Weller®

WA2000
SOLDERING IRON ANALYZER

INSTRUCTION MANUAL

INTRODUCTION

The WA2000 soldering iron analyzer was developed for testing soldering irons for compliance with the DOD-STD-2000 and the new MIL-STD-2000 specifications. This portable unit is capable of testing tip temperature, tip to ground resistance and tip to ground noise (mVRMS). Correctly used and maintained, it is the most accurate of any comparable tester currently available on the market. Please read this document thoroughly, prior to using the WA2000.

TEMPERATURE

Range: 32 to 1040°F (0 – 560°C)
*Accuracy: Contact Pyrometer, ±.1% over a ten degree span (stability).
Auxiliary T/C, ±.5% of reading (Absolute) ±1 digit.
Resolution: 1°F or 1°C, user selectable
Sensor: CP-01** or CP-02** Contact Pyrometer, K-111, K-121, K-181 Type K Thermocouple assembly.

*NOTE: Analyzer accuracy only. Tolerance of thermocouple and external fixturing must be added.

**Patent pending

TIP OHMS TO GROUND

Range: 0 to 100 Ohms
Accuracy: 1% of reading ±.2 Ohms
Resolution: .1 Ohms
Test Current: 10 milliamperes AC Current Source to RMS Conversion.
US Patent #5,073,758

TIP VOLTAGE TO GROUND

Range: 0 to 100 mV RMS, Crest Factor of 3
Accuracy: 1% of Reading ±0.2mV
Resolution: 0.1 mV
Measurement: True RMS conversion

Digital Display: 3 1/2 Digit LCD

Power: 9VDC Battery
Battery Life: 50hrs.

TIP TEMPERATURE MEASUREMENT

The unit has the ability to check for either temperature stability (ΔT) or absolute temperature. To perform these tests, two methods must be used.

TEMPERATURE STABILITY

This test is used for compliance with the MIL-STD-2000 requirement. The detachable contact pyrometers were designed for use in this test. The pyrometers will not give accurate absolute measurements. Due to loading effects, the temperature measured will be lower than the actual tip temperature (about 30°F or 17°C); however, stability can easily be checked with the pyrometer. The ΔT measured has an accuracy of better than ±0.1% over a ten degree span. This is more than adequate to fulfill the temperature measurement requirements of the MIL-STD-2000 specification.

ABSOLUTE MEASUREMENT

The K-111 and K-181 thermocouple assemblies have been provided for making absolute temperature measurements. These assemblies can also be used to monitor active soldering and can measure temperature loading, excursions and heater response. Although not a requirement for compliance to the MIL-STD-2000 specification, it does provide a good tool for process control and improvement.

MEASUREMENT PROCEDURE

1. Set the rotary selector switch to the **TEMP** position and the slide switch to °**C** or °**F** to select the desired unit of measure.
2. Plug either a contact pyrometer or thermocouple assembly into the **TEST** receptacle. If using a pyrometer, place the tinned tip of the iron to be tested onto the contact pyrometer. Using the iron "holder" provided with the WA2000 will aid in obtaining an accurate reading. Add additional solder to increase contact area to each side of the pyrometer. Response time will be 5 seconds or less.
3. Record both the low and the high temperature reading and calculate $\Delta T = (T_H - T_L)$.

*** PLEASE NOTE ***

The ground adapter is provided for testing tip noise and resistance only. For temperature measurements, the ground adapter must not be connected to the tester or temperature errors can occur.

TIP VOLTAGE POTENTIAL

Tip to ground noise is typically associated with any electrical voltage that is induced by the iron itself and can be measured from the working area of the tip referenced to ground. The DOD requirements are quite clear as to the maximum RMS voltage that should not be exceeded.

To measure this low level voltage accurately, it should be tested under "ideal" conditions, i.e., an electrically shielded screen room. This helps to eliminate spurious noise generated from sources other than the iron itself.

MEASUREMENT PROCEDURE

1. Set the analyzer rotary selector switch to the **mVAC** position.
2. Plug the iron under test into the ground adapter and plug the adapter into an AC source. Connect the ground lead from the adapter into the analyzer **GND** receptacle and plug a pyrometer into the **TEST** receptacle (Do not use the K-111 or K-181 thermocouple assembly for this test).
3. With the iron under test off, contact the pyrometer with the iron's tip. The iron "holder" provided with the WA2000 may be used to hold the iron steady. Record the analyzer reading V_1.
4. Turn iron under test on and allow to stabilize. With the iron's tip making contact to the pyrometer, add additional solder to the tip to increase contact area. Allow to stabilize for thirty seconds. Record the analyzer reading V_2.
5. Calculate tip noise $V_{TIP} = V_2 - V_1$. This procedure removes extraneous noise, which is measured with the iron off. Remember, per the MIL-STD-2000 procedure, for adjustable temperature controlled irons, measurements are to be taken at the maximum temperature setting. For fixed temperature irons, measurements will be taken at its rated temperature.

TIP TO GROUND RESISTANCE

The WA2000 is capable of measuring tip to ground resistance up to 100.0 ohms. Per the MIL-STD-2000 specification, an iron's tip to ground resistance must not exceed two ohms. This measurement must be made with the iron hot. There is no need to be concerned with polarity (Seebeck induced errors) since the patented circuit design removes the error electronically which provides an accurate, corrected reading in ohms.

MEASUREMENT PROCEDURE

1. Set the analyzer rotary selector switch to the **OHMS** position.
2. Insert the yellow plug from the ground adapter into the analyzer **TEST** receptacle and the ground pin into the **GND** receptacle. Record lead resistance R_L, which will be subtracted later.
3. Remove yellow plug from the analyzer **TEST** receptacle and reinstall pyrometer. Plug iron to be tested into the ground adapter and the adapter into an AC power source. Turn on the iron under test and allow to stabilize. Lay the iron's tip onto the pyrometer to complete the test circuit. Add additional solder to increase contact area.
4. Record the reading R_T and subtract lead resistance, $R_T - R_L$. The result will be the iron's tip to ground resistance.

IMPORTANT

When making measurements, always use a clean tinned tip. A dirty oxidized tip can cause erroneous measurements.

Always add additional solder to the tip and pyrometer, during measurement, to ensure sufficient electrical contact. Do not add solder to the thermocouple assemblies.

RECORDER OUTPUT

A buffered output and recorder plug assembly has been provided for connection to a chart recorder. This output can also be connected to a DVM with an IEEE 488 type output for data acquisition and statistical analysis on a P.C.

Recorder Output Parameters

Temperature:	1mV/degree (°F or °C)
Resistance:	1mV/0.1 ohms
Tip Noise:	1mV/0.1 mVRMS

HANDS OFF OPERATION

A small stand is provided with the analyzer to enable the user to support the iron under test when using the contact pyrometer. This helps in providing a stable method of supporting the iron, which results in consistent measurements.

MIL SPECIFICATION REQUIREMENTS AND FREQUENCY OF PERIODIC TESTS

REQUIREMENT	MIL-STD-2000	DOD-STD-2000	WS-6536
Tip to ground, max. resistance, hot	2.0 ohms quarterly	2.0 ohms quarterly	20.0 ohms daily
Tip to ground, max. voltage, hot	2.0 mv biannually	2.0 mv biannually	2.0 mv monthly
Tip temperature, at idle (stability)	±10°F monthly	±10°F monthly	±10°F weekly
Visual for damage, oxidation, and cleanliness	daily	daily	daily*
Proper operation and performance	undefined daily	see note 1 daily	see note 2 daily
ESD per DOD-STD-1686	N.R.	N.R.	N.R.

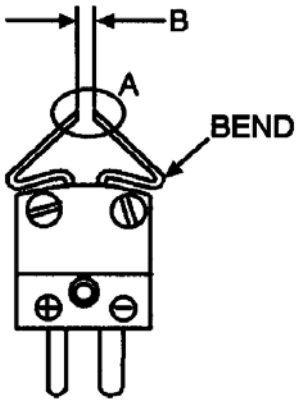
Note 1: Complete soldering within 2-5 seconds.
Note 2: Complete soldering within 5 seconds.
*Cleanliness only required
N.R. - Periodic test not required

For confirmation of specifications write to:

WD6536E-2	CODE 3681 Soldering Technology Standards NAVAL WEAPONS SYSTEM China Lake, CA 93555
MIL-STD-2000	CODE 9313 Soldering Technology Standards NAVAL AIR ENGINEERING CENTER Lakehurst, NJ 08733-5100

CONTACT PYROMETER MAINTENANCE

The contact pyrometers have been designed for accuracy, ease of use and low cost. As with any pyrometer, certain guidelines should be followed in order to obtain maximum precision of measurement.



Prior to use, it is important that the wire ends (A) be inspected and cleaned if necessary. Use a solvent such as alcohol and a stiff brush to clean the wires. It is sometimes necessary to use a sharp instrument to shave the burned flux off. After about eight hours of actual use it will be necessary to either file or clip off the wire ends. The wire should then be bent to maintain a gap (B) of .06". This will restore the pyrometer to like new condition. This process may be repeated as many times as the wire length will allow.

DISPLAY CALIBRATION

1. Set the analyzer rotary selector switch to **OHMS**.
2. Connect a 100 ohm, ±0.1%, resistor from the **TEST** receptacle to the **GND** receptacle.
3. Measure voltage from pin 7 (+) to pin 8 (ground) of the ribbon cable (pin 1 of the cable is nearest to the battery leads, see figure on page 7) and adjust R3 on the display board until display and volt meter readings match, i.e., 1.000V = 100.0 ohms.

TEMPERATURE CALIBRATION

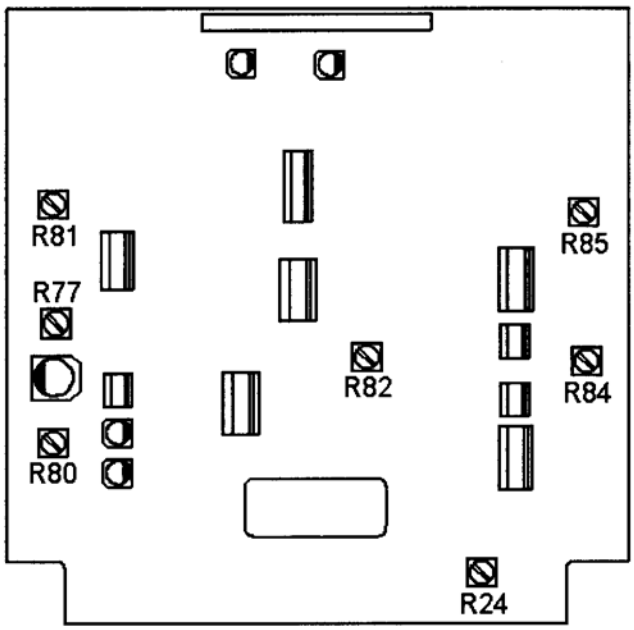
1. Set the analyzer rotary selector switch to **TEMP** and the slide switch to °**F**.
2. Connect K-111 or K-181 thermocouple assembly to the **TEST** receptacle.
3. Measure room temperature with a calibrated thermometer and record temperature T_A.
4. Adjust R24 until display matches thermometer reading. Set the slide switch to °**C** and adjust R85 until display reads the °C equivalent of room temperature, i.e., T_A = 72°F = 22°C.
5. Disconnect thermocouple assembly from the analyzer and set the slide switch to °**F**.
6. Using a precision millivolt power supply, input 22.251 mVdc (type K equivalent voltage of 1000°F) to the **TEST** socket.
7. Adjust R84 until display reads 1,000°F + (T_A-32°F). For example, if room temperature T_A = 72°F then adjust display to read 1,000°F + (72°F - 32°F) = 1,040°F. Set slide switch to °**C** and adjust R81 until display reads °C equivalent of °F input, i.e., 1,040°F = 560°C.

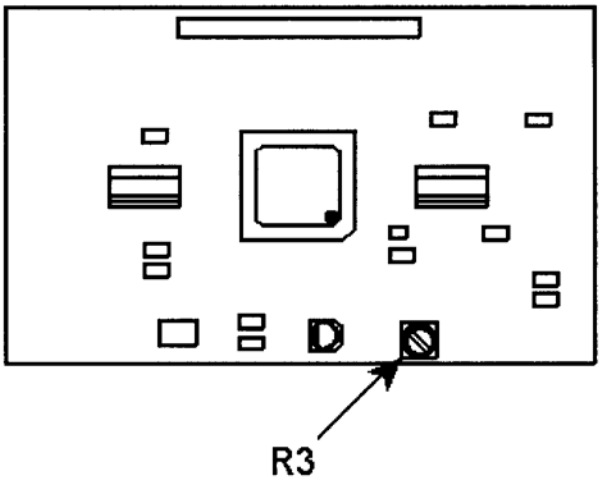
mVAC RMS CALIBRATION

1. Set the analyzer rotary selector switch to **mVAC**.
2. Connect a signal generator to the analyzer **TEST** and **GND** receptacles. The test cable should include an internal two ohm load from input (**TEST**) to ground (**GND**).
3. With no signal applied (zero signal), adjust R80 for a reading of 00.0 on display. Allow time for the reading to settle, it will take several seconds.
4. Connect a precision digital voltmeter to monitor input and adjust signal generator output for a 100 mVAC RMS sinusoidal 60 Hz. signal.
5. Adjust R77 until the analyzer display matches the voltmeter reading.

OHMS CALIBRATION

1. Set the analyzer rotary selector switch to **OHMS**.
2. Connect a 100 ohm, ±0.1%, resistor to the analyzer **TEST** and **GND** receptacles.
3. Adjust R82 until the display reads 100.0 ohms, or the actual value of the connected resistor.





REPLACEMENT PARTS FOR THE WA2000

(Please include model number when ordering these parts from your original supplier.) Please allow six weeks for delivery of items marked with *.

ITEM	DESCRIPTION	P/N
1	Vinyl Accessory Case	*C724
2	Ground Cord Adapter	*7-3400
3	Contact Pyrometer, Large Gauge	CP-01
4	Contact Pyrometer, Small Gauge	CP-02
5	Type K Thermocouple Assembly, ETA tip	K-111
6	Type K Thermocouple Assembly, EPH107 Tip	K-121
7	Type K Thermocouple Assembly, LTB Tip	K-181
8	Recorder Cable Assembly	*P143
9	Iron Stand	*S719