



Marine Electrical Thermographic Survey

SAMPLE REPORT

By

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Report Details

Customer

Vessel Name

Contact Person

Contact Person Address

Phone Number

Email Address

Thermographer

Thermographer Certification

ITC Level 2 Certified Thermographer

Assistant on Vessel

Survey Equipment

Flir Thermacam SC640 Infrared Camera
Reporter 9.2 Software

Inspection Date

INFORMATION

Marine electrical thermographic surveys are carried out while the vessel is operational. No supplies are interrupted during the course of a survey.

Inspections can be carried out on following systems or components:

- Main Switchboards & Emergency Switchboards
- Electrical Switchgear
- Electrical Distribution Boards
- Plant Control Panels
- UPS & Battery Systems
- Navaid Controls
- Bridge Panels

A detailed schedule of all equipment inspected can be found at the back of this report.

REPORT DATA

A summary of all thermographic data is contained in the report pages that follow. The pages in the report have been designed as single page entries, each of which carries its own information so that individual pages can be given to the relevant professions in order that they may carry out any remedial repairs that may be necessary.

INFRARED ELECTRICAL INSPECTIONS

All electrical distribution equipment is subject to mechanical deterioration at connections, joints and contacts due to looseness, over-tightening, corrosion and contamination. If these conditions remain uncorrected further deterioration will occur resulting in equipment failure, fire and possible explosions.

FAULT SITE CONDITIONS

The pages contained within this report have been designed so that the thermal images show temperature differences between components. These differences typically represent the early stages of a fault site. The temperature relationship between a fault site and the external measurable surfaces will be determined by the nature of heat transfer paths, which may contain conducting materials, insulating materials or even air gaps. All of these must be considered during the image analysis process. Increases in circuit current will have an exponential effect on power dissipation with a corresponding increase in temperature of the surface being measured.

FAULT CONDITIONS AND RATINGS

This inspection has been designed to assess the performance of all equipment on site and to highlight any areas which require attention. Once the analysis of each image in the report has taken place we apply a fault rating system with a recommended a course of action to each anomaly found.

Before any type of rating can be applied to any of the identified anomalies we first assess their potential risk to equipment, loss of productivity and safety of personnel. In order to do this we must interrogate the fault site further by asking the following questions:

- What is the **probability** of the equipment/component failing whilst the present anomaly exists?
- Is the phase-to-phase temperature greater than 35°C?
- Is the absolute temperature greater than 105°C?
- Is there any visual indication that the insulation has melted or degraded?
- Is there any indication that annealing has occurred?
- Is the problem located at a busbar connector?
- Is the view of the heat source indirect i.e. an oil filled device or un-opened cabinet?
- Is loading of the component/circuit likely to increase to its full load capacity?

If the answer to any of these questions is 'yes' then the risk becomes high and the fault immediately becomes a **Priority 1**.

What is the **possibility** of the equipment/component undergoing the following changes?

- Is the phase-to-phase temperature difference greater than 10°C and likely to rise?
- Is the wind speed greater than 5mph and likely to decrease to little or nothing?
- Is the equipment subject to dirt, dust vibration or ambient temperature swings?
- Will loading increase 2x or greater prior to scheduled repairs?
- Will ambient temperatures increase by 25°C or more prior to scheduled repairs?
- Is there a history of failure for this type of component?

If the answer to any of these questions is 'yes' then the risk becomes medium and the fault becomes a **Priority 2**.

If our Thermographer has deemed it necessary to include an image within the report which does not meet Priority 2 fault criteria, but exhibits indications that an early stage fault exists then it is recorded as a **Priority 3**.

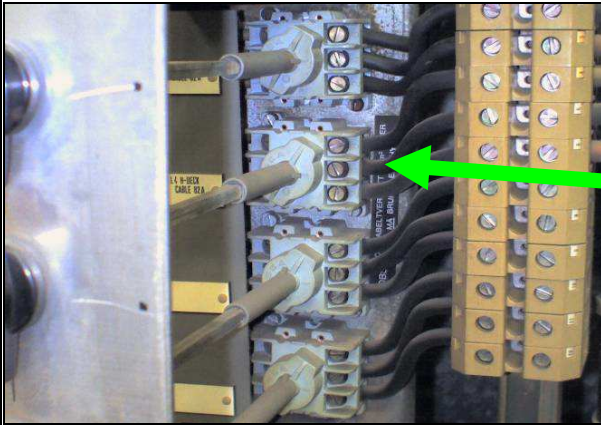
The last priority is a **Priority 0** which means the image has been included within the report to demonstrate that no fault exists or that a previous fault has been repaired successfully.

High risk of equipment failure, loss of production and safety of personnel	Priority 1	Urgent attention required
Medium risk of equipment failure, loss of production and safety of personnel	Priority 2	Investigation or corrective action is necessary at the earliest opportunity
Low risk of equipment failure, loss of production and safety of personnel	Priority 3	Plan repair at next natural outage. Non urgent.
No risk of equipment failure, loss of production and safety of personnel	Priority 0	Image included for information only

Summary of Issues Found

Location	Equipment	Type	Priority	Page Number
Main Control Room	Main Switchboard (Aft)	Panel 14 - Isolator Phase 2 Connection	2	6
Main Control Room	Main Switchboard (Aft)	Panel 15 - Bottle Fuse - Lighting Board L11 Phase 3	1	7
Main Control Room	Main Switchboard (Central)	Panel 5 - Main Breaker - Phase 2 & 3	1	8
Main Control Room	Main Switchboard (Central)	24V Simos Alarms Negative Battery Connection	2	9
VPP Room	VPP Oil Pump (Centre)	Isolator Incoming Phase 2 Contact	1	10
Generator Room	DB Engine Panel 2	Bottle Fuse - Fresh Water Hydro FGR Pump - Phase 2	2	11
Level 5 Battery Room	220v Batteries	Battery Connection	3	12
Level 7 - Galley	Hot Plate Control Panel	Termination in Base of Panel	2	13

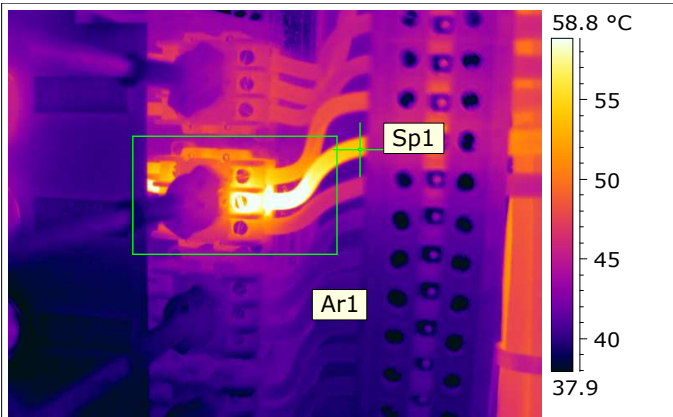
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Main Control Room
Equipment	Main Switchboard (Aft)
Type	Panel 14 - Isolator Phase 2 Connection

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	25.0 °C
Sp1 Temperature	53.9 °C
Ar1 Max. Temperature	71.4 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_6723.jpg
Difference Ar1 - Sp1	17.5 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Elevated temperature noted on isolator outgoing phase 2 connection.

Current measurements indicate that imbalanced load is not the cause of this anomaly.

Likely cause of heat rise is a poor or loose connection.

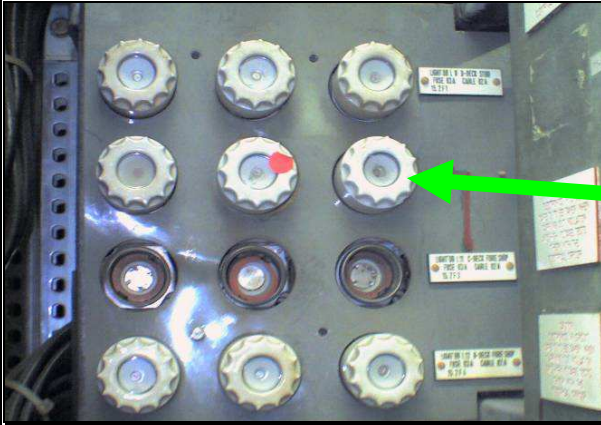
Recommendation is to inspect, clean and remake off this connection.

Repaired by:

Date:

Comment:.....

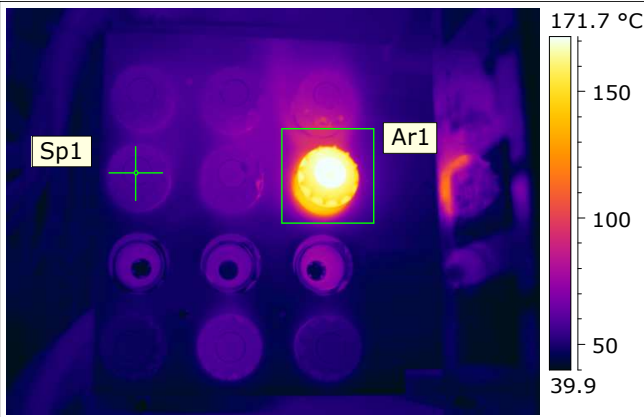
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Main Control Room
Equipment	Main Switchboard (Aft)
Type	Panel 15 - Bottle Fuse - Lighting Board L11 Phase 3

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	25.0 °C
Sp1 Temperature	58.9 °C
Ar1 Max. Temperature	193.8 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_6727.jpg
Difference Ar1 - Sp1	134.9 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

Significantly elevated surface temperatures noted on bottle fuse carrier.

Likely causes of heat rise include dirty or pitted conductive surface, loose or poorly fitted fuse carrier or poor outgoing connection at rear.

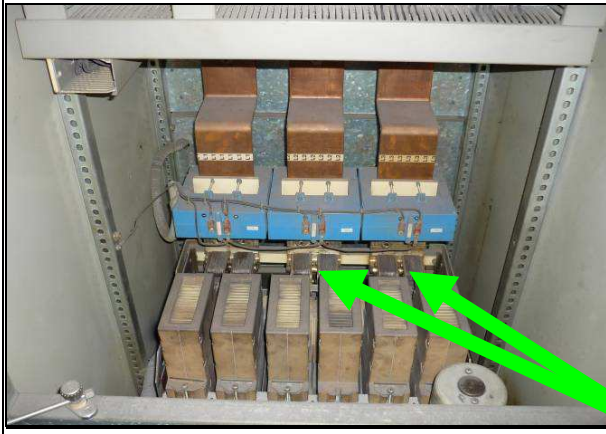
Recommendation is to remove the carrier, replace the fuse, check all surfaces are clean and re-install the carrier ensuring it is tight.

Repaired by:

Date:

Comment:.....

VISUAL IMAGE



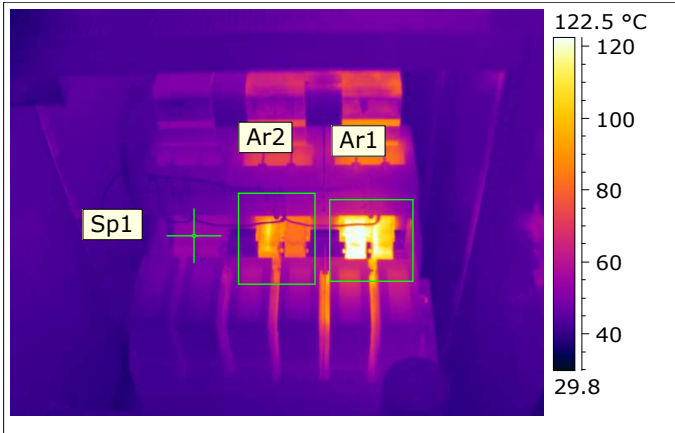
EQUIPMENT INFORMATION

Location	Main Control Room
Equipment	Main Switchboard (Central)
Type	Panel 5 - Main Breaker - Phase 2 & 3

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Red	550 Amps
Yellow	550 Amps
Blue	550 Amps

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	25.0 °C
Sp1 Temperature	53.4 °C
Ar1 Max. Temperature	163.9 °C
Ar2 Max. Temperature	111.6 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_6731.jpg
Difference Ar1 - Sp1	110.5 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

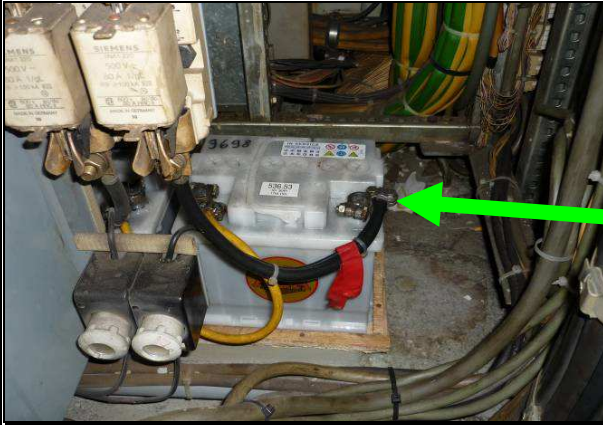
Significantly elevated temperatures noted on the contacts of Phases 3 and 2 of the circuit breaker.
Likely cause of this heat rise is poor or dirty connections between the breaker and the contact.
Recommendation is to remove and completely clean the connections and contacts of phases 2 and 3.

Repaired by:

Date:

Comment:.....

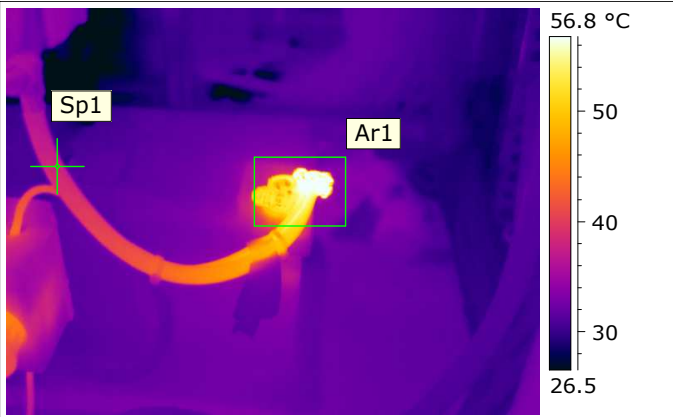
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Main Control Room
Equipment	Main Switchboard (Central)
Type	24V Simos Alarms Negative Battery Connection

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	25.0 °C
Sp1 Temperature	37.9 °C
Ar1 Max. Temperature	61.3 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_6733.jpg
Difference Ar1 - Sp1	23.5 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

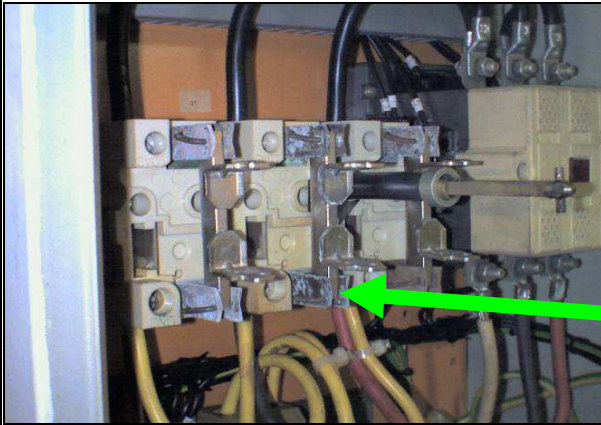
Elevated temperature noted on battery negative connection.
Likely cause of heat rise is a poor or loose connection.
Recommendation is to inspect, clean and re-tighten this connection.

Repaired by:

Date:

Comment:.....

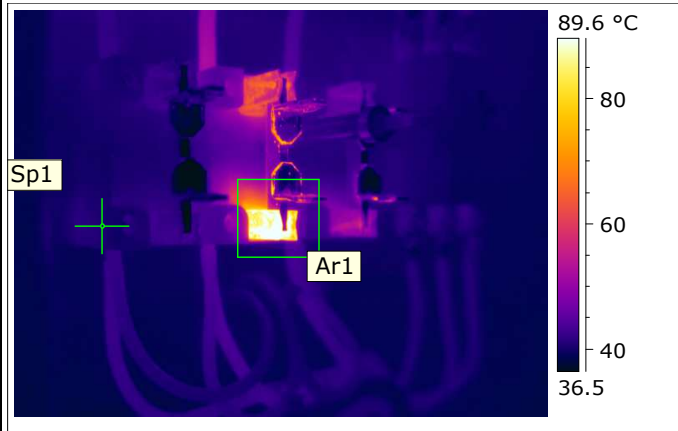
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	VPP Room
Equipment	VPP Oil Pump (Centre)
Type	Isolator Incoming Phase 2 Contact

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	33.1 °C
Sp1 Temperature	40.7 °C
Ar1 Max. Temperature	105.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	33.1 °C
Image File name	IR_6739.jpg
Difference Ar1 - Sp1	64.3 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

Significantly elevated temperature noted on phase 2 of the isolator mechanism.
Likely cause of this heat rise is a loose or dirty contact connection.
Recommendation is to inspect and thoroughly clean this contact.

Repaired by:

Date:

Comment:.....

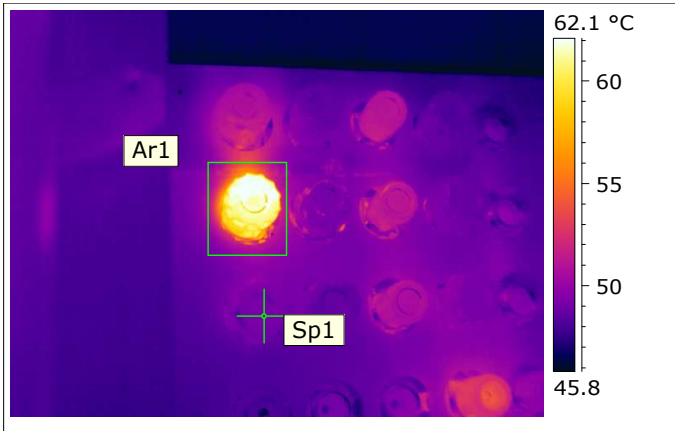
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Generator Room
Equipment	DB Engine Panel 2
Type	Bottle Fuse - Fresh Water Hydro FGR Pump - Phase 2

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	36.5 °C
Sp1 Temperature	49.3 °C
Ar1 Max. Temperature	64.5 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	36.5 °C
Image File name	IR_6754.jpg
Difference Ar1 - Sp1	15.2 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Elevated surface temperatures noted on bottle fuse carrier.

Likely causes of heat rise include dirty or pitted conductive surface, loose or poorly fitted fuse carrier or poor outgoing connection at rear.

Recommendation is to remove the carrier, replace the fuse, check all surfaces are clean and re-install the carrier ensuring it is tight.

Repaired by:

Date:

Comment:.....

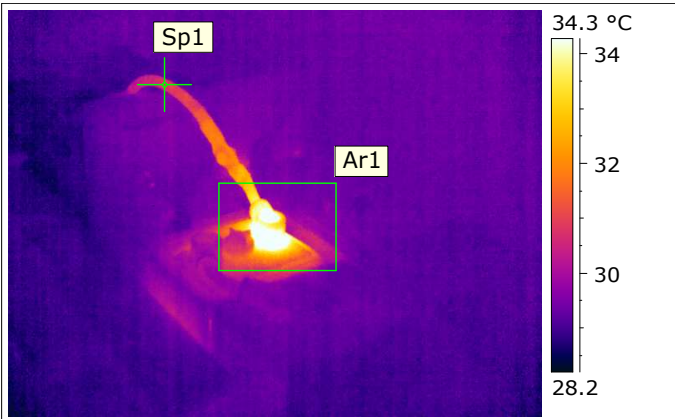
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Level 5 Battery Room
Equipment	220v Batteries
Type	Battery Connection

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	32.3 °C
Sp1 Temperature	30.9 °C
Ar1 Max. Temperature	36.6 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	32.3 °C
Image File name	IR_6772.jpg

Difference Ar1 - Sp1	5.7 °C
Fault Rating	Priority 3

ANALYSIS & OBSERVATIONS

Elevated temperature noted on battery connection.

The thermal profile indicates that the likely cause of this heat rise is a faulty battery cell.

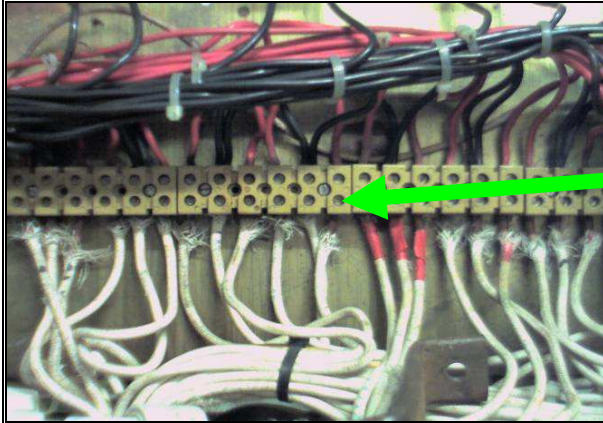
Recommendation is to replace the battery cell.

Repaired by:

Date:

Comment:.....

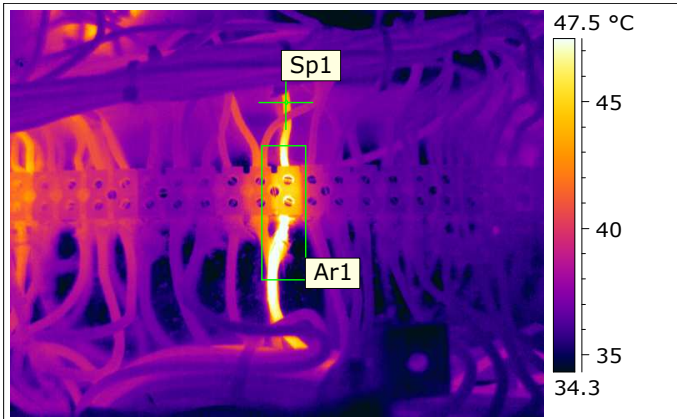
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Level 7 - Galley
Equipment	Hot Plate Control Panel
Type	Termination in Base of Panel

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	32.3 °C
Sp1 Temperature	44.4 °C
Ar1 Max. Temperature	54.9 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	32.3 °C
Image File name	IR_6774.jpg

Difference Ar1 - Sp1	10.6 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Elevated temperature noted on terminal connection.
Likely cause of heat rise is a poor or loose connection.
Recommendation is to inspect, clean and remake off this connection.

Repaired by:	Date:
Comment:.....	

The following plant and panels were inspected during the survey:

Level 2

Main Control Room

Main Switchboard (Aft)
Main Switchboard (Middle)
Main Switchboard (Forward)
VPP Plant Control Panels
Pyropress Control Panel

General Areas

Ventilator Eng Change Room Control Panel
Low Level Lighting Charger Control Panel
Traffic Light Relay Box
D.B Workshop Control Panel
Lighting Distribution Box
Emergency Lighting Distribution Box
Lift Control Panel

VPP Room

VPP Oil Pump (Centre) Control Panel
Level Oil Pump (Centre) Control Panel
VPP Oil Pump (Port) Control Panel
Level Oil Pump (Port) Control Panel
VPP Oil Pump (STBD) Control Panel
Level Oil Pump (STBD) Control Panel
Hydrophore Pump 1 Control Panel
Hydrophore Pump 2 Control Panel

Shaft Generator Room

A/C Engine Control Room Control Panel
VA3 Control Panel
Port Standby Gear Oil Control Panel
STBD Standby Gear Oil Control Panel

Main Engine Room (Lower)

Heavy Fuel Oil Heater Control Panel
Lube Oil STBD Pump Box 1
BK Filter Control Panel
Sea Cool Water Pump for Harbour
BK Filter Control Panel
Lube Oil Centre Pump Box 1
Port M/E Main LO Pump 1 Control Panel