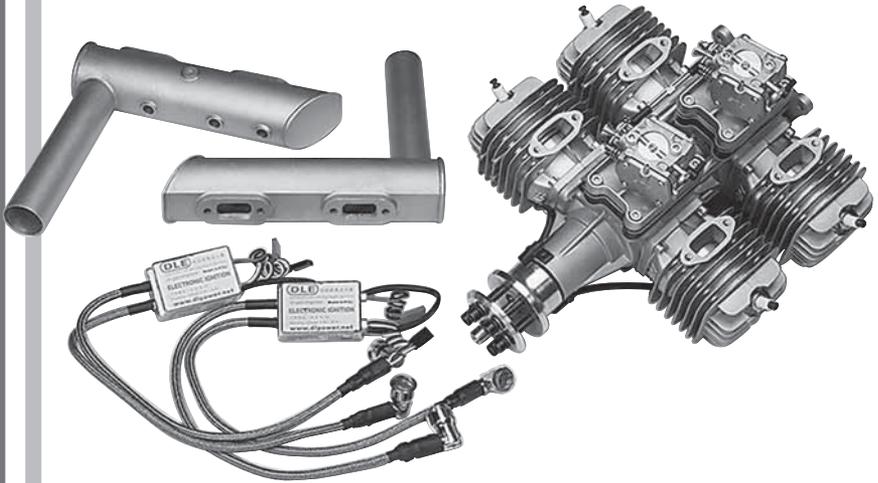


DLE-222

Operator's Manual



Specifications

Displacement: 222 cc [13.5 cu. in.]

Performance: 21.5 HP / 7,500 RPM

Idle speed: 1,000 RPM

Ignition Style: Dual Electronic Ignitions

Recommended Propellers: 32 × 10, 32 × 12, 34 × 10

Spark Plug Type: CM6

(Gap) 0.018 in. – 0.020 in. [0.45 mm – 0.51 mm]

Diameter x Stroke: 1.77 in. [45 mm] × 1.38 in. [35 mm]

Compression Ratio: 7.6:1

Carburetor: (2) DLE with Manual Choke

Weight: Main Engine – 10.91 lbs [4,950 g]

Mufflers (2) – 14.2 oz [402g]

Electronic Ignitions – (2) 13.8 oz [391g]

Engine Mount Standoffs – (4) 1.9 oz [54g]

Fuel: 87–93 Octane Gasoline with a 30:1
gas/2-stroke (2-cycle) oil mixture

DLETM

Parts List



- (1) DLE-222cc Gas Engine with (2) DLE carburetors
- (4) CM6 Spark plugs
- (2) Mufflers with (4) gaskets
- (8) 5×20 mm SHCS (muffler mounting)
- (2) Electronic Ignition Modules with additional tachometer lead
- (4) 25mm Engine Mounting Standoffs
- (8) 6×55 mm SHCS with 6mm lock washers & 6mm flat washers (propeller mounting)
- (2) Silicone Pick-up Wire Cover / Ignition Wire Cover
- (2) Red Three Pin Connector Lead with Pig Tail (ignition kill switches)
- (4) Three Pin Connector Securing Clips
- (1) DLE-222 Decal Set
- (2) Brass Pressure Fittings (smoke system use/not included)

Safety Tips and Warnings

- This engine is not a toy. Please place your safety and the safety of others paramount while operating. DLE will not be held responsible for any safety issues or accidents involving this engine.
- Operate the engine in a properly ventilated area.
- Before starting the engine, please make sure all components including the propeller and the engine mount are secure and tight. It is strongly recommended that a screw sealant is used (Great Planes Threadlocker GPMR6060) during engine installation.
- During the break-in period, it is recommended that the engine be installed on the aircraft or a test stand with an appropriate shock

absorber. Otherwise it is probable that vibration could rebound back to the engine and serious damages may occur during the break-in period.

- For your safety and the safety of others, please do not stand in front or in line with the propeller when the engine is running. Keep onlookers away from the running engine, especially small children.
- Always use a balanced spinner and a balanced propeller. An unbalanced spinner and propeller combination will cause high levels of vibration and may cause the propeller shaft to break. Always use a lightweight spinner on your engine. Lightweight spinners are considered to be those with a cone wall of 1mm or less. Heavy spinners could cause the propeller shaft to break. Securely tighten the spinner and propeller on the engine to prevent them from being thrown off the engine while running.
- Never use a propeller that has hit the ground. Even though it may look good from the outside, it may be cracked on the inside which may cause it to disintegrate while in use. Do not use a nicked, cracked or split propeller.
- Keep foreign objects away from the propeller. Make sure that nothing can be “sucked in” by the propeller.
- Never start the engine on loose gravel or sand.
- Do not attempt to stop the engine by throwing anything into the path of the propeller.
- Make sure the fuel line is well-secured to the engine and to the fuel tank so that it won't come off in flight.
- Do not use silicone fuel line because it will be dissolved by the fuel. Use gasoline approved rubber fuel line. Always secure the fuel line away from the cylinder head. The engine's heat can damage the fuel line.
- Never touch the engine immediately after a run. The engine will be hot.
- Before transporting your model, remove all the fuel from the fuel tank and fuel lines.
- Always use high-quality oil intended for 2-stroke (2-cycle) engines. It's a good idea to use a petroleum-based 2-cycle motor oil like Lawn Boy All Season - Ashless, Generation II oil for the break-in period. Break-in should be considered about the first 3-5 gallons you run in the engine. A high quality synthetic 2-cycle oil is recommended for optimum performance and a longer engine life. Synthetic 2-cycle oils leave fewer combustion byproducts than natural oils, which can foul the engine and exhaust ports, resulting in reduced performance. Synthetic oils also better reduce friction and provide more fluidity at low temperatures.

- For optimum performance please use fresh or recently purchased 93 octane gasoline (87 octane gasoline will suffice) with a 30:1 gas/oil mixture.

GAS/OIL Mixing Guide

1 Gallon Gasoline(128 fl oz/3.78L)/2-Cycle
Oil(4.26floz/125.68ml)=30:1 ratio

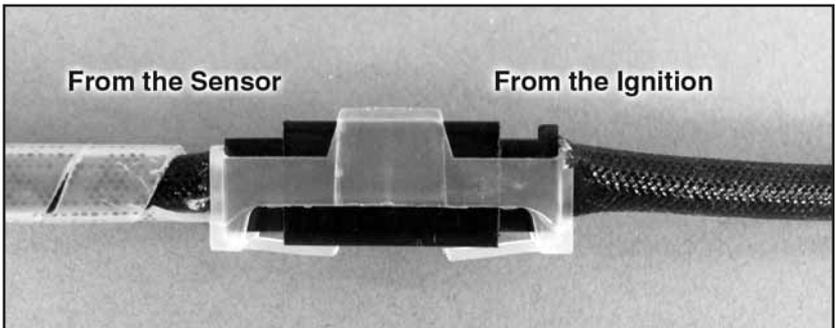
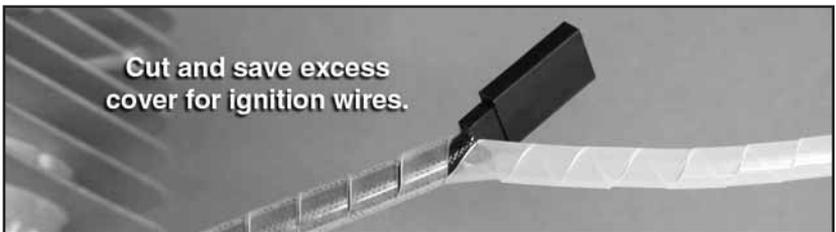
- Always install ignition system kill switches on the aircraft used.
- Do not install your throttle servo or kill switch servo inside the engine compartment. Doing so could cause radio interference. Install all electronic radio devices at least 12" [305mm] away from the engine.
- The throttle and choke pushrods should be non-metallic.
- If the engine is not to be used for more than a month, drain the fuel tank and remove any fuel from inside the carburetors. Do this by running the engine at idle until it quits by running out of fuel. Keeping gasoline inside the carburetors over an extended period of time will damage the diaphragm valve and clog passages inside the carburetors. Due to the carburetors being more complicated than those used in glow engines, keep the fuel clean by using an on-board fuel filter. Use a filter intended to be used with gasoline engines. Metal filters intended for glow engine are too coarse and will not screen out finer particles.
- Always filter your fuel by using an appropriate filter before putting it into the airplane's fuel tank.
- Gasoline is extremely flammable. Keep it away from an open flame, excessive heat or sources of sparks.
- Do not smoke near the engine or the fuel tank.
- This engine was designed for use in a model aircraft. Do not attempt to use it for any other purpose.
- **Caution:** Running the engine with a lean gas mixture will cause the engine to overheat and burn the electrode of the spark plug. Pay close attention to the High-speed Needle adjustment. Running the engine with the proper gas mixture will cause the spark plugs to appear slightly yellow at the ignition point.
- Excessive running of the engine at idle speed can result in seriously carbonized spark plugs.
- Keep the surface of the engine clean to ensure proper heat dissipation. Ensure proper cooling/ventilation around both cylinders with adequate air exhaust.

- To avoid permanent damage to the electronic ignition systems, **NEVER** rotate the propeller on your DLE engine with either of the electronic ignition systems switched on and the plugs not installed in the plug caps.
- If you elect to not use a smoke system with your engine and aircraft, the two included brass fittings must be installed in the muffler and then obstructed to prevent exhaust from leaking into the cowling. To do this use two short segments of neoprene fuel line and two (GPMQ4166) fuel-line plugs (not included).

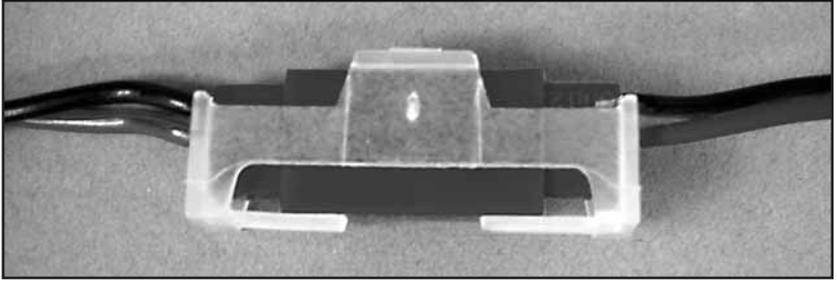
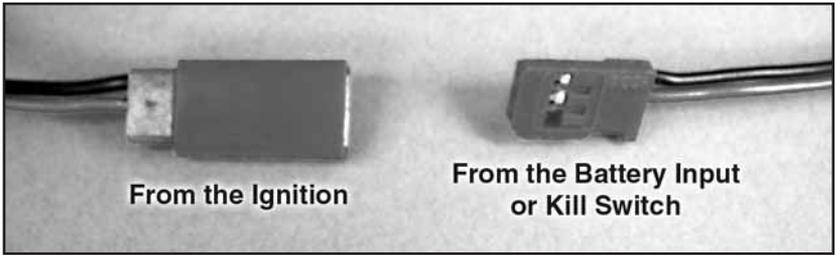
Installation Instructions

Prepare the Engine for Installation

1. Check to see that all screws and bolts are tight. Check carefully for any cracks, broken or missing parts. Tighten or replace any damaged or missing parts before proceeding.



2. Install the silicone wire covers over the ignition pick up sensor leads coming from the engine (cut the excess silicon wire covers) and connect the leads to the pick up sensor leads from the Electronic Ignition Modules. Secure the connections with the included three pin connector securing clips.



3. Connect the ignition kill switch leads to the red connector from the ignition control module using the lead from the kill switch or with the included three pin connector with pig tail. Use the included three pin securing clips to secure the connections.

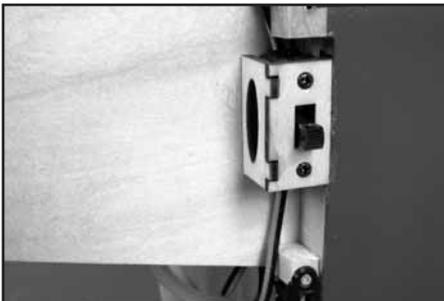
4. Connect the ignition module batteries to the kill switches. Any two 4.8-6.0V, 1000mAh and above capacity batteries will work well for this. Use heat shrink tubing to secure this connection.



5. Install the silicone ignition wire covers over the ignition wires.

6. Install the spark plugs into the engine cylinders (7-8lbs Torque).

7. Use the following pictures and diagrams to install the Electronic Ignition Modules to the engine.

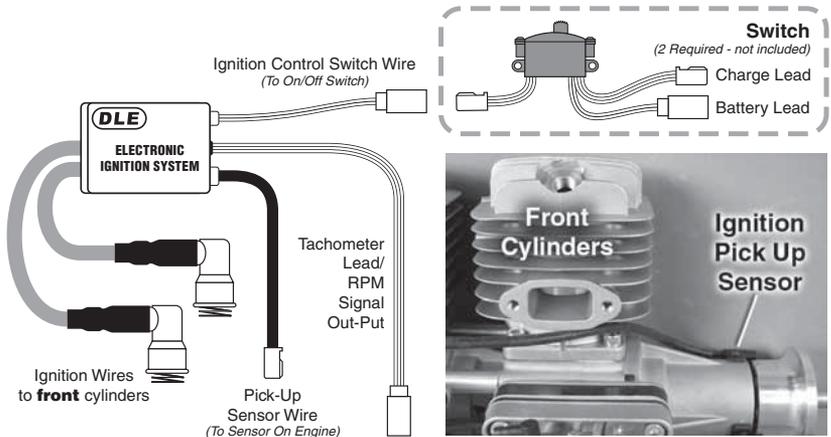


8. Install both ignition kill switches on the aircraft so that they are easily accessible from the outside of the plane.

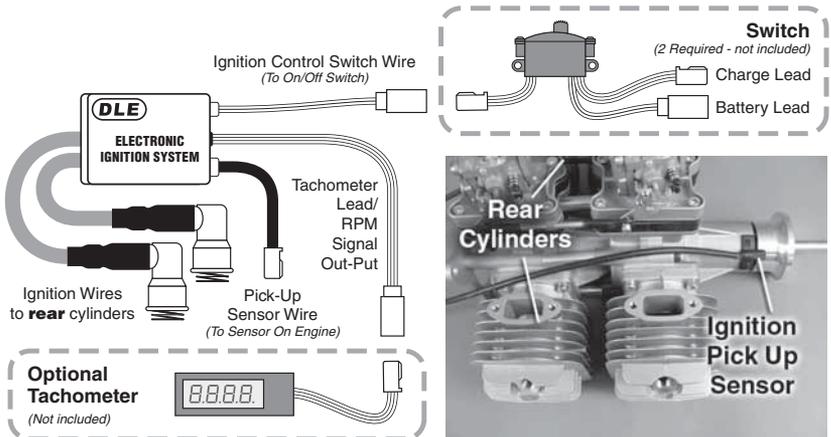
9. Install the ignition modules securely in the airplane forward area. It is recommended that a thin piece of foam rubber is placed

between the modules and the mounting surfaces and that Velcro® is used to hold the modules in place.

10. Secure all connections with heat shrink tubing (not included).



The Ignition Pick-Up Sensor Wire labeled in this picture of the engine corresponds to the **front** cylinders. Connect the Ignition Pick-Up Sensor Wire to the EIS that will control the ignition of the spark plugs installed in the **front** cylinders.



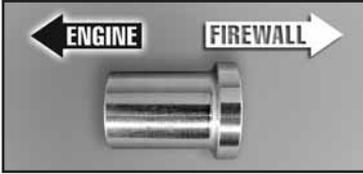
The Ignition Pick-Up Sensor Wire labeled in this picture of the engine corresponds to the **rear** cylinders. Connect the Ignition Pick-Up Sensor Wire to the EIS that will control the ignition of the spark plugs installed in the **rear** cylinders.

Installing the DLE-222 on Your Airplane

Note: The DLE-222 must be installed on at least a 1/2" [12.5mm] firewall. The firewall must be securely glued to the airplane. Use triangle stock and pin the firewall with hardwood dowels to reinforce the firewall glue joints. Never install the DLE-222 onto a firewall thinner than specified because it may fail due to the power of the engine.

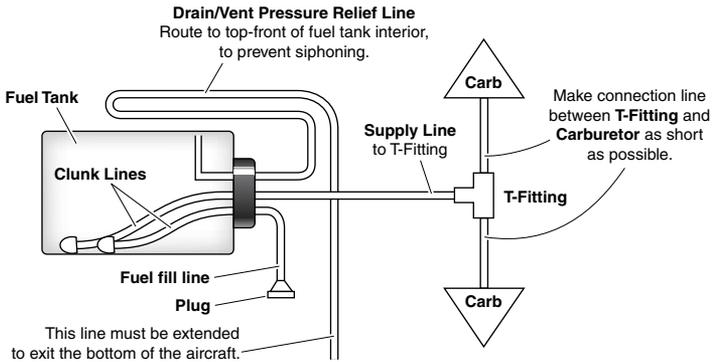
Note: The distance from the firewall to the propeller washer is 11" [280 mm].

1. Use the supplied template (on page 19) to drill the engine mounting bolt holes.



Note: The mounting hardware mentioned in step 2 is not included with the DLE-222.

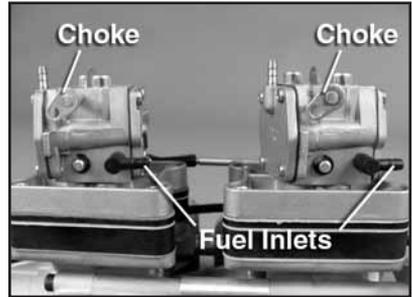
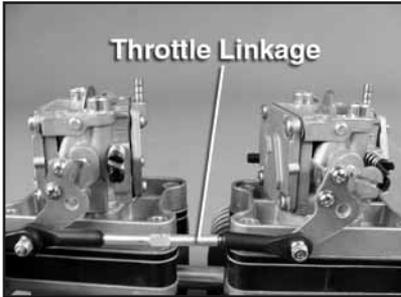
2. Install the engine to the firewall using (4) 6 × 65mm SHCS with 6mm lock washers and 6mm flat washers or (4) 1/4"-20 × 2-1/2" SHCS with 1/4" lock washers and 1/4" flat washers. Hex head bolts will suffice for the cap screws. Place them through the engine mounting flanges and the included standoffs. On the opposite side of the firewall (non engine side), use (4) 1/4" × 1" fender washers with 6mm lock nuts or 1/4"-20 lock nuts. Apply some threadlocking compound, such as Great Planes® Pro™ Threadlocker (GPMR6060), on the bolts where the threads enter the lock nuts.



3. Install the fuel tank in the airframe. Use only gasoline-safe fuel tank and lines and a gasoline safe stopper. The recommended minimum inner diameter for fuel tubing is 5/32" [4mm]. One line should go to the carburetors via a gasoline approved T-fitting and the other is to be used as a vent (a vent line is simply an open ended fuel line from the fuel tank which exits the engine compartment or the fuselage; most vent lines exit at the bottom of the firewall). Installing a third line is the cleanest and easiest way to add fuel. Be sure to use a filler

plug on the fill line. It's a good idea to add an extension to the vent line as shown, that goes up and to the rear of the tank. This helps to avoid draining fuel from the tank when the model is pointed down.

4. Install the throttle servo at least 12" [305mm] away from the engine. Make sure that you get both carburetor's full range of rotation with your servo travel. Be sure to use a non-metallic linkage with the included 6-32 link. A high-torque heavy duty metal gear servo is recommended to operate the throttle on the DLE-222.



5. Control of the chokes will be necessary during start-up and operation. Make sure you have manual access or control of the chokes via a servo or mechanical linkage before completing installation of the DLE-222.

6. Connect the ignition wires from ignition modules to the spark plugs.

7. Install the mufflers onto the engine with the included gaskets. Tighten the four bolts on each muffler evenly to ensure a proper seal. Be sure to use thread locker and that the ignition wires do not contact the mufflers.

8. Cut all necessary clearance, carburetor adjustment, cooling, and exhaust holes in the cowl.

9. Make sure the cowl is secured to the airplane and that the spinner back plate to cowl clearance is at least 1/4" [6.3mm].

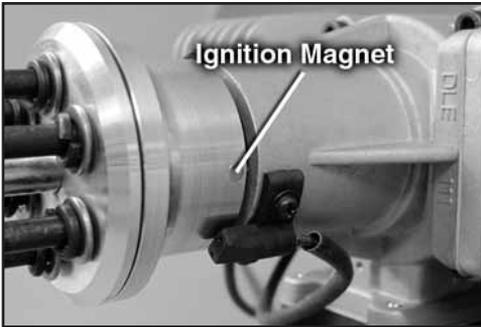
Drill and Install the Propeller

The easiest way to drill the propeller to fit the hub is to use a drill guide. If you do not have a drill guide, you can use the following method to drill your propellers. Most propellers within the recommended size range have a 0.393" [10mm] center hole pre-drilled. If your propeller has this predrilled hole, move on to step 3. If not, start with step 1.

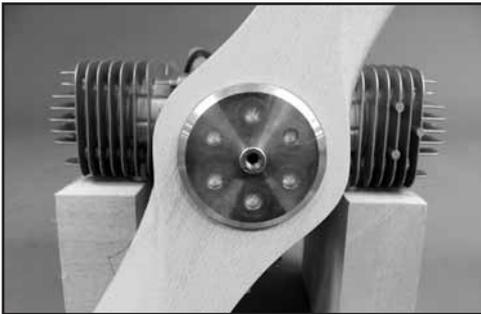
1. Remove the cowling from the aircraft. Use the included propeller washer to mark the centering hole on the propeller

2. Once the location is established, use a drill press with a 13/32" (0.406/10.31mm) drill bit. In order to achieve a clean hole opening

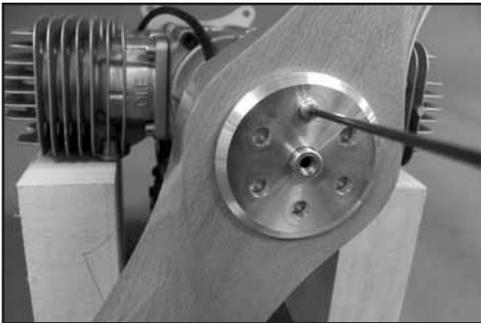
on both sides of the propeller, drill only half way through the propeller with the 13/32" (0.406/10.31mm) drill bit. Then flip the propeller over and drill completely through the hole.



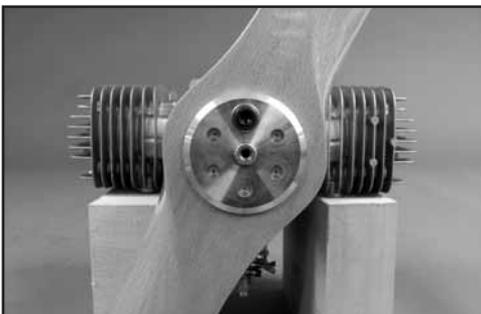
3. Next, set the engine at the beginning of the compression stroke. Note the position of the ignition magnet with engine inverted.



4. Place the propeller on the crankshaft at the one o'clock position.



5. Mark the location of one of the outer holes on the propeller. Use a GPM Dead Center Hole Locator (GPMR8130) to center and start the hole.



6. Remove the propeller from the engine and drill the outer hole on the drill press using a #35 (0.110"/ 2.81mm) drill bit as a pilot hole. Next use a 1/4" (6.28mm) drill bit to finish the hole. In order to achieve a clean finish on both sides of the propeller,

drill only half way through the propeller with the finishing drill bit. Then flip the propeller over and drill completely through the hole.

7. Use one of the 6×55mm SHCS with 6mm lock washers and flat washers to align the propeller washer on the propeller and use the Dead Center Hole Locator to mark the position of the remaining holes.

8. Drill the remaining five holes in the propeller using the same technique as step 6.

9. Mount the propeller to the engine using the 6×55mm SHCS with 6mm lock washers and flat washers. Be sure to use threadlocker.

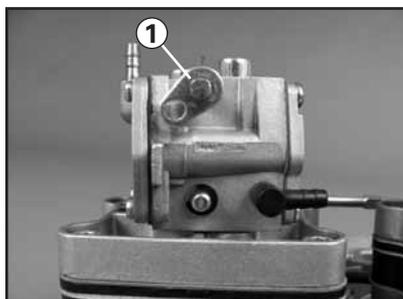
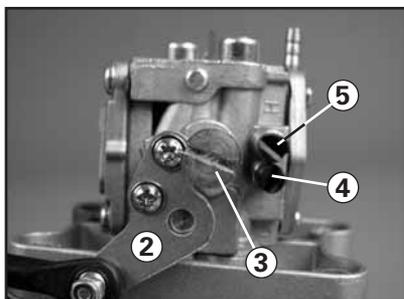
Adjustment of the Engine

Each DLE-222 has been factory preset. However, higher elevations will influence the performance of the carburetors. To obtain optimum output of the engine, slight adjustment of the carburetors maybe necessary.

The dual DLE carburetors on the DLE-222 have been factory synchronized. However, for best results and due to temperature differences between the front and rear cylinder sets, separate tuning adjustments to the carburetors of the DLE-222 should be done in order to achieve maximum performance and engine life. When making adjustments to one carburetor always adjust the other carburetor in the same manner. Once you are satisfied with the overall performance it is a good idea to “richen” the rear carburetor slightly because the rear cylinders tend to run a little hotter.

Engine Functions and Adjustments

1. Choke Control (the choke control should be used when the engine is cold)
2. Throttle Control
3. Idle Adjustment Screw (adjust the idle speed)
4. (L) Low-speed Needle (adjusts the fuel/air mixture at low speeds)
5. (H) High-speed Needle (adjusts the fuel/air mixture at high speeds)



Idle Adjustment

Turning the Idle Adjustment Screw (No.3) clockwise will increase the idle speed. Turning the Idle Screw counter-clockwise will decrease the idle speed.

Low Speed Needle Adjustment

Turning the Low-speed Needle (No.4) clockwise will lean the fuel/air mixture at low speeds. Turning the Low-speed Needle (No.4) counter-clockwise will richen the fuel/air mixture at low speeds. (The default or factory setting of the Low-speed Needle is as follows: turn the needle to the fully stop/closed position and then turn back 1.5 turns)

High Speed Needle Adjustment

Turning the High-speed Needle (No.5) clockwise will lean the fuel/air mixture at high speeds. Turning the Low-speed Needle (No.5) counter-clockwise will richen the fuel/air mixture at high speeds. (The default or factory setting of the High-speed Needle is as follows: turn the needle to the fully stop/closed position and then open the needle 1.5-2 turns). It is recommended that the High-speed Needle be adjusted by the use of a tachometer to obtain maximum speed.

Smooth acceleration and deceleration is an indicator of proper engine performance.

Ignition Timing Adjustment

For most applications mount the sensor with the mounting screw centered in the slot. The ignition timing is preset on the DLE-222 at 45° before top dead center (TDC). The ignition timing can be advanced or retarded slightly by loosening the (2) ignition sensor phillips head screws and sliding the sensor to the full extent clockwise (46° advancing the ignition) or counter clockwise (44° retarding the ignition). Be sure to retighten the phillips head screws after adjusting the ignition timing.

Advancing the timing causes combustion to occur earlier resulting in higher performance of the engine. However, advancing the timing also causes higher engine temperatures and can cause premature wear of internal engine components. Due to the dual ignition set up on the DLE-222, it is not recommended to adjust the ignition timing. Mis-calibration of the ignitions could severely damage the engine.

Carburetor Adjustment Troubleshooting

Problem:

If The engine hesitates when accelerated rapidly.

or The rpm increases at idling.

or The engine stops when the throttle is moved from high to low.

Solution:

The low-speed needle "L" is too lean. Open it up about 1/8 of a turn and try again.

Problem:

If The idle is not steady.

Solution:

The low-speed needle "L" valve is too rich. Close it 1/8 of a turn and try again.

Problem:

If Engine stops at full throttle.

or Engine hesitates when accelerated rapidly.

or The engine will not come up to full rpm at full throttle.

Solution:

The high-speed needle valve "H" is too lean. Open it up 1/8 of a turn and try again.

Problem:

If Your engine does not reach full rpm.

or Carbon build-ups appear consistently on your spark plug.

Solution:

The high-speed needle valve "H" is too rich. Close it up 1/8 turn and try again.

Starting Procedures

When starting the engine for the first time and during break-in, it's recommended that you run the engine without the cowling. Also for safety reasons do not make adjustment to the carburetors while the engine is running.

There are two recommended ways to start the DLE-222.

A. Manual Starting

Note: When hand starting the DLE-222, use a thick glove or heavy duty starter stick to protect your hand.

1. The propeller should be installed on the drive washer at the one o'clock position and at the beginning of the compression stroke so that it's comfortable to flip it through compression.
2. Have someone help you hold the airplane while you start the engine.
3. Close the chokes on the carburetors and open the throttles slightly from the idle position.

4. Switch the ignition switch to ON.
5. Flip the propeller counter clockwise several times briskly, until a popping sound is heard. This indicates that the engine is firing.
6. Move the choke levers to the OPEN position.
7. Set the throttle to a high idle. Set the propeller so that it is at the beginning of the compression stroke.
8. Flip the propeller through compression rapidly. If this is done properly, the engine will start after several brisk flips of the prop.
9. After starting, let the engine idle for 30 to 45 seconds. Open and close the throttle slowly until the engine runs smoothly at idle and at full throttle. Acceleration should also be smooth. If acceleration is not smooth, adjustments to the carburetor may be necessary (see Adjustments of the Engine pages 11-13).
10. If your engine does not start, repeat steps 2-10.

B. Electric Starter Starting

A 24V electric starter is recommended to start the DLE-222.

1. Make sure you use a good quality, lightweight aluminum spinner.
2. Have someone help you hold the airplane while you start it.
3. Close the chokes on the carburetors and open the throttle slightly from the idle position.
4. Switch the ignitions to ON and use the electric starter to turn the engine through compression until a popping sound is heard. This indicates that the engine is firing.
5. Open the chokes.
6. Set the throttle to high idle and use your electric starter to turn over the engine until it starts.
7. After starting, let the engine idle for 30 to 45 seconds. Open and close the throttle slowly until the engine runs smoothly at idle and at full throttle. Acceleration should also be smooth. If acceleration is not smooth, adjustments to the carburetor may be necessary (see Adjustments of the Engine on pages 11-13).
8. If your engine does not start, repeat steps 2-7.

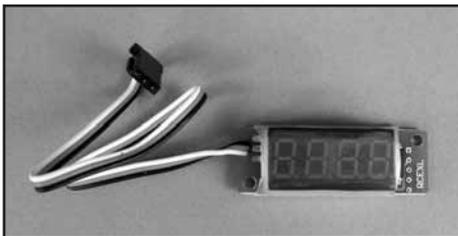
Engine Troubleshooting

If your engine fails to start after the preceding starting procedures please check the following.

Symptom	Diagnosis	Fix
Engine does not fire	Ignition battery voltage low	Charge or replace battery
	Battery wires faulty or loose	Replace wires or Re-connect/check connections
	Faulty spark plug or not firing	Replace spark plug or check for spark *
	Engine flooded	Remove plug, disconnect fuel lines, rotate prop to remove fuel
Engine starts, then rpm increases till engine cuts out	Fuel not reaching engine	Check for: a) fuel in tank b) fuel tubing cut, blocked, or kinked c) carburetor clogged

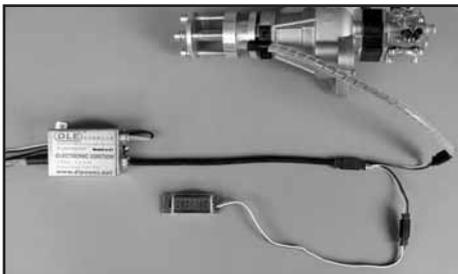
*This can be done by removing the spark plugs from the cylinders of the engine and contacting the plug on the outside of the crank case. Have an assistant turn the engine over while checking this and be sure to have the spark plug firmly plugged into the ignition wire. **Warning:** The high voltage from the ignitions can cause bodily harm, especially when checking for spark in this manner.

Optional Digital Tachometer (not included)



An optional digital tachometer is available that can be directly connected to the ignition and display the RPMs of the engine. This unit can be installed on the aircraft or used to spot check the Engine RPMs. Do not install

or uninstall the Digital Tachometer while the engine is running.



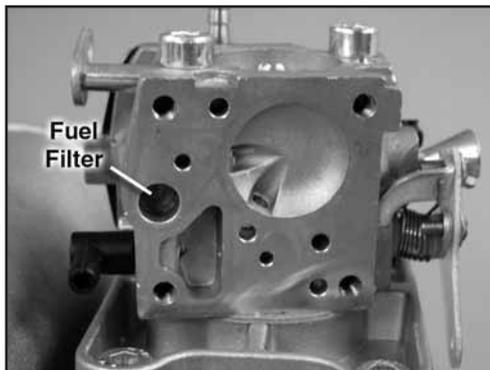
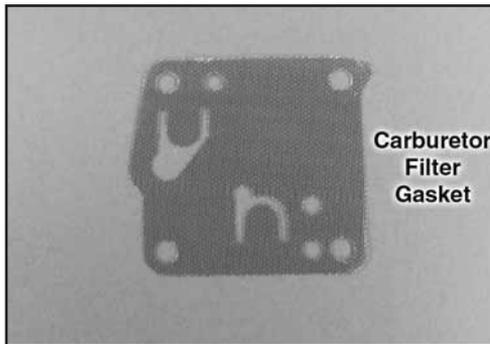
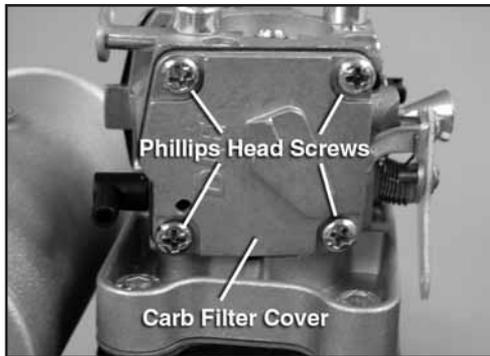
Many of the DLE Ignition modules have an additional lead to plug into the optional tachometer. If your ignition module does not have this additional lead, the digital tachometer can still be used. Simply use the Y-harness (included with the Digital

Tachometer) to connect to the pick-up lead from the engine. Be

sure to secure all connections and to secure the Digital Tachometer or leads on the aircraft used.

Engine Maintenance

Please clean the fuel filters in the DLE Carburetors periodically. Failure to do so may result in miss-calibration of the needle adjustments. In order to do this it is necessary to remove the Phillips head screw which secures the carburetor filter cover and the carburetor filter gasket. Use only carburetor cleaner to spray around the opening of the filter.





Warranty Information

The DLE-222 has a two year limited warranty through Hobby Services beginning at date of purchase. Please retain your receipt as your proof of purchase.

Contact Us

Hobby Services

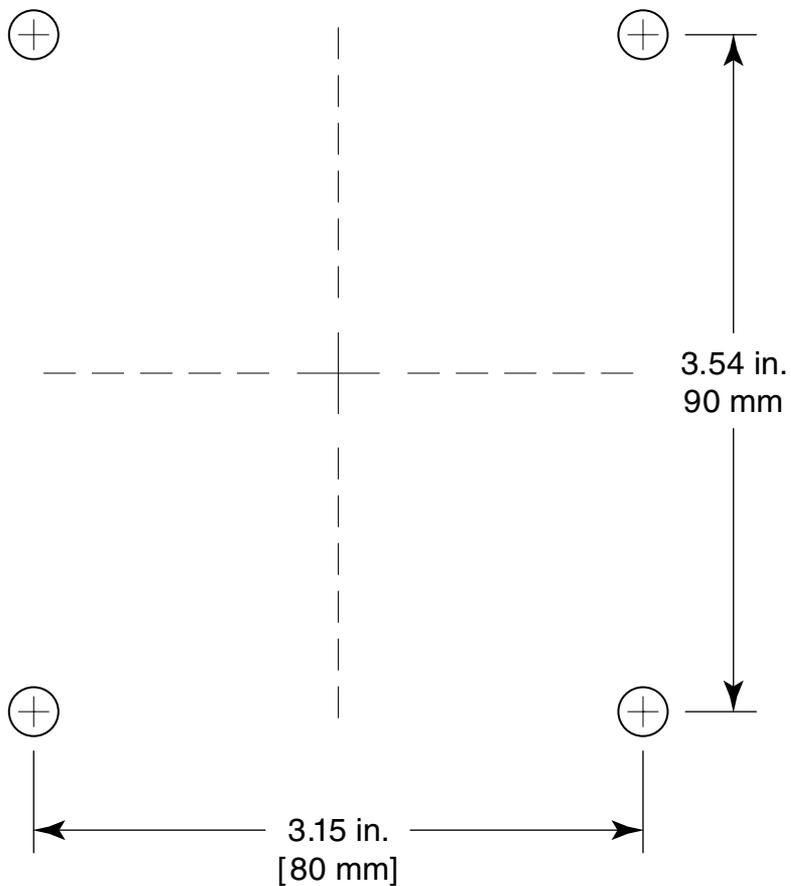
3002 N. Apollo Drive Suite #1
Champaign, IL 61822

Tel: 217-398-8970

Fax: 217-398-7721

E-mail: www.enginesupport@Hobbico.com

DLE-222 Mounting Pattern





DLETM