

TUNING S.U. CARBURETTORS

INCLUDING FULL NEEDLE CHARTS



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97L

TUNING



CARBURETTERS

INCLUDING FULL NEEDLE CHARTS

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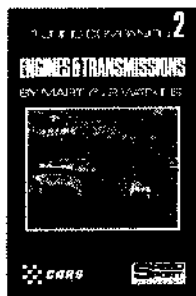
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ACKNOWLEDGEMENT

We should like to acknowledge the invaluable assistance given by the S.U. Carburetter Company in letting us reproduce so much of their literature. In particular we thank them for the information on their carburetter specifications and needles — which will be of so much help to readers of this book.

We hope that this book will serve as a trusty guide to millions of motorists running cars with S.U. carburetters.

IMPORTANT

The tuning procedure described in this publication does not apply to vehicles sold in the U.S.A. after October, 1968, and which are made to satisfy the U.S.A. statutory regulations regarding exhaust emission. These carburetters must not be dismantled or the settings altered without reference to the relevant manufacturers' servicing instructions.

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SECTION I

SINCE so many people have been writing in asking what needles, and jets to use in such and such car or induction set-up, and in view of the fact that it is impossible in most cases to give a clear cut answer we have attempted to explain just how one can obtain the correct answers.

First let us consider why it is usually impossible to give a clear-cut answer to reader's carburation problems. As explained in the recent Mini Tuning series and book, even small variations in engine specification can radically alter the carburation requirements of an engine. These variations can be as obscure as small differences in port or chamber shape, or as obvious as the fitting of larger valves and different manifolds and camshafts. Thus it is quite possible that two identical motors with outwardly similar conversions, and identical written specifications, can in fact have quite different carburation requirements. To complicate matters even further there is still the human factor of the fuel-consumption-to-performance-ratio preference of the individual. Tuning an S.U. Carburetter installation to match an engine specification is, a matter of selecting the following items:—

i Size and number of carburetter(s) to be used.

ii Strength of piston spring fitted above the carburetter piston.

iii Entry of air into carburetter. i.e.—The fitting of an air cleaner system or the selection of a size and type of ram pipe, or the decision to use open-intakes.

iv Profile of jet needle.

Size of jet and range of jet needles is governed by the size of carburetter.

To be certain of obtaining the correct solutions to the above points, the engine has to be mounted on a test bed and a series of set procedures carried out. However, it is possible to arrive at a carburation setting which is reasonably close to the optimum by careful road testing and applying a given sequence to the operation.

It is advisable, after a long run with an experimental jet needle fitted, to check both spark plug appearance and condition of the tail pipe bore. In both cases 'whiteness' is a sign of weak mixture.

Having obtained a jet needle which allows the car to accelerate smoothly up to maximum revs, is steady under part throttle conditions and is also satisfactory at the top end, then consumption tests can be carried out.

These should be undertaken in good weather conditions and if the standard fuel system is used (sometimes a separate gallon tank is fitted for this purpose), fill the tank to the brim, note the mileage carefully and refill to the brim. This will give the exact quantity of

fuel used.

To obtain the best m.p.g. figures without sacrificing performance, these consumption checks should be done at steady speeds, (say 30, 40 and 50 m.p.h.), and also at top speed; then if there is excessive consumption at particular points on the needle then a closer setting can be looked for. (See back of this book), bearing in mind what part of the needle is affected.

Two last points to remember are:—

When going from weak to rich on the setting it is usual to try a dimension about .002" (two 'thou') smaller at a time, but when going from rich to weak at a point on the needle, it is advisable to go no more than .001" (one 'thou') larger on the dimensions, unless there are signs of excessive richness.

If these methods are to be used for jet needle determination please use the utmost care whilst carrying out checks on the public highways—really such road testing requires a test track.

Size of Carburetter.

An alteration in size of carburetter should only be necessary if the breathing capacity of the engine has been substantially increased. To improve the breathing will require possibly larger inlet valves, alteration to the head or ports, a change of camshaft or an increase in engine capacity.

Polishing and lining-up the ports and increasing compression by about one ratio is not really sufficient justification for increas-

ing carburetter size.

If larger instruments are to be fitted then the next size should be used; it is very rare that an engine's breathing capacity is increased to the stage where it requires an increase of two sizes. Remember if a larger instrument is fitted to a power unit which does not really merit this increase in carburetter size, the piston will not reach its full travel—the only benefit achieved will be a more impressive underbonnet appearance!

Piston spring

Piston springs are identified by a colour code and this can be found painted on the end coils of the spring.

The range for carburetters up to and including $1\frac{3}{4}$ " bore size is:—
2½ oz. blue. 4½ oz. red. 8 oz. yellow and 12 oz. green.

It is best to use the red spring but if the carburetters are suspected of being on the large size for an engine then the blue should be tried. Conversely if the instrument is only just large enough, a stronger yellow spring might be required.

A correct strength of piston spring will be one which allows the piston to reach its maximum travel at the point in the speed range where maximum power is obtained.

In the paper on the S.U. Carburetter given to the Institute of Mechanical Engineers by Mr. P. G. G. Knight, Technical Manager of S.U. Carburetter Co. Ltd., there is a description of a simple

piston height indicator which can be used whilst the vehicle is in motion. This device can be extremely useful in determining, both piston spring and needle profile by road test methods. (See footnote*)

It should be noted that the change from a medium spring (say the red) to a weaker one (blue), will have the effect of weakening the mixture throughout the range. The effect of going to a stronger one will be to enrich the mixture throughout the range.

A way of getting a rough guide as to which spring to use is to refer to the S.U. Leaflet AUC.9631. This lists carburetter specifications for both current and earlier models. Look down the list of vehicles and find a power unit which gives about the same power with the same number and size of carburetter fitted. This will give a piston spring/jet needle combination which can be used as a good starting point. See also appendix 1.

Carburetter air intake

The way by which the air reaches the carburetter intake can greatly affect the mixture requirements.

In addition to this manometer device Mr. Knight also refers to checking piston lift by means of a rod inserted in a hole drilled vertically through the suction chamber cap.

The rod is cut off flush with the top of the cap when piston is resting on the carburetter bridge and is therefore at its lowest point. As the piston rises, it carries the rod with it and a simple measurement reveals the extent of lift. A device of this type is actually available on the market—the PSW tool set, manufactured by PSW Test Equipment (P. M. Schleyer) of Western Germany, and imported into this country by Motor Books and Accessories, 33 St. Martins Court, St. Martin's Lane, London W.C.2. Sets are available for S.U. carburetors and for Strombergs, they cost 36s 6d. As well as piston lift, they permit immediate checks to be made of jet centralisation, synchronisation of twin carbs, mixture strength and fuel level.

Removal of an air cleaner system will tend to weaken the mixture supplied to the engine and the effect will be greater at the top end of the speed range.

The degree of weakening will depend upon the type of air cleaner and this will be governed by how much restriction the cleaner offers—the greater the restriction, the greater the weakening effect when removed. In general, oil bath type cleaners offer more restriction than the paper element types.

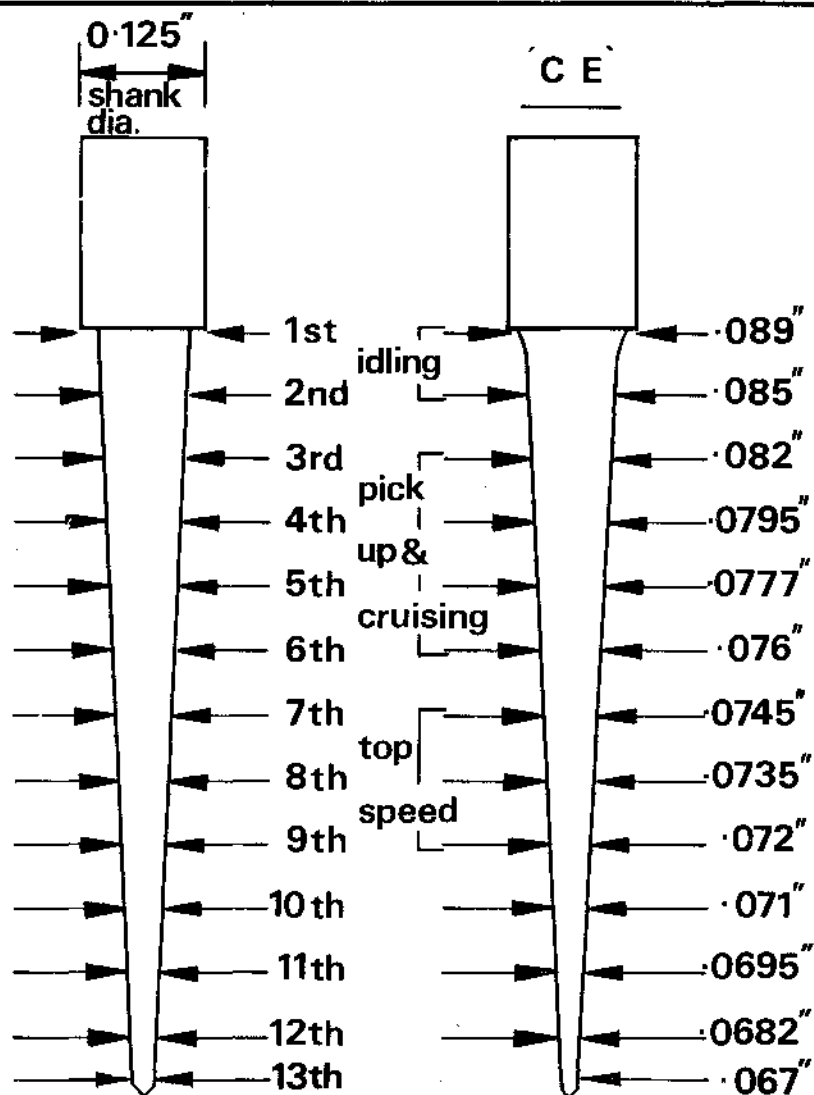
Fitting ram pipes to the intake flange of the carburetter(s) can also affect the mixture requirement (usually weakening the mixture slightly in the mid-speed range). The effect on power curve varies with type, and length.

There is no simple formula for ram pipe length, but in general a length of between 2 to 3 inches is used. The effect of these pipes is to boost power very slightly in the mid-speed range.

Jet needle profile.

Two leaflets which are obtainable from S.U. Carburetter Co. Ltd., or their agents, are extremely useful for jet needle determination; one is the Carburetter Specification booklet already mentioned and the other is the list of needle sizes (AUC.9618). See Appendix 2.

The book of needle sizes gives a list of diameters for each needle starting with the diameter immediately under the shank or head of the needle and working down the length in increments of one eighth of an inch. The smaller the dia-



NB. The above bracketing applies
for $\frac{1}{4}$ " (H2 or HS2) carburettors

meter at any particular point the richer the needle will be at that point.

To illustrate what the needle dimensions in the book actually represent we will take an example, (a diagram of this needle appears on page 10) the CE, list the dimensions and discuss which part affects which driving condition.

Referring to diagram (1) the first two dimensions are given as 1). .089 2). .085; these are the idling or datum positions and it is advisable when changing from one needle to another to choose one with the same idling dimensions.

If this is not possible then bear in mind that if the new needle has weaker or larger idling dimensions (say .089-.0855) the rest of the needle will give slightly richer results than suggested by the dimensions.

If the idling dimensions are richer or smaller (say .089-.0845) the needle will give slightly weaker results than one would expect. This is due to the alteration in the jet position required by the new idling dimensions.

The next four dimensions govern the pick up in top gear from about 20 m.p.h. to 50 m.p.h. These are 3) .082 4) .0795 5) .0777 6) .076 and are also the part of the needle which meters fuel for the part throttle or cruising conditions. A cruising speed of 30 m.p.h. will lie approximately (depending on

size of carburetter) between the second and third dimensions on the diagram; a steady 50 m.p.h. will occur around the fifth portion.

Dimensions from the seventh (.0745) to the ninth (.072) affect the top end full throttle conditions. The last three dimensions (with $1\frac{1}{4}$ " diameter carburetters) do not take part in the metering.

Testing procedure

With the carburetter(s) correctly set for mixture at idle conditions (see S.U. Service Literature) and the engine oil and water at normal temperatures, carry out a number of acceleration tests and part throttle tests.

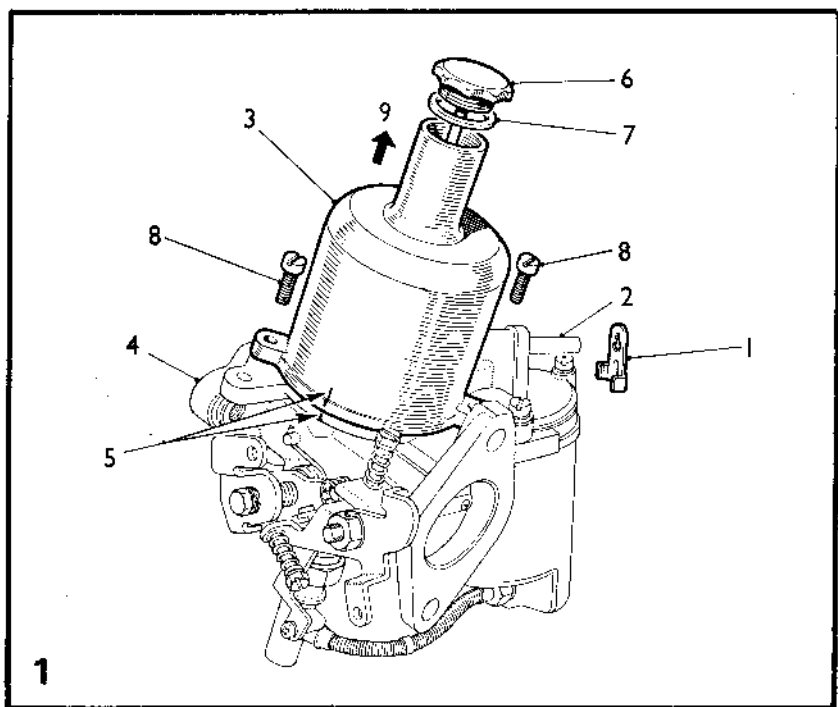
First accelerate from about 20 m.p.h. in top gear to about 50 m.p.h. If there is hesitation or a pulling back, repeat test with the choke pulled out about $\frac{5}{8}$ ". If there is an improvement, make a note that the third, fourth and fifth, and possibly the sixth needle dimensions require to be a little richer. Now try driving at a steady 30, 40 and 50 m.p.h., if there is a slight see-sawing action, try to cure this by richening the mixture control slightly.

If weakness is suspected at these cruising speeds then again the third, fourth and fifth dimensions will require richening. A similar test can be carried out for high speed in top gear. Here it is very important to ensure that there is no weakness.



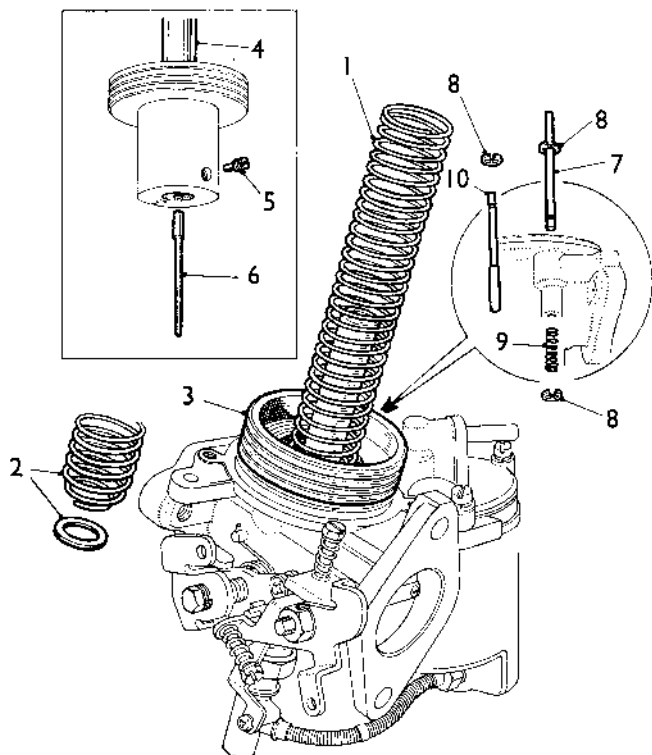
SECTION II

Adjusting and Servicing



- | | |
|---------------------------|------------------------------|
| 1. Baffle plate. | 6. Damper. |
| 2. Inlet nozzle. | 7. Damper washer. |
| 3. Suction chamber. | 8. Chamber retaining screws. |
| 4. Carburettor body. | 9. Direction of removal. |
| 5. Marks for replacement. | |

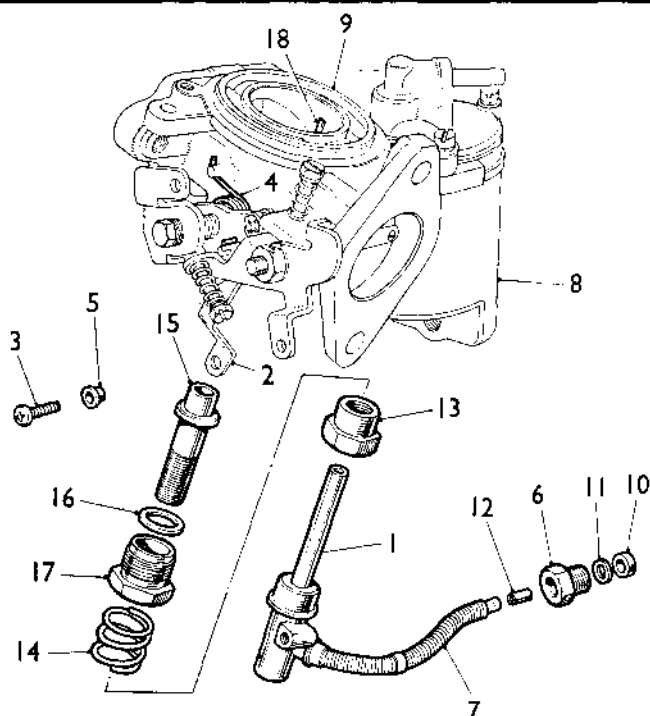
- A. Remove the baffle plate from the inlet nozzle.
B. Thoroughly clean the outside of the carburettor.
C. Mark the relative positions of the suction chamber and the carburettor body.
D. Remove the damper and its washer. Unscrew the chamber retaining screws.
E. Lift off the chamber without tilting it.



2

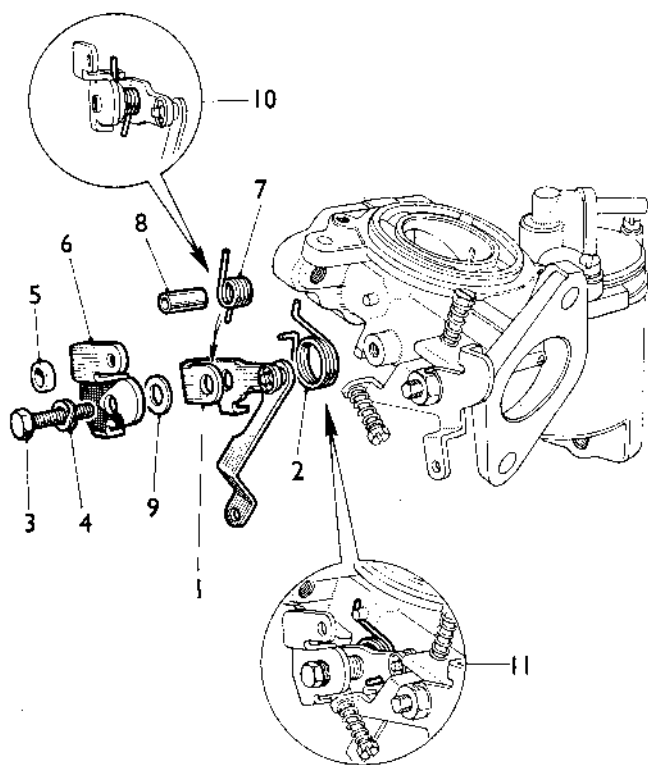
- | | |
|------------------------------------|------------------------------|
| 1. Piston spring. | 6. Needle. |
| 2. Alternative spring with washer. | 7. Piston lifting pin. |
| 3. Piston assembly. | 8. Circlip for pin. |
| 4. Piston rod. | 9. Spring for pin. |
| 5. Needle locking screw. | 10. Alternative lifting pin. |

- A. Remove the piston spring and washer (when fitted).
- B. Carefully lift out the piston assembly and empty the damper oil from the piston rod.
- C. Remove the needle locking screw and withdraw the needle. If it cannot easily be removed, tap the needle inwards first and then pull outwards. Do not bend the needle.
- D. If a piston lifting pin with an external spring is fitted, remove the spring retaining circlip and spring, then push the lifting pin upwards to remove it from its guide. With the concealed spring type, press the pin upwards, detach the circlip from its upper end, and withdraw the pin and spring downwards.



- | | |
|---------------------------------|------------------------|
| 1. Jet assembly. | 10. Gland. |
| 2. Pick-up link. | 11. Washer. |
| 3. Link retaining screw. | 12. Ferrule. |
| 4. Pick-up lever return spring. | 13. Jet adjusting nut. |
| 5. Brass bush. | 14. Spring for nut. |
| 6. Sleeve nut. | 15. Jet bearing. |
| 7. Flexible jet tube. | 16. Brass washer. |
| 8. Float-chamber. | 17. Jet locking nut. |
| 9. Carburettor body. | 18. Piston key. |

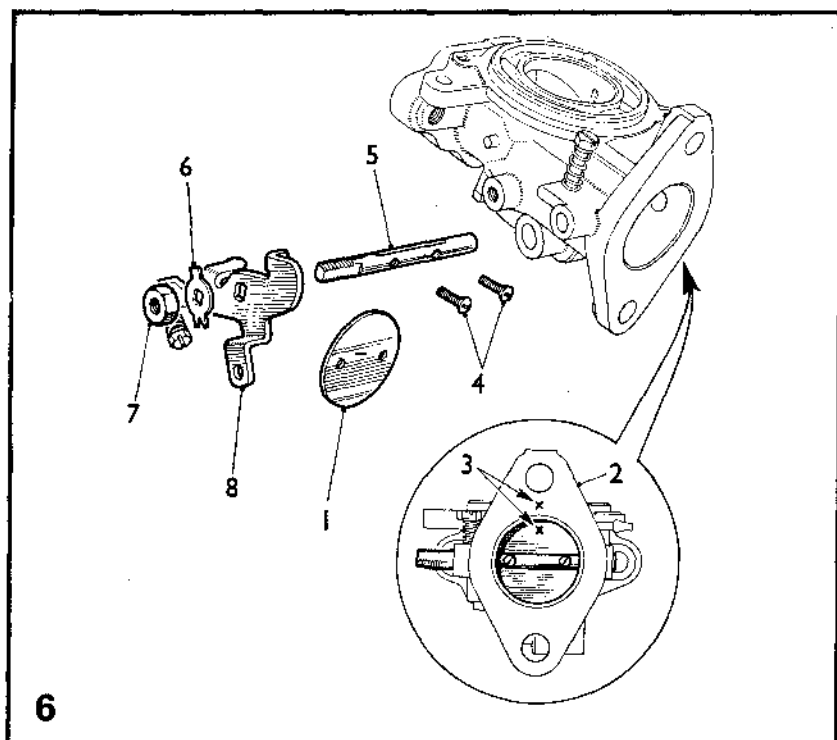
- A. Support the moulded base of the jet and slacken the screw retaining the jet pick-up link.
- B. Relieve the tension of the pick-up lever return spring from the screw and remove screw and brass bush (when fitted).
- C. Unscrew the brass sleeve nut retaining the flexible jet tube to the float-chamber and withdraw the jet assembly from the carburettor body. Note the gland, washer, and ferrule, at the end of the jet tube.
- D. Remove the jet adjusting nut and screw. Unscrew the jet locking nut and detach the nut and jet bearing. Withdraw the bearing from the nut, noting the brass washer under the shoulder of the bearing.



4

- | | |
|-------------------------------|------------------------------------|
| 1. Pick-up lever. | 7. Lever spring. |
| 2. Lever return spring. | 8. Pivot bolt tube. |
| 3. Lever pivot bolt. | 9. Skid washer. |
| 4. Double-coil spring washer. | 10. Cam lever spring location. |
| 5. Spacer (alternative). | 11. Pick-up lever spring location. |
| 6. Cam lever. | |

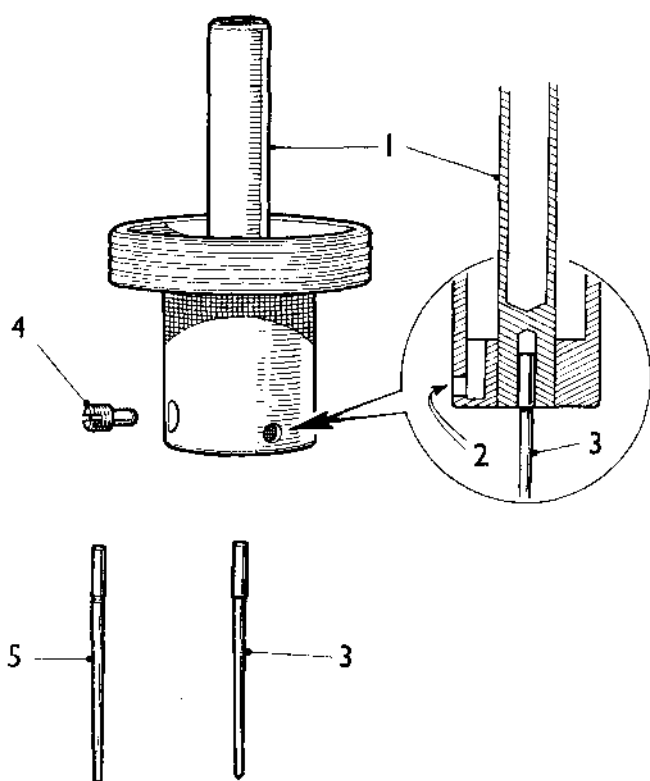
- A. Note the location points of the two ends of the pick-up lever return spring. Unscrew the lever pivot bolt together with its double-coil spring washer, or spacer. Detach the lever assembly and return spring.
- B. Note the location of the two ends of the cam lever spring and push out the pivot bolt tube or tubes, taking care not to lose the spring. Lift off the cam lever, noting the skid washer between the two levers.



- | | |
|---------------------------|----------------------|
| 1. Throttle disc. | 5. Throttle spindle. |
| 2. Carburetter flange. | 6. Tab washer. |
| 3. Marks for replacement. | 7. Spindle nut. |
| 4. Disc retaining screws. | 8. Lever arm. |

- A. Close the throttle and mark the relative positions of the throttle disc and the carburetter flange.
- B. Unscrew the two disc retaining screws. Open the throttle and ease out the disc from its slot in the throttle spindle. The disc is oval and will jam if care is not taken.
- C. Tap back the tabs of the tab washer securing the spindle nut. Note the location of the lever arm in relation to the spindle and carburetter body; remove the nut and detach the arm.

NOTE.—Before reassembling, examine all components for damage and/or wear. Unserviceable components must be renewed.



1. Piston rod.
2. Transfer holes.
3. Needle.

4. Needle locking screw.
5. Alternative needle.

- A. Examine the throttle spindle and its bearings in the carburettor body. Check for excessive play. Renew parts as necessary.
- B. Refit the spindle to the body. Assemble the operating lever with tab washer and spindle nut, to the spindle. Ensure that when the stop on the lever is against the abutment on the carburettor body, i.e. throttle closed position, the countersunk ends of the holes in the spindle face outwards. Tighten the spindle nut and lock with the tab washer.
- C. Insert the throttle disc in the slot in the spindle in its original position as marked. Manoeuvre the disc in its slot until the throttle can be closed and fit two new retaining screws, but do not fully tighten. Check visually that the disc closes fully, and adjust its position as necessary. With the throttle closed there must be clearance between the throttle lever and the carburettor body. Tighten the screws fully and spread their split ends just enough to prevent turning.

- A. Examine the float needle and seating for damage. Check that the spring-loaded plunger in the end of the plastic-bodied needle operates freely.
- B. Screw the seating into the float-chamber carefully. Do not overtighten. Replace the needle in the seating, coned end first. Test the assembly for leakage with air pressure.
- C. Refit the float and lever to the lid and insert the hinge pin. Check the float level as described in item 15
- D. Examine the lid gasket for re-use. Assemble the gasket on the lid and refit the lid to the float-chamber in the position marked on dismantling. Tighten the securing screws evenly.
- E. Refit the float-chamber assembly to the carburettor body and tighten the retaining bolt fully, making sure that the registers on the body and the chamber engage correctly.

- A. Refit the piston lifting pin, spring, and circlip.
- B. Examine the piston assembly for damage on the piston rod and the outside surface of the piston. The piston assembly must be scrupulously clean. Use petrol or methylated spirit as a cleaning agent. **Do not use abrasives.** Lightly oil the outside of the piston rod.
- C. Clean inside the suction chamber and piston rod guide using petrol or methylated spirit. Refit the damper assembly and washer. Seal the transfer holes in the piston assembly with rubber plugs or Plasticine and fit the assembly to the suction chamber. Invert the complete assembly and allow the suction chamber to fall away from the piston. Check the time this takes, which should be 3 to 5 seconds for HS2-type carburettors of 1½

in. (31.75 mm.) bore, or 5 to 7 seconds for larger carburettors. If the time taken is in excess of that quoted, the cause will be thick oil on the piston rod, or an oil film on the piston or inside the suction chamber. Remove the oil from the points indicated and re-check.

- D. Refit the needle to the piston assembly. The shoulder or lower edge of the groove must be level with the bottom face of the piston rod. Fit a new needle locking screw and tighten. Invert the suction chamber and spin the piston assembly inside it to check for concentricity of the needle.
- E. Check the piston key for security in the carburetter body. Refit the piston assembly to the body and replace the piston spring over the piston rod. Fit the suction chamber and retaining screws. Tighten the screws evenly.

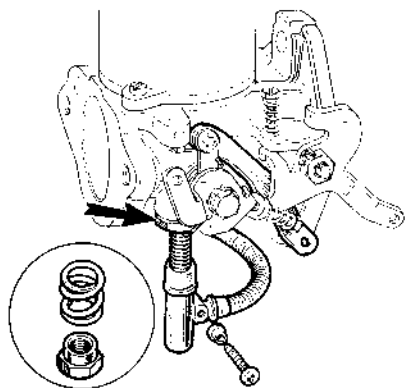
- A. Refit the jet bearing, washer, and locking nut: do not tighten the nut. Refit the jet in its bearing and the flexible tube to the base of the float-chamber without the gland and washer.
- B. Centralize the jet as described in item 13
- C. Withdraw the jet and tube; refit the spring and jet adjusting nut. Fit the gland washer and ferrule to the flexible tube. The end of the tube should project a minimum of $\frac{1}{8}$ in. (4.8 mm.) beyond the gland. Refit the jet and tube. Tighten the sleeve nut until the neoprene gland is compressed. Overtightening can cause leakage.
- D. Refit the damper and washer.

11

- A. Reassemble the pick-up lever, cam lever, cam lever spring, skid washer, and pivot bolt tube or tubes in the positions noted on dismantling.
- B. Place the pick-up lever return spring in position over its boss and secure the lever assembly to the carburetter body with the pivot bolt. Ensure that the double-coil spring washer or spacer fits over the projecting end of the pivot bolt tube.
- C. Register the angled end of the return spring in the groove in the pick-up lever, and hook the other end of the spring around the moulded peg on the carburetter body.
- D. Fit the brass ferrule to the hole in the end of the pick-up link. Relieve the tension of the return spring and fit the link to the jet with its retaining screw. When finally tightening the screw, support the moulded end of the jet.
- E. Refit the baffle plate to the float-chamber lid nozzle.

12

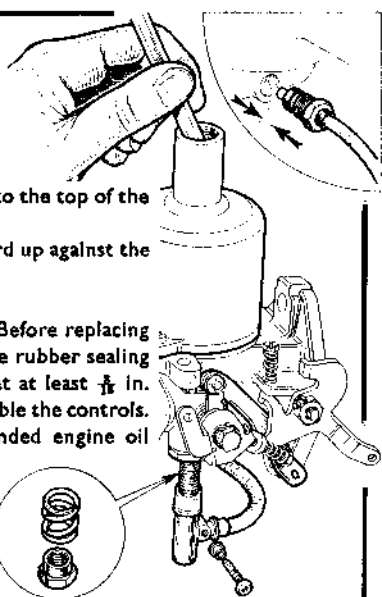
JET CENTREING



13

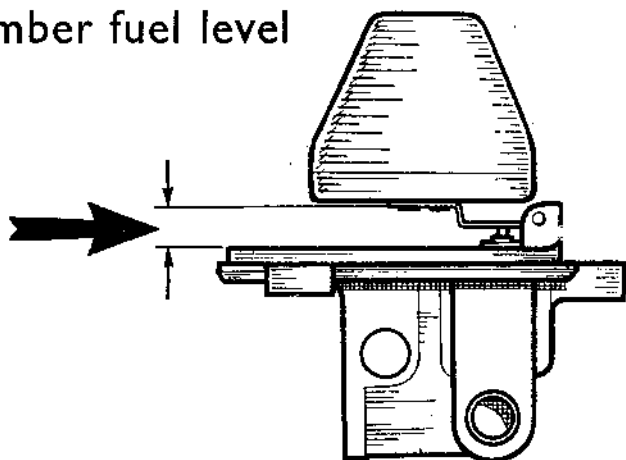
The piston should fall freely onto the carburettor bridge with a click when the lifting pin is released with the jet in the fully up position. If it will only do this with the jet lowered then the jet unit requires re-centring. This is done as follows:

- A. Remove the jet head screw to release the control linkage.
- B. Withdraw the jet, disconnecting the fuel feed pipe union in the float-chamber, and removing the rubber sealing washer. Remove the jet locking spring and adjusting nut.
- C. Replace the jet and insert the fuel feed pipe connection into the float-chamber.
- D. Slacken the jet locking nut until the assembly is free to rotate.

- 
- A. Remove the piston damper and apply pressure to the top of the piston rod with a pencil.
- B. Tighten the jet locking nut keeping the jet hard up against the jet bearing.
- C. Finally check again as in Item 13.
- D. Re-fit the jet locking spring and adjusting nut. Before replacing the fuel feed pipe into the float-chamber, fit the rubber sealing washer over the end of the plastic pipe so that at least $\frac{1}{8}$ in. (4.8 mm.) of pipe protrudes (see inset). Reassemble the controls.
- E. Refill the piston dampers with the recommended engine oil (see Item 26).

14

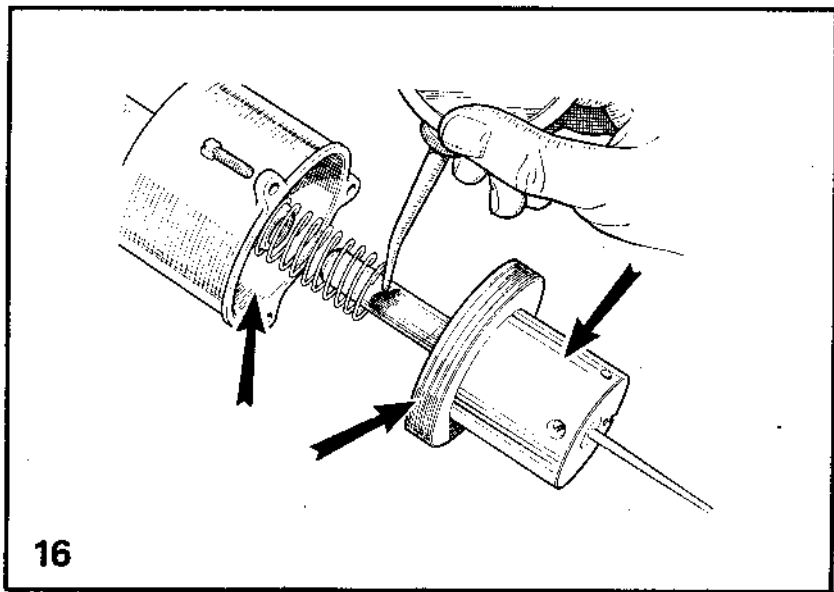
Float-chamber fuel level



- A. Remove and invert the float-chamber lid.
- B. With the needle valve held in the shut-off position by the weight of the float only, there should be a $\frac{1}{8}$ to $\frac{1}{4}$ in. (3.2 to 4.8 mm.) gap between the float lever and the rim of the float-chamber lid.
- C. The float may be set by bending at the crank.

15

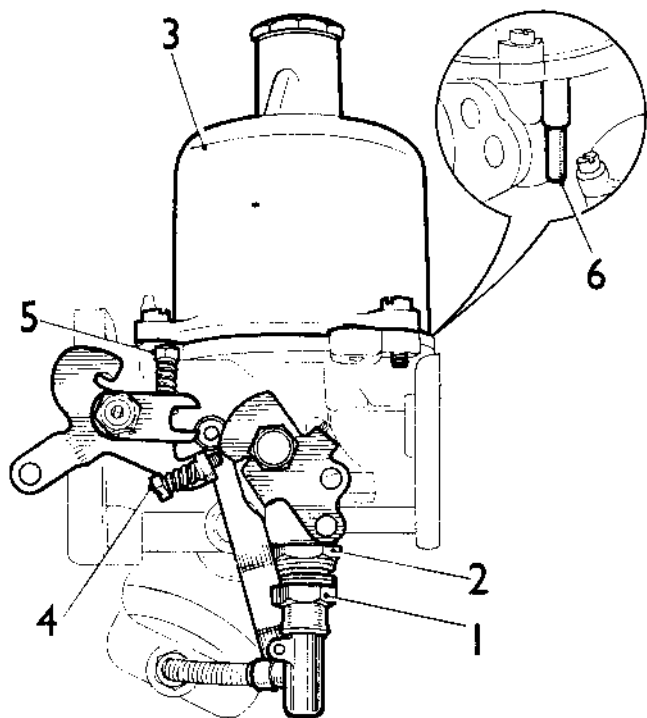
ROUTINE CLEANING



- A. At the recommended intervals mark for reassembly and carefully remove the piston/suction chamber unit.
- B. Using a petrol-moistened cloth, clean the inside bore of the suction chamber and the two diameters of the piston.
- C. Lightly oil the piston rod only and reassemble as marked.
- D. Refill piston damper (see item 26)

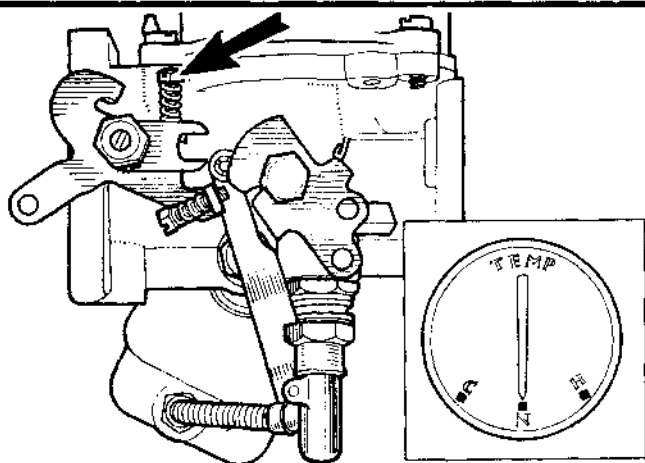
SECTION III

Tuning Multi Carburetters

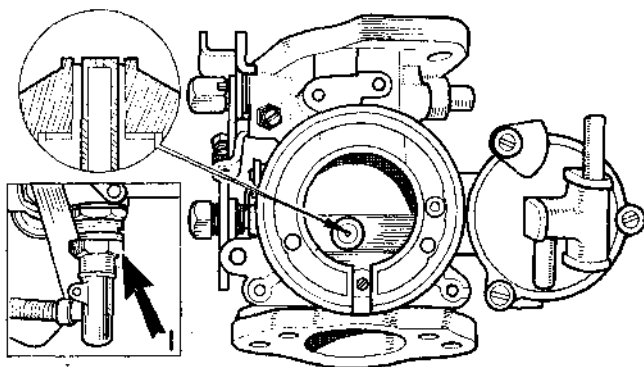


The Type HS Carburetter

- | | |
|----------------------------|-------------------------------|
| 1. Jet adjusting nut. | 4. Fast-idle adjusting screw. |
| 2. Jet locking nut. | 5. Throttle adjusting screw. |
| 3. Piston/suction chamber. | 6. Piston lifting pin. |

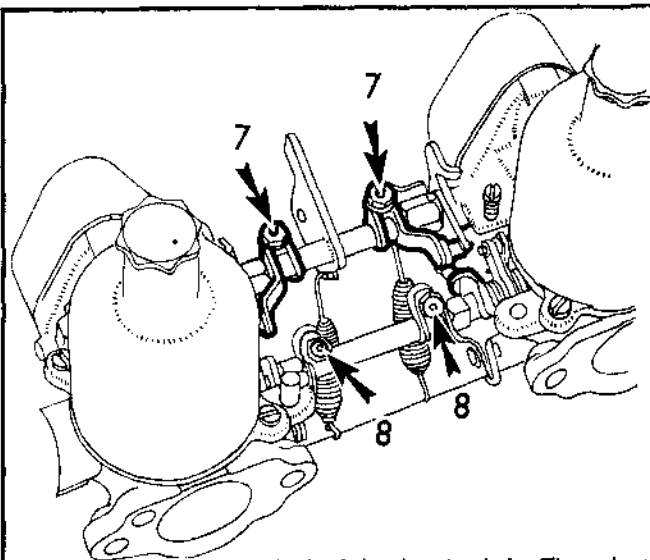


- 17
- A. Warm engine up to normal temperature.
 - B. Switch off engine.
 - C. Unscrew the throttle adjusting screw until it is just clear of its stop and the throttle is closed.
 - D. Set each throttle adjusting screw $\frac{1}{4}$ of a turn open.



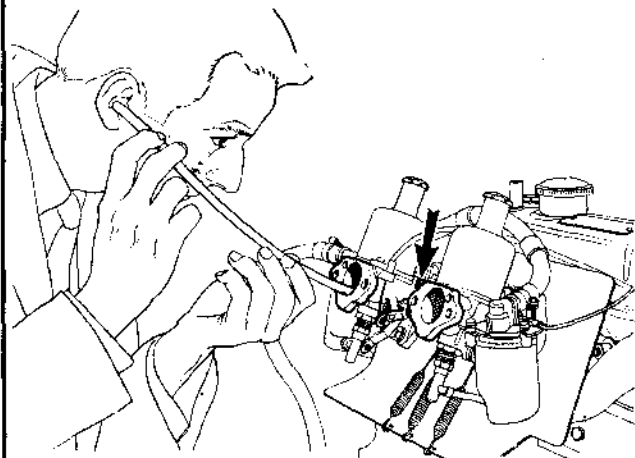
- A. Mark for reassembly and remove piston/suction chamber unit.
- B. Disconnect mixture control wire.
- C. Screw the jet adjusting nut (1) until the jet is flush with the bridge of the carburetor or fully up if this position cannot be obtained.
- D. Replace the piston/suction chamber unit as marked.
- E. Turn down the jet adjusting nut (1) two complete turns.

18



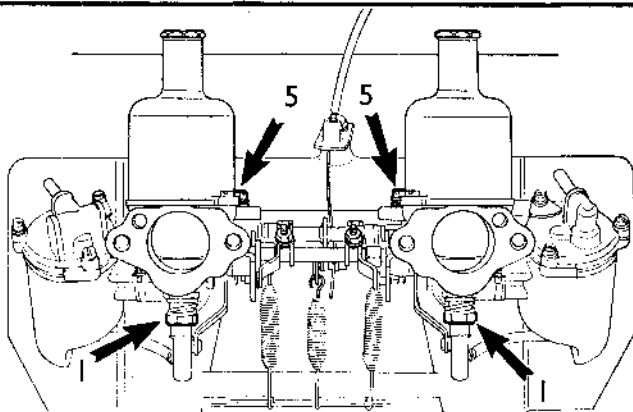
- A. Slacken both of the clamping bolts (7) on the throttle spindle interconnections.
- B. Disconnect the jet control interconnection by slackening the clamping bolts (8).

19



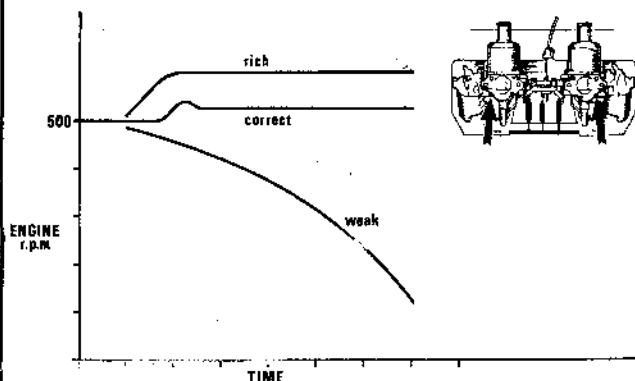
- A. Restart the engine and adjust the throttle adjusting screws on each carburettor to give the desired idling speed as indicated by the glow of the Ignition warning light.
- B. Compare the intensity of the Intake 'hiss' on all carburetters and alter the throttle adjusting screws until the 'hiss' is the same.

20



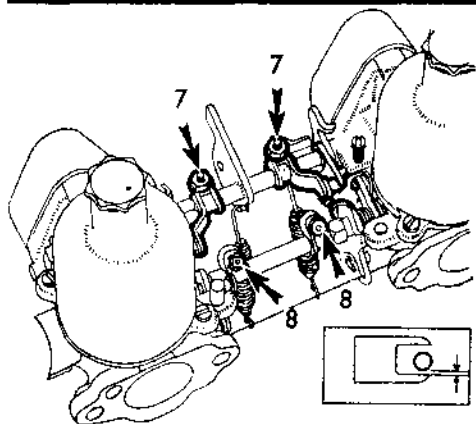
21

- A. Turn the jet adjusting nuts (1) on all carburetors up to weaken or down to richen the same amount until the fastest idling speed consistent with even running is obtained.
- B. Readjust the throttle adjusting screws (5) to give correct idling if necessary.



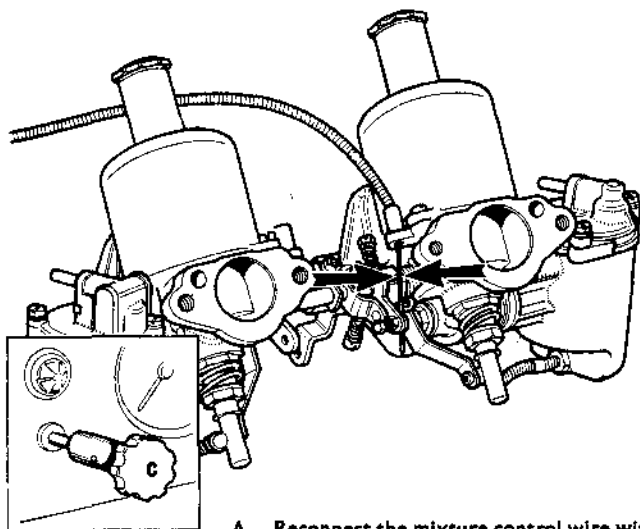
22

- A. Check for correct mixture by gently pushing the lifting pin of the front carburetor up $\frac{1}{32}$ in. (.8 mm.) after free movement has been taken up. The graph illustrates the possible effect on engine r.p.m. Readjust the mixture strength if necessary.
- B. Repeat the operation on the other carburetors and after adjustment re-check since they are all inter-dependent.
- C. Item 25. shows the correct type of exhaust smoke.



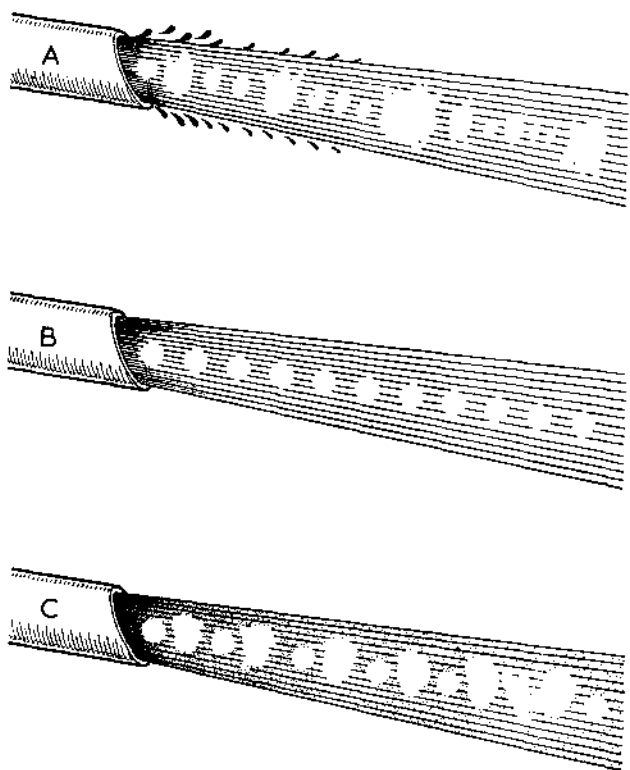
23

- A. Set the throttle interconnection clamping levers (7) so that the link pin is .012 in. (.30 mm.) away from the lower edge of the fork (see inset). Tighten the clamp bolts.
- B. With both jet levers at their lowest position, set the jet interconnection lever clamp bolts (8) so that both jets commence to move simultaneously.



24

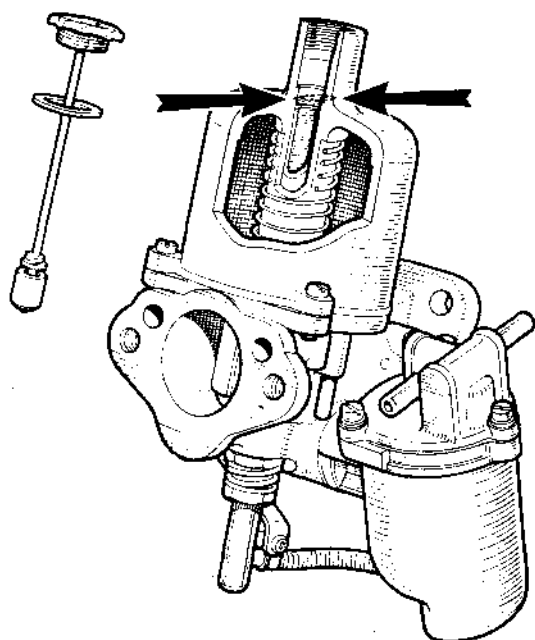
- A. Reconnect the mixture control wire with about $\frac{1}{8}$ in. (1.6 mm.) free movement before it starts to pull on the jet levers.
- B. Pull the mixture control knob until the linkage is about to move the carburettor jets, and adjust the fast idle screws, comparing the intensity of the air intake 'hiss' to give an engine speed of about 1,000 r.p.m. when hot.
- C. Refit the air cleaners.



25

The effect of mixture strength on exhaust smoke

- A. TOO WEAK: Irregular note, splashy misfire, and colourless.
- B. CORRECT: Regular and even note.
- C. TOO RICH: Regular or rhythmical misfire, blackish.



26

Finally top up the piston damper with the recommended engine oil until the level is $\frac{1}{2}$ in. (13 mm.) above the top of the hollow piston rod.

Note

On dust-proofed carburettors, identified by a transverse hole drilled in the neck of the suction chambers and no vent hole in the damper cap, the oil level should be $\frac{1}{2}$ in. (13 mm.) below the top of the hollow piston rod.

S.U. carburetter specifications

Appendix 1

CAR MODEL	YEAR	TYPE No.	NEEDLE			SPRING COLOUR
			RICH	STD.	WK.	
AUSTIN HEALEY						
2963 c.c.	Austin-Healey 100 BN2	1953/6	QA	QW	AT	Yellow
	Austin-Healey Le Mans	1954/6	QA6	QA7	QA8	Red
	Austin-Healey 100 S	1955	KW	KWI	SA	Red
2639 c.c.	Austin-Healey 100/6 BN4	1957	4	AJ	MI	Red
2912 c.c.	Austin-Healey BN6 3000 (Mk. I)	1959	RD	CV	SQ	Yellow
	Austin-Healey BN7	1959	RD	CV	SQ	Green
	Austin-Healey BN7	1959	RD	CV	SQ	Green
	Austin-Healey BN7 (RC)	1960	RD	CV	SQ	Green
2912 c.c.	Austin-Healey BN7 (Mk. II)	1961/2	DK	DJ	DH	Red
2912 c.c.	Austin-Healey 3000 (Mk. II)	1962/3	RD	BC	TZ	Green
2912 c.c.	Austin-Healey BJ8 (Mk. III)	1964	UN	UH	UL	Red/Green
AUSTIN						
948 c.c.	Sprite	1959	EB	GG	MOW	
2912 c.c.	A 99	1959/61		M5	HA	Yellow
848 c.c.	Seven (Mini)	1959	M	EB	GG	Red
848 c.c.	Seven and Super	1961/2	M	EB	GG	Red
997 c.c.	Mini-Cooper	1961/2	AH2	GZ	EB	Red
1622 c.c.	A 60	1961/4	M	GX	GG	Yellow
948 c.c.	A 40	1961/2	AH2	M	EB	Red
948 c.c.	Healey Sprite (Mk. II)	1961/2	V2	V3	GX	Blue
1098 c.c.	Healey Sprite (Mk. II)	1962/3	M	GY	GG	Blue
1098 c.c.	Healey Sprite (Mk. III)	1963/4	H6	AN	GG	Blue
1275 c.c.	Healey Sprite (Mk. IV)	1966	H6	AN	GG	Blue
948 c.c.	A 35 Van	1962/3	H6	AN	EB	Red
1098 c.c.	A 40 and Austin 1100	1962/4	H6	AN	EB	Red
1070 c.c.	Mini-Cooper S	1963/4	3	H6	EB	Red
1275 c.c.	Mini-Cooper S	1964	AH2	M	EB	Red
970 c.c.	Mini-Cooper S	1964	H6	AN	EB	Red
998 c.c.	Mini-Cooper	1964	M	GY	GG	Blue
1800 c.c.	Austin 1800	1964	SW	TW	CIW	Yellow
948 c.c.	A 35 Van	1965/6	M	EB	GG	Red
850 c.c.	Mini Automatic	1965/6	H6	AN	EB	Red
1098 c.c.	1100 Automatic	1965/6	BG	DL	ED	Red
1800 c.c.	1800	1966	SW	TW	CIW	Yellow

Appendix 1 contd

CAR MODEL	YEAR	TYPE No.	NEEDLE			SPRING COLOUR
			RICH	STD.	WK.	
CONVERSION SETS						
M.G.—Elva	1959/61	Pair H4		GS		Red
B.M.C. A Series—Turner	1959/61	Pair H1		BXI		
Minor 1000—Speedwell	1959/61	Pair H2		M8		Blue
B.M.C. A Series—Turner	1959/61	Pair H2		M6		Red
Sprite-Sebring	1960	Pair H2		GX		Blue
F2 Cooper Climax S/C	1960	Single H8				
B.M.C.—FJ Cooper	1960	Pair H4		AM		Blue
948 c.c. Alexander Herald	1960/1	Pair H2		M6		Blue
948 c.c. Sprite	1960	Pair H4		A5		Blue
Mangoletsi Remix	1961/3	Pair H1		M8		
Healey 3000 Competition	1961	Three HD8		UH		Blue/Black
997 c.c. Mini Cooper (Thermo jets)	1961/3	Pair H4		MME		Blue
Sprite—Speedwell	1962/3	Pair H4		AO		Red
Mini competition	1962/3	Pair H4		MME		Blue
970 c.c. Mini-Cooper S Group 2	1964	Pair H4		CP4		Blue
1070 c.c. Mini-Cooper S Group 2	1964	Pair H4		MME		Blue
1275 c.c. Mini-Cooper S Group 2	1964	Pair H4		BG		Blue
Formula 3 B.M.C.—Cooper	1964	Single HS6		SS		Red
1098 c.c. Morris 1100 (Downton)	1964	Pair H4		AM		Blue
COVENTRY CLIMAX						
1100 c.c.	1954/8	Pair H4	R6	BE	6	Blue
F.W.A. Stage I		Pair H4		BE		Blue
F.W.A. Stage II		Pair H4		BF		Blue
1220 c.c. Lotus Elite		Pair H4		BQ		Blue
1220 c.c. Lotus Elite		Single H4		BF		Yellow
1500 c.c. F.P.F.		Pair DU6		ZB		
FORD (CONVERSIONS)						
1172 c.c. E93A	1949/53	Pair HV1	M9	EK	MOW	
1172 c.c. 100E Aquasport	1953/7	Pair MC2	MI	A5	HA	Red
1172 c.c. 100E Prefect and Anglia	1953	Pair H1		M6		
1172 c.c. 100E Lotus	1954/60	Pair H2	M5	M6	M7	Red

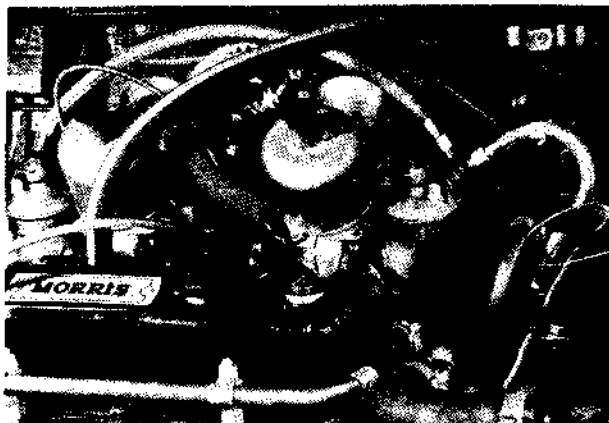
CAR MODEL FORD (CONVERSIONS)	YEAR	TYPE No.	NEEDLE			SPRING COLOUR
			RICH	STD.	WK.	
Consul—Aquaplane (Series 1)	1954/7	Pair H4	4	3	L	Red
Consul—W.H.M.B. Ltd.	1955/7	Pair H2	H2	QA	QW	Red
Zephyr—Aquaplane (Series 1)	1954/7	Three H4	4	3	L	Red/Centre Yellow front and rear
Zephyr—W.H.M.B. Ltd.	1955/7	Three H2	EM	ES	AP	Red
Zephyr—Raymond Mays (Series 1)	1954/6	Pair H4	CN	5	GE	Yellow
Zephyr—Raymond Mays (Series 2)	1957/62	Pair H4	MME	7	AO	Yellow
Consul—R. Owen (Series 2) 4 port head	1958/60	Single H6		RB		Red
Consul—R. Owen (Series 2) 6 port head	1958/60	Pair H6		RB		Red
105E FJ	1060/2	Pair H4		AM		Blue
100E Aquaplane	1960/2	Pair H2		GX		Blue
105E/107E Aquaplane	1960/2	Pair H2		A5		Blue
Consul—R. Owen (Series 2) 4 port head	1962	Single H6		RB		Red
Zephyr—Raymond Mays	1962	Pair H4		AY		Yellow
E93A—Dellow	1950	Single HV3		RLS		Red
Consul (Series 1)—Dellow	1953	Pair H2		M5		Red
Zephyr (Series 1)—Dellow	1954	Three H2		M5		Red
100E Prefect and Anglia—Dellow	1955	Pair H1	M9	EK	MOW	Red
V.8 (Special adaptor)	1950	Pair H4	RO	6		Red
Consul (Series 1)	1952	Pair H4 DD		61		Yellow
Consul (Series 1)	1953	Pair H2 DD		62		Yellow
Zephyr (Series 1)	1953	Three H2 DD		WX		Yellow
Lotus 105E	1961/2	Pair H2		A5		Blue
Turner/Classic	1961/2	Single HS4		DJ		Red
Reliant Ford	1962/3	Pair HS4		CZ		Red
Reliant Zephyr 4	1963/4	Pair HS4		DH		Red
Formula 3 (Holbay-Ford)	1964	Single HS6		UVP		Red

30 h.p.

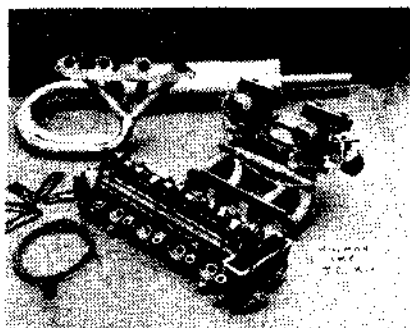
Appendix 1 contd

	CAR MODEL	YEAR	TYPE No.		NEEDLE		SPRING	
				RICH	STD.	WK.	COLOUR	
HILLMAN	875 c.c. Imp (Conversion)	1964	Pair HS2		H4		Blue	
	1600 c.c. Minx (Conversion)	1964	Pair H4		QA		Red	
	1390 c.c. Minx (Conversion)	1956/8	Pair H2	CU	CZ	CF	Blue	
	Alexander Minx (Conversion)	1959/61	Pair H2		GR		Blue	
JAGUAR	XK 120	1949/50	Pair H6 Thermo		RB		Red	
	XK 120	1951/4	Pair H6 Thermo	53	RF	RG	Red	
	XK 120 (Remote air cleaner)	1951/4	Pair H6 Thermo	WO4	WO2	WO3	Red	
	XK 120 7:1 and 8:1 C.R.C. Type	1952	Pair H8	75	VR	VE	Black/Red	
	XK 120 8:1 C.R.C. Type	1952	Pair H6 Thermo		RG		Red	
	XK 120 8:1 C.R. (Remote air cleaner)	1952	Pair H6 Thermo		DG		Red	
	XK 120 9:1 C.R.C. Type	1952	Pair H6 Thermo		RC		Red	
	XK 140 7:1 and 8:1 C.R.	1954	Pair H6 Thermo	SA	SJ	LBA	Red	
	XK 130 C 7:1 and 8:1 C.R. (C Type head)	1954	Pair H6 Thermo		SR		Red	
	XK 140C 7:1 and 8:1 C.R. (C Type Head)							
	disc air cleaners	1954	Pair H6 Thermo		WO2		Red	
	XK 140C 8:1 and 9:1 C.R. (C head)	1954	Pair H8	75	VR	VE	Black/Red	
	XK140C 7:1 and 8:1 C.R. D/H Coupé and standard	1955	Pair H6 Thermo		WO2		Red	
	XK 140C 7:1 and 8:1 C.R. R.H.D. F/H Coupé	1955	Pair H6 Thermo		WO2		Red	
	XK 140C 7:1 and 8:1 C.R. L.H.D. F/H Coupé	1955	Pair H6 Thermo		WO2		Red	
	XK 140 7:1 and 8:1 C.R. L.H.D. F/H Coupé	1955	Pair H6 Thermo	SA	SJ	LBA	Red	
	XK 140 7:1 and 8:1 C.R. R.H.D. F/H Coupé	1955	Pair H6 Thermo	SA	SJ	LBA	Red	
	XK 140 7:1 and 8:1 C.R. Borg-Warner	1955	Pair H6 Thermo	SA	SJ	LBA	Red	
	XK 140 7:1 and 8:1 C.R. Borg-Warner R.H.D. F/H Coupé	1956	Pair H6 Thermo	SA	SJ	LBA	Red	
	XK 140 7:1 and 8:1 C.R. Borg-Warner L.H.D. D/H Coupé	1956	Pair H6 Thermo	SA	SJ	LBA	Red	
	XK 140 7:1 and 8:1 C.R. Borg-Warner R.H.D. D/H Coupé	1956	Pair H6 Thermo	SA	SJ	LBA	Red	
	3-4 litre	XK 150 S	1959/62	Three HD8 Thermo		UE		Blue/Black
		XK 150	1959	Pair HD6 Thermo	WO3	TL	SJ	Red
	3-4 litre	XK 150	1960/2	Pair HD6 Thermo	WO3	TL	SJ	Red
	3-8 litre	XK 150	1960/2	Pair HD6 Thermo		TU		Red
	3-8 litre	E Type	1961/4	Three HD8		UM		Blue/Black
4-2 litre	E Type	1965	Three HD8		UM		Blue/Black	

CAR MODEL	YEAR	TYPE & No.	NEEDLE			SPRING COLOUR
			RICH	STD.	WK.	
M.G.						
1250 c.c.	TF (and 1.5 litre)	1954/5	HI	GJ	GL	Blue
	ZA Magnette	1954/5	M	GM	GO	Red
1500 c.c.	MGA	1955/9	CC	GS	4	Red
	ZA/ZB Magnette	1956/8		EQ	M5	Red
1588 c.c.	Twin Cam	1958	RH	OA6	OA7	Red
	Magnette III	1959/61	FT	FU	M9	Red
1588 c.c.	MGA (Marks I and II)	1959/62	RO	6	AO	Red
1622 c.c.	Magnette (Mk. IV)	1961/3	FU	H8	FK	Red
948 c.c.	Midget	1961/2	V2	V3	GX	Blue
1098 c.c.	1100	1962/3	D6	D3	GV	Blue
1098 c.c.	Midget	1962/3	M	GY	GG	Blue
1800 c.c.	MGB	1962/3	6	MB	21	Red
	MGB Competition	1963/4		UVD		Blue/Black
1800 c.c.	MGB and GT	1966	6	5	21	Red
1098 c.c.	Midget Mk. II	1964	H6	AN	GG	Blue
MORRIS						
	Minor (Series II) O.H.V.	1953/6	EB	GG	MOW	
	Minor 1000	1957	S	BXI	MO	Red
	Minor 1000 (paper air cleaner)	1957	AH2	M	EB	Red
	Minor 1000 (rubber fuel line)	1957	S	BXI	MO	Red
	Minor 1000 (rubber fuel line and paper cleaner)	1957		M		Red
	Minor 1000 (steel levers)	1958	S	BXI	MO	Red
	Minor 1000 (steel levers, paper air cleaner)	1958/9	AH2	M	EB	Red
848 c.c.	Mini Minor	1959/62	M	EB	GG	Red
948 c.c.	Minor 1000*	1960/2	AH2	M	EB	Red
1098 c.c.	Minor and 1100	1962/3	H6	AN	EB	Red
	*Replacement for Minor 1000	1960/2	AH2	M	EB	Red
Twin carburettor sets						
	Minor MM and Series II—Derrington	1948/56	M9	EK	MOW	
	Oxford MO Series II/III—Derrington	1950/7	CJ	HB	MO	Red
950 c.c.	Minor—Power Drive and Alexander	1957	EB	GG	MOW	
	Series II Minor	1953/6				



A works Mini Cooper S: within the engine department lurk these twin 1 1/2 ins. SUs in place of the standard 1 1/2 ins. carbs. Note the carb bellmouths and the re-routed oil breather pipe all very neatly done.

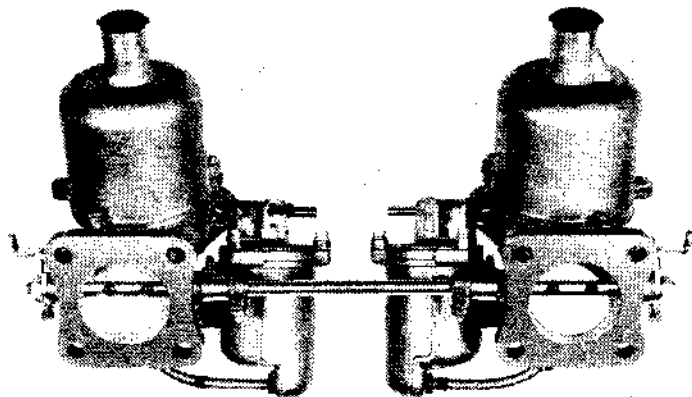


Above: twin 1 1/2 ins. SUs as supplied by Nerus for the Imp, other well known tuners sell this type of conversion for about £30 and results are generally good. Below: HS6s (1 1/2 ins.) as

Below: these twin 1 1/2 ins. SUs were fitted to an MGB tuned by Bill Nicholson of Northampton. Together with other mods they helped propel it to a 0-60 time of 8.8 secs.



visually similar 1 1/2 ins. twin HS4 carbs.



Appendix I contd

CAR MODEL	YEAR	TYPE & No.	NEEDLE			SPRING COLOUR
			RICH	STD.	WK.	
RILEY						
1489 c.c. One-Point-Five	1957/64	Pair H4	AR	AD	HA	Red
1489 c.c. One-Point-Five (L.H.D.)	1957/62	Pair H4	AR	AD	HA	Red
1498 c.c. 4/68	1959/61	Pair HD4	FT	FU	M9	Red
848 c.c. Elf	1961/2	Single HS2	M	EB	GG	Red
1622 c.c. 4/72 Saloon	1961/4	Pair HD4	FU	HB	FK	Red
998 c.c. Elf	1963/4	Single HS2	M	GX	GG	Red
1098 c.c. Kestrel	1965/6	Pair HS2	D6	D3	GV	Blue
1275 c.c. Kestrel	1967	Single HS4	BQ	DZ	CF	Red
ROVER						
2 litre 2000	1963/4	Single HS6		RN		Green
2 litre 2000 (Smith's valve)	1963/4	Single HS6		RR		Green
2 litre 2000 TC	1966	Pair HD8		U1		Black/Blue
STANDARD						
9 h.p. and 10 h.p.	1955/6	Pair H1		D3		
TRIUMPH						
TR2	1953/5	Pair H4	GER	FV	CR	Red
1991 c.c. TR3	1956/8	Pair H6	RH	SM	SL	Red
948 c.c. Herald	1959/61	Pair H1	EB	GV	CA	
1991 c.c. TR3; TR3A and TR4	1959/62	Pair H6	RH	SM	SL	Red
1147 c.c. Spitfire 4	1962/3	Pair HS2	H6	AN	EB	Red
2.2 litre TR4A	1965/6	Pair HS6	SW	TW	CIW	Red
1147 c.c. Spitfire Group II	1966	Pair H4		DB		Blue
Vitesse (Conversion)	1963/4	Pair HS2		MO		Red

090 JET NEEDLES

APPENDIX 2

AS	AA	AB	AC	AC2	AD	AE	AY	AZ	AAA	AAA cont.			
-089	-089	-089	-089	-088	-089	-089	-089	-089	-089	-050			
-085	-0845	-085	-085	-084	-085	-085	-085	-085	-085	-048			
-0826	-080	-080	-082	-082	-082	-081	-0805	-0815	-0814	-046			
-080	-0767	-0785	-080	-080	-080	-078	-0768	-079	-0785				
-0782	-0725	-0768	-0783	-0783	-0780	-0763	-0741	-0755	-0755				
-0765	-071	-075	-0765	-0765	-0760	-0754	-072	-071	-072				
-0746	-0689	-0732	-0746	-0746	-0740	-0745	-0694	-0662	-0674				
-073	-0661	-0718	-073	-073	-0720	-0737	-0669	-0615	-063				
-0711	-0638	-0702	-071	-071	-070	-0728	-0643	-0575	-060				
-0694	-0614	-0688	-0694	-0694	-0680	-0718	-0617	-0532	-058				
-0676	-0591	-0671	-0676	-0676	-066	-071	-059	-0490	-056				
-066	-0566	-0657	-056	-066	-064	-070	-0565	-0445	-0540				
	-054	-064	-064	-064	-062		-0538	-0405	-052				
AF	AG	AH	AH1	AH2	AI	AJ	BA	BB	BD	BE	BF	BG	BH
-089	-089	-088	-088	-089	-089	-089	-090	-089	-090	-089	-089	-089	-089
-085	-085	-0862	-086	-085	-085	-085	-0856	-085	-0856	-084	-085	-085	-085
-0814	-0795	-083	-082	-082	-0817	-0815	-0822	-0825	-0822	-0805	-082	-0815	-0812
-078	-0745	-0803	-079	-0794	-0798	-079	-0805	-080	-0805	-0773	-0796	-0782	-0775
-0758	-0702	-0775	-0765	-077	-078	-0767	-0794	-0775	-0794	-074	-0764	-0745	-0753
-0727	-0665	-0756	-075	-0748	-0765	-0745	-0777	-075	-0777	-0705	-072	-0695	-074
-071	-063	-0733	-073	-0726	-075	-0723	-0760	-0725	-0760	-067	-068	-0647	-0731
-0695	-0598	-0711	-071	-0704	-0732	-0703	-0743	-070	-0750	-0634	-0635	-060	-0722
-068	-0567	-069	-069	-0683	-0712	-0683	-0727	-0675	-0740	-060	-0591	-0557	-0714
-0665	-054	-067	-067	-0662	-0693	-0663	-0710	-065	-0730	-0565	-0549	-0515	-0705
-065	-051	-065	-065	-064	-0685	-064	-0694	-0625	-0720	-053	-0505	-0474	-0696
-0632	-0485	-063	-063	-062	-0675	-062	-0677	-060	-0710	-0495	-0463	-043	-0688
	-046	-061	-061	-060				-0575		-046	-042	-039	-068
AK	AL	AM	AN	AO	AP	AQ	BI	BJ	BK	BL	BM	BN	BO
-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089
-086	-085	-085	-0855	-085	-085	-085	-0855	-0855	-0855	-0855	-0855	-0855	-0855
-0825	-0816	-081	-0827	-082	-0817	-080	-0808	-0824	-0815	-081	-0805	-0816	-0835
-0795	-0796	-078	-0807	-0793	-0796	-076	-0777	-0794	-0785	-0777	-0768	-0784	-0815
-0786	-0781	-0753	-0787	-0766	-0777	-0724	-0751	-0769	-0762	-075	-074	-0758	-080
-078	-077	-073	-077	-0737	-0765	-0694	-073	-0749	-0738	-073	-072	-0738	-0787
-077	-076	-0704	-0753	-0705	-0752	-0688	-0714	-0734	-0722	-0715	-0705	-0724	-077
-0764	-0748	-068	-074	-0673	-0745	-0642	-0705	-0725	-0715	-0707	-0695	-0714	-0757
-0755	-0738	-0655	-073	-064	-0736	-062	-0701	-0721	-071	-070	-0692	-0707	-075
-0747	-0726	-063	-072	-0608	-0727	-060	-0697	-0717	-0706	-0698	-0688	-0703	-074
-0738	-0715	-0606	-071	-0576	-072	-058	-0694	-0714	-0703	-0693	-0684	-0701	-073
-073	-0705	-0583	-070	-0544	-071	-0558	-069	-071	-070	-069	-068	-070	-072
		-056	-069	-051		-0536			-0695	-0688			-071
AR	AS	AT	AU	AV	AW	AX	BP	BQ	BR	BS	BT	BU	BV
-089	-089	-088	-089	-089	-090	-089	-089	-089	-089	-088	-088	-090	-089
-085	-0845	-0856	-084	-085	-085	-0843	-085	-085	-085	-0856	-0856	-085	-0845
-082	-079	-0833	-0815	-0805	-0807	-0807	-0814	-082	-0817	-0836	-0835	-080	-081
-0795	-075	-0809	-079	-0773	-078	-0775	-078	-079	-0785	-0817	-0813	-077	-0785
-0771	-072	-0785	-0773	-0742	-0757	-075	-074	-075	-0757	-0798	-0792	-0745	-076
-0748	-0692	-0761	-0755	-0717	-0735	-073	-0715	-0725	-075	-0778	-0771	-072	-074
-073	-0665	-0738	-0737	-070	-0713	-071	-0695	-0705	-0741	-076	-0749	-0695	-072
-0712	-0635	-0714	-0717	-0675	-0693	-0692	-0673	-0685	-0735	-074	-0726	-0675	-070
-0696	-061	-069	-0698	-065	-0674	-0675	-065	-0662	-0728	-072	-0705	-0655	-068
-068	-0586	-0666	-068	-0625	-0655	-066	-0625	-064	-072	-0701	-0684	-0625	-066
-066	-056	-0643	-066	-060	-0637	-0645	-060	-0616	-071	-0683	-0663	-0602	-064
-064	-0533	-0619	-064	-059	-0618	-063	-058	-0594	-070	-0664	-064	-058	-062
	-051			-058	-060	-0615	-056	-057	-069			-056	-060

090 JET NEEDLES

BW	BX	BX1	BY	BZ			CS1	CT	CU	CW	CX	CY	CZ
-089	-089	-089	-088	-089			-089	-089	-089	-089	-089	-089	-089
-0855	-085	-085	-084	-0843			-088	-085	-085	-085	-085	-085	-085
-0818	-0805	-0827	-0805	-081			-081	-081	-0825	-081	-081	-080	-0827
-079	-077	-081	-0775	-0752			-077	-077	-080	-079	-0796	-076	-0806
-0765	-075	-0792	-0745	-0719			-073	-0738	-0775	-078	-0788	-0738	-0785
-0742	-0735	-0777	-0725	-0686			-069	-0706	-0735	-077	-078	-0715	-0745
-0718	-072	-076	-0709	-0653			-065	-0675	-0715	-0763	-0771	-0695	-0727
-0693	-0705	-075	-069	-0622			-0615	-0643	-070	-0754	-0763	-068	-071
-067	-0687	-074	-067	-059			-058	-061	-0683	-0745	-0755	-067	-0693
-0645	-067	-073	-0653	-056			-0546	-058	-0665	-0736	-0748	-066	-0675
-062	-0655	-072	-0635	-053			-051	-0547	-0647	-0727	-074	-0655	-0657
-0596	-064	-071	-062	-050			-0475	-0515	-0630	-0718	-073	-065	-064
-057			-060	-047			-044	-0485	-0610			-0645	-0625
C	CA	CB	CC	CD	CE	CF	D1	D2	D3	D4	D6	D7	D8
-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089	-089
-0845	-0855	-085	-085	-085	-085	-085	-085	-085	-085	-0855	-0855	-0855	-085
-081	-084	-0805	-081	-0815	-082	-083	-082	-0815	-083	-0825	-0825	-0817	-0817
-077	-0825	-077	-078	-0775	-0795	-0805	-0802	-0800	-081	-0805	-0805	-0785	-0785
-0742	-081	-0745	-075	-0735	-0777	-0787	-0793	-0795	-080	-079	-0793	-0785	-0767
-071	-0807	-0725	-070	-076	-076	-0767	-0785	-0790	-0794	-078	-0785	-0778	-076
-0683	-0803	-071	-0698	-069	-0745	-0747	-0776	-0785	-0785	-0767	-0776	-077	-075
-066	-0803	-0695	-067	-0678	-0735	-0727	-077	-0780	-0778	-0756	-077	-0765	-074
-0635	-0803	-068	-064	-0666	-072	-0707	-0764	-0775	-0772	-0745	-0764	-0759	-073
-0613	-0803	-0665	-061	-0654	-071	-0687	-0759	-0770	-0764	-0733	-0759	-0752	-072
-0594	-0803	-065	-058	-0643	-0695	-0667	-0752	-0765	-0757	-0721	-0752	-0747	-071
-0575	-0803	-0635	-055	-063	-0682	-0647	-0748	-0760	-075	-071	-0748	-074	-070
-056	-0803	-062	-052	-062	-067								
CG	CH	CJ	CK	CL	CM	CN	D9	DA	DB	DC	DD	DE	DH
-090	-090	-090	-090	-090	-088	-089	-089	-089	-089	-089	-089	-089	-089
-084	-084	-084	-084	-084	-084	-085	-0852	-084	-085	-084	-0855	-0855	-085
-081	-0805	-0815	-081	-080	-0805	-0812	-0825	-082	-082	-082	-0835	-0825	-0822
-079	-0782	-0795	-079	-0775	-0775	-078	-0806	-080	-080	-0805	-0817	-0802	-080
-0765	-0767	-0775	-0775	-076	-074	-075	-0791	-0788	-078	-0796	-0798	-0772	-0775
-075	-076	-0761	-077	-075	-0718	-072	-0778	-0784	-0753	-0794	-0782	-0745	-074
-0735	-0756	-0747	-0766	-0746	-070	-069	-0764	-0780	-0717	-0792	-0767	-0734	-072
-0722	-0752	-0734	-0762	-0742	-0685	-0665	-075	-0776	-0674	-0790	-0752	-0729	-071
-0707	-0747	-072	-0757	-0737	-0668	-064	-0736	-0773	-062	-0787	-0740	-0723	-070
-0693	-0743	-0705	-0753	-0733	-0652	-062	-0723	-0769	-0557	-0785	-0730	-0717	-069
-0678	-0738	-0692	-0749	-0728	-0635	-060	-071	-0765	-0493	-0783	-0720	-0712	-068
-0664	-0723	-0677	-0745	-0724	-062	-058	-0696	-0761	-043	-0780	-0710	-0707	-067
-065	-073	-0644	-074	-072	-060	-056			-0368				-066
CO	CP	CP4	CQ	CR	CS	CS1	DJ	DK	DL	DM	DN	DP	DQ
-089	-089	-088	-088	-088	-089	-089	-089	-089	-089	-089	-0885	-089	-089
-085	-085	-0852	-0852	-0852	-085	-085	-085	-085	-085	-084	-085	-085	-085
-081	-0813	-0825	-0825	-083	-0822	-081	-0822	-0817	-082	-081	-082	-081	-0815
-0787	-0793	-079	-0798	-0805	-0792	-077	-0795	-0787	-0795	-0791	-080	-0777	-0785
-0765	-0775	-0757	-0768	-078	-0765	-073	-0765	-0755	-077	-0780	-0782	-075	-076
-0747	-0757	-0725	-0737	-0754	-0725	-0692	-073	-072	-0745	-0775	-077	-0735	-073
-073	-074	-069	-0706	-0725	-0706	-066	-071	-070	-0715	-0770	-076	-0723	-071
-0725	-0735	-0659	-0676	-0697	-069	-063	-070	-069	-070	-0765	-075	-0715	-070
-072	-073	-062	-0646	-067	-0672	-060	-069	-068	-0685	-0760	-074	-071	-069
-0717	-0725	-0585	-0615	-064	-0655	-057	-068	-067	-067	-0735	-0728	-0703	-068
-0714	-072	-0545	-0585	-0613	-0638	-054	-067	-066	-0655	-0750	-0717	-0698	-067
-071	-0715	-051	-0555	-0585	-062	-051	-066	-065	-064	-0745	-0705	-069	-066
		-047	-0525	-0556	-0605	-048	-065	-064	-0625			-0688	-068

090 JET NEEDLES

DR	DS	DT	DU	DV	DW	DY	EP	EQ	ER	ES	ET	EU	EV
088	089	088	089	089	089	089	089	089	089	089	088	089	090
085	085	084	085	084	085	085	085	085	085	085	084	085	0855
090	0805	081	081	0822	0815	079	0835	0817	0833	0818	0845	0825	0815
0768	0776	078	0773	081	0795	0765	0815	0785	081	079	0825	0805	078
0735	0759	076	0755	0792	0780	074	0795	076	0777	077	0803	0785	075
0705	074	074	074	0781	0765	0715	0775	0746	074	0755	0781	077	0725
0675	0725	0723	073	078	0752	069	0755	0732	0725	0748	0773	0755	0705
065	071	0712	072	078	074	0645	075	072	0712	074	077	0745	069
0635	0695	0709	071	078	0728	0643	075	071	0706	073	077	074	068
0627	068	0705	070	078	0714	062	075	070	0704	073	077	074	067
0618	067	0703	069	078	070	061	075	069	0704	073	077	074	066
0608	066	0701	068	078	0686	060	075	068		073			065
060		070				059							
DZ	E1	E2/1	E3	E3/1	E4	EA	EW	EX	EX/1	EY	EZ		
089	088	089	088	088	088	089	089	088	088	088			
085	0845	085	0862	0845	084	085	085	0862	0865	0866	0865		
0827	081	0826	083	0817	080	081	0825	0835	084	0835	0838		
0795	0775	0788	0803	079	078	078	081	081	0816	0812	0798		
077	075	0763	0775	076	076	075	079	0785	0794	0789	0775		
0745	0725	0736	0747	073	0739	072	0775	076	077	0741	0751		
0715	070	0711	072	070	0718	0695	0755	0735	0745	0716	0737		
070	0675	0685	0693	0675	0695	067	0745	071	072	0708	0726		
0685	0646	066	0665	0646	0673	0645	074	0685	0698	0704	0716		
067	0626	064	0638	0626	0651	062	074	066	0675	0701	0706		
0655	0605	062	062	0605	063	0595	074	0635	065	0698	0696		
064	059	060	060	059	061	057		061	0627				
0625	057	058	0582	057	059	0545		058	0602				
EB	EC	ED	EE	EF	EG	EH	FA	FB	FC	FD	FE	FF	FG
089	089	089	089	089	088	089	089	089	090	088	089	089	089
0855	085	085	085	085	085	085	085	085	0865	0865	085	0856	085
0835	081	0825	080	082	080	082	081	0806	083	084	081	0822	0795
0815	0775	0805	0777	0795	0768	0805	077	0767	0795	0805	0775	079	075
0795	0740	0785	075	077	074	0788	072	0729	076	078	074	0757	071
0777	0705	076	0735	074	071	0775	067	070	073	076	071	0722	0678
0762	0675	074	072	072	0685	077	063	0687	071	075	0695	0700	065
075	0645	072	0715	071	0665	077	060	0676	070	074	0686	0672	0625
074	0625	070	0709	070	065	077	0585	0667	069	073	0678	0651	060
073	0605	068	0703	069	0637	077	0576	0658	068	072	0671	0639	058
072	0585	066	0696	068	062	077	0567	065	067	071	0664	0622	056
071	0570	064	069	067	061	077	056	0643	066		0657		054
	0555	062		064	060	077	055	0635	065		065		052
EI	EJ	EK	EL	EM	EN	EO	FI	FJ	FJ	FK	FL	FM	FN
089	089	089	089	089	089	088	089	089	090	089	089	090	089
085	085	085	085	085	085	085	085	085	085	085	085	083	085
081	0805	0827	080	081	0813	0806	082	0825	081	083	079	0796	081
0775	076	081	0775	078	0778	0773	080	079	0775	0812	0765	0772	0775
073	0715	0792	0747	0763	074	0746	079	076	076	0796	074	075	0735
069	068	0777	0772	0747	0706	072	078	073	0745	0784	0715	0727	069
066	065	0762	070	073	068	0697	077	0705	0725	0772	069	0703	066
0635	0625	075	068	0725	0657	0677	076	0693	071	076	0645	068	063
0618	0605	075	066	072	0643	0668	075	0682	070	0748	065	0657	061
060	059	075	064	0715	0632	0659	074	067	068	0736	065	0635	058
059	058	075	062	071	062	065	073	0656	0665	0724	065	0612	055
058	057	075	060	0705	061	064	072	064	065	0712		060	
057	056		058		060	063		063					

090 JET NEEDLES

FO	FP	FQ	FR	FS	FT	FU	GN	GO	GP	GR	GS	GT	GU
089	0898	0890	089	089	089	089	089	089	089	089	089	089	089
085	0855	0850	085	085	085	085	0855	086	085	085	085	085	0855
0818	0826	0820	081	0827	082	082	0835	0845	080	082	0815	082	083
0785	0799	0795	078	081	0795	080	081	0825	076	079	0785	0795	0805
076	0778	0774	075	0785	0772	078	078	0792	075	077	0755	077	0775
0745	0762	0758	0728	076	0753	0763	0755	0777	0725	075	0725	0745	0745
0731	0754	0745	0705	075	0738	075	0725	0765	0696	073	070	071	0705
0729	0750	0735	0685	074	0728	074	070	0755	0666	071	0675	0675	067
0727	0743	0725	0663	073	0724	0733	0675	0750	0636	069	0650	0640	0635
0725	0735	0715	0642	072	072	0728	0650	0745	0606	067	0625	0605	060
0723	0728	0705	0622	071	072	0724	0625	0740	0577	065	060	0570	0565
0721	0710	0695	060	070	072	0714	060	0735	055	063	0575	0535	053
							0575	0730	052	061	055	050	
FV	FW	FX	FY	FZ			GV	GW	GX	GY	GZ		
089	089	089	090	089			089	089	089	089	089		
085	085	0855	085	085			0855	085	0855	0855	0855		
083	081	0827	081	0813			0836	083	0835	0832	0835		
080	0775	080	0775	0789			082	080	0815	0812	0811		
0773	075	0775	075	077			0804	0775	0795	079	0788		
0745	0725	075	0735	0756			080	076	0775	077	0765		
0715	070	0715	072	0748			0796	0745	0755	0753	0742		
0686	0675	068	071	074			0793	073	0735	074	072		
0658	0645	0653	070	0735			0793	0715	072	073	0698		
0647	0635	0627	068	073			0793	070	070	072	0676		
0636	0645	060	066	0725			0793	0685	068	071	0655		
0623	0665	069	064	072			0793	067	064	070	0631		
0614	0665	058	062				0793	066	064	069	061		
G1	GA	GB	GC	GD	GE	GE/R	H1	H2	H4	H4	HA	HB	HC
0875	089	089	089	089	089	089	088	088	089	089	089	089	089
0835	085	085	085	085	085	085	085	085	085	0855	085	085	0855
081	0795	082	083	0833	082	0825	082	082	081	082	0825	0825	0822
0785	077	0795	080	081	0793	0795	0792	0792	0778	080	0805	0805	0805
0765	074	0771	0773	079	0766	076	0762	0762	076	078	0785	0785	0785
0745	0715	0748	0740	0766	0739	0725	0735	0735	0741	076	077	0776	077
0725	069	073	0705	0705	0712	069	0707	0707	072	074	0756	0764	0755
0705	067	0712	0665	0743	0686	066	0686	0684	0702	072	074	0752	0751
069	065	0696	0630	0738	0656	064	0665	0661	0683	070	0727	0743	0747
0674	0632	0685	0605	0738	0643	062	0644	0638	0663	068	0711	0732	0743
066	0615	068	0590	0738	0627	0615	0622	0615	064	066	0698	072	0739
0642	0597	067	0575	0738	0627	061	0601	0592	062	064	068	071	0735
	058		0560		0627	0605	058	057			067	070	
GF	GG	GH	GI	GJ	GL	GM	HD	HE	HF	HG	HV1	HV3	HV4
089	089	089	089	089	089	089	089	090	090	089	089	089	089
085	087	0845	085	084	084	086	0855	0845	0845	0845	084	084	084
0795	0845	082	0825	0817	082	0842	0825	0817	082	0823	080	080	080
077	0825	0786	079	0792	0795	0817	081	080	0805	0802	0778	078	0782
0745	0808	0753	075	0770	0722	0782	0795	0787	0797	0782	0756	076	0764
073	079	0695	0715	0745	075	0770	078	078	079	0753	0734	074	0746
072	078	0635	069	0717	0727	0758	0766	0776	0787	0737	0712	072	0728
0715	077	0586	067	0696	0706	0750	0762	0772	0784	072	069	070	071
071	0758	070	0665	0675	0685	0745	0758	0769	078	070	0668	068	0692
0703	0745	0565	0645	0654	0644	0740	0754	0766	0776	068	0646	066	0674
0696	0732	0545	0645	0632	0642	0735	0751	0763	0774	066	0626	064	0656
069	072	0565	0645	0611	0621	0730	0748	0759	077	064	0602	062	0638
				059	060			0755	0766	062	058	060	062

-090 JET NEEDLES

JM							1	2	3	4	5	6	7
-089							-089	-089	-089	-089	-089	-089	-089
-085							-085	-085	-085	-085	-085	-085	-085
-081							-0 14	-0814	-0814	-0814	-0814	-0814	-0814
-078							-0785	-0785	-0785	-0785	-0785	-0785	-0785
-0752							-077	-0767	-0765	-0761	-0758	-0755	-0755
-0729							-0755	-0749	-0744	-0737	-0733	-0725	-072
-0702							-074	-0732	-0723	-0714	-0705	-0696	-0686
-068							-0725	-0714	-0703	-0692	-068	-0666	-065
-0653							-071	-0696	-0683	-0668	-0653	-0636	-062
-0627							-0695	-0678	-0661	-0645	-0627	-0606	-0587
-060							-068	-066	-064	-062	-060	-0577	-0553
-059							-067	-065	-063	-061	-059	-055	-052
-058							-066	-064	-062	-060	-058	-052	-049
L	L11	L12	LS	LS1			20	21	24	24A	24B	61	62
-069	-069	-069	-068	-068			-089	-089	-088	-088	-088	-089	-089
-085	-084	-085	-085	-085			-0855	-0855	-0845	-0845	-0845	-085	-085
-081	-0801	-081	-080	-080			-0822	-0827	-0815	-0815	-0815	-0805	-081
-079	-0772	-078	-077	-0765			-0792	-080	-0785	-0785	-0795	-0775	-078
-077	-0745	-0735	-0735	-073			-076	-0775	-0755	-076	-0775	-0745	-075
-075	-0722	-073	-0705	-071			-073	-075	-0725	-0738	-0755	-0725	-0734
-0735	-0702	-0702	-068	-0798			-0703	-0723	-0702	-0716	-0735	-0709	-0719
-072	-0675	-0675	-0658	-0678			-0677	-0697	-0682	-0698	-0715	-069	-070
-071	-065	-065	-0636	-066			-0647	-0671	-0667	-068	-0695	-067	-0685
-070	-0625	-0625	-0613	-064			-0624	-0646	-065	-066	-0675	-0635	-067
-069	-060	-060	-059	-062			-060	-0628	-0636	-064	-0655	-0635	-065
-068	-0575	-0575	-057	-060			-058	-0608	-0625	-062	-0635	-062	-0635
	-055	-055	-055	-058			-056	-059	-061	-060	-0615	-060	-062
M	M1	M2	M5	M6	M7	M8	69	80	81				
-089	-089	-089	-089	-089	-089	-089	-089	-089	-089				
-0855	-085	-085	-085	-085	-085	-086	-085	-085	-085				
-0832	-0817	-0817	-0817	-0817	-0822	-0827	-0805	-080	-080				
-0808	-0796	-080	-0792	-0801	-0807	-0812	-0785	-078	-077				
-0785	-0777	-0785	-0776	-0785	-0792	-0797	-0765	-0758	-0742				
-0763	-0757	-0765	-076	-077	-0777	-0782	-075	-0733	-0719				
-0745	-0737	-0745	-0745	-0754	-0762	-0767	-074	-0705	-0699				
-0726	-0717	-0725	-0729	-0738	-0747	-0752	-073	-068	-068				
-0707	-0698	-0705	-0712	-0723	-0732	-0737	-072	-0653	-0653				
-0688	-0678	-0688	-0696	-0707	-0717	-0722	-071	-0627	-0627				
-0669	-0659	-0669	-068	-0691	-0702	-0707	-070	-060	-060				
-065	-064	-0665	-0666	-0676	-0687	-0692	-069	-059	-059				
								-058	-058				
M9	MA	MB	MME	MO	MOW	MW	07						
-089	-089	-089	-089	-089	-089	-089	-089						
-085	-085	-085	-085	-0855	-0855	-0855	-085						
-0827	-0817	-0815	-0813	-0835	-0837	-084	-0815						
-081	-0795	-079	-078	-0815	-082	-0825	-0795						
-0792	-078	-0767	-074	-080	-0808	-0813	-078						
-0777	-0765	-074	-0707	-07875	-0795	-0803	-077						
-0762	-075	-0715	-0673	-0775	-0783	-0792	-076						
-0747	-0735	-068	-0636	-07625	-077	-078	-075						
-0732	-072	-0653	-060	-075	-0758	-0768	-074						
-0717	-0705	-0627	-0563	-07375	-0745	-0757	-073						
-0702	-069	-060	-053	-0725	-0732	-0746	-072						
-0687	-0675	-059	-0495	-07125	-072	-0735	-071						
		-058	-046										

090 JET NEEDLES

P4	P6	P41	PJ				T8						
-088	-088	-088	-089				-089						
-0845	-0845	-0845	-085				-085						
-081	-081	-081	-0822				-081						
-0785	-0775	-077	-0807				-078						
-0755	-0738	-0746	-0795				-075						
-073	-0703	-0715	-079				-073						
-070	-067	-0684	-0785				-071						
-0675	-0638	-0653	-078				-0698						
-0645	-0603	-062	-0775				-0678						
-06175	-057	-059	-077				-066						
-059	-054	-056	-0765				-064						
-0562	-0505	-053	-076				-062						
-0535	-0473	-050					-060						
QA	QW						V2	V3	V5				
-089	-089						-089	-089	-089				
-085	-085						-085	-085	-085				
-082	-0825						-082	-0826	-081				
-0796	-0802						-0795	-0804	-077				
-077	-0781						-0775	-0783	-0748				
-0745	-0755						-0756	-0764	-0725				
-072	-0731						-0738	-0746	-071				
-0695	-0708						-0718	-0726	-0695				
-0668	-0685						-0698	-0706	-068				
-0642	-066						-0678	-0686	-0665				
-0615	-0636						-0658	-0666	-065				
-059	-0613						-064	-0646	-0635				
-0565	-059												
R3	R3-2	R4	RLB	RLS	RO	RS	W3	WW	WXI				
-089	-088	-089	-089	-089	-089	-089	-088	-089	-089				
-085	-084	-085	-085	-085	-085	-085	-083	-085	-085				
-0805	-0805	-081	-081	-0804	-081	-0823	-0805	-0814	-082				
-0776	-0776	-077	-077	-076	-077	-081	-078	-0785	-0795				
-0759	-0759	-0732	-0732	-0725	-074	-0803	-0763	-0775	-0777				
-074	-074	-070	-0693	-0692	-071	-0795	-0745	-0765	-0765				
-0722	-0722	-0665	-066	-066	-0685	-0786	-073	-0755	-0755				
-0703	-0703	-063	-0626	-0626	-066	-078	-071	-0746	-0746				
-0687	-0687	-060	-0592	-0592	-0633	-0775	-0694	-0736	-0736				
-067	-067	-057	-056	-056	-0605	-077	-0677	-0728	-0728				
-065	-065	-054	-0526	-0526	-058	-0765	-066	-0718	-0718				
-0632	-0632	-051	-0495	-0495	-0538	-076	-065	-0709	-0709				
		-048	-046	-046	-053								
S	S4	S5	S6										
-089	-0895	-0895	-089										
-085	-0852	-0852	-085										
-0822	-082	-0815	-0805										
-0806	-079	-078	-077										
-079	-0765	-0753	-0743										
-0774	-0744	-073	-0715										
-0758	-0722	-0707	-069										
-074	-070	-0684	-0666										
-0724	-0677	-0663	-064										
-0708	-0656	-0639	-062										
-069	-0634	-0616	-059										
-0675	-0612	-0593	-0568										
	-059	-057	-0545										

100 JET NEEDLES

A9						GK			K	KA	KB	KC
098						100			100	099	099	099
0946						094			095	095	095	0935
0913						089			0905	092	0917	090
088						085			0865	0895	090	087
085						081			083	0875	0886	084
0834						078			080	0855	0872	082
0818						075			0777	0835	086	080
0802						072			076	0814	085	0785
0787						069			074	0793	0845	0765
077						066			0722	0784	084	075
0755						063			0705	078	0835	071
074						060			0685	078	083	0715
0722						057			0667	078	0725	0695
0706						054			065	078		0675
BC						KD	KE	KF	KG	KH	KI	KK
099						097	099	099	099	099	098	099
095						095	095	095	095	0935	094	095
091						0908	0917	091	0915	0883	090	0925
088						0883	090	089	0895	0863	0865	0893
085						0856	0885	0875	0875	0843	083	086
0825						083	087	0855	0855	0825	080	0828
0803						0775	0848	0835	0841	0805	0777	0795
0785						074	0838	082	0834	0785	076	0738
0765						0705	083	081	0827	076	074	0615
075						067	0822	080	0820	0735	0722	0517
073						0635	0815	0795	0810	071	0705	042
072						060	0808	079	0800	0685	0685	042
071						0565	080	079	0790	066	0667	042
070						053	0792	079	0780		065	042
CI	CIW	CV				KT	KTa	KW	KW1	KW2	KWR	
099	099	099				100	100	100	100	100	100	
095	0955	094				095	095	095	095	095	095	
0916	093	090				0905	0895	091	0915	0905	090	
0889	0905	0867				087	0865	0877	0885	0875	087	
0861	0875	084				0845	0835	084	0851	0845	084	
084	0856	0815				0822	0815	0805	082	0815	081	
0818	0834	0795				0802	0802	077	079	0788	0786	
0796	0819	0775				079	0788	073	076	076	076	
0778	080	076				0775	0775	0695	0728	0728	0728	
076	078	0745				076	076	0661	0695	0695	0695	
074	076	0732				075	075	063	0663	0663	0663	
073	0752	072				074	074	060	063	063	063	
072	0746	071				073	073	057	060	060	060	
071	074	070				072	072	054	057	057	057	
DF	DG	DX				LB1	LB2	LFN	LBA		MC	
100	100	099				100	100	099	100		100	
098	098	0958				096	095	094	096		095	
096	096	0926				0925	091	0885	093		0915	
091	0905	0888				0895	0895	085	0906		0885	
088	087	0859				087	086	0815	0883		0851	
085	0836	0830				085	084	078	0863		082	
082	0804	0775				083	0825	075	0848		079	
0782	0772	0740				082	0815	0723	0839		076	
075	074	0705				081	0805	0695	0830		0728	
0725	071	0670				080	0795	0668	0821		0684	
070	0689	0635				079	0785	064	0812		064	
0685	067	0600				078	0775	061	0804		060	
067	0653	0565				077	0765	0585	0796		0555	
0655	0636	0530				076	0755	0556	0788		051	

100 JET NEEDLES

51	52	53		OA6	OA7	OA8	SA	SB	SC	SD	SE	SF	SG
100	100	100		100	100	100	099	099	100	100	100	100	100
095	095	095		096	096	097	095	095	095	095	095	095	095
090	090	090		0917	093	094	0915	091	0915	0912	0915	09125	0917
0858	0858	0858		0867	0902	0913	0885	0875	0882	088	0903	0895	090
0815	0815	0815		0856	0872	0888	086	084	0865	0862	0889	08825	0887
0777	078	078		0825	0843	086	084	080	0845	0842	087	087	0878
0738	074	0744		0794	0814	0835	0815	076	0823	0822	0852	08575	0869
070	070	0712		0762	0786	0808	079	072	080	080	0845	085	0862
0668	067	0685		0731	0757	0782	0768	0695	079	079	084	0845	0859
0636	064	066		070	0727	0755	0743	067	078	078	084	084	0855
0606	062	064		067	070	073	072	064	077	077	084	084	0855
0579	060	062		064	067	0702	070	062	076	076	084	084	0855
0552	057	060		061	064	0675	068	059	075	075	064	084	0855
053	055	058		058	061	065	066	057	074	074	084	084	0855
RA	RB	RC	RD	RE	RF	RG	SH	SJ	SK	SL	SM	SN	SO
100	099	099	099	099	100	100	099	099	099	099	099	099	100
094	095	0946	095	095	095	095	0952	095	0954	095	095	095	096
088	0907	090	090	092	090	0905	0917	092	093	092	0915	0915	092
083	0866	0855	0865	089	0863	087	0885	0895	090	089	0885	0885	089
0785	0825	081	0835	0856	0825	0836	0865	0875	0867	0867	0855	0865	086
0753	0784	0765	081	0805	0789	0802	0845	0855	0833	0833	0825	0845	083
0722	074	072	079	0753	075	0768	082	0835	080	080	0795	0835	0804
069	070	0674	077	0712	0712	0732	0793	0815	077	077	0765	082	0778
0658	0657	0627	0757	0670	0675	070	077	0792	074	074	0735	080	075
0627	0615	0583	0742	0628	0637	0645	0743	077	0714	0714	071	078	0743
0595	0575	0537	073	0587	060	0630	0722	075	0695	0695	069	0765	0737
0564	0532	0492	0715	0543	057	060	070	073	0676	0676	067	075	073
053	049	0446	0703	0501	054	057	068	071	065	065	065	074	0722
050	045	040	069	0460	051	054	066	069		063	063	073	
RH	RI	RJ	RK	RL	RN	RP	SP	SQ	SR	SS	ST	SU	SV
100	099	100	100	100	099	099	099	100	099	099	099	099	099
095	095	095	095	095	095	095	095	095	095	0945	095	095	0955
0915	0912	0910	0915	0920	092	0905	0915	0915	092	0905	0925	0992	0923
0878	0881	087	088	089	089	087	0892	088	089	086	0895	0868	089
0846	0846	0844	0854	086	0859	085	0871	0854	086	084	087	0834	0867
0813	0804	0819	0830	0835	0808	0832	0852	083	083	080	0852	0802	0845
078	0763	0792	0805	0810	076	082	0834	0812	0804	0755	0831	0764	0818
075	0722	0766	0780	0785	0731	0815	0810	0794	0778	0715	0805	0728	079
072	067	0740	0756	0760	0688	0809	0786	0775	075	0655	0787	069	0755
069	0605	0714	0732	0735	0651	080	0762	0757	0743	059	077	0655	072
066	0567	0688	0708	0710	0617	0794	0738	0738	0737	0535	0753	062	0685
063	0525	0662	0683	0685	0581	0796	0714	0719	073	0485	0737	0586	0665
060	049	0630	066	0660	0547	0778	089	070	0722	045	071	0552	0635
057		0610	0635	0635	0510	077	0666	068	0715	042	069	0518	064
RR	RU	RV					SW	SX	SY	SZ			
099	100	100					099	099	099	099			
095	095	095					0955	095	095	0945			
0922	089	089					0925	0902	091	0903			
0895	084	084					088	0868	0875	0858			
086	081	081					086	084	0855	0837			
0808	0785	0785					084	0808	0825	0798			
076	0756	0755					082	0774	078	0753			
0721	0733	073					0795	0744	075	0707			
0688	071	070					077	0713	069	0643			
0651	0688	067					0745	0686	063	0570			
0617	066	0645					072	0657	0575	0508			
0581	0636	0618					0695	063	0525	0470			
0547	061	059					067	060	049	0445			
051	059	056					0645	0572	046	0420			

100 JET NEEDLES

TA	TC	TD	TE	TF	TG	TH
-099	-099	-099	-099	-099	-099	-096
095	095	095	095	096	095	092
-0915	-0915	-0925	-092	-0925	-0922	-0908
0882	-089	090	0895	-089	-0895	0893
0867	-087	-0875	087	-0855	-0878	0878
0852	-085	-0845	0837	-082	-0862	0863
-0831	-0832	-0803	0805	-0782	-0847	-0848
0805	-0825	-077	-076	-0748	-0837	0825
0787	-0815	-073	-0715	-0714	0827	074
0770	-0805	-0678	067	-068	-0818	-065
0753	-0795	-0631	-0625	-0645	-0812	-055
-0737	-0785	-0585	-058	-061	-0806	-049
-0710	-0775	-0538	0535	-0575	-0800	-044
-0690	-0765	-049	-049	-054	-0794	-040

TJ	TK	TL	TM	TN	TO	TP
-099	-099	-099	-099	-099	-099	-099
095	-095	-095	095	-0945	095	-0955
-092	-092	-092	-092	-091	-092	-092
0895	-090	-089	-0894	-087	-0893	-090
0877	-0885	-086	-0867	-085	-0865	-0875
086	-087	-0835	-0842	-082	-0845	-0856
0845	-086	081	-0814	-078	-083	0836
-084	-0855	-0793	0785	-073	-082	-0819
083	-0845	-0776	-0775	-0665	-081	-080
-082	-0835	-0759	077	-060	-080	-078
-081	-0825	-0746	-077	-0535	-079	-076
-080	-0815	-0733	-077	-050	-078	-0752
-079	-0805	-072	-077	-0475	-077	-0746
-078	-0795	-071	-077	-045	-076	-074

TR	TS	TT	TU	TV	TW	TX
-099	-099	-0989	099	-099	-099	-099
095	-095	-0941	-095	-095	-095	-095
-092	-0915	-0904	-091	-0925	-0925	-091
089	-088	-0883	-088	-090	-0895	-0894
0869	-0853	-0861	-085	-088	-087	-0867
-084	-0823	-0825	-083	-086	-0852	-0842
0817	-0812	-0799	-081	-084	-0831	-0814
0791	-0782	-078	-0793	-0825	-0805	0785
-0765	-0742	-0766	-0776	-081	-0775	-078
-0738	-0710	-0748	-0759	-080	-075	-078
-071	-0675	-0733	-0746	-0795	-0722	-078
-0685	-061	-0721	-0733	-0785	-070	-078
-063	-055	-0715	-072	-0775	-068	-078
-062	-049		-071	-0765	-066	-078

TY	TZ	WO2	WO3	WO4
-099	-099		-100	-100
095	-095		-095	-095
-0918	-0915		-091	-091
0887	-0893		-087	-08775
-086	-087		-0835	-0845
0836	-0847		-081	-0822
-0825	-0827		-0785	-080
-0805	-0805		-076	-078
-0775	-0787		-0732	-0755
-075	-077		-071	-0733
-0722	-0753		-0683	-0712
-070	-0737		-0657	-069
-068	-071		-063	-067
-066	-069		-061	-065

ZB	ZC	ZD	ZE	ZF	ZG	ZH
-099	-099	099	-099	-099	-099	-099
-095	-095	095	095	-095	-095	-095
-0915	-091	-090	-0895	-089	-089	-0915
089	-088	-865	0858	-085	-0845	-0893
-0865	-0855	-084	-083	-0821	-0815	-087
-084	-083	-0815	-0805	-0798	-079	-0847
-082	-081	-079	-0782	-0775	-0765	-082
-0795	-0785	-077	-076	-075	-074	-0795
-0775	-0765	-0745	-0732	-072	-071	-0775
-0755	-0745	-072	-0703	-0687	-0675	-0755
-0735	-0725	-069	-0673	-065	-063	-0735
-071	-0695	-065	-0629	-0608	-059	-0715
-067	-065	-0605	-0584	-0563	-054	-0695
-063	-0605	-056	-054	-052	-050	-0675
-059	-056	-0515	-0495	-0475	-045	

NA	UA	UB	UC	UD	UE	UF
-124	-124	-124	-124	-124	-124	-124
-1205	-1205	-120	-1205	-1205	-1205	-1205
-1170	-1175	-1165	-118	-1178	-1155	-1163
-1144	-1146	-113	-1153	-1158	-1135	-113
-1125	-1117	-111	-1128	-114	-1112	-1106
-1108	-1074	-109	-1107	-1126	-109	-1073
-1090	-1023	-107	-1086	-1115	-107	-1035
-1078	-0974	-1055	-107	-1104	-105	-0997
-1063	-0931	-104	-1056	-1092	-103	-0960
-1065	-0890	-103	-1046	-108	-1015	-0926
-1065	-0849	-102	-104	-1069	-100	-089
-1065	-0803	-101	-1032	-1064	-099	-0854
-1065	-0767	-100	-1025	-1058	-098	-0819
-1065	-0726	-099	-1018	-1047	-0965	-0783
-1065	-0685	-098	-101	-1036	-095	-0748
-1065	-0644	-097	-1002	-1025	-0935	-0713

125 JET NEEDLES

UG	UH	UI	UJ	UK	UL	UM	VA UYA	VB UYB	VC UYC	VD UYD	VE UYE	VF UYF	VG UYG
-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124
-1205	-1205	-1205	-1205	-1205	-1205	-1205	-1188	-1188	-1188	-1184	-1178	-1172	-1166
-116	-1165	-1172	-1165	-116	-1173	-1165	-1145	-1145	-1145	-1135	-1125	-1114	-1103
-1084	-1105	-1114	-1105	-1106	-1113	-1123	-111	-111	-111	-1096	-109	-1063	-1047
-1054	-1085	-1092	-108	-1073	-1090	-1104	-108	-108	-108	-106	-104	-102	-100
-1023	-1065	-107	-1055	-1035	-1076	-1086	-1061	-1056	-1052	-103	-1008	-9985	-9962
-999	-104	-1051	-103	-9997	-106	-107	-1044	-1034	-1025	-100	-9975	-995	-9925
-9954	-1015	-1032	-100	-9960	-1035	-1056	-1025	-101	-997	-997	-9943	-9915	-9887
-9923	-999	-1018	-997	-9927	-1006	-1046	-1006	-9986	-997	-994	-991	-988	-985
-9895	-9965	-1006	-994	-990	-998	-104	-987	-9964	-9943	-991	-9877	-9845	-9813
-9875	-994	-995	-991	-9875	-9956	-1032	-9968	-994	-9915	-988	-9846	-981	-9775
-986							-995	-9917	-9888	-9852	-9814	-9775	-9737
-9845	-9915	-9985	-9875	-9860	-9937	-1025	-9932	-9895	-986	-9822	-978	-974	-970
-983	-989	-9975	-9845	-9845	-9917	-1018	-9913	-9872	-9833	-979	-975	-9715	-9662
-9815	-9865	-9965	-9815	-9830	-9897	-101	-9895	-9848	-9805	-976	-9715	-967	-9625
	-984	-9955	-980	-9815	-9877	-1002	-9875	-9825	-9777	-9732	-9685	-9635	-9586
UN	UO	UP	UR	US	UT	UU	VH UVH	VI UVI	VJ UVJ	VK UVK	VL UVL	VM UVM	VN UVN
-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124	-124
-1205	-1205	-1205	-1205	-1205	-1205	-1205	-116	-1154	-1146	-1134	-1122	-1122	-1122
-1165	-1155	-116	-116	-1172	-1147	-1165	-109	-1077	-1065	-1046	-103	-103	-103
-113	-1135	-114	-1128	-1133	-1114	-114	-103	-1015	-997	-997	-9956	-9946	-9946
-110	-110	-1105	-1094	-1105	-1084	-112	-998	-996	-994	-992	-990	-988	-987
-107	-108	-1075	-106	-1092	-1054	-1095	-994	-9917	-9895	-9874	-985	-9827	-980
-104	-1055	-1045	-103	-1085	-1023	-107	-990	-9875	-985	-9825	-980	-9775	-9734
-1005	-103	-1025	-9997	-1068	-9990	-105	-986	-9833	-9805	-9778	-975	-9722	-967
-9985	-101	-101	-996	-1043	-9954	-1025	-982	-979	-976	-973	-970	-9668	-9644
-9965	-9985	-9995	-9927	-102	-9917	-100	-978	-9748	-9715	-9684	-965	-9615	-955
-9945	-9965	-9985	-990	-1006	-988	-999	-974	-9715	-967	-9635	-960	-9563	-9494
-9915	-994	-9975	-9875	-9995	-9858	-998	-970	-9662	-9625	-9588	-955	-951	-944
-9885	-993	-996	-9860	-9985	-9836	-997	-966	-962	-958	-954	-950	-9457	-939
	-9915	-9945	-9845	-9975	-9813	-996	-962	-9577	-9535	-9493	-945	-9405	-934
-9855	-990	-993	-983	-9965	-979	-9945	-958	-9535	-949	-9445	-940	-935	-9295
-9830	-989	-9915	-9815	-9955	-9768	-993	-954	-9492	-9445	-9396	-935	-930	-925
-9805													
UV	UW	UX	UY	UZ			VO UYO	VP UYP		VR UVR	VT UYT		ZA
-124	-124	-124	-124	-124			-124	-124		-124	-125		-999
-1205	-1205	-1205	-1205	-1205			-121	-121		-119	-121		-995
-1182	-1175	-1165	-1174	-1172			-117	-117		-1145	-116		-9905
-1160	-1146	-114	-1145	-1135			-113	-113		-1108	-1115		-9875
-1135	-1117	-112	-1128	-1113			-110	-110		-1073	-107		-9847
-1112	-1074	-1095	-1107	-1095			-1075	-107		-1038	-103		-9822
-1095	-1023	-107	-1086	-1084			-105	-104		-1004	-999		-980
-108	-9974	-105	-107	-1066			-1022	-100		-997	-995		-9778
-1065	-992	-1025	-1056	-1048			-9995	-9965		-9925	-991		-9758
-1053	-9865	-100	-1046	-103			-997	-993		-988	-987		-9737
-1047	-981	-999	-104	-102			-9935	-989		-9835	-984		-971
-1042	-9755	-998	-1032	-101			-9895	-9855		-979	-981		-9675
-1036	-970	-9955	-1025	-100			-9855	-982		-976	-9775		-963
-1029	-964	-9931	-1018	-999			-982	-9782		-973	-9745		-9585
-1029	-958	-991	-101	-998			-978	-9745		-970	-972		-954
-1029	-952	-989	-1002	-997			-974	-9707		-967	-969		

NOTE.—V' Series, 1/32" UV' Series, 1/16" shank

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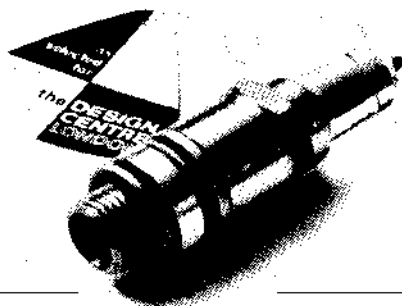
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