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4.1 General

The generating set is fitted with an advanced YML5220 series control system to provide simple use and protection of the generating set.

The next sections detail the control system, its details and capabilities, please study these and become familiar with the system.

4.2 Component Identification

<table>
<thead>
<tr>
<th>REF</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YML5220 CONTROLLER</td>
</tr>
<tr>
<td>2</td>
<td>EMERGENCY STOP PUSHBUTTON</td>
</tr>
</tbody>
</table>

Figure 11. YML5220 Panel Layout
4.2.1 YML5220 Controller

The YML5220 Controller is the core of the system and deals with all operations of the generating set. Section 4.6.2 explains how to use the controller in order to operate the generating set.

4.2.3 Emergency Stop Pushbutton

The Emergency stop pushbutton is a red lock down type pushbutton which causes immediate shutdown of the generating set. The YML5220 Controller will indicate this on its LCD screen.
4.3 The YML5220 Controller

The YML5220 controller is a fully 32 Bit micro-processor driven controller and is fully programmable to the users requirements. This manual provides a generalised guide, but certain extra features may be built into the control panel you have.

**Figure 11A. YML5220 Controller**

<table>
<thead>
<tr>
<th>REF</th>
<th>DESCRIPTION</th>
<th>REF</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD DISPLAY</td>
<td>6</td>
<td>MANUAL MODE (CONFIG -)</td>
</tr>
<tr>
<td>2</td>
<td>SCROLL BUTTON</td>
<td>7</td>
<td>TEST MODE OPERATION</td>
</tr>
<tr>
<td>3</td>
<td>ALARM INDICATORS</td>
<td>8</td>
<td>AUTO MODE (CONFIG ENTER)</td>
</tr>
<tr>
<td>4</td>
<td>LOAD INDICATORS</td>
<td>9</td>
<td>MANUAL START BUTTON</td>
</tr>
<tr>
<td>5</td>
<td>STOP/RESET PUSHBUTTON</td>
<td>10</td>
<td>GENERATOR INDICATORS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>USER CONFIGURABLE INDICATORS</td>
</tr>
</tbody>
</table>
4.4.1 LCD Display

The LCD display is used to display every system status indication including alarms, shutdowns and operating parameters. The display is fitted with a back light which is permanently powered from the plant batteries to assist the user in low light.

4.4.2 Scroll Button

The scroll button is to allow the operator to scroll through the system information manually on the LCD Screen.
4.4.3 Mode Selector

The mode selector provides the following modes:

- **O**

Off – This position de-activates the unit and resets all alarms.

- AUTO

Automatic Mode – Powers up the unit and awaits a start signal from a Mains Failure, monitored by the controller. Timers operate in this mode.

- 

Manual Mode – In this position the generator will start and operate until the unit is returned to the auto or off positions. Note no timers will operate in this mode. The Generator will not be applied to the Load, unless the Mains supply fails during this operation.

4.4.4 CONFIGURABLE LCD's

These LCD can be configured to suit particular client requirements and can indicate pre-programmed alarms. The details of these are inserted in the space provided.

4.4.5 Common Alarm Indicator

⚠️ (warning) or ⚠️ (shutdown)

This LCD indicates when an alarm condition is present.
4.5 Navigation
4.5.1 General Navigation
The operator can navigate through the various information displays on the YML5220 display by manually using the scroll button. After a period of inactivity the module will revert to the initial display.

**Instrument Page Order:**
- Generator RPM / Frequency (Hz)
- AC Voltage Line-Neutral
- AC Voltage Line-Line
- Oil Pressure
- Coolant temperature
- Fuel level (%)
- Engine Hours Run
- DC Battery Voltage
- AC Line Current
- AC Line power (kW)
- AC Line power (kVA)
- AC phase angle (cos $\theta$)

Initial display

![Initial display image]

![Scroll button image]

![Display image 1]

![Scroll button image]

![Display image 2]

![Scroll button image]

![Display image 3]

ETC
4.5.2 The Event Log

To view the event log, press the log button 📊. The LCD display will flash the log symbol ⬇️ to confirm that the event log has been entered.

The model 5220 remote start module maintains a log of the last 15 shutdown alarms to enable the operator or engineer to view the past alarms history. Only shutdown and electrical trip alarms are logged; warning alarms are not logged.

Once the log is full (15 shutdown alarms), any subsequent shutdown alarms will overwrite the oldest entry in the log. Hence the log will always contain the 15 most recent shutdown alarms. The alarm is logged, along with the date and time of the event in the format shown in this example.

For example, the diagram below shows an oil pressure shutdown occurred on November 1\(^{st}\) 2002 at 8:17.
4.6 Operation

The following procedures detail the steps required to prepare the set for operation, start and stop it for the first time after installation, and start and stop it normally.

4.6.1 Pre-Start Checks

The following checks should be performed prior to starting the generating set:

---

⚠️ **WARNING**

*As generating sets with YML5220 panels can be remotely started without warning, always ensure the control panel is switched off by moving the selector to ‘O’ prior to carrying out any checks.*

---

⚠️ **WARNING**

*Do not remove the radiator cap when the coolant is hot. Do not add large amounts of cold coolant to a hot system as serious damage could result.*

1. Check the engine oil and coolant levels - replenish as necessary.

**Note:**
Diesel engines normally consume lube oil at a rate of .25% to 1 % of the fuel consumption.

**Note:**
When adding coolant to the radiator system, always pour slowly to help prevent air from becoming trapped in the engine.

---

⚠️ **WARNING**

*WHEN FILLING THE FUEL TANK, DO NOT SMOKE OR USE AN OPEN FLAME IN THE VICINITY.*

2. Check the fuel level - fill as necessary.
WARNING

Before tightening fan belts, disconnect the battery negative (-) lead to ensure the engine cannot be accidentally started.

3. Check the condition and tension of the fan and engine alternator belts - tighten as necessary.

4. Check all hoses for loose connections or deterioration - tighten or replace as necessary.

5. Check the battery terminals for corrosion - clean as necessary.

WARNING

When working with the batteries, do not smoke or use an open flame in the vicinity. Hydrogen gas from batteries is explosive.

WARNING

Do not short the positive and negative terminals together.

6. Check the battery electrolyte level - fill with distilled water as necessary. If the battery is new and has never been wet charged, fill with suitable premixed electrolyte and charge as per instructions in Section 5.

7. Check the control panel and the generating set for heavy accumulation of dust and dirt - clean as necessary. These can pose an electrical hazard or give rise to cooling problems.

8. Check the air filter restriction indicator, if fitted replace the filter as necessary.

9. Clear the area around the generating set of any insecure items that could inhibit operation or cause injury. Ensure cooling air ventilation screens are clear.

10. Visually check the entire generating set for signs of leaks from the fuel system, cooling system or lubrication seals.

11. Periodically drain exhaust system condensate traps, if equipped.

12. Ensure the Alternator Output Circuit Breaker is in the "OFF" (handle down) position.

4.6.2 Initial Startup/Shutdown

The following procedure should be used when starting a generating set equipped with a YML5220 Series Control System for the first time or when it has been out of service for a time for maintenance purposes:

Note:
The generating set may be stopped at any time by turning the Control Switch to OFF or by pushing the emergency stop pushbutton.

1. Complete Pre-Start checks as per Section 4.6.1
2. Connect the batteries to the engine, positive lead first then the negative lead. The LCD display will illuminate showing 0Hz

Prime the lube oil system by first removing one wire from the fuel solenoid or actuator. This prevents the engine from starting. Turn the unit to manual mode and the YML5210 controller will run through the following sequence.

The unit then begins cranking the engine for crank attempt number 1. This is normally set for 10 sec at which point the unit will count a crank rest period before trying again. After 3 failed attempts the unit will issue a shutdown alarm.

Upto crank attempt number 3 then ![fail to start icon] will illuminate indicating fail to start.

Turn the unit to Off ‘O’ to reset the alarm. Then re-connect the fuel solenoid/actuator.

3. Prime the fuel system using the hand priming pump and bleed entrapped air from the fuel filter - see Engine Manual for details.

4. Start: Ensure the Emergency Stop Pushbutton and any remote Stop Pushbuttons are released. Press the Manual Mode pushbutton and then the Start Pushbutton

5. The engine will automatically crank up to 3 times or until the engine fires. If the engine does not fire, the control system locks-out on "FAIL TO START" as described above. If this happens refer to the trouble shooting guide in Section 9 or the Engine Manual to determine the cause of failure to start.
WARNING

Unburned fuel gases can build-up in the exhaust system after multiple failed attempted starts. Unscrew the plugs on the exhaust outlet elbows or stub pipes and allow the unburned fuel to dissipate. Once all signs of unburned fuel (white smoke) have disappeared and any other problems causing the failure to start have been rectified, replace the plugs and repeat the cranking procedure.

WHEN ENGINE HAS STARTED

6. Once the engine has started the YML5220 will display

![Rpm: 1500, Hz: 50.0]

and the controller begins its safety on timer, which is the delay prior to the shutdown alarms being activated.

7. After approximately 1 minute, shutdown the generating set by switching the plant controller to OFF ‘O’. Remove the radiator cap and wait 5 minutes for the system to settle and any trapped air to escape. Re-check the coolant level and refill as necessary.

Note:
A newly filled coolant system can have air locks that must be cleared by running the engine for a short time and the system refilled prior to extended running of the engine.

8. Restart the engine following the procedure in step 5 above.

9. Check for any abnormal noise or vibration.

10. Check for fluid leakage or leaks in the exhaust system.

11. Check the control panel for indications of abnormal operation, particularly abnormally high temperature or abnormally low oil pressure. The oil pressure should be in the normal range within about 10 seconds of starting.

12. The no load frequency is approximately 52 Hz for 50 Hz units and approximately 62 Hz for 60 Hz units. Adjustments should only be carried out by a qualified technician.
Three means of voltage adjustment are available:

Fine adjustment is achieved by varying the setting of the speed potentiometer on the control panel, if fitted.

Coarse adjustment is achieved by varying the setting of a potentiometer mounted inside the automatic voltage regulator which is fitted to the alternator terminal box.

Gross adjustment to completely change the voltage setting of the alternator is achieved by reconnecting the alternator windings at the alternator terminal box. Details of these connections can be found in the Alternator Manual.

---

**WARNING**

*Do not close the circuit breaker during the phase rotation check if load cables have already been connected.*

13. While the generating set is producing voltage, check the phase rotation of the set by connecting a phase rotation meter to the terminals on the generator side of the circuit breaker. This check should be carried out by a qualified technician.

14. **Shutdown:** To shutdown the generating set press the Stop/Reset pushbutton.

---

**WARNING**

*Always switch off the circuit breaker, shut down the generating set and disconnect the battery negative (-) lead prior to connection or disconnection of the load cables.*

15. The load cables can now be connected to the generating set in preparation for normal operation.
4.3.3 Normal Startup/Shutdown

The following procedure should be used for subsequent starts on a generating set equipped with a YML5220 Series Control System:

**Note:**
The generating set may be stopped at any time by switching the controller to the off position

1. Complete Pre-Start checks as per Section 4.6.1

**Note:**
The engine will not start if any fault indicators are illuminated. Reset the control system by pressing the Stop/Reset pushbutton. Ensure the faults have been corrected prior to attempting to start the generating set.

2. **Manual Start:** Place the control switch in the Manual position and the YML5220 controller will run through the startup sequence.

3. The unit then begins cranking the engine for crank attempt number 1. This is normally set for 10 sec at which point the unit will count a crank rest period before trying again. After 3 failed attempts the unit will issue a shutdown alarm.

**WHEN ENGINE HAS STARTED**

4. If the unit starts successfully then the generator will initiate its safety on timer prior to indicating that the generating set is on line as follows:

   ![Output Specifications](image)

   5. Check for any abnormal noise or vibration.

   6. Check for fluid leakage or leaks in the exhaust system.

   7. Check the control panel for indications of abnormal operation, particularly abnormally high temperature or abnormally low oil pressure. The oil pressure should be in the normal range within about 10 seconds of starting.
8. **Shutdown:** To shut the generating set down, turn off the load by switching the Alternator Output Circuit Breaker to “OFF” (handle down). Allow the generating set to run without load for a few minutes to cool. Turn the switch to the OFF Position.

9. Once the unit has stopped the display will read 0Hz

   **Note:**
   In case of an emergency where immediate shutdown is necessary, the Emergency shutdown button should be pressed immediately without disconnecting the load.
4.6.4 Automatic Start up/Shutdown

The following procedure should be used for preparing a generating set equipped with a YML5220 Series Autostart Control System to be started from a remote location.

**Note:**
The generating set may be stopped at any time by turning the plant control switch to the OFF ‘O’ position or by pushing the emergency stop pushbutton.

1. Complete Pre-Start checks as per Section 4.6.1

**Note:**
The engine will not start if any fault indicators are illuminated. Reset the control system by turning the plant control switch to the OFF ‘O’ position. Ensure the faults have been corrected prior to attempting to start the generating set.

2. **Automatic Start:** Ensure the Emergency Stop Pushbutton and any remote Stop Pushbuttons are released. Turn the plant control switch to the Auto position.

3. Switch the Alternator Output Circuit Breaker to "ON" (handle up).

The generating set is now ready to automatically start when it receives a remote start signal. When the start signal is removed it will automatically stop.