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# SERVICE DATA

## CHAIN SAW

# CS-3700ES
# CS-4200ES

**(Serial number : 36000001 and after)**

### INTRODUCTION

We are constantly working on technical improvement of our products. For this reason, technical data, equipment and design are subject to change without notice. All specifications, illustrations and directions in this SERVICE DATA are based on the latest products information available at the time of publication.

ECHO SERVICE MANUAL Ord. 401-21(Model : CS-4200, CS-4400) contains lots of information for servicing this model.

Introduction of primer and carburettor change on CS-3700ES are informed by Technical Information No. 2006-324.

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Reference No. **01-36C-01**
**REVISED: 200607**
ISSUED: 200409

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KIORITZ CORPORATION

## 1 SERVICE INFORMATION

### 1-1 Specifications

| Model | | | CS-3700ES | CS-4200ES |
|---|---|---|---|---|
| Dimensions | Length* | mm(in) | 383 (15.1) | |
| | Width | mm(in) | 238 (9.4) | |
| | Height | mm(in) | 270 (10.6) | |
| Dry weight* | | kg(lb) | 4.4 (9.7) | |
| Engine | Type | | KIORITZ, air-cooled, two-stroke, single cylinder Ventilated piston | |
| | Rotation | | Clockwise as viewed from the output end | |
| | Displacement | $cm^3(in^3)$ | 35.8 (2.19) | 39.6 (2.42) |
| | Bore | mm(in) | 39 (1.54) | 41 (1.61) |
| | Stroke | mm(in) | 30 (1.18) | 30 (1.18) |
| | Compression ratio | | 7.4 | 7.45 |
| Carburettor | Type | | Diaphragm horizontal-draught with auto-return choke | |
| | Model | | WT-416C | Walbro WT-594 |
| | | | Walbro WT-812 with primer** | |
| | Venturi size-Throttle bore | mm(in) | 13.5 - 15.85 (0.532 - 0.624) | |
| Ignition | Type | | CDI (Capacitor discharge ignition) system | |
| | Spark plug | | BPMR7A | RCJ6Y |
| Starter | Type | | ES (Effortless-start) | |
| | Rope diameter x length | mm(in) | 3.0 x 830 (0.12 x 32.7) | |
| Fuel | Type | | Premixed two-stroke fuel | |
| | Mixture ratio | | 50 : 1 (2 %) | |
| | Petrol | | Minimum 89 octane petrol (RON) | |
| | Two-stroke air cooled engine oil | | ISO-L-EGD (ISO/CD13738), JASO FC | |
| | Tank capacity | L (U.S.fl.oz.) | 0.41 (13.9) | |
| Clutch | Type | | Centrifugal, 3-shoe slide with 3-tension spring | |
| Guide bar / Saw chain lubrication type | | | Automatic with volume adjuster | |
| Oil | Tank capacity | L (U.S.fl.oz.) | 0.24 (8.1) | |
| Sprocket | Type | | Spur | |
| | Number of teeth | | 7 | |
| | Pitch | in | 0.325 | |

* Without guide bar and saw chain.
** Primer is installed on switch bracket since serial number 36008701 on CS-3700ES.

| Cutting devices | | | | | |
|---|---|---|---|---|---|
| Guide bar | Type | | 33RD58-325 | 38RD58-325 | 43RD58-325 |
| | Called length | cm | 33 | 38 | 43 |
| | Gauge | in | 0.058 | | |
| Saw chain | Number of drive links | | 56 | 64 | 72 |
| | Pitch | in | 0.325 | | |
| | Gauge | in | 0.058 | | |

### 1-2 Technical data

| Model | | CS-3700ES | | CS-4200ES |
|---|---|---|---|---|
| Engine | | | | |
| Idling speed | r/min | 2300 - 3000 | | |
| Operating speed* | r/min | 8500 - 9000 | | |
| High speed (No load full throttle)* | r/min | 11500 - 12500 | | |
| Clutch engagement speed* | r/min | 3500 - 4300 | | |
| Compression pressure | MPa (kgf/cm$^2$) (psi) | 1.0 (10) (145) | | 1.15 (11.5) (165) |
| Ignition system | | | | |
| Spark plug gap | mm(in) | 0.6 - 0.7 (0.024 - 0.028) | | |
| Minimum secondary voltage at 1000 r/min | kV | 15 | | |
| Secondary coil resistance | kΩ | 1.7 - 2.2 | | |
| Pole shoe air gaps | mm (in) | 0.35 - 0.45 (0.014 - 0.018) | | |
| Ignition timing at 1500 r/min | °BTDC | 25 | | |
| Carburettor | | **WT-416C** | **WT-812** | **WT-594** |
| Idle adjust screw initial setting | turns in** | 1 1/8 | 1 3/4 | 1 3/8 |
| L mixture needle initial setting | turns back | 1 1/4 | | 1 1/4 |
| H mixture needle initial setting | turns back | 3 | 3 1/2 | 2 5/8 |
| Test Pressure, minimum | MPa (kgf/cm$^2$) (psi) | 0.05(0.5)(7.0) | | |
| Metering lever height | mm(in) | 1.65 (0.06) lower than diaphragm seat | | |
| Chain oil discharge volume at 7000 r/min | mL/min(U.S.fl.oz./min) | Adjustable : 1.5 - 13 (0.05 - 0.40) (Factory set 7 mL/min) | | |

BTDC: Before top dead centre.

*With 38cm guide bar and saw chain.

**Set idle adjust screw to contact throttle plate before initial setting.

### 1-3 Torque limits

| Descriptions | | | Size | kgf•cm | N•m | in•lbf |
|---|---|---|---|---|---|---|
| Starter system | Starter pawl | | M5* | 40 - 60 | 4 - 6 | 35 - 50 |
| | Starter case | | M4 | 10 - 20 | 1 - 2 | 9 - 18 |
| Ignition system | Magneto rotor (Flywheel) | | M8 | 200 - 240 | 20 - 24 | 175 - 210 |
| | Ignition coil | | M5 | 50 - 75 | 5.0 - 7.5 | 45 - 65 |
| | Spark plug | | M14 | 150 - 170 | 15 - 17 | 130 - 150 |
| Fuel system | Carburettor | | M5 | 25 - 35 | 2.5 - 3.5 | 22 - 30 |
| | Intake bellows | | M5 | 30 - 45 | 3.0 - 4.5 | 26 - 40 |
| Clutch | Clutch hub | | LM10 | 300 - 400 | 30 - 40 | 260 - 350 |
| Engine | Crankcase | | M5*† | 70 - 110 | 7 - 11 | 60 - 95 |
| | Engine mount | | M5 | 70 - 110 | 7 - 11 | 60 - 95 |
| | Muffler | | M5 | 70 - 100 | 7 - 10 | 60 - 90 |
| Others | Auto-oiler | | M4 | 15 - 25 | 1.5 - 2.5 | 13 - 22 |
| | Front handle | | M5** | 45 - 65 | 4.5 - 6.5 | 40 - 55 |
| | Cushion | Front | M5 | 30 - 40 | 3 - 4 | 26 - 35 |
| | | Rear | M4 | 35 - 50 | 3.5 - 5 | 30 - 45 |
| | Brake lever (Hand guard) | | M5 | 25 - 45 | 2.5 - 4.5 | 22 - 40 |
| | Chain catcher | | M5** | 20 - 40 | 2 - 4 | 18 - 35 |
| | Guide bar | | M8 | 200 - 230 | 20 - 23 | 175 - 200 |
| Regular bolt, nut, and screw | | | M3 | 6 - 10 | 0.6 - 1 | 5 - 9 |
| | | | M4 | 15 - 25 | 1.5 - 2.5 | 13 - 22 |
| | | | M5 | 25 - 45 | 2.5 - 4.5 | 22 - 40 |
| | | | M6 | 45 - 75 | 4.5 - 7.5 | 40 - 65 |

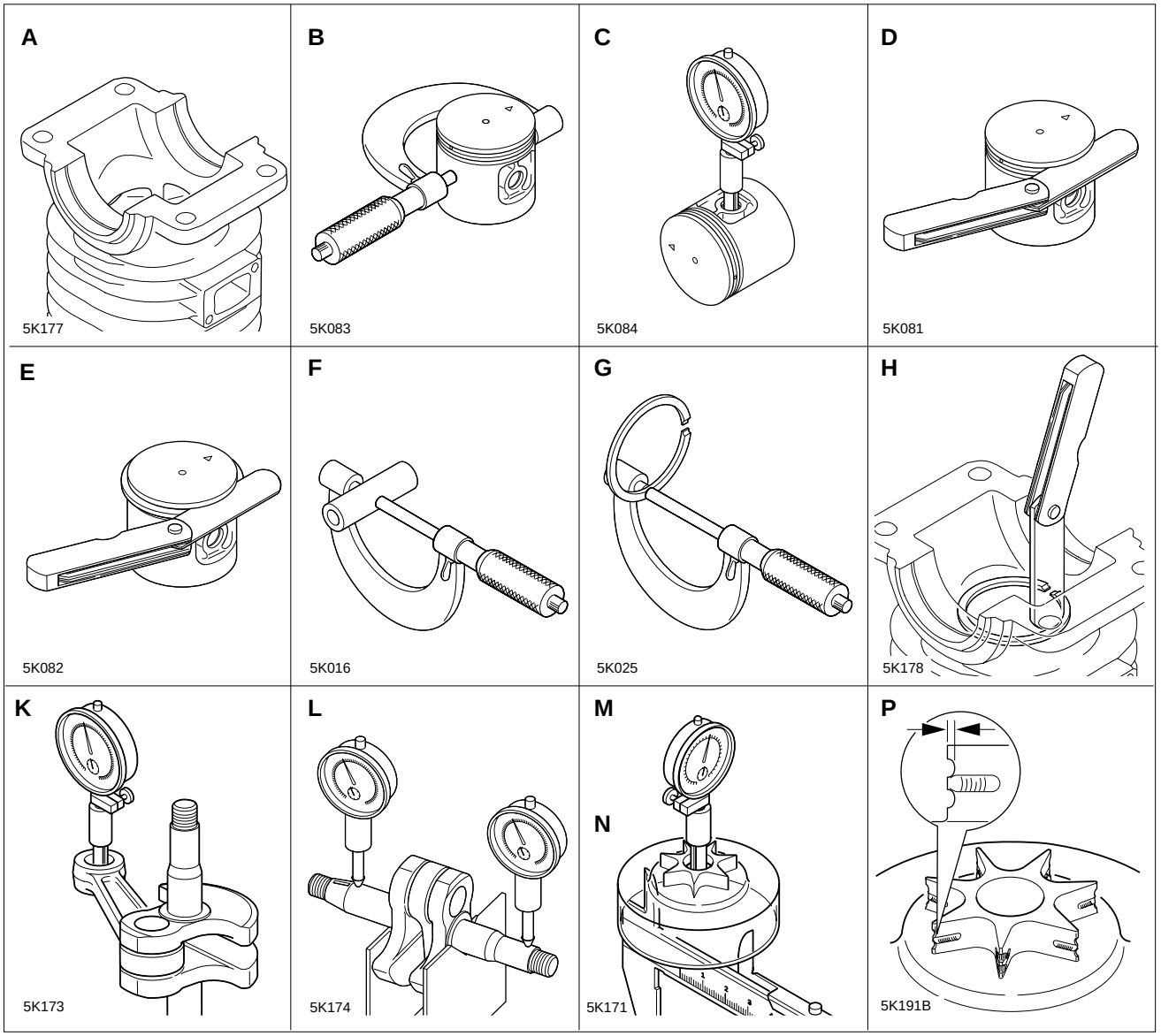
LM: Left-hand thread *Apply thread locking sealant (See below) ** Tapping screw

† The torque differences among four bolts should not exceed 20 kgf•cm (2N•m, 17in•lbf) on one cylinder or crankcase.

### 1-4 Special repairing materials

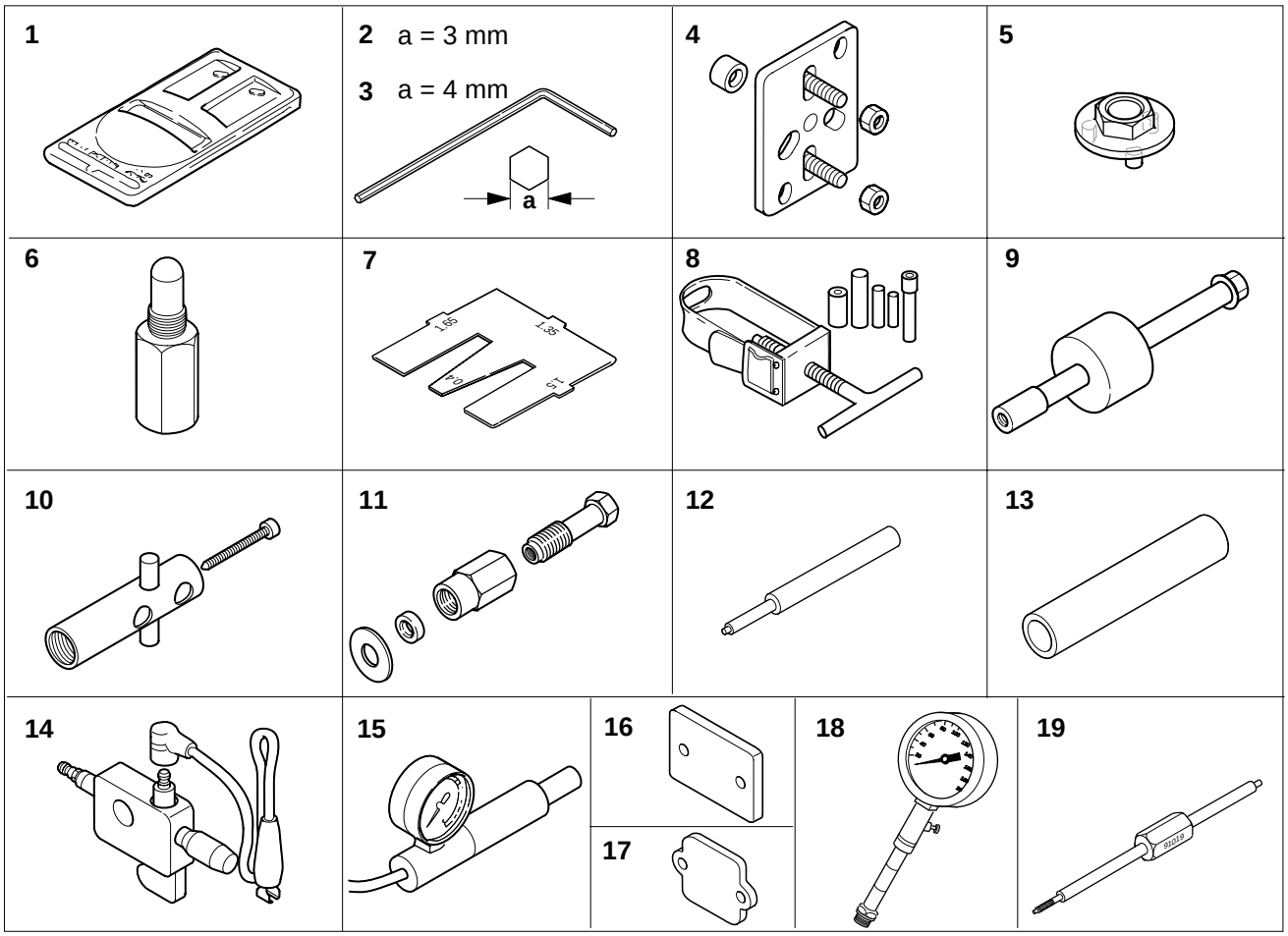
| Material | Location | Remarks |
|---|---|---|
| Adhesive | Ball bearing outer / crankcase | Loctite #675 or equivalent |
| | Cushion (Small : 4pcs) | Loctite #424 or equivalent |
| Liquid gasket | Crankcase seams | Loctite #515 or equivalent |
| Thread locking sealant | Starter pawl screws | Loctite #242, ThreeBond 1324 or equivalent |
| Grease | Auto-oiler worm | Lithium based grease |
| | Clutch needle bearing | |
| | Rear handle cushion | |
| | Rewind spring | |
| | Starter center shaft | |
| | Chain brake (metal contact part) | Molybdenum grease (approx. 1 gram) |

### 1-5 Service Limits




| | | | mm (in) | |
|---|---|---|---|---|
| A | Cylinder bore | | When plating is worn and aluminium can be seen | |
| B | Piston outer diameter | Min. | 38.91 (1.53) | 40.94 (16.12) |
| C | Piston pin bore | Max. | 9.030 | (0.356) |
| D | Piston ring groove | Max. | 1.6 | (0.063) |
| E | Piston ring side clearance | Max. | 0.1 | (0.004) |
| F | Piston pin outer diameter | Min. | 8.98 | (0.353) |
| G | Piston ring width | Min. | 1.45 | (0.057) |
| H | Piston ring end gap | Max. | 0.5 | (0.02) |
| K | Con-rod small end bore | Max. | 12.125 | (0.477) |
| L | Crankshaft runout | Max. | 0.05 | (0.002) |
| M | Sprocket bore | Max. | 12.98 | (0.511) |
| N | Clutch drum bore | Max. | 71.5 | (2.81) |
| P | Sprocket wear limit | Max. | 0.5 | (0.02) |

### 1-6 Special tools




| Key | Part Number | Description | Used for: |
|---|---|---|---|
| 1 | 897801-33330 | Tachometer PET-1000 | Measuring engine speed to adjust carburettor |
| 2 | 895612-79920 | L-hex wrench (3 mm) | Removing and installing hex. socket bolt (M4) |
| 3 | 895610-79920 | L-hex wrench (4 mm) | Removing and installing hex. socket bolt (M5) |
| 4 | 897501-03938 | Puller | Removing magneto rotor |
| 5 | 897505-16133 | Clutch tool | Removing and assembling clutch assembly |
| 6 | 897537-30130 | Piston stopper | Locking crankshaft rotation |
| 7 | 897563-19830 | Metering lever gauge | Measuring metering lever height on carburettor |
| 8 | 897702-30131 | Piston pin tool | Removing and installing piston pin |
| 9 | 897603-23030 | PTO shaft puller | Removing PTO shaft |
| 10 | 897708-19835 | Worm puller | Removing auto-oiler worm |
| 11 | Y089-000010 | Worm inserter | Installing auto-oiler worm |
| 12 | 897724-01361 | Spring pin tool | Removing and installing spring pin (4 mm or 5/32 in dia.) |
| 13 | 897726-09130 | Oil seal tool | Installing oil seals |
| 14 | 897800-79931 | Spark tester | Checking ignition system |
| 15 | 897803-30132 | Pressure tester | Testing carburettor and crankcase leakage |
| 16 | 897826-16131 | Pressure rubber plug | Plugging intake port to test crankcase / cylinder leakages |
| 17 | 897827-16131 | Pressure plate | Plugging intake port to test crankcase / cylinder leakages |
| 18 | 91007 | Compression gauge | Measuring cylinder compression |
| 19 | 91019 | Limiter cap tool | Removing and installing limiter cap |

## 2 EMISSION ADJUSTMENT GUIDE

### 2-1 General adjusting rules

A. Before starting the unit for adjustment, check the following items.

1. The correct spark plug must be clean and properly gapped.

2. The air filter element must be clean and properly installed.

3. The muffler exhaust port must be clear of carbon.

4. The fuel lines, tank vent and fuel filter are in good condition and clear of debris.

5. The fuel is fresh ( > 89 octane : RON) and properly mixed at 50 : 1 with “ISO L-EGD” or “JASO-FC” 2-stroke oil.

6. The recommended bar and chain must be installed, and properly tensioned.

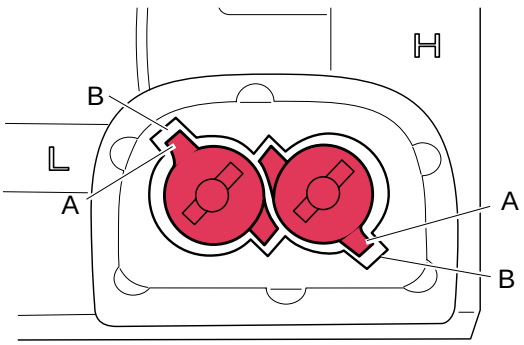
**NOTE :** In order to achieve proper carburettor adjustment, 38 cm bar and chain should be installed on the unit. Otherwise serious engine damage will occur due to overspeeding.

B. Set L and H mixture needles full anticlockwise. Start and run engine for two minutes alternating engine speed between WOT and idle every 5 seconds. Adjust idle speed screw to 2,700 +/- 200 r/min. Adjust H mixture needle to 12,000 +/- 500 r/min. If engine does not run correctly after this adjustment, proceed to the next step 2-2.

**IMPORTANT : After adjusting carburettor according to the steps 2-2 and 2-3, the limiter cap(s) must be installed on L and H mixture needle(s) to comply with Emission Directive.**

### 2-2 Presetting idle adjust screw, L mixture needle and H mixture needle

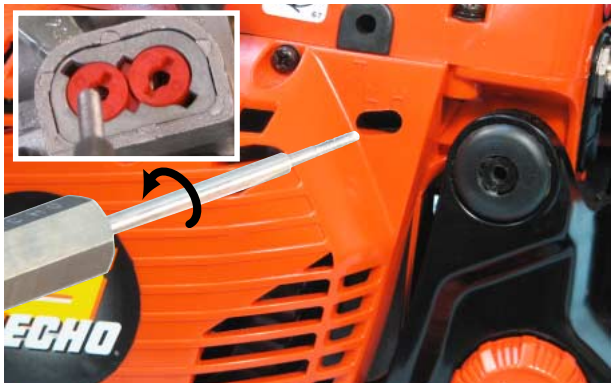
1. Turn the L and H mixture needles anticlockwise to rich side stop to align limiter cap tab (A) with locating slot (B), using 2.5 mm blade screwdriver.

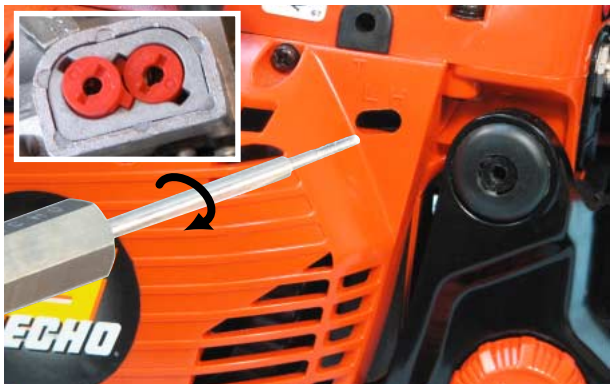



**NOTE :** If cap tabs (A) misalign with locating slots (B), there is a chance to strip thread.

(continued)

2-2 Presetting idle adjust screw, L mixture needle and H mixture needle (continued)





2. Screw threaded end of limiter cap tool 91019 with 2.5 mm left-hand thread into center hole of limiter cap anticlockwise until tab of the limiter cap just comes out of the locating slot.

**NOTE :** DO NOT COMPLETELY REMOVE LIMITER CAP FROM CARBURETOR!
If the limiter cap was pulled out completely, there is a chance that the other mixture needle would turn and limiter cap tab would misalign with locating slot when screwing the limiter cap removal tool into center hole of the limiter cap. As a result, the thread of the limiter cap would be stripped. Use 3 mm diameter thread of wood screw to remove the stripped limiter cap.

3. Remove the limiter cap removal tool from the limiter cap by turning the tool clockwise, leaving the limiter cap in place.

4. Screw threaded end of limiter cap removal tool 91019 into center hole of the other limiter cap anticlockwise until the limiter cap is removed from the mixture needle completely. Remove the limiter cap from limiter cap removal tool turning clockwise, and screw thread of limiter cap removal tool 91019 into center hole of previous limiter cap to pull out completely.

5. Turn L and H mixture needles clockwise until lightly seated, and then turn out both mixture needles following turns.

L mixture needle : 1 1/4

H mixture needle : 3 (CS-3700ES:3600001 - 36008700)

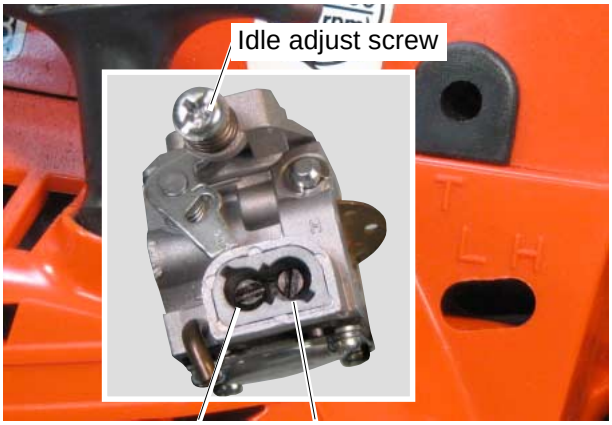
3 1/2 (CS-3700ES:36008701 and after)

2 5/8 (CS-4200ES)

**NOTE :** If needles are forced during seating, damage to carburetor may occur.

6. Remove air filter cover and air filter to see that idle adjust screw contacts the throttle plate. Turn idle adjust screw anticlockwise and set the screw until the tip just contacts the throttle plate. Then turn idle adjust screw 1 1/8 (CS-3700ES : Serial Number 36000001 - 36008700),1 3/4(CS-3700ES: Serial Number 36008701 and after), 1 3/8(CS-4200ES) turns clockwise. Reinstall air filter, and air filter cover.

### 2-3 Adjusting carburetor




1. Start engine and warm it up at idle for one minute. Turn H mixture needle anticlockwise until engine speed drops to approx. 11,000 r/min.

2. Warm it up well for 100 sec with cycle of 5 seconds at WOT (Wide Open Throttle) and 5 seconds at idling.

**NOTE :** Do not run engine at high speed without load longer than 5 seconds, or engine damage may occur.

3. Adjust L mixture needle with 2.5 mm blade screwdriver to reach maximum engine speed just before lean drop off.

4. Set idle engine speed to 3,700 r/min by turning idle adjust screw. Engine speed should be stable at 3,700 +/- 10 r/min after idle adjust screw adjustment.

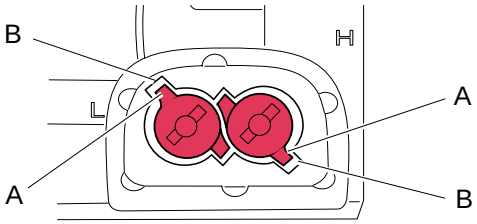
5. Turn L mixture needle anticlockwise reducing engine idle speed 1,000 r/min to set idle speed at 2,700 r/min. The engine idle speed range is 2,500 - 2,900 r/min.

**NOTE :** Engine speed must be allowed to stabilize a minimum of 20 seconds after each adjustment of L mixture needle to assure accurate tachometer readings.

6. Make sure WOT engine speed is approx. 11,000 r/min. If WOT engine speed is over 11,500 r/min, turn H mixture needle anticlockwise until engine speed drops to approx. 11,000 r/min. Turn H mixture needle 1/8 turn increments clockwise at idle engine speed, then squeeze throttle trigger and check WOT engine speed. If the WOT engine speed is less than 11,500 r/min, turn H mixture needle 1/8 turn clockwise again, and check WOT engine speed. The final WOT engine speed should fall within the11,600 to 12,400 r/min range.


7. After adjusting carburettor, screw new limiter cap on the limiter cap removal tool 91019 (C) anticlockwise approx. 2 turns as shown, and put the limiter caps on L and H mixture needles respectively and remove the limiter cap tool. And then press the caps on L and H mixture needles with bar tool.

**NOTE :** Align the limiter cap's tabs (A) with locating slots (B) in extended housing of carburettor.




**IMPORTANT : The limiter caps must be installed L and H mixture needles to comply with Emission Directive.**

8. Start engine, and verify engine idle speed ranges from 2,300 to 3,000 r/min, and WOT engine speed ranges from 11,500 to 12,500 r/min. Make sure chain does not rotate when engine is idling. When final adjustment is completed, the engine should idle, accelerate smoothly, and attain WOT per above specification.

**NOTE :** Initial carburettor setting (idle adjust screw, L and H mixture needles) shown on page 3 and 8 is to start the engine after restoration or carburettor change. Idle adjust screw, idle and H needles turn for designated engine revolution through procedures indicated here may vary. As long as idle and WOT engine speed is set in given range, variance would be ignorable.