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1 GENERAL

1.1 Introduction
This manual serves to provide only the basis operator’s information on the operation of the Fire Extinguishing System. To ensure continuous reliability of the system, it is recommended that an agreement to carry out regular maintenance of the installation be made with a competent and qualified contractor trained to service and maintain this system.

Arrangements should be made such that a qualified person is available on call to provide service in the event of any emergency arising at the installation. For more details on maintenance, please refer to the section on routine maintenance covered in this manual.

1.2 System Description
This Fire Extinguishing System utilises the PATENT System 88 Fire Extinguishing Control Panel. The system comprises a Fire Extinguishing Control Panel, which perform the task of processing the input signals and thereafter transmit the output signals or initiates other auxiliary functions. The panel is usually sited outside the protected room prominent location clearly visible from the entrance.

Input devices are used to cause a change in panel status. These devices may be the combination of Remote Electrical Manual Release Call Points, Remote Mechanical Release Control Switches (if provided), Heat/Smoke Detectors or Remote Abort Station.

Output devices are used to provide an audio & visual warning. Output devices commonly used are alarm bells, electronic sounders, strobe light, “Evacuate” flashing sign and “Gas Discharged” flashing sign. These three components: Input Devices, Control Panel and Output Devices form the backbone of a Fire Extinguishing System.

The detection system of Fire Extinguishing Systems operates on a “Dual Risk Zone” basis. These zones are groups of input devices grouped in accordance to the locality they are protecting. In the event of a Fire/Fault condition, the location where the signal had originated will be defined by the respective indication on the panel. It is therefore important to be familiar with the zoning of the protected area. A zoning diagram (or zone chart) is usually provided for this purpose.

The Fire Extinguishing Control Panel is provided with a feature that continuously monitoring the continuity of the input/detection, output/sounder circuits and Electrical actuator circuits to ensure integrity of the system. It is also equipped with a battery back-up supply (lasting at least 24 hours) in the event of an incoming supply failure.
2 OPERATING INSTRUCTIONS

2.1 Normal Operating Conditions
Under normal operating conditions
a) The green “POWER ON” LED lighted
b) Countdown timer display indicating the Pre-set time eg: 30 for 30 sec time delay before firing
c) No other indicator should be lighted
d) The panel should be completely silent
e) All alarms should be silent

2.2 Fire Alarm Condition
The detection configuration of the Fire Extinguishing System is arranged on a “Dual Risk/Cross Zone” basis. The 1st detection will occur when any detector is activated. The 2nd detection will occur when another detector connected to the other detection circuit of the same grouped zone is activated.

1st Detection observations
a) Twin red “FIRE” LEDs of the activated detection circuit lighted
b) General, red “FIRE” LED lighted
c) Alarm Sounder activated
d) “Evacuate” Sign flashes
e) Flashing light activated
f) Fire signal to Main Alarm Panel activated
g) 1st detection Aux Relay activated

2nd Detection observations
a) Twin red “FIRE” LEDs of the other activated detection circuit lighted
b) Electronic Sounder activated
c) “Gas Discharged” Sign and red “Actuator Fired” LED flashes
d) 2nd detection Aux Relay activated
e) Delay timer display “30” starts countdown

Upon expiry of timer countdown (ie. 00 secs)
a) Gas Discharged
b) “Gas discharged” Sign and red “Actuator Fired” LED becomes steady
c) Backlighted “Gas Gone” wording flashes

TO INHIBIT DISCHARGE DURING COUNTDOWN
a) Press green “FIRING ABORT” Switch
2.2.1 Silencing the Alarm
To silence the alarm, carry out the following procedures;
a) Press orange “SOUNDER SILENCE” Switch (After 3 minutes of alarm sounding)
b) Built-in LED in switch lighted
c) External sounders silenced
d) To silence Buzzer, press yellow “BUZZER SILENCE” Switch
e) Remaining intermittent “Beep” emitted at intervals of about 15 seconds
f) Panel remains in alarm state until reset

2.2.2 Electrical Manual Activation
To manually discharge the system via the control panel, press “MANUAL RELEASE” (Red) Gas discharge after time delay.

2.2.3 Resetting the System
Before the system is reset, the cause of the alarm must be investigated and duly rectified. In the case of a false alarm, make sure that there is no incident of fire before resetting the system.
a) Re-instate the affected devices to normal
b) Press brown “RESET” Switch
c) After resetting, the panel will resume to normal operating condition, assuming that there are no other events to cause another alarm and the original cause of the alarm being rectified.

2.3 Fault Conditions
The panel is equipped with a self diagnostic feature that checks itself and indicates a wide range of possible faults. In the event of a fault the following will be observed;
a) An amber LED of the respective zone fault lighted and/or
b) An amber LED of the respective system fault lighted
c) General, amber “FAULT” LED lighted
d) Panel buzzer sounding

2.3.1 Silencing the Fault
If the fault cannot be rectified, it may be silenced by carrying out the following:
a) Press yellow “BUZZER SILENCE” Switch
b) Built-in LED in switch lighted
c) Panel buzzer silenced
d) Reminding intermittent “Beep” emitted at intervals of about 15 seconds
e) Panel remains in fault state until fault rectified

2.3.2 Resetting the System
The cause of the fault should be investigated and rectified. If it is due to a mains supply failure, the system will normalise when the power supply resumes. Some faults are internal to the system and are not covered in this manual. The operator will have to contact the maintenance or service contractor. Once the fault(s) are rectified, the panel will reset itself.
2.4 Initiating Evacuate Alarm
The operator can raise an evacuate alarm in the event of emergency from the panel by carrying out the following:
   a) Press red “EVACUATE ALARM” Switch
   b) Panel buzzer sounding
   c) External sounders sounding, “Evacuate” sign flashes, flashing light activated.

2.4.1 Silencing Evacuate Alarm
To cut off the evacuate alarm:
   a) Release the red “EVACUATE ALARM” Switch
   b) External sounders silenced, “Evacuate” sign and flashing stop operation.

2.5 Zone/Auxiliary Isolations
This function is executed when isolation of the respective zone(s) and/or auxiliary functions is intended. Zone isolation will render the respective zone(s) in-operative and will not be affected by the change in condition of the related input device(s).
   Note: It is not possible to perform a zone isolation when an alarm condition has already occurred in the respective zones. To carry out zone/auxiliary isolation:
   a) Press green “ISOLATE” or “AUXILIARY ISOLATE” Switch
   b) Built-in LED in switch lighted
   c) General, amber “ISOLATED” LED lighted
   d) Reminding intermittent “Beep” emitted at intervals of about 15 seconds
   e) Zone(s)/auxiliary function remains in isolated state until normalised

2.6 Indicators Test
This is provided to test the working condition of the visible (LEDs) and audible (Buzzer) indicators
   a) Press the blue momentary “INDICATORS TEST” Switch
   b) Built-in LED in switches as well as all the LED indicators lighted and Buzzer sounds
   c) Release the switch to normalise

   Note: Upon activation of any control switches, reminding beeping remains until system normalised and reset.
2.7 Zone Detection & Extinguishing Control Module

2.7.1 Description of indicators

a) Zone Fire (Red – Twin) : Zone in fire condition
b) Zone Fault (Amber) : Zone in fault condition (Line open / Line short)
c) Actuator Fault (Amber) : Actuator fuse blown / actuator line open
d) Actuator Fired (Red) : Actuator being fired
e) Remote Abort Activated (Amber) : Remote Abort station being activated
f) Pressure Low (Amber) : Storage pressure within cylinder is low
g) Remote Manual Release Activated (Red) : Remote Manual Release station being activated
h) Line Fault (Amber) : Remote Manual Release line / Gas Gone line open / short
i) Count Down Timer (2 Digit No.) : Display remaining time for activation of actuator
j) Gas Gone (Red – Flashing) : System Gas been released

2.7.2 Description of Control Switches

a) Zone Isolate Switch (Green) : To isolate zone detection circuit
b) Manual Release (Red) : Manual activation for Gas discharge with Timer count down
c) Firing Abort (Green) : To abort firing of Actuator, Timer reset to pre-set time
d) Auxiliary Isolate (Green) : To isolate 1\textsuperscript{st} alarm and 2\textsuperscript{nd} alarm auxiliary control function
e) Remote Manual Release Isolate (Green) : To isolate Remote Manual Release station input signal
## 2.8 System Front Control Module

### 2.8.1 Description of Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power On (Green)</td>
<td>System energised by Mains and/or Standby Battery</td>
</tr>
<tr>
<td>Fire (Red)</td>
<td>General Fire Indicator, system is in fire condition</td>
</tr>
<tr>
<td>Fault (Amber)</td>
<td>General Fault Indicator, system is in fault condition</td>
</tr>
<tr>
<td>Isolated (Amber)</td>
<td>General Isolated Indicator, system is in isolated condition</td>
</tr>
<tr>
<td>Sounder Line Fault (Amber)</td>
<td>Alarm sounder line open/short</td>
</tr>
<tr>
<td>(Note: It shall not be suppressed during Fire Alarm condition)</td>
<td></td>
</tr>
<tr>
<td>Earth Fault (Amber)</td>
<td>Field input/output wires shorted to ground</td>
</tr>
<tr>
<td>Mains Fault (Amber)</td>
<td>230V AC Mains supply failure</td>
</tr>
<tr>
<td>Charger fault (Amber)</td>
<td>Charger Fuse blown / charger voltage low / high</td>
</tr>
<tr>
<td>Battery Fault (Amber)</td>
<td>Battery supply disconnected / battery fuse blown / battery voltage low / high</td>
</tr>
</tbody>
</table>

### 2.8.2 Description of Control Switches

<table>
<thead>
<tr>
<th>Switch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sounder Silence (Orange)</td>
<td>To silence alarm sounder</td>
</tr>
<tr>
<td>Buzzer Silence (Yellow)</td>
<td>To silence fault buzzer</td>
</tr>
<tr>
<td>Spare</td>
<td>Spare control switch for future operation</td>
</tr>
<tr>
<td>Evacuate Alarm (Red)</td>
<td>To raise alarm sounder manually for emergency evacuation</td>
</tr>
<tr>
<td>Indicators Test (Blue)</td>
<td>To test the working condition of all LED indicators and buzzer</td>
</tr>
<tr>
<td>Reset (Brown)</td>
<td>To normalise the system</td>
</tr>
<tr>
<td>(Note: Silence alarm sounder before RESET)</td>
<td></td>
</tr>
</tbody>
</table>

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**Operator's Manual for Fire Extinguishing Control Panel**

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**PATENT**
3 EMERGENCY OPERATING INSTRUCTIONS

IN THE EVENT OF AN ALARM
Identify the location where the alarm had originated by referring to the zoning diagram. Proceed to the respective location to investigate the cause of the alarm.

IF A FIRE IS DISCOVERED
a) Call 995 to notify the Singapore Civil Defence Force immediately
b) Try to control or extinguish the fire by using the fire hosereel or extinguisher. This should be done only when personal safety is not endangered.

IF IT IS A FALSE ALARM
a) Be very sure that there is no incident of fire
b) Call the respective alarm monitoring company to notify them of the false alarm
c) Silence the sounders by pressing the orange “SOUNDER SILENCE” Switch
d) Silence the Buzzer by pressing the yellow “BUZZER SILENCE” Switch
e) Re-instate the respective zone to normal
f) Press the brown “RESET” Switch to re-instate the system to normal

TO RAISE AN EVACUATE ALARM
a) Press the red “EVACUATE ALARM”. Sounders will sound, “Evacuate” Sign flashes and flashing light activated immediately.
b) To cut off, de-activate the same switch again

IN THE EVENT OF A FAULT CONDITION
The panel buzzer will emit a continuous warning with indication of the respective panel faults.
a) Press the yellow “BUZZER SILENCE” Switch to silence the continuous warning. An intermittent “Beep” at intervals of about 15 seconds will be emitted to reminding that a fault has been silenced.
Note: This reminding “Beep” will continue until the panel has been normalised.
b) The panel will reset itself when the fault is cleared.
c) Notify the maintenance department or the respective maintenance contractor.
4 ROUTINE MAINTENANCE

4.1 Introduction
In order to ensure safe and continuous reliability of the fire alarm system, it should be regularly tested and serviced. Routine testing and maintenance should only be carried out by competent personnel trained in this field and armed with the appropriate equipment to do the job.

4.2 Maintenance Responsibilities
The owner of the fire alarm system is responsible for ensuring that it is correctly maintained so that it is in proper working conditions at all times. This will involve arranging for the system to be checked, tested and serviced in accordance with the requirements as described in the Singapore Standard CP 10 : 2005 – Code of Practice for the installation and Servicing of Electrical Fire Alarm Systems.

The recommendations covered in section 5.4 of this manual may conflict or may require additional tests/checks to be performed as imposed by the local authorities. Where such conflicts occur, the local authority regulation should be followed.

4.3 Operator Duties – Log Book Entries
The fire alarm system should have a log book associated with it, it is used to record details of all alarm (genuine, practice, test or false), faults, service tests and routine attention given. A format is recommended in CP 10 : 2005.

The operator is responsible for recording all events raised by the system into the log book. The log book is an important record of the history of the system and should be kept up to date by the operator and the maintenance personnel.

4.4 Routine Checks and Tests
The recommended maintenance procedures can be divided into the following categories:

4.4.1 Daily check
4.4.2 Weekly checks
4.4.3 Monthly checks
4.4.4 Annual checks

4.4.1 Daily Checks
The following checks should be made everyday by the panel operator to ensure that the system is operating normally.

a) Check that only the green “POWER ON” LED is lighted. All other indicators should be off and the panel completely silent. If a fault has occurred and the panel buzzer sounding, the appropriate indicator will light up

b) Record the fault (s) detected

c) Determine the area affected by the fault and decide whether special attention (such as fire patrols) are required in that area
d) Determine the reason for the cause of the fault or note the activities immediately prior to the cause of the fault in the area affected

e) Silence the fault buzzer

f) Inform the maintenance contractor responsible for servicing and arrange for repair

4.4.2 Weekly Checks

Weekly checks may be made by the operator or by the maintenance or contractor responsible for servicing the installation. The following checks are recommended.

a) Check that all LEDs/indicators are operational by carrying out a “LAMP TEST” as described in section 2.6

b) Isolate auxiliary functions as described in section 2.5 so as to prevent the initiation of the auxiliary functions

c) Carry out a simulated fire alarm condition by activating any detector. Always activate a different zone each week to ensure a more uniform test on of the system. Note: It may be necessary to contact the alarm monitoring company prior to activating the alarm to warn them of the simulated fire condition being tested and also to check with the monitoring company after completion of test to ensure that the fire alarm signal was received and the system reset.

d) Check that all sounders are working and the panel conditions as described in section 2.2 are observed

e) Silence and reset the panel as described in section 2.2.1 and 2.2.4

f) Initiate the evacuate alarm as described in section 2.4 and normalise as described in section 2.4.1

g) Check the battery condition and the voltage reading by the use of a multimeter

h) On completion of the above tests, ensure that all switches are in the correct operating position

i) Rectify all faults (if any) immediately

j) Record in the log book that the above tests has been conducted

4.4.3 Monthly Checks

In addition to the weekly checks, the following inspection and testing procedures are to be carried out each month. Any corrective action that has not yet been taken should be noted and carried out.

a) Simulate fire condition in all zones one by one. Silence and reset one zone followed by the next (similar to that as described in section 5.4.2.c). Check that all auxiliary functions are executed as according to that as intended during a fire situation. Reset system after this test.
b) Simulate fire condition in all alarm zones one by one. This time silence the activated zone followed by the simulation of a fire condition of the next zone. The alarm should resound whenever a new zone is set into alarm. Reset the system after this test.

c) Remove the detector fuse. The buzzer should sound together with “FAULT” and amber “LO” indications lighted in all zones. The panel should be silenced when “BUZZER SILENCE” is activated. Replace detector fuse. System should normalise.

d) Short the detector line of all zones one by one. The buzzer should sound together with “FAULT” and red “LS” indications lighted at the respective zone. The buzzer should sound whenever a new zone is shorted. The buzzer should be silenced when the short is removed.

e) Remove the bell line fuse. The buzzer should sound together with “SOUNDER FAULT” and both amber “LO” indications lighted. The panel should be silenced when “BUZZER SILENCE” is activated. Replace bell line fuse. System should normalise.

f) Isolate a zone in accordance to the procedures as described in section 2.5. Trigger a device in that respective zone. It should have no alarm effect on the panel. Normalise the isolated zone.

g) Check battery and terminals condition. If a “wet type” battery is used, check the specific gravity and level of the electrolyte.

h) Disconnect the battery supply. The “POWER ON” and “BATTERY FAULT” indicators should be lighted and the buzzer sounding. Connect back the battery and system should normalise itself.

i) Switch off incoming mains supply. The “POWER ON”, “MAINS FAULT” and “CHARGER FAULT” indicators should be lighted and the buzzer sounding. The standby battery should take over the supply to the system. Resume the mains supply and system should normalise itself.

j) Check earth leakage function by applying a short between the positive leg of the detector line and earth (chassis). The buzzer should sound together with “EARTH FAULT” and red “+” indications lighted. Repeat, using the negative leg of the detector line. The buzzer should sound together with “EARTH FAULT” and amber “-” indications lighted.

k) Check that the panel is in a clean and operative condition.

l) Visually inspect the condition of the components, terminations and cables.

m) Ensure that all faulty components are properly replaced.

n) Record in the log book any circuit that require repair and arrange accordingly.

o) Ensure that all switches are in the correct operation position.

p) Record in the log book that the above tests has been conducted.
4.4.4 **Annual Checks**
The annual checks should include all the inspections and testing as described in sections 5.4.1, 5.4.2 and 5.4.3. In addition, the following should be carried out.

a) The maintenance/servicing personnel should arrange to check the operation of at least 20 percent of the detectors in an installation each year. The selection of detectors to be tested should be spread over as many zones as possible and should be made in such a way that all detectors in an installation should have been checked at least once in 5 years.

The checking of the detectors should take the form of either:

(i) The testing of a detector in site or  
(ii) The removal of a detector and its replacement by a detector which has been checked and calibrated by the supplier.

b) Circuits requiring automatic voltage regulated supplies should be checked to ensure correct operation and voltage output

c) Where the heat-sensitive element of thermal detectors or the enclosure of other detectors are found to be coated with paint or any material likely to affect the operation of the detectors, such material should be cleaned off or if necessary have the detector replaced.  
   **Note:** In certain environments it may be necessary to clean and adjust smoke detectors at more frequent intervals

d) Record in the log book any fault (s) identified and that the above tests had been conducted.