Ti Thermal Imaging LTD

Unit 8, Weybridge Business Centre, 66 York Road, Weybridge, Surrey, KT13 9DY

Tel: 0845 458 6315 Fax: 0871 9004978 E-mail: info@thermalimaging.co.uk Web: www.thermalimaging.co.uk

RISK MANAGEMENT ELECTRICAL THERMOGRAPHIC INSPECTION FOR:

TI
UPS CELLS DISCHARGING
SAMPLE

LOCATION:

UNIT 8 66 YORK ROAD
WEYBRIDGE
SURREY
KT13 9DY

DATE:

22/11/11

TI JOB NO.

TI-14935

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Introduction to your Ti Thermal Imaging LTD risk management thermographic inspection

This electrical, mechanical and visual thermographic inspection has been carried out using a Flir P-series camera with data input onto a purpose built tablet PC platform for instantaneous results and report generation. A Webmanager houses all data that is permanently accessible over the internet allowing the user to track and monitor problems and their repair status.

This is a guide which should help you to fully understand how the inspection was performed and how the results were achieved

- The framework to this inspection can either be generated onsite during the inspection, building the list during the survey or a list exported to MS Excel can be imported into the tablet PC to provide comprehensive information such as item locations, tag numbers, work orders etc.
- Images are captured of all online items and a record is kept of temperature data to enable a trending programme to begin. Subsequent inspections will see the addition of a new image for each inspection so that temperatures can be monitored.
- Baseline images and anomalous pieces of equipment have been recorded as one of three types of inspection:
  - T/D Electrical – This covers transmission, distribution and instrumentation
  - Mechanical – This covers all mechanical/moving/rotary equipment
  - Visual – This covers all visual findings only
- All component baseline images are taken under normal load conditions.
- Panels have been removed where safe and possible to do so and where covered by the Permit To Work system. In addition load readings have been captured using a clamp meter only where covered by the Permit to Work system and where safe to do so. In some cases load readings have not been taken so these are left as blank intentionally so that the normalised graph will function correctly. If a 0 value is inserted then a fictitious reading will be obtained. An explanation of the Normalization graph is listed later.
- A complete inventory will be built of the equipment giving Test Status at the time of the inspection allowing transparency to the inspection and what occurred with each piece of equipment. These Test Status include:

TBT	To Be Tested	These appear in bold on the thermographers tablet to identify which items are still to be tested
TESTED	TESTED	Marked as Tested once images and faults have been documented
NTLO	Not Tested Locked Out	Selected if the item could not be opened safely
NTNL	Not Tested No Load	Selected if the item was offline at the time of inspection and could not be started
NTNA	Not Tested Not Available	Selected if the item is no longer available
NTNS	Not Tested Not Specified	Selected if an item is found to be unspecified
NTUR	Not Tested Under Repair	Selected if an item is currently under a repair procedure
NSFI	Not Scheduled For Inspection	Selected if an item is not due or needed to be tested
NTTC	Not Tested Time Constraint	Selected if the inspection has not been allocated enough time or access problems have cause it to overrun.

- Each piece of equipment has been allocated a priority to operation taken from the following non-changeable list:

CTO	Critical To Operation
ETO	Essential to Operation
NON	Non-Essential To Operation
UNC	Unclassified

- Emissivity is the value in which an object emits it's infra-red radiation and is also directly proportional to it's reflectivity. For example if an item had 0.9 emissivity then it's reflectivity would be 0.1. This inspection uses an emissivity set to 0.96 because this value is found to be suitable when assessing the temperatures of most electrical components due to them usually being housed in plastic or rubber which has a similar emissivity value. Emissivity is only changed were absolutely necessary. An example of this would be copper busbar with no electrical tape/labels attached.
- Anomalous components are assessed in one of two ways.

1. With the use of Reference components operating under similar conditions: These would include using line/load sides or different phases with similar load patterns to compare an anomalous component with another which has a more normal temperature gradient.
2. The use of load correction formulas which results in the following value:
   - Estimated fault component temp at full load (°C) – This estimates the temperature that the component would be running at if it was loaded at 100%. This value has been arrived at using a formula correction using anomalous and ambient temperatures, measured and maximum load.

- The value of 75°C has been taken from the British Standard BS7671 (*.*). This value is the recommended cable temperatures of between 65-85C at full load.
- Using this value it is possible to use a fault rating system to grade the severity of the fault. The following fault ratings and colour coding have been used:

Fault Ratings	minor	Important	Serious	Critical
Temp above ref temp or above 75°C	0-7	8-15	16-32	33+

- This value of 75°C is also used as a threshold temperature for the captured baseline images. In certain circumstances, this value has either been increased to 100°C or decreased to 50°C. The value has been increased to 100°C where the thermographer deems this a more appropriate value due to an elevated cubicle ambient or where components are tightly arranged together causing uplift in operating temperature. The value has been decreased to 50°C where the thermographer deems this a more appropriate value due to panel covers not being able to be removed and only the surface of the component can be seen and not the actual connections. In certain circumstances where SP2 Reference temperature cannot be suitably obtained, the value has been set from the BS Ref of 75°C as the SP2 reference temp.
- The normalization graph simulates temperature at 0, 50% and 100% load and is designed to assist the prediction of component operating temperature where a reference component has been used. According to Ohms law $P=I^2R$ but the graph is designed as a quick glance tool to assist in viewing the potential that a problem may become.
- Where anomalous components are found, a knowledge base library is used to house specific statements that ensure synergy between inspections for faults, root causes and recommended remedial actions.
- **Formulas:**

Normalization Graph	$P=I^2R$ where P=Power, I=Current, R=Resistance
T load corrected	Let (Tm – Tamb) = Trise ; I meas / I full = LF (Load factor) Then: Tcorr = (((1/ LF)^1.68+(1/ LF)^1.46)/2)*Trise + Tamb

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Report pages:

The combined report contains the following pages:

NB Page numbers have been left in for additional ID purposes. Page numbers run in sequence beginning at #1 for each section but do not run in sequence for the whole combined report.

1. Cover Page for TD Electrical: This is a summary report which offers the amount of problems found and their severity grade. It is for a complete site overview.
2. List of all open problems: This is the full list of equipment found with problems and includes their locations and tag numbers
3. Inspection Inventory: This is a full inventory of equipment inspected, their ID numbers and their test status.
4. Documentation pages: These pages include the details of all anomalies found for individual pieces of equipment.
5. Cost Benefit Analysis: This lists the possible cost benefits of finding the faults before they have failed and estimates how much cost has been saved by predicting a failure before it happens. These values are deliberately very conservative and loss of production has not been taken into account.

The Webmanager contains all of the above reports and lists problems, cost benefits and baseline trends in easy to source locations. To view your current and previous inspections, please logon to your personal Webmanager using your username and password already supplied. If you do not have this please contact Ti on 0845 4586315.

http://193.228.155.40/inspectrend or www.thermalimaging.co.uk then 'Login to Webmanager' tab

Webmanager tutorial snapshot:

Navigate to the area you need using one of the 6 tabs at the top of the screen:

REP'S/ELECTRICIANS ENTER CORRECTIVE WORKORDERS INTO WEBMANAGER HERE →	**Overview**	Summary listing all problems active or closed with severity grade.
	Inspection	Select site and then hit search to reveal historical list of inspections. Select 'more' next to the inspection that you want to see further details of. At the bottom is a 'reports' button that highlights in red, hit this to reveal a list of your reports. **Your combined report will be prefixed by 1_ to ensure it the very first report.**
	Inventory	Select site and then hit search to reveal a full inventory of surveyed equipment, test status, priority to site operation and last inspected date.
	Problems	Select site and then hit search to reveal a list of all open/closed problems found with severity grade, repair status and date found. Attach a work order here for remedial action and view the problem in its own individual report page.
	Cost Benefit	Select site and then hit search to reveal the savings you have made by having this inspection carried out. Typical ratio is spend £1 and save £4.
	Baseline	Select site and then hit search to reveal baseline trend data for all equipment surveyed. Here you can view individual trend reports for each piece of equipment where the latest IR/DC images are displayed with a historical temperature graph for baseline temp/current insp. Temp and threshold temp.

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Cover Page for T/D Electrical

Executive and Operations summary of problems found

Also available on your Webmanager Overview page
Please use your login details provided

http://193.228.155.40/inspectrend

INFRARED THERMOGRAPHIC INSPECTION
OF
TRANSMISSION / DISTRIBUTION
ELECTRICAL INSPECTION

Report Date: 22/11/2011

Provided for

TI , TI Site 3.1 UPS Battery Discharge Testing

Overview:

The Infrared Electrical Inspection was performed by TI Thermal Imaging, by a certified infrared Thermographer. All of the items inspected are listed in this InspecTrend report. Any anomalies are listed in order of priority based on the component's temperature rise, as measured from a reference component of equal type and load at the time of the inspection. TI Thermal Imaging assumes no liability directly or indirectly as a result of this inspection.

Current Inspection No: 1665 November 22, 2011

Prior Inspection No:

Priority	Temp Rise	**Current Inspection**	Prior Inspection	Percent of Change
1-Critical	33 - Above	**1 = 20%**	NA	NA
2-Serious	16 - 32	**1 = 20%**	NA	NA
3-Important	8 - 15	**3 = 60%**	NA	NA
4-Minor	1 - 7	**0 = 0%**	NA	NA
5-Normal	0	**0 = 0%**	NA	NA
	Total Tested Problems:	**5**	NA	NA
	Number of New Documented Problems:	5 =100%	NA	NA
	Number of Tested re-occuring Problems:	0 = 0%	NA	NA

Number of prior problems which were Not Tested this inspection : NA

Number of Total Open Problems : **5**

Number of prior problems which tested Normal this inspection : NA

I hereby certify the above project was inspected by myself or under my direction and that the enclosed data is the direct result of this inspection.

TI Thermal Imaging

Administrator

Certification Level/No.:

* Summary of reoccuring problems on following page(s)

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Cover Page for Visual

Executive and Operations summary of problems found

Also available on your Webmanager Overview page
Please use your login details provided

http://193.228.155.40/inspectrend

INFRARED THERMOGRAPHIC INSPECTION
OF
VISUAL PROBLEMS

Report Date: 22/11/2011

Provided for

TI , TI Site 3.1 UPS Battery Discharge Testing

Overview:

The Infrared Inspection was performed by TI Thermal Imaging, by a certified infrared Thermographer. All of the items inspected are listed in this InspecTrend report. Any anomalies are listed in order of priority based on the component's temperature rise, as measured from a reference component of equal type and load at the time of the inspection. TI Thermal Imaging assumes no liability directly or indirectly as a result of this inspection.

Current Inspection No: 1665 November 22, 2011

Prior Inspection No:

Priority	Temp Rise	**Current Inspection**	Prior Inspection	Percent of Change
1-Critical		**0 = 0%**	NA	NA
2-Serious		**0 = 0%**	NA	NA
3-Important		**0 = 0%**	NA	NA
4-Minor		**0 = 0%**	NA	NA
	Total Tested Problems:	**0**	NA	NA
	Number of New Documented Problems:	0	NA	NA
	Number of Tested re-occuring Problems:	0	NA	NA

Number of prior problems which were Not Tested this inspection : NA

Number of Total Open Problems : **NA**

Number of prior problems which tested Normal this inspection : NA

I hereby certify the above project was inspected by myself or under my direction and that the enclosed data is the direct result of this inspection.

TI Thermal Imaging

Administrator

Certification Level/No.:

* Summary of reoccuring problems on following page(s)

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List of Open Problems

Full list of thermal, mechanical and visual issues found

Also available on your Webmanager Problems page
Please use your login details provided

http://193.228.155.40/inspectrend

List of All Open Problems

TI

TI Site 3.1 UPS Battery Discharge Testing

Operation Priority Key

CTO = Critical to operation
ETO = Essential to operation
NON = Non-essential to operation
UNC = Un-Classified

Report Date: 22/11/2011

Prior Inspection No :

Current Inspection No : 1665 **November 22, 2011**

Prob#	Asset ID		Insp#	Temp Rise	% Load	Severity	Status
TD 3	B203722	Equipment: UPSA1 \ STRING B	1665	61 C		1-Critical	TESTED
		Component: Cell link 33B-34B connection indicates higher temperature than expected on 6v cell					
TD 5	B203806	Equipment: UPSA2 \ STRING B	1665	13 C		3-Important	TESTED
		Component: Indicated higher temperature than expected on 6v cell no.8					
TD 1	B203804	Equipment: UPSA3 \ STRING A	1665	8 C		3-Important	TESTED
		Component: Cell link 43A-42A connection indicates higher temperature than expected on 6v cell					
TD 2	B203804	Equipment: UPSA3 \ STRING B	1665	32 C		2-Serious	TESTED
		Component: Cell link 74B-75B connection indicates higher temperature than expected on 6v cell					
TD 4	B204784	Equipment: UPSA4 \ STRING A	1665	13 C		3-Important	TESTED
		Component: Indicated higher temperature than expected on 6v cell					

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Inspection Inventory Pages

Equipment listing and test status

Also available on your Webmanager Inventory page with Photos
Please use your login details provided

http://193.228.155.40/inspectrend

Current Inspection Inventory Status
By Inspection Order

Other

NI = Not Issued

Test Status Note

SCE = Safety Critical

Problem Type Key

TD = T/D Electrical
M = Mechanical
V = Visual Inspection

Operation Priority Key

CTO = Critical to operation
ETO = Essential to operation
NON = Non-essential to operation
UNC = Un-Classified

Equipment Test Status Key

TBT = To Be Tested
NT/NL = Not Tested/No Load
NT/TC = Not Tested/Time Constraint
NT/UR = Not Tested/Under Repair
NT/LO = Not Tested/Locked Out
NT/NA = Not Tested/Not Available
NT/NS = Not Tested/Not Specified
NSFI = Not Selected for this insp.

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Report Date: 22/11/2011

Current Inspection No: 1665

Inspected By : Administrator

Work Order	Asset ID	Equipment Description	CTO	Tested	Problem #	Test Status Notes
NI	B204784	UPSA4	CTO	TESTED		
NI	B204784	SUPPLY TERMINALS	CTO	TESTED		
NI	B204784	STRING A	CTO	TESTED	TD4	
NI	B204784	STRING B	CTO	TESTED		
NI	B203804	UPSA3	CTO	TESTED		
NI	B203804	A3 SUPPLY TERMINALS	CTO	TESTED		
NI	B203804	STRING A	CTO	TESTED	TD1	
NI	B203804	STRING B	CTO	TESTED	TD2	
NI	B203806	UPSA2	CTO	TESTED		
NI	B203806	A2 SUPPLY TERMINALS	CTO	TESTED		
NI	B203806	STRING A	CTO	TESTED		
NI	B203806	STRING B	CTO	TESTED	TD5	
NI	B203722	UPSA1	CTO	TESTED		
NI	B203722	SUPPLY TERMINALS	CTO	TESTED		
NI	B203722	STRING A	CTO	TESTED		
NI	B203722	STRING B	CTO	TESTED	TD3	

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Documentation pages for TD Electrical

Details of TD electrical problems found

Also available on your Webmanager Problems page
Please use your login details provided

http://193.228.155.40/inspectrend

Client	Asset	Inspection Number	Report Date	Inspection Type
TI	TI Site 3.1 UPS Battery Discharge	1665	22/11/2011	T/D Electrical

Location / Equipment Information

Work Order	**NOT ISSUED**
Equipment ID	**B203804**
Location	**UPSA3**
Description	**STRING A**
Severity	**3-Important**
Anomoly	**Cell link 43A-42A connection indicates higher temperature than expected on 6v cell**
Possible Root Cause	**Suspected loose/deteriorated connection**
Recommendation	**Check, clean & re-make connection**

Equipment Information

Component:	**Batteries**		
Manufacturer:	**Powersafe**		
Model No:	**6v 165 2**		
Rated Amps:	**5**		
Circuit Voltage:	**6 Volts**		
Measured Loads (Load taken if safe and allowed on PTW)	**Phase**	**Actual Loads (A)**	**Load %**
	-:		
	-:		
	Neutral		

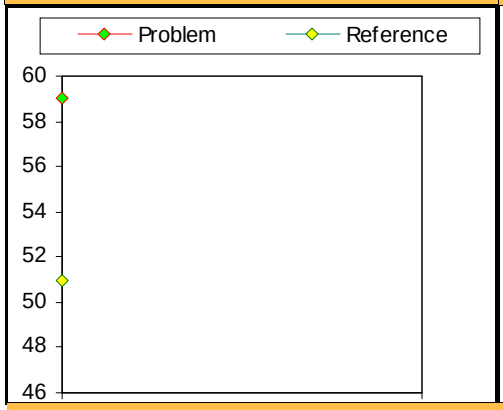
Current Prob No: T/D Electrical/1

Operation Priority:	**Critical to operation**
Max Component Temperature - Ar1 Max Temperature	**59 C**
Reference Temperature or SP2 Temperature	**51 C**
Temperature Rise Above Reference	**8 C**
Maximum allowable Temperature British Standard Reference	**75 C**
British Standard Reference - BS7671	

Temperature Information

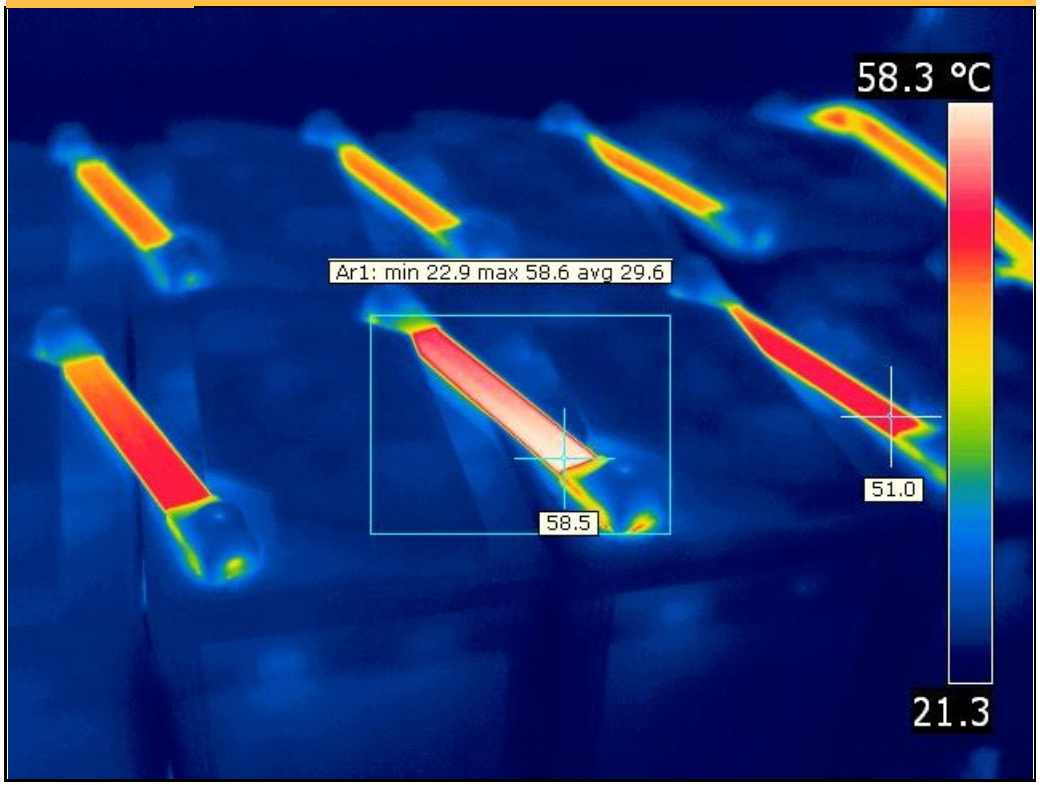
Cubicle ambient:	**22 C**
Emissivity:	**0.96**
Environment:	**Indoors**
Adjusted Temperature Rise above reference:	**8 C**
Estimated Temp Rise over reference @ 50% Load: (See * 1)	**0 C**
Estimated Temp Rise over reference @ 100% Load: (See * 2)	**0 C**

Normalized Graph



Digital Image: DC_23095.jpg **Date:** 04/09/2010

Infrared Image: IR_23094a.jpg **Date:** 04/09/2010



Client	Asset	Inspection Number	Report Date	Inspection Type
TI	TI Site 3.1 UPS Battery Discharge	1665	22/11/2011	T/D Electrical

Location / Equipment Information

Work Order	**NOT ISSUED**
Equipment ID	**B203804**
Location	**UPSA3**
Description	**STRING B**
Severity	**2-Serious**
Anomoly	**Cell link 74B-75B connection indicates higher temperature than expected on 6v cell**
Possible Root Cause	**Suspected loose/deteriorated connection**
Recommendation	**Check, clean & re-make connection**

Equipment Information

Component:	**Batteries**		
Manufacturer:	**Powersafe**		
Model No:	**6V 165 2**		
Rated Amps:	**5**		
Circuit Voltage:	**6 Volts**		
Measured Loads (Load taken if safe and allowed on PTW)	**Phase**	**Actual Loads (A)**	**Load %**
	-:		
	-:		
	Neutral		

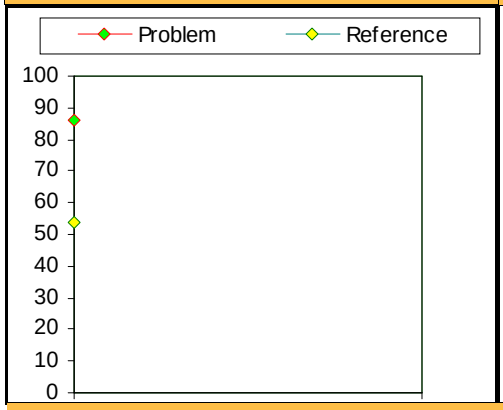
Current Prob No: T/D Electrical/2

Operation Priority:	**Critical to operation**
Max Component Temperature - Ar1 Max Temperature	**86 C**
Reference Temperature or SP2 Temperature	**54 C**
Temperature Rise Above Reference	**32 C**
Maximum allowable Temperature British Standard Reference	**75 C**
British Standard Reference - BS7671	

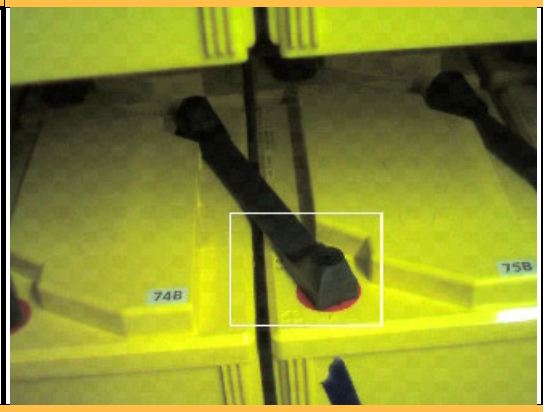
Temperature Information

Cubicle ambient:	**22 C**
Emissivity:	**0.96**
Environment:	**Indoors**
Adjusted Temperature Rise above reference:	**32 C**
Estimated Temp Rise over reference @ 50% Load: (See * 1)	**0 C**
Estimated Temp Rise over reference @ 100% Load: (See * 2)	**0 C**

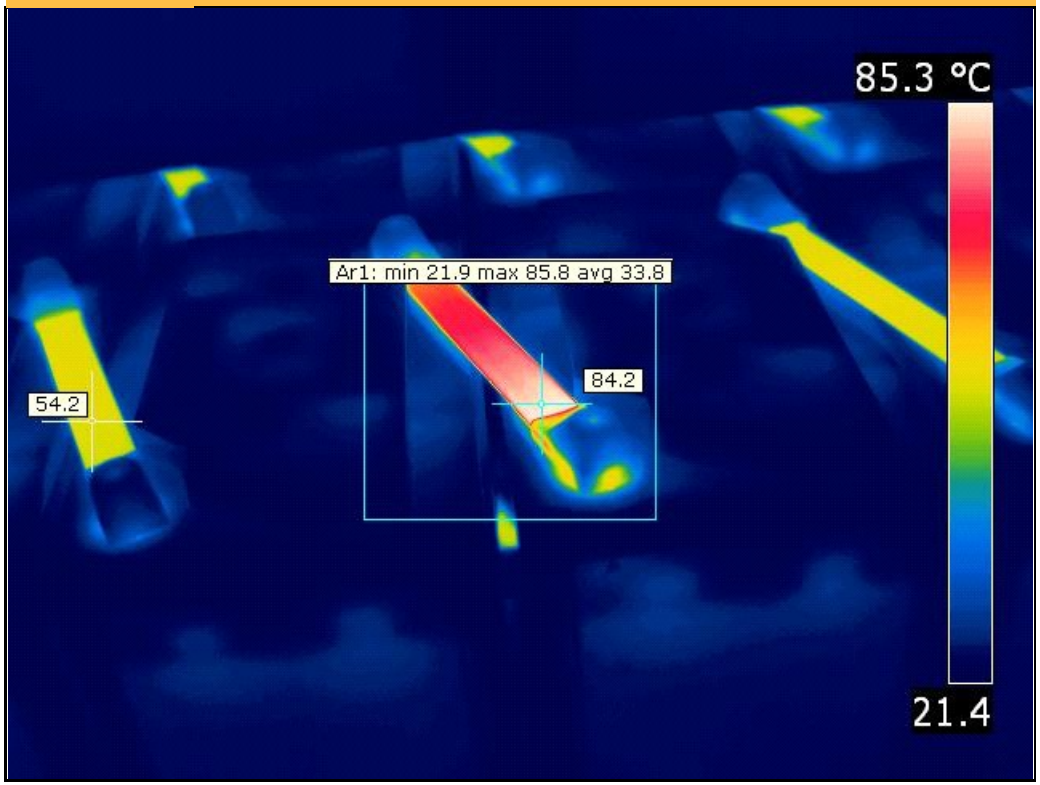
Normalized Graph



Digital Image: DC_23134.jpg **Date:** 04/09/2010



Infrared Image: IR_23133a.jpg **Date:** 04/09/2010



Client	Asset	Inspection Number	Report Date	Inspection Type
TI	TI Site 3.1 UPS Battery Discharge	1665	22/11/2011	T/D Electrical

Location / Equipment Information

Work Order	**NOT ISSUED**
Equipment ID	**B203722**
Location	**UPSA1**
Description	**STRING B**
Severity	**1-Critical**
Anomoly	**Cell link 33B-34B connection indicates higher temperature than expected on 6v cell**
Possible Root Cause	**Suspected loose/deteriorated connection**
Recommendation	**Check, clean & re-make connection**

Equipment Information

Component:	**Batteries**		
Manufacturer:	**Powersafe**		
Model No:	**6v 165 2**		
Rated Amps:	**5**		
Circuit Voltage:	**6 Volts**		
Measured Loads (Load taken if safe and allowed on PTW)	**Phase**	**Actual Loads (A)**	**Load %**
	-:		
	-:		
	Neutral		

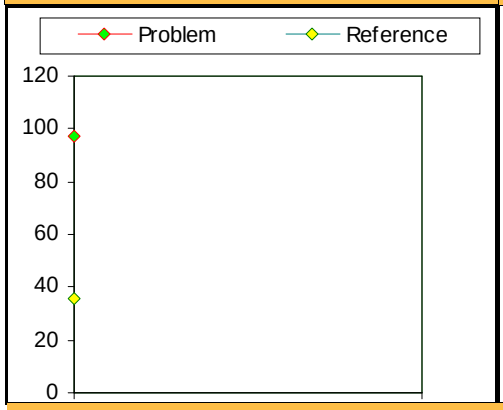
Current Prob No: T/D Electrical/3

Operation Priority:	**Critical to operation**
Max Component Temperature - Ar1 Max Temperature	**97 C**
Reference Temperature or SP2 Temperature	**36 C**
Temperature Rise Above Reference	**61 C**
Maximum allowable Temperature British Standard Reference	**75 C**
British Standard Reference - BS7671	

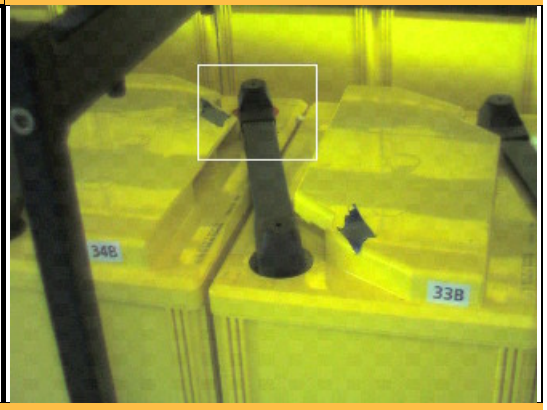
Temperature Information

Cubicle ambient:	**22 C**
Emissivity:	**0.96**
Environment:	**Indoors**
Adjusted Temperature Rise above reference:	**61 C**
Estimated Temp Rise over reference @ 50% Load: (See * 1)	**0 C**
Estimated Temp Rise over reference @ 100% Load: (See * 2)	**0 C**

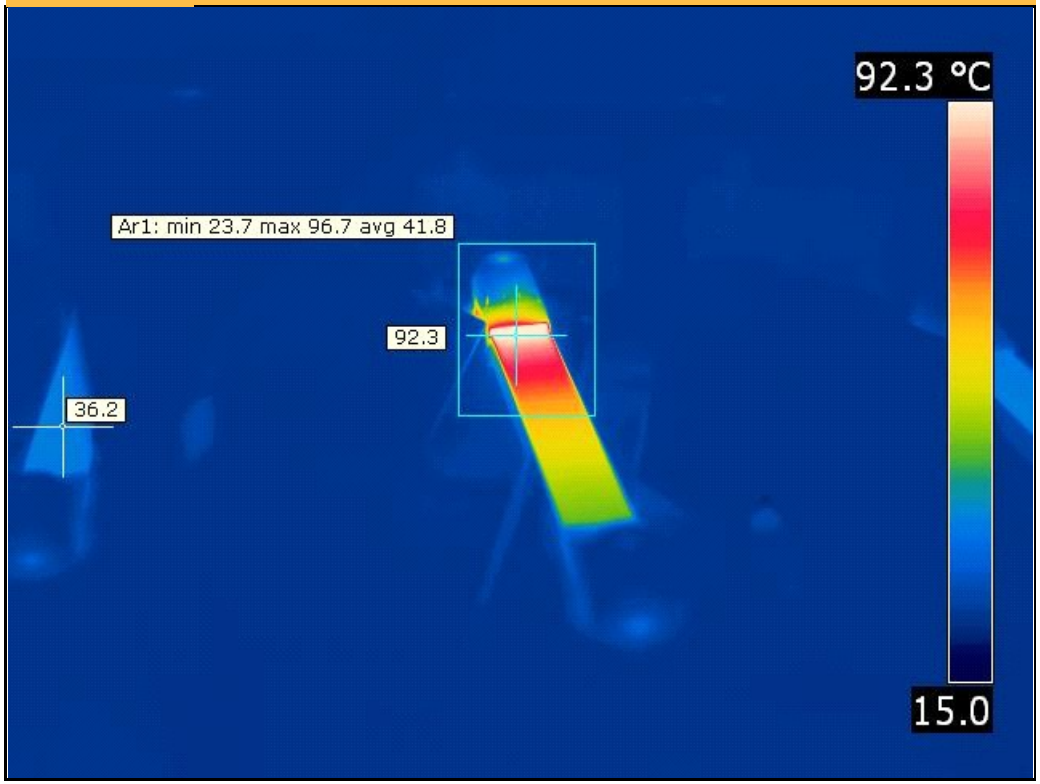
Normalized Graph



Digital Image: DC_23142.jpg **Date:** 05/09/2010



Infrared Image: IR_23141a.jpg **Date:** 05/09/2010



Client	Asset	Inspection Number	Report Date	Inspection Type
TI	TI Site 3.1 UPS Battery Discharge	1665	22/11/2011	T/D Electrical

Location / Equipment Information

Work Order	**NOT ISSUED**
Equipment ID	**B204784**
Location	**UPSA4**
Description	**STRING A**
Severity	**3-Important**
Anomoly	**Indicated higher temperature than expected on 6v cell**
Possible Root Cause	**Suspected internal problem**
Recommendation	**Either replace or investigate internal contacts to determine source of temperature anomaly**

Equipment Information

Component:	**Batteries**		
Manufacturer:	**Powersafe**		
Model No:	**6V 165 2**		
Rated Amps:	**5**		
Circuit Voltage:	**6 Volts**		
Measured Loads (Load taken if safe and allowed on PTW)	**Phase**	**Actual Loads (A)**	**Load %**
	-:		
	-:		
	Neutral		

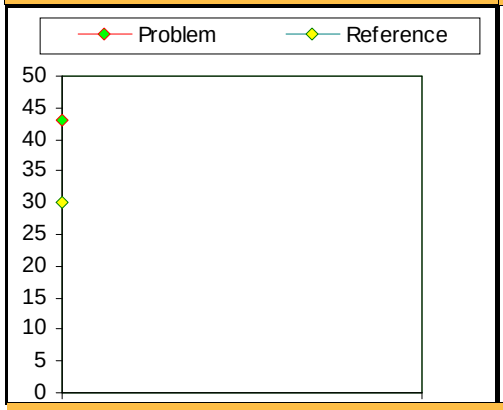
Current Prob No: T/D Electrical/4

Operation Priority:	**Critical to operation**
Max Component Temperature - Ar1 Max Temperature	**43 C**
Reference Temperature or SP2 Temperature	**30 C**
Temperature Rise Above Reference	**13 C**
Maximum allowable Temperature British Standard Reference	**75 C**
British Standard Reference - BS7671	

Temperature Information

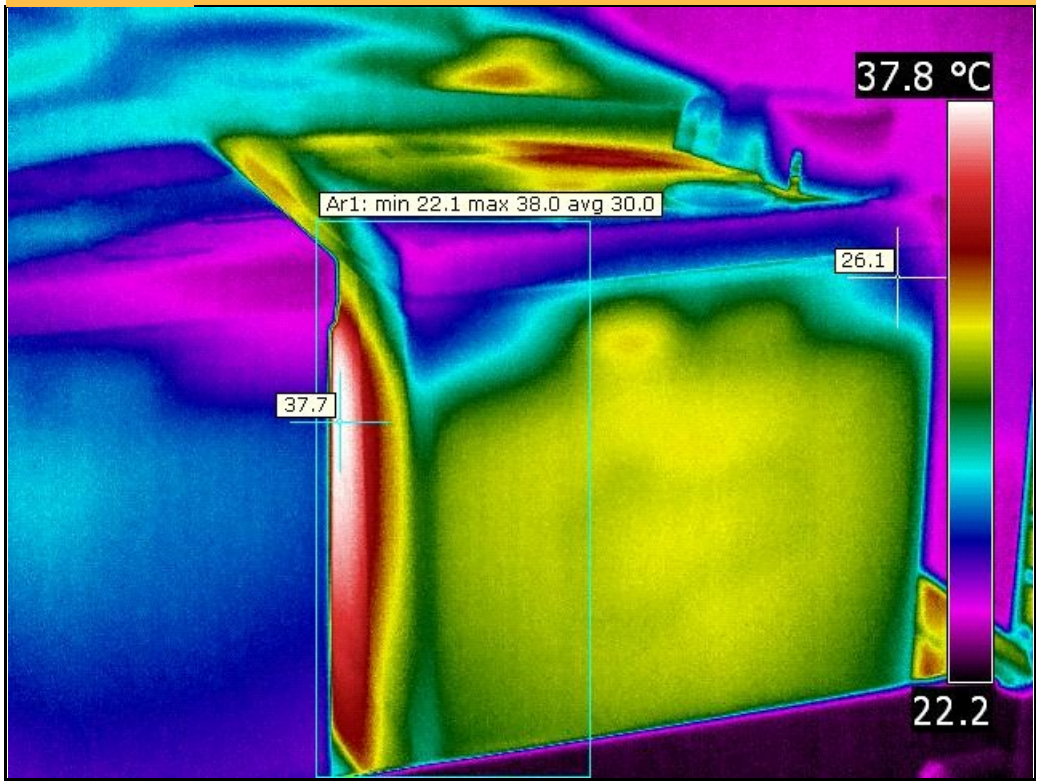
Cubicle ambient:	**22 C**
Emissivity:	**0.96**
Environment:	**Indoors**
Adjusted Temperature Rise above reference:	**13 C**
Estimated Temp Rise over reference @ 50% Load: (See * 1)	**0 C**
Estimated Temp Rise over reference @ 100% Load: (See * 2)	**0 C**

Normalized Graph



Digital Image: DC_18687.jpg **Date:** 12/12/2010

Infrared Image: IR_18686a.jpg **Date:** 12/12/2010



Client	Asset	Inspection Number	Report Date	Inspection Type
TI	TI Site 3.1 UPS Battery Discharge	1665	22/11/2011	T/D Electrical

Location / Equipment Information

Work Order	**NOT ISSUED**
Equipment ID	**B203806**
Location	**UPSA2**
Description	**STRING B**
Severity	**3-Important**
Anomoly	**Indicated higher temperature than expected on 6v cell no.8**
Possible Root Cause	**Suspected internal problem**
Recommendation	**Either replace or investigate internal contacts to determine source of temperature anomaly**

Equipment Information

Component:	**Batteries**		
Manufacturer:	**Powersafe**		
Model No:	**6v 165 2**		
Rated Amps:	**5**		
Circuit Voltage:	**6 Volts**		
Measured Loads (Load taken if safe and allowed on PTW)	**Phase**	**Actual Loads (A)**	**Load %**
	-:		
	-:		
	Neutral		

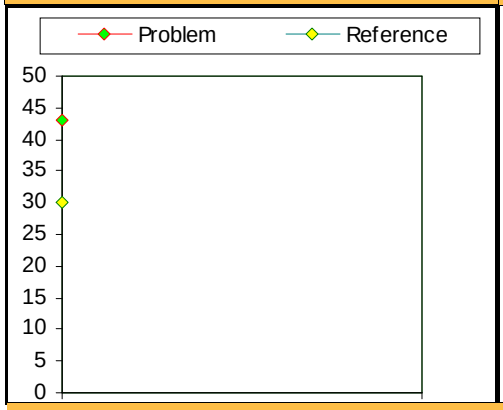
Current Prob No: T/D Electrical/5

Operation Priority:	**Critical to operation**
Max Component Temperature - Ar1 Max Temperature	**43 C**
Reference Temperature or SP2 Temperature	**30 C**
Temperature Rise Above Reference	**13 C**
Maximum allowable Temperature British Standard Reference	**75 C**
British Standard Reference - BS7671	

Temperature Information

Cubicle ambient:	**22 C**
Emissivity:	**0.96**
Environment:	**Indoors**
Adjusted Temperature Rise above reference:	**13 C**
Estimated Temp Rise over reference @ 50% Load: (See * 1)	**0 C**
Estimated Temp Rise over reference @ 100% Load: (See * 2)	**0 C**

Normalized Graph



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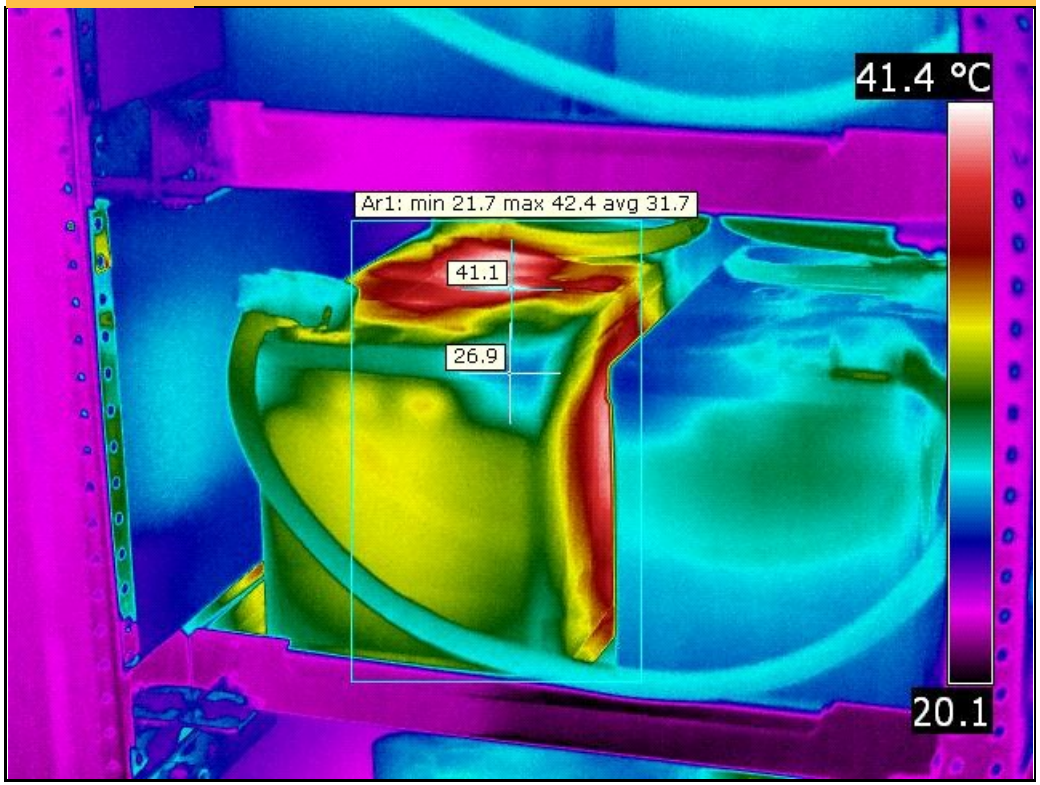
Infrared Image: IR_18682a.jpg **Date:** 12/12/2010



Ti Thermal Imaging LTD

Unit 8, Weybridge Business Centre, 66 York Road, Weybridge, Surrey, KT13 9DY

Tel: 0845 458 6315 Fax: 0871 9004978 E-mail: info@thermalimaging.co.uk Web: www.thermalimaging.co.uk

Benchmark Baseline Trending

Full list of equipment baseline trends is also available on your Webmanager
Please use your login details provided

http://193.228.155.40/inspectrend

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

Key

CTO = Critical to operation
ETO = Essential to operation
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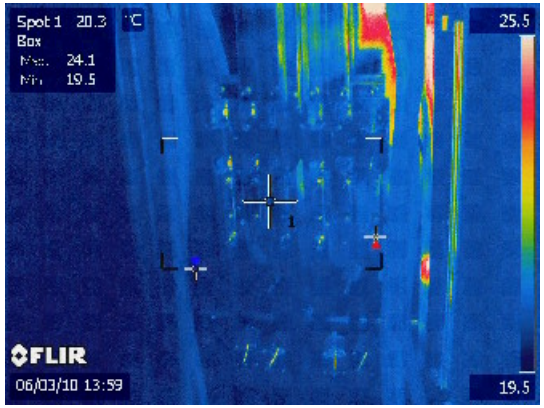
UNC = Un-Classified
NI = Not Issued

Report Date: **22/11/2011**

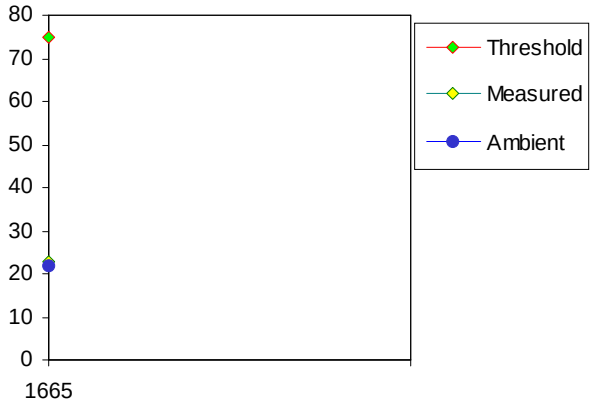
UPSA4 \ SUPPLY TERMINALS

Equipment ID: **B204784** **Work Order:** **NI** **Operation Priority:** **CTO**



IR_13390.jpg

DC_13391.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	23 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

Key

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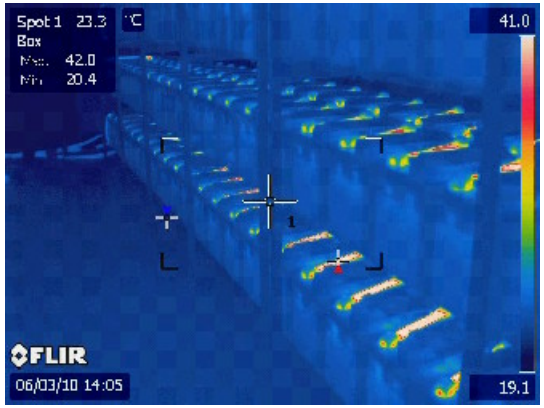
UNC = Un-Classified
NI = Not Issued

Report Date: **22/11/2011**

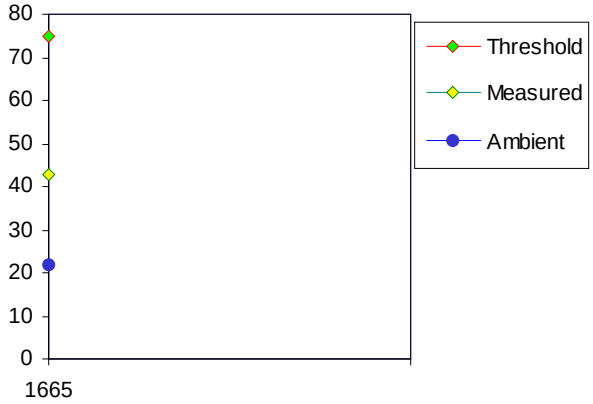
UPSA4 \ STRING A

Equipment ID: **B204784** **Work Order:** **NI** **Operation Priority:** **CTO**



IR_13392.jpg

DC_13393.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	43 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

Key

CTO = Critical to operation
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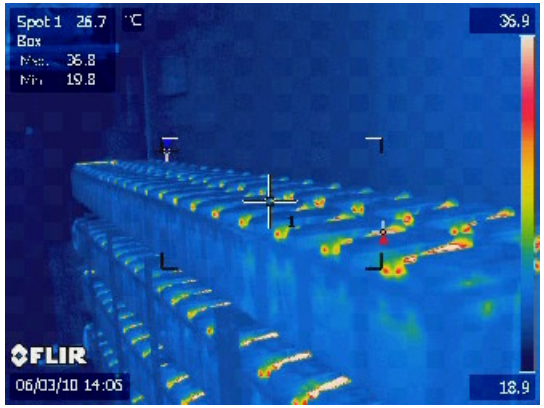
UNC = Un-Classified
NI = Not Issued

Report Date: **22/11/2011**

UPSA4 \ STRING B

Equipment ID: **B204784** **Work Order:** **NI** **Operation Priority:** **CTO**



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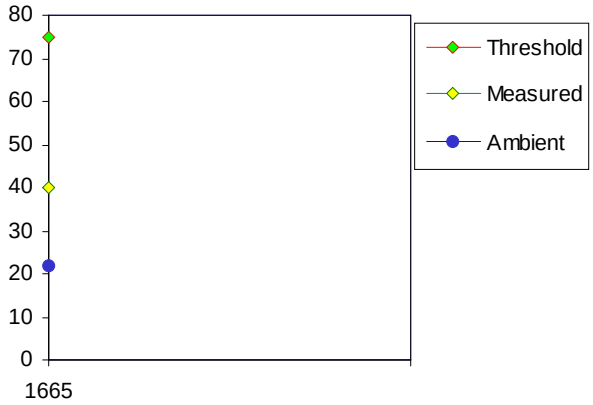
DC_13395.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	40 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

Key

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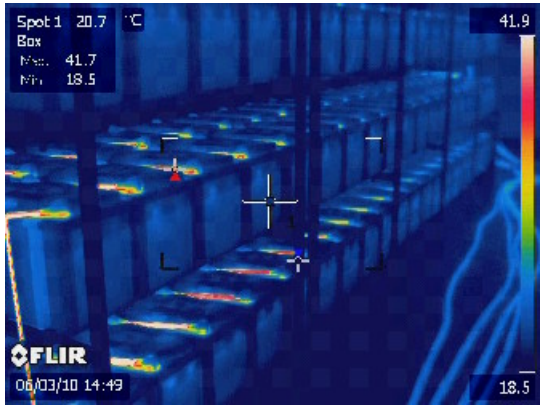
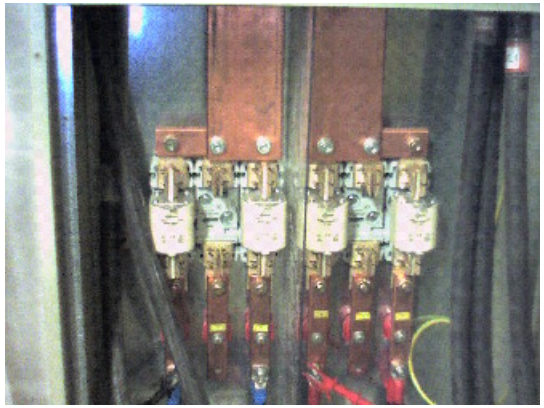
Report Date: 22/11/2011

UPSA3 \ A3 SUPPLY TERMINALS

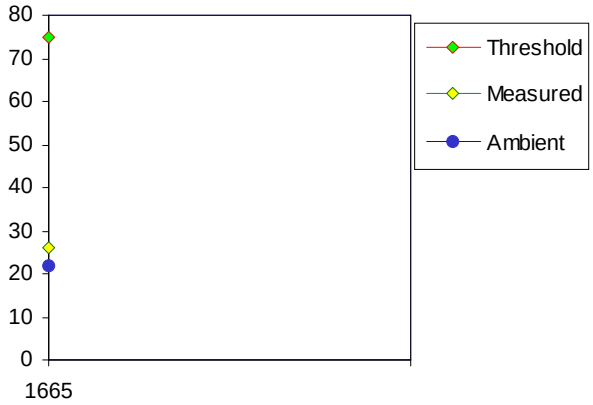
Equipment ID: B203804 **Work Order:** NI **Operation Priority:** CTO



IR_13398.jpg



DC_13397.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	26 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

Key

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ETO = Essential to operation
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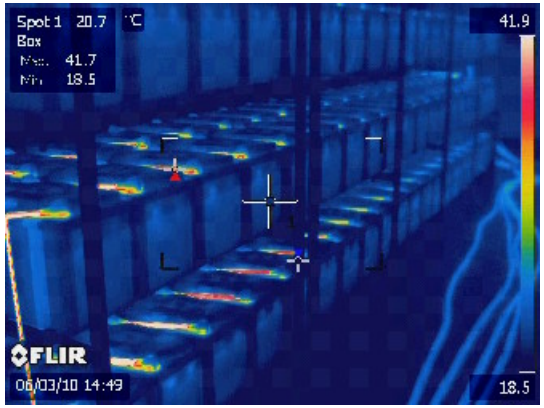
UNC = Un-Classified
NI = Not Issued

Report Date: **22/11/2011**

UPSA3 \ STRING A

Equipment ID: **B203804** **Work Order:** **NI** **Operation Priority:** **CTO**



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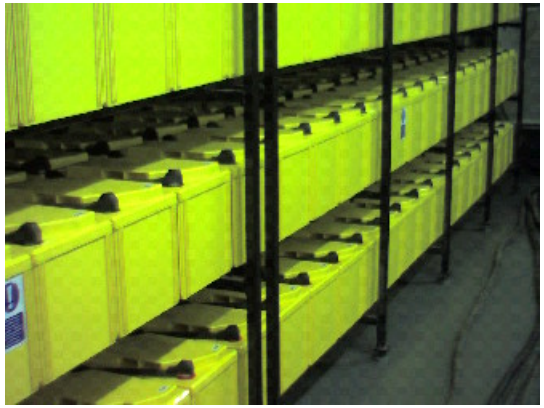

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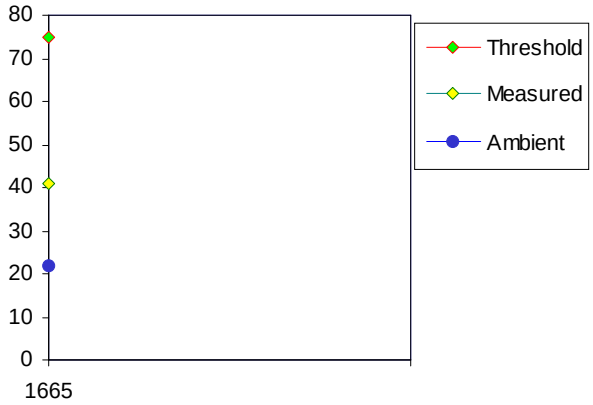

Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	41 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

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NON = Non-essential to operation
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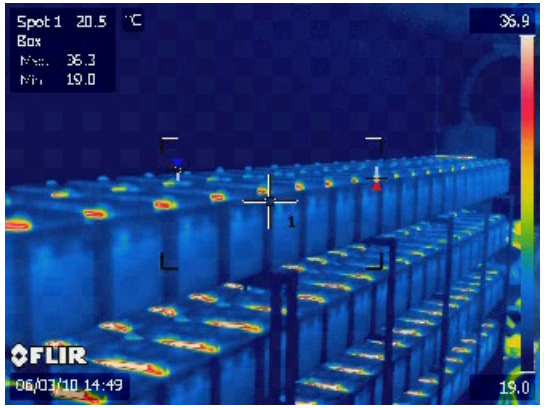
NI = Not Issued

Report Date: **22/11/2011**

UPSA3 \ STRING B

Equipment ID: **B203804** **Work Order:** **NI** **Operation Priority:** **CTO**



IR_13402.jpg

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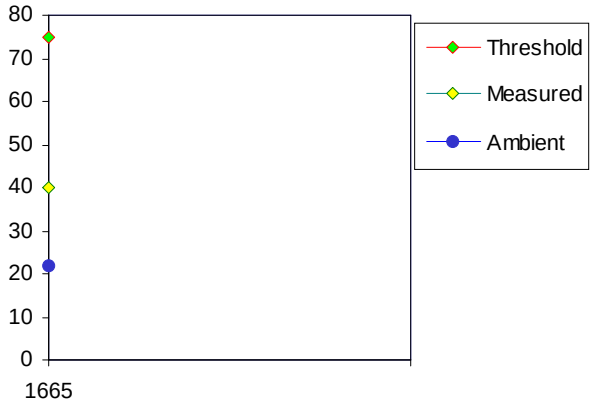

Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	40 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

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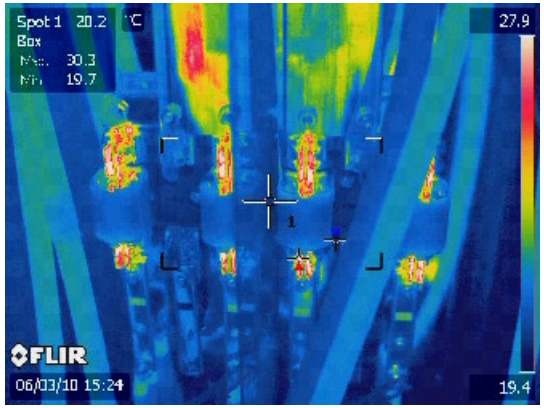
NI = Not Issued

Report Date: **22/11/2011**

UPSA2 \ A2 SUPPLY TERMINALS

Equipment ID: **B203806** **Work Order:** **NI** **Operation Priority:** **CTO**



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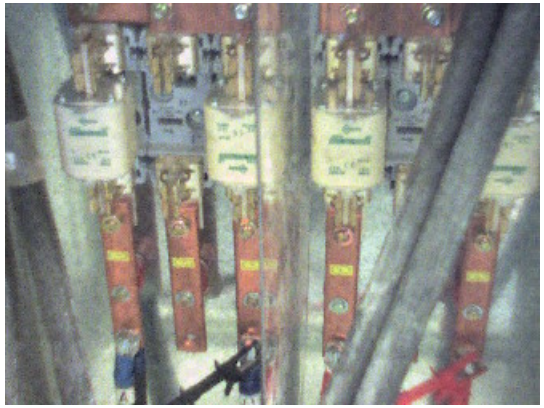
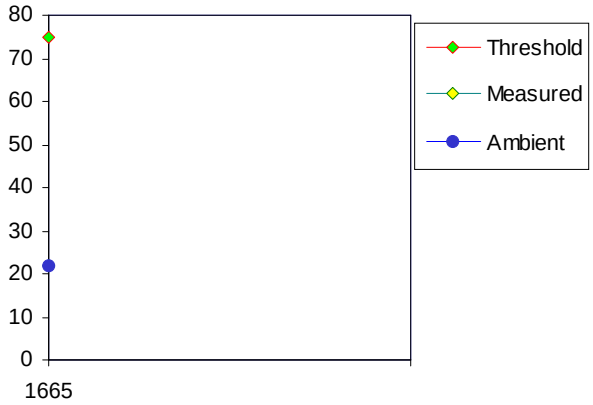


DC_13405.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	22 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

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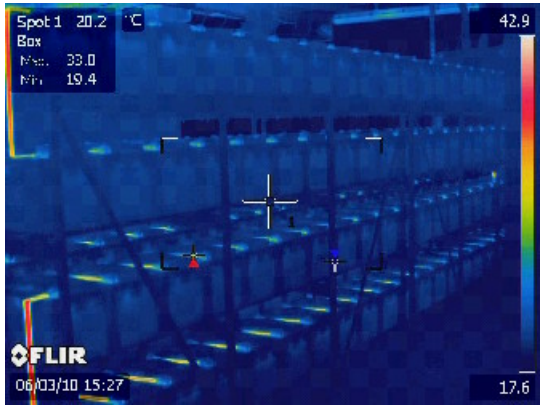
UNC = Un-Classified
NI = Not Issued

Report Date: **22/11/2011**

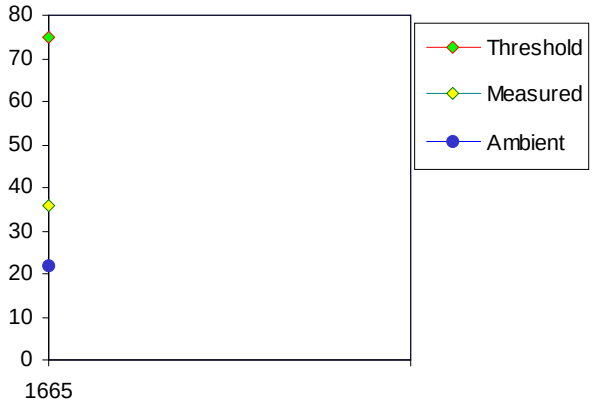
UPSA2 \ STRING A

Equipment ID: **B203806** **Work Order:** **NI** **Operation Priority:** **CTO**



IR_13406.jpg

DC_13407.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	36 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

Key

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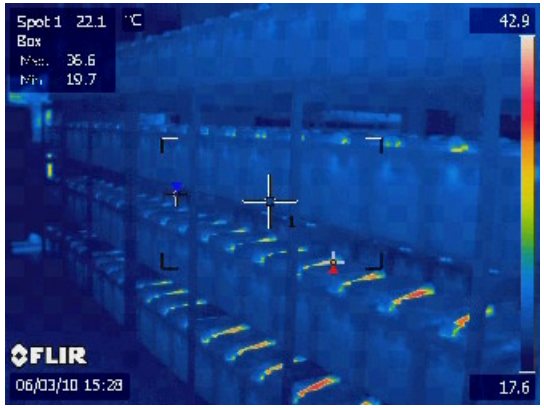
NI = Not Issued

Report Date: **22/11/2011**

UPSA2 \ STRING B

Equipment ID: **B203806** **Work Order:** **NI** **Operation Priority:** **CTO**



IR_13408.jpg

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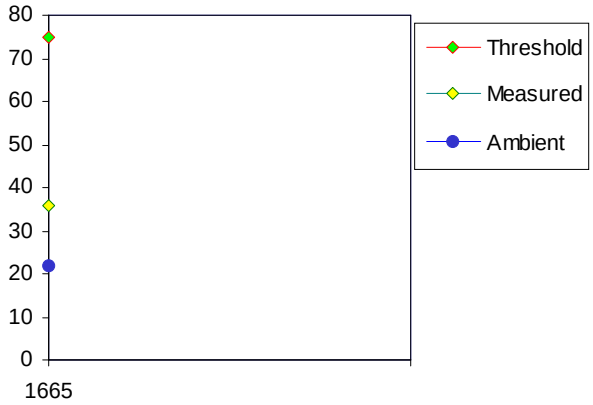

Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	36 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

Key

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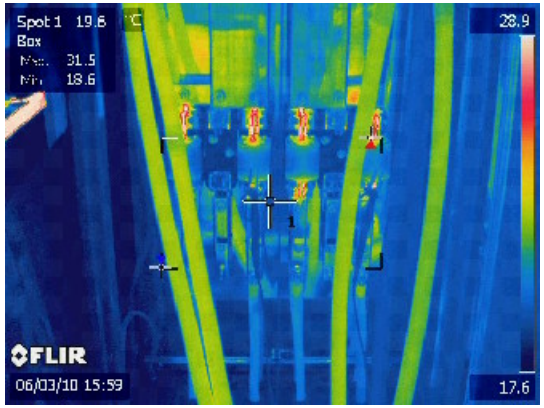
NI = Not Issued

Report Date: **22/11/2011**

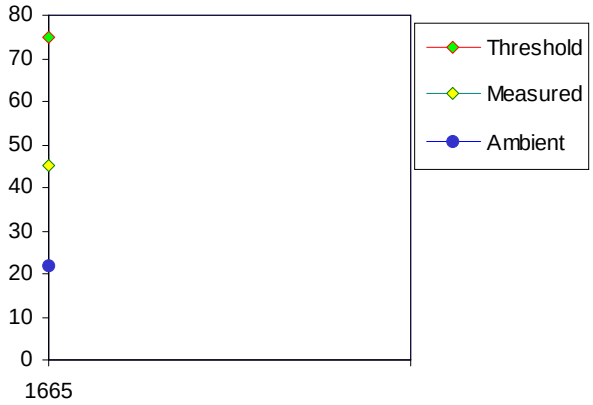
UPSA1 \ SUPPLY TERMINALS

Equipment ID: **B203722** **Work Order:** **NI** **Operation Priority:** **CTO**



IR_13410.jpg

DC_13411.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	45 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

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CTO = Critical to operation
ETO = Essential to operation
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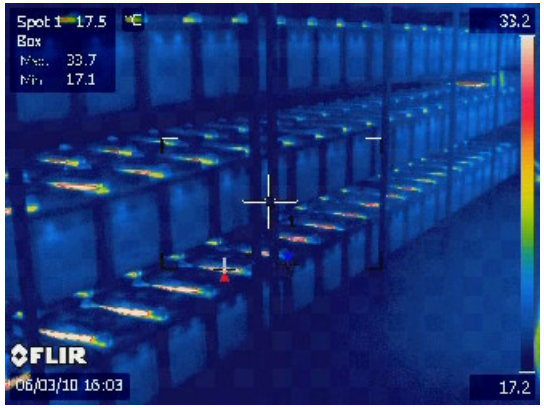
NI = Not Issued

Report Date: **22/11/2011**

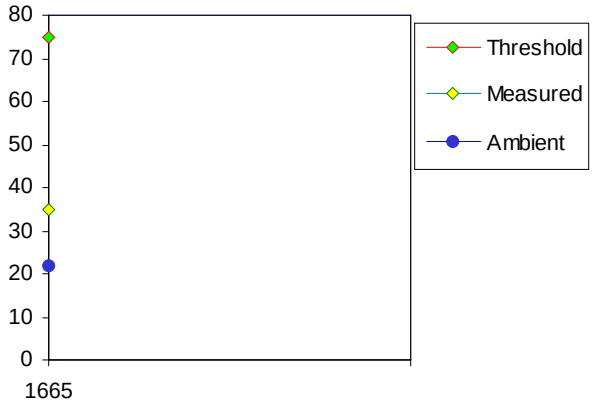
UPSA1 \ STRING A

Equipment ID: **B203722** **Work Order:** **NI** **Operation Priority:** **CTO**



IR_13412.jpg

DC_13413.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	35 C	75 C	22 C		

Equipment Baseline Trending Report
By Inspection Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Prior Inspection No:

Current Inspection No: 1665 **November 22, 2011**

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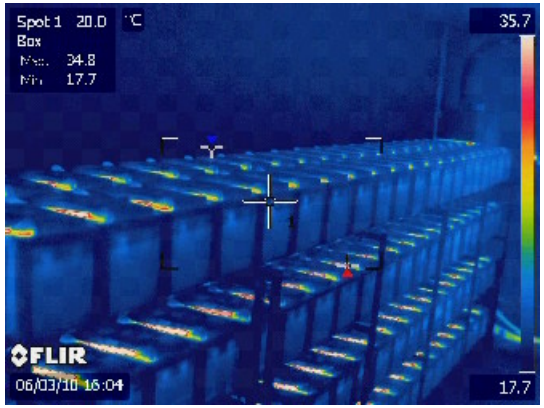
NI = Not Issued

Report Date: 22/11/2011

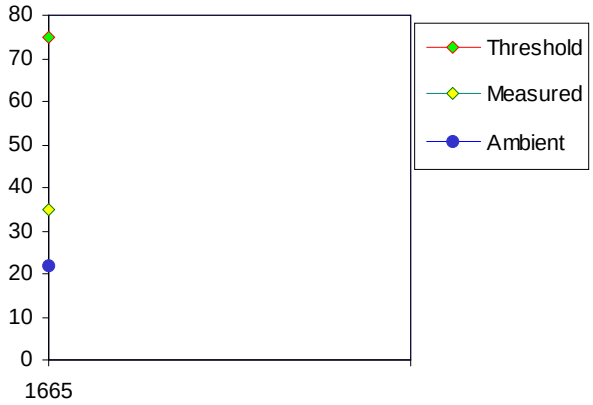
UPSA1 \ STRING B

Equipment ID: B203722 **Work Order:** NI **Operation Priority:** CTO



IR_13414.jpg

DC_13415.jpg



Inspection History:

Inspection No	Date Inspected	Test Status	Measured Temp	Threshold Temp	Ambient Temp	Status Note	Customer Notes
1665	22/11/2011	TESTED	35 C	75 C	22 C		

Ti Thermal Imaging LTD

Unit 8, Weybridge Business Centre, 66 York Road, Weybridge, Surrey, KT13 9DY

Tel: 0845 458 6315 Fax: 0871 9004978 E-mail: info@thermalimaging.co.uk Web: www.thermalimaging.co.uk

Work Order Documentation pages

Fax or Email back Corrective Work Orders

Also available on your Webmanager Problems page
Please use your login details provided

http://193.228.155.40/inspectrend

Documentation/Work Order T/D Electrical: Please add Corrective Work Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Work Order #: NOT ISSUED

Corrective Work Order #:

PLEASE ADD CORRECTIVE WORK ORDER ABOVE

InspectionNo: 1665
Report Date: 22/11/2011

1665-1

Current Prob No: T/D Electrical/1

Location/Equipment Information

Asset ID: B203804
Barcode: NI
Location: UPSA3
STRING A

Component: **Batteries**
Problem: Cell link 43A-42A connection indicates higher temperature than expected on 6v cell

Manufacturer: **Powersafe**
Model No: **6v 165 2**
Circuit Voltage: **6 Volts**

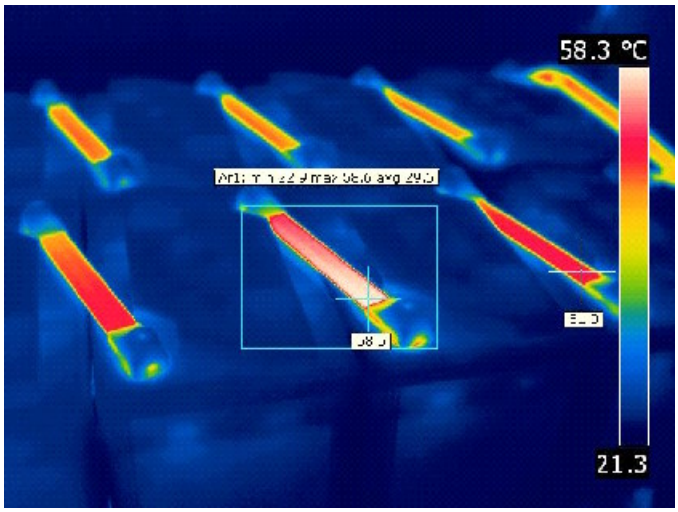
Load Test Results

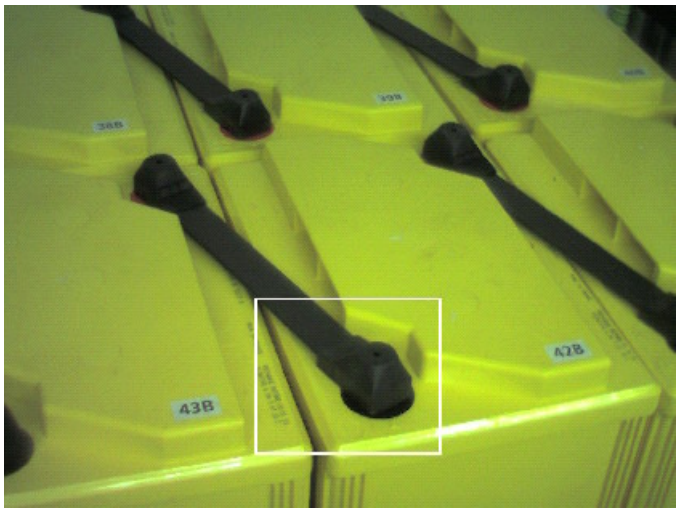
Component Rated Load:	5	amps
-:		amps
-:		amps
		amps

Thermal Information

Operation Priority: **Critical to operation**
Repair Priority: **3-Important**
Ambient: **22 C** Enviroment: **Indoors**

Component Temperature On -:	**59 C**
- Reference Temperature:	**51 C**
Temperature Rise Above Reference:	**8 C**
ANSI/EEE/NEMA Max Allowable Temp @ 100% Load:	**75 C**
Est Temp Rise over reference @ 50% Load:	**0**
Est Temp Rise over reference @ 100% Load:	**0**





IR File: IR_23094a.jpg IR Date: 04/09/2010 Photo File: DC_23095.jpg Photo Date: 04/09/2010

Repair Information

PLEASE FAX BACK AFTER REPAIR TO: 0871 900 4978 OR INFO@THERMALIMAGING.CO.UK

Loss to Production
☐ Yes ☐ No ☑ Unknown

Consequences of Failure:
Loss of STRING A

Parts Req. Before Failure:

Parts Req. After Failure:

Repair Recommendation:
Check, clean & re-make connection

Repair Date:

Repaired By:

Root Cause:

Repair Procedure:

Repair Action:

TI

TI Site 3.1 UPS Battery Discharge Testing

Documentation/Work Order T/D Electrical: Please add Corrective Work Order

Work Order #: NOT ISSUED

Corrective Work Order #:

PLEASE ADD CORRECTIVE WORK ORDER ABOVE

InspectionNo: 1665
Report Date: 22/11/2011

1665-2

Current Prob No: T/D Electrical/2

Location/Equipment Information

Asset ID: B203804
Barcode: NI
Location: UPSA3
STRING B

Component: **Batteries**
Problem: Cell link 74B-75B connection indicates higher temperature than expected on 6v cell

Manufacturer: **Powersafe**
Model No: **6V 165 2**
Circuit Voltage: **6 Volts**

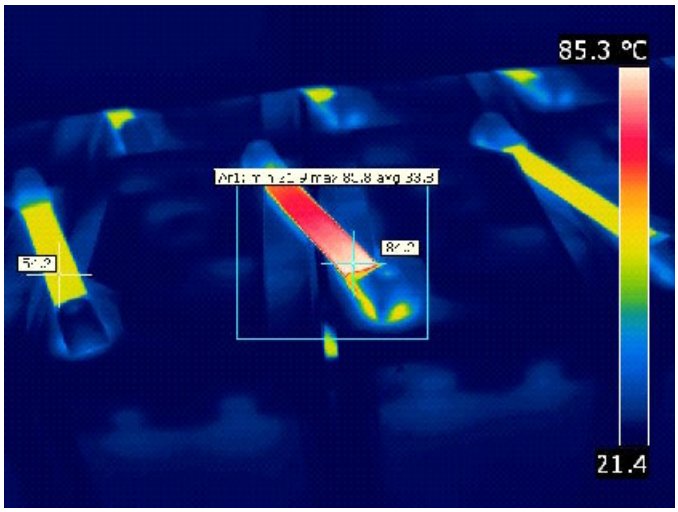
Load Test Results

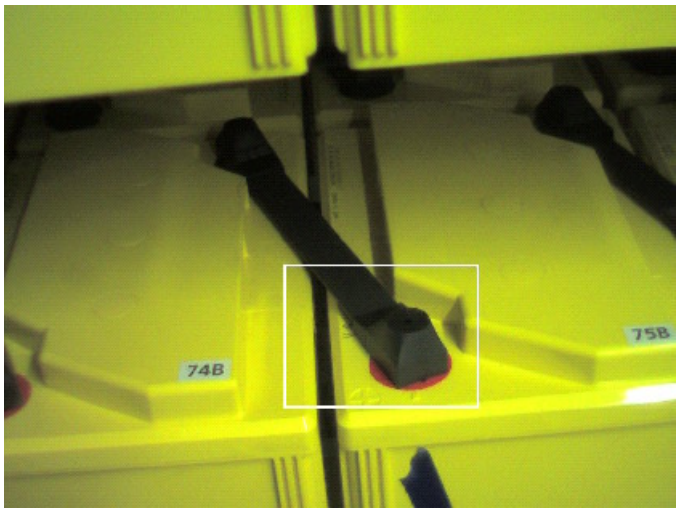
Component Rated Load:	5	amps
-:		amps
-:		amps
		amps

Thermal Information

Operation Priority: **Critical to operation**
Repair Priority: **2-Serious**
Ambient: **22 C** Enviroment: **Indoors**

Component Temperature On -:	86	C
- Reference Temperature:	54	C
Temperature Rise Above Reference:	32	C
ANSI/EEE/NEMA Max Allowable Temp @ 100% Load:	75	C
Est Temp Rise over reference @ 50% Load:	0	
Est Temp Rise over reference @ 100% Load:	0	





IR File: IR_23133a.jpg IR Date: 04/09/2010 Photo File: DC_23134.jpg Photo Date: 04/09/2010

Repair Information

PLEASE FAX BACK AFTER REPAIR TO: 0871 900 4978 OR INFO@THERMALIMAGING.CO.UK

Loss to Production
☐ Yes ☐ No ☑ Unknown

Consequences of Failure:
Loss of STRING B

Parts Req. Before Failure:

Parts Req. After Failure:

Repair Recommendation:
Check, clean & re-make connection

Repair Date: **Repaired By:**

Root Cause:

Repair Procedure:

Repair Action:

Documentation/Work Order T/D Electrical: Please add Corrective Work Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Work Order #: NOT ISSUED

Corrective Work Order #:

PLEASE ADD CORRECTIVE WORK ORDER ABOVE

InspectionNo: 1665
Report Date: 22/11/2011

1665-3

Current Prob No: T/D Electrical/3

Location/Equipment Information

Asset ID: B203722
Barcode: NI
Location: UPSA1
STRING B

Component: **Batteries**
Problem: Cell link 33B-34B connection indicates higher temperature than expected on 6v cell

Manufacturer: **Powersafe**
Model No: **6v 165 2**
Circuit Voltage: **6 Volts**

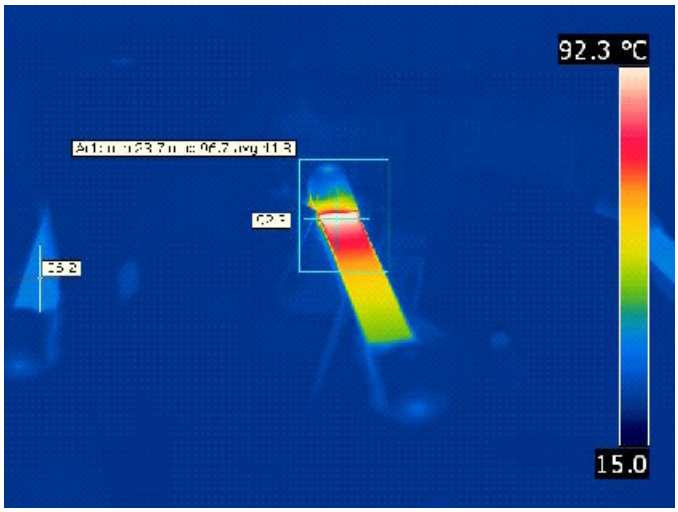
Load Test Results

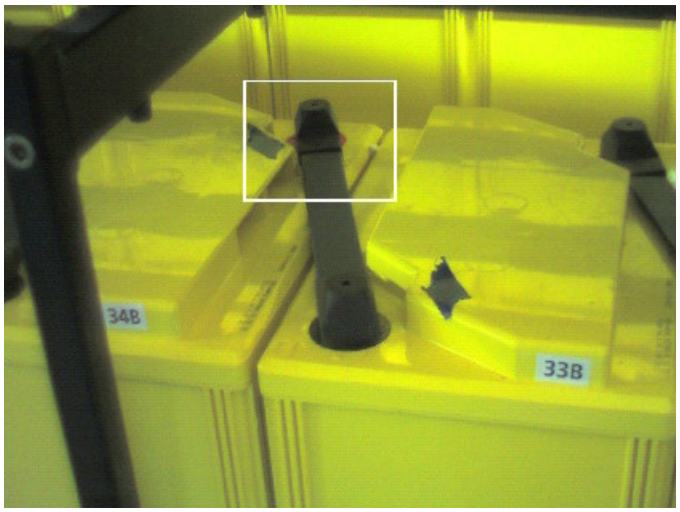
Component Rated Load:	5	amps
-:		amps
-:		amps
		amps

Thermal Information

Operation Priority: **Critical to operation**
Repair Priority: **1-Critical**
Ambient: **22 C** Enviroment: **Indoors**

Component Temperature On -:	**97 C**
- Reference Temperature:	**36 C**
Temperature Rise Above Reference:	**61 C**
ANSI/EEE/NEMA Max Allowable Temp @ 100% Load:	**75 C**
Est Temp Rise over reference @ 50% Load:	**0**
Est Temp Rise over reference @ 100% Load:	**0**





IR File: IR_23141a.jpg IR Date: 05/09/2010 Photo File: DC_23142.jpg Photo Date: 05/09/2010

Repair Information

PLEASE FAX BACK AFTER REPAIR TO: 0871 900 4978 OR INFO@THERMALIMAGING.CO.UK

Loss to Production
☐ Yes ☐ No ☑ Unknown

Consequences of Failure:
Loss of STRING B

Parts Req. Before Failure:

Parts Req. After Failure:

Repair Recommendation:
Check, clean & re-make connection

Repair Date: **Repaired By:**

Root Cause:

Repair Procedure:

Repair Action:

TI

TI Site 3.1 UPS Battery Discharge Testing

Documentation/Work Order T/D Electrical: Please add Corrective Work Order

Work Order #: NOT ISSUED

Corrective Work Order #:

PLEASE ADD CORRECTIVE WORK ORDER ABOVE

InspectionNo: 1665
Report Date: 22/11/2011

1665-4

Current Prob No: T/D Electrical/4

Location/Equipment Information

Asset ID: B204784
Barcode: NI
Location: UPSA4
STRING A

Component: **Batteries**
Problem: Indicated higher temperature than expected on 6v cell

Manufacturer: **Powersafe**
Model No: **6V 165 2**
Circuit Voltage: **6 Volts**

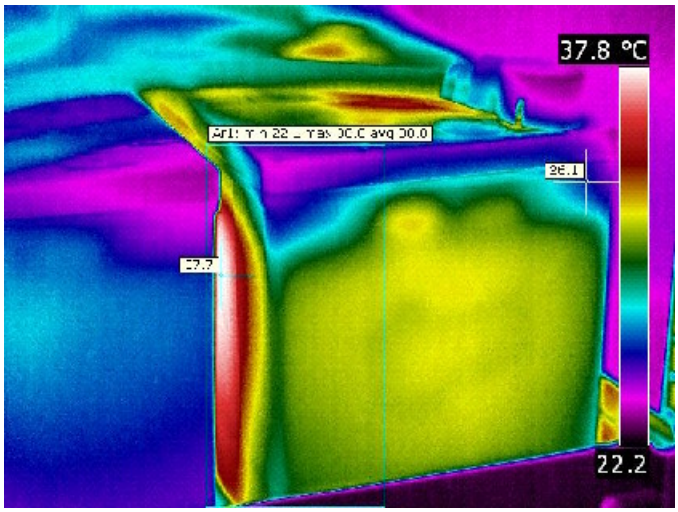
Load Test Results

Component Rated Load:	5	amps
-:		amps
-:		amps
		amps

Thermal Information

Operation Priority: **Critical to operation**
Repair Priority: **3-Important**
Ambient: **22 C** Enviroment: **Indoors**

Component Temperature On -:	**43 C**
- Reference Temperature:	**30 C**
Temperature Rise Above Reference:	**13 C**
ANSI/EEE/NEMA Max Allowable Temp @ 100% Load:	**75 C**
Est Temp Rise over reference @ 50% Load:	**0**
Est Temp Rise over reference @ 100% Load:	**0**



IR File: IR_18686a.jpg IR Date: 12/12/2010 Photo File: DC_18687.jpg Photo Date: 12/12/2010

Repair Information

PLEASE FAX BACK AFTER REPAIR TO: 0871 900 4978 OR INFO@THERMALIMAGING.CO.UK

Loss to Production
☐ Yes ☐ No ☑ Unknown

Consequences of Failure:
Loss of STRING A

Parts Req. Before Failure:

Parts Req. After Failure:

Repair Recommendation:
Either replace or investigate internal contacts to determine source of temperature anomaly

Repair Date:

Repaired By:

Root Cause:

Repair Procedure:

Repair Action:

Documentation/Work Order T/D Electrical: Please add Corrective Work Order

TI

TI Site 3.1 UPS Battery Discharge Testing

Work Order #: NOT ISSUED

Corrective Work Order #:

PLEASE ADD CORRECTIVE WORK ORDER ABOVE

InspectionNo: 1665
Report Date: 22/11/2011

1665-5

Current Prob No: T/D Electrical/5

Location/Equipment Information

Asset ID: B203806
Barcode: NI
Location: UPSA2
STRING B

Component: **Batteries**
Problem: Indicated higher temperature than expected on 6v cell no.8

Manufacturer: **Powersafe**
Model No: **6v 165 2**
Circuit Voltage: **6 Volts**

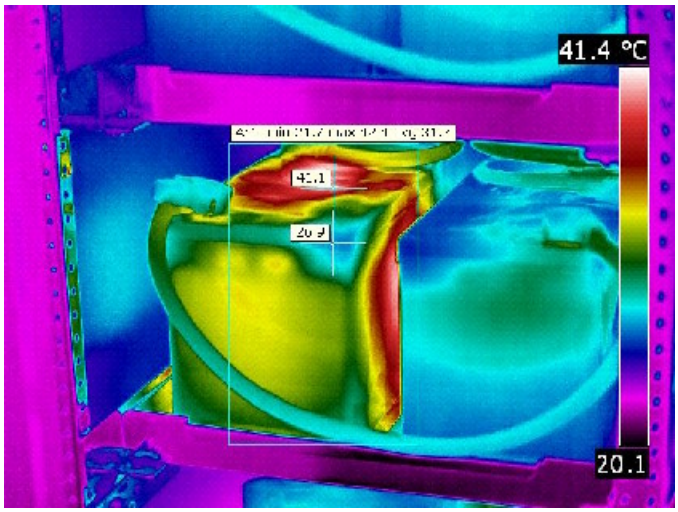
Load Test Results

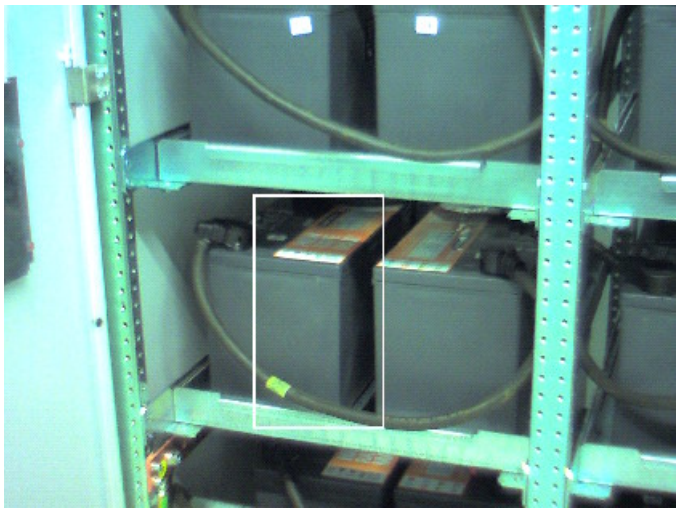
Component Rated Load:	5	amps
-:		amps
-:		amps
		amps

Thermal Information

Operation Priority: **Critical to operation**
Repair Priority: **3-Important**
Ambient: **22 C** Enviroment: **Indoors**

Component Temperature On -:	**43 C**
- Reference Temperature:	**30 C**
Temperature Rise Above Reference:	**13 C**
ANSI/EEE/NEMA Max Allowable Temp @ 100% Load:	**75 C**
Est Temp Rise over reference @ 50% Load:	**0**
Est Temp Rise over reference @ 100% Load:	**0**





IR File: IR_18682a.jpg IR Date: 12/12/2010 Photo File: DC_18683.jpg Photo Date: 12/12/2010

Repair Information

PLEASE FAX BACK AFTER REPAIR TO: 0871 900 4978 OR INFO@THERMALIMAGING.CO.UK

Loss to Production
☐ Yes ☐ No ☑ Unknown

Consequences of Failure:
Loss of STRING B

Parts Req. Before Failure:

Parts Req. After Failure:

Repair Recommendation:
Either replace or investigate internal contacts to determine source of temperature anomaly

Repair Date: **Repaired By:**

Root Cause:

Repair Procedure:

Repair Action:

Ti Thermal Imaging LTD

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Client Work Appraisal

We are continually trying to improve our service and ensure that all our inspections are carried out to the highest standards. Please use the form below to add your comments, anonymously if you prefer and send back to us at the address above or:

Email: info@thermalimaging.co.uk
Fax: +44 870 9004971

TI Job Number: (Optional)	Excellent	Good	Mediocre	Poor	Comments
Office:					
Response time to enquiry					
Content of information sent on enquiry					
Telephone and email manner					
Price					
Value					
Engineer:					
Time keeping					
Appearance					
Code of conduct					
Subject knowledge					
Method of work					
Engineer flexibility					
Inspection Specification:					
Equipment and software					
Report content					
Report delivery time					
Report retrieval					
Other Comments:					