PART 6

CONTENTS

		Page
Appendix A	Imperial/Metric Conversion Table	1
Appendix B	Lubricants	2
Appendix C	Tools and Accessories	3
Appendix D	Fault Location	7
Appendix E	Loctite Sealant	26
Appendix F	Glossary of Terms	28
Model Seventy-fiv	with this symbol apply only to special applica e teleprinter and are not included in the star uual. They will, however, be obtainable on rec	ndard equip
♦ Appendix G	Synchronous Motor	
♦ Appendix H	Tape Reader Attachment	
♦ Appendix J	Silencing Cover	
♦ Appendix K	Parallel Input (5-wire) Version	
♦ Appendix L	Printing Reperforator Version	

LIST OF ILLUSTRATIONS

Fig. 6.1 Model Seventy-five Tools

Fig. 6.2 Model Seventy-five Tools

Fig. 6.3 Fault Localisation Table

Fig. 6.4 Fault Localisation Chart

Part 6 EM75

APPENDIX A

IMPERIAL/METRIC CONVERSION TABLE

Inches	Millimetres
. 001	.025
. 002	. 051
. 003	. 076
.004	. 102
. 005	. 127
.006	. 152
. 007	. 178
. 008	. 203
. 009	. 229
.010	. 254
.011	. 279
.012	. 305
.013	. 330
.014	. 356
.015	. 381
.016	. 406
.017	. 432
.018	. 457
.019	. 483
.020	. 508
. 021	. 533
.022	. 559
. 023	. 584
.024	.610
. 025	. 635
. 026	.660
.027	. 686
.028	.711
. 029	. 737
.030	.762
.031	.787
. 032	.813
.033	. 838

Inches	Millimetres
.034	. 864
.035	. 889
. 036	.914
. 037	. 940
. 038	. 965
. 039	. 991
.040	1.02
.041	1.04
.042	1.07
. 043	1.09
.044	1.12
. 045	1.14
.046	1.17
.047	1.19
.048	1.22
.049	1.24
.050	1.27
.051	1.30
.052	1.32
.053	1.35
.054	1.37
. 055	1.40
. 056	1.42
. 057	1.45
. 058	1.47
. 059	1.50
.060	1.52
.061	1.55
.062	1.58
. 063	1.60
.064	1.63
. 065	1.65
.066	1.68
1	I .

Inches	Millimetres
.067	1.70
. 068	1.73
. 069	1.75
. 070	1.78
.071	1.80
. 072	1.83
. 073	1.85
. 074	1.88
. 075	1.90
.076	1.93
. 077	1.95
. 078	1.98
. 079	2.00
. 080	2.03
.081	2.06
. 082	2.08
. 083	2.11
.084	2. 13
. 085	2.16
. 086	2. 18
. 087	2.21
.088	2.23
. 089	2.26
. 090	2. 29
. 091	2.31
.092	2.34
. 093	2.36
. 094	2.39
. 095	2.41
. 096	2.44
. 097	2.46
. 098	2.49
. 099	2.51

APPENDIX B

LUBRICANTS

Creed No.	Part No.	Supplied In.	Description	Equivalents
1	TA 1095	¼ pint tin	Thin oil - SAE 10	Shell Clavus oil 17 Castrol Magna RS G.P.O. oil No.12
2	TA 1096	¼ pint tin	Medium oil - SAE 30	Shell Talpa oil 30 Castrol XL G.P.O. oil No.14
4	TA 1097	2 oz. tin	Lithium base soft grease	AeroShell 6B Castrol Spheerol AP.3
5	TA 1098	2 oz. tin	Semi-fluid water-resistant grease	Shell Mytilus A Castrol Impervia CL Mobilgrease No.1
6	TA 1317	2 oz. tube	High melting-point molybdenum disulphide grease	Rocol MT-LM
7	TA 1331	2 oz. tin	Lithium base soft grease	Shell Alvania No.1 Castrol Spheerol AP.1
8	TA 1330	¼ pint tin	Thin oil - SAE 20	Shell Tellus oil 33
9	TA 1333	¼ pint tin	Thin oil - SAE 10	Shell Tellus oil 29
10			Thick oil - SAE 140	Shell Omala 79 Mobilube GX140
11	TA 1358	¼ pint tin	Thin oil + molybdenum disulphide	Rocol MO4

APPENDIX C

TOOLS AND ACCESSORIES

1. T00LS

Description	Quantity	Part No.	Reference
Spring Hook	1	TA 1008	D, Fig.6.1
Spring Hook	1	TA 1130	A, Fig. 6.1
Tommy Pin - Medium	1	TA 1011]	,
Tommy Pin - Small	1	TA 1020	E, Fig.6.2
Tommy Pin - Large	1	TA 1360	, ,
Spanner OBA - 2BA	2	TA 1039	B, Fig. 6.2
Spanner 2BA	1	TA 1367	A, Fig. 6.2
Spanner 4BA - 6BA	2	TA 1022	
Spanner 8BA - 10BA	2	TA 1036	B, Fig.6.2
Box Spanner 2BA	1	TA 1375	N, Fig.6.1
Screwdriver 4 x 1/10 in.	1	TA 1053	Q, Fig. 6.1
Screwdriver 5 x 5/32 in.	1	TA 1187	S, Fig. 6.1
Screwdriver 5 x 1/4 in.	1	TA 1148	P, Fig. 6.1
Autoplex Tension Gauge 0-4 lb	1	1285/35	
Autoplex Tension Gauge 0-12 oz	1	1285/84	R, Fig. 6.1
Allen key	1	17504A	H, Fig.6.2
Tweezers	1 pair	8199	M, Fig. 6.1
Oilcan (For medium oil)	1	8620	E, Fig. 6.1
Oilcan (For thin oil)	1	16771	J, Fig. 6.1
Feeler Gauge .003 in.	1	TA 1344	0, 116.0.1
Feeler Gauge .004 in.	ī	TA 1345	
Feeler Gauge .005 in.	1	TA 1346	
Feeler Gauge .006 in.	i	TA 1347	
Feeler Gauge .008 in.	1	TA 1348 }	C, Fig.6.2
Feeler Gauge .010 in.	i	TA 1349	0, 118.0.2
Feeler Gauge .015 in.	1	TA 1350	
Feeler Gauge .020 in.	i	TA 1351	
Feeler Gauge .0625 in.	1	TA 1352	
Feeler Gauge .005 in.	1	TA 1339	G, Fig.6.2
Feeler Gauge .010 in. Angled End	1	TA 1340	K, Fig. 6.2
Feeler Gauge .032 in. Angled End	1	TA 1341	
Feeler Gauge .045 in. Angled End	1	TA 1342	D, Fig. 6.2
Feeler Gauge .045 in. Curved End	1	TA 1343	F, Fig. 6.2
Slip Gauge .1250/.1094 in.	1	TA 1337	
Slip Gauge .2187/.1562, .4375/.5000 in.	1	TA 1338	J, Fig.6.2
Circlip Applicator No. 2	1	TA 1373	
Circlip Applicator No.3	1	TA 1374	F, Fig. 6.1
Spring Clip (For Transmitter machines only)	1	TA 1384	M, Fig.6.2
Contact Burnisher (For Transmitter machines			, _
only) Contact Adjuster (For Transmitter machines	1	TA 1027	L, Fig.6.2
only)	1	TA 1402	K, Fig.6.1
Timing Disc (For Transmitter machines only)	1	TA 1316	B, Fig.6.1
Stroboscope 140 dvs	1	TA 1117/ 140	L, Fig.6.1
Tape Pitch Gauge	1	TA 1385	U Di~ C 1
	1		H, Fig. 6.1
Typehead Clamp		TA 1353	C, Fig.6.1
Lapping Block (For machines with Reperforating Attachment only)	1	TA 1301	G, Fig.6.1

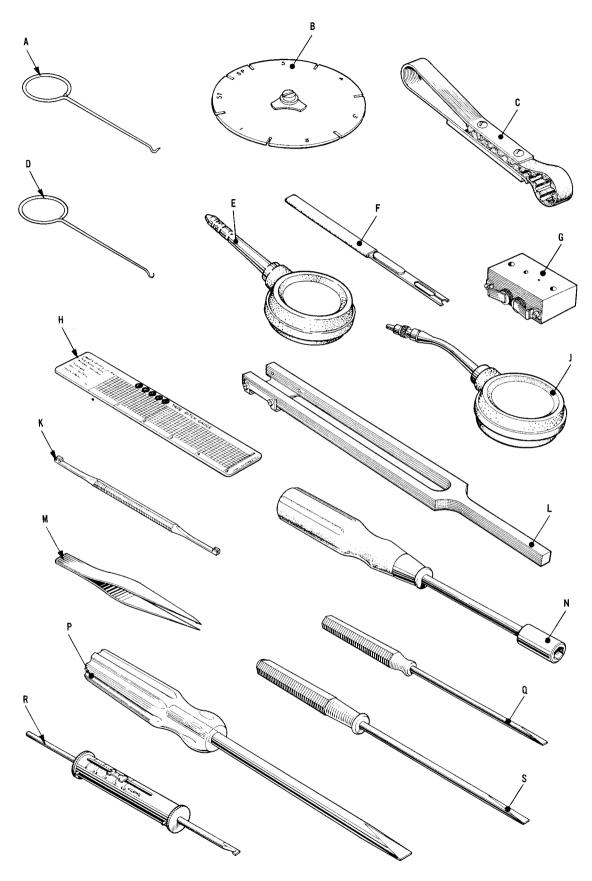


Fig. 6.1 MODEL SEVENTY—FIVE TOOLS

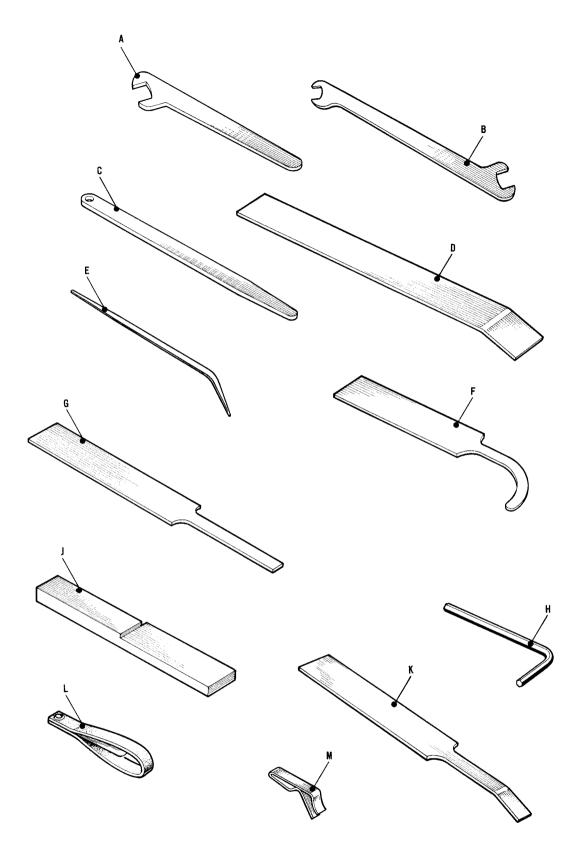


Fig. 6.2 MODEL SEVENTY—FIVE TOOLS

2. ACCESSORIES

Description	Quantity	Part No.
Lubricant No. 2 - ¼ pint tin	1	TA 1096
Lubricant No.4 - 2 oz. tin	1 1	TA 1097
Lubricant No.6 - 2 oz. tube	1	TA 1317
Lubricant No.7 - 2 oz. tin	1 1	TA 1331
Lubricant No.9 - ¼ pint tin	1 1	TA 1333
Paper Roll, code word 'ABABY'	1 1	8682
Paper Tape Reel - 11/16 in. wide, code word 'ABAST' (For		
machines with Reperforating Attachment only)	1 1	8184
Copy of Typehead Chart	1 1	
Copy of Keyboard Chart	1	
Equipment Manual EM75	i i	

FAULT LOCATION

GENERAL

The efficient correction of faults depends upon a thorough knowledge of the principles of operation of the teleprinter and the type of circuit in which it is being used. Without this knowledge it may be possible to restore the machine temporarily to a working condition, but there will be no guarantee that it will continue to work satisfactorily for any length of time. This is because a fault may sometimes be cleared temporarily by adding a compensating maladjustment to the machine, e.g. bias in the incoming signals can be compensated by biasing the electromagnet. Such practises should be avoided because they have a cumulative effect on the serviceability of the teleprinter and, in time, any slight change in the circuit conditions or in the adjustment of the remainder of the machine will probably lead to a series of faults. The cause of the trouble should be systematically localised and, if adjustment is required, rectified by using the standard adjustments only.

Since a logical analysis of the fault symptoms is essential, wherever possible it is recommended that known test messages are used in conjunction with a second machine. Suitable test messages and their uses are given on page 18. If no other teleprinter is available and the machine is fitted with a keyboard and transmitter, the 'Self-test' method described in Part 2, page 3 may be used.

The Fault Localisation Table, Fig. 6.3, provides a systematic preliminary procedure for localising faults. This table is applicable to a simple point-to-point arrangement of two Model Seventy-five teleprinters but most of the procedure can be used, with very little alteration, for other arrangements.

1	HOME STATION		STANT ATION	PROBABLE LOCATION OF FAULT	
RECEPTION	LOCAL RECORD	RECEPTION	LOCAL RECORD	OF FAULT	
Correct	Faulty	Faulty	Correct	Home keyboard or associated linkages	
Faulty	Correct	Correct	Correct	(a) Home magnet or selector (b) Distant transmitter (c) No distant signalling power	
Faulty	Faulty	Correct	Correct	Home translator and linkages or typehead	
Faulty	Correct	Correct	Faulty	Distant keyboard or associated linkages	
Correct	Correct,	Faulty	Correct	(a) Distant magnet or selector (b) Home transmitter (c) No home signalling power	
Correct	Correct	Faul ty	Faulty	Distant translator and linkages or typehead	
Faulty	Correct	Faulty	Correct	Line or line equipment	

Fig. 6.3 FAULT LOCALISATION TABLE

The majority of faults on the Model Seventy-five teleprinter will be found to be due to one or more of the following five causes.

- Maladjustment cleared by local adjustment.
- Lack of lubrication cleared either by lubricating or by cleaning and lubricating, possible necessitating local adjustment.
- Excess of dirt or foreign bodies cleared by cleaning and lubricating, possibly necessitating local adjustment.
- Worn parts cleared either by local adjustment, or by changing parts followed by local adjustment.
- Broken parts cleared by changing parts followed by local adjustment.

The Fault Localisation Chart, Fig. 6.4, and its associated text will act as an approximate guide to most general fault possibilities.

Fig. 6.4 Reference	Fault	Probable Cause	Rectification
	MOTOR		
1	Motor will not start (Receive)	(a) Dirty or disconnected plug connexions	Clean or re-connect
		(b) Starter switch operating link maladjusted	Adjustment No.37
		(c) Starter switch linkage stiff	Remove cause of stiffness
		(d) Worn brushes	Renew
		(e) Dirty commutator	Clean and polish
2	Motor will not start (Transmit)	(a) Dirty or disconnected plug connexions	Clean or re-connect
		(b) Trip shaft maladjusted	Adjustment No.38
		(c) Starter switch linkage stiff	Remove cause of stiffness
		(d) Worn brushes	Renew
		(e) Dirty commutator	Clean and polish
3	Motor will not stop	(a) Incorrect engagement of starter switch spindle	Adjustment No.14
		(b) Starter switch hold-out lever maladjusted	Adjustment No.15
		(c) Starter switch hold-out bush maladjusted	Adjustment No.16
		(d) Trip shaft maladjusted	Adjustment No.38
4	Motor speed incorrect	(a) Incorrect governor spring tension	Adjustment No.81
		(b) Governor contacts incorrectly set or damaged	Adjustment Nos. 18 and 19
		(c) Variation in mains voltage	Adjust governor spring to suit
		(d) Motor or governor components	See Fig.1.10 - Renew components if necessar

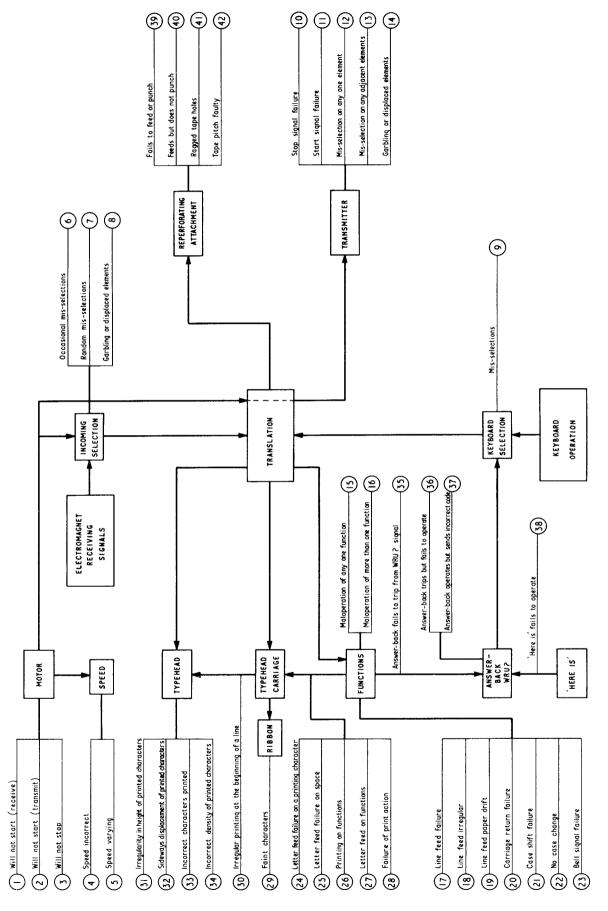


Fig. 6.4 FAULT LOCALISATION CHART

Fig.6.4 Reference	Fault		Probable Cause	Rectification
5	Motor speed varying	(a)	Governor contacts incorrectly set or damaged	Adjustment Nos. 18 and 19
		(b)	Worn brushes	Renew
		(c)	Worn commutator	Skim and polish
		(d)	Faulty connexion in mains circuit	Repair connexion
	RECEPTION			
6	Occasional mis-selections	(a)	Pecker retention arm hook maladjusted	Adjustment No.30
		(b)	Incorrect pecker clearance	Adjustment No.39
		(c)	Pecker traverse maladjusted	Adjustment No.40
		(d)	Electromagnet/rockshaft linkage loose or jammed	Re-position linkage and tighten rockshaft operating arm screw
		(e)	Excessive play in pecker assembly	Renew worn parts
		(f)	Worn selection pins	Renew
		(g)	Weak pin springs	Renew
		(h)	Excessive side-play in selector camshaft	Renew bearings
7	Random mis-selections	(a)	Motor speed incorrect	See paragraph 4 above
		(b)	Excessive bias on electromagnet	Adjustment No. 2
		(c)	Pecker retention arm hook maladjusted	Adjustment No.30
		(d)	Rockshaft tight	Adjustment No.34
		(e)	Incorrect pecker clearance	Adjustment No.39
		(f)	Pecker traverse maladjusted	Adjustment No.40
		(g)	Pin-box endplate loose	Tighten
		(h)	Electromagnet/rockshaft linkage loose or jammed	Re-position linkage and tighten rockshaft operating arm screw
		(j)	Excessive play in pecker assembly	Renew worn parts
		(k)	Worn selection pins	Renew
		(1)	Weak pin springs	Renew
		(m)	Excessive side-play	Renew bearings

Fig. 6.4 Reference	Fault	Probable Cause	Rectification
8	Garbling or displaced elements	(a) Motor speed varying	See paragraph 5 above
		(b) Incorrect trans- lator clutch trigger backstop clearance	Adjustment No.3
		(c) Incorrect translator clutch abutment engagement	Adjustment No.4
		(d) Translator clutch maladjusted	Adjustment No. 28
		(e) Incorrect selector detent clearance	Adjustment No.31
		(f) Excessive play in selector detent	Adjustment No.32
		(g) Selector clutch maladjusted	Adjustment No.33
		(h) Rockshaft tight	Adjustment No.34
		(j) Translator trip maladjusted	Adjustment No. 36
		(k) Translator clutch abutment pivot dry	Lubricate
		(1) Selector detent pivot dry	Lubricate
		(m) Selector camshaft binding on drive spindle	Remove cause of binding
		(n) Selector drive gear partially loose	Tighten
		(p) Worn selector camshaft	Renew
		(q) Worn selector detent	Renew
		(r) Worn translator detent	Renew
	TRANSMISSION - LOCAL RECORD AND DISTANT STATION		
9	Mis-selections	(a) Trip lever pivot incorrectly set	Adjustment Nos. 21 and 70
		(b) Incorrect push rod lift	Adjustment No. 22
		(c) Combination bar reset mechanism maladjusted	Adjustment No.69
,		(d) Incorrect selector bar/selection pin alignment	Adjustment No.71

Fig. 6.4 Reference	Fault	Probable Cause	Rectification
		(e) Incorrect selector bar/selection pin clearance	Adjustment No.72
		(f) Lag weight release lever maladjusted	Adjustment Nos.73 and 74
		(g) Keyboard combination bars stiff	Remove cause of stiffness
		(h) Weak combination bar springs	Renew
		(j) Keyboard push rods stiff	Remove cause of stiffness
		(k) Keyboard selector bars stiff	Remove cause of stiffness
		(1) Swarf between run out and trip bars	Clean
		(m) Worn trip lever pivot	Renew
		(n) Worn selection pins	Renew
		(p) Weak pin springs	Renew
	TRANSMISSION - DISTANT STATION ONLY		
10	Stop signal failure	(a) Incorrect setting of transmitter readout contacts	Adjustment Nos. 23 and 82 or 83
		(b) Send-receive switch contacts maladjusted	Adjustment No.78
		(c) Send-receive switch delay maladjusted	Adjustment No.79
11	Start signal failure	(a) Incorrect setting of transmitter readout contacts	Adjustment Nos.23 and 82 or 83
		(b) Send-receive switch contacts maladjusted	Adjustment No.78
12	Mis-selection on any one element	(a) Incorrect setting of transmitter readout contacts	Adjustment Nos. 23 and 82 or 83
		(b) Incorrect setting of transmitter contact	Adjustment No.82 or 83
13	Mis-selection on any adjacent elements	(a) Incorrect setting of transmitter readout contacts	Adjustment Nos.23 and 82 or 83
14	Garbling or displaced elements	(a) Motor speed incorrect	See paragraph 4 above
		(b) Transmitter levers stiff	Remove cause of stiffness
		(c) Transmitter lever stop bracket displaced	Clamp bracket in its lowest position

Fig. 6.4 Reference	Fault	Probable Cause	Rectification
	FUNCTIONAL		
15	Maloperation of any one function	(a) Function bar reset mechanism maladjusted	Adjustment No.5
		(b) Print release lever maladjusted	Adjustment No.6
		(c) Weak function bar operating spring	Renew
		(d) Function bar stiff	Remove cause of stiffness
		(e) Function bar unit incorrectly fitted	Refit unit correctly
16	Maloperation of more than one function	(a) Function bar reset mechanism maladjusted	Adjustment No.5
		(b) Print release lever maladjusted	Adjustment No.6
		(c) Function bar unit incorrectly fitted	Refit unit correctly
17	Line feed failure	(a) Line feed operating lever latch maladjusted	Adjustment No. 42
		(b) Weak line feed operating lever spring	Renew
		(c) Maloperation of any one function	See paragraph 15 above
18	Line feed irregular	(a) Platen retention lever maladjusted	Adjustment No. 43 or 44
		(b) Line feed overthrow stop maladjusted	Adjustment No.46
		(c) Platen pressure rollers too light	Adjust to increase pressure
19	Line feed paper drift	(a) Platen pressure rollers unequal	Adjust to equalise pressure
20	Carriage return failure	(a) Carriage return operating lever latch maladjusted	Adjustment No.11
		(b) Insufficient carriage return pawl lift	Adjustment No. 41
		(c) Carriage return pawl latch maladjusted	Adjustment No.41
		(d) Incorrect carriage return spring tension	Adjustment No.52
		(e) Typehead carriage stiff	Remove cause of stiffness
		(f) Weak carriage return operating lever latch spring	Renew
		(g) Maloperation of any one function	See paragraph 15 above

Fig. 6.4 Reference	Fault		Probable Causes	Rectification
21	Case shift failure	(a)	Shift bellcrank lever not centralised	Adjustment No.8
		(b)	Shift retainer stiff	Remove cause of stiffness
		(c)	Weak shift retainer spring	Renew
22	No case change	(a)	Shift bellcrank lever not centralised	Adjustment No.8
		(b)	Shift retainer stiff	Remove cause of stiffness
		(c)	Maloperation of any one function	See paragraph 15 above
23	Bell signal failure	(a)	Faulty contact spring settings	Adjustment No.90
		(b)	Function reset bar or switch arm maladjusted	Adjustment No.90
		(c)	Maloperation of any one function	See paragraph 15 above
24	Letter feed failure on a printing character	(a)	Print release lever maladjusted	Adjustment No.6
		(b)	Letter feed operating lever latch maladjusted	Adjustment No. 10
		(c)	Excessive typehead carriage end-play	Adjustment No. 48
		(d)	Incorrect position of feed and retention pawls	Adjustment No.51
		(e)	Weak letter feed operating lever latch spring	Renew
		(f)	Worn pivot of feed and retention pawls	Renew
25	Letter feed failure on space	(a)	Letter feed operating lever latch maladjusted	Adjustment No. 10
		(b)	Maloperation of any one function	See paragraph 15 above
26	Printing on functions	(a)	Print release lever maladjusted	Adjustment No.6
		(b)	Non-print hook maladjusted	Adjustment No.9
27	Letter feed on functions	(a)	Print release lever maladjusted	Adjustment No.6
		(b)	Letter feed operating lever latch maladjusted	Adjustment No. 10
		(c)	Weak letter feed operating lever latch spring	Renew

Fig.6.4 Reference	Fault]	Probable Cause	Rectification
		(d)	Worn pivot of feed and retention pawls	Renew
28	Failure of print action	(a)	Non-print hook maladjusted	Adjustment No.9
	PRINTING			
29	Faint characters	(a)	Excessive typehead/platen clearance	Adjustment No.55
		(b)	Print beam stop screw maladjusted	Adjustment No. 56
		(c)	Ribbon feed failure	Adjustment No.67
		(d)	Ribbon changeover failure	Clean and adjust changeover mechanism
30	Irregular printing at the beginning of a line	(a)	Excessive typehead carriage end-play	Adjustment No.48
		(b)	Incorrect position of retention pawl or pawl latch	Adjustment Nos. 49 and 50
		(c)	Incorrect carriage return spring tension	Adjustment No. 52
		(d)	Incorrect carriage return damping	Adjustment Nos. 53 and 87
31	Irregularity in height of printed characters	(a)	Typehead rear splined shaft maladjusted	Adjustment No.59
		(b)	Incorrect engagement of push rod/No.2 aggregate motion bellcrank	Adjustment No.64
		(c)	Incorrect engagement of shift rod/shift bellcrank	Adjustment No.64
		(d)	Typehead movement stiff	Remove cause of stiffness
		(e)	Weak typehead lift spring	Renew
		(f)	Worn typehead bushes	Renew
32	Sideways displacement of printed characters	(a)	Eccentric pivot of typehead corrector maladjusted	Adjustment Nos. 17 and 57
		(b)	Corrector track rail height maladjusted	Adjustment No.58
		(c)	Incorrect engagement of the push rods and the appropriate aggre- gate motion bellcrank	Adjustment Nos.60, 61, 62 or 63
		(d)	Typehead rotary motion stiff	Remove cause of stiffness

Fig. 6.4 Reference	Fault	Probable Cause	Rectification
		(e) Weak aggregate motion spring	Renew
33	Incorrect characters printed	(a) Eccentric pivot of typehead corrector maladjusted	Adjustment Nos. 17 and 57
		(b) Incorrect engagement of the push rods and the appropriate aggregate motion bellcrank	Adjustment Nos. 60, 61, 62 or 63
		(c) Aggregate motion lever (usually No.1) off its cam follower	Reset
34	Incorrect density of printed characters	(a) Print spring maladjusted	Adjustment No.54
		(b) Incorrect typehead/platen clearance	Adjustment No.55
		(c) Print beam stop screw maladjusted	Adjustment No.56
		(d) Corrector track rail height maladjusted	Adjustment No.58
		(e) Ribbon worn in patches	Renew
		(f) Worn platen	Renew
	ANSWER-BACK		
35	Unit fails to trip from WRU? signal	(a) Lag disc spring unwound	Rewind spring
		(b) Incorrect release lever lift	Adjustment No. 26
		(c) Lag weight release lever latch maladjusted	Adjustment No.74
		(d) Vertical trip link maladjusted	Adjustment No. 107
		(e) Incorrect trip from function bar	Adjustment No. 108
		(f) Maloperation of any one function	See paragraph 15 above
36	Unit trips but fails to operate	(a) Incorrect release lever lift	Adjustment No. 26
		(b) Incorrect position of feed pawl	Adjustment No. 111
		(c) Feed pawl stop maladjusted	Adjustment No.112
		(d) Weak lag disc spring	Renew
		(e) Weak feed pawl spring	Renew
37	Unit operates but sends incorrect code	(a) Selector bar/selection pin maladjusted	Adjustment Nos. 71 and 72

Fig. 6.4 Reference	Fault	Probable Cause	Rectification
		(b) Incorrect position of feed pawl	Adjustment No.111
		(c) Feed pawl stop maladjusted	Adjustment No.112
38	Here Is' fails to operate	(a) Lag disc spring unwound	Rewind spring
		(b) Incorrect release lever lift	Adjustment No.26
		(c) Lag weight release lever latch maladjusted	Adjustment No.74
		(d) Here Is' trip bell- crank maladjusted	Adjustment No. 106
		(e) Incorrect position of feed pawl	Adjustment No.111
		(f) Feed pawl stop maladjusted	Adjustment No.112
	REPERFORATING ATTACHMENT		
39	Fails to feed or punch	(a) Incorrect position of interposer	Adjustment No. 101
		(b) Worn fork driving plate	Renew
40	Feeds but does not punch	(a) Unit incorrectly fitted	Refit unit correctly
		(b) Worn fork driving plate	Renew
41	Ragged tape holes	(a) Tape guide mal- adjusted	Adjustment No. 102
		(b) Worn punches or die plates	Renew
42	Tape pitch faulty	(a) Tape guide mal- adjusted	Adjustment No. 102
		(b) Incorrect feed hole pitch adjustment	Adjustment No. 103

TEST MESSAGES

Whenever possible it is recommended that known transmit or receive test messages are used in conjunction with a second machine as a guide to fault location. An example of each of these types of test message is given in Tables 1 and 2, together with an explanation of the code or mechanism which the particular line checks.

'LETTERS' REPEATED ON RUN-OUT.

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 1234567890 RYRYRY RYRYRY RYRYRY RYRYRY RYRYRY RYRYRY RYRYRY RYRYRY RYRYRY

Table I. TRANSMIT TEST MESSAGE

Table I - Explanatory Notes

- checks code element No.1 (MSSSS)
- Line 1 Line 2 checks code element Nos. 1 and 2 (MMSSS)
- Line 3 checks code element Nos. 1, 2 and 3 (MMMSS)
- Line 4 checks code element Nos. 1, 2, 3 and 4 (MMMMS)
- Line 5 checks all five code elements (MMMMM)
- Line 6 checks code element Nos. 2, 3, 4 and 5 (SMMMM) Line 7 checks code element Nos. 3, 4 and 5 (SSMMM)
- Line 8 checks code element Nos. 4 and 5 (SSSMM)
- Line 9 checks code element No. 5 (SSSSM)
- Line 10 checks the Figures/Letters case shift mechanism
- Line 11 checks every individual letter and figure
- Line 12 checks the operating limits of the mechanism by alternating 'R's (SMSMS) and Y's (MSMSM).

ונונונונונננני פיפיפיפיצ'פיפינונונונננני

* In the first two words each character is followed by Carriage Return, then each word is followed by Carriage Return and Letters, Space being used to come up to the correct word spacing.

Table 2. RECEIVE TEST MESSAGE

Table 2 - Explanatory Notes

- Line 1 checks the overall printing mechanism. All characters should be level, equally spaced and printed squarely.
- Line 2 checks the pin-box and pecker traverse mechanism.
- Line 3 checks the vertical aggregate motion mechanism.
- Lines 4 and 5 check the circular aggregate motion mechanism.
- Lines 6, 7, 8 and 9 check the circular limits of the aggregate motion mechanism.
- Line 10 checks the Figures/Letters case shift mechanism.
- Line 11 checks the translator clutch mechanism.
- Line 12 checks the distortion margin of the machine by means of the orientation device.
- Line 13 checks the typehead carriage feed, carriage return and dashpot mechanism.

FAULTY TEST MESSAGES

The most difficult types of fault to diagnose are printing faults due to the maloperation of the circular aggregate motion levers and their respective linkages, as the final position of any one type depends on a complex series of movements of one or more of the levers. Such faults may appear as a sideways displaced print-out of a character or even an adjacent type to the correct character.

A thorough knowledge of the principle of operation of the aggregate motion system and reference to a copy of the particular typehead chart will help in the location of printing

faults. For example, on the standard typehead, there is a greater chance of printing errors occurring on the letters 'T-L-R-O-G-I' (or their figure equivalents) in that order, than on other characters. This is because the positioning of these types depend on the movement of three circular aggregate motion levers, e.g. the letter 'T' or its figure equivalent is obtained by the largest total circular aggregate motion movement, i.e. levers 3.1 and 4, giving an 8 counter-clockwise movement set off against a 4+2 clockwise movement.

If the faulty test message does not provide enough information to determine exactly where the fault lies, lower the corrector track rail, Part 4 - Fig. 4.50, by slackening the two track rail clamping screws 1/8 of a turn and screwing down the two shouldered pins as far as they will go. Re-run the text message. This procedure will isolate the typehead corrector mechanism from the printing action, thus the re-run copy will give a clearer indication where the aggregate motion levers are actually positioning the characters without reference to any correction which may have occurred in the original test message. If this procedure has to be adopted, restore the corrector track rail to its original position after the tests have been completed - Adjustment No.58 (Part 4, page 44) refers.

Examples of faulty test messages are given in Tables 3-8, together with explanations of the methods of analysing the faults and the recommended procedures for rectification.

HAHBHCHDHEHFHGHIHJHKHLHMHNHOHPHQHRHSHTHUHVHWHXHYHZH

JJWWAAGGRRLLKKQQUUVVCCPPII BBDDZZEEO ITTXXFFYYSSMMNNHH

KXK8K£K KXK8K£K KXK8K£K KXK8K£K KXK8K£K KXK8K£K KXK8K£K

KQUVCPIJWAGRL (17=:082-)-4) XFYSMNHBDZEOT /%61.,£?+3 5

KQUVCPIJWAGRL (17=:082-@4) XFYSMNHBDZEOT /%61.,£?+395

JJJJJJJJS'S'S'S'S'S'S'S

Table 3. FAULTY TEST MESSAGE No. I.

Table 3 - Explanatory Notes

Obvious printing errors in Table 3 are 'O' (line 2) '@' and '9' (line 4). All these characters appear to be moving too far from a counter-clockwise direction and partly printing the following adjacent character. However, since this is not conclusive enough to determine the cause of the errors, it will be necessary to lower the corrector track rail as described above and re-run the test message with the typehead corrector mechanism isolated. The re-run test is shown in Table 4.

Table 4. RE-RUN FAULTY TEST MESSAGE No. 1

Table 4 - Explanatory Notes

It can now be seen that all the characters on the clockwise movement side of the typehead are printing substantially squarely. The characters on the counter-clockwise movement side, however, are all printing heavily on their right-hand sides. This indicates that they are moving too far under the drive of the aggregate motion lever common to them all, i.e. No.3. This lever requires a slight readjustment to restrict its movement, after which all the characters, except those in lines 6, 7, 8 and 9, should print squarely. Note that the characters in lines 6, 7, 8 and 9, which check the circular limits of the aggregate motion mechanism, may not print squarely even after the readjustment of the lever has been made, because without any corrector action some overthrow is usually unavoidable.

As a final check, return the corrector track rail to its operating position and re-run the test message.

Table 5. FAULTY TEST MESSAGE No. 2

Table 5 - Explanatory Notes

Obvious printing error in Table 5 is 'A' (lines 1, 2 and 4) not moving far enough from the counter-clockwise direction and thus partly printing the preceding adjacent character 'G'. The letter 'D' (line 5) is blurred, with an indication that it is not moving far enough. Lower the corrector track rail and re-run the test message which will now be as shown in Table 6.

HAHBHCHTHEHFHCHIHJHKHLHMHNHOHPHQHRHSHTHUHVHWHXHYHZH

JJWWYAGGRRLLKKQQUUVVCCPPII EEDDZZEEOOTTXXFFYYSSMMNNHH

KXKEKEK KXKEKEK KXKEKEK KXK8KEK KXK8KEK KXK8KEK KXK8KEK

KQUVCPIJWAGRL (17=:C82-@4) XFYSMNHEDZEOT /%61.,£?+395

KQUVCPIJWAGRL (17=:C82-@4) XFYSMNHEDZEOT /%61.,£?+395

JJJJJJJJJ 51515151515151515

Table 6. RE-RUN FAULTY TEST MESSAGE No. 2

Table 6 - Explanatory Notes

It can now be seen that fifteen characters are printing heavily on their left-hand sides. Make a list of these characters against the levers which move to print them. From this list it will be found that No.1 lever appears 5 times, No.3 lever 7 times, No.4 lever 7 times and No.5 lever 7 times, thus the re-run test shows that no particular lever is causing the errors. The fault could possibly be due to general wear but is more likely to be due to the rest position of the typehead being displaced. This conclusion is also supported by the fact that the key letter 'X' is printing slightly heavily on its left-hand side. Return the corrector track rail to its operating position and check the equality of backlash around the printing point of the key characters 'X', 'K', 'Q', 'V' and 'B', as recommended in Adjustment Nos. 59 and 64 inclusive (Part 4, pages 45 to 47). Follow this with another re-run with the corrector track rail lowered and examine the copy again. If any characters are still printing heavily on one side make a further analysis to determine which lever is causing the trouble and refine that lever adjustment accordingly.

As a final check, return the corrector track rail to its operating position and re-run the text message.

Table 7. FAULTY TEST MESSAGE No. 3

Table 7 - Explanatory Notes

Obvious printing errors in Table 7 are 'I' (lines 1, 2 and 8) and '8' (line 3) moving too far from the clockwise direction under the action of the three clockwise levers. To determine which of the levers is at fault, lower the corrector track rail and re-run the test message which will now be as shown in Table 8.

Table 8. RE-RUN FAULTY TEST MESSAGE No. 3

Table 8 - Explanatory Notes

Examination of Table 8 shows two main groups 'VCPI' and 'MNH' printing heavily on their left-hand sides. Both these groups are operated by No.1 lever. The characters 'G' and 'R' also show the same symptoms and are partially operated by No.1 lever. It is necessary, therefore, to restrict the movement of this lever until all these characters are printing squarely.

Although having no connexion with the original fault, line 13 of the re-run test message shows that the characters 'Q', 'E' and 'A' are all printing heavily on their right-hand sides. These characters are operated by No.4 lever and it is advisable to adjust this lever now otherwise, at some later date, a further fault may develop due to this condition.

As a final check, return the corrector track rail to its operating position and re-run the test message.

APPENDIX E

LOCTITE SEALANT

GENERAL

Loctite sealant is a liquid polymer which possesses the property of hardening into a tough plastic bond when confined between closely-fitting metal parts. Nuts, screws and other fasteners retained with the medium strength grade of this sealant can later be released with ordinary hand tools.

Although this sealant does not harden off while exposed to air even when on a metal surface, once it is in close contact with metal in the absence of air, it begins to harden within a few minutes and reaches 85% of its final strength within 4 to 12 hours at 72^{OF} . Loctite is effective on all common metals including steel, iron, brass, aluminium alloys, copper and silver.

The hardening process can be speeded up either by applying heat or by treating the components involved with an activating rinse called Locquic. The bonding time of components previously treated with activator is reduced to about an hour. This activating rinse can also be used to prime the surface of non-metallic and plated parts and so render them capable of being bonded together with Loctite.

The sealant is produced in six main strengths, each of which is made up in various degrees of viscosity. To discriminate between these strengths, the manufacturers tint each one a different colour. The various degrees of viscosity within a particular strength are identified by a reference letter marked on the package and on the sealant container.

At present only *Grade C* Loctite is used on the Model Seventy-five teleprinter. This grade has a shear strength of 300 - 400 psi and a viscosity of 10 - 15 degrees centipoise. It is a blue-tinted liquid with a consistency similar to paraffin. Stocks of Loctite Grade C can be obtained from the Service Division under reference TA1435. The activator Locquic is held under reference number TA1436, and is suitable for all grades of sealant and material.

APPLICATION

- 1. Treat components which are to be sealed with a degreasing solvent such as white spirit or trichlorethylene to remove oil or grease. Allow the components to dry off.
- 2. Dip the components into Locquic priming rinse and then allow them to dry off again. It is important to be sure that activated parts are quite dry before any of the sealant is applied. If the components form part of major units secured to the machine, apply the priming rinse to the unit with a small brush. Shield adjacent parts while doing this to prevent the rinse splashing on to moving parts of the machine. Rinsed components can be stored before use, and do not necessarily lose their activation in storage.
- 3. A small quantity of the Loctite sealant (one drop is usually sufficient) may now be applied direct from the container to the threaded parts of the nut or screw involved, and the parts can then be screwed together. The sealant will harden off in about an hour, and thereafter the two components will be locked together until such time as a turning force sufficient to break down the plastic bond is applied to them.
- 4. The sealant may also be applied to a fully assembled and tightened nut or screw by placing a drop of sealant at the point where the two threaded portions of the fastener meet each other. The liquid will then be drawn up into the joint by capilliary attraction and will harden between the threads. The presence of a ring of sealant on the outside of the joint after a few minutes indicates that the threaded portion of the screw has been filled.
- 5. To re-use nuts and screws previously treated with sealant and activator, apply a drop of sealant to their threads either before or after tightening.

6. If any of the sealant drips into the mechanism, remove it at once with trichlorethylene. For obvious reasons, the sealant must not be allowed to harden off on moving parts. Any surplus activator should also be removed, as it has a trichlorethylene base and will therefore strip the oil from any component with which it comes into contact.

DATA SUMMARY

DATA COMMAN	
Supplies	Loctite Grade C is TA1435.
	Locquic Activator is TA1336.
Grade	Grade C sealant is tinted blue and has a shear strength of 300 - 400 psi.
Hardening time	At room temperature Loctite begins to harden within a few minutes of confinement between metal surfaces in the absence of air, reaches 85% of its final strength in 4 - 12 hours and is fully hardened within 24 hours.
	Pre-treatment of components with Locquic priming rinse will reduce the hardening time to one hour Application of heat, in the order of 200°F, will harden off the seal in ten minutes.
Shelf life	In a sealed bottle Loctite has a shelf life of at least one year. It must not be contaminated with metal particles however or it will harden off inside the bottle.
	Locquic has an indefinite shelf life but, as it has a trichlorethylene base, it should be kept in a tightly closed container otherwise it will evaporate.
Solubility	Loctite is soluble in trichlorethylene and in most degreasing solvents. Hardened Loctite is insoluble in water, petrol and mineral oils.
Handling	Loctite is non-toxic and no cases of allergy have been reported to the manufacturers. Avoid contact with organic finishes. Lacquer finishes are softened immediately, but baked enamel finishes will resist contact for several hours. Loctite does not affect thermosetting urea or phenolic-based plastics, neoprene, gum rubber, nylon or polythene. It softens polystrene, and cellulose and vinyl plastics.
Priming	The following materials and finishes require a priming rinse in Locquic primer to ensure an adequate bond.
	* all non-metallic parts
	* zinc, cadmium or gold-plated parts
	* anodised parts.
Operating range	$-65^{ m OF}$ to $300^{ m OF}$.
Approval	Loctite and Locquic are approved by the Ministry of Aviation under specification DTD900/4588. Both materials are Air Registration Board approved.

APPENDIX F

GLOSSARY OF TERMS

The following explanations of telegraph terms, except where they are derived from standard glossaries, are not intended to be exact definitions of universal application. They are included as descriptions of some of the commoner usages of telegraph terms, chiefly as these apply to Creed teleprinters.

Abbreviation:

(BS) = British Standard

Answer-Back

A device which, when released by the receiving mechanism in response to an appropriate signal from the distant end, controls the transmitter and causes it to send back automatically the identity of the called station. This facility assures the calling operator:-

- (1) that he is connected to the station desired.
- (2) that the called teleprinter is operating, even if it is unattended, and
- (3) if operated at the end of a message, that the whole message has been received.

Baud

The unit of telegraph speed. Telegraph signals are characterised by intervals of time of duration equal to or greater than the shortest or elementary interval. Telegraph speed is, therefore, expressed as the inverse of the value of the elementary interval in seconds. A speed of one elementary interval per second is termed one baud (BS).

The elementary interval for teleprinter transmission is 20 milliseconds i.e. 1/50th of a second. Therefore, the telegraph speed is 50 bauds (see Telegraph Speed).

Bias Distortion

Distortion due to either the marking or spacing elements of the signals being lengthened due to asymetry in the transmitting and receiving apparatus (BS).

Cadence Speed

For teleprinters this is the telegraph speed in words per minute. Two teleprinters having the same telegraph baud speed do not necessarily have the same cadence speed:

For a telegraph baud speed of 50 bauds, using 7-unit transmission, the cadence speed is 71.4 words per minute.

For a baud speed of 50 bauds, using 7-1/2-unit transmission, the cadence speed is 66.6 words per minute.

Case

In telegraphy this term is often used synonymously with shift.

Character

A printed symbol. Characters may be letters, figures, punctuation marks or signs. Signs may be sub-divided into operation signs (e.g. +./.=), abbreviation signs (e.g. @.£), and functional signs (e.g. \equiv for Line Feed).

Combination

A particular arrangement of code elements.

Double-Current System

A telegraph system in which signals are transmitted by reversing a current that is normally on the line during transmission (BS).

Duplex System

A multiple-way system in which the circuit is arranged for simultaneous operation in opposite directions, over a single circuit (BS).

APPENDIX F

End-of-Line Indicator

A mechanism attached to the transmitter of a teleprinter, to provide a visual or aural indication when a specific number of keys have been depressed after the Carriage Return key. This device is used as a warning to depress the Carriage Return key in cases where there is no local record or only a tape record at the transmitting end and the receiving machine is a page machine.

Extra

A mis-selected element of a code combination in which a spacing condition has been replaced by a marking condition.

Failure

A mis-selected element of a code combination in which a marking condition has been replaced by a spacing condition.

Figure Shift

One of the shifts into which the characters and functions of the five-unit code are grouped.

Function

A teleprinter operation other than printing or perforating which requires the transmission of a particular code combination (e.g. Line Feed).

Letter Shift

One of the shifts into which the characters and functions of the five-unit code are grouped.

Local Record

A reproduction by the transmitting telegraph instrument of the message transmitted (BS).

Margin

The maximum distortion which, when occurring on any or all of the signals applied to a telegraph receiver, is compatible with correct registration of all the symbols for which the receiver is designed (BS).

Mark

One of the two kinds of elements in the international binary start-stop code, e.g. the first two elements in the combination for 'A' in the code are marks.

Reperforator

An instrument which converts incoming electrical impulses of the five-unit code into equivalent perforations of a paper tape.

Send-Receive Switch

A switch used in simplex systems for changing over from the sending to the receiving condition, and vice versa. On the teleprinter this switch is operated automatically, the tongue moving over to the send contact before the transmission of each character signal. The return to the receive contact may take place either directly after the transmission of the character signal, or be delayed.

Simplex System

A telegraph system in which the circuit is arranged for operation in one direction at one time (BS).

Space

One of the two kinds of elements in the international binary start-stop code, e.g. the last three elements of the combination for 'A' in the code are spaces.

TDMS

Teleprinter Distortion Measuring Set. An apparatus for making distortion and margin tests on the transmitting and receiving mechanisms of the teleprinter.

Telegraph Distortion

In telegraph systems in which the signals at their origin are characterised by modulation at specific instants, the degree of distortion of the modulations when reproduced at the receiver is the ratio of the difference in delay or reproduction of the instants to the duration of the shortest modulation interval applicable to the particular system under consideration (BS).

Telegraph Speed

The rate of transmission, either in characters or words per minute, or in bauds. For the purpose of calculation, a word is accepted as consisting of 5 letters and a space, or 6 characters (BS).