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Kingsmill are passionate about protecting infrastructure from the devastating impact of lightning activity. Not only do Kingsmill offer a wide range of protection solutions, we also offer systems designed to monitor activity.

**TRANSIENT  
MONITORING**  
page **MON:8**



The **Jupiter Transient Monitoring System (TMS)** is a high-speed data acquisition device, that continuously monitors power, control and communication systems for transient overvoltage activity. The system can quickly identify transient signals that could compromise system operation and based upon accurate waveform characterisation, efficiently pinpoint the source.

**JUPITER OLS**  
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Jupiter OLS is a site-specific, high-speed video based lightning location system, that detects 100% of lightning return strokes and pinpoints the location of lightning strikes with unprecedented accuracy.

**CuTS<sup>®</sup>**  
**ZM**  
**THEFT DETECTION**  
pages MON:4 - 7



CuTS<sup>®</sup> Copper Theft Detection and Earthing Integrity Monitoring technology monitors earthing infrastructure in real time for theft, degradation and failure, providing operating companies with immediate, accurate intelligence on safety risks and service status.



# Copper Theft Detection & Earthing Integrity Monitoring



## Theft

**Every year, copper is stolen from installations, whether they are:**

- Cell phone sites
- Substations
- Industrial complexes
- Commercial complexes
- Domestic dwellings

**It is an ever-increasing problem resulting in:**

- Costly downtime
- Safety issues including danger to life
- Replacement material and installation costs

CuTS offers a way of monitoring theft. It works on most metals, so the application doesn't have to be copper based. For example, CuTS works just as well on steel structures.

## Earth integrity monitoring

Over time, anything buried in the ground corrodes. If that material is part of an earthing system providing a low impedance path to earth, then problems could arise.

CuTS® offers a way of monitoring the integrity of earthing systems, especially in remote sites. CuTS® can be used to monitor single asset earths on, for instance, a transformer or Earthing on the whole site.

**CuTS® technology monitors earthing infrastructure in real time for theft, degradation and failure, providing operating companies with immediate, accurate intelligence on safety risks and service status.**

- Protecting staff and public from death and serious injury
- Minimising outage risk and unplanned maintenance
- Reducing consequential damages and other financial loss
- CuTS® - Detecting earthing conductor theft and degradation as it happens
- Integrates with existing security & control infrastructure eg SCADA
- Reports degradation of safety infrastructure
- Proactively anticipate faults/optimize maintenance
- Root cause analysis
- Quick fault resolution
- Reduce operational down time for services
- Meet contractual performance commitments

CuTS® is a scalable solution designed for service environments where safety and continuity are paramount. CuTS® technology monitors earthing infrastructure in real time for theft, degradation and failure, providing operating companies with immediate, accurate intelligence on asset status. Monitoring enhances site safety, protecting both staff and public from death and serious injury. It also minimises risk of outage, asset damage and unplanned maintenance thereby reducing engineering costs, consequential damages and other financial loss.

## Typical applications

### Power Transmission/Distribution

- Substation grounding
- Power cables

### Telecoms

- Mobile base station grounding
- General site grounding

### Rail infrastructure

- Communications site grounding
- Substation grounding

Wires are connected between representative points of the grounding infrastructure and the CuTS® unit. The inductive properties of the monitored infrastructure are then continuously compared to a controlled reference. The CuTS® unit incorporates a unique and highly sensitive patented inductance/impedance change monitoring system. Changes to the monitored grounding infrastructure (such as the theft of metal), induce changes in the measured inductance. On board algorithms apply filters and thresholds to understand the change and effectively manage non-relevant spurious site conditions such as voltages, ground connectivity, fault conditions or electrical discharges. Once analysed, appropriate notifications of the change are communicated.

Configuration is achieved through simple tuning/adjustment at installation via the CuTS® management interface. Notifications are sent to a cloud based interface via an IoT modem, and/or can be incorporated into existing monitoring platforms.

## The impact of copper theft

### Safety and service are the primary issues arising from copper theft from substations

#### *The Facts*

- Theft of copper from substations is common
- It represents serious safety and operational risk

#### *Resultant outage and costs*

- Resultant damage to plant is often substantially more costly than the cost of replacing stolen material
- Service outage (loss of service) may result in regulatory and/or compensation costs

#### *Risk mitigation*

- Requires there to be knowledge of the event
- Undetected events are potentially lethal on site
- Undetected events can be a risk to the public at service delivery points

# Technology

## Features

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- Detects damage and physical disconnection of the earthing system (ie theft)
- Detects changes in grounding infrastructure
- System is difficult to circumvent
- High impedance sensor input
- Not susceptible to false alarms
- Easy to install with no disconnections
- Embedded Lightning and Surge Protection

## Benefits

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- Alerts operator upon damage, disconnection or other physical change, such as corrosion
- Secure against knowledgeable thieves
- Does not interfere with grounding integrity
- Avoids unnecessary investigation time
- Common deployment procedure across all sites
- No service interruptions to the site
- Ensures minimal failure due to storms and operational surge events
- Low cost compared to 24 hour manned monitoring . . .

. . . Thus providing 360° 24 hour all-round monitoring (vs camera systems which require constantly manned monitoring, are susceptible to false alarms, have limited field of vision and might not cover the whole site)

# Commercial

## Features

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- Monitors grounding infrastructure above and below ground, providing unique data
- Accurate location based fault detection
- Permanently installed with very low asset and maintenance costs
- Automated remote monitoring
- Designed for remote or city sites
- Flexible communications options

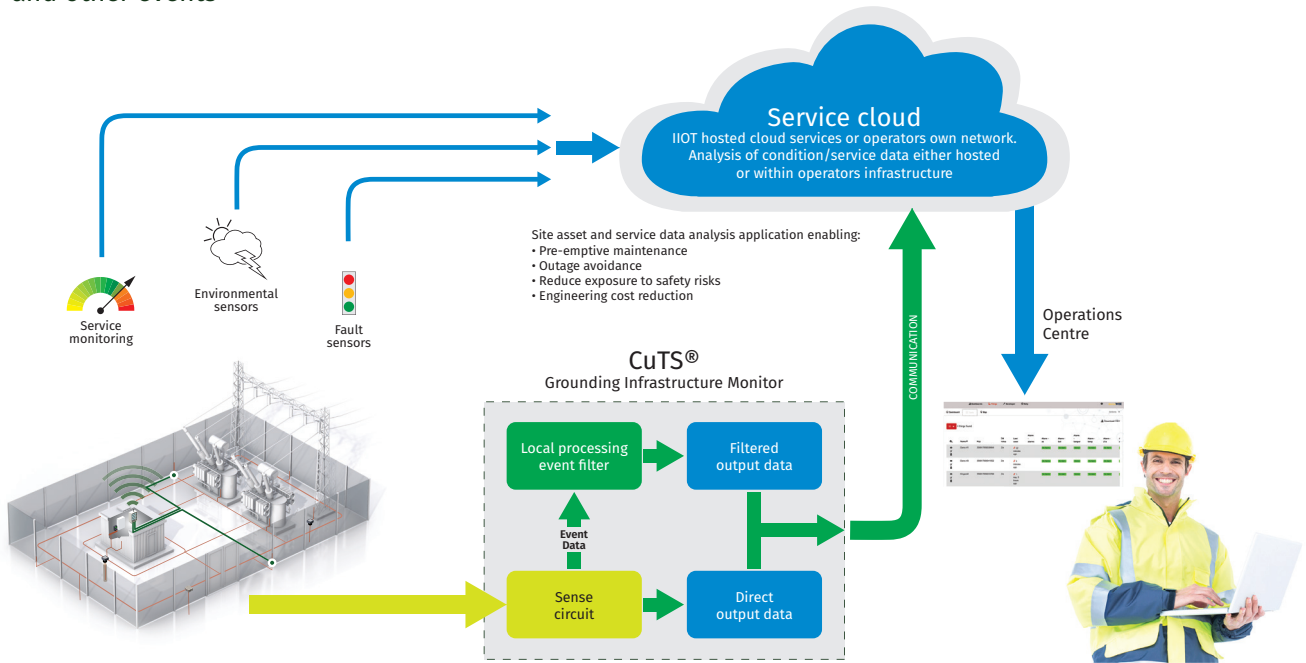
## Benefits

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- Enhances asset and site safety
- Reduces outage time when site compromised
- Reduces engineering fix time and costs
- Low lifetime cost
- Cost reduction through reduced physical inspection
- Minimises costs and maximises operational gain from common deployment
- Provides future proofing for changing technologies communications systems

How it works

- CuTS® monitors metallic infrastructure for change due to cutting, removal, damage or degradation
- CuTS® system looks for changes in the monitored infrastructure inductance characteristics
- The monitored infrastructure is coupled into a sensing circuit via sense wire inputs which detect minor changes (down to below 0.02µH)
- When change occurs beyond the adjustable thresholds, the unit alarm is activated, sending secure alerts
- Filter thresholds include the extent of change detected and duration of change - this copes with site faults and other events

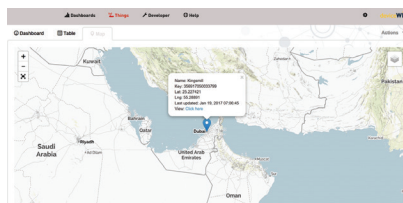


Client portal

Clients are provided with their own Portal Dashboard from where they can monitor all sites and activity. Examples of client data that is available through the Portal Dashboard are shown below:

Name	Key	Def status	Last test	Alarms	Alarm - 1s	Alarm - 5s	Alarm - 15s	Alarm - 30s	Alarm - 1m	Alarm - 5m	Alarm - 15m	Alarm - 30m	Alarm - 1h
Quays 01	3000170000000000	2m	17/02/2018 10:00	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Quays 02	3000170000000000	2m	17/02/2018 10:00	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Quays 03	3000170000000000	2m	17/02/2018 10:00	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Quays 04	3000170000000000	2m	17/02/2018 10:00	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

All sites status table



Site map view

Details	Attributes	Events	Files
Thing definition	2m	OK	
Key	3000170000000000		
Last test	17/02/2018 10:00		
Tags	OK		
Security Tags	OK		
Location	2m		
Identifiers	OK		
Description	OK		
Identify	OK		
Storage	21,301 MB		
API counts - needs to data	0		

Site details

Contact us for a full demonstration of the CuTS Copper Theft Detection & Earthing Integrity Monitoring system.



# Jupiter Transient Monitoring System - TMS

Lightning strikes can induce hazardous transients on power and data lines, resulting in damage to electronic systems and costly downtime and repairs.

Damaging transients can also be generated from within a facility. These are known as Switching Transients and result from the operation of large inductive loads, for example, large banks of lighting and production process machinery.

Today, more than ever before, our everyday lives depend upon the continuous and reliable operation of electronic systems, whether they are located in retail centres, medical facilities, air traffic control, utilities, banks, Government departments, commercial and industrial facilities.

The Jupiter Transient Monitoring System (TMS) is a high-speed data acquisition device, that continuously monitors power, control and communication systems for transient overvoltage activity.

The Jupiter TMS system can quickly identify transient signals that could compromise system operation and based upon accurate waveform characterisation, efficiently pinpoint the source.

Alerts are immediate and the unit is rugged and proven immune to the electromagnetic effects of lightning.



## Benefits

- Accurate measurement of direct, or indirectly coupled, lightning and switching transients
- High bandwidth, high fidelity current, voltage and electromagnetic field measurements
- Near real time alerts, reporting and characterisation of recorded transient events

## Specifications

Power	24V DC
Communication	Cell or fibre LAN
Channels	4 Analog Channels
Input	Balanced Differential
Input Range	±200mV - ±200V
Sampling Rate	80MS/s (up to 125MS/s)
Resolution	14 bits
Memory	4GB
Example Sensor Types	Magnetic Field Sensors, Electric Field Sensors, Current Sensors, Voltage Sensors

## How can Jupiter TMS work for you?

### Bandwidth:

Jupiter TMS has greater than 40MHz of analog bandwidth - more than an order of magnitude higher than typical power quality monitors. Jupiter TMS will accurately resolve all high-speed transient waveforms, allowing users to fully characterise damaging transient events.

### Signal Conditioners:

The analog front-end of Jupiter TMS is customisable for handling AC and DC voltages in addition to the outputs of various transducers, including current probes, electromagnetic field sensors and environmental sensors. Users define trigger thresholds for all connected sensors through a graphical interface.

### Zero-Deadtime Recording:

Most data acquisition systems cannot resolve transient signals that arrive repeatedly in quick-time succession - the systems are effectively blind while data is being saved and processed. Jupiter TMS is capable of triggering continuously without losing a single data point. The result? You know every time your system or facility has been exposed to a dangerous transient signal.

### Transient Immunity:

Jupiter TMS captures accurate, high-fidelity transient measurements while ensuring the captured data is not degraded by the effects of those same transients. The proven design was born through the rigorous demands of the USA's Space Program - where failures are not an option.



# Jupiter Optical Lightning Surveillance - OLS

Jupiter OLS is a site-specific, high-speed video based lightning location system, that detects 100% of lightning return strokes and pinpoints the location of lightning strikes with unprecedented accuracy.

Existing commercially available location systems only identify the general strike locations of lightning flashes, fail to detect more than 10% of individual ground strikes, may misreport strike locations by up to several kilometres and can ignore lightning discharges with multiple attachment points – a phenomenon that can occur in approximately 50% of cloud-to-ground lightning flashes.

Jupiter OLS was developed following years of research into the physics of lightning, high-speed data acquisition systems and state of the art sensing equipment. The performance and value of this system has been validated during extended deployment and testing at NASA's Kennedy Space Center, where the systems monitor critical NASA payloads and facilities.

## Benefits

### > Aviation and Aerospace

Avoid closures, unnecessary launch delays, and simplify inspections after storms occur.

### > Insurance and Warranty Claims

Substantiate claims and deter fraud.

### > Military and Security

Timely intelligence for mission critical assets.

### > Energy

Monitor the functionality of lightning-vulnerable nuclear, solar, wind, oil and gas production, storage and distribution systems.

### > Communication, Data & Operation Centres

When downtime is simply not acceptable, depend on Jupiter OLS.

## Technical specifications

General	
Power	Solar, AC
Communication	Cell or fibre LAN
Infrastructure required	None
Photographs	
Resolution	1280 x 1024px
Frame Rate	100 - 1800fps
Bit Depth	12 bit colour or monochrome
Pixel Size	5.6µm
Enclosure	
ANSI/IEC 60529	IP66, protected against dust and high pressure water jets from any direction, resists coastal and industrial environments

## Coverage and configuration

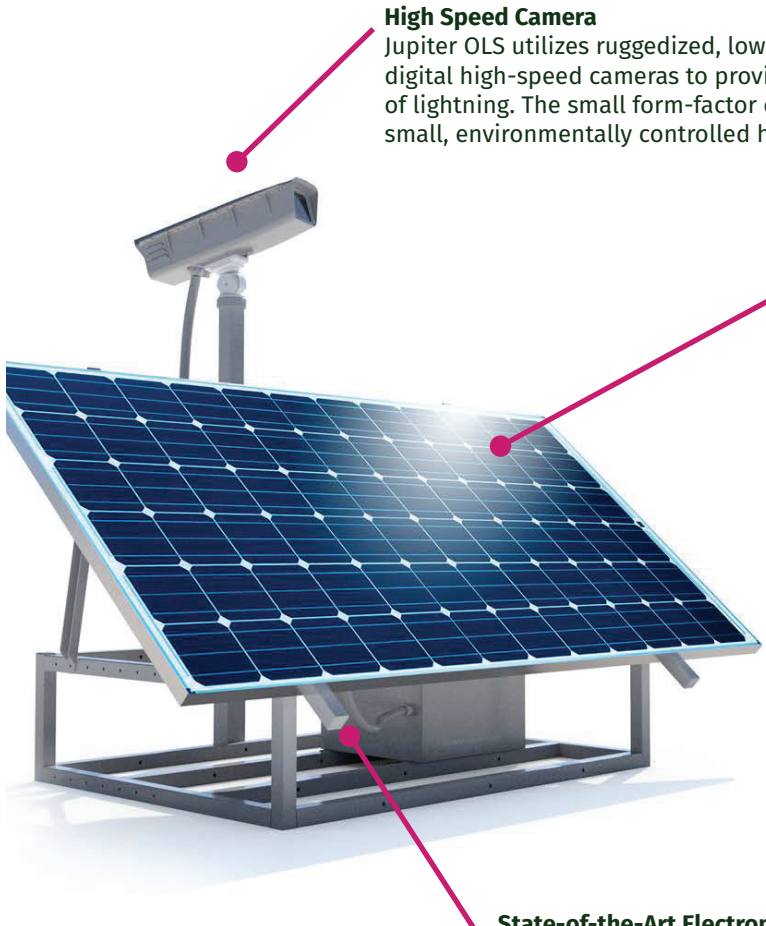
Each Jupiter OLS installation is configured specifically for the site and monitored assets. Smaller sites can be monitored with a single camera, and two or more cameras may be required to provide multi-angle image captures and/or precision surveillance of larger sites.

## Customisable features

- > Number, position and mounting of Jupiter OLS units
- > Camera framing rates and lensing
- > Communication, alarm and reporting protocols
- > Power input

## Jupiter OLS is lightning fast

The heart of Jupiter OLS is a unique, high-speed image acquisition and processing system designed to quickly and accurately capture the optical radiation of lightning. The system automatically photographs and records critical data about the lightning strike and immediately sends actionable alerts. Jupiter OLS monitors all lightning interaction with your assets and facilities 24/7 with zero system downtime.



**High Speed Camera**  
Jupiter OLS utilizes ruggedized, low-power, zero dead-time digital high-speed cameras to provide high-resolution imagery of lightning. The small form-factor cameras are deployed in small, environmentally controlled housings.

**Solar Powered**  
The Jupiter OLS system can be powered exclusively via an integrated photovoltaic array, requiring no external power input or other supporting communication infrastructure. Power is conditioned to be immune to the electromagnetic effects of very close lightning, making Jupiter OLS a robust lightning monitoring system.

**State-of-the-Art Electronics and Software**  
Lightning images are automatically acquired, processed, time-tagged with microsecond accuracy, and quickly delivered to the user via secure email and web interfaces. Jupiter OLS is designed using the most advanced aerospace-grade components to provide years of maintenance-free operation with zero system down time. The robust performance of the Jupiter OLS system has been fully tested and qualified at Kennedy Space Center, including prolonged exposure to extreme heat, humidity, and harsh corrosive and electromagnetic environments.

**Note:** Jupiter OLS is a monitoring and surveillance system. It does not provide warning of potential lightning strikes nor protection against lightning strikes. For assistance in these areas, contact Kingsmill.

◀ Typical ground-based, solar-powered Jupiter OLS installation