Aviation Service Manual AV6-R

Spark Plugs/Oil Filters

$3.00

CHAMPION
AEROSPACE

Revised November 2004

Bringing Power To Flight®

Purpose

This service manual presents recommended service, handling and reconditioning practices to assure economic, satisfactory operation from Champion Aerospace spark plugs and oil filters. Proper service and handling can help lengthen the time between replacement periods, while reducing unscheduled or emergency replacements.

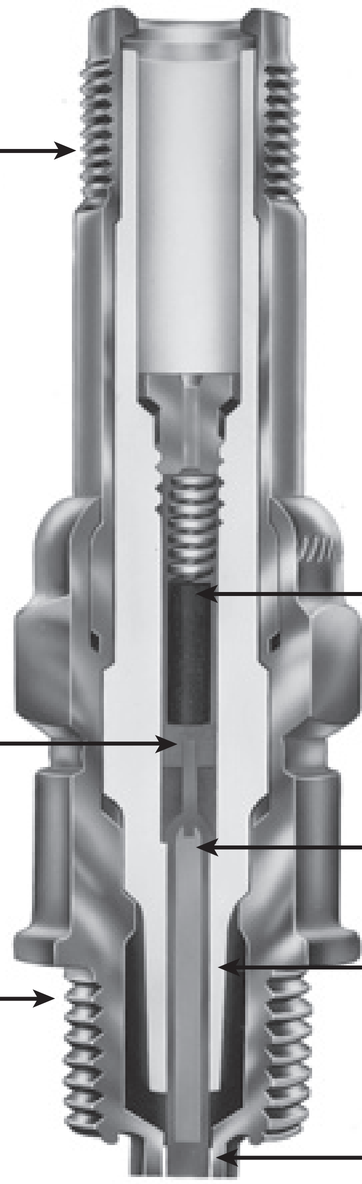
Included are ways to analyze spark plug performance through examples of adverse effects from certain engine operating conditions. You will also find application information and spark plug type selection criteria, as well as useful references to supplemental Champion publications.

FAA/PMA Approved

Champion Aerospace products are manufactured in accordance with standards established by the Federal Aviation Administration.

Spark Plugs

Product Features



Design Features

Advanced-engineered Champion Aerospace spark plugs are designed for the critical difference in performance, far beyond the ordinary. Champion spark plugs stand up to high temperatures, pressures and lead deposits, with a performance second to none. When you're up in the air, count on quality Champion spark plugs.

The # I Choice Worldwide - OEM for all U.S. Piston Engines

Champion spark plugs are a product of Champion Aerospace's commitment to quality and advanced technology, a commitment that has made Champion spark plugs the #I choice of engine manufacturers, maintenance technicians and pilots around the world.

Choose Iridium "S" spark plugs for high-performance engines.

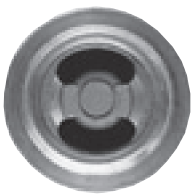
Longer-lasting than platinum spark plugs, Iridium "S" plugs resist lead attack better and provide better scavenging than standard platinum plug designs, resulting in exceptional performance, even under the most demanding conditions.

CHAMPION®
AEROSPACE

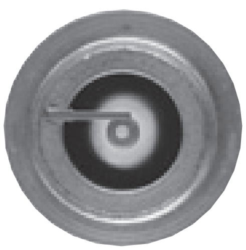
Spark Plug Type Designation System

All Champion Aerospace spark plugs are identified by type designations as indicated on the following spark plug number and symbol chart. The symbol is composed of a rating position number, together with prefix and suffix numbers to indicate major plug design characteristics.

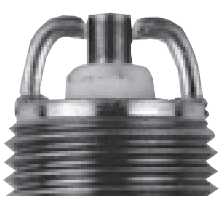
Typical Types of Electrode Construction



Two-Prong E Ground Electrodes

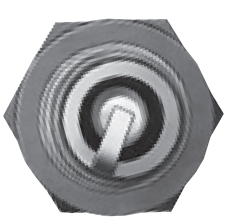


Fine Wire



Projected Core Nose

Two-Prong B Tangent to Center



Single-Ground Electrode Automotive Gap Configuration

Typical Spark Plug Number with Symbol Explanation

R H B 37 E

Resistor

None — No Resistor

R — Mil Spec.

Resistor — Erosion Protection

Electrode Design

None — Conventional Single

E — Two Electrode Massive

N — Four Electrode Massive

S — Single Electrode (Iridium)

B — Twin Electrodes

R — Push-wire - 90' to Center

Y — Projected Core Nose

Barrel Style

None — Unshielded

E —Shielded 5/8" - 24 Thread

H — Shielded 3/4" - 20 Thread (All-weather Plug)

Heat Rating Position

Low Number — Cold

High Number — Hot

Mounting Thread	Reach	Hex Size
B - 18mm	13/16" (2.06cm)	7/8" (2.22cm)
M - 18mm	1/2" (l.27cm)	7/8" (2.22cm)
J - 14mm	3/8" (.095cm)	13/16" (2.06cm)
L - 14mm	1/2" (l.27cm)	13/16" (2.06cm)
U - 18mm	1-1/8" (2.85cm)	7/8" (2.22cm)
N - 14mm	3/4" (1.90cm)	13/16" (2.06cm)

Operating Period

The useful operating life of a spark plug varies greatly with operating conditions, engine models, ignition systems and spark plug types. Scheduled service intervals should be established by the individual operator.

It is normally recommended that spark plug gaps and deposit conditions be checked at 50-hour intervals. In addition, removal time specifications are usually available from the engine manufacturer and may be supplemented by past experience with a particular engine model.

Checking spark plug gaps and deposits at appropriate regular intervals is crucial to preventing engine misfires. Since plug deterioration can vary with operating conditions, the operating period could increase somewhat or be sharply reduced, depending on manufacturer gap width recommendations, increased voltage needed to fire the gap or deterioration of magneto components and ignition harness.

Selection Criteria

Champion Aerospace spark plugs are manufactured within all military and commercial standards established for aviation spark plugs. All plug types are designed to meet specific engine and aircraft requirements for thread size, reach , heat rating, shielding and terminal connectors.
The following Champion application catalog and charts display in red print the recommended spark plugs by aircraft and engine model for the most satisfactory service.

- Champion aviation catalog AV-12
- Champion pocket size catalog AV-14
- Champion wall chart AV-33

Reach

The reach of a spark plug is the distance from the shell gasket seat to the end of the shell threads. A proper-reach plug ensures that the electrodes are appropriately positioned in the combustion chamber to ignite the fuel-air mixture, based on requirements of the cylinder head design.

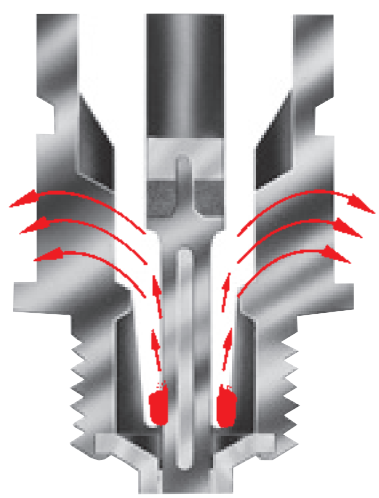
Shell threads are furnished in 14mm- and 18mm-diameter, long reach and short reach.

Thread Diameter	Long Reach	Short Reach
14mm	1/2"	3/8"
18mm	13/16"	1/2"

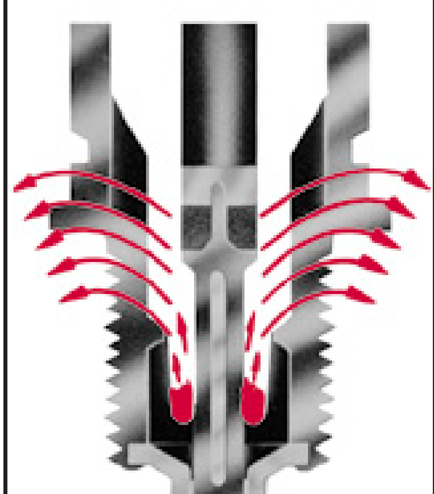
Heat Rating

The heat rating of a spark plug is the measure of its ability to transfer heat received from the combustion chamber to the cylinder and engine cooling system. The correct heat rating for the engine design ensures that the plug operates cool enough to prevent preignition but warm enough to resist accumulation of conductive, plug-fouling deposits. Champion aviation spark plugs are available in a wide range of heat ratings to meet all engine and operational requirements.

A hot-type spark plug has a longer core nose and transfers heat more slowly than a cold-type plug.



Hot Type

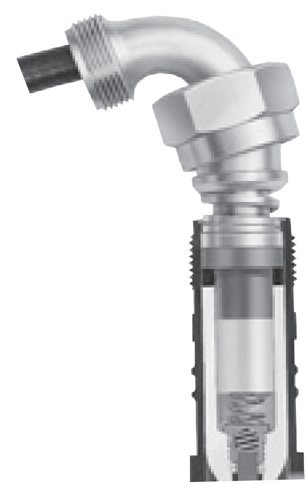


Cold Type

Shielded Terminal Designs

Shielded terminal connections are used on aviation spark plugs to prevent radio interference by the engine ignition system. The current industry standard is the all-weather 3/4"-20 spark plug, although some engine models are still equipped with 5/8"-24 spark plug connectors. We strongly recommend that these ignition harnesses be modified and updated during engine overhaul to accept the improved all-weather spark plug.

The all-weather design uses an improved terminal seal with greater terminal well insulation that prevents entry of moisture.



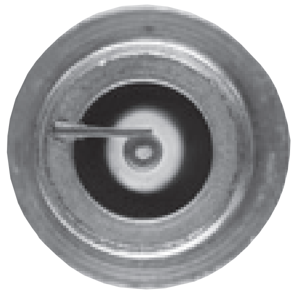
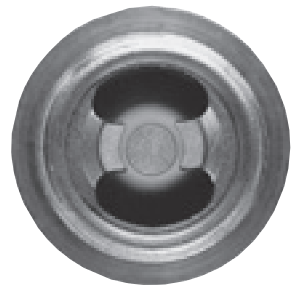
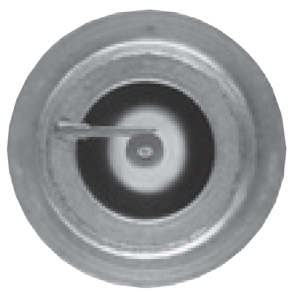
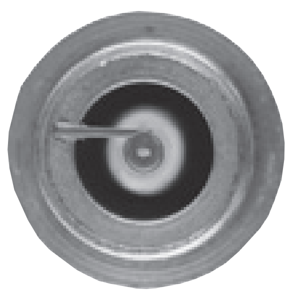
3/4"-20 All-weather Shielding Barrel with Connector

5/8"-24 Shielding Barrel with Connector

Electrode Conditions

Normal erosion of spark plug electrodes can be expected because of the constant blasting effect of the high-voltage current jumping the gaps and corrosive gases and high temperatures in the combustion chamber. However, excessive center electrode erosion is not normal, and should you observe such erosion, check carefully to determine if proper heat-rated plugs are being used. Also check whether engine timing and operating procedures conform to manufacturer's recommendations.

Electrode Wear Patterns

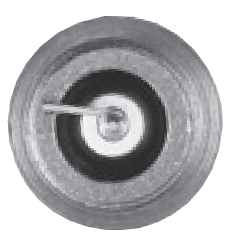
	Fine Wire Electrode	Massive Electrode
Normal Electrode Condition. ▪ Insulator tip gray, tan or light brown. ▪ Few combustion deposits. ▪ Electrodes not burned or eroded. ▪ Proper type and heat range plug for engine and service. ▪ Spark plug should be cleaned, regapped and tested before reinstallation.		
Normal Worn-Out Condition. ▪ Electrodes eroded by high-voltage sparking and by corrosive gases formed during combustion to less than 1/2 original thickness. ▪ More voltage needed to fire spark plugs - often more than ignition system can produce. ▪ Replace with new Champion aviation spark plugs.		
Severe Worn-Out Condition. ▪ Excessively eroded center and ground electrodes plus extensive necking of fine wire ground electrodes indicate abnormal engine power or plugs long overdue for replacement. ▪ Check fuel metering and magneto timing. ▪ Discard spark plugs and check heat range before installing new ones. ▪ Replace with new Champion aviation spark plugs in appropriate heat range.		

Other conditions that cause excessive electrode erosion are constant magneto-polarity firing and capacitance after-firing.

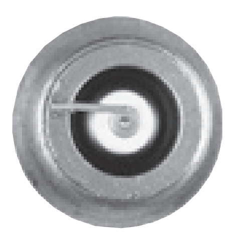
Electrode Wear Patterns

Constant polarity occurs with even-numbered cylinder magnetos. One plug fires with positive polarity, causing excessive ground-electrode wear, while the next plug fires negatively, causing excessive center-electrode wear. Capacitance after-firing wear is caused by the stored energy in the ignition-shielded lead unloading after normal-timed ignition.

Spark Plug Fired Positive
Adverse Ground-Electrode Wear



Spark Plug Fired Negative
Adverse Center-Electrode Wear

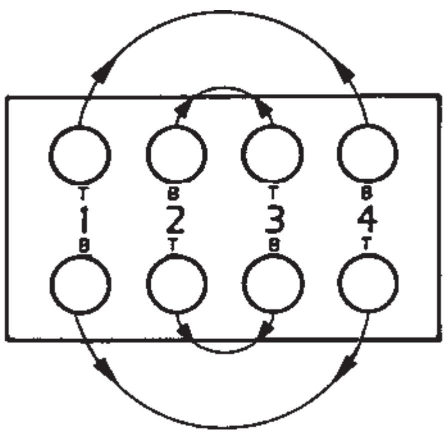


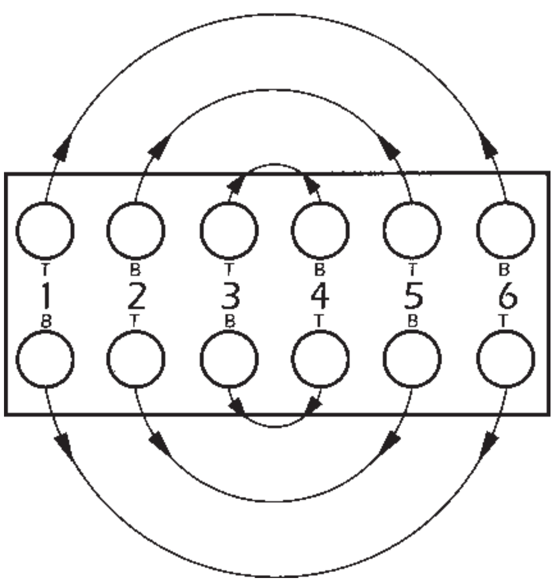
To equalize this wear, keep spark plugs in engine sets, placing them in trays identified by cylinder locations. After servicing the plugs, rotate as indicated in the following illustrations.

Electrode Conditions

Spark plug caddy layouts for four-, and six-cylinder opposed engines. Swap the long-lead spark plugs with the short-lead plugs, as shown, at each re-condition overhaul to equalize wear caused by constant polarity and high capacitance.

NOTE: Four cylinder engines equipped with single drive dual magneto fire with constant polarity, therefore, it is not necessary to rotate plugs to maintain even electrode wear. You may wish to rotate top to bottom to minimize deposit build up.





REM37BY Electrode Wear

While providing excellent protection against lead fouling, the projected core nose design on the REM37BY lends itself to an unusual wear pattern. This wear condition shown below constitute criteria for spark plug replacement.

New REM37BY

Worn REM37BY

Compare typical wear patterns to new REM37BY.

Center-electrode bottlenecking. Erosion adjacent to the ground electrode is the result of electrical erosion and chemical corrosion. Replace with new Champion aviation spark plugs.

Ground-electrode erosion. Ground electrodes eroded to knife-edge pointed condition. Replace with new Champion aviation spark plugs.

Electrode Conditions

An engine's spark plugs can reveal a lot of information about how the engine is running. Many times, examining the used spark plugs can be useful in diagnosing the cause of engine roughness or other erratic engine operating conditions. In some cases, it may be that it is simply time to change the spark plugs, but the type of wear the plugs experience could also reveal the cause of adverse cylinder-piston conditions.

When removing spark plugs from an aircraft engine, it is necessary to keep track of each spark plug's corresponding cylinder number, so you'll be able to relate any diagnosed problems back to the appropriate cylinder. Mark the cylinder number on each plug or use Champion CT-446 pre-numbered spark plug tray, placing each plug in the correct position in the tray.

Some typical adverse conditions that cause spark plug malfunctions are shown here. For more detailed illustrations, refer to the Champion check-a-plug card, Form AV-27.

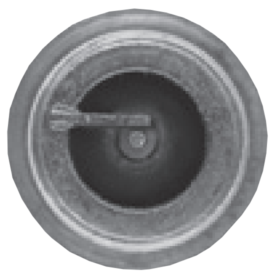
Carbon Fouling

Carbon fouling can be identified by sooty, black deposits indicating that the spark plug is operating too cold. Common causes of carbon fouling can be both fuel- and ignition-related.

Typical fuel-related causes to look for are over-rich fuel mixture, excessive idle or excessive operation at closed-throttle idle. Other causes might be improper idle mixture setting or improper (too cold) spark plug application. Ignition-related causes of carbon fouling include improper magneto timing, a failing lead or failed spark plug.

After replacing the faulty spark plugs, and as an additional aid in cleaning up any partially fouled plugs, increase engine power slowly to normal magneto-check power and hold for one minute before making the magneto check. With a satisfactory magneto check, idle the engine and check idle mixture for proper adjustment.

Fine Wire Electrode



Massive Electrode

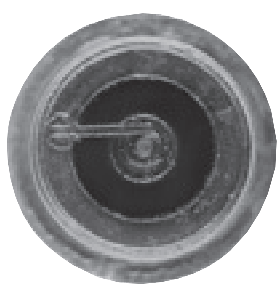
Oil Fouling

Oil fouling deposits appear as wet, black carbon deposits on the firing end. Oil fouling deposits are conductive at all temperatures and will cause plug misfiring under all power conditions.

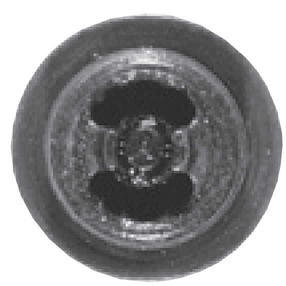
It is not uncommon to find this condition in mild form on lower plugs of some horizontal opposed engine models or in lower cylinders of radial engines. It may be caused by oil draining by the piston rings and collecting in the combustion chamber during extended engine shutdown periods. Such mild conditions can usually be cleared up by cycling the engine with slow increases of power until misfiring stops.

If the oil fouling condition is persistently repetitious and is found on both spark plugs of a cylinder, a possible adverse engine condition of faulty rings, damaged piston or worn valve guides, may be present, requiring corrective action.

Fine Wire Electrode



Massive Electrode



Lead Fouling

Under normal conditions, the lead oxybromide deposits from the tetraethyl-lead (TEL) of high-octane aviation fuels form an even, fluffy coating ranging from light tan to light brown in color. A darkening of these colors near the core tip indicates adverse temperature conditions. Mal-distribution of the TEL causes severe lead fouling, which appears as hard cinder-like globules of lead on the firing end, and in time will gradually fill the firing end cavity.

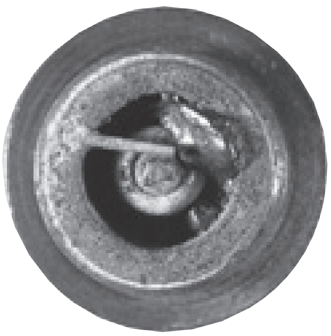
Electrode Conditions

Severely fouled spark plugs, like those shown here, will operate colder, causing misfires, and will also misfire at higher power because of the conductive nature of the deposits at elevated temperatures.

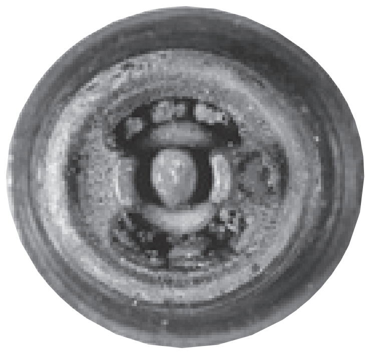
Replace the malfunctioning spark plug with a serviceable unit.

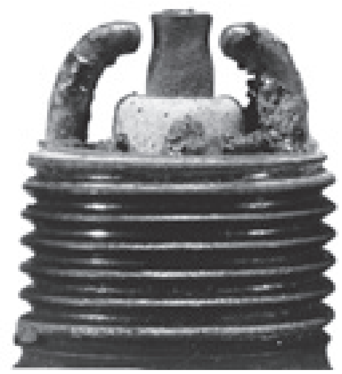
If not too severely fouled, removed spark plugs can be reconditioned for further use, but if severely fouled like these shown, they should be scrapped.

Fine Wire -Electrode



Massive Electrode





The REM37BY Extended Core Nose spark plug does not prevent the accumulation of lead deposits, but its design makes it capable of firing with severe lead deposit buildup.

Bridged Electrode Gaps

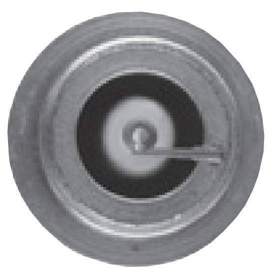
In rare circumstances, free combustion chamber deposits will lodge in, or bridge the gap, as a fused deposit, shorting out the spark plug. Such a malfunctioned plug will misfire at all powers in a manner similar to an oil-fouled plug.

To clear out small carbon particles lodged in the gap, cycle the engine with slow increases in power until the misfiring stops, as for mild oil fouling.

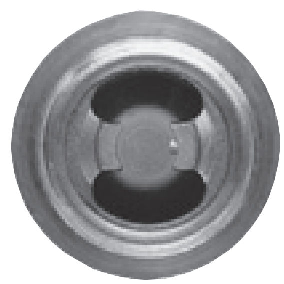
The bridged gap condition shown represents a gap bridged by a beaded lead globule. Such a condition will not clear up by engine operation and can be corrected only by replacing the malfunctioning spark plug with a serviceable unit.

Normally, the removed plug can be reconditioned for further use.

Fine Wire Electrode



Massive Electrode



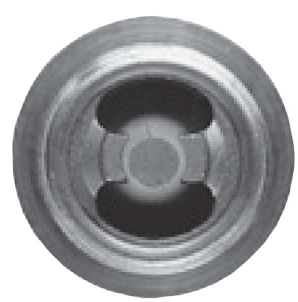
Cracked Core Nose

Normal engine operation cycles thermal shock to the core nose, and insulator materials and designs are chosen to avoid core nose cracks from such thermal shock. However, occasional abnormal engine operation will exceed even the built-in safety factors, resulting in infrequent core nose cracking.

The typical cracked core nose condition shown may be caused by improper cleaning or gapping procedures and by detonation. These conditions are discussed in detail elsewhere in this manual.

Fine Wire Electrode

Massive Electrode



Operating Data

Preignition

Preignition occurs when the combustion charge is ignited ahead of the normal, timed ignition spark. Effectively, it produces a condition of extremely advanced ignition timing. The hot spot causing this advanced timing or preignition, may be an overheated spark plug, valve head or glowing combustion chamber deposits. Preignition can cause serious damage to the engine because of the extreme increase in cylinder combustion pressures and temperatures.

The cylinder-head temperature gauge will show a rapid rise in temperature if preignition occurs in the thermocouple-connected cylinder. If it occurs in other cylinders, the only indication is engine roughness.

If you suspect that an engine has operated in preignition, remove all spark plugs and inspect for possible damage. Often, combustion chamber parts such as pistons, rings, valves and guides are damaged when an engine has been subjected to preignition. If damage has resulted, follow the engine manufacturer's recommendations for inspection, damage correction and operational protective procedures.

Detonation

Detonation occurs during normal burning of the combustion charge with an abrupt, spontaneous burning or explosion of the balance of the unburned charge ahead of the normal flame front. Detonation subjects the combustion chamber to adverse mechanical shock pressures of short duration, which do not cause an extensive rise in cylinder temperature. The effect of this mechanical shock will sometimes damage spark plug electrodes or crack the insulator core nose.

A mildly rough engine with audible knock indicates the presence of detonation. If you suspect that an engine has been experiencing detonation, remove the spark plugs for inspection as soon as possible and follow the engine manufacturer's recommendations for cause and correction.

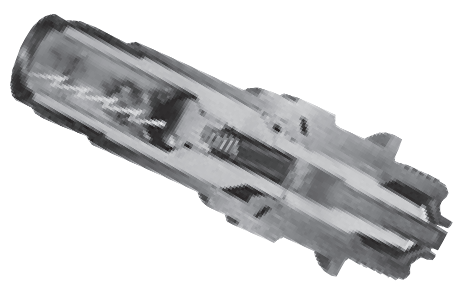
Connector Well Flashover

The connector terminal transmits the high-voltage ignition system current to the spark plug by providing a means of disconnecting, and reconnecting, the shielded spark plug from the ignition harness.

As the electrode gaps increase from normal wear, the ignition system voltages increase, placing more stress on the insulation in the connector terminal well. As the terminal well becomes dirty with moisture or other foreign matter, the insulation value of the connector continues to decrease. Eventually, flashover of the ignition current will occur when the current tracks across the widened gap, through the dirty terminal well, to ground on the shell.

In turn, flashover can cause the spark plug to misfire in an erratic manner that is difficult to isolate. If caused by moisture, the engine may be difficult to start, but the misfiring may fully or partially cease as the engine warms up. Spark plugs with dirty connector wells are likely candidates for flashover and should be replaced with serviceable units. Fully recondition and test the removed plug before reuse.

Good, preventive maintenance is the best way to guard against flashover. Clean and inspect ignition harness connector terminals and seal grommets, making certain that no moisture enters the connector well through the seal grommet. Any possibility of moisture is cause for inspection to isolate the source for potential failure of the shielding lead. Even touching the terminals with your fingers after cleaning could leave enough salt deposits from perspiration to attract moisture and lose insulation value in service.



To help avoid flashover problems, all-weather connector plugs with their superior-sealing grommet are recommended. however, they will not eliminate the need for inspection and preventive maintenance.

Some 5/8"-24 ignition systems have 1" terminal sleeves and no seal grommets. To improve flashover protection, modify such ignition systems with the 9/16" terminal sleeve and silicone rubber terminal sleeve grommet.

Improper Gaskets

Aviation spark plug gaskets are manufactured to precise dimensions and material standards, based on the effective reach of a spark plug as determined by its installed thickness. An ideal installation has the firing end flush with the combustion chamber wall, with no plug threads or cylinder bushing exposed to combustion gases. Exposed threads can become hot spots for initiating preignition.

Use and installation of proper gaskets are essential to reliable engine operation. Two gaskets or a non-standard thin gasket will expose the threads, contributing to preignition. Use of new gaskets ensures a tight, gas-sealed plug. A gas leak at the installation gasket can cause higher-than-normal operating temperatures, also contributing to the possibility of preignition.

Installation Procedures

Preinstallation

Even though electrode gaps are preset to manufacturer's specifications, it is good practice to spot-check gap settings to ensure that they have not changed during shipment or handling.

Gaskets

Always install both new and reconditioned Champion aviation spark plugs with a new copper gasket. Champion gaskets are manufactured to prevailing military and commercial aircraft standards to ensure proper seal and heat transfer. New spark plugs are packaged with a new gasket. The new gasket numbers shown are available for reconditioned spark plugs.

Gaskets
M-674
18mm Solid Copper
M-677
18mm Folded Steel
N-673
14mm Solid Copper

CAUTION: Thermocouple gaskets, when used, should be carefully removed from the spark plugs without damaging or breaking the thermocouple wire leads. Usually only one thermocouple gasket is used on an engine, and no regular gasket is required on this particular spark plug.

Anti-Seize Compound

Apply anti-seize compound sparingly to the firing end threads but never to the first thread, to prevent the material from running onto the electrodes. Anti-seize compound can cause the spark plug to misfire if it contacts the electrodes.

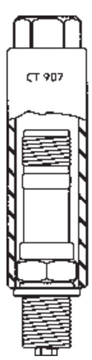
Applying anti-seize compound.

CAUTION: Never apply anti-seize compound to the terminal threads of the shielding barrel.

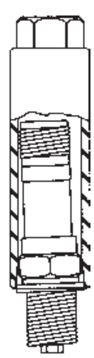
Installation

Correct Socket Tools

Use the correct tools for installing aviation spark plugs to prevent spark plug damage during installation and to ensure proper operation. Always use a six-point socket such as the Champion CT-907 to avoid damage to spark plugs. As shown, 12-point sockets can contact the terminal thread area and damage the threads. Enough side pressure exerted on the shielding barrel can crack the insulator, causing the plug to misfire.



Correct
CT-907 Socket

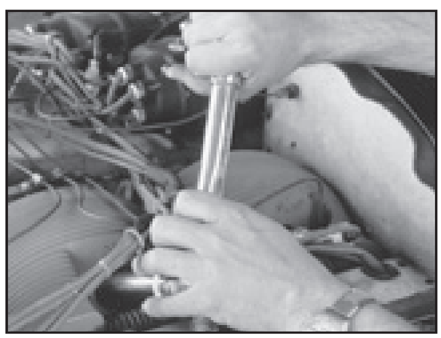


Incorrect
Socket Type

Spark Plug Installation

Always visually check the spark plugs before installing them. Check the firing end for ceramic cracks or foreign matter, and inspect the condition of the threads. **Never install a spark plug that has been dropped. Throw it out immediately.**

Install only one new gasket on the spark plug before inserting it into the cylinder head. When a thermocouple gasket is used, no other gasket is required.



Tightening spark plugs with torque handle.

Turn the spark plug by hand into the cylinder head to within one or two threads of the gasket. If this is not possible, the cylinder head threads need cleaning. Remove deposits from the cylinder head threads with a thread clean-out tool until hand tightening to one or two threads of the gasket is possible. Using the proper-size deep-socket wrench with a torque-indicating handle, tighten the spark plugs to the torque limits specified by the engine manufacturer.

Avoid over-tightening to prevent damage to the spark plug and bushing. If a torque-indicating handle is not available, use a handle no more than 10 in. long.

NOTE: 14mm spark plugs should be torqued at 20-25 ft.-lb. (240-300 in.-lb.).

CAUTION: To prevent possible internal cracks to the insulator, always support socket and wrench to ensure against putting side loads on the spark plug shielding barrel.

Engine Manufacturer	Ft.-lb.	In.-lb.
Teledyne Continental	25-30	300-360
Textron Lycoming	35	420
Pratt & Whitney Aircraft	25-30	300-360
Wright Aeronautical	35-40	420-480

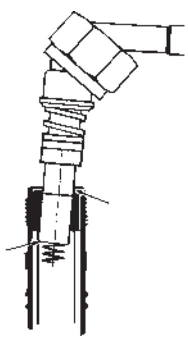
Spark Plug Connector Installation

The key to successful installation of the connector onto the spark plug is keeping everything clean and dry.

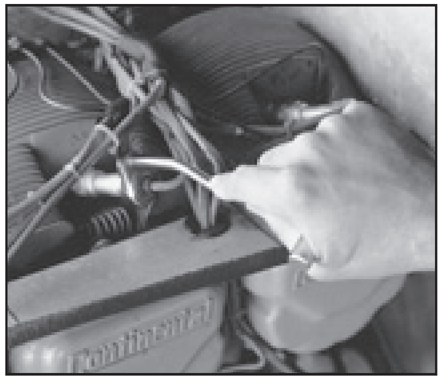
- Handle terminal sleeves only with clean, dry hands.
- Before installing the connector, wipe it with a clean, lint-free cloth moistened in methylethylketone, acetone, wood alcohol or naphtha.
- Inspect all terminal assemblies and replace those showing evidence of mechanical or electrical failure. (If Dow Corning Compound is to be used, see next section now.)
- Make certain that the inside of the spark shielding barrel is clean and dry.
- Without touching the connector or spring with the fingers, insert the assembly in a straight line with the spark plug.

Installation Procedures

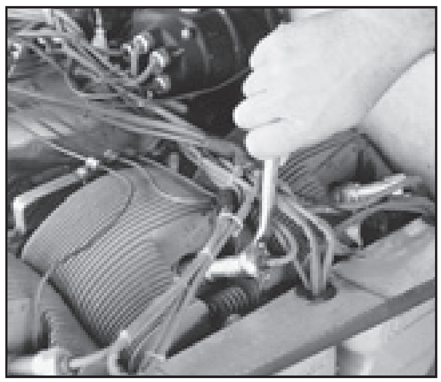
- Screw the connector nut into place until finger-tight.
- Tighten an additional 1/8 turn with the proper wrench, as shown. **Damaged threads or cracked shielding barrels may result if the connector nuts are over-tightened.**
- If an open-end wrench is used, avoid excessive side load while tightening.
- Where an unshielded ignition system is used, inspect the cable connector for cleanliness and good mechanical condition. Then wipe the exposed insulator with a clean, dry cloth before attaching the terminal to the spark plug.
- Check the security of the connector with a light pull; use safety wire if required.



Connectors and spark plugs can be damaged by careless installation.



Using Leadmaster T-Handle wrench.

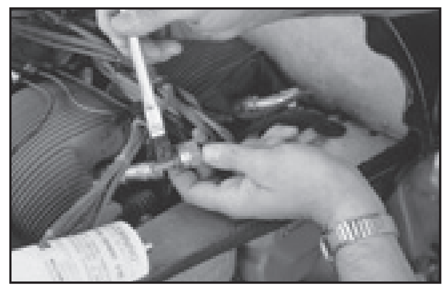


Using Leadmaster straight-handle wrench.

Proper application is essential to normal spark plug life. It is unlikely that a Champion Aviation harness will ever require a lubricant for installation.

A clean dry connection is strongly recommended. For the technician who insists on using a lube, we have found that Dow Corning DC 3452 Compound only can be used with 5/8"-24 spark plugs. Apply a thin coating with a clean brush or cloth to the **clean** connector. Remove any compound from the shielding barrel threads to ensure an adequate electrical bond between the spark plug and the shielded lead.

Do not apply DC3452Compound with the fingers and do not place any quantity of compound in the spark plug barrel.



CAUTION: DC 3452 Compound may be used on silicone connector materials as well as on neoprene.

Removal Procedures

Shielded Terminal Connectors

To remove shielded terminal connectors, loosen the elbow nut with the appropriate size crow foot or open-end wrench. Pull out terminal sleeve assemblies in a straight line to avoid damaging either the wire, terminal sleeve or barrel insulator.

Unshielded Terminal Connectors

To remove unshielded terminal connectors, carefully pull them off the spark plug terminal. If the ignition cable connectors are safety-wired to the plug terminal, cut the safety wire before removal.

Spark Plug Handling

Loosen spark plugs with the proper size deep-socket wrench by seating the socket securely on the spark plug hex. Do not cock the wrench, because damage to the insulator or connector threads could result. **Do not use an impact wrench.**

See the chart on page 11 for wrench sizes required to remove Champion aviation spark plugs. Always use a six-point socket, such as Champion CT-907 aviation spark plug socket, to avoid damage to spark plug.

Place removed spark plugs in spark plug trays to make handling easier and to minimize danger of damaging electrodes, threads and insulators. Be sure to remove the gasket with each spark plug. It is good practice to remove spark plugs in pairs from each cylinder and to place them in the tray by cylinder number. This pre-numbering system will simplify trouble-shooting should one or more spark plugs in a set be noticeably different in firing end appearance.

Removing Terminal in a Straight Line

Removing Spark Plug

Champion CT-446 spark plug tray.

Reconditioning Service

Successful reconditioning service of aviation spark plugs results in a spark plug possessing the following characteristics.

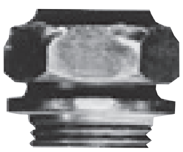
- Firing and terminal barrel ends with the cleanliness equivalent of a new spark plug.
- Mechanically sound.
- Sufficient electrode material for an additional service period. **Discard any plug with electrodes worn beyond half their original thickness.**
- Satisfactory electrode contours.
- Properly gapped electrodes.
- Electrically sound, based on passing prescribed tests.
- Properly stored and handled.

Tools

Satisfactory reconditioning of spark plugs can be accomplished only with proper and adequate tools. Champion offers a complete line of required equipment for this work. See the Champion aviation products catalog for details.

Preliminary Visual Inspection

Preliminary inspection of all spark plugs should be made before servicing to eliminate those obviously unfit for further service. Discard all spark plugs with any of the following defects.

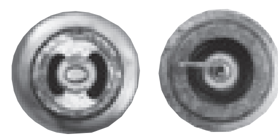


Shell hex mutilated.

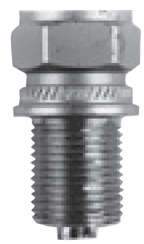
Ceramic in the firing end or shielding barrel chipped or cracked.

Connector seat and/or threads at top of shielding barrel badly nicked or corroded. Terminal barrel sleeve cracked.

Terminals on unshielded spark plugs badly worn., burred or damaged.



Electrodes too badly worn to permit satisfactory regapping.



Threads on shell badly nicked, damaged or corroded

Degreasing

The recommended method of degreasing spark plugs is the solvent method, using synthetic or petroleum solvents such as Stoddard Solvent or Varsol. **Do not use carbon tetrachloride. Do not soak spark plugs in solvent and keep solvent out of the shielding barrel.**

CAUTION: After degreasing, dry all plugs with an air blast. Any oil or solvent present in the firing end or connector well of the spark plug will cause packing of abrasive between the shell and the insulator during abrasive blasting.

Cleaning the Firing End

Model 2600A Vibrator/Cleaner

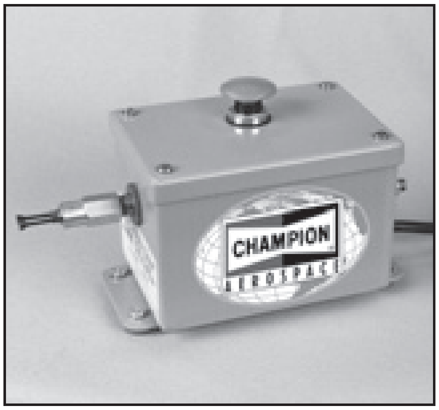
The Champion Model 2600A vibrator/cleaner for aviation spark plugs is specifically designed to remove heavy lead deposits which are difficult or impossible to remove from the firing end of the fine wire and massive electrode plugs with standard abrasive blast cleaning.

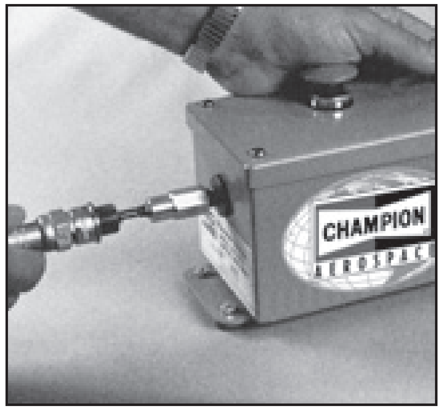
Each Model 2600A vibrator/cleaner comes equipped with accessories for cleaning fine-wire and two-electrode plugs.

Operating Instructions

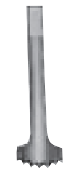
- Install proper cutter head and align firing end of plug. Move the cutter blades past the ground electrodes into the firing end cavity. To allow the cutter blades to pass freely between the ground electrodes, one or more may require finger-bending adjustment.
- With moderate pressure, hold the plug in line with the cutter blades. Firmly depress the cleaner switch with the other hand.
- Lightly work the plug against the cutter blade with a right-left rotating motion. The vibrating action will release the loosened lead deposits through the firing end of the plug. Do not force the plug against the cutter – fastest cleaning is accomplished with the blades picking at the deposit surface.
- After the deposits are removed, use an abrasive cleaner to complete the cleaning process and ensure that all conductive material has been removed from the ceramic insulator.

Reconditioning Service





CT-435A



CT-435F

CT-435A Assembly
Fine-Wire and Two-Electrode

CT-435F
Replacement Cutter Blades. Fine quality, steel cutter blades are available for Model 2600A under Champion Part No. CT-435F.

CAUTION: If you are cleaning a large number of spark plugs in a small restricted area, wear a mask to prevent inhaling abrasive dust.

Cleaning the Firing End (cont'd)

Model CT-475AV Cleaner/Tester

Cleaning firing end with model CT-475AV Cleaner/Tester.

The CT-475AV requires P/N 91893 Abrasive Compound, 15-ounce size.

- Select the proper size rubber adapter and secure in place with the hold-down cap.
- Insert spark plug into the rubber adapter and press red button labeled Abrasive Blast. Wobble the top of the plug in a complete circle for three to five seconds.
- Continue wobbling action and press black button labeled Air Blast to remove abrasive particles from the spark plug firing end.
- Remove and inspect the spark plug. If cleaning is incomplete, repeat the cleaning cycle.

Cleaning the Barrel End

Model CT-475AV Cleaner/Tester

Cleaning barrel end with Model CT-475AV Cleaner/Tester

- Insert the barrel end approximately half the length into the rubber adapter and press red button labeled Abrasive Blast. Rotate the plug for three to five seconds.
- Pull the spark plug up until barrel threads rest against the rubber adapter. Continue rotating action and press the black button labeled Air Blast to remove abrasive particles from the barrel end.
- Remove and inspect the spark plug. If cleaning is incomplete, repeat the cleaning cycle.
- **Do not attempt to remove terminal contact screws.**

Cleaning Terminal Well

Solvent Method

Clean shielding barrel insulators with a cotton or felt swab saturated with Stoddard Solvent, wood alcohol or methylethylketone. **Do not use carbon tetrachloride.** Swabs should be approximately 5/8" x 1" x 3/16" in size and should project slightly beyond the end of a slotted holder to safely clean the terminal contact. **Do not use a metal brush for cleaning.**

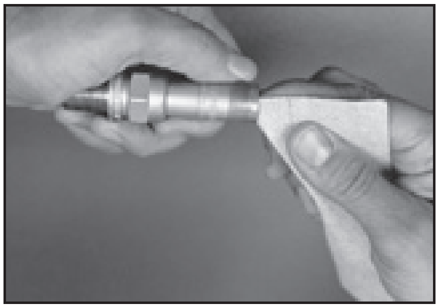
Other Methods

If solvent alone does not remove stains from the barrel insulator, you may use abrasives such as Kennecott Corporation's Aloxite (325 mesh sieve fineness), Bon Ami or finely powdered flint.

- Dip the swab in the solvent and then in the abrasive. Scrub the barrel insulator with a twisting motion long enough to remove the stains.
- Wet a second swab with solvent only and clean out all residue. Then blow out the shielding barrel.

Reconditioning Service

Cleaning Connector Seats



Connector seats may be cleaned with fine-grained garnet or sand paper.

Clean the connector seat located at the top of the shielding barrel to ensure a satisfactory seal and shield bond when the ignition lead is installed.

- If solvent alone does not remove dirt and rust from this chamfered surface, use fine-grained garnet or sand paper. **Do not use emery paper.**
- Hold the spark plug in a partially inverted position to prevent abrasive particles from entering the shielding well.
- After cleaning, thoroughly blow out the shielding barrel with an air blast. Examine the shielding barrel for cracks and discard those plugs showing evidence of damage.

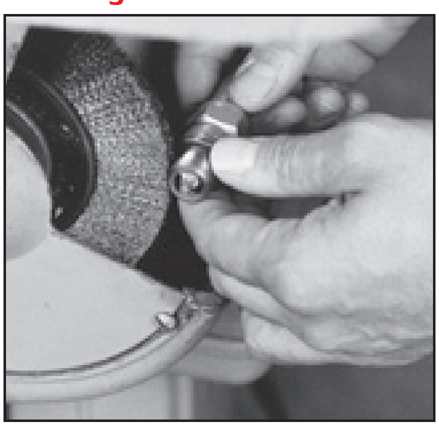
Firing End Inspection

Inspecting firing end.

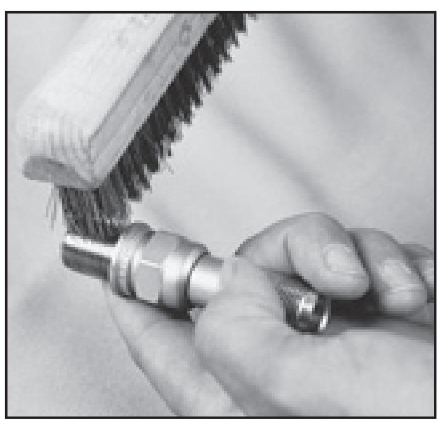
Use a suitable inspection light. A lighted magnifier is an excellent aid in making these examinations.

- The firing-end insulator must be thoroughly clean.
- Shielded spark plugs must also have thoroughly clean terminal wells.
- Spark plugs must be thoroughly dry to eliminate all traces of solvent.

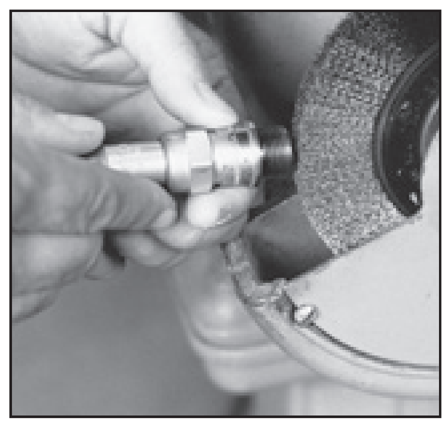
Cleaning the Threads



Cleaning threads with a rotary brush.



With a wire hand brush.



Do not wire brush firing end.

Clean the threads on the shell and shielding barrel with either a wire hand brush or a power-driven brush.

- Inspect the threads for condition and size with a suitable ring gauge. Slightly damaged threads may be restored to a suitable condition by using a #2 three-cornered file.
- Plugs with badly nicked threads should be discarded to avoid damaging the cylinder-head bushing.

CAUTION: If using power-driven brush, do not use wire size exceeding 0.005″ diameter. NEVER BRUSH THE INSULATOR OR THE ELECTRODES. Wire brushing the electrodes will cause the metal to flow. Wire brushing will cause side pressure on the nose insulator tip. This may result in hairline cracks that could develop into insulator tip fractures. A fractured insulator can cause preignition and piston burning.

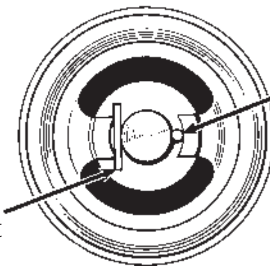
Gap-Setting Tools and Procedures

Gap Setting

All spark plugs should be cleaned thoroughly before setting the gaps. Tools and methods used to set spark plug gaps will vary with electrode configuration.

In all gap-setting procedures, **never bend the center electrode and never apply pressure to the ground electrode with feeler wire gauge, because this will fracture the ceramic material.** Always use round wire feeler gauges of the GO and NO-GO type for measuring gap spacing.

Champion recommends the same spark plug gap settings as new plugs, specified in the Champion Aviation Products Catalog.



CT-482 Erosion Gauge

This gauge eliminates the guesswork in identifying a spark plug that should be replaced. It has been calibrated to allow insertion of properly gapped worn plug (see pg. 6).

Gap the spark plug to 0.016. If electrode enters the center hole from the chamfered side, remove the spark plug from service.

Operating and Maintenance Procedures Model 2500 A Tool

Since the Champion Model 2500A gap-setting tool adjusts two electrodes simultaneously, it is particularly useful for high-volume gap-setting requirements. This tool easily adjusts four-electrode N Type and two-electrode E Type aviation spark plugs.

Operating Instructions

- With the stationary finger retracted and the adjusting lever reversed, insert the spark plug into the upper collet bushing. Align the centering bushing over the spark plug installation threads.
- Rotate the lower collet, adjusting bushing clockwise or counter-clockwise until the firing end of plug is flush with centering bushing.
- Swing the stationary finger onto the spark plug and turn the plug until the finger aligns with the electrode.
- Insert the proper spacing gauge vertically between the electrode gap openings. Holding the gauge in position, move the adjusting lever forward until the toggle arm meets the electrode. Exert moderate pressure on lever, moving electrodes to the prescribed gap.
- Reverse the adjusting lever. Withdraw the spacing gauge and remove plug.

For N Type, rotate spark plug 90 degrees and repeat above procedure.

Maintenance Procedures

The Champion Model 2500A gap-setting tool requires minimum shop maintenance. However, like all shop tools, it should be kept clean and be lubricated periodically for most efficient operation.

- Lubricate the adjusting levers and fingers with light machine oil.
- Clean and lubricate the upper collet bushing and frame collet bearing surface with a light grease or Champion thread lubricant, part no. 2612, as required. It is important that the collet float freely in the frame at all times.
- Cover the gap-setting tool when not in use.

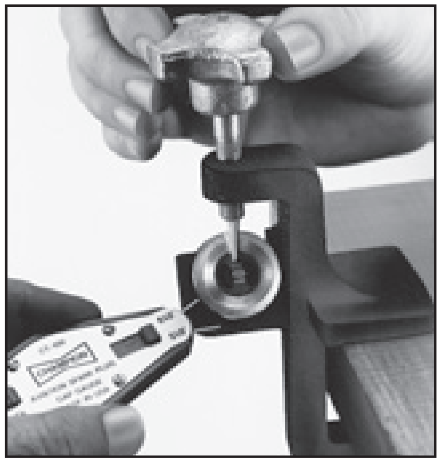
Gap-Setting Tools and Procedures

Gap Setting with Model CT-415 Tool

The Champion CT-415 gap-setting tool adjusts two-electrode E Type and four-electrode N Type, both short- and long-reach spark plugs.

- Adjust gaps by applying pressure on the ground electrode only.
- To avoid the possibility of fracturing the insulator ceramic, **always remove the wire feeler gauge while actually adjusting the gap.**

Do not attempt to open gaps that are too close. Spark plugs with gaps accidentally set too closely over 0.004" less than recommended) require special attention and work. Request instructions for this special work from Champion aviation service department.



Setting one gap at a time with Model CT-415.

NOTE: Use GT-204 Adapter (cadmium plated) for gapping 18mm spark plugs. Use GT-208 Adapter (gun metal blue) to gap REM37BY spark plug.

Gap Setting with Model CT-457 Tool

To gap fine-wire (platinum or iridium) spark plugs, use the Champion CT-457 gap-setting tool. The spark plug can be supported in a vise-mounted socket wrench as shown, or hand held in place.

- Place gap-setting tool slot on the ground electrode and carefully adjust the gap, making sure not to disturb the center electrode.
- Check gap clearance with the Champion CT-450 gauge. Setting should be 0.015 GO and 0.019 NO-GO.

Setting gap on fine-wire spark plug.

CAUTION: Do not bend iridium electrodes excessively. Iridium is a very brittle material and fractures easily. It isn't necessary to regap iridium plugs unless gap exceeds .019.

Testing Tools and Procedures

Testing Spark Plugs with Model CT-475AV Cleaner/Tester

- Select the proper size steel adapter and install in test chamber. Finger tighten the serviced plug into the compression chamber.

NOTE: Air leakage at the adapter or spark plug threads helps facilitate steady control of air pressure and permits the exhaust of ionized air.

- Connect the high-voltage lead to the shielding barrel contactor. Insert in barrel end.
- Press tester switch button and observe spark jumping gaps satisfactorily. Open tester air valve until gauge indicates the proper pressure for the gap setting on the plug being tested. Observe satisfactory spark.

Voltage required to spark the plug gap varies directly with the electrode gap opening and bomb test pressure. To ensure satisfactory plug operation in the engine, the plug being tested should spark steadily at the following gap settings and their corresponding test pressures.

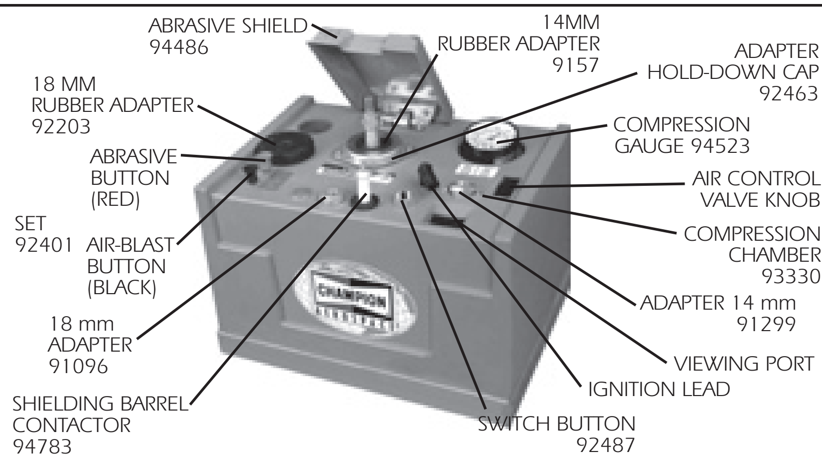
Electrode Gap	Test Pressure (psi)
0.016	135
0.019	115

Tester Calibration

- Set a new RJ12YC to 0.035" (0.9mm) gap.
- Install plug in the pressure chamber, increase the pressure until indicator needle reaches 125 psi.
- Adjust the voltage control on the bottom of the electronic control module just until the arc is extinguished.

The unit is now properly calibrated for all plug testing.

NOTE: Champion recommends this calibration procedure at least once a year.



Preservation and Storage

To preserve reconditioned spark plugs, use a rust-proofing compound meeting the requirements of Specification MIL-C-6529A Type III. Brush the compound lightly on the shielding barrel and shell threads of the serviced spark plugs.

Do not dip spark plugs in corrosion-preventive compound.

Package spark plugs carefully for lengthy storage or shipping to another location. You may use individual tubular cartons for packaging reconditioned spark plugs equipped with new gaskets. If tubular cartons are not available, install new gaskets and thread protectors, wrap plug in waxed paper and place in any suitable carton.

If you are storing large quantities of spark plugs, place plugs in wooden boxes having suitable drilled partitions. Label all storage containers with the plug type and gap setting.

Champion recommends using ventilated storage cabinets heated with an ordinary light bulb for storing spark plugs over long periods of time. This storage method is particularly recommended for damp, humid climates or near salt water.

Oil Filters

Shorter Installed Height
Shortened can height by approximately 1/2", with no impact to the filter media's performance.

Improved Spring
Replaced old "leaf" spring with an improved coil spring design.

Thicker-Walled Can
Increased wall thickness for improved structural integrity.

Stronger Center Tube
Redesigned center tube for added strength, with collapse pressures more than double the current design.

New Inlet Design
Changed four-hole design to an eight-hole design for approximately 30% greater inlet flow area.

New Improved Wrench Flats
Provides: secure fit, proper torque, and easier removal.

Increased Lid Thickness
Increased thickness of seaming lid by approximately 35%, which subsequently provided for higher burst and impulse testing.

Improved Baseplate Thread
Replaced cut thread with an improved rolled thread, without affecting tolerances on the thread dimensions.

Design Features

Champion Aerospace's full-pleat, resin-impregnated micronic filter media traps all harmful particles, including metallic chips which result from abnormal engine wear. Because the oil flows through many layers of locked-in fibers, there is no migration of fiber material to clog engine oil passages or affect bearing surfaces. According to industry-approved tests, the Champion oil filter traps more dirt and harmful particles during its operating time than any other similar filter.

Aircraft Engine Oil Filters

Champion oil filter elements and spin-on filters are manufactured to meet or exceed the specifications in ARP 1400 B. These specifications define uniform parameters for the design, manufacture and testing of filters for general aviation lubricating oil systems for aircraft-type reciprocating engines. In addition, Champion has been chosen as original equipment supplier to both Teledyne Continental Motors and Textron Lycoming for all their reciprocating oil filter requirements.

Specific operational, maintenance and inspection procedures for oil filters are contained in aircraft and engine manuals. We highly recommend their use to obtain specific details that apply to the requirements of any given model engine or aircraft. However, this service manual includes some cautionary notes and guidelines which should be taken into account when servicing reciprocating engines.

Champion Full Flow Spin-On Oil Filters

Lycoming
CH48103-1 CH48104-1

Continental
CH48108-1 CH48109-1
TCM No. 649922 TCM No. 649923

Lycoming and Continental
CH48110-1 CH48111-1

Benefits of Efficient Engine Oil Filtration

For all general aviation piston engines, the basic purpose of an engine lube oil filter is to help supply a continuous flow of filter-clean oil to vital engine parts. Clean lube oil of a type approved by the engine manufacturer provides the best possible protection for engine parts during the service life of the engine.

For maximum engine protection, the best working companion to engine lube oil is an efficient oil filter, free of harmful contaminants and performing its multipurpose job of lubricating, sealing, cooling and cleaning. Engine lube oil performs all of these functions best with full-flow, filter-cleaned oil.

- Lubricating. By maintaining a protective film of lubrication between all frictional surfaces of vital engine parts under all operating conditions.
- Sealing. By providing a film of heat-resistant lubricant between piston rings, pistons and cylinder walls necessary to maintain proper compression and combustion pressures, as well as protection against harmful blow-by into crankcase sections.
- Cooling. Internal engine parts (pistons, rings, bearing surfaces) operating at high temperatures are an essential function of engine lube oil. Rapid transfer of heat away from these internal parts is increased by the aid of an externally mounted oil cooler.
- Cleaning. A major function of lube oil is to keep engine parts such as oil lines, galleys, squirt jets, piston ring lands and oil holes clean and open. Some approved engine lube oils even contain special ashless dispersants to aid in internal engine cleaning.

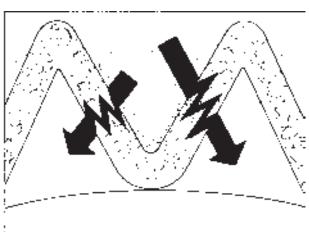
Oil Filter and Replacement Element Design

Champion offers two types of oil filter cartridges to cover all existing aircraft piston engine lube oil system applications. Replacement elements service engine-mounted or line-installed filter systems incorporating a permanent housing assembly. And a modern spin-on oil filter contains the element incorporating the valve mechanisms of anti-drain back valves and the pressure relief valve, sealed in a disposable housing.

Champion replacement elements are manufactured to exact specifications required by the housing assembly system. Important design features of Champion aviation oil filters are described here.

Filter Media

The filter media is a Champion exclusive high performance resin-impregnated cellulosic/glass fiber composite paper manufactured to rigid specifications to assure uniform density and porosity. Preforming, convoluting and high-temperature curing transform the basic structure into a durable filter medium that resists heat, shock and oil chemicals. The filter medium provides both surface and scientific depth filtration, because the oil flows through many layers of locked-in fibers. No migration of filter material is possible, so engine oil passages remain clear, and bearing surfaces are not affected.

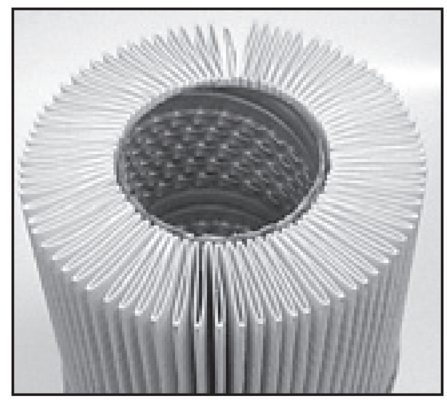


Dirt-Holding Capability

Advancements in design and materials in aviation oil filter manufacturing have produced a superior filter element at Champion Aerospace. Our own laboratory-controlled comparative tests, conducted in accordance with established filter industry test procedures, have shown that the Champion oil filter traps and holds more contaminants during its normal operating life than other similar filters.

Resistance to Collapse

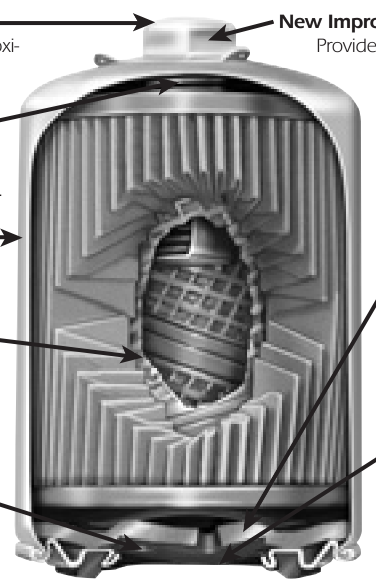
The Champion Aerospace design, with a corrugated, steel center tube supporting each convoluted pleat of the filter media, results in a collapse-pressure rating approximately twice that of other similar filters. Substantially higher, this rating offers a significant extra margin of protection from failure under cold-start conditions.



Champion Spin-On Oil Filters

Champion spin-on oil filters contain the same high-quality high-performance element, without perforated wrapper, as our other oil filters – plus these design and performance features.

- Wrench pad with 1′ hex, spot-welded to case, handles torque pressures far beyond normal removal or installaton requirements.
- Tough steel case provides exceptional strength to resist the high oil pressures which occur during cold engine starts. Meets or exceeds engine manufacturer specifications.
- High performance resin-impregnated cellulosic paper is manufactured to rigid specifications, assuring uniform density and porosity. The high quality media is preformed, convoluted and cured at a controlled temperature to form a durable, heat shock- and chemical-resistant filter medium. It provides both surface and scientific depth filtration because the oil flows through many layers of locked-in fibers. Filter material cannot migrate to clog engine oil passages or affect bearing surfaces.
- Heavy, corrugated steel center tube supports each convoluted pleat of the filter element and produces a substantially higher collapse-pressure rating, twice that of other similar filters.
- Maximum full-flow design, without interference from center-bolt oil filter assemblies, provides increased oil filtration each engine operating hour.
- Heavy-duty steel mounting plate is cemented, spot-welded and crimped to case. Even under abnormal oil temperatures and pressures, this primary, standard part of the filter assembly ensures freedom from troublesome oil leakage when the filter is installed according to the instructions printed on the case.

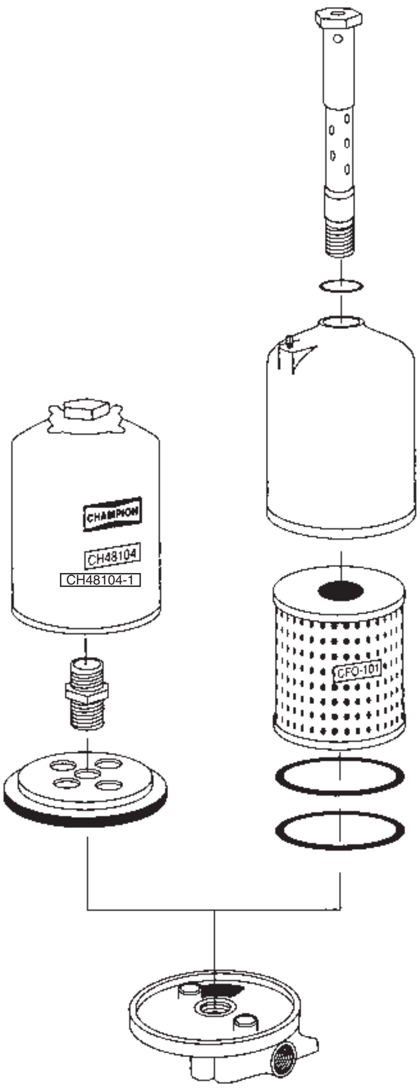


Aviation Engine Oil Filters

Lycoming Replacement Filters

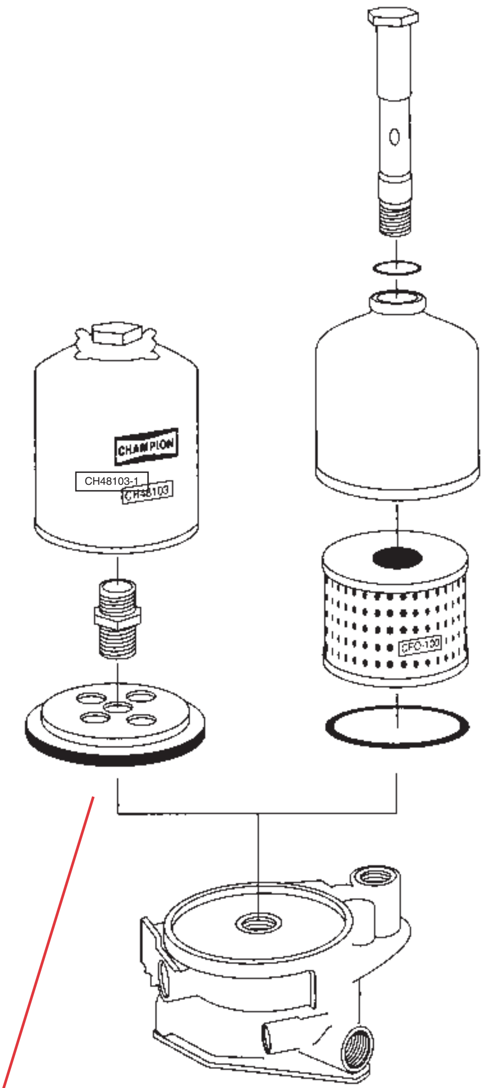
Champion spin-on oil filters, CH48103-1 and CH48104-1, are designed to replace oil filter element housing assemblies in Lycoming engine models TIO-541, TIGO-541 and direct-drive engines that have the die-cast accessory case with single-drive dual magneto. One exception is the 0-320-H2AD engine which uses Lycoming Filter Kit #LW-14969.

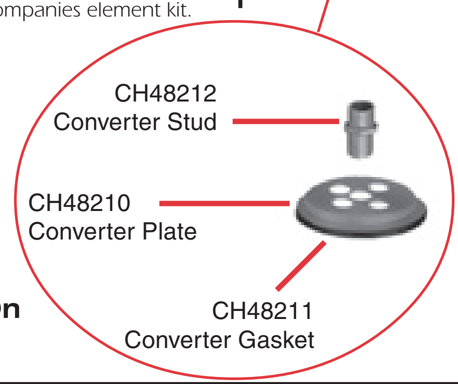
Models TIO-541 and TIGO-541.



NOTE: Do not use flat gasket which accompanies element kit.

Models with Single-Drive, Dual Magnetos.





CH48922 (54E23093) Spin-On Oil Filter Converter Kit.

NOTE: Replace gasket anytime converter plate is removed. Textron Lycoming now supplies the converter kit, formerly sold under Champion part no. CH48922. This kit is now available from your Lycoming distributor under part no. 54E23093.

Aviation Engine Oil Filters

Semi-Depth Type Filters

All Champion Aerospace oil filters are classified as semi-depth types. They incorporate exclusive construction design features to provide the advantages of a full-flow engine oil filtration system under all engine operating conditions.

A semi-depth type oil filter combines the filtration functions of surface- and depth-type filters. The most popular semi-depth type oil filter incorporates convoluted or pleated paper filter media. This filter media is manufactured within closely controlled specifications to ensure efficient performance and uniform product quality.

The filter media is usually resin-coated to impart special characteristics such as strength and resistance to water and temperature. Strength is especially important during cold engine starts. The filter element experiences literally thousands of pressure differential cycles during its life. During pressure pulsations of the lubrication system resin impregnation provides desirable pore structure rigidity to retain media pore size and maintain filtering efficiency through flow-fatigue resistance.

Oil Filters Element Removal and Installation Instructions

Housing Removal

- To remove filter housing from adapter, cut and remove safety wires, loosen the hex head screw (1) and turn the entire housing counterclockwise.
- Remove nylon nut (8) which secures coverplate (6).
- Remove coverplate (6) from case (3).
- Remove hex head screw (1) from case (3). Push on threaded end of screw and pull out on screwhead side.

CAUTION: Do not mar or damage threaded end of screw.

- Remove and discard used filter element (4).

NOTE: Old filter element may be inspected at this time by removing the outer body wrapper and observing the type of contaminant in the paper pleats like wear particles or metal chips. Such inspection may help define potential operating problems.

- Discard used rubber gaskets (5,7) and copper gasket (2).

NOTE: Do not reuse old gaskets. Replacement kit contains new gaskets.

Cleaning and Lubrication

- Wipe clean all remaining filter housing parts and the aircraft adapter.
- Lightly oil rubber grommets in the new filter element (4), new copper gasket (2) and new rubber gaskets (5,7) with clean oil.

Assembly

- Place new rubber gaskets (5,7) in the cover (6) and seat properly.
- Insert screw (1) through new copper gasket (2) into filter case (3) and stand upon screw head.
- Carefully push element (4) over screw (1) into case (3) until bottomed.
- Place cover (6) over case (3) and thread on the nylon nut (8) by hand.

NOTE: When the nylon nut is properly threaded onto the screw, it will not protrude above the metal surfaces of the cover. Do not use pliers or wrench.

CT-921 Torque Wrench

Oil Filter Installation and Removal

The one-inch ratchet can be used for installation of Spin On Champion Oil Filters. The CT-921 is also a torque wrench calibrated to the recommended installation torque of 17 foot-pounds. The torque wrench can be easily recalibrated.

Aviation Oil Filters

Assembly (con't)

- Install housing on engine adapter by turning the entire housing clockwise until the gasket (7) seats against the adapter.
- Torque the screw (1) according to applicable values provided at right. Always use a torque wrench and tighten the screw to the specified torque.
- Check the gasket (7) for circular distribution around the edge of the adapter. If not properly distributed, the gasket may have become unseated during assembly and must be replaced.

NOTE: Do not use a gasket which has been unseated, since it is damaged and cannot be reused. A close check of the adaptor for warpage due to overtightening is a must.

- Check for leakage by starting and warming up the engine. Observe the areas around the gasket seal to the adapter and the screw seal to the housing. Turn off the engine and recheck the screw torque for required value as shown previously. The filter housing holds about one quart of oil. **Check oil level.**
- Complete assembly by safety-wiring the screw (1) to the case (3) and the case (3) to the adapter or engine.

NOTE: If spare copper gaskets or rubber gaskets are required, they may be obtained by ordering Gasket Replacement Kit PN CFO-205, which includes:

Filter Housing	Manufacturer	Torque Ft./Lb.	In./L.b
OF-71-A	AC	20 to 25	240 to 300
OF-7-A	AC	15 to 18	180 to 216
1250406-1	Cessna	15 to 18	180 to 216
OF-81-A	AC	20 to 25	240 to 300
OF-8-A	AC	15 to 18	180 to 216
OF-9-A	AC	15 to 18	180 to 216
C-294505	Cessna	20 to 25	240 to 300

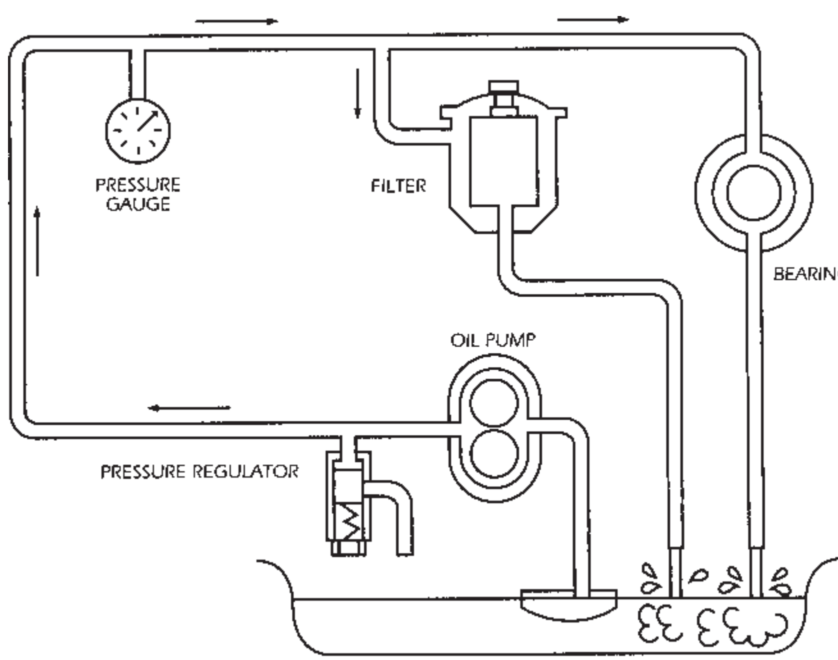
NOTE:	# of Turns	Approximately = # of Ft./Lb. of Screw
	1-5/8 to 1-3/4	15 to 18
	1-3/4 to 1-7/8	20 to 25

Description	Part No.
Copper Gasket (2)	CFO-240
Flat Rubber Gasket (5)	CFO-203
Square Rubber Gasket (70	CFO-202

Bypass Filter System

Most new aircraft engines are equipped with, or have provisions to accept, a full-flow type oil filter system. However, some older model engines do not have these provisions. Instead, they have a bypass system sometimes known as a partial-flow system.

The partial-flow bypass system filters only about 10% of the oil through the filtering element, returning the filtered oil directly to the sump. Therefore, as shown here, the oil passing through the engine bearing is not filtered oil.



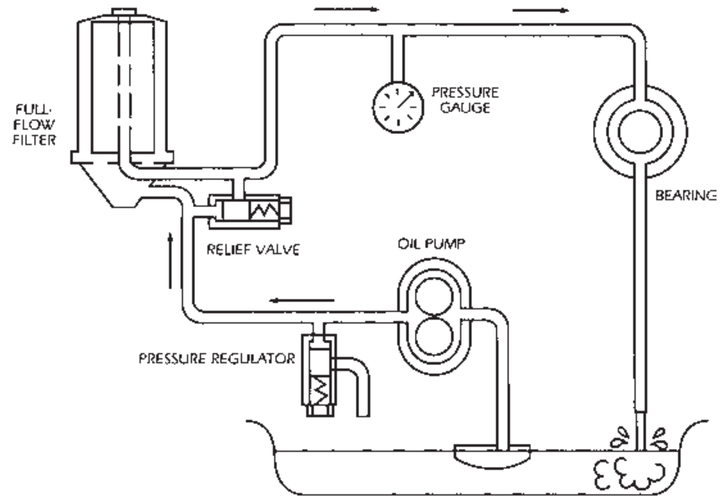
BYPASS FILTER SYSTEM

Aviation Engine Oil Filters

Full-Flow Filter System

Champion oil filters are designed for a full-flow oil system. This system positions the filter between the oil pump and the engine bearings, thereby filtering the contaminants from the circulated oil before it passes through the bearing surfaces.

All full-flow systems incorporate a pressure-relief valve, which opens at a predetermined differential oil pressure Therefore, should the filter become clogged, the relief valve will open, allowing the oil to bypass and prevent engine oil starvation.



FULL-FLOW FILTER SYSTEM

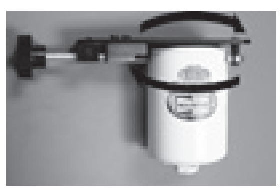
Oil Filter Sludge Inspection

Inspection of engine sludge trapped in spin-on oil filters has been recommended practice for many years. Service engineers of engine manufacturers, oil companies and licensed aircraft mechanics recognize the valve of visual inspection to help determine if internal engine wear or malfunction has occurred through inspection for metal or other contaminants within the engine oil system.

CT-923 Oil Filter Can Cutter

The Champion CT-923 Oil Filter Can Cutter is a useful tool for opening spin-on filters without introducing foreign material into the filter. Use the following recommended procedures to inspect full-flow oil filters.

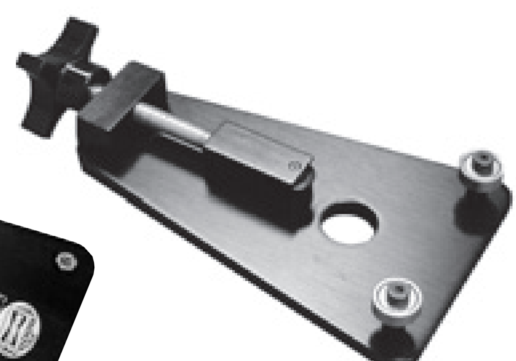
- Remove the filter from the engine and place it on a drain tray. Allow oil to drain through a clean cloth to determine if foreign material drains from the filter.
- Using the Champion CT-923 Can Cutter, open the filter as shown here.
- Using a clean plastic bucket containing approximately one pint of clean Varsol, swish the filter element around in the Varsol to loosen entrapped metal or other contaminants.
- Using a clean magnet, work the magnet around in the Varsol. Ferrous metal particles in the solution should adhere to the magnet for inspection.



Slightly tighten cutter blade against filter and rotate 360°. Repeat operation until mounting plate section separates.

Lift mounting plate to expose complete filter media for inspection.

- After all ferrous metal particles have been retrieved with the magnet, pour the remaining Varsol through another clean shop rag, and any nonferrous metals should be detectable in bright light.



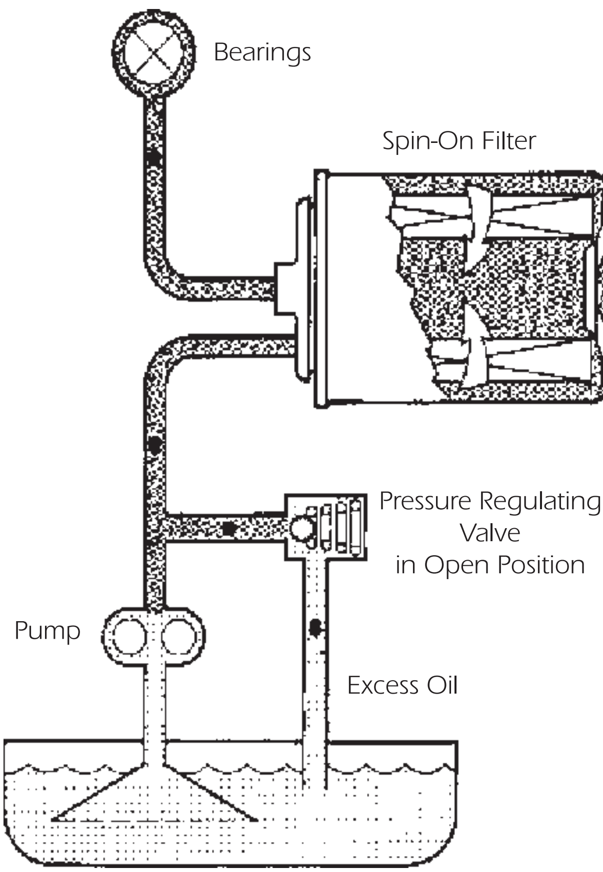
Over Pressurized Lube Oil Filters

Have you ever had a filter that appears to be "BLOWN UP"? Looks like a balloon or the gasket is protruding from the base of the filter? Often the deformed filter is the only sign that a problem existed in the lube oil system.

The first thing you want to blame is the filter. However, if the pressure was sufficient to blow out the gasket or unroll the lockseam, the pilot may have experienced immediate and costly problems. This should be considered a non-airworthy condition.

A look at how a lube oil system functions will show that the oil pump creates oil pressure. A pressure-regulating valve controls the upper limit of this pressure, which is usually an integral part of the pump.

Figure 1 is a simplified diagram of the lube oil system showing the pump, regulating valve, filter and bearings.



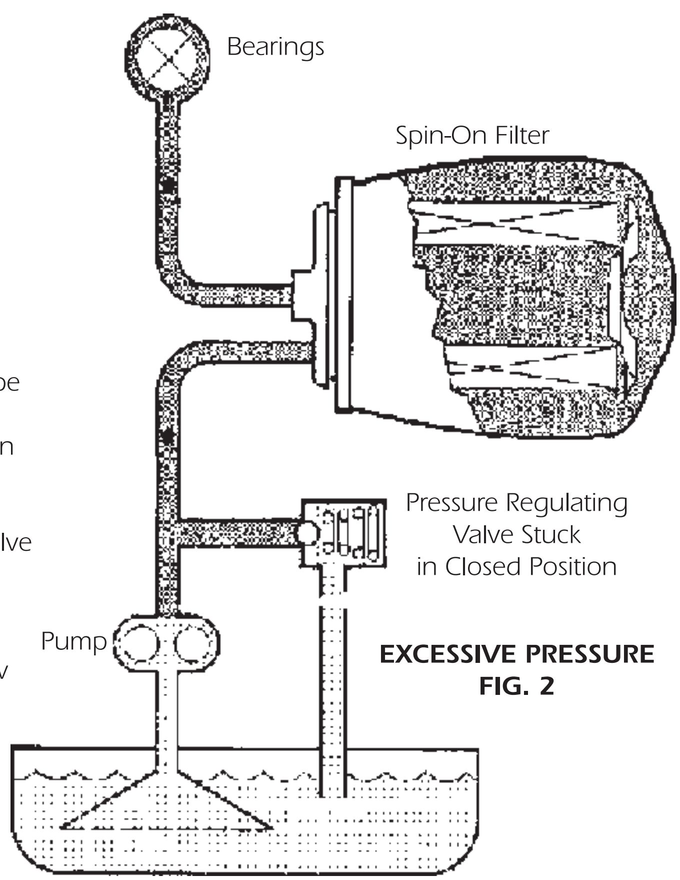
NORMAL PRESSURE
FIG. 1

The oil pump supplies sufficient flow to lubricate the bearings and other moving parts of the engine. This oil must be under pressure if it is to properly separate the highly loaded parts of an engine and prevent excessive wear. The purpose of the regulating valve is to provide a constant pressure for the system.

The regulating valve consists of a ball or plunger, which regulates pressure with the aid of a spring. The spring is calibrated so that the plunger will lift off its seat when the oil pressure reaches the desired setting. Once the valve is open, the pressure remains fairly constant with only small changes occurring as the engine rpm varies.

The filter and all other components in the oil system are subjected to the pressure established by the regulating valve. If this pressure is excessive, filter damage may occur. This is the point that many mechanics that are not familiar with lube systems fail to realize. Just remember any blockage in the system can also send the pressure beyond what the filter can stand which is rated at 400 psi. Burst.

Figure 2 shows the system operating with the regulating valve stuck in the shut position. Under this condition the pressure will build up in seconds and unless something happens to relieve the pressure the filter will become the victim and not the cause. With a high spike of pressure the gasket will blow out or the lockseam will unwind as the pressure increases.



EXCESSIVE PRESSURE
FIG. 2

In conclusion, if a filter distorts due to over pressure in the system, the fault might be the regulating valve **Not the filter**

Courtesy of Filter Manufacturers Council

Current/Discontinued Aviation Spark Plugs

	CURRENT PLUG TYPES	DISCONTINUED PLUG TYPES
18mm 1/2” Reach:	M40J*	AY4
	M40E	M42E, M41N, D41N, C27, C26
	REM40E	EM41E, EM42E, ED41N, C27S, C26S, REM39N, RED39N, RC26S
	REM38E	REM37N, RED37N, R25S
	REM38S	REM38P, REM38W
	RMH40E	HM41E
	RHM40E	RHM39N, RHD39N
	RHM38E	RHM37N, RHD37N
	RHM38S	RHM38P, RHM38W
18mm 13/16” Reach:	REB37E	REB37N, REA37N, R37S-1, RC35S, C35S
	REB36S	REB87N, REA87N, REB36W, R819, H014S
	REB32E	REB32N, REA32N, R56S, RC34S, C34S
	-	REB29N, REA29N, R33S
	RHB37E	RHB38E, RHB37N, RHA37E, RHA37N, RHB87N, RHA87N, R119, R115
	RHB32E	RHB32N, RHB33E, RHA32E, RHA32N, R111
	RHB29E	RHB29N, RHA29E, RHA29N, R103
	RHB36S	R214D, RHB36P, RHB36W
	RHB32S	RHB32P, RHB32W
	-	RHB27P
	-	RHB27W
18MM 1 1/8” Reach:	RHU32E	RHU37E
	RHU27E	RHU30P, RHU30W
14MM 3/8” Reach:	REJ38	C10S4, 78S
	NON-SHIELDED UNAVAILABLE	J43, AJ66
14MM 1/2” Reach:	RHL27SA*	HL26P/HL601P*
	RHL28SA*	HL31P/HL602P*
	REL37B	REL37W, REL38B
	NON-SHIELDED UNAVAILABLE	L34R, AJ10
	EL602YC	EL601Y
14MM 3/4” Reach:	REN30S	

***Racing Spark Plug Only**

Supplemental Information

Whenever possible, Champion Aerospace issues technical bulletins, providing more information on changing conditions within the aviation industry as they relate to reciprocating engines. Copies of these bulletins are available upon request from;

Champion Aerospace
Products Support Department
P.O. Box 686
Liberty, SC 29657
864-843-5400
www.championaerospace.com

You are also encouraged to contact this department for assistance on any technical problem that may arise.

FAA-Repair Station
(IZMR441L)

Aviation Service Manual

AV6-R

Spark Plugs
Oil Filters

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