Sleeper Air IX: Air Conditioning & Battery Charge Controller

User Reference Manual

Revision B
30/08/2023

Rocklea Truck Electrical

Rocklea Truck Electrical is Brisbane's premier truck lighting and custom accessory manufacturer and installer, providing premium quality lighting, electrical and custom accessories to truck owners & operators. Based in Oxley, on the south side of Brisbane, RTE can design and fit accessories which will complement the look of your vehicle with our high-quality creative design.

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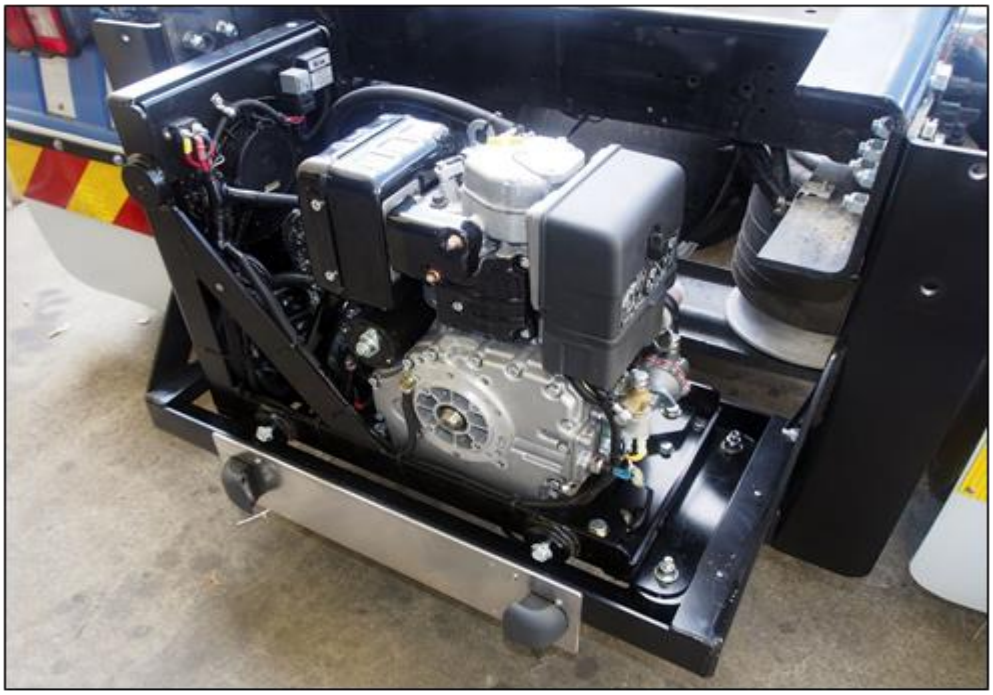
Description

Sleeper Air is a diesel-powered system to provide air conditioning and battery charging for long haul sleeper cab applications. The system is designed to be extremely easy to operate, economic to run and provide trouble free performance. There are four major components to the system:

- An engine unit containing the diesel engine, air conditioning compressor and battery charging alternator is attached to the truck chassis – this is the part that powers the system.
- An evaporator unit contains a 3 speed fan and evaporator that is mounted inside the cabin – this is the part that keeps the cabin cool.
- A condenser unit has an electric fan and air conditioning condenser mounted outside the truck cabin – this is where the cabin heat goes.
- An Engine Control Unit (ECU) provides automatic control and safety supervision of the system.

Features and Specifications

FEATURES	SPECIFICATION
• Manual or automatic climate control operation • One press start and stop • Service interval and engine hour counter • Fully protected shutdown on low oil, low and high voltage pressure and high engine temperature • Compressor cut-out on high and low refrigerant pressure • Self-Diagnostic • Battery maintenance when truck parked up • Electrical system back up in the case of truck alternator failure • Lightweight and compact in size • Alloy enclosure with sound insulation • Fuel from existing truck tanks	• 310 CFM 18000 BTU cooling capacity • Kohler single cylinder air cooled diesel engine KD350S with full flow oil filter • Sanden SD7H13 Compressor or Unicla UP120 • Remote mounted condenser with electric fan • Nippon Denso 12V/80A (24V/50A) alternator • 0.5L per hour fuel consumption • 250 hour oil change • R-134a



Product Description

The Sleeper Air IX system is comprised of 2 key components; The PV380 display and the IX3212 Power Distribution Module. The PV380 functions as the interface between the user and the air conditioning/battery charge system. The PV380 features a 3.8” monochrome display to provide the user with a rich information on the behaviour of the system.

It is a configurable and programmable device, capable of adding functionality and being used as part of a multiplexing solution. The PV380 is effectively the brain of the system and communicates with the IX3212 via J1939 CAN protocol.

The IX3212 Power Distribution Module features 12 Digital Outputs, 12 Digital Inputs and 8 Analog Inputs. The PDM features built-in over-current protection and shutdown capability. It is a robust device that eliminates the need to constantly replace blown fuses and reduces the requirements for relays in many applications.

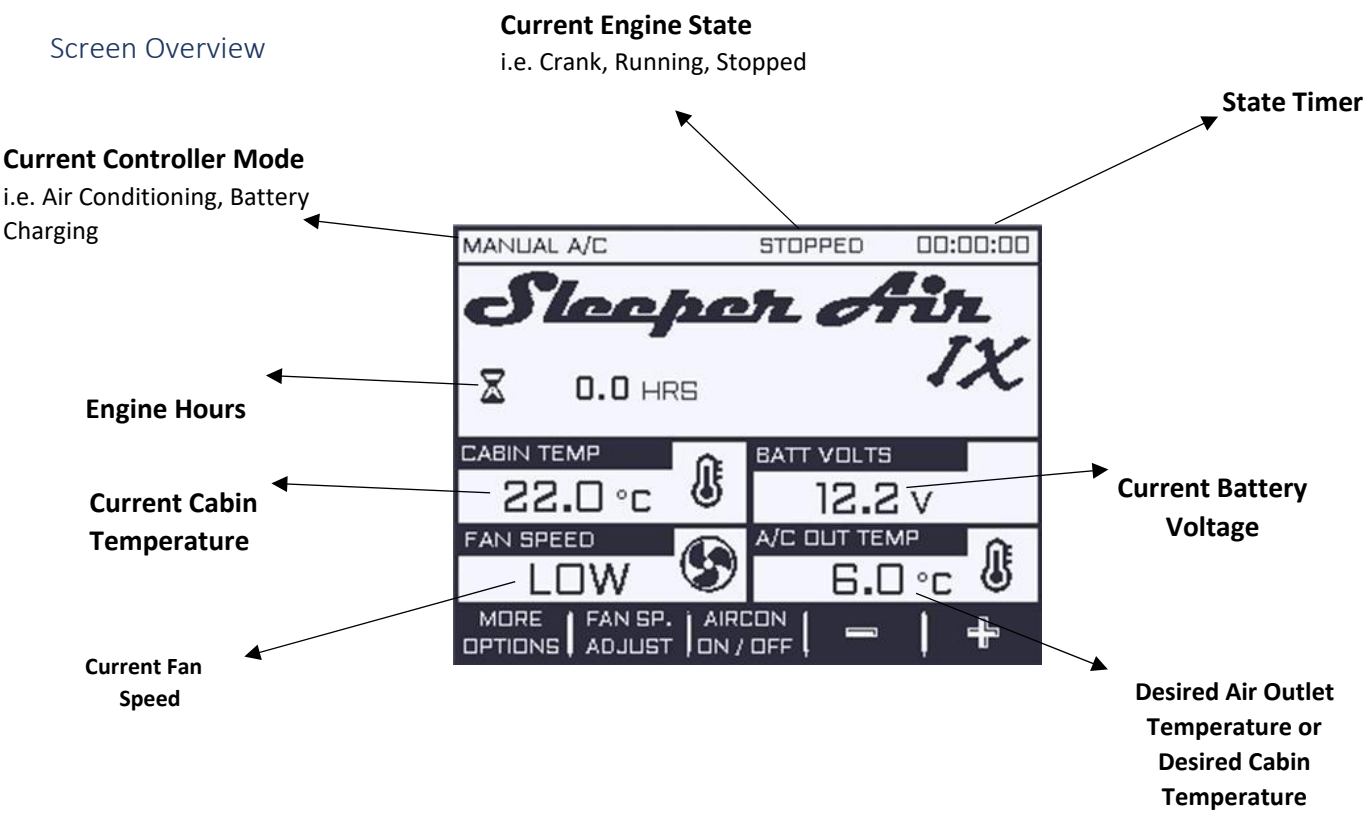
Features

- Engine Unit Connections:
  - Fuel Solenoid
  - Starter Motor
  - Engine Fans
  - Oil Pressure Switch
  - Engine Temperature Switch
  - A/C Compressor Clutch
- Condenser Unit Connections:
  - Condenser Fan, Low/High Pressure Cut-out
- Evaporator Unit Connections:
  - Evaporator Fan
  - Evaporator Inlet Temperature
  - Evaporator Outlet Temperature
- 12/24V System Voltage Compatibility

Operation

The Sleeper Air IX Control system has 2 core operating modes –Air Conditioning with Manual and Auto Climate Control functions and Battery Charging Mode.

Screen Overview



Air Conditioning

Upon powering on the unit, the system will be in Air Conditioning mode by default. In this mode, the user can adjust the air outlet temperature and the fan speed. There is a dedicated button, “Aircon On/Off” which is used to start and stop the engine, “Auto/Fan Ctrl” which is used to cycle between Auto, Low, Med and High Fan speeds. as well as 2 dedicated buttons to increase/decrease the desired air outlet temperature.

For Manual Air conditioning:

- The desired Cabin Temperature is adjusted in increments of 0.5 °C
- The compressor clutch is engaged/disengaged based on the evaporator outlet temperature reaching 6°C and 8°C when the Evaporator Inlet Temperature is 1 °C or more than the Set Cabin Temperature. This aims to bring the cabin temperature closer to the Set Cabin Temp rapidly.
- Once the Cabin Temperature is within +/- 1°C of the Set Cabin Temperature, compressor control is dictated by the current Cabin Temp. Compressor engages/disengages when the current Cabin temp falls or rises to +/- 0.5°C of the Set Cabin Temperature
- If the user selects “MIN” for the Cabin temperature, the compressor will only disengage/engage based on the evaporator inlet temperature hitting 6°C and 8°C respectively.
- Use the “Aircon On/Off” button, to toggle the Air Conditioning on and off. This will start/stop the engine and resume the last fan speed setting.

For Climate Control Air Conditioning:

In Climate Control A/C mode, the user sets their desired Cabin Temperature. The system automates control of the compressor clutch to regulate cabin temperature by engaging and disengaging the clutch at menu-configurable setpoints as well as automates the control of the fan speed depending on difference between the current cabin temperature and the set cabin temperature.

- Enter Climate Control A/C mode by cycling to “Auto” Fan Speed via the Auto/Fan Ctrl button
- The Compressor clutch is engaged/disengaged to maintain the Evaporator Outlet Temperature between 6°C and 8°C until the cabin temperature reaches +/- 1°C of the set temperature at which the compressor is then engaged/disengaged based on the cabin temperature hitting +/- 0.5°C of the set temperature.
- The fan speed is automatically adjusted to maintain the set cabin temperature. As the cabin temperature reaches the set cabin temperature, the fan speed is automatically adjusted to ensure the set cabin temperature will be maintained. There is a 30 second delay between each time the fans are automatically adjusted if necessary.
- If the user selects “MIN” for the Cabin temperature, the compressor will only disengage/engage based on the evaporator inlet temperature hitting 6°C and 8°C respectively.

Battery Charging

Battery Charging mode is used to ensure the battery in the system maintains charge by running the engine for a given amount of time. The engine is started when the battery voltage drops below 12.2V for 30 seconds or more and will continue to run for 2 hours. The battery voltage setpoint at which the system will automatically start charging is menu configurable as well as the delay and duration of running.

- Air Conditioning does not operate in this mode however the evaporator fans can be turned on for ventilation in the cabin using the Fan Sp. Adjust button
- Battery Charging Mode is accessed through the “More Options” sub-menu from the Air conditioning screen
- It is possible to force the system to charge by pressing and holding the “Force Charge” button for 3 seconds. The “Stop Cycle” button can be used to end any charge cycle, automatically triggered or through Force Charge.
- Switching into Battery Charging mode from any of the Aircon modes will stop the engine and will wait for the battery voltage to drop below the setpoint before starting again with the exception of a Force Charge being initiated

Engine Starting

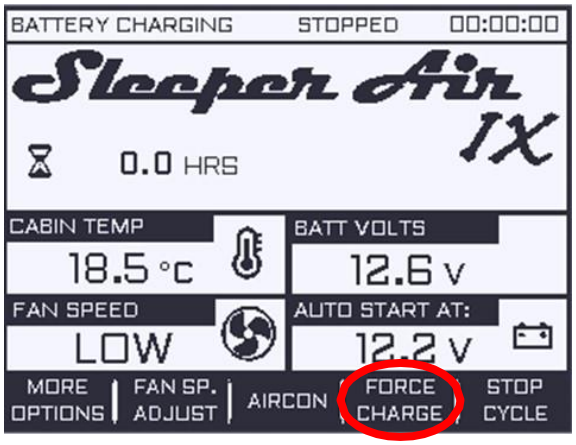
The engine starting sequence is applicable for all 3 modes of operation. Prior to cranking, the controller will check that there is no oil pressure, to indicate it is safe to proceed with cranking. When there is no oil pressure, the engine will crank for 1.2 seconds (menu-configurable) and will shift from the Crank Engine State to Running once there is oil pressure. Failure for the controller to see oil pressure will move to the Crank Rest state for 10 seconds before attempting another Crank cycle. If the engine does not successfully start after 5 attempts, an “Engine Start Failure” error will be displayed on the screen. This error must be acknowledged before another start sequence can be initiated.

Force Start: Pre-Crank Oil Pressure Override

During an engine start sequence and there is oil pressure detected prior to cranking, a “Pre-Crank Oil Pressure” error will be displayed on-screen. After ensuring that the error is a result of a faulty oil pressure switch, the user can override this error by pressing “OK, Allow Start” from the fault screen. The user will be pushed back to the Aircon screen and can turn on the aircon by pressing “Force Start” once the red LED on the display turns off.

Force Charge in Battery Charging Mode

When the controller is placed in Battery Charging mode, it is possible to initiate a charge cycle before the battery voltage drops below the setpoint by using the Force Charge function. To initiate this, Press and Hold the Force Charge button and the engine will start and run for the set charge duration.



Faults

High Engine Temperature

The engine temperature switch is activated due to High Engine Temperature causing the engine to shutdown.

Low Oil Pressure

The oil pressure switch is activated due to Low Oil Pressure causing the engine to shutdown.

Pre-Crank Oil Pressure

The engine is unable to crank due to oil pressure being detected whilst the engine is not running. Inspect the oil level, pressure switch and wiring. If certain that the fault is due to a faulty pressure switch, it is possible to initiate a Force Start condition.

Failed to Start

The unit has attempted to crank 5 times however oil pressure has not been detected and the engine has not been started and cannot run.

High Battery Voltage

The battery voltage has exceeded the High Battery setpoint causing the engine to shutdown. Indication of a potential alternator fault.

Low Battery Voltage

The battery voltage is below the low battery setpoint causing the engine to shutdown. Indication of a potential alternator fault.

Alternator Charge Fail

The system has received a signal from the alternator indicating failure to charge. Inspect the engine for belt break or alternator fault.

Refrigerant Pressure Fault

The condenser pressure switch is OPEN indicating High or Low refrigerant pressure. The compressor clutch is disengaged until the switch becomes active and refrigerant pressure has normalised.

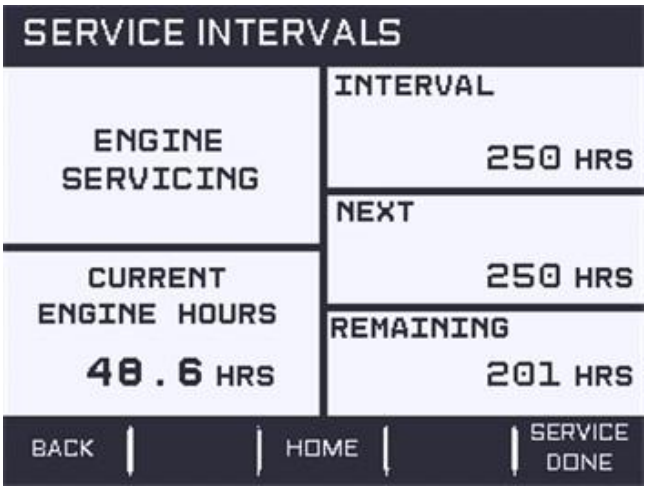
Communication Failure

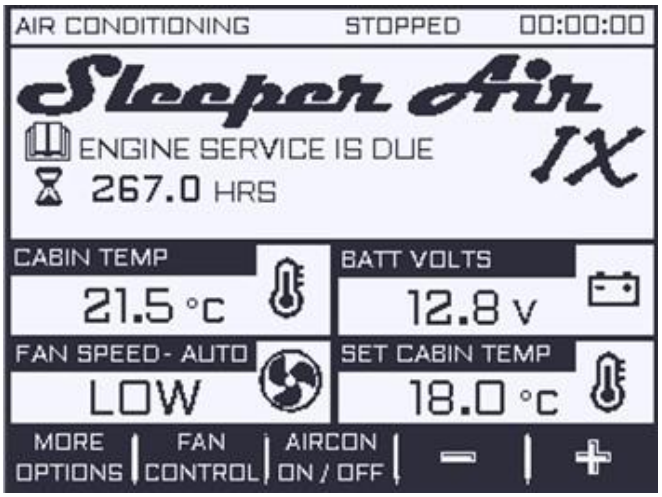
The PV380 has lost communication with the IX3212 Power Distribution Module. Check the J1939 CAN network and inspect wiring.

Engine Stalled

This fault occurs when there is a mechanical fault on the engine and is not the result of low oil pressure or high engine temperature. The alternator lamp signal is active followed by a loss in oil pressure, indicating a mechanical stop has occurred.

Service Reminders





The controller features Service reminders to ensure the engine is maintained and serviced every 250 hours of operation. Upon the engine running for 250 hours, a message will be displayed on the screen stating, “ENGINE SERVICE IS DUE”. The dedicated service intervals page depicts the service interval that has been set by the OEM when the next service is due (Engine Hours at next due service) and the remaining hours before the engine is due for service. The current engine hours are also displayed on this screen.

When a service has been completed, Press the “Service Done” button to reset the Service notification and update the counter for the next and remaining engine hours until the next service.

Digital Inputs

Digital Input 9 – Start Air Conditioning from Dash

This input is active on B+ (High-side input) and is programmed to work as a momentary switch. When active, the controller will start the Air Conditioning and resume previous Air Conditioning settings from the last time it was running.

Digital Input 10 – Stop Air Conditioning from Dash

This input is active on B+ (High-side input) and is programmed to work as a momentary switch. When active, the controller will stop the engine and turn off the air conditioning.

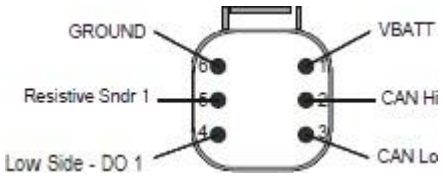
PV380

The PV380 display has a 3.8” monochrome display that presents all system information to the user. It is simple to use with the 5 keys that perform the function of the text on the screen above it. i.e. Key 1 would bring up the “More Options” popup which will have options such as Service, Access to the Main Menu, Battery Charging mode and Active Fault recall.

Key 2 will cycle through Fan Speeds – Auto, Low, Medium and High for each key press (When Engine is running). Key 3 will turn the Aircon on and off and resume the previous A/C mode and fan speed. Keys 4 and 5 are used to set the desired Cabin Temperature or Evaporator Outlet Temperature in the A/C modes whilst they are used to trigger a Force Charge cycle or Stop the charge cycle when in Battery Charging mode. Ultimately, the key will perform the function of the text directly above it. Where there is no text, there will be no function.

There are two LEDS on the PV380; 1 amber and 1 red. The yellow LED is used to indicate warnings whereas the RED indicates and shutdown conditions. The PV380 requires a 6-Way Deutsch Connector (DT066S) with B+, B- and J1939 CAN Hi and J1939 CAN Low.

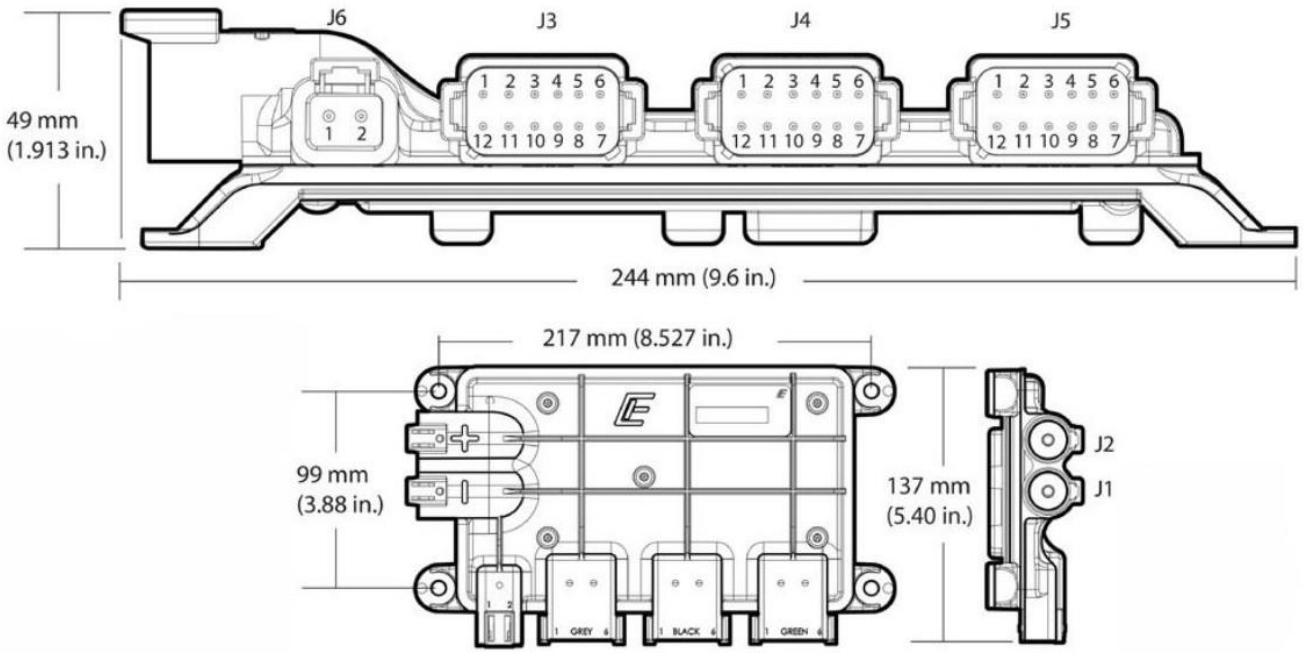
PV380 Pinout:
Pin 1: Battery Positive
Pin 2: CAN Hi
Pin 3: CAN Lo
Pin 4: Digital Output (Not used)
Pin 5: Resistive Input (Not used)
Pin 6: Battery Negative



IX3212 Pinout

The I/O for the IX3212 PDM is presented in the table below. The IX3212 uses an array of Deutsch type connectors. Connectors J1 and J2 require Deutsch DTHD 06-1-4S. Connector J3 requires a Deutsch DT06-12SA (Gray), Connector J4 requires a Deutsch DT06-12SB (Black), Connector J5 utilises a DT06-12SC (Green) and J6 requires a Deutsch DTP06-2S however this connector is not utilised in this application.

IX3212 Pin out					
Connector J1					
Pin	Name	Function	Wire size	8C Wire No	Colour
1	Gnd	Battery -ve	6 B&S		Black
Connector J2					
Pin	Name	Function	Wire size	8C Wire No	Colour
1	PWR	Battery +ve	6 B&S		Red
		Sense	4mm	8	Red
Connector J3	Grey				
Pin	Name	Function	Wire size	8C Wire No	Colour
2	DI12	Service Reset/Completed			
3	DO7	Evap Fan Low	4mm		Blue
4	DO8	Evap Fan Med	4mm		Yellow
5	DO9	Evap Fan High	4mm		Red
6	DO10	Service Due Output			
Connector J4	Black				
Pin	Name	Function	Wire size	8C Wire No	Colour
1	DO1	Fuel Solenoid	4mm	2	Yellow
2	DO2	Start Relay	4mm	5	Pink
3	DO3	Condenser Fan	4mm		Purple
4	DO4	Compressor Clutch	4mm	1	Green
5	DO5	Engine Fan	4mm	4	Brown
6	DO6	Engine Fan 2			
8	AI2	Evap Out Temp	3mm		Red/White
9	AI1	Evap Return Temp	3mm		Red/Black
10	DI11	Remote Charge Input +ve	3mm	5 core	Yellow
Connector J5	Green				
Pin	Name	Function	Wire size	8C Wire No	Colour
2	DI3	Oil Pressure	4mm	7	White
3	DI4	Engine Temp	4mm	6	Orange
4	DI5	Alternator Lamp	4mm	3	Grey
5	DI6	Refrigerant Pressure	4mm		Green/White
9	DI8	Full Disable	3mm		
10	DI9	Remote Start +ve	3mm	5 core	Brown
11	DI10	Remote Stop +ve	3mm	5 core	Green



Warranty

LIMITED 1 YEAR SLEEPER AIR WARRANTY

Rocklea truck electrical warrants to the original retail consumer that each new SLEEPER AIR will be free from manufacturing defects in materials or workmanship in normal service for a period of one (1) year or 1000 hours whichever occurs first from the date of purchase, provided it is operated and maintained in accordance with SLEEPER AIR instructions and manuals.

Our obligation under this warranty is expressly limited, at our option, to the replacement or repair at Rocklea Tuck Electrical, or at a service agent designated by us of such parts as inspection shall disclose to have been defective. This warranty does not apply to defects caused by unreasonable use, including faulty repairs by others and failure to provide reasonable and necessary maintenance.

ROCKLEA TRUCK ELECTRICAL AND/OR THE SELLER SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, including but not limited to labour costs or transportation charges in connection with the repair or replacement of defective parts. IMPLIED OR STATUTORY WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. We make no other express warranty, nor is any one authorized to make any on our behalf.

To obtain warranty service Purchaser must bring the unit to an authorized Sleeper Air service facility. To locate the nearest facility, visit our website, www.rockleatruckelectrical.com or Ph: (07) 3375 3500

Maintenance

ITEM	EVERY 250 HOURS	EVERY 500 HOURS	EVERY 1000 HOURS
Change oil	X		
Replace oil filter cartridge	At first service		X
Clean or replace air cleaner	X		
Replace Kohler fuel filter			X
Replace FS1251			X
Wash out condenser fins	X		
Check fan operation	X		
Adjust valve clearance			X
Remove and clean Injector		X	
Check mounting bolts/brackets	X		
Check belts	X		
Check wiring and hoses for potential rubbing and security	X		
Adjust engine speed	As Required		
Replace drier and regas	Every 2 years		
Reset service hours **Recommended oils - We use Cadilac SAE40 Oil**	X		

Authorised Sleeper Air Repair Agents

Brisbane QLD – Rocklea Truck Electrical – P: 07) 3375 3500
Toowoomba QLD – Pengelly Trucks – Ph: 07) 4633 1305
Gladstone QLD – 24/7 Electrical Services – 0406 288 242 (Nathan)
Townsville QLD – Kenny's Auto Electrics – Ph: 07) 4789 4649
Townsville QLD – PK's Auto Electrics – Ph: 0427 289 037 (Paul)
Rockhampton QLD – Wade's Auto Electrics – 0408 456 723
Perth WA – KRU – Ph: 08) 9493 6610 / 0408 907 144 (Mark)
Adelaide SA – Heavylec Ph: 08) 8347 4246
Adelaide SA – Diesel Enterprises – Ph: 0477 714 904 (Noel)
Bendigo VIC –Trans Air & Electrics – Ph: 0429 842 644 (Steve)
Flinders NSW – AA Truck Repairs & Auto Care – Ph: 0417 373 337 (Narj)
Riverstone NSW – Truckelec – 0420 973 308 (Chris)

CAUTION

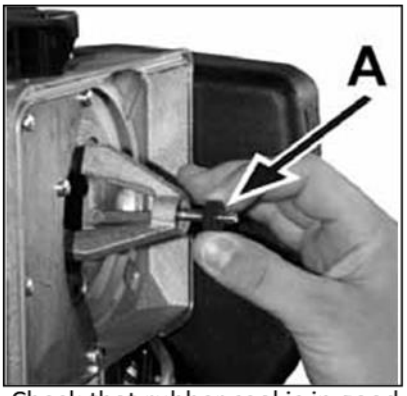
- unit may start at any time without notice
- keep hands clear of moving parts – for example pulleys, belts and fans
- disconnect battery power to unit before any maintenance

Air Filter

Do not reuse air filter or pre cleaner if any damage or deterioration has occurred. Replace with new. Use only genuine Kohler parts.

Open Air Cleaner Cover

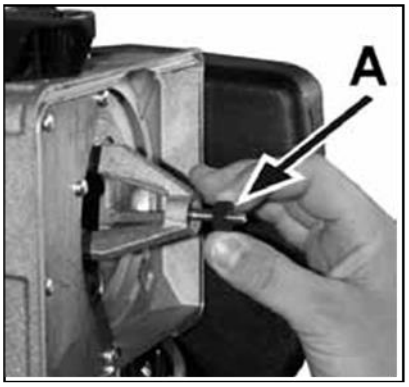
Unscrew wing nut (1) and remove air filter



Check that rubber seal is in good condition (A)

Clean or replace air filter if necessary, remove pre cleaner and wash with water and soap. Dry pre cleaner carefully.

If the housing appears clogged, remove, clean, and reassemble



When replacing air filter, also replace the rubber seal (A), (a new seal is included in new air filter package).

Engine Oil

Remove drain plug and drain oil into an approved container. Reinstall drain plug.

Remove oil fill cap.

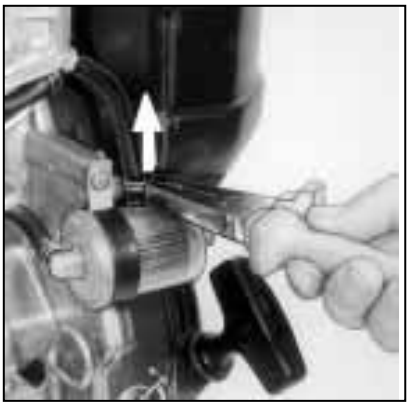
Fill to correct level with oil. Reinstall fill cap

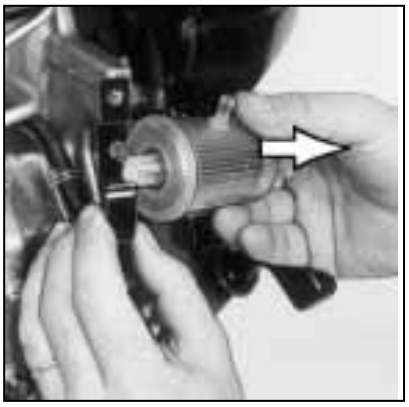
Remove and Replace Oil Filter

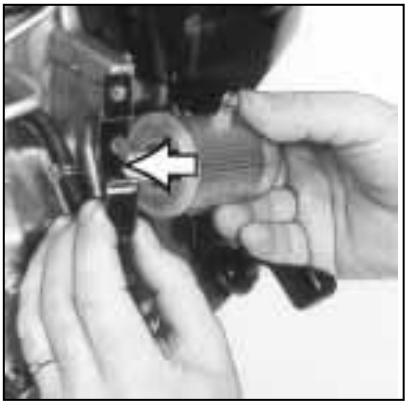
Remove oil filter cover

Remove and replace oil filter

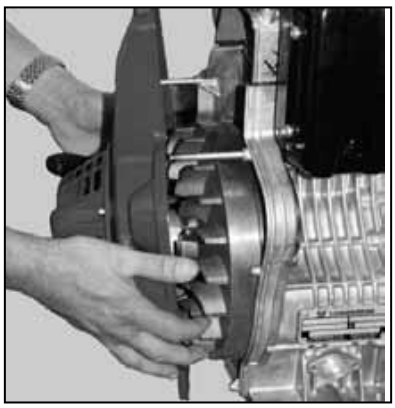
Remove and Replace Fuel Filter



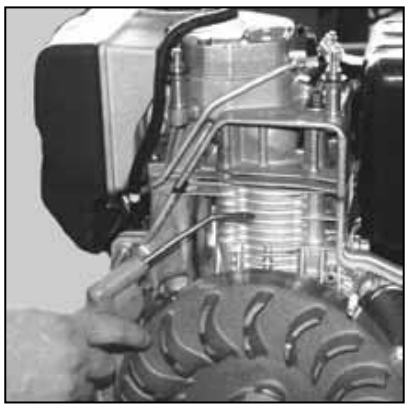




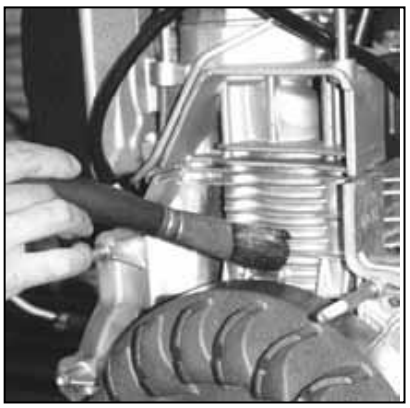
Clean Engine Cooling Fins



Remove air shroud mounting hardware and remove air shroud



Use compressed air on cylinder cooling fins and Flywheel



Clean with a brush soaked in detergent if really dirty.