

INTRODUCTION

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**INTRODUCTION**

This Workshop Manual which is in loose leaf form for easy amendment, has been compiled to assist Massey-Ferguson Distributor and Dealer personnel to undertake routine maintenance and servicing, minor and major repairs, replacements, adjustments and out of season storage efficiently by the most straight forward method.

With this aim in mind, the Manual is divided into parts and sections, and each page bears the part and section number. This will make the required subject easier to find and the numbered operations will simplify cross reference.

**REPAIRS AND REPLACEMENTS**

When service parts are required it is essential that only genuine Massey-Ferguson replacements are used. Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories.

Safety features embodied in the tractor may be impaired if other than genuine parts are fitted.

In certain territories, legislation prohibits the fitting of parts not to the tractor manufacturers specification.

Torque wrench setting figures given in the Workshop Manual must be strictly adhered to. Locking devices, where specified must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed.

The tractor warranty may be invalidated by the fitting of other than genuine Massey-Ferguson parts.

All Massey-Ferguson replacements have the full backing of the factory warranty.

Massey-Ferguson Distributors and Dealers are obliged to supply only genuine service parts.

**Special Tools**

The use of special tools mentioned in the text contributes to an efficient and profitable repair. Some operations are, in fact, impracticable without their use, particularly those, for example, which deal with the assembly of the differential unit. Distributors are therefore urged to check their tools against the list provided and order those necessary from: V. L. Churchill & Co. Ltd., London Road, Daventry, England.

**Schedule of Repair Operations**

The operations listed in the Repair Time Schedule refer to those described in this manual. The time set against each operation in the schedule is evolved by performing the actual operations on a standard tractor using special tools where stated. The Repair Time Schedule for use with this manual, is issued as a separate publication.

**NOTE – SERVICE INFORMATION SHEETS AMENDMENT SHEETS AND REPAIR TIME SCHEDULES ARE ISSUED TO THE MASSEY-FERGUSON DISTRIBUTORS AND DEALERS ONLY AND ARE NOT FOR GENERAL PUBLICATION**

**Service Tools and Equipment**

Where the use of a Service Tool is specified in an operation the tool number will be shown under the operation heading and also following the instruction requiring its use.

**AMENDMENTS****AMENDMENTS**

To assist in identifying amendments on revised pages, two asterisks (\*\*) or stars will be inserted at the beginning and the end of the amended paragraph, section, instruction or illustration.

To ensure that a record of amendments to this manual is available, this page will be re-issued with each set of revised pages. The amendment number, date of issue, appropriate instructions and revised page numbers will be quoted.

Revised pages must be inserted in place of existing pages carrying the same number and the old page discarded.

Additional pages or complete major assembly groups may be issued. In such cases the new pages must be inserted immediately following the existing pages carrying the next lowest number. Where the new pages are to be inter-leaved with existing pages, the new page numbers will carry a suffix letter, and these pages must be inserted as indicated by their numbers and suffixes.

Amendment No.	Date	Pages Issued

## MF 135 AND MF 148 TRACTORS

Publication Numbers 1856 027 M1 and 1856 002 M1

The following amendment should be applied by hand to the pages indicated.

Page No.	Operation No.	Issue	Amendment
4B-06	4B-05-06	1	Delete from Item 3, Removal "centre thrust washer (53)". Delete from Item 4, Refitment "and thrust washer (53)".
4B-08	Fig. 14	1	Delete the thrust washer and the reference '53'.
4B-13	4B-11-10	1	Delete from Item 38, Disassembly "centre thrust washer (53)".
4B-14	4B-11-10	1	Delete from Item 21, Refitment "and thrust washer (53)".
7B-26	7B-13-26	1	Amend the torque figures in Item 5 to read "3,5 kg m (25 lb ft)".

The following additional information should be attached to page 4B-10.

### MULTI-POWER REGULATOR VALVE

(From Serial Numbers – MF 135 – 404918  
MF 148 – 600004)

#### Servicing

Special Tools Required – See operation 4B-03-05.

#### Disassembly

1. Remove the p.t.o. input housing as stated in operation 4B-03-05.
2. After removing the regulator from the input housing, remove the plug, adjacent to the feed pipe adapter, spring and ball.
3. Withdraw the large spool.
4. Remove the other plug washer, spring and spool.

#### Reassembly

1. Fit a new 'O' ring to the large spool.
2. Slide the spool into the spool block, then refit the ball, spring and plug.
3. Refit the small spool, spring, new washer and plug.
4. Tighten the plug to 2,75 kg m (20 lb ft).
5. Refit the p.t.o. input housing and p.t.o. input shaft as stated in operation 4B-03-05.

**MF 135/148 TRACTOR**  
**WORKSHOP SERVICE MANUAL**

**PART 4**

Publication No. 1856 002 M2

**AMENDMENT**

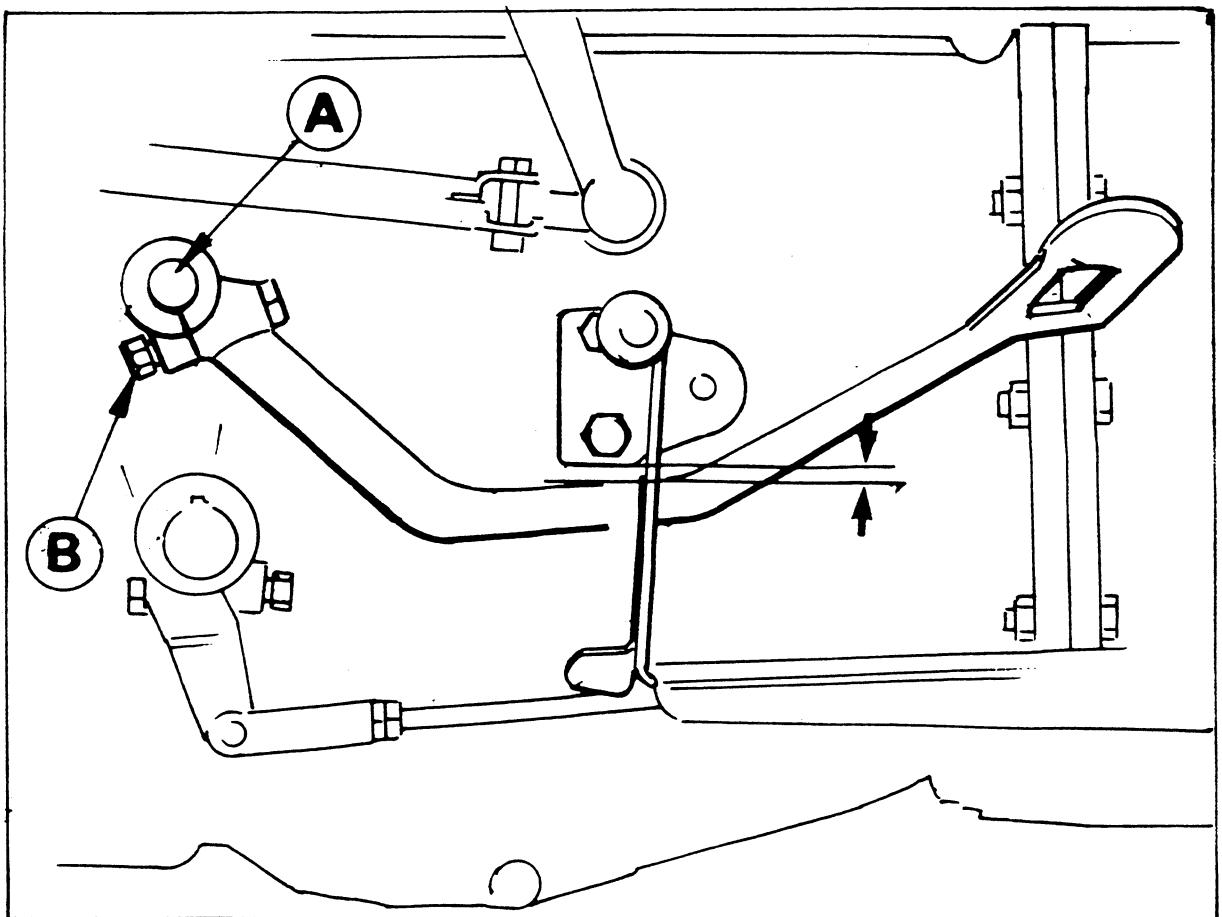
**Page 4A-02 MAIN FRICTION DISC OR CLUTCH ASSEMBLY**

**Item 9. Fig. 9**      **Depress the clutch pedal until the distance between the arm and the transmission case is 3,2 mm (1/8 in). Retain the arm in this position and tighten the clamping bolt (B). Recheck the adjustment.**

**SHOULD READ:**

**Depress the clutch pedal until the distance between the arm and the transmission case is 11,11 mm (7/16 in). Retain the arm in this position and tighten the clamp bolt (B). Recheck the adjustment.**

**Illustration 9, Page 4A-06 should be replaced with the illustration below:**



# MF 148 TRACTOR

Publication No. 1856 002 M1

## ADDENDUM

The following pages are amendments which should be applied by hand to the pages indicated

Page No.	Operation No.	Issue	Amendment
4B-05	4B-04-05	1	Add to Special Tools Required "MF 218A-2 Adapter".
4B-06	4B-04-05	1	Add to Item 3, Refitment "and adapter MF 218A-2".
4B-10	4B-11-10	1	Add to Special Tools Required "MF 218A-2 Adapter".
4B-17	4B-11-10	1	Add to Item 30, Refitment, "and adapter MF 218A-2".
<hr/>			
4C-07	4C-04-07	1	Special Tools Required, amend "MF 265A" to read "MF 331". Item 4, Refitment, amend "MF 256A" to read "MF 331".
4C-08	4C-05-08	1	Add to Special Tools Required "MF 281A-2 Adapter". Add to Item 3, Refitment "and adapter MF 218A-2".
4C-08	4C-06-08	1	Add to Special Tools Required "MF 218A-2 Adapter". Add to Item 3, Refitment "and adapter. MF 218A-2".
4C-10	4C-11-10	1	Add to Special Tools Required "MF 218A-2 Adapter". Special Tools Required, amend "MF 256A" to read "MF 331".
4C-13	4C-11-10	1	Item 3, Reassembly, amend "MF 256A" to read "MF 331". Add to Item 25, Reassembly "and adapter MF 281-2".
<hr/>			
5B-01	GENERAL	1	Amend "Figures" to read "1 and 2".
5B-11		1	Amend "Part 5 Section C" to read "Part 5 Section B".
5B-15	5B-12-15	1	Item 4, Disassembly, amend to read "Withdraw the selector shaft from the side cover". Item 1, Reassembly, delete all text and amend Item "2" to read Item "1" and so on.
<hr/>			
7A-11		1	Pressure Control, line 3, amend "211" to read "179" and "3000" to read "2550".
7A-27	7A-12-27	1	Draft Control Rod, Item 3, amend "MF 333" to read "MF 271".
7A-32	7A-15-31	1	Item 8, Refitment, amend "'O' rings" to read "gaskets".
7A-32	7A-15-32	1	Add between Items 2 and 3. Disassembly "2a. Remove the split pin securing the coupler (if fitted) to the camshaft and remove the coupler". Add between Items 10 and 11 Reassembly "10a. Refit the coupler (if fitted) to the camshaft and secure with a new split pin".

<b>Page No.</b>	<b>Operation No.</b>	<b>Issue</b>	<b>Amendment</b>
7B-02	GENERAL	1	Line 16, amend "28,6" to read "31,8" and "6.3" to read "7.0". Line 18, amend "14,1" to read "15,0" and "3.1" to read "3.3". Line 19, amend "42,7" to read "46,7" and "9.4" to read "10.3". Line 31, amend "211" to read "179" and "3000" to read "2550".
7B-02	7B-01-02	1	Removal, transpose Items 2 and 3. Refitment, transpose Items 2 and 3.
7B-17	CIRCUIT FLOWS	1	Lines 13 and 14, amend "211" to read "179" and "3000" to read "2550".
7B-31	HYDRAULIC TESTS	1	Below first paragraph add "Low Capacity Pump 7B-15-31". Relief Valve, Item 4 amend "500 to 550" to read "725 to 775". "46" to read "49". "650" to read "700". "2000" to read "2250". "53" to read "70" and "750" to read "1000". Multi-Power Operating Pressure, Item 4, amend "2000" to read "2550".
7B-31	7B-16-31	1	Multi-Power Relief Valve, Item 2, amend "500 to 550" to read "725 to 775". "46" to read "49". "650" to read "700". "2000" to read "2250". "53" to read "70" and "750" to read "1000". Multi-Power Flow Test, Item 5 amend "500 to 550" to read "725 to 775".
7B-32	7B-16-31	1	Filter By-Pass Valve, Item 4, amend "500 to 550" to read "725 to 775". Multi-Power Operating Pressure, Item 2, amend "2000" to read "2250". Flow Check, Item 3, amend "2000" to read "2250".

## GENERAL INSTRUCTION

### GENERAL INSTRUCTIONS

These instructions will be helpful in following the information in the Service Manual. In analysing a system malfunction, use this systematic procedure to locate and correct the problem.

1. Determine problem.
2. List possible causes.
3. Devise checks.
4. Conduct checks in logical order to determine cause.
5. Consider remaining service life against cost of parts and labour.
6. Make necessary repair.
7. Recheck.

### SAFETY

Your safety and that of others is always the first consideration when working around machines. Safety is a matter of thoroughly understanding the job to be done and the application of good common sense. It is not just a matter of "do's" and don'ts".

### CLEANLINESS

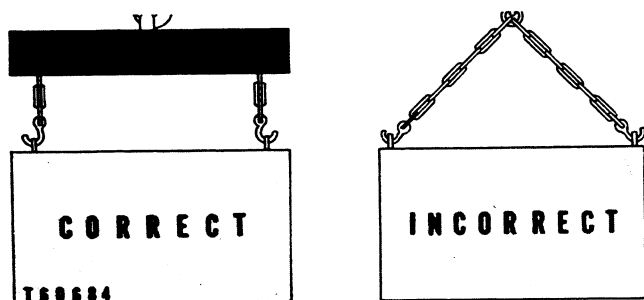
The most important single item in preserving the long life of the machine is to keep dirt out of vital working parts. Precautions have been taken to safeguard against this. Enclosed compartments, seals and filters have been provided to keep the supply of air, fuel and lubricants clean. These safeguards must be maintained, be maintained.

Whenever hydraulic, fuel, lubricating oil or air lines are disconnected, clean the point of disconnection as well as the adjacent area. As soon as the disconnection is made, cap, plug or tape the line or opening to prevent entry of foreign material. The same recommendations for cleaning and covering apply when access covers or inspection plates are removed.

Clean and inspect all parts. Be sure all passages and holes are open. Cover all parts to keep them clean. Be sure parts are clean when they are installed. Leave new parts in their containers until ready for assembly.

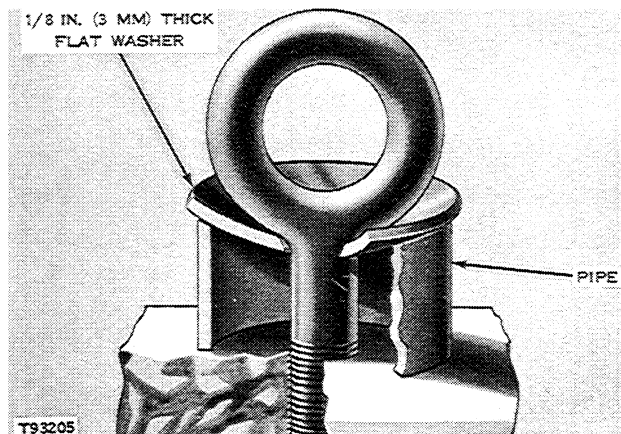
### REMOVAL AND INSTALLATION

Unless otherwise specified, all removals should be accomplished using an adjustable lifting beam. All supporting members (chains and cables) should be parallel to each other and as near perpendicular as possible to the top of the object being lifted.



Correct and incorrect method of lifting a component

When removing a component on an angle, remember that the capacity of an eyebolt diminishes as the angle between the supporting members and the object becomes less than 90°. Eyebolts and brackets should never be bent and should only have stress in tension. A length of pipe and a washer can be used, as shown, to help relieve these stresses on eyebolts.



Forged eyebolt support

Some removals require the use of lifting fixtures to obtain proper balance and to provide safe handling. Use a hoist to remove heavy parts.

If a part resists removal, check to be certain all nuts and bolts have been removed and that an adjacent part is not interfering.

### DISASSEMBLY AND REASSEMBLY

When reassembling a machine, complete each step in turn. Do not partially assemble one part and start assembling some other part. Make all adjustments as recommended. Always check the job after it is completed to see nothing has been overlooked.

Recheck the various adjustments before returning the machine to the job.

### PRESSING PARTS

When one part is pressed into another lubricate the mating surfaces.

Assemble tapered parts dry. Before assembling, be sure the tapers are clean, dry and free from burrs.

### BOLTS AND BOLT TORQUE

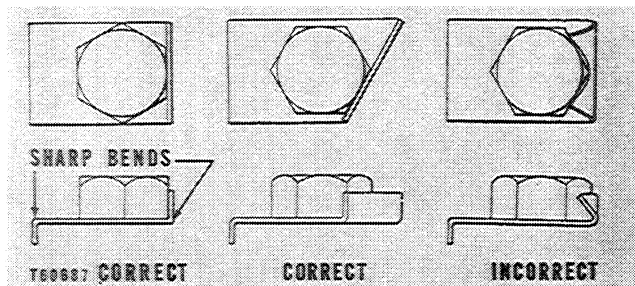
Use bolts of the correct length. A bolt which is too long may "bottom" before the head is tight against the part it is to hold. The threads can be damaged when a "long" bolt is removed.

If a bolt is too short, there may not be enough threads engaged to hold the part securely.

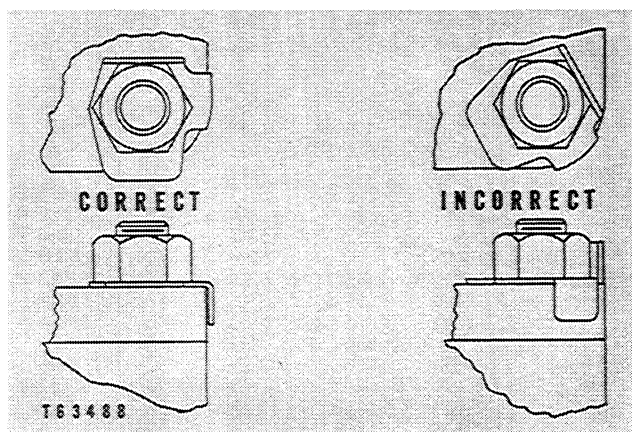
## GENERAL INSTRUCTION

Apply proper torque values to all bolts and nuts when re-assembling equipment. When a specific torque value is required, the value is listed in the text. Tighten all other bolts and nuts for general usage or taperlock studs to the torque values given in the charts at the front of the SPECIFICATION.

## LOCKS



Correct and incorrect methods of installing flat metal locks.



Correct and incorrect method for lock positioning and bending.

Lockwashers, flat metal lock or cotter pins are used to lock nuts and bolts.

Flat metal locks must be installed properly to be effective. Bend one end of the lock around the edge of the part. Bend the other end against one flat surface of the nut or bolt head.

Always install new locks in compartments which house moving parts.

When installing lockwashers on housings made of aluminium, use a flat washer between the lockwasher and the housing.

## CABLES AND WIRES

When removing or disconnecting a group of cables or wires, tag each one to assure proper assembly.

## LUBRICATION

Where applicable, fill the compartments of the components serviced with the amount, type and grade of lubricant recommended in the Regular Maintenance Section (1B) of this Manual.

## RUST PREVENTITIVE COMPOUND

Clean the rust preventitive compound from all machined surfaces of new parts before installing them.

## SHIMS

When shims are removed, tie them together and identify them as to location. Keep shims clean and flat until they are reinstalled.

## BEARING BUSHES

Do not install bearing bushes with a hammer. Use a press if possible and be sure to apply the pressure directly in line with the bore. If necessary, drive on a bearing using a bearing driver or a bar with a smooth flat end. If a sleeve bearing has an oil hole, align it with the oil hole in the mating part.

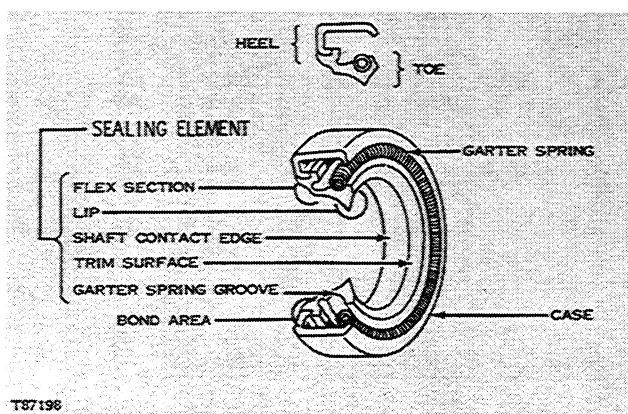
## GASKETS

Be sure the holes in the gaskets correspond with the lubricant passages in the mating parts. If gaskets are to be made, select material of the proper type and thickness. Be sure to cut holes in the right places. Blank gaskets can cause serious damage.

## LIP-TYPE RUBBER SEALS

Lubricate the lips of lip-type rubber seals before installation. Use petroleum jelly. Do not use grease on any seal except a grease seal.

The main parts of a lip-type seal are the case, sealing element, and garter spring. The picture below illustrates the construction of a simple lip-type seal. The cross section at the top shows the terms "heel" and "toe" used to identify the sides of a single element seal. With few exceptions, the toe of an oil seal with one lip is next to the lubricant that is sealed. Some seals have a second auxiliary lip, which does not carry a garter spring.



Lip-type seal construction.

If, during installation, the seal lip must pass over a shaft that has splines, a keyway, rough surface or a sharp edge, the lip can be easily damaged. Always use a seal protector, when one is provided.



CONVERSION TABLES

INCHES	DECIMALS	MILLI-METRES	INCHES TO MILLIMETRES		MILLIMETRES TO INCHES		FAHRENHEIT & CENTIGRADE				
			Inches	Milli-metres	mm	inches	°F	°C	°C	°F	
	1/64	.015625	.3969		0.001	.000039	-20	-28.9	-30	-22	
		.03125	.7937		0.002	.000079	-15	-26.1	-28	-18.4	
	1/32	.046875	1.1906		0.003	.000118	-10	-23.3	-26	-14.8	
1/16	3/64	.0625	1.5875	.0001	.00254	0.004	.000157	-5	-20.6	-24	-11.2
		.078125	1.9844	.0002	.00508	0.005	.000197	0	-17.8	-22	-7.6
	5/64	.09375	2.3812	.0003	.00762	0.006	.000236	1	-17.2	-20	-4
	3/32	.109375	2.7781	.0004	.01016	0.007	.000276	2	-16.7	-18	-0.4
1/8	7/64	.125	3.1750	.0005	.01270	0.008	.000315	3	-16.1	-16	3.2
		.140625	3.5719	.0006	.01524	0.009	.000354	4	-15.6	-14	6.8
	5/32	.15625	3.9687	.0007	.01778	0.01	.00039	5	-15.0	-12	10.4
		.171875	4.3656	.0008	.02032	0.02	.00079	10	-12.2	-10	14
3/16	11/64	.1875	4.7625	.0009	.02286	0.03	.00118	15	-9.4	-8	17.6
	13/64	.203125	5.1594	.001	.0254	0.04	.00157	20	-6.7	-6	21.2
	7/32	.21875	5.5562	.002	.0508	0.05	.00197	25	-3.9	-4	24.8
	15/64	.234375	5.9531	.003	.0762	0.06	.00236	30	-1.1	-2	28.4
1/4		.25	6.3500	.004	.1016	0.07	.00276	35	1.7	0	32
	17/64	.265625	6.7469	.005	.1270	0.08	.00315	40	4.4	2	35.6
	9/32	.28125	7.1437	.006	.1524	0.09	.00354	45	7.2	4	39.2
5/16	19/64	.296875	7.5406	.007	.1778	0.1	.00394	50	10.0	6	42.8
		.3125	7.9375	.008	.2032	0.2	.00787	55	12.8	8	46.4
	21/64	.328125	8.3344	.009	.2286	0.3	.01181	60	15.6	10	50
	11/32	.34375	8.7312	.01	.254	0.4	.01575	65	18.3	12	53.6
	23/64	.359375	9.1281	.02	.508	0.5	.01969	70	21.1	14	57.2
3/8		.375	9.5250	.03	.762	0.6	.02362	75	23.9	16	60.8
	25/64	.390625	9.9219	.04	1.016	0.7	.02756	80	26.7	18	64.4
	13/32	.40625	10.3187	.05	1.270	0.8	.03150	85	29.4	20	68
	27/64	.421875	10.7156	.06	1.524	0.9	.03543	90	32.2	22	71.6
7/16		.4375	11.1125	.07	1.778	1	.03937	95	35.0	24	75.2
	29/64	.453125	11.5094	.08	2.032	2	.07874	100	37.8	26	78.8
	15/32	.46875	11.9062	.09	2.286	3	.11811	105	40.6	28	82.4
	31/64	.484375	12.3031	.1	2.54	4	.15748	110	43.3	30	86
1/2		.5	12.7000	.2	5.08	5	.19685	115	46.1	32	89.6
	33/64	.515625	13.0969	.3	7.62	6	.23622	120	48.9	34	93.2
	17/32	.53125	13.4937	.4	10.16	7	.27559	125	51.7	36	96.8
	35/64	.546875	13.8906	.5	12.70	8	.31496	130	54.4	38	100.4
9/16		.5625	14.2875	.6	15.24	9	.35433	135	57.2	40	104
	37/64	.578125	14.6844	.7	17.78	10	.39370	140	60.0	42	107.6
	19/32	.59375	15.0812	.8	20.32	11	.43307	145	62.8	44	111.2
	39/64	.609375	15.4781	.9	22.86	12	.47244	150	65.6	46	114.8
5/8		.625	15.8750	1	25.4	13	.51181	155	68.3	48	118.4
	41/64	.640625	16.2719	2	50.8	14	.55118	160	71.1	50	122
	21/32	.65625	16.6687	3	76.2	15	.59055	165	73.9	52	125.6
	43/64	.671875	17.0656	4	101.6	16	.62992	170	76.7	54	129.2
11/16		.6875	17.4625	5	127.0	17	.66929	175	79.4	56	132.8
	45/64	.703125	17.8594	6	152.4	18	.70866	180	82.2	58	136.4
	23/32	.71875	18.2562	7	177.8	19	.74803	185	85.0	60	140
	47/64	.734375	18.6531	8	203.2	20	.78740	190	87.8	62	143.6
3/4		.75	19.0500	9	228.6	21	.82677	195	90.6	64	147.2
	49/64	.765625	19.4469	10	254.0	22	.86614	200	93.3	66	150.8
	25/32	.78125	19.8437	11	279.4	23	.90551	205	96.1	68	154.4
	51/64	.796875	20.2406	12	304.8	24	.94480	210	98.9	70	158
13/16		.8125	20.6375	13	330.2	25	.98425	212	100.0	75	167
	53/64	.828125	21.0344	14	355.6	26	1.02362	215	101.7	80	176
	27/32	.84375	21.4312	15	381.0	27	1.06299	220	104.4	85	185
	55/64	.859375	21.8281	16	406.4	28	1.10236	225	107.2	90	194
7/8		.875	22.2250	17	431.8	29	1.14173	230	110.0	95	203
	57/64	.890625	22.6219	18	457.2	30	1.18110	235	112.8	100	212
	29/32	.90625	23.0187	19	482.6	31	1.22047	240	115.6	105	221
	59/64	.921875	23.4156	20	508.0	32	1.25984	245	118.3	110	230
15/16		.9375	23.8125	21	533.4	33	1.29921	250	121.1	115	239
	61/64	.953125	24.2094	22	558.8	34	1.33858				
	31/32	.96875	24.6062	23	584.2	35	1.37795				
		.984375	25.0031	24	609.6	36	1.41732				
				25	635.0	37	1.45669				
				26	660.4	38	1.49606				
						39	1.53543				
						40	1.57480				

CONVERSION TABLES

INCHES TO CENTIMETERS

	0	1	2	3	4	5	6	7	8	9	
—	—	2.54	5.08	7.62	10.16	12.70	15.24	17.78	20.32	22.86	—
10	25.40	27.94	30.48	33.02	35.56	38.10	40.64	43.18	45.72	48.26	10
20	50.80	53.34	55.88	58.42	60.96	63.50	66.04	68.58	71.12	73.66	20
30	76.20	78.74	81.28	83.82	86.36	88.90	91.44	93.98	96.52	99.06	30
40	101.60	104.14	106.68	109.22	111.76	114.30	116.84	119.38	121.92	124.46	40
50	127.00	129.54	132.08	134.62	137.16	139.70	142.24	144.78	147.32	149.86	50
60	152.40	154.94	157.48	160.02	162.56	165.10	167.64	170.18	172.72	175.26	60
70	177.80	180.34	182.88	185.42	187.96	190.50	193.04	195.58	198.12	200.66	70
80	203.20	205.74	208.28	210.82	213.36	215.90	218.44	220.98	223.52	226.06	80
90	228.60	231.14	233.68	236.22	238.76	241.30	243.84	246.38	248.92	251.46	90

FEET TO METRES

	0	1	2	3	4	5	6	7	8	9	
—	—	0.305	0.610	0.914	1.219	1.524	1.829	2.134	2.438	2.743	—
10	3.048	3.353	3.658	3.962	4.267	4.572	4.877	5.182	5.486	5.791	10
20	6.096	6.401	6.706	7.010	7.315	7.620	7.925	8.230	8.534	8.839	20
30	9.144	9.449	9.754	10.058	10.363	10.668	10.973	11.278	11.582	11.887	30
40	12.192	12.497	12.802	13.106	13.411	13.716	14.021	14.326	14.630	14.935	40
50	15.240	15.545	15.850	16.154	16.459	16.764	17.069	17.374	17.678	17.983	50
60	18.288	18.593	18.898	19.202	19.507	19.812	20.117	20.422	20.726	21.031	60
70	21.336	21.641	21.946	22.250	22.555	22.860	23.165	23.470	23.774	24.079	70
80	24.384	24.689	24.994	25.298	25.603	25.908	26.213	26.518	26.822	27.127	80
90	27.432	27.737	28.042	28.346	28.651	28.956	29.261	29.566	29.870	30.175	90

SQUARE INCHES TO SQUARE CENTIMETRES

	0	1	2	3	4	5	6	7	8	9	
—	—	6.452	12.903	19.355	25.807	32.258	38.710	45.161	51.613	58.065	—
10	64.516	70.968	77.420	83.871	90.323	96.774	103.226	109.678	116.129	122.581	10
20	129.033	135.484	141.936	148.387	154.839	161.291	167.742	174.194	180.646	187.097	20
30	193.549	200.000	206.452	212.904	219.355	225.807	232.259	238.710	245.162	251.613	30
40	258.065	264.517	270.968	277.420	283.871	290.323	296.775	303.226	309.678	316.130	40
50	322.581	329.033	335.485	341.936	348.388	354.839	361.291	367.743	374.194	380.646	50
60	387.098	393.549	400.001	406.452	412.904	419.356	425.807	432.259	438.711	445.162	60
70	451.614	458.065	464.517	470.969	477.420	483.872	490.324	496.775	503.227	509.678	70
80	516.130	522.582	529.033	535.485	541.937	548.388	554.840	561.291	567.743	574.195	80
90	580.646	587.098	593.550	600.001	606.453	612.904	619.356	625.808	632.259	638.711	90

CUBIC INCHES TO CUBIC CENTIMETERS

	0	1	2	3	4	5	6	7	8	9	
—	—	16.387	32.774	49.162	65.549	81.936	98.323	114.710	131.097	147.484	—
10	163.872	180.259	196.646	213.033	229.420	245.808	262.195	278.582	294.969	311.356	10
20	327.743	344.130	360.518	376.905	393.292	409.679	426.066	442.453	458.841	475.228	20
30	491.615	508.002	524.389	540.776	557.164	573.551	589.938	606.325	622.712	639.099	30
40	655.486	671.874	688.261	704.648	721.035	737.422	753.809	770.197	786.584	802.971	40
50	819.358	835.745	852.132	868.520	884.907	901.294	917.681	934.068	950.455	966.843	50
60	983.230	999.617	1016.004	1032.391	1048.778	1065.166	1081.553	1097.940	1114.327	1130.714	60
70	1147.101	1163.489	1179.876	1196.263	1212.650	1229.037	1245.424	1261.811	1278.199	1294.586	70
80	1310.973	1327.360	1343.747	1360.134	1376.522	1392.909	1409.296	1425.683	1442.070	1458.457	80
90	1474.845	1491.232	1507.619	1524.006	1540.393	1556.780	1573.168	1589.555	1605.942	1622.329	90

## CONVERSION TABLES

## CENTIMETRES TO INCHES

	0	1	2	3	4	5	6	7	8	9	
—	—	0.3937	0.7874	1.1811	1.5748	1.9685	2.3622	2.7559	3.1496	3.5433	—
10	3.9370	4.3307	4.7244	5.1181	5.5118	5.9055	6.2992	6.6929	7.0866	7.4803	10
20	7.8740	8.2677	8.6614	9.0551	9.4488	9.8425	10.2362	10.6299	11.0236	11.4173	20
30	11.8110	12.2047	12.5984	12.9921	13.3858	13.7795	14.1732	14.5669	14.9606	15.3543	30
40	15.7480	16.1417	16.5354	16.9291	17.3228	17.7165	18.1102	18.5039	18.8976	19.2913	40
50	19.6850	20.0787	20.4724	20.8661	21.2598	21.6535	22.0472	22.4409	22.8346	23.2283	50
60	23.6220	24.0157	24.4094	24.8031	25.1968	25.5905	25.9842	26.3779	26.7716	27.1653	60
70	27.5590	27.9527	28.3464	28.7401	29.1338	29.5275	29.9212	30.3149	30.7086	31.1023	70
80	31.4960	31.8897	32.2834	32.6771	33.0708	33.4645	33.8582	34.2519	34.6456	35.0393	80
90	35.4330	35.8267	36.2204	36.6141	37.0078	37.4015	37.7952	38.1889	38.5826	38.9763	90

## METRES TO FEET

	0	1	2	3	4	5	6	7	8	9	
—	—	3.2808	6.5617	9.8425	13.1233	16.4042	19.6850	22.9658	26.2467	29.5275	—
10	32.8083	36.0892	39.3700	42.6508	45.9317	49.2125	52.4933	55.7742	59.0550	62.3358	10
20	65.6167	68.8975	72.1783	75.4592	78.7400	82.0208	85.3017	88.5825	91.8633	95.1442	20
30	98.4250	101.7058	104.9867	108.2675	111.5483	114.8292	118.1100	121.3908	124.6717	127.9525	30
40	131.2333	134.5142	137.7950	141.0758	144.3567	146.6375	150.9183	154.1992	157.4800	160.7608	40
50	164.0417	167.3225	170.6033	173.8841	177.1650	180.4458	183.7266	187.0075	190.2883	193.5691	50
60	196.8500	200.1308	203.4116	206.6925	209.9733	213.2541	216.5350	219.8158	223.0966	226.3775	60
70	229.6583	232.9391	236.2200	239.5008	242.7816	246.0625	249.3433	252.6241	255.9050	259.1858	70
80	262.4666	265.7475	269.0283	272.3091	275.5900	278.8708	282.1516	285.4325	288.7133	281.9941	80
90	295.2750	298.5558	301.8366	305.1175	308.3983	311.6791	314.9600	318.2408	321.5216	324.8025	90

## SQUARE CENTIMETRES TO SQUARE INCHES

	0	1	2	3	4	5	6	7	8	9	
—	—	0.1550	0.3100	0.4650	0.6200	0.7750	0.9300	1.0850	1.2400	1.3950	—
10	1.5500	1.7050	1.8600	2.0150	2.1700	2.3250	2.4800	2.6350	2.7900	2.9450	10
20	3.1000	3.2550	3.4100	3.5650	3.7200	3.8750	4.0300	4.1850	4.3400	4.4950	20
30	4.6500	4.8050	4.9600	5.1150	5.2700	5.4250	5.5800	5.7350	5.8900	6.0450	30
40	6.2000	6.3550	6.5100	6.6650	6.8200	6.9750	7.1300	7.2850	7.4400	7.5950	40
50	7.7500	7.9050	8.0600	8.2150	8.3700	8.5250	8.6800	8.8350	8.9900	9.1450	50
60	9.3000	9.4550	9.6100	9.7650	9.9200	10.0750	10.2300	10.3850	10.5400	10.6950	60
70	10.8500	11.0050	11.1600	11.3150	11.4700	11.6250	11.7800	11.9350	12.0900	12.2450	70
80	12.4000	12.5550	12.7100	12.8650	13.0200	13.1750	13.3300	13.4850	13.6400	13.7950	80
90	13.9500	14.1050	14.2600	14.4150	14.5700	14.7250	14.8800	15.0350	15.1900	15.3450	90

## CUBIC CENTIMETRES TO CUBIC INCHES

	0	1	2	3	4	5	6	7	8	9	
—	—	0.0610	0.1220	0.1831	0.2441	0.3051	0.3661	0.4272	0.4882	0.5492	—
10	0.6102	0.6713	0.7323	0.7933	0.8543	0.9154	0.9764	1.0374	1.0984	1.1594	10
20	1.2205	1.2815	1.3425	1.4035	1.4646	1.5256	1.5866	1.6476	1.7086	1.7697	20
30	1.8307	1.8917	1.9527	2.0138	2.0748	2.1358	2.1968	2.2579	2.3189	2.3799	30
40	2.4409	2.5020	2.5630	2.6240	2.6850	2.7461	2.8071	2.8681	2.9291	2.9901	40
50	3.0512	3.1122	3.1732	3.2342	3.2953	3.3563	3.4173	3.4783	3.5394	3.6004	50
60	3.6614	3.7224	3.7834	3.8445	3.9055	3.9665	4.0275	4.0886	4.1496	4.2106	60
70	4.2716	4.3327	4.3937	4.4547	4.5157	4.5768	4.6378	4.6988	4.7598	4.8208	70
80	4.8819	4.9429	5.0039	5.0649	5.1260	5.1870	5.2480	5.3090	5.3701	5.4311	80
90	5.4921	5.5531	5.6142	5.6752	5.7362	5.7972	5.8582	5.9193	5.9803	6.0413	90

## CONVERSION TABLES

## POUNDS TO KILOGRAMS

	0	1	2	3	4	5	6	7	8	9	
—	—	0.454	0.907	1.361	1.814	2.268	2.722	3.175	3.629	4.082	—
10	4.536	4.990	5.443	5.897	6.350	6.804	7.257	7.711	8.165	8.618	10
20	9.072	9.525	9.979	10.433	10.886	11.340	11.793	12.247	12.701	13.154	20
30	13.608	14.061	14.515	14.968	15.422	15.876	16.329	16.783	17.237	17.690	30
40	18.144	18.597	19.051	19.504	19.958	20.412	20.865	21.319	21.772	22.226	40
50	22.680	23.133	23.587	24.040	24.494	24.948	25.401	25.855	26.308	26.762	50
60	27.216	27.669	28.123	28.576	29.030	29.484	29.937	30.391	30.844	31.298	60
70	31.751	32.205	32.659	33.112	33.566	34.019	34.473	34.927	35.380	35.834	70
80	36.287	36.741	37.195	37.648	38.102	38.555	39.009	39.463	39.916	40.370	80
90	40.823	41.277	41.731	42.184	42.638	43.091	43.545	43.998	44.452	44.906	90

## LBS PER SQUARE INCHES TO KGS. PER SQUARE CENTIMETRE

	0	1	2	3	4	5	6	7	8	9	
—	—	0.070	0.141	0.211	0.281	0.352	0.422	0.492	0.562	0.633	—
10	0.703	0.773	0.844	0.914	0.984	1.055	1.125	1.195	1.266	1.336	10
20	1.406	1.476	1.547	1.617	1.687	1.758	1.828	1.898	1.969	2.039	20
30	2.109	2.179	2.250	2.320	2.390	2.461	2.531	2.601	2.672	2.742	30
40	2.812	2.883	2.953	3.023	3.093	3.164	3.234	3.304	3.375	3.445	40
50	3.515	3.586	3.656	3.726	3.797	3.867	3.937	4.007	4.078	4.148	50
60	4.218	4.289	4.359	4.429	4.500	4.570	4.640	4.711	4.781	4.851	60
70	4.921	4.992	5.062	5.132	5.203	5.273	5.343	5.414	5.484	5.554	70
80	5.624	5.695	5.765	5.835	5.906	5.976	6.046	6.117	6.187	6.257	80
90	6.328	6.398	6.468	6.538	6.609	6.679	6.749	6.820	6.890	6.960	90

## FOOT LBS. TO KILOGRAM METRES

	0	1	2	3	4	5	6	7	8	9	
—	—	0.138	0.277	0.415	0.553	0.691	0.830	0.968	1.106	1.244	—
10	1.383	1.521	1.659	1.797	1.936	2.074	2.212	2.350	2.489	2.627	10
20	2.765	2.903	3.042	3.180	3.318	3.456	3.595	3.733	3.871	4.009	20
30	4.148	4.286	4.424	4.562	4.701	4.839	4.977	5.116	5.254	5.392	30
40	5.530	5.668	5.807	5.945	6.083	6.221	6.360	6.498	6.636	6.774	40
50	6.913	7.051	7.189	7.328	7.466	7.604	7.742	7.881	8.019	8.157	50
60	8.295	8.434	8.572	8.710	8.848	8.987	9.125	9.263	9.401	9.540	60
70	9.678	9.816	9.954	10.093	10.231	10.369	10.507	10.646	10.784	10.922	70
80	11.060	11.199	11.337	11.475	11.613	11.752	11.890	12.028	12.166	12.305	80
90	12.443	12.581	12.719	12.858	12.996	13.134	13.272	13.411	13.549	13.687	90

## KILOGRAMS TO POUNDS

	0	1	2	3	4	5	6	7	8	9	
—	—	2.2046	4.4092	6.6139	8.8185	11.0231	13.2277	15.4324	17.6370	19.8416	—
10	22.0462	24.2508	26.4555	28.6601	30.8647	33.0693	35.2740	37.4786	39.6832	41.8878	10
20	44.0924	46.2971	48.5017	50.7063	52.9109	55.1156	57.3202	59.5248	61.7294	63.9340	20
30	66.1387	68.3433	70.5479	72.7525	74.9572	77.1618	79.3664	81.5710	83.7756	85.9803	30
40	88.1849	90.3895	92.5941	94.7988	97.0034	99.2080	101.4126	103.6172	105.8219	108.0265	40
50	110.2311	112.4357	114.6404	116.8450	119.0496	121.2542	123.4589	125.6635	127.8681	130.0727	50
60	132.2773	134.4820	136.6866	138.8912	141.0958	143.3005	145.5051	147.7097	149.9143	152.1189	60
70	154.3236	156.5282	158.7328	160.9374	163.1421	165.3467	167.5513	169.7559	171.9605	174.1652	70
80	176.3698	178.5744	180.7790	182.9837	185.1883	187.3929	189.5975	191.8021	194.0068	196.2114	80
90	198.4160	200.6206	202.8253	205.0299	207.2345	209.4391	211.6437	213.8484	216.0530	218.2576	90

## CONVERSION TABLES

## KILOGRAMS PER SQUARE CENTIMETRE TO POUNDS PER SQUARE INCH

	0	1	2	3	4	5	6	7	8	9	
—	—	14.2235	28.4471	42.6706	56.8941	71.1177	85.3412	99.5647	113.7883	128.0118	—
10	142.2353	156.4589	170.6824	184.9059	199.1295	213.3530	227.5765	241.8001	256.0236	270.2471	10
20	284.4707	298.6942	312.9177	327.1413	341.3648	355.5883	369.8119	384.0354	398.2589	412.4825	20
30	426.7060	440.9295	455.1531	469.3766	483.6001	497.8237	512.0472	526.2707	540.4943	554.7178	30
40	568.9413	583.1649	597.3884	611.6119	625.8355	640.0590	654.2825	668.5061	682.7296	696.9531	40
50	711.1767	725.4002	739.6237	753.8472	768.0708	782.2943	796.5178	810.7414	824.9649	839.1884	50
60	853.4120	867.6355	881.8590	896.0826	910.3061	924.5296	938.7532	952.9767	967.2002	981.4238	60
70	995.6473	1009.8708	1024.0944	1038.3180	1052.5414	1066.7650	1080.9885	1095.2120	1109.4356	1123.6591	70
80	1137.8826	1152.1062	1166.3297	1180.5532	1194.7768	1209.0003	1223.2238	1237.4474	1251.6709	1265.8944	80
90	1280.1180	1294.3415	1308.5650	1322.7886	1337.0121	1351.2356	1365.4592	1379.6827	1393.9062	1408.1298	90

## KILOGRAM METRE TO FOOT POUNDS

	0	1	2	3	4	5	6	7	8	9	
—	—	7.2330	14.4660	21.6990	28.9320	36.1651	43.3981	50.6311	57.8641	65.0971	—
10	72.3301	79.5631	86.7961	94.0291	101.2622	108.4952	115.7282	122.9612	130.1942	137.4272	10
20	144.6602	151.8932	159.1262	166.3593	173.5923	180.8253	188.0583	195.2913	202.5243	209.7573	20
30	216.9903	224.2233	231.4564	238.6894	245.9224	253.1554	260.3884	267.6214	274.8544	282.0874	30
40	289.3204	296.5535	303.7865	311.0195	318.2525	325.4855	332.7185	339.9515	347.1845	354.4175	40
50	361.6506	368.8836	376.1166	383.3496	390.5825	397.8156	405.0486	412.2816	419.5146	426.7476	50
60	433.9807	441.2137	448.4467	455.6797	462.9127	470.1457	477.3787	484.6117	491.8447	499.0777	60
70	506.3108	513.5438	520.7768	528.0098	535.2428	542.4758	549.7088	556.9418	564.1749	571.4079	70
80	578.6409	585.8739	593.1069	600.3399	607.5729	614.8059	622.0389	629.2720	636.5050	643.7380	80
90	650.9710	658.2040	665.4370	672.6700	679.9030	687.1360	694.3691	701.6021	708.8351	716.0681	90

## LITRES TO GALLONS (IMPERIAL)

	0	1	2	3	4	5	6	7	8	9	
—	—	0.2200	0.4400	0.6599	0.8799	1.0999	1.3199	1.5399	1.7598	1.9798	—
10	2.1998	2.4198	2.6398	2.8597	3.0797	3.2997	3.5197	3.7397	3.9596	4.1796	10
20	4.3996	4.6196	4.8396	5.0595	5.2795	5.4995	5.7195	5.9395	6.1594	6.3794	20
30	6.5994	6.8194	7.0394	7.2593	7.4793	7.6993	7.9193	8.1393	8.3592	8.5792	30
40	8.7992	9.0192	9.2392	9.4591	9.6791	9.8991	10.1191	10.3391	10.5590	10.7790	40
50	10.9990	11.2190	11.4390	11.6589	11.8789	12.0989	12.3189	12.5389	12.7588	12.9788	50
60	13.1988	13.4188	13.6388	13.8587	14.0787	14.2987	14.5187	14.7387	14.9586	15.1786	60
70	15.3986	15.6186	15.8386	16.0585	16.2785	16.4985	16.7185	16.9385	17.1584	17.3784	70
80	17.5984	17.8184	18.0384	18.2583	18.4783	18.6983	18.9183	19.1383	19.3582	19.5782	80
90	19.7982	20.0182	20.2382	20.4581	20.6781	20.8981	21.1181	21.3381	21.5580	21.7780	90

## LITRES PER 100 KILOMETRES TO MILES PER GALLON (IMPERIAL)

4	70.62	6	47.08	8	35.31	10	28.25	12	23.54	14	20.18	17.5	16.14	22.5	12.55	27.5	10.27	32.5	8.69
4.2	67.26	6.2	45.56	8.2	34.45	10.2	27.69	12.2	23.15	14.2	19.89	18	15.69	23	12.28	28	10.09	33	8.56
4.4	64.20	6.4	44.14	8.4	33.63	10.4	27.16	12.4	22.78	14.4	19.62	18.5	15.27	23.5	12.02	28.5	9.91	33.5	8.43
4.6	61.41	6.6	42.80	8.6	32.85	10.6	26.65	12.6	22.42	14.6	19.35	19	14.87	24	11.77	29	9.74	34	8.31
4.8	58.85	6.8	41.54	8.8	32.10	10.8	26.15	12.8	22.07	14.8	19.09	19.5	14.49	24.5	11.53	29.5	9.58	34.5	8.19
5	56.49	7	40.35	9	31.39	11	25.68	13	21.73	15	18.83	20	14.12	25	11.30	30	9.42	35	8.07
5.2	54.32	7.2	39.23	9.2	30.70	11.2	25.22	13.2	21.40	15.5	18.22	20.5	13.78	25.5	11.08	30.5	9.26	35.5	7.96
5.4	52.31	7.4	38.17	9.4	30.05	11.4	24.78	13.4	21.08	16	17.65	21	13.45	26	10.86	31	9.11	36	7.85
5.6	50.44	7.6	37.17	9.6	29.42	11.6	24.35	13.6	20.77	16.5	17.12	21.5	13.14	26.5	10.66	31.5	8.97	36.5	7.74
5.8	48.70	7.8	36.21	9.8	28.82	11.8	23.94	13.8	20.47	17	16.62	22	12.84	27	10.46	32	8.83	37	7.63

## CONVERSION TABLES

## GALLONS (IMP.) TO LITRES

	0	1	2	3	4	5	6	7	8	9	
—	—	4.546	9.092	13.638	18.184	22.730	27.276	31.822	36.368	40.914	—
10	45.460	50.005	54.551	59.097	63.643	68.189	72.735	77.281	81.827	86.373	10
20	90.919	95.465	100.011	104.557	109.103	113.649	118.195	122.741	127.287	131.833	20
30	136.379	140.924	145.470	150.016	154.562	159.108	163.654	168.200	172.746	177.292	30
40	181.838	186.384	190.930	195.476	200.022	204.568	209.114	213.660	218.206	222.752	40
50	227.298	231.843	236.389	240.935	245.481	250.027	254.573	259.119	263.665	268.211	50
60	272.757	277.303	281.849	286.395	290.941	295.487	300.033	304.579	309.125	313.671	60
70	318.217	322.762	327.308	331.854	336.400	340.946	345.492	350.038	354.584	359.130	70
80	363.676	368.222	372.768	377.314	381.860	386.405	390.952	395.498	400.044	404.590	80
90	409.136	413.681	418.227	422.773	427.319	431.865	436.411	440.957	445.503	450.049	90

## MILES PER GALLON (IMP.) TO LITRES PER 100 KILOMETRES

10	28.25	15	18.83	20	14.12	25	11.30	30	9.42	35	8.07	40	7.06	50	5.65	60	4.71	70	4.04
10½	26.90	15½	18.22	20½	13.78	25½	11.08	30½	9.26	35½	7.96	41	6.89	51	5.54	61	4.63	71	3.98
11	25.68	16	17.66	21	13.45	26	10.87	31	9.11	36	7.85	42	6.73	52	5.43	62	4.55	72	3.92
11½	24.56	16½	17.12	21½	13.14	26½	10.66	31½	8.97	36½	7.74	43	6.57	53	5.33	63	4.48	73	3.87
12	23.54	17	16.61	22	12.84	27	10.46	32	8.83	37	7.63	44	6.42	54	5.23	64	4.41	74	3.82
12½	22.60	17½	16.14	22½	12.55	27½	10.27	32½	8.69	37½	7.53	45	6.28	55	5.13	65	4.35	75	3.77
13	21.73	18	15.69	23	12.28	28	10.09	33	8.56	38	7.43	46	6.14	56	5.04	66	4.28	76	3.72
13½	20.92	18½	15.27	23½	12.02	28½	9.91	33½	8.43	38½	7.34	47	6.01	57	4.96	67	4.22	77	3.67
14	20.18	19	14.87	24	11.77	29	9.74	34	8.31	39	7.24	48	5.89	58	4.87	68	4.16	78	3.62
14½	19.48	19½	14.49	24½	11.53	29½	9.58	34½	8.19	39½	7.15	49	5.77	59	4.79	69	4.10	79	3.57

## SCREW THREADS

BSW  
(British Std. Whitworth)

Size	Threads per Inch	Tapping Drill
3/16	24	9/64
1/4	20	3/16
5/16	18	1/4
3/8	16	19/64
7/16	14	23/64
1/2	12	25/64
9/16	12	29/64
5/8	11	1/2
11/16	11	37/64
3/4	10	5/8

BSP  
(British Std. Pipe) (Gas)

Size	Diameter	Threads per Inch	Tapping Drill
1/8	.383	28	11/32
1/4	.518	19	15/32
3/8	.656	19	19/32
1/2	.825	14	3/4
5/8	.902	14	53/64
3/4	1.041	14	31/32
7/8	1.189	14	1-7/64
1	1.309	11	1-13/64

BSF  
(British Std. Fine)

Size	Threads per Inch	Tapping Drill
7/32	28	11/64
1/4	26	13/64
9/32	26	15/64
5/16	22	1/4
3/8	20	5/16
7/16	18	23/64
1/2	16	27/64
9/16	16	31/64
5/8	14	17/32
11/16	14	19/32
3/4	12	41/64

BA  
(British Association)

Size	Diameter	Threads per Inch	Tapping Drill
0	.236	25.4	7
1	.209	28.2	16
2	.185	31.4	22
3	.161	34.8	29
4	.142	38.5	31
5	.126	43.1	36
6	.110	47.9	42
7	.098	52.9	45
8	.087	59.2	49
9	.075	64.9	52
10	.067	72.5	54

**CONVERSION TABLES**

**UNC**  
(Unified Coarse)

Size	Diameter	Threads per Inch	Tapping Drill
(No. 4)	.1120	40	42 or 44
(No. 6)	.1380	32	7.64
(No. 8)	.1640	32	29
(No. 10)	.1900	24	24 or 26
	1/4	20	13/64
	5/16	18	17/64
	3/8	16	5/16
	7/16	14	U
	1/2	13	27/64

**UNF**  
(Unified Fine)

Size	Diameter	Threads per Inch	Tapping Drill
(No. 10)	.190	32	5/32
	1/4	28	3
	5/16	24	1
	3/8	24	21/64
	7/16	20	25/64
	1/2	20	29/64
	9/16	18	13 mm (.5118 in)
	5/8	18	14.5 mm (.5709 in)
	3/4	16	11/16

**SELF TAPPING SCREWS**

Size		Tapping Drill
No. 2	FOR 20 SWG SHEET	49
No. 4		39
No. 6		35
No. 8		31
No. 10		27
No. 12		19
No. 14		11

**Spanner Sizes for unified Nuts and Bolts**  
Measured across the Flats (A/F)

Bolt diameter		1/4	5/16	3/8	7/16
Spanner Sizes	Nuts	7/16	1/2	9/16	11/16*
	Bolts	7/16	1/2	9/16	5/8
Bolt diameter		1/2	9/16*	5/8	3/4
Spanner Sizes	Nuts	3/4	7/8	13/16	1 1/8
	Bolts	3/4	13/16	13/16	1 1/8

*\*Note variation in Nut and Bolt Head sizes.*

**RECOMMENDED SPECIAL TOOLS****RECOMMENDED SPECIAL TOOLS**

<b>Tool No.</b>	<b>Description</b>	<b>Tool No.</b>	<b>Description</b>
<b>ENGINE</b>			
<b>PD.1C</b>	Valve Guide Remover & Replacer (Main Tool)	<b>MF.263-2</b>	Front Axle & Steering Bush Remover/Replacer Adaptors (1½")
<b>PD.1C-1</b>	Adaptor for PD.1C	<b>MF.263-3</b>	Front Axle & Steering Bush Remover/Replacer Adaptors (1¾")
<b>PD.1C-4</b>	Adaptor for PD.1C	<b>MF.264</b>	Front Axle & Steering Bush Reamer (Main Tool)
<b>4RL</b>	Tension Wrench	<b>MF.264-1</b>	Reamer & Pilot
<b>No. 13</b>	Tension Wrench	<b>MF.264-2</b>	Reamer & Pilot
<b>PD.41B</b>	Piston Height & Valve Depth Gauge	<b>MF.268</b>	Steering Wheel Remover
<b>PD.137</b>	Valve Guide Reamer .015" O/size	<b>MF.332</b>	Power Steering Pump Oil Seal Protector
<b>PD.138</b>	Valve Guide Reamer .030" O/size	<b>6312A</b>	Steering Drop Arm Remover
<b>PD.150</b>	Cylinder Liner Remover & Replacer (Main Tool)	<b>MF.334</b>	Steering Pivot Pin Remover
<b>PD.150-1A</b>	Adaptors for PD.150	<b>REAR AXLE</b>	
<b>PD.150-7</b>	Adaptors for PD.150	<b>MF.9A</b>	Differential Housing Holder and Bench Plate
<b>PD.155A</b>	Basic Puller	<b>MF.10</b>	Wheel Axle Outer Bearing Cone & Differential Cone Replacer (Main Tool)
<b>PD.155-1</b>	Adaptor for PD.155A	<b>MF.197</b>	Differential Carrier Plate Bearing Cone Replacer Adaptor
<b>335</b>	Con Rod Jig & Master Arbor	<b>MF.197-2</b>	Differential Carrier Plate Bearing Cone Replacer Adaptor
<b>PD.336-6</b>	Arbor Adaptor 2.6459" dia.	<b>MF.200-2</b>	Drive Cover Assembly & Bearing Remover
<b>6000C</b>	Diesel Compression Tester	<b>MF.200-3</b>	Differential Carrier Plate Bearing Cone Remover Adaptor
<b>6000C-3</b>	Adaptor for 6000C	<b>MF.200-23</b>	Driving Pinion Bearing & Pilot Bearing Remover/Replacer Adaptor
<b>6000C-4A</b>	Adaptor for 6000C	<b>MF.200-24</b>	Epicyclic Hub Inner Bearing Cone Remover Adaptor
<b>6118B</b>	Valve Spring Compressor	<b>MF.202A</b>	Rear Drive Shaft Needle Bearing Remover
<b>PD.6118-3</b>	Adaptor for 6118B	<b>MF.203A</b>	Rear Drive Shaft Needle Bearing Replacer & P.T.O. Remover/Replacer
<b>7066</b>	Circlip Pliers	<b>MF.224</b>	Differential Lock Shaft Circlip Remover/Replacer
<b>FC.9900</b>	Injector Tester	<b>MF.245D</b>	Rear Axle Preload Gauge
<b>MF.200-26</b>	Water Pump Overhaul Kit	<b>MF.245D-1</b>	Straight Edge
<b>6200C</b>	Small End Reaming Fixture	<b>MF.257</b>	Differential Bearing Cone Replacer
<b>316X</b>	Valve Seat Cutter Handle	<b>MF.258</b>	Differential Housing Holder
<b>316-10</b>	Pilot (5/16" dia. Valve Guide)	<b>MF.265</b>	Planetary Carrier Assembly Remover
<b>316-12</b>	Pilot (3/8" dia. Valve Guide)	<b>MF.266B</b>	Planetary Carrier Bush Inner Coil Seal Bearing Cone & Unit Replacer
<b>316-13</b>	Pilot	<b>MF.267A</b>	Epicyclic Hub Pre-load Gauge
<b>316-125</b>	Pilot (.015" O/size on 3/8" Guide)		
<b>PD.317-22</b>	Valve Seat Cutter		
<b>PD.317-23</b>	Valve Seat Cutter		
<b>317-30</b>	Valve Seat Cutter		
<b>317G-19</b>	Valve Seat Glazebreaker		
<b>317G-25</b>	Valve Seat Glazebreaker		
<b>317G-30</b>	Valve Seat Glazebreaker		
<b>FRONT AXLE &amp; STEERING</b>			
<b>MF.148-7</b>	Power Steering Adaptor		
<b>MF.195-4</b>	Front Axle Pivot Pin Bush Remover/Replacer & P.T.O. Bush Remover/Replacer		
<b>MF.263</b>	Front Axle & Steering Bush Remover (Main Tool)		



**RECOMMENDED SPECIAL TOOLS**

<b>Tool No.</b>	<b>Description</b>	<b>Tool No.</b>	<b>Description</b>
MF.555-2A	Differential Coupling Bearing Cone Remover	MF.167	P.T.O. Oil Seal Pilot
MF.278	Dial Indicator with Magnetic Base (Baty No. D.1)	MF.168	P.T.O. Shaft Oil Seal Remover/Replacer
MF.1105-2A	Differential Bearing Cup Remover/Replacer	MF.195-5	P.T.O. Needle Bearing Bush Remover/Replacer Adaptor
MF.1105-6	Differential Carrier Plate Oil Seal Remover/Replacer Adaptor	MF.196B	Hydraulic Pump Valve Seat Chamber Cutter & Glaze Breaker
MF.1105-7A	Differential Bearing Cup Remover/Replacer Adaptor	MF.226A	Hydraulic Lift Cover Remover/Replacer
MF.1105-8	Epicyclic Hub Inner Bearing Cup Remover/Replacer Adaptor	MF.260-1	Multi-Power Hydraulic Test Adaptor
MF.1105-11	Rear Axle Shaft Oil Seal Remover and Replacer	MF.260-3	Multi-Power Hydraulic Adaptor
<b>CLUTCH &amp; TRANSMISSION</b>		MF.260-4	Multi-Power Pressure Test Adaptor
MF.159A	Single & Dual Clutch Centraliser	MF.260-5	Multi-Power Pump Flow Adaptor
MF.177	Transmission Main Drive Shaft Oil Seal Pilot	MF.269	Response Plunger Adjusting Wrench
MF.178	P.T.O. Main Drive Shaft Pilot	MF.270B	Dashpot Piston Wedge
MF.179	Transmission & P.T.O. Pinion Oil Seal Replacer	MF.271	Roller Assembly Tool & Draft Control Rod Gauge
MF.200-25	Multi-purpose Bearing Remover	MF.272	Ram Arm Gauge Fixture
MF.215	Secondary Clutch Setting Gauge	MF.273	Hydraulic Control Lever Setting Fixture
MF.218A	Front P.T.O. Housing Replacer (Main Tool)	MF.333	Draft Control Rod Gauge (Increased Tension Range)
MF.218A-2	Front P.T.O. Housing Replacer Adaptor	810	Hydraulic Pressure & Flow Test Fixture (Main Tool)
MF.220	Lever Fulcrum Height Setting Gauge	MF.810-1	Adaptor
MF.255A	Multi-Power Pinion Oil Seal Replacer & Assembly Sleeve	MF.810-4	Multi-Power Pump Flow Adaptor
MF256A	Multi-Power Pinion Assembly Inner Oil Seal Replacer	<b>MULTI-PURPOSE &amp; MISCELLANEOUS TOOLS</b>	
MF.314	Lever Fulcrum Height Setting Gauge	13A	Tension Wrench
MF.315	Main Drive Shaft Retainer Needle Bearing & Seal Remover Replacer	MF.148A	Hydraulic Pressure Test Equipment (Main Tool)
MF.331	Transmission Input Shaft Oil Seal Replacer	MF.195	Bearing Cups Remover/Replacer (Main Tool)
7600B	Flywheel Spigot Bearing Remover (Main Tool)	MF.200	Hand Press (Main Tool)
MF.7600-1	Flywheel Spigot Bearing Remover Adaptor	MF.260	Low Pressure Hydraulic Test Set (Main Tool)
<b>P.T.O. &amp; HYDRAULICS</b>		270	Tractor Splitting Kit
MF.163	Spring Retainer Nut Wrench	550	Driver Handle (Main Tool)
MF.166	Hydraulic Adaptor for Lift Cover	555	Three Leg Adjustable Puller (Main Tool)
		MF.1105	Bearing Remover (Main Tool)
		7065M	Heavy Duty Circlip Pliers
		7066	Circlip Pliers
		HD.3	Circlip Plier Points

**TORQUE DATA**

The following information gives standard torquing requirements for MF standard bolts, nuts and cap screws for use where the torque requirements are not otherwise specified.

NOMINAL SIZE (diameter)	WRENCH TORQUE kg-m (lb-ft)	
	A	B
$\frac{1}{4}$ in	0,69 to 0,83 (5 to 6)	1,1 to 1,4 (8 to 10)
$\frac{5}{16}$ in	1,4 to 1,6 (10 to 12)	2,1 to 2,5 (15 to 18)
$\frac{3}{8}$ in	2,6 to 3,0 (19 to 22)	4,1 to 4,8 (30 to 35)
$\frac{7}{16}$ in	4,5 to 5,3 (33 to 38)	6,9 to 7,6 (50 to 55)
$\frac{1}{2}$ in	6,5 to 7,3 (47 to 53)	10,5 to 11,7 (76 to 85)
$\frac{9}{16}$ in	8,9 to 10,0 (65 to 73)	15,9 to 17,3 (115 to 125)
$\frac{5}{8}$ in	13,8 to 17,3 (100 to 125)	21,4 to 23,5 (155 to 170)
$\frac{3}{4}$ in	24,2 to 27,6 (175 to 200)	37,3 to 41,5 (270 to 300)

*COLUMN A***NON-RIGID JOINTS**

Column "A" specifies the spanner torques to be used with non-rigid joints where extrusion, deformity or other damage would result when higher clamping forces are used.

**LIMITED STRENGTH NUTS**

The torque values in column "A" are also the maximum recommended for weld nuts, slotted nuts or other limited strength nuts.

**STANDARD NUTS WITH LOCK WASHERS**

When lock washers are used under the nut, the torque values in column "A" should be applied.

Laboratory tests indicate that lock washers substantially reduce the friction under the nut. This is especially true if the bolt, nut and lock washer are oiled. Due to this reduction in friction, proper bolt elongation is obtained by use of the torque in column "A". Column "B" torques may cause failure of the nut or bolt during assembly.

*COLUMN B*

Column "B" is the wrench torque to be used for assembly of rigid joints where extrusion, deformity or other damage will not result, and it is desirable to obtain more elastic elongation of the bolt or stud to ensure that it remains tight.

## GENERAL SPECIFICATION

## Part 1 Section A

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**GENERAL**

This section of the manual gives details of all general information related to this tractor. The section has

been divided into sub-section related to the various parts of this Manual, i.e. the seventh sub-section is related to Part 7 – Hydraulics.

**GENERAL SPECIFICATION**

**Recommended Antifreeze Solutions**

Smith's Super Bluecol  
 Duckham's Antifreeze  
 Mobil Permazone

Prestone Two-phase  
 Esso Antifreeze  
 Union Carbide P3B

**NOTE – ONLY THE ANTIFREEZE SOLUTIONS LISTED HERE MEET MASSEY-FERGUSON TEST SPECIFICATIONS. THE USE OF INFERIOR GRADES OF ANTIFREEZE (INCLUDING SOME SOLUTIONS CONFORMING TO BS.3151) CAN CAUSE SEVERE DAMAGE TO THE COOLING SYSTEM.**

**RECOMMENDED LUBRICATION BRITISH ISLES ALL SEASONS**

UNIT		CAPACITY	B.P.	Castrol	Duckham's	Esso	Mobil	Shell
ENGINE including FILTER	Dipstick Full	6.8 litres (12 pints)	Tractor Oil Universal	Agricastrol Multi-use	Farmadcol Multigrade	Tractorlube (Universal)	Mobiland Universal	Tractor Oil Universal
STEERING BOX		0.85 litres (1½ pints)						
TRANSMISSION See note 2	Standard Multi-power	28.4 litres (50 pints) 27.27 litres (48 pints)	Hydraulic TF8 or Tractran	Agricastrol AS (BB11)	Hydrolube	1L 1941	Mobilfluid 422	S 7884
POWER STEERING		0.47 litres (0.84 pints)	Autran DX	Deusol TFA Dexron	Fleetmatic D D-matic	Esso Automatic Transmission Fluid (Dexron)	Mobil A.T.F. 200 or Mobil A.T.F. 220	A.T.F. Dexron
LIFT SHAFT (2 nipples)			Tractor Gear Oil SAE 90EP	Agricastrol Gear EP90/140	Farm Mesh EP 90	Tractorlube Gear Oil GP90/140	Mobilube GX 90	Tractor Gear Oil
GREASE GUN			Energrease Universal	Agricastrol Multi-use Grease	Duckham's Admax L2	Esso Multi-purpose Grease H	Mobilgrease Special	Farm Grease Universal

- NOTES:**
1. Provided the oil change periods recommended in the Maintenance Section have been followed, discolouration of the engine oil with use is normal and of no significance.
  2. If the tractor is to work on slopes and inclines, the transmission should be filled to the 'H' mark on the dipstick.

**RECOMMENDED LUBRICANTS—OVERSEAS**

UNIT	CAPACITY	Temperature °F °C	B.P.	Castrol	Duckham's	Esso	Mobil	Shell
ENGINE Including FILTER	6.8 litres (12 pints)	Below 30 Below -1	B.P. Vanellus SAE 10W	Castrol Deusol CRB 10	Duckham's Fleetol HDX 10	Essolube HDX 10	Delvac 1110	Rotella 'T' Oil 10W
STEERING BOX	0.85 litres (1½ pints)	30 to 80 -1 to 27	B.P. Vanellus SAE 20W	Castrol Deusol CRB 20	Duckham's Fleetol HDX 20	Essolube HDX 20W	Delvac 1120	Rotella 'T' Oil 20/20W
		Above 80 Above 27	B.P. Vanellus SAE 30	Castrol Deusol CRB 30	Duckham's Fleetol HDX 30	Essolube HDX 30	Delvac 1130	Rotella 'T' Oil 30
TRANSMISSION See Notes 3 and 4 Standard	28.4 litres (50 pints) 27.7 litres (48 pints)	Below 0 Below -17	B.P. TF-7	Agricastrol M.D.	Hydrol 303	Torque Fluid 56	—	S.6332
Multi-Power		0 to 80 -17 to 27	Hydraulic TF-8	Agricastrol AS BB 11	Hydrolube	1L 1941	Mobilfluid 422	S 7884
POWER STEERING	0.47 litres (0.84 pints)	All Temps.	Autran DX	Castrol TQ Dexron R	D-matic	Esso Automatic Transmission Fluid (Dexron)	Mobilfluid ATF 220	ATF Dexron
LIFT SHAFT (2 nipples)		All Temps.	Gear Oil SAE 90EP	Castrol Hypoy EP90	Duckham's Farm Mesh	Esso Gear Oil GP 90	Mobilube GX 90	Spirax 90EP
GREASE GUN		All Temps.	Energrease L2	Castrol LM Grease	Duckham's Admax L2	Esso Multi-purpose Grease	Mobilgrease Special	Retinax A

- NOTES:**
1. Provided the oil change periods recommended in the Maintenance Section have been followed, discolouration of the engine oil with use is normal and of no significance.
  2. The multi-purpose oils listed as recommended for U.K. can be used in other territories where available in the temperature range 30° to 80°F (-1°C to 27°C) only. Where it is desired to use such lubricants in temperature ranges other than this, the MF Distributor/Dealer should be consulted.
  3. If the tractor is to work on slopes and inclines the transmission should be filled to the 'H' mark on the dipstick.
  4. The transmission oils listed for -17°C (0°F) and below are intended for use only in very severe conditions.