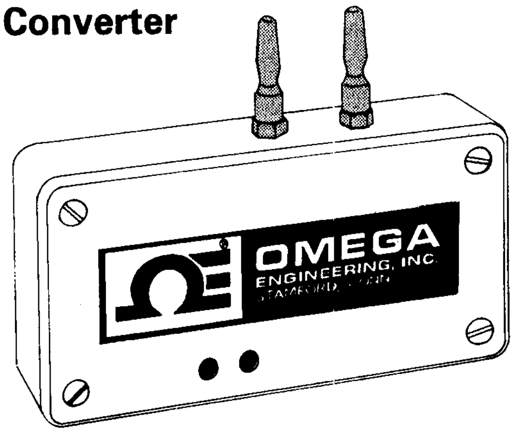
TAC-386

Thermocouple to Analog Converter



OMEGA®
An OMEGA Technologies Company

Operator's Manual
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THERMOCOUPLE TO ANALOG CONVERTER

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SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® TAC-386 Thermocouple to Analog Converter can turn any chart recorder or analog or digital voltmeter into an accurate, wide-range temperature measuring instrument.

The TAC-386 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 °F output
- Rugged - completely portable
- Long-life battery
- Bi-polar output

SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department at (203) 359-1660 or 1-800-622-2378 (USA Only).

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-386 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 TAC-386. Refer to the *OMEGA Complete Temperature Measurement Handbook and Encyclopedia*™ for a complete selection of thermocouples and probes.

SECTION 3 OPERATION

3.1 MULTIMETER USE

1. For temperatures less than 200°C (392°F), set the multimeter range to 200 mV.
2. For temperatures greater than 200°C (392°F), set the multimeter range to 2 V.

Temperature is recorded directly on the multimeter in °C or °F (depending on model); the TAC-386 converts the mV or V signal into a temperature measurement recorded as °C or °F.

3.2 STRIP CHART RECORDER USE

To use the instrument 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

The output is 1 mV per °C or °F (depending on model).

SECTION 4 TAC-386 TEST PROCEDURE

4.1 EQUIPMENT REQUIRED

1. Thermocouple simulator
2. DVM 4½ digits, or 5½ digits, input impedance > 10,000 megohms.
3. An accurate digital thermometer

Connect the thermocouple simulator to the input of the TAC-386. Connect the output of the TAC-386 to the 4½ or 5½ digit DVM.

4.2 ZERO ADJUSTMENT

1. Set the thermocouple simulator to 0°C (for TC, JC, and KC Models) or 0°F (for TF, JF, and KF Models).

2. Adjust R11 until V out reads:
   - TC 0.00 mV ±0.4 mV
   - JC 0.00 mV ±0.4 mV
   - KC 0.00 mV ±0.4 mV
   - TF 0.85 mV ±0.7 mV
   - JF 1.0 mV ±0.7 mV
   - KF 1.4 mV ±0.7 mV
3. Ground the thermocouple simulator and the TAC-386 together temporarily. It should not cause the output to change. Short the input connector of the TAC-386. The output should read the same as listed in step 2.

4.3 GAIN ADJUSTMENT

4.3.1 Model TC

1. Set the thermocouple simulator to +183°C and adjust R17 until Vout reads +183 mV.
2. Input −72°C and check that the output is within the range of −72 mV ±2.5 mV. If not, adjust R17.

3. Recheck the output at an input of +183°C; the output should be within the tolerance of +183 mV ±2 mV. If not, readjust R11. However, the following tolerances must still be met:

INPUT	Vout
−72°C	−72 mV ±2.5 mV
0°C	0.0 mV ±0.4 mV
+183°C	+183 mV ±2.0 mV

4. Check the following:

INPUT	Vout
−86°C	−86 mV ±3.5 mV
+50°C	+50 mV ±3.0 mV
+150°C	+150 mV ±3.0 mV

5. Input +330°C and adjust R24 until Vout reads 330 mV ±3 mV. Then check the following:

INPUT	Vout
+250°C	+250 mV ±3.0 mV
+300°C	+300 mV ±3.0 mV
+350°C	+350 mV ±3.0 mV

If the above tolerances cannot be met, readjust R24; however, the tolerance at 330°C is ±3 mV.

4.3.2 Model JC

1. Set the thermocouple simulator to +561°C and adjust R17 until Vout reads +561 mV.
2. Input −90°C and check that the output is within the range of −90 mV ±2.5 mV. If not, readjust R17.
3. Recheck the output at an input of +561°C; the output should be within the tolerance of +561 mV ±2 mV. If not, readjust R11. However, the following tolerances must still be met:

INPUT	Vout
−90°C	−90 mV ±2.5 mV
0°C	0.0 mV ±0.4 mV
+561°C	+561 mV ±2 mV

4. Check the following:

INPUT	Vout
−50°C	−50 mV ±3.5 mV
+50°C	+50 mV ±3 mV
+300°C	+300 mV ±3 mV

5. Input +701°C and adjust R24 until Vout reads +701 mV ±3 mV. Then check the following:

INPUT	Vout
+575°C	+575 mV ±3 mV
+650°C	+650 mV ±3 mV
+750°C	+750 mV ±3 mV

4.3.3 Model KC

1. Set the thermocouple simulator to +962°C and adjust R17 until Vout reads +962 mV.
2. Input 0°C and check that the output is within the range of 0.0 mV ±0.4 mV. If not, readjust R17.
3. Recheck the output at an input of +962°C; the output should be within the tolerance of +962 mV ±2 mV. If not, readjust R11. However, the following tolerances must still be met:

INPUT	Vout
0°C	0.0 mV ±0.4 mV
+962°C	+962 mV ±2 mV

4. Check the following:

INPUT	Vout
−20°C	−20.0 mV ±3.5 mV
+100°C	+100 mV ±3 mV
+500°C	+500 mV ±3 mV

5. Input +1173°C and adjust R26 until Vout reads +1173 mV ±3 mV. Then check the following:

INPUT	Vout
+1000°C	+1000 mV ±3 mV
+1100°C	+1100 mV ±3 mV
+1150°C	+1150 mV ±3 mV

4.3.4 Model TF

1. Set the thermocouple simulator to +361°F and adjust R17 until Vout reads +361 mV.
2. Input −112°F and check that the output is within the range of −112 mV ±3.5 mV. If not, adjust R17.

3. Recheck the output at an input of +361°F; the output should be within the tolerance of +361 mV ±3.5 mV. If not, readjust R11. However, the following tolerances must still be met:

INPUT	Vout
−112°F	−112 mV ±3.5 mV
0°F	0.85 mV ±0.7 mV
+32°F	+32 mV ±2.5 mV
+361°F	+361 mV ±3.5 mV

4. Check the following:

INPUT	Vout
−130°F	−130 mV ±5.4 mV
+100°F	+100 mV ±5.4 mV
+395°F	+395 mV ±5.4 mV

5. Input +626°F and adjust R26 until Vout reads +626 mV ±5.4 mV. Then check the following:

INPUT	Vout
+500°F	+500 mV ±5.4 mV
+600°F	+600 mV ±5.4 mV
+667°F	+667 mV ±5.4 mV

4.3.5 Model JF

1. Set the thermocouple simulator to +1042°F and adjust R17 until Vout reads +1042 mV.
2. Input −135°F and check that the output is within the range of −135 mV ±3.5 mV. If not, readjust R17.
3. Recheck the output at an input of +1042°F; the output should be within the tolerance of +1042 mV ±3.5 mV. If not, readjust R11. However, the following tolerances must still be met:

INPUT	Vout
−135°F	−135 mV ±3.5 mV
0°F	+1.0 mV ±0.7 mV
+32°F	+32 mV ±2.5 mV
+1042°F	+1042 mV ±3.5 mV

4. Check the following:

INPUT	Vout
−100°F	−100 mV ±5.4 mV
+300°F	+300 mV ±5.4 mV
+700°F	+700 mV ±5.4 mV

5. Input +2138°F and adjust R24 until Vout reads +2138 mV ±5.4 mV. Then check the following:

INPUT	Vout
+1830°F	+1830 mV ±5.4 mV
+2000°F	+2000 mV ±5.4 mV
+2192°F	+2192 mV ±5.4 mV

4.3.6 Model KF

1. Set the thermocouple simulator to +1764°F and adjust R17 until Vout read +1764 mV.
2. Input 0°F and check that the output is within the range of +1.4 mV ±0.7 mV. If not, readjust R17.

3. Recheck the output at input = +1764°F; the output should be within the tolerance of +1764 mV ±3.5 mV. If not, readjust R11. However, the following tolerances must still be met:

INPUT	Vout
0°F	+1.4 mV ±0.7 mV
+32°F	+32 mV ±2.5 mV
+1764°F	+1764 mV ±3.5 mV

4. Check the following:

INPUT	Vout
−4°F	−4 mV ±5.4 mV
+500°F	+500 mV ±5.4 mV
+1000°F	+1000 mV ±5.4 mV

5. Input +2138°F and adjust R26 until Vout reads +2138 mV ±5.4 mV. Then check the following:

INPUT	Vout
+1830°F	+1830 mV ±5.4 mV
+2000°F	+2000 mV ±5.4 mV
+2192°F	+2192 mV ±5.4 mV

4.4 FINAL CALIBRATON

1. Connect the thermocouple simulator to the input of the TAC-386 with thermocouple extension wire. Make sure that the proper type of thermocouple extension wire is used. For example, when using a Model TAC-386-K, type K (Chromel-Alumel) extension wire must be used.

NOTE

Perform the following tests at room temperature.

2. Set temperature as shown below and check Vout; adjust R8 if necessary.

MODEL	TEMPERATURE	Vout
Model TC	0°C	0.0 mV ±0.4 mV
Model JC	0°C	0.0 mV ±0.4 mV
Model KC	0°C	0.0 mV ±0.4 mV
Model TF	0°F	+0.85 mV ±0.7 mV
Model JF	0°F	+1.0 mV ±0.7 mV
Model KF	0°F	+1.4 mV ±0.7 mV

3. Check the overall range tolerances (refer to paragraphs 4.3.1 through 4.3.6). If necessary readjust R8 for zero, R17 for Gain and R24 or R26 for HI range
4. Short the input terminal. The output should be the ambient temperature (reading on accurate digital thermometer). If not, re-adjust R8.

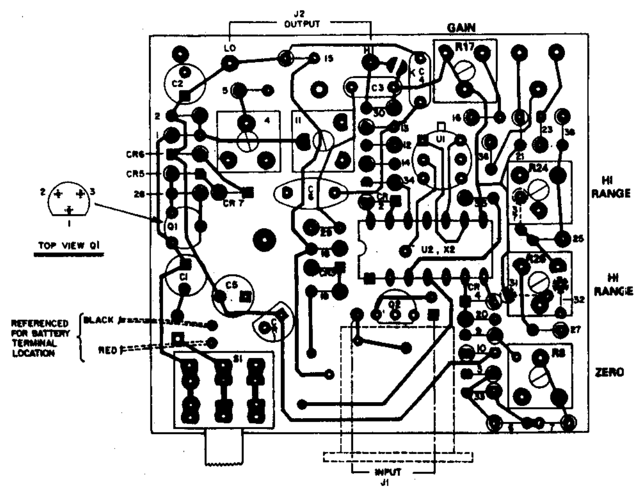

Figure 4-1. Component Layout

SECTION 5 SPECIFICATIONS

RANGES:	Type J: −105° to 750°C; −157° to 1382°F Type T: −86° to 350°C; −123° to 662°F Type K: −20° to 1200°C; −40° to 2192°F
OPERATING TEMPERATURE:	0° to 50°C (32° to 122°F)
STORAGE TEMPERATURE:	0° to 65°C (32° to 148°F)
RELATIVE HUMIDITY:	80% max.
POWER:	9 V alkaline battery
OUTPUT:	1 mV/°C or °F
RESPONSE TIME:	1 second
REFERENCE JUNCTION STABILITY:	0.05°C/°C
INPUT CONNECTION:	Quick-disconnect terminals
OUTPUT CONNECTION:	Standard banana plug 19 mm spacing
ACCURACY:	±4°C over entire range
DIMENSIONS:	H: 2¼ (57 mm) x W: 3½ (88 mm) x D: 1 (25 mm)

MADE IN USA

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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