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**MIDAS Outstation Generic Installer and Maintainer
Training Course**

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CONTENTS:Page No.

1.0	INTRODUCTION	6
1.1	Purpose of This Document	6
1.2	Outline of the Course	6
1.3	Aims of the Course	6
1.4	Who Should Attend	6
1.5	Example Timetable	7
1.6	Costain Service Desk	7
2.0	EQUIPMENT	8
3.0	CONTENT OF THE COURSE	9
3.1	Arrival, registration and welcome	9
3.2	Introductory Presentation	9
3.3	Questions, Break and Refreshments	9
3.4	Introduction to MIDAS OS Manuals	10
3.5	Introduction to MOTE (MIDAS Outstation Test Equipment)	10
3.6	Demonstrated Installation and Commissioning – IP and RS485	10
3.7	Practice Installations	11
3.8	Engineer’s Terminal Facilities	11
3.9	Fault finding and Diagnosis	11
3.10	Review, Questions, Short Test	12
3.11	Close	12
A.	EXAMPLE SHORT TEST	13
B.	FEEDBACK FORM	15
C.	CERTIFICATE	16
D.	TRAINING PRESENTATION	17
E.	ENGINEER’S TERMINAL ACCESS USING MOTE	18

References:

- [1] TEC4424 MIDAS Outstation Installation and User Manual
- [2] TR2597 Generic Roadside Device Requirements for Remote Access

Glossary:

CLI	Command Line Interpreter
ET	Engineer's Terminal
IP	Internet Protocol (over Ethernet)
MIDAS	Motorway Incident Detection and Automatic Signalling
MOTE	MIDAS Outstation Test Equipment
NRTS	National Roads Telecommunication Services
NTP	Network Time Protocol
OAL	Outstation Auxiliary Link
OS	Outstation
pcb	printed circuit board
RMAS	Remote Maintenance Access Service

1.0 INTRODUCTION

1.1 Purpose of This Document

This document is provided for Costain trainers who are giving the MIDAS Outstation (OS) training course. It provides details of the material to be covered and any hints and tips gleaned from presenting courses to installers, maintainers and managers.

1.2 Outline of the Course

Venue: Costain Intelligent Transport Systems, Worle

Duration: 1 Day Course, 9:30am to 16.00pm nominally

Number of Attendees: Minimum 1, maximum 12

1.3 Aims of the Course

To introduce the Costain MIDAS OS

Familiarise trainees with the MIDAS OS Manuals

Familiarise trainees with the use of MIDAS Outstation Test Equipment (MOTE)

Instruct trainees in the safe and correct installation procedures

Demonstrate how to install and commission a MIDAS OS correctly onto NRTS IP or RS485

Allow trainees to practice installing and commissioning a MIDAS OS during a practical session

Demonstrate fault-finding and maintenance activities

Review trainees' knowledge and provide a short test on the concepts learned during the day.

1.4 Who Should Attend

Although this course is aimed at installation and maintenance personnel it provides a good insight into the steps required for operation and commissioning of the Costain MIDAS OS System. Therefore, the course is suitable for personnel who are working with MIDAS OS at a higher level such as scheme designers and project managers.

In practice, many of the attendees will be familiar with previous designs of MIDAS OS produced by other companies but none of these will have the remote access facilities of the Costain MIDAS OS.

1.5 Example Timetable

09:00 Arrival, registration and welcome with refreshments

09:30 Introductory Presentation

10:30 Questions, Break and Refreshments

10:45 Introduction to MIDAS OS Manuals

11:00 Introduction to MOTE (MIDAS Outstation Test Equipment)

11:30 Demonstrated Installation and Commissioning – IP and RS485

13:00 Lunch

13:30 Practice Installations

14:00 Engineer's Terminal Facilities using MOTE

14:30 Fault finding and Diagnosis

15:30 Review, Questions, Short Test

16:30 Close

1.6 Costain Service Desk

This is the trainee's point of contact for all things MIDAS once the training course has finished:

The Costain Service Desk can be contacted by:

- calling them on 01934839039
- Email the issue to TechSD@costain.com.

2.0 EQUIPMENT

The following is required:

1. Means of displaying the PowerPoint presentation on-screen to all attendees.
2. MIDAS OS.
3. MIDAS OS Install kit.
4. Ethernet cable.
5. RADAR card (not strictly necessary but useful to show attendees what these look like).
6. ECP programmed with known electronic address, IP address and Authorised Instation(s) address. These addresses should be noted.
7. Laptop running IP version of MOTE (v6.00 or later) and running an ntp server.
8. Configuration file for MOTE compatible with the ECP XML contents. This can be generated using the Costain (SSL) NMCS2 Configuration Builder program available from Service Desk.
9. If demonstrating the Remote Maintenance Access Service (RMAS) Command Line Interpreter (CLI) facilities, PuTTY and midasoscli private key (issued by Highways England).
10. Optional: Costain Loop Simulator running a script giving a typical traffic mix across all lanes.

3.0 CONTENT OF THE COURSE

This is based around the sample timetable given in section 1.5.

3.1 Arrival, registration and welcome

The course can start as soon as all attendees are present. Note that attendees will often differ on the day from those registered due to more pressing work.

3.2 Introductory Presentation

The PowerPoint presentation is at Appendix D.

Items to emphasise are as follows:

1. Safety Topic
 - 15 minute swap-out; all connectors on the front
 - RMAS facilities designed to reduce need for roadside visits
2. The Detector Cards **must NOT** be “hot swapped” as this can destroy the Processor module.
3. MIDAS Outstation Connections
 - Most if not all Ramp Metering Outstations are RS485 only - can have IP Instation with RS485 Outstation Auxiliary Link (OAL)
 - RMAS - Remote Maintenance Access Service - the Costain MIDAS OS has full RMAS capability for fault reporting, software upgrade and logging (reference [2]).
4. MIDAS Outstation - IP Only and IP/RS485 Versions
 - Supplied with NO detector cards and two blanking plates
 - Blanking plates must be fitted from the right most slot (Slot 5)
 - Must order Detector Cards as a separate Stores item
 - No battery backup - Schemes must provide UPS in the cabinets if required.
5. MIDAS Outstation Rear View
 - All connectors are on the front.
6. Loop Detector Connections
 - Two printed circuit boards (pcbs) provided to simplify connection into Klippons at rear of 600 cabinet
 - Do not drop them - the fingers are fragile!
7. Loop Detectors
 - D = detect - lit whilst a vehicle is over the loop
 - F = fault.

3.3 Questions, Break and Refreshments

Self-explanatory.

3.4 Introduction to MIDAS OS Manuals

The Installation and User Manual, reference [1] will be found most useful in practice.

This manual is issued by Highways England in pdf format. Costain is not allowed to issue this document directly to any persons working for Highways England. One reason for this is so that Highways England can ensure that all recipients are advised when a new version is issued.

3.5 Introduction to MOTE (MIDAS Outstation Test Equipment)

Many of the attendees will be familiar with the MOTE but will not have used the IP Engineer's Terminal version which must be used to interface with the Costain MIDAS OS.

Note that the MIDAS outstation **MUST** be in Normal Mode to connect to the Engineer's Terminal facilities (a Highways England requirement - easily forgotten!).

The modes to be shown are:

- 1) IP Instation - acting as IP LCC to get the Outstation into Normal Mode
- 2) IP Engineer's Terminal

It is intended that this familiarisation is to show the facilities used in installation, commissioning and fault finding.

Items to note for this demonstration:

- a) The RS485 MOTE facilities require a Costain MOTE interface box and card. Recent laptop designs cannot accommodate the card.
- b) Any sales enquiries for the Costain MOTE application software should be directed to the Costain Service Desk (section 1.6).

3.6 Demonstrated Installation and Commissioning – IP and RS485

Start with:

1. OS on the bench/table
2. Safety earth attached
3. Loop simulator operational and connected
4. OS plugged into the mains but not switched on
5. MOTE connected as IP Instation.

Show where safety earth cable attaches. Note two ring sizes are provided for affixing to cabinet earth point.

Attach ECP.

Power up Outstation, point out changing front panel lights as OS initialises then connects to Instation.

Items to note for this demonstration:

- a) Emphasise the importance of the safety earth connection - this is the first one to connect.

- b) Loop connections are made via two PCBs that have fingers to enter the Klippon blocks.
- c) Loop connection PCBs are not bullet proof outside of the Klippon blocks - it is not advised to drop them as the fingers can snap off.
- d) The majority of Ramp Metering OS are RS485 only. Must use IP Instation and RS485 Outstation Auxiliary Link connection. Hence, the older IP only version of the OS is not suitable for Ramp Metering use.
- e) All MIDAS OS ECP schema are supported, ie replacing an older design of MIDAS OS with a Costain MIDAS OS should not need the ECP reprogramming.
- f) If the ECP is replaced, the OS must be reset to read it - press the recessed RESET switch on the front panel.

Once operational, use the MOTE as an ET (connect to the ENG TERM Ethernet port on the OS) to display individual vehicle data from one lane only. This is used to set loop sensitivity.

When replacing an existing MIDAS OS, the OS Information Card - (which should be inside the 600 Cabinet but do not rely on it) - will give a starting point for loop sensitivity.

Set loop sensitivity to middle setting. View vehicle lengths on MOTE and compare to actual length, eg is it a car, lorry or artic? Change the sensitivity to be:

- Measured length is too short - more sensitive, ie a smaller value of dL/L
- Measured length is too long - less sensitive, ie a larger value of dL/L

Items to note for this demonstration:

1. If it is not possible to set a consistent sensitivity or the operation is intermittent, the loops should be checked for any faults.
2. Loops with additional turns or one too few turns will give very different sensitivities from the other loops on the OS.
3. Please record the loop sensitivity settings on the OS Information Cards - it will make life much easier if the OS has to be replaced!

3.7 Practice Installations

Invite attendees to practice disconnecting and connecting the various connections. You may or may not get any takers!

3.8 Engineer's Terminal Facilities

This part of the course can be used to cover any items not already covered. It can also be used as an opportunity to ask if there are any areas of MOTE operation that attendees would like to be explained in more detail.

Appendix E gives details of logging onto the MIDAs outstation using MOTE.

3.9 Fault finding and Diagnosis

This is covered in the Installation and User Manual, reference [1].

The main tools are:

1. Local Facilities - IP ET. This is accessed using the MOTE v6.00 or later.
2. Remote Facilities – CLI and web based interfaces for use by the Remote Maintenance Access Service (RMAS), reference [2].

The RMAS facilities are designed to reduce time spent at the roadside and hence lower the risk to personnel. RMAS has the full RMAS functionality, such as remote fault and diagnostic reporting, so all MIDAS OS should be enrolled onto RMAS at the time of installation. (Note: Any MIDAS OS connected to the Instation via RS485 cannot be connected to RMAS).

Items to note for this demonstration:

1. There is no routine maintenance required.
2. The only checks could be to ensure that all connectors are securely fixed and the Klippon block screws are tight.
3. All repairs are return to Costain, Worle. A returns form **MUST** be filled out first - contact the Help Desk on 01934 838803 or email TechSD@costain.com.

3.10 Review, Questions, Short Test

Ask for any final questions.

Hand out the short test forms (Appendix A) and feedback forms (Appendix B).

Certificates should be pre-dated and prepared for each attendee (Appendix C). They can be signed by the course presenters whilst attendees are taking the test.

Do not be too harsh when marking the test responses - the aim is to ensure that attendees have been paying some attention and to identify any areas that need correction or further explanation. Expected answers are given in the Appendix.

Provide any further correction or explanation after marking the test responses and hand out the Certificates.

3.11 Close

Wish attendees a good journey home.

A. Example Short Test

Costain MIDAS Outstation

TRAINING TEST

Name:

No.	Question
1.	<p>How do you reset a MIDAS Outstation?</p> <p><i>Expected Answer:</i> Press the reset switch on the front panel. (Do not power cycle - this takes longer and is bad practice).</p>
2.	<p>What types of detector does the MIDAS Outstation support and what interface card do you need?</p> <p><i>Expected Answer:</i> Loops - Costain. Radar - Wavetronix or Techmiracle.</p>
3.	<p>What is the most useful item of test equipment for installing, commissioning and maintaining the MIDAS Outstation?</p> <p><i>Expected Answer:</i> MOTE</p>
4.	<p>What does the IP only version of the MIDAS Outstation connect to in the 600 cabinet?</p> <p><i>Expected Answer:</i> NRTS modem</p> <p>What does the IP+RS485 version of the MIDAS Outstation connect to in the 600 cabinet?</p> <p><i>Expected Answer:</i> NRTS modem; RS485 Klippons.</p>

5.	<p>What connections are on the rear of the MIDAS Outstation?</p> <p><i>Expected Answer: None.</i></p>
6.	<p>What version of MIDAS outstation is required for connecting directly over IP to the MIDAS LCC and to an RS485 Ramp Metering Controller?</p> <p><i>Expected Answer: Combined RS485 and IP version.</i></p>
7.	<p>Where are the Lightning Protection Units located?</p> <p><i>Expected Answer: Internal to the unit.</i></p>
8.	<p>What routine maintenance is required?</p> <p><i>Expected Answer: None.</i></p>

B. Feedback Form

MIDAS Outstation

MIDAS Outstation Generic Installer and Maintainer Training Course

Can you please complete this form at the end of the training? Your views are important to us as they will help us to improve the quality of future training.

No.	Question
1.	Are you satisfied with the general presentation and the contents of this training? Did it meet your expectations? Why?
2.	Was the time spent on theory and practical enough? Was the duration of the training appropriate?
3.	How will this training be of a benefit to you?
4.	Are there any areas of the training that could be improved?
5.	Are there any observations regarding the MIDAS OS or its components that can be improved? If so, please provide a justification.

C. Certificate

Note: This should be printed in landscape format.



TR2169J MIDAS Outstation Training

This is to certify that

Anthony Other
Of
Company C

Has successfully completed the

Generic Installation and Maintenance Training

At Costain ITS Worle on <Date>

Signed on behalf of Costain by <name> – Training Co-ordinator

.....

D. Training Presentation

This is a PowerPoint presentation. Double click on the icon below to open.



MIDAS OS Training
Presentation 300919

E. Engineer's Terminal Access Using MOTE

This procedure applies whether the MIDAS Outstation is connected to the Instation over RS485 or IP Ethernet.

Required:

- MOTE v6 or later – this has the IP connection for Engineer's Terminal
- Costain (SSL) NMCS2 Configuration Builder program. This is usually shipped with the MOTE software or is available from the Costain Service Desk at Worle (section 1.6)
- NMCS2 Site Data database for the relevant Control Office
- The MIDAS Outstation **must** be in Normal Mode to connect to the Engineer's Terminal facilities - see below.

Generating the MOTE Configuration File(s):

1. Load the NMCS2 Site Data database onto the laptop running MOTE.
2. Run the NMCS2 Configuration Builder program to generate a MOTE configuration file for the MIDAS Outstation(s).

Loading the configuration file onto MOTE:

1. Run the MOTE application.
2. File menu (top left on screen):
 - Open Configuration
 - Browse and select the configuration file generated above
 - Select Open
3. Check that the logging screen shows:
SYSTEM CONFIGURATION FILE LOADED OK.

The following illustrates the processes using Instation address 192.168.100.1 and Outstation address 192.168.100.7

Getting a MIDAS Outstation into Normal Mode:

1. Connect the laptop running MOTE to the NRTS Ethernet connection on the MIDAS Outstation.
2. Switch on the Outstation.
3. Check that the MIDAS Outstation is in Initialisation Mode by observing that the NORMAL MODE LED on the front panel is flashing.
4. Configure the IP address of the laptop to be that of the relevant Approved Instation. For a Windows machine, the steps are as follows:
 - Invoke the command prompt.
 - To open the Command Prompt in Windows 10, look in its Start menu folder. Find the Windows System folder from the list of apps and tap or click it. Under the Windows System folder, click Command Prompt.
 - To open the command prompt in earlier versions of Windows, select the Globe button and type "cmd" in the search window. Click on **Command Prompt** when it appears in the results.
 - Command: ipconfig
 - Check if the IP address is the IP address of the Instation (192.168.100.1)
 - If it needs changing, invoke the Network and Sharing Centre, then Local Area Network/Connection

- Select Properties
 - Double click on IP4 and enter the IP address of the Instation (192.168.100.1) and click OK
 - Command: ipconfig – check the IP address is now correct (192.168.100.1)
 - Command: ping <IP address of Outstation>
 - for this example, type: ping 192.168.100.7
 - Check that there is a response to the ping command – this shows that there is now an IP connection to the Outstation.
5. Run MOTE as Administrator – right click on the MOTE icon to access this command.
 6. Load the relevant configuration file as above.
 7. Select “Transponder Simulation” on the bottom tabs
 8. Select INS\ button on the top toolbar. In the MIDAS Device Selection window select:
 - Instation – Outstation Link (TCP/IP)
 - The relevant MIDAS Device from the list
 - OK

This establishes the connection between MOTE (acting as the Instation) and Outstation.

9. The Outstation should reply with an EXTENDED STATUS REPLY message confirming that it is in Initialisation Mode.
10. Send the following messages from MOTE in this order:
 - Device Data (from the Commands box)
 - Update Time (from the Broadcasts box)
11. The Outstation should reply with an EXTENDED STATUS REPLY message confirming that it is now in Normal Mode. The Normal Mode light on the front of the Outstation should also be constantly lit green.
12. Send the following message from MOTE:
 - Outstation Control (from the Commands box)
13. The Outstation should reply with an EXTENDED STATUS REPLY message confirming:
 - Algorithms: Under Instation control

Connecting MOTE as Engineer’s Terminal

This applies for all MIDAS Outstations whether IP or RS485 connected to the Instation

1. Connect the laptop running MOTE to the Engineer’s Terminal Ethernet connection on the MIDAS Outstation.
2. Configure the IP address of the laptop to be the MIDAS Engineer’s Terminal IP address of 192.168.0.1. For a Windows machine, the steps are as follows:
 - Invoke the command prompt as above
 - Command: ipconfig
 - Check the IP address

- If it needs changing, invoke Network and Sharing Centre, then Local Area Connection
- Select Properties
- Double click on IP4 and enter the IP address above followed by OK
- Command: ipconfig – check the IP address is now correct (192.168.0.1)
- Command: ping 192.168.0.2
 - All MIDAS outstations use this same IP address for the ET connection
- Check that there is a response to the ping command – this shows that there is now an IP connection to the MIDAS Outstation.

3. Run MOTE as Administrator – right click on the MOTE icon to access this command.

4. Load the relevant configuration file as above.

5. Select “Engineers Terminal” on the bottom tabs.

Ensure that all buttons on the top toolbar are deselected. (Check the INS\ button in particular if the MOTE has previously been used to get the Outstation into Normal Mode).

6. Select the Connect button:

- Select SSL/Costain as Device Manufacturer then select OK.
- Interface Selection window:
 - Interface – select Ethernet adaptor (not WiFi)
 - IP address: 192.168.0.2
 - Subnet mask: 255.255.255.0
 - Server IP address And Port: 192.168.0.2:30000

MOTE should show that it has detected a device on the IP Engineer’s Terminal link.

7. All available commands are now shown on the MOTE screen.

8. To tune the loops, use the Logging Control window command: Vehicle Data/Link 1, then select the Logging Control button.

The Outstation replies with a HOST STATUS message showing: Logging Control; Vehicle Data. Individual vehicle data is shown on the MOTE screen.

END OF DOCUMENT