2025 SPRAYFOAM Convention & Expo
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Multi-meter Testing and Training for the SPF Installer

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SPFA Antitrust Policy

"Our policy is to comply with all federal, state and local laws, including the antitrust laws. It is expected that all company member representatives involved in SPFA activities and SPFA staff will be sensitive to the unique legal issues involving trade associations and, accordingly, will take all measures necessary to comply with U.S. antitrust laws and similar foreign competition laws."

It is a per se violation of the federal antitrust laws for competitors to agree on prices, limitation of supplies, allocation of customers or territory, or boycotts. "Per se" means that no legal defense can be used to mitigate this automatic violation.

Even an agreement by competitors that is for the good of society and our industry may be a violation of the antitrust laws if it could affect competition.

If a topic of antitrust concern is raised at any time during a meeting, note your objection for the record. If the topic continues to be discussed, you should leave the room immediately and contact SPFA's general counsel and your company's attorney for further guidance.

Ensure that every SPFA meeting, where members are present, has an agenda, the agenda is followed, and minutes are kept by SPFA staff of the proceedings.

Understanding and acting on the requirements of U.S. and foreign antitrust and competition laws sometimes can be difficult. If you have a question about the propriety of activities or discussions in SPFA, you are encouraged immediately to contact your company's legal counsel and SPFA management.

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Background

SPF equipment is becoming more sophisticated with electronic controls that a layman cannot trouble shoot without owning and knowing how to use a Multimeter!

Knowing how to use a multimeter to troubleshoot, diagnose and repair SPF equipment in the field (working with tech support) can dramatically reduce costly downtime.

Learning Objectives

Learn about the different types of multimeters to keep your equipment running properly.

Learn how to use multimeters to diagnose different types of SPF equipment problems.

Review different multimeter selection options.

Toolbox Multimeter Tester

Let's first start out by picking the most correct multimeters on the market.

We will start with this Fluke 362 which can do most any test that you will do. This multimeter will measure:

- AC and DC Voltage
- C200A AC/DC CLAMP METER
- Resistance
- Continuity

To Read DC Amps, you will need the 362, 200A AC/DC Clamp Meter

Toolbox Multimeter Tester

Here is another of the correct multimeters on the market; great for most applications on a SprayFoam rig. We will show you with this Bside ACU91 which can do most any test that you will do. This multimeter will measure:

AC and DC Voltage
AC/DC CLAMP METER
Resistance
Continuity
Hertz
Temperature
Very Economical

Pocket Multimeter tester

A simple pocket type digital tester that is very handy. The Fluke 101 Basic is economical and compact and easy to use and performs basic measurements including AC/DC voltage, resistance and continuity

Non-Contact Voltmeter

Another multimeter is a non-contact voltmeter. This option may improve safety when measuring high voltages.

Clamp-on Amp Meter

Another multimeter is a non-contact or clamp-on amp meter. This device is useful for measuring load on powered equipment.

Multimeter Quality

IMPORTANT

There are many different manufacturers of multimeters.

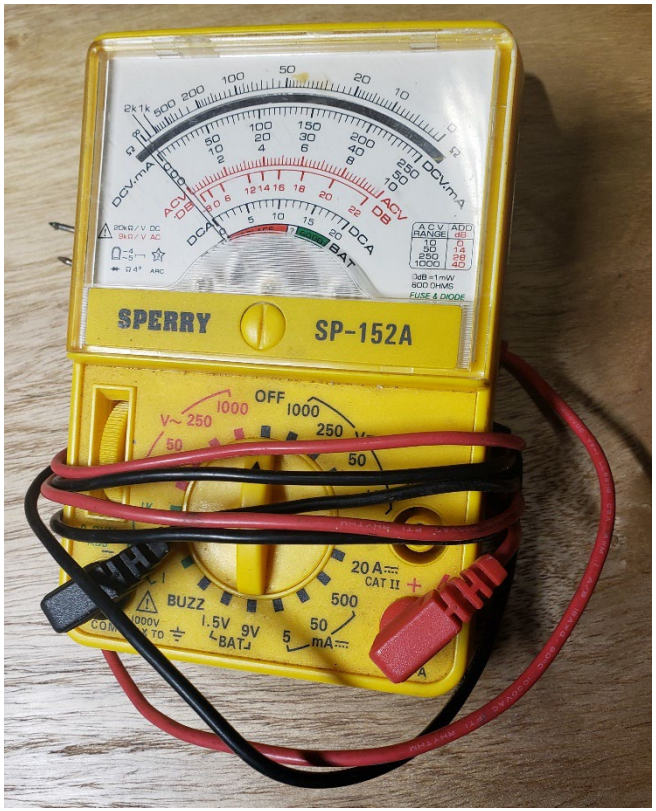
Selecting the best manufacturer is often a trade-off between price and factors like durability, accuracy and overall quality.

This presentation will demonstrate the use of professional-grade multimeters.

Multimeter Quality

This low-cost analog multimeter is difficult to find the right scale and viewing angle to get an accurate reading.

Analog multimeters are NOT recommended for SPF contractors.



Multimeters for your Toolbox

Different Meters

A. Economy-grade digital multimeter
B. Non-contact voltmeter
C. Hand multimeter
D. Digital pocket multimeter
E. Analog clamp amp meter

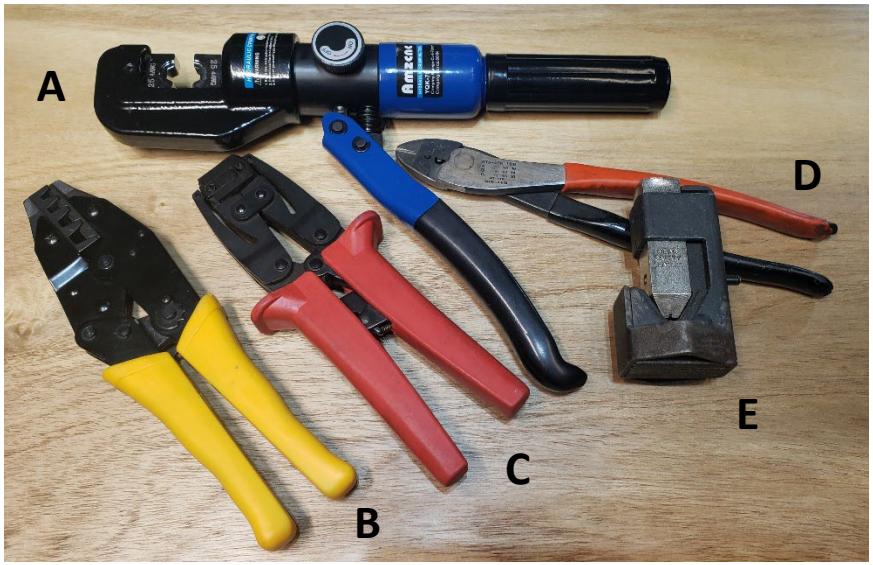
Electrical Hand Tools

A. Wire cutters
B. Strippers
C. Electrical (insulated) screwdrivers

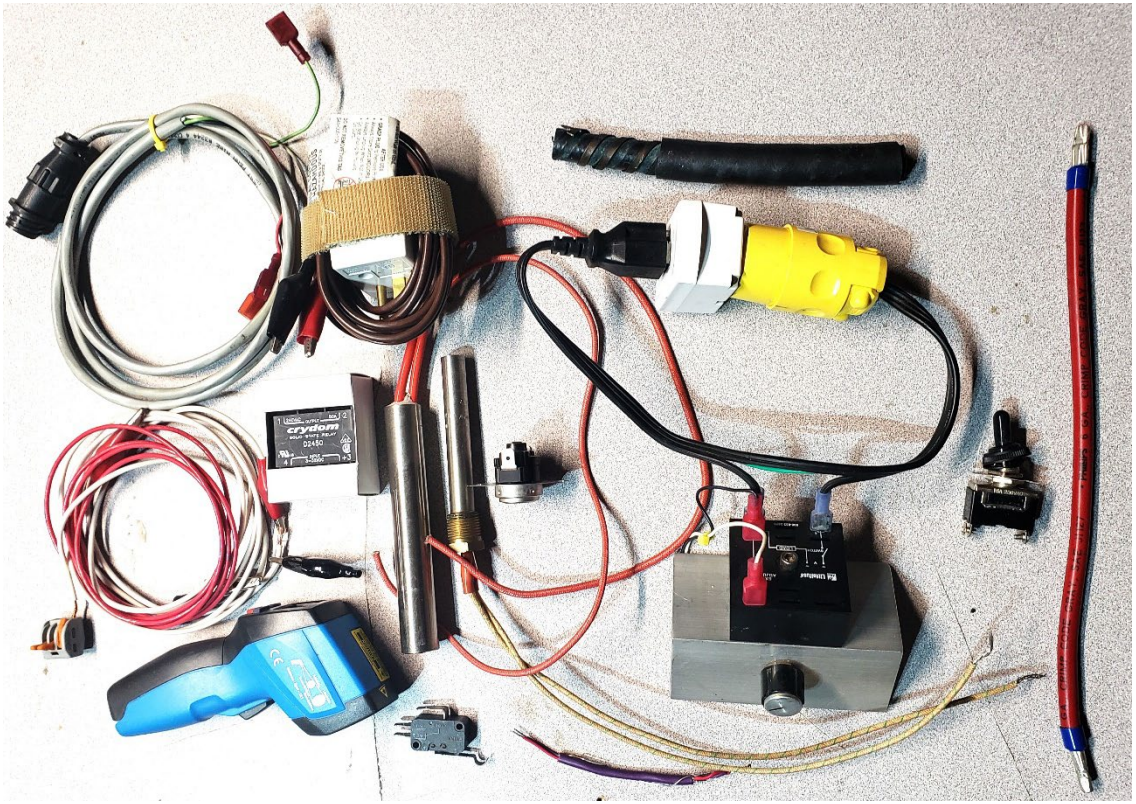
Electrical Hand Wire Crimpers

A. Hydraulic crimper for cables
B. Adjustable crimps
C. Small Ferrule crimper
D. Auto wire crimper
E. Hammer crimper for #6 wire.

A

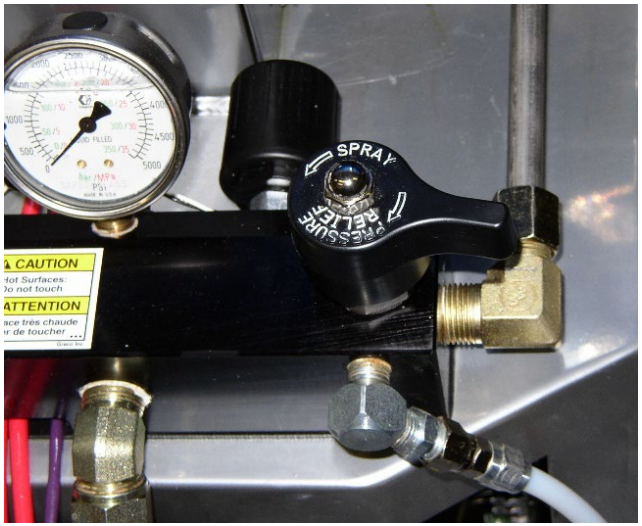


Electrical Components for SPF Equipment



Component Testing Examples

Pump Controls
Pressure Switches
Error Codes E24, E04, E02, E03 and E01
Heat Sensor Test
Heating Element Test
Temperature Controller
Hose Amperage Controller
Hose Heating Transformer
Hose Heat Circuitry
Capacitor Test
Thermocouple Switches
Directional switches
TSU / FTS Thermocouple sensor



Pressure Switches

Pressure Settings

Pump Lights

Diagnose

How to bypass a bad one.

Test for Continuity

E04: TS Thermocouple Wire

Er 4 tells you that you have an open circuit

Disconnect TC wire connector in front of meter

Jump Terminals 1 & 2

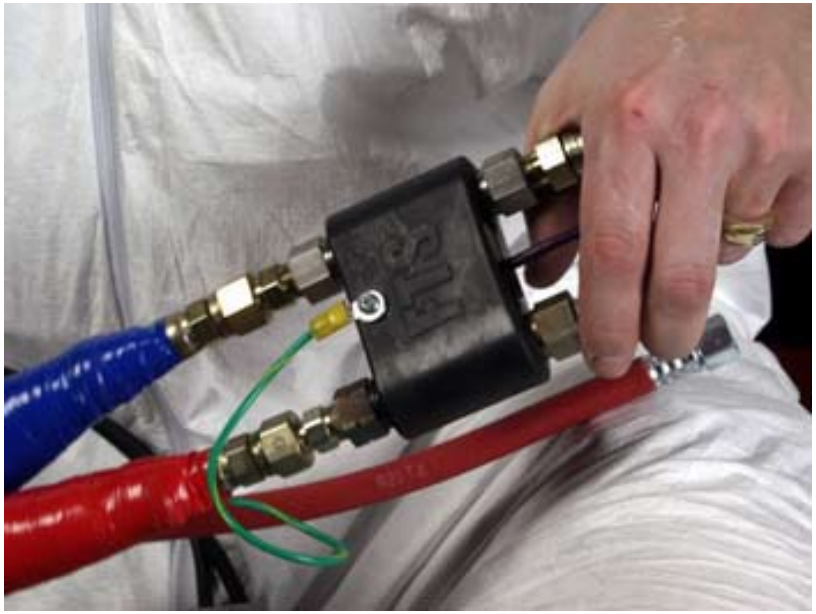
If Watlow meter responds with a temperature

Problem in the hose

E04: FTS Not Connected

Check

- Cable connections
- Temperature Sensor connection to board
- FTS operation by connecting directly to proportioner
- Should read ambient and then rise if tip pinched by fingers
- Place probe in ice water should read ≈34°F



Electrical Meter Functions

Electrical Meter Reads:

AC Volts ~

DC Volts

Amps Ã

Ohms Ω

Continuity Ω

Checking Amps on wire

When using amp clamp meter, always run power wire through the clamp and, NOT clamped onto the wire.

Check Continuity of TSU/FTS

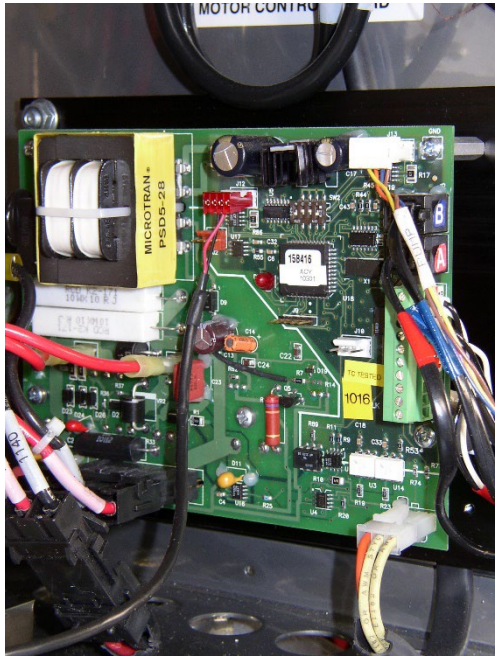
Using a multimeter to test for continuity in the TSU/FTS

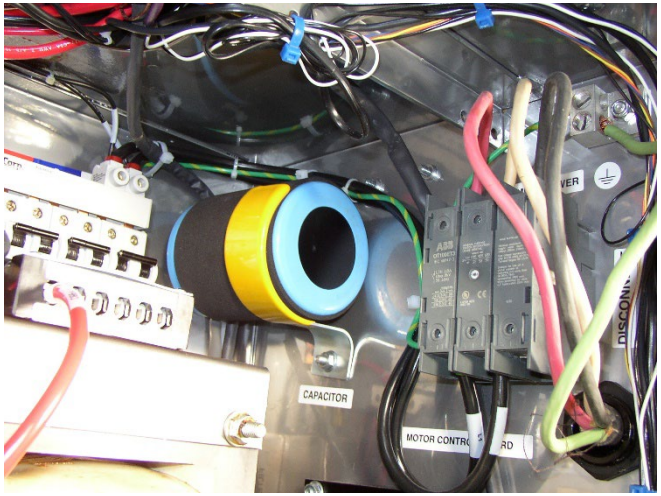
Test across pins 1 & 2

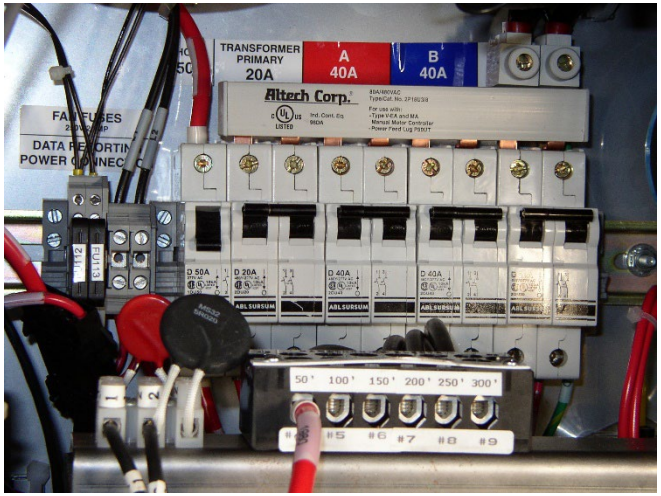
Should have Continuity

If an open Circuit..

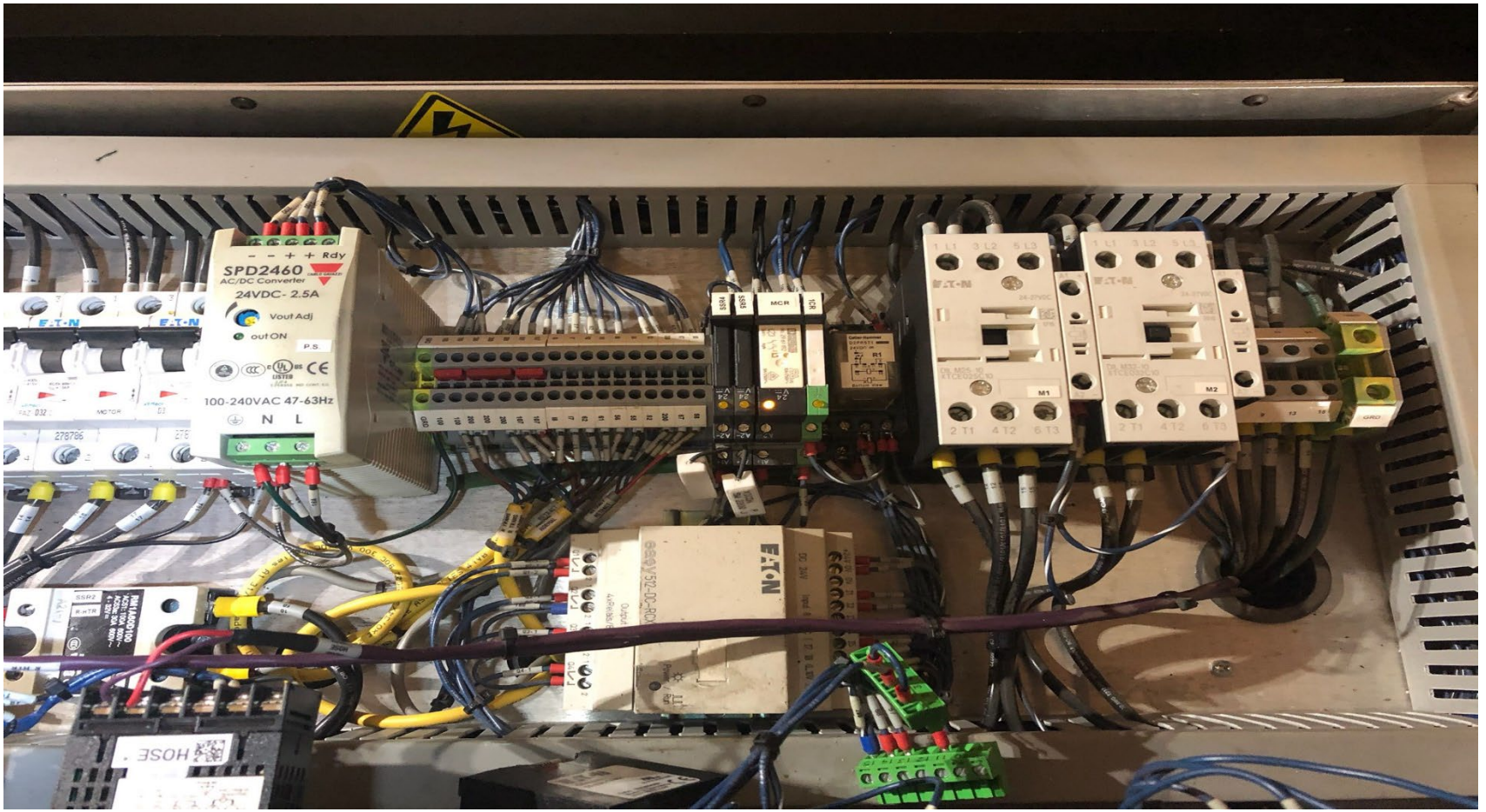
Other Electrical Components



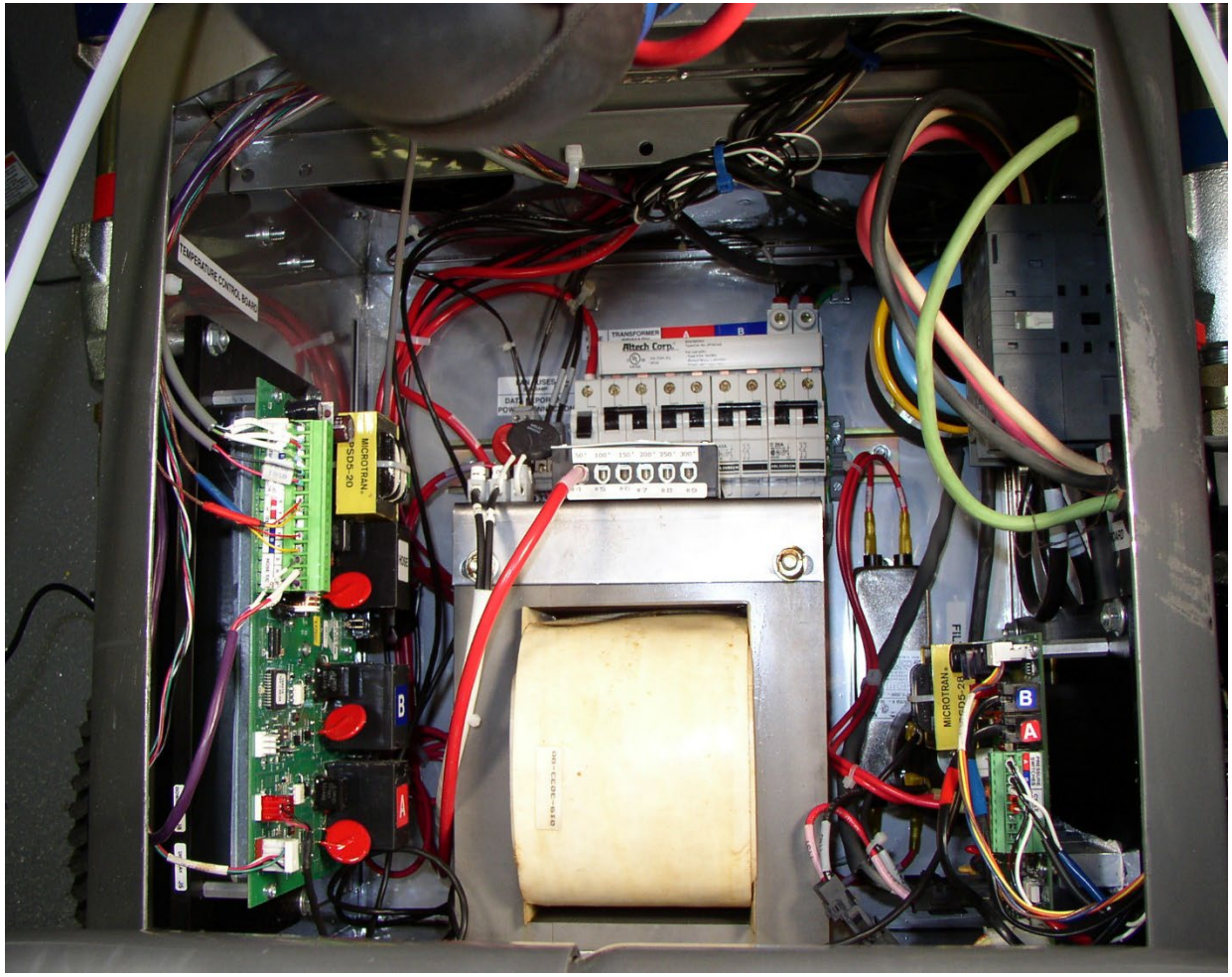




Electrical Components



Hose Heating Transformer

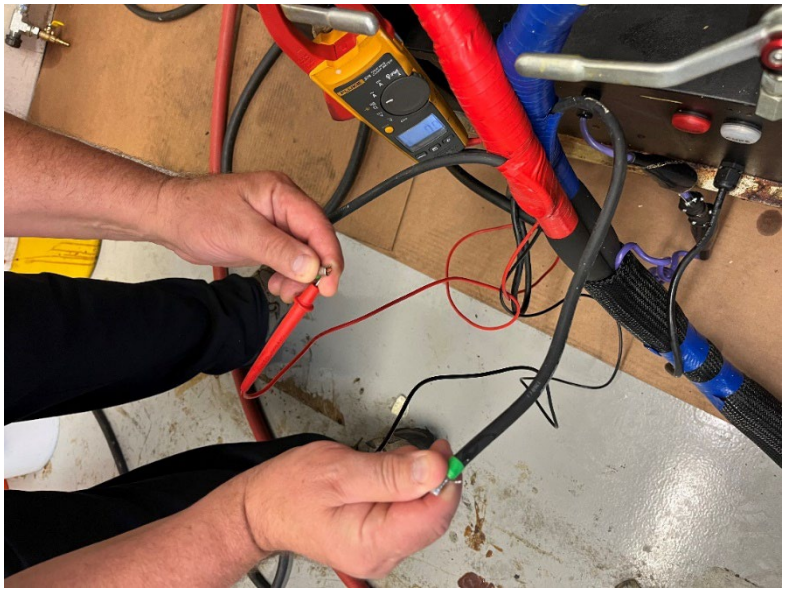


Continuity check on hose

Must! Remove the electrical connection for the #6 wire at the machine. If you fail to do this you will read continuity back through the machine.

With your meter set on ohms check for continuity through the hose.

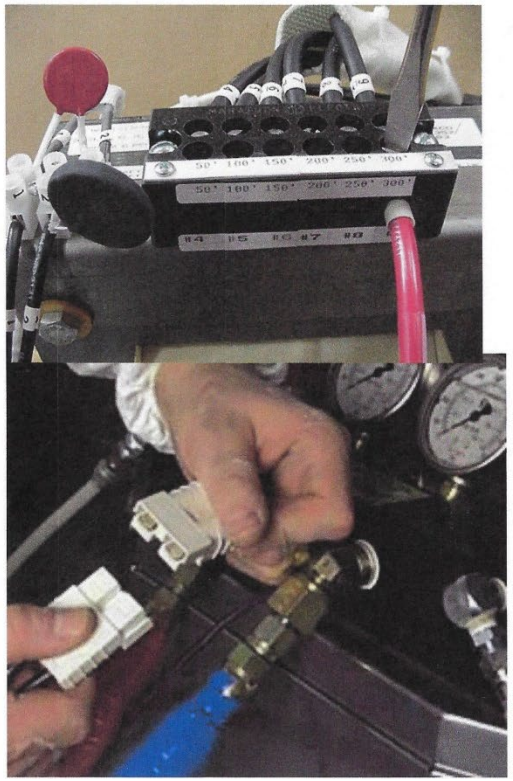
No continuity found then start at the width and work each 50 foot section back until the failure is isolated.



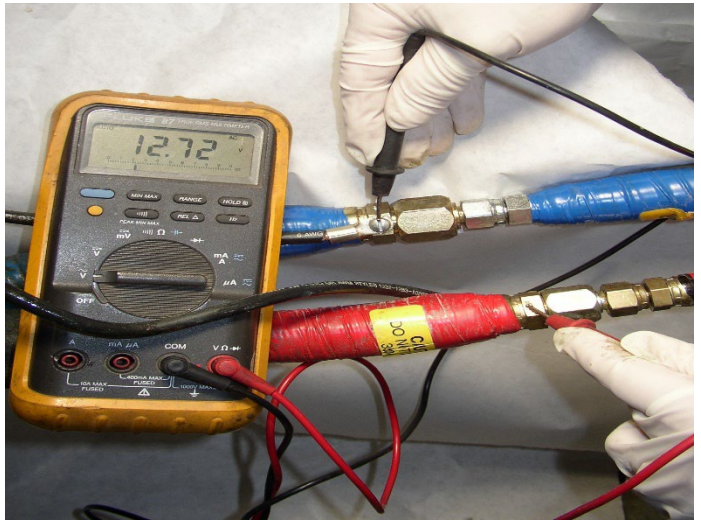
Hose Heating Transformer

Transformer Test

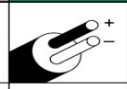
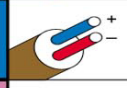
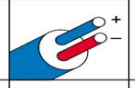
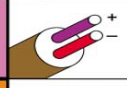
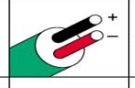
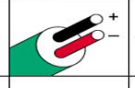
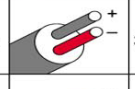
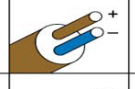
- Check Voltage at Hose Connection on front
  - Press stop button to shut off heaters
  - Disconnect connector
  - Plug meter in to connector
  - Turn on hose heater
  - Will supply voltage for 3 seconds.
  - 50’ = 15 Vac 200’ = 60 Vac
  - 100’ = 30 Vac 250’ = 75 Vac
  - 150’ = 45 Vac 300’ = 90 Vac



Test Hose Heat Circuitry



Thermocouple Wire Identifications

ANSI Code	ANSI MC 96.1 Colour Coding: Thermocouple Grade	ANSI MC 96.1 Colour Coding: Extension Grade	Alloy Combination: + Lead	Alloy Combination: – Lead	Comments Environment Bare Wire	Maximum T/C Grade Temp. Range	EMF (mV) Over Max. Temp. Range	IEC 584-3 Colour Coding: Thermocouple Grade	IEC 584-3 Colour Coding: Intrinsically Safe	IEC Code
J			IRON Fe (magnetic)	CONSTANTAN COPPER-NICKEL Cu-Ni	Reducing, Vacuum, Inert. Limited Use in Oxidising at High Temperatures. Not Recommended for Low Temperatures.	–210 to 1200°C –346 to 2193°F	–8.095 to 69.553			J
K			CHROME NICKEL-CHROMIUM Ni-Cr	NICKEL-ALUMINUM Ni-Al (magnetic)	Clean Oxidising and Inert. Limited Use in Vacuum or Reducing. Wide Temperature Range, Most Popular Calibration	–270 to 1372°C –454 to 2501°F	–6.458 to 54.886			K
T			COPPER Cu	CONSTANTAN COPPER-NICKEL Cu–Ni	Mild Oxidising, Reducing Vacuum or Inert. Good Where Moisture Is Present. Low Temperature & Cryogenic Applications	–270 to 400°C –454 to 752°F	–6.258 to 20.872			T
E			CHROME NICKEL-CHROMIUM Ni-Cr	CONSTANTAN COPPER-NICKEL Cu-Ni	Oxidising or Inert. Limited Use in Vacuum or Reducing. Highest EMF Change Per Degree	–270 to 1000°C –454 to 1832°F	–9.835 to 76.373			E
N			NICROSIL Ni-Cr-Si	NISIL Ni-Si-Mg	Alternative to Type K. More Stable at High Temps	–270 to 1300°C –450 to 2372°F	–4.345 to 47.513			N
R	NONE ESTABLISHED		PLATINUM-13% RHODIUM Pt-13% Rh	PLATINUM Pt	Oxidising or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature	–50 to 1768°C –58 to 3214°F	–0.226 to 21.101			R
S	NONE ESTABLISHED		PLATINUM-10% RHODIUM Pt-10% Rh	PLATINUM Pt	Oxidising or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature	–50 to 1768°C –58 to 3214°F	–0.236 to 18.693			S
U	NONE ESTABLISHED		COPPER Cu	COPPER-LOW NICKEL Cu-Ni	Extension Grade Connecting Wire for R & S Thermocouples. Also Known as RX & SX Extension Wire.					U
B	NONE ESTABLISHED		PLATINUM-30% RHODIUM Pt-30% Rh	PLATINUM-6% RHODIUM Pt-6% Rh	Oxidising or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temp. Common Use in Glass Industry	0 to 1820°C 32 to 3308°F	0 to 13.820			B
G* (W)	NONE ESTABLISHED		TUNGSTEN W	TUNGSTEN-26% RHENIUM W-26% Re	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399°C (750°F). Not for Oxidising Atmosphere	0 to 2320°C 32 to 4208°F	0 to 38.564	NO STANDARD USE ANSI COLOUR CODE		G (W)
C* (W5)	NONE ESTABLISHED		TUNGSTEN-5% RHENIUM W-5% Re	TUNGSTEN-26% RHENIUM W-26% Re	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399°C (750°F) Not for Oxidising Atmosphere	0 to 2320°C 32 to 4208°F	0 to 37.066	NO STANDARD USE ANSI COLOUR CODE		C (W5)
D* (W3)	NONE ESTABLISHED		TUNGSTEN-3% RHENIUM W-3% Re	TUNGSTEN-25% RHENIUM W-25% Re	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399°C (750°F)–Not for Oxidising Atmosphere	0 to 2320°C 32 to 4208°F	0 to 39.506	NO STANDARD USE ANSI COLOUR CODE		D (W3)

Connectors

Connectors

SPRAY POLYURETHANE FOAM ALLIANCE

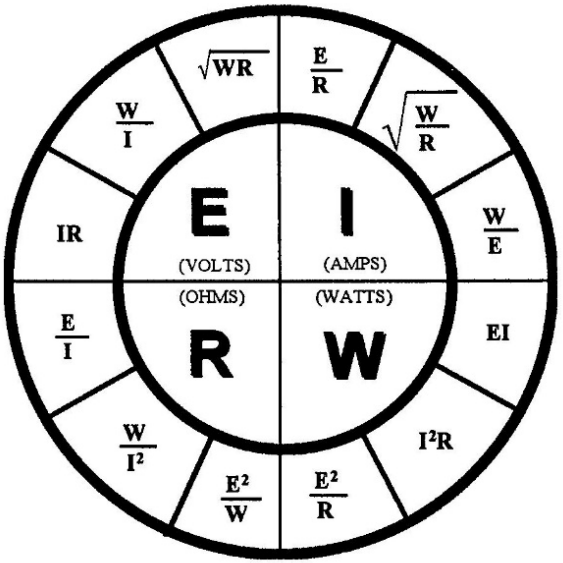
Backup informat

- **The most informative Chart for Electrical!**

HEAT OUTPUT CHANGE DUE TO VOLTAGE CHANGE

$$\text{Actual Wattage} = \text{Rated Wattage} \times \frac{(\text{Applied Voltage})^2}{(\text{Rated Voltage})^2}$$

Ohm's Law



$$\text{3 Phase Ampheres} = \frac{\text{Total Watts}}{\text{Volts X 1.732}}$$

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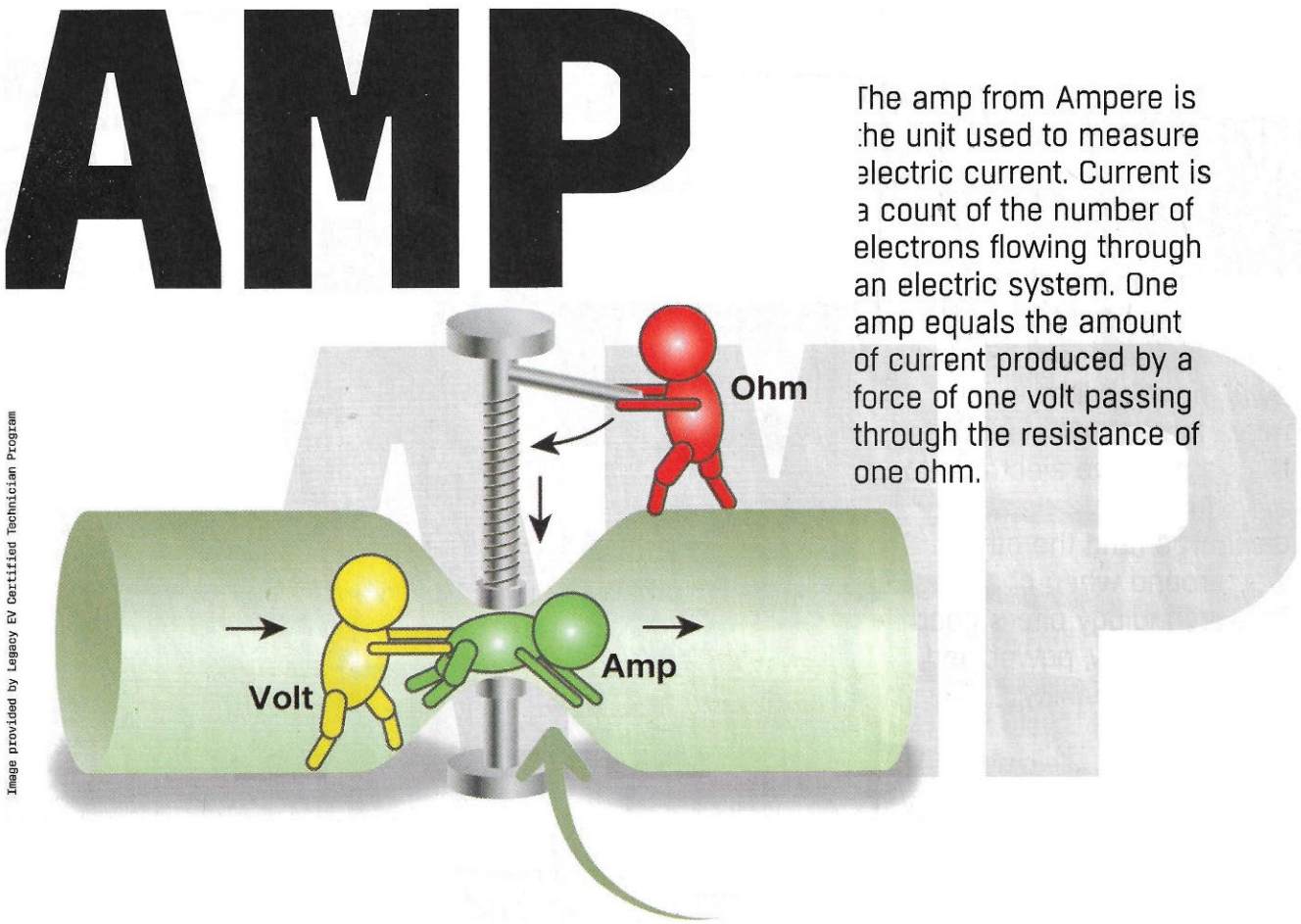
Backup information



Reasons for Test Equipment

Save time and money

Needed to test for the problem

A must own and know how to operate tool

Don’t leave the shop without it!

Investing in a Multimeter on your rig will pay for itself the first time you need it!

Presented by the Equipment Committee! JPC

Thank You!

Questions?

SPFA Website:
www.sprayfoam.org