Re: trial 1 - Over-dimension vehicle enforcement using LTI lasers at marulan south HVSS

From: Sam Sol <[redacted]>
To: SOLIMAN Samer <samer.soliman@rms.nsw.gov.au>, Steve Yeah <[redacted], [redacted]>
Date: Mon, 03 Oct 2016 18:25:58 +1100
Attachments: Quote 095 - Over-dimension vehicle enforcement using LTI lasers.doc (82.94 kB); Hume Highway, Marulan Southbound HVCS, NSW TIRTL Site Plan V4.pdf (401.86 kB); Maruilan Southbound HVCS - Project plan.pdf (1.11 MB)

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quote attached. convert to PDF and send

On Fri, Sep 30, 2016 at 10:48 AM, SOLIMAN Samer <Samer.SOLIMAN@rms.nsw.gov.au> wrote:

Samer Soliman
Manager Heavy Vehicle Programs
Compliance Systems | Compliance Operations Branch | Compliance and Regulatory Services
T 02 88370687 | [redacted]
www.rms.nsw.gov.au

Roads and Maritime Services
99 Phillip st Parramatta NSW 2150

Before printing, please consider the environment

---------- Forwarded message ----------
From: SINGH Jai <Jai.SINGH@rms.nsw.gov.au>
To: "'Jonathan Spring'" <spring@ceos.com.au>, "kristian.penno@ceos.com.au" <kristian.penno@ceos.com.au>, "'Colin Campbell'" <colinc@ciceng.com.au>, SOLIMAN Samer <Samer.SOLIMAN@rms.nsw.gov.au>, "greg.robinson@ceos.com.au" <greg.robinson@ceos.com.au>
Cc:
Date: Thu, 29 Sep 2016 15:32:19 +1000
Subject: RE: Over dimension screening lane trial and secondary trigger trial
Hi All,

Just some quick minutes from today's meeting

- 1. *Confirm installation and trial dates (CEOS should be present for trial days to assist)*
  - * As this solution is still in R&D phase, there will still be quite a lot of testing required post install which could take a few weeks to complete.
  - * New proposed date for trial is 14/10/2016 (pending outcome from testing)
  - * Meeting will be scheduled after install to discuss progression
  - * Depending on the outcome from testing, there may not be a need for CEOS to be present during trial period.
- 2. *Discuss options for real time data during trial (likely VOI portal)*
  - * The trial will consist of an output from the HARE to trigger for heavy vehicles deemed to be over height or length based on data collected from the LTI and TIRTL. This output will be presented in Truckscan using the existing 'over height' criteria. The inspector will then be required to measure both the height and length of the vehicle
- 3. *Confirm hardware installation location (does new hardware interfere with current setup and is there any more room for additional hardware on gantry)*
  - * The TIRTL data will be collected and correlated with the data collected from the LTI sensors. This will then be used to analyse the performance of the LTI sensors.
  - * There may be an option to relocate the body height TIRTL closer to the beginning of the screening lane to allow for a more confident length reading.
- 4. *Discuss proof of concept i.e. how do we determine successful trial (IVR will have manually measure vehicles to compare with LTI measurement)*
  - * Trial will be conducted as following:

---------- Forwarded message ----------
From: Greg Robinson <greg.robinson@ceos.com.au>
To: SINGH Jai <Jai.SINGH@rms.nsw.gov.au>, SOLIMAN Samer <Samer.SOLIMAN@rms.nsw.gov.au>
Cc: Col Campbell <colinc@ciceng.com.au>, Chris PATTERSON <chrisp@ciceng.com.au>, Kristian Penno <kristian.penno@ceos.com.au>, Jon Spring <jon.spring@ceos.com.au>
Date: Wed, 21 Sep 2016 16:44:33 +1000
Subject: Marulan Southbound OH-OL TIRTL project plan
Hi Jai, Samer,

Jon has asked me to send you the site plan and project plan for the upcoming installation of an overheight + overlength TIRTLs including some lasers.
Please let me know if you have any questions.

regards,
GregR
--
Greg Robinson
Customer Service Manager
CEOS Pty Ltd
Unit 3, 17 Burgundy St
Heidelberg VIC 3084
Telephone: +61 3 9458 4955
Fax: +61 3 9458 4966
Mobile: [redacted]
Email: greg.robinson@ceos.com.au
Skype: greg.f.robinson

NOVATION

Novation Engineering Pty Ltd
ABN: 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: (02) 9629 1826
Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 095: Over-dimension vehicle enforcement system using LTI lasers - Field Trials and scoping study

Introduction

Further to our recent discussions, Novation Engineering Pty Ltd is pleased to provide a fixed price quotation to Roads and Maritime Services for the below scope of works.

Scope of Works

The following items would be carried out as per this quote:

.1 Field Trial at RMS selected site(s): Over-dimension vehicle enforcement system using LTI lasers.

.2 Scoping Study – Over-dimension vehicle enforcement system using LTI lasers. With the understanding that RMS is currently investigating automated vehicle over-dimension screening technologies to enforce heavy vehicle over-dimension regulations in NSW.

.3 Over-dimension vehicle enforcement system field trial requirements:
- Gantry mounted.
- Adverse weather conditions.
- Vehicle speed limitations and dimension accuracy measurement.

.4 Engineering/design and fabrication of:
- Mounting bracket for gantry mounted LTI lasers.
- Mounting brackets for pole mounted required “body-height and over-height” TIRTL’s.

.5 Report on:
- Results of all over-dimension vehicle enforcement system trial results in the format prescribed by RMS (scoping study report).
- Provide recommendations on potential enforcement applications based on world best practice research performed.

Inclusions:
The following items are included in the services scope as per this proposal

- Scope of works listed above.

Exclusions:
The following items are excluded from the services scope as per this proposal:

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Assumptions:
This quote assumes the following:

- Novation Engineering will abide by all RMS WHS requirements.
- The trial period is to run for a 3 month period; or until the required sample size (to be agreed with RMS) is met.

Project Deliverables:
The following are deliverables along with the Project Management and testing:

- Scoping Study Report

Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

Fixed Cost Quotation
$79,100 excluding GST.

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Quote Valid until: 03/11/2016
Quote Ref: 095

This quotation is accepted by: Name: _____;

Title: _____; Date: ___ / ___ / _____

PO Ref: _____ Signature: _____

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Samer.SOLIMAN@rms.nsw.gov.au

_AuthorEmailDisplayName:
SOLIMAN Samer

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Steve O

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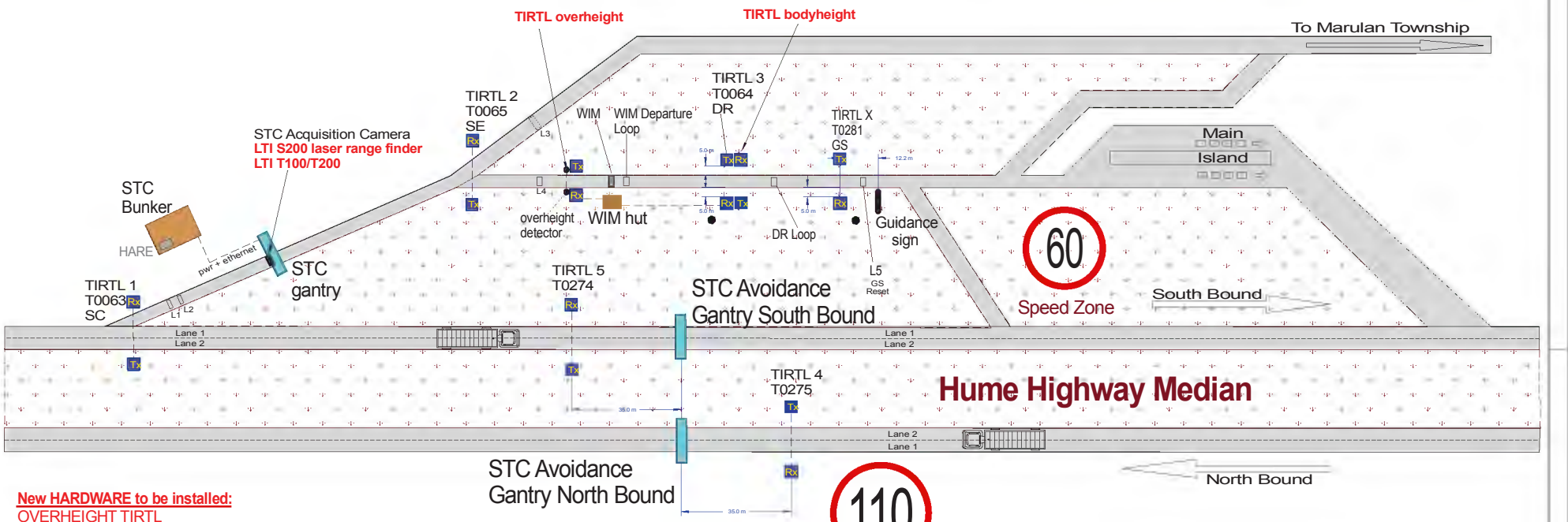
Marulan Southbound HVCS
Hume Highway, Marulan South, NSW TIRTL Site Plan

TIRTLs		
TIRTL1	T0063	Marulan Southbound HVCS SC (Safe-T-Cam camera)
TIRTL2	T0065	Marulan Southbound HVCS SE (Screening Lane Entry)
TIRTL3	T0064	Marulan Southbound HVCS DR (Driver Reaction)
TIRTLX	T0281	Marulan Southbound HVCS GS (Guidance Sign)
TIRTL5	T0274	Marulan Southbound Avoidance STC
TIRTL4	T0275	Marulan Northbound Avoidance STC



New HARDWARE to be installed:

OVERHEIGHT TIRTL
- mounted to existing overheight detector pole
- power + comms to WIM hut

BODY HEIGHT TIRTL
- mounted next to existing T0064 DR TIRTL
- power + comms run back to WIM hut

ACQUISITION CAMERA GANTRY SENSORS
- install LTI S200 laser range finder + DIGI serial/ethernet converter
- install LTI T100/T200 laser + DIGI serial/ethernet converter
- add switch to gantry

CONNECTIONS
- connect to existing HARE inside STC bunker

Notes:
- 12V DC and Communication provided from:
  STC bunker Marulan North HVCS (TIRTL 1),
  WIM hut (TIRTLs 2, 3 and X),
  STC cabinets Marulan Hwy Avoidance gantries (TIRTLs 4 and 5)
- Supply power to both RX and TX TIRTLs
- 2.5mm-squared versolex power cable used for all power runs less than 100m
- 4.0mm-squared versolex power cable used for all power runs in excess of 100m
- Antenna is 50mm galvanised steel pole, 3m high, with GPS/3G antenna mounted

CEOS Pty. Ltd
Unit 3, 17 Burgundy Street
Heidelberg
Vic 3084
Ph: (03) 9458-4955

Amendments			Approvals		
Issue	Change	Date	Date	Name	Position

Marulan Southbound HVCS,Hume Hwy, NSW TIRTL Site Drawing	
Version 4.0	Scale 1:1250
Sheet: 1 of 1	Date: 20/09/2016
Client: RTA	Filename: T0281 - Hume Highway, Marulan South, NSW TIRTL Site Drawing v3.SKF
Dwg. No.	Drawn By: OC Updated By: GR

Project plan for
Marulan Southbound HVCS
Installation of

- Overlength TIRTL
- Overheight TIRTL
- Laser sensors

Version 1.0

CEOS Industrial Pty. Ltd.
Unit 3, 17 Burgundy Street
Heidelberg, VIC, 3084

1. Objectives

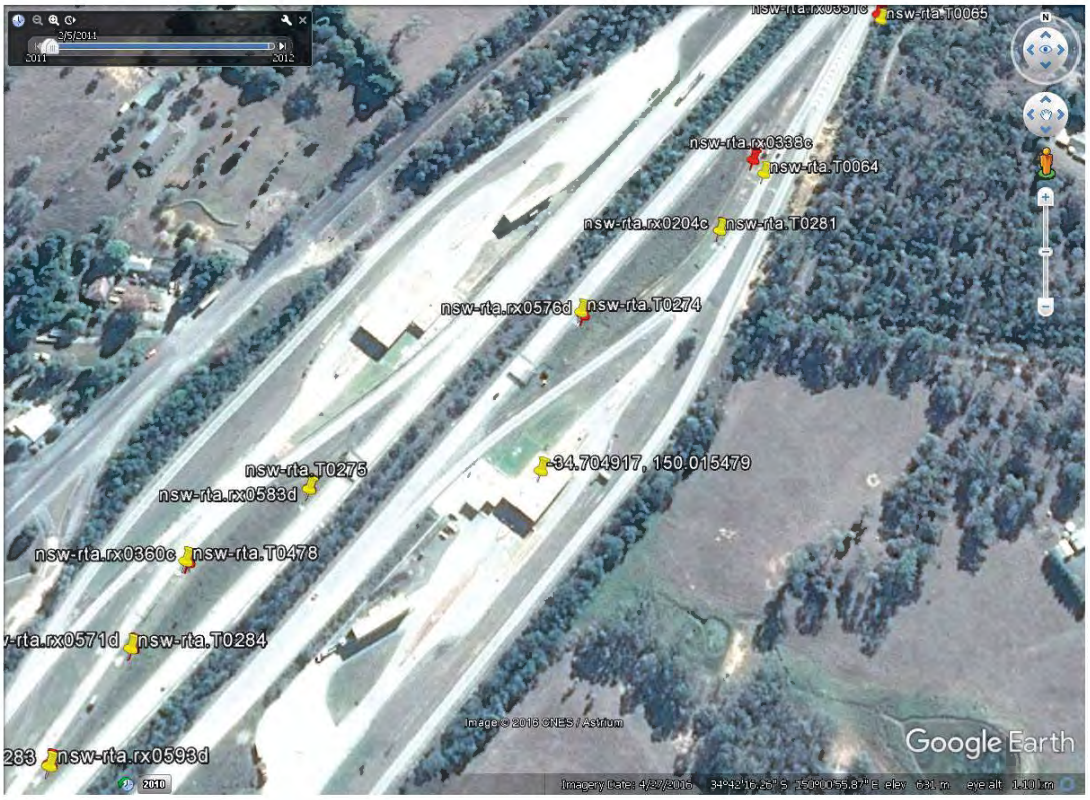
Installation of new equipment at the Marulan Southbound Heavy Vehicle Checking Station. The major equipment to be installed includes:

- Body height TIRTL detector
- Overheight TIRTL detector
- LTI TruSense S200 laser range finder
- LTI TruSense T100, T200 sensor

2. Site Location

The equipment is to be installed at the Marulan Southbound HVCS.

GPS coordinates (of the Marulan Southbound offices): -34.704917, 150.015479



3. Equipment List

- Overheight TIRTL (supplied by RMS)
- Overlength TIRTL (supplied by RMS)
- Qty 2 – antenna for TIRTL including postcap

- Overheight installation fittings (mounting brackets) (supplied by CEOS)
- 800mm aluminium enclosure for overlength TIRTL (CEOS)
- 200mm frangible mounting bracket for overlength TIRTL 800mm enclosure (CEOS)
- TruSense T100/200 dual laser (CEOS)
- TruSense S200 laser range finder (CEOS)

4. Scope of works

2.1 Overlength TIRTL

The body height TIRTL will be mounted at the location of the existing DR TIRTL. The body height TIRTL should be mounted as close as practicable beside the existing DR TIRTL – either before or after is acceptable. Closer is better – as this will assist matching algorithm performance. The mounting location will depend on the difficulty/ease of civil works.

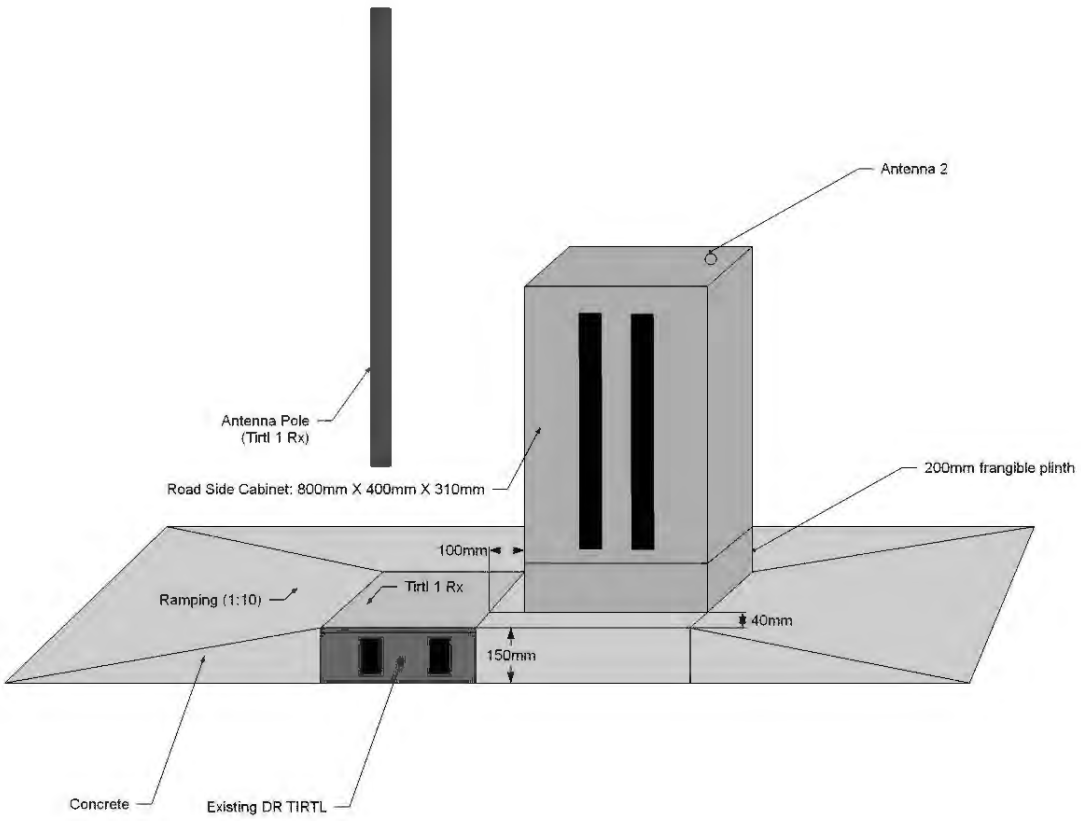


Figure 1 - suggested overlength TIRTL cabinet installation

- Power down existing DR TIRTL Rx and Tx. (CIC)
- Remove existing ethernet cable from DR TIRTL Rx (CIC)
- Installation of plinths and overlength cabinets for Rx and Tx (CIC)
- Bring power and ethernet into the overlength cabinet. Terminate and plug ethernet cable into (new) switch. Provide power to switch and TIRTL Rx. (CIC)
- Bring ethernet from overlength cabinet switch to both DR TIRTL Rx and new overlength TIRTL Rx and terminate cat 5 cables. (CIC)
- Termination of power cable on Rx and Tx (CIC)
- Connection of power and ethernet into switch inside WIM hut (CIC)
- Installation of a new RevE TIRTL pair (CIC)

- Alignment and configuration of TIRTL (CIC)
- Remote checks of configuration and operation (CEOS)

4.2 Overheight TIRTL

The overheight TIRTL will be mounted to the existing overheight detector pole. The body height TIRTL should be mounted at the same detection height as the existing overheight TIRTL.

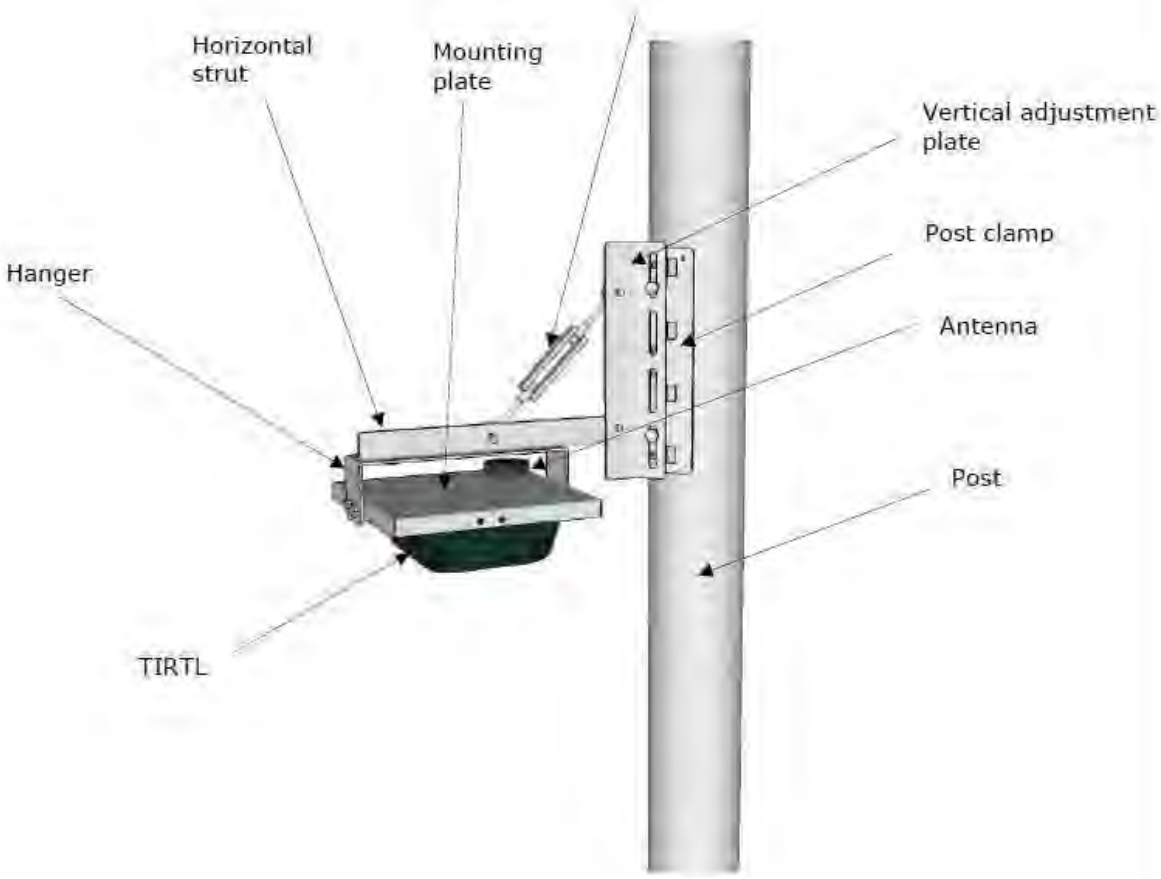


Figure 2 - Overheight TIRTL mounting

- Installation of overheight mounting brackets to both overheight poles (CIC)
- Installation of power cables from WIM hut to transmitter and receiver (CIC)
- Installation of new Cat5 cable from WIM to receiver (CIC)
- Termination of Cat5 cable at receiver (CIC)
- Termination of power cable on Rx and Tx (CIC)
- Connection of ethernet into switch inside WIM hut (CIC)
- Installation of a new RevE TIRTL pair including antenna (CIC)
- Alignment and configuration of TIRTL (CIC)
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4.3 Two (2) Laser Sensors

These sensors will be mounted on the STC acquisition gantry.

Figure 3 – TruSense S220 laser range finder

Figure 4 - TruSense T100/200 dual laser

- Installation of new switch in a STC acquisition gantry cabinet (this cabinet may be needed to be installed) (CIC)
- Utilisation of existing spare CAT5 cable from STC bunker to STC acquisition gantry cabinet (CIC)

- Termination of Cat5 cable and connection to switch (CIC)
- Installation and power-up of one (1) new DIGI serial-ethernet media converters in STC acquisition gantry cabinet (CIC)
- Installation of 12 V DC power cabling from STC bunker to two (2) new Laser sensors (CIC)
- Installation of serial cabling from laser sensors to DIGI (inside the STC acquisition gantry cabinet) (CIC)
- Installation of TruSense S200 laser range finder (CIC)
- Installation of TruSense T100, T200 laser sensor (CIC)
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Marulan Southbound HVCS
Hume Highway, Marulan South,
NSW TIRTL Site Plan

TIRTLs		
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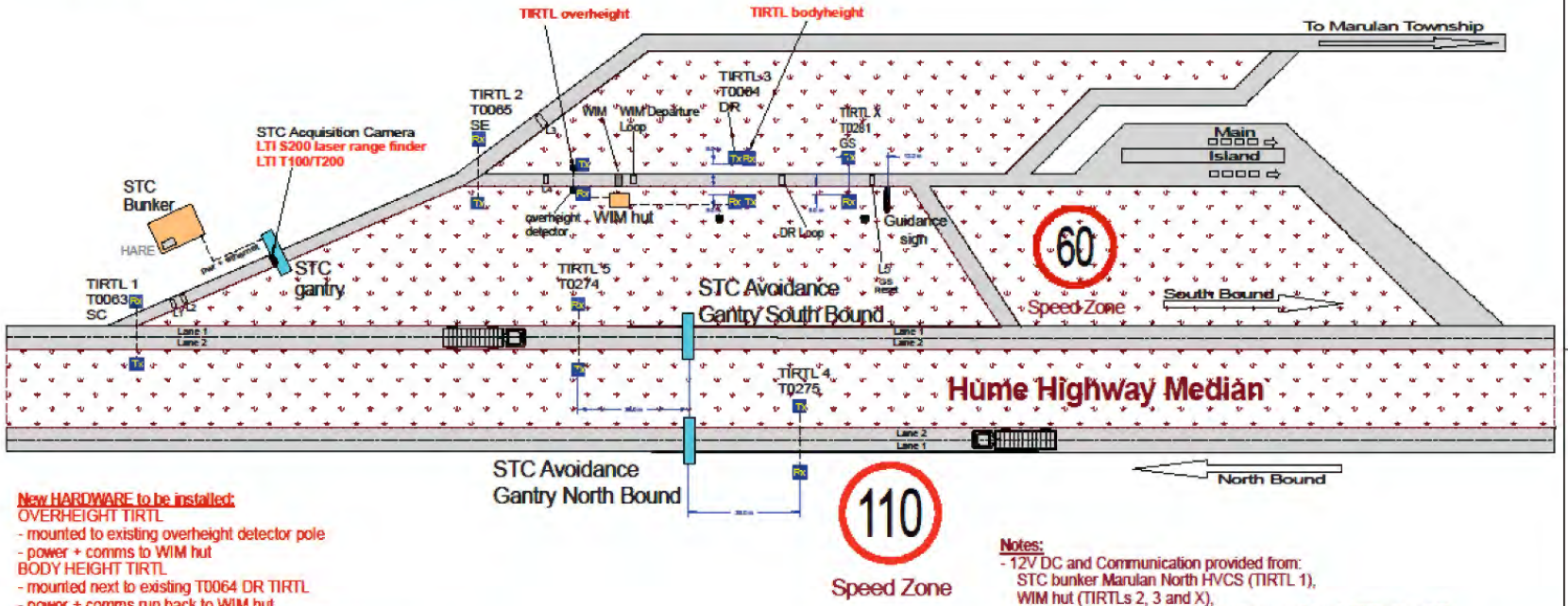

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Dwg. No.	Drawn By: OC Updated By: GR

Figure 5 - STC Acquisition Camera Gantry

Figure 6 – T0064 DR TIRTL

Figure 7 – Existing overheight detector

Novation Engineering Pty Ltd
ABN: 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: (02) 9629 1826
Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 095: Over-dimension vehicle enforcement system using LTI lasers - Field Trials and scoping study

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Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

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$79,100 excluding GST.

Date Issued: 03/10/2016
Quote Valid until: 03/11/2016
Quote Ref: 095

This quotation is accepted by: Name: _____;

Title: _____; Date: ___ / ___ / _____

PO Ref: _____ Signature: _____

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NTFS ACE 1 Type:
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Read; Write; Write; Read Extended Attributes; Write Extended Attributes; Execute File; Delete Child; Read Attributes; Write Attributes; Delete; Read Security Descriptor; Write DACL; Write Owner; Synchronize

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NTFS ACE 2 Type:
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NTFS ACE 3 Access Mask:
Read; Write; Write; Read Extended Attributes; Write Extended Attributes; Execute File; Delete Child; Read Attributes; Write Attributes; Delete; Read Security Descriptor; Write DACL; Write Owner; Synchronize

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Monday, October 3, 2016 at 6:23:43 PM Australian Eastern Daylight Time

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QUOTE0~1.DOC

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Monday, October 3, 2016 at 6:23:43 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:23:43 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:02:49 PM Australian Eastern Daylight Time

NTFS File Name Attribute Win32 File Modified:
Monday, October 3, 2016 at 6:23:43 PM Australian Eastern Daylight Time

NTFS File Name Attribute Win32 File Name:
Quote 095 - Over-dimension vehicle enforcement using LTI lasers.doc

NTFS Hard Links:
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NTFS MFT Index:
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Monday, October 3, 2016 at 5:21:51 PM Australian Eastern Daylight Time

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58,607

Page Count:
2

Paragraphs:
4

Physical Start Sector:
13,811,200

Revision Number:
6

Scale Crop:
false

Shared Document:
false

Subject:

Template:
Normal

Title:

Word Count:
366

Quote 095- Over Dimension LTI Sensors

From: novationengineering novationengineering <novationengineering@bigpond.com>
To: SOLIMAN Samer <samer.soliman@rms.nsw.gov.au>
Date: Fri, 07 Oct 2016 14:25:50 +1100
Attachments: Quote 095 - Over-dimension vehicle enforcement using LTI lasers.pdf (175.28 kB)

Hi Samer,

As discussed, Please find attached a quote for the Over Dimention LTI sensors trial.

Regards,
Stephen Thammiah

NOVATION

Novation Engineering Pty Ltd
ABN: 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: (02) 9629 1826
Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 095: Over-dimension vehicle enforcement system using LTI lasers - Field Trials and scoping study

Introduction

Further to our recent discussions, Novation Engineering Pty Ltd is pleased to provide a fixed price quotation to Roads and Maritime Services for the below scope of works.

Scope of Works

The following items would be carried out as per this quote:

.1 Field Trial at RMS selected site(s): Over-dimension vehicle enforcement system using LTI lasers.

.2 Scoping Study – Over-dimension vehicle enforcement system using LTI lasers. With the understanding that RMS is currently investigating automated vehicle over-dimension screening technologies to enforce heavy vehicle over-dimension regulations in NSW.

.3 Over-dimension vehicle enforcement system field trial requirements:
- Gantry mounted.
- Adverse weather conditions.
- Vehicle speed limitations and dimension accuracy measurement.

.4 Engineering/design and fabrication of:
- Mounting bracket for gantry mounted LTI lasers.
- Mounting brackets for pole mounted required “body-height and over-height” TIRTL’s.

.5 Report on:
- Results of all over-dimension vehicle enforcement system trial results in the format prescribed by RMS (scoping study report).
- Provide recommendations on potential enforcement applications based on world best practice research performed.

Inclusions:
The following items are included in the services scope as per this proposal

- Scope of works listed above.

Exclusions:
The following items are excluded from the services scope as per this proposal:

- System Integration. This quote does not include software integration into existing RMS systems.

Assumptions:
This quote assumes the following:

- Novation Engineering will abide by all RMS WHS requirements.
- The trial period is to run for a 3 month period; or until the required sample size (to be agreed with RMS) is met.

Project Deliverables:
The following are deliverables along with the Project Management and testing:

- Scoping Study Report

Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

Fixed Cost Quotation
$79,100 excluding GST.

Date Issued: 03/10/2016
Quote Valid until: 03/11/2016
Quote Ref: 095

This quotation is accepted by: Name: _____;

Title: _____; Date: ___ / ___ / _____

PO Ref: _____ Signature: _____

Novation Engineering Pty Ltd
ABN: 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: (02) 9629 1826
Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 096: Secondary Vehicle Trigger using laser technology - Field Trials and scoping study

Introduction

Further to our recent discussions, Novation Engineering Pty Ltd is pleased to provide a fixed price quotation to Roads and Maritime Services for the below scope of works.

Scope of Works

The following items would be carried out as per this quote:

.1 Field Trial at RMS selected site(s): Secondary Vehicle Trigger using laser technology.

.2 Scoping Study – Secondary Vehicle Trigger using laser technology. With the understanding that RMS is currently investigating a replacement technology for road loops to reduce overall maintenance costs associated with road loops and increase accurate vehicle trigger accuracy.

.3 Secondary Vehicle Trigger field trial requirements:
- Road-side curb mounted LTI laser.
- Adverse weather conditions.
- Vehicle speed limitations.
- Vehicle trigger accuracy performance.

.4 Engineering/design and fabrication of:
- Mounting bracket for curb mounted LTI laser.

.5 Report on:
- Results of all secondary vehicle trigger trial results in the format prescribed by RMS (scoping study report).

Inclusions:
The following items are included in the services scope as per this proposal

- Scope of works listed above.

Exclusions:
The following items are excluded from the services scope as per this proposal:

- System Integration. This quote does not include software integration into existing RMS systems.

Assumptions:
This quote assumes the following:

- Novation Engineering will abide by all RMS WHS requirements.
- The trial period is to run for a 3 month period; or until the required sample size (to be agreed with RMS) is met.

Project Deliverables:
The following are deliverables along with the Project Management and testing:

- Scoping Study Report

Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

Fixed Cost Quotation
$69,700 excluding GST.

Date Issued: 03/10/2016
Quote Valid until: 03/11/2016
Quote Ref: 096

This quotation is accepted by: Name: _____;

Title: _____; Date: ___ / ___ / _____

PO Ref: _____ Signature: _____

File Size:
82,944

File Type:
Microsoft Word Document

GUID:
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Item Date:
Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

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Shannon Entropy:
5.428507148742035

Property Source:
E18-0281-AS-7-1-PR-0007-HDD2

_AdHocReviewCycleID:
2,132,389,924

_AuthorEmail:
Samer.SOLIMAN@rms.nsw.gov.au

_AuthorEmailDisplayName:
SOLIMAN Samer

_EmailSubject:
Mobile ANPR Trial

_ReviewingToolsShownOnce:

Application Version:
983,040

AppName:
Microsoft Office Word

Author:
Steve O

Char Count:
1,921

Char Count with Spaces:
2,253

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Comment Authors:
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Company:

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Tuesday, May 3, 2016 at 3:22:00 PM Australian Eastern Standard Time

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Edit Time:
1 hour, 2 minutes, 0 seconds

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Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

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Saturday, December 16, 2017 at 12:29:44 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:27:03 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

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1,388,352

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11,106,816

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Keywords:

Last Author:
Samer

Last Saved:
Monday, October 3, 2016 at 6:51:00 PM Australian Eastern Daylight Time

Lines:
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Name:
Quote 096 - Secondary Vehicle Trigger.doc

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NTFS ACE 1 Raw Flags:
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NTFS ACE 1 SID Name:
Local System

NTFS ACE 1 Type:
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NTFS ACE 2 Raw Access Mask:
2,032,127

NTFS ACE 2 Raw Flags:
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NTFS ACE 2 SID Name:
BUILTIN\Administrators

NTFS ACE 2 Type:
Allow

NTFS ACE 3 Access Mask:
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NTFS ACE 3 Raw Access Mask:
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NTFS ACE 3 Raw Flags:
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NTFS ACE 3 Type:
Allow

NTFS ACE 4 Access Mask:
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Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:27:03 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

NTFS File Name Attribute DOS File Name:
QUOTE0~1.DOC

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Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 6:51:55 PM Australian Eastern Daylight Time

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Quote 096 - Secondary Vehicle Trigger.doc

NTFS Hard Links:
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2,621

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Monday, October 3, 2016 at 5:21:51 PM Australian Eastern Daylight Time

NTFS Parent MFT Index:
1,288

Page Count:
2

Paragraphs:
4

Physical Start Sector:
11,313,664

Revision Number:
7

Scale Crop:
false

Shared Document:
false

Subject:

Template:
Normal

Title:

Word Count:
336

Fwd: trial 2 - Secondary trigger to replace loops using LTI lasers at marulan south HVSS

From: Sam Sol <[redacted]>
To: novationengineering@bigpond.com, SOLIMAN Samer <samer.soliman@rms.nsw.gov.au>, Steve Yeah <[redacted]>
Date: Mon, 03 Oct 2016 18:52:55 +1100
Attachments: Hume Highway, Marulan Southbound HVCS, NSW TIRTL Site Plan V4.pdf (401.86 kB); Maruilan Southbound HVCS - Project plan.pdf (1.11 MB); Quote 096 - Secondary Vehicle Trigger.doc (82.94 kB)

---------- Forwarded message ----------
From: **SOLIMAN Samer** <Samer.SOLIMAN@rms.nsw.gov.au>
Date: Fri, Sep 30, 2016 at 10:48 AM
Subject: trial 2 - Secondary trigger to replace loops using LTI lasers at marulan south HVSS
To: [redacted]" <[redacted]>

Samer Soliman
Manager Heavy Vehicle Programs
Compliance Systems | Compliance Operations Branch | Compliance and Regulatory Services
T 02 88370687 | [redacted]
www.rms.nsw.gov.au

Roads and Maritime Services
99 Phillip st Parramatta NSW 2150

---------- Forwarded message ----------
From: SINGH Jai <Jai.SINGH@rms.nsw.gov.au>
To: "'Jonathan Spring'" <spring@ceos.com.au>, "kristian.penno@ceos.com.au" <kristian.penno@ceos.com.au>, "'Colin Campbell'" <colinc@ciceng.com.au>, SOLIMAN Samer <Samer.SOLIMAN@rms.nsw.gov.au>, "greg.robinson@ceos.com.au" <greg.robinson@ceos.com.au>
Cc:
Date: Thu, 29 Sep 2016 15:32:19 +1000
Subject: RE: Over dimension screening lane trial and secondary trigger trial
Hi All,

Just some quick minutes from today's meeting

- 1. *Confirm installation and trial dates (CEOS should be present for trial days to assist)*
  - * As this solution is still in R&D phase, there will still be quite a lot of testing required post install which could take a few weeks to complete.
  - * New proposed date for trial is 14/10/2016 (pending outcome from testing)
  - * Meeting will be scheduled after install to discuss progression
  - * Depending on the outcome from testing, there may not be a need for CEOS to be present during trial period.
- 2. *Discuss options for real time data during trial (likely VOI portal)*
  - * The trial will consist of an output from the HARE to trigger for heavy vehicles deemed to be over height or length based on data collected from the LTI and TIRTL. This output will be presented in Truckscan using the existing 'over height' criteria. The inspector will then be required to measure both the height and length of the vehicle
- 3. *Confirm hardware installation location (does new hardware interfere with current setup and is there any more room for additional hardware on gantry)*
  - * The TIRTL data will be collected and correlated with the data collected from the LTI sensors. This will then be used to analyse the performance of the LTI sensors.
  - * There may be an option to relocate the body height TIRTL closer to the beginning of the screening lane to allow for a more confident length reading.
- 4. *Discuss proof of concept i.e. how do we determine successful trial (IVR will have manually measure vehicles to compare with LTI measurement)*
  - * Trial will be conducted as following:

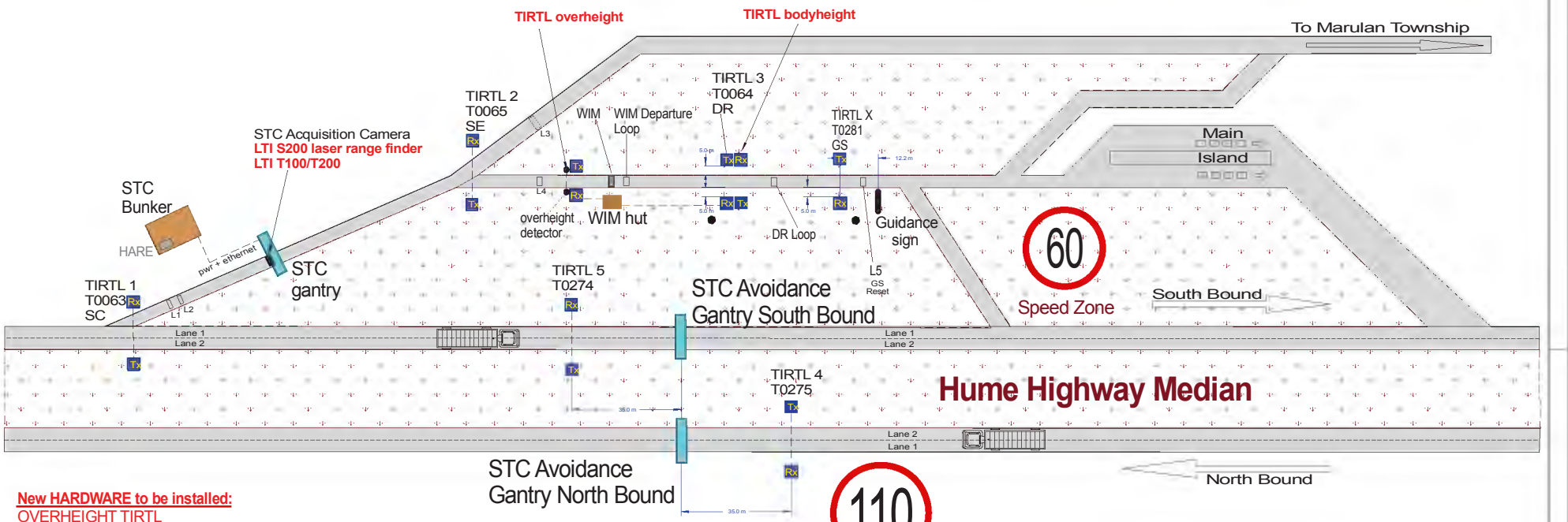
---------- Forwarded message ----------
From: Greg Robinson <greg.robinson@ceos.com.au>
To: SINGH Jai <Jai.SINGH@rms.nsw.gov.au>, SOLIMAN Samer <Samer.SOLIMAN@rms.nsw.gov.au>
Cc: Col Campbell <colinc@ciceng.com.au>, Chris PATTERSON <chrisp@ciceng.com.au>, Kristian Penno <kristian.penno@ceos.com.au>, Jon Spring <jon.spring@ceos.com.au>
Date: Wed, 21 Sep 2016 16:44:33 +1000
Subject: Marulan Southbound OH-OL TIRTL project plan
Hi Jai, Samer,

Jon has asked me to send you the site plan and project plan for the upcoming installation of an overheight + overlength TIRTLs including some lasers.
Please let me know if you have any questions.

regards,
GregR
--
Greg Robinson
Customer Service Manager
CEOS Pty Ltd
Unit 3, 17 Burgundy St
Heidelberg VIC 3084
Telephone: +61 3 9458 4955
Fax: +61 3 9458 4966
Mobile: [redacted]
Email: greg.robinson@ceos.com.au
Skype: greg.f.robinson

Marulan Southbound HVCS
Hume Highway, Marulan South, NSW TIRTL Site Plan

TIRTLs		
TIRTL1	T0063	Marulan Southbound HVCS SC (Safe-T-Cam camera)
TIRTL2	T0065	Marulan Southbound HVCS SE (Screening Lane Entry)
TIRTL3	T0064	Marulan Southbound HVCS DR (Driver Reaction)
TIRTLX	T0281	Marulan Southbound HVCS GS (Guidance Sign)
TIRTL5	T0274	Marulan Southbound Avoidance STC
TIRTL4	T0275	Marulan Northbound Avoidance STC



New HARDWARE to be installed:

OVERHEIGHT TIRTL
- mounted to existing overheight detector pole
- power + comms to WIM hut

BODY HEIGHT TIRTL
- mounted next to existing T0064 DR TIRTL
- power + comms run back to WIM hut

ACQUISITION CAMERA GANTRY SENSORS
- install LTI S200 laser range finder + DIGI serial/ethernet converter
- install LTI T100/T200 laser + DIGI serial/ethernet converter
- add switch to gantry

CONNECTIONS
- connect to existing HARE inside STC bunker

Notes:
- 12V DC and Communication provided from:
  STC bunker Marulan North HVCS (TIRTL 1),
  WIM hut (TIRTLs 2, 3 and X),
  STC cabinets Marulan Hwy Avoidance gantries (TIRTLs 4 and 5)
- Supply power to both RX and TX TIRTLs
- 2.5mm-squared versolex power cable used for all power runs less than 100m
- 4.0mm-squared versolex power cable used for all power runs in excess of 100m
- Antenna is 50mm galvanised steel pole, 3m high, with GPS/3G antenna mounted

CEOS Pty. Ltd
Unit 3, 17 Burgundy Street
Heidelberg
Vic 3084
Ph: (03) 9458-4955

Amendments			Approvals		
Issue	Change	Date	Date	Name	Position

Marulan Southbound HVCS,Hume Hwy, NSW TIRTL Site Drawing	
Version 4.0	Scale 1:1250
Sheet: 1 of 1	Date: 20/09/2016
Client: RTA	Filename: T0281 - Hume Highway, Marulan South, NSW TIRTL Site Drawing v3.SKF
Dwg. No.	Drawn By: OC Updated By: GR

Project plan for Marulan Southbound HVCS Installation of

- Overlength TIRTL
- Overheight TIRTL
- Laser sensors

Version 1.0

CEOS Industrial Pty. Ltd.
Unit 3, 17 Burgundy Street
Heidelberg, VIC, 3084

1. Objectives

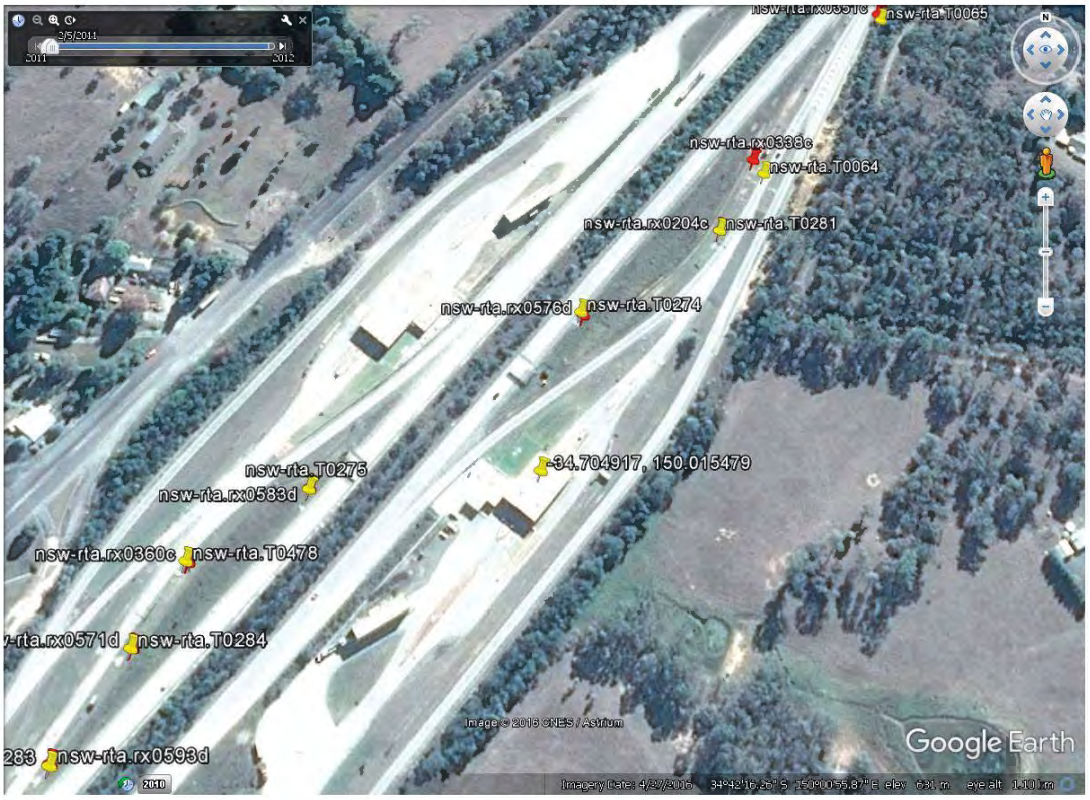
Installation of new equipment at the Marulan Southbound Heavy Vehicle Checking Station. The major equipment to be installed includes:

- Body height TIRTL detector
- Overheight TIRTL detector
- LTI TruSense S200 laser range finder
- LTI TruSense T100, T200 sensor

2. Site Location

The equipment is to be installed at the Marulan Southbound HVCS.

GPS coordinates (of the Marulan Southbound offices): -34.704917, 150.015479



3. Equipment List

- Overheight TIRTL (supplied by RMS)
- Overlength TIRTL (supplied by RMS)
- Qty 2 – antenna for TIRTL including postcap

- Overheight installation fittings (mounting brackets) (supplied by CEOS)
- 800mm aluminium enclosure for overlength TIRTL (CEOS)
- 200mm frangible mounting bracket for overlength TIRTL 800mm enclosure (CEOS)
- TruSense T100/200 dual laser (CEOS)
- TruSense S200 laser range finder (CEOS)

4. Scope of works

2.1 Overlength TIRTL

The body height TIRTL will be mounted at the location of the existing DR TIRTL. The body height TIRTL should be mounted as close as practicable beside the existing DR TIRTL – either before or after is acceptable. Closer is better – as this will assist matching algorithm performance. The mounting location will depend on the difficulty/ease of civil works.

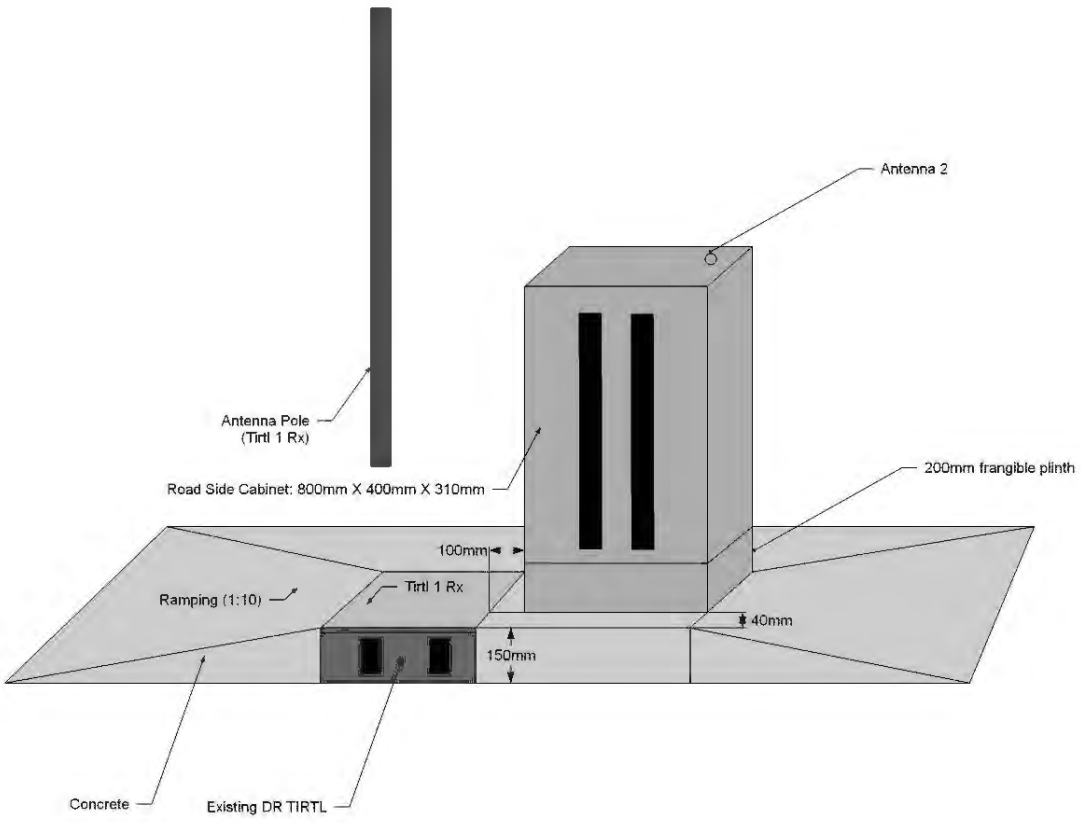


Figure 1 - suggested overlength TIRTL cabinet installation

- Power down existing DR TIRTL Rx and Tx. (CIC)
- Remove existing ethernet cable from DR TIRTL Rx (CIC)
- Installation of plinths and overlength cabinets for Rx and Tx (CIC)
- Bring power and ethernet into the overlength cabinet. Terminate and plug ethernet cable into (new) switch. Provide power to switch and TIRTL Rx. (CIC)
- Bring ethernet from overlength cabinet switch to both DR TIRTL Rx and new overlength TIRTL Rx and terminate cat 5 cables. (CIC)
- Termination of power cable on Rx and Tx (CIC)
- Connection of power and ethernet into switch inside WIM hut (CIC)
- Installation of a new RevE TIRTL pair (CIC)

- Alignment and configuration of TIRTL (CIC)
- Remote checks of configuration and operation (CEOS)

4.2 Overheight TIRTL

The overheight TIRTL will be mounted to the existing overheight detector pole. The body height TIRTL should be mounted at the same detection height as the existing overheight TIRTL.

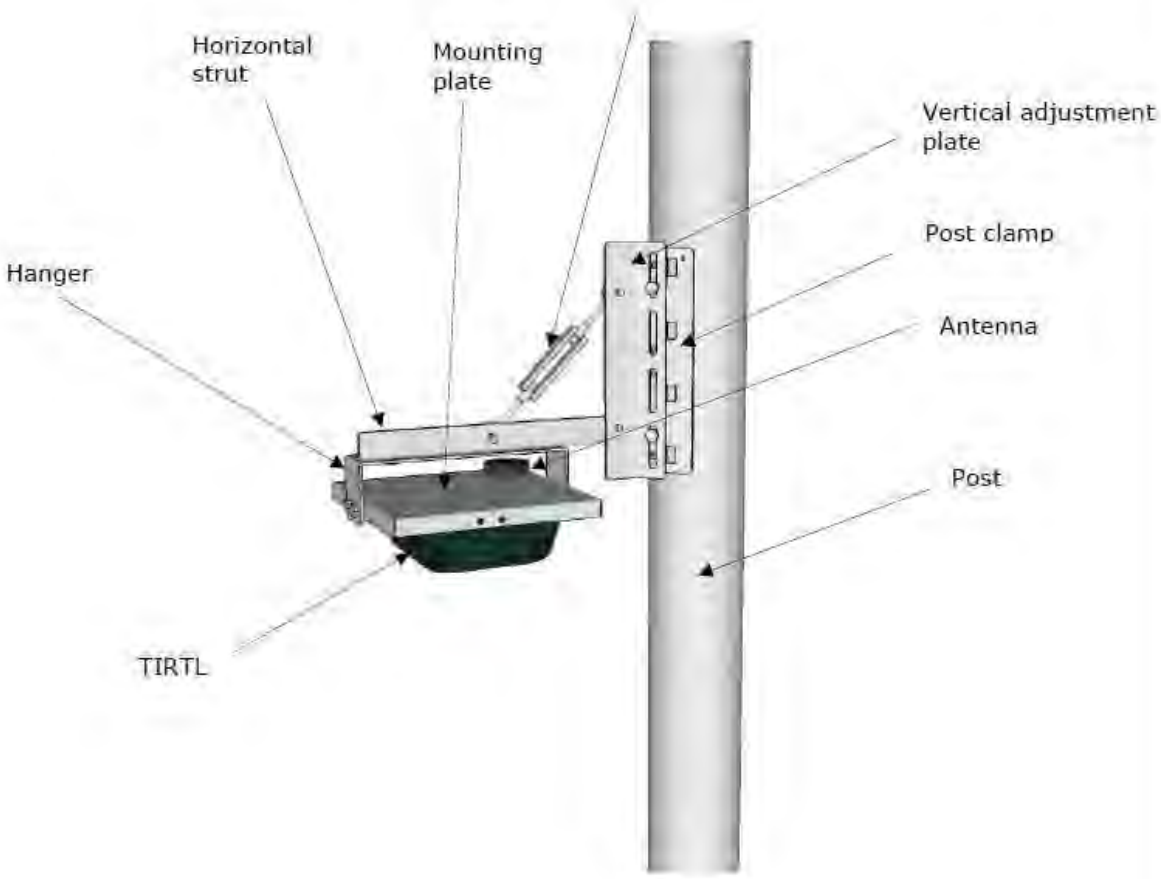


Figure 2 - Overheight TIRTL mounting

- Installation of overheight mounting brackets to both overheight poles (CIC)
- Installation of power cables from WIM hut to transmitter and receiver (CIC)
- Installation of new Cat5 cable from WIM to receiver (CIC)
- Termination of Cat5 cable at receiver (CIC)
- Termination of power cable on Rx and Tx (CIC)
- Connection of ethernet into switch inside WIM hut (CIC)
- Installation of a new RevE TIRTL pair including antenna (CIC)
- Alignment and configuration of TIRTL (CIC)
- Remote checks of configuration and operation (CEOS)

4.3 Two (2) Laser Sensors

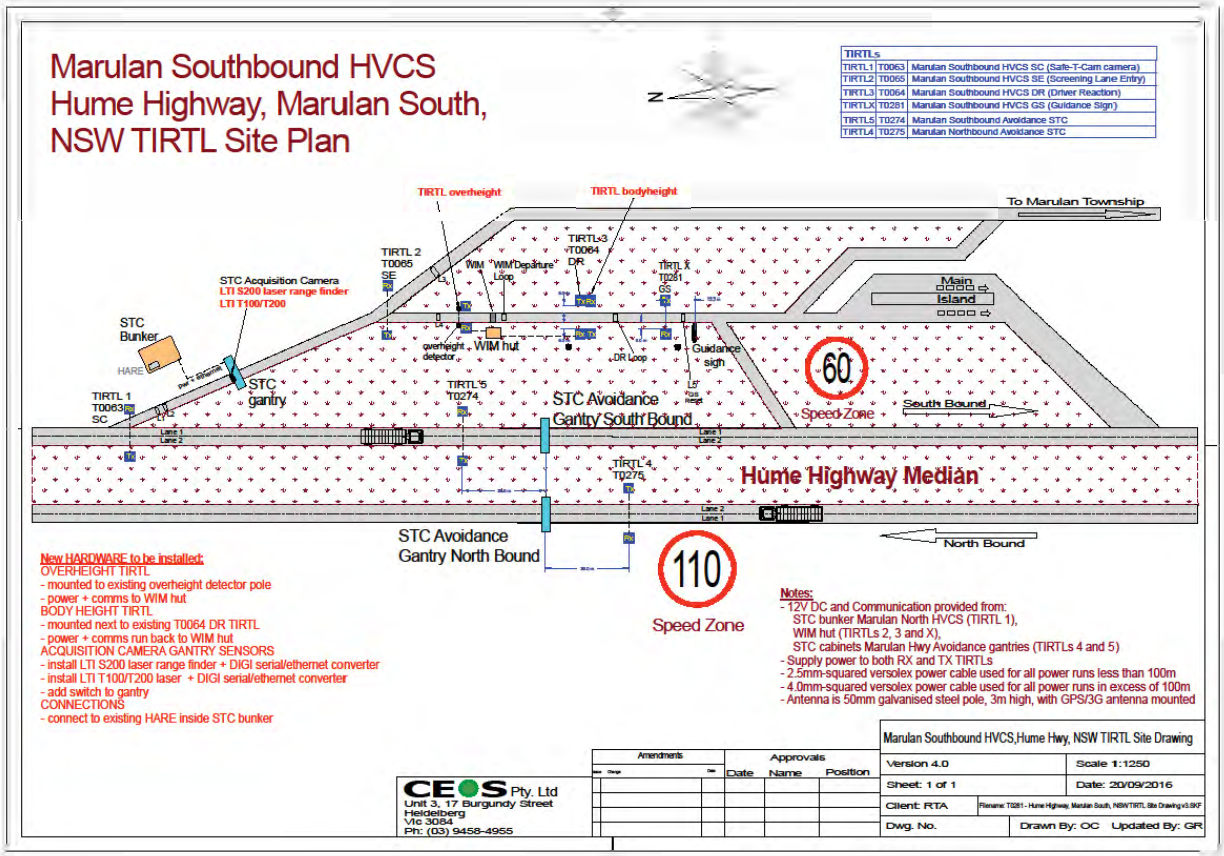
These sensors will be mounted on the STC acquisition gantry.

Figure 3 – TruSense S220 laser range finder

Figure 4 - TruSense T100/200 dual laser

- Installation of new switch in a STC acquisition gantry cabinet (this cabinet may be needed to be installed) (CIC)
- Utilisation of existing spare CAT5 cable from STC bunker to STC acquisition gantry cabinet (CIC)

- Termination of Cat5 cable and connection to switch (CIC)
- Installation and power-up of one (1) new DIGI serial-ethernet media converters in STC acquisition gantry cabinet (CIC)
- Installation of 12 V DC power cabling from STC bunker to two (2) new Laser sensors (CIC)
- Installation of serial cabling from laser sensors to DIGI (inside the STC acquisition gantry cabinet) (CIC)
- Installation of TruSense S200 laser range finder (CIC)
- Installation of TruSense T100, T200 laser sensor (CIC)
- Remote checks of configuration and operation (CEOS)



E18-0281-AS-2-1-PR-0001 D1049338

Figure 5 - STC Acquisition Camera Gantry

Figure 6 – T0064 DR TIRTL

Figure 7 – Existing overheight detector

Novation Engineering Pty Ltd
ABN: 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: (02) 9629 1826
Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 096: Secondary Vehicle Trigger using laser technology - Field Trials and scoping study

Introduction

Further to our recent discussions, Novation Engineering Pty Ltd is pleased to provide a fixed price quotation to Roads and Maritime Services for the below scope of works.

Scope of Works

The following items would be carried out as per this quote:

.1 Field Trial at RMS selected site(s): Secondary Vehicle Trigger using laser technology.

.2 Scoping Study – Secondary Vehicle Trigger using laser technology. With the understanding that RMS is currently investigating a replacement technology for road loops to reduce overall maintenance costs associated with road loops and increase accurate vehicle trigger accuracy.

.3 Secondary Vehicle Trigger field trial requirements:
- Road-side curb mounted LTI laser.
- Adverse weather conditions.
- Vehicle speed limitations.
- Vehicle trigger accuracy performance.

.4 Engineering/design and fabrication of:
- Mounting bracket for curb mounted LTI laser.

.5 Report on:
- Results of all secondary vehicle trigger trial results in the format prescribed by RMS (scoping study report).

Inclusions:
The following items are included in the services scope as per this proposal

- Scope of works listed above.

Exclusions:
The following items are excluded from the services scope as per this proposal:

- System Integration. This quote does not include software integration into existing RMS systems.

Assumptions:
This quote assumes the following:

- Novation Engineering will abide by all RMS WHS requirements.
- The trial period is to run for a 3 month period; or until the required sample size (to be agreed with RMS) is met.

Project Deliverables:
The following are deliverables along with the Project Management and testing:

- Scoping Study Report

Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

Fixed Cost Quotation
$69,700 excluding GST.

Date Issued: 03/10/2016
Quote Valid until: 03/11/2016
Quote Ref: 096

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Title:

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NOVATION

Novation Engineering Pty Ltd
ABN: 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: (02) 9629 1826
Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 097: Over-dimension vehicle enforcement using SICK high-speed FPS - Field Trials and scoping study

Introduction

Further to our recent discussions, Novation Engineering Pty Ltd is pleased to provide a fixed price quotation to Roads and Maritime Services for the below scope of works.

Scope of Works

The following items would be carried out as per this quote:

.1 Field Trial at RMS selected site(s): Over-dimension vehicle enforcement using SICK high-speed 'Freeflow Profiling System'.

.2 Scoping Study: Over-dimension vehicle enforcement using SICK high-speed FPS. With the understanding that RMS is currently investigating automated vehicle over-dimension screening technologies to enforce heavy vehicle over-dimension regulations in NSW.

.3 Over-dimension vehicle enforcement system field trial requirements:
- Gantry mounted.
- Adverse weather conditions.
- Vehicle speed limitations and dimension accuracy measurement.

.4 Engineering/design and fabrication of:
- Mounting brackets for 5 x SICK laser scanners(LMS511 lasers)
- Provision of an appropriate gantry or pole.
- Mechanical installation of sensors and placement of cables.
- Power Supply 230V; Fuse 10AT.
- Network connection.

.5 Report on:
- Results of all over-dimension vehicle enforcement system trial results in the format prescribed by RMS (scoping study report).

Inclusions:
The following items are included in the services scope as per this proposal

- Scope of works listed above.

Exclusions:
The following items are excluded from the services scope as per this proposal:

- System Integration. This quote does not include software integration into existing RMS systems.

Assumptions:
This quote assumes the following:

- Novation Engineering will abide by all RMS WHS requirements.
- The trial period is to run for a 3 month period; or until the required sample size (to be agreed with RMS) is met.

Project Deliverables:
The following are deliverables along with the Project Management and testing:

- Scoping Study Report

Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

Fixed Cost Quotation
$72,800 excluding GST.

Date Issued: 03/10/2016
Quote Valid until: 03/11/2016
Quote Ref: 097

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Title: _____; Date: ___ / ___ / _____

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Steve O

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Quote 097 - Over-dimension vehicle enforcement using SICK high-speed FPS.doc

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Quote 097 - Over-dimension vehicle enforcement using SICK high-speed FPS.doc

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FW: Vehicle Dimension Scanner Scoping Study

From: SOLIMAN Samer <"/o=rta/ou=exchange administrative group (fydibohf23spdlt)/cn=recipients/cn=solimans">
To: SINGH Jai <jai.singh@rms.nsw.gov.au>
Date: Mon, 13 Mar 2017 12:43:38 +1100
Attachments: Vehicle Dimension Scanner Scoping Study.pdf (1.35 MB)

Samer Soliman
Manager Heavy Vehicle Programs

From: novationengineering@bigpond.com [mailto:novationengineering@bigpond.com]
Sent: Saturday, 2 July 2016 2:33 PM
To: SOLIMAN Samer
Subject: Vehicle Dimension Scanner Scoping Study

Hi Samer,

I am pleased to submit the final version of the vehicle dimension scanner scoping study. Please do not hesitate to contact me for any further information.

Regards,
Stephen Thammiah

NOVATION
Novation Engineering Pty Ltd
ABN 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: +61 449 144 125
Email: Novationengineering@bigpond.com

Vehicle Dimension Scanner
Scoping Study

Novation Engineering Pty Ltd
27th June 2016
Prepared for Roads and Maritime Services
Commercial-in-confidence

Vehicle Dimension Scanner Scoping Study *(2016).*
Novation Engineering Pty Ltd.

Contents

Executive Summary

This scoping study was commissioned to investigate the potential use of automated vehicle over-dimension screening technologies to enforce heavy vehicle over-dimension regulations in NSW by Roads and Maritime Services.

The dimension scanner selected to trial was the SICK laser scanner which builds a three dimensional model with coloured oversize on-screen render of height, width and length of the vehicle. In principle, the field trials successfully proved that this type of technology can be utilised by RMS for heavy vehicle over-dimension enforcement. In addition, the SICK dimension scanner performed well within stated tolerances and improved accuracy and efficiency of vehicle dimension measuring practises.

The SICK dimension scanner proved to be an effective over-dimension enforcement tool when taking into consideration the business requirements, costs, and other factors discussed within this scoping study.

Abbreviations

RMS: Roads and Maritime Services
CIC: CIC Engineering
WHS: Work Health and Safety
NSW: New South Wales
GUI: Graphical User Interface
NMI: National Measurement Institute
HVSS: Heavy Vehicle Safety Station
LMS: Laser Measurement Scanner
TEMS: Traffic Enhanced Measurement System
TEMS Manager: VPS software on Traffic Controller
VPS: Vehicle Profiling System

Project Background

This scoping study is created for Roads and Maritime Services. A scoping study has been performed to trial a vehicle dimension scanner (VPS553 model) selected by RMS to prove concept for potential use/suitability for heavy vehicle over-dimension regulatory applications in NSW. The VPS553 consists of three LMS511 Traffic laser scanners, one Traffic Controller featuring the VPS software, plus the TEMS Manager and TEMS Info sample client software programs.

The current RMS heavy vehicle over-dimension measuring practices are not aligned with current best-practice for dimension measurement; this adds a prosecution risk for RMS, resulting in RMS seeking an enhanced solution. Enforcement operations inspectors currently utilise a ruler and tape-measure to inspect a vehicle's height, width and length. This practice currently takes approximately ten minutes and requires two inspectors. In addition, a RMS prosecution of an over-dimension heavy vehicle court matter in 2015 was dismissed due to the lack of alignment with NMI standards; revealing the need for RMS to investigate alternative heavy vehicle dimension enforcement. This is the primary reason this scoping study has been initiated by RMS.

Novation Engineering performed an extensive in-field study on the dimension scanner selected by RMS according to best practice standards and WHS requirements. RMS provided several requirements for which the technology was to be trialed to ensure appropriate recommendations are provided.

Stakeholder Engagement

RMS:
Compliance Systems - Heavy Vehicle Programs Unit Manager.
Enforcement Operations Inspectors.
Enforcement Operations Managers.

External:
SICK
CIC Engineering
NMI

Scoping Study

Vehicle Dimension Scanner - Field Trial Requirements

Following several meetings and discussions with RMS stakeholders, requirements and considerations for the field trials of the dimension scanner are as follows:

1) Roof or Gantry mounted:
   The vehicle dimension scanner trialed will be stationary roof mounted at Marulan Southbound HVSS.

2) Efficacy:
   a. Adverse weather conditions.
   b. Vehicle speed limitations.
   c. Dimension accuracy.

SICK VPR553 Vehicle Dimension Scanner Specifications Summary

Field of application	System for measurement of vehicle dimensions
Integrated application	Measurement of dimensions for one vehicle at a time
Scanner design	3-scanner solution
Vehicle data	Vehicle dimensions (length, width, height) Vehicle speed 3D measuring points on the vehicle
Number of covered lanes	1
Recommended vehicle distance	Vehicles must pass through the measuring station one by one
Calibration	Yes
Accuracy of length measurement	+/-50 mm at a speed of < 7 km/h
Accuracy of width measurement	+/-30 mm at a speed of < 7 km/h
Accuracy of height measurement	+/-30 mm at a speed of < 7 km/h
Driving speed	0.1 – 7 km/h for full coverage
Minimum object size	1.0 x 0.6 x 0.6 m (L x W x H)
Maximum object size	30.0 x 5.0 x 5.0 m (L x W x H)

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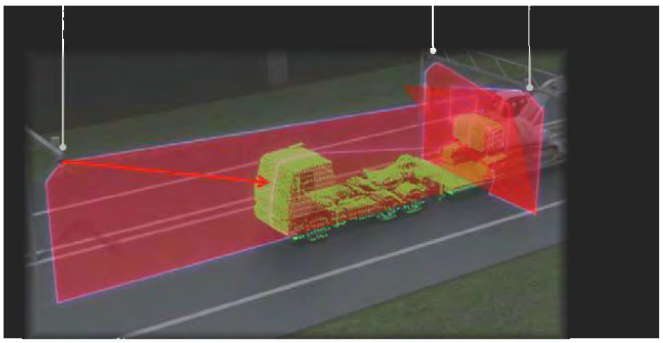

figure 1.0 shows a 3D model created using SICK laser based dimension scanning technology.

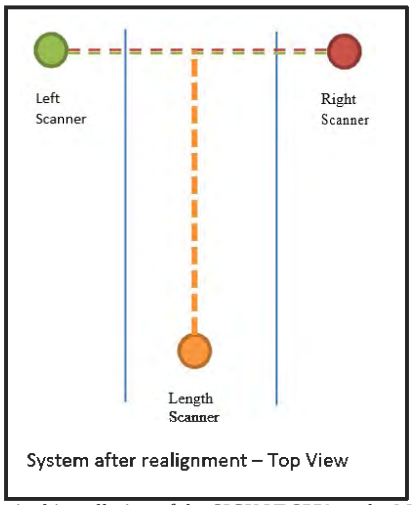

figure 1.1 depicts the physical installation of the SICK VPS553 at the Marulan Southbound HVSS.

Vehicle Dimension Scanner - Field Trial Results Summary

Field trials were conducted at the RMS Marulan Southbound HVSS site in conjunction with enforcement operations inspectors. The scanner was trialed against the business requirements and comparatively against the current manual vehicle dimension measuring processes. Three individual scanners were installed on the roof of the HVSS, which were connected to one central controller. Heavy vehicles were intercepted and were automatically measured using this technology as they drove over the weigh bridge, which is where the scanners were installed. These measurements were compared to manual measurements taken by safety station operators and results documented in this scoping study.

KPI 1:Efficacy

1) Adverse weather conditions:
The performance was not impacted by different weather conditions or ambient light conditions.

2) Vehicle speed limitations:
As per appendix 1.3, this SICK VPS553 vehicle dimension scanner has a vehicle speed limitation of up to 7km/h. Of the vehicles scanned, an average vehicle speed of 7km/h was detected (as per table 1.0, 2.0, 3.0) with an average measurement accuracy of 0.22%, 0.44% and 15.49% for length, width and height respectively as expressed in section 3 below. This falls within the maximum allowable vehicle speed of 7km/h. Hence, the dimension scanner is suitable for the application.

3) Dimension accuracy.

a. Length

Vehicle Number	Valid Measurement	VPS Speed (km/h)	VPS Width (m)	RMS Width (m)	Deviation (m)	RMS Accuracy (m)	VPS Accuracy (m)	Error % of Manual Measure
1915	Yes	13.212	17.653	17.59	-0.063	±0.11	±0.05	-0.36%
1916	Yes	6.75	17.335	17.35	0.015	±0.11	±0.05	0.09%
1917	No	9.1548	19.098	19.4	0.302	±0.11	±0.05	1.56%
1918	Yes	5.9904	17.621	17.59	-0.031	±0.11	±0.05	-0.18%
1919	Yes	7.4376	18.964	19	0.036	±0.11	±0.05	0.19%
1920	Yes	7.6932	19.118	19.07	-0.048	±0.11	±0.05	-0.25%
1921	No	7.1712	11.538	11.4	-0.138	±0.11	±0.05	-1.21%
1922	No	3.1824	25.714	25.6	-0.114	±0.11	±0.05	-0.45%
1923	Yes	5.58	20.969	20.89	-0.079	±0.11	±0.05	-0.38%
1924	No	5.8248	25.975	25.85	-0.125	±0.11	±0.05	-0.48%
1925	No	14.5368	7.967	7.89	-0.077	±0.11	±0.05	-0.98%
1926	Yes	16.0884	11.035	10.99	-0.045	±0.11	±0.05	-0.41%
1927	Yes	9.1116	19.142	19.09	-0.052	±0.11	±0.05	-0.27%
1928	Yes	6.5772	18.938	18.94	0.002	±0.11	±0.05	0.01%

Table 1.0 displays a subset of the vehicle length data collated during the trial and associated accuracies.

Figure 2.0 shows the length perspective of the 3D rendered model of a vehicle screened during the trial.

b. Width

Vehicle Number	Valid Measurement	VPS Speed (km/h)	VPS Width (m)	RMS Width (m)	Deviation (m)	RMS Accuracy (m)	VPS Accuracy (m)	Error % of Manual Measure
1915	**No**	13.212	2.91	2.49	-0.42	±0.03	±0.03	-16.87%
1916	**No**	6.75	3.503	2.49	-1.013	±0.03	±0.03	-40.68%
1917	**No**	9.1548	2.825	2.5	-0.325	±0.03	±0.03	-13.00%
1920	**No**	7.6932	3.854	2.5	-1.354	±0.03	±0.03	-54.16%
1922	**No**	7.1712	2.61	2.485	-0.125	±0.03	±0.03	-5.03%
1923	**No**	3.1824	2.613	2.49	-0.123	±0.03	±0.03	-4.94%
1924	**No**	5.58	3.476	3.27	-0.206	±0.03	±0.03	-6.30%
1925	**No**	5.8248	3.15	2.5	-0.65	±0.03	±0.03	-26.00%
1926	**No**	6.2172	2.952	2.455	-0.497	±0.03	±0.03	-20.24%
1928	**Yes**	14.5368	2.527	2.495	-0.032	±0.03	±0.03	-1.28%
1929	**No**	16.0884	2.618	2.5	-0.118	±0.03	±0.03	-4.72%
1930	**No**	9.1116	2.611	2.458	-0.153	±0.03	±0.03	-6.22%
1931	**Yes**	6.5772	3.393	3.33	-0.063	±0.03	±0.03	-1.89%

Table 2.0 displays a subset of the vehicle width data collated during the trial and associated accuracies.

Figure 3.0 shows the width perspective of the 3D rendered model of two vehicles screened during the trial.

c. Height

Vehicle Number	Valid Measurement	VPS Speed (km/h)	VPS Width (m)	RMS Width (m)	Deviation (m)	RMS Accuracy (m)	VPS Accuracy (m)	Error % of Manual Measure
1915	Yes	13.212	4.327	4.3	-0.027	±0.04	±0.03	-0.63%
1916	Yes	6.75	4.319	4.284	-0.035	±0.04	±0.03	-0.82%
1917	Yes	9.1548	4.348	4.338	-0.01	±0.04	±0.03	-0.23%
1918	Yes	5.9904	3.291	3.31	0.019	±0.04	±0.03	0.57%
1919	Yes	7.4376	4.296	4.275	-0.021	±0.04	±0.03	-0.49%
1920	Yes	7.6932	4.308	4.285	-0.023	±0.04	±0.03	-0.54%
1921	No	7.1712	4.042	3.89	-0.152	±0.04	±0.03	-3.91%
1922	Yes	3.1824	4.103	4.085	-0.018	±0.04	±0.03	-0.44%
1923	Yes	5.58	4.463	4.46	-0.003	±0.04	±0.03	-0.07%
1924	Yes	5.8248	4.506	4.485	-0.021	±0.04	±0.03	-0.47%
1925	Yes	6.2172	4.601	4.62	0.019	±0.04	±0.03	0.41%
1926	Yes	14.5368	2.72	2.74	0.02	±0.04	±0.03	0.73%
1927	Yes	16.0884	3.522	3.54	0.018	±0.04	±0.03	0.51%
1928	Yes	9.1116	4.234	4.2	-0.034	±0.04	±0.03	-0.81%

Table 3.0 displays a subset of the vehicle height data collated during the trial and associated accuracies.

Figure 4.0 shows the height perspective of the 3D rendered model of two vehicles screened during the trial.

Once the sensors were correctly calibrated, the SICK vehicle dimension scanner trialed met the vendor stated accuracy threshold over all conditions specified in the field trial requirements. Refer to appendix 1.3 for vendor stated measurement accuracy tolerances.

	Length	Height	Width
Accuracy	0.22%	0.44%	15.49%

Note: The large deviation in width measurement is due to the sensors detecting the side mirrors of all vehicles. SICK has demonstrated that configuration changes in the software allow for side mirrors to be excluded from measurement to successfully achieve the stated tolerances.

Other Considerations

- **Certification for enforcement:** It is to be noted that this dimension scanning technology is not currently certified for heavy vehicle over-dimension enforcement in NSW. However it has been confirmed that this technology can be certified for enforcement purposes by using international dimension certification standards currently utilised in Switzerland. SICK have estimated a time frame of 6 months to produce required documentation including calibration procedure and frequency requirements in order to enable this dimension scanner to be legally used for over-vehicle dimension prosecution in NSW.

- **System Integration:** It is recommended that this vehicle dimension scanner be integrated with the current RMS heavy vehicle enforcement system (Truckscan) which would enable seamless infringement workflow by automatically transferring the measured vehicle dimensions into Truckscan.

Conclusion

The SICK vehicle dimension scanner has proven to be suitable and met all key performance indicators specified by RMS. The performance was not impacted by different weather conditions or ambient light conditions. Hence the recommendation to RMS is to proceed with enforcement certification for this device, or other suitable vehicle dimension scanners for use in heavy vehicle safety stations and other high risk assets such as tunnels and bridges in NSW.

The increased efficiency of vehicle inspections utilising such technologies not only enables more vehicles to be screened but also increases the measured accuracy compared to current practises and mitigates the current prosecution risk associated with the current manual measuring method.

Appendix

Title	Attachment
Appendix 1.0: SICK VPS553 Product information	SICK VPS553 Product_information.
Appendix 1.1: SICK VPS553 Operating instructions	SICK VPS553 Operating_instructior
Appendix 1.2: SICK LMS511 laser scanners and controller.	
Appendix 1.3: SICK VPS553 measurement accuracy tolerance	Length ± 50 mm with vehicle speed < 7 km/h Width ± 30 mm with vehicle speed < 7 km/h Height ± 30 mm with vehicle speed < 7 km/h

File Size:
1,347,364

File Type:
Portable Document Format

GUID:
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Item Date:
Saturday, July 2, 2016 at 2:33:27 PM Australian Eastern Standard Time

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Property Source:
E18-0281-AS-2-1-PR-0001

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Saturday, July 2, 2016 at 2:32:03 PM Australian Eastern Standard Time

Application Modified:
Saturday, July 2, 2016 at 2:32:03 PM Australian Eastern Standard Time

Author:
solimans

File Created:
Saturday, July 2, 2016 at 2:33:27 PM Australian Eastern Standard Time

File Modified:
Saturday, July 2, 2016 at 2:33:27 PM Australian Eastern Standard Time

Mapi-Attach-Extension:
.pdf

Mapi-Attach-Filename:
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Mapi-Attach-Long-Filename:
Vehicle Dimension Scanner Scoping Study.pdf

Mapi-Attach-Method:
1

Mapi-Attach-Mime-Tag:
application/pdf

Mapi-Attach-Size:
1,347,738

Mapi-Display-Name:
Vehicle Dimension Scanner Scoping Study.pdf

Mapi-Rendering-Position:
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Name:
Vehicle Dimension Scanner Scoping Study.pdf

Page Count:
17

PDF Certification Level:
Not Certified

PDF Contains Annotations:
true

PDF Contains Comments:
false

PDF Creator:
Microsoft® Word 2013

PDF Encryption Level:
None

PDF Images Greyscale:
1

PDF Images JPEG:
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5

PDF Javascript Present:
false

PDF Metadata Encrypted:
false

PDF Portfolio:
false

PDF Producer:
Microsoft® Word 2013

PDF Version:
5

Title:
PowerPoint Template

NOVATION

Novation Engineering Pty Ltd
ABN: 50 608 485 409
PO Box 451
Kings Langley 2147
Ph: (02) 9629 1826
Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 098: FLIR A615 brake & tyre compliance scanner – Field Trials and scoping study

Introduction

Further to our recent discussions, Novation Engineering Pty Ltd is pleased to provide a fixed price quotation to Roads and Maritime Services for the below scope of works.

Scope of Works

The following items would be carried out as per this quote:

.1 Field Trial at RMS selected site(s): FLIR A615 brake & tyre compliance scanner.

.2 Scoping Study – FLIR A615 brake & tyre compliance scanner. With the understanding that RMS is currently investigating automated thermal scanning technologies to detect potentially defective heavy vehicle axles (tyres, brakes and wheel hubs).

.3 Thermal Vehicle Scanner technology field trial requirements:
- Pavement mounted.
- Adverse weather conditions including:
  - Rain.
  - Fog.
  - Very high ambient temperatures.
  - Low ambient lighting conditions (night).

.4 Engineering/design and fabrication of:
- Pavement mounting for vehicle thermal scanner.
- Tarmac mounted housing for FLIR A615.

.5 Report on:
- Results of all FLIR A615 brake & tyre compliance scanner trial results in the format prescribed by RMS (scoping study report).

Inclusions:
The following items are included in the services scope as per this proposal

- Scope of works listed above.

Exclusions:
The following items are excluded from the services scope as per this proposal:

- System Integration. This quote does not include software integration into existing RMS systems.

Assumptions:
This quote assumes the following:

- Novation Engineering will abide by all RMS WHS requirements.
- The trial period is to run for a 3 month period; or until the required sample size (to be agreed with RMS) is met.

Project Deliverables:
The following are deliverables along with the Project Management and testing:

- Scoping Study Report

Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

Fixed Cost Quotation
$84,340 excluding GST.

Date Issued: 03/10/2016
Quote Valid until: 03/11/2016
Quote Ref: 098

This quotation is accepted by: Name: _____;

Title: _____; Date: ___ / ___ / _____

PO Ref: _____ Signature: _____

File Size:
81,920

File Type:
Microsoft Word Document

GUID:
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Item Date:
Monday, October 3, 2016 at 8:09:05 PM Australian Eastern Daylight Time

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Shannon Entropy:
5.405336491587052

Property Source:
E18-0281-AS-7-1-PR-0007-HDD2

_AdHocReviewCycleID:
2,132,389,924

_AuthorEmail:
Samer.SOLIMAN@rms.nsw.gov.au

_AuthorEmailDisplayName:
SOLIMAN Samer

_EmailSubject:
Mobile ANPR Trial

_ReviewingToolsShownOnce:

Application Version:
983,040

AppName:
Microsoft Office Word

Author:
Steve O

Char Count:
1,945

Char Count with Spaces:
2,282

CLSID:
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Comment Authors:
Unknown

Company:

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Thursday, December 3, 2015 at 11:47:00 AM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 8:09:04 PM Australian Eastern Daylight Time

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Saturday, December 16, 2017 at 12:29:44 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 7:47:57 PM Australian Eastern Daylight Time

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Keywords:

Last Author:
Samer

Last Saved:
Monday, October 3, 2016 at 8:09:00 PM Australian Eastern Daylight Time

Lines:
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Links Dirty:
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Name:
Quote 098 - FLIR A615 brake & tyre temperature scanner.doc

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Read; Write; Write; Read Extended Attributes; Write Extended Attributes; Execute File; Delete Child; Read Attributes; Write Attributes; Delete; Read Security Descriptor; Write DACL; Write Owner; Synchronize

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Local System

NTFS ACE 1 Type:
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Read; Write; Write; Read Extended Attributes; Write Extended Attributes; Execute File; Delete Child; Read Attributes; Write Attributes; Delete; Read Security Descriptor; Write DACL; Write Owner; Synchronize

NTFS ACE 2 Flags:
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NTFS ACE 2 Raw Flags:
16

NTFS ACE 2 SID:
S-1-5-32-544

NTFS ACE 2 SID Name:
BUILTIN\Administrators

NTFS ACE 2 Type:
Allow

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Read; Write; Write; Read Extended Attributes; Write Extended Attributes; Execute File; Delete Child; Read Attributes; Write Attributes; Delete; Read Security Descriptor; Write DACL; Write Owner; Synchronize

NTFS ACE 3 Flags:
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NTFS ACE 3 Raw Flags:
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NTFS ACE 3 Type:
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Monday, October 3, 2016 at 8:09:04 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 8:09:05 PM Australian Eastern Daylight Time

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Monday, October 3, 2016 at 8:09:05 PM Australian Eastern Daylight Time

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Quote 098 - FLIR A615 brake & tyre temperature scanner.doc

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Monday, October 3, 2016 at 5:21:51 PM Australian Eastern Daylight Time

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Paragraphs:
4

Physical Start Sector:
13,863,616

Revision Number:
4

Scale Crop:
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Shared Document:
false

Subject:

Template:
Normal

Title:

Word Count:
341

Fwd: trial 4 - defective brake/tyre enforcement using FLIR A615 thermal vehicle scanner

From: Sam Sol <[redacted]>
To: novationengineering@bigpond.com, Steve Yeah <[redacted]>, SOLIMAN Samer <samer.soliman@rms.nsw.gov.au>
Date: Mon, 03 Oct 2016 20:12:38 +1100
Attachments: thermalbrakemonitor.zip (7.18 MB); Flir A6650 - AUT_025_EN.pdf (176.29 kB); Flir A615 - AUT_014_EN.pdf (267.1 kB); Flir A65 - AUT_009_EN.pdf (269.65 kB); Flir Automation Catalogue AUT_021_EN.pdf (3.79 MB); Quote 098 - FLIR A615 brake & tyre temperature scanner.doc (81.92 kB)

---------- Forwarded message ----------
From: **SOLIMAN Samer** <Samer.SOLIMAN@rms.nsw.gov.au>
Date: Fri, Sep 30, 2016 at 11:29 AM
Subject: trial 4 - defective brake/tyre enforcement using FLIR A615 thermal vehicle scanner
To: "[redacted]" <[redacted]>

- * Flir A615 with 45° lens (mirror setup for trial instead of wide angle lens)
- * Pelco EH3512 housing with germanium window
- * Small fanless computer with solid state recording drive (in IP66 weather proof box)
- * Trigger input for start/stop provided by pressure strips
- * Power provided by local supply or car/truck batteries if remote location
- * Software configured to capture radiometric video at 50 frames per second when triggered

Samer Soliman
Manager Heavy Vehicle Programs
Compliance Systems | Compliance Operations Branch | Compliance and Regulatory Services
T 02 88370687 | [redacted]
www.rms.nsw.gov.au

Roads and Maritime Services
99 Phillip st Parramatta NSW 2150

---------- Forwarded message ----------
From: Tim Snell <tim.snell@imcontrol.com.au>
To: SINGH Jai <Jai.SINGH@rms.nsw.gov.au>
Cc: Joe Bullock <joe.bullock@imcontrol.com.au>, SOLIMAN Samer <Samer.SOLIMAN@rms.nsw.gov.au>, PASILOW David A <David.PASILOW@rms.nsw.gov.au>
Date: Mon, 12 Sep 2016 17:02:11 +1000
Subject: Re: Flir cameras for brake temperature detection
Hi Jai,

Apologies for the delay in reply, today was my first day back in the office. Jon has put together a few models for camera housings, please see attached. The A65 will definitely fit. We are working on a solution for the A615 at the moment.

What is the maximum height clearance for the trial camera housing? Is there any area where the camera could be partially mounted below the road surface (is it even worth checking to see if there is an existing pothole in the entry road?)?

If not we may need to look at a reflector arrangement for the A615.

Regards,

TIM SNELL

Industrial Monitoring & Control Pty Ltd / IMC-Store
e: tim.snell@imcontrol.com.au ph: 02 4969 7569 m: [redacted] f: 02 4961 4455

On Thu, Sep 1, 2016 at 10:59 AM, SINGH Jai <Jai.SINGH@rms.nsw.gov.au> wrote:

Hi Tim,

Thanks for that. It was great meeting you and Joe.

I'd like to get a proposal with costings from your team for the following

- Rental of the A615 thermal camera (rental costs for 1 week, 2 weeks, 3 weeks and 4 weeks)
- Enclosure for thermal camera (need to ensure that the size of the enclosure allows clearance for a heavy vehicle to drive over)
- Support from your team for the duration of the trial.
- Any other additional equipment (e.g. ruggedized Ethernet cable)

We can supply a laptop however if any specialised software is required then may be worthwhile bringing your own.

Let me know if you need more information.

Regards,

Jai

From: Tim Snell [mailto:tim.snell@imcontrol.com.au]
Sent: Wednesday, 24 August 2016 4:24 PM
To: SINGH Jai; SOLIMAN Samer; PASILOW David A
Cc: Joe Bullock
Subject: Re: Flir cameras for brake temperature detection

Hi All,

Thanks again for your time today, it was great to get a better understanding of the final system goals. As discussed, there are several camera options that we should investigate during the trial.

If cost and size was no object then a cooled detector camera would be prefered, such as the A6650. The data sheet is attached. Realistically, this camera is going to be outside of budget for any kind of roll out ($100k+ per unit).

The A615 is potentially the best option. The 80° field of view lens, 8ms detector time constant and 200Hz frame rate in windowing mode will potentially be the best combination of size, cost and features (approx. $30k).

The A65 is more compact and much cheaper (approx. $12k per unit). Detector time constant is slower, at 12ms and frame rate is 30Hz. A 60Hz frame rate is available as a special order.

We will design a few enclosure mock ups to suit the A615 and A615 to try and minimise the height above ground. Please contact Joe if you have any questions or we can help in any way.

Regards,

T I M
S N E L Industrial Monitoring & Control Pty Ltd / IMC-Store
e: tim.snell@imcontrol.com.au ph: 02 4969 7569 m: [redacted] f: 02 4961 4455

On Mon, Aug 22, 2016 at 2:12 PM, SINGH Jai <Jai.SINGH@rms.nsw.gov.au> wrote:

Hi All,

Booking some time to visit Industrial Monitoring and Control office to discuss brake temperature detection with Flir cameras.

Let me know if this date/time is not suitable.

Roads & Maritime

Before printing, please consider the environment

---------- Forwarded message ----------
From: Tim Snell <tim.snell@imcontrol.com.au>
To: SINGH Jai <Jai.SINGH@rms.nsw.gov.au>, SOLIMAN Samer <Samer.SOLIMAN@rms.nsw.gov.au>, PASILOW David A <David.PASILOW@rms.nsw.gov.au>
Cc: Joe Bullock <joe.bullock@imcontrol.com.au>
Date: Wed, 24 Aug 2016 16:24:21 +1000
Subject: Re: Flir cameras for brake temperature detection
Hi All,

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Regards,

TIM SNELL

Industrial Monitoring & Control Pty Ltd / IMC-Store
e: tim.snell@imcontrol.com.au ph: 02 4969 7569 m: [redacted] f: 02 4961 4455

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Hi All,

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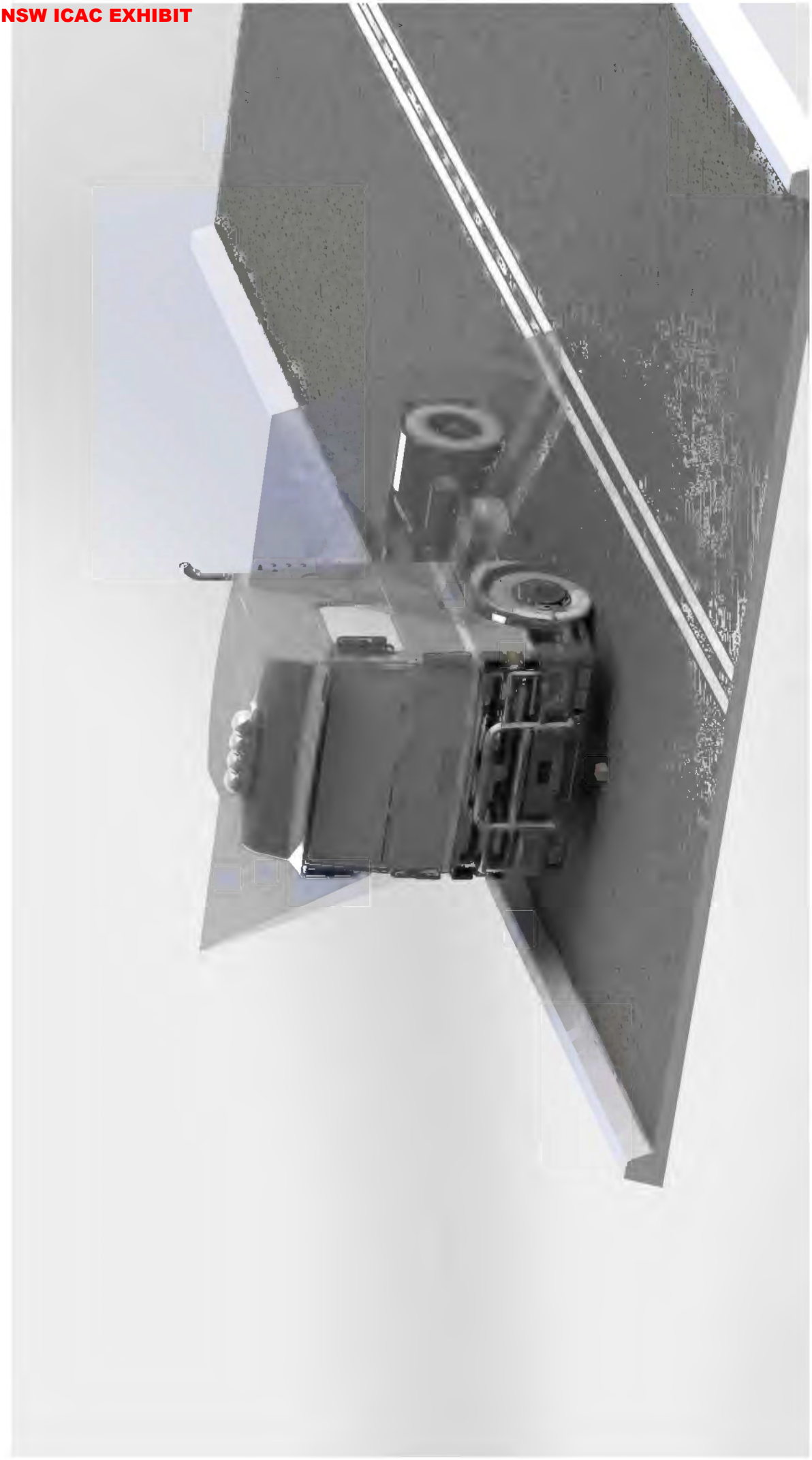
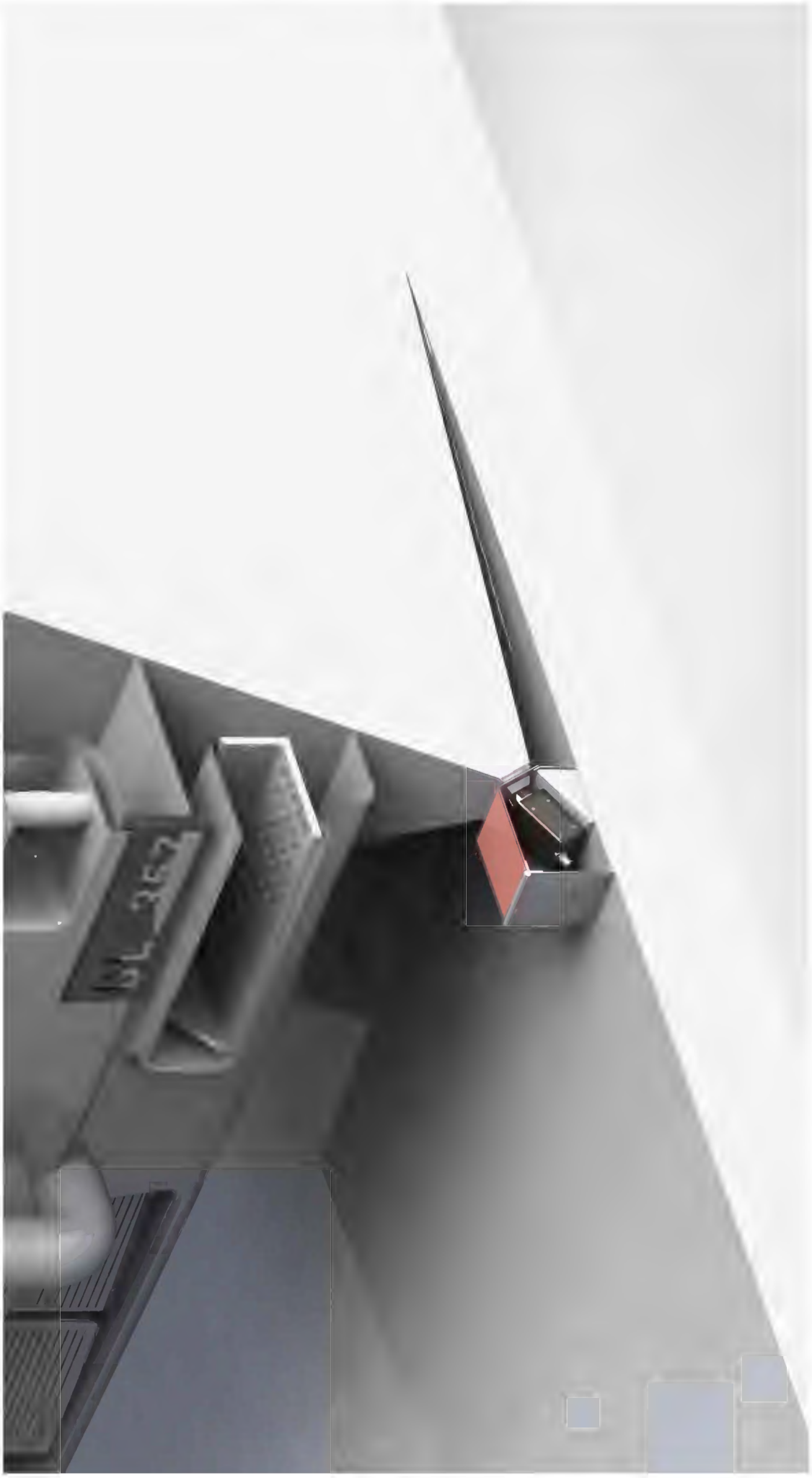
Let me know if this date/time is not suitable.

Before printing, please consider the environment

IMPORTANT NOTICE: This email and any attachment to it are intended only to be read or used by the named addressee. It is confidential and may contain legally privileged information. No confidentiality or privilege is waived or lost by any mistaken transmission to you. Roads and Maritime Services is not responsible for any unauthorised alterations to this email or attachment to it. Views expressed in this message are those of the individual sender, and are not necessarily the views of Roads and Maritime Services. If you receive this email in error, please immediately delete it from your system and notify the sender. You must not disclose, copy or use any part of this email if you are not the intended recipient.





FLIR A6600/A6650

High Speed Thermal Imaging Camera with FLIR Cooled InSb Detector

Manufacturing and process engineering specialists use thermal imaging cameras with great success for a full range of automation applications. Practical uses include: automated inspections, process control, condition monitoring, fire prevention & detection, and continuous optical gas imaging.

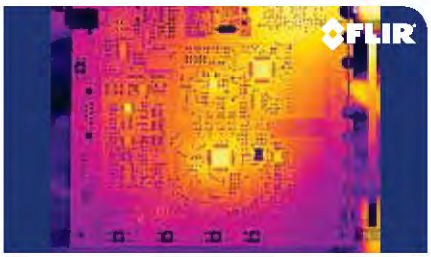
Powerful cooled FLIR A66xx-Series thermal cameras can help you see minute temperature differences, capture high speed processes and thermal events, measure temperatures of very small targets, and synchronize with other measuring devices.

HIGH SENSITIVITY, CRISP THERMAL IMAGES

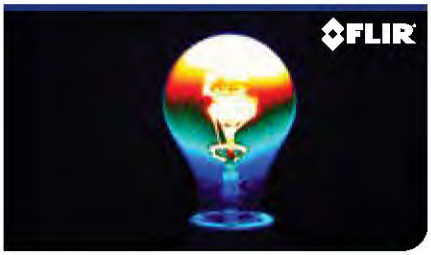
FLIR A66xx-Series incorporates a cooled FLIR Indium Antimonide (InSb) detector that operates in the 3- to 5-micron waveband. The camera produces crisp thermal images of 640 x 512 pixels. Achieving a high thermal sensitivity of <20 mK, FLIR A66xx-Series is able to capture the finest image details.

FAST INTEGRATION TIMES

Working in snapshot mode, FLIR A66xx-Series cameras are able to capture all pixels from a scene simultaneously. This is particularly important when monitoring fast-moving objects where an uncooled thermal imaging camera would suffer from image blur. The A6600 supports image frame rates up to 480 frames per second when operating in windowing mode. The A6650 supports frame rates up to 4,175 frames per second when operating in a 16 x 4 pixel window.



High resolution inspection of PCB board



Through glass inspection of light bulb filament

STANDARD VIDEO INTERFACES

FLIR A66xx-Series uses a standard GigE Vision™ / GenICam interface to transmit both commands and full dynamic range digital video. Additional interfaces include a BNC analog video output. The Gigabit Ethernet and analog video are simultaneously active yet independently controlled allowing greater flexibility for recording and display purposes.

CUSTOM COLD FILTERS AVAILABLE

Custom cold filtering options for specific spectral detection and measurement are available. Perfect for imaging through glass, measuring temperature of thin film plastics, filtering different wavebands for laser profiling and detection, or optical gas imaging.

SOFTWARE

A Software Developer's Kit (SDK) is optionally available.

Imaging Specifications

System Overview	FLIR A6600	FLIR A6650
Detector Type	FLIR Indium Antimonide (InSb)	
Spectral Range	3 – 5 µm or 1 - 5 µm	
Resolution	640 × 512	
Detector Pitch	15 µm	
NETD	<20 mK (18 mk typical)	
Well Capacity	7.2 M electrons	
Operability	>99.8% (>99.95% typical)	
Sensor Cooling	FLIR Closed Cycle Rotary	
Electronics / Imaging		
Readout	Snapshot	
Readout Modes	Asynchronous Integrate While Read; Asynchronous Integrate Then Read	
Synchronization Modes	Frame Sync	
Integration Time	500 ns to full frame	
Subwindow Modes	Full, 1/2 or 1/4 Window	Flexible (16x4 incr.)
Max Frame Rate	60Hz @ Full Window 240Hz @ 1/2 Window 480 Hz@ 1/4 Window	125Hz @ Full Window 409Hz @ 1/2 Window 1077Hz @ 1/4 Window 4175Hz @ 16x4 pixels Window
DRX	No	Yes
Dynamic Range	14-bit	
Digital Data Prototcol	Gigabit Ethernet (GigE Vision 2.0)	
Analog Video	NTSC, PAL	
Camera Control	GenICam	
Trigger In (Record Start)	No	Yes
Sync OUT	No	Yes
AUX Connector (RS-232, GPIO)	No	Yes
Measurement		
Standard Temperature Range	-20°C to 350°C (-4°F to 662°F)	
Optional Temperature Range	Up to 1,500°C (2,732°F) Up to 2,000°C (3,632°F)	
Accuracy	± 2°C or ±2% of reading	
Optics		
f/#	f/4.0 or f/2.5	
Available Lenses	3-5µm: 13mm, 13mm (low distortion), 25mm, 50mm, 100mm (all lenses are f/2.5) 1-5µm: 25mm, 50mm, 100mm (lenses are f/2.5)	
Microscopes	1x (this lens is f/4 and requires an f/4 camera)	
Focus	Manual	
Filtering	Removable Behind the Lens or Permanent "cold" Filter Available	
Analog Video		
Analog Palettes	Selectable 8-bit	
AGC	Manual, Linear, Plateau Equalization, DDE	
Digital Zoom	Video Zoom is Auto Selected: 1x for Full and 1/2 window, 2x for 1/4 window	
General		
Operating Temperature Range	-40°C to 50°C (-40°F to 122°F)	
Storage Temperature Range	-55°C to 80°C (-67°F to 176°F)	
Shock / Vibration	40 g , 11 msec ½ sine pulse / 4.3 g RMS Random Vibration, All 3 Axis	
Power	24 VDC (< 50 W steady state)	
Weight w/o Lens	5 lbs / 2,3 kg	
Size (L × W × H) w/o Lens	8.5 x 4.0 x 4.3" / 21.6 x 10.2 x 10.9cm	
Mounting	2 × ¼"-20, 1 × 3/8"– 16, 4 × 10/24	

FLIR Systems Trading Belgium BVBA
Luxemburgstraat 2
B-2321 Meer
Belgium
PH: +32 (0) 3 665 51 00

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Nashua, NH 06063
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PO Box 7376
SE-187 66 Täby
Sweden
PH: +46 (0)8 753 25 00

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920 Sheldon Ct
Burlington, Ontario
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FLIR Systems UK
2 Kings Hill Avenue -
Kings Hill
West Malling
Kent
ME19 4AQ
United Kingdom
PH: +44 (0)1732 220 011

www.flir.com
flir@flir.com
NASDAQ: FLIR

FLIR A315 / A615

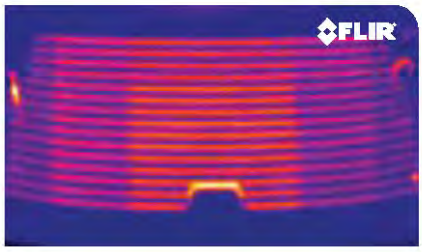
Thermal Imaging Cameras for Machine Vision

The FLIR A315 / A615 is a series of compact and affordable thermal imaging cameras, fully controlled by a PC. Due to their compliance to standards, FLIR A315 / A615 are Plug&Play with third-party Machine Vision software like National instruments, Cognex, Matrox, MVtec and Stemmer Imaging.

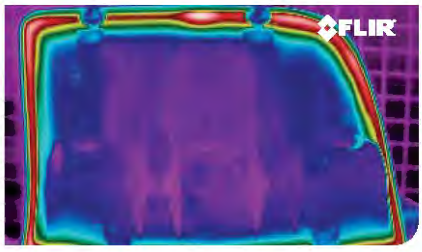
EXCELLENT IMAGE QUALITY

The FLIR A615 is equipped with an uncooled Vanadium Oxide (VoX) detector that produces crisp thermal images of 640 x 480 pixels. This allows more accuracy and shows more details at a longer distance. The FLIR A615 also has a high-speed infrared windowing option.

Users that do not need the high image quality of the FLIR A615 can choose the A315 that produces thermal images of 320 x 240 pixels. Both cameras make temperature differences as small as 50 mk clearly visible. They come with a built-in 25° lens with motorized focus and autofocus. Optional lenses are available.



Inspection of a windshield defroster for damaged electrical elements.



Black glue on black plastic.

GigE VISION™ STANDARD COMPATIBILITY

An industry first, GigE Vision is a camera interface standard developed using the Gigabit Ethernet communication interface. GigE Vision is the first standard to enable fast image transfer using low-cost standard cables even over long distances. With GigE Vision, hardware and software from different vendors can interoperate seamlessly over GigE connections.

GenICam™ PROTOCOL SUPPORT

Another industry first. The goal of GenICam is to provide a generic programming interface for all kinds of cameras. The GenICam protocol also makes third-party software compatible with the camera.

16-BIT TEMPERATURE LINEAR OUTPUT

Allows you to do temperature measurements in a non-contact mode with any third-party software. A built-in Gigabit Ethernet connection allows real-time 16-bit image streaming to a computer.

ENVIRONMENTAL HOUSING (FLIR A315)

The FLIR A315 can be ordered with an environmental housing. The housing increases the environmental specifications of the FLIR A315 to IP66, protecting the camera's from dust and water without affecting any of the camera features. The housing is available for cameras that are equipped with a 25°, 45° or 90° lens, and can be ordered separately as an accessory.

Technical specifications FLIR A315/ A615

Imaging & Optical Data	FLIR A315	FLIR A615
Field of view (FOV) / Minimum focus distance	25° × 18.8° / 0.4 m (1.31 ft.)	15°: 15° × 11° (19° diagonal) / 0.50 m (1.64 ft.) 25°: 25° × 19° (31° diagonal) / 0.25 m (0.82 ft.) 45°: 45° × 34° (55° diagonal) / 0.15 m (0.49 ft.) 7°: 7° × 5.3° (8.7° diagonally) / 2.0 m (6.6 ft.) 80°: 80° × 64.4° (92.8° diagonal) / 65 mm (2.6 in.)
Spatial resolution (IFOV)	1.36 mrad	15°: 0.41 mrad 25°: 0.68 mrad 45°: 1.23 mrad 7°: 0.19 mrad 80°: 2.62 mrad
Focal length	18 mm (0.7 in.)	15°: 41.3 mm (1.63 in.) 25°: 24.6 mm (0.97 in.) 45°: 13.1 mm (0.52 in.) 7°: 88.9 mm (3.5 in.) 80°: 6.5 mm (0.26 in.)
F-number	1.3	1.0
Image frequency	60 Hz	50 Hz (100/200 Hz with windowing)
Detector data		
Focal Plane Array (FPA) / Spectral range	Uncooled microbolometer / 7.5–13 µm	Uncooled microbolometer / 7.5–14 µm
IR resolution	320 × 240 pixels	640 × 480 pixels
Detector pitch	25 µm	17 µm
Detector time constant	Typical 12 ms	Typical 8 ms
Measurement		
Object temperature range	–20 to +120°C (-4 to 248°F) 0 to +350°C (32 to 662°F)	-20 to +150°C +100 to +650°C +300 to +2000°C
USB		
USB	N/A	Control and image
USB, standard	N/A	USB 2 HS
USB, connector type	N/A	USB Mini-B
USB, communication	N/A	TCP/IP socket-based FLIR proprietary
USB, image streaming	N/A	16-bit 640 × 480 pixels at 25 Hz - Signal linear - Temperature linear - Radiometric
USB, protocols	N/A	TCP, UDP, SNTP, RTSP, RTP, HTTP, ICMP, IGMP, ftp, SMTP, SMB (CIFS), DHCP, MDNS (Bonjour), uPnP
Ethernet		
Ethernet, image streaming	16-bit 320 × 240 pixels at 60 Hz - Signal linear - Temperature linear - Radiometric GigE Vision and GenICam compatible	16-bit 640 × 480 pixels at 50 Hz 16-bit 640 × 240 pixels at 100 Hz 16-bit 640 × 120 pixels at 200 Hz - Signal linear - Temperature linear - Radiometric GigE Vision and GenICam compatible

Imaging & Optical Data	
Lens identification	Automatic
Thermal sensitivity/NETD	< 0.05°C @ +30°C (86°F) / 50 mK
Focus	Automatic or manual (built in motor)
Measurement	
Accuracy	±2°C or ±2% of reading

Measurement analysis	
Atmospheric transmission correction	Automatic, based on inputs for distance, atmospheric temperature and relative humidity
Optics transmission correction	Automatic, based on signals from internal sensors
Emissivity correction	Variable from 0.01 to 1.0
Reflected apparent temperature correction	Automatic, based on input of reflected temperature
External optics/windows correction	Automatic, based on input of optics/window transmission and temperature
Measurement corrections	Global object parameters
Ethernet	
Ethernet	Control and image
Ethernet, standard	IEEE 802.3
Ethernet, connector type	RJ-45
Ethernet, type	Gigabit Ethernet
Ethernet, communication	TCP/IP socket-based FLIR proprietary and GenICam protocol
Ethernet, protocols	TCP, UDP, SNTP, RTSP, RTP, HTTP, ICMP, IGMP, ftp, SMTP, SMB (CIFS), DHCP, MDNS (Bonjour), uPnP
Digital input/output	
Digital input	2 opto-isolated, 10–30 VDC
Digital output, purpose	Output to ext. device (programmatically set)
Digital output	2 opto-isolated, 10–30 VDC, max 100 mA
Digital I/O, isolation voltage	500 VRMS
Digital I/O, supply voltage	12/24 VDC, max 200 mA
Digital I/O, connector type	6-pole jackable screw terminal
Digital input, purpose	Image tag (start, stop, general), Image flow ctrl. (Stream on/off), Input ext. device (programmatically read)
Power system	
External power operation	12/24 VDC, 24 W absolute max
External power, connector type	2-pole jackable screw terminal
Voltage	Allowed range 10–30 VDC
Environmental data	
Storage temperature range	–40°C to +70°C (-40 to 158°F)
Humidity (operating and storage)	IEC 60068-2-30/24 h 95% relative humidity +25°C to +40°C (77 to 104°F)
EMC	• EN 61000-6-2:2001 (Immunity) • EN 61000-6-3:2001 (Emission) • FCC 47 CFR Part 15 Class B (Emission)
Vibration	2 g (IEC 60068-2-6)
Physical data	
Housing material	Aluminium
Scope of delivery	
Hard transport case or cardboard box, Thermal imaging camera with lens, Utility CD-ROM, Calibration certificate, Ethernet™ cable, USB cable (FLIR A615), Mains cable, Power cable (pig-tailed), Power supply, Printed Getting Started Guide, Printed Important Information Guide, User documentation CD-ROM, Warranty extension card or Registration card, 6-pole screw terminal (mounted on camera)	

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FLIR A65 / A35 / A15 / A5

Compact Thermal Imaging Cameras For Machine Vision

The FLIR Ax5-Series is the perfect solution for those applications that require the benefits of a thermal image. The FLIR Ax5-Series camera has features and functions that make it the natural choice for anyone who uses PC software to solve problems.

EXTREMELY AFFORDABLE AND COMPACT

The Ax5-Series are low-cost infrared cameras, with the FLIR A5 being the most affordable. They are ideal tools for putting thermal imaging at work in an automation or machine vision environment. All models are extremely compact. They can easily be integrated in a machine vision environment.

CHOICE OF IMAGE QUALITY

The FLIR A65 produces crisp thermal images with 640 x 512 pixels. Users that do not need this high image quality for their application can choose for the FLIR A35, which produces thermal images of 320 x 256 pixels; from the FLIR A15, which produces thermal images with 160 x 128 pixels or the FLIR A5, which produces thermal images with 80 x 64 pixels. The FLIR Ax5-Series makes temperature differences as small as 50 mk clearly visible.

GigE VISION™ STANDARD COMPATIBILITY

GigE Vision is a camera interface standard developed using the Gigabit Ethernet communication interface. GigE Vision is the first standard to allow for fast image transfer using low cost standard cables, even over long distances. With GigE Vision, hardware and software from different vendors can operate seamlessly over Gigabit Ethernet connections.

GenICam™ PROTOCOL SUPPORT

The goal of GenICam is to provide a generic programming interface for all types of cameras. Regardless of interface technology (Gigabit Ethernet, Camera Link, IEEE-1394 etc) or features implemented, the Application Programming Interface (API) will always be the same. The GenICam protocol also makes it possible to use third party software with the camera.

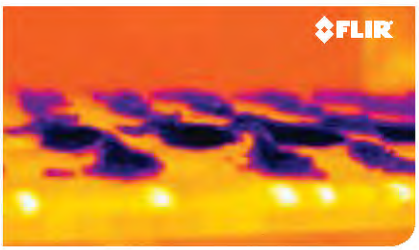
14-BIT TEMPERATURE LINEAR OUTPUT

Allows you to do temperature measurements, in a non-contact mode, within any 3rd party software. A built-in Gigabit Ethernet connection allows real time 14-bit image streaming to computer.

SYNCHRONIZATION

Possible to configure one camera to be master and others to be slave(s) for applications that call for more than one camera to cover the object or for stereoscopic applications.

Detecting liquid level in visually opaque bottles.



Quality control of food production line

Technical specifications

Imaging & Optical Data	FLIR A65	FLIR A35	FLIR A15	FLIR A5
IR resolution	640 x 512 pixels	320 x 256 pixels	160 x 128 pixels	80 x 64 pixels
Spatial resolution (IFOV)	45° (H) x 37° (V) with 13 mm lens 25° (H) x 20° (V) with 25 mm lens lenses are not interchangeable and need to be specified at time of order	48° (H) x 39° (V) with 9 mm lens 25° (H) x 19° (V) with 19 mm lens lenses are not interchangeable and need to be specified at time of order	48° (H) x 39° (V) with 9 mm lens 25° (H) x 19° (V) with 19 mm lens lenses are not interchangeable and need to be specified at time of order	44° (H) x 36° (V) with 5 mm lens 25° (H) x 20° (V) with 9 mm lens lenses are not interchangeable and need to be specified at time of order
Image frequency	7.5 Hz / 30Hz	60 Hz	60 Hz	60 Hz
Detector data				
Detector pitch	17 µm	25 µm	50 µm	50 µm
Measurement				
Object temperature range	-25°C to +135°C (-13 to 275°F) / –40°C to +550°C (-40 to 1022°F)			

Imaging & Optical Data	
Thermal sensitivity/NETD	< 0.05°C @ +30°C (+86°F) / 50 mK
Accuracy	Accuracy ±5°C (±9°F) or ±5% of reading
F-number	1.25
Focus	Fixed
Detector data	
Focal Plane Array (FPA) / Spectral range	Uncooled VOX microbolometer / 7.5–13 µm
Detector time constant	Typical 12 ms
Ethernet	
Ethernet	Control and image
Ethernet, type	Gigabit Ethernet
Ethernet, standard	IEEE 802.3 / RJ-45
Ethernet, communication	GigE Vision ver. 1.2 Client API GenICam compliant
Ethernet, image streaming	8-bit monochrome @ 7.5 / 30 / 60 Hz (variant dependant) Signal linear/ DDE, Automatic/ Manual, Flip H&V 14-bit @ 7.5 / 30 / 60 Hz (variant dependent) according to IR camera resolution Signal linear/ DDE, GigE Vision and GenICam compatible
Ethernet, power	Power over Ethernet, PoE IEEE 802.3af class 0 Power
Ethernet, protocols	TCP, UDP,ICMP, IGMP, DHCP, GigEVision
Digital input/output	
Digital input	General purpose , 1× opto-isolated, "0" < 2, "1"=2–12 VDC
Digital output, purpose	General purpose output to ext. device (programmatically set)
Digital output	1× opto-isolated, 2–40 VDC, max 185 mA
Digital I/O, isolation voltage	500 VRMS
Digital I/O, supply voltage	2–40 VDC, max 200 mA
Digital I/O, connector type	12-pole M12 connector (shared with Digital Synchronization and External power)
Synchronization In, purpose	Frame sync In to control camera
Synchronization In	1×, non-isolated
Synchronization In, type	LVC Buffer @3.3V, "0" <0.8 V, "1">2.0 V.
Synchronization Out, purpose	Frame sync Out to control another Ax5 camera
Synchronization Out	1×, non-isolated
Synchronization Out, type	LVC Buffer @ 3.3V, "0"=24 MA max, "1"= –24 mA max.
Digital Synchronization, connector type	12-pole M12 connector (shared with Digital I/O and External power)

Power system	
External power operation	12/24 VDC, < 3.5 W nominal < 6.0 W absolute max
External power, connector type	12-pole M12 connector (shared with Digital I/O and Digital Synchronization)
Voltage	Allowed range 10–30 VDC
Environmental data	
Operating temperature range	–15°C to +50°C (+5°F to +122°F)
Storage temperature range	–40°C to +70°C (–40°F to +158°F)
Humidity (operating and storage)	IEC 60068-2-30/24 h 95% relative humidity +25°C to +40°C (+77°F to +104°F)
EMC	EN 61000-6-2 (Immunity) EN 61000-6-3 (Emission) FCC 47 CFR Part 15 Class B (Emission)
Encapsulation	IP 40 (IEC 60529)
Bump	25 g (IEC 60068-2-27)
Vibration	2 g (IEC 60068-2-6)
Physical data	
Weight	0.200 kg (0.44 lb.)
Camera size (L × W × H)	106 × 40 × 43 mm (4.2 × 1.6 × 1.7 in.)
Tripod mounting	UNC ¼"-20 (on three sides)
Base mounting	4 × M3 thread mounting holes (bottom)
Housing material	Magnesium and aluminum
Scope of delivery	
Packaging, contents	Cardboard box, thermal imaging camera with lens, focus adjustment tool, printed documentation, user documentation CD-ROM, FLIR Tools download card

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THERMAL IMAGING FOR MACHINE VISION AND INDUSTRIAL SAFETY APPLICATIONS

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2

FLIR: THE WORLD LEADER IN THERMAL IMAGING CAMERAS

FLIR is the world leader in the design and manufacturing of thermal imaging systems for a wide variety of commercial, industrial and government applications.

FLIR thermal imaging systems use state-of-the-art infrared imaging technology that detects infrared radiation - or heat. Based on detected temperature differences, thermal imaging cameras produce a visible image of a target's thermal profile. Advanced algorithms also make it possible to read correct temperature values from this image.

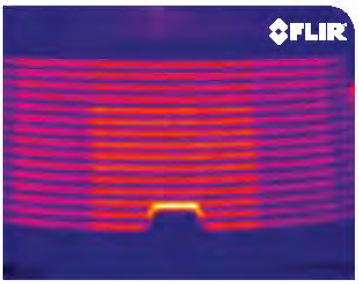
We design and manufacture all of the critical technologies inside our products, including detectors, electronics, and lenses.

Thermal imaging cameras for machine vision applications

FLIR knows that a machine vision environment is totally different from any other environment in which thermal imaging cameras are being used. That is why we are designing and developing a dedicated product range for these types of applications. These cameras are designed and developed in our state-of-the-art facility in Taby, Sweden.

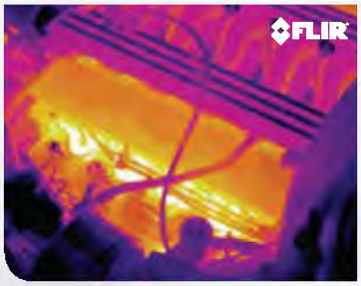
Thermal imaging for automation

FLIR thermal imaging cameras are ideal for a wide range of automation applications when flexibility and unequaled performance are vital. Accuracy, reliability, sensitivity and high performance are also vitally important. That's why FLIR thermal imaging cameras are widely used around the world for a wide variety of automation applications.



Inspection of a windshield defroster for damaged electrical elements.

Product development



Thermal image of a car engine.

FLIR Systems Sweden

MACHINE VISION (MONITOR PRODUCTION PROCESSES CONTINUOUSLY)

Many industries can take advantage of implementing thermal imaging cameras that continuously monitor production. In some cases the data acquired by a thermal imaging camera can be used to improve the production process.

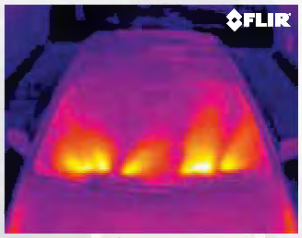
Thermal imaging cameras for automated inspections

For many applications, such as the production of parts and components for the automotive or electronics industry, thermal data are critical. While machine vision can see a production problem, it cannot detect thermal irregularities. Thermal imagery provides much more information to production specialists and decision makers.

Quality control of food production line.

Food inspection

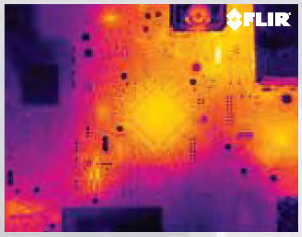
In the food industry, it's essential to carefully control the temperature and shape of perishable goods throughout production, transportation, storage, and sales. Food processors need tools that automate crucial operations in a way that helps minimize human error while holding down costs.



Inspection of car windscreen defrosting.

Automotive industry

New vehicles are subjected to a number of individual and automated quality control tests. Many automobile manufacturers are using thermal imaging cameras for quality control. Typical applications include inspection of rear window heating, heated seats, checking exhaust flaps, air-conditioning outlets and more.



A flawed resistor detected by a thermal imaging camera.

Electronic components

Cutting down failure rates of electronic components is essential for companies that want to supply a perfect product to their customers. The only way to ensure this is by checking each individual component to provide 100% quality control.

Thermal image shows bottles that are over- or under-filled.

Packaging

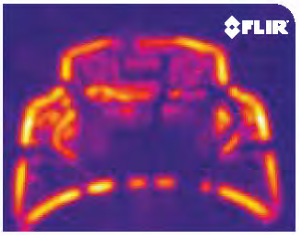
Thermal imaging cameras make a clear distinction between what is hot and what is not. This, combined with emissivity effects, sometimes allows thermal imaging cameras to "see through" plastic or other material.

Thermal imaging cameras for process control

Assuring quality control, deciding if a product is 100% to specifications, whether it is "good or bad" is just one step. Thermal imaging cameras can help to do this and more. Often thermal imaging cameras provide valuable data about the production process. Production engineers can use these data to improve the entire production process.

Automotive industry

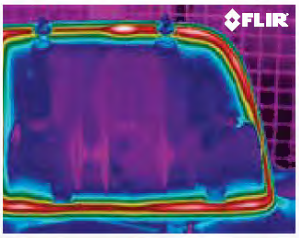
Cars need to be light and strong. To achieve both of these goals, modern car panels are made of a combination of a metal layer on top and a structural adhesive layer underneath. These layers are glued together using induction. The temperature has to be exactly right for the adhesion to work properly. To ensure that the adhesion goes smoothly, FLIR thermal imaging cameras can provide automatic feedback during the process.



This thermal image shows induction heating at work.

Glue bead verification

Clear glue or black glue applied to a black background is very difficult for a visible light camera to see and measure. FLIR automation cameras, however, can easily determine whether the glue bead has been applied properly, has gaps, and even if it is within the allowable temperature limits.



Black glue on black plastic.

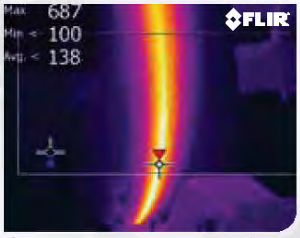
Paper moisture characterization

Paper quality can be affected by variations in moisture. FLIR thermal automation cameras pick up the temperature differences caused by moisture variations to help paper mills keep their processes in control.

Paper moisture characterization.

Weld inspection

Spot and linear welds can be inspected in real time by FLIR thermal automation cameras.



Controlling the positioning of pipes in an automated welder.

INDUSTRIAL SAFETY

Safety is important in any industry. Accidents and fire need to be avoided and production needs to be running at all times. Thermal imaging cameras can help to ensure safety and avoid unplanned outages.

Condition monitoring

Condition monitoring is all about identifying problems before failure occurs in order to prevent costly production stops. Typical equipment that is monitored includes high- and low-voltage installations, turbines, compressors and other electrical and mechanical equipment. Sometimes processes need to be monitored because an anomaly can cause dangerous situations.

Thermal image of a flare.

Flare monitoring

Flares, that often have a flame that is not visible to the naked eye, need to be monitored to see if they are effectively burning the produced gasses. A thermal imaging camera can help do this.

Thermal inspection of a high voltage installation.

Substation monitoring

Utilities are looking for ways to address these issues in order to improve the reliability of electric power delivery while at the same time reducing costs. By using FLIR thermal imaging cameras and automation software, impending equipment failures and security breaches can be detected anytime, day or night, at a remote monitoring location.

Hot spots on the ladle indicate possible failure.

Steel ladle monitoring

Steel mill ladles have limited lives. As their refractory linings wear or develop breaks due to shock, the outer part of a ladle can be exposed to excessive temperatures. If not caught in time, the result can be ladle disintegration and a molten metal breakout, threatening the lives of workers and destroying equipment.

Overloaded fuse.

Continuous monitoring of electrical / mechanical installations

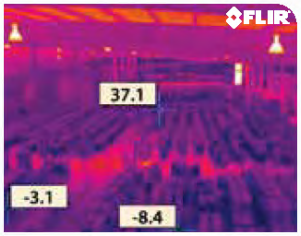
Some critical electrical and mechanical installations are monitored 24/7 with a thermal imaging camera. A fixed mounted thermal imaging camera gives you the advantage, so you don't need to rely on periodic inspections. Alarms can be set to go off once a temperature threshold is exceeded.

Fire prevention/detection

Fire can destruct entire premises and storage areas within an extremely short timeframe. The value of the destroyed goods during a fire can be tremendous, and the cost of a life that is lost during a fire is impossible to calculate. Statistics show high increase in asset loss due to fire. Thermal imaging can help prevent fires or detect them in an early stage.

Warehouse fire prevention

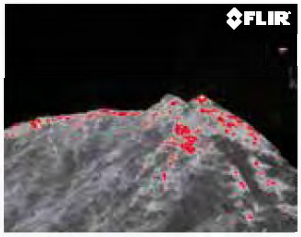
FLIR thermal imaging cameras provide an early warning response to hot spots that are detected. This is important for all types of warehouses. By detecting hot spots in an early stage, warehouse fires can be avoided.



Continuous monitoring of a warehouse.

Combustible pile monitoring

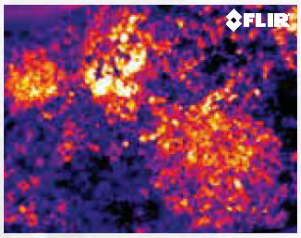
Storage of some material brings along the risk of spontaneous fires. As always, prevention is better than cure. A thermal imaging camera from FLIR can help to ensure safety and detect spontaneous self-combustion. The system provides a cost-effective solution for continuous, remote monitoring of temperatures. Typical examples are coal piles, wood chips, ore milling?, fertilizers, etc.



Hot spots in wood chip pile.

Waste bunker monitoring

Waste is potentially flammable when stored. Self-combustion, heat development due to pressure, spontaneous chemical reactions between the disposals and methane gas-building are potential fire creators. Thermal imaging cameras can help prevent fires.



Fire detection in waste bunkers.

Hot spot detection

Electrical or mechanical installations tend to get hot before they fail. A small electrical problem can have severe consequences. Not only can production break down but sparks can fly, resulting in a dangerous fire. By monitoring electrical and mechanical installations 24/7, thermal imaging cameras can help avoid fires.

A transformer showing an excessive temperature.

CONTINUOUS OPTICAL GAS IMAGING (OGI)

Thermal imaging cameras can visualize and pinpoint gas leaks. With an optical gas imaging camera it is easy to continuously scan installations that are in remote areas or in zones that are difficult to access. Continuous monitoring means that you will immediately be informed when a dangerous or costly gas leak appears so that immediate action can be taken.

Monitoring a petrochemical installation 24/7 to increase safety.

Offshore and petrochemical industry

Many chemical compounds and gases are invisible to the naked eye, yet many companies work intensively with these substances before, during and after their production processes. A fixed mounted OGI can monitor critical areas 24/7. They can be carried out remotely, rapidly and – most important of all – problems can be identified at an early stage.

Captured gas leak from production site.

Pipeline inspection

Leak detection of gases can be performed in a non-contact mode, and from a safe distance. This reduces the risk of the inspector being exposed to invisible and potentially harmful or explosive chemicals. With an optical gas imaging camera it is easy to scan areas of interest that are difficult to reach with conventional methods. A typical application is the continuous inspection of remote pipelines.

Gas leak is clearly visible on the thermal image.

Greatly improved efficiency

Experience shows that up to 84 percent of leaks occur in less than one percent of the components in a refinery. This means that 99 percent of what are expensive, time-consuming inspection tools are being used to scan safe, leak-free components.

A leaking pressure gauge.

Protect the Environment

Several gases have a high global warming potential, and strict regulations govern how companies trace, document, rectify and report any leaks of harmful gaseous compounds, and how often these procedures are to be carried out.

SOFTWARE SOLUTIONS

In order to fully utilize the FLIR A-Series cameras and integrate them into working systems for safety and automation, the A-Series offer a set of software tools and utilities. Further information regarding downloads and updates is available at http://flir.custhelp.com/

GENERAL

IP Config (AX8, A3xx, A6xx, Ax5 only)

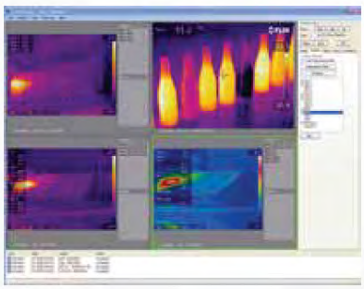
Utility program for network camera detection and IP address setting, the program comes with the Utility CD in the delivery box or can be downloaded from FLIR Custhelp.

EtherNet/IP™ conformance tested

FLIR Tools (A3xx, A6xx, Ax5 only)

The FLIR Axx-Series thermal imaging cameras work seamlessly together with FLIR Tools. It allows for viewing and analyzing thermal images and includes functions such as time versus temperature plots. Users who need more functionality and also want to be able to record images can optionally choose FLIR Tools+.

FOR MACHINE VISION (A315/A615/AX5)



- **FLIR GigE Vision compliant SDKs**
  For application development, a Pleora eBus SDK or FLIR GEV Demo sample can be downloaded from FLIR Custhelp.
- **FLIR Camera Player**
  Utility program for first camera connection and streamed image viewing, the program comes with the Utility CD in the delivery box or can be downloaded from FLIR Custhelp.
- **GigE Vision and GenICam compliance**
  Machine Vision camera standard supported in many third-party image processing software.

GEN<i>CAM GiGE VISION

FOR INDUSTRIAL SAFETY (AX8/A310/A310 PT/A310 F)

- **FLIR IR Monitor (A310, A310f without Nexus)**
  Utility program for first camera connection and control and setup of internal features/functions, supports up to 9 cameras simultaneously, the program comes with the Utility CD in the delivery box or can be downloaded from FLIR Custhelp.
- **Built-in Web server (AX8, A310)**
  Simple built-in camera control and image viewer, connect using http://"camera ip adress" in a Web browser or connect through the IP Config program. AX8 WEB interface is a complete setup and control interface for the camera.
- **Ethernet/IP or Modbus TCP (AX8, A310)**
  Industrial Field bus protocols, allows Analyze, Alarm and Camera control to be shared with PLC's. This function is always turned on in the A310 Camera.
- **ThermoVision SDK (A310)**
  An ActiveX component that allows camera control and image grabbing and transformation, purchased separately.
- **FLIR Sensors Manager (A310pt, A310f with Nexus)**
  Manage and control A310 f and A310 pt cameras in a TCP/IP network.

ACCESSORY SOLUTIONS

In today's fast-changing environment, requirements for purchased capital equipment can change from year to year or from project to project. Things that are vital today can be redundant tomorrow. That makes it important for the equipment in which you invest to be flexible enough to meet the ever-changing needs of your applications.

No other infrared camera manufacturer offers a wider variety of accessories than FLIR Systems.
Optics – From microscope optics that resolve down to 3 µm to 1 meter telescopes, FLIR has the right optic for your application needs.
Mounts & Stands – FLIR offers multiple options for mounting camera systems including tripods and microscope stands.

Cables and Connectors – Fiber optic converters, fiber cable, extended cablelengths, and camera link PC cards are just a few of the options available from FLIR to help you meet any application requirement.

AFTER SALES SERVICE

At FLIR, building a relationship with a customer takes more than just selling a thermal imaging camera. After the camera has been delivered, FLIR is there to help meet your needs.

Because FLIR designs and manufactures their cameras from the sensor up, they can quickly troubleshoot and effectively service all aspects of FLIR camera systems.
FLIR Systems offers different types of service contracts. A service contract offers you the advantage that you will never have unforeseen expenses if something should happen to your thermal imaging camera after the warranty period. Some service contracts even guarantee that you will have a replacement camera at your service if necessary.

A FULL PRODUCT RANGE FOR THE MOST DEMANDING AUTOMATION APPLICATIONS

FLIR Systems is active in all markets where the power of thermal imaging is being used for the most diverse applications. Whether it is for non-contact temperature measurement applications such as condition monitoring, automation of firefighting or for night vision applications such as security and maritime, FLIR Systems markets a full range of cameras that is totally dedicated to the needs of the user.

The same goes for Machine Vision. Whether you are monitoring a production process, doing continuous condition monitoring in a substation, involved in fire prevention or monitoring installations for gas leaks, FLIR Systems has the correct thermal imaging camera for your application.

Technical specifications of our products can be consulted on our website or ask for a product leaflet.

FLIR AX8

FLIR A65 / A35 / A15 / A5

FLIR A310 ex

FLIR A310 f

FLIR A310 pt

FLIR A6604

FLIR A310

FLIR G300 a

FLIR A615

FLIR FC-Series R

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PO Box 451
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Email: NovationEngineering@bigpond.com

Dear Roads and Maritime Services;
ATT: Samer Soliman

Quote 098: FLIR A615 brake & tyre compliance scanner – Field Trials and scoping study

Introduction

Further to our recent discussions, Novation Engineering Pty Ltd is pleased to provide a fixed price quotation to Roads and Maritime Services for the below scope of works.

Scope of Works

The following items would be carried out as per this quote:

.1 Field Trial at RMS selected site(s): FLIR A615 brake & tyre compliance scanner.

.2 Scoping Study – FLIR A615 brake & tyre compliance scanner. With the understanding that RMS is currently investigating automated thermal scanning technologies to detect potentially defective heavy vehicle axles (tyres, brakes and wheel hubs).

.3 Thermal Vehicle Scanner technology field trial requirements:
- Pavement mounted.
- Adverse weather conditions including:
  - Rain.
  - Fog.
  - Very high ambient temperatures.
  - Low ambient lighting conditions (night).

.4 Engineering/design and fabrication of:
- Pavement mounting for vehicle thermal scanner.
- Tarmac mounted housing for FLIR A615.

.5 Report on:
- Results of all FLIR A615 brake & tyre compliance scanner trial results in the format prescribed by RMS (scoping study report).

Inclusions:
The following items are included in the services scope as per this proposal

- Scope of works listed above.

Exclusions:
The following items are excluded from the services scope as per this proposal:

- System Integration. This quote does not include software integration into existing RMS systems.

Assumptions:
This quote assumes the following:

- Novation Engineering will abide by all RMS WHS requirements.
- The trial period is to run for a 3 month period; or until the required sample size (to be agreed with RMS) is met.

Project Deliverables:
The following are deliverables along with the Project Management and testing:

- Scoping Study Report

Payment Milestones:
100% upon completion (scoping study report acceptance by RMS).

Fixed Cost Quotation
$84,340 excluding GST.

Date Issued: 03/10/2016
Quote Valid until: 03/11/2016
Quote Ref: 098

This quotation is accepted by: Name: _____;

Title: _____; Date: ___ / ___ / _____

PO Ref: _____ Signature: _____

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Shannon Entropy:
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Steve O

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