INTRODUCTION

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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

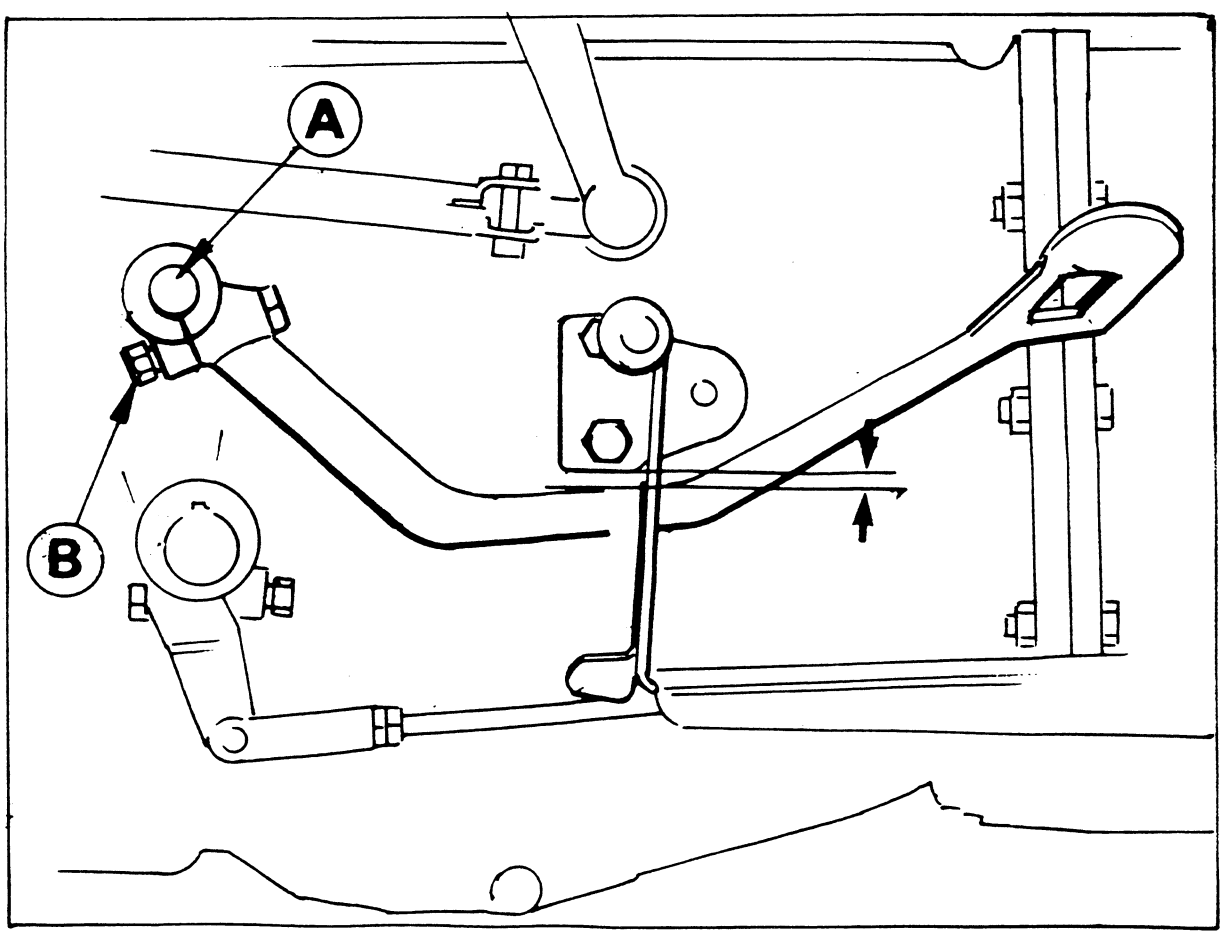
Page 4A-02 MAIN FRICTION DISC OR CLUTCH ASSEMBLY

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".
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".
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.
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".

Page No.	Operation No.	Issue	Amendment
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

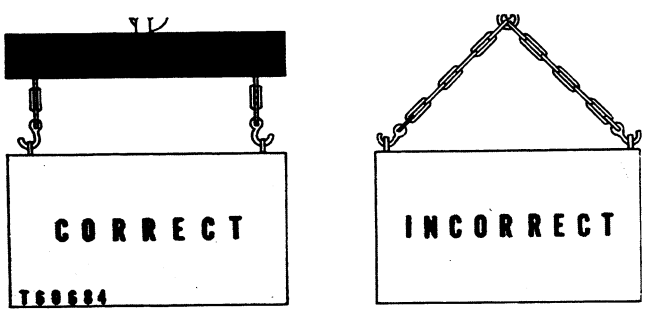
The most important single item in preserving the long life of the machine is to keep dirt out of vital working parts. Precautions have been taken to safeguard against this. Enclosed compartments, seals and filters have been provided to keep the supply of air, fuel and lubricants clean. These safeguards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

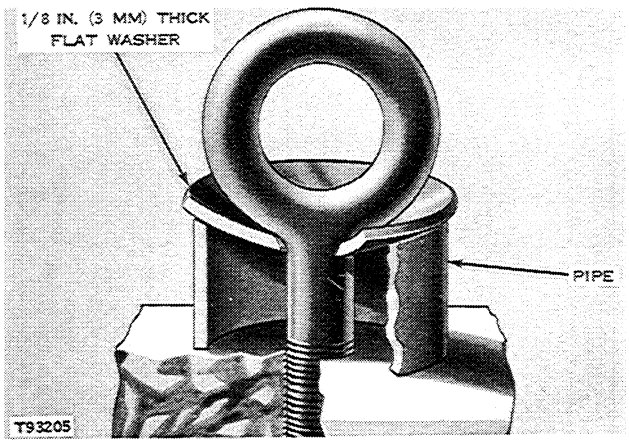
REMOVAL AND INSTALLATION

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.

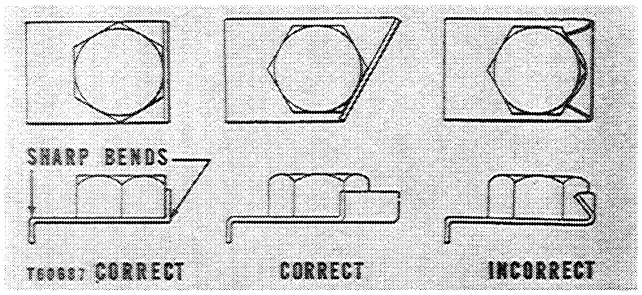
BOLTS AND BOLT TORQUE

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.

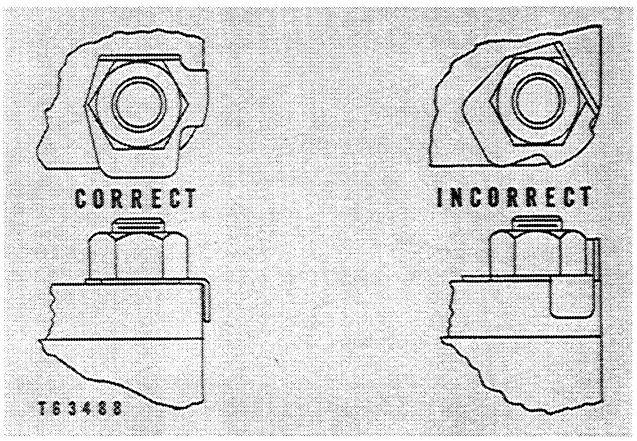
If a bolt is too short, there may not be enough threads engaged to hold the part securely.

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.

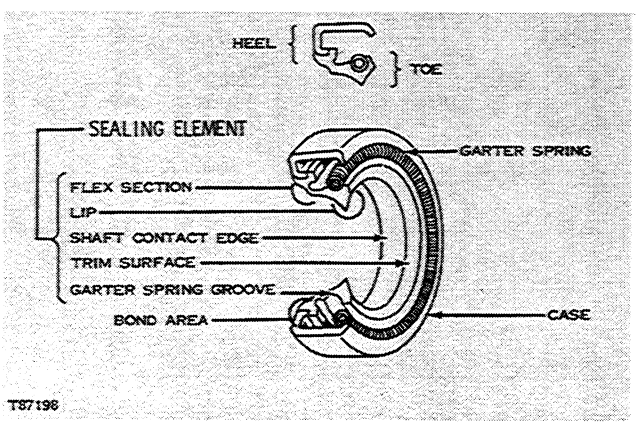
GASKETS

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
1/64	.015625	.3969
1/32	.03125	.7937
3/64	.046875	1.1906
1/16	.0625	1.5875
5/64	.078125	1.9844
3/32	.09375	2.3812
7/64	.109375	2.7781
1/8	.125	3.1750
9/64	.140625	3.5719
5/32	.15625	3.9687
11/64	.171875	4.3656
3/16	.1875	4.7625
13/64	.203125	5.1594
7/32	.21875	5.5562
15/64	.234375	5.9531
1/4	.25	6.3500
17/64	.265625	6.7469
9/32	.28125	7.1437
19/64	.296875	7.5406
5/16	.3125	7.9375
21/64	.328125	8.3344
11/32	.34375	8.7312
23/64	.359375	9.1281
3/8	.375	9.5250
25/64	.390625	9.9219
13/32	.40625	10.3187
27/64	.421875	10.7156
7/16	.4375	11.1125
29/64	.453125	11.5094
15/32	.46875	11.9062
31/64	.484375	12.3031
1/2	.5	12.7000
33/64	.515625	13.0969
17/32	.53125	13.4937
35/64	.546875	13.8906
9/16	.5625	14.2875
37/64	.578125	14.6844
19/32	.59375	15.0812
39/64	.609375	15.4781
5/8	.625	15.8750
41/64	.640625	16.2719
21/32	.65625	16.6687
43/64	.671875	17.0656
11/16	.6875	17.4625
45/64	.703125	17.8594
23/32	.71875	18.2562
47/64	.734375	18.6531
3/4	.75	19.0500
49/64	.765625	19.4469
25/32	.78125	19.8437
51/64	.796875	20.2406
13/16	.8125	20.6375
53/64	.828125	21.0344
27/32	.84375	21.4312
55/64	.859375	21.8281
7/8	.875	22.2250
57/64	.890625	22.6219
29/32	.90625	23.0187
59/64	.921875	23.4156
15/16	.9375	23.8125
61/64	.953125	24.2094
31/32	.96875	24.4062
63/64	.984375	25.0031

INCHES TO MILLIMETRES	
Inches	Milli-metres
.0001	.00254
.0002	.00508
.0003	.00762
.0004	.01016
.0005	.01270
.0006	.01524
.0007	.01778
.0008	.02032
.0009	.02286
.001	.0254
.002	.0508
.003	.0762
.004	.1016
.005	.1270
.006	.1524
.007	.1778
.008	.2032
.009	.2286
.01	.254
.02	.508
.03	.762
.04	1.016
.05	1.270
.06	1.524
.07	1.778
.08	2.032
.09	2.286
.1	2.54
.2	5.08
.3	7.62
.4	10.16
.5	12.70
.6	15.24
.7	17.78
.8	20.32
.9	22.86
1	25.4
2	50.8
3	76.2
4	101.6
5	127.0
6	152.4
7	177.8
8	203.2
9	228.6
10	254.0
11	279.4
12	304.8
13	330.2
14	355.6
15	381.0
16	406.4
17	431.8
18	457.2
19	482.6
20	508.0
21	533.4
22	550.8
23	584.2
24	609.6
25	635.0
26	660.4

MILLIMETRES TO INCHES	
mm	inches
0.001	.000039
0.002	.000079
0.003	.000118
0.004	.000157
0.005	.000197
0.006	.000236
0.007	.000276
0.008	.000315
0.009	.000354
0.01	.00039
0.02	.00079
0.03	.00118
0.04	.00157
0.05	.00197
0.06	.00236
0.07	.00276
0.08	.00315
0.09	.00354
0.1	.00394
0.2	.00787
0.3	.01181
0.4	.01575
0.5	.01969
0.6	.02362
0.7	.02756
0.8	.03150
0.9	.03543
1	.03937
2	.07874
3	.11811
4	.15748
5	.19685
6	.23622
7	.27559
8	.31496
9	.35433
10	.39370
11	.43307
12	.47244
13	.51181
14	.55118
15	.59055
16	.62992
17	.66929
18	.70866
19	.74803
20	.78740
21	.82677
22	.86614
23	.90551
24	.94480
25	.98425
26	1.02362
27	1.06299
28	1.10236
29	1.14173
30	1.18110
31	1.22047
32	1.25984
33	1.29921
34	1.33858
35	1.37795
36	1.41732
37	1.45669
38	1.49606
39	1.53543
40	1.57480

FAHRENHEIT & CENTIGRADE			
°F	°C	°C	°F
−20	−28.9	−30	−22
−15	−26.1	−28	−18.4
−10	−23.3	−26	−14.8
− 5	−20.6	−24	−11.2
0	−17.8	−22	− 7.6
1	−17.2	−20	− 4
2	−16.7	−18	− 0.4
3	−16.1	−16	3.2
4	−15.6	−14	6.8
5	−15.0	−12	10.4
10	−12.2	−10	14
15	− 9.4	− 8	17.6
20	− 6.7	− 6	21.2
25	− 3.9	− 4	24.8
30	− 1.1	− 2	28.4
35	1.7	0	32
40	4.4	2	35.6
45	7.2	4	39.2
50	10.0	6	42.8
55	12.8	8	46.4
60	15.6	10	50
65	18.3	12	53.6
70	21.1	14	57.2
75	23.9	16	60.8
80	26.7	18	64.4
85	29.4	20	68
90	32.2	22	71.6
95	35.0	24	75.2
100	37.8	26	78.8
105	40.6	28	82.4
110	43.3	30	86
115	46.1	32	89.6
120	48.9	34	93.2
125	51.7	36	96.8
130	54.4	38	100.4
135	57.2	40	104
140	60.0	42	107.6
145	62.8	44	112.2
150	65.6	46	114.8
155	68.3	48	118.4
160	71.1	50	122
165	73.9	52	125.6
170	76.7	54	129.2
175	79.4	56	132.8
180	82.2	58	136.4
185	85.0	60	140
190	87.8	62	143.6
195	90.6	64	147.2
200	93.3	66	150.8
205	96.1	68	154.4
210	98.9	70	158
212	100.0	75	167
215	101.7	80	176
220	104.4	85	185
225	107.2	90	194
230	110.0	95	203
235	112.8	100	212
240	115.6	105	221
245	118.3	110	230
250	121.1	115	239

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	5.6650	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

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	38.855	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	1393.0962	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	499.9778	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	16.0595	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

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

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

RECOMMENDED SPECIAL TOOLS

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

Table of Contents

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	IL 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

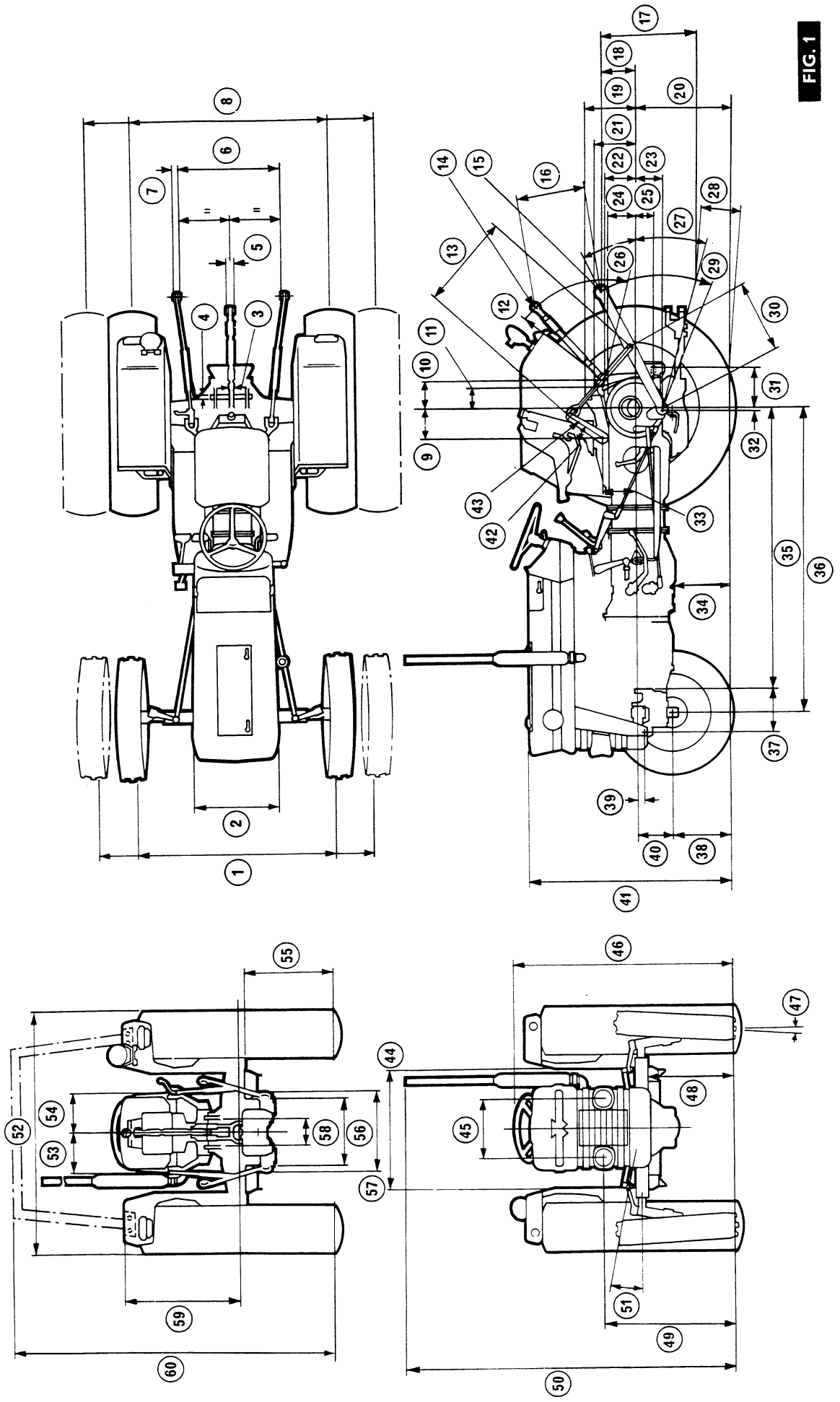
NOTES:
1. Provided the oil change periods recommended in the Maintenance Section have been followed. discolouration of the engine oil with use is normal and of no significance.
2. If the tractor is to work on slopes and inclines. the transmission should be filled to the 'H' mark on the dipstick.

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		Below 0	Below –17					—	
Standard	28,4 litres (50 pints)			B.P. TF-7	Agricastrol M.D.	Hydrol 303	Torque Fluid 56		S.6332
Multi-Power	27,7 litres (48 pints)	0 to 80	–17 to 27	Hydraulic TF-8	Agricastrol AS BB 11	Hydrolube	IL 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	Mobil-grease 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.

FIG. 1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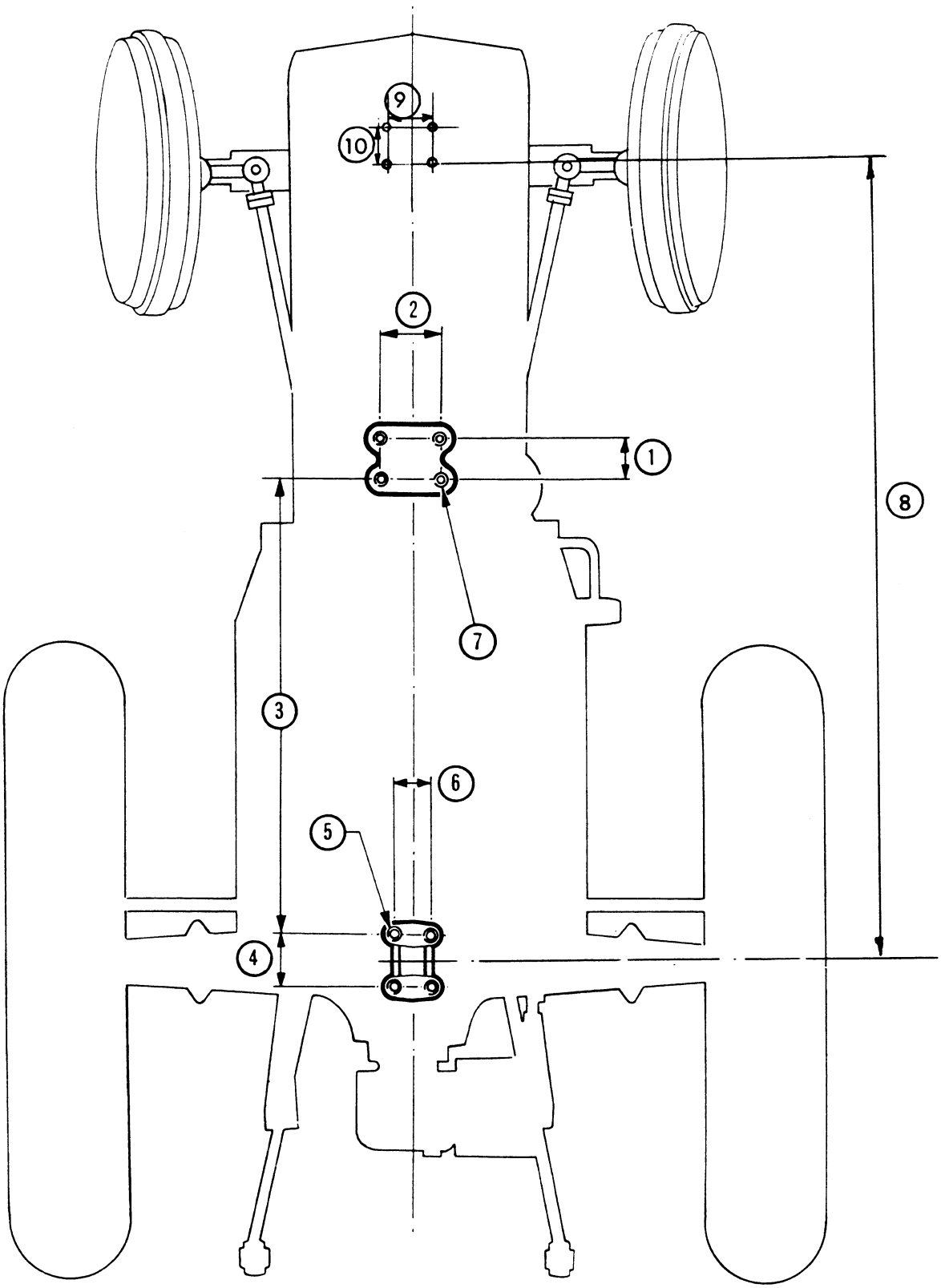


FIG. 2

GENERAL INFORMATION

Main Dimensions
The following overall dimensions relate to the MF 148 tractor fitted with 6.00–19 front tyres and 11–32 rear tyres.

Key to Figure 1.

1. Manual Steering – 1212 to 1829 mm (48 to 72 in) in 102 mm (4 in) steps.
   Power Steering – 1321 to 1829 mm (52 to 72 in) in 102 mm (4 in) steps.
2. 565 mm (22¼ in)
3. 29 mm (1⅛ in)
4. 19 mm (¾ in) dia.

	CAT. 1	CAT. 2
5.	43,6 to 43,9 mm (1.72 to 1.73 in)	50,5 to 51,0 mm (1.99 to 2.01 in)
6.	683 mm (26⅞ in)	824 mm (32 7/16 in)
7.	34,8 to 35,1 mm (1.37 to 1.38 in)	44,4 to 44,7 mm (1.75 to 1.76 in)

8. 1321 to 1930 mm (52 to 76 in) in 102 (4 in) steps.
9. 196 mm (7.7 in)
10. 184 mm (7¼ in)
11. 133 mm (5¼ in)

	CAT. 1	CAT. 2
12.	692 mm radius (27¼ in)	683 radius (26⅞ in)
13.	610 mm (24 in)	606 mm (23⅞ in)
14.	19,3 to 19,6 mm dia. (0.76 to 0.77 in)	25,6 to 25,9 mm dia. (1.01 to 1.02 in)
15.	22,4 to 22,7 mm dia. (0.885 to 0.895 in)	28.8 to 29,1 mm dia. (1.135 to 1.145 in)
16.	457 mm (18 in)	457 mm (18 in)
17.	625 mm (24⅝ in)	625 mm (24⅝in)
18.	232 mm (9⅛in)	229 mm (9 in)

19. 338 mm (13.3 in)
20. 630 mm (24.8 in)
21. 274 mm (10.8 in)
22. 206 mm (8⅛ in)
23. 184 mm (7¼ in)
24. 191 mm (7.5 in)
25. 127 mm (5 in)

	CAT.1	CAT. 2
26.	28° 30'	28° 30'
27.	13° 30'	14°
28.	248 mm (9¾ in)	245 mm (9⅝ in)
29	883 mm (34¾ in)	870 mm (34¼ in)
30	454 mm (17⅞ in)	448 mm (7⅝ in)

31. 261 mm (10 9/32 in)
32. 9 mm (1 1/32in)
33. 233 mm (9.165 in)
34. 356 mm (14 in)
35. 1891 mm (74.45 in)
36. 2048 mm (80⅝ in)
37. 285 to 286 mm (11.21 to 11.25 in)
38. 381 mm (15 in)
39. 42 mm (1.66 in)
40. 229 mm (9 in)
41. 1343 mm (52⅞ in)
42. 33°
43. 64°
44. 813 mm (32 in) approx.
45. 392 mm (15 7/16 in)
46. 1445 mm (56⅞ in)
47. 3° 30' Camber
48. 546 mm (21½ in)
49. 851 mm (33½ in)
50 2210 mm (87 in)
51. 11° maximum swing
52. 1626 mm (64 in) at 1321 mm (52 in) track
53. 267 mm (10½ in)
54. 267 mm (10½ in)
55. 589 mm (23.2 in)
56. 474 mm (18⅝ in)
57. 562 mm (22¼ in)
58. 182 mm (7.16 in)
59. 778 mm (30⅝ in)
60. 2241 mm (88¼ in)

Mounting Points
These mounting points can be used for the attachment of some implements.

Key to Figure 2.

1. 101,6 mm (4 in)
2. 184 mm (7¼ in)
3. 1168 mm (46 in)
4. 152,4 mm (6 in)
5. 4 holes tap ¾ in 10 UNC 3B x 28,6 mm (1⅛ in) deep (blind).
6. 85,7 mm (3⅜ in)
7. 8 holes tap ⅝ in 11 UNC 3B x 31,7 mm (1¼ in) deep (blind).
8. 1982 mm (77⅛ in)
9. 152,4 mm (6 in).
10. 114,3 mm (4½ in)

ENGINE

A comprehensive specification for the AD3.152 engine is provided in the Perkins Workshop Service Manual.
For all data, consult the Perkins AD3.152 Manual.

COOLING SYSTEM

The cooling system comprises a fan and centrifugal type pump, driven by a belt, from the crankshaft, coolant flow being controlled by a wax type thermostat. The radiator is of a conventional fin and tube type, with a header tank.

System capacity – 10,2 litres (18 Imp pints)
Pump Impeller Clearance – 0,25 to 0.51 mm (0.010 to 0.020 in)
Thermostat Opening Temperature – 76 to 80°C (169 to 176°F)
Thermostat Valve fully open – 88 to 90,6°C (190 to 195°F)
Thermostat Valve Lift – 7,9 to 11,9 mm (5/16 to 1 5/32 in)

Antifreeze solutions should be used where there is a risk of freezing.

GENERAL SPECIFICATION

FUEL SYSTEM

Air Cleaner
A two stage dry air cleaner is fitted, this air cleaner has a washable, pleated main element, and inner safety element and a self acting unloader valve.

Fuel Tank
The 47,73 litres (10.5 Imp gal) fuel tank is situated above the engine and has a thermostart reservoir and a fuel tap at the rear end.

Thermostart
C.A.V. Thermostart Mk IIIC is fitted to this tractor. Full details and data are provided in the Perkins AD3.152 Manual.

Fuel Injection Equipment
A C.A.V. D.P.A. type fuel pump with C.A.V. injector holders and nozzles are fitted. For full details, consult the Perkins AD3.152 Manual.

Fuel Filters
C.A.V. primary and secondary fuel filters with replaceable cartridge type elements are fitted. A sediment bowl is incorporated in the primary fuel filter.

Throttle Controls
A hand throttle and foot throttle are fitted as standard equipment. The action of the foot throttle overrides the hand throttle. The throttle controls are of the rod type, adjustable for length to permit setting of maximum engine speed.

TRANSMISSION

Clutch
The dual clutch is of the Auburn ventilated type, with a 305 mm (12 in) diameter main drive disc and a 254 mm (10 in) p.t.o. disc. The main drive clutch is coil spring operated and the p.t.o. clutch is Belleville spring operated.

Colour Code
Clutch Cover Assembly – White
Coil Spring – Brown
- Free length 65,40 mm (2.575 in)
- Compressed Length 33,59 mm (1.283 in)
- Working Length 34,16 mm (1.345 in)
- Test Load 32,66 to 35,38 kg (72 to 78 lb)
- Total Load Rating (12 springs) 408 kg (900 lb)

Belleville Spring – Dark Blue
- Free Height 5,9 to 6,2 mm (0.235 to 0.245 in)
- Thickness 2,89 mm (0.114 in)
- Total Load Rating 566,9 kg (1250 lb)

Toggle Lever Height Setting
79,24 to 83,3 mm (3.12 to 3.28 in)
Use Special Tool MF 314 to adjust toggle lever height.

P.T.O. Clutch Setting
2,03 mm (0.080 in)
Use Special Tool MF 215 to adjust
Pedal free travel, measured between the pedal and the shoulder on the transmission case – 11,11 mm ($\frac{7}{16}$ in).

Eight Speed Transmission
The eight speed transmission provides four forward and one reverse gear, compounded by a planetary reduction gearset on the output end of the mainshaft to give eight forward and two reverse gears.

	No of teeth
Main Input Shaft Constant Mesh Gear	17
P.t.o. Input Shaft Constant Mesh Gear	17
Main Input Layshaft Constant Mesh Gear	52
P.t.o. Input Layshaft Constant Mesh Gear	53
Mainshaft 1st	44
Mainshaft 2nd	46
Mainshaft 3rd	41
Mainshaft 4th	36
Layshaft 1st	15
Layshaft 2nd	23
Layshaft 3rd	28
Layshaft 4th	33
Reverse Gear Cluster	13/21
Planetary Reduction Unit Sun Gear	18
Planetary Reduction Unit Planet Gear	18
Planetary Reduction Unit Ring Gear	54
Transmission Ratios: 1st	2.933 : 1
2nd	2 : 1
3rd	1.464 : 1
4th	1.09 : 1
Reverse	2.156 : 1
Constant Mesh Ratios: Main	3.059 : 1
P.t.o.	3.12 : 1
Planetary Reduction in Unit Ratios – Low Range	4 : 1
Planetary Reduction in Unit Ratios – High Range	1 : 1

11-32 Tyres–716,3 mm (25.2 in) Dynamic rolling radius

Planetary Range	Gear	Total Ratio	Road speeds 1 500 e.r.p.m.		2 250 e.r.p.m.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	221.4	1.02	1.64	1.53	2.46
	2nd	150.98	1.49	2.39	2.23	3.59
	3rd	110.52	2.03	3.27	3.04	4.90
	4th	82.28	2.73	4.39	4.09	6.59
	Rev.	162.76	1.38	2.22	2.07	3.33
HIGH	5th	55.35	4.08	6.56	6.12	9.84
	6th	37.74	5.96	9.59	8.94	14.38
	7th	27.63	8.14	13.09	12.21	19.64
	8th	20.57	10.92	17.56	16.36	26.36
	Rev.	40.69	5.52	8.88	8.28	13.32

Multi-Power Transmission

The Multi-Power transmission has three forward and one reverse gear, compounded by a planetary reduction gearset to give six forward and two reverse gears which are further compounded by a hydraulically actuated two-speed input gearset to give twelve forward and four reverse gears.

	No of teeth
Main Input Shaft Constant Mesh Gear High Range	15
Main Input Shaft Constant Mesh Gear Low Range	18
P.t.o. Input Shaft Constant Mesh Gear	17
Main Input Layshaft Constant Mesh Gear High Range	45
Main Input Layshaft Constant Mesh Gear Low Range	42
P.t.o. Input Layshaft Constant Mesh Gear	53
Mainshaft 1st	44
Mainshaft 2nd	46
Mainshaft 3rd	36
Layshaft 1st	15
Layshaft 2nd	23
Layshaft 3rd	33
Reverse Gear Cluster	13/21
Planetary Reduction Unit Sun Gear	18
Planetary Reduction Unit Planet Gear	18
Planetary Reduction Unit Ring Gear	54
Transmission Ratios: 1st	2.933 : 1
2nd	2 : 1
3rd	1.09 : 1
Reverse	2.156 : 1
Constant Mesh Ratios Main (High)	2.33 : 1
Constant Mesh Ratios Main (Low)	3 : 1
Constant Mesh Ratios P.t.o.	3.12 : 1
Planetary Reduction Unit Ratio – Low Range	4 : 1
Planetary Reduction Unit Ratio – High Range	1 : 1

11-32 Tyres–716,3 mm (25.2 in) Dynamic rolling radius

Planetary Range	Gear	Total Ratio	Road Speeds 1 500 r.p.m.		1 700 r.p.m.		2 250 r.p.m.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st Low	217.05	1.04	1.67	1.17	1.89	1.56	2.50
	1st High	168.66	1.38	2.14	1.51	2.42	2.00	3.21
	2nd Low	148.00	1.52	2.44	1.72	2.76	2.28	3.66
	2nd High	114.96	1.96	3.15	2.22	3.57	2.94	4.72
	3rd Low	80.66	2.79	4.49	3.16	5.09	4.19	6.73
	3rd High	62.66	3.59	5.78	4.07	6.55	5.38	8.67
	Rev. Low	160.00	1.40	2.92	1.59	2.56	2.11	3.39
	Rev. High	123.90	1.81	3.25	2.05	3.31	2.71	4.38
HIGH	4th Low	54.26	4.16	6.69	4.68	7.56	6.20	10.00
	4th High	42.16	5.32	8.56	6.03	9.68	7.98	12.84
	5th Low	37.00	6.08	9.76	6.83	11.04	9.12	14.64
	5th High	28.74	7.84	12.60	8.88	14.28	11.76	18.88
	6th Low	20.17	11.16	17.96	12.64	20.36	16.76	26.92
	6th High	15.67	14.36	23.10	16.28	26.20	21.52	34.68
	Rev. Low	40.00	5.60	9.01	6.36	10.24	8.44	13.58
	Rev. High	30.98	7.24	11.68	8.20	13.24	10.84	17.52

GENERAL SPECIFICATION

REAR AXLE AND BRAKES

Spiral bevel rear axle with lockable differential unit is fitted.

	No of teeth
Crownwheel	37
Pinion	6
Crownwheel and Pinion Ratio	6.17 : 1

Brakes
Girling 355,6 x 50,8 mm (14 x 2 in), two shoes, internal expanding full servo drum brakes, operated together or independently to assist steering. The brake pedals can be locked together for use on the road. The parking brake (where fitted) operates on both rear wheels simultaneously.

Power Take-Off
Live p.t.o. is driven from the clutch through constant mesh gears in the transmission case to the hydraulic pump and then to the p.t.o. drive shaft. Engagement by a lever on L.H. side of centre housing.

Independent p.t.o. is driven from the clutch through constant mesh gears in the transmission case to the hydraulic pump and the i.p.t.o. multi-plate wet clutch and then to the p.t.o. drive shaft. Engagement by a lever on L.H. side of centre housing.

Reduction Ratio – 3.12 : 1
Speeds: 540 p.t.o. rev/min at 1684 eng. rev/min
721 p.t.o. rev/min at 2250 eng. rev/min

P.t.o. Shaft Dimension

Number of Splines	6
Major Diameter of Splines	34,82 to 34,87 mm (1.371 to 1.373 in)
Minor Diameter of Splines	27,89 to 28,14 mm (1.098 to 1.108 in)
Spline Width	8,58 to 8,63 mm (0.338 to 0.340 in)
Length suitable for Drive Attachment	73,03 mm (2.875 in)
Hole Diameter	8,28 to 8,53 mm (0.326 to 0.336 in)
Distance of Hole Centre From Shaft End	15,875 mm (0.625 in)
Groove Diameter	29,34 to 29,46 mm (1.155 to 1.160 in)
Groove Radius	6,53 mm (0.265 in)
Distance of Groove Centre from Shaft End	28,575 mm (1.125 in)
Ground Speed Ratio (Live p.t.o. or Side i.p.t.o. only)	Approx 549 mm (21 in) of forward travel for each revolution of the p.t.o. shaft. When ground speed p.t.o. is engaged the shaft revolves clockwise when the tractor moves forwards or, anti-clockwise when the tractor reverses.

FRONT AXLE AND STEERING

A three section front axle, adjustable for track width is fitted. Outer arms are secured to the centre beam by two bolts and nuts.

Castor Angle	4° 56'
Camber Angle	3° 30' Positive
King-pin inclination	9° 30'
Toe-in	3,17 mm (⅛ in)
King-pin diameter	31,62 to 31,64 mm (1.245 to 1.246 in)
King-pin Bush diameter	31,73 to 31,75 mm (1.249 to 1.250 in)
Pivot Pin diameter	41,96 to 41,99 mm (1.652 to 1.653 in)
Pivot Pin Bush diameter	42,04 to 42,19 mm (1.655 to 1.661 in)
Track Adjustments	
Manual Steering	1219 to 1829 mm (48 to 72 in)
Power Steering	1321 to 1829 mm (52 to 72 in)

Recirculating ball worm and nut type steering is fitted. Power assisted steering is available as an optional extra.

Steering Ratio	13 : 1
Power Steering Pump	Output @ 56 kg/cm² (800 lb/in²) 16,95 lit/min (3.73 Imp gal/min)
Maximum Pressure	98,43 kg/cm² (1400 lb/in²)
Power Steering System Capacity	0,47 litre (0.84 pints)

WHEELS AND TYRES

This tractor is available with W10 x 32 pressed steel, single disc rear wheels, fitted with 11-32 tyres. The maximum pressures and weights are as follows:

Tyre Size	Max. Pressure		Max. Load	
	kg/cm²	lb/in²	kg	lb
11-32 (4 ply)	0,98	14	1016	2240
11-32 (6 ply)	1,55	22	1297	2860

The front wheels available are 4.50 x 19 rims and pressed steel centres, fitted with 6.00-19 tyres.

Tyre Size	Weight on the tractor front wheels		Maximum permissible front end weight		Normal tyre pressures		Maximum tyre pressures	
	lb	kg	lb	kg	lb/in²	kg/cm²	lb/in²	kg/cm²
6.00-19 (4 ply)	1404	637	2370	1075	26	1,82	32	2,25
6.00-19 (6 ply)	1404	637	3000	1360	28	1,96	48	3,37

Wheel Weight Data

Rear Wheels

The Adapter weight weighs 31,8 kg (70 lb) (two halves)

The second weight weighs 50,8 kg (112 lb).

The maximum number which can be attached is determined by the ply rating and pressure of the tyres fitted.

Front Wheels

Two peice weights per wheel 68 kg (150 lb)

HYDRAULICS

The four cylinder, Scotch Yoke pump is driven from the p.t.o. driveshaft and supplies oil, under pressure, to the ram cylinder and four external tapping points. The Pressure Control System operated from 10,6 to 179 kg/cm² (150 to 2550 lb/in²).

The auxiliary hydraulic system can be used to operate external services and can be used to operate independently, or combined with the output of the linkage pump.

Lift Pump

Output @ 2250 eng. rev/min	15,0 litres/min (3.3 Imp. gal/min)
Hydraulic h.p. @ 2250 eng. rev/min and 140,6 kg/cm² (2000 lb/in²)	4.4 h.p.
Maximum Pressure	179 kg/cm² (2550 lb/in²)
Piston Diameter	25,04 to 25,06 mm (0.986 to 0.9865 in)
Piston Bore	25,08 to 25.11 mm (0.9875 to 0.9885 in)
Stroke	15,24 mm (0.06 in)
Piston Area	4,95 cm² (0.767 in²)

Auxiliary Pump (High Capacity)

Output @ 2250 eng. rev/min	31,8 litres/min (7 Imp gal/min)
Hydraulic h.p. @ 2250 eng. rev/min and 140,6 kg/cm² (2000 lb/in²)	9.8 h.p.
Multi-Power Circuit Flow @ 2250 eng. rev/min	15,9 litres/min (3.5 Imp gal/min)
Maximum Pressure	169 kg/cm² (2400 lb/in²)
Multi-Power Relief Valve Pressure	49,2 to 70,3 kg/cm² (700 to 1000 lb/in²)

Multi-Power Pump (Low Capacity)

Output @ 2250 eng. rev/min	17,5 litres/min (3.8 Imp gal/min)
Relief Valve Pressure	49,2 to 70,3 kg/cm² (700 to 1000 lb/in²)

Hydraulic Tapping Points

From lift pump	Two tapping points on sides of the lift cover – ⅜ – 18 N.P.T.F (Dry Seal) taper plug. On top of the lift cover to the left of the transfer cap – ⅜ N.P.S.M. x 19 mm (¾ in) deep. On the transfer cap – ⅜ - 27 N.P.T.F. (Dry Seal).
From Auxiliary Pump	With Spool Valve fitted, 'Pioneer' self sealing, quick release couplings. The hoses adjacent to the quick release couplings have identification tags for flow and return:

L.H. Couplers; Flow – White, Return – Yellow

R.H. Couplers; Flow – Red, Return – Blue

LINKAGE

Three point linkage is fitted, the lower links being of the interchangable ball type and the top link of the barrel and turnbuckle type.

Lower Link – between centres 879 mm (34 ⅝ in)

Width and Thickness 76 x 17,8 mm (3 x 11/16 in)

Lift Rod – Nominal Length	612 mm (24 ⅛ in)
Top Link – Nominal Length	685,8 mm (27 in)
Adjustment	609,6 to 702 mm (24 to 30 in)
Barrel Length	476,3 mm (18¾ in)

Swinging Drawbar

Settings and Load Capacity (Static) 254 mm (10 in) – 990 kg (2200 lb)

356 mm (14 in) – 765 kg (1700 lb)

Offset – three positions per side

1. 60 mm (2⅜ in)
2. 130 mm (5⅛ in)
3. 233 mm (9 3/16 in)

GENERAL SPECIFICATION

ELECTRICAL SYSTEM

Voltage	12 volt NEGATIVE EARTH
Battery	17 plate, 96 amp (temperate) or 125 amp (cold climate)
Starter Motor	Lucas M50G or M45G with solenoid engaged pinion. Starter circuit protected by neutral safety start switch incorporated in the trans mission.
Dynamo	Lucas C40A
Voltage Control Box	Lucas RB 108
Lamp Bulb Sizes:	
Headlamp	12V 36/36 watt
Plough Lamp	12V 36 watt
Side Lamp	12V 6 watt
Tail Lamp	12V 6 watt
Number Plate Lamp	12V 6 watt
Panel Light	12V 2.2 watt
Fuses – Tractor	25 amp
Safety Cab Wiper (if fitted)	35 amp

ACCESSORIES

Front Weights	each weight weighs 27 kg (60 lb)
Auto-Hitch	Lift capacity 1814 kg (4000 lb)

Belt Pulley

Pulley Diameter	228,6 mm (9 in)
Pulley Width	165 mm (6½ in)
Gear ratio to p.t.o. shaft	1.824 : 1
Pulley Oil Capacity	0,85 litres (1½ Imp pints)

Speeds

Engine rev/min	P.T.O. rev/min	Pulley rev/min	Belt Speed m/min	Belt Speed ft/min
1685	540	985	708,6	2325
2250	721	1315	946	3105

Linkage Drawbar

Drawbars to fit Category 2 link ends are available.

Length of Drawbar, over flat section	660 mm (26 in)
Number of securing holes	9
Diameter of securing holes	19,8 mm (0.781 in)
Stay Length – from the right hand corner of the cranked section to the straight end – Upper	765 mm (30 ⅛ in)
– Lower	768 mm (30¼ in)

Selector Valve

Port thread sizes Ext 1	$\frac{9}{16}$ 18 UNF
Ext 2	$\frac{9}{16}$ 18 UNF
Port 'R'	¾ 16 UNF
Relief Valve Setting	260 kg/cm^2 (3700 lb/in^2)

GENERAL SPECIFICATION

Part 1 Section A

Table of Contents

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

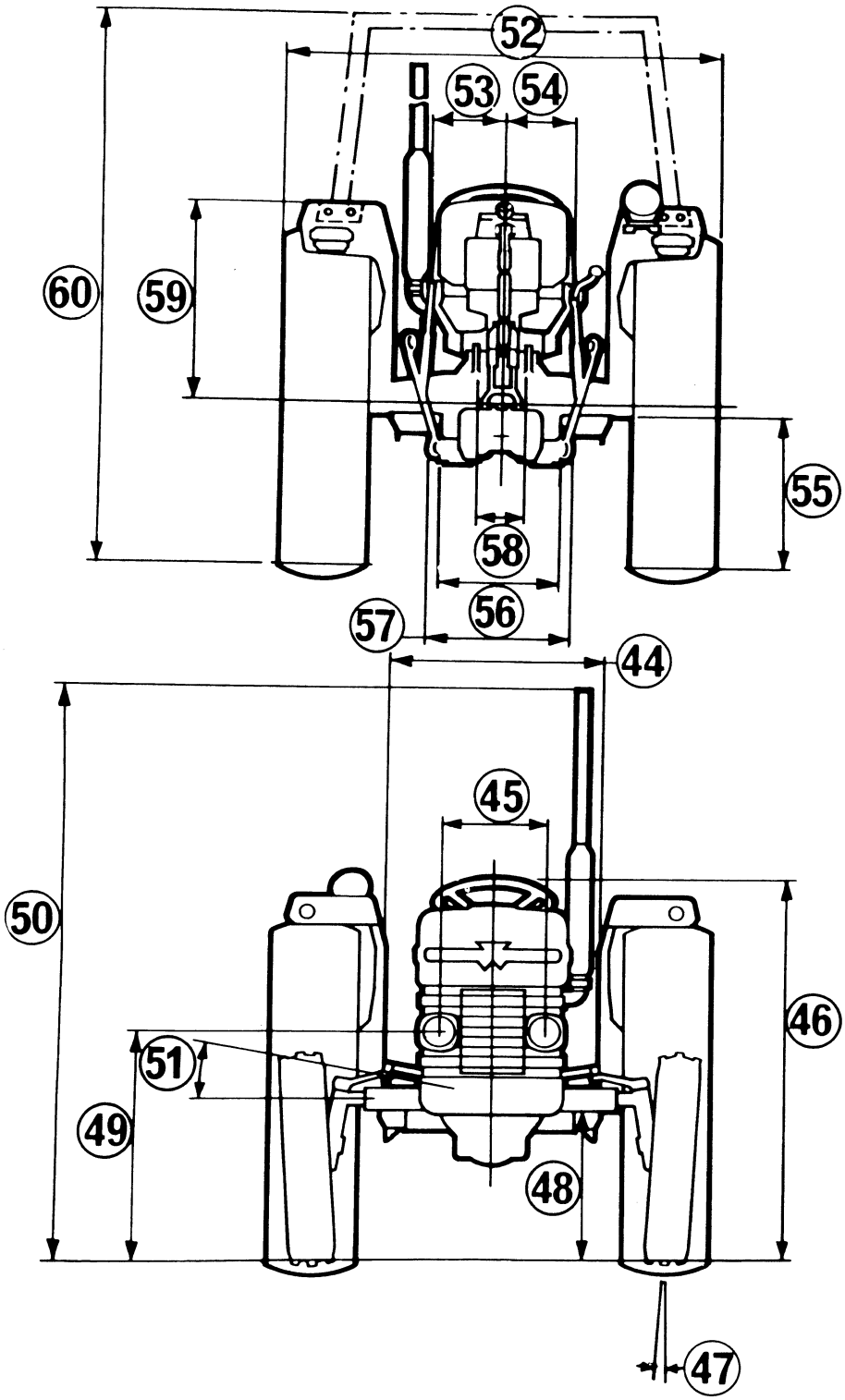
UNIT		*CAPACITY*	*B.P.*	*Castrol*	*Duckham's*	*Esso*	*Mobil*	*Shell*
ENGINE including FILTER	Dipstick Full	6,8 litres (12 pints)	Tractor Oil Universal	Agricastrol Multi-use	Farmadcol Multigrade	Tractorlube (Universal)	Mobiland Universal	Tractor Oil Universal
STEERING BOX		0,85 litres (1½ pints)						
TRANSMISSION See note 2	Standard Multi-power	25 litres (44 pints) 23,5 litres (42 pints)	Hydraulic TF8 or Tractran	Agricastrol AS (BB11)	Hydrolube	IL 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.F.T. 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 10 W
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 20/20 W
		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	25 litres (44 pints)	Below 0 Below –17	B.P. TF-7	Agricastrol M.D.	Hydrol 303	Torque Fluid 56	—	S.6332
Multi-Power	23,5 litres (42 pints)	0 to 80 –17 to 27	Hydraulic TF-8	Agricastrol AS BB 11	Hydrolube	IL 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 90 EP
GREASE GUN		All Temps.	Energrease L2	Castrol LM Grease	Duckham's Admax L2	Esso Multi-purpose Grease	Mobil-grease 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.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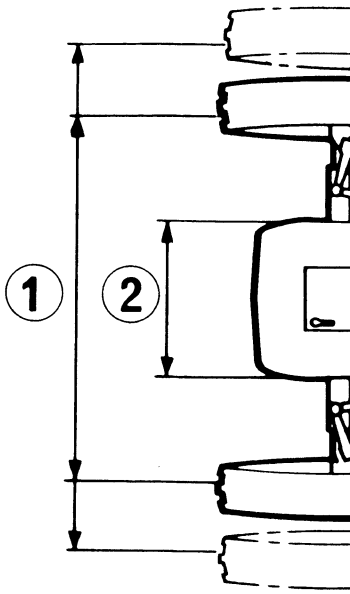
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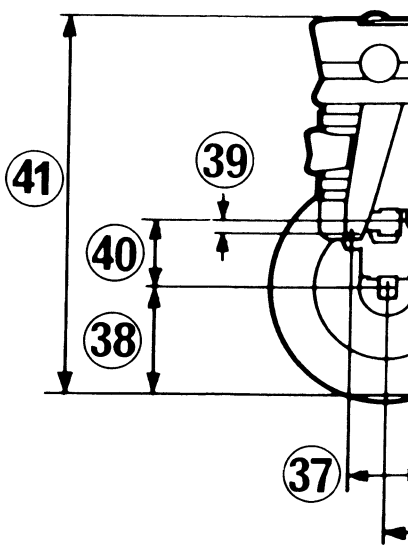
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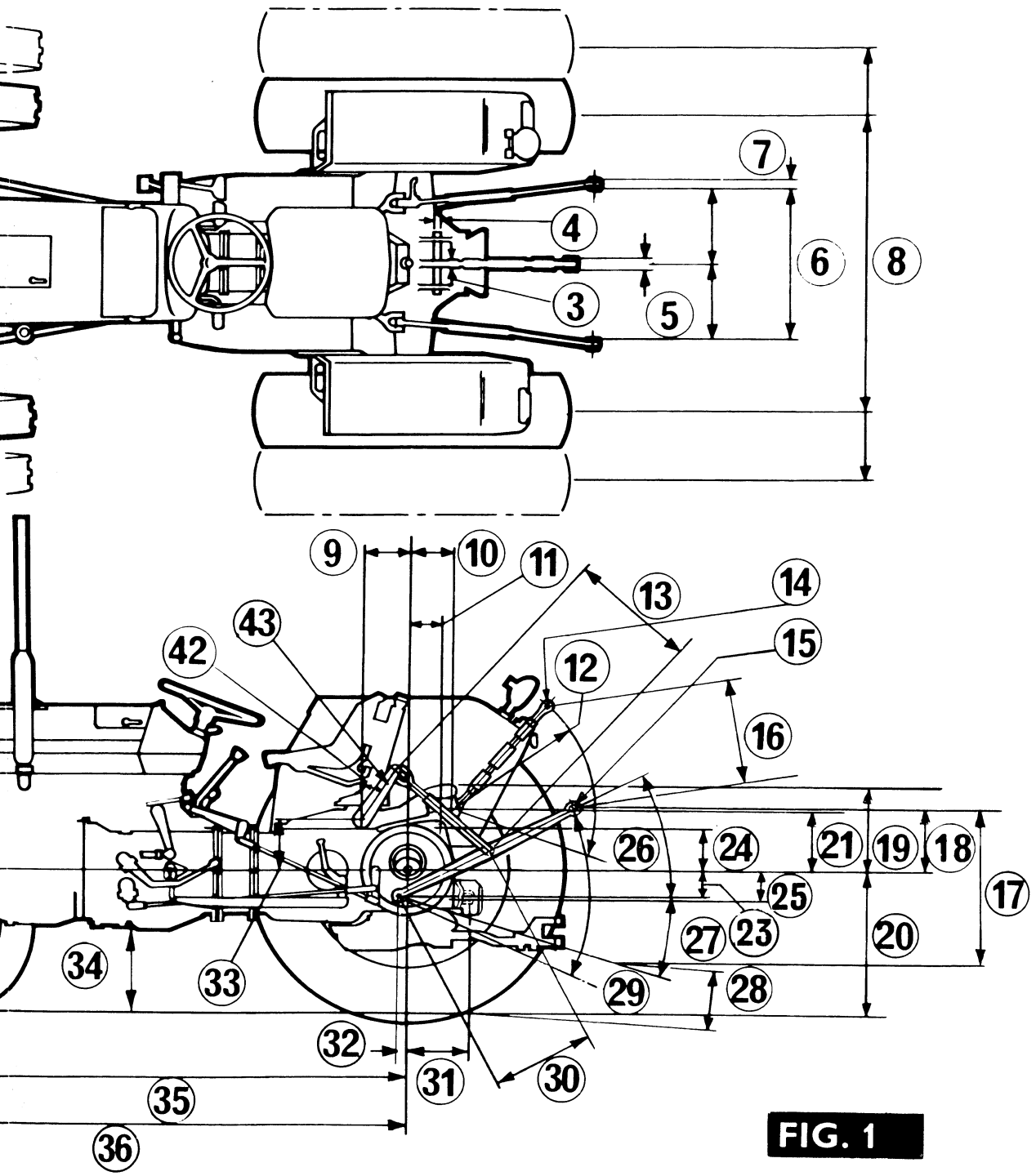
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FIG. 1

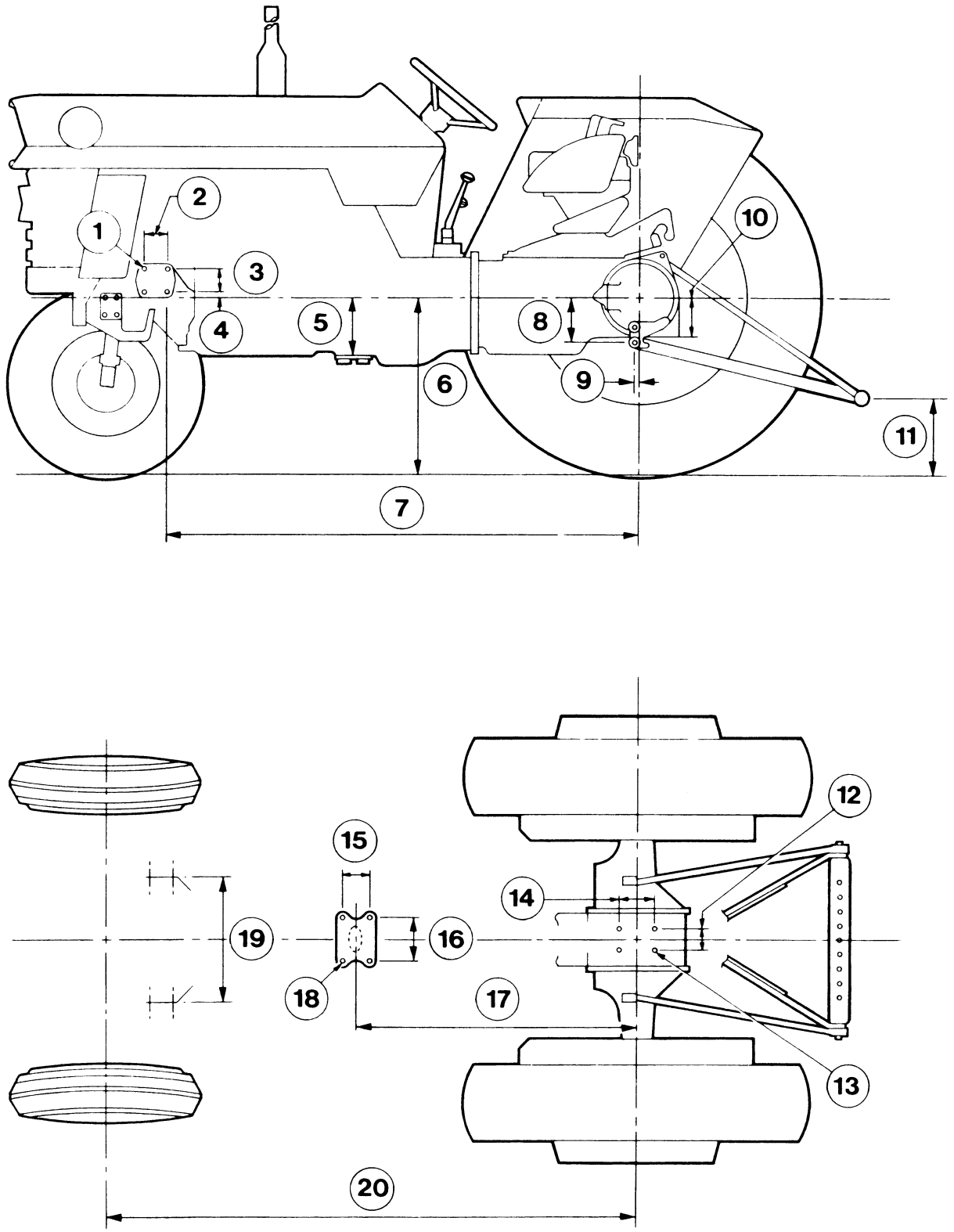

FIG. 2

GENERAL INFORMATION

Main Dimensions

The following overall dimensions relate to the MF 135 tractor fitted with 6.00—16 front tyres and 11—28 rear tyres.

Key to Figure 1

1. Manual Steering – 1212 to 1829 mm (48 to 72 in) in 102 mm (4 in) steps.
   Power Steering – 1321 to 1829 mm (52 to 72 in) in 102 mm (4 in) steps.
2. 565 mm (22¼ in)
3. 29 mm (1 ⅛ in)
4. 19 mm (¾ in) dia.

	CAT. 1	CAT. 2
5.	43,6 to 43,9 mm (1.72 to 1.73 in)	50,5 to 51,0 mm (1.99 to 2.01 in)
6.	683 mm (26 ⅞ in)	824 mm (32 7/16 in)
7.	34,8 to 35,1 mm (1.37 to 1.38 in)	44,4 to 44,7 mm (1.75 to 1.76 in)

8. 1321 to 1930 mm (52 to 76 in) in 102 (4 in) steps.
9. 196 mm (7.7 in)
10. 133 mm (5¼ in)
11. 102 mm (4 in)

	CAT. 1	CAT. 2
12.	635 mm radius (25 in)	622 mm radius (24½ in)
13.	513 mm (20.2 in)	509 mm (20 in)
14.	19,3 to 19,6 mm dia. (0.76 to 0.77 in)	25,6 to 25,9 mm dia. (1.01 to 1.02 in)
15.	22,4 to 22,7 mm dia. (0.885 to 0.895 in)	28,8 to 29,1 mm dia. (1.135 to 1.145 in)
16.	457 mm (18 in)	457 mm (18 in)
17.	645 mm (25 ⅜ in)	641 mm (25¼ in)
18.	284 mm (11 3/16 in)	281 mm (11 1/16 in)

19. 369 mm (14 17/32 in)
20. 579 mm (22.8 in)
21. 274 mm (10.8 in)
*22. Not applicable.
23. 114 mm (4½ in)
24. 191 mm (7.5 in)
25. 127 mm (5 in)

	CAT. 1	CAT.2
26.	29°	30°
*27.	18°	18°
28.	219 mm (8 ⅝ in)	219 mm (8 ⅝ in)
29.	802 mm (31 9/16 in)	787 mm (31 in)
30.	401 mm (15 25/32 in)	394 mm (15½ in)

*31. 261 mm (10 9/32 in)
32. 45 mm (1¾ in)
33. 233 mm (9.165 in)
34. 311 mm (12¼ in)
35. 1741 mm (68½ in)
36. 1896 (74 ⅝ in)
37. 285 to 286 mm (11.21 to 11.25 in)
38. 342 mm (13.45 in)
39. 42 mm (1.66 in)
40. 229 mm (9 in)
41. 1305 mm (51⅜ in)
42. 33°
43. 64°
44. 813 mm (32 in) approx.
45. 392 mm (15 7/16 in)
46. 1400 mm (55 ⅛ in)
47. 3° 30′ Camber
48. 508 mm (20 in)
49. 813 mm (32 in)
50. 2165 mm (85¼ in)
51. 11° maximum swing
52. 1626 mm (64 in) at 1321 mm (52 in) track
53. 267 mm (10½ in)
54. 267 mm (10½ in)
55. 539 mm (21.2 in)
56. 450 mm (17¾ in)
57. 520 mm (20½ in)
58. 182 mm (7.16 in)
59. 778 mm (30 ⅝ in)
60. 2196 mm (87¼ in)

Mounting Points

These mounting points can be used for the attachment of some implements.

Key to Figure 2.

1. 101,6 mm (4 in)
2. 184 mm (7¼ in)
3. 1018 mm (40 1/16 in)
4. 152,4 mm (6 in)
5. 4 holes tap ¾ in 10 UNC 3B x 28,6 mm (1⅛ in) deep (blind).
6. 85,7 mm (3 ⅜ in)
7. 8 holes tap ⅝ in 11 UNC 3B x 31,7 mm (1¼ in) deep (blind).
8. 1832 mm (72 ⅛ in)
9. 152,4 mm (6 in)
10. 114,3 mm (4½ in)

ENGINE

A comprehensive specification for the AD3.152 engine is provided in the Perkins Workshop Service Manual.
For all data, consult the Perkins AD3.152 Manual.

COOLING SYSTEM

The cooling system comprises a fan and centrifugal type pump, driven by a belt, from the crankshaft, coolant flow being controlled by a wax type thermostat. The radiator is of a conventional fin and tube type, with a header tank.

System capacity – 10,2 litres (18 Imp pints).

Pump Impeller Clearance – 0,25 to 0,51 mm (0.010 to 0.020 in).

Thermostat Opening Temperature – 76 to 80°C (169 to 176°F).

Thermostat Valve fully open – 88 to 90,6°C (190 to 195°F).

Thermostat Valve Lift – 7,9 to 11,9 mm (5/16 to 15/32 in).

Antifreeze solutions should be used where there is a risk of freezing.

GENERAL SPECIFICATION

FUEL SYSTEM

Air Cleaner
A two stage dry air cleaner is fitted, this air cleaner has a washable, pleated main element, and inner safety element and a self acting unloader valve.

Fuel Tank
The 47,73 litres (10.5 Imp gal) fuel tank is situated above the engine and has a thermostart reservoir and a fuel tap at the rear end.

Thermostart
C.A.V. Thermostart Mk IIIC is fitted to this tractor. Full details and data are provided in the Perkins AD3.152 Manual.

Fuel Injection Equipment
A C.A.V. D.P.A. type fuel pump with C.A.V. injector holders and nozzles are fitted. For full details, consult the Perkins AD3.152 Manual.

Fuel Filters
C.A.V. primary and secondary fuel filters with replaceable cartridge type elements are fitted. A sediment bowl is incorporated in the primary fuel filter.

Throttle Controls
A hand throttle and foot throttle are fitted as standard equipment. The action of the foot throttle overrides the hand throttle. The throttle controls are of the rod type, adjustable for length to permit setting of maximum engine speed.

TRANSMISSION

Clutch
The dual clutch is of the Auburn ventilated type, with a 305 mm (12 in) diameter main drive disc and a 254 mm (10 in) p.t.o. disc. The main drive clutch is coil spring operated and the p.t.o. clutch is Belleville spring operated.

Colour Code
Clutch Cover Assembly – White

Coil Spring Brown
Free length 65,40 mm (2.575 in)
Compressed Length 33,59 mm (1.283 in)
Working Length 34,16 mm (1.345 in)
Test Load 32,66 to 35,38 kg (72 to 78 lb)
Total Load Rating (12 springs) 408 kg (900 lb)

Belleville Spring – Dark Blue
Free Height 5,9 to 6,2 mm (0,235 to 0,245 in)
Thickness 2,89 mm (0.114 in)
Total Load Rating 566,9 kg (1250 lb)

Toggle Lever Height Setting
79,24 to 83,3 mm (3.12 to 3.28 in)
Use Special Tool MF 314 to adjust toggle lever height.

P.T.O. Clutch Setting
2,03 mm (0.080 in).

Use Special Tool MF 215 to adjust.

Pedal free travel, measured between the pedal and the shoulder on the transmission case – 11,11 mm (7/16 in).

Six Speed Transmission
The six speed transmission provides three forward and one reverse gear, compounded by a planetary reduction gearset on the output end of the mainshaft to give six forward and two reverse gears.

		No of teeth
Main Input Shaft Constant Mesh Gear		18
P.t.o. Input Shaft Constant Mesh Gear		17
Main Input Shaft Constant Mesh Gear		50
P.t.o. Input Layshaft Constant Mesh Gear		53
Mainshaft 1st		44
Mainshaft 2nd		46
Mainshaft 3rd		36
Layshaft 1st		15
Layshaft 2nd		23
Layshaft 3rd		33
Reverse Gear Cluster		13/21
Planetary Reduction Unit Sun Gear		18
Planetary Reduction Unit Planet Gear		18
Planetary Reduction Unit Ring Gear		54
Transmission Ratios:	1st	2.933:1
	2nd	2:1
	3rd	1.09:1
	Reverse	2.2:1
Constant Mesh Ratios:	Main	2.78:1
	P.t.o.	3.12:1
Planetary Reduction in Unit Ratios– Low Range		4:1
Planetary Reduction in Unit Ratios– High Range		1:1

Eight Speed Transmission
The eight speed transmission provides four forward and one reverse gear, compounded by a planetary reduction gearset on the output end of the mainshaft to give eight forward and two reverse gears.

		No of teeth
Main Input Shaft Constant Mesh Gear		18
P.t.o. Input Shaft Constant Mesh Gear		17
Main Input Layshaft Constant Mesh Gear		50
P.t.o. Input Layshaft Constant Mesh Gear		53
Mainshaft 1st		46
Mainshaft 2nd		46
Mainshaft 3rd		41
Mainshaft 4th		36
Layshaft 1st		15
Layshaft 2nd		23
Layshaft 3rd		28
Layshaft 4th		33
Reverse Gear Cluster		13/21
Planetary Reduction Unit Sun Gear		18
Planetary Reduction Unit Planet Gear		18
Planetary Reduction Unit Ring Gear		54
Transmission Ratios:	1st	2.933:1
	2nd	2:1
	3rd	1.464:1
	4th	1.09:1
	Reverse	2.156:1
Constant Mesh Ratios:	Main	2.78:1
	P.t.o.	3.12:1
Planetary Reduction in Unit Ratios– Low Range		4:1
Planetary Reduction in Unit Ratios– High Range		1:1

Multi-Power Transmission
The Multi-Power transmission has three forward and one reverse gear, compounded by a planetary reduction gearset to give six forward and two reverse gears which are further compounded by a hydraulically actuated two-speed input gearset to give twelve forward and four reverse gears.

	No. of teeth
Main Input Shaft Constant Mesh Gear High Range	19
Main Input Shaft Constant Mesh Gear Low Range	16
P.t.o. Input Shaft Constant Mesh Gear	18
Main Input Layshaft Constant Mesh Gear High Range	40
Main Input Layshaft Constant Mesh Gear Low Range	44
P.t.o. Input Layshaft Constant Mesh Gear	50
Mainshaft 1st	44
Mainshaft 2nd	46
Mainshaft 3rd	36
Layshaft 1st	15
Layshaft 2nd	23
Layshaft 3rd	33
Reverse Gear Cluster	13/21
Planetary Reduction Unit Sun Gear	18
Planetary Reduction Unit Planet Gear	18
Planetary Reduction Unit Ring Gear	54
Transmission Ratios: 1st	2.933:1
2nd	2:1
3rd	1.09:1
Reverse	2.156:1
Constant Mesh Ratios Main (High)	2.105:1
Constant Mesh Ratios Main (Low)	2.75:1
Constant Mesh Ratios P.t.o.	3.12:1
Planetary Reduction Unit Ratio— Low Range	4:1
Planetary Reduction Unit Ratio— High Range	1:1

REAR AXLE AND BRAKES

Spiral bevel rear axle with lockable differential unit is fitted.

	No of teeth
Crownwheel	37
Pinion	6
Crownwheel and Pinion Ratio	6.17:1

Brakes
Girling 355,6 x 50,8 mm (14 x 2 in), two shoes, internal expanding full servo drum brakes, operated together or independently to assist steering. The brake pedals can be locked together for use on the road. The parking brake (where fitted) operates on both rear wheels simultaneously.

Power Take-Off
Live p.t.o. is driven from the clutch through constant mesh gears in the transmission case to the hydraulic pump and then to the p.t.o. drive shaft. Engagement by a lever on L.H. side of centre housing.

Independent p.t.o. is driven from the clutch through constant mesh gears in the transmission case to the hydraulic pump and the i.p.t.o. multi-plate wet clutch and then to the p.t.o. drive shaft. Engagement by a lever on L.H. side of centre housing.

Reduction Ratio – 3.12:1
Speeds: 540 p.t.o. rev/min at 1684 eng. rev/min
721 p.t.o. rev/min at 2250 eng. rev/min

P.t.o. Shaft Dimension

Number of Splines	6
Major Diameter of Splines	34,82 to 34,87 mm (1.371 to 1.373 in)
Minor Diameter of Splines	27,89 to 28,14 mm (1.098 to 1.108 in)
Spline Width	8,58 to 8,63 mm (0.338 to 0.340 in)
Length suitable for Drive Attachment	73,03 mm (2.875 in)
Hole Diameter	8,28 to 8,53 mm (0.326 to 0.336 in)
Distance of Hole Centre From Shaft End	15,875 mm (0.625 in)
Groove Diameter	29,34 to 29,46 mm (1.155 to 1.160 in)
Groove Radius	6,53 mm (0.265 in)
Distance of Groove Centre From Shaft End	28,575 mm (1.125 in)
Ground Speed Ratio (Live p.t.o. or Side i.p.t.o. only)	Approx 477 mm (18.8 in) of forward travel for each revolution of the p.t.o. shaft. (10–28 tyres). When ground speed p.t.o. is engaged the shaft revolves clockwise when the tractor moves forwards or, anti-clockwise when the tractor reverses.

GENERAL SPECIFICATION

10–28 TYRES – 566 mm (22.3 in) DYNAMIC ROLLING RADIUS

6 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	.99	1.59	1.12	1.80	1.48	2.38
	2nd	137.1	1.47	2.33	1.64	2.64	2.18	3.51
	3rd	74.7	2.67	4.29	3.02	4.86	4.00	6.45
	Rev.	147.77	1.35	2.17	1.53	2.46	2.92	3.25
	4th	50.31	3.95	6.35	4.48	7.21	5.93	9.54
HIGH	5th	34.2	5.81	9.38	6.59	10.61	8.73	14.05
	6th	18.7	10.64	17.12	12.06	19.88	15.96	25.70
	Rev.	36.94	5.39	8.67	6.11	9.83	8.08	13.00

8 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds			
			1500 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	0.99	1.59	1.48	2.38
	2nd	137.04	1.45	2.34	2.18	3.51
	3rd	100.33	1.98	3.19	2.98	4.79
	4th	74.74	2.66	4.28	3.99	6.43
	Rev.	147.77	1.35	2.17	2.02	3.25
HIGH	5th	50.31	3.95	6.35	5.95	9.54
	6th	34.28	5.81	9.35	8.71	14.01
	7th	25.08	7.94	14.38	11.90	19.15
	8th	18.69	10.65	13.13	15.97	25.70
	Rev.	36.94	5.39	8.67	8.08	13.00

Multi-Power Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st Low	198.96	1.00	1.61	1.13	1.82	1.50	2.41
	1st High	152.28	1.31	2.10	1.48	2.38	1.96	3.15
	2nd Low	135.52	1.47	2.36	1.66	2.68	2.20	3.54
	2nd High	103.73	1.92	3.08	2.17	3.50	2.88	4.63
	3rd Low	73.86	2.52	4.06	2.85	4.92	4.03	6.49
	3rd High	56.53	3.51	5.67	3.97	6.39	5.28	8.49
	Rev. Low	144.12	1.36	2.19	1.54	2.48	2.04	3.29
	Rev. High	111.84	1.78	2.86	2.02	3.24	2.67	4.29
HIGH	4th Low	49.74	4.00	6.44	4.53	7.29	6.00	9.66
	4th High	38.07	5.23	8.41	5.93	9.54	7.84	12.62
	5th Low	33.93	5.87	9.45	6.63	10.67	8.81	14.18
	5th High	25.93	7.67	12.36	8.67	13.96	11.51	18.54
	6th Low	18.46	10.78	17.36	12.18	19.61	16.18	26.05
	6th High	14.13	14.09	22.68	15.91	25.52	21.13	34.03
	Rev. Low	36.53	5.45	8.77	6.18	9.94	8.17	13.15
	Rev. High	27.96	7.12	11.45	8.07	12.98	10.68	17.18

11–28 TYRES – 589 mm (23.2 in) DYNAMIC ROLLING RADIUS

6 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	1.03	1.66	1.16	1.87	1.54	2.48
	2nd	137.1	1.51	2.44	1.71	2.75	2.28	3.67
	3rd	74.7	2.79	4.47	3.15	5.07	4.18	6.75
	Rev.	147.77	1.40	2.26	1.59	2.55	2.10	3.38
HIGH	4th	50.31	4.12	6.63	4.66	7.49	6.17	9.93
	5th	34.2	6.07	9.77	6.86	8.83	9.11	14.67
	6th	18.7	11.14	17.92	12.58	20.26	16.71	26.89
	Rev.	36.94	5.61	9.03	6.35	10.22	8.41	13.53

8 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds			
			1500 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	1.03	1.66	1.54	2.48
	2nd	137.04	1.51	2.43	2.27	3.65
	3rd	100.33	2.06	3.32	3.10	4.42
	4th	74.74	2.77	4.48	4.16	6.69
	Rev.	147.77	1.40	2.26	2.10	3.38
HIGH	5th	50.31	4.12	6.63	6.17	9.93
	6th	34.28	6.04	9.72	9.07	14.59
	7th	25.08	8.26	13.28	12.38	19.93
	8th	18.69	11.08	17.83	16.62	26.74
	Rev.	36.94	5.61	9.03	8.41	13.53

Multi-Power Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st Low	198.96	1.04	1.67	1.18	1.90	1.56	2.51
	1st High	152.28	1.36	2.19	1.54	2.48	2.04	3.28
	2nd Low	135.52	1.52	2.46	1.73	2.79	2.29	3.68
	2nd High	103.75	1.99	3.21	2.26	3.63	2.99	4.81
	3rd Low	73.86	2.80	4.51	3.17	5.10	4.20	6.76
	3rd High	56.53	3.66	5.90	4.15	6.68	5.49	8.84
	Rev Low	144.12	1.42	2.28	1.69	2.58	2.12	3.42
	Rev High	111.84	1.85	2.98	2.10	3.38	2.78	4.47
HIGH	4th Low	49.74	4.16	6.70	4.72	7.59	6.24	10.05
	4th High	38.07	5.43	8.75	6.16	9.92	8.16	13.13
	5th Low	33.93	6.10	9.82	6.91	11.14	9.15	14.74
	5th High	25.93	7.98	12.85	9.05	14.54	11.98	19.27
	6th Low	18.46	11.12	18.06	12.78	20.58	16.82	27.08
	6th High	14.13	14.65	23.59	16.61	26.74	21.98	35.38
	Rev Low	36.53	5.67	9.12	6.42	10.34	8.50	13.68
	Rev High	27.96	7.41	11.92	8.39	13.51	11.11	17.87

GENERAL SPECIFICATION

13–24 TYRES – 584 mm (23 in) DYNAMIC ROLLING RADIUS

6 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	1.02	1.64	1.16	1.87	1.53	2.46
	2nd	137.1	1.49	2.42	1.69	2.72	2.26	3.64
	3rd	74.7	2.76	4.43	3.12	5.02	4.14	6.67
	Rev.	147.77	1.39	2.24	1.57	2.53	2.08	3.35
HIGH	4th	50.31	4.08	6.56	4.62	7.43	6.12	9.85
	5th	34.2	6.01	9.68	6.79	10.93	9.03	14.54
	6th	18.7	11.04	17.76	12.47	20.08	16.56	26.65
	Rev.	36.94	5.56	8.95	6.30	10.14	8.34	13.41

8 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds			
			1500 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	1.02	1.64	1.53	2.46
	2nd	137.04	1.50	2.41	2.25	3.62
	3rd	100.33	2.05	3.29	3.07	4.94
	4th	74.74	2.74	4.42	4.12	6.63
	Rev.	147.77	1.39	2.24	2.08	3.35
HIGH	5th	50.31	4.08	6.56	6.12	9.84
	6th	34.28	5.99	9.64	8.99	14.48
	7th	25.08	8.18	13.17	12.28	19.75
	8th	18.69	10.78	17.69	16.47	26.51
	Rev.	36.94	5.56	8.95	8.34	13.41

Multi-Power Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st Low	198.96	1.03	1.66	1.17	1.88	1.55	2.49
	1st High	152.28	1.35	2.17	1.53	2.46	2.02	3.25
	2nd Low	135.52	1.51	2.43	1.71	2.75	2.27	3.65
	2nd High	103.73	1.97	3.17	2.24	3.60	2.96	4.76
	3rd Low	73.86	2.57	4.14	3.14	5.05	4.16	6.69
	3rd High	56.53	3.63	5.84	4.11	6.63	5.44	8.76
	Rev. Low	144.12	1.41	2.26	1.59	2.56	2.11	3.39
	Rev. High	111.84	1.83	2.95	2.08	3.35	2.75	4.43
HIGH	4th Low	49.74	4.13	6.64	4.68	7.53	6.19	9.96
	4th High	38.07	5.39	8.68	6.11	9.83	8.09	13.01
	5th Low	33.95	6.04	9.72	6.85	11.03	9.06	14.59
	5th High	25.93	7.91	12.73	8.97	14.44	11.87	19.11
	6th Low	18.46	11.02	17.74	12.66	20.38	16.67	26.84
	6th High	14.13	15.53	25.00	14.64	26.50	21.78	35.06
	Rev. Low	36.53	5.62	9.04	6.37	10.25	8.43	13.56
	Rev. High	27.96	7.34	11.81	8.32	13.39	11.01	17.72

11–32 TYRES – 640 mm (25.2 in) DYNAMIC ROLLING RADIUS

6 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	1.12	1.80	1.27	2.04	1.68	2.70
	2nd	137.1	1.64	2.64	1.86	2.99	2.46	3.96
	3rd	74.7	3.01	4.85	3.41	5.48	4.52	7.26
	Rev.	147.77	1.52	2.45	1.72	2.77	2.28	3.67
HIGH	4th	50.31	4.47	7.19	5.07	8.15	6.71	10.80
	5th	34.2	6.57	10.60	7.44	11.98	9.86	15.86
	6th	18.7	12.05	19.30	13.60	21.90	18.01	29.00
	Rev.	36.94	6.08	9.78	6.90	11.10	9.13	14.69

8 Speed Transmission

Planetary Range	Gear	Total Ratio	Road Speeds			
			1500 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st	201.24	1.12	1.80	1.68	2.70
	2nd	137.04	1.64	2.63	2.46	3.96
	3rd	100.33	2.23	3.59	3.36	5.41
	4th	74.74	3.00	4.83	4.51	7.26
	Rev.	147.77	1.52	2.45	2.28	3.67
HIGH	5th	50.31	4.47	7.19	6.71	10.80
	6th	34.28	6.54	10.82	9.85	15.84
	7th	25.08	8.94	14.38	13.45	21.64
	8th	18.68	11.99	19.29	18.05	29.04
	Rev.	36.94	6.08	9.78	8.94	14.39

Multi-Power Transmission

Planetary Range	Gear	Total Ratio	Road Speeds					
			1500 E.R.P.M.		1700 E.R.P.M.		2250 E.R.P.M.	
			m.p.h.	*k.p.h.*	*m.p.h.*	*k.p.h.*	*m.p.h.*	*k.p.h.*
LOW	1st Low	198.96	1.13	1.81	1.28	2.06	1.69	2.73
	1st High	152.28	1.48	2.38	1.67	2.69	2.21	3.56
	2nd Low	135.52	1.65	2.65	1.87	3.01	2.48	3.99
	2nd High	103.73	2.19	3.53	2.46	3.96	3.26	5.25
	3rd Low	73.86	3.03	4.86	3.44	5.53	4.55	7.33
	3rd High	56.53	3.96	6.36	4.50	7.25	5.96	9.60
	Rev. Low	144.12	1.54	2.48	1.74	2.81	2.31	3.72
	Rev. High	111.84	2.01	3.01	2.28	3.67	3.02	4.85
HIGH	4th Low	49.74	4.52	7.27	5.12	8.25	6.78	10.91
	4th High	38.07	5.91	9.51	6.69	10.77	8.86	14.26
	5th Low	33.93	6.62	10.65	7.51	12.09	9.95	16.02
	5th High	25.93	8.66	15.92	9.81	15.80	13.00	20.93
	6th Low	18.46	12.20	19.60	13.81	22.23	18.30	29.45
	6th High	14.13	15.90	25.60	18.01	29.00	23.85	38.40
	Rev. Low	36.53	6.16	9.91	6.98	11.23	9.24	14.87
	Rev. High	27.96	8.04	12.94	9.12	14.67	12.07	19.42

GENERAL SPECIFICATION

FRONT AXLE AND STEERING

A three section front axle, adjustable for track width is fitted. Outer arms are secured to the centre beam by two bolts and nuts.

Castor Angle	4° 56′
Camber Angle	3° 30′ Positive
King-pin inclination	9° 30′
Toe-in	3.17 mm (⅛ in)
King-pin diameter	31,62 to 31,64 mm (1.245 to 1.246 in)
King-pin Bush diameter	31,73 to 31,75 mm (1.249 to 1.250 in)
Pivot Pin diameter	41,96 to 41,99 mm (1.652 to 1.653 in)
Pivot Pin Bush diameter	42,04 to 42,19 mm (1.655 to 1.661 in)
Track Adjustments	
Manual Steering	1219 to 1829 mm (48 to 72 in)
Power Steering	1321 to 1829 mm (52 to 72 in)

Recirculating ball worm and nut type steering is fitted. Power assisted steering is available as an optional extra.

Steering Ratio	13:1
Power Steering Pump	Output @ 56 kg/cm² (800 lb/in²) 16,95 lit/min (3.73 Imp gal/min)
Maximum Pressure	98,43 kg/cm² (1400 lb/in²)
Power Steering System Capacity	0,47 litre (0.84 pints)

WHEELS AND TYRES

The following rim sizes are available. W9 x 28 pressed steel, single disc rear wheels, fitted with 10–28 or 11–28 tyres. W12 x 24 pressed steel, single disc rear wheels. Fitted with 13 - 24 tyres.

W9 x 28 P.A.V.T. rear wheels with pressed steel rims. Fitted with 11–28 tyres. W10 x 32 pressed steel, single disc rear wheels. Fitted with 11–32 tyres (not available in U.K.).

Maximum Pressures and Weights

Tyre Size	Ply-Rating	Maximum Pressure lb/in²	Maximum Pressure kg/cm²	Maximum Load lb	Maximum Load kg
10–28	4	16	1,1	1860	844
10–28	6	26	1,8	2475	1123
11–28	4	14	0,9	2070	939
11–28	6	22	1,5	2685	1218
11–32	4	14	0,9	2200	998
11–32	6	22	1,5	2860	1297
13–24	6	18	1,2	3125	1417

FRONT WHEELS

The following front wheels are available. W3 x 19 fitted with 4.00–19 tyres.
W4.50 x 16 rims fitted with 6.00–16 tyres.

Maximum Pressures and Weights

Tyre Size	Weight on the tractor front wheels		Maximum permissible front end weight		Normal tyre pressures		Maximum tyre pressures	
	lb	kg	lb	kg	lb/in²	kg/cm²	lb/in²	kg/cm²
4.00–19 (4 ply)	1362	618	1500	680	38	2,6	44	3,0
6.00–16 (4 ply)	1362	618	1980	898	26	1,8	32	2,2
6.00–16 (6 ply)	1362	618	2520	1143	26	1,8	48	3,4

WHEEL WEIGHT DATA

Pressed Steel Rear Wheels
10–28 and 11–28 tyres: Two weights per wheel, each weight weighs 49 kg (108 lb).

11–32 tyres: Adapter weight weighs 31,8 kg (70 lb) (two halves). Second weight weighs 50,8 kg (112 lb). The maximum number which can be attached is determined by the ply rating and pressure of the tyres.

Front Wheels
16 in wheels – 2 weights per wheel 42 kg (94 lb).
19 in wheels – 1 weight per wheel 45 kg (100 lb).

HYDRAULICS

The four cylinder, Scotch Yoke pump is driven from the p.t.o. driveshaft and supplies oil, under pressure, to the ram cylinder and four external tapping points. The Pressure Control System operated from 10,6 to 179 kg/cm² (150 to 2550 lb/in²).

The auxiliary hydraulic system can be used to operate external services and can be used to operate independently, or combined with the output of the linkage pump.

Lift Pump

Output @ 2250 eng. rev/min	15.0 litres/min (3.3 Imp. gal/min)
Hydraulic h.p. @ 2250 eng. rev/min and 140,6 kg/cm² (2000 lb/in²)	4.4 h.p.
Maximum pressure	179 kg/cm² (2250 lb/in²)
Piston Diameter	25,04 to 25,06 mm (0.986 to 0.9865 in)
Piston bore	25,08 to 25.11 mm (0.9875 to 0.9885 in)
Stroke	15,24 mm (0.06 in)
Piston Area	4,95 cm² (0.767 in²)

Auxiliary Pump (High Capacity)

Output @ 2250 eng. rev/min	31,8 litres/min (7 Imp gal/min)
Hydraulic h.p. @ 2250 eng. rev/min and 140,6 kg/cm² (2000 lb/in²)	9.8 h.p.
Multi-Power Circuit Flow @ 2250 eng. rev/min	15,9 litres/min (3.5 Imp gal/min)
Maximum Pressure	169 kg/cm² (2400 lb/in²)

Multi-Power Relief Valve Pressure

Before Serial No. 405916	42,2 to 56,2 kg/cm² (600 to 800 lb/in²)
After Serial No. 405916	49,2 to 70,3 kg/cm² (700 to 1000 lb/in²)

Multi-Power Pump (Low Capacity)

Output @ 2250 eng. rev/min	17,5 litres/min (3.8 Imp gal/min)
Relief Valve Pressure	
Before Serial No. 405916	42,2 to 56,2 kg/cm² (600 to 800 lb/in²)
After Serial No. 405916	49,2 to 70,3 kg/cm² (700 to 1000 lb/in²)

Hydraulic Tapping Points

From lift pump	Two tapping points on sides of the lift cover – ⅜ – 18 N.P.T.F. (Dry Seal) taper plug. On top of the lift cover to the left of the transfer cap – ⅜ N.P.S.M. x 19 mm (¾ in deep. On the transfer cap – ⅜ - 27 N.P.T.F. (Dry Seal).
From Auxiliary Pump	With Spool Valve fitted, 'Pioneer' self sealing quick release couplings. The hoses adjacent to the quick release couplings have identification tags for flow and return:

L.H. Couplers: Flow – White, Return – Yellow.
R.H. Couplers: Flow – Red, Return – Blue

LINKAGE

Three point linkage is fitted, the lower links being of the interchangeable ball type and the top link of the barrel and turnbuckle type.

Lower Link – between Centres	800 mm (31½ in) (880 mm (34⅝ in) 11–32 tyres)
Width and Thickness	76 x 17,8 mm (3 x 1 1/16 in)
Lift Rod – Nominal Length	515 mm (20¼ in) (556 mm (21¾ in) 11–32 tyres)
Top Link – Nominal Length	647 mm (25½ in) (686 mm (27 in) 11–32 tyres)
Adjustment	584 to 725 mm (23 to 28½ in) (610 to 762 mm (24 to 30 in) 11–32 tyres)
Barrel Length	440 mm (17¼ in) (476 mm (18¾ in) 11–32 tyres)

Swinging Drawbar

Settings and Load Capacity (static)	254 mm (10 in) 990 kg (2200 lb) 356 mm (14 in) 765 kg (1700 lb)
Offset – three positions per side	1. 60 mm (2⅜ in) 2. 130 mm (5⅛ in) 3. 233 mm (9 3/16 in)

GENERAL SPECIFICATION

ELECTRICAL SYSTEM

Voltage	12 volt NEGATIVE EARTH
Battery	17 plate, 96 amp (temperate) or 125 amp (cold climate).
Starter Motor	Lucas M50G or M45G with solenoid engaged pinion. Starter circuit protected by neutral safety start switch incorporated in the trans mission.
Dynamo	Lucas C40A
Voltage Control Box	Lucas RB 108
Lamp Bulb Sizes:	
Headlamp	12V 36/36 watt
Plough Lamp	12V 36 watt
Side Lamp	12V 6 watt
Tail Lamp	12V 6 watt
Number Plate Lamp	12V 6 watt
Panel Light	12V 2.2 watt
Fuses – Tractor	25 amp
Safety Cab Wiper (if fitted)	35 amp

ACCESSORIES

Front Weights	each weight weighs 27 kg (60 lb)
Auto-Hitch	Lift capacity 1814 kg (4000 lb)

Belt Pulley

Pulley Diameter	228,6 mm (9 in)
Pulley Width	165 mm (6½ in)
Gear ratio to p.t.o. shaft	1.824 : 1
Pulley Oil Capacity	0,85 litres (1½ Imp pints)

Speeds

Engine rev/min	P.T.O. rev/min	Pulley rev/min	Belt Speed m/min	Belt Speed ft/min
1685	540	985	708,6	2325
2250	721	1315	946	3105

Linkage Drawbar

Drawbars to fit Category 1 link ends are available.

Length of Drawbar, over flat section	660 mm (26 in)
Number of securing holes	9
Diameter of securing holes	19,8 mm (0.781 in)
Stay Length – from the right hand corner of the cranked section to the straight end – Upper	686 mm (27 in) (765 mm (30⅛ in) 11–32 tyres)
Lower	740 mm (29½ in) (768 mm (30¼ in) 11–32 tyres)

Selector Valve

Port thread sizes Ext 1	9/16 18 UNF
Ext 2	9/16 18 UNF
Port 'R'	¾ 16 UNF
Relief Valve Setting	260 kg/cm^2 (3700 lb/in^2)

REGULAR MAINTENANCE

Part 1 Section B

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GENERAL

This section has been compiled to enable the Manual user to ascertain quickly what action is necessary in any servicing period. The section also lists the obligatory tasks specified for FREE SERVICE VOUCHERS.

In addition to the above, operations to be executed on new tractors during the running-in period are listed as follows:

Stipulate that the tractor should be kept on light work for the first 25 hours and, that all nuts and bolts should be examined for tightness.

At 25 hours change the engine oil.

At 100 hours change the transmission oil, clean the hydraulic pump oil strainer and change the Multi-Power filter element.

IMPORTANT – THE TRANSMISSION OIL IN A NEW TRACTOR MUST NOT BE USED FOR MORE THAN THE FIRST 100 HOURS.

1. In addition to the oils listed in the tables in Part 1, Section A; details of alternative products of the companies listed are available.
2. 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.
3. The multi-purpose oils listed as recommended for U.K. can be used in other territories where available in the temperature range -1°C to 27°C (30°F to 80°F) only. Where it is desired to use such lubricants in temperature range other than this, Distributor/Dealer should provide the information.

10 HOURS OR DAILY

Check the oil level in the sump (ensure that the tractor is on level ground). Fill, if necessary.

Check the dry air cleaner hoses and unloader valve.

Inspect the primary fuel filter glass bowl and drain off any water.

Check the water level in the radiator and top up, if required, to within 37 mm (1½ in) from the top of the radiator.

Check the belt pulley oil level, when in service. Refill if necessary to the plug level with a recommended transmission oil.

Grease the front axle spindles and front hubs.

Grease the front axle pivot pin (two nipples).

Grease the levelling box and lift rods.

Grease the brake pedal bearing assembly.

Check tyre pressures.

IMPORTANT – THE SIGNIFICANCE OF DAILY GREASING IS THE FLUSHING ACTION APPLIED TO GREASE POINTS, WHICH DISPEL DIRT AND MOISTURE FROM THE BEARING SURFACES. ALL EXCESSIVE GREASE WHICH COULD ACCUMULATE DUST SHOULD BE WIPED OFF.

100 HOURS

Carry out 10 hour service.

Check the fan belt tension and adjust if necessary, deflection should be no more than 19 mm (¾ in).

Check the oil level in the power steering reservoir and top up if necessary.

Check the transmission oil level and top up if necessary. Allow time for the oil to reach the dipstick.

Check the front and rear wheel nuts for tightness.

Front	8,3 kg-m (60 lb-ft)
Rear	27,5 kg-m (200 lb-ft)

Check the clutch pedal free travel and adjust if necessary.

Examine and top up the battery with distilled water as necessary. Do not overfill.

FREE SERVICE VOUCHER

100 hours (Initial Service)

Engine
Check fan belt tension.

Clean fuel sediment bowl and gauze filters.

Renew fuel filter element (primary).

Ensure engine oil has been renewed at 25 hour period.

Renew oil filter element.

Tighten manifold nuts.

Clutch and Brakes
Check clutch operation and pedal clearance.

Check/adjust secondary clutch (if tractor performing heavy p.t.o. work).

Adjust brakes (foot and parking) as necessary, and test.

Hydraulic System and Transmission
Renew transmission oil.

Clean hydraulic pump oil strainer.

Tighten the four nuts securing hydraulic cylinder to lift cover.

Renew Multi-Power filter element.

Check operation of Multi-Power.

Check operation of Auxiliary Hydraulics.

Front Axle and Steering
Grease front hubs to flush out dust.

Adjust front hub bearings if necessary.

Check oil level in steering box.

Check power steering oil level, check operation of steering and adjust as necessary.

Grease front axle pivot pin.

Safety Frame (if fitted)
Check all safety frame bolts for correct torque tightness.

Electrical
Top up battery and clean terminals.

Lubricate dynamo rear bearing.

Check tightness of terminals and cable clips.

Check all electrical wiring and examine for chafing.

Check operation of starter safety switch.

Check operation of all lamps.

General
Lubricate all points and oil where necessary.

Examine for external leaks, generally check all bolts, nuts, clips for tightness, notably air intake connections.

Check all pipes for chafing.

Carry out any other maintenance as detailed for 100 hours.

Check tyre pressures and tightness of wheel nuts.

Check tractor for satisfactory operation of hydraulics, engine, instruments, etc., and field test.

200 HOURS

Carry out 100 hour service.

Clean the radiator fins.

Wipe the battery with a clean dry cloth and grease terminals with petroleum jelly to prevent corrosion.

Check the front axle hub nuts for tightness and adjust if necessary.

Check the brakes and adjust them if necessary.

Change the engine oil every 200 hours if conditions are dusty, or involve extensive light or heavy running. In normal conditions, using recommended oil and fuels, change the oil every 300 hours (maximum).

Lubricate the dynamo rear bearing.

Lubricate the hydraulic lift shafts.

Grease the upper steering column bush.

Grease the pressure control coupler boom pivot.

300 HOURS

The oil change period at 300 hours assumes that maintenance of the engine assemblies, i.e. air cleaner and engine lubricating oil filter has been efficiently fulfilled and that oils and fuels are within recommended specifications. If inadequate maintenance and inferior oils or fuels are used, engine oil changes must be more frequent.

Carry out 100 hour service.

Change the engine oil.

Change the lubricating oil filter element.

Change the Multi-Power filter element.

500 HOURS

Carry out 100 hour service.

Renew the primary fuel filter element.

Drain, clean, flush and refill the radiator.

Check the steering box oil level, and top up as necessary.

Renew the power steering filter element.

Change the transmission oil. Both control levers should be in the 'down' position to drain the ram cylinder.

The following operation should be carried out by the Distributor/Dealer.

Injectors serviced.

Examine valve springs and check valve clearances.

Clean engine breather pipe.

FREE SERVICE VOUCHER

600 hours (Initial Service)

Engine
Check fan belt tension.

Clean fuel sediment bowl and gauze filters.

Renew primary fuel filter element.

Drain engine oil and renew.

Renew oil filter element.

Service injectors.

Examine valve springs and check valve clearances.

Clean the engine breather pipe.

Clutch and Brakes
Check clutch operation and pedal clearance.

Adjust brakes (foot and parking) as necessary and test.

Hydraulic System and Transmission
Check transmission oil level.

Clean hydraulic pump oil strainer.

Tighten the four nuts securing hydraulic cylinder to lift cover.

Renew the Multi-Power filter element.

Check operation of Multi-Power.

Check operation of Auxiliary Hydraulics.

Front Axle and Steering
Grease front hubs to flush out dust and adjust if necessary.

Check oil level in steering box.

Check power steering oil level, check operation of steering and adjust if necessary.

Grease the front axle pivot pin.

Electrical
Top up battery and clean terminals.

Lubricate dynamo rear bearing.

Check tightness of terminals and cable clips.

Check all electrical wiring.

Check operation of starter safety switch.

Check operation of all lamps.

General
Lubricate all points and oil where necessary.

Check tyre pressures and tightness of wheel nuts.

Examine for external leaks; generally check all bolts, nuts, clips, and unions for tightness, notably air intake connections.

Check all pipes for chafing.

Check tractor for satisfactory operation of hydraulics, engine, instruments, etc., and field test.

Carry out any other maintenance detailed for 10, 100 and 200 hours.

1000 HOURS

Carry out 200 and 500 hour services.

Replace the dry air cleaner elements. The elements must be renewed at 1000 hours or after a maximum of ten washings of the main element.

The following operations should be carried out by the Distributor/Dealer.

Renew the secondary fuel filter element.

Drain, clean and refill fuel tank.

Examine the dynamo commutator and brushes.

Clean the hydraulic pump oil strainer.

Check the rubber protective sleeves on the gear levers to ensure that they are free from the ingress of water or dirt.

PRE DELIVERY AND INSTALLATION

Part 1 Section C

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PRE DELIVERY & INSTALLATION

GENERAL

To ensure regular maintenance of the tractor during the 12 months Warranty period, two free services must be carried out. The two Service Vouchers, detailing the work to be undertaken, cover the first 100 and 600 hours running of the tractor. The intervals between the free Service Vouchers are calculated to provide maximum benefit throughout the tractor Warranty period.

Pre-Delivery Check

The following items must be checked by the Distributor before disposal and by the Dealer before sale of the tractor.

1. Check the battery electrolyte level and terminals. Charge the battery as necessary.
2. Check all electrical connections, lights and cable clips.
3. Check the oil level in the following:
   - Power Steering Reservoir
   - Engine Sump
   - Steering Box
   - Transmission
   - Belt Pulley
4. Apply grease to all greasing points.
5. Check the fan belt adjustment, which must be 19 mm (¾ in) deflection, measured midway between the water pump pulley and the crankshaft pulley.
6. Flush the radiator and fill with rain water, except where anti-freeze solution is provided.
7. Remove the clutch pedal keeper and check the clutch adjustment.
8. Check that the correct fuel is in the tank.
9. De-aerate the fuel system, check the injectors, and tighten all fuel pipe connections.
10. Check the tightness of the clips securing the hose connecting the air cleaner to engine manifold.
11. Start the engine.
12. Check the engine oil pressure.
13. Check the dynamo, ammeter and fuel gauge.
14. Check the water temperature gauge.
15. Check the engine governor with the hand and foot throttle and the tractormeter.
16. Fit the lower links and free the linkage joints. Check that the correct top link barrel is fitted.
17. Mount an implement and check the operation of the tractor hydraulics.
18. Check the tyre pressures which should be:
    front 1,83 kg/cm^2 (26 lb/in^2)
    rear 0,84 kg/cm^2 (12 lb/in^2)
19. Check all nuts, bolts, plugs, unions and clips for tightness.
20. Road test the tractor. Check the brakes, Multi-Power and tractormeter.
21. Check the oil cooler hoses for leaks and chafing.
22. Check the headlamp adjustment.
23. Fit the cigarette lighter and mirror.

Customer Installation

Instructions must be given to the Owner or Operator on the following items, appropriate to his tractor model. When the instructions have been given to the Owner or Operator, the installation Certificate must be signed by the Distributor and returned to Service Department, Coventry, also the Marketing Economic Card should be returned to the appropriate Department.

1. Use of the tractor instruction book.
2. Location and significance of the tractor and engine numbers. Importance of quoting these numbers in any communication. (It is the Distributor's responsibility *physically* to verify all serial numbers).
3. Instruments and controls.
4. Starting and stopping procedure. Position of dual range selector lever for starting.
5. Uses of Multi-Power.
6. Coasting and towing. Multi-Power tractors cannot be started by towing.
7. Gear selection. Danger of changing gear when the tractor is moving.
8. Use and adjustment of brakes. Interlock latch.
9. Use of the differential lock.
10. Running in.
11. Tyre Pressures.
12. Operation of hydraulic system.
13. Attaching and detaching implements. Danger of towing from top link.
14. Using power take-off. Danger of reversing the tractor when ground speed p.t.o. is being used.
15. Use of dual clutch. Consequences of continually resting the foot on the clutch pedal.
16. Wheel track width adjustments.
17. Accessories, Belt pulley, drawbars, hitches.
18. Lubrication and grease points. Daily attention.
19. Changing factory fill oils.
20. Engine and hydraulic oil filter replacements.
21. Operation of fuel system. De-aeration. Cold starting. Air Cleaner.
22. Fuel handling and storage. Fuel cleanliness.
23. Cooling system. Frost precautions. Fan belt adjustment.
24. Engine speed adjustments.
25. Maintenance of electrical equipment. Negative earth system.
26. Power steering. Procedure for topping up reservoir oil level.
27. Tightness of all nuts, bolts, plugs, unions and clips.
28. Use of auxiliary hydraulics.

TRACTOR STORAGE

General

When preparing a tractor for storage, comply with the following recommendations to ensure that the tractor is in good condition when required for service again. Clean the tractor thoroughly, paying special attention to greasing points and oil filler plugs.

Select a dry protected area where the tractor is not exposed to weather or livestock. If the tractor has to be stored outside, park it in the shelter of a building or wall, and cover it completely with a good tarpaulin or cover.

Tyres

If water ballasted tyres are not filled with calcium chloride it is necessary to empty and inflate with air. All tyres should be inflated slightly above normal pressures, and protected from direct sunlight.

Hydraulics

Check the oil level in the centre housing, if it is low, top-up to the high mark on the dipstick.

Using the hydraulics, raise and lower the linkage several times with the p.t.o. engaged to circulate the oil around the inside of the housing. Raise the rear linkage to its transport position. Use a piece of wood

as a prop. between the top of the L.H. rear axle casing and the "crook" formed by the lift arm and the lift rod, to hold the linkage in this position. Leave the control quadrant levers at transport, i.e. outer lever placed in the fully "UP" position and the inner lever against "TRANSPORT". DO NOT move the levers from this position. The response lever should be left in the "FAST" position.

Power Steering
Remove the filler plug from the reservoir, and add oil to the filler oil level. Replace the plug.

Engine and Fuel System
Clean all the fuel filters (see Operator Instruction Book) and drain the fuel tank of diesel fuel.

Completely refill the tank and add rust inhibitor, (see chart on page 1C–04) then bleed the fuel system as stated in the Operator Instruction Book.

Start the engine and run it for 15 minutes at half MAXIMUM speed, the oil will have then thoroughly circulated through the pump and fuel lines, then refil the tank with fuel.

The following points must be observed when using fuel system protectors.

1. When using Duckham's Adcoid additive, a winter grade fuel must be used.
2. With Mobilkote 203, the following procedure is recommended:
   (a) Drain the diesel fuel tank.
   (b) Pour 2.25 litres (½ gal.) of Mobilkote 203 into the fuel tank.
   (c) Start the engine and run it until the Mobilkote has completely filled the fuel pump, pipes and injectors.
   (d) Stop the engine and fill the fuel tank with winter grade diesel fuel.

NOTE – THE FUEL TANK SHOULD BE FILLED AS FULLY AS POSSIBLE, TO PREVENT CONDENSATION FORMING ON THE UNFILLED PORTION OF THE TANK, THUS CAUSING RUSTING. RUST, IF ALLOWED TO FORM IN LARGE QUANTITIES CAN CAUSE FILTER BLOCKAGE.

Drain the radiator and block while the engine is still warm and leave the taps in the open position after all the water has drained out.

Ensure that the tractor is on level ground and drain the engine sump oil. Change the filter element.

Refill engine with a recommended grade of oil.

Remove atomisers and spray into the cylinder bores approximately 72 cc (⅛ pt.) of engine oil, divided between all the cylinders. Replace the atomisers (using new joint washers) and slowly rotate the crankshaft through one complete revolution.

Seal the fuel tank cap air intake, crankcase breather pipe and exhaust pipe with adhesive tape or polythene bags.

Lubricate throttle control linkage joints.

Clean the dry air cleaner main element.

Battery
Remove the battery from the tractor.

Check the electrolyte level, if it is low, top it up with distilled water so that the top of the separator plates are just covered. Fully charge the battery i.e. to a state of free gassing, from a separate source of supply.

Repeat this charging process every month of storage. A smear of petroleum jelly or a non-acid grease, on the terminals will prevent corrosion.

The battery should be stored in a cool dry dust-free place where there is no chance of freezing. DO NOT store batteries directly on metal or concrete surfaces.

Clutch
In order to prevent the clutch lining bonding itself to the flywheel when stored for long periods, the following procedures should be used:

Depress the clutch pedal fully (onto the step board) then slip a wedge of hardwood, or similar material in between the clutch release shaft arm and the bottom of the footrest bracket.

General
Lubricate all grease fittings with a recommended grease.

Smear starter motor and generator terminals with petroleum jelly.

Remove the seat and backrest and store them in a cool dry place where vermin cannot reach them.

Sheet Metal, Exposed Castings and Bright Metal Components
Any rusty, scratched or bare patches of sheet metal or castings should be cleaned with an abrasive paper and re-painted in the appropriate colour. Matching shades are available for all MF Tractors from MF Distributors.

The bright metal protective (see chart) can be applied either by spraying or with a brush.

Final Preparation
1. Jack up the tractor and place substantial blocks under the axles to relieve the tyres of weight.
2. Ensure that water ballast has been drained from the tyres and that any wheel weights have been removed.

Manufacturer	Diesel Fuel System	Bright Metal Surfaces
Duckham's	7% Adcoid Fuel Additive	Hydropel 400
Esso	IL 1047A	Rust-Ban 392
Shell	Shell Calibration Fluid "C" (U.K. only) Shell Calibration Fluid "B" (Overseas)	Ensis 256
B.P.	Energol LM	Energol CPD 32
Castrol	Castrol Iso	Surecoat
Mobil	Mobilkote 203	Mobilkote 236

PREPARING THE TRACTOR PRIOR TO RE-ENTERING SERVICE

1. Remove all the covering from the exhaust pipe, air intake, crankcase breather pipe and fuel tank filler cap.
2. Close all taps on the cylinder block and radiator. Re-fill the system with either clean rain water or soft water. In winter, re-fill with an anti-freeze solution. Check for leaks.
3. Check that the battery is fully charged and that the electrolyte is to the correct level. After checking the specific gravity of the electrolyte (see section 8A), refit the battery into the tractor.
4. Wipe the petroleum jelly from the dynamo and starter motor terminals.
5. On diesel engine tractors, the fuel level should be high, but some topping up may be necessary. Bleed the system.
6. Grease all nipples as recommended in the Regular Maintenance Section of the Operator Instruction Book.
7. Check the oil level in the engine sump and the transmission. Top up if necessary.
8. Remove the wooden blocks from the clutch pedal and hydraulic linkage.
9. Remove the jacking blocks from under the axles.
10. Check tyre pressures and adjust if necessary.
11. Start the engine and run on light load for 10-15 minutes.
    Check the instruments to ensure that all services are working correctly, especially the oil pressure gauge and ammeter.

IF ANY INSTRUMENT INDICATES A MAL-FUNCTION IN ITS SYSTEM, SWITCH OFF THE ENGINE IMMEDIATELY AND RECTIFY THE FAULT BEFORE RESTARTING.

Drive the tractor for a short time under light load, constantly checking all instruments and making use of all systems to check for correct functioning.

TRACTOR WATERPROOFING

General

Before working in Paddy Fields certain essential modifications must be made to prevent water entering the major components and electrical equipment of the tractor. Complete sealing is not possible if the depth of the water exceeds 60 cm (24 in). Ideally, only tractors with sealed type disc brakes should be used in such conditions, as little can be done to ensure braking efficiency with drum brakes.

MODIFICATIONS

Clutch Housing Drain Hole

1. Remove the split pin from the drain hole under the clutch housing.
2. Enlarge the hole, tap and fit a screwed plug.

Clutch Housing Cover Plate

Ensure that a gasket (180 481 M1) is fitted between the clutch housing and the cover plate (180 482 M1).

Engine Breather Pipe

1. Shorten the existing breather pipe by approximately 20 cm (8 in).
2. Attach a suitable length of rubber hose, 23 cm (9 in) long to the shortened breather pipe.
3. Route the hose to the front of the engine and secure it to one of the timing case bolts with a suitable clip.

NOTE – THE BREATHER PIPE IN AN UNMODIFIED CONDITION IS OF A CRITICAL LENGTH. AFTER MODIFICATION, THE PIPE MAY BE LENGTHENED, BUT NEVER SHORTENED AND MUST POINT IN A GENERALLY DOWNWARD DIRECTION, WITHOUT ANY RESTRICTION, OR A 'U' BEND WHICH COULD TRAP LIQUID OR DIRT.

Engine and Transmission Dipsticks

Remove the dipsticks and replace them with seal fit tapered rubber plugs. The dipsticks can be stored in the tractor toolbox.

Brake and Clutch Pedal Cross – Shafts

The bosses from which the brake and clutch pedal cross-shafts protrude should be drilled, tapped and fitted with grease nipples. Charge the nipples with a recommended grease until grease exudes from the bearings, thus building up a wall of grease and preventing the ingress of water. Do not over-grease.

Brakes

Enlarge each sealed brake housing drain hole, tap and fit a screwed plug.

P.T.O. Shaft

Grease the thread of the p.t.o. cap and screw it fully home.

ELECTRICAL SYSTEM

Starter Motor and Solenoid

1. Remove the starter motor complete. Thoroughly clean the starter motor and solenoid.
2. Carefully fill any slots, or gaps, where water could enter with 'VYPATCH' putty, available from:
   Plastic Coating Ltd.,
   Products Division,
   Trading Estate,
   Farnham, Surrey,
   England.
3. Spray the starter motor and solenoid with 'VYCOAT' plastic coating (also available form the same address).
4. Leave the 'VYCOAT' coating to harden for at least 10 minutes, then give a second liberal coat of 'VYCOAT'.
5. Leave the 'VYCOAT' to finally dry, then clean off all terminals to ensure a good contact when reconnecting the wiring.
6. Refit the starter motor.

Dynamo

Only the Lucas type C40A dynamo, should be used. The dynamo must be fitted with a breather pipe, as, unlike the starter motor, continuous air circulation is necessary.

1. Remove the dynamo from the tractor.
2. Disassemble the dynamo and thoroughly clean all components.
3. Strip the paint from the dynamo outer case.
4. Drill and tap the top of the dynamo outer case ¼ UNC to accept a breather pipe.
5. Using a piece of tubing approximately 25 cm (10 in) long tap the inside diameter at one end ⅛ in x 27 PTF and fit a one-way breather (182 099 M91) is suitable).
6. Die the opposite end of the tube ¼ UNC and screw the tube into the tapped hole in the top of the dynamo case.
7. Apply a thick layer of grease to the commutator, the bearing shafts and the outside diameter of the armature.
8. Spray a thick coating of 'VYCOAT' on to the armature field coils.
9. Remove the grease from the armature, bearing shafts and commutator.
10. Re-assemble the dynamo.
11. Seal all openings with 'VYPATCH' putty, then spray the entire exterior of the dynamo with 'VYCOAT'.
12. Leave for at least 10 minutes, then liberally re-coat the dynamo with 'VYCOAT'. Allow the 'VYCOAT' to finally harden, then clean the terminals thoroughly.
13. Refit the dynamo and reconnect the wiring harness.

Voltage Control Box

Ensure that the rubber gasket fits correctly; also, if necessary, seal with 'VYCOAT'.

Batteries

Keep the battery terminals clean and well smeared with petroleum jelly.

Special Extra Maintenance

Every 10 hours or daily.

1. Charge all grease points with a recommended grease until grease exudes from the seals.
2. Remove the dynamo drain plug and allow any water to drain away. Replace the plug.

Every 50 hours or weekly.

1. Remove the special drain plugs from the clutch housing and sealed brake housings and allow any oil which may have accumulated to drain away.
2. Ensure that the engine breather pipe is clear of foreign matter.

SEATS

Part 2 Section A

GENERAL

This section of the Service Manual covers the seats which are optional equipment.

SEATS

DE-LUXE SEAT

Figure 1

This seat is a pan type unsprung seat with a detachable foam rubber cushion covered in waterproof leathercloth.

The cushion is secured to the seat pan by webbing straps. A backrest, similarly upholstered, is secured to the seat pan by bolts and nuts.

The seat pan is connected to the tractor by a double hinged link which in turn is attached to a mounting bracket secured to a seat riser. The seat riser is fitted to the tractor hydraulic lift cover by studs and nuts.

The double hinged link allows the seat to be tilted backwards, enabling the driver to operate the tractor from a standing position.

ADJUSTMENTS

The seat riser has two 50,0 mm ($1\frac{21}{32}$ in) long slots in the base allowing fore and aft adjustment on the mounting studs in the hydraulic lift cover. In addition a 246,8 mm ($9\frac{23}{32}$ in) long slot is machined to the inclined face of the riser to allow variable height adjustment of the seat.

SPRING SUSPENSION SEAT

Figures 2, 3, 4 & 5

This seat has a pressed steel pan to which is attached a foam rubber insert, with a formed leathercloth cover bonded to the pan. A plastic sealing strip is attached around the edge of the cover and pan, thus making the upholstery waterproof.

The seat cover incorporates a waterproof air valve, which allows the foam rubber insert to "breathe". The seat pan has water drain holes and can be inverted when the tractor is parked, giving additional weather protection to the upholstery.

The seat pan is mounted on nylon bearings to the front of a tubular swing arm (1, Figure 2), the swing arm in turn, is mounted on nylon bushes and bolted to the seat pillar (2). A bracket (16, Figure 3) bolted to the seat backrest, locates on runners (17) with nylon inserts, welded to a channel section plate (18) on the seat pillar. The channel section plate, is mounted at the top on nylon rollers (3, Figure 2) which travel through a vertical plate on tracks (4) welded to the seat pillar.

The suspension is governed by two coil springs (5) which are mounted vertically with the seat pillar. The springs are attached at one end to a threaded spring adjuster (6), secured to the top of the seat pillar by a control knob (7), the other end of the springs are mounted on a pin (8) fitted to the base of the channel section plate. Nylon spacers (9) are postioned between the spring end loops on the plate pin to maintain the springs in a vertical position.

The spring adjuster is threaded into the control knob and rotation of the knob causes the spring adjuster to rise or fall, depending on the direction of rotation, thereby altering the tension in the springs to suit the driver's weight.

A hydraulic damper (10), is located between the fixed seat pillar and sliding channel section plate, to compensate for seat oscillations when travelling over rough ground.

The seat assembly is mounted on runners, with nylon inserts, to a seat riser (11) secured by studs and nuts to the tractor hydraulic lift cover.

ADJUSTMENTS

A control lever (20, Figure 3) situated on the bottom of the seat frame allows the seat to be locked in any position on the seat riser. With the lever in the central position, the seat can be moved on its runners, along the riser, giving fore, aft and height adjustment. The seat is locked in the selected position by moving the lever to the right.

To adjust the rake of the seat, loosen the four nuts (14, Figure 2) securing the bearings and housings (12) to the seat pan and tubular swing arm. The bearing housings are slotted and sliding the bearing housings fully rearwards will increase the rake by 25 mm (1 in). Conversely sliding the housings fully forwards will reduce the rake by 25 mm (1 in). Re-tighten the nuts when the desired inclination is reached.

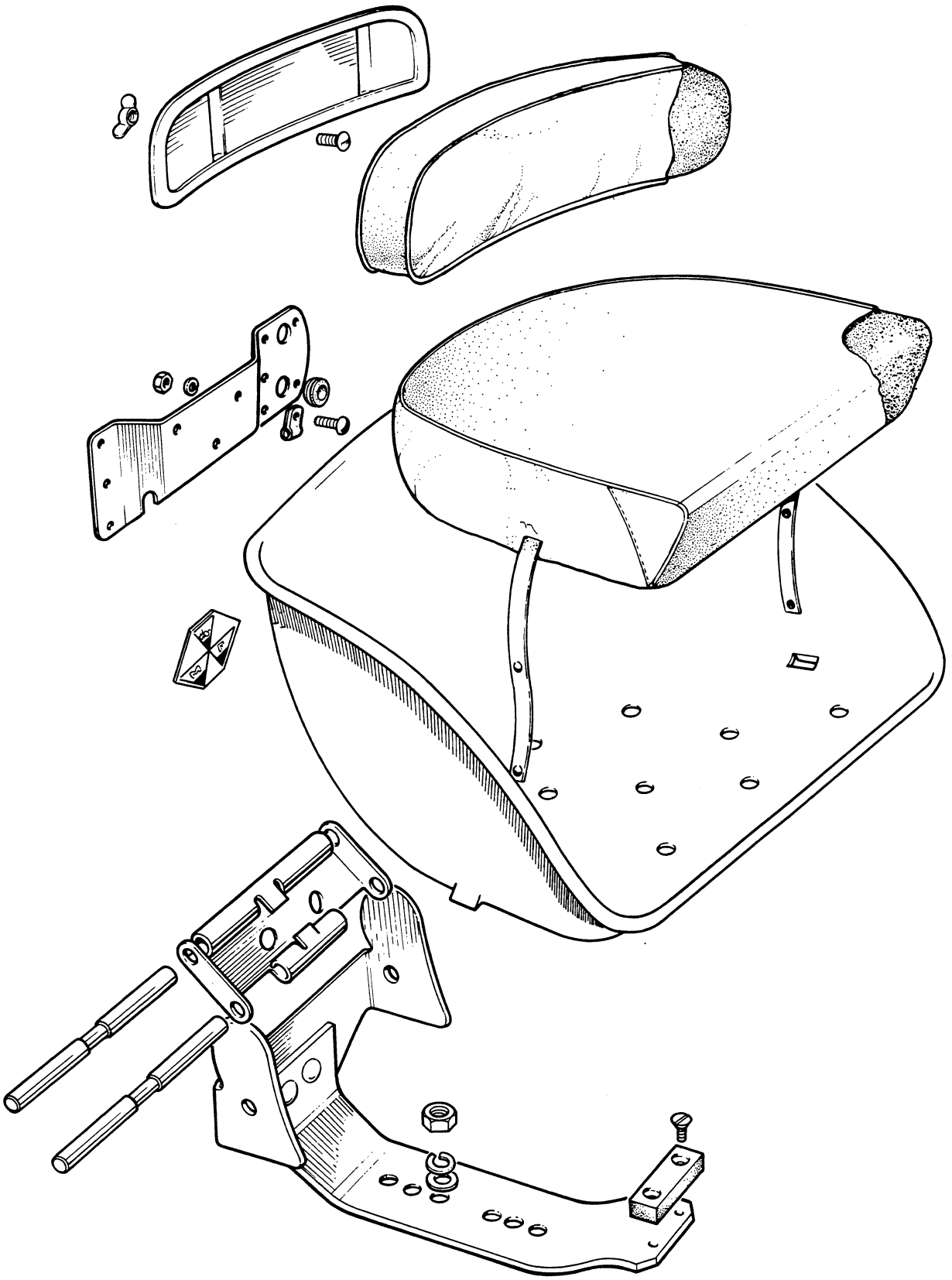

FIG. 1

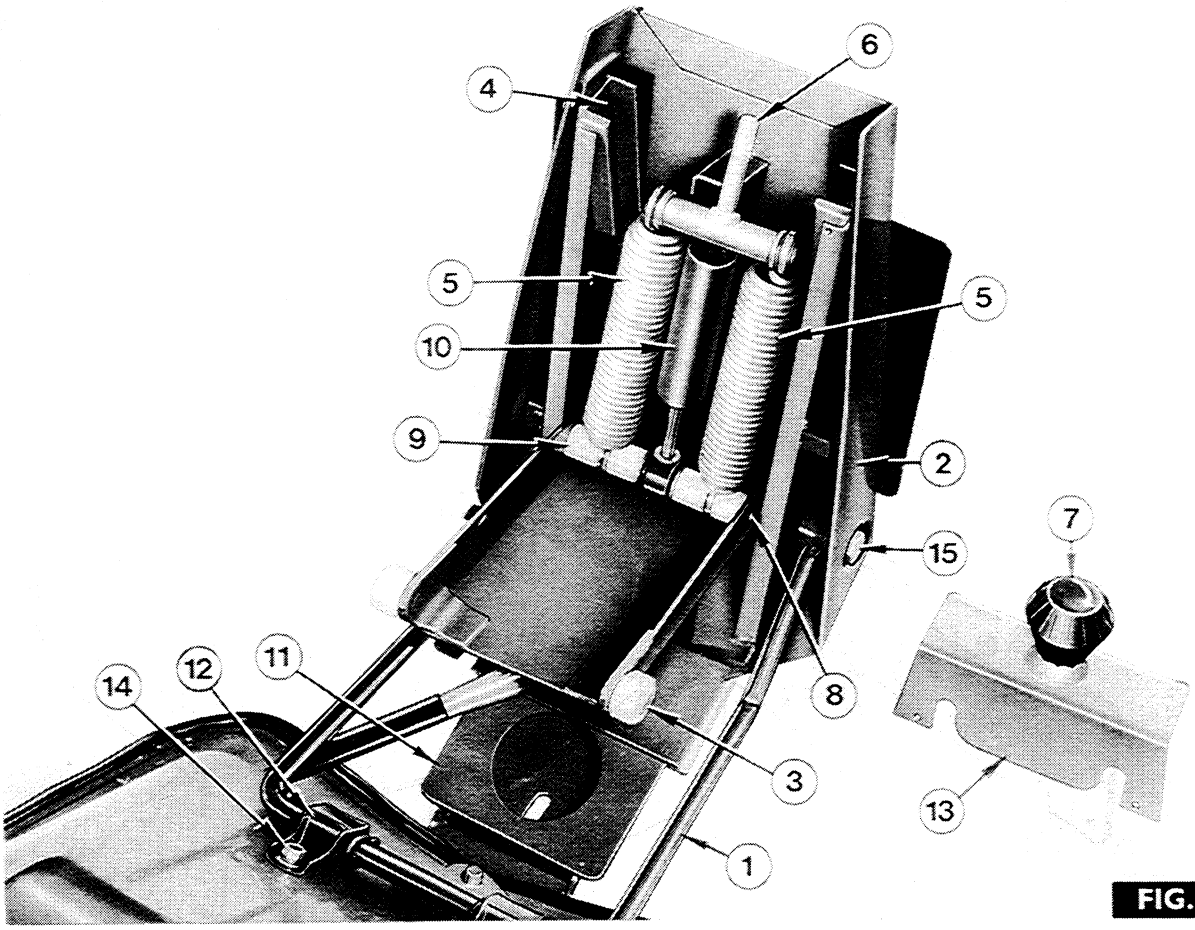

FIG. 2

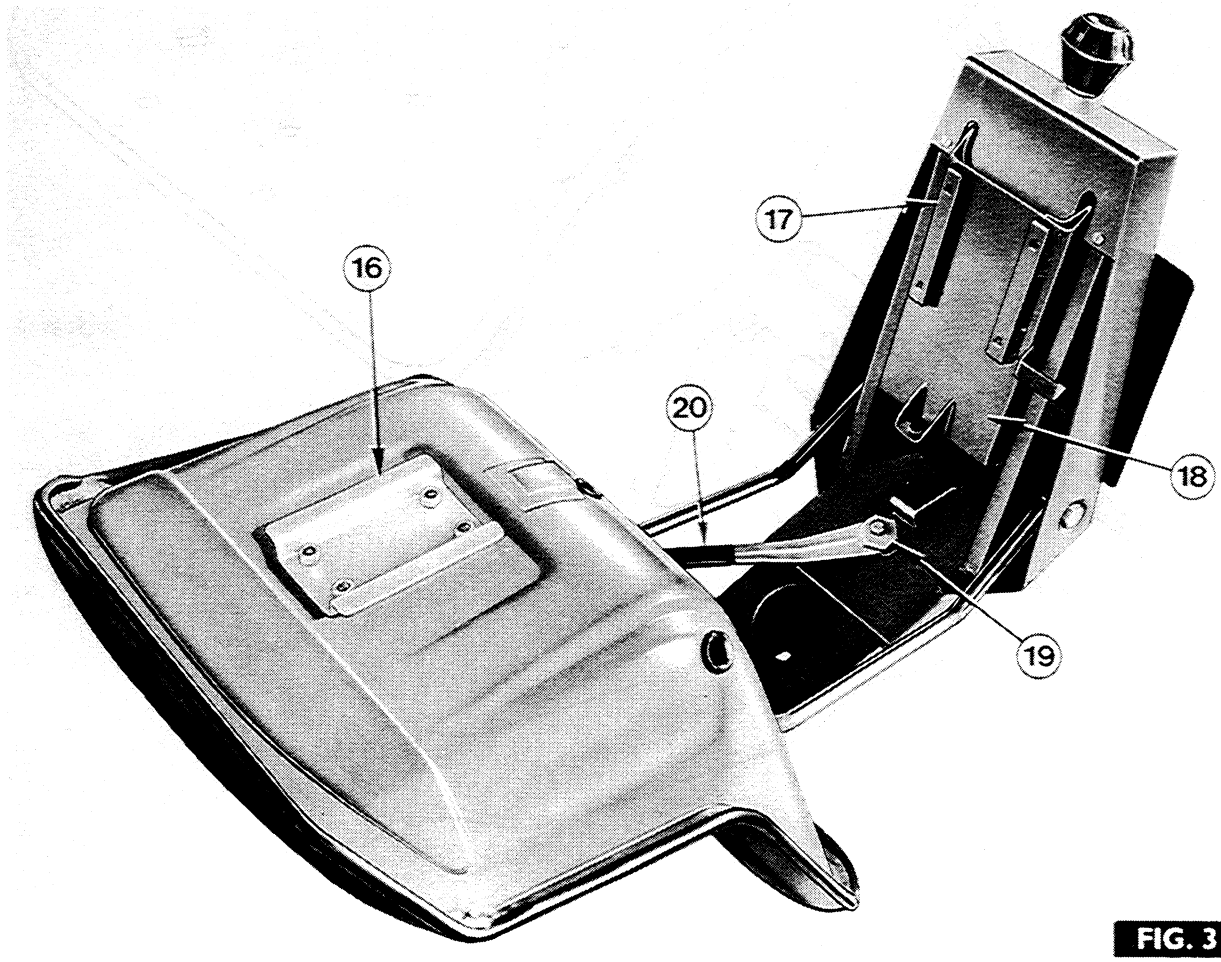

FIG. 3

SPRING SUSPENSION SEAT

Disassembly and Reassembly 2A-01-05

Figures 2, 3, 4 & 5

1. Rotate the control knob (7, Figure 2), in an anti-clockwise direction to remove the tension from the suspension springs, and to release the control knob from spring adjuster.
2. Lift the back of the seat pan to disconnect it from its runners (17) on the channel section plate (18) in the seat pillar (2).
3. Remove the four nuts and washers (14), bearing caps (12), and nylon bearings securing the seat pan to the tubular swing arm (1) and lift off the seat pan.
4. Remove the seat suspension assembly from the studs in the tractor hydraulic lift cover.
5. Unscrew the self tapping screws retaining the top cover (13) and control knob to the seat pillar and lift off the cover complete with control knob. Remove the retaining circlip beneath the top cover, to detach the knob.
6. Lift the base of the channel section plate as shown in Figure 4, to free the nylon rollers (3, Figure 2) from their tracks (4) on the seat pillar.
7. Remove the snap rings and washers retaining the spring loops to the spring adjuster (6) and remove the adjuster.
8. Remove the snap rings retaining the pin (8) to the bottom of the channel section plate and withdraw the pin. The nylon spacers (9) and piston end of shock absorber (10) can now be removed.
9. Remove the snap ring and pin securing the barrel end of the shock absorber.
10. Remove the bolts (15) securing the tubular swing arm and nylon bushes to the seat pillar.
11. Remove the bolt (19, Figure 3) securing the seat locking lever (20) to the seat and lift off the lever. The large bolt beneath the locking lever can now be removed to release the locking plate, situated beneath the top face of the seat riser.
12. Slide the seat frame backwards to detach from the riser.
13. Reassembly is a reversal of the disassembly procedure.

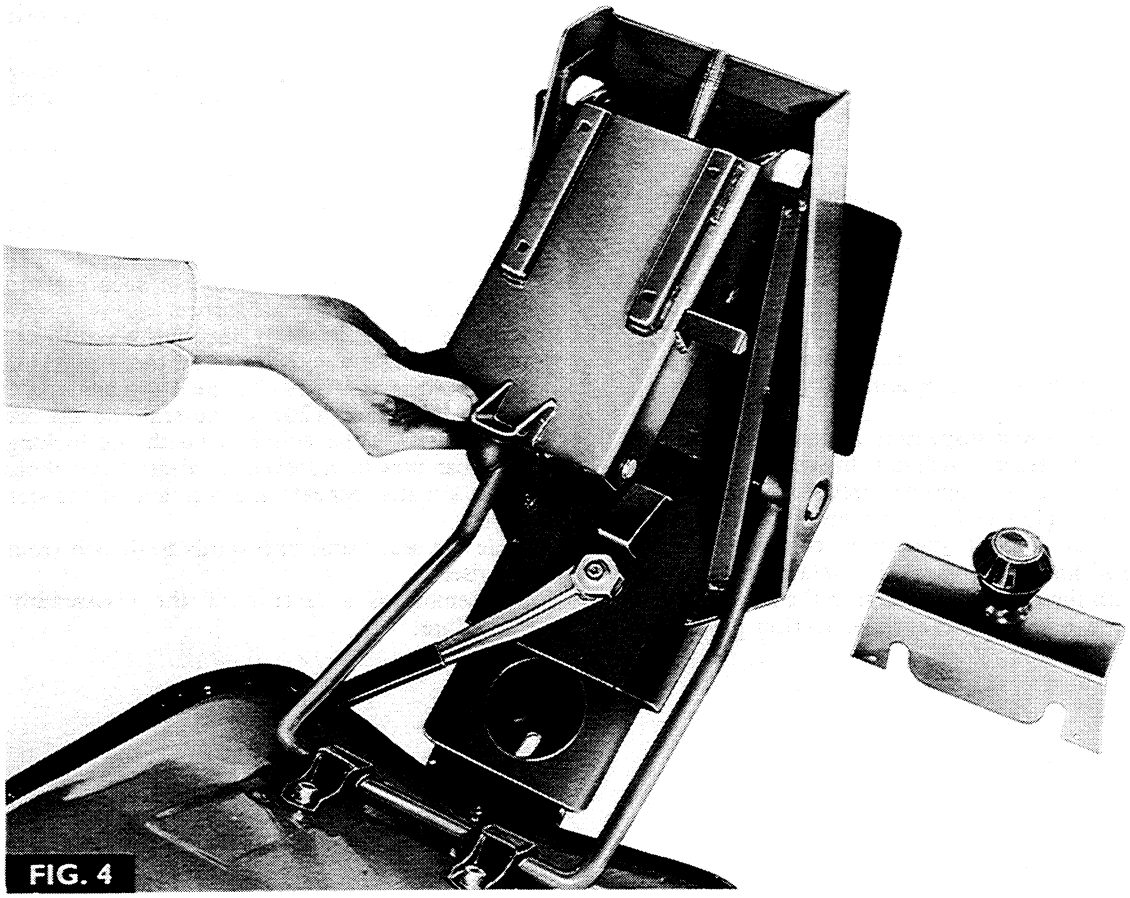

FIG. 4

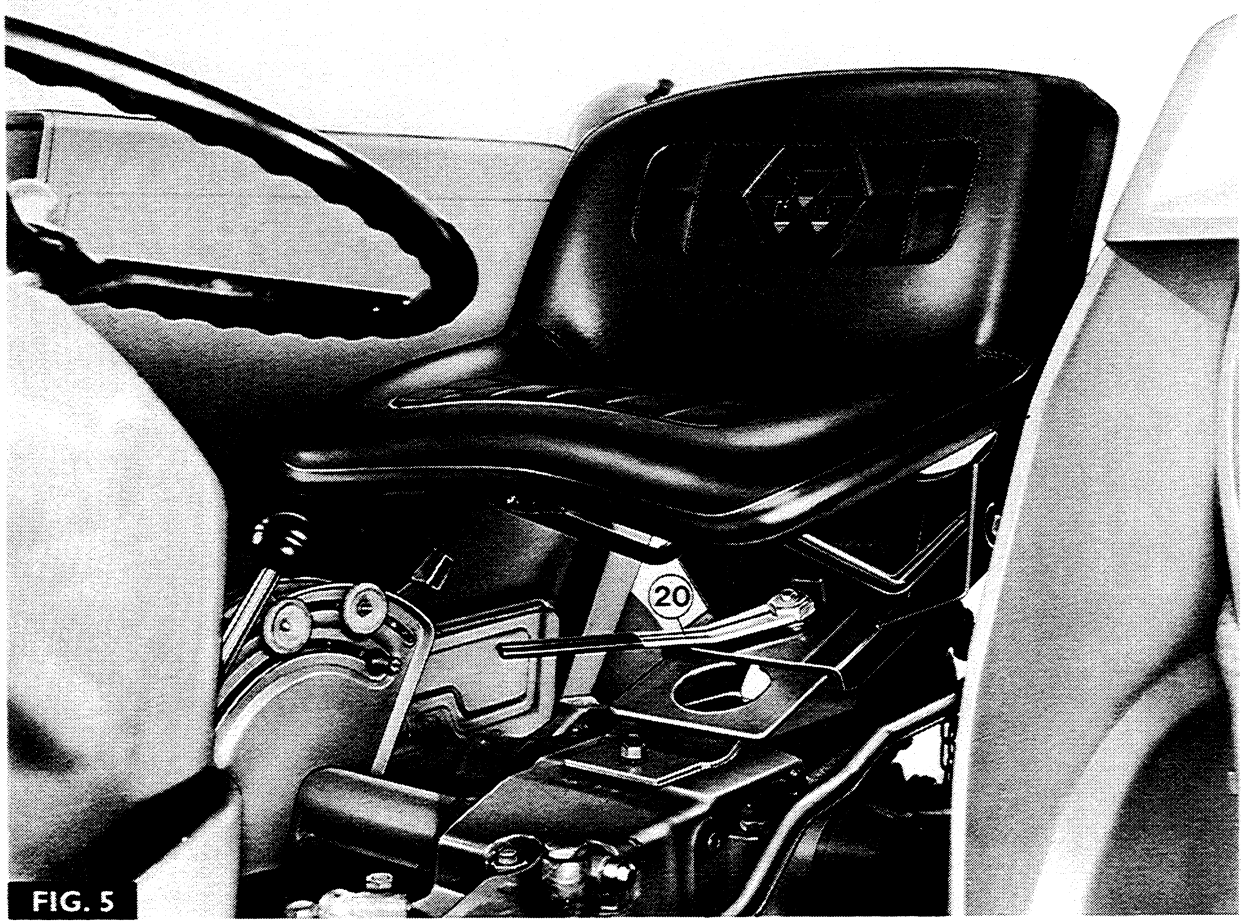

FIG. 5

SHEET METAL AND FENDERS

Part 2 Section B

GENERAL

Fig. 1. The hood (1), grille (2), fender (5) and footplate (3) assemblies are shown. There is also a lower instrument panel (4) which gives access to the underside of the instrument panel. The battery is inspected by removing the access panel (6).

Each of the fenders (5) incorporate a toolbox with a hinged lid.

All sheet metal is readily removed and refitted and gives protection to the tractor and the operator. The tractor must not be operated with any of these panels removed, except for the p.t.o. guard which has to be removed when certain implements are used.

Always keep the sheet metal clean and respray, as soon as possible, any parts which become chipped, to prevent corrosion.

SHEET METAL AND FENDERS

HOOD AND GRILLE ASSEMBLY

Removal and Refitment 2B-01-02

Removal

1. Remove the six bolts and washers securing the hood to the instrument panel.
2. Slacken the two bolts and washers securing the grille to the front axle support.
3. Disconnect the two oil cooler pipes (if fitted) at the couplings adjacent to the grille front panel.
4. Remove the battery access panel.
5. Disconnect the headlight wiring at the light switch.
6. Fig. 2. Lift the hood and grille assembly clear of the tractor as shown.

Refitment

1. Place the hood and grille assembly over the tractor, locating the grille on the bolts at the front axle support.
2. Secure the hood to the instrument panel with the six bolts and washers and tighten the bolts at the front axle support.
3. Reconnect the oil cooler pipes (if fitted).
4. Reconnect the headlight wiring at the light switch and refit the battery access panel.

GRILLE AND SIDE PANELS ASSEMBLY

Removal and Refitment 2B-02-02

Removal

1. Remove the hood and grille assembly as stated in operation 2B-01-02.
2. If necessary, remove the oil cooler (if fitted) as stated in operation 7B-01-02 and then withdraw the two oil cooler pipes from the grille.
3. Release the headlight wiring from the hood.
4. Remove the five bolts and washers securing the grille to the hood, and the two bolts and washers each side, securing the side panels to the hood.
5. Remove the grille and side panels assembly from the hood.

Refitment

1. Place the grille and side panels assembly in position on the hood and secure the grille with the five bolts and washers and the side panels with two bolts and washers each side.
2. If necessary, refit the oil cooler pipes (if fitted) and the oil cooler.
3. Secure the headlight wiring to the hood with the clips.
4. Refit the hood and grille assembly as stated in operation 2B-01-02.

SEALS REMOVAL AND REPLACEMENT 2B-03-02

Removal

1. Remove the hood and grille assembly as stated in operation 2B-01-02.
2. If necessary remove the oil cooler as stated in operation 7B-01-02 and withdraw the oil cooler pipes.
3. Fig. 3. Release the required panel by removing the two bolts and washers.

   NOTE – IF THE BOTTOM PANEL IS TO BE REMOVED THE TWO SIDE PANELS MUST BE REMOVED FIRST.

4. Remove all traces of the old seal and adhesive from the panel.

Replacement

1. Pre-coat the neoprene material on the contact surface of the new seal with an approved adhesive (i.e. Bostik 19A 186) and allow to dry completely.
2. Apply a coat of the adhesive to the metal surface and allow it to become tacky.
3. Place the seal in position, applying pressure evenly to exclude air bubbles.
4. Refit the panel and secure with the two bolts and washers.
5. If necessary, refit the oil cooler pipes and the oil cooler.
6. Refit the hood and grille assembly as stated in operation 2B-01-02.

LOWER INSTRUMENT PANEL

Removal and Refitment 2B-04-02

Removal

1. Remove the battery access panel.
2. Disconnect the tube from the air cleaner service indicator.
3. Fig. 4. Remove the two bolts and washers securing the lower instrument panel and release the panel from the instrument panel as shown.
4. If necessary, remove the air cleaner service indicator, by removing the screw, nut and washers securing the mounting bracket to the lower panel.

Refitment

1. If necessary, refit the air cleaner service indicator and secure it to the lower panel with the screw, nut and washers.
2. Fig. 4. Refit the lower panel and secure with the two bolts and washers.
3. Reconnect the tube to the air cleaner service indicator and refit the battery access panel.

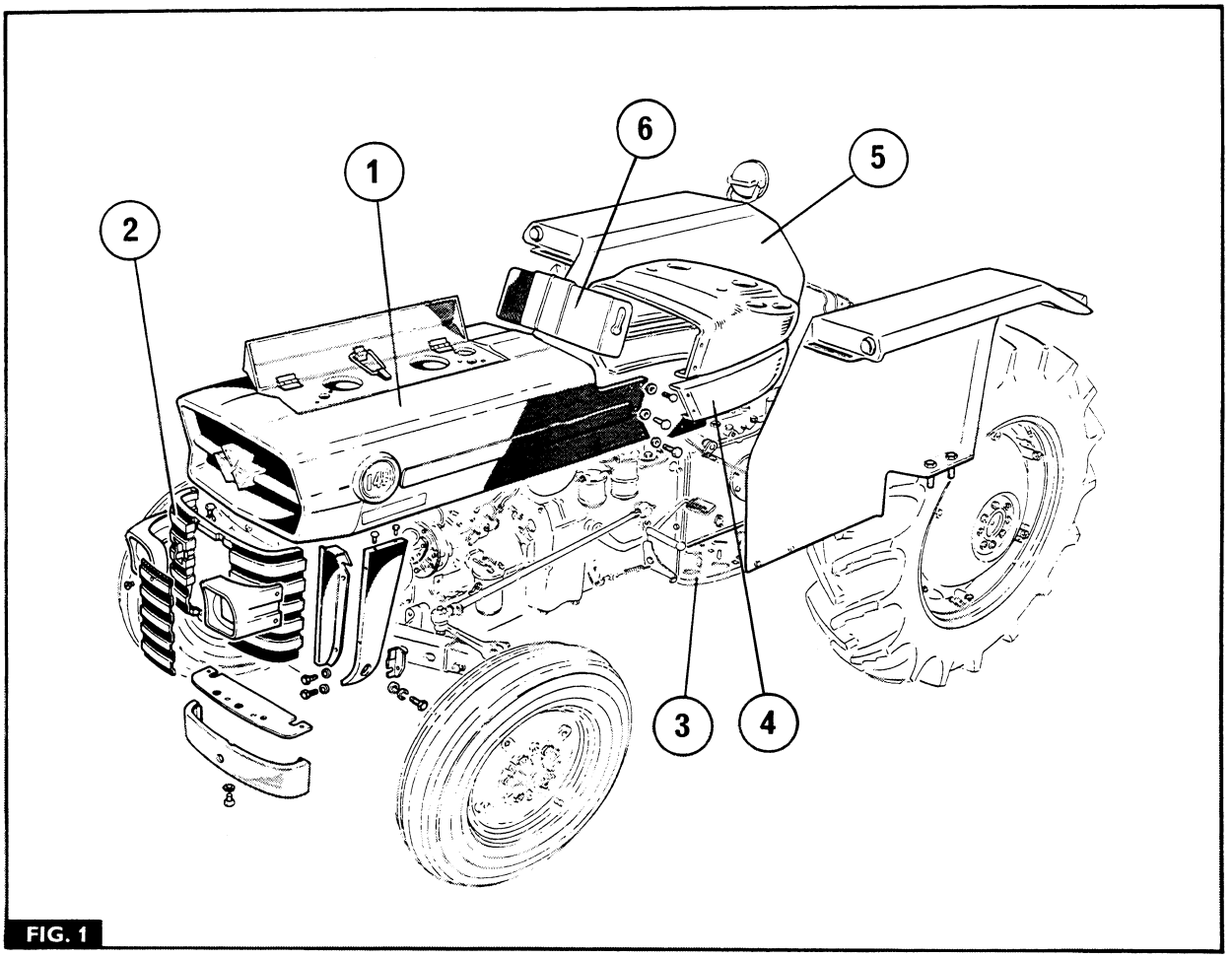

FIG. 1

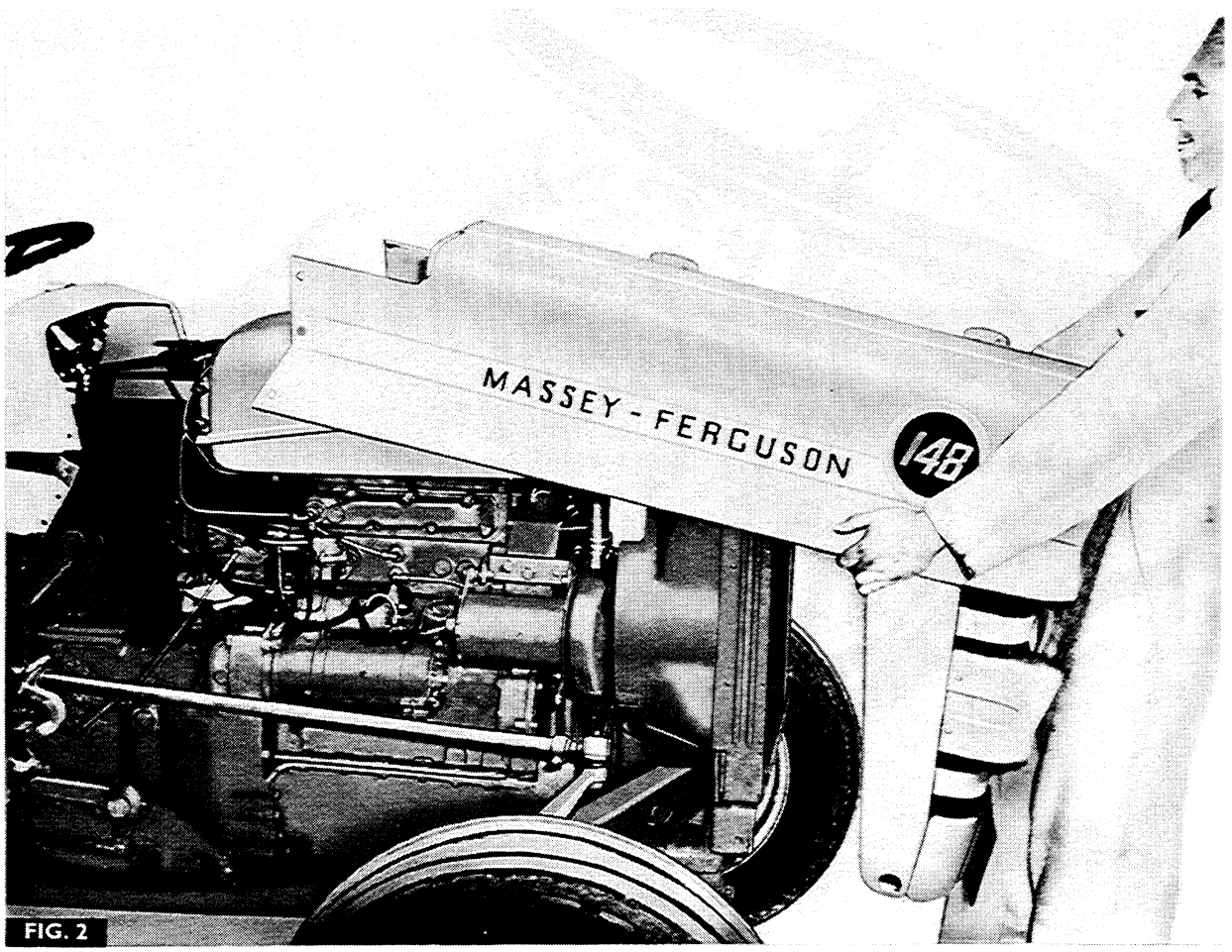

FIG. 2

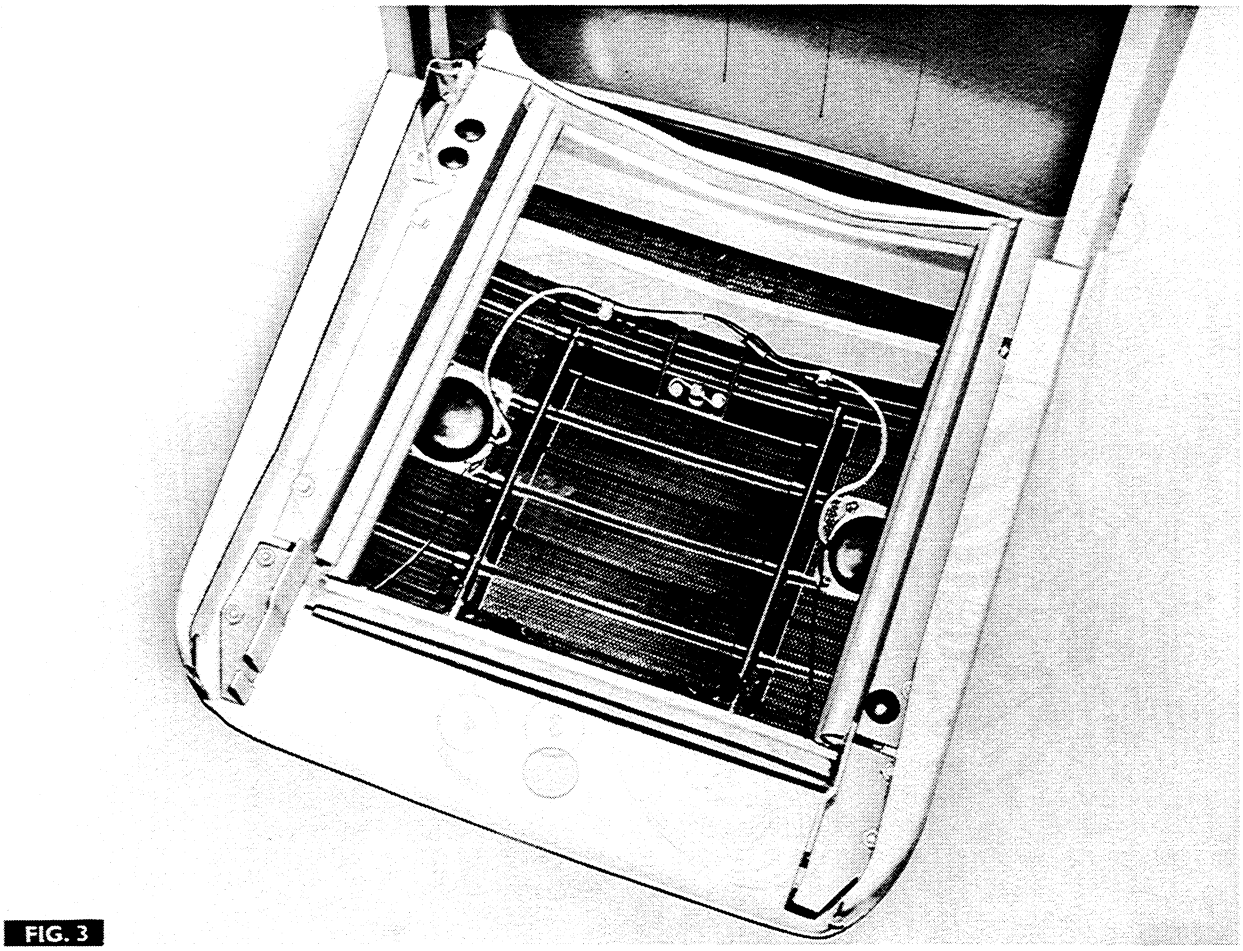

FIG. 3

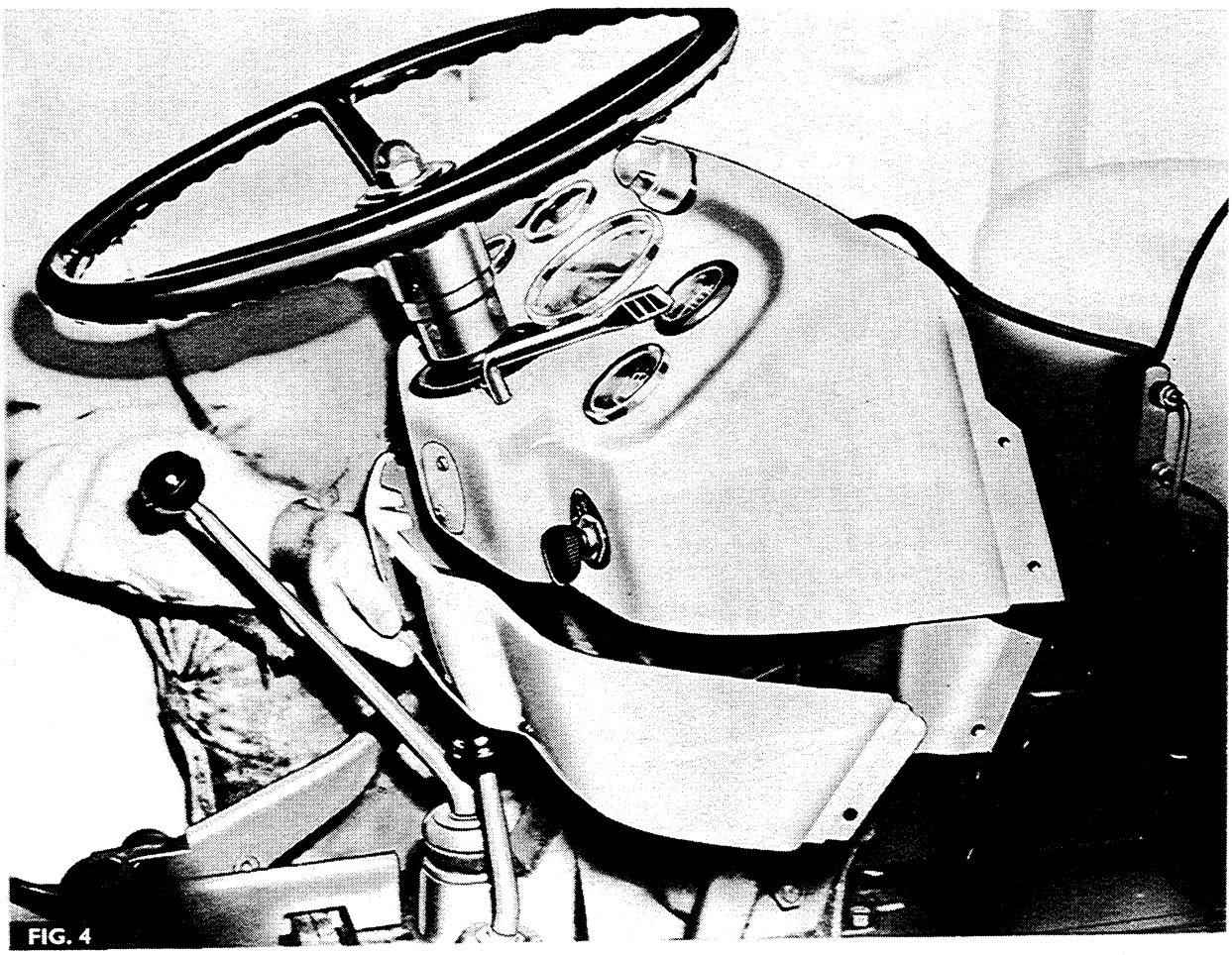

FIG. 4

FENDER

Removal and Refitment 2B-05-05

Removal

1. Disconnect the rear light wiring (if fitted) at the fender.
2. Remove the three bolts, nuts and washers securing the fender to the footplate.

   NOTE – IF A SAFETY FRAME IS FITTED, THE UNDER FENDER SUPPORT MUST BE REMOVED.

3. Remove the two nuts, spring washer, flat washers and plate securing the fender to the trumpet housing.
4. Lift the fender slightly and remove the two bolts from inside the tool box.
5. Lift the fender clear of the tractor.

Refitment

1. Locate the fender on the trumpet housing and refit the two bolts through the base of the tool box.
2. Secure the fender with the two nuts, spring washers, flat washers and plate, then tighten the nuts to 17 kg-m (125 lb-ft).
3. If necessary, refit the under fender support.
4. Secure the fender to the footplate with the three bolts, nuts and washers.
5. Reconnect the rear light wiring (if fitted) at the fender.

FOOTPLATE

Removal and Refitment 2B-06-05

Removal

1. Remove the three bolts, nuts and washers securing the fender to the footplate.
2. Remove the four bolts, nuts and washers securing the footplate to the front and rear mounting brackets and remove the footplate.

Refitment

1. Locate the footplate on the mounting brackets and secure with the four bolts, nuts and washers.
2. Secure the fender to the footplate with the three bolts, nuts and washers.

SAFETY FRAME AND CABS

Part 2 Section C

GENERAL

This section details fitment and rigid safety cabs.

For full details of the Government Statutory Instrument 1967 No. 1072, or any queries related to safety cabs, apply to:

Ministry of Agriculture, Fisheries and Food,
Safety Branch
Great Westminster House
Horseferry Road,
London S.W.1.

A comprehensive statement regarding Distributor's and Dealer's responsibilities related to cab fitment and Massey-Ferguson policy concerning safety cabs is contained in Service Information TRAC 233, 8th October, 1970, which was circulated to all Massey-Ferguson Distributors and Dealers in Great Britain.

Before beginning any assembly, always check the contents of the kits and prepare the components for assembly, as described.

SAFETY FRAME KIT

Fitment 2C-01-02

Before Fitment
The following important points must be noted before attempting assembly:

ALWAYS:–

Remove any surface irregularities (paint lumps, burrs, swarf and dirt) from mating faces, this will ensure firm contact when torque loading is applied.

Assemble the complete safety frame with all bolts finger tight, then fully tighten all bolts, progressively and evenly.

Torque values must be strictly obeyed.

ALL bolts which project into the inside edges and faces of the frame or cab, must be fitted from the inside, facing outwards, i.e. the threaded portion of the bolt and the nut must be outside the frame to reduce the number of sharp corners and projections to a minimum.

During assembly use only the bolts and other hardware supplied in the kit. these bolts are manufactured from high tensile steel; the use of substitute mild steel nuts and bolts automatically invalidates regulation approval and could be extremely dangerous. All slotted holes must be covered by a flat washer and all nuts must be secured with a lock washer, except where self locking nuts are provided. Before assembly, identify all of the safety cab components.

If the frame is to be removed for tractor servicing, refitting must follow the initial procedure exactly and all bolts must be re-tightened to the correct torque values.

ILLEGAL PRACTICES

Never drill the frame to accept equipment such as extra mirrors or flashing indicators as this could dangerously weaken the frame structure.

Never weld anything to the frame.

Never straighten a bent frame.

Never interchange components with other safety frames even of identical type, or modify the frame in any way whatsoever without prior approval by Massey-Ferguson.

OTHER IMPLEMENTS

It is an offence to attach other implements or fittings to the tractors by means of the safety frame or its attachment points unless such attachments are approved by Massey-Ferguson.

New Tractors Fig. 1
New tractors are despatched from the factory with the rear lower struts fitted (6, 7, 8, 9, 10 and 11) except where an MF approved conversion is to be fitted.

Assembly Method (Figs. 1 and 2)

1. Remove the bolt and nut securing the rear lower strut to the fender top. Discard the nut but retain the bolt.
2. Slacken the fender mounting bolts and the rear lower strut mounting bolts.
3. Attach the rear upper struts (3 & 5) to the top of the fender using two ⅝ UNF x 50,8 mm (2 in) bolts and ⅝ lockwashers.

   NOTE – ENSURE THAT THE UPPER STRUTS ARE FITTED WITH THE OPEN THREADED HOLES ON THE INSIDE OF THE MEMBER.

4. Attach each front strut (2 & 4 Fig. 1) to the transmission housing using three ⅝ UNC x 44,5 mm (1¾ in) bolts and ⅝ lockwashers.
5. Inspect the roof frame for obstructions in strut location points (extraneous paint, packing or weld). Raise the roof frame and locate it on the four struts.

   NOTE – THE FRAME SERIAL NUMBER PLATE MUST BE LOCATED IN THE FRONT L.H. CORNER OF THE ROOF FRAME.

6. Secure the roof frame with two ½ UNF x 89,0 mm (3½ in) bolts, plain washers, lock-washers and nuts per strut.

   IMPORTANT – THE ROOF FRAME BOLTS MUST BE FITTED FROM THE INSIDE, I.E. NUTS AND ALL WASHERS ON THE OUTSIDE.

7. Tighten all bolts and nuts progressively in the following order and to the torque values stated:

	kgm	lb-ft
Rear fender to rear axle Rear lower strut to attachment bracket Rear lower strut to rear upper strut Front strut to transmission case	17,0	125
Roof Frame	8,7	50

8. Attach the plough lamp to the R.H. rear upper strut approximately 300 mm (12 in) above the fender top. Route the wire down the front side of the strut, secure it with the two plastic straps, then feed the wire through the grommet on the fender top. Attach the spade end connector to the spare terminal in the rear lamp, and attach the eyelet terminal to one of the rear lamp securing screws.

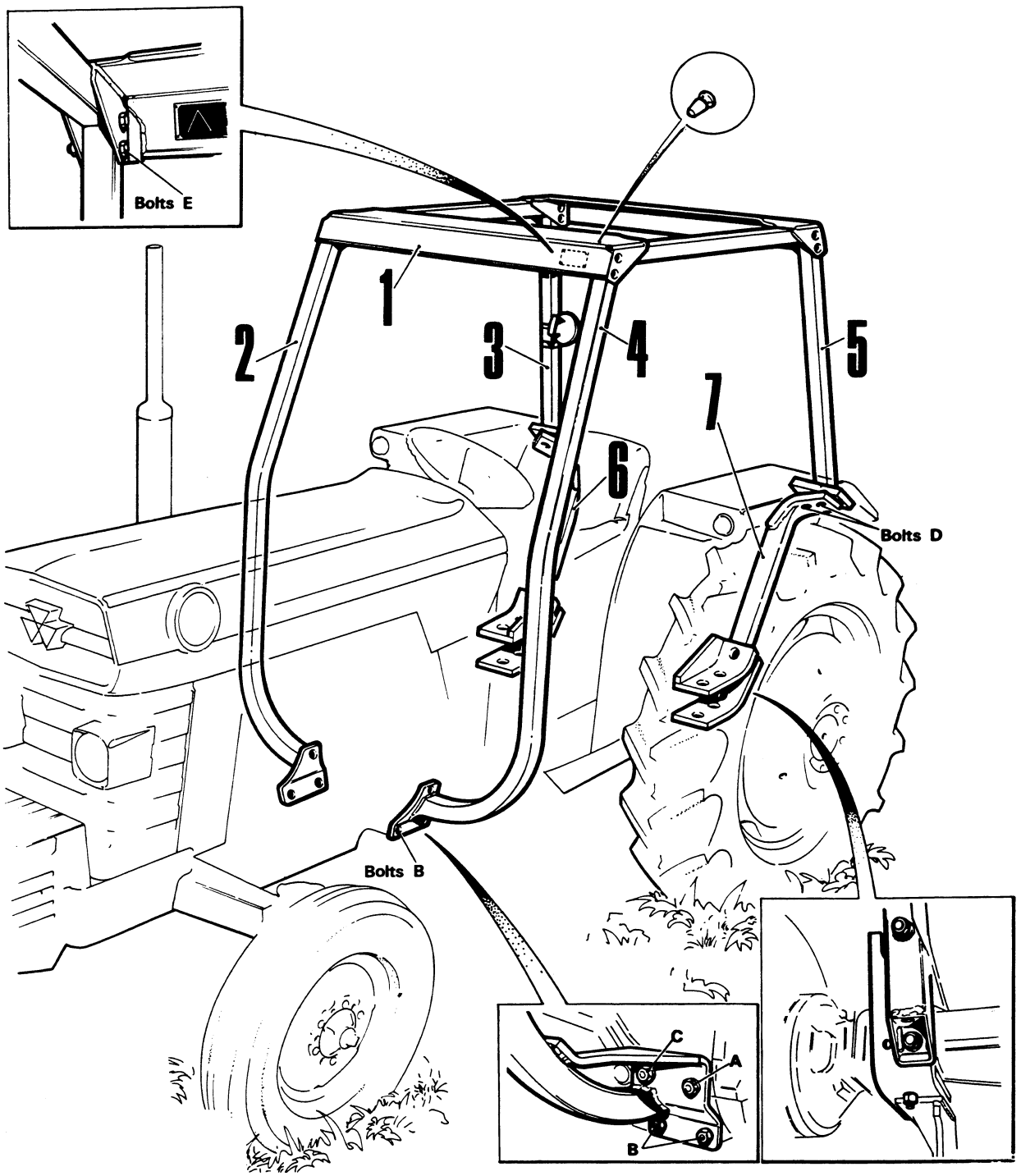

FIG. 1

FIG. 2

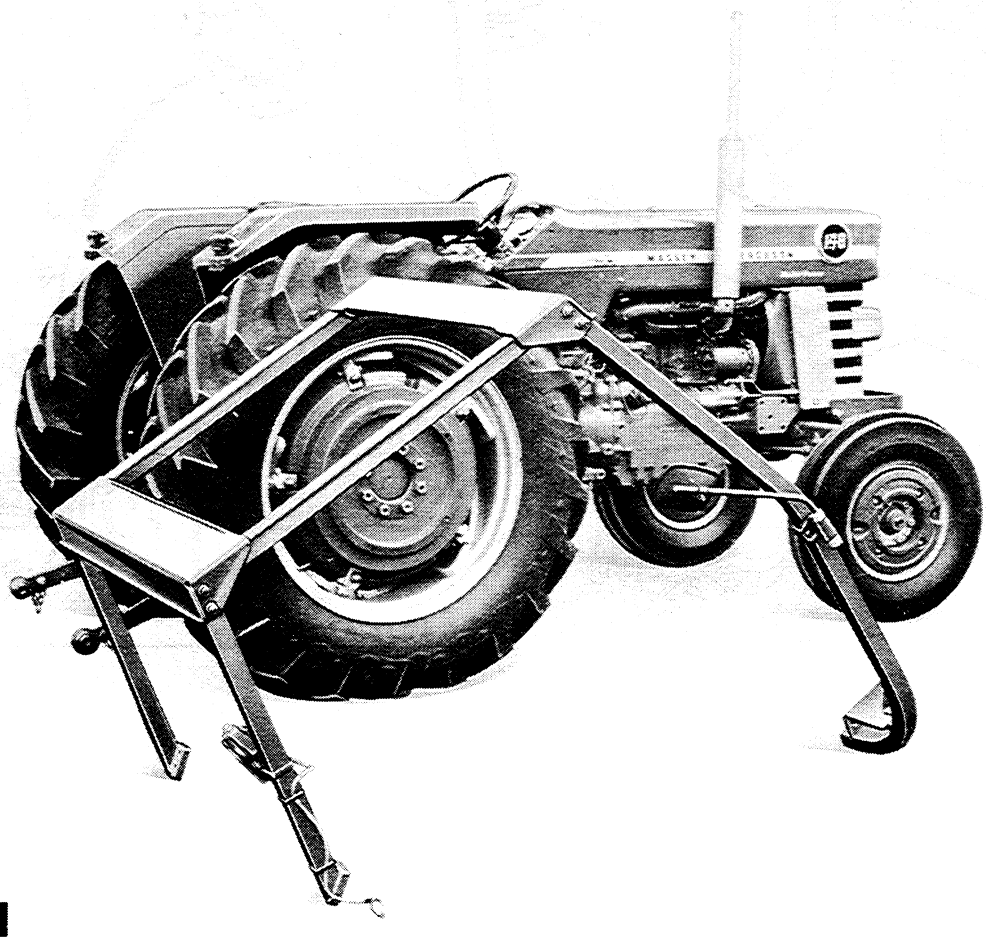

FIG. 3

SAFETY FRAME

Removal and Refitment 2C-02-05

Removal

1. Remove the cladding as stated in either operation 2C-04-06 or 2C-06-09, for flexible or rigid cladding respectively.
2. Disconnect the plough lamp wiring.

3A. If a crane is available: Remove the L.H. front strut as shown in Fig. 2, then, using a crane support the frame by slinging from the roof member. Remove the remaining bolts securing the other three legs to the tractor, then lift the complete assembly off the tractor as shown in Fig. 3.

3B. If no crane is available: Remove the bolts securing the roof member, then lift off the roof member. Remove the bolts securing the front and rear struts.

4. Store the bolts, nuts and washers carefully, as they must all be refitted to comply with the safety regulations.
   Except in exceptional circumstances, there is no necessity to remove the under fender supports.
5. If the under fender supports are to be removed, remove the fender mounting bolts and the bolts securing the brackets to the fender.

Refitment

1. If necessary refit the under fender supports and their brackets, then refit the fender mounting bolts.

2A. If a crane is available: Refit the L.H. front leg securing it with three ⅝ UNC x 44,5 mm (1¾ in) bolts and ⅝ lockwashers. Using the crane, lift the roof assembly back onto the tractor and refit the remaining bolts; two ⅝ UNF x 50,8 mm (2 in) bolts and ⅝ lockwashers for each rear strut, two ½ UNF x 89,0 mm (3½ in) bolts, plain washers and lockwashers to the roof and three ⅝ UNC x 44,5 mm (1¾ in) bolts and ⅝ lockwashers to the front R.H. strut.

2B. If no crane is available: Refit the two rear struts using two ⅝ UNF x 50,8 mm (2 in) bolts and ⅝ lockwashers for each, then refit the two front struts, securing them with three ⅝ UNC x 44,5 mm (1¾ in) bolts and lockwashers. Refit the roof member and refit the two ½ UNF x 89,0 mm (3½ in) bolts to each corner from the INSIDE, facing OUTWARDS. Refit the flat-washers, lockwashers and nuts.

3. Tighten all bolts and nuts progressively in the following order and to the torque values stated:

	kg-m	lb-ft
Rear fender to rear axle Rear lower strut to attach-ment bracket Rear lower strut to rear upper strut Front strut to transmission case	17,0	125
Roof Frame	8,7	50

4. Reconnect the plough lamp wiring.
5. Refit the cladding, as stated in operation 2C-04-06 or 2C-06-09 for flexible or rigid cladding respectively.

FLEXIBLE CLADDING KIT

Fitment 2C-03-05

1. Assemble the safety frame as stated in operation 2C-01-02.
2. Place the windscreen on the front of the safety frame. Locate the channel on the screen top edge over the lip on the roof frame front edge.

NOTE – TO OVERCOME TIGHTNESS BETWEEN THE SAFETY FRAME AND THE HINGE BRACKETS, RAISE THE WINDSCREEN APPROXIMATELY 150 MM (6 IN) THEN LOWER IT INTO THE CORRECT POSITION.

3. Loosely assemble the four windscreen attachment bolts using two 'U' bolts at the top and two 'L' bolts at the bottom.
4. Attach the top edge of each lower screen behind the bottom edge of the windscreen using two bolts, plain washers and locknuts each side.

NOTE – FLAT WASHERS SHOULD BE PLACED UNDER THE BOLT HEADS AND UNDER THE LOCKNUTS.

5. Loosely assemble the 'S' brackets to the lower panels, using a bolt, plain washers and locknut each side.
6. Fully tighten the front screen bolts, starting at the top and working downwards. Before tightening the bolts securing the lower front screen, hold each lower screen firmly against the safety frame strut. Do not tighten the two inner bolts.
7. Remove the bottom bolts, securing the sump to the clutch housing on each side, and fit the heat duct retaining tabs, securing them with the bolts.
8. Place the inverted 'U' frame of the engine shroud over the bonnet, just forward of the steering wheel, but behind the windscreen, locating the end of the 'U' frame on the pegs attached to the lower screens, Draw the side covers through the gaps between the engine and the front screens.
9. Engage the heat duct retaining hooks on the lips under the bonnet, adjacent to the battery compartment and at the tabs on the sump. Adjust the strap at the sump until the duct is a tight fit around the bonnet.
10. Fasten the side covers at the front end of the tractor with the rubber straps. Place the two wire hooks through the drain slots in the footplates and fasten the clips around the tie rods.
11. Fit the two 'Z' clips to the inner bolts securing the lower screen to the windscreen to secure the top edge of the heat shield.
12. Place the heat shield exhaust frame in the side duct (if necessary).
13. Remove the protective sleeve from the wiper motor shaft. Position the wiper mechanism in place (R.H. top corner of the windscreen) taking care not to dislodge the rubber grommet with the wiper motor shaft, and secure the wiper mechanism with three screws, plain washers and locking nuts.

14. Connect the wiring to the starter motor solenoid and clip the wire to the R.H. safety frame leg with the strap provided.
15. Fit the windscreen wiper blade and arm. Pull back the arm until the ⅛ in A/F Allen screw can be tightened. Before fully tightening the screw, adjust the sweep of the arm.
16. Insert a plastic plug into each top outer corner of the safety frame.
17. Slacken off the adjusters on the roof canopy and position the roof canopy on top of the safety frame.
18. Secure the rear corners of the roof canopy to the safety frame rear struts using a 'U' bolt, plate, plain washers and locking nut each side. Do not fully tighten the bolts at this stage.
19. Secure the front corners using the over-centre catches. Make sure by use of the adjusters that the gap between the safety frame and the roof frame is the same both sides.
20. Fit the top half of each door.
21. Position the centre post and spacer on top of the fender, approximately 58 mm (2¼ in) inwards from a line taken from the inside edge of the side light. Whilst ensuring that the rear edge of the door and the door catch locate correctly on the centre post, drill the fender through the hole in the centre post and spacer. Remove the burrs and retouch the paintwork.
22. Secure the centre post and spacer to the fender with a bolt, flat washer and locknut.
23. Repeat operations 20 and 21 for the other side.
24. Position the front edge of a side screen in place at the centre post, by locating the rod in the side screen, first at the top and then at the bottom of the centre post.
25. Make sure the stay in the rear of the side screen is located in the side screen correctly, then secure the stay to the plate at the top of the safety frame leg, with a bolt, plain washers and locknut.
26. With the stay vertical (nearly touching the reflector) drill the fender through the bottom hole in the stay, secure the stay with a bolt, flat washer and locknut.
27. Drill a hole in the front end of the fender to take the side screen front retaining hook, and locate the hook.
28. Locate the side screen rear retaining hook in the upper hole in the stay, taking care that both the side screen bottom sealing edges face outwards.
29. Fully tighten the 'U' bolt on the rear leg of the safety frame.
30. Secure the top rear corner of the side screen by engaging the rubber ring with the angled hook suspended from the underside of the roof canopy.
31. Repeat operation 23 to 29 for the other side.
32. If the rear screen is to be fitted, unroll the screen and hook the metal cross-bar on to the vertical hooks suspended from the roof canopy. With the stowing strap on the inside, engage the rubber loop on the bottom corners of the rear screen to the upper hole in the side screen stays.
33. Ensure that the roof edging pelmet hangs freely to cover the roof to side screen joint.
34. Place the fender extension in position on the outside of each fender and secure them to the footplates using a new bolt, plain washer and locknut, and the existing bolt, flatwasher, spring washer and nut each side, then drill the fenders through the holes in the fender extensions and secure the extensions with two bolts, flat washers and locknuts each side.
35. Fit the bottom half of each door; engage the hinge pin in the hinge bracket, push the door upwards and forwards to locate the frame into the inverted 'U' bracket, and locate the front pin through the hole in the door top half. Insert a hairpin through the top front pin.
36. Close each door and draw the flaps inside the fender. Pull the rubber loops onto the inner face of the fenders at right angles to the edge of the door flaps.
37. Stretch the loops approximately 20 mm (¾ in) and mark the position on the fenders. Drill a hole and fit a nylon thimble with a bolt, plain washer and locknut each side.
38. Bolt the rear view mirror to the R.H. side of the windscreen.
39. Lubricate the door hinges with oil.
40. If a loader is fitted, the clear plastic in the R.H. front lower screen must be removed and a suitable aperture cut out to enable the loader trip mechanism to be used.

FLEXIBLE CLADDING

Removal and Refitment 2C-04-06

Removal

1. Remove the hairpins securing the lower doors to the upper doors, then remove the lower doors.
2. Lift off the upper doors.
3. Release the heat shield retaining straps from; the front of the bonnet; the retaining tabs at the sump; the bonnet, adjacent to the battery compartment; the footplates and the tie rods; then remove the two 'Z' clips securing the heat shield to the lower edge of the windscreen, and lift off the heat shield.
4. Remove the rear screen by releasing the two rubber loops at the bottom of the screen and unhooking the screen from the roof canopy.
5. Disengage the sidescreen hooks from the front and rear of the fenders and release the rubber loops from each side screen upper edge.
6. Remove the two bolts, washers and nuts, securing each side screen rod to the fender and to the plate attached to the safety frame strut, then push each side screen up at the front until it becomes free from the retaining rod and then pull down and release it from the top and lift clear of the tractor.
7. Release the over-centre catches securing the front edge of the roof.
8. Remove the two bolts, washers and nuts securing the rear edge of the roof to the plates attached to the safety frame struts.
9. Remove the bolt, washer and nut securing the centre post to each fender and lift the roof assembly clear of the tractor.
   DO NOT lose the two spacers.
10. Disconnect the wiper motor wiring to allow the lower panels and windscreen to be removed.

11. Remove the 'S' brackets securing the two front lower panels to the safety frame, then remove the remaining bolts and washers securing the panels to the windscreen and remove the panels.
12. Remove the wiper arm, then remove the three screws, washers and nuts securing the wiper motor to the windscreen and remove the wiper motor
13. Remove the nuts and washers securing the 'U' bolts and 'L' bolts at the top and bottom of the windscreen and lift off the windscreen.

Refitment
Refitment procedure is similar to that for assembling the kit (operation 2C-03-05) except that certain operations (e.g. operation 21) will already have been completed.

RIGID CLADDING KIT

Fitment 2C-05-07
Special Tools Required: 5/16 A/F Socket Screwdriver
No. 10 UNC Taps
¼ UNC Taps

Before Assembly
Check the markings on cladding pack for tractor compatibility. Open the pack and check its contents against the list provided. The list is protected in a polythene bag attached to the inside of the crate. Count and group all hardware to ascertain correct quantities of nuts, bolts, washers, brackets, etc.

Before commencing assembly, use the appropriate tap to clean all threads in welded nuts, and lightly oil all tapped threads.

Assembly Method
1. Assemble the safety frame, as stated in operation 2C-01-02.
2. Fig. 4. Position the roof rail (1) on the top of the safety frame, ensure that the narrow groove is on the underside and that weld nuts are situated to the front and rear. Assemble four 'Z' retainers (2) to secure the roof rail to the safety frame. Use four ¼ UNC x ⅝ in bolts and nuts, together with plain washers and spring washers. Assemble with nuts at the top and both washers under each nut.

   NOTE – LEAVE ALL ASSEMBLED BOLTS SLACK UNTIL BOLT TIGHTENING IS SPECIFIED.

3. Fit sealing strip (19) to the lower centre edge of the windscreen panel using angle bar as shown. This bar incorporates four weld nuts and is used to sandwich the sealing strip to the inside bottom edge of the windscreen panel. Use four No. 10 x ½ in bolts, spring washers and plain washers.
4. Position the windscreen assembly (3) against the safety frame front members and attach it to the roof rail (1) using three ¼ UNC x ⅝ in bolts screwed into weld nuts. Use a spring and a plain washer under each bolt head.
5. Before fitting lower front panels, disconnect the throttle control rod from the throttle pedal. Position the lower front panels (5). On the R.H. panel, feed the throttle control rod through the hole in the skirt, then reconnect the throttle control rod. Attach the top edge of lower front panels (5) to the bottom edge of windscreen assembly (3) using eight (4 per side) No. 10 UNC x ½ in bolts, spring washers and plain washers. First assemble the outer bolt on each lower panel, then assemble the remaining bolts with heads and washers on the inside. Unless a loader is to be fitted, fit blanking plate (22) using two of the above No. 10 bolts. Fit skirts (21) to existing bolts as shown, omit washers, and fit retaining bracket (23) to secure firmly against panel form.
6. Attach the windscreen assembly to the safety frame front members using 4 retainers (7) and two No. 10 UNC x ½ in bolts, spring washers and plain washers per retainer.
7. Attach both lower front panels to the safety frame using the retainers shown, and two No. 10 UNC x ½ in bolts, spring washers and plain washers per retainer. The upper retainer (6) is designed to secure the inner end of the door check strap.
8. Secure the rear view mirror arm (8) to the top outer corner of the lower front panel 'R.H.' Use two ¼ in UNC x ½ in bolts, spring washers and plain washers.
9. The top inner corner of each side panel sealing skirt is to be laced to the cross bar securing the central sealing strip.
10. Fit the rear curtain (15) to the roof rail (1). Use three ¼ in UNC x ⅝ in bolts and plain washers. (Turn buttons to face rearwards).
11. Attach side panel assemblies (12) by pushing the top edge of each panel fully into the groove in the underside of the roof rail. Locate the rear curtain (15) and the bottom rear corner of the side panel against the safety frame rear member. Insert and secure the three turn buttons on each side of the rear curtain. Ensure that the 'side panel to fender' sealing rubber remains in its true location. Secure the rear of each panel with a retainer (13) and two No. 10 UNC x ½ in bolts, spring washers and plain washers.
    The top front of each panel must be secured to the safety frame roof member using a slotted bracket (14) and two ¼ in UNC x ⅝ in bolts, spring washers and plain washers.
12. Assemble clamp brackets to slotted holes in fender extensions (9) using three ¼ in UNC x ⅝ in bolts, spring washers and plain washers per assembly. Slacken the front bolt attaching the fender support bracket (10). When attaching the extension (9) slide the bottom rear edge between the fender and the support bracket. Position the clamps over the fender rim. Insert a ¼ in UNC x 2½ in bolt, nut spring washer and plain washer to secure the bottom front corner of the side panels to the attachment block on the fender extensions.
13. Attach each footstep extension (11) to the appropriate fender extension (9) and to the lower front panel (5). Use four ¼ in UNC x ⅝ in bolts, plain washers and spring washers. Insert two bolts through panel (5). Ensure that bolts securing the fender extension (9) to the fender front edge are slack, push the extension (9) forward until the lower edge locates against the rear edge of footplate extension (11). Insert two bolts through extension (9) in the rear edge of footplate (11). Secure the front inner corner of each footplate extension to the safety frame using the brackets (24 and 26) as illustrated.

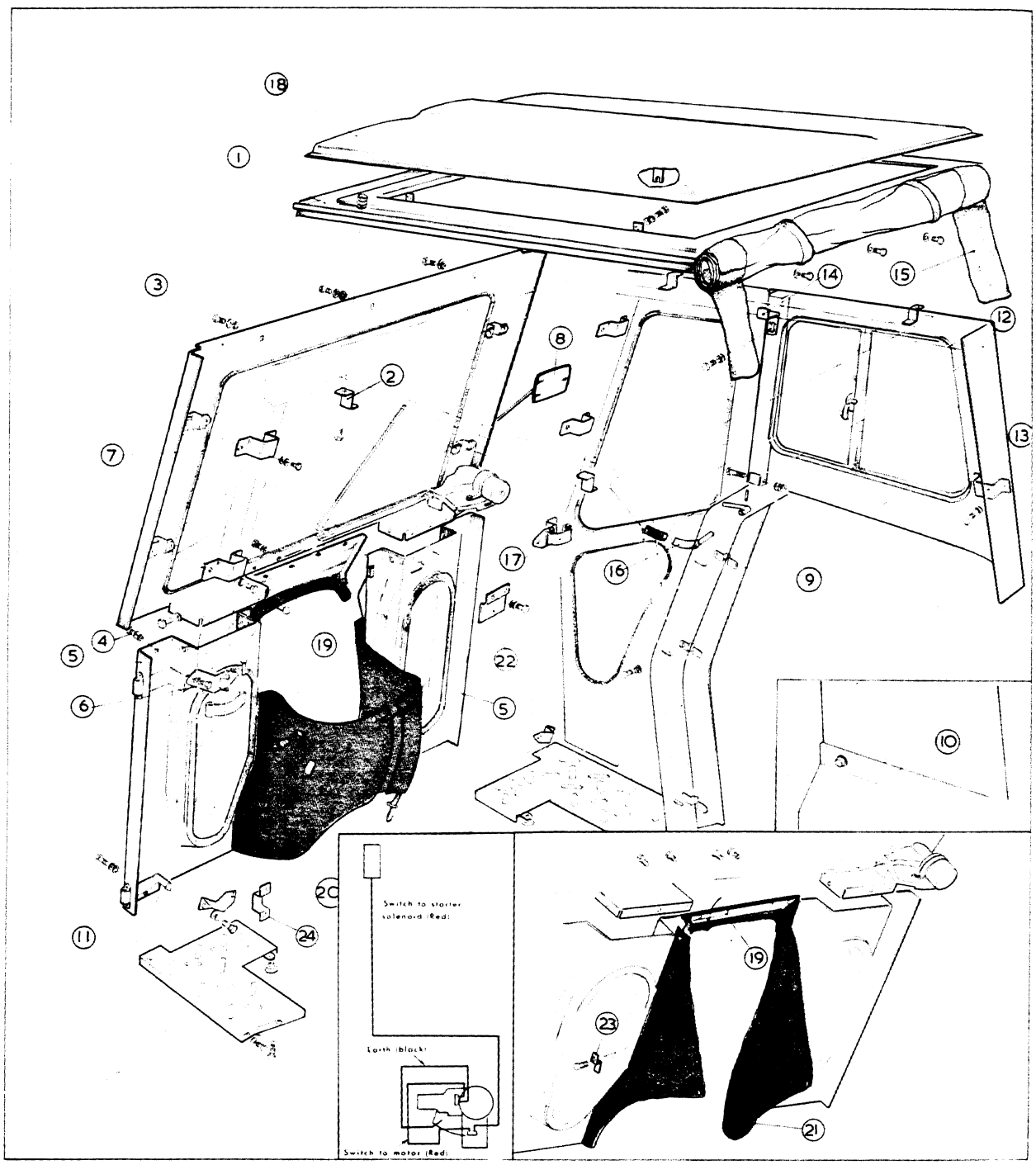
18
1
3
2
8
14
15
12
7
13
17
16
9
4
5
19
22
6
5
10
20
Switch to starter solenoid (Red)
11
24
19
23
Earth (Black)
21
Switch to motor (Red)

FIG. 4

Use two ¼ in bolts, plain washers and spring washers.

14. Connect wiper motor wiring (see inset). Tighten the nuts securing the plate behind the wiper pivot. Use one spring clip to secure the supply wire to the lower front panel as shown, cross the wire under the hood behind the engine, and use the remaining two clips to route the wire along the underlip of the hood to the starter motor. Ensure that there is a metal-to-metal contact at the earth eyelet attachment on the wiper motor mounting. Check operation of wiper mechanism and inclusion of correct fuse (35A). Fit and adjust wiper arm and blade.
15. Lubricate the hinge pins on both doors, ensure that the female portion of the hinge is fully tightened, and hang the doors. Slide a black plastic cover on to each inner door handle (16) and fit each handle into the release mechanism. Assemble a fibre washer on to the outer end of the stem and fit the outer door handles using a roll pin in each handle. Gently close the doors to ascertain what adjustment is necessary for a satisfactory fit. Use available manoeuvrability of fender extensions and door hinge brackets to obtain a secure engagement of door catch and adequate sealing around the door. The outer angle of the door sealing rubber, at the front, should seal against the rearward facing sharp edge of the front panel. If there are any gaps under the door seal after all adjustments have been made, set the door by hand to eliminate the gaps. Fit check strap (17) using pins provided.
    If difficulty is still experienced with door fitting, the following procedure should be adopted: Remove the floor extension plate. Slacken off all of the fender and safety frame mounting bolts, then attach a piece of rope to the fender hand grip. Pass the rope round the front leg of the safety frame, diagonally opposite the fender being worked on. Pull the cord tight to "toe-in" the fender, then fully tighten all of the fender and safety frame bolts, using the specified torques, where necessary. Remove the rope and check the door for fit. Refit the floor extension plate.
16. Tighten all remaining bolts, re-check bolts previously tightened and ensure that cab doors close satisfactorily.
17. Fit roof panel (18) and secure it with four ¼ in UNC x ⅝ in bolts, plain washers and spring washers.
18. Clean the cab windows; touch up paintwork where necessary; check zips on rear curtain and remove protective tissue from transparent portion. Lubricate the door hinges with oil.
19. Check that throttle control is free of restrictions. If the sealing skirt rubs the control rod, enlarge the hole in the skirt with a knife or coarse file.
20. If necessary remove a small portion of the sealing skirt top edge to clear the air cleaner indicator.

RIGID CLADDING

Removal and Refitment 2C-06-09

Special Tools Required: ⅝16 A/F Socket Screwdriver

Removal

1. Slacken the four roof bracket securing bolts, then lift off the roof.
2. Remove the screws securing each side panel to the safety frame and fender extension, then release the rear curtain turn buttons and lift off the side panels.
3. Remove the rear curtain.
4. Release the door check straps then lift off the doors.
5. Remove the bolts securing the skirt to the tractor hood.
6. Release the throttle rod.
7. Remove the bolts securing the lower front panels and lift off the panels, sliding the throttle rod out of the hole in the skirt.
8. Remove the windscreen assembly by releasing the clamps and wiper wire, then removing the bolts securing the windscreen to the roof rail.
9. Remove the four 'Z' clamps securing the roof rail and lift off the roof rail.
10. Reconnect the throttle rod.
    The floor extension plates and fender extensions need not normally be removed.

Refitment

Refitment procedure is generally similar to that for kit fitment (operation 2C-05-07) except that items such as sealing strip fitment or skirt attachment will be unnecessary.

ENGINE REMOVAL

Part 3 Section A

GENERAL

This section gives details on procedure for splitting the tractor into five major assemblies and will be referred to whenever major splitting operations are required.

This section also includes information on the spacer housing fitted between the transmission and the centre housing.

ENGINE REMOVAL

SPLITTING THE TRACTOR BETWEEN THE ENGINE AND THE TRANSMISSION

3A-01-02

Special Tools Required: 270 Rail Trolley
MF27G Support Stand

Disassembly

1. Remove the fuel tank as stated in Part 3C.
2. Place wedges between the front axle beam and the engine support casting.
3. Release the drag links from the steering box drop arms.
4. Position the tractor dismantling stand No. 270 under the tractor and support the transmission housing on a rail trolley and the engine on a fixed stand.
5. Disconnect the battery leads.
6. Disconnect the wiring from the starter motor, dynamo, thermostart, and horn (if fitted).
7. Disconnect the Multi-Power oil cooler pipes (if fitted) at the transmission housing.
8. Remove the temperature gauge bulb from the thermostat housing and release the tube back to the battery carrier.
9. Disconnect the oil pressure gauge pipe and the tractormeter drive cable at the engine.
10. Disconnect the fuel cut-off control rod from the injector pump and remove the rod from the tractor.
11. Disconnect the L.H. throttle control rod at the cross shaft.
12. Disconnect the air cleaner hose at the air cleaner.
13. Disconnect the four power steering ram hoses (two each side) at the metal pipes (if fitted).
14. Disconnect the two power steering pump pipes (if fitted) adjacent to the starter motor.
15. Disconnect the following fuel pipes:
    Both pipes from the secondary fuel filter to the injector pump at the filter.
    Injector leak off pipe to the secondary fuel filter at the leak off pipe.
    Fuel pump to the primary fuel filter at the fuel pump.
16. If the tractor is fitted with a horizontal exhaust system; remove the bolt, nut, washer and clip securing the silencer to the exhaust down-pipe, then release the down-pipe from the silencer.
17. Remove the two bolts and spring washer securing the battery carrier to the engine.
18. Remove the bolts securing the engine to the transmission.
19. Roll the rear half of the tractor on the trolley, clear of the engine.
20. Fit the support stand MF 27G on the front of te transmission housing and secure it with two bolts each side.

Reassembly

1. Support the transmission on a rail trolley No. 270 and remove the support stand MF 27G from the front of the transmission housing.
2. Align the transmission with the engine, the use of a slave bolt in each side of the transmission will facilitate alignment.
3. Push the rear half of the tractor towards the engine, simultaneously rotating the flywheel to engage the transmission input shaft spline with the splines of the clutch friction disc. To engage the p.t.o. input shaft splines with the splines of the clutch friction disc, remove the $\frac{9}{16}$ A/F Allan plug from the left-hand side of the clutch housing, and using a suitable lever, rotate the flywheel.
4. Bolt the engine to the transmission. Tighten the nuts and bolts to a torque of 7,5 kg-m (55 lbs-ft).

   NOTE –DO NOT FORGET TO REFIT THE POWER STEERING CLAMP BRACKET (IF FITTED) TO THE L.H. SIDE OF THE ENGINE.

5. Refit the two bolts and washers securing the battery carrier to the engine.
6. If the tractor is fitted with a horizontal exhaust system, refit the down-pipe into the silencer, and secure the silencer with a clip, bolt, nut and washers.
7. Reconnect the fuel pipes.
8. Refit the fuel cut off control rod and connect it to the injector pump.
9. Reconnect the throttle rod to the injector pump.
10. Refit the temperature gauge bulb to the thermostat housing.
11. Reconnect the oil pressure gauge pipe and the tractormeter drive cable to the engine.
12. Reconnect the air cleaner hose to the air cleaner.
13. Reconnect the Multi-Power oil cooler pipes (if fitted) at the transmission housing.
14. Connect the wiring to the starter motor, dynamo, thermostart, and horn (if fitted).
15. Refit the fuel tank as stated in Part 3C.
16. Refit the drag links to the steering box drop arms.
17. Remove the wedges from the front axle beam and remove the tractor stand from beneath the tractor.
18. Reconnect the power steering pipes and hoses (if fitted) and top up the reservoir with a recommended fluid.
19. Reconnect the battery leads and bleed the fuel system as stated in Part 3C, then refill the power steering reservoir (if fitted) as stated in Part 6C.

FRONT AXLE ASSEMBLY

Removal and Refitment 3A-02-02

Removal

1. Remove the hood and grille assembly as stated in Part 2B.
2. Drain the coolant from the engine and the radiator.
3. Release the top and bottom radiator hoses.
4. Disconnect the hoses from the power steering rams (if fitted).
5. Disconnect the radiator support stay from the fan shroud.
6. Release the drag links from the steering box drop arms.
7. Jack up the tractor under the transmission housing.
8. Remove the nuts and bolts securing the engine support to the engine and manoeuvre the front axle assembly complete with drag links and radiator clear of the tractor.

Refitment

1. Manoeuvre the front axle assembly in line with the engine and secure it with the nuts and bolts.

NOTE – DO NOT FORGET TO REFIT THE TWO POWER STEERING HOSE RETAINING CHAINS (IF FITTED) TO THE SUPPORT CASTING BOLTS.

2. Reconnect the drag links to the steering box drop arms.
3. Reconnect the radiator hoses and the radiator support stay.
4. Refill the engine and radiator with coolant.
5. Refit the hood and grille assembly as stated in Part 2B.
6. Reconnect the power steering hoses (if fitted) to the rams, and refill the reservoir as stated in Part 6C.

ENGINE UNIT

Removal and Refitment 3A-03-03

Special Tools Required: 270 Rail Trolley
MF 27G Support Stand

Removal

1. Remove the exhaust pipe.
2. Split the tractor between the engine and the transmission as stated in operation 3A-01-02.
3. Remove the front axle assembly as stated in operation 3A-02-02.

Refitment

1. Refit the front axle assembly as stated in operation 3A-02-02.
2. Reassemble the rear half of the tractor to the engine as stated in operation 3A-01-02.
3. Refit the exhaust pipe.

STEERING BOX UNIT

Removal and Refitment 3A-04-03

Removal

1. Remove the fuel tank as stated in Part 3C.
2. Disconnect the battery leads then lift the battery clear of the tractor.
3. Disconnect the wiring from the starter motor, dynamo, safety start switch, thermostart and the horn (if fitted) then, feed the main wiring harness back through the battery carrier.
4. Disconnect the rear light wire (if fitted) from the switch and then release the wire from the clip on the steering column.
5. Disconnect the oil pressure gauge pipe at the engine and the gauge and remove it.
6. Remove the temperature gauge bulb from the thermostat housing and release the tube back to the battery carrier.
7. Disconnect the tractormeter drive cable from the engine.
8. Disconnect the fuel cut-off control rod from the injector pump and remove the rod from the tractor.
9. Release the L.H. and the foot throttle control rods from the cross shaft.
10. Disconnect the air cleaner hose at the air cleaner.
11. Release the drag links from the steering box drop arms.
12. Disconnect the following fuel pipes:–
    Both pipes from the secondary fuel filter to the injector pump at the filter.
    Injector leak-off pipe to the secondary fuel filter at the leak-off pipe.
    Fuel pump to the primary fuel filter at the filter.
13. Disconnect the Multi-Power shift lever at the transmission housing (Multi-Power tractors only).
14. Disconnect the two power steering pump pipes (if fitted) adjacent to the starter motor.
15. Disconnect the four power steering ram hoses (two each side) at the metal pipes (if fitted) and then release the two pipes from the clamp bracket on the R.H. side of the tractor.
16. Remove the two bolts and washers securing the front of the battery carrier to the engine.
17. Remove the eight bolts and spring washers securing the steering box to the transmission.
18. Lift and manoeuvre the steering box unit clear of the tractor and place on a suitable surface taking care not to damage the filters or the gear selector levers.

Refitment

1. Ensuring that all the gears and levers are in the neutral position, place the steering box unit onto the transmission housing and secure with the eight bolts and spring washers.

NOTE –DO NOT FORGET TO REFIT THE WIRING CLIP (IF FITTED) TO THE BOLT ADJACENT TO THE HIGH/LOW GEAR LEVER.

2. Secure the front of the battery carrier to the engine with the two bolts and spring washers.
3. Reconnect the power steering pipes and hoses (if fitted) and secure the R.H. pipes with the clamp bracket, and then top up the reservoir with a recommended fluid.
4. Reconnect the Multi-Power shift lever. (Multi-Power tractors only).
5. Reconnect the fuel pipes.
6. Reconnect the drag links to the steering box drop arms.
7. Reconnect the air cleaner hose to the air cleaner.
8. Reconnect the L.H. and the foot throttle control rods to the cross shaft.
9. Refit the fuel cut-off control rod and connect it to the injector pump.
10. Reconnect the tractormeter drive cable to the engine.
11. Refit the oil pressure gauge pipe to the engine and the gauge.
12. Refit the temperature gauge bulb to the thermostat housing.
13. Refit the rear light wire (if fitted) to the switch and secure the wire to the steering column with the clip.
14. Feed the main wiring harness through the battery carrier and connect the wiring to the starter motor, dynamo, safety start switch, thermostart and the horn (if fitted).
15. Refit the battery.
16. Refit the fuel tank as stated in Part 3C.
17. Reconnect the battery leads and bleed the fuel system as stated in Part 3C, then refill the power steering reservoir (if fitted) as stated in Part 6C.

ENGINE REMOVAL

SPLITTING THE TRACTOR BETWEEN THE TRANSMISSION AND THE SPACER HOUSING OR BETWEEN THE SPACER HOUSING AND THE CENTRE HOUSING

3A-05-04

Special Tools Required: See operation 7A-03-16 (Multi-Power tractors only) and
270 Rail Trolley
MF 27T Support Stand

Disassembly

1. Drain the oil from the transmission and the centre housing.
2. Release the footbrake operating rods from the brake cross shaft levers.
3. Remove the two bolts, nuts and washers each side, securing the footplates to their front mounting brackets.
4. Disconnect the rear light wire from the switch and then release the wire from two clips, one underneath the instrument panel on the steering column and the other adjacent to the High/Low gear lever.
5. If the tractor is fitted with a horizontal exhaust system, remove the bolt, nut, washer and clip securing the silencer to the exhaust down-pipe, then release the down-pipe from the silencer.
6. Place wedges between the front axle beam and engine support casting.
7. Position the tractor dismantling stand No. 270 under the tractor and support the transmission housing and centre housing on trolleys.
8. Remove the hydraulic lift cover as stated in operation 7A-03-16 and then disconnect the hose to the Multi-Power spool valve at the Multi-Power pump (Multi-Power tractors only).
9. Release the operating rods from the parking brake cross shaft and lever (Splitting between spacer housing and centre housing only).
10. Remove the bolts securing the transmission or the centre housing to the spacer housing.
11. Push the rear part of the tractor out of engagement with the transmission or the spacer housing.
12. Fit support stands 27T to the transmission housing, centre housing or spacer housing and secure with one bolt each side.

Reassembly

1. Support the transmission housing and centre housing on rail trolleys and then remove the support stands MF 27T.
2. Fit the rear drive shaft to the transmission, then fit the shear tube to the rear drive shaft.
3. Remove the p.t.o. side cover from the centre housing (8 speed transmission tractors only).
4. Fit a new gasket to the spacer housing.

5A. **Tractor split between transmission and spacer housing.**
Push the rear half of the tractor into engagement with the transmission, simultaneously aligning the shear tube splines into the rear axle pinion splines and the transmission front p.t.o. drive shaft into the intermediate shaft coupler splines.

5B. **Tractor split between spacer housing and centre housing.**
Push the rear half of the tractor into engagement with the spacer housing, simultaneously aligning the shear tube splines onto the rear axle pinion splines and the intermediate shaft into the hydraulic pump camshaft coupler splines or the plated drive unit (Multi-Power tractors only).

NOTE – ALIGNMENT OF THE SHEAR TUBE CAN BE EFFECTED THROUGH THE P.T.O. SIDE COVER APERTURE IN THE CENTRE HOUSING (8 SPEED TRANSMISSION TRACTORS ONLY).

Alignment of the hydraulic pump drive is facilitated by rotating the flywheel, this is effected by removing the 9/16 Allan plug in the L.H. side of the clutch housing and using a suitable lever.

6. End float between the rear drive shaft and the main shaft must be governed to 0,4 to 2,5 mm (0.015 to 0.100 in), by fitting the split pin to the appropriate hole in the shear tube.
7. Bolt the transmission or the centre housing to the spacer housing.
8. Replace the p.t.o. cover (8 speed transmission tractors only).
9. Reconnect the Multi-Power spool valve hose to the Multi-Power pump and refit the lift cover as stated in operation 7A-03-16. (Multi-Power tractors only)
10. Remove the wedges from the front axle beam and remove the tractor stand from beneath the tractor.
11. If the tractor is fitted with a horizontal exhaust system, refit the exhaust down-pipe into the silencer and secure with clip, bolt, nut and washer.
12. Reconnect the rear light wiring to the light switch and secure the wire with the two clips.
13. Secure the footplates.
14. Reconnect the footbrake and parking brake (if removed) operating rods.
15. Refill the transmission with recommended oil.

SPACER HOUSING

Removal and Refitment 3A-06-04

Special Tools Required: See operation 7A-03-16 (Multi-Power tractors only) and
270 Rail Trolley
MF 27T Support Stand

Removal

1. Split the tractor between the spacer housing and the centre housing as stated in operation 3A-05-04.
2. Remove the two bolts securing the parking brake to the spacer housing and remove the parking brake.
3. Supporting the spacer housing remove the securing bolts and then move the spacer housing out of engagement with the transmission.

Refitment

1. Using a new gasket, position the spacer housing on the transmission housing simultaneously aligning the transmission front p.t.o. drive shaft into the intermediate shaft coupler splines and then secure the spacer housing to the transmission housing with the nuts and bolts.
2. Refit the parking brake and secure with the two bolts.
3. Refit the rear half of the tractor to the spacer housing as stated in operation 3A-05-04.

SPACER HOUSING

Servicing 3A-07-05

Special Tools Required: See operation 7A-03-16 (Multi-Power tractors only) and
270 Rail Trolley
MF 27T Support Stand

Disassembly

1. Remove the spacer housing as stated in operation 3A-06-04.
2. Remove the split pin securing the coupler to the intermediate shaft and then remove the coupler and withdraw the shaft from the spacer housing.
3. Using a suitable drift, carefully drive out the needle bearing.
4. If necessary, remove the stop bolt from the spacer housing.

Reassembly

1. If necessary, degrease the stop bolt and spacer housing threads with trichlorethylene, then apply a few drops of either Casco ML 15 or Loctite grade AAV to the stop bolt threads and refit the bolt and tighten to a torque of 4,8 kg-m (35 lb-ft)
2. Tap a new needle bearing into the spacer housing until the bearing is 2,54 mm (0.1 in) below the surface of the spacer housing.
3. Slide the intermediate shaft into the needle bearing and then refit the coupler to the shaft and secure with a new split pin.
4. Refit the spacer housing as stated in operation 3A-06-04.

ENGINE REMOVAL

Part 3 Section A

Table of Contents

GENERAL

This section gives details on procedure for splitting the tractor into five major assemblies and will be referred to whenever major splitting operations are required.

ENGINE REMOVAL

SPLITTING THE TRACTOR BETWEEN THE ENGINE AND THE TRANSMISSION

3A-01

Special Tools Required: 270 Rail Trolley
MF27G Support Stand

Disassembly

1. Remove the fuel tank as stated in Part 3C-03-05
2. Place wedges between the front axle beam and the engine support casting.
3. Release the drag links from the steering box drop arms.
4. Position the tractor dismantling stand No. 270 under the tractor and support the transmission housing on a rail trolley and the engine on a fixed stand.
5. Disconnect the battery leads.
6. Disconnect the wiring from the starter motor, dynamo, thermostart, and horn (if fitted).
7. Disconnect the Multi-Power oil cooler pipes (if fitted) at the transmission housing.
8. Remove the temperature gauge bulb from the thermostat housing and release the tube back to the battery carrier.
9. Disconnect the oil pressure gauge pipe and the tractormeter drive cable at the engine.
10. Disconnect the fuel cut-off control rod from the injector pump and remove the rod from the tractor.
11. Disconnect the L.H. throttle control rod at the cross shaft.
12. Disconnect the air cleaner hose at the air cleaner.
13. Disconnect the four power steering ram hoses (two each side) at the metal pipes (if fitted).
14. Disconnect the two power steering pump pipes (if fitted) adjacent to the starter motor.
15. Disconnect the following fuel pipes:
    Both pipes from the secondary fuel filter to the injector pump at the filter.
    Injector leak off pipe to the secondary fuel filter at the leak off pipe.
    Fuel pump to the primary fuel filter at the fuel pump.
16. If the tractor is fitted with a horizontal exhaust system; remove the bolt, nut, washer and clip securing the silencer to the exhaust down-pipe, then release the down-pipe from the silencer.
17. Remove the two bolts and spring washer securing the battery carrier to the engine.
18. Remove the bolts securing the engine to the transmission.
19. Roll the rear half of the tractor on the trolley, clear of the engine.
20. Fit the support stand MF 27G on the front of the transmission housing and secure it with two bolts each side.

Reassembly

1. Support the transmission on a rail trolley No. 270 and remove the support stand MF 27G from the front of the transmission housing.
2. Align the transmission with the engine, the use of a slave bolt in each side of the transmission will facilitate alignment.
3. Push the rear half of the tractor towards the engine, simultaneously rotating the flywheel to engage the transmission input shaft spline with the splines of the clutch friction disc. To engage the p.t.o. input shaft splines with the splines of the clutch friction disc, remove the 9/16 A/F Allan plug from the left-hand side of the clutch housing, and using a suitable lever, rotate the flywheel.
4. Bolt the engine to the transmission. Tighten the nuts and bolts to a torque of 7,5 kg-m (55 lbs-ft).

NOTE – DO NOT FORGET TO REFIT THE POWER STEERING CLAMP BRACKET (IF FITTED) TO THE L.H. SIDE OF THE ENGINE.

5. Refit the two bolts and washers securing the battery carrier to the engine.
6. If the tractor is fitted with a horizontal exhaust system, refit the down-pipe into the silencer, and secure the silencer with a clip, bolt, nut and washers.
7. Reconnect the fuel pipes.
8. Refit the fuel cut off control rod and connect it to the injector pump.
9. Reconnect the throttle rod to the injector pump.
10. Refit the temperature gauge bulb to the thermostat housing.
11. Reconnect the oil pressure gauge pipe and the tractormeter drive cable to the engine.
12. Reconnect the air cleaner hose to the air cleaner.
13. Reconnect the Multi-Power oil cooler pipes (if fitted) at the transmission housing.
14. Connect the wiring to the starter motor, dynamo, thermostart, and horn (if fitted).
15. Refit the fuel tank as stated in Part 3C-03-05.
16. Refit the drag links to the steering box drop arms.
17. Remove the wedges from the front axle beam and remove the tractor stand from beneath the tractor.
18. Reconnect the power steering pipes and hoses (if fitted) and top up the reservior with a recommended fluid.
19. Reconnect the battery leads and bleed the fuel system as stated in Part 3C, then refill the power steering reservior (if fitted) as stated in Part 6C-03-05

FRONT AXLE ASSEMBLY

Removal and Refitment 3A-02

Removal

1. Remove the hood and grille assembly as stated in Part 2B-01-02.
2. Drain the coolant from the engine and the radiator.
3. Release the top and bottom radiator hoses.
4. Disconnect the hoses from the power steering rams (if fitted).
5. Disconnect the radiator support stay from the fan shroud.
6. Release the drag links from the steering box drop arms.
7. Jack up the tractor under the transmission housing.
8. Remove the nuts and bolts securing the engine support to the engine and manoeuvre the front axle assembly complete with drag links and radiator clear of the tractor.

Refitment

1. Manoeuvre the front axle assembly in line with the engine and secure it with the nuts and bolts.

NOTE – DO NOT FORGET TO REFIT THE TWO POWER STEERING HOSE RETAINING CHAINS (IF FITTED) TO THE SUPPORT CASTING BOLTS.

2. Reconnect the drag links to the steering box drop arms.
3. Reconnect the radiator hoses and the radiator support stay.
4. Refill the engine and radiator with coolant.
5. Refit the hood and grille assembly as stated in Part 2B-01-02.
6. Reconnect the power steering hoses (if fitted) to the rams, and refill the reservior as stated in Part 6C-08-10

ENGINE UNIT

Removal and Refitment 3A-03

Special Tools Required: 270 Rail Trolley
MF 27G Support Stand

Removal

1. Remove the exhaust pipe.
2. Split the tractor between the engine and the Transmission as stated in operation 3A-01
3. Remove the front axle assembly as stated in operation 3A-02

Refitment

1. Refit the front axle assembly as stated in operation 3A-02
2. Reassemble the rear half of the tractor to the engine as stated in operation 3A-01
3. Refit the exhaust pipe.

STEERING BOX UNIT

Removal and Refitment 3A-04

Removal

1. Remove the fuel tank as stated in Part 3C-03-05
2. Disconnect the battery leads then lift the battery clear of the tractor.
3. Disconnect the wiring from the starter motor, dynamo, safety start switch, thermostart and the horn (if fitted) then, feed the main wiring harness back through the battery carrier.
4. Disconnect the rear light wire (if fitted) from the switch and then release the wire from the clip on the steering column.
5. Disconnect the oil pressure gauge pipe at the engine and the gauge and remove it.
6. Remove the temperature gauge bulb from the thermostat housing and release the tube back to the battery carrier.
7. Disconnect the tractormeter drive cable from the engine.
8. Disconnect the fuel cut-off control rod from the injector pump and remove the rod from the tractor.
9. Release the L.H. and the foot throttle control rods from the cross shaft.
10. Disconnect the air cleaner hose at the air cleaner.
11. Release the drag links from the steering box drop arms.
12. Disconnect the following fuel pipes:–
    Both pipes from the secondary fuel filter to the injector pump at the filter.
    Injector leak-off pipe to the secondary fuel filter at the leak-off pipe.
    Fuel pump to the primary fuel filter at the filter.
13. Disconnect the Multi-Power shift lever at the transmission housing (Multi-Power tractors only).
14. Disconnect the two power steering pump pipes (if fitted) adjacent to the starter motor.
15. Disconnect the four power steering ram hoses (two each side) at the metal pipes (if fitted) and then release the two pipes from the clamp bracket on the R.H. side of the tractor.
16. Remove the two bolts and washers securing the front of the battery carrier to the engine.
17. Remove the eight bolts and spring washers securing the steering box to the transmission.
18. Lift and manoeuvre the steering box unit clear of the tractor and place on a suitable surface taking care not to damage the filters or the gear selector levers.

Refitment

1. Ensuring that all the gears and levers are in the neutral position, place the steering box unit onto the transmission housing and secure with the eight bolts and spring washers.

NOTE – DO NOT FORGET TO REFIT THE WIRING CLIP (IF FITTED) TO THE BOLT ADJACENT TO THE HIGH/LOW GEAR LEVER.

2. Secure the front of the battery carrier to the engine with the two bolts and spring washers.
3. Reconnect the power steering pipes and hoses (if fitted) and secure the R.H. pipes with the clamp bracket, and then top up the reservior with a recommended fluid.
4. Reconnect the Multi-Power shift lever. (Multi-Power tractors only).
5. Reconnect the fuel pipes.
6. Reconnect the drag links to the steering box drop arms.
7. Reconnect the air cleaner hose to the air cleaner.
8. Reconnect the L.H. and the foot throttle control rods to the cross shaft.
9. Refit the fuel cut-off control rod and connect it to the injector pump.
10. Reconnect the tractormeter drive cable to the engine.
11. Refit the oil pressure gauge pipe to the engine and the gauge.
12. Refit the temperature gauge bulb to the thermostat housing.
13. Refit the rear light wire (if fitted) to the switch and secure the wire to the steering column with the clip.
14. Feed the main wiring harness through the battery carrier and connect the wiring to the starter motor, dynamo, safety start switch, thermostart and the horn (if fitted).
15. Refit the battery.
16. Refit the fuel tank as stated in Part 3C-03-05.
17. Reconnect the battery leads and bleed the fuel system as stated in Part 3C, then refill the power steering reservior (if fitted) as stated in Part 6C-08-10.

SPLITTING THE TRACTOR BETWEEN THE TRANSMISSION AND THE CENTRE HOUSING

3A-05

Special Tools Required: See operation 7A-03-16 (Multi-Power tractors only)
and
270 Rail Trolley
MF 27T Support Stand

Disassembly

1. Drain the oil from the transmission and the centre housing.
2. Release the footbrake operating rods from the brake cross shaft levers.
3. Remove the two bolts, nuts and washers each side, securing the footplates to their front mounting brackets.
4. Disconnect the rear light wire from the switch and then release the wire from two clips, one underneath the instrument panel on the steering column and the other adjacent to the High/Low gear lever.
5. If the tractor is fitted with a horizontal exhaust system, remove the bolt, nut, washer and clip securing the silencer to the exhaust down-pipe, then release the down-pipe from the silencer.
6. Place wedges between the front axle beam and engine support casting.
7. Position the tractor dismantling stand No. 270 under the tractor and support the transmission housing and centre housing on trolleys.
8. Remove the hydraulic lift cover as stated in operation 7A-03-16 and then disconnect the hose to the Multi-Power spool valve at the Multi-Power pump (Multi-Power tractors only).
9. Remove the bolts securing the transmission to the centre housing.
10. Push the rear part of the tractor out of engagement with the transmission.
11. Fit support stands 27T to the transmission housing and the centre housing. Secure each stand with one bolt each side.

Reassembly

1. Support the transmission housing and centre housing on rail trolleys and then remove the support stands MF 27T.
2. Fit the rear drive shaft to the transmission, then fit the shear tube to the rear drive shaft.
3. Remove the p.t.o. side cover from the centre housing (6 and 8 speed transmission tractors only).
4. Fit a new gasket to the centre housing.
5. Push the rear half of the tractor into engagement with the transmission, simultaneously aligning the shear tube splines onto the rear axle pinion splines and the transmission front p.t.o. drive shaft into the camshaft coupler splines or the plated drive unit (Multi-Power tractors only).

NOTE – ALIGNMENT OF THE SHEAR TUBE CAN BE EFFECTED THROUGH THE P.T.O. SIDE COVER APERTURE IN THE CENTRE HOUSING (6 and 8 SPEED TRANSMISSION TRACTORS ONLY).

Alignment of the hydraulic pump drive is facilitated by rotating the flywheel, this is effected by removing the 9/16 Allan plug in the L.H. side of the clutch housing and using a suitable lever.

6. End float between the rear drive shaft and the main shaft must be governed to 0,4 to 2,5 mm (0.015 to 0.100 in), by fitting the split pin to the appropriate hole in the shear tube.
7. Bolt the transmission to the centre housing.
8. Replace the p.t.o. cover (6 and 8 speed transmission tractors only).
9. Reconnect the Multi-Power spool valve hose to the Multi-Power pump and refit the lift cover as stated in operation 7A-03-16. (Multi-Power tractors only).
10. Remove the wedges from the front axle beam and remove the tractor stand from beneath the tractor.
11. If the tractor is fitted with a horizontal exhaust system, refit the exhaust down-pipe into the silencer and secure with clip, bolt, nut and washer.
12. Reconnect the rear light wiring to the light switch and secure the wire with the two clips.
13. Secure the footplates.
14. Refill the transmission with recommended oil.

COOLING SYSTEM

Part 3 Section B

GENERAL

The coolant is circulated by thermo-syphon action and a centrifugal type pump driven by a belt from the crankshaft. The system incorporates a thermostat, which prevents the coolant flowing to the radiator unit the working temperature is reached. Cooling is aided by the action of the fan drawing air through the radiator and the fan shroud.

The only maintenance required on the cooling system is to ensure that there is no obstruction to the flow of air to the radiator, and that the fan belt is kept to the correct tension.

This section of the Workshop Manual gives only partial details of the cooling system components. For more comprehensive details, particularly related to servicing, see the Perkins Workshop Manual.

COOLING SYSTEM

RADIATOR

Removal and Refitment 3B-01-02

Removal
1. Remove the radiator cap and drain the coolant from the radiator and engine.
2. Remove the hood and grille assembly as stated in Part 2B.
3. Remove the top and bottom radiator hoses.
4. Remove the two bolts, plain washers and lockwashers securing the radiator to the front axle support.
5. Remove the bolt securing the radiator tie rod to the shroud.
6. Remove the radiator and shroud assembly from the tractor.
7. If necessary remove the 11 screws securing the shroud and the two plates to the radiator.

Refitment
1. If necessary refit the shroud and the two plates to the radiator and secure them with the 11 screws.
2. Locate the radiator and shroud assembly on the front axle support and secure with the two bolts, plain washers and lockwashers.
3. Refit the radiator tie rod securing bolt.
4. Refit the top and bottom hoses.
5. Refit the hood and grille assembly as stated in Part 2B.
6. Close the radiator and engine drain taps and refill the radiator and engine with coolant.
7. Refit the radiator filler cap.

WATER PUMP

Removal and Refitment 3B-02-02

Removal
1. Remove the radiator as stated in Operation 3B-01-02.
2. Remove the water pump as stated in the Perkins Workshop Manual.

Refitment
1. Refit the water pump as stated in the Perkins Workshop Manual.
2. Refit the radiator as stated in operation 3B-01-02.

WATER PUMP

Servicing 3B-03-02

1. Remove the water pump as stated in operation 3B-02-02
2. For servicing details see the Perkins Workshop Manual.
3. Refit the water pump as stated in operation 3B-02-02.

THERMOSTAT

Removal and Refitment 3B-04-02

Removal
1. Remove the fuel tank as stated in operation 3C-03-02.
2. Remove the thermostat as stated in the Perkins Workshop Manual.

Refitment
1. Refit the thermostat as stated in the Perkins Workshop Manual.
2. Refit the fuel tank as stated in operation 3C-03-02.

THERMOSTAT

Testing Procedure 3B-05-02

1. Remove the thermostat as stated in operation 3B-04-02.
2. Test the thermostat as stated in the Perkins Workshop Manual.
3. Refit or replace the thermostat as necessary, as stated in operation 3B-04-02.

FROST PRECAUTIONS

For obvious reasons precautions must be taken against the ravages of frost. There are three methods whereby protection may be afforded. These are listed below.

Draining the Cooling System after each day's work
This method offers economy, but can be inconvenient and leaves the cooling system unprotected during idle periods. In extremely unfavourable conditions the cooling system can freeze while the engine is running.

Under conditions where hard water conditions exist, silt formation and impeller erosion will be accelerated by the frequent draining and refilling of the cooling system.

Under these conditions the saving is debatable..

The use of Heated Premises, Engine or sump Heaters
Possesses disadvantages similar to the above method, i.e. during the working day no protection is afforded if the tractor is standing idle.

The use of Anti-Freeze
Probably the most universally accepted method of frost protection. Anti-freeze solutions, by their very nature, are capable of power of penetration not possessed by water. A cooling system which is normally sound may well exude leaks and drips when anti-freeze is employed. Even if no leaks are apparent in the initial filling, they may subsequently develop within a very short time. It is precisely for this reason that all cooling system hoses, joints, etc., must be in sound condition if expensive loss is to be avoided. A leaky cooling system and frequent topping up will reduce the protection afforded to dangerous limits.

NOTE – ONLY THE ANTI-FREEZE SOLUTIONS LISTED IN THE SPECIFICATION SECTION MEET MASSEY-FERGUSON TEST SPECIFICATIONS. THE USE OF INFERIOR GRADES OF ANTI-FREEZE (INCLUDING SOME SOLUTIONS CONFORMING B.S. 3151) CAN CAUSE SEVERE DAMAGE TO THE COOLING SYSTEM.

Recommended Anti-Freeze solutions are given in the Specification section.

The cooling system must be drained and flushed when the risk of frost has passed.

FAULT DIAGNOSIS

The diagnosis of faults contributing to overheating of the engine must be undertaken carefully, and all external causes thoroughly investigated. An apparent cooling system defect may, for example, be cured by adjusting the injection setting, or by tightening the fan belt. It is not intended to cover in this section the engine defects which may contribute towards overheating. The faults listed below are cooling system faults which, of course, can be accentuated by engine deficiencies, conditions, and the handling of the tractor.

Symptom	Possible Causes	Remedy
Coolant Boils	Insufficient water in radiator	Top up radiator
	Leaking radiator filler cap	Rectify
	Leaking hoses or joints	Rectify
	Leaking water pump seal	Rectify
	Weak or broken spring Defective valve seat in radiator filler cap	Renew filler cap
	Fan blades incorrectly fitted	Rectify
	Slack or worn fan belt	Adjust or renew belt
	Incorrect gear selection (Engine slogging or racing)	Select correct gear to suit operation requirements
	Faulty thermostat (remaining closed or not opening sufficiently)	Renew thermostat
	Perished cooling system hoses	Renew hoses
	Choked radiator core or restricted water passages	Flush out cooling (reversed flusing advised) or fit replacement radiator
	Damaged or corroded water pump impeller	Fit new impeller
	Radiator choked with mud or chaff	Clean radiator and grille
Engines runs too cool	Faulty thermostat (remaining open or not closing sufficiently)	Renew thermostat
	Operating conditions (cold head winds, etc.)	Blank off portion of the radiator

FUEL SYSTEM AND AIR CLEANER

Part 3 Section C

FUEL SYSTEM AND AIR CLEANER

GENERAL

The components and layout of the fuel and air systems are shown in Fig. 1. Cleanliness must always be observed when servicing any components of the fuel system. Suitable caps or masking tape should be available for blanking off open fuel connections as soon as a union has been removed. Do not use cotton waste or fluffy rags to clean out any part of the fuel system. When working with Diesel equipment, mechanics should always protect their hands with a protective cream. Servicing of fuel and air system components should be limited to the recommendations given in the following pages.

This section of the Workshop Manual gives only partial details of the fuel systems components. For more comprehensive details of the fuel system components, particularly related to servicing, see the Perkins Workshop Manual.

TWO STAGE DRY AIR CLEANER

The two stage dry air cleaner is situated alongside the battery on the R.H. side of the tractor. A section through the air cleaner is shown in Fig. 2. Air entering the cleaner is swirled so that particles of grit and dust are spun off and expelled through the unloader valve (4).

When the service indicator (on the instrument panel) shows red the air cleaner requires attention, after cleaning the air cleaner the indicator should be reset by pressing the button on top of the indicator.

TWO STAGE DRY AIR CLEANER

Servicing 3C-01-02

The air cleaner only needs servicing when the service indicator shows red. If, after servicing, the indicator shows red, the main element (3) is unfit for service and must be replaced. However, if, after replacement of the main element, the indicator continues to show red, the SAFETY element (2) must also be replaced.

NOTE – DO NOT CLEAN THE SAFETY ELEMENT.

The procedure is as follows:–

1. Remove the wing nut (1) and carefully slide out the main element (3).
2. Either – (a) Carefully tap the element on a CLEAN, DRY tyre. Rotate the element and continue tapping until all loose dust is removed. Alternatively – Blow the element clean, FROM THE INSIDE, with compressed air at not more than 7 kg-cm^2 (100 lb/in^2), and keeping the air line at a reasonable distance from the element at all times.

   THESE PRACTICES WILL ONLY WORK SATISFACTORILY IN DRY CONDITIONS.

   WARNING – DO NOT ATTEMPT TO BLOW THE MAIN ELEMENT CLEAN USING THE TRACTOR EXHAUST GASES.

   (b) If the element is oily, soot laden or contains damp foreign matter, the element should be washed as follows. Seal the open end of the element with either a suitable plug, or waterproof adhesive tape, then immerse the element in a vessel containing a solution of warm water (not more than 38°C (100°F – BLOOD HEAT) and a non-foaming automatic washing machine detergent (e.g. 'Pat Low Lather or Persil Automatic'). Leave the element to stand for approximately 10 minutes, then roll the element around in the liquid to clean off the dirt. Thoroughly rinse the element in CLEAN water, then remove the bung and flush out the element from the inside until the water comes through clear.

   NOTE – NEVER USE PETROL (GASOLENE) PARAFFIN OR CLEANING SOLVENTS TO CLEAN THE ELEMENT.

   Shake off the excess water and leave the element to dry naturally (this will take at least 12 hours in humid conditions). After drying out the element, check its condition for damage, or deterioration – particularly the sealing washer. A small light shone inside the element will reveal any holes or 'thin' areas. If the element is in any way damaged, it must be discarded.
3. Before refitting the element, wipe out the cleaner body with a damp cloth to remove any loose dust.
4. Squeeze the unloader valve (4) to release any loose dust.
5. Check the filter housing and hose for damage and ensure that all hose connections are tight.
6. Slide the cleaned element back into place and refit the wing nut (1).

TWO STAGE DRY AIR CLEANER

Removal and Refitment 3C-02-02

Removal

1. Disconnect the induction manifold hose at the air cleaner.
2. Disconnect the service indicator tube at the air cleaner.
3. Open the battery access panel, remove the two bolts securing the air cleaner to the battery platform and remove the air cleaner.
4. Assemble in reverse sequence.

Key to Fig. 1

1. Start-Aid Tank.
2. Two Stage Dry Air Cleaner.
3. Primary Fuel Filter.
4. Secondary Fuel Filter.
5. Injection Pump.
6. Fuel Lift Pump.
7. Injectors.
8. Fuel Tap.

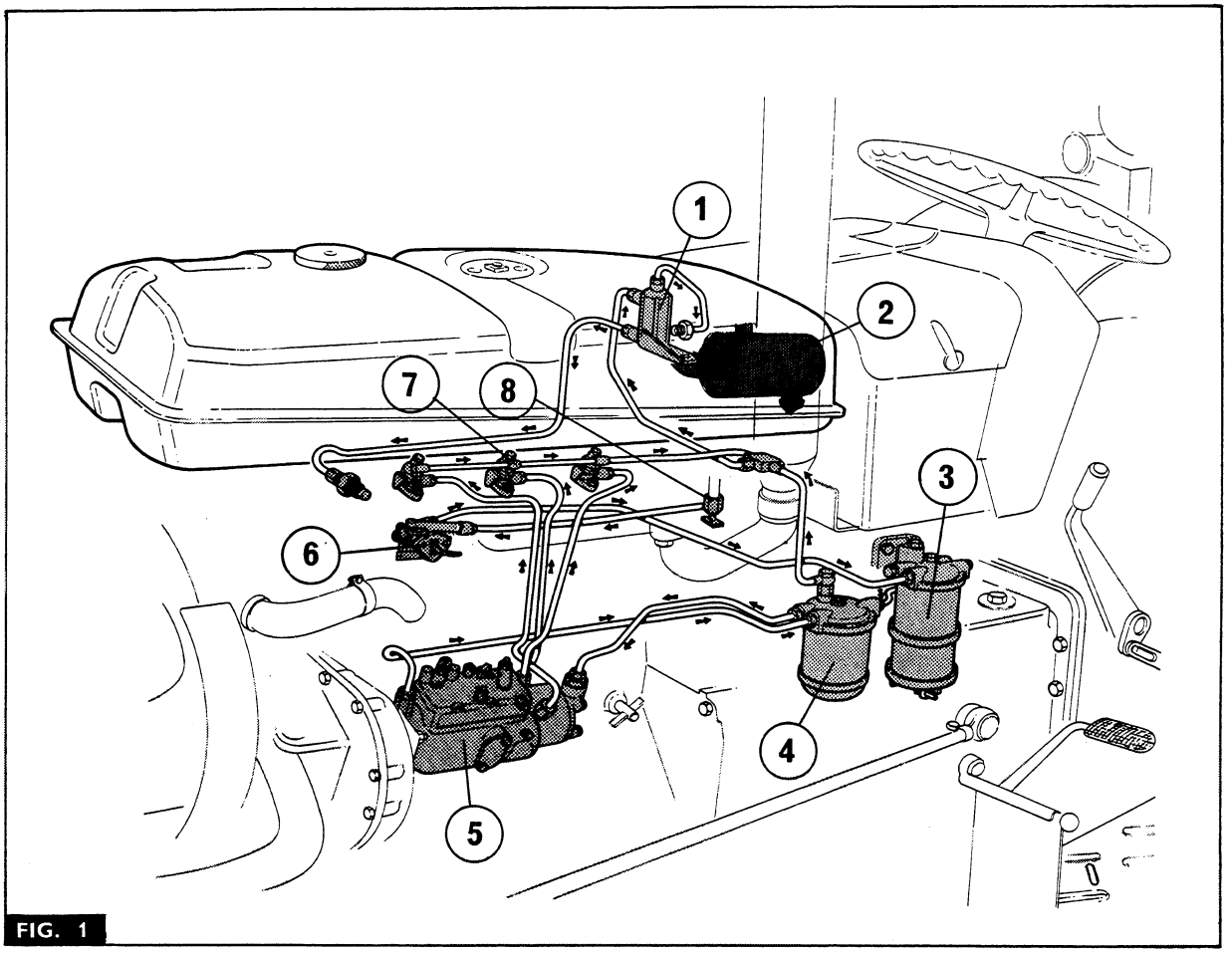
1
2
3
4
5
6
7
8

FIG. 1

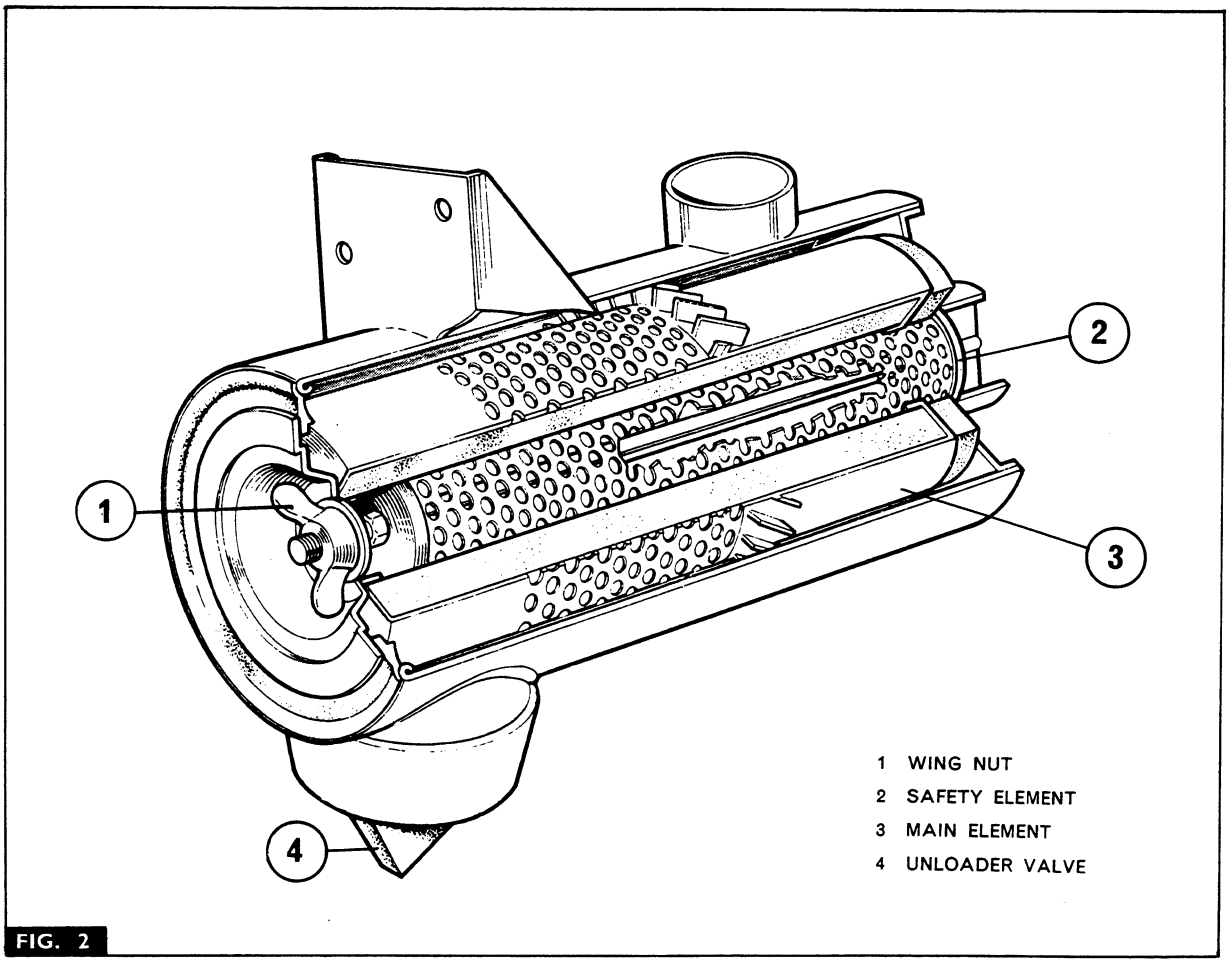
1
2
3
4
1 WING NUT
2 SAFETY ELEMENT
3 MAIN ELEMENT
4 UNLOADER VALVE

FIG. 2

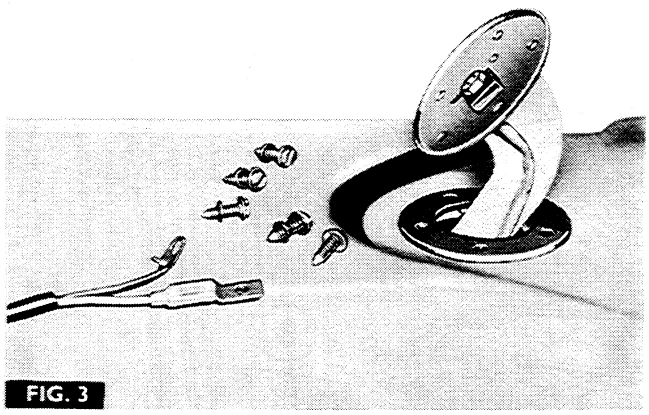

FIG. 3

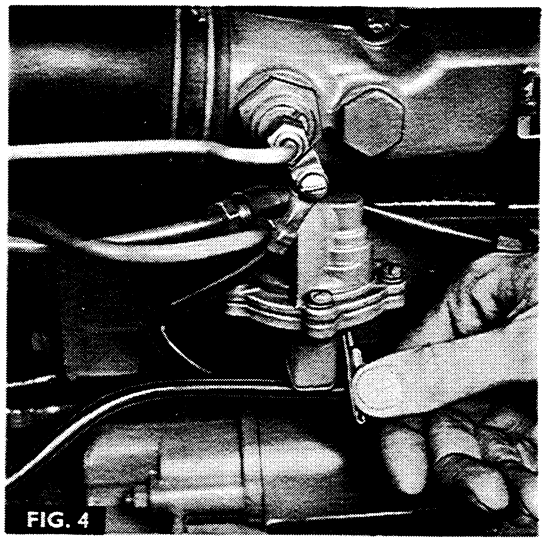

FIG. 4

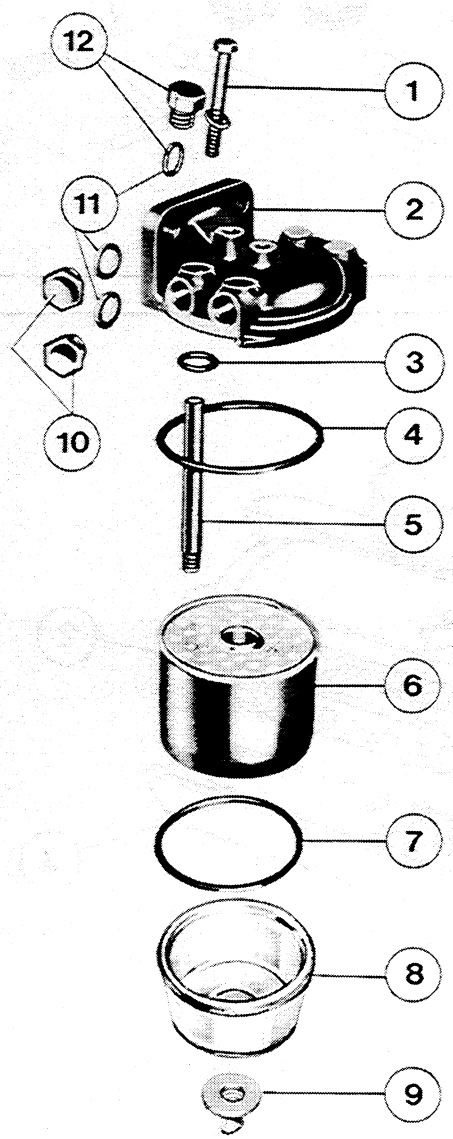

FIG. 5

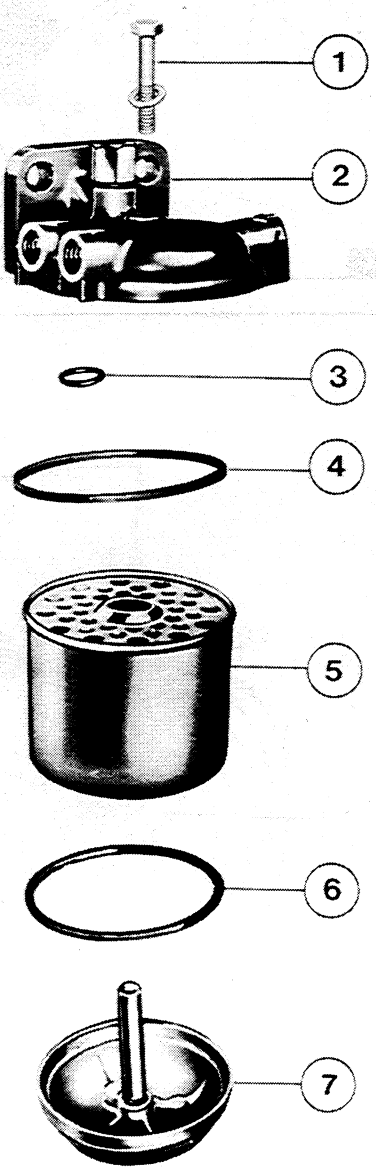

FIG. 6

FUEL TANK

The fuel tank has a capacity of 47,7 litres (10.5 Imp. gal.) and is rubber mounted above the engine. A fuel tap is fitted to the rear of the tank which enables the fuel to be turned off when required. The fuel tap incorporates a gauze filter, which extends inside the fuel tank. A fuel gauge sender unit is located in the top of the tank.

FUEL TANK

Removal and Refitment 3C-03-05

Removal

1. Remove the hood as stated in Part 2B.
2. Disconnect the battery cables and the battery securing hooks.
3. Disconnect the fuel gauge sender unit wires.
4. Disconnect the start-aid tank pipes.
5. Turn off the fuel and disconnect the pipe at the fuel tap.
6. Release the tabwashers, and remove the two bolts, metal plates and rubber pads securing the battery hook bracket, start-aid tank and the fuel tank to the mounting bracket and then lift off the start-aid tank and the battery hook bracket.
7. Remove the two self locking nuts, washers and springs securing the front of the fuel tank to the engine.
8. Move the fuel tank rearwards until the front securing bolts can be released from the fuel tank and then lift the fuel tank clear of the tractor.
9. Remove the two fuel tank securing bolts, rubber pads and washers from the thermostat housing..

Refitment

1. Refit the two fuel tank securing bolts, rubber pads and washers to the thermostat housing.
2. Place the fuel tank over the engine and locate the two front securing bolts in place and secure with the two springs, washers and lock nuts.
3. Refit the battery hook bracket, start-aid tank, rubber pads and metal plates to the rear of the fuel tank and secure with the two bolts and tabwasher.

NOTE – THE RUBBER PADS MUST BE PLACED BETWEEN THE FUEL TANK AND THE MOUNTING BRACKET AND ABOVE THE BATTERY HOOK BRACKET.

4. Reconnect the start-aid tank pipes and the pipe to the fuel tap.
5. Reconnect the fuel gauge sender unit wires.
6. Reconnect the battery cables and refit the battery securing hooks.
7. Refit the hood as stated in Part 2B.
8. Turn the fuel tap on and bleed the fuel system as stated in operation 3C-10-09.

FUEL GAUGE SENDER UNIT

Removal and Replacement 3C-04-05

1. Open the hood panel and disconnect the wires from the sender unit.
2. Remove the five screws and washers.
3. Fig. 3. Manoeuvre the sender unit out through the aperture in the tank.
4. Remove the cork seal.
5. When replacing, attach the wire to the centre terminal before placing the sender unit in the fuel tank.

START-AID TANK

The start-aid tank is a small container situated between the fuel tank and the battery. This tank serves as a reservoir for the engine thermostart and a junction for the primary fuel filter, fuel injection pump and injector leak-off pipes. It contains no valves and requires no maintenance other than ensuring that there are no leaks at the unions.

START-AID TANK

Removal and Refitment 3C-05-05

1. Remove the hood as stated in Part 2B.
2. Disconnect and blank off pipes:
   (a) Injectors to start-aid tank.
   (b) Start-aid tank to thermostart.
   (c) Fuel tank to start-aid tank, at the start-aid tank.
3. Release the tabwasher and remove the R.H. fuel tank securing bolt and lift off the start-aid tank.
4. Replace in reverse order.

NOTE – PRIME START-AID TANK BEFORE ATTEMPTING TO USE THERMOSTART.

THERMOSTART

To facilitate starting under cold weather conditions, a thermostart is fitted to the engine induction manifold and provides pre-heating and priming of the inlet manifold and combustion chambers. The first movement anti-clockwise, of the starter switch operates the thermostart heater, so causing the heater coil to expand and allowing the ball valve to lift and, at the same time, a small quantity of fuel flows from the reservoir tank through the heater, wherein it is vapourised and then ignited by the heater coil. A second anti-clockwise movement of the starter switch operates the starter motor and the ignited fuel is drawn into the engine. Before operating the thermostart, ensure fuel is present in the start-aid tank.

NOTE – SEE PERKINS WORKSHOP MANUAL FOR SERVICING DETAILS.

FUEL LIFT PUMP

Fig. 4.
A mechanical diaphragm type fuel lift pump operated by the engine camshaft and incorporating a hand primer is fitted to the R.H. side of the engine. The pump is installed between the induction manifold and the starter motor solenoid.

NOTE – SEE PERKINS WORKSHOP MANUAL FOR SERVICING DETAILS.

FUEL INJECTORS

The fuel injectors deliver to the engine combustion chambers the quantity of atomised fuel determined by the engine throttle load.

Injection operation pressure is 170 atmospheres. The servicing of injectors must not be attempted unless proper facilities and equipment are available.

Servicing is advised at least every 500 hours. Attention will be required more frequently if the fuel cleanliness, or the engine cooling system is neglected.

NOTE – SEE PERKINS WORKSHOP MANUAL FOR SERVICING DETAILS.

FUEL INJECTION PUMP

The C.A.V. distributor type fuel injection pump is a robust precision built unit incorporating a mechanical governor, and is gear driven from the engine timing case. Provided clean fuel of correct grade is used, and regular attention is paid to the fuel filters, very little trouble should be experienced with the injection pump. Servicing of the injection pump should be limited to recommendations given in the Perkins Workshop Manual.

FUEL FILTER

Two fuel filters, a primary and secondary, are fitted beneath the battery on the L.H. side of the tractor.

These filters are fitted, not to compensate for careless filling, but to protect the finely machined components of the fuel injection equipment from the ravages of dirt and foreign bodies which may be present in the fuel oil. Careless filling can over-burden these filters and defeat their purpose. Before attempting to dismantle the fuel filters, thoroughly clean the exterior of the filter bodies.

PRIMARY FUEL FILTER

Fig. 5.
The filter consists of the filter head (2), element (6), glass bowl filter base (8) and drain tap (9). Any water which accumulates in the bottom of the glass bowl can be drained off, by turning the tap in the base of the filter, anti-clockwise.

An expendable cartridge type filter element is employed and this should be discarded and replaced by a new one every 500 hours. No attempt must be made to clean or in any way reclaim the old element.

PRIMARY FILTER ASSEMBLY

Removal and Refitment 3C-06-06

1. Disconnect and blank off pipes.
   (a) Primary to secondary filter.
   (b) Fuel lift pump to primary filter, at primary filter.
2. Remove two securing bolts and withdraw filter complete.
3. Replace in the reverse order and bleed the fuel system as stated in operation 3C-10-09

PRIMARY FUEL FILTER ELEMENT

Replacement 3C-07-06

1. Remove drain plug (9) and run off fuel. The bleed screw (12) may need slackening to permit fuel to drain off.
2. Remove the 7/16 in AF bolt (1) from the filter head (2).
3. Remove the sediment filter bowl (8) complete with the filter element.
4. Discard the filter element. Reclamation must not be attempted.
5. Flush out the filter sediment bowl in clean fuel or paraffin. Do not use rags.
6. Fit new 'O' rings (3, 4 and 7).
7. Insert a new filter element and assemble bowl.
8. Bleed the fuel system as stated in operation 3C-10-09, before attempting to start the engine.

NOTE – RENEW ELEMENT EVERY 500 HOURS.

SECONDARY FUEL FILTER

Fig. 6.
The filter consists of a filter head (2), element (5) and base (7). Again an expendable cartridge type element is employed, and this should be changed every 1000 hours. No attempt must be made to clean or reclaim the element.

SECONDARY FUEL FILTER ASSEMBLY

Removal and Refitment 3C-08-06

1. Disconnect and blank off pipes:
   (a) From secondary to primary filter.
   (b) From secondary filter to fuel injection pump (2 pipes).
   (c) From secondary filter to start-aid tank, at the secondary filter.
2. Remove the two securing bolts and washers and remove filter.
3. Replace in the reverse order. Bleed the fuel system as stated in operation 3C-10-09.

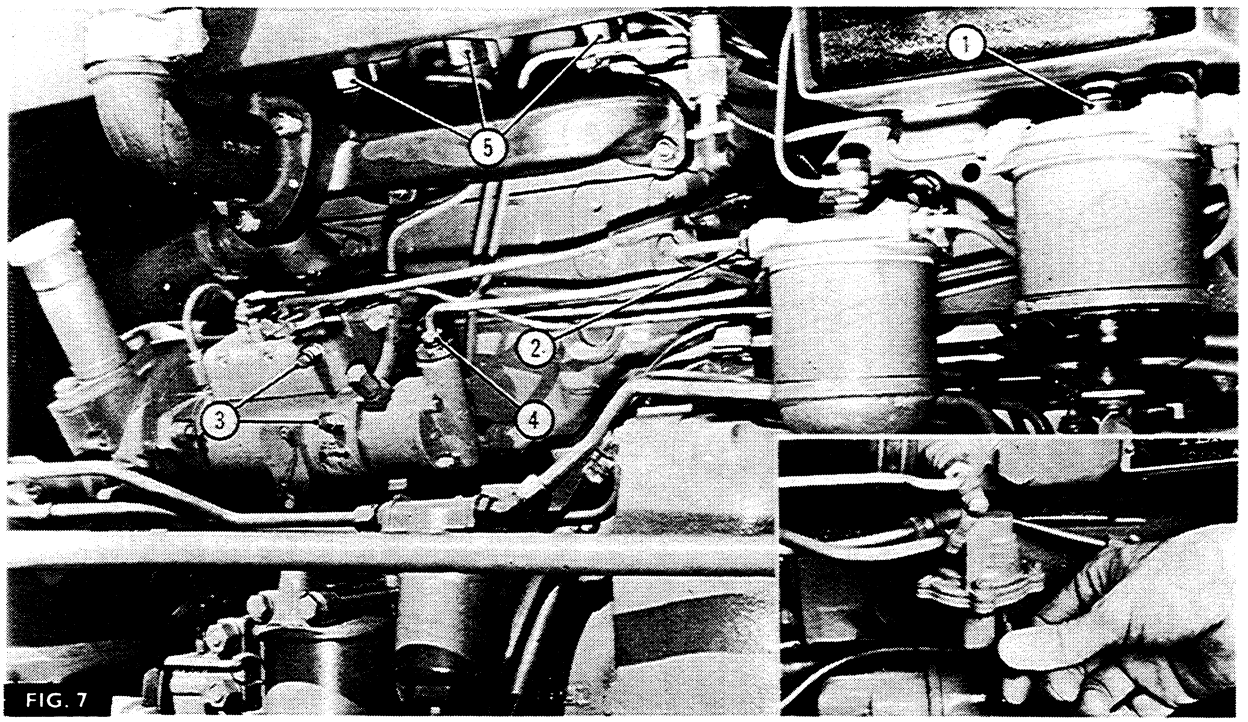

FIG. 7

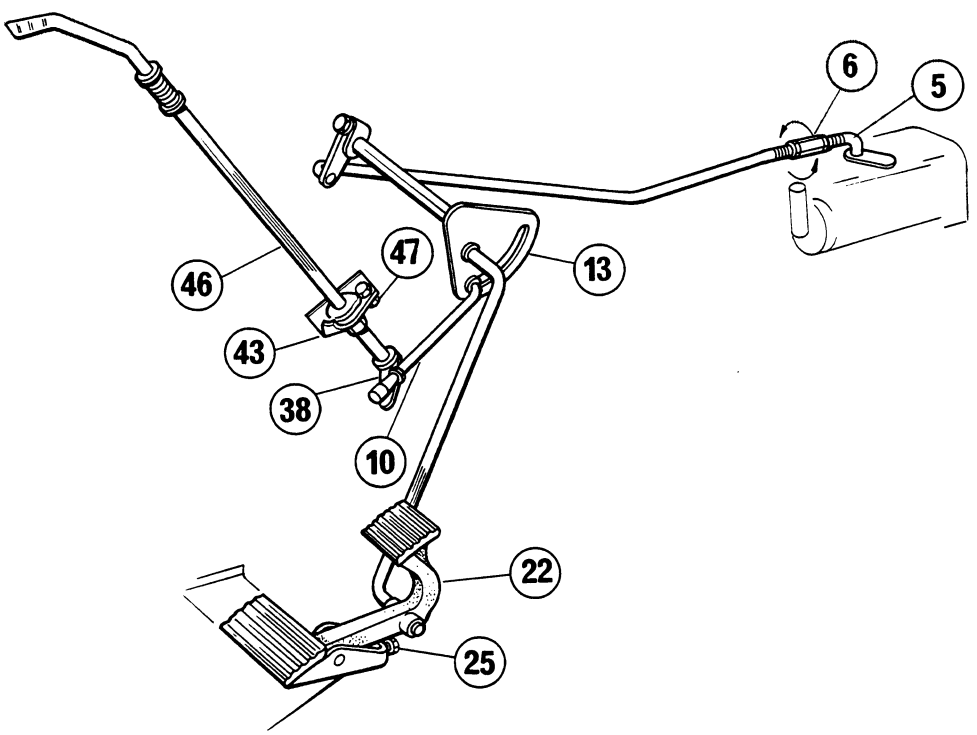

FIG. 8

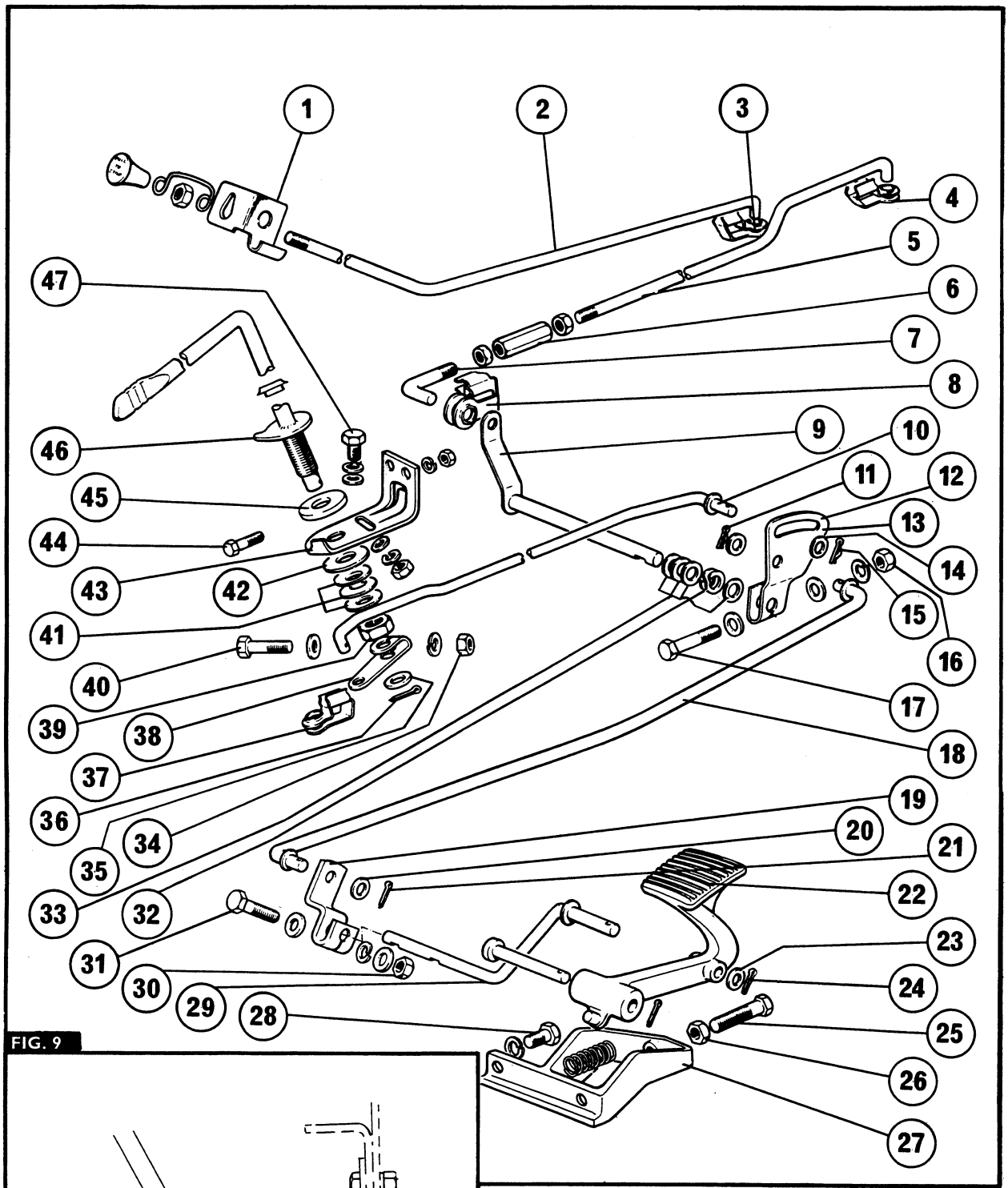
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FIG. 9

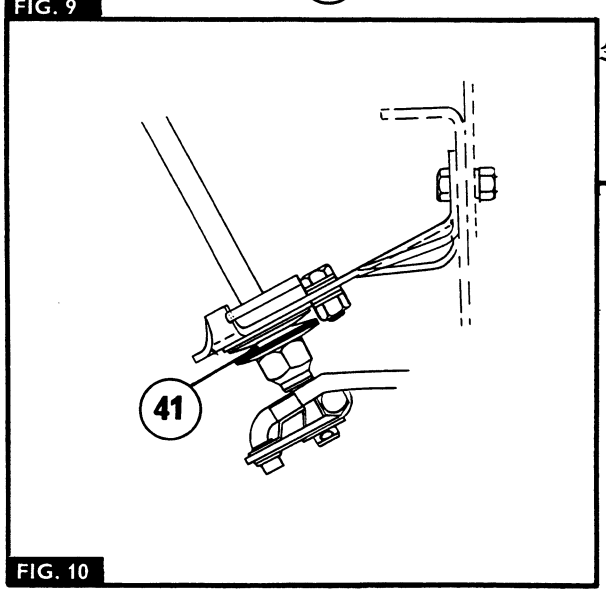
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FIG. 10

SECONDARY FUEL FILTER ELEMENT

Replacement 3C-09-09

1. Remove 7/16 in AF centre bolt (1) from the filter head (2).
2. Ease base (7) and element (5) from the filter head.
3. Fit new 'O' rings (3, 4 and 6).
4. Change element (5) and replace in reverse order. Bleed the fuel system as stated in operation 3C-10-09

NOTE – ELEMENT RENEWAL SHOULD BE CARRIED OUT EVERY 1000 HOURS. NO ATTEMPT SHOULD BE MADE TO CLEAN OR RECLAIM THE FILTER ELEMENT.

DE-AERATION OF FUEL SYSTEM 3C-10-09

Should air enter the system, due to unexpected emptying of the fuel tank, dismantling of the fuel filter, sediment bowl or feed pump for cleaning or for any other reason, the fuel system must be de-aerated before any attempt is made to start the engine.

Procedure as follows:

1. Fig. 7. Check all fuel line connections for tightness, except those which will be slackened during the process of bleeding.
2. Slacken the vent plug on top of the primary fuel filter (1). Operate the hand priming lever (Inset Fig. 7) on the fuel lift pump until fuel free of air bubbles issues from vent plug. Tighten the vent plug.
3. Slacken the secondary fuel filter outlet union (2) and operate the hand priming lever until fuel free of air bubbles issues from the union.
4. Slacken off the two vent plugs (3), on the fuel injection pump body, and operate the hand priming lever until both vent plugs cease to exude air. Still operating the hand primer, tighten the lower and then upper vent plugs.
5. Slacken the bleed screw on the inlet pipe union (4) on the pump inlet; operate the priming lever and re-tighten when fuel free from air bubbles issues from around the threads.
6. Slacken the unions at the atomiser ends of all three pipes (5).
7. Set the throttle control at the fully open position and ensure that the "stop" control is pushed fully in.
8. Operate the starter to crank the engine, until fuel oil free from air bubbles issues from the high pressure pipes.
9. Tighten the unions on the high pressure pipes, and the engine is ready for starting.
10. Finally, ensure that all fuel lines are free from leaks.

FUEL CONTROL LINKAGE

Adjustments 3C-11-09

1. Fig. 8. With the rod (5) disconnected from the injector pump, and the lever (38) slack on lever (46), fully depress the foot pedal (22).
2. With the foot pedal fully depressed, adjust the rod (5) until it freely assembles into the injector pump lever at 'full throttle' setting. Tension the linkage by giving half a turn to the connector (6) in the direction indicated. Tighten the locknuts on the rod (5).
3. Release the foot pedal (22) and with the bolt (47) slack, adjust the bolt (25) so that the engine idling speed is obtained. Without further movement of the bolt (25) tighten the locknut.
4. With the foot pedal (22) fully depressed, open the hand throttle (46) against the stop on the bracket (43). Adjust the lever (38) so that the link (10) just contacts the rear of the slot on the quadrant (13). Lock the lever (38) in this position.
5. Release the foot pedal (22) and fully close the hand throttle (46). Move the hand throttle (46) slowly towards the open throttle setting until the idling rev/min is just at the point of increase. At this position, adjust the bolt (47) to provide the hand throttle idling stop.

FUEL CUT-OFF CONTROL

Removal and Refitment 3C-12-09

1. Fig. 9. Remove the rod (2) from the clip (3) at the fuel injection pump.
2. Withdraw the complete assembly through the bracket (1).
3. Reassemble in the reverse order.

HAND THROTTLE LINKAGE

Removal and Refitment 3C-13-09

1. Fig. 9. Remove the rod (5) from the clip (4) at the injection pump.
2. Disconnect the rod (7) from the clip (8) at the shaft (9).
3. Remove the clip (15) and washer (14) from the rod (10) and then remove the rod from the clip (37) at the lever (38).
4. Remove the nut (16), spring washer, flat washers and bolt (17) from the quadrant (13), then remove the quadrant, spring (32) and washers (33) from the shaft (9).
5. Withdraw the shaft (9).
6. Remove the lower instrument panel as stated in Part 2B.
7. Disconnect the battery cables and remove the battery securing brackets.
8. Move the battery as far forward as possible and remove the bolts (44) securing the throttle lever bracket (43) and then manoeuvre the complete lever from beneath the instrument panel.

9. To overhaul the lever, remove the pin (36) and washer (35), then remove the nut (34), spring washer, flat washers and bolt (40); remove the lever (38), nut (39), belleville washers (41), flat washer (42), bracket (43) and friction disc (45).
10. Assemble in reverse order and adjust the linkage as stated in operation 3C-11-09.

NOTE – THE BELLEVILLE WASHERS MUST BE FITTED AS SHOWN IN FIG. 10.

FOOT THROTTLE LINKAGE

Removal and Refitment 3C-14-10

1. Fig. 9. Carry out operations 1 and 2 of operation 3C-13-09
2. Remove the clip (15) and washer (14) from the rod (10) and release the rod.
3. Remove the pin (21) and washer (20), and release the rod (18) from the lever (19).
4. Remove the nut (16), spring washers, flat washers and bolt (17) from the quadrant (13), then remove the quadrant complete with the rod (18) from the shaft (9). If necessary, remove the clip (11) and washer (12) to release the rod (18).
5. Remove the spring (32) and washers (33) from the shaft (9) and withdraw the shaft.
6. Remove the pin (24) and washer (23) from the shaft (29).
7. Remove the two bolts (28) and spring washers securing the pedal bracket (27) to the footrest, then remove the pedal (22) complete with the bracket.
8. Remove the bolt (31), flat washers, spring washer and nut (30) and then remove the lever (19) from the rod (29) and withdraw the rod from the footrest.
9. Assemble in reverse order and adjust the linkage as stated in operation 3C-11-09.

DUAL CLUTCH

Part 4 Section A

GENERAL

The Dual Clutch Assembly enables the main transmission drive to be disconnected without interrupting the drive to the pump and p.t.o. shaft. When the main transmission drive is stopped, with the first movement of the pedal, p.t.o. driven implements can still be operated and raised and lowered by the hydraulic system. Further movement of the pedal will stop p.t.o. driven implements and the hydraulic pump.

DESCRIPTION AND PRINCIPLE OF OPERATION.

Figures 1 and 2.
The Dual Clutch Assembly consists of a main 305 mm (12 in) friction disc (16), driving the transmission main input shaft, and a p.t.o. 254 mm (10 in) friction disc (12) driving the p.t.o. input shaft. The main friction disc (16) is operated by the main pressure plate (15), against the engine flywheel. The p.t.o. friction disc (12) is operated by the p.t.o. pressure plate (11) against a false flywheel (13). Pressure plate movement is obtained by three release levers (7), pivoted on the clutch cover plate (9). Initial release lever movement operating against the 12 coil springs (18), moves the main pressure plate (15), rearwards and so releases the main friction disc (16). Further movement of the main pressure plate (15), by the release levers, forces the setscrews (5) on the main pressure plate against the p.t.o. pressure plate (11). This moves the p.t.o. pressure plate (11) against its belleville spring (10), and releases the p.t.o. friction disc (12). The clutch release levers (7) are operated by a release bearing (3) which is moved by the clutch pedal.

DUAL CLUTCH

MAIN FRICTION DISC OR CLUTCH ASSEMBLY

Removal and Refitment. 4A-01-02

Special Tools Required: MF 159A Clutch Centraliser
MF 215 P.T.O. Clutch Setting Gauge
MF 314 Lever Height Setting Gauge

WARNING : SPRING PRESSURE WILL CAUSE THE CLUTCH COVER TO FLY APART IF PRESSURE IS NOT RELEASED SLOWLY AND EVENLY. THE GIVEN SEQUENCE OF INSTRUCTIONS MUST BE CAREFULLY FOLLOWED.

Removal

1. Split the tractor between the engine and transmission as stated in Part 3.
2. Fig 3. Fit three slave bolts, ¼ in UNC x 54 mm (2⅛n) to the three equi-spaced holes in the clutch cover.
3. Fig. 4. Progressively slacken and remove the six bolts securing the clutch assembly to the flywheel. Detach the complete clutch assembly from the flywheel. The main friction disc will remain seperate from the clutch assembly.

Refitment.

1. Fit the main friction disc (16) to the flywheel, with the splined boss facing away from the flywheel. A very slight smear of Mobilgrease Super should be applied to the splines.
2. Fig 5. Position the clutch assembly on the flywheel and centralise the clutch assembly and main friction disc with special tool MF159A
3. Fig 4. Refit the six bolts and washers securing the clutch to the flywheel and progressively tighten the bolts.
4. Remove the three ¼ in UNC x 54 mm (2⅛ in) slave bolts and then the centraliser tool.
5. Fig 6. Using gauge MF 215, check the clearance between the p.t.o. clutch adjusting setscrews and the p.t.o. pressure plate. Slacken each adjusting screw locknut, and adjust the setscrews as required. Tighten the locknuts after adjustment.
6. Figs 7 & 8. Fit the guage MF 314 and check the adjustment of each release lever. The domed end of the release lever setscrew must be touching the gauge. Slacken the release lever setscrew locknut, then adjust the setscrew as required. Tighten the locknut after adjustment.
7. Connect the rear half of the tractor to the engine as stated in Part 3.
8. Fig. 9. To adjust the clutch pedal to the correct clearance, fit a suitable lever to the hole (A) in the end of the clutch release shaft.
9. Fig. 9. Depress the clutch pedal until the distance between the arm and the transmission case is 3,2 mm (⅛ in). Retain the arm in this position and tighten the clamping bolt (B). Re-check the adjustment.

NOTE – THE ROD ASSEMBLY MUST BE FITTED TO THE FRONT HOLE IN THE ARM. THE CORRECT ADJUSTMENT OF THE ROD ASSEMBLY IS 646 mm (25⁷⁄₁₆in) MEASURED BETWEEN THE HOLE CENTRES IN THE FORK ENDS.

CLUTCH COVER ASSEMBLY SERVICING. 4A-02-02

Special Tools Required: Hydraulic Press.

Disassembly.

1. Remove the clutch assembly, as stated in operation 4A-01-02.
2. Mark the following components to permit their refitment in the same relative positions:
   Cover Plate (9)
   P.t.o. Pressure Plate (11)
   False Flywheel (13)
   Main Pressure Plate (15)
3. Fig 10. Place the cover assembly on the hydraulic press and locate a suitable bar, as shown.
4. Apply the press pressure until the three ¼ UNC slave bolts can be easily removed.
   Remove the retaining clips (6), then drive the lever pivot pins (8) out of the cover.
6. Remove the springs (4) from the release levers (7).
7. Release the pressure from the press. The springs (18) will fully expand, raising the cover.
8. Lift off the cover plate (9) Belleville spring (10) p.t.o. pressure plate (11) p.t.o. friction disc (12) and false flywheel (13).
9. Remove the twelve springs (18) and the fibre washers (17).
10. If necessary remove the links (7 and 14).

Examination

Check all components for signs of wear, scoring, overheating or other damage.
Always check the coil springs and Belleville springs for correct loading and pressures, as stated in the Specification section.
Always fit a new pair of friction discs (12 and 16) and new fibre washers (17).
If the tractor flywheel is scored, it can be skimmed to remove scoring in 0,254 mm (0.010 in) increments up to a maximum of 1,00 mm (0.040 in).
The ledge to which the clutch cover is bolted, must also be skimmed by the same amount to maintain the distance from the clutch face to 39,75 to 39,62 mm (1.565 to 1.560 in).

WARNING: – NEVER, UNDER ANY CIRCUMSTANCES, ATTEMPT TO SKIM EITHER THE FALSE FLYWHEEL, OR THE PRESSURE PLATES, AS THIS WILL SEVERELY IMPAIR THEIR HEAT DISSIPATION CHARACTERISTICS.

KEY TO FIG 1 & 2

1	Spring
2	Carrier
3	Bearing
4	Spring
5	Setscrews
6	Clip
7	Release Lever
8	Pin
9	Cover Plate
10	Belleville Spring
11	P.T.O. Pressure Plate
12	P.T.O. Friction Disc
13	False Flywheel
14	Link
15	Main Pressure Plate
16	Main Friction Disc
17	Washer
18	Coil Spring

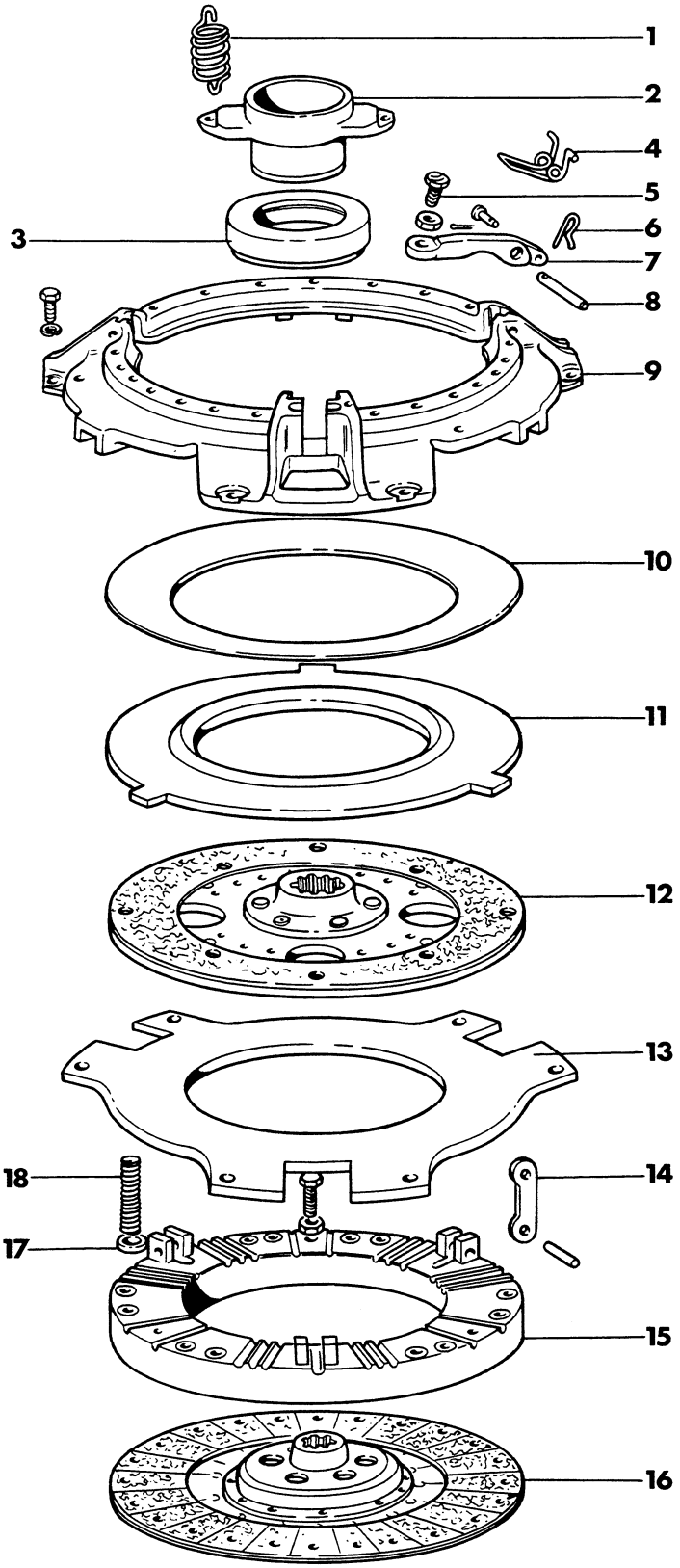


FIG. 1

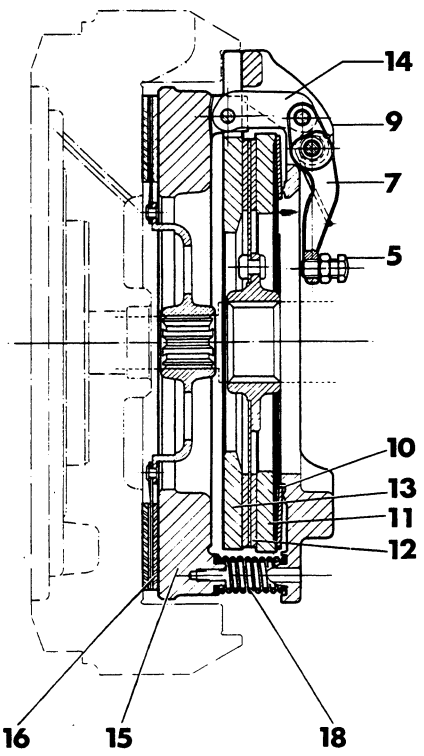


FIG. 2

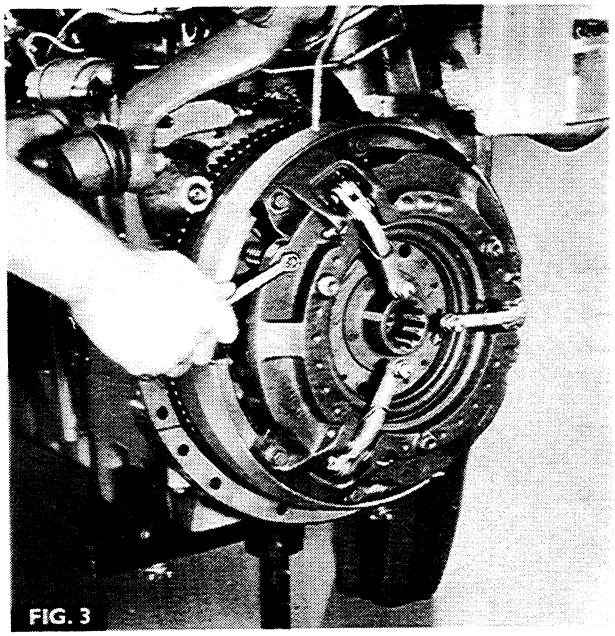
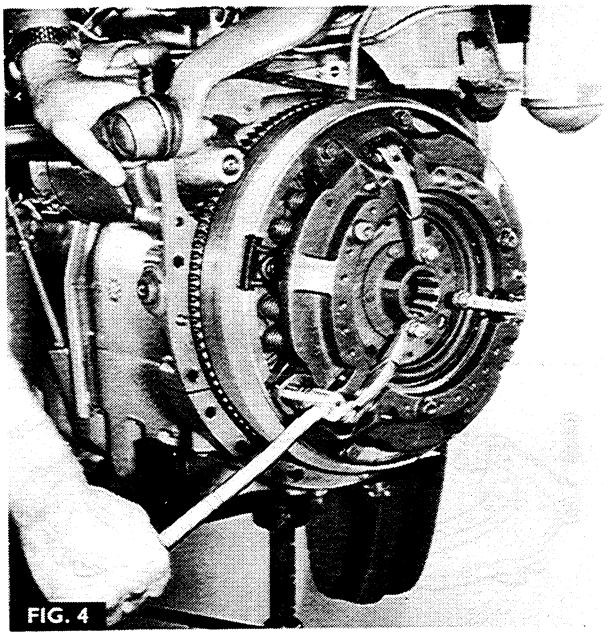


FIG. 3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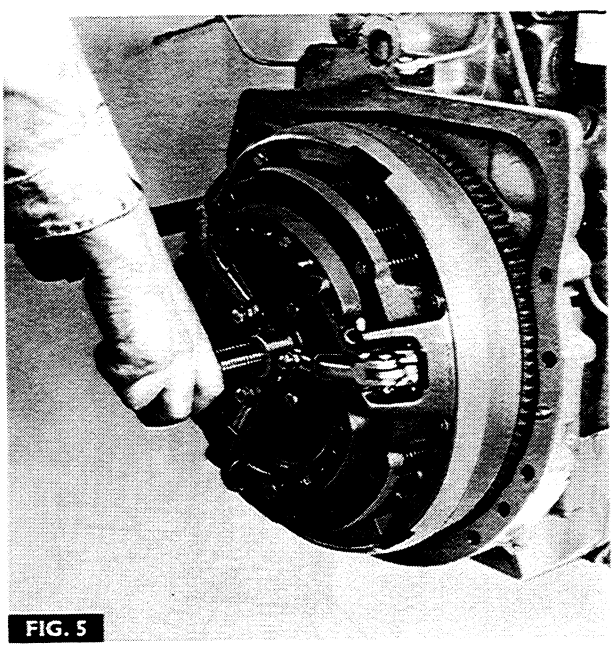
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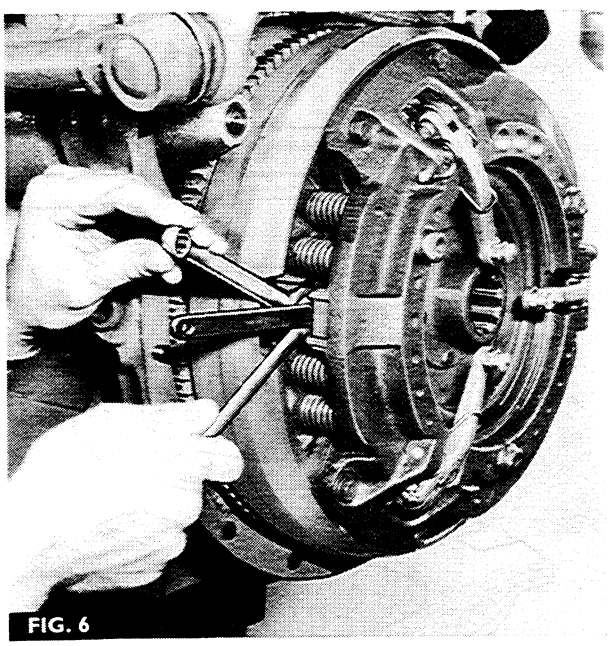
FIG. 6

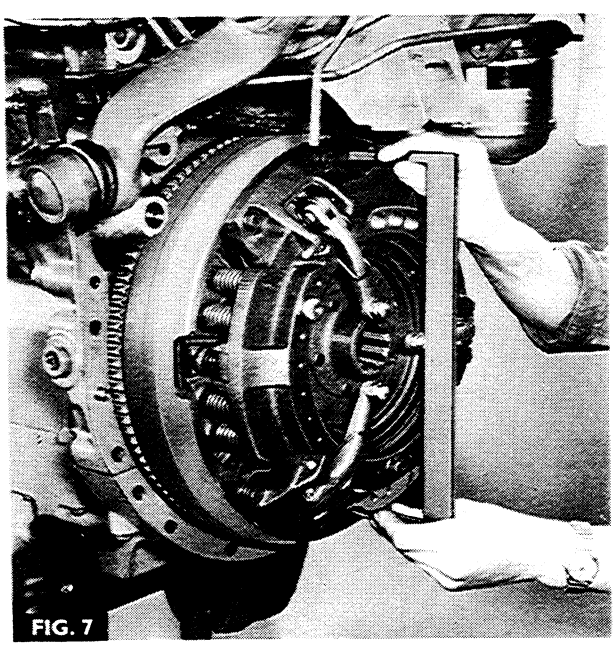
FIG. 7

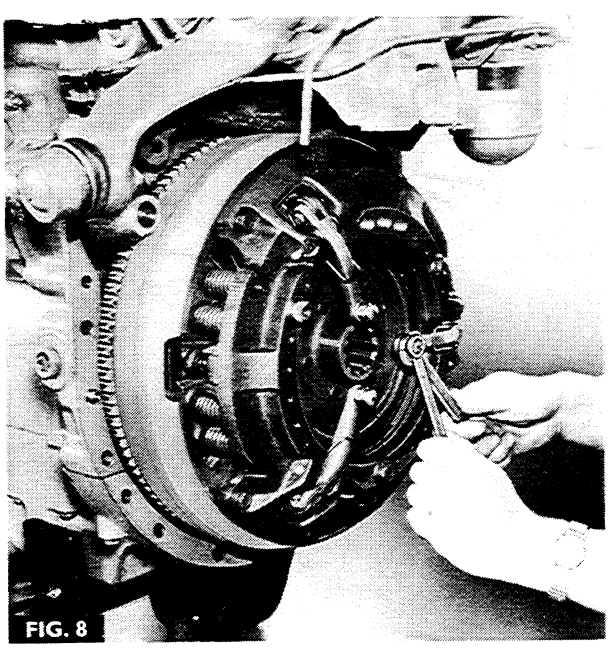
FIG. 8

Reassembly.

1. If necessary, refit the links (7 and 14) to the main pressure plate (15).
2. Aligning the marks, refit the false flywheel (13), new p.t.o. friction disc (12) p.t.o. pressure plate (11) and Belleville spring (10).
3. Fit twelve new fibre washers (17) then fit the springs (18) and finally the cover plate (9) locating the links (7) through the slots in the cover plate.
4. Fig 10. Place the cover assembly on the press, refit the bar and compress the springs until the springs (4) and pins (8) can be refitted. Secure the pins (8) with the retaining clips (6).
5. Compress the springs fully and refit the three ¼ UNC slave bolts.
6. Remove the cover assembly from the press then refit the cover assembly to the tractor, as stated in operation 4A-01-02, using a new friction disc (16).

RELEASE BEARING, CARRIER, FORK AND SHAFT

Removal and Refitment 4A-03-05

Removal

1. Split the tractor between the engine and transmission as stated in Part 3.
2. Release the two springs securing the release bearing carrier, and slide the carrier and bearing assembly off the input shaft retainer.
3. Drive out the carrier from the release bearing, only if either is being replaced.
4. Release the locking wire and remove the two locking setscrews from the release fork.
5. Slacken off the clamp bolt on the clutch pedal lever and remove the fork and shaft.

Examine the bearing, carrier, shaft and fork for wear or damage and replace if necessary.

Refitment.

1. Refit the shaft and fork, secure with the two locking setscrews and lockwire.
2. Lubricate the release bearing, carrier and input housing with Mobilgrease Super.
3. Press the release bearing onto the carrier, slide the carrier on to the input shaft retainer and secure with the two springs.
4. Connect the rear half of the tractor to the engine as stated in Part 3.
5. Adjust the clutch pedal clearance, as stated in item 8 and 9 of refitment, operation 4A-01-02.

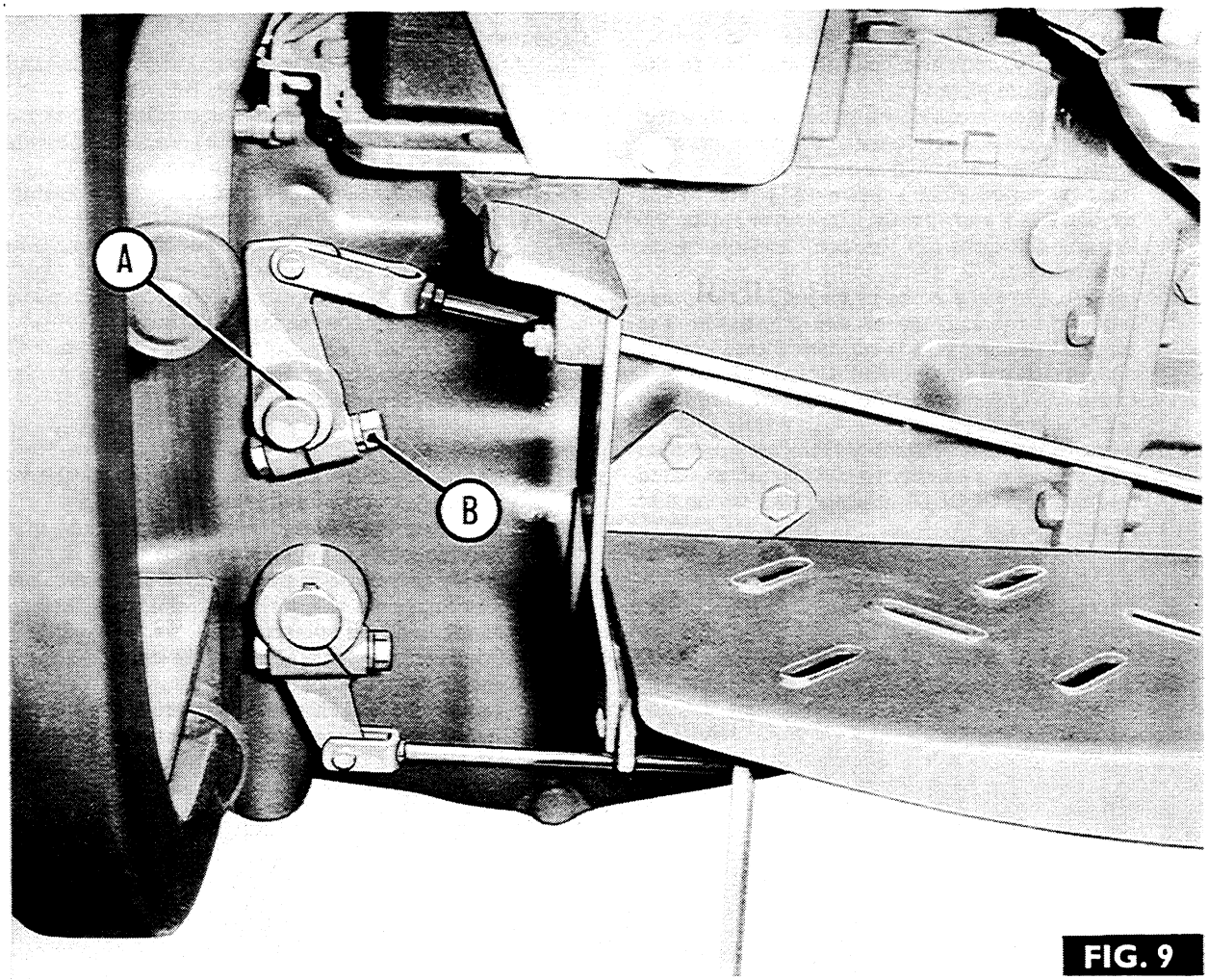

FIG. 9

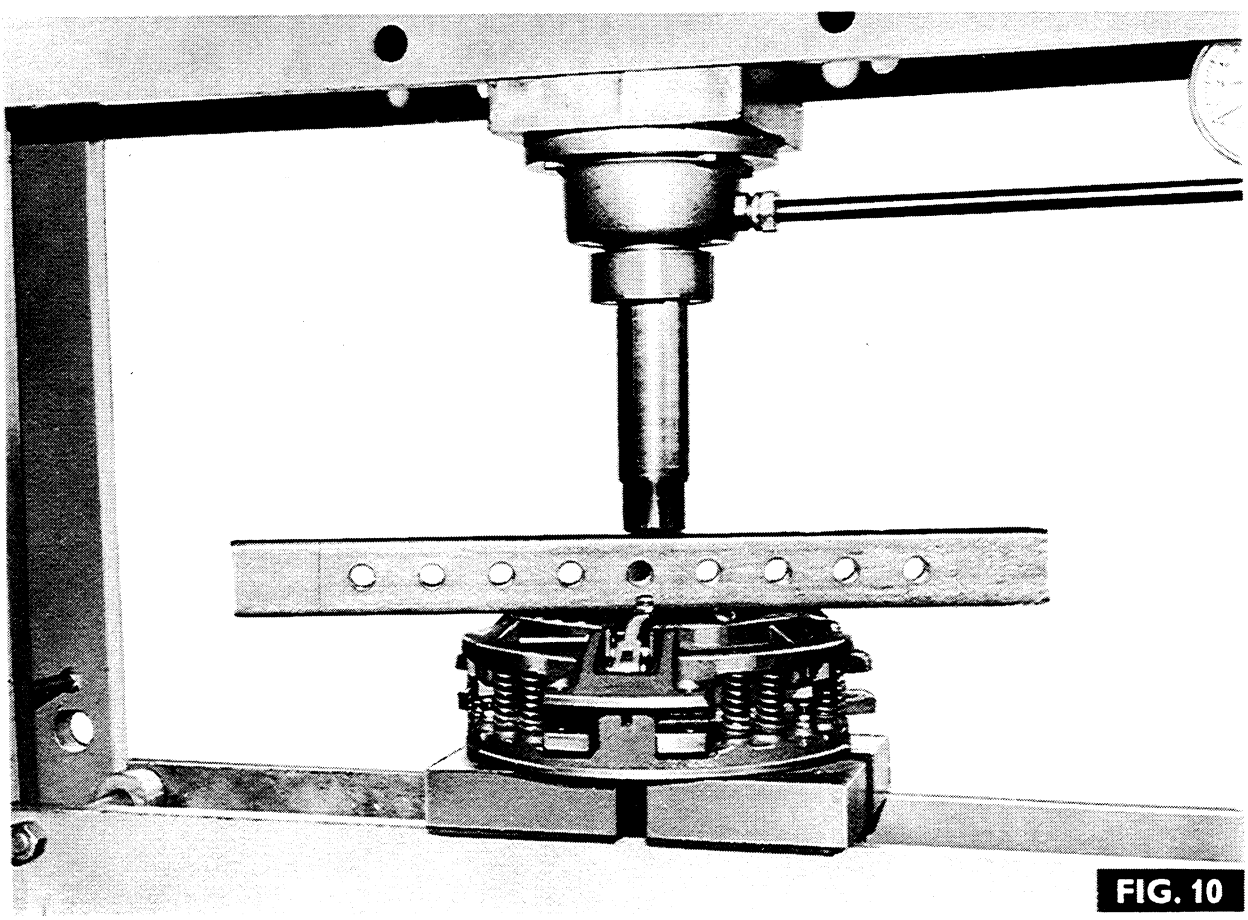

FIG. 10

MULTI-POWER TRANSMISSION

Part 4 Section B

GENERAL

Figures 1 and 2.
Multi-Power transmission provides twelve forward gears and four reverse gears. This is achieved by combining with the standard transmission, low driving (57) and driven (95) constant mesh gears, operated by a free-wheel coupler (94), and high driving (52), and driven (92) constant mesh gears operated by a multi-plate hydraulic clutch (43). By driving the countershaft (98) with either of these two pairs of gears, an alternative speed for each gear becomes available.

To provide Multi-Power, the following components are added to the standard transmission; a pair of constant mesh gears, free-wheel unit (94), multi-plate clutch (43), oil pump, oil control valve and shift mechanism (30).

The high driving gear (52), runs on a bush on the main input shaft (57), next to the low driving gear (54). The front end of the high driving gear (52) is splined to engage the clutch disc splines. The three clutch discs, plates, piston and return springs are held