

**Preventive Maintenance Inspection
Thermographic Survey
For**

Sample Customer #2

Date of Scan:

May 28, 2002

This Service was performed by

Electrical Technology Services, Inc.

262-250-9234

WWW.IRSCAN.com

Operator:

ETS Scanner#3 - Equipment PM200

Infrared Inspection Report

Inspection Completed
ETS Job Number

May 28, 2002
ETS-C4434

This Infrared inspection Report contains the thermal anomalies found in the electrical equipment that was scanned at the facility. A control photograph identifying the equipment and a thermograph of the components identifying the anomaly are included for each problem found. The arrows indicate the general area of the anomaly.

Temperature rise in like components is used to classify the severity of the anomaly. The data, reference temperature, highest and lowest temperature is indicated on each of the individual pages. If you are unable to correct these anomalies immediately, the following criteria is a recommended guideline to determine the priority of scheduling maintenance based on the temperature rise of the components.

Classification of Severity of Anomalies Identified

Classification	Temperature Rise	Remarks
<i>Minor</i>	0 to 10 Degree C rise	Repair during regular maintenance
<i>Intermediate</i>	10 - 20 degree C rise	Repair 10 - 14 days
<i>Serious</i>	20 - 30 degree C rise	Repair 1 - 2 days
<i>CRITICAL</i>	30 Degree C or above	Repair Immediately

Decisions on the priority, timing, and importance of repairing the thermal anomalies found in the equipment that was scanned is the responsibility of customer. It is recommended that not only the temperature rise be considered in determining the prioritization of repairing the thermal anomalies found but also the criticality of the equipment/process.

The reason for this is that hundreds of connections have shown that even though the temperature rise was 5 to 10 degrees centigrade, they were seriously deteriorated while components with higher temperature rises have shown little deterioration. The reason for this paradox is that excessive heating causes connections to arc and burn to the point where severe deterioration occurs. Arcing causes the connector to weld to the conductor, which forms a low resistance path for current flow. As a result, heating of the component drops and may cease entirely for a time. These unintentional welds are generally poor and are easily broken by mechanical stress, high loads or fault currents. Once such a weld separates, heating and arcing occurs again until the connector re-welds to the conductor. Meanwhile, deterioration continues, and if not detected by inspection, the equipment eventually fails.

GENERAL RECOMMENDATIONS AND COMMENTS

In general, the equipment that was scanned appears to be in good condition and good working order. The facility connections and components were scanned and only those pieces of equipment listed in the report were found to contain thermal anomalies.

The infrared inspection was performed with the electrical system in the "as found" condition. No attempt was made to verify that the system was under full load at the time of the infrared inspection.

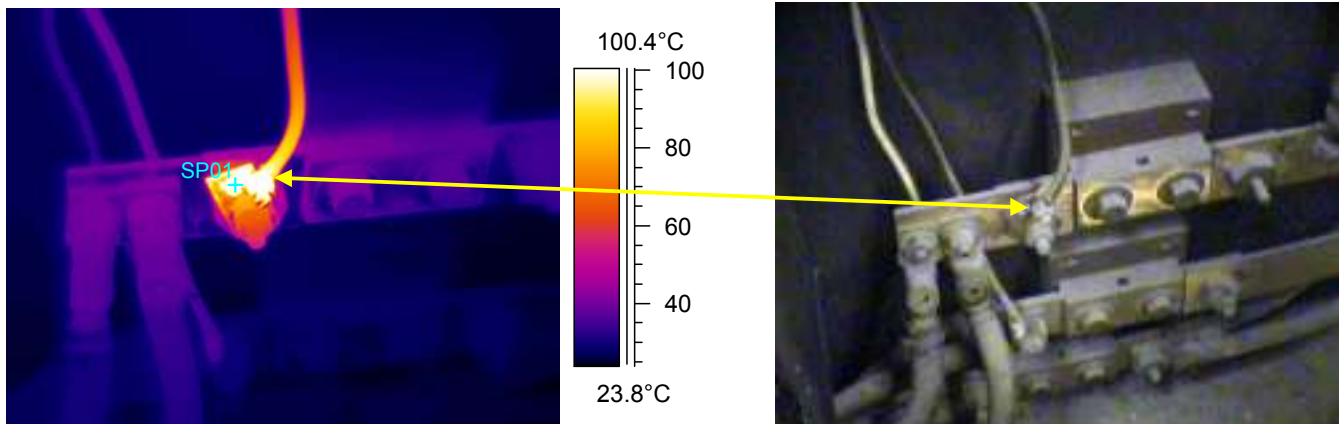
The infrared inspection was performed by our scanning technician. If there are any questions regarding the content of the Infrared Inspection Report, please contact Eric Hansen at (262) 250-9234.

It is recommended that an annual infrared scan be performed as part of an ongoing predictive maintenance program.

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 6:37:32 AM
IR Scan Image File: C0528-01.img
Location: Distribution Area
Equipment: Main 240 volt feed
Component: Load side cable top phase
Maximum Temperature: 153.7°C
Minimum Temperature: 24.2°C
Differential Temperature: 132.9°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Disassemble connection clean well and re-assemble using joint compound. Tighten and torque to proper specifications.

Repair Action Taken:

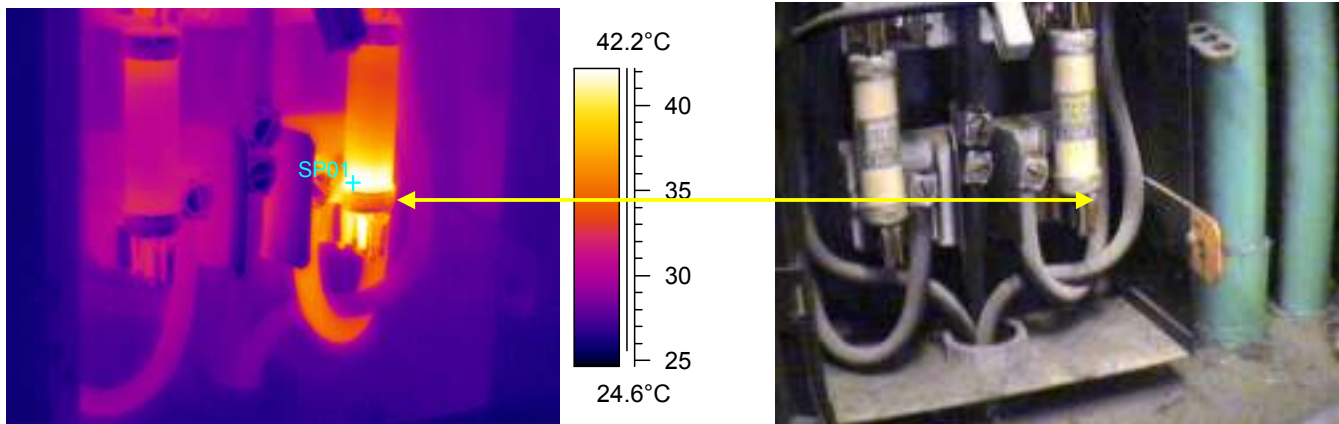
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 6:41:58 AM
IR Scan Image File: C0528-03.img
Location: Distribution Area
Equipment: West Door Disconnect
Component: Load side lower right fuse clip
Maximum Temperature: 42.7°C
Minimum Temperature: 25.5°C
Differential Temperature: 21.8°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection.



Clean connection and fuse clip.

Repair Action Taken:

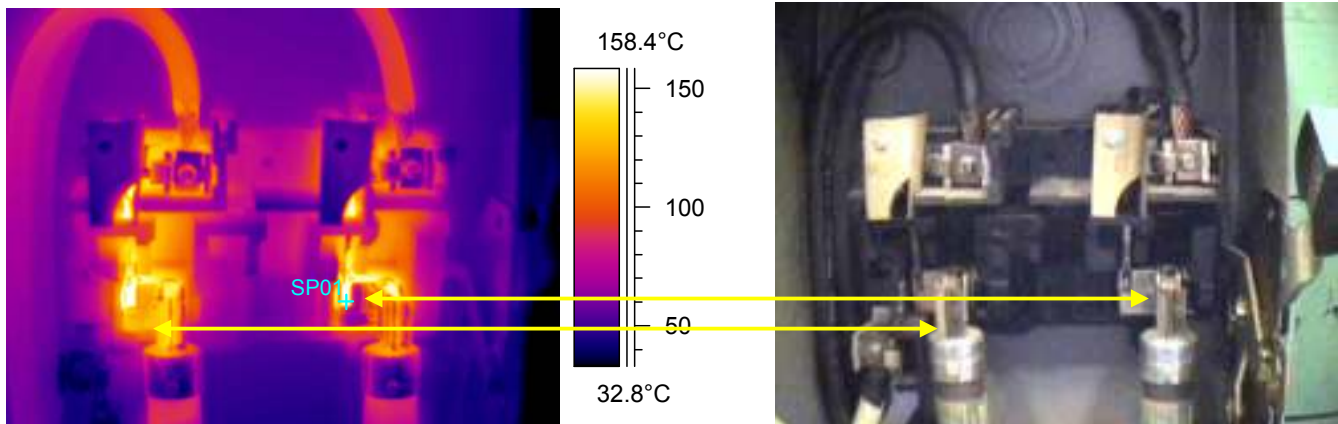
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 6:44:22 AM
IR Scan Image File: C0528-05.img
Location: Distribution Area
Equipment: Machining Sander
Component: Upper knife blades & fuse clips
Maximum Temperature: 166.5°C
Minimum Temperature: 28.6°C
Differential Temperature: 142.4°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connections



Clean knife blades and fuse clips as needed.

Repair Action Taken:

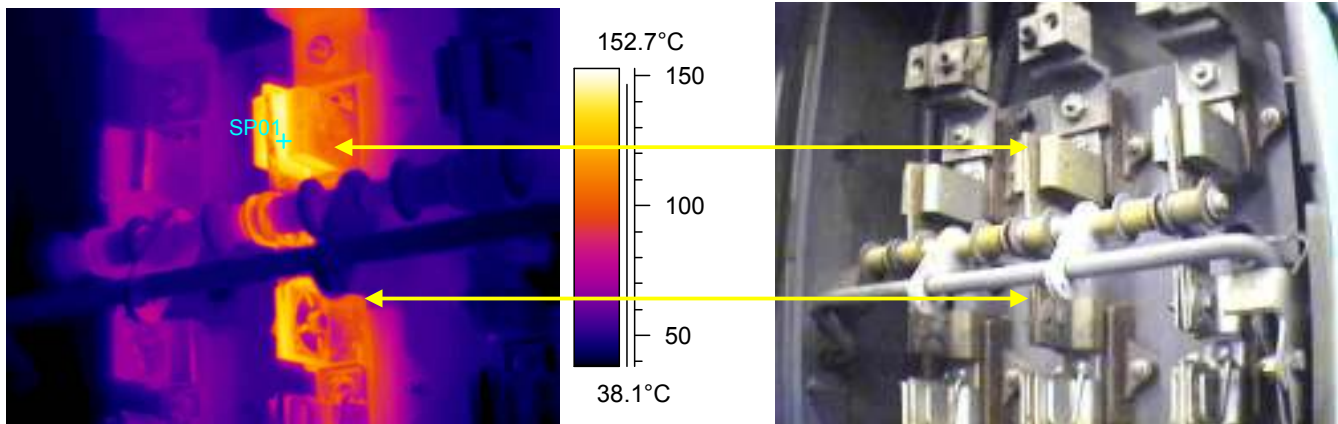
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 6:50:32 AM
IR Scan Image File: C0528-07.img
Location: Main Distribution
Equipment: 250 Amp Main
Component: Center Phase main blade & hinge
Maximum Temperature: 147.9°C
Minimum Temperature: 33.4°C
Differential Temperature: 124.3°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and replace parts as needed.



Clean main blade and hinge or replace as needed.

Repair Action Taken:

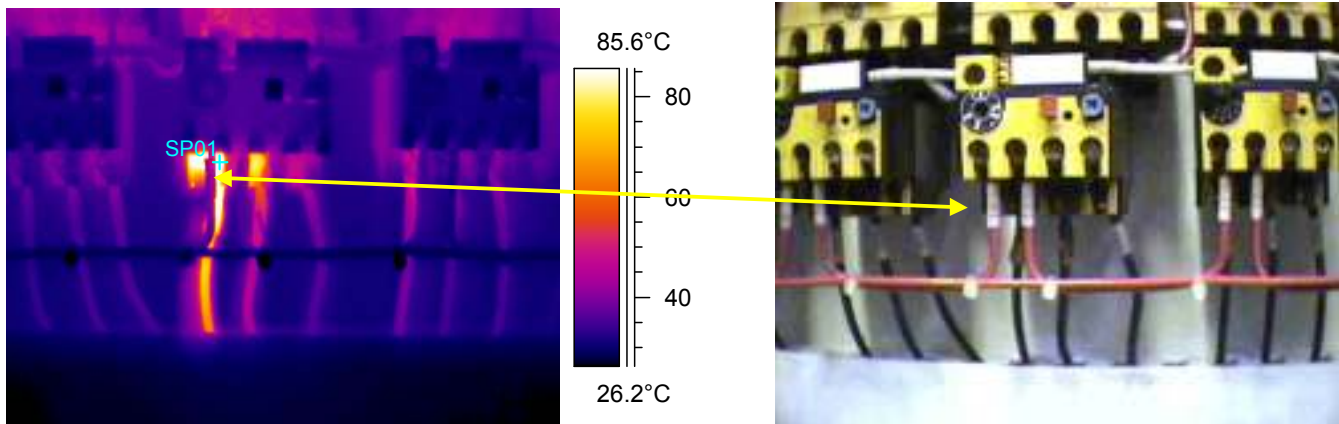
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 7:03:09 AM
IR Scan Image File: C0528-09.img
Location: Generator Area
Equipment: WO1 Contactor 4M
Component: Overload block
Maximum Temperature: >174.0°C
Minimum Temperature: 24.3°C
Differential Temperature: >153.1°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Clean Cable connections and re-install.

Repair Action Taken:

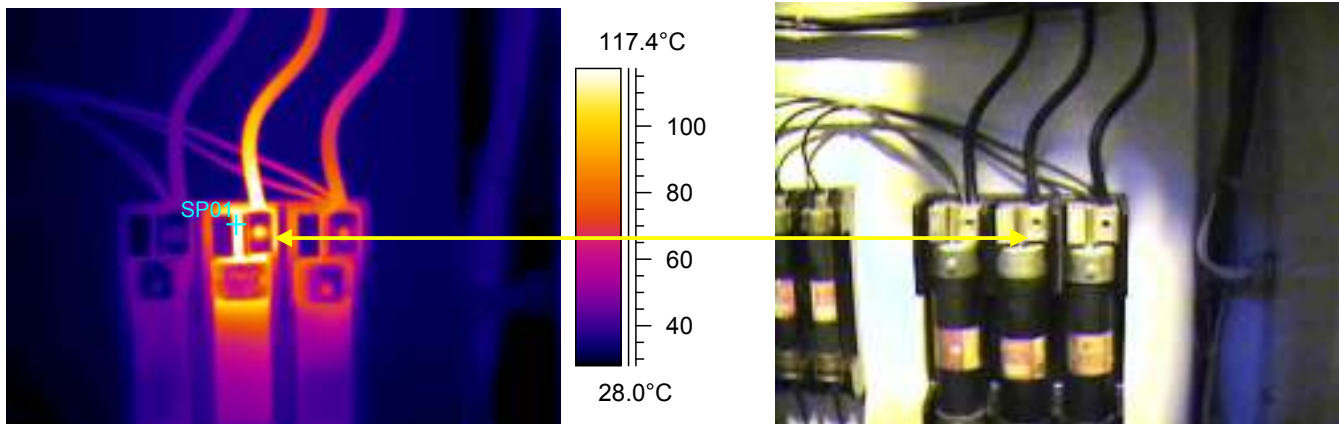
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 7:11:45 AM
IR Scan Image File: C0528-11.img
Location: Foundry Area
Equipment: B14 Control Cabinet
Component: 80 amp fuse array - fuse clip
Maximum Temperature: 144.3°C
Minimum Temperature: 26.5°C
Differential Temperature: 123.4°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Disassemble fuse clip and wire connection clean and re-connect.

Repair Action Taken:

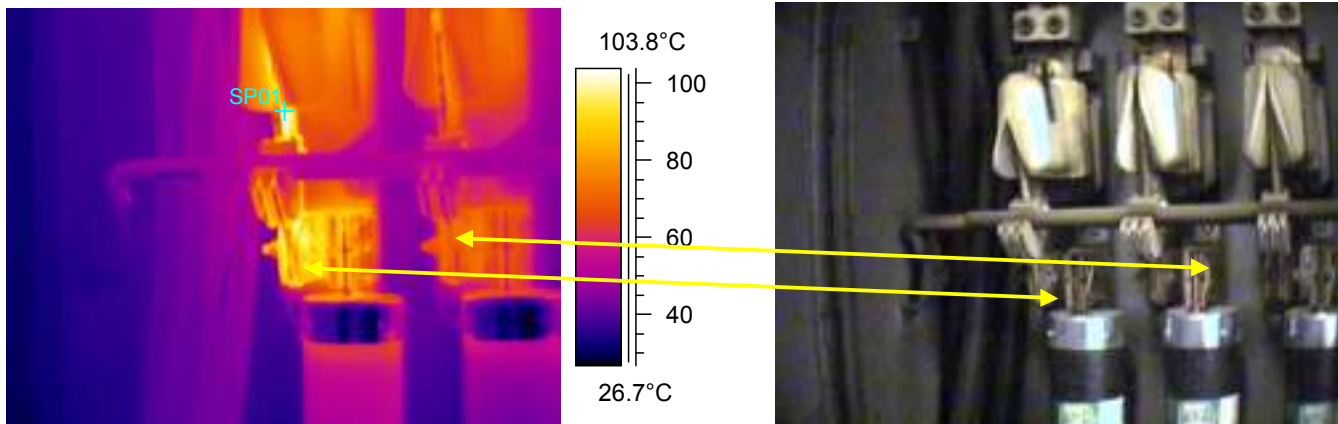
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 7:31:13 AM
IR Scan Image File: C0528-13.img
Location: South Distribution
Equipment: 600 amp Disconnect
Component: Left & Center fuse clip & knife blades
Maximum Temperature: 105.0°C
Minimum Temperature: 27.3°C
Differential Temperature: 84.1°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection re-assemble



Clean fuse clips and knife blades as needed.

Repair Action Taken:

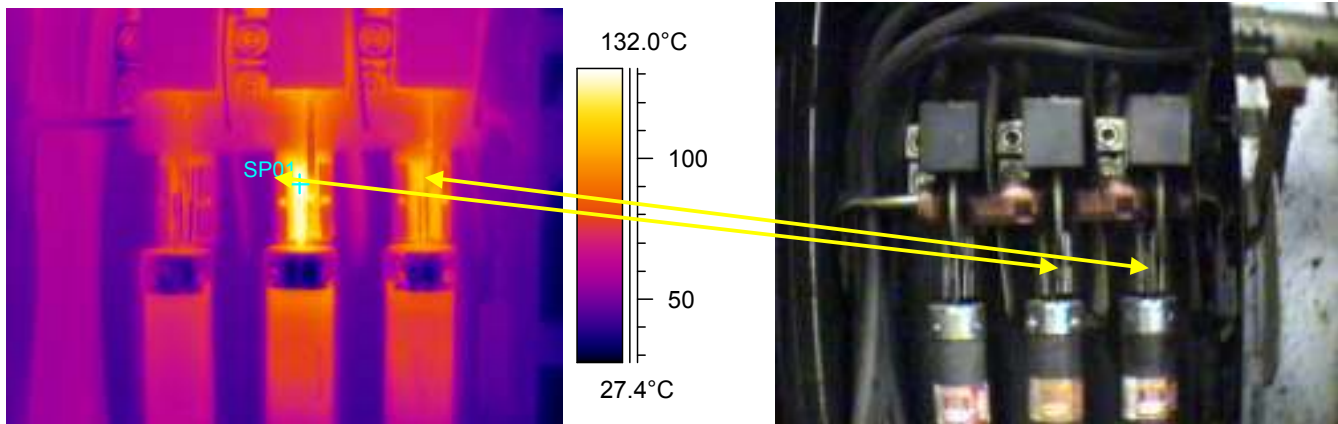
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 7:34:17 AM
IR Scan Image File: C0528-15.img
Location: South Distribution
Equipment: 200 Amp Disconnect
Component: Right and center knife blade & fuse clips
Maximum Temperature: 134.0°C
Minimum Temperature: 27.2°C
Differential Temperature: 113.1°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Clean knife blades and fuse clip connections.

Repair Action Taken:

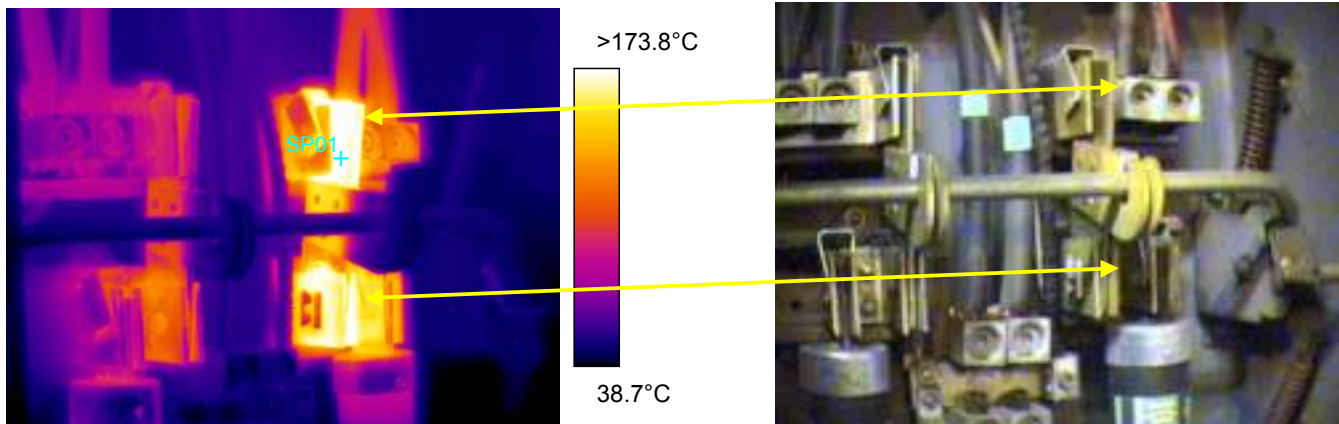
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 8:14:44 AM
IR Scan Image File: C0528-17.img
Location: Distribution Area
Equipment: 600 Amp Main
Component: Right phase connection & blade
Maximum Temperature: >173.8°C
Minimum Temperature: 35.1°C
Differential Temperature: >152.9°C
Probable Cause: Blade not installed correct

Recommended Action: Clean Connection and torque to proper specifications.



Claen Blade and connection areas, make sure that the blade is all the way in when closed.

Repair Action Taken:

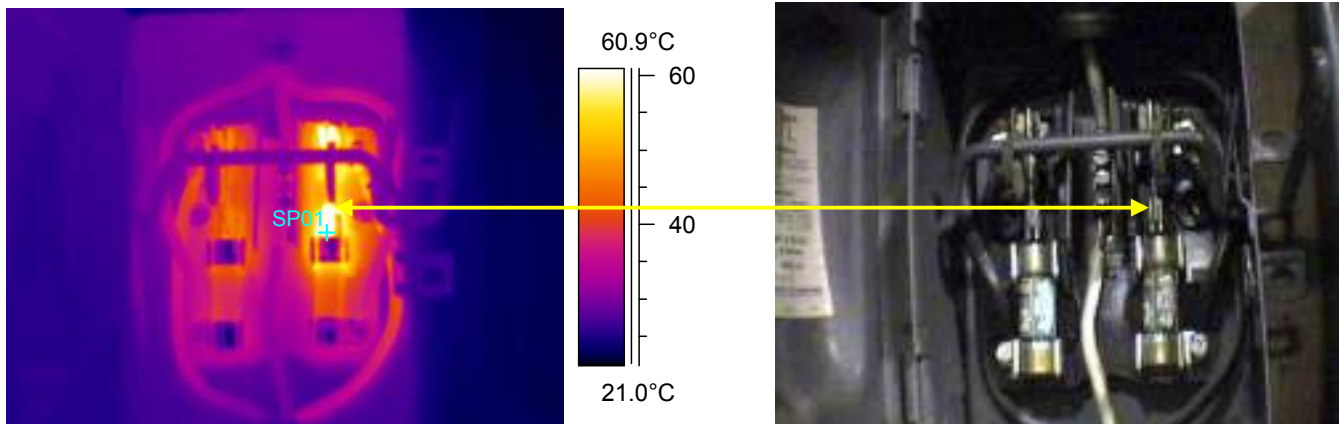
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 8:57:56 AM
IR Scan Image File: C0528-19.img
Location: Warehouse
Equipment: 30 Amp Power TFX
Component: Right knife blade & fuse clip
Maximum Temperature: 67.1°C
Minimum Temperature: 21.1°C
Differential Temperature: 46.3°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Clean knife blade and fuse clips, replace parts as needed.

Repair Action Taken:

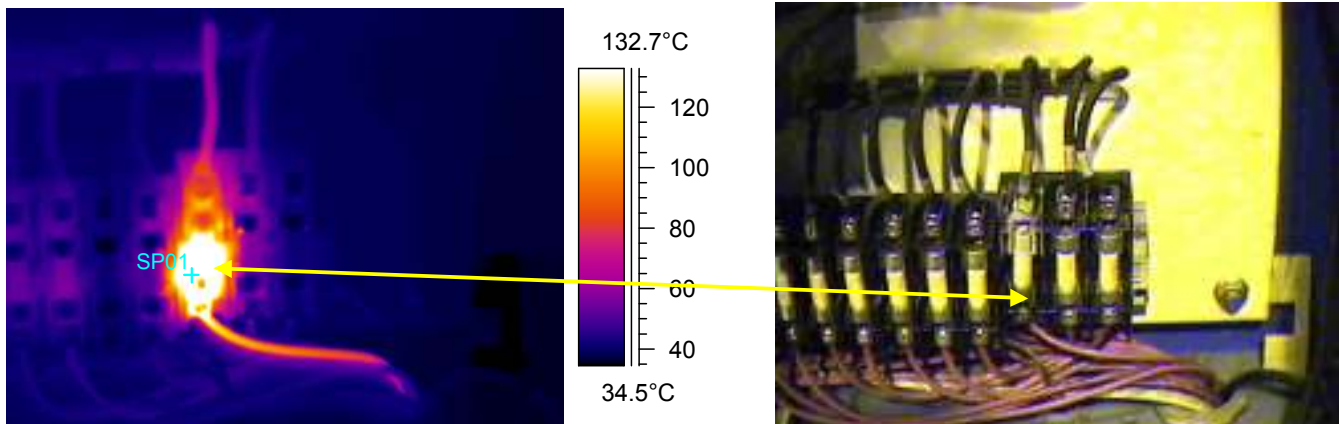
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 9:04:16 AM
IR Scan Image File: C0528-21.img
Location: Holding Controls
Equipment: Machine C11 - 30 Amp
Component: Left phase bottom fuse clip
Maximum Temperature: >174.0°C
Minimum Temperature: 34.0°C
Differential Temperature: >153.2°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Replace bottom fuse clip.

Repair Action Taken:

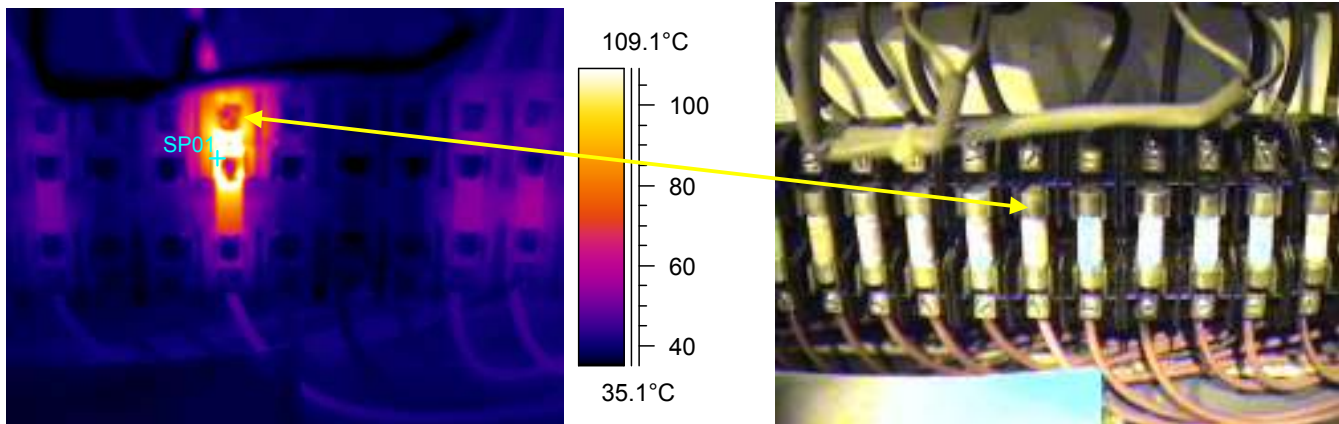
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 9:06:28 AM
IR Scan Image File: C0528-23.img
Location: Holding Control
Equipment: Holding Pot C11
Component: 30 amp fuse array
Maximum Temperature: 133.8°C
Minimum Temperature: 33.6°C
Differential Temperature: 113.0°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Replace top fuse clip as needed.

Repair Action Taken:

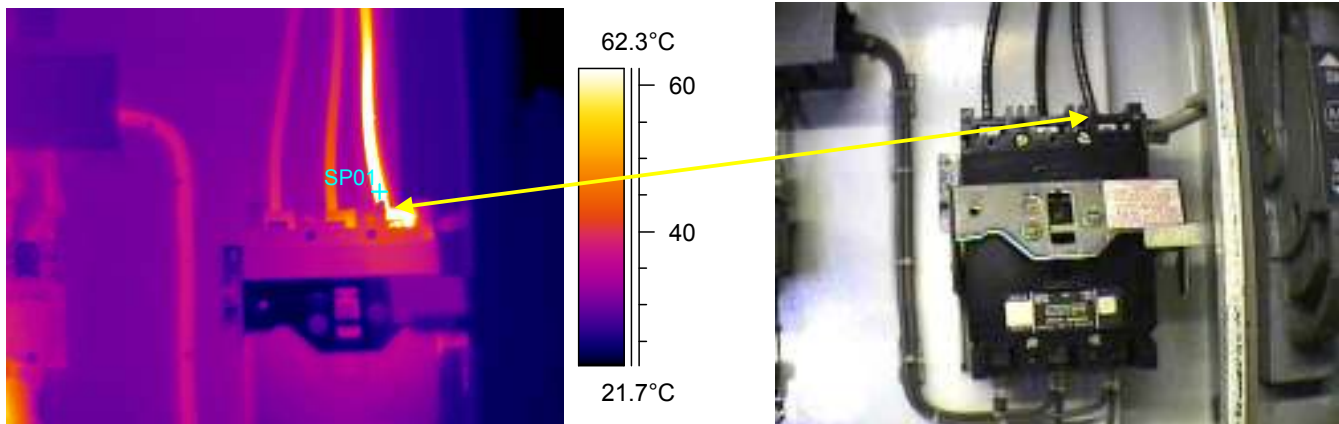
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 9:15:21 AM
IR Scan Image File: C0528-25.img
Location: Air Makeup CC
Equipment: 40 Amp Main Breaker
Component: Right Line side cable connection
Maximum Temperature: 91.5°C
Minimum Temperature: 20.6°C
Differential Temperature: 70.7°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Clean cable connection and lug, using compound re-assemble and toqure to proper specifications.

Repair Action Taken:

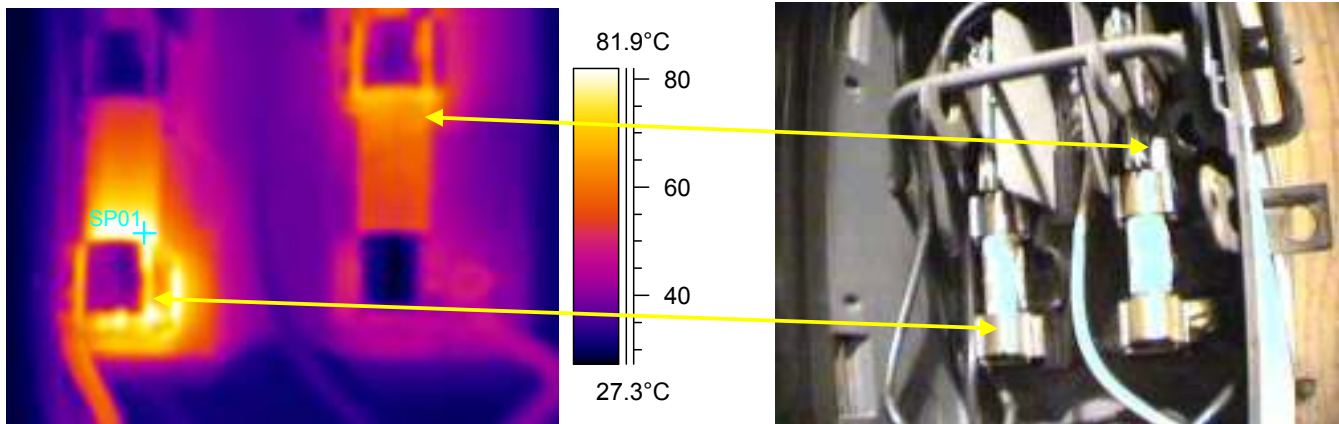
Repaired by Who:

Date Repaired:

INFRARED INSPECTION REPORT

Date: 5/28/2002
Time: 9:52:09 AM
IR Scan Image File: C0528-27.img
Location: Boiler Room
Equipment: Cooling Tower Disc
Component: Fuse Clip lower left & top right
Maximum Temperature: 88.2°C
Minimum Temperature: 26.0°C
Differential Temperature: 67.4°C
Probable Cause: Loose / dirty connection

Recommended Action: Clean Connection and torque to proper specifications.



Clean all fuse clips or replace as needed both right and left.

Repair Action Taken:

Repaired by Who:

Date Repaired:

Summary of Problems Identified

For

Sample Customer #2

Location	Equipment	Hot Spot Temp	Diff Temp	Severity
Distribution Area	Main 240 volt feed	153.7°C	132.9°C	<i>Critical</i>
Distribution Area	West Door Disconnect	42.7°C	21.8°C	<i>Intermediate</i>
Distribution Area	Machining Sander	163.3°C	142.4°C	<i>Critical</i>
Main Distribution	250 Amp Main	145.1°C	124.3°C	<i>Critical</i>
Generator Area	WO1 Contactor 4M	>174.0°C	>153.1°C	<i>Critical</i>
Foundry Area	B14 Control Cabinet	144.3°C	123.4°C	<i>Critical</i>
South Distribution	600 amp Disconnect	105.0°C	84.1°C	<i>Critical</i>
South Distribution	200 Amp Disconnect	134.0°C	113.1°C	<i>Critical</i>
Distribution Area	600 Amp Main	>173.8°C	>152.9°C	<i>Critical</i>
Warehouse	30 Amp Power TFX	67.1°C	46.3°C	<i>Critical</i>
Holding Controls	Machine C11 - 30 Amp	>174.0°C	>153.2°C	<i>Critical</i>
Holding Control	Holding Pot C11	133.8°C	113.0°C	<i>Critical</i>
Air Makeup CC	40 Amp Main Breaker	91.5°C	70.7°C	<i>Critical</i>
Boiler Room	Cooling Tower Disc	88.2°C	67.4°C	<i>Critical</i>