

## 1 SECTION 1 – DESIGN AND OPERATION

### 1.1 INTRODUCTION

This Operation and Maintenance Manual (OMM) is designed to provide guidance for the effective operation and maintenance of the Fire Protection System in the **Dieppe Barracks** Project.

This OMM covers the Fire Protection System in **Block 2** at **Dieppe Barrack**, including the fire alarm system, clean agent fire extinguishing (FM200) system, wet sprinkler system, dry riser system, hose reel system and fire extinguisher system. The manual provides comprehensive instructions for the maintenance and operation of these systems, ensuring their safety and reliability. By following the guidelines outlined in this manual, the Fire Protection System will continue to operate at an optimal level, providing effective protection to the **Block 2 Dieppe Barracks**.

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### 1.1.1 Project Team

#### **Developer:**

**DSTA**

1 DEPOT ROAD,  
SINGAPORE 109679

#### **Architect:**

**ID ARCHITECTS PTE LTD**

3 HARBOUR FRONT PLACE, #03-01, HARBOUR  
FRONT TOWER TWO, SINGAPORE 099254

#### **Civil & Structural Consulting Engineers**

**TW-ASIA CONSULTANTS PTE LTD**

NO.28 SIN MING LANE, #04-137 MIDVIEW CITY,  
SINGAPORE 573972

#### **M&E Consultant**

**PDC CONSULTANTS PTE LTD**

23 NEW INDUSTRIAL ROAD, #06-03,  
SOLSTICE BUSINESS CENTER, SINGAPORE 536209

#### **Main Contractor**

**DEEN ENGINEERING PTE LTD**

29 HARRISON ROAD, LIAN BENG BUILDING,  
SINGAPORE 369648

#### **Fire Sub Contractor**

**NORTHWAY FIRE PROTECTION PTE LTD**

BLK 2 DEFU LANE 10, #04-523  
SINGAPORE 539183

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### 1.1.2 Emergency Contact Number During DLP Period

Person To Contact	During Office Hours	After Office Hours
Northway Office	6285 2846	6285 2846
Mr. Zin Ko (Operation Manager)	9617 7733	9617 7733
Wann Ko (Project Engineer)	9244 4148	9244 4148

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## 1.2 SYSTEM DESCRIPTION

### 1.2.1 Fire Alarm System

The Fire Alarm System installed at **Blk 2** consists of a **ZP3 ZITON PANEL** configured as the **Sub Alarm Panel** located **inside Stair Case 1** and **Repeater Panel** was inside **the Ops-Room (#02-02)**. The Blk 2 ZP3 ZITON PANEL have 1 addressable loop, capable of addressing up to 128 intelligent detectors, call points and modules. Additionally, there was **Three Sub Mimic Panels** which located **inside the Stair Case 1** in each floor and a **Repeater Mimic Panel** is located beside the **Repeater Panel** to enable security personnel to identify the exact location of the alarm. The **Sub Mimic Panel** indicates One Storey Layout of Blk 2, while the **Repeater Mimic Panel** indicates overall camp development layout.

The Fire Alarm System is connected and monitored by **ADEMCO** (DECAM System). Upon activation, Fire Alarm Signal will be sent to **ADEMCO** and **SCDF**.

The Fire Alarm System is comprised of various components, each with a specific function as below:

#### **Smoke Detector**

The intelligent photoelectric smoke detectors (ZP730-2P) are installed in air-conditioned and electrical-related rooms and risers throughout the building.

#### **Heat Detector**

The intelligent heat detectors (ZP720-3P) are installed in natural ventilated areas and toilet areas.

#### **Call Point**

The manual call points (ZP7) are installed in designated locations as allocated by the architect, usually near the exit area or close to the hosereel drum.

#### **Alarm Bell**

Alarm bells (MBA-6-24) are also installed according to the architect's designated locations, usually near the exit area or close to the hosereel.

#### **Strobe Light**

Strobe lights (SYS-ST) are installed in designated locations as allocated by the architect, including exit areas and inside the toilet. These components work together to provide reliable detection and notification of a fire outbreak, allowing for swift and effective evacuation of the building's occupants.

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## 1.2.2 Clean Agent Fire Extinguishing System

The clean gas fire suppression system installed is **HyGood FM200**, which is a total flood suppression system. The complete system is installed in the following rooms:

- **1<sup>st</sup> Storey FM200 Protected Room**

1. **#01-07** (OT Sever Room)
2. **#01-08** (Battery Room)
3. **#01-09** (NCR(S) Room)
4. **#01-10** (NCR(C) Room)

These Rooms includes the mechanical and electrical installation, detection and control equipment, agent storage containers, **HyGood FM200** agent, discharge nozzles, pipes and fittings, manual release & abort stations, audible & visible alarm devices, auxiliary devices & controls, shutdowns, alarm interface and caution/advisory signs.

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## 1.2.3 Wet Sprinkler System

The Wet Sprinkler System is the most common and reliable fire protection solution used in commercial, residential, and industrial buildings. This system consists of a network of pipes filled with water, ready for immediate discharge upon activation. Each sprinkler head is equipped with a heat-sensitive element, such as a glass bulb or fusible link, which responds to the heat from a fire. When the ambient temperature reaches a predetermined level, the element activates, allowing water to flow from the sprinkler head directly onto the fire.

The Wet Sprinkler System is designed for rapid response, providing an effective means of controlling and extinguishing fires, thereby minimizing damage and enhancing occupant safety. It is suitable for environments where the temperature remains above freezing to prevent the water in the pipes from freezing. The system requires minimal maintenance and offers high reliability due to its straightforward design.

Key components of a Wet Sprinkler System include sprinkler heads, piping network, control valves, alarms, and water supply connections. The system operates automatically and is an essential component of a comprehensive fire safety strategy.

There are four control valves in the building. The Wet Sprinkler System is controlled by **SCV 4-4** and serves the following areas in the building,

- **SCV 4-4 (Wet Sprinkler)** – Office Area, Corridor, Toilet, Store Room, Pantry Room, DC Room, IDS Room, Briefing Room.

The incoming water supply for the sprinkler system is taken from **BLK11**.

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### 1.2.4 Dry Riser System

There are 2 stacks of dry riser installed in the building for firefighting purposes, fitted with inlet connections at the fire appliances access level and landing valves on the various floors, which is normally dry but is capable of being charged with water usually pumping from the pumps of the Singapore Civil Defence Force (SCDF) vehicles.

#### 1.2.4.1 Landing Valves

The position of the dry risers and the associated landing valves are located in the common area within the protected shaft, immediately outside the exit staircase.

#### 1.2.4.2 Breeching Inlets

The breeching inlet is located as close as possible to the dry riser main to serve with any connecting pipe between the inlets and the vertical run of the dry riser main. The breeching inlet is fitted with a drain valve to facilitate draining of the dry riser after use.

A breeching inlet includes a fire department connection which is an external access point at ground level through which water can be pumped from the fire department's fire engine the firefighters' hose attachment on each floor.

## 1.2.5 Hosereel System

A hosereel system is an essential component of any building's fire protection system. It is a permanent pressurized system designed to combat any fire that may occur within the building. The system comprises a hose tubing fitted with a shut-off nozzle that is attached to a reel that rotates in a direction to wind the hose onto the reel and allows the reel to rotate freely when the hose is reeled out.

The location of each hosereel system is determined by the FSSD Approved building plans and is in compliance with the Singapore Fire Code. Each hosereel system is equipped with a 30m hose, and it is capable of providing a jet discharge of approximately 6 meters. In the event of a fire emergency, the hosereel system can be quickly activated to release water to extinguish the fire.

The water connection to supply the fire hosereel is directed from the supply side of the hosereel tank with the PUB incoming main, which is located at the 1<sup>st</sup> Storey near staircase. There are 2 electrically driven pumps installed in the hosereel pump area, capable of being started or stopped manually based on the water pressure conditions. The standby pump will operate automatically in case of failure of the duty pump.



## 1.2.6 Fire Extinguisher System

In the premises, the fire extinguisher system is comprised of 4Kg dry chemical powder extinguishers. These extinguishers are specifically chosen to address the fire hazards expected in the areas protected. The number of extinguishers and their capacity are installed according to FSSD approved building plans.

The locations of these fire extinguishers are strategically installed to ensure that they are easily accessible and unobstructed, allowing for quick and prompt use in case of a fire emergency. It is crucial to note that these extinguishers are only effective in fighting small fires or in containing fires until professional help arrives.

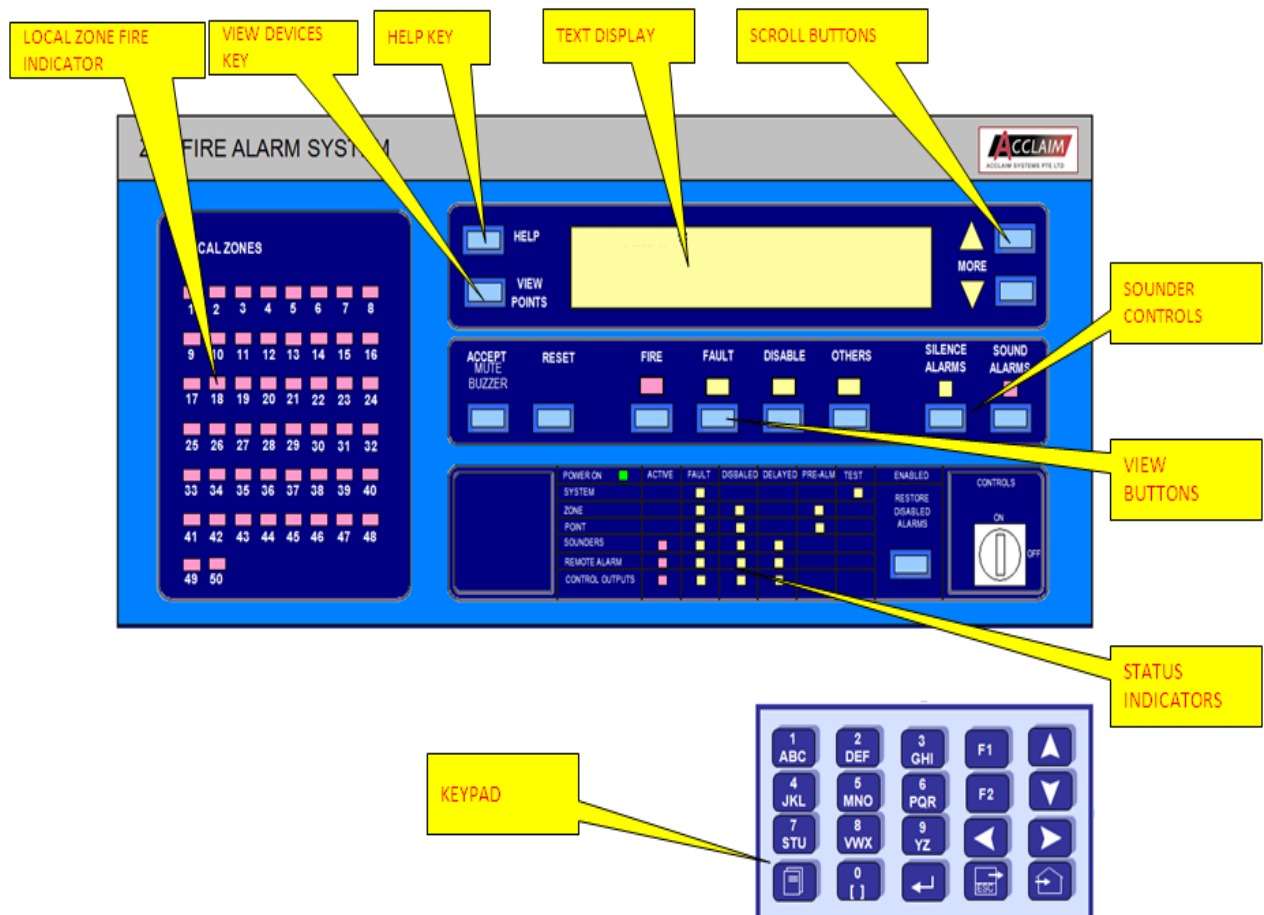
Overall, the fire extinguisher system provides a crucial line of defense against fire emergencies, allowing building occupants to respond quickly and effectively in the event of a fire. Regular maintenance and inspection of the system are essential to ensure that it remains fully functional and operational in the event of an emergency.

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## 1.3 SYSTEM OPERATION

### 1.3.1 Fire Alarm System Operation

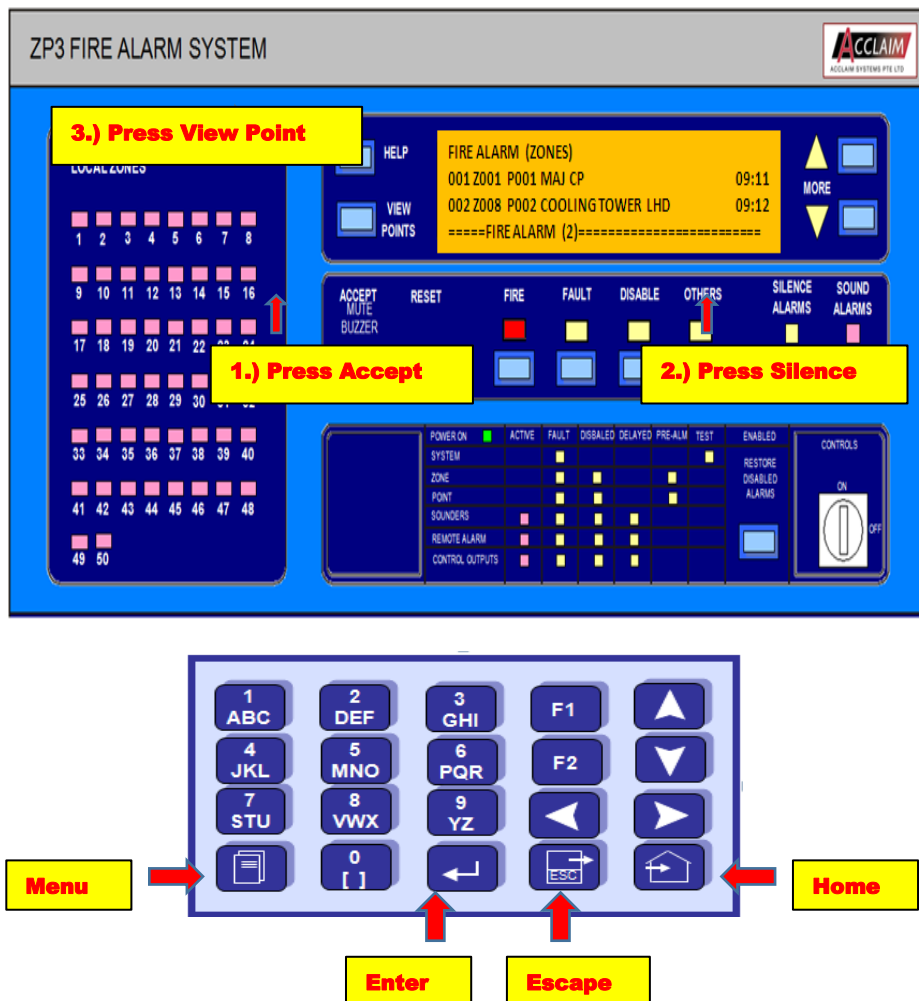
#### 1.3.1.1 Panel General Description



<b>Local Zone Fire Indicator:</b>	Any Fire Activation, Zone LED will be lighted up
<b>View Device Key:</b>	Allows you to see Point that is being activated
<b>Help Key:</b>	Allow you to see the help menu
<b>Text Display:</b>	LCD Display of events
<b>Scroll Button:</b>	Allow you to scroll through the event that happen
<b>Sounder Control:</b>	Allow you to Silence of Alarm Bell when there is a fire activation
<b>View Buttons:</b>	Allow you to see zone that is being activated
<b>Status Indicators:</b>	LED Indicator on the overall system activation, fault and disablement

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### 1.3.1.2 Action To Be Taken When FIRE ALARM Is Triggered



- Press **Accept** button to mute panel buzzer
- Press **Silence** button to silence off bell (Both MAP bell and SAP bell will be silenced)
- Press **View Point** button to see which point device is being detected (etc. **001-1001**)
- Scroll **UP Arrow** to see first point, **Down Button** to see Last point.
- Investigate whether it is a false alarm or a genuine alarm.

#### FALSE ALARM

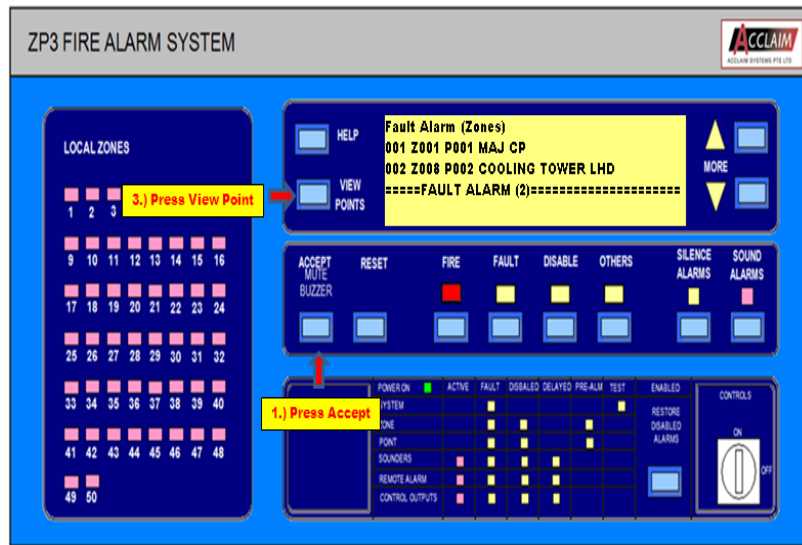
- 1) Press Menu
- 2) Maintenance (Password 2000)
- 3) Edit Disable
- 4) Point
- 5) Key in Point Address that need to be disable.
- 6) Enter and Home

#### GENUINE ALARM

1. Break the nearest Break Glass to sound of the bell again
2. **Inform (Tel : 995 ) Fire Brigade**

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### 1.3.1.3 Action To Be Taken When **FAULT/TROUBLE** Is Triggered



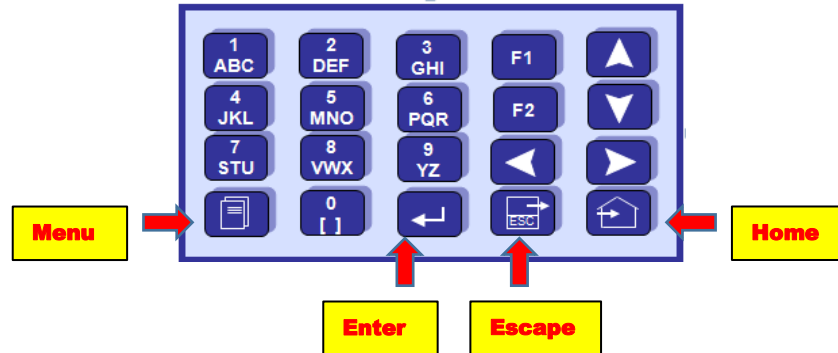
- Press **Accept** button to mute panel buzzer
- Press **View Point** to see which point device is faulty
- Disable point device that is faulty

#### Wiring and Other Fault

- Contact the installer on the issue to rectify the fault.

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## 1.3.1.4 Disable / Enable Procedure



### **Disablement**

- 1) Press Menu
- 2) Maintenance (Password 2000)
- 3) Edit Disabled
- 4) Point
- 5) Key in Point Address that need to be Disable and press 1 for Disable
- 6) Enter and Home

### **Enablement**

- 1) Press Menu
- 2) Maintenance (Password 2000)
- 3) Edit Disabled
- 4) Point
- 5) Key in Point Address that need to be Enable and press 2 for Enable
- Enter and Home

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### **1.3.1.5 Operational Procedure**

The following operation procedure is only meant as a guideline to assist the appointed building Fire Manager/Fire Officer in formulating a customized Fire Response Plan. The appointed building Fire Manager/Fire Officer should take into account the system capabilities as well as the building's operational procedure in modifying this suggested operational procedure.

### **1.3.1.6 Activation of Fire Alarm**

On receipt of a Fire Alarm, a Fire Response investigation team should be dispatched immediately to the location of the alarm to investigate the source of the alarm. A decision should then be made as to whether the source of the alarm is due to a genuine outbreak of fire, and whether there is any need to evacuate the building occupants.

### **1.3.1.7 Acknowledgment of Fire Alarm**

The ACK/STEP Key should be depressed to acknowledge a new alarm and to silence the piezo-electric buzzer. This step can be performed either before or after the Fire Response team is dispatched.

### **1.3.1.8 Requesting Alarm Silence**

It is determined that there is no need to evacuate the building, the building alarm bells can then be silenced by pressing the Signal Silence Key.

WARNING: Requesting for Alarm Silence of building alarm bells without first investigating the source of alarm could have serious repercussions and may result in loss of life/property. The Fire Manager must consider this and all Fire Operational Staff must be properly briefed.

### **1.3.1.9 Resetting of Alarm**

If the fire alarm is determined to be non-threatening, the fire alarm can be reset as follows:

- a. Ensure that the field device is reset.
- b. Press System Reset.
- c. Ensure that the point in alarm has been returned to normal.

### **1.3.1.10 Disabling of a Point or Zone**

An alarm point or a software zone should be disabled only for as long as it takes to perform a System Reset or to replace the device. During the time when a point or zone is disabled, the system will only provide limited fire alarm capabilities.

NOTE: The ZP3 should be left 'armed' at all times. Disabling of points/zones as a method of preventing possible nuisance alarms is not acceptable and must NOT be prepared.

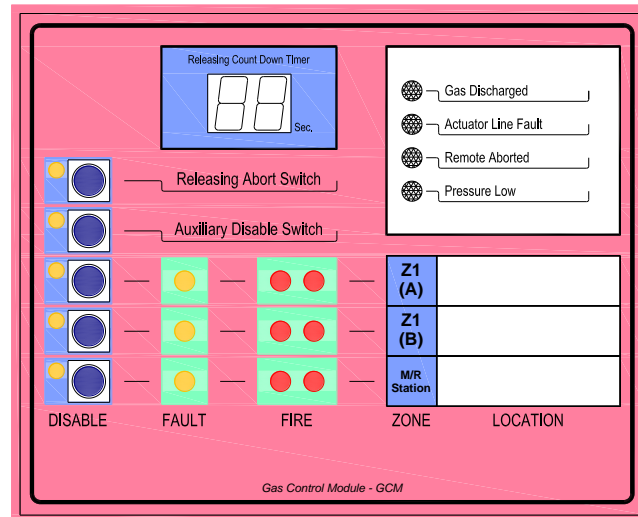
### **1.3.1.11 Alarm Latching**

Once a point has gone into alarm, the ZP3 will hold this point in alarm until a System Reset is performed. This is true even if the actual point that caused the alarm has been physically reset.

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## 1.3.2 Clean Agent Fire Extinguishing System (FM200) Operation

### 1.3.2.1 Extinguishing Control Module



#### Detection Zone Indicators and Control (Detectors and Remote Manual release)

- a) Fire (Red) : Zone in fire condition
- b) Fault (Amber) : Zone detection circuit open/short fault condition
- c) Disable (Amber) : Zone in disabled condition
- d) Disable Switch (Blue) : To disable zone fire & fault detection circuit
- e) (*Note: Zone disabled function only prior to an alarm activation.*)

#### Extinguishing Indication and Control

- a) Releasing Count Down Timer : To indicate the remaining time in seconds before activation of actuator.
- b) Releasing Abort Switch (Blue) : To manual-disable the discharge of the gas and all the 2<sup>nd</sup> Alarm output circuits (effective only before gas discharged)
- c) Auxiliary Disable Switch (Blue) : To disable 1<sup>st</sup> and 2<sup>nd</sup> alarm auxiliary output signals to prevent activation of ancillary equipment.
- d) Gas Discharged LED (Red) : To indicate actual gas discharged upon expiry of pre-set timer countdown delay.
- e) Actuator Line Fault LED (Amber) : To indicate the open and/or short circuit of the actuator line c/w fuse protection.
- f) Remote Aborted LED (Amber) : To indicate that remote abort switch has been activated to prevent gas from discharging.
- g) Pressure Low LED (Amber) : To indicate cylinder storage pressure at low level.

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### **1.3.2.2 Automatic Operation of the FM200 Clean Gas Suppression System**

#### **Upon 1<sup>st</sup> Alarm of either detector A or B of the smoke detectors**

- a) The combination of bell and strobe light within the protected area will sound and flash.
- b) The “Evacuate Area Immediately” signage within the protected area will illuminate and start flashing.
- c) The “Alarm” LED on the Gas Control Panel indicates an alarm/fire event, location of which detectors is being triggered.
- d) The buzzer in the Gas Control Panel will start beeping.
- e) A signal will be sent from the Gas Control Panel to the building’s fire alarm system.
- f) A signal will be sent to the HVAC Panel for air-con shutdown.

#### **Upon 2<sup>nd</sup> Alarm of either detector A or B of the smoke detectors**

- a) The horn within the protected area will sound.
- b) The “Gas Discharged” signage outside the protected area will illuminate and start flashing.
- c) The “Alarm” LED on the Gas Control Panel indicates an alarm/fire event, location of which detectors is being triggered.
- d) The Buzzer in the Gas Control Panel will continue to beep.
- e) The delay timer of 30sec will start counting down.

#### **Upon lapse of the delay (30sec)**

- a) A signal from the Gas Control Panel will be sent to the Solenoid Valve to discharge the gas into the room within **30sec**.



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### **1.3.2.3 Electrical Manual Operation of the FM200 Clean Gas Fire Suppression System**

#### **Upon Break the Glass of the remote Manual Release Station.**

- a) The combination of bell and strobe light within the protected area will sound and flash.
- b) The “**Evacuate Area Immediately**” signage within the protected area will illuminate and start flashing.
- c) The “**Alarm**” LED on the Gas Control Panel indicates an alarm/fire event, location of which detectors is being triggered.
- d) The buzzer in the Gas Control Panel will start beeping.
- e) A signal will be sent from the Gas Control Panel to the building’s fire alarm system.
- f) A signal will be sent to the HVAC Panel for air-con shutdown.
- g) The delay timer of 30sec will start counting down.

#### **Upon lapse of the delay (30sec)**

- a) A signal from the Gas Control Panel will be sent to turn on the Solenoid Valve and discharge the gas into the room within 60sec.
- b) A signal from the Pressure Switch will be sent back to the Gas Control Panel to feedback that gas is being discharged.

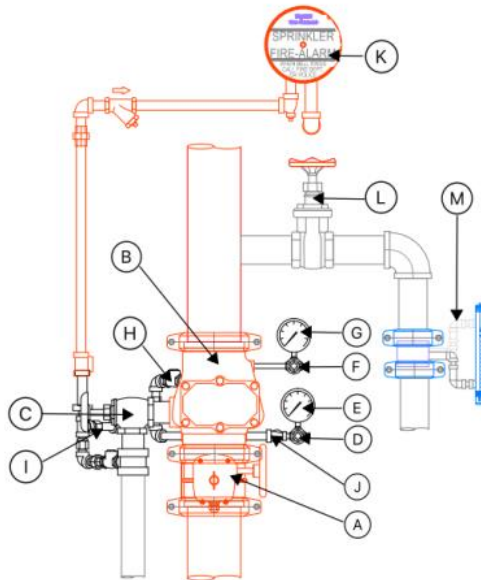
### **1.3.2.4 Mechanical Activation of the FM200 Clean Gas Suppression System during Emergency**

Pull out the safety pin of the Manual Release Actuator at the cylinder and press the Manual Release.

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### 1.3.3 Wet Sprinkler System Operation

#### 1.3.3.1 Control Valve Setting Procedure

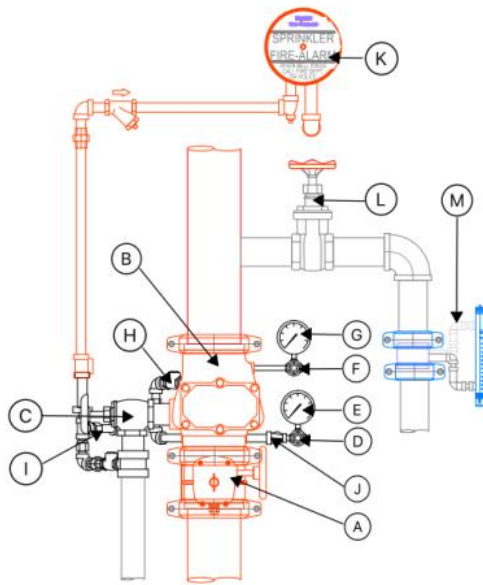


S/N	Description	Standby
A	Control Valve	Open (Locked)
B	AV-1 Wet Alarm Valve	
C	System Main Drain Valve	Closed
D	Water Supply Pressure Gauge Valve	Open (Locked)
E	Water Supply Pressure Gauge	
F	System Supply Pressure Gauge Valve	Open (Locked)
G	System Supply Pressure Gauge	
H	Bypass Check Valve	
I	Asystem Alarm Strainer	
J	System Alarm Test Valve	Closed
K	Alarm Gong WMA-1	De-Pressurized
L	Flow Test Drain Valve	Closed
M	Flow Meter	

1. Ensure the system pipeline is fully closed and all sprinkler heads are in order.
2. Close the system main drain (C).
3. Open the 1/4 inch gauge test valves for the supply (D) and system pressure gauges (F).
4. Close the alarm test valve (J).
5. Slowly open the main control valve (A) until the sound of flowing water just begins, then open the valve one more turn and observe the system branch line.
6. Fully open the main control valve (A) if there are no leaks in the system pipeline.
7. Monitor the water supply pressure gauge (E) and system supply pressure gauge (G) to ensure they reach the desired pressure.
8. After verifying that the flow of water inside the pipeline has stopped, the alarm valve is set and ready for service.
9. Reset the fire alarm panel if required and notify the central alarm station.

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#### 1.3.3.2 Control Valve Drain Off Procedure



S/N	Description	Standby
A	Control Valve	Open (Locked)
B	AV-1 Wet Alarm Valve	
C	System Main Drain Valve	Closed
D	Water Supply Pressure Gauge Valve	Open (Locked)
E	Water Supply Pressure Gauge	
F	System Supply Pressure Gauge Valve	Open (Locked)
G	System Supply Pressure Gauge	
H	Bypass Check Valve	
I	Asystem Alarm Strainer	
J	System Alarm Test Valve	Closed
K	Alarm Gong WMA-1	De-Pressurized
L	Flow Test Drain Valve	Closed
M	Flow Meter	

1. Close the main control valve **(A)**.
2. Drain the water from the system by opening the main system drain valve **(C)** and all other auxiliary drain valves pertaining to the system.
3. Wait until the supply pressure gauge **(E)** **(G)** reads zero pressure and the sound of draining water has stopped before performing any maintenance work on the fire protection system.
4. Reset the fire alarm panel if required and notify the central alarm station.

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### 1.3.4 Fire Hosereel System Operation

The fire hose reel is used by building occupiers to fight fire at the initial stage.

The fire hose reel system is used to fight fire at close range, manually, by pointing the nozzle at the bottom of the fire, it tends to put out the fire more efficiently. The throw of the water spray is approximately 6 meters, it may be used for wetting materials such as wood or other combustible materials to prevent further burning.

The sequence of operation the fire hose reel system is as follows:

- Turn on the stop valve at the hose reel drum.
- Pull the hose towards the direction required.
- Point the spray of jet of water at the direction to the fire.
- Turn on the nozzle by turning the nozzle anti-clockwise.
- After using, always close the stop valve at the hose reel drum.
- Drain out all water from the hose.
- Close the nozzle by turning clockwise.
- Return fire hose back into drum.

### Fire Hosereel Operation Instruction

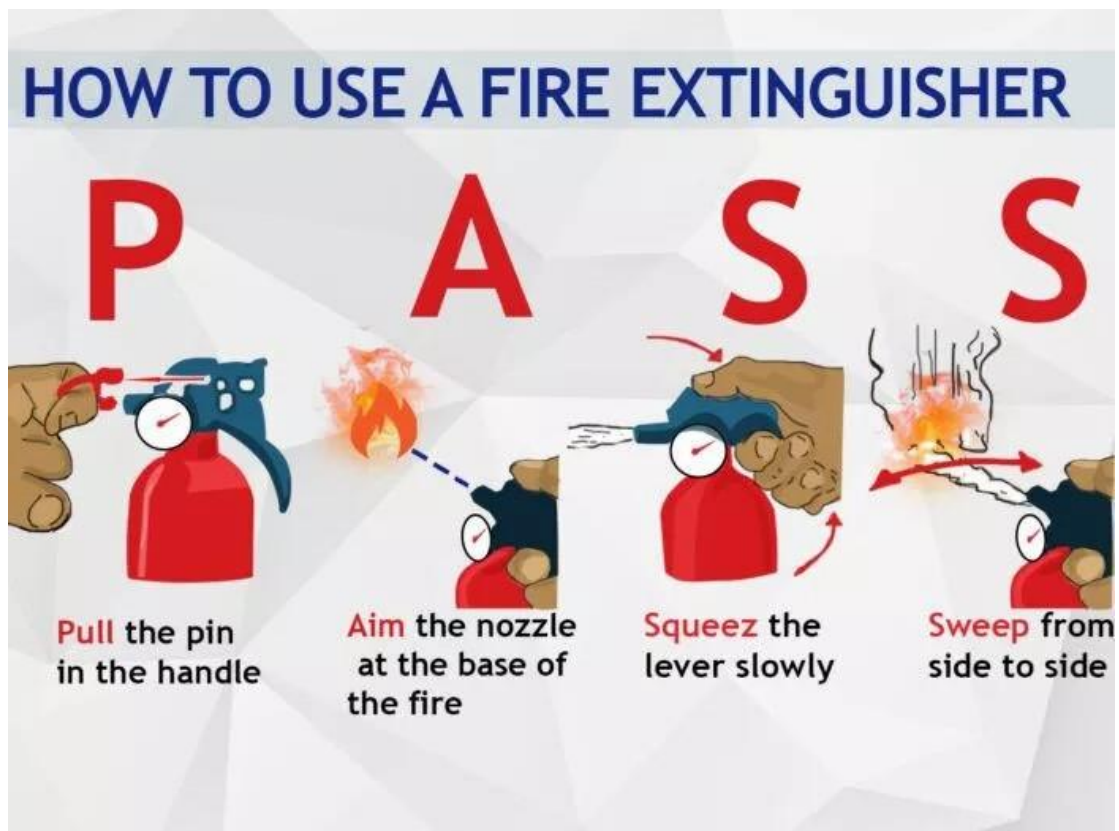


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### 1.3.5 Fire Extinguisher System Operation

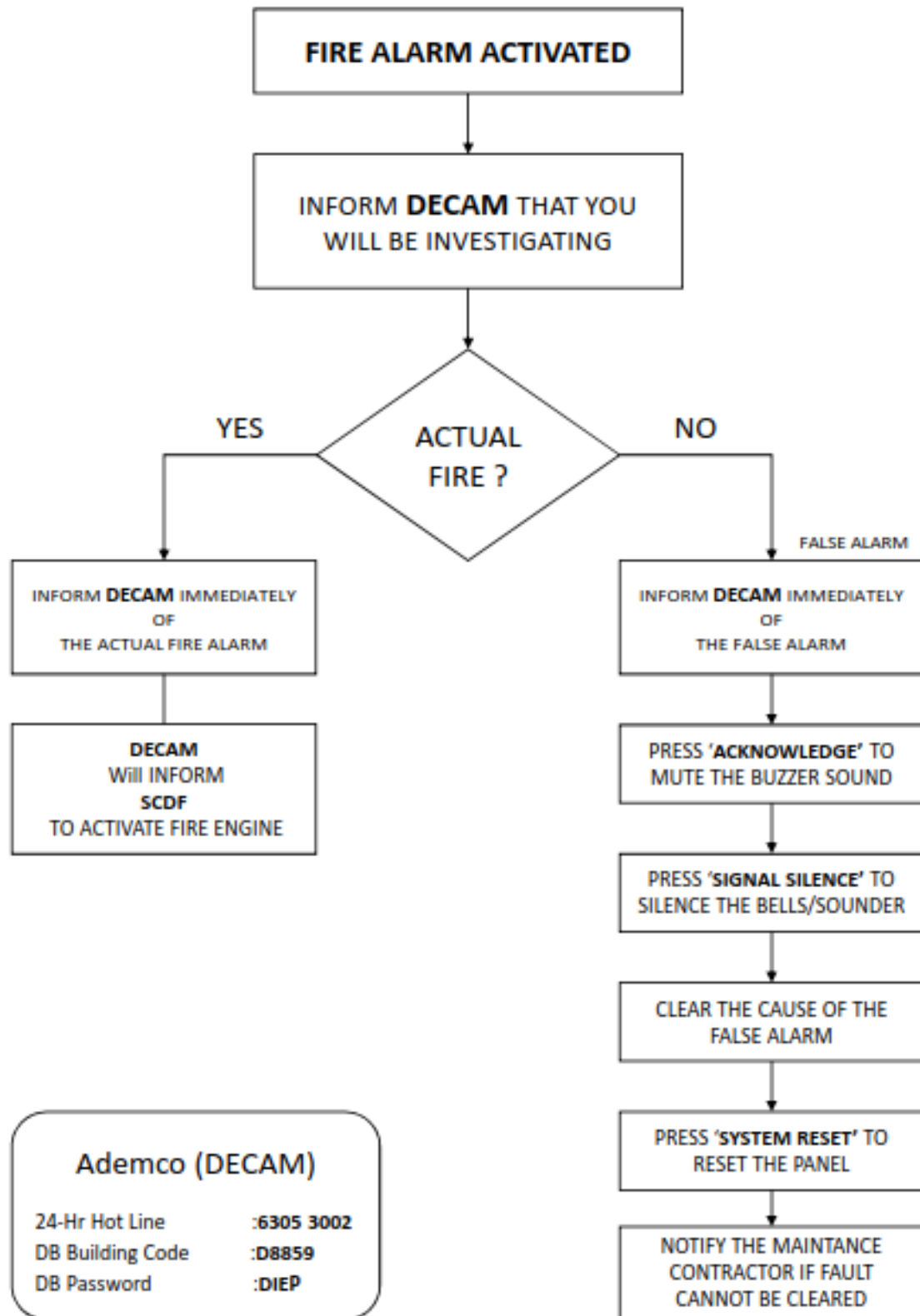
- **P**ull the Pin at the top of the extinguisher. The pin releases a locking mechanism and will allow you to discharge the extinguisher.
- **A**im nozzle at the base of the fire, not the flames. This is important - in order to put out the fire, you must extinguish the fuel.
- **S**queeze the lever slowly. This will release the extinguishing agent in the extinguisher. If the handle is released, the discharge will stop.
- **S**weep from side to side. Using a sweeping motion, move the fire extinguisher back and forth until the fire is completely out. Operate the extinguisher from a safe distance, several feet away, and then move towards the fire once it starts to diminish.

#### Fire Extinguisher Operation



## 1.4 OPERATING FLOW CHARTS

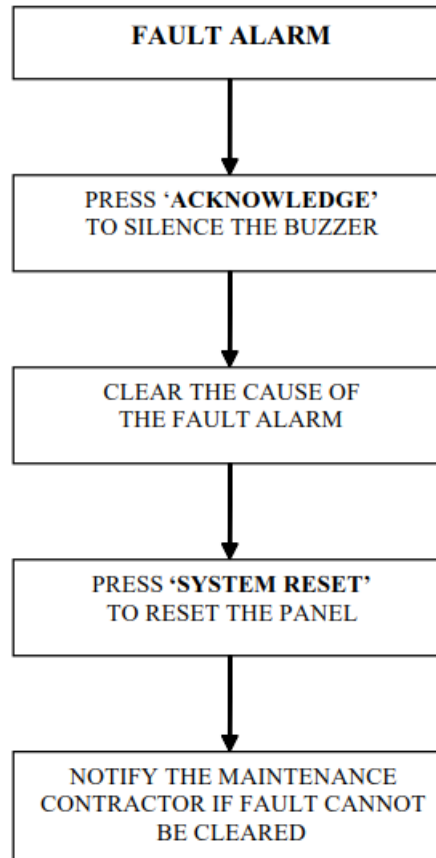
### 1.4.1 Fire Alarm Operating Flow Chart



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### 1.4.2 Fault Operating Flow Chart

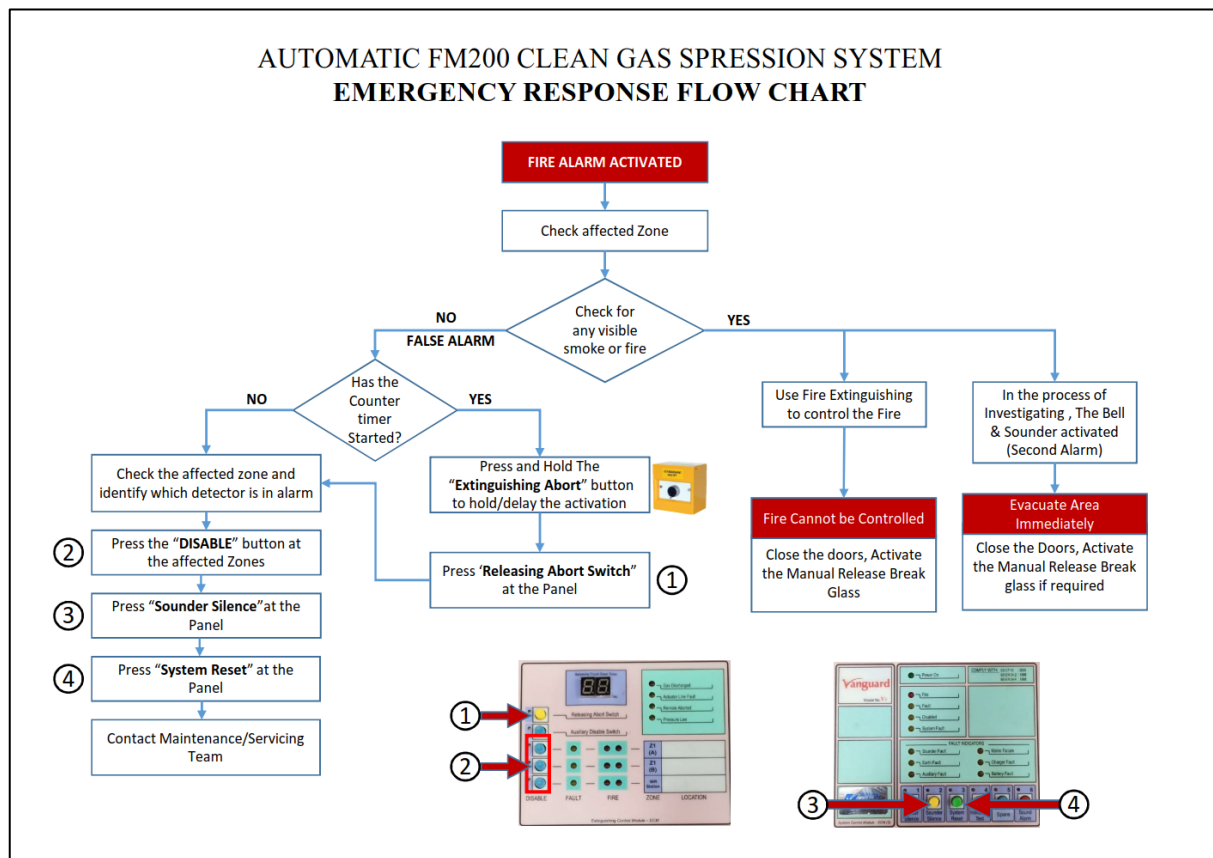
#### **FAULT ALARM OPERATING FLOW-CHART**





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## 1.4.3 CAFES (FM 200) Flow Chart





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## 1.5 OPERATOR ROUTINE CHECKS

### 1.5.1 Operator Responsibilities

A Duty Person should be appointed to supervise all matters relating to the fire alarm system that is:

1. Making sure the system is checked at least once every 24 hrs and that there are no faults on the system.
2. Making sure that situations are avoided that are detrimental to the standard of protection provided by the system, for example:
  - Making sure that a clear space of at least 500 mm is preserved around and below all fire detectors.
  - Making sure that all manual call points remain unobstructed and conspicuous.
  - Making sure to communicate with those responsible for changes to, or maintenance of, the building to ensure that changes do not compromise the effectiveness of the system.
3. Updating record documents and operating instructions when building changes are made.
4. Making sure that the level of false alarms is minimized.
5. Ensuring that the following spare parts are held in the building:
  - Six replacement glasses and test keys for manual call points (unless the system has less than twelve manual call points, in which case only two sets of glasses and keys are required).
  - One set of spare fuses.
  - Any other spare parts recommended by the servicing agent.

### 1.5.2 Regular Procedures

The recommended routine maintenance procedures can be divided into the following categories:

- Daily checks
- Weekly checks
- Monthly services

The daily and weekly checks require no technical knowledge and can often be carried out by the panel operator.

An authorized servicing company, usually under maintenance contract, should carry out the monthly services. Monthly services are not the responsibility of the operator, and are not covered in this manual.

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## 1.5.3 Routine Checks

### **Daily checks**

Do the following checks every day:

1. Check that the green Power-on indicator is illuminated. All other LED's should be off except the Common Disabled LED (depending on the network status, e.g. other blk under disabled) and the panel should be silent. The display should show the time and date only.
2. If the panel is indicating a fault alarm, contact the maintenance staff and arrange for the fault to be rectified.

### **Weekly checks**

Do the following checks every week:

1. Make sure that the correct time and date is displayed on the ZP3 panel display. If not, then correct the time/date.
2. Check that all LED's are operational by carrying out a lamp-test.