



# A Qualitative Infrared Thermographic Survey of Electrical System Components



*The Widget Building - Widgetville Michigan*

**Mr. William Widget IX  
Pinnacle Widgets Inc  
1234 Widget Lane  
Widgetville, MI 99943**

Armco Infrared LLC - Thermal Imaging Services  
Authorized ElectricIR™ Contractor  
888-908-3547 [info@ARMCOinfrared.com](mailto:info@ARMCOinfrared.com)



Mr. William Widget IX  
 Pinnacle Widgets Inc  
 1234 Widget Lane  
 Widgetville, MI 99943

3-11-2009

Dear William Widget IX:

The electrical switchgear of The Widget Building at 4321 Widget Boulevard in Widgetville Michigan, was the subject of an infrared (IR) survey on 3-11-2009. Equipment designated by the client for this survey is listed in this report.

**Your Armco Infrared LLC - *ElectricIR™* report includes:**

- Section A - Data Log, a list of all equipment surveyed
- Section B - Repair Guide, a list of all equipment with thermal anomalies
- Section C - Thermographic Reports, individual report pages of all equipment with thermal anomalies

Armco Infrared, an Authorized *ElectricIR™* Contractor, was retained for an electrical thermographic survey of the building in an effort to identify areas of thermal anomalies and to document them for further review and repair. Further investigations of these areas may reveal additional conditions that were not readily visible at time of inspection. This report is based on information obtained at the site at the given date and time. We document our findings with infrared thermograms and visual photographs of the areas. Our inspection is designed to comply with accepted industrial standards and this report is for the exclusive use of our client and is not intended for any other purpose. The report is based on the information available to us at this time as described in the report. Should additional information become available at a later date, we reserve the right to determine the impact, if any, that the new information may have on our discovery and recommendations and to revise the report if necessary and warranted.

**Analysis and Recommendations**

We recommend that your maintenance team carefully review this report. Items listed on the repair Guide should be checked by qualified personnel. We use the Delta—T method of rating equipment. Below, see the temperature ratings, however, your criteria for rating a problem will include not only temperature, but criticality of the equipment and other factors.

Rating	Temperature Rise F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
Alert	16-50 °F	Repair within 30 days, watch load and inspect for physical damage.
Serious	51-100 °F	Repair/Replace ASAP. Inspect surrounding components for physical damage.
Critical	100+ °F	Immediate repair/replace. Danger exists!

Our reports are designed to be clear, concise and useful. Please review this report carefully. If there is anything you would like us to explain, or if there is other information you would like, please feel free to call us as we would be happy to answer any questions.

Sincerely,

Robert E McCoy Jr, PE

N.C. Registered Professional Electrical Engineer #020697  
 Certified Level III Thermographer #7672  
 BPI Certified Building Analyst #5009435  
 Armco Infrared LLC - Authorized *ElectricIR™* Contractor  
 216 E Chatham Street Unit 109, Cary NC 27215

## GLOBAL REPORT INFORMATION

<b>Client:</b>	Pinnacle Widgets Inc
<b>Building Name:</b>	The Widget Building
<b>Building Location:</b>	4321 Widget Boulevard
<b>Facility Qualified Assistant</b>	Good Buddy
<b>Survey Date:</b>	3-11-2009
<b>Ambient Temperature:</b>	35
<b>Imager used:</b>	Flir T620
<b>Notes:</b>	

## REPORT FINDINGS -- TOTALS and SUMMARY

(NR) Not Rated =	<b>6</b>
(M) Minor =	<b>1</b>
(A) Alert =	<b>1</b>
(S) Serious =	<b>2</b>
(C) Critical =	<b>1</b>
<b>TOTAL =</b>	<b>11</b>

## Understanding Infrared Imagery

Infrared imagery is often a grayscale picture or thermograph whose scales (or shades of gray) represent the differences in emitted energy from the surface often referred to as temperature. As a general rule, patterns in the image that are lighter in shade are warmer and darker patterns cooler. Unlike visible imagery that capture visible light in the 0.4-0.7 micrometer wavelengths, objects observed using infrared imagery capture infrared wavelengths in the 3-5 or 8-14 micrometer range. Visible lights that produce heat and other relatively hot objects are very evident, but as a result of their heat or infrared emission and not due to the visible light emissions.

When an image is taken with an infrared camera, it is often recorded onto videotape and/or digitally saved to an on-board storage device. The image may be then modified in a number of ways to enhance its value to the end user. Imager files are digitized, saved, then adjusted for color, contrast and brightness before being scaled and placed into a report file. The report is then printed in high quality and saved to a CD-ROM for the clients use.

We scan the building with sensitive infrared cameras to detect the patterns and record them for later analysis. Once a pattern is detected the infrared images can be saved for documentation in the report. *For more information, please visit us at... [www.ARMCOinfrared.com](http://www.ARMCOinfrared.com) and [www.electricir.com](http://www.electricir.com).*

## SECTION A: DATA LOG

EQUIPMENT DATA LOG & INSPECTION STATUS																			
CLIENT NAME: Pinnacle Widgets Inc.																			
FACILITY NAME: The Widget Building																			
1234 Widget Production Lane																			
Widget, MI 66666																			
ABBREVIATION LEGEND							FAULT RATING LEGEND												
OV = Overview	NO = Not Operating	CS = Combination Starter	DISC = Disconnect	OK															
FV = Front View	NS = Not Surveyed	MCC = Motor Control Center	FDISC = Fused Disconnect									1 = Minor - Routine Repair							
RV = Rear View	LO = Locked Out	MCR = Master Control Relay	CBPNL = Circuit Bkr Pnl																
SV = Side View	CNR = Cover Not Remo	MTS = Master Transfer Switch	EXT = Exterior									3 = Serious - Repair ASAP							
UPS = Upstairs	QA = Qualified Assista	ATS = Automatic Tfr Switch	US = Ultrasound Inspection																
DNS = Downstairs	OH = Overheated	XFMR = Transformer	US = Ultrasound Inspection									5 = Get the Hell out NOW							
				CTL+SHFT+;															
Location 1	Location 2	Equipment Name	Time of Day	Stated Load	Survey Type	Temp Rise	Fault Rating	Fault No.	Load Phase A	Load Phase B	Load Phase C								
Plant 4	Shipping Dept	P4-D CBPNL	12:47 PM	Full	IR	67	3	1											
Plant 4	Main	P4-A XFMR		<40%	IR		OK												
Plant 4	Main	P4-B FDISC		>40%	IR		OK												
Plant 4	Boiler #5	P4 FDISC Feedwater Pump		Full	IR	62	3	2											
Plant 5 Computer Room	Main	P5-C1 FDISC	12:48 PM	Full	IR	14	1	3											
Plant 5 EXT	Substation	P5-A XFMR		<40%	IR		OK												
Plant 6 Production	Main	P6-D DIST PNL		<40%	IR		OK												
Plant 6 Production	Main	P6-C DIST PNL		Full	IR&US		OK												
Plant 6 Production	Main	P6-B DIST PNL		<40%	US		OK												
Chip Core Bldg	Main	P49A FDISC		Full	IR	48	2	4											
Chip Core Bldg	Truck Loading	P49D CBPNL	12:48 PM	>40%	IR	123	4	5											

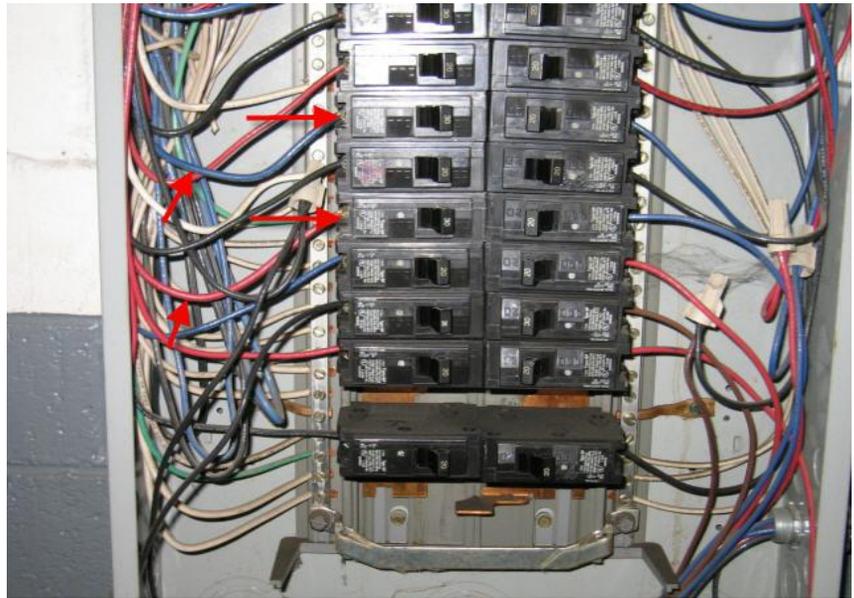
## SECTION B: REPAIR GUIDE

REPORT #:	AREA1:	AREA2:	EQPT NAME	Temperature Rise:	Fault Rating	Survey Notes and Comments
1	Plant 4	Shipping Dept	P4-D Lighting Panel	67	<b>Serious</b>	Rebalance loads in panel – investigate possible breaker damage
2	Plant 4	Boiler #5	P4 FDISC Feedwater Pump	62	<b>Serious</b>	Feedwater pump is high priority
3	Plant 5 Computer Room	Main	P5-C1 FDISC	14	<b>Minor</b>	Power feed to half of IT department - higher priority than indicated
4	Chip Core Bldg	Main	P49A FDISC	48	<b>Alert</b>	Incorrect fuse installed - Fuse corrected now - overload investigated at next pm
5	Chip Core Bldg	Truck Loading	P49D FDISC	123	<b>Critical</b>	Possible fire hazard - investigate and repair today

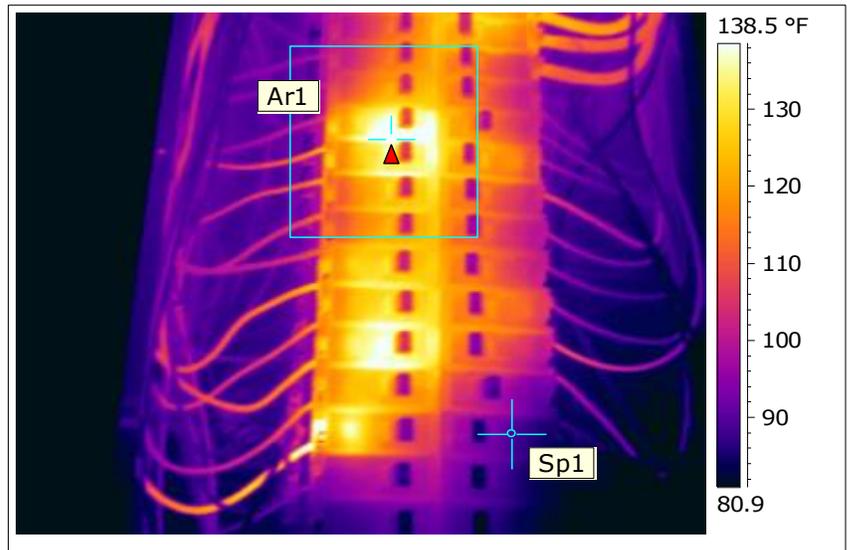
## SECTION C: THERMOGRAPHIC REPORTS

# THERMOGRAPHIC REPORT

<b>REPORT #: 1</b>	
<b>CLIENT</b>	Pinnacle Widgets Inc
<b>BUILDING</b>	The Widget Building
<b>AREA 1</b>	Plant 4
<b>AREA 2</b>	Shipping Dept
<b>EQPT NAME</b>	P4-D Lighting Panel
<b>Image Date</b>	3/11/2009
<b>Image Time</b>	5:05:38 PM
<b>Image File Name</b>	IR_1.jpg



<b>Reference Temperature</b>	
Sp1.Temperature 100.3 °F	
Ar1.Max Temperature 167.4 °F	
Temperature Rise: 67 °F	
<b>Fault Rating Serious</b>	
<b>AMPERAGES:</b>	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



## DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

**Possible Equipment Damage -** The thermal image is indicative of potential internal damage or a defective breaker. We recommend satisfactory equipment operation with subsequent repairs or replacements as needed.

**Overload conditions may also be issues which are to be investigated.**

Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
Alert	16-50 °F	Repair within 30 days, watch load and inspect for physical damage.
Serious	51-100 °F	Repair/Replace ASAP. Inspect surrounding components for physical damage.
Critical	100+ °F	Immediate repair/replace. Danger exists!

**QUESTION ABOUT THIS REPORT? Call 1-888-722-6447**

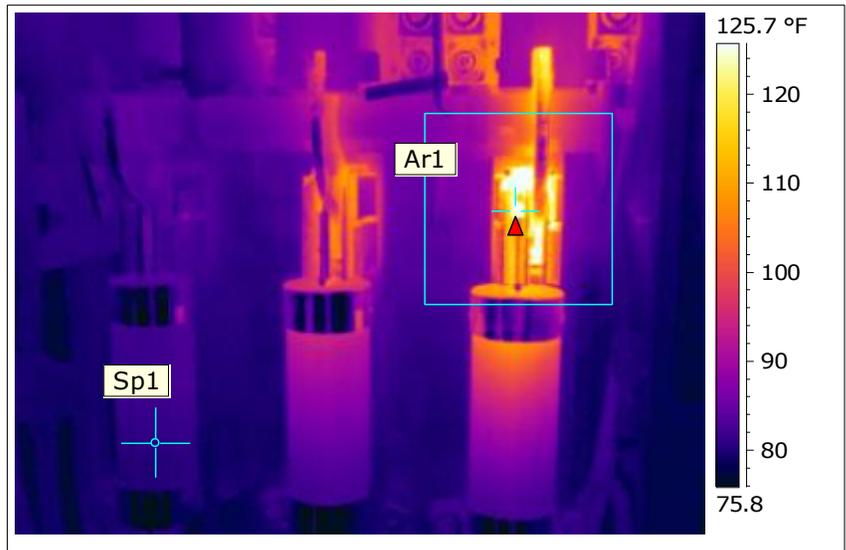
<b>REPAIRED BY:</b>	<b>DATE:</b>
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# THERMOGRAPHIC REPORT

<b>REPORT #: 2</b>	
<b>CLIENT</b>	Pinnacle Widgets Inc
<b>BUILDING</b>	The Widget Building
<b>AREA 1</b>	Plant 4
<b>AREA 2</b>	Boiler #5
<b>EQPT NAME</b>	P4 FDISC Feedwater Pump
<b>Image Date</b>	3/11/2009
<b>Image Time</b>	5:34:29 PM
<b>Image File Name</b>	IR_2.jpg



<b>Reference Temperature</b>	
Sp1.Temperature 90.8 °F	
Ar1.Max Temperature 152.4 °F	
Temperature Rise: 62 °F	
<b>Fault Rating Serious</b>	
<b>AMPERAGES:</b>	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



## DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

**Poor Connections** - The thermal image finding is often indicative of a loose or poor connection. We recommend checking connection integrity with repairs as may be necessary.

Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
Alert	16-50 °F	Repair within 30 days, watch load and inspect for physical damage.
Serious	51-100 °F	Repair/Replace ASAP. Inspect surrounding components for physical damage.
Critical	100+ °F	Immediate repair/replace. Danger exists!

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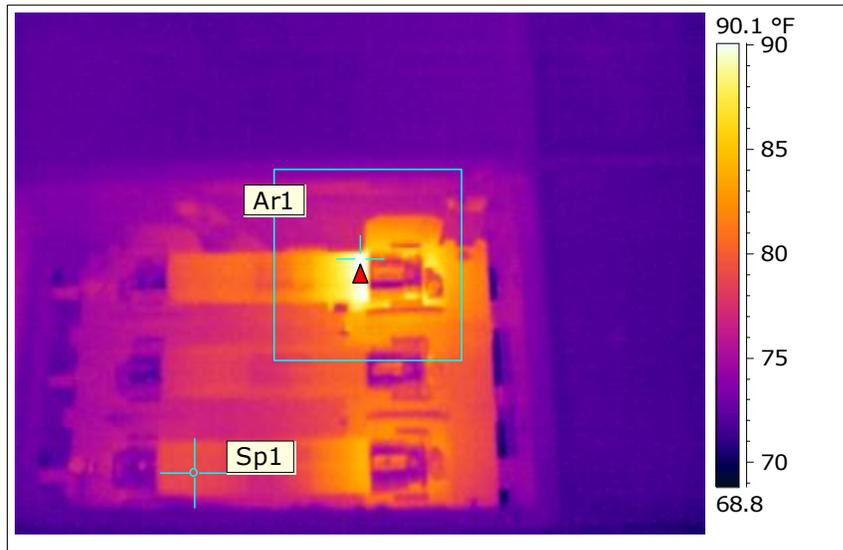
<b>REPAIRED BY:</b>	<b>DATE:</b>
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# THERMOGRAPHIC REPORT

<b>REPORT #: 3</b>	
<b>CLIENT</b>	Pinnacle Widgets Inc
<b>BUILDING</b>	The Widget Building
<b>AREA 1</b>	Plant 5 Computer Room
<b>AREA 2</b>	Main
<b>EQPT NAME</b>	P5-C1 FDISC
<b>Image Date</b>	3/11/2009
<b>Image Time</b>	3:54:32 PM
<b>Image File Name</b>	IR_3.jpg



<b>Reference Temperature</b>	
Sp1.Temperature 88.6 °F	
Ar1.Max Temperature 102.5 °F	
Temperature Rise: 14 °F	
<b>Fault Rating Minor</b>	
<b>AMPERAGES:</b>	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



## DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

**Poor Connections** - The thermal image finding is often indicative of a loose or poor connection. We recommend checking connection integrity with repairs as may be necessary.

Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
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Serious	51-100 °F	Repair/Replace ASAP. Inspect surrounding components for physical damage.
Critical	100+ °F	Immediate repair/replace. Danger exists!

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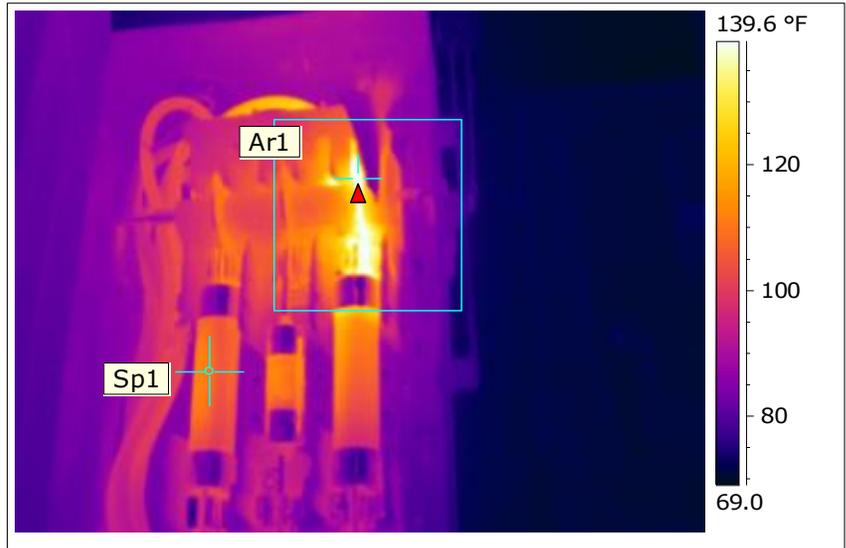
<b>REPAIRED BY:</b>	<b>DATE:</b>
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# THERMOGRAPHIC REPORT

<b>REPORT #:</b> 4	
<b>CLIENT</b>	Pinnacle Widgets Inc
<b>BUILDING</b>	The Widget Building
<b>AREA 1</b>	Chip Core Bldg
<b>AREA 2</b>	Main
<b>EQPT NAME</b>	P49A FDISC
<b>Image Date</b>	3/11/2009
<b>Image Time</b>	5:38:26 PM
<b>Image File Name</b>	IR_4.jpg



<b>Reference Temperature</b>	
Sp1.Temperature	123.5 °F
Ar1.Max Temperature	171.7 °F
Temperature Rise:	48 °F
<b>Fault Rating Alert</b>	
<b>AMPERAGES:</b>	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



## DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

**Poor Connections** - The thermal image finding is often indicative of a loose or poor connection. We recommend checking connection integrity with repairs as may be necessary.

Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
Alert	16-50 °F	Repair within 30 days, watch load and inspect for physical damage.
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Critical	100+ °F	Immediate repair/replace. Danger exists!

**QUESTION ABOUT THIS REPORT? Call 1-888-722-6447**

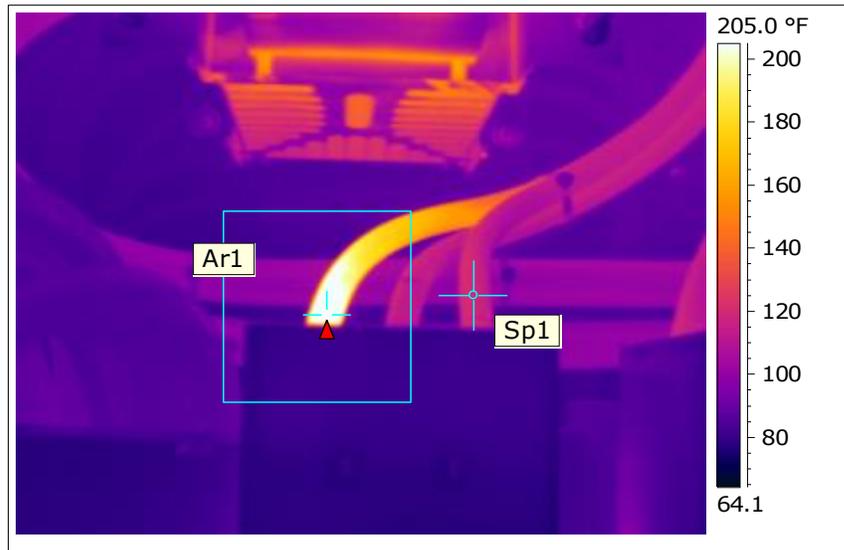
<b>REPAIRED BY:</b>	<b>DATE:</b>
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# THERMOGRAPHIC REPORT

<b>REPORT #: 5</b>	
<b>CLIENT</b>	Pinnacle Widgets Inc
<b>BUILDING</b>	The Widget Building
<b>AREA 1</b>	Chip Core Bldg
<b>AREA 2</b>	Truck Loading
<b>EQPT NAME</b>	P49D FDISC
<b>Image Date</b>	4/14/2011
<b>Image Time</b>	8:22:51 AM
<b>Image File Name</b>	IR_5.jpg



<b>Reference Temperature</b>	
Sp1.Temperature 134.1 °F	
Ar1.Max Temperature 257.0 °F	
Temperature Rise: 123 °F	
<b>Fault Rating Critical</b>	
<b>AMPERAGES:</b>	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



## DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

**Poor Connections** - The thermal image finding is often indicative of a loose or poor connection. We recommend checking connection integrity with repairs as may be necessary.

Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
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Critical	100+ °F	Immediate repair/replace. Danger exists!

**QUESTION ABOUT THIS REPORT? Call 1-888-722-6447**

<b>REPAIRED BY:</b>	<b>DATE:</b>
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