



# **Mk 7 OIL MIST DETECTOR**

# INSTALLATION, OPERATION AND MAINTENANCE MANUAL

59812-K007

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#### **REVISION HISTORY**

Issue	Date Of Issue	Revision History	Amended by	Approved by
1	Oct 2011	Draft – For Approval	M Daley	AWIIIis
2	Nov 2011	Approved for Distribution	M Daley	AWILL
3	Jan 2012	Changes to Back Alarm operating philosophy and Smoke Test procedure.	M Daley	AWILL
4	May 2012	Changes to Warranty section, addition of default values.	M Daley	AWILLIS

### **Oil Mist Detector Warranties**

- 1. Kidde Products Ltd (KPL) warrants, for a period of 3 years from the handover of the new vessel which is installed with KPL Oil Mist Detector (OMD) system to the system owner, and for a period of 2 years from the commissioning<sup>(1)</sup> date of a retro fitted Mk7 Oil Mist Detector (OMD) system, that any component forming part of the original OMD system manufactured by or supplied by KPL shall be free from defects in workmanship or materials during normal usage (the "OMD System Warranty"). If any such component does not conform to this warranty KPL will, at its sole discretion and its cost, either repair or replace such component. Installation of the repaired / replacement parts is not covered under the OMD System Warranty. Components replaced or repaired under the terms of the OMD System Warranty shall continue to have the benefit of the unexpired portion of the OMD System Warranty, unless that unexpired portion is less than 12 months, in which case the repaired / replacement parts shall have the benefit of a 12 month warranty against defects in workmanship or materials during normal usage starting on the date of delivery. OMD's supplied as spares shall be warranted in accordance with paragraph 2 below only.
- 2. KPL warrants for a period of 12 months from delivery that individual OMD's supplied as spares shall be free from defects in workmanship or materials during normal usage.
- 3. Performance of KPL's repair or replacement obligations shall constitute an entire discharge of KPL's liability under the warranties set out in paragraphs 1 and 2 above ("Warranties").
- 4. The Warranties shall not apply to the following:
  - a. defects reasonably judged by KPL as being caused by the improper installation of the OMD's and/or OMD system;
  - b. defects reasonably judged by KPL as being caused by the failure to follow the recommendations contained in KPL's product manuals and/or other documentation regarding the frequency of routine maintenance and testing of the OMD's and/or OMD system and/or the failure to have such routine maintenance performed;
  - c. defects which are attributable to careless handling or storage, accident, improper use of the OMD's and/or OMD system, or incorrectly completed repairs or routine maintenance services;
  - d. damages or losses occurring as a result of any act or omission which is wilfully unlawful or negligent;
  - e. defects arising from the use of non-genuine KPL parts or accessories, or the use of materials not approved for use by KPL;
  - f. any modifications to or installations performed on the OMD's and/or OMD system outside the scope of normal routine maintenance or running repairs without the express prior written approval of KPL;
  - g. deterioration, staining or corrosion of parts which will occur due to normal exposure and usage;
  - h. alleged defects not materially affecting the quality or proper functioning of the OMD system.
- 5. In addition the Warranties shall be limited as follows:
  - a. KPL shall be under no liability in respect of any defect in the OMD's and/or OMD System arising from any drawing, design or specification supplied by or at the request of the buyer or system owner (not being a drawing, design or specification of KPL);

- b. KPL shall be under no liability in respect of any defect or failure of the OMD's and/or OMD System to operate in accordance with specifications, illustrations, descriptions or other particulars due to their combination or use with any incompatible equipment or product.
- 6. The Warranties are conditional upon:
  - a. the buyer or OMD system owner giving written notice to KPL of the alleged defect, such notice to be given immediately when the buyer or OMD system owner discovers or ought to have discovered the defect;
  - b. the buyer or OMD system owner affording KPL a reasonable opportunity to inspect the OMD's and/or OMD system;
  - c. the buyer or OMD system owner not altering or attempting to repair the OMD's and/or OMD system without the written consent of KPL.
- 7. The Warranties can be transferred to any new owner of the OMD system provided KPL is informed in writing within 30 days of the transfer. The OMD System Warranty cannot be transferred to another KPL OMD system.
- 8. Save to the extent amended by the provisions set out above, KPL's standard terms and conditions of sale shall apply.

\* Commissioning is to be performed by a KPL approved service agent.

### **OMD Service Life**

Oil Mist Detectors (OMD's) are an integral part of critical safety systems designed to detect certain conditions that could lead to crankcase explosions on large Diesel engines. They are typically installed in harsh operating conditions - particularly with respect to temperature and vibration - and are expected to provide continuous service over extended periods. They are therefore subject to considerable wear and tear.

In order to ensure reliable performance, it is particularly important that OMD's are properly installed, operated and maintained in accordance with the manufacturer's instructions and guidelines. Given that they are components within key safety systems, as precautionary advice the manufacturer recommends replacing or refurbishing OMD's which are more than 10 years old, even if they are functioning correctly at that time.

### 1 DESCRIPTION AND OPERATION

#### 1.1 INTRODUCTION

High temperatures, in excess of 200°C that occur on bearing surfaces under initial failure conditions, can lead to a rapid generation of oil vapour When the hot vapour contacts the relatively cooler atmosphere of the crankcase it condenses into a fine mist, with typical particle sizes of around 0.5 to 5 microns in diameter. When the density of these particles reaches between 30 to 50 mg/I (Milligrams per litre), depending upon the type of oil, an explosive condition exists.



Figure 2 Areas of Failure – 4 Stroke Engine

A fire or explosion needs three constituents: fuel, oxygen and an ignition source. Remove one of these and no explosion will occur. Similarly, within the crankcase, the three constituents which could cause an explosion are air, oil mist and an ignition source, the "hot spot". Using optical measuring techniques, oil mist density can be measured at levels as low as 0.05 mg/l and give early warning of a rise in oil mist density.

Oil Mist Detection (OMD) techniques have been used to monitor diesel engine crankcases for potential explosive conditions and early detection of bearing failures. The systems available rely mainly on analysing the optical density of oil mist samples drawn from the crankcase compartments, through pipes to the detector. While these systems proved successful in the past, engine design has improved significantly over the years and oil mist detection techniques have improved substantially to maintain adequate protection.

The Graviner Mk 7 OMD provides the following benefits:

- Auto addressed system monitoring up to 10 detector heads per control unit
- Up to 10 control units per single system.
- Suitable for both 2 stroke and 4 stroke engines.
- Elimination of sample pipes reduced installation costs.
- Engine mounted Control Unit.
- Optional Remote Display Unit mounted in a safe area, typically the Engine Control Room (ECR).



#### 1.2 DESCRIPTION

And

The system comprises three main components (refer to Figure 3):

	Detectors	53836-K269 (with base) / 53836-K272 (replacement head	
		53836-269-01 (Short sample	pipe)
	Control Unit	53836-K270 (With Membrane 53836-K276 (Without Membra	) ane)
	Remote Display Unit	53836-K271	
со	nnecting cables		
	Control Unit to Detector of	able (Straight)	43682-K286-XX

Control Unit to Detector cable (Right Angle) 43682-K285-XX

The Graviner Mk 7 OMD system can comprise up to 100 detectors directly mounted on the crankcases of up to 10 engines, allowing both main propulsion and auxiliary generators to be monitored at the same time.

Each detector communicates electronically over a serial data link via the engine mounted Control Unit with the optional Remote Display Unit designed to be mounted within the Engine Control Room. This eliminates the need to enter the machinery space in alarm conditions.



#### 1.3 TECHNICAL SPECIFICATION

Detector		
Mounting	¾ inch BSP	
Enclosure Rating	IP65	
Indicators	Green	Detector On
	Red	Alarm
	Amber	Detector Fault
Power Consumption	1.5W	
Temperature Rating	$0-70^{\circ}C$	
Height	153mm	
Width	90mm	
Length	205mm	
Weight	0.5kg	

#### **Control Unit**

Enclosure Rating	IP65		
Max detector inputs	10		
Output Relays	Volt-free change over	contacts rated at 30Vdc 1A	
Back-up Alarm	1 set (de-energised d	uring normal operation)	
Pre Alarm	1 set (de-energised d	uring normal operation)	
Fault Alarm	1 set (energised durin	g normal operation)	
Engine Slowdown / Shutdown	1 set (de-energised d	uring normal operation)	
Alarm Ranges	Pre Alarm 0.5mg/l to 1.2mg/l (adjustable)		
	Alarm 1.3mg/l to 2.4m	ng/l (adjustable)	
	Backup 3.0mg/l (fixed	)	
Power Consumption	3.9W		
Temperature Rating	$0 - 70^{\circ}C$		
Dimensions			
Height	186mm	(110mm mounting centres)	
Width	318mm	(240mm mounting centres)	
Depth	90mm		
Weight	2.8kg		

#### Remote Display Unit

Enclosure Rating	IP32	
Max No. of detectors	100	
Max No. of engines monitored	10	
Power Supply	24Vdc (+30% -25%)	
Power Consumption	6.0W	
Temp Rating	$0 - 70^{\circ}C$	
Humidity level	95%	
Dimensions		
Bulkhead Mounted:	Height	225mm (202mm mounting centres)
	Width	240mm (217mm mounting centres)
	Depth	58mm
Panel Mounted:	Height	225mm (202mm mounting centres)
	Width	240mm (217mm mounting centres)
	Depth	55mm
	Weight	1.0kg

#### 1.4 SYSTEM OVERVIEW

The Graviner Mk7 OMD is an auto addressed oil mist detection system capable of monitoring up to 10 Control Units per system with each Control Unit having up to 10 detectors connected to it. This is achieved without external sample pipes and with minimum cabling. Each detector head monitors a single crank space and is a stand-alone device. On power up the detectors gather oil mist density data and convert it to a digital signal for transmission via the data lines in the detector cable to the Control Unit which is also mounted on the side of the engine. Alarm levels and Alarm output requirements are all set from either the optional Remote Indicator Display or a PC connected directly to the control unit.

The Remote Display Unit houses a 7.5" LCD Touch Screen display that shows, on demand, the signal from each detector and indicates the oil mist level for each engine and when required each detector as well as the status of the system. In the event of an alarm, the display immediately shows the oil mist levels for the relevant engine. It also enables the individual readings of each detector on the engine to be displayed on demand and automatically under alarm conditions.

In the event of a detector fault, that detector can be isolated without affecting the function of the other detectors on the engine. The system will continue to operate while the faulty detector is replaced, repaired or maintenance is carried out.

The Mk7 detectors still use optical sensing; (light scatter) as it's detection method and continually monitors the oil mist density in the crank space to which it is connected. In addition, it self checks for any internal faults. The Control Unit interrogates each detector in turn, identifies the position connected at the Control Unit, the oil mist density value and determines the status of the detector.

Each detector is fitted with 3 LED indicator lights:

Green	-	Power on
Red	-	Alarm
Amber	-	Fault

As all detectors operate independently, the loss of one detector through a fault does not affect the operation of the rest of the system. Individual detectors, or engine groups, can be isolated from the rest of the system for maintenance while the rest of the system remains in operation.

The Control Unit can be supplied with or without a control membrane. The control membrane has LED indication for detectors connected, push buttons for isolation and de-isolation of detectors, as well as pushbuttons for Accepting and Resetting Alarms.

#### Alarm Philosophy

The system has 3 separate alarm levels as detailed below

- 1. **Pre Alarm** This indicates that the oil mist levels are increasing in a particular crank space and that investigation should be undertaken. This alarm will not operate the slowdown or shutdown relays.
- 2. **High Alarm** When any detector reaches this threshold then the slowdown or shutdown relays will be operated if they are connected.
- 3. **Back Up Alarm** In the event of a failure of either the Pre Alarm or High Alarm, then the Back Up Alarm will operate, but it will not operate the slowdown or shutdown relay. This is an additional functional precaution added by Kidde Products Ltd which can be connected in any way the customer requires. This is usually connected to a warning beacon or siren; however the customer may choose to connect the relay to another device or the engine slow down circuitry.

On receipt of either a Pre Alarm or High Alarm the engine should, unless connected to a slowdown / shutdown relay, be stopped if safe to do so and allowed to cool down so that the background oil mist levels reduce before entering the engine room.

When the oil mist levels have returned to normal then the Accept and Reset buttons can be operated from the Control Unit membrane if fitted or alternatively form the Remote Display Unit and the system will then return to normal operation.

#### Fault Diagnosis

When a system fault is received, the information on the display should be noted and then the appropriate Fault Finding procedure in <u>Chapter 4</u> of the manual should be checked to enable the fault to be rectified.

When the faults have been rectified the Accept and Reset buttons can be operated and the system will return to normal

#### Event Log

All alarms, faults and events are recorded in an Event Log which is date and time stamped and will indicate the type of event which enables analysis of the events at a later time. The Event Log has a capacity of 1024 events and is a rolling buffer.

#### 1.5 SYSTEM CONTROLS AND DISPLAYS

The Remote Display Unit and PC software is menu driven and provides a logical route to all functions. It has three operating levels:

User Engineer Service

The User level is essentially for read only interrogation and does not allow any adjustments to be made to alarm settings or system configuration.

The Engineer level is password protected and allows access to most functions and the full range of programmable settings

When selected, a prompt for a password will appear, Enter 012345, when programming is completed the Password should be changed by an authorised person to prevent unauthorised access in the future. This process can be followed in Chapter 2.9 of this manual

The Service level is also password protected (different from the Engineer Menu) and allows access to all functions. This is only available to authorised Kidde Fire Protection personnel and authorised service agents.

Relay Description	Unit off	Unit on	Pre-Alarm	Slowdown	Backup Alarm	Fault
Pre-Alarm			•			
Alarm			+ <	+		+ <
Backup-alarm		+ <	+ <			
Fault		→	→			+

Figure 5

Relay Function Modes

### **2 INSTALLATION AND COMMISSIONING**

#### OMD Mk7 Installation

#### 2.1 CONTROL UNIT MOUNTING

The Control Unit 53836-K270 or 53836-K276 is designed for on-engine mounting and it is recommended that the Control Unit is installed as near to the centre of the engine as possible to minimise detector cable lengths.

Mounting is via the four M6 locating holes in the box. Sufficient space must be left around the Control Unit to allow access to the cable glands and the routing of the cables and to facilitate easy access to all aspects of the Control Unit.



Figure 6 Control Unit 53836-K270

#### 2.2 DETECTOR MOUNTING

Each detector is mounted to an individual crankcase via a <sup>3</sup>/<sub>4</sub> inch BSP threaded hole.

Ensure all detectors fitted to the engine are locked tightly in place by means of the lock nut supplied.

It is recommended that the detector be located at the upper part of the crankcase wall not in the direct line of the oil throw. On smaller engines it is permissible to mount the detector on the crankcase door if desired or as installation dictates, subject to vibration levels.



Figure 7 Ideal Mounting Position

lacal meaning r conten

The detector must be fitted at a maximum of plus or minus 20 degrees from the vertical. Horizontally the detector must be mounted level or with the detector body inclined towards the engine to ensure oil drainage. Refer to Figure 8, and Figure 9.

Please ensure that Detector 1 is connected to position 1 on the Control Unit, Detector 2 to position 2. Repeat for all Detectors fitted.





#### 2.3 DETECTOR CABLES

Each detector must be connected to the Control Unit by way of a supplied detector cable. Refer Figure 10.

Ensure that the cables are run in a suitable cable tray and clipped at regular intervals to ensure they cannot be subjected to mechanical damage caused by vibration.

Cable Length	90° Connector	Straight Connector
m	Part No.	Part No.
1.0	43682-K285-1.0	43682-K286-1.0
1.5	43682-K285-1.5	43682-K286-1.5
2.0	43682-K285-2.0	43682-K286-2.0
2.5	43682-K285-2.5	43682-K286-2.5
3.0	43682-K285-3.0	43682-K286-3.0
3.5	43682-K285-3.5	43682-K286-3.5
4.0	43682-K285-4.0	43682-K286-4.0
4.5	43682-K285-4.5	43682-K286-4.5
5.0	43682-K285-5.0	43682-K286-5.0
5.5	43682-K285-5.5	43682-K286-5.5
6.0	43682-K285-6.0	43682-K286-6.0
6.5	43682-K285-6.5	43682-K286-6.5
7.0	43682-K285-7.0	43682-K286-7.0
7.5	43682-K285-7.5	43682-K286-7.5
8.0	43682-K285-8.0	43682-K286-8.0
8.5	43682-K285-8.5	43682-K286-8.5
9.0	43682-K285-9.0	43682-K286-9.0
9.5	43682-K285-9.5	43682-K286-9.5
10.0	43682-K285-10.0	43682-K286-10.0
10.5	43682-K285-10.5	43682-K286-10.5
11.0	43682-K285-11.0	43682-K286-11.0
11.5	43682-K285-11.5	43682-K286-11.5
12.0	43682-K285-12.0	43682-K286-12.0
12.5	43682-K285-12.5	43682-K286-12.5
15.0	43682-K285-15.0	43682-K286-15.0
17.5	43682-K285-17.5	43682-K286-17.5
20.0	43682-K285-20.0	43682-K286-20.0
22.5	43682-K285-22.5	43682-K286-22.5
25.0	43682-K285-25.0	43682-K286-25.0



Figure 10 Detector Cable



2. CABLE LENGTHS ARE 'STRAIGHT LENGTHS'

3. CLIPS TO BE SECURED EVERY 0.5M (CLIPS ARE NOT KIDDE SUPPLY).

4. DO NOT EXCEED THE MINIMUM BEND RADIUS AS SHOWN

5. NOTE ORIENTATION OF KEY-WAY.

#### Figure 11 Detector Cable Assembly (Straight Connector)

0



NDTES:



1. CABLE SPEC: 8-CORE SCREENED (90°C) (HALOGEN FREE & DIL RESISTANT) SUPPLIER REFS: BST CABLE DRG ND MCD1027 or F & S CABLE (DRAWING NO. 31500708) CABLE LENGTH VARIES, REFER TO PART NO. TABLE AS SHOWN BELOW.

VERSION	LENGTH DF	CABLE (L)	VERSION	LENGTH DF	CABLE (L)	VERSION	LENGTH DF	CABLE (L)
No.	MIN	MAX	No.	MIN	MAX	No.	MIN	MAX
1.0	1.00m	1.10m	7.0	7.00m	7.10m	15.0	15.00m	15.10m
1.5	1.50m	1.60m	7.5	7.50m	7.60m	17.5	17.50m	17.60m
2.0	2.00m	2.10m	8.0	8.00m	8.10m	20.0	20.00m	20.10m
2.5	2.50m	2.60m	8.5	8.50m	8.60m	22.5	22.50m	22.60m
3.0	3.00m	3.10m	9.0	9.00m	9.10m	25.0	25.00m	25.10m
3.5	3.50m	3.60m	9.5	9.50m	9.60m			
4.0	4.00m	4.10m	10.0	10.00m	10.10m			
4.5	4.50m	4.60m	10.5	10.50m	10.60m			
5.0	5.00m	5.10m	11.0	11.00m	11.10m			
5.5	5.50m	5.60m	11.5	11.50m	11.60m			
6.0	6.00m	6.10m	12.0	12.00m	12.10m			
6.5	6.50m	6.60m	12.5	12.50m	12.60m			

2. CABLE LENGTHS ARE 'STRAIGHT LENGTHS'.

3. CLIPS TO BE SECURED EVERY 0.5M (CLIPS ARE NOT KIDDE SUPPLY).

4. NOTE ORIENTATION OF KEY-WAY.

#### Figure 12 Detector Cable Assembly (Right Angle Connector)

#### 2.4 REMOTE DISPLAY UNIT

The Remote Display Unit part number 53836-K271 must be mounted in the Engine Control Room (ECR) or similar safe environment, do not mount in an Engine Room as it is not designed to be mounted in this type of environment. Additionally Class Society rules state that any display must be mounted in a safe area away from the Engine Room.

For flush mounting details see below and Figure 13 and Figure 14. For bulk head mounting details see Figure 15.







Figure 14

Flush Mounting for Remote Display Unit



Figure 15 Bulk Head Mounting for Remote Display Unit

#### 2.5 CONTROL UNIT

#### 24v DC Input supply

The supply should be 24v DC +30% -25% rated at 1.2 amps.

### Cables should be segregated from high voltage cables and follow good installation practice

Cable type-2 Cores + Earth, CSA 2.5mm<sup>2</sup> (50/0.25mm), flexible stranded bare copper conductors, low smoke halogen free insulation, cores laid up, braided screen, low smoke halogen free sheath – grey, outside diameter 9.8mm, operating temperature 0°C + 80°C.

Suggested cables

Lapp KabelCY cable 3 core 2.5mm²PrysmianLSM-HF 3 core 2.5mm²HelkamaLKAM-HF 3 core 2.5mm²

Refer Figure 16 for connector location. Refer Figure 16 for wiring drawing.

#### <u>Modbus</u>

Cable type – Individually screened 2 pair data cable, 24AWG, low capacitance, low smoke halogen free. Outer diameter 7mm (max)

## Cables should be segregated from high voltage cables and follow good installation practice

Suggested cablesFS Cables2402PIFFHBeldon9729HelkamaRFE-HF(i) 2x2x0.75Jinro60V RCOP(IS)

The above cable should be used to connect between the Control Unit and either the ships AMS system or the Remote Display Unit.

Refer Figure 16 for connector location. Refer Figure 16 for wiring drawing.

#### Relay Outputs

The relay outputs are rated at 30v DC at 1amps.

2 Cores + Earth, CSA 2.5mm<sup>2</sup> (50/0.25mm), flexible stranded bare copper conductors, low smoke halogen free insulation, cores laid up, braided screen, low smoke halogen free sheath – grey, outside diameter 9.8mm, operating temperature 0oC + 80oC.

## Cables should be segregated from high voltage cables and follow good installation practice

Approved cablesLapp KabelCY cable 3 core 2.5mm²PrysmianLSM-HF 3 core 2.5mm²HelkamaLKAM-HF 3 core 2.5mm²

Refer Figure 16 for connector location. Refer Figure 16 for wiring drawing.

#### USB Connection

Refer Figure 16 for connection location.



All Detector connectors are prewired.



#### 2.6 REMOTE DISPLAY UNIT

#### 24v DC Input supply

A 24v DC supply rated 1.5 amps should be connected via a Hirschmann GM216 NJ.

Cable type – 2 Cores + Earth, CSA 1.5mm<sup>2</sup>, fine stranded bare copper wires, braided screen, low smoke halogen free sheath, outside diameter 10mm (max), operating temperature  $0^{\circ}$ C +  $80^{\circ}$ C.

## Cables should be segregated from high voltage cables and follow good installation practice

Suggested cables

Lapp Kabel 1.5mm <sup>2</sup> Ölfle	ex Classic 110CH - 10035068
Prysmian LSM-HF 3 co	pre 1.5mm <sup>2</sup>
Helkama LKAM-HF 3	core 1.5mm <sup>2</sup>

Refer Figure 18 for 24vDC Socket wiring drawing. Refer Figure 20 for connection location.



#### Modbus

Cable type – Individually screened 2 pair data cable, 24AWG, low capacitance, low smoke halogen free. Outer diameter 7mm (max)

## Cables should be segregated from high voltage cables and follow good installation practice

Suggested cablesFS Cables2402PIFFHBeldon9729HelkamaRFE-HF(i) 2x2x0.75Jinro60V RCOP(IS)

The above cable should be used to connect between the control unit and either the ships AMS system or the Remote Display Unit

Refer Figure 19 for Modbus Connector Wiring Drawing. Refer Figure 20 for connector location.





Figure 20 Remote Display Unit 53836-K271

Intentionally Left Blank

Figure 21 Intentionally Left Blank

#### 2.7 CONNECTING THE SYSTEM

2.7.1 Input power

+24 V dc and 0 V dc power input cables for the Control Unit should be terminated onto Supply Input (terminal block TB1).

## Cables should be segregated from high voltage cables and follow good installation practice

Note all terminations should be made using crimped wires.

For each of the power connections strip the power cable to the required length to connect to the terminals in the control unit. Then remove approximately 1cm of the outer sheath to expose the cable screen as shown below.



Feed the cable into the control unit via a metal IP65 EMC gland supplied, ensuring that the metal prongs make contact with the exposed cable screen as shown below.



#### 2.7.2 Relay Cables

The connection to the slowdown relay, pre-alarm relay, backup alarm relay and fault relay and 24Vdc supply cables at the Control Unit should be made using screened cable. For each of the relay connection strip the cable to the required length to connect to the terminals in the control unit. Then remove approximately 1cm of the outer sheath to expose the cable screen as shown below see Figure 24.

### Cables should be segregated from high voltage cables and follow good installation practice



Figure 24 Control unit relay cable assembly

Feed the cable into the control unit via a metal IP65 EMC gland supplied, ensuring that the metal prongs make contact with the exposed cable screen as shown.

#### 2.7.3 Control Unit to Detector Connections

At the detector, screw the connector to the top of the detector.





At the control unit, screw the connector to the input required.



Figure 26 Control unit - Detector cable assembly

#### 2.8 SYSTEM CHECKS PRIOR TO SWITCHING ON

- 2.8.1 Ensure that the 24v DC input power supply cable is connected correctly at each Control Unit (if more than one installed).
- 2.8.2 Ensure that the Modbus Communication (if required) is terminated correctly at each Control Unit (if more than one installed and/or Remote Indication Display installed or connected to AMS).
  - 2.8.2.1 If more than one control unit is installed, please ensure the End of Line (EOL) jumpers are removed from all Control Units (refer Figure 15) <u>except</u> for the highest Modbus addressed Control Unit.
  - 2.8.2.2 Make sure that the Modbus address's are set as required, refer section 2.9.1 for procedure.
- 2.8.3 Ensure that the Backup Alarm, Pre Alarm, Fault and Slowdown relays are connected correctly at each Control Unit (if more than one installed).
- 2.8.4 Ensure the detectors are connected to each Control Unit in the correct number sequence.
- 2.8.5 Check the cable run of all Modbus Communication cables between all installed Control Units to each other and to the Remote Indication Display (If Installed) or AMS to ensure that it is not damaged.
- 2.8.6 Ensure all unused Glands are removed from all Control Units and replaced by Blanking Plugs.
- 2.8.7 Ensure that the Modbus Communication and power supply cables are connected correctly at the Remote Display Unit (If installed).
- 2.8.8 Ensure that the input voltage at the Control Unit(s) and the Remote Display Unit (If installed) is a clean 24 V dc +30%, 25%
- 2.8.9 When all of the above have been checked and are satisfactory the system is ready to switch on.
- 2.8.10 Allow the engine to reach its' normal operating temperature before continuing to System Configuration and Commissioning.

Oil Mist alarm levels should be set to a level above the actual normal operating level displayed,

#### 2.9 SYSTEM SETUP / CONFIGURATION – WITH A REMOTE DISPLAY UNIT

When all of the connections have been completed and checked, power up the Control Unit and Remote Display Unit, the following power up screen will show for a few seconds on the Remote Display Unit.

If there is more than one Control Unit connected to the display the Modbus address needs to be set up via the USB connection on the control unit before it can talk to the display unit. Please refer to section 2.9.1.1 for the Modbus setup



## Mk7 Oil Mist Detector P66300

Screen Shot 1 Figure 27 Engines Engineer After a few seconds the following will ME be seen on the Remote Display Unit, Service 2.5this shows one engine connected but 2.0 may show up to ten. 1.5-Press 'OK' 1.0-0.5-**GRAVINER** 0- 🛄 ng/I **0.0** Mk7 Oil Mist Detector 1 Engine Found. Press OK to continue. OK P66300 v0.01 Figure 28 Screen Shot 2 Engines Engineer Press the 'Engineer' button to log in ME as an Engineer. Service 2.5-2.0-Note - To setup Engine and **Detectors and Save Logs, you** 1.5must be logged in as Engineer. 1.0-0.5-GRAVINER 0-ng/l Mk7 Oil Mist 0.0 Detector ME 1 P66300 v0.01 • User • Figure 29 Screen Shot 3


## **Engine Selection List**

ME 1 – Main Engine 1	ME 2 – Main Engine 2	FSU – Fuel Supply Unit
G/E 1 – Generator 1	GEN 1 – Generator 1	AUX 1 – Auxiliary Engine 1
G/E 2 – Generator 2	GEN 2 – Generator 2	AUX 2 – Auxiliary Engine 2
G/E 3 – Generator 3	GEN 3 – Generator 3	AUX 3 – Auxiliary Engine 3
G/E 4 – Generator 4	GEN 4 – Generator 4	AUX 4 – Auxiliary Engine 4
G/E 5 – Generator 5	GEN 5 – Generator 5	AUX 5 – Auxiliary Engine 5
G/E 6 – Generator 6	GEN 6 – Generator 6	AUX 6 – Auxiliary Engine 6
G/E 7 – Generator 7	GEN 7 – Generator 7	AUX 7 – Auxiliary Engine 7
G/E 8 – Generator 8	GEN 8 – Generator 8	AUX 8 – Auxiliary Engine 8
G/E 9 – Generator 9	GEN 9 – Generator 9	AUX 9 – Auxiliary Engine 9





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Press the up and down arrows to scroll through possible Detector Names, this figure shows one detector connected but may show up to ten detectors.

## Please see below for the full list of **Detector Names.**

Press 'Save' once your desired name is selected for Detectors.

Figure 45

Screen Shot 19 Detector Selection List

Detector 1	Cylinder 1	Fuel Supply Unit 1
Detector 2	Cylinder 2	Fuel Supply Unit 2
Detector 3	Cylinder 3	Fuel Supply Unit 3
Detector 4	Cylinder 4	Fuel Supply Unit 4
Detector 5	Cylinder 5	Fuel Supply Unit 5
Detector 6	Cylinder 6	Chain Case
Detector 7	Cylinder 7	Gear Box
Detector 8	Cylinder 8	Transfer Box
Detector 9	Cylinder 9	Thrust Bearing
Detector 10	Cylinder 10	Moment Compensator
Detector 11	Cylinder 11	
Detector 12	Cylinder 12	
Detector 13	Cylinder 13	
Detector 14	Cylinder 14	
Detector 15	Cylinder 15	
Detector 16	Cylinder 16	
Detector 17	Cylinder 17	
Detector 18	Cylinder 18	
Detector 19	Cylinder 19	
Detector 20	Cylinder 20	



Figure 46

Screen Shot 20

Press 'OK'. Figure 44 will then be displayed.

Press 'Exit'.



Once Detectors on Engine 1 have been set, Press 'Back' to return to Engine Overview screen. Repeat setting Engine Names & Detector settings for the number of Engines connected. The OMD Mk7 System should now be setup. 2.9.1 Control Unit Addressing

> When more than one Control Unit is connected on 1 system, the Modbus address needs to be set up via the USB connection on the PCB in each Control Unit (refer Figure 51) before the system will work properly.

NOTE - For multiple Control Units per system, each Control Unit must have its own Control Unit Address and they must be sequential, i.e. 01. 02. 03 .....10

All Control Units will come shipped as Modbus address 01 (1<sup>st</sup> Control Unit)

- 2.9.1.1 To change the Modbus address
  - a. Connect the 24Vdc power supply to the Control Unit to be changed.
  - b. Connect the USB-B end to the USB socket located on the PCB inside the Control Unit (refer Figure 51)



Figure 51 Control Unit – USB Connector

c. Connect the other end of the USB Lead to a USB socket on your computer (refer Figure 53)



Figure 52 Computer Connection – USB Connector

2.9.1.2 With the above cables connected, open the 'Mk7 Oil Mist Engine Manger' software on the computer.

Why Joli Hint Ingles Hanager       With Diametry       Software Version       Software Version       Vers	Roose Love Une	Click 'Login', then 'Engineer'
Figure 53	USB Screen Shot 1	
Wink 7 Oil Mink Englise Manager           File         Login           Kink Legins 1           Uogs         Tell           Software Version         12.01           Peak Level         1.06 mg/l           Detector Indiated         1%           Pre-Alem Nodated         1%           Veckcholog Fault         1%           Veckcholog Fault         1%           Detector Indiated         1%           Veckcholog Fault         1%           Veckcolog Fault         1%           Detector Product	ineer PIN: 1 Login Login	Enter 012345 and press 'Login'
Figure 54	USB Screen Shot 2	
What 2 UI Mist Ingten Annaget       The upper Serve Tool in the Control UK ASS in the Control	Access Level: Engreer	Select the required Control Unit Address (this is the Modbus address)
Figure 55	USB Screen Shot 3	

Repeat the above for the number of Control Units installed per system.

After the address's have been changed, please ensure that the EOL jumpers are fitted to the last Control Unit, all other Control Units need to have the EOL jumpers removed.

Refer Figure 16 for EOL jumper positions.

## 2.9.2 Detector Smoke Alarm Test

Commence the smoke alarm test as follows: with the detector(s) fitted, electrically connected, functioning and configured as described in the instruction manual.

Note: Isolation of the output relays (Pre Alarm and Slow-Down Relays) is required before commencing the smoke alarm test. If the Back-up Alarm Relay is connected to the engine shut/slow down system this should be disconnected.

Warning: Carrying out this test without isolation or disconnection of the output relays will cause the engine shut/slow down system to operate if connected.

a. Cut a length of wick approximately 30 mm long. Assemble the smoke tester by pushing the wick into the wick holder fitted with the pipette bulb. Press the nylon pipe into the pipe connector (refer to Figure 56).



b. Push the nylon pipe of the smoke tester into the connector on the side of the detector base body (refer to Figure 57).



Figure 57 Smoke Test

c. Dip the wick into the bottle of smoke oil and reseal the bottle firmly

Note: Only a small quantity of oil is required.

d. Ignite the wick of the smoke tester and blow out the flame. Squeeze the pipette bulb to keep the wick smoking.

## Note: Care to be taken with this activity at all times.

- e. While the wick is still smouldering, insert it into the pipe connector and squeeze the pipette bulb.
- f. Observe the wick is still smouldering, insert nylon pipe into the pipe connector of the detector and squeeze the pipette bulb.
- g. After tests are completed the Detector Peak Level readings should be erased. This can be done via the Engine Menu using Clear Peak. (refer Figure 44)
- h. To release the pipe from the connector, press in the metal collar on the end of the connector at the same time as pulling the pipe out
- i. Remove the nylon pipe from the pipe connector for stowage purposes.
- j. The wick is reusable and can be left in the wick holder. Fully extinguish the wick after use at all times.
- k. Refer to the Material Safety Data Sheet in the event of health or safety issues.

#### 2.9.3 Back Up Alarm

The backup alarm is a hard wired link from each Detector installed on the system. This facility will allow any detector which is in a fault condition and sees an oil mist level of 3.0mg/l or greater to produce a 'Back Up Alarm. This will produce operation of the Backup Alarm Relay in the Control Unit; the Backup Alarm will also override any detector or detectors that are isolated.

# Whilst any detectors are in a Backup Alarm condition the accept key is inoperative until the oil mist level drops below 3.0mg/l.

It is possible for a healthy detector to produce a back up alarm if the level of oil rises very rapidly.

#### NOTE - The Backup Alarm will not operate the Slow-Down Relay

# 2.10 ISOLATION - USING THE REMOTE DISPLAY UNIT

If required, it is possible to isolate any individual detector, a complete engine, engine Pre-Alarm or Slow Down relays. This allows maintenance to be carried out without affecting the remaining system. Isolation inhibits all alarms and faults for the isolated item except the Backup Alarm, which is a fixed level.

To prevent the possible activation of the Back-up Alarm Relay disconnect the cable from the top of the detector unit.

## 2.10.1 Engine Isolation











# 2.10.2 Detector Isolation





## 2.10.3 Detector Isolation – Using the Membrane

To isolate a detector at the Control Unit fitted with a Membrane, press the detector number button for 2 seconds until the amber LED is steady. (Refer Figure 85)

Note: with the detector isolated the Back-up Alarm Relay may be activated if the oil mist level increases above 3mg/l or light is introduced in to the detector. To prevent the possible activation of the Back-up Alarm Relay disconnect the cable from the top of the detector unit.

	Oil Mist Detector
and the second	POWER FAULT ALARM
E-La	
(pur	ACCEPT RESET
	OPERATING DETECTOR
	DETECTOR FAULT / ISOLATE
	• • • • •
	1 2 3 4 5
E M	OPERATING DETECTOR
	e e e e e
- In	DETECTOR FAULT / ISOLATE
en	
	CDAVIDIED
	Mk7 OIL MIST DETECTOR CONTROL UNIT
0	
	Ö 📕

Figure 85

**Control Unit Membrane** 

Repeat the above to de-isolate a detector.

# 2.11 TEST MENU & EVENT LOG

This section will show how to Test the components in the OMD Mk7 system, and how to view the Event Log. The Test and Event Log instructions are the same for User Level and Engineer Level with the exception that the User Level <u>cannot</u> Test the Slow Down Relay.

# 2.11.1 Test Menu.

# Warning: Carrying out this test with the engine operating will cause the engine shut/slow down system to operate if connected.









![](_page_58_Figure_2.jpeg)

## 2.11.2 Event Log.

The Event Log enables the user to interrogate the past 1024 events and can be accessed via the menus below. The Event Log is a rolling buffer and when the events exceed 1024 then the oldest event is dropped off the Event Log.

To access the Event Log from Figure 87, press 'Event Log' button.

Main Engine 1 Event Log Use the Up and Down arrows to All Events By Date By Event By Detector scroll through the events in this 
 No.
 Date
 Time
 Event

 530
 07/07/11
 11:20:26
 System Reset

 529
 07/07/11
 11:19:59
 Accept

 528
 07/07/11
 11:18:52
 Alarm

 527
 07/07/11
 11:18:52
 Alarm

 526
 07/07/11
 11:18:51
 Alarm Test

 525
 07/07/11
 11:18:02
 Front Panel Test

 524
 07/07/11
 11:18:02
 Stoply Voltage

 523
 07/07/11
 11:18:17:49
 Stoply Voltage

 523
 07/07/11
 11:17:49
 Accept

 521
 07/07/11
 11:17:43
 Photodiode Fault
 Detector / Description Value screen. Detector 1 Press 'By Date' tab to view event log 3.6 mg/l 3.6 mg/l Detector Detector 1 by date. Passed 23.8v Detector 1 ₽ All log events will be displayed. 1 Exit Figure 103 Screen Shot 70 Engine 1 Event Log Use the number buttons to select the All Events By Date By Event By Detector date to view events. Press 'Search' once the correct date Day Month Year Date: 18 / 07 / 11 is entered. 2 3 5 1 4 6 7 8 9 0 Del Search Exit Figure 104 Screen Shot 71 Engine 1 Event Log Use the Up and Down arrows to All Events By Date By Event By Detector scroll through the events in this 
 Date
 Time
 Event

 18/07/11
 16:00:23
 Front Panel Test

 18/07/11
 16:00:23
 Supply Voltage

 18/07/11
 16:00:24
 System Test

 18/07/11
 15:55:24
 System Test

 18/07/11
 15:55:16
 Acrem

 18/07/11
 15:55:16
 Alarm

 18/07/11
 15:55:16
 Ararm

 18/07/11
 15:55:16
 Ararm

 18/07/11
 15:55:16
 Ararm

 18/07/11
 15:55:20
 Accept

 18/07/11
 15:55:300
 Accept

 18/07/11
 15:55:300
 Accept
 Value Passed 24.9v No. Date Time Event Detector / LED screen. 45 44 43 42 41 40 39 38 37 36 Press 'By Event' tab to view event log by Event. Detector 2 Detector 2 Detector 2 3.6 mg/l 3.6 mg/l

Figure 105 Screen Shot 72

Hide Log

Search

<u>Note</u> - If there are no Events matching your search then this screen will be blank.

₽

Exit

1

select the event to search.

selected event.

Use the Up and Down arrows to

Press 'Search' to view event log by

![](_page_60_Picture_2.jpeg)

Figure 106

Screen Shot 73

Screen Shot 74

Detector / LED

Value

₽

Exit

1

	1			Lvent Log	
All	Events	By Date	By Event By Det	tector	
No.	Date	Time	Event	Detector / LED	Value
23	07/07/11	10:53:16	Power On		
22	04/07/11	10:22:00	Power On		
21	30/06/11	12:55:31	Power On		
20	30/06/11	08:11:28	Power On		
19	27/06/11	07:12:55	Power On		
18	24/06/11	08:11:03	Power On		
17	23/06/11	12:57:52	Power On		
16	23/06/11	10:11:30	Power On		
15	08/04/11	12:41:17	Power On		
14	08/04/11	09:47:28	Power On		$\frown$
Р	ower On				
			Searc	:h	Exit

Main Engine 1 Event Log

Figure 107

All Events By Date By Event By Detector

No. Date Time Event

Detector 1

Use the Up and Down arrows to scroll through the events in this screen.

Press 'By Detector' tab to view event log by Detector.

Use the Up and Down arrows to select the detector to search.

Press 'Search' to view event log by selected detector.

Figure 108 Screen Shot 75

Search

₽

Main Engine 1 Event Log					
All	Events	By Date	By Event By Detector		
No.	Date	Time	Event	Detector / LED	Value
122	07/07/11	11:18:52	Alarm	Detector 1	3.6 mg/l
121	07/07/11	11:18:52	Pre-Alarm	Detector 1	3.6 mg/l
120	07/07/11	11:18:51	Alarm Test	Detector 1	
119	07/07/11	11:17:43	Photodiode Fault	Detector 1	
118	07/07/11	11:15:23	Photodiode Fault	Detector 1	
117	30/06/11	14:59:54	Alarm	Detector 1	3.6 mg/l
116	30/06/11	14:59:54	Pre-Alarm	Detector 1	3.6 mg/
115	30/06/11	14:59:53	Alarm Test	Detector 1	
114	30/06/11	14:59:16	Alarm Level Changed	Detector 1	2.2 mg/l
113	30/06/11	13:21:40	Alarm	Detector 1	3.6 mg/l
D	Detector 1				
			Search		Exit

Figure 109

Screen Shot 76

Use the Up and Down arrows to scroll through the events in this screen.

Press 'Exit' to return to Engine 1 overview, Figure 87.

Press 'Back' to return to Engines Overview screen.

# 3 MAINTENANCE

3.1 ROUTINE MAINTENANCE

Warning: Do not work on the system unless the power is switched off or isolated.

![](_page_61_Picture_5.jpeg)

# Caution: Ensure that anti static handling procedures are observed applied when working on the system, i.e. Anti- Static Wrist Straps

The following checks are recommended to be carried out every 6 months, with the system switched off. The checks should be carried out by competent personnel with suitable skill levels.

- 3.1.2 Control Unit
  - 1. Ensure that all connectors are tight to prevent ingress of oil and moisture and the screws on the Control Unit are correctly tightened
- 3.1.3 Cables
  - 1. Ensure all connections on the Control Unit are tight.
  - 2. Check all cables. Replace any that are found to be damaged.
- 3.1.4 Detectors
  - 1. Ensure that the detector base is screwed tight into the crankcase,
  - 2. Remove the cable connector from the detector and check for damage.

# 3.2 DETECTOR HEAD REPLACEMENT

Warning: Do not remove the detector base from the crankcase whilst the engine is in operation. This operation should be carried out while the engine is stopped to avoid the possibility of hot oil coming out of the base fixing hole.

If an in-service detector head is removed for any reason, the detector optics must be cleaned before reassembling and replacing it.

- 3.2.1 To replace the detector:
  - 1. Switch off the system (if safe to do so) or isolate the detector
  - 2. Remove the cable connector fitted to the top of the detector
  - 3. Using a 4mm hexagonal key, loosen the two fixing screws in the assembly base.

![](_page_62_Picture_9.jpeg)

- 4. Lift out the faulty detector head
- 5. Fit the new detector head onto its base and tighten up the fixing screws. Re-fit the cable to the detector head.
- 6. If the system was switched off, switch back on and allow the system to initialise.
- 7. If isolated, then de-isolate, Press OK on the Remote Display Unit, display will then return to normal

# 3.3 DETECTOR HEAD REFURBISHMENT

- 1. Isolate the detectors as described in section 2.10 of the instruction manual.
- 2. Disconnect the cable from the top of the detector unit and remove the unit from the engine casing (refer to Figure 111).

![](_page_63_Picture_5.jpeg)

Figure 111 Cable Disconnect

- 3. Using a 4mm hexagon key, unscrew 2 off screws from the underside of the detector head (refer to Figure 110). The screws are self-retaining.
- 4. Remove and invert the top part of the detector head. Examine the base moulding seal and replace if damaged or perished (refer to Figure 112).

![](_page_63_Picture_9.jpeg)

5. Using the Pulling Tool (refer to Figure 113), remove the Fan Retaining Plug by capturing the shoulder and pulling. Carefully remove the Fan from its mountings (refer to Figure 114).

![](_page_64_Figure_3.jpeg)

- 6. Examine the 4 off compression springs and the fan retainer plug; replace any bent or damaged items from the spares.
- 7. Examine the fan for free running and clogging due to oil residues. If damaged, refer to paragraph 3.4 in the instruction manual. Although not necessary for service cleaning, spares of the M3 screw and the fan connector seal are included in the kit.
- 8. Using a foam bud with glass cleaner applied, wipe carefully around the inside of the smoke detecting orifice (refer to Figure 115).

![](_page_65_Picture_5.jpeg)

Figure 115 Cleaning Light Guide

- 9. Dry the inside of the unit.
- 10. Examine the base body cavity and sampling tube, and wipe clean where necessary.
- 11. Reassemble the fan to the detector using a fan retaining plug.

# Caution: Do not press the fan, only handle the outer housing.

- 12. Reassemble the detector head and base body. Replace the detector and then de-isolate.
- 13. Repeat the procedure for all detectors to be cleaned.

Refer to the Materials Safety Data Sheet in the event of health or safety issues.

# 3.4 FAN REPLACEMENT

Warning: Do not remove the detector base from the crankcase whilst the engine is in operation. This operation should be carried out while the engine is stopped to avoid the possibility of hot oil coming out of the base fixing hole.

## 3.4.1 To replace the fan:

- 1. Switch off the system (if safe to do so), or isolate the associated detector.
- 2. Remove the cable connector from the top of the detector.
- 3. Using a 4mm Allen key, loosen the detector fixing screws on the base.
- 4. Remove the detector from its base and turn it upside down to reveal the fan.
- 5. Remove the fixing screw holding the fan socket to the mounting plate.
- 6. Using a pulling tool (Part Number D9131-002 available with service kit Part No.D9221-027), remove the fan retaining plug holding the fan onto its mounting legs.
- 7. Lift the fan off of its mounting legs, ensuring the springs under the fan are not lost.
- 8. Discard the failed fan and fit a replacement fan in reverse order of disassembly.

# 3.5 CABLE REPLACEMENT

If changing a detector cable, isolating that detector will be sufficient (see section 2.10)

- 3.5.1 Detector Cable
  - 1. Isolate the detector with the damaged cable.
  - 2. Remove the cable connector on top of the detector.
  - 3. Identify the cable to be removed at the Control Unit
  - 4. Unscrew the cable connector at the Detector and discard the damaged cable.
  - 5. Connect the replacement cable to the connector on the Control Unit ensuring it is screwed in place.
  - 6. Connect the cable connector to the detector
  - 7. De-isolate the detector
  - 8. Press OK on The Remote Display Unit
- 3.5.2 Power Supply Cable Replacement (Supplied by Others)
  - 1. Switch off the system.
  - 2. Disconnect the damaged power supply cable from the Control Unit or Remote Display Unit.
  - 3. Connect the replacement power supply cable to the Control Unit or Remote Indictor Unit ensuring wires and cable screen are correctly fitted in the terminals.
  - 4. Switch the system on and allow the system to initialise.

## 3.5.3 Communications Cable Replacement (Supplied by Others)

- 1. Switch off the system.
- 2. Disconnect the damaged communications cable from the Control Unit.
- 3. Disconnect the damaged communications cable from the Remote Display Unit or AMS.
- 4. Connect the replacement communications cable to the Control Unit ensuring it is screwed in place.
- 5. The replacement communications cable must be connected to the terminals in the Control Unit and the Remote Display Unit or AMS.
- 6. Switch the system on and allow it to initialise.
- 3.5.4 Control Unit (Pre-Alarm, Slowdown/Shutdown and Back Up Alarm or Fault Relay Cable Replacement (Supplied by Others)
  - 1. Switch off the system.
  - 2. Remove the Control Unit Lid by removing the 4 screws
  - 3. Disconnect the damaged relay cable from the Control Unit.
  - 4. Disconnect the damaged relay cable from the monitoring equipment.
  - 5. Connect the replacement relay cable to the control unit ensuring it is screwed in place.
  - 6. Connect the replacement relay cable to the monitoring equipment.
  - 7. Switch the system on and allow it to initialise.

## 3.6 CONTROL UNIT MEMBRANE

A new Control Unit Lid will be supplied fitted with the Membrane.

- 1. Unscrew the 4 screws to remove the Control Unit Lid
- 2. Disconnect the 2 ribbon cables connecting the Control Unit Lid to the main PCB.
- 3. Fit new lid in reverse

## 3.7 CONTROL UNIT PCB REPLACEMENT

- 1. Power down the system
- 2. Remove the 4 screws from the lid
- 3. Disconnect the ribbon cables
- 4. Remove the top half of the terminal blocks for the Communications Cables, Pre Alarm and High Alarm Cables and Fault Cables
- 5. Disconnect the detector connectors (1 through to 10) Push sides to release.
- 6. Remove the 4 screws at the corners of the PCB
- 7. Remove PCB
- 8. Fit new PCB in reverse order to the above

## 3.8 DECOMMISSIONING

All the components of the Graviner Mk7 OMD system must be disposed of as electrical/electronic equipment waste. i.e. using waste disposal methods in accordance with current local waste disposal regulations.

# 4 FAULT FINDING

# 4.1 GENERAL

The table below lists a series of failure modes and the likely faults that would be indicated should that failure mode appear. Also listed are Actions, numbered 1 to 19, which should be followed if the associated fault appears. On the following pages, Actions 1 to 19 are shown as flow charts which will assist with fault finding on the Graviner Mk7 OMD system

Control Unit without a Remote Display				
Failure Mode	Fault Indication	Fault	Action	
Control Unit Power indicator is off	All Control Unit LED's off	Supply Failure Membrane failure	1.	
Control Unit fault	Control Unit fault LED on.	Control Unit fault	2.	
All detector Power On (Green) indicators are off.	No indication on the detectors. Control Unit fault LED on, all detector fault LED's flashing 1sec on 1sec off	Control Unit fuse. Detectors disconnected.	3.	
A detector indicating communications fault	Detector fault LED on Control Unit fault LED on, all detector fault LED flashing 1sec on 1sec off	Damaged detector cable Detector failure. Damaged Control Unit PCB	4.	
Detector fault other than communications fault.	Detector fault LED on Control Unit fault LED on, all detector fault LED flashing 0.5sec on 0.5sec off	Fan fault LED contamination fault Detector failure	5.	

Control Unit with Remote Display				
Failure Mode	Fault Indication	Fault	Action	
	All Control Unit LED's off			
Control Unit Power indicator is off	Communications fault with the engine indicated on the Remote Display	Supply Failure	6.	
	Control Unit fault LED on.	Control Unit membrane		
Control Unit membrane fault	Front panel test failed indicated on the Remote Display	fault Control Unit PCB fault	7.	
	Control Unit fault LED on.			
Control Unit memory fault	External RAM indicated on the Remote Display	Control Unit PCB fault	8.	
	Control Unit fault LED on.			
Control Unit watchdog fault	Watchdog fault indicated on the Remote Display	Control Unit PCB fault	8.	
	No indication on the detectors.			
All detector Power On (Green) indicators are off.	Control Unit fault LED on, all detector fault LED's flashing 1sec on 1sec off	Detectors disconnected. Power Supply failure	3.	
	Remote Display indicates communications fault on all detectors for that engine.			
	Detector fault LED on			
A detector indicating	Control Unit fault LED on, all detector fault LED flashing 1sec on 1sec off	Damaged detector cable Detector failure.	4.	
communications fault	Remote Display indicates communications fault on one detector	Damaged Control Unit PCB		
	Detector fault LED on			
Detector fan fault.	Control Unit fault LED on, all detector fault LED flashing 0.5sec on 0.5sec off	Fan fault	9.	
	Remote Display indicates fan fault on a detector			
	Detector fault LED on			
Detector LED fault.	Control Unit fault LED on, all detector fault LED flashing 0.5sec on 0.5sec off	requires cleaning.	10.	
	Remote Display indicates an LED fault on a detector	Detector failure.		

Control Unit with Remote Display				
Failure Mode	Fault Indication	Fault	Action	
	Detector fault LED on			
Detector LED fault.	Control Unit fault LED on, all detector fault LED flashing 0.5sec on 0.5sec off	Detector sample area requires cleaning.	10.	
	Remote Display indicates a photodiode fault on a detector	Detector failure.		
Detector watchdog fault.	Detector fault LED on			
	Control Unit fault LED on, all detector fault LED flashing 0.5sec on 0.5sec off	Detector software has reset	11	
	Remote Display indicates a watchdog fault on a detector			
	Remote Display indicates a communications fault on all engines	Modbus communications cable fault		
Remote Display communications with all engines fault.		End of line termination incorrect.	12	
		Remote Display failure		

Action 1

![](_page_71_Figure_3.jpeg)
































5 SPARE PARTS





May 2012

Control Unit Spares			
Item	Description	Part No.	
	Control Unit with Membrane	53836-K270	
	Control Unit without Membrane	53836-K276	
1.	Printed Circuit Board c/w Ribbon Cables	43782-K172-00	
1.	Printed Circuit Board w/out Ribbon Cables	43782-K172-01	
2.	25mm Blanking Plug	22540-K029	
3.	Metal Gland	22540-K028	
4.	Detector Connection Cap	27400-K303	
	Detector Harness Kit	53569-K003	
5.	6 Way Detector Connection – Qty 1		
	Wrench Tool – Qty 1		
	Control Unit Connector Kit	53569-K004	
6.	Relay & Power Plugs – Qty 3		
7.	Modbus Plug – Qty 1		
8.	EOL Jumpers – Qty 2		



Remote Display Unit Spares			
Item	Description	Part No.	
	Remote Display Unit	53836-K271	
1.	24VDC Power Socket (no Cable)	27400-K304	
2.	Modbus Connector (no Cable)	27400-K305	
3.	Modbus Connector c/w 5m Cable	43682-K297	
4.	24VDC Power Socket c/w 5m Cable	43682-K296	



Figure 117 Detector Spares

Detector Spares				
ltem	Description	Part No.		
	Detector Complete	53836-K269		
	Detector Complete (Short Sample Pipe)	53836-K269-01		
1	Detector Head Assembly	53836-K272		
2	Fan Assembly	D5622-005-02		
3	Base Unit sub-Assembly	D5622-101		
4	Connector Push In	B5465-307		
5	Base moulding O Ring	C1513-802		

Commissioning Kit D9221-026 consists of:				
Description	Part No.	Qty	Category	
Wipes, Wet & Dry	A7311-001	2	Consumables	
Smoke Test Oil -30 ml	D9221-028	1 Bottle	Consumables	
Wick - 150 mm	17100-H06	3	Consumables	
Smoke Tester	D9221-029	1	Tools	
Materials Safety Data Sheet	-	2	Information	

Service Kit D9221-027			
Description	Part No	Qty	Category
Fan Retainer	B3741-902	5	Spares
Compression Spring	B3721-006	5	Spares
Base Moulding Seal	C1513-802	5	Spares
Fan Connector Seal	C1413-801	5	Spares
M3 Screw	21833-H01	5	Spares
Glass Cleaner 500ml	A7311-002	1	Consumables
Foam Buds Pkts	B6910-217	2	Consumables
4mm Hexagon Key	B691 0-219	2	Tools
Pulling Tool	D9131-002	1	Tools
Materials Safety Data Sheet	-	2	Information

Recommended Operational Spares				
Description	Part No.	Qty		
Commissioning Kit	D9221-026	1		
Service Kit	D9221-027	1		
For systems with more than 10 detectors, it is recommended that additional detector head assemblies (53836-K272) are supplied.				

#### 5.1 COMPLETE SPARE PARTS LIST

Part No.	Description		
53836-K270	Control Unit with Membrane for 10 detectors		
53836-K276	Control Unit without Membrane for 10 detectors		
53836-K271	Touch Screen Display Unit		
53836-K269	Detector Complete		
53836-K260-01	Detector Complete (Short Sample pipe)		
33030-1(203-01			
	Cable Assemblies		
	90º Connector		
43682-K285-1.0	1.0m Cable with 90° Connector	1.0	Metres
43682-K285-1.5	1.5m Cable with 90° Connector	1.5	Metres
43682-K285-2.0	2.0m Cable with 90° Connector	2.0	Metres
43682-K285-2.5	2.5m Cable with 90° Connector	2.5	Metres
43682-K285-3.0	3.0m Cable with 90° Connector	3.0	Metres
43682-K285-3.5	3.5m Cable with 90° Connector	3.5	Metres
43682-K285-4.0	4.0m Cable with 90° Connector	4.0	Metres
43682-K285-4.5	4.5m Cable with 90° Connector	4.5	Metres
43682-K285-5.0	5.0m Cable with 90° Connector	5.0	Metres
43682-K285-5.5	5.5m Cable with 90° Connector	5.5	Metres
43682-K285-6.0	6.0m Cable with 90° Connector	6.0	Metres
43682-K285-6.5	6.5m Cable with 90° Connector	6.5	Metres
43682-K285-7.0	7.0m Cable with 90° Connector	7.0	Metres
43682-K285-7.5	7.5m Cable with 90° Connector	7.5	Metres
43682-K285-8.0	8.0m Cable with 90° Connector	8.0	Metres
43682-K285-8.5	8.5m Cable with 90° Connector	8.5	Metres
43682-K285-9.0	9.0m Cable with 90° Connector	9.0	Metres
43682-K285-9.5	9.5m Cable with 90° Connector	9.5	Metres
43682-K285-10.0	10.0m Cable with 90° Connector	10.0	Metres
43682-K285-10.5	10.5m Cable with 90° Connector	10.5	Metres
43682-K285-11.0	11.0m Cable with 90° Connector	11.0	Metres
43682-K285-11.5	11.5m Cable with 90° Connector	11.5	Metres
43682-K285-12.0	12.0m Cable with 90° Connector	12.0	Metres
43682-K285-12.5	12.5m Cable with 90° Connector	12.5	Metres
43682-K285-15.0	15.0m Cable with 90° Connector	15.0	Metres
43682-K285-17.5	17.5m Cable with 90° Connector	17.5	Metres
43682-K285-20.0	20.0m Cable with 90° Connector	20.0	Metres
43682-K285-22.5	22.5m Cable with 90° Connector	22.5	Metres
43682-K285-25.0	25.0m Cable with 90° Connector	25.0	Metres
43682-K285-27.5	27.5m Cable with 90° Connector	27.5	Metres
43682-K285-30.0	30.0m Cable with 90° Connector	30.0	Metres
43682-K285-32.5	32.5m Cable with 90° Connector	32.5	Metres
43682-K285-35.0	35.0m Cable with 90° Connector	35.0	Metres

Part No.	Description		
	Straight Connector		
43682-K286-1.0	1.0m Cable with Straight Connector	1.0	Metres
43682-K286-1.5	1.5m Cable with Straight Connector	1.5	Metres
43682-K286-2.0	2.0m Cable with Straight Connector	2.0	Metres
43682-K286-2.5	2.5m Cable with Straight Connector	2.5	Metres
43682-K286-3.0	3.0m Cable with Straight Connector	3.0	Metres
43682-K286-3.5	3.5m Cable with Straight Connector	3.5	Metres
43682-K286-4.0	4.0m Cable with Straight Connector	4.0	Metres
43682-K286-4.5	4.5m Cable with Straight Connector	4.5	Metres
43682-K286-5.0	5.0m Cable with Straight Connector	5.0	Metres
43682-K286-5.5	5.5m Cable with Straight Connector	5.5	Metres
43682-K286-6.0	6.0m Cable with Straight Connector	6.0	Metres
43682-K286-6.5	6.5m Cable with Straight Connector	6.5	Metres
43682-K286-7.0	7.0m Cable with Straight Connector	7.0	Metres
43682-K286-7.5	7.5m Cable with Straight Connector	7.5	Metres
43682-K286-8.0	8.0m Cable with Straight Connector	8.0	Metres
43682-K286-8.5	8.5m Cable with Straight Connector	8.5	Metres
43682-K286-9.0	9.0m Cable with Straight Connector	9.0	Metres
43682-K286-9.5	9.5m Cable with Straight Connector	9.5	Metres
43682-K286-10.0	10.0m Cable with Straight Connector	10.0	Metres
43682-K286-10.5	10.5m Cable with Straight Connector	10.5	Metres
43682-K286-11.0	11.0m Cable with Straight Connector	11.0	Metres
43682-K286-11.5	11.5m Cable with Straight Connector	11.5	Metres
43682-K286-12.0	12.0m Cable with Straight Connector	12.0	Metres
43682-K286-12.5	12.5m Cable with Straight Connector	12.5	Metres
43682-K286-15.0	15.0m Cable with Straight Connector	15.0	Metres
43682-K286-17.5	17.5m Cable with Straight Connector	17.5	Metres
43682-K286-20.0	20.0m Cable with Straight Connector	20.0	Metres
43682-K286-22.5	22.5m Cable with Straight Connector	22.5	Metres
43682-K286-25.0	25.0m Cable with Straight Connector	25.0	Metres
43682-K286-27.5	27.5m Cable with Straight Connector	27.5	Metres
43682-K286-30.0	30.0m Cable with Straight Connector	30.0	Metres
43682-K286-32.5	32.5m Cable with Straight Connector	32.5	Metres
43682-K286-35.0	35.0m Cable with Straight Connector	35.0	Metres
		l	

Part No.	Description	
	Spare Parts	
17100-H06	Cotton Wick (1 hank = 10 meters)	
21833-H01	M3 screw	
22540-K028	Metal Gland	
22540-K029	25mm Blanking Plug	
27400-K303	Detector Connection Cap	
27400-K304	24VDC Power Socket (no Cable)	
27400-K305	Modbus Connector (no Cable)	
35100-K274	Mk5 - Mk7 Retrofit Plate	
43682-K296	24VDC Power Socket c/w 5m Cable	
43682-K297	Modbus Connector c/w 5m Cable	
43782-K172-00	Printed Circuit Board c/w Ribbon Cables	
43782-K172-01	Printed Circuit Board w/out Ribbon Cables	
53569-K003	Detector Harness Kit	
	Incl 1 x 6Way Detector Connection	
	Incl 1 x Wrench Tool	
53569-K004	Control Unit Connector Kit	
	Incl 3 x Relay & Power Plugs	
	Incl 1 x Modbus Plug	
	Incl 2 x EOL Jumpers	
53836-K272	Mk7 Detector Head Assembly	
	Incl 1 x D5622-005-02	
	Incl 1 x C1513-802	
A7311-001	Wet Wipes	
A7311-002	Glass Cleaner 500ml	
B3721-006	Compression spring	
B3741-902	Fan Retainer	
B5465-307	Connector Push in	
B6910-217	Foam Buds Pkts	
B6910-219	4mm Hex Key	
C1413-801	Fan Connector seal	
C1513-802	Base moulding O ring	
D5622-005-02	Fan, Micronel type F41LP-005KK-9	
D5622-101	Base unit sub assy	
	Incl 1 x B5465-307	
D9131-002	Pulling tool	
D9221-026	Commissioning Kit	
D9221-027	Service Kit	
D9221-028	Smoke Oil	
D9221-029	Smoke tester	