Operation and maintenance Verdegro LLTT-H

⚠	READ BEFORE USE! ONLY AUTHORIZED PERSONS MAY WORK WITH THE MACHINE, IMPROPER USE CAN CAUSE SERIOUS INJURIES! *All maintenance and repair should be done by the manufacturer, or under their supervision by an official distributor.*

Contact Verdegro once in at least 6 months for latest version

Index

1 Data producer and specific machine:

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Date release : _____

VIN Number : _____

Company stamp:

Note: This document is only valid with an original company stamp of the producer.

2 Introduction:

The Verdegro LED Light Tower Trailer Hybrid (LLTT-H) is equipped with own battery pack, charged by its own solar charge system. The maximum height of the unit is 8m (26.2ft) (Optional 9.5m(31.1ft)) 6-sectional tower, it has 4 LED floodlights of 100 or 150 Watt with horizontal and vertical degree angle lighting possibilities (Standard), optional 6 LED floodlights with multiple angle adjustments, Main power switch and many more!

Before first use/ operation of the LLTT-H make sure the battery bank is fully charged by using a 24Volt DC battery charger or using the Kubota engine, by having it run for a couple of hours without the lights in operation. The battery bank can be discharged during transport causing failures when used with an empty battery bank.

Thanks to its extremely compact design combined with the unique jacks, it's very easy to transport and to set up.

The Verdegro LLTT-H unit can be easily stamped after been placed and controlled from the control panel. After stable stamped jacks, the mast can raise up by pushing the button with the arrow pointed upwards. Every light can be switched on and off separately.
After use the straight forward design of the control unit will bring the tower easily down by using the button with the arrow pointing downwards.

The LLTT-H is amply equipped with features that raises safety. By inspecting them the quality, efficiency and safety of the LLTT-H will be improved.

Check the condition of the LLTT-H daily on the instructions before starting the work. It is strictly forbidden to use the LLTT-H when it is damaged, not weekly cleaned, not maintained and/or not inspected.

The Manufacturer reserves the right to the machine construction, parts and maintenance instructions without notice.

This manual is only for the Verdegro LLTT-H. Some drawings, photo's or colours in this manual can be slightly different from the delivered model, which should be recognized as a typical Verdegro LLTT-H.

	**Attention! Before maintenance or checks, disconnected the power!**
	**Attention! Some images and pictures in this manual can be slightly different from the delivered model, which should be recognized as a typical Verdegro LLTT-H.**

3 Recognition and dimensions

3.1 Photos of a typical LLTT-H

4 Technical data

Verdegro LLTT-H Solar LED light tower trailer hybrid, 12-24V DC batteries, 6 section telescopic with total height of 8m (26.2ft)(Optional 9.5m(31.1ft)) mast powered by a 24V winch with a steel cable. And has his own solar charge system, 4 or 6 pcs LED lights, forklift pockets, water cooled Diesel DC generator and a 120 liter fuel tank.

Serial nr/ Vin's LLTT-H XL9VD1000 (001 for example)

Weight LLTT-H	: 850kg (1873.9lbs) (Empty tank and no jacks equipped)
Height	: Total height 8m (26.2ft) (Optional 9.5m (31.1ft)) / transport 2,4 m (7.8ft)
Dimensions Min.	: 293cmx145cmx240cm (9.6 ft x 4.8 ft x 7.8 ft)
Light(s)	: 4/6 pcs 100 or 150W Led Lights
Construction materials	: Galvanized steel frame + Aluminium painted body parts & doors
Engine	: 12,7 Hp, 2 cylinders diesel engine (water cooled)
Generator	: Brushless DC generator 2400W
Winch	: 24V 1.95hp motor

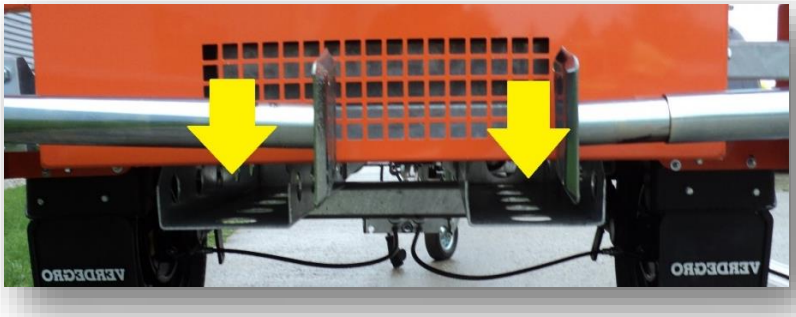
5 Hoisting

Hoisting is only allowed with a forklift with the minimum lift capacity of 1500Kg.
The unit can be lift by using either the forklift sprockets or the lifting eye. Both methods can hold the complete weight of the unit, this includes the optional weight of a full fuel tank. Lifting has to be done by trained and authorized persons. Every unit gets fully tested by The Verdegro Group before delivery.

Please keep in mind, use of the machine is forbidden when the unit is damaged, please contact your official distributor or The Verdegro Group for more information.

Using the lifting eye (red arrow below):
Whenever this method has to be used always check that there is no chance for damage after lifting the unit. When the lifting eye is used, the horizontal movement might damage the solar panel or lights attached on the tower, please be extra careful and protect the unit extra if needed.

Only hoist the unit after informing the owner, only certified forklift driver may alter the unit.
Always double check if the unit is stable before lifting, this to avoid damage.
The Safe Lifting Load (SWL) is 950Kg.



6 General specifications and safety instructions

1. Always make sure the system is delivered with the right certificates, stickers and documentation! Do not remove the sticker(s)!!
2. Never remove safety instructions!
3. Read these instructions carefully before using the “LLTT-H”
4. The LLTT-H should not be used without knowledge of the operating instructions and safety precautions. Keep the operating instructions, always within easy reach of the machine, the operator's manual should ALWAYS be at or near the machine.
5. The operator of the LLTT-H must be at least 18 years old and trained in using the Verdegro LLTT-H.
6. The owner/holder of the LLTT-H must ensure that all users are trained in the use of the machine.
7. Be careful when the machine is used near live power lines.
8. Transport the LLTT-H only if it is properly secured to vehicle or trailer.
9. Always take into account external influences that may affect the operation and safety of the machine such as: wind, rain, temperature, brine, thunderstorms, snow, hail and ice.
10. Use the LLTT-H purely as light tower, and not as a lifting mechanism or other device.
11. Make sure the machine is clean from leaves, twigs, snow, bolts, nuts, etc.
12. The safety devices are never deactivated. Defective safety devices may only be repaired by an official authorized worker of The Verdegro Group or by a qualified repair service company. Always contact The Verdegro Group before repairs.
13. Before and during operation of the machine always look at / near the machine, they will prevent accidents from happening.
14. For safe and smooth operation, keep the LLTT-H clean from snow and ice.
15. Be careful with fuels, lubricants and hydraulic oils of the LLTT-H. Avoid skin contact with these substances. Exposure Danger!
16. The LLTT-H regular inspection and maintenance of service - repair outsourcing to an expert in this field service company.
17. The construction of the LLTT-H may not be altered without permission and the manufacturer's instructions.
18. Inspect the LLTT-H every day before use or during use and pass through the machine.
19. Control all axles bolts / nuts, before each use.

20. Let the LLTT-H annual inspection always be done by the manufacturer or an authorized service company. The inspection must take place more frequently if welding is done in supporting parts, or other special reasons exist for the device to be debating. For modification and repair, always contact the manufacturer! After repair or replacement of parts, the LLTT-H should always be served a full test. The Verdegro Group can only guarantee the working when repair and service is done by the Verdegro Group or under their supervision by an official distributor.

21. The operator of the machine may not be under the influence of alcohol or narcotic drugs.

22. The maximum speed allowed with an attached unit is 90km/h (55.9mph), Moving with an extended tower is absolutely forbidden!

23. The maximum wind rating, in which the LLTT-H can be used is 100 kmh (62 mph). Please note that the unit needs to be stamped correctly.

24. Weekly clean the whole unit from dirt, dust or any other material, this to avoid damaged caused by any of these materials.

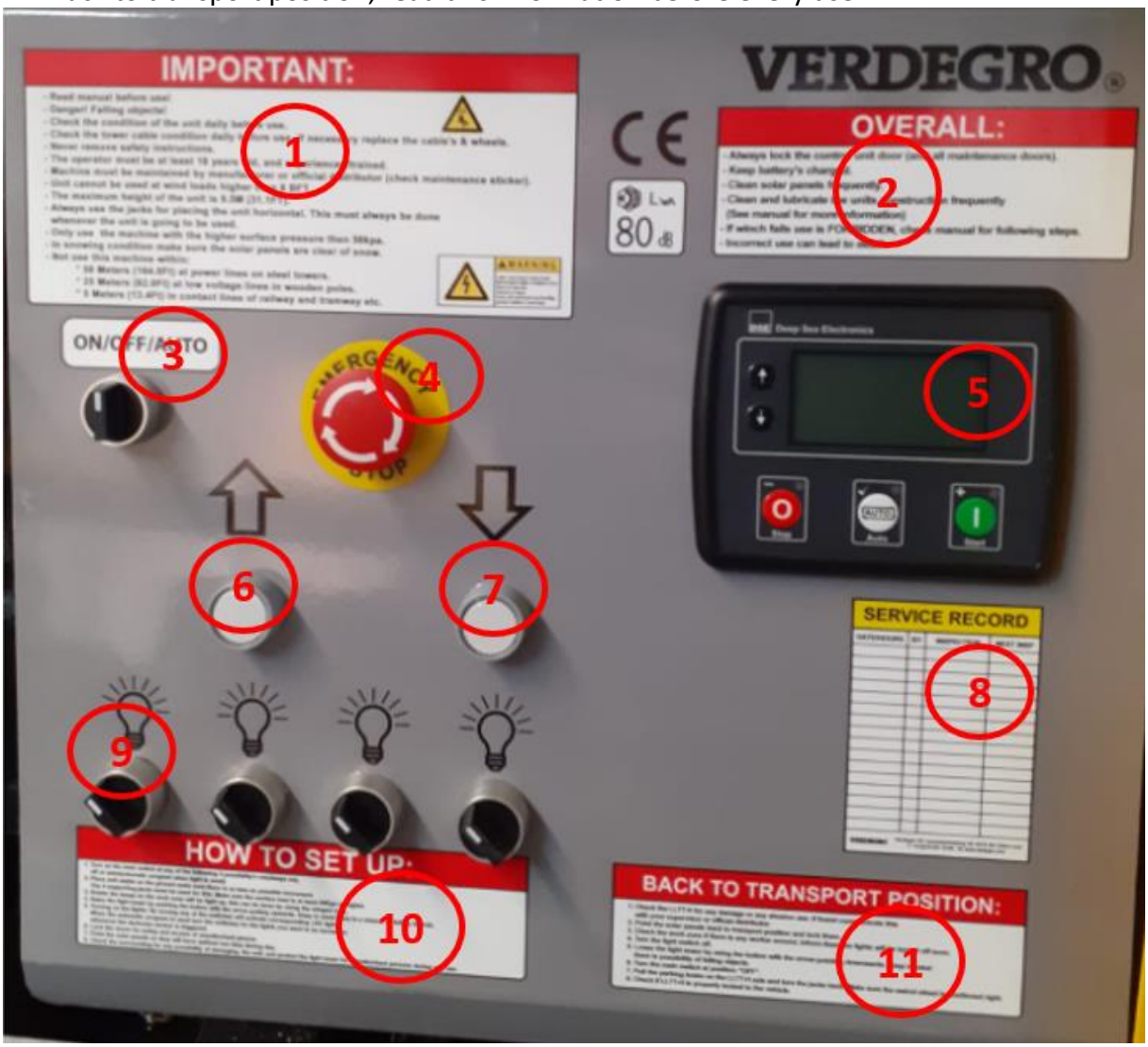
25. Monthly lubricated the steel cable on the winch and wheels.

26. Ensure that the steel cable is fit for use, no breakage or wear on the cable is visible. The steel cable needs to be replaced every year!

27. Make sure the battery bank is fully charged every 2 weeks, low batteries can damage safety equipment and other key equipment of the unit.

7 Control Panel and operation

Control panel:
1: Important, read this information before use.
2: Overall, read this information before use.
3: On/Off/Auto switch.
4: Emergency Stop.
5: DSE Unit, more information at Par. 8.3.
6: Tower up.
7: Tower down.
8: Service Record table.
9: Light switches
10: How to set up, read this information before every use.
11: Back to transport position, read this information before every use.



7.1 Positioning/Back to transport position

The following steps must be seen as extra information about “positioning” and putting it “back to transport position” before use you should have carefully read the steps below, and all the steps on the control panel sticker. For any use of the LLTT-H in dark hours of the day use of a portable light is handy for usage of the equipment. Please always check before use if the unit is clean from dirt, dust, ice, or any other material that can cause damage.

Lubrication of the unit is important for expended lifetime! If not done according Verdegro specs, can the lifetime cycle degrease greatly!

How to set up:

1. Turn on the main switch at any of the following 3 possibility’s on (always power on), off or auto (automatic program when light sensor is used).
2. Place unit stable on the ground, make sure there is as less as possible movement, the 4 supporting jacks may be used for accomplishing that. Make sure the surface load is at least 50Kpa or higher (Check Par. 8.2).
3. Rotate the angle of the lamps so the work zone will be light up, this can be done by using the winged nuts at the side of the lamps.
4. Raise the light tower by pushing the button with the arrow pointing upwards. Keep in mind there is a chance of falling objects from the solar deck.
5. Turning on the lights: By turning the switches you can switch on the lights separate of each other. When the automatic program is used, pre-turn the switches for the lights you want to turn on whenever the darkness sensor is triggered.
6. Lock the doors for safety and unauthorized persons.
7. Point the solar panels so they will have optimal sun during day time.
8. Control the surrounding area for any possibility of damaging the unit, and protect the light tower for unauthorized persons, this can be accomplished by putting it in the sight line of a security camera.

Back to transport position:

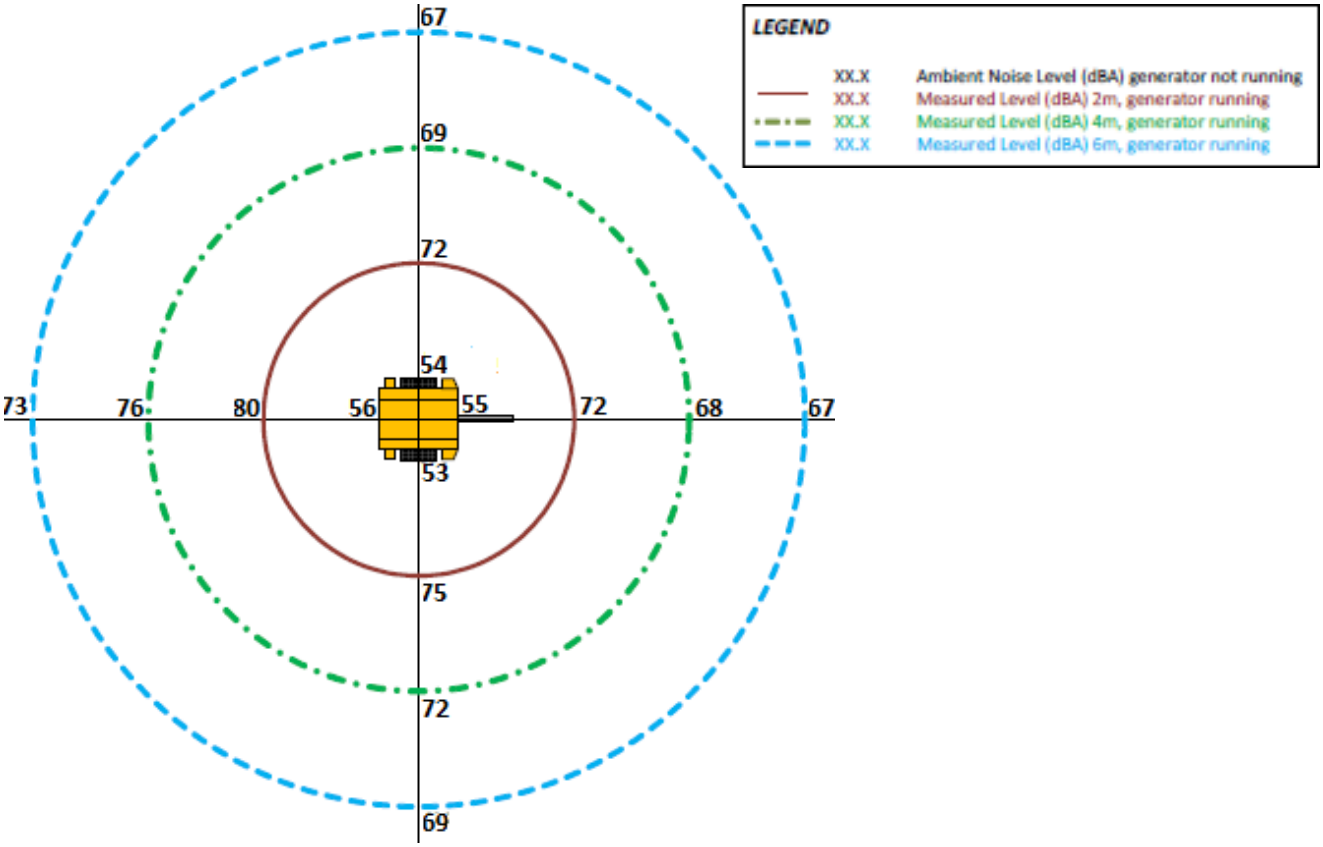
1. Control the LLTT-H for any damage or any abusive use. If found, communicate this with your supervisor or official distributor.
2. Point the solar panels back to transport position and lock them.
3. Control the work zone if there is any worker around, inform them the lights will be turned off soon.
4. Turn the light switches off.
5. Lower the light tower by using the button with the arrow pointing downwards. Keep in mind there is possibility of falling objects.
6. Turn the main switch at position “OFF”.
7. Pull the parking brake on the LLTT-H adze and turn the jacks back. Make sure the swivel wheel is positioned right.
8. Control if LLTT-H is properly locked to the vehicle.

7.2 Ground pressure table

Ground type	Density of soil	Surface pressure in kPa	LLTT-H pressure per stamp in kPa
Tarmac / Concrete	Tarmac	1500	50
	Concrete	2000	50
	Brick paving	1000	50
Gravel / Debris	Very dense	600	50
	Medium density	400	50
	Loose	200	50
Sand	Very dense	500	50
	Medium density	300	50
	Loose	150	50
Fine sand	Very dense	400	50
	Medium density	200	50
	Loose	100	50
Clay	Soft (Easy distorting)	25	50
	Tough	50	50
	Solid (Very difficult distorted)	100	50

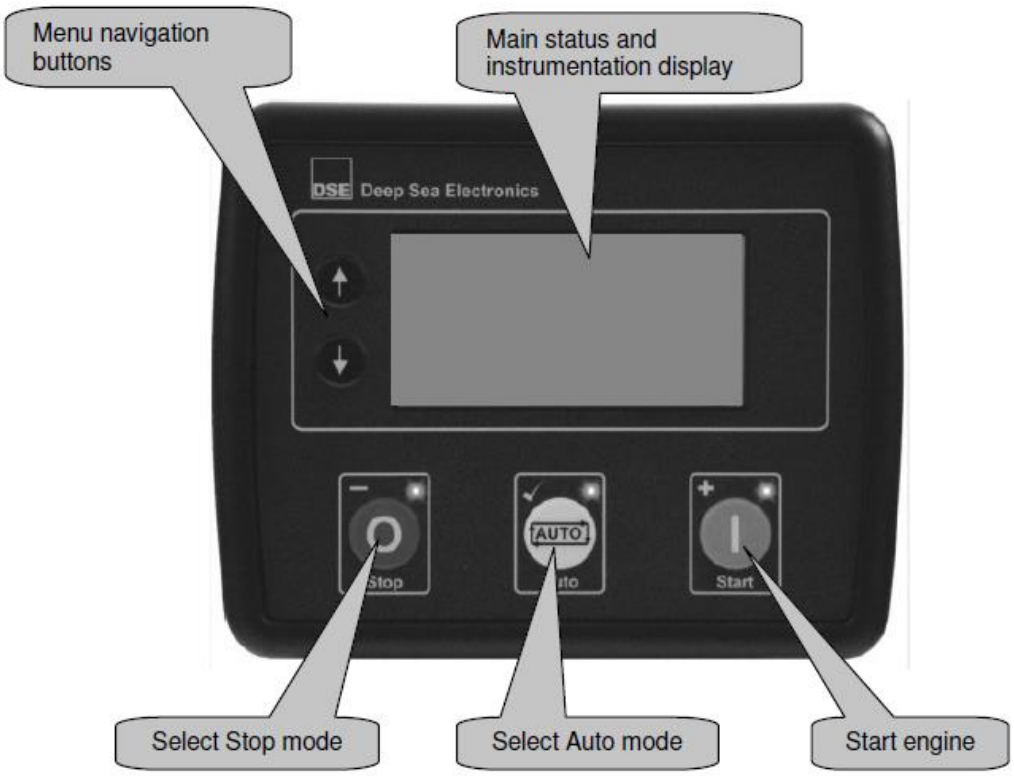
7.3 Decibel measurement

The table below is measured in an open field, please keep in mind that measurement can be slightly different in your environment, in case of big difference please contact your Official Verdegro Distributor or The Verdegro Group.



8 DSE Unit

DESCRIPTION OF CONTROLS



Reminder: If manual stop is active, motor will NOT start automatic! The lamps can still be turned on and will make the battery's drop below engine starting voltage.

When displaying instrumentation a small icon is displayed in the instrumentation area to indicate what value is currently being displayed.

Icon	Description
	Generator voltage and generator frequency
	Mains voltages and mains frequency
	Current
	Engine speed
	Engine running hours
	Battery voltage
	Oil pressure
	Coolant temperature
	Flexible sensor
	Appears when the event log is being displayed
	Current time held in the unit
	The current value of the scheduler run time and duration
	ECU diagnostic trouble codes
	Oil Filter maintenance timers
	Air Filter maintenance timers
	Fuel Filter maintenance timers

6.1 QUICKSTART GUIDE

This section provides a quick start guide to the module's operation.

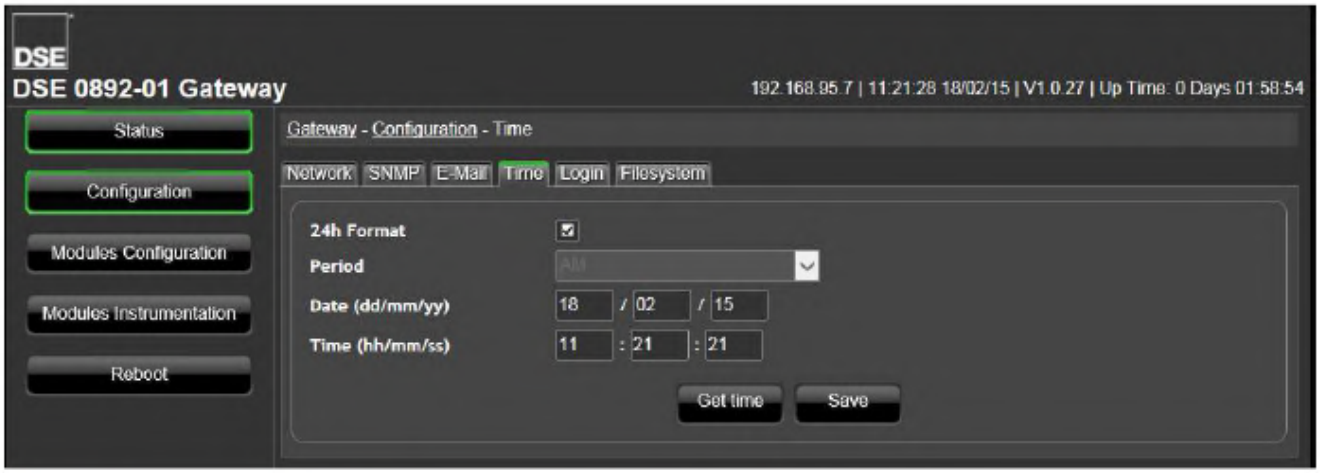
6.1.1 STARTING THE ENGINE

NOTE: For further details, see the section entitled 'OPERATION' elsewhere in this manual.

6.1.2 STOPPING THE ENGINE

NOTE: For further details, see the section entitled 'OPERATION' elsewhere in this manual.

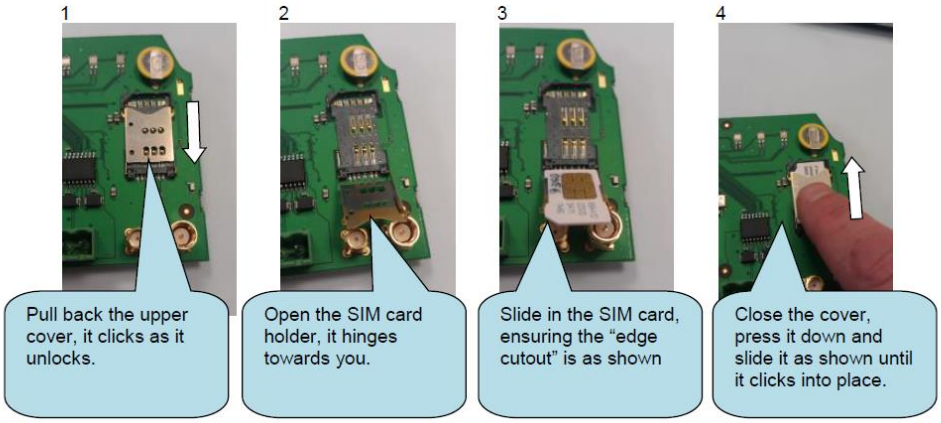
8.1 DSE time editing



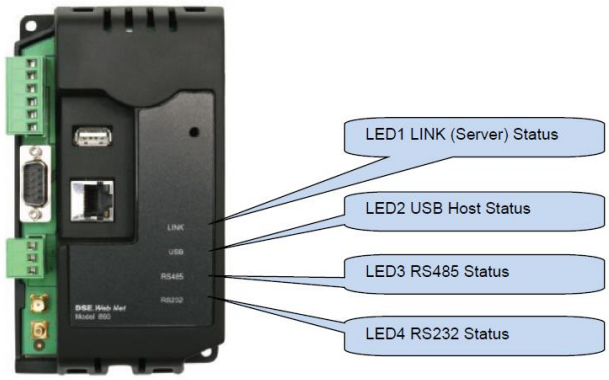
Parameter	Description
24h Format	☑ = Clock is displayed in 24 hr format ☐ = Clock is displayed in 12 hr format
Period	***am*** or ***pm*** (when 24h Format is not selected)
Date / Time	Set the date and time local to the site.
Get Time	Gets the time from the PC and enters this into the Date and Time boxes above
Save	Sends the values entered to the DSE892 Gateway.

8.2 The DSE gateway

How to insert the 2G or 3G SIM-Card into the Gateway



LEDs on the DSE gateway



LED	Function	Colour	Action
1	Server Status	Red	No connection to DSEWebNet® Server
		Green	Connected to DSEWebNet® Server and all configured ports are OK
2	USB Host Status	Red	No Unit Detected
		Green	Data transfer OK
3	RS485 Status	Red	No Unit Detected
		Green	Data transfer OK
4	RS232 Status	Red	No Unit Detected
		Green	Data transfer OK

8.3 Engine settings

The Kubota engine build in the LLTT-H has multiple setting which keep the engine reliable and safe to use, some of the important settings will be explained below.

Engine start

When the LLTT-H main switch on the control panel is turned to either manual “on” or “auto(matic)”, will always start up de DSE unit, DSE unit measures the battery’s voltage when this reaches 22.8V will automatic trigger the start of the engine, maximum run time is 2 hours, after 2 hours of runtime will the engine be turned off automatic.

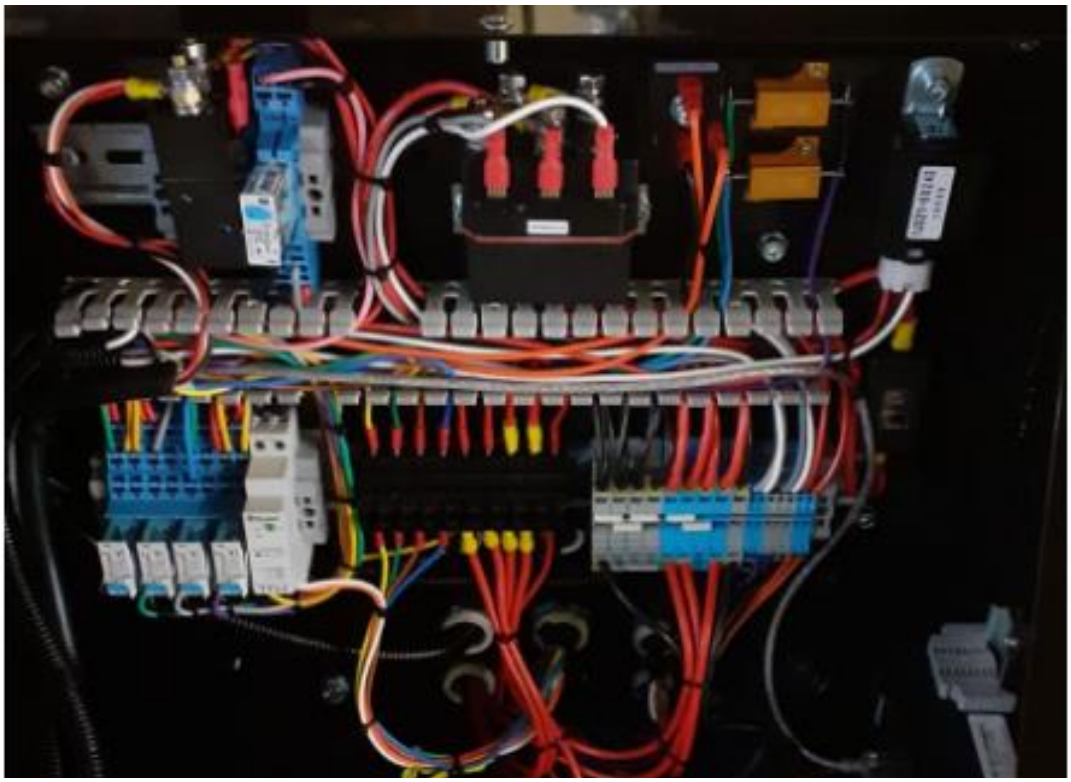
Fuel level

The DSE unit has its own build in fuel level indicator, by switching the display text with the arrow buttons on the DSE unit you able to see the fuel level in %, when the % drops under the 3% there will be displayed a fuel empty alarm, this can be seen at the red or white light located next to the mast, this light is also fit with a fuel sticker, when this light turns on will trigger an automatic process which turns of the lights and the engine will only run its left overtime till it fulfils the maximum run time of 2 hours, the engine will be turned off when the fuel reaches 1%, this trigger can reset by filling the tank for at least 15% displayed on the DSE unit.

For more unit description please contact Verdegro.

8.4 Adjustable Lux meter

The automatic program is programed to turn on the lights during night and turn them off during light hours, below will be explained how to adjust this setting with the build in meter.



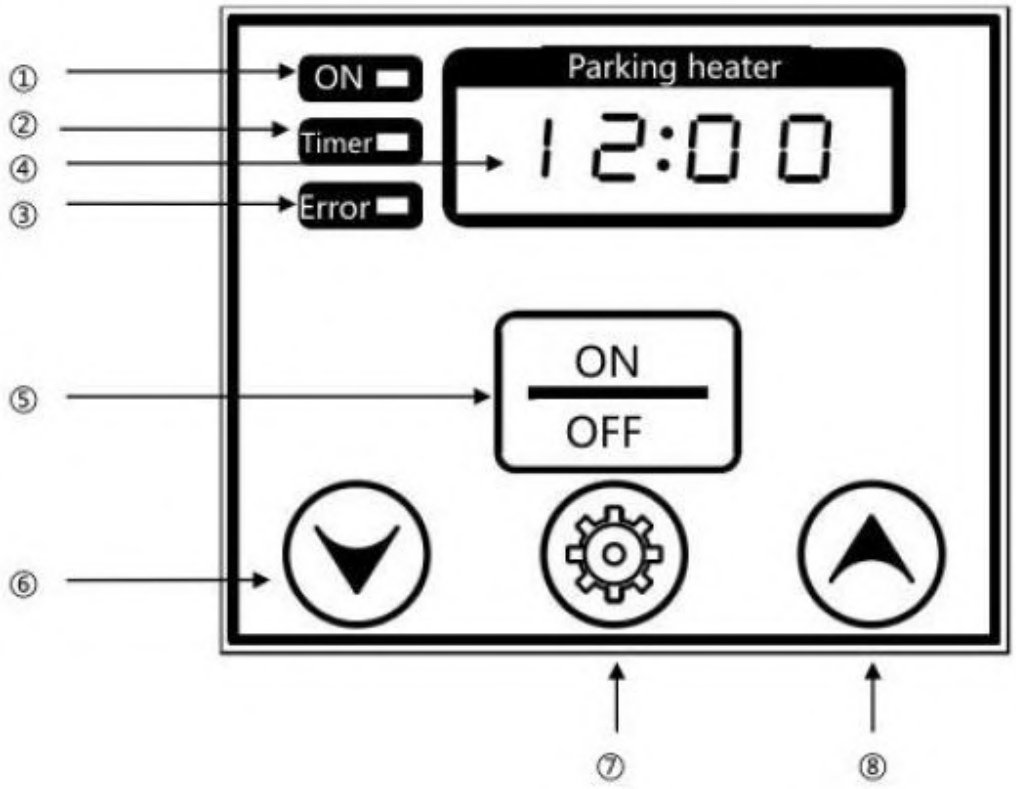
By unscrewing the control panel will show up the electrical components as above.

The Lux meter look as shown below.

Turn the green bold clockwise when the lamps need to turn off later.
Turn the green bold anti-clockwise when lamps need to turn off earlier.

9 Diesel Heater

The operation of controller and the display:



① The operation indication (green) It flickers when it is running. And the standby mode shows the "running time" when the interface lights up.

② The timing indication(red);Start timing mode,the standby mode shows the "timing" when the interface light up.

③ The fault indication(yellow); Lighting up at fault.

④ Display the information(digital)

- Standby mode:
  Time interface: "12:00" ;
  Timing interface:
  Timing mode: "06:00" ;
  Manual mode: "--:--" ;
  Running time interface: "00:40"
- Running mode: "075C" ;
- Sleeping mode: "No display" ;
- Pairing mod: "___"
- Fault mode: "E-00" ;
- Query and pivot mode:
  - Host version: "v000" ;
  - Fault code: "E-00" ;
  - Host state code: "0H00" ;
  - The water temperature: "t-01" "075C" Scroll display;
  - The shell temperature: "t-02" "055C" Scroll display;
  - The furnace temperature: "t-03" "155C" Scroll display;
  - Supply voltage: "P-24" ;
  - Bootstrap voltage: "b-34" ;
  - The pump current: "2_5A" ;
- Off the heater OFF: " Off" Flicker "OFF" ;

⑤ Running the key of OFF: Long press IS to start or stop.And long press IS to off when it happened fault condition.

⑥ Set minus key:

- The electric power can adjust the corresponding parameters in the setting mode. And it is circularly decreased with 1 bit unit.
- Running time can be viewed under the running mode.This interface can adju st the operating time of the electric,with circulation decline of 10 as one unit,and the minimumis 10 minutes.
- Long press "plus key" and "minus key" to enter the matching mode.It will exit the matching mode when you act this operation again.

⑦ Set plus key:

- Setting mode can adjust the parameters with 1 bits per cycling increasing.
- The operation mode can view the running time.And the interface can adjust the operation time with 10 unit cycling decline, the maximum is 1 hour.
- Long press "set key" and "plus key" to view the parameter and click the "set key" to switch the item.
- Long press "plus key" and "minus key" to enter the matching mode.It will exit the matching mode when you act this operation again.

⑧ Set key: can set up time

- Standby mode:" setting time" after long press with 3 seconds in the interface of " time display" .And point to exchange the position of setting.
- Standby mode: "setting time" after long press with 3 seconds in the interface of " timer display" .And point to exchange the position of setting.
- "Set running time" after long press with 3 seconds in the interface of "running time display" (10-60minutes)
- Set mode:long press" set key" to exit with setting parameters.
- Long press "set key" and "minus key" to view the parameter.It will exit thefunction of "view mode" when doing this step again.

10 Use of the machine in cold

- Take into account delays in cold (-5°C (23°F) or colder)
- Ensure that there is no snow, ice or dirt on the safety switch.
- Ensure that there is no snow, ice or dirt on the unit.
- Protect the machine from the snow and ice when not in use.
- Clean the unit weekly, this to avoid any damage caused by dirt, dust or any other material.

11 High voltage

Not use this machine within:

- 50 Meters (164.0 ft) at power Lines on steel towers
- 25 Meters (82.0 ft) at low voltage lines on wooden poles
- 5 Meters (16.2 ft) in contact Lines of railway and tramway etc.

12 Maintenance

Scheduled maintenance keeps the LLTT-H in safe and reliable condition. From the maintenance schedule and checklist for the annual inspection shows what measures are required. Read for the maintenance of the LLTT-H the entire manual carefully! If in doubt about the maintenance work it is better that it is carried out by the manufacturer. If not, then it must be done under supervision of the manufacturer, for example by an official distributor. Distributors can be found on the website www.verdegro.com

Each year after delivery should be communicated with Verdegro about the steel cable quality, this to prevent any danger situation regarding falling danger of the mast pieces.

12.1 Torque index Tension

Dimensions thread	*Of torque for bolt with thread in hermetically ISO Nm*		
	Hex bolt Class 8.8	***Hex bolt Class 10.9***	***Hex bolt Class 12.9***
M4	2,8	4,0	4,9
M5	5,7	7,9	9,5
M6	9,7	13,7	16,2
M8	23,5	33,3	39,2
M10	47,1	65,7	79,4
M12	81,4	114,7	137
M14	130	181	216
M16	196	280	333
M18	270	382	461
M20	382	539	647
M22	519	730	873
M24	662	932	1118
M30	1324	1863	2236

13 Motor service

13.1 Kubota Z482 diesel engine

The Verdegro LLTT-H has a build in engine to produce power whenever the battery's need it, the type of motor use is the Kubota Z482-E2B. the RPM from this engine are set on a approx. 2300 rpm. The starting system is powered by a 12V 0.8KW starter. For more specs check list below, or contact Verdegro.

Model		Z482-E2B	Z602-E2B	
Number of Cylinders		2		
Type		Vertical, Water-cooled, 4 cycle IDI diesel engine		
Bore × Stroke	mm (in.)	67 × 68 (2.64 × 2.68)	72 × 73.6 (2.83 × 2.90)	
Total Displacement	cm^3 (cu.in.)	479 (29.23)	599 (36.55)	
ISO Net Continous kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		8.1 / 3600 (10.9 / 3600)	8.8 / 3200 (11.8 / 3200)	10.1 / 3600 (13.5 / 3600)
ISO / SAE Net Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		9.3 / 3600 (12.5 / 3600)	10.1 / 3200 (13.5 / 3200)	11.6 / 3600 (15.5 / 3600)
SAE Gross Intermittent kW/min^{-1} (rpm) (HP/min^{-1} (rpm))		9.9 / 3600 (13.3 / 3600)	10.8 / 3200 (14.5 / 3200)	12.5 / 3600 (16.8 / 3600)
Maximum Bare Speed	(min^{-1} (rpm))	3800	3450	3800
Minimum Bare Idling Speed	(min^{-1} (rpm))	900 to 1000		
Combustion Chamber		Spherical type (E-TVCS)		
Fuel Injection Pump		Bosch MD type mini pump		
Governor		All speed mechanical governor		
Direction of Rotation		Counter-clockwise (viewed from flywheel side)		
Injection Nozzle		Bosch "Throttle" type		
Injection Timing		0.35 rad (20 °) before T.D.C.	0.31 rad (18 °) before T.D.C.	0.35 rad (20 °) before T.D.C.
Firing Order		1-2		
Injection Pressure		13.73 MPa (140 kgf/cm^2, 1991 psi)		
Compression Ratio		23.5 : 1	24 : 1	
Lubricating System		Forced lubrication by trochoid pump		
Oil Pressure Indicating		Electrical type switch		
Lubricating Filter		Full flow paper filter (Cartridge type)		
Cooling System		Pressurized radiator, forced circulation with water pump (not included in the basic engine)		
Starting System		Electric Starting with Starter		
Starting Motor		12 V, 0.8 kW	12 V, 1.0 kW	
Starting Support Device		By glow plug in combustion chamber		
Battery		12 V, 28 AH equivalent	12 V, 36 AH equivalent	
Charging Alternator		12 V, 150 W	12 V, 480 W	
Fuel		Diesel Fuel No.2-D (ASTM D975)		
Lubricating Oil		Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page G-5, 8.		
Lubricating Oil Capacity	Oil Pan Depth 101 mm (3.98 in.)	2.1 L (0.55 U.S.gals)	2.5 L (0.66 U.S.gals)	
	Oil Pan Depth 121 mm (4.76 in.)	2.5 L (0.66 U.S.gals)	–	
Weight (Dry)	kg (lbs)	53.1 (117.1)	57.0 (125.7)	

* The specification described above is of the standard engine of each model.
* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

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13.2 Lubricating Oil

CAUTION

- **When changing or inspecting, be sure to level and stop the engine.**

■ NOTE

Lubricating Oil

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

Fuel / Lubricating oil class	Low sulfur (0.5 % ≥)	High sulfur	Remarks
CF	❍	❍	TBN ≥ 10
CF-4	❍	X	
CG-4	❍	X	

❍ : Recommendable X : Not recommendable

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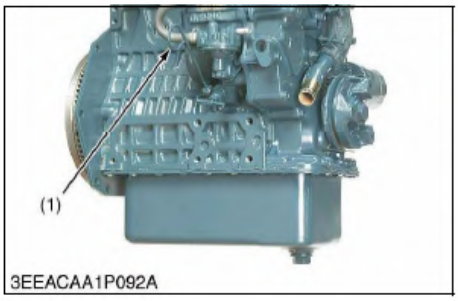
4. CHECK AND MAINTENANCE

[1] DAILY CHECK POINTS



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Checking Engine Oil Level

1. Level the engine.
2. To check the oil level, draw out the dipstick (1), wipe it clean, reinsert it, and draw it out again.
   Check to see that the oil level lies between the two notches.
3. If the level is too low, add new oil to the specified level.

■ **IMPORTANT**

- **When using an oil of different maker or viscosity from the previous, drain old oil. Never mix two different types of oil.**

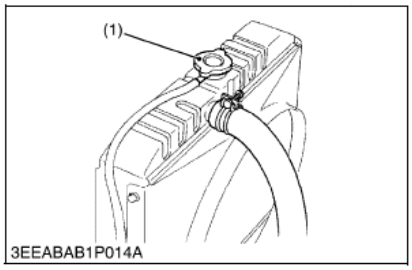
■ **NOTE**

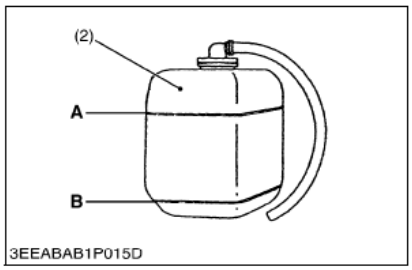
- **Be sure to inspect the engine, locating it on a horizontal place. If placed on gradients, accurately, oil quantity may not be measured.**
- **Be sure to keep the oil level between upper and lower limits of the dipstick. Too much oil may cause a drop in output or excessive blow-by gas. On the closed breather type engine in which mist is sucked through port, too much oil may caused oil hammer. While too little oil, may seize the engine's rotating and sliding parts.**

(1) Dipstick

W1016222

13.4 Checking and replenish coolant





Checking and Replenish Coolant

1. Without recovery tank :
   Remove the radiator cap (1) and check to see that the coolant level is just below the port.
   With recovery tank (2) :
   Check to see that the coolant level lies between **FULL** (**A**) and **LOW** (**B**).
2. If coolant level is too low, check the reason for decreasing coolant.
   (Case 1)
   If coolant is decreasing by evaporation, replenish only fresh, soft water.
   (Case 2)
   If coolant is decreasing by leak, replenish coolant of the same manufacture and type in the specified mixture ratio (fresh, soft water and L.L.C.). If the coolant brand cannot be identified, drain out all of the remaining coolant and refill with a totally new brand of coolant mix.

⚠ CAUTION

- **Do not remove the radiator cap until coolant temperature is below its boiling point. Then loosen the cap slightly to relieve any excess pressure before removing the cap completely.**

■ IMPORTANT

- **During filling the coolant, air must be vented from the engine coolant passages. The air vents by jiggling the radiator upper and lower hoses.**
- **Be sure to close the radiator cap securely. If the cap is loose or improperly closed, coolant may leak out and the engine could overheat.**
- **Do not use an antifreeze and scale inhibitor at the same time.**
- **Never mix the different type or brand of L.L.C..**

(1) Radiator Cap
(2) Recovery Tank

A: FULL
B: LOW

W1035779

13.5 Check points of initial 50 Hours

[2] CHECK POINTS OF INITIAL 50 HOURS

Changing Engine Oil

CAUTION

- **Be sure to stop engine before changing engine oil.**

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. To drain the used oil, remove the drain plug (2) at the bottom of the engine and drain the oil completely.
4. Screw the drain plug (2).
5. Fill new oil up to upper line on the dipstick (1).

■ **IMPORTANT**

- **When using an oil of different maker or viscosity from the previous one, remove all of the old oil.**
- **Never mix two different types of oil.**
- **Engine oil should have properties of API classification CD/CE/CF/CF-4/CG-4.**
- **Use the proper SAE Engine Oil according to ambient temperature.**
- **Upon an oil change, be sure to replace the gasket with new one.**

Above 25 °C (77 °F)	SAE 30 or SAE 10W-30 SAE 10W-40
0 °C to 25 °C (32 °F to 77 °F)	SAE 20 or SAE 10W-30 SAE 10W-40
Below 0 °C (32 °F)	SAE 10W or SAE 10W-30 SAE 10W-40

Oil pan depth / Models	Engine oil capacity	
	101 mm (3.98 in.)	121 mm (4.76 in.)
*Z482-E2B	2.1 L 0.55 U.S.gals	2.5 L 0.66 U.S.gals
*D662-E2B *D722-E2B	3.2 L 0.85 U.S.gals	3.8 L 1.00 U.S.gals
D782-E2B	–	3.6 L 0.95 U.S.gals
Z602-E2B	2.5 L 0.66 U.S.gals	–
D902-E2B	3.7 L 0.98 U.S.gals	–

* 101 mm (3.98 in.) oil pan depth is optional.

Tightening torque	Drain plug with copper gasket	M12 × 1.25	32.4 to 37.3 N·m 3.3 to 3.8 kgf·m 23.9 to 27.5 ft-lbs
		M22 × 1.5	63.7 to 73.5 N·m 6.5 to 7.5 kgf·m 47.0 to 54.2 ft-lbs
	Drain plug with rubber coated gasket	M22 × 1.5	44.1 to 53.9 N·m 4.5 to 5.5 kgf·m 32.5 to 39.8 ft-lbs

(1) Dipstick (2) Drain Plug

W1016604

13.6 Check points Kubota engine

If more info required, contact Verdegro or an official distributor.

Service table 0hours-800hours of run time
After the first 200 run hours of the engine, clean the air cleaner + Fuel filter

Item		Service Interval Every 50 hrs	75 hrs	100 hrs	150 hrs	200 hrs	400 hrs	500 hrs	1 or 2 months	1 year	800 hrs	1500 hrs	3000 hrs	2 years
*Checking fuel hoses and clamp bands		☆												
Changing Engine oil	(1) Oil pan depth (101 mm, 3.98 in.)	★	☆											
	(2) Oil pan depth (121 mm, 4.76 in.)	★					★							
	(3) Extended oil pan depth (101 mm, 3.98 in.)	★		☆										
Checking fan belt tension and damage				☆										
*Cleaning air cleaner element (Replace the element after 6 times cleaning)							★							
Cleaning fuel filter (element type)							★							
Checking battery electrolyte level				☆										
Replacing oil filter cartridge	(1) Oil pan depth (101 mm, 3.98 in.)	★			☆									
	(2) Oil pan depth (121 mm, 4.76 in.)	★					★							
	(3) Extended oil pan depth (101 mm, 3.98 in.)	★				☆								
Checking radiator hoses and clamp bands						☆								
*Checking intake air line						☆								
*Replacing fuel filter							☆							
Cleaning water jacket and radiator interior											★			
Replacing fan belt											★			

(1) This oil pan depth is optional for Z482-E2B, D662-E2B and D722-E2B.
(2) This oil pan depth is standard for Z482-E2B, D662-E2B, D722-E2B and D782-E2B.
(3) This oil pan depth is standard for Z602-E2B and D902-E2B.
★ Change engine oil and replace oil filter cartridge after the first 50 hours of operation.
* The items listed above (* marked) are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.

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Oil pan “2” is installed.

Service table 1month- 2years

Item	Service Interval												
	Every												
	50 hrs	75 hrs	100 hrs	150 hrs	200 hrs	400 hrs	500 hrs	1 or 2 months	1 year	800 hrs	1500 hrs	3000 hrs	2 years
Recharging battery								☆					
*Replacing air cleaner element									☆				
Checking valve clearance										☆			
*Checking injection nozzle condition											☆		
*Checking injection timing												☆	
*Checking injection pump												☆	
*Replacing intake air line													☆
Replacing battery													☆
Replacing radiator hoses and clamp bands													☆
*Replacing fuel hoses and clamp bands													☆
Changing radiator coolant (L.L.C.)													☆

* The items listed above (* marked) are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.

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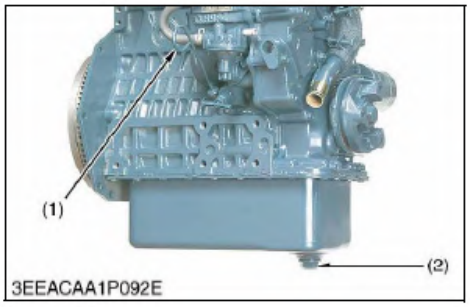
13.7 Changing engine oil

Change engine oil every 400 run hours.



Changing Engine Oil

CAUTION

- **Be sure to stop engine before changing engine oil.**

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. To drain the used oil, remove the drain plug (2) at the bottom of the engine and drain the oil completely.
4. Screw the drain plug (2).
5. Fill new oil up to upper line on the dipstick (1).

■ **IMPORTANT**

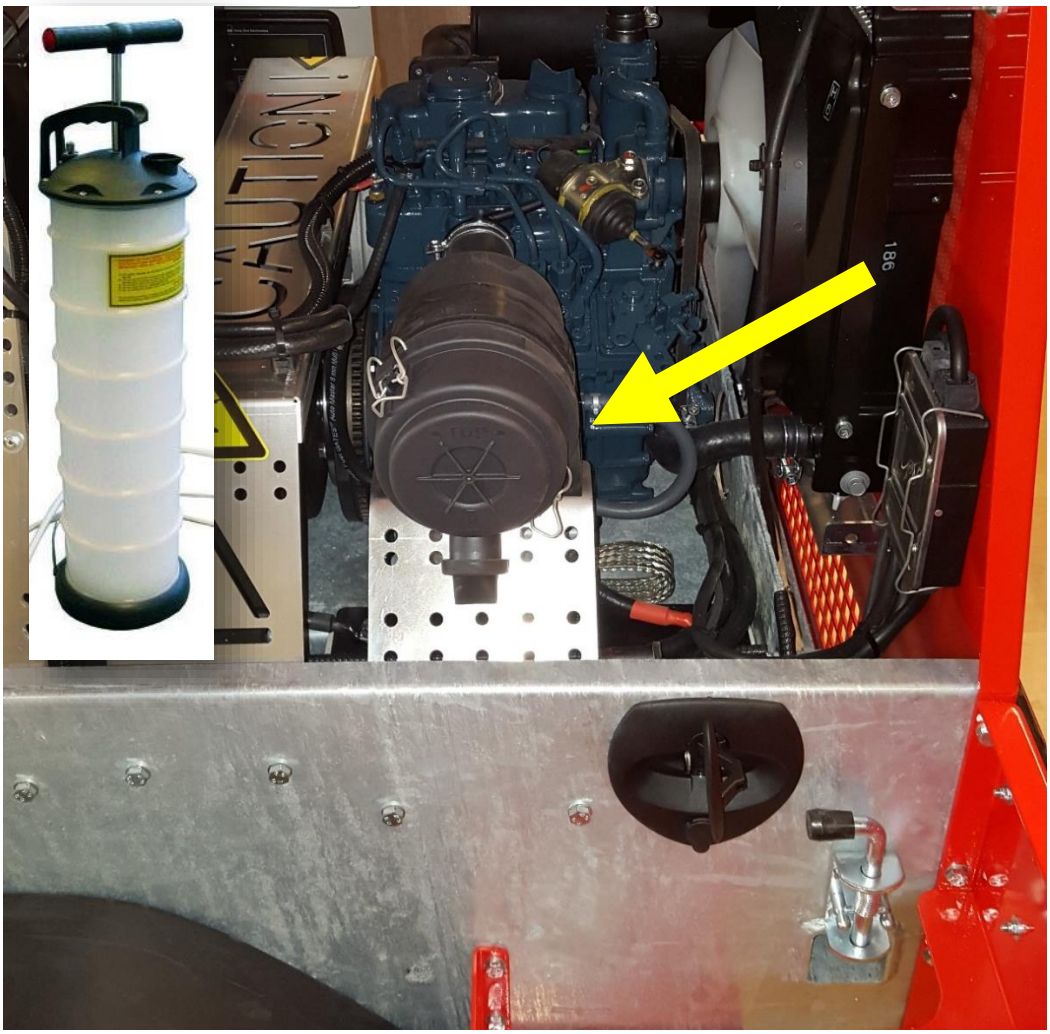
- **When using an oil of different maker or viscosity from the previous one, remove all of the old oil.**
- **Never mix two different types of oil.**
- **Engine oil should have properties of API classification CD/ CE/CF/CF-4/CG-4.**
- **Use the proper SAE Engine Oil according to ambient temperature.**
- **Upon an oil change, be sure to replace the gasket with new one.**

Above 25 °C (77 °F)	SAE 30 or SAE 10W-30 SAE 10W-40
0 °C to 25 °C (32 °F to 77 °F)	SAE 20 or SAE 10W-30 SAE 10W-40
Below 0 °C (32 °F)	SAE 10W or SAE 10W-30 SAE 10W-40

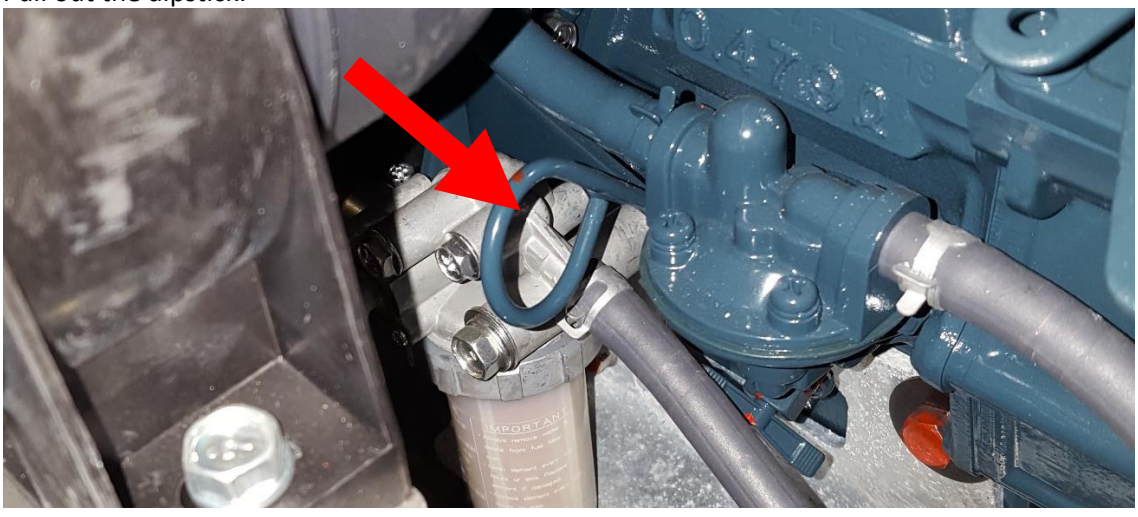
Oil pan depth / Models	Engine oil capacity	
	101 mm (3.98 in.)	121 mm (4.76 in.)
*Z482-E2B	2.1 L 0.55 U.S.gals	2.5 L 0.66 U.S.gals

13.7.1 Guide to change engine oil

Whenever the oil pan can't be cleared traditional ways, follow the following steps then carefully: Needed materials: oil-pump, pump tube and new engine oil (witch type check at Par. 13.7), keep in mind mixing 2 types of oil is forbidden, remove all old oil before placing new oil.



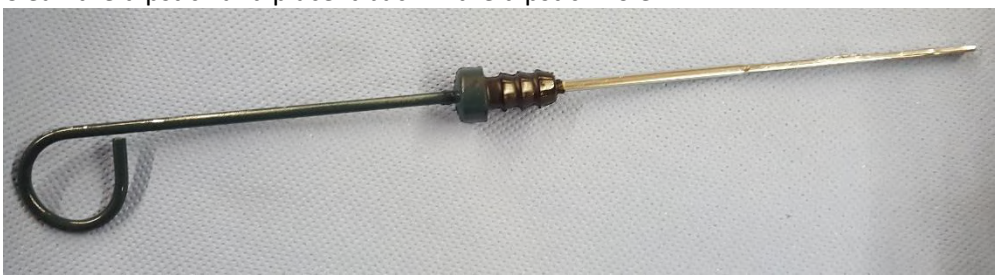
1. Turn the motor on for at least 5minutes. (How to? check Par. 9)
2. Pull out the dipstick.



3. Place the pump tube in the dipstick hole until the bottom is reached.

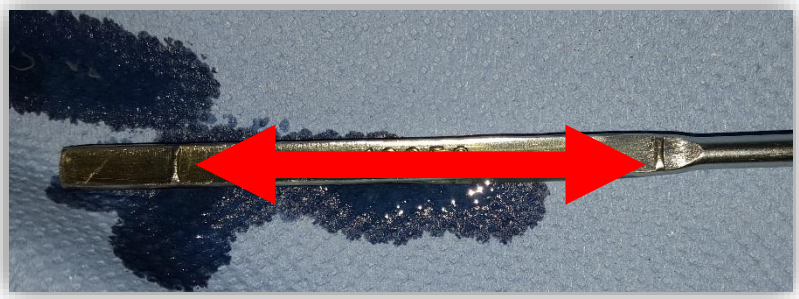
4. Make sure the tube is in oil at any time during the following steps.
5. Start manual pumping the oil in the pumps reservoir.

6. When the pump doesn't pump any oil anymore, pull out the pump tube.
7. Clean the dipstick and place it back in the dipstick hole.



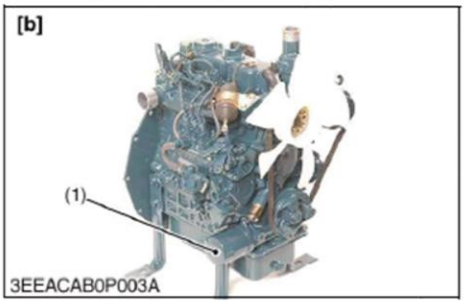
8. Pull out the dipstick and check the oil level.
9. When dipstick is clear from oil, fill up the pan with the new oil. (approx. 2.5L (0.66 U.S gals)

10. Check the oil level using the dipstick. Make sure the oil level is between the stripes



13.8 Changing oil filter

Change oil filter every 400Hours!



Replacing Oil Filter Cartridge

CAUTION

- **Be sure to stop the engine before changing filter cartridge.**

1. Remove the oil filter cartridge (1) with the filter wrench.
2. Apply a slight coat of oil onto the new cartridge gasket.
3. To install the new cartridge, screw it in by hand. Over tightening may cause deformation of rubber gasket.
4. After the new cartridge has been replaced, the engine oil normally decrease a little. Thus see that the engine oil does not leak through the seal and be sure to read the oil level on the dipstick. Then, replenish the engine oil up to the specified level.

■ **IMPORTANT**

- **To prevent serious damage to the engine, replacement element must be highly efficient. Use only a KUBOTA**

2-
y

150 hours.

(1) Engine Oil Filter Cartridge

[a] Standard Type
[b] One-side Maintenance Type

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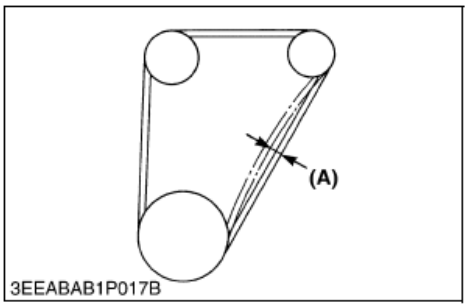
13.9 Checks for the Fan Belt and air cleaner element

Check every 800 Hours



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Fan Belt Tension

1. Measure the deflection **(A)**, depressing the belt halfway between the fan drive pulley and alternator pulley at specified force 98 N (10 kgf, 22 lbs).
2. If the measurement is not within the factory specifications, loosen the alternator mounting screws and relocate the alternator to adjust.

Deflection **(A)**	Factory spec.	7.0 to 9.0 mm 0.28 to 0.35 in.

(A) Deflection

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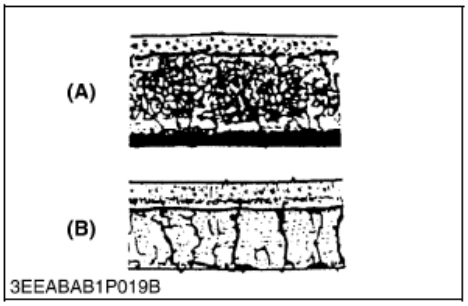

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Fan Belt Damage and Wear

1. Check the fan belt for damage.
2. If the fan belt is damaged, replace it.
3. Check if the fan belt is worn and sunk in the pulley groove.
4. If the fan belt is nearly worn out and deeply sunk in the pulley groove, replace it.

(A) Good **(B) Bad**

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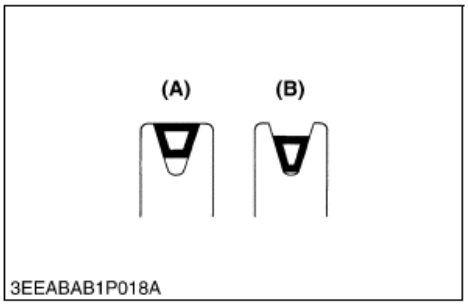

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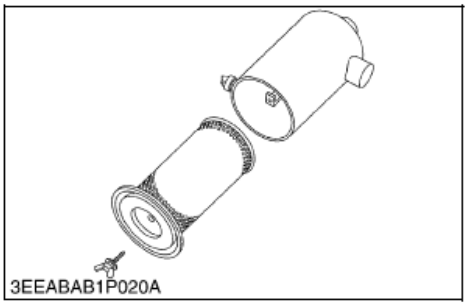
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Cleaning Air Cleaner Element

1. Remove the air cleaner element.
2. Use clean dry compressed air on the inside of the element.
   Pressure of compressed air must be under 205 kPa (2.1 kgf/cm^2, 30 psi).
   Maintain reasonable distance between the nozzle and the filter.

■ **NOTE**

- **The air cleaner uses a dry element. Never apply oil to it.**
- **Do not run the engine with filter element removed.**
- **Change the element once a year or every 6th cleaning.**

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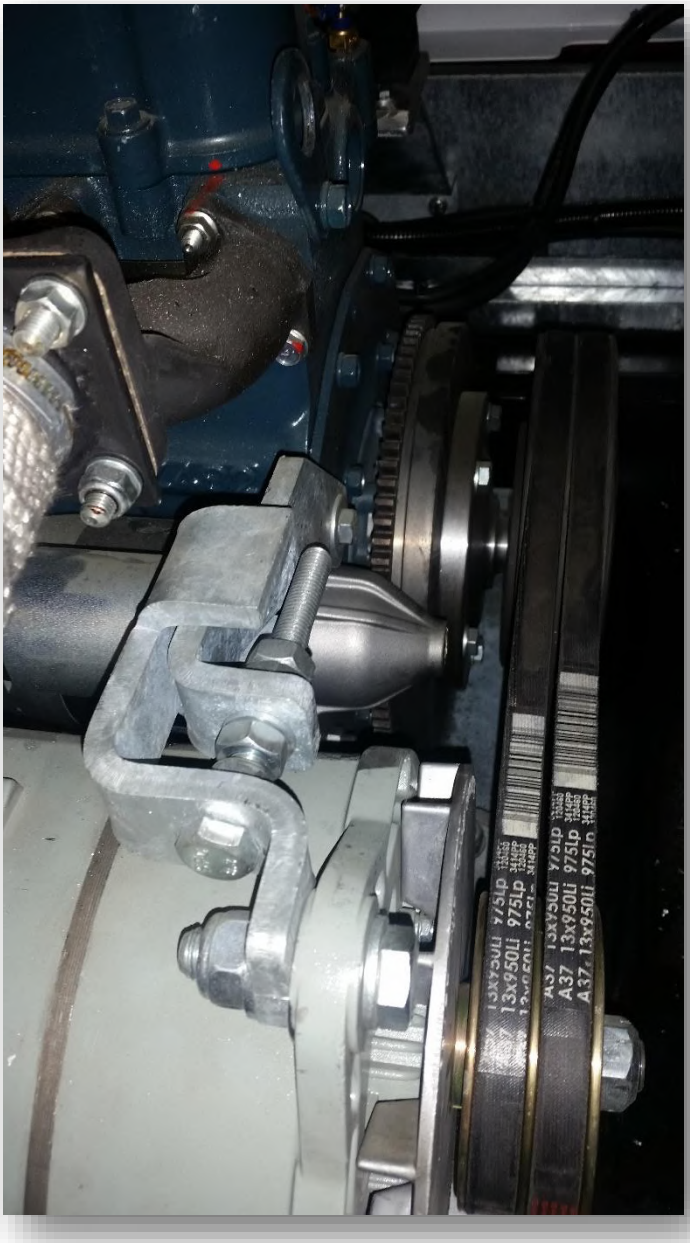
13.10 Alternator belts

The recommended alternator belt, used in the LLTT-H is the AX38.

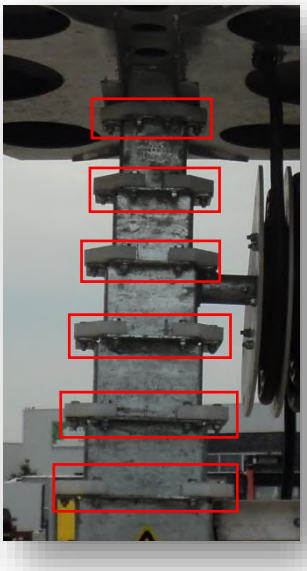


Alternator belts: check each 100 run hours, and set on right tension.
Alternator belts should be replaced each 300 run hours.

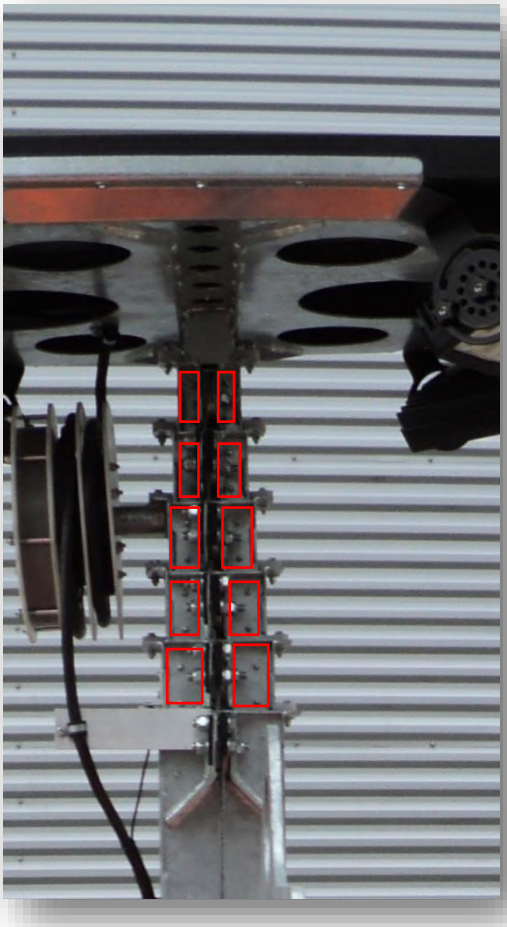
Belt AX38 = 5mm push: New belt: 3Kgf Used belt: 2Kgf

13.11 Lubrication points

Aluminium and steel wheels: lubricate on top, this decreases wear on steel cables.



Slide blocks left and right side: should be greased above and below, below can be sprayed trough the small gap right under the slide block, make sure right and left are both lubricated correctly.



Vertical Slide blocks: Slide blocks left and right side should be greased from the top.

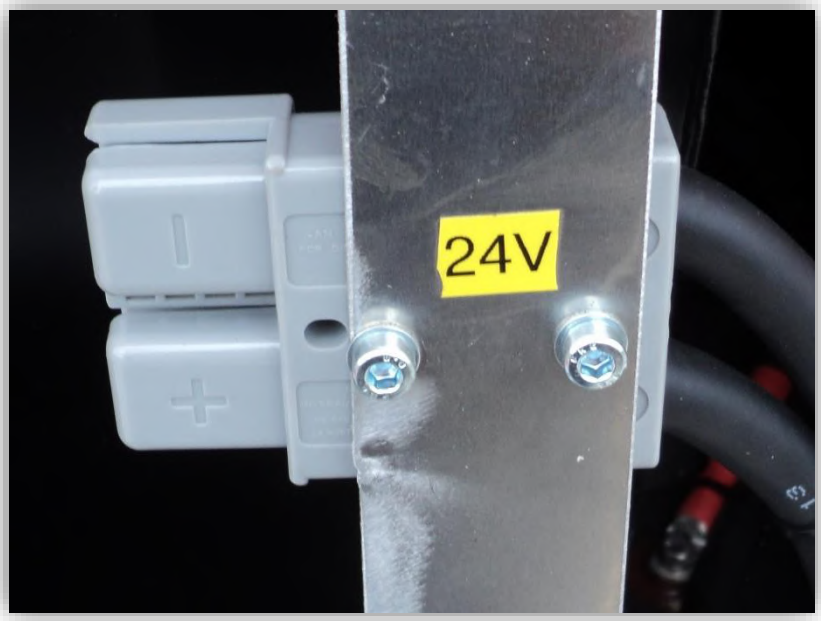
Winch drum: The drum of the winch should be lubricated while turned, this will decrease wear on the steel cable during rotation of the winch.

14 Emergency operations

14.1 Empty battery

The followings steps explain how to charge the battery pack delivered with the LLTT-H. Whenever the dynamo on the engine is not able to.

The photo below is near the diesel tank. Connect battery charger 24VDC and load the battery pack for at least 30min before use, with a booster pack you can start the engine, afterwards will the engine charge the batteries for one hour only! Check after one hour the current voltage to make sure the engine will start up after his cooldown period!



15 Emergency procedure winch

This is a test version of the emergency procedure, please contact Verdegro if the following information is out dated. (11-2015)

The following steps are meant for safely bringing the tower down to his transport position.

1. Connect a 24V battery charger to the socket explained in Par. 13.
2. Try to lower the tower.
    - if this doesn't work follow the steps below.

1. Make sure the area around the unit is cleared from unauthorized persons, make sure the workers in de work zone or any other person close to the unit are informed about the situation.
2. Disable the power of the unit.
3. Use the spoons from an fork lift truck to stabilize the highest possible tower piece, keep in mind the location of the fork lift truck.
   The higher tower piece you reach the less damage can occur at next steps, to the unit or persons involved.
4. Make sure the break on fork lift truck is active.
5. Unscrew the bolds from the control panel in the front and top (4-6 bolds), unscrew the locking device in front of the panel, as last unscrew the bolds holding the control box, make sure you do not press any buttons on the control panel while doing any of this.
6. Check the fork lift spoons if they still have contact with the tower.
7. Your own safety is most important, always stay extra focused at the next steps.
8. Turn the winch to manual control.
9. Lower the forklift slowly till it's completely down.

After the steel cable is cleared from the winch follow the steps at par. 16 for replacing the winch, please also contact distributor to inform about the current situation.

16 Replacing winch

The type of winch installed in the Verdegro LLTT-H is the Electrical Winch VDC4500EWX, it has a 24V 1.95hp motor installed. The winch has a capacity following the table below. Whenever this winch is defect or gives any errors, contact The Verdegro Group or an official distributor of The Verdegro Group. For placing a new winch, read the following steps carefully, when followed step by step the winch will be replaced safely. For specs and extra information which is not mention below contact the manual of the VDC4500EWX.

Layer	Rated line pull Kgs (lbs)	Total rope on the drum M (ft)
1	2041(4500)	2.3(7.6)
2	1652(3642)	5.2(17.0)
3	1388(3060)	8.3(27.0)
4	1169(2638)	11.8(38.6)
5	/	14.5(47.6)

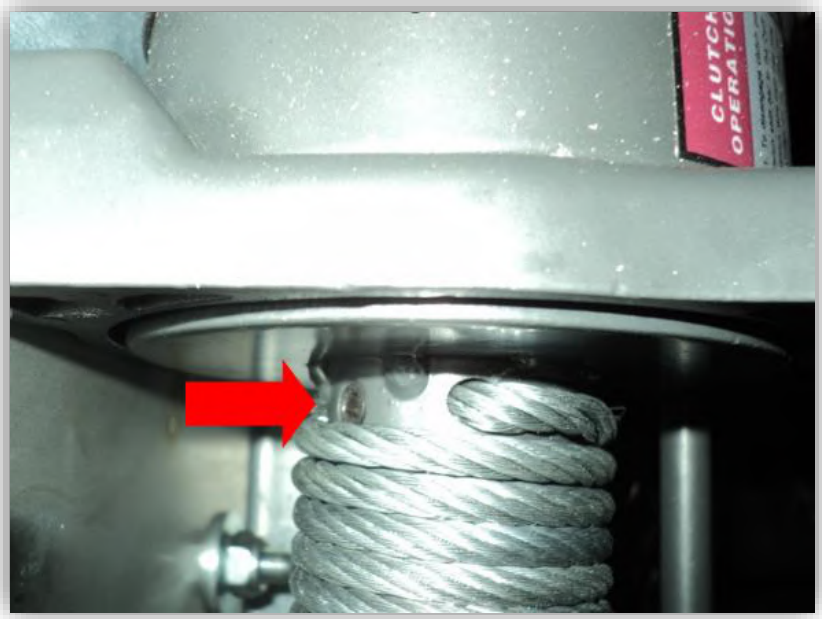
Warning: Do not exceed rated capacity shown in this table.

Before you for replace the new winch read the following rules:

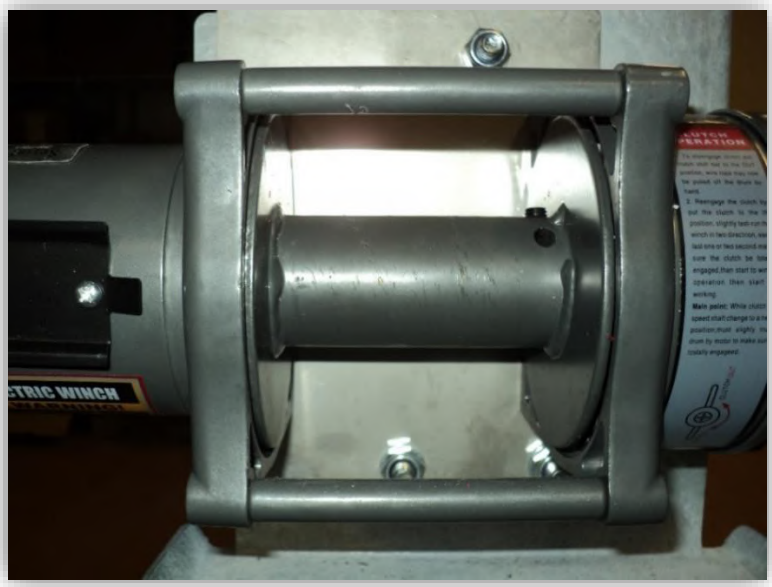
- Intermittent use only. Allow winch to cool between uses
- NEVER cut, weld or modify any part of the winch or cable
- A minimum of five wraps of cable around the drum barrel is necessary for pulling and holding the rated load.
- Keep yourself and other a safe distance to the side of the cable when it is under tension
- Don't move the vehicle. This could result in cable breakage
- Always control if vehicle is locked so unauthorized persons can't reach the control panel.
- Always make sure to up and down the light tower in one smooth motion to avoid shock loads, this can exceed the capacity by far.
- Use gloves to protect your hands when handling the steel cable.
- NEVER disengage the clutch when there is a load on the winch

Step 1: Make sure the Light tower is FULLY down if not there is entrapment danger. (How to read at Par. 8.1)

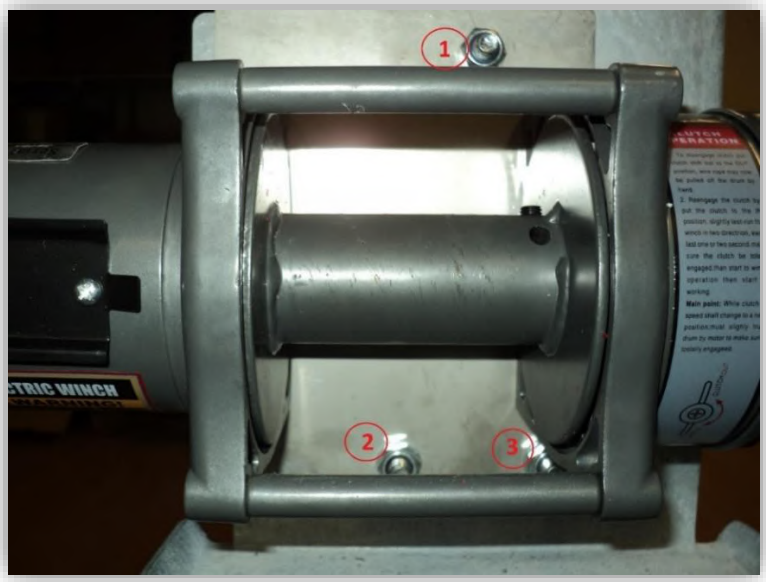
Step 2: Make sure the steel cable is like the picture right, so you can reach the adjusting bolt. Now you can unscrew the adjusting bolt safely.



Step 3: Unroll the steel cable from the winch, so you have the same result as the picture below:



Step 4: Unscrew the bolds at point 1, 2 and 3 in the picture below the winch construction will come off. Keep in mind you write down the connected electrical wires for connecting them back after replacing the winch.



Step 5: Unscrew the 4 bolds on the construction plate and the winch will come off the plate.

Step 6: Put a new winch on the plate and put 4 bolds in.

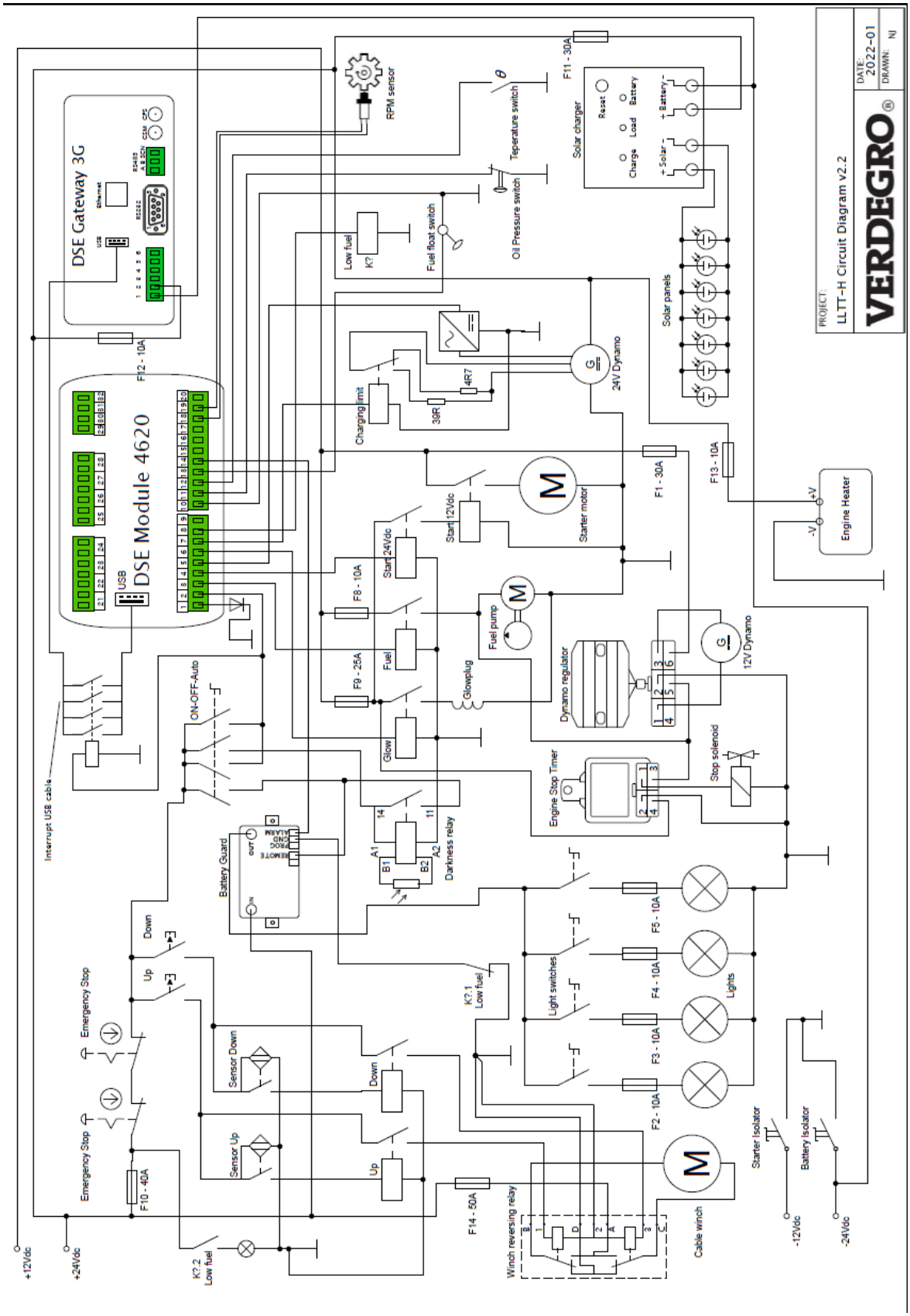
Step 7: Put the winch construction back in his original position and put bolds at point 1, 2 and 3 in the picture from “step 4”.

Step 8: Put the steel cable back in and screw the adjusting bold till it locks the steel cable in.

Step 9: Test the light tower always under super vision of The Verdegro Group or an official distributor after replacement of the winch.

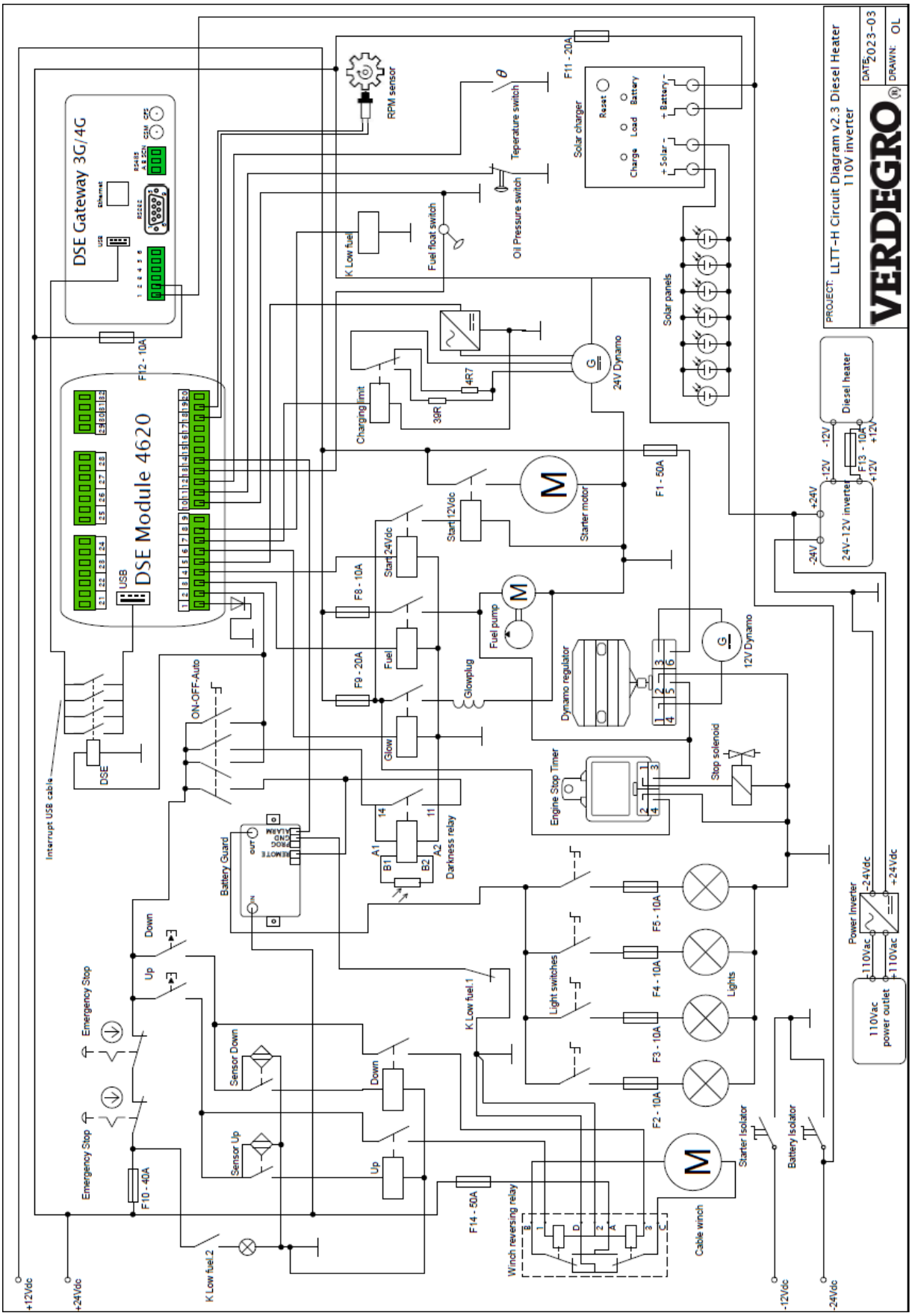
17 Electrical Diagrams.

17.1 Electrical diagram Base model



For more information contact The Verdegro Group.

17.2 Circuit diagram LLTT-H + Diesel heater/power outlet



For more information contact The Verdegro Group.

18 Optional extra's

In some cases, it is desirable to have extras on the LLTT-H light tower. Below is a list with some options that are made available with the LLTT-H light tower. These options are incorporated in the circuit diagram with the extra options.

18.1 Diesel heater

The diesel heater is a system that makes the use of the unit possible in cold conditions. When the engine needs to be running the diesel needs to be at a certain temperature to be able to combust. When the temperature is too low the diesel will be too thick and the engine can't start properly. By heating the diesel the fuel will get thinner and will be able to combust with enough compression.

18.2 Power outlet

For some applications it may be handy to have a power outlet on the unit. This way tools can still be used around the unit without having to have an external power source like a truck or support vehicle.

19 Repairs (by manufacturer or official distributor)

19.1 Welding

If parts of the LLTT-H are repaired with welding, it should be noted in the report under "Remarks''

- Welded points
- Date of welding
- Make sure when welding the manufacturer's instructions are followed

19.2 Other welding

If other repairs are made to supporting parts (example cylinders), make a note under "Remarks''

- Maintenance points
- Date
- Contractor
- Ensure that the repair to the manufacturer's instructions are followed

20 Warranty

Verdegro strives by various internal and external inspections and final inspections that the delivered LLTT-H system is free from error into operation. We only provide the warranty for any defect in the parts Verdegro delivered.

The guarantee is effective up to 12 months from the date of delivery of the machine to the buyer. The guarantee applies only to a new LLTT-H sold in possession of the first owner, and officially delivered by Verdegro.

Verdegro is based on an obligation to guarantee the absence of LLTT-H occurred in accordance with this warranty for free repair. The warranty repair is performed only in the first 12 months from first delivery, and during normal working hours by a technician authorized by Verdegro BV at the workshop in Etten-Leur, The Netherlands.

Verdegro decides whether parts and labour are under warranty or not. Parts should always be send back to Verdegro, here they will be checked, repaired and shipped back in the fastest way possible.

The warranty does not cover defects caused by neglect of the use - and safety instructions in the operations manual, or mainly due to improper or inadequate use, installation or maintenance unauthorized persons, or resulting from normal wear or deterioration quality or caused by an accident.

Verdegro does not reimburse any damage to property or persons / companies due to a defective LLTT-H, neither revenue, driving costs to the repair company etc.

The guarantee *will terminate immediately* in full if the LLTT-H is repaired or serviced by another company / person than the Verdegro Group or an official distributor, when strange or inappropriate components are mounted on the LLTT-H, or when the settings of the LLTT-H are changed by unauthorized persons.

21 CE certification

CE Verklaring van conformiteit
CE Declaration of conformity
CE Konformitätserklärung
Déclaration CE de conformité

The Verdegro Group
verklaart hiermee, dat het produkt
hereby declare, that the product
erklären hiermit, daß das Produkt
déclare par la présente, que l'outil

LLTT-H

NL

Is geproduceerd conform de normen en normatieve documenten overeenkomstig de bepalingen van de EG-richtlijnen 2006/42/EG.

GB

Is manufactured in conformity with the EG 2006/42/EG.

Other applied standards	
EG 2006/42/EG	

22 Maintenance history

Date:…… Hours:…… Stamp:	Date:…… Hours:…… Stamp:
Date:…… Hours:…… Stamp:	Date:…… Hours:…… Stamp:
Date:…… Hours:…… Stamp:	Date:…… Hours:…… Stamp:
Date:…… Hours:…… Stamp:	Date:…… Hours:…… Stamp: