V	$0.1\mu/50$ V	
$0.1\mu/50$ V	$0.1\mu/50$ V	$0.1\mu/50$ V	
$0.1\mu/50$ V	$0.1\mu/50$ V	$0.1\mu/50$ V	
$0.1\mu/50$ V	$0.1\mu/50$ V	$0.1\mu/50$ V	
100μF	100μF	100μF	
	100kΩ 1kΩ 1kΩ 10kΩ 80-K MTS105 80-K 0.1μ/50 V	100kΩ 100kΩ 1kΩ 1kΩ 1kΩ 1kΩ 10kΩ 10kΩ 10	

^{*} Model TAC81

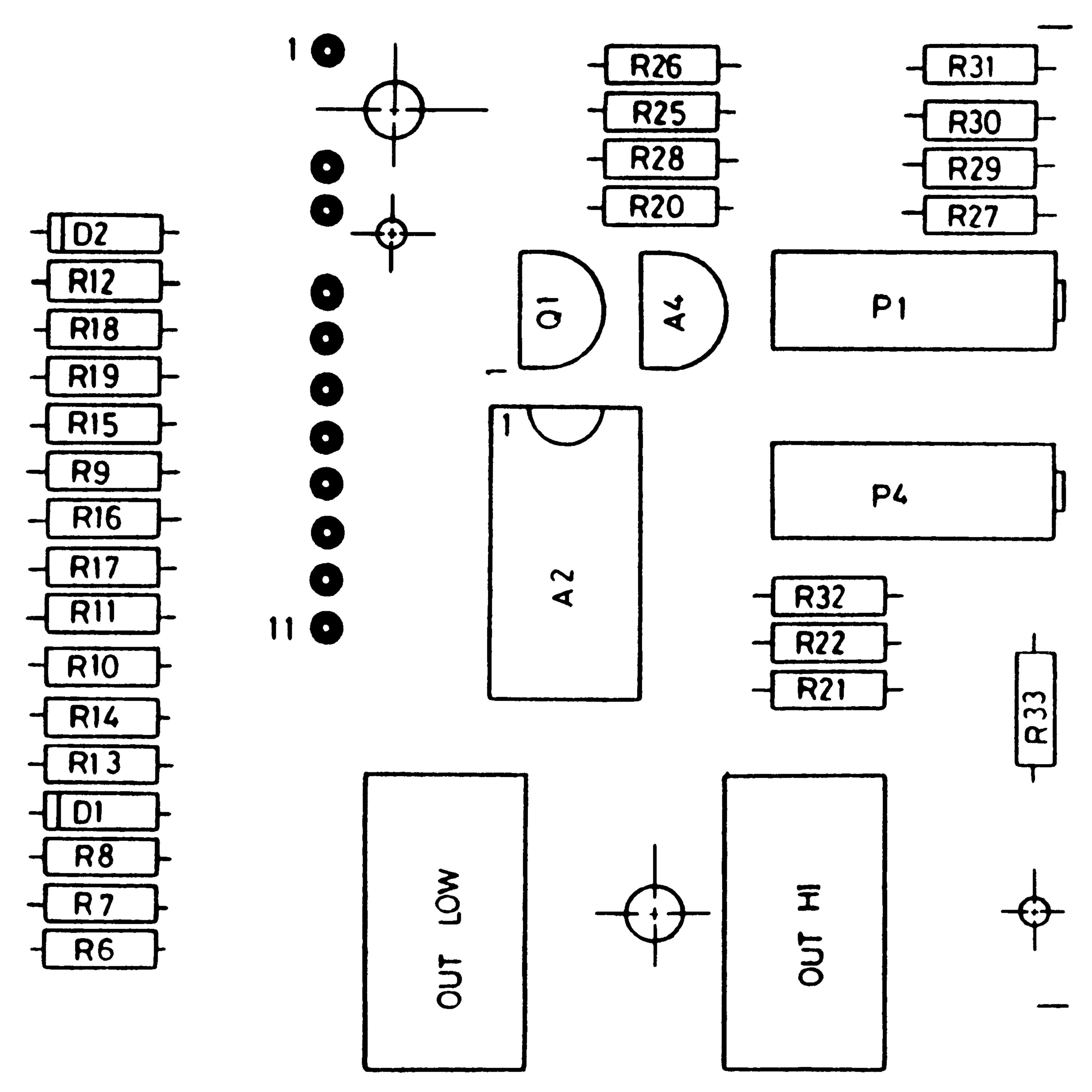
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PARTS LIST (Continued)

		Diodes	
Component Number	80-K	80-J	80-T
D1	IN4148	IN4148	IN4148
D2	IN4148	IN4148	IN4148
		Integrated Cir	cuits
Component Number	80-K	80-J	80-T

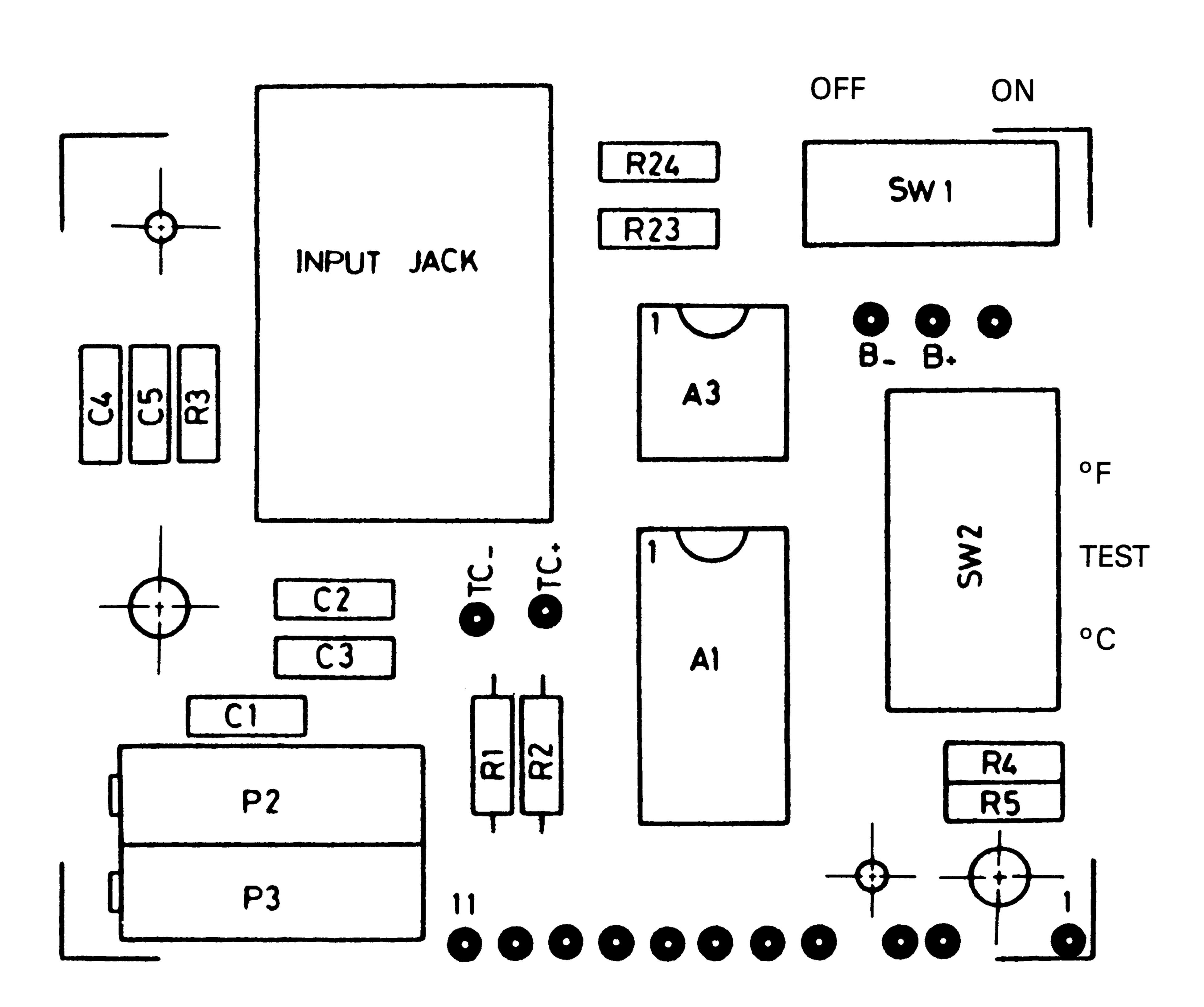
Component Number	80-K	80-J	80-T
A1	ICL7650	ICL7650	ICL7650
A2	LM324	LM324	LM324
A3	LM741	LM741	LM741
A4	ICL8069	LM336	ICL8069
*A5	LM7809	LM7809	LM7809

^{*} Model TAC81



Model TAC 80/81 Component Layout (TVC-1A)

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Model TAC 80/81 Component Layout (TVC-1B)

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pH

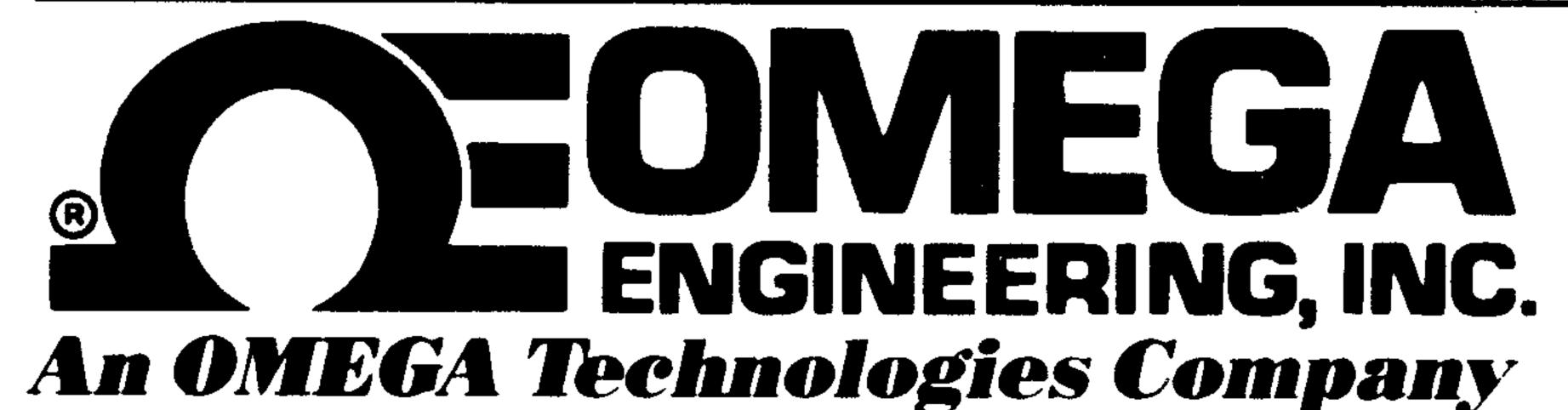
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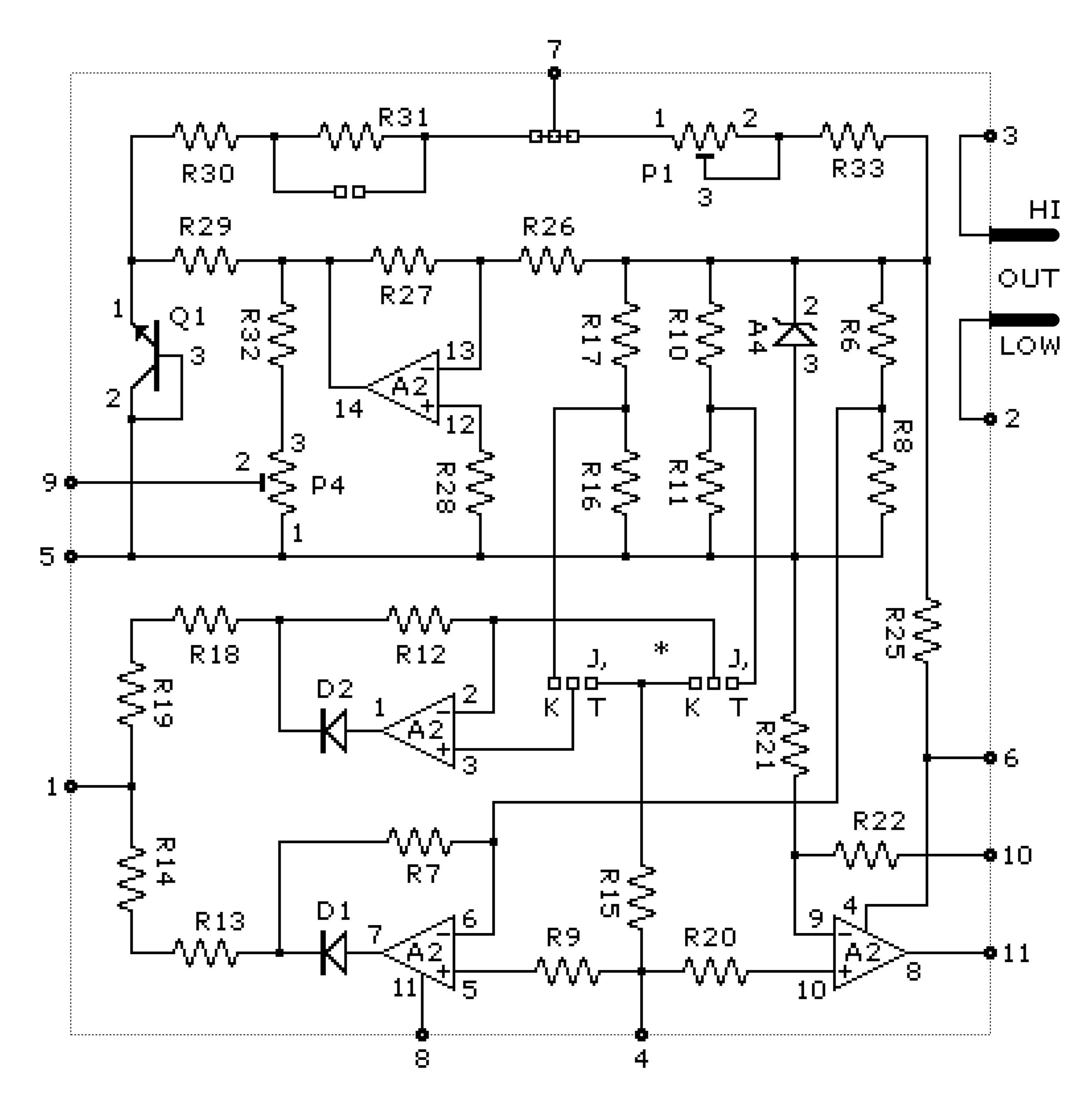
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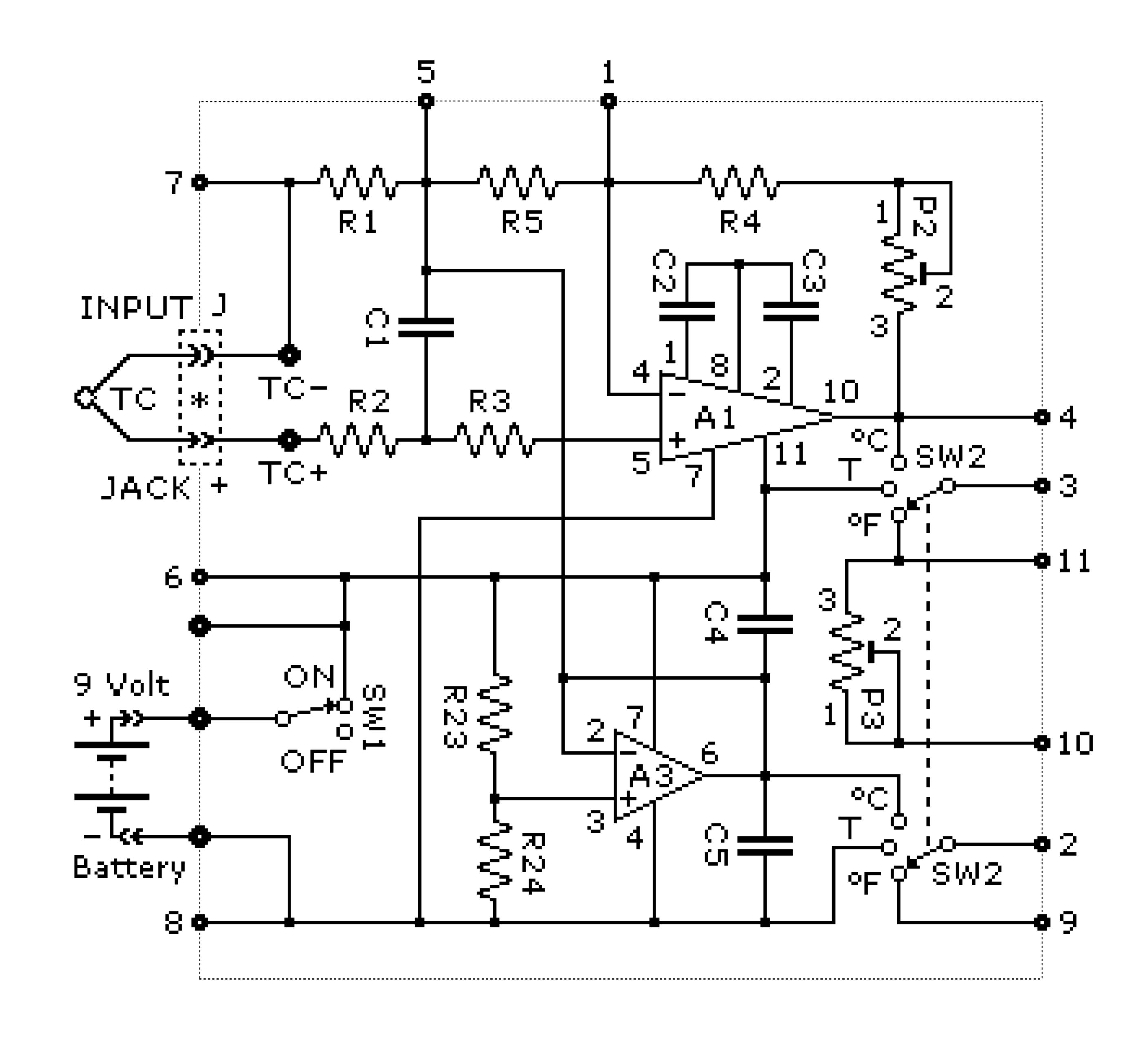
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Model TAC 80/81 Schematic (TVC-1A PCB Assy)

*Notes: Circuit board pads J,T or K are bridged according to unit type and Input Jack is of corresponding type J or T or K.



Model TAC 80/81 Schematic (TVC-1B PCB Assy)