ARMY TM 11-5815-206-34
AIR FORCE TO 31W4-2PGC1-62

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TELETYPEWRITER SETS

AN/PGC-1 (NSN 5815-00-198-5963)

AN/PGC-3 (NSN 5815-01-012-8773)

AND

TELETYPEWRITERS

TT-4A/TG (NSN 5815-00-198-4438) **TT-4B/TG (NSN 5815-00-198-4438)**

TT-4C/TG (NSN 5815-00-198-4438) **TT-335/TG (NSN 5815-00-878-8449)**

TT-537/G (NSN 5815-00-926-7378) **TT-698/TG (NSN 5815-01-008-9628)**

TT-698A/TG (NSN 5815-01-008-9628) **TT-698B/TG (NSN 5815-01-008-9628)**

TT-722/TG AND TT-722A/TG

(NSN 5815-01-017-9172)

This copy is a reprint which includes current pages from Changes 1 and 2. Title was changed by Change 2 as shown above.

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

30 APRIL 1976

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the 105- to 125-volt motor and signal circuits. Serious injury or death may result from contact with these circuits. Turn off the power and discharge all high-voltage capacitors before making any connections or replacing any parts inside the equipment.

DON'T TAKE CHANCES!

TECHNICAL MANUAL
No. 11-5815-206-34
TECHNICAL ORDER
No. 31W4-2PGC1-62

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE

WASHINGTON, DC, *30 April 1976*

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TELETYPEWRITER SETS AN/PGC-1 (NSN 5815-00-198-5963), AN/PGC-3 (NSN 5815-00-012-8773), AND TELETYPEWRITERS TT-4A/TG, TT-4B/TG, TT-4C/TG (NSN 5815-00-198-4438), TT-335/TG (NSN 5815-00-878-8449), TT-537/G (NSN 5815-00-926-7378), TT-698/TG, TT-698A/TG, TT-698B/TG (NSN 5815-01-008-9628), TT-722/TG AND TT-722A/TG (NSN 5815-01-017-9172)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028-2 located in the back of the manual. Simply tear out the self-addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

If there are no blank DA Form 2028-2 in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to the Commander, US Army Electronics Command, ATTN: DRSEL-MA-Q, Fort Monmouth, New Jersey 07703.

For Air Force, use USAFLC Form 252 (Request for TO Revision or Change). Forward direct to prime ALC/MST.

In either case, a reply will be furnished direct to you.

		Paragraph	Page
CHAPTER 1.	INTRODUCTION	1-1	1-1
CHAPTER 2.	FUNCTIONING OF EQUIPMENT		
Section I.	General	2-1	2-1
II.	Mechanical functioning of keyboard	2-8	2-8
III.	Mechanical functioning of teletypewriter	2-15	2-18
IV.	Circuits of Teletypewriters, TT-4(*)/TG, TT-335/TG, TT-537/G, TT-698(*)/TG and TT-722(*)/TG	2-37	2-58
CHAPTER 3.	DIRECT SUPPORT MAINTENANCE INSTRUCTIONS		
Section I.	General	3-1	3-1
II.	Maintenance	3-4	3-3
III.	Lubrication	3-11	3-5
IV.	Troubleshooting	3-16	3-21
V.	Removal and replacement of teletypewriter components	3-21	3-29
VI.	Disassembly and reassembly of teletypewriter components	3-33	3-36
VII.	Teletypewriter adjustment procedures	3-114	3-175
VIII.	Spring data	3-273	3-250
CHAPTER 4.	GENERAL SUPPORT MAINTENANCE PROCEDURES		
Section I.	General support maintenance procedures for all models except TT-698(*)/TG	4-1	4-1
II.	General support maintenance procedures for TT-698(*)/TG	4-10	4-20
APPENDIX A.	REFERENCES		A-1
GLOSSARY			Glossary 1
INDEX			Index 1

* This manual supersedes TM 11-5815-206-35, 24 August 1959

LIST OF ILLUSTRATIONS

Number	Title	Page
1-1	DA Form 2028-2 (TEST) - Sample	1-1
2-1	Basic Teletypewriter Circuits Showing Pairs of High and Low Level Teletypewriters Interconnected	2-2
2-2	Teletypewriter Code Chart	2-3
2-3	Teletypewriter TT-4(*)/TG, Block Diagram	2-4
2-4	Teletypewriter TT-335/TG and TT-537/G, Block Diagram	2-5
2-5	Teletypewriter TT-698(*)/TG, Block Diagram	2-6
2-6	Motor Governor, TT-4(*)/TG and TT-698(*)/TG	2-7
2-7	Mechanical Power Distribution	2-8
2-8	Keyboard-Transmitter, Removed From Teletypewriter	2-9
2-9	Transmission of Start, Stop, Spacing, and Marking Impulses (all high level units)	2-10
2-10	Deleted	2-11
2-11	Transmitter Friction Clutch	2-12
2-12	Transmitter Camshaft Control Mechanism	2-13
2-13	Repeat-Lever Operation	2-17
2-14	Armature Held in Marking Position by Energized Selector Magnet	2-18
2-15	Selector Camshaft and Selector Friction Clutch	2-19
2-16	Stop-Lever in Engaged and Released Positions	2-20
2-17	Recording Marking and Spacing Code Impulses	2-20
2-18	Rangefinder Mechanism	2-21
2-19	Armature Spring Tension Adjustment Mechanism	2-22
2-20	Transfer Lever in Latched Position	2-23
2-21	T-Levers and Code Rings Set to Marking and Spacing Positions	2-23
2-22	Code-Ring Locking Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	2-24
2-23	Cutaway View of Code Ring Cage, Showing Selection of Outer Stop Bar by Code Rings	2-25
2-24	Side View of Code Ring Cage, Showing Location of Stop Bars	2-25
2-25	Type Bar Selection, Simplified Drawing	2-26
2-26	Printing Mechanism	2-27
2-27	Mechanical Power Transfer from Main Shaft to Function Shaft and Square Shaft	2-27
2-28	Stop-Arm Antibounce Clutch, Cutaway View	2-28
2-29	Carriage-Feed Mechanism	2-29
2-30	Function-Selecting Arm and Associated Mechanism	2-30
2-31	Carriage-Feed Blocking Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	2-31
2-32	Carriage-Feed Blocking Mechanism, (TT-4A/TG and TT-698/TG)	2-31
2-33	Restoring Rollers and Draw-Bar Cam Assembly (TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG	2-32
2-34	Carriage-Return Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	2-32
2-36	Carriage-Return Mechanism, TT-4A/TG and TT-698/TG	2-33
2-36	Carriage-Return Sensing Mechanism (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG)	2-34
2-37	Carriage-Return Sensing Mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	2-35
2-38	Manual Carriage-Return Mechanism	2-35
2-39	Carriage-Return Clutches	2-36
2-40	Carriage-Return Blocking Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	2-37
2-41	Carriage-Return Blocking Mechanism, TT-4A/TG and TT-698/TG	2-37
2-42	Margin-Bell Mechanism	2-38
2-43	Figures-Shift Mechanism	2-40
2-44	Platen-Blocking Mechanism	2-41
2-45	Letters-Shift Mechanism	2-41
2-46	Figures-Shift Mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	2-42
2-47	Line Feed Mechanism (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698/TG)	2-44
2-48	Positions of Single-Double Line Feed Lever	2-45
2-49	Line Feed Mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	2-46
2-50	Automatic Carriage-Return and Line-Feed Mechanism (TT-537/G and TT-722(*)/TG)	2-47
2-51	Ribbon-Feed Mechanism Positioned for Feeding Ribbon from Right Ribbon Spool to Left Ribbon Spool (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698B/TG)	2-48
2-52	Ribbon Feed Mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	2-49
2-53	Ribbon Reverse Mechanism	2-49
2-64	Ribbon Lifter Mechanism (TT-4A/TG and TT-698/TG)	2-50
2-55	Ribbon Lifter Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	2-50
2-58	Punch-Bar-Guide Block Assembly, Exploded View	2-51
2-57	Signal Bell Mechanism	2-51
2-58	Location of Stopped Positions of Function-Selecting Arm After Receipt of Function Code Groups	2-52
2-69	Signal-Bell and Motor-Stop Punch Bars Blocked and Not Blocked by Aperture Gate	2-52

LIST OF ILLUSTRATIONS—Continued

Number	Title	Page
2-60	Motor-Stop Relay Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)	2-53
2-61	Positions of TT-4B/TG Contact Lever	2-54
2-62	Motor-Stop Relay Mechanism (TT-4A/TG)	2-54
2-63	Positions of TT-4A/TG Contact Lever	2-55
2-64	Teletypewriter Timing Chart	2-57
4-65①	Teletypewriter TT-4A/TG, Wiring Diagram (sheet 1 of 2)	2-59
2-65②	Teletypewriter TT-4A/TG, Wiring Diagram (sheet 2 of 2)	2-60
2-66①	Teletypewriter TT-4B/TG and TT-4C/TG, Wiring Diagram (sheet 1 of 2)	2-61
2-66②	Teletypewriter TT-4B/TG and TT-4C/TG Wiring Diagram (sheet 2 of 2)	2-62
2-67	Keyboard Transmitter Send Circuits, Simplified Schematic Diagram TT-698(*)/TG	2-63
2-68	Transmitter Module, Simplified Schematic Diagram TT-698(*)/TG	2-64
2-69	Page Printer Receiver Circuit, Simplified Schematic Diagram, TT-698(*)/TG	2-65
2-70	Receiver Module, Simplified Schematic Diagram, TT-698(*)/TG	2-66
2-71	TD Clutch/Selector Magnet Driver Module, Simplified Schematic Diagram	2-67
2-72	Power Supply, 30Vdc, Schematic Diagram, TT-698(*)/TG	2-69
2-73	Teletypewriter, TT-698/TG, Wiring Diagram	2-70
2-74	Teletypewriter, TT-698A/TG and TT-698B/TG, Wiring Diagram	2-71
3-1	Teletypewriter, Top View, Partially Disassembled to Show Lubrication Points	3-10
3-2	Teletypewriter, Motor Side, Lubrication Points	3-2
3-3	Teletypewriter, Rear View, Lubrication Points	3-12
3-4	Teletypewriter (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG) Rear View, Lubrication Points	3-13
3-5	Teletypewriter, Selector Mechanism Side, Lubrication Points	3-14
3-6	Teletypewriter, Left Front View, Lubrication Points	3-15
3-7	Carriage, Rear View, Lubrication Points	3-16
3-8	Keyboard-Transmitter, Top View, Lubrication Points	3-17
3-9	Keyboard-Transmitter, Right Front View, Lubrication Points	3-18
3-10	Governor Lubrication Points (TT-4(*)/TG and TT-698(*)/TG)	3-19
3-11	Left Side and Right Rear Views of Automatic Carriage-Return of TT-537/G, Showing Lubrication Points	3-20
3-12	Teletypewriter Test Connections	3-22
3-13	Components of Teletypewriter TT-4(*)/TG, Except for Motor, TT-335/TG and TT-537/G, and A1 Terminal Box Assembly TT-698(*)/TG	3-20
3-14	400-Cycle Motor Mounting Arrangements (TT-335/TG and TT-537/G)	3-31
3-16	A1 Terminal Box Assembly, Exploded View	3-38
3-16	Transmitter Contact Assembly Exploded View	3-40
3-17	Keyboard-Transmitter Sensing and Selector Lever Assembly, Exploded View (TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG)	3-42
3-18	Keylevers and Code Bars, Exploded View	3-46
3-19	Keyboard-Transmitter-Camshaft Locking Mechanism, Exploded View	3-48
3-20	Transmitter Camshaft and Filter, Exploded View	3-49
3-21	Instrument Panel, Exploded View (TT-4(*)/TG and TT-698(*)/TG)	3-52
3-22	Instrument Panel (TT-335/TG and TT-537/G, with keyboard), Exploded View	3-56
3-23	Motor and Governor, Exploded View (TT-4(*)/TG and TT-698(*)/TG)	3-59
3-24	Motor Assembly, Exploded View (TT-335/TG and TT-537/G)	3-62
3-25	Platen Frame Assembly, Exploded View (TT-4(*)/TG, TT-335/TG, TT-537/G and TT-698(*)/TG	3-64
3-26	Platen Exploded View (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG	3-66
3-27	Platen-Trough Assembly (TT-4A/TG and TT-698/TG), Exploded View	3-67
3-28	Platen-Trough Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, Exploded View	3-70
3-28	Carriage Frame Assembly, Exploded View	3-72
3-30	Type-Selecting Arm Assembly, Exploded View (TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG)	3-73
3-31	Ribbon Lifter Assembly (TT-4A/TG and TT-698/TG), Exploded View	3-74
3-32	Carriage Lock Mechanism (TT-537/G), Exploded View	3-75
3-33	Platen Lock Mechanism (TT-537/G), Exploded View	3-76
3-34	Ribbon Lifter Assembly, Exploded View (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/TG, TT-698A/TG, and TT-698B/TG)	3-76
3-36	Ribbon Feed Mechanism, Exploded View	3-78
3-36	Type-Bar Group, Exploded View	3-81
3-37	Carriage Frame Assembly, Exploded View (TT-537/G Only)	3-83
3-38	Selector-Magnet Assembly, Exploded View	3-85
3-39	Selector-Lever-Comb Bracket Assembly, Exploded View	3-86
3-40	Selector Levers and Y-Levers (TT-4A/TG) and TT-698/TG), Exploded View	3-88
3-41	Selector Levers and Y-Levers (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, Exploded View	3-90
3-42	Transfer-Lever Shaft Assembly, Exploded View	3-92

LIST OF ILLUSTRATIONS—Continued

Number	Title	Page
3-43	Print-Bail Shaft Assembly, Exploded View	3-94
3-44	Signal-Bell Assembly, Exploded View	3-96
3-45	Automatic Carriage-Return and Line-Feed Mechanism, Exploded View (TT-537/G and TT-722(*)/TG)	3-97
3-46	Function-Selecting Mechanism, Exploded View	3-100
3-47	Line-Feed and Platen-Shift Mechanism (TT-4A/TG and TT-698/TG), Exploded View	3-102
3-48	Line-Feed and Platen-Shift Mechanism (TT-4B/TG and TT-698A/TG), Exploded View	3-104
3-49	Line-Feed and Platen-Shift Mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG), Exploded View	3-106
3-50	Square-Shaft Assembly, Exploded View	3-108
3-51	Function-Shaft Assembly, Exploded View	3-110
3-52	Selector Camshaft Assembly, Exploded View	3-113
3-53	Main Shaft Assembly (TT-4A/TG and TT-698/TG), Exploded View	3-115
3-54	Main Shaft Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG), Exploded View	3-117
3-55	Code Ring Cage (TT-4A/TG and TT-698/TG), Exploded View	3-119
3-56	Code Ring Cage (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), Exploded View	3-120
3-57	Function-Sensing Lever Group (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG), Exploded View	3-124
3-58	Function-Sensing Lever Group (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG, Exploded View	3-126
3-59	Manual Carriage-Return Mechanism (TT-4A/TG and TT-698/TG), Exploded View	3-128
3-60	Carriage-Feed Mechanism (TT-4A/TG and TT-698/TG), Exploded View	3-130
3-61	Carriage-Feed Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG), Exploded View	3-132
3-62	Carriage-Return Operating Mechanism (TT-4A/TG and TT-698/TG), Exploded View	3-133
3-63	Carriage Return Operating Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG), Exploded View	3-134
3-64	Carriage-Rack Drive Shaft Assembly, Exploded View	3-136
3-65	Margin-Bell Assembly, Exploded View	3-137
3-66	Carriage-Feed Shaft Assembly, Exploded View	3-139
3-67	Carriage-Return Shaft Assembly (TT-4A/TG and TT-698/TG), Exploded View	3-141
3-68	Carriage-Return Shaft Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG), Exploded View	3-143
3-69	Carriage-Return Clutch Assembly, Exploded View	3-145
3-70	Keyboard-Transmitter Drive Shaft Assembly, Exploded View	3-147
3-71	Motor-Stop Assembly (TT-4A/TG), Exploded View	3-149
3-72	Motor-Stop Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G), Exploded View	3-151
3-73	Paper Shaft, Paper Shaft Brackets, and Paper Chute (TT-4(*)/TG, TT-335/TG, and TT-698(*)/TG), Exploded View	3-153
3-74	Paper Shaft, Paper Shaft Bracket, and Paper Chute, Exploded View (TT-537/G only)	3-154
3-75	Motor Filter Box Assembly (TT-4(*)/TG and TT-698(*)/TG), Exploded View	3-156
3-76	Junction Box Assembly (TT-335/TG), Exploded View	3-158
3-77	Junction Box Assembly, Exploded View (TT-537/G only)	3-160
3-78	Line Terminal Board and Signal Cable Assembly, Exploded View (TT-4(*)/TG, TT-335/TG, and TT-537/G)	3-163
3-79	Teletypewriter Frame Assembly (TT-4A/TG, TT-4B/TG, TT-4C/TG, TT-698/TG, TT-698A/TG and TT-698B/TG), exploded view	3-165
3-80	Teletypewriter Frame Assembly (TT-335/TG nad TT-537/G), Exploded View	3-168
3-81	Dust Cover, Exploded View	3-170
3-82	Teletypewriter Base Assembly, Exploded View	3-172
3-83	Immersionproof Cover (TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG), Exploded View	3-174
3-84	Keylever-Locking-Bar Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-178
3-85	Transmitter-Camshaft End-Play Adjustment	3-178
3-86	Cam-Stop Lever-Latch End-Play Adjustment	3-178
3-87	Universal-Bar Adjustment	3-178
3-88	Repeat-Blocking-Lever Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-178
3-89	Sensing-Levers Alignment and End-Play Adjustment	3-179
3-90	Selector-Levers and Sensing-Levers Clearance Adjustment	3-180
3-91	Selector-Levers End-Play Adjustment	3-180
3-92	Sensing-Lever Locking-Bail Adjustment	3-180
3-93	Transmitter Friction-Clutch Adjustment (TT-4A/TG and TT-698/TG)	3-181
3-94	Transmitter Friction-Clutch Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-181
3-95	Start-Stop Selector-Lever-Latch and Transmitter Contact Adjustment	3-182

LIST OF ILLUSTRATIONS—Continued

Number	Title	Page
3-96	Transmitter Impulse Length Requirements	3-183
3-97	Code Ring and Locking-Bail Cam-Follower Lever End-Play Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-184
3-98	Function-Sensing-Levers End-Play Adjustment	3-184
3-99	Function-Sensing-Levers End-Play Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-185
3-100	Draw-Bar Shimming Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-185
3-101	Restoring Rollers and Draw-Bar Cam Assembly Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-185
3-102	Code-Ring Cage Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-186
3-103	Function-Shaft Driven Gear End-Play Adjustment	3-186
3-104	Function-Cam Assembly Adjustment (TT-4A/TG and TT-698/TG)	3-187
3-105	Function-Cam Assembly Alignment (TT-4B/TG and TT-698A/TG)	3-187
3-106	Function-Shaft Drive-Collar Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-188
3-107	Line-Feed and Figures-Shift Cam-Followers Clearance Adjustment (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG)	3-188
3-108	Function Stop-Bar Guide Adjustment	3-189
3-109	Code-Ring Locking-Bail Cam-Follower Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-189
3-110	Locking-Bail Shaft Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-189
3-111	Code-Ring Locking-Bail Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-190
3-112	T-Lever Alignment Adjustment	3-190
3-113	Transfer-Lever-Shaft End-Play Adjustment	3-191
3-114	Transfer-Lever Roller Stud Adjustment	3-191
3-115	Transfer-Lever-Spring Tension Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-192
3-116	Y-Lever Eccentric Stop Preliminary Adjustment	3-192
3-117	T-Lever Pivot Stud Adjustment	3-192
3-118	Y-Lever Stud Bracket Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-193
3-119	Function-Clutch Clearance Adjustment	3-193
3-120	Function-Clutch Latch Adjustment	3-194
3-121	Function-Clutch Eccentric Post Adjustment, (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-194
3-122	Y-Lever Detent End-Play Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-194
3-123	Y-Lever Detent and Y-Lever Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-195
3-124	Y-Lever Friction Adjustment (TT-4A/TG and TT-698/TG)	3-195
3-125	Selector-Friction-Clutch Adjustment (TT-4A/TG and TT-698/TG)	3-196
3-126	Selector-Friction-Clutch Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-196
3-127	Rangefinder Shaft Adjustment	3-197
3-128	Orientation Lever Adjustment Requirements (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-197
3-129	Selector-Lever Adjustment	3-198
3-130	Selector-Lever Comb Adjustment	3-198
3-131	Selector-Magnet Armature Adjustment (TT-4A/TG and TT-698/TG)	3-199
3-132	Selector-Magnet Armature Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-199
3-133	Stop-Lever Adjustment	3-200
3-134	Armature Upper-Stop-Screw Adjustment	3-200
3-135	Amrature Lower-Stop-Screw Adjustment	3-201
3-136	Selector-Magnet Adjustments	3-201
3-137	Selector-Magnet Armature and Selector Lever Clearance Adjustment	3-202
3-138	Function Punch-Bar and Side Plate Adjustment	3-202
3-139	Function-Lever-Bracket Adjustment	3-203
3-140	Letters-Shift-Lever Shaft End-Play Adjustment	3-203
3-141	Function-Clutch Tension Adjustment (TT-4A/TG and TT-698/TG	3-204
3-142	Function-Shaft Flexible Coupling Disk Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-204
3-143	Location of Parts on Function Shaft (TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG)	3-205
3-144	Function-Cam Adjustment	3-206

LIST OF ILLUSTRATIONS—Continued

Number	Title	Page
3-145	Carriage-Feed Ratchet Adjustment	3-206
3-146	Carriage-Feed-Shaft Drive-Collar Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-206
3-147	Carriage-Feed Driving Gear End-Play Adjustment	3-207
3-148	Carriage-Feed Driven Gear Adjustment	3-207
3-149	Carriage-Feed Pawl Adjustment	3-207
3-150	Carriage-Return Clutch-Lever-Shaft Clearance Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-208
3-151	Carriage-Return Clutch Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-208
3-152	Carriage-Return Clutch Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-209
3-153	Carriage-Feed-Clutch Drum Adjustment	3-209
3-154	Decelerating Cam and Carriage-Feed-Clutch Positioning Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-210
3-155	Carriage-Return Latch-Tripping-Arm Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-211
3-156	Square-Shaft Sliding-Gear Bearing Adjustment	3-211
3-157	Carriage Position Adjustment	3-212
3-158	Ball Bearing Adjustment	3-212
3-159	Carriage-Rack Adjustment	3-213
3-160	Carriage-Rack Drive Shaft Adjustment	3-213
3-161	Carriage-Rack Retainer Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-213
3-162	Carriage-Feed Blocking Adjusting Lever and Carriage-Return Blocking-Lever Clearance (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-214
3-163	Carriage-Return Blocking-Lever Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-214
3-164	Carriage-Feed Blocking-Lever Adjustment	3-214
3-165	Right-Margin Stop-Screw Adjustment (TT-4A/TG and TT-698/TG)	3-215
3-166	Carriage-Return Adjusting Plate Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-215
3-167	Throw-Out Lever Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, and TT-698A/TG and TT-698B/TG)	3-216
3-168	Carriage-Return Clutch Adjustment (TT-4A/TG and TT-698/TG)	3-216
3-169	Carriage-Return-Link Adjustment (TT-4A/TG and TT-698/TG)	3-217
3-170	Carriage-Return Latch Tripping Arm Adjustment (TT-4A/TG and TT-698/TG)	3-217
3-171	Carriage-Feed Friction-Clutch Adjustment	3-218
3-172	Carriage-Return Friction-Clutch Adjustment	3-218
3-173	Fulcrum Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-219
3-174	Square-Shaft Driven-Gear Adjustment	3-219
3-175	Carriage-Rear-Support Bracket Adjustment	3-220
3-176	Type-Selecting Arm and Function-Selecting-Arm Adjustment	3-220
3-177	Square-Shaft Stop-Arm Torque Adjustment	3-221
3-178	Print-Bail-Blade Adjustment	3-222
3-179	Print-Bail and Ribbon-Lifter Adjustments (TT-4A/TG and TT-698/TG)	3-223
3-180	Print-Bail and Ribbon-Lifter Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-223
3-181	Platen-Trough-Spring Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-224
3-182	Platen-Shaft End-Play Adjustment	3-224
3-183	Platen-Trough End-Play Adjustment	3-224
3-184	Paper-Guide Adjustment (TT-4B/TG and TT-698A/TG)	3-225
3-185	Paper-Guide Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-226
3-186	Platen Pressure-Roller Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-226
3-187	Platen Pressure-Rollers Adjustment (TT-4A/TG and TT-698/TG)	3-227
3-188	Platen-Assembly End-Play and Positioning Adjustment	3-227
3-189	Character-Printing Density Adjustment	3-228
3-190	Figures-Shift Preliminary Adjustment	3-228
3-191	Figures-Shift Position Adjustment	3-228
3-192	Letters-Shift Position Adjustment (TT-4A/TG and TT-698/TG)	3-229
3-193	Letters-Shift Position Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-229
3-194	Platen-Shift Final Adjustment	3-230

LIST OF ILLUSTRATIONS—Continued

Number	Title	Page
3-195	Platen-Blocking-Arm Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-230
3-196	Platen-Blocking-Arm Bracket Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-231
3-197	Line-Feed Detent Adjustment	3-231
3-198	Line-Feed Bellcrank Adjustment (TT-4B/TG and TT-698A/TG)	3-231
3-199	Adjustable Block and Pawl Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-232
3-200	Line-Feed Connecting Link Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)	3-233
3-201	Line-Feed Mechanism, Side View (TT-4A/TG and TT-698/TG)	3-234
3-202	Positions of Single-Double Line-Feed Lever	3-234
3-203	Margin-Bell and Bracket Adjustment	3-235
3-204	Manual Carriage-Return Bracket Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698/TG)	3-235
3-205	Carriage-Return Trip-Pawl Adjustment (TT-4A/TG and TT-698/TG)	3-235
3-206	Carriage-Return Trip-Pawl Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-236
3-207	Left-Hand Margin Trip Plate Adjustment (TT-537/G and TT-722(*)/TG)	3-236
3-208	Automatic Carriage-Return Shift Link Adjustment (TT-537/G and TT-722(*)/TG)	3-236
3-209	Automatic Carriage-Return Shift Stop Adjustment (TT-537/G and TT-722(*)/TG)	3-237
3-210	Automatic Carriage-Return Stop Bar Return Spring Adjustment (TT-537/G and TT-722(*)/TG)	3-238
3-211	Ribbon-Feed Mounting Adjustment	3-238
3-212	Ribbon-Spool Shaft Adjustment	3-239
3-213	Ribbon-Reverse Beam Adjustment	3-239
3-214	Ribbon-Reverse Detent-Plate Adjustment	3-240
3-215	Ribbon-Spool Driving-Collar Adjustment	3-240
3-216	Ribbon-Spool Friction-Spring Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-241
3-217	Ribbon-Sensing-Lever Adjustment	3-241
3-218	Ribbon-Reverse Cam-Follower Adjustment	3-242
3-219	Signal-Bell Bracket Adjustment	3-242
3-220	Signal-Bell Preliminary Adjustment	3-242
3-221	Signal-Bell Final Adjustment	3-243
3-222	Motor-Stop Contact-Lever Lug and Relay Contacts Adjustment (TT-4A/TG)	3-243
3-223	Motor-Stop Contact-Lever Spring Assembly and Relay Coil Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)	3-244
3-224	Motor-Stop Switches Eccentric Sleeves, and Contact Lever Lug Adjustments (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)	3-245
3-225	Motor Gears Backlash Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-246
3-226	Motor Governor Brush Holder Adjustment	3-246
3-227	Motor-Governor Contact Alignment (TT-4(*)/TG and TT-698(*)/TG)	3-246
3-228	Governor-Assembly Locating Adjustment (TT-4(*)/TG and TT-698(*)/TG)	3-247
3-229	Governor Target Adjustment (TT-4(*)/TG and TT-698(*)/TG)	3-247
3-230	Copy-Light Screws Adjustment	3-247
3-231	Dust-Cover Cam-Lock Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-248
3-232	Carriage-Lock-Lever Adjustment (TT-537/G)	3-248
3-233	Platen Lock Clamp Lever End-Play Adjustment (TT-537/G)	3-248
3-234	Platen Clamp Adjustment (TT-537/G)	3-249
3-235	Platen-Lock Release Arm Adjustment	3-249
3-236	Compression Spring	3-250
3-237	Parallel-End and Random-End Springs	3-250
3-238	Crossed-End Springs	3-250
3-239	Selector-Lever Springs	3-250
3-240	Governor Worm Spring	3-250
3-241	Platen Trough Spring	3-250
3-242	Keybar Bail Spring	3-251
3-243	Code-Ring Locking Bail Spring	3-251
3-244	Armature Latch Spring	3-251
3-245	Felt Lubricating Washer Data (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)	3-254
4-1	Direct Current Control Device for Testing High-Level Teletypewriters, Schematic Diagram	4-2
4-2	Operational Tests (high-level teletypewriters only	4-10
4-3	Receiving Circuit, Bias and End Distortion Tests (high-level teletypewriters only)	4-14
4-4	Keyboard Bias Test (high-level teletypewriters only)	4-18

LIST OF ILLUSTRATIONS

Number	Title	Page
4-5	Operational tests (low-level teletypewriters)	4-26
FO-1	Teletypewriter TT-4A/TG, Schematic Diagram	Back of manual
FO-2	Teletypewriter TT-4B/TG and TT-4C/TG, Schematic Diagram	Back of manual
FO-3	Teletypewriter TT-335/TG, Schematic Diagram	Back of manual
FO-4	Teletypewriter TT-537/G (with keyboard), Schematic Diagram	Back of manual
FO-4.1	Teletypewriter TT-537/G, without keyboard, (Work Order No. C9409887), Schematic Diagram	Back of manual
FO-5	Teletypewriter TT-335/TG, Wiring Diagram	Back of manual
FO-6 ①	Teletypewriter TT-537/G (with keyboard), Wiring Diagram (sheet 1 of 2)	Back of manual
FO-6 ②	Teletypewriter TT-537/G (with keyboard), Wiring Diagram (sheet 2 of 2)	Back of manual
FO-6.1 ①	Teletypewriter TT-537/G, without keyboard, (Work Order No. C9409887), Wiring Diagram (sheet 1 of 2)	Back of manual
FO-6.1 ②	Teletypewriter TT-537/G, without keyboard, (Work Order No. C9409887), Wiring Diagram (sheet 2 of 2)	Back of manual
FO-7	Teletypewriter TT-698(*)/TG, Schematic Diagram	Back of manual

CHAPTER 1

INTRODUCTION

1-1. Scope

a. This manual covers direct support, general support, and maintenance of Teletypewriter TT-4A/TG, TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698/TG, TT-698A/TG, TT-698B/TG, TT-722/TG and TT-722A/TG. It describes detailed functions of the set and includes instructions for lubrication, troubleshooting, part replacement, adjustment, and testing the equipment. It also lists tools, materials and test equipment required for these echelons of maintenance.

b. Official nomenclature followed by (*). is used to indicate all models of the equipment item covered in this manual. Thus, Teletypewriter TT-4(*)/TG represents Teletypewriters TT-4A/TG and TT-4B/TG, TT-4C/TG, and Case CY-694(*)/PGC-1 represents Cases CY-694/PCG-1 and Cy-694A/PGC-1. The complete instructions for this equipment include the information in this manual and the information in TM 11-5815-206-12.

c. Teletypewriters modified for low level signaling operation have nomenclature changes as follows:

High level signaling		*Low level signaling*
TT-4A/FG	becomes	TT-698/TG
TT-4B/FG	becomes	TT-698A/TG
TT-4C/FG	becomes	TT-698B/TG

- High level teletypewriters operate with line currents of 20 or 60 milliamperes.
- Low level teletypewriters operate with line currents of 100 micro-amperes or less.
- Although the TT-698(*)/TG low level teletypewriters use polar signal transmission, neutral keying of the selector magnet is maintained.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750 (Army). Air Force personnel will use AFM 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) in accordance with OPNAVINST 4790.2, Vol 3 and unsatisfactory material/conditions (UR submissions) in accordance with OPNAVINST 4790.2, Vol 2, chapter 17.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DSAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33A/AFR 75-18/MCO P4610.19B, and DSAR 4500.15.

Figure 1-1. DA Form 2028-2 (TEST) – Sample.

(Located in back of manual.)

1-3.1 Reporting Equipment Improvement Recommendations (EIR)

a. Army. EIR's will be prepared using DA Form 2407, Maintenance Request. Instructions for preparing EIR's are provided in TM 38-750, the Army Maintenance Management System. EIR's should be mailed direct to Commander, US Army Electronics Command, ATTN: DRSEL-MA-Q, Fort Monmouth, New Jersey 07703. A reply will be furnished direct to you.

b. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFM 900-4.

1-3.2. Administrative Storage

For procedures; forms and records, and inspections required during administrative storage of this equipment, refer to TM 740-90-1.

1-3.3. Destruction of Army Electronic Materiel

Demolition and destruction of electronic equipment will be under the direction of the commander and in accordance with TM 750-244-2.

1-4. Differences in Models

Internal differences in models which affect field maintenance are described in the table below. Differences that affect operator's and organizational maintenance of the equipment are covered in TM 11-5815-206-12.

Item	Teletypewriters					
	TT-4A/TG *TT-698/TG	TT-4B/TG *TT-698A/TG **TT-722/TG	TT-4B/TG, Order No. 19039-Phila-69 **TT-722/TG	TT-4C/TG *TT-698B/TG **TT-722A/TG	TT-338/TG	TT-537/G
Transmitter filter (Not applicable to TT-698(*)/TG)	Two-path filter (Fig. 2-65)	Three-path transmitter filter (fig. 2-66).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Noise Suppressor (TT-698(*)/TG only)	Two-path filter (replaces transmitter filter)	Same as TT-698/TG		Same as TT-698/TG		
Transmitter Contacts	Mechanical Switch	Same as TT-4A/TG		Same as TT-4A/TG	Same as TT-4A/TG	Same as TT-4A/TG
Transmitter Module (TT-698(*)/TG only)	Installed in Low Level units send circuit to produce 6V polar signals.	Same as TT-698/TG		Same as TT-698/TG	Not Used	Not Used
Receiver Module (TT-698(*)/TG only)	Installed in Low Level units receive circuit to accept 6V polar signals.	Same as TT-698/TG		Same as TT-698/TG	Not Used	Not Used
TD Clutch/Selector Magnet Driver Module (TT-698(*)/TG only)	Installed in low level units receive circuit to drive the selector magent.	Same as TT-698/TG		Same as TT-698/TG	Not Used	Not Used
30VDC Power Supply (TT-698(*)/TG only)	Installed in low level units to supply DC power to modules.	Same as TT-698/TG		Same as TT-698/TG	Not Used	Not Used
Shaft bearing mounts	Screws and washers used to hold bearings in main frame assembly (fig. 3-67).	Bearing caps used to hold bearings in main frame assembly (fig. 3-68).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Friction Clutches	Include solid friction-adjusting collar (B, fig. 2-11).	Included split friction-adjusting collar (A, fig. 2-11).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Carriage-feed and carriage-return blocking lever adjustment.	Adjusting stud used to adjust carriage-feed and carriage-return blocking levers (fig. 2-41).	Carriage-return blocking adjusting collar and carriage-feed blocking adjusting plate used to adjust carriage-feed and carriage-return blocking levers (fig. 2-40).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Transfer-lever-spring post.	Nonadjustable.	Eccentric spring post adjustable (fig. 3-115).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Code-ring cage assembly.	Does not include adjustable function stop-bar fulcrums or code-ring locking-bail mechanism (fig. 3-55).	Includes adjustable function stop-bar fulcrums and code-ring locking-bail mechanism (fig. 3-56).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Method of holding Y-levers in selected position.	Friction plates used (fig. 3-40).	Y-lever detents and springs used (fig. 3-41).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Device for stabilizing relationship of Y-lever pivot stud and Y-lever eccentric stop.	Not included.	Eccentric tie, stud bracket, and spacer used (fig. 3-41).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.

footnote at end of table

Item	Teletypewriters					
	TT-4A / TG *TT-698 / TG	TT-4B / TG *TT-698A / TG **TT-722/TG	TT-4B / TG, Order No. 19686-Phila-60 **TT-722/TG	TT-4C / TG *TT-698B / TG **TT-722A/TG	TT-335 / TG	TT-537 / G
Platen figures-shift blocking mechanism.	Not included.	Platen lowercase latch, platen-blocking arm, and platen-blocking arm bracket included to prevent accidental shift of platen to figures-shift position (fig. 2-44).	Same as TT-4B/TG.	Same as TT-4B/TG,	Same as TT-4B/TG,	Same as TT-4B/TG.
Platen and paper trough assembly.	Includes six pressure rollers (fig. 3-27).	Includes only one pressure roller and new pressure release mechanism (fig. 3-28).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Keylever locking bar	Not included.	Included to hold keylevers in keylever mounting bracket (fig. 3-18).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Rangefinder orientation lever.	Does not include machine screw for adjustment.	Includes machine screws for adjustment (7, fig. 3-39).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Line-feed mechanism	Includes one-piece line-feed bellcrank (fig. 3-47) includes one-piece platen-shift link.	Includes Adjustable two-piece line-feed bellcrank (18 and 19, fig. 3-48); includes three-piece shock-absorbing platen-shift link (25).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Ribbon-lifter assembly	Adjusted by rotating turnbuckle (fig. 2-54).	Adjusted by repositioning and adjusting links (fig. 2-55).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Dust cover	10-1/4 in. high.	10-7/16 in. high.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG. except that instruction plate on front replaced by caution plate, line cable plug hole is provided in left side, and retainer clamp for ac cable is mounted on front.
Immersionproof cover	10-1/2 in. high.	10-11/16 in. high.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Method of securing page printer to teletypewriter base.	Nut, lockwasher, and flat washer (fig. 3-79) and mounting screw in shock mounts (fig. 3-82) used.	Machine screw, washers, and hole through mounting stud used (fig. 3-82).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Motor mounting	Machine screws, lockwashers, and shims used (1, 2, and 3, fig. 3-23).	Machine screws, washers, and adjustable sleeves used (4 through 7, fig. 3-23).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Motor-stop relay assembly. (Not included in TT-698(*)/TG models.)	Includes two-bladed armature that controls exposed contacts (figs. 2-62 and 2-63).	Includes single-bladed armature that operates sealed switches (fig. 2-60 and 2-61).	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.

See footnote at the end of table

Item	Teletypewriters					
	TT-4A/TG *TT-69A/TG	TT-4B TG *TT-69BA TG **TT-722/TG	TT-4B TG, Order No. 19930-Phila-60 **TT-722/TG	TT-4C TG *TT-69BB TG **TT-722A/TG	TT-335 TG	TT-537 G
Mechanical fastening devices.	Flat washers and cotter pins used.	Retainer rings used.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.	Same as TT-4B/TG.
Felt lubricating washers.	Not used.	Not used.	Used to increase the number of hours between lubrication checks.	Same as TT-4B/TG. Order No. 19930 Phila-60.	Same as TT-4B/TG. Order No. 19930 Phila-60.	Same as TT-4B/TG. Order No. 19930 Phila-60.
Antibackup mechanism on ribbon feed and reversing mechanism.	Not used.	Not used.	Not used.	Used to prevent the ribbon feed drive shaft from reversing upon carriage-return (fig. 2-52).	Same as TT-4C/TG.	Same as TT-4C/TG.
Line-feed and figures-shift (draw bars) cam followers.	Two provided for the functions. Swinging type (figs. 2-43 and 2-47).	Same as TT-4A/TG.	Same as TT-4A/TG.	One provided (draw-bar assembly) for both functions. Reciprocating type (figs. 2-46 and 2-49).	Same as TT-4C/TG.	Same as TT-4C/TG.
Function sensing levers	Carriage-return, figures-shift, and line-feed sensing levers are cam restored (figs. 2-36, 2-43 and 2-47).	Same as TT-4A/TG.	Same as TT-4A/TG.	Carriage-return, figures shift, line-feed, plus additional line-feed-on-carriage-return sensing levers, are roller restored (figs. 2-37, 2-46 and 2-49).	Same as TT-4C/TG.	Same as TT-4C/TG.
Carriage rack retainer bracket.	Not used.	Not used.	Not used.	Used to insure engagement of the carriage rack with the driving gear.	Same as TT-4C/TG.	Same as TT-4C/TG.
Motor	1/23 hp, 60-cycle, series-governed.	1/23 hp, 60-cycle, series-governed.	1/23 hp, 60-cycle, series-governed.	1/20 hp, 60-cycle, series-governed.	1/15 hp, 400-cycle, single-phase, synchronous hysterersis.	1/15 hp, 400-cycle, single-phase, synchronous hysteresis.
Location of alternate gear set.	Mounted on gear cover.	Mounted on gear cover.	Mounted on gear cover.	Mounted on gear cover.	Stored separately.	Stored separately.
Recording paper shaft holddown.	Retaining spring-type of holddown	Same as TT-4A/TG	Same as TT-4A/TG	Same as TT-4A/TG.	Same as TT-4A/TG.	Retaining level type of holddown.
Carriage locking device for transport.	Wingnut and arm type of lock	Same as TT-4A/TG	Same as TT-4A/TG	Same as TT-4A/TG.	Same as TT-4A/TG.	Lever-type locking device accessible through top door of dust cover.
Platen locking device for transport	Wingnut and arm type of lock	Same as TT-4A/TG	Same as TT-4A/TG	Same as TT-4A/TG.	Same as TT-4A/TG.	Lever-type locking device accessible through top door of dust cover. Crank on device permits manual letters shaft before locking.
Solid-state amplifier.	Not provided.	Same as TT-4A/TG	Same as TT-4A/TG	Same as TT-4A/TG.	Same as TT-4A/TG.	Installed in junction box to permit receipt of low-voltage signals (Nominal 6 volts).

*See footnote at the end of table

Item	Teletypewriters						
	TT-4A TG *TT-698 TG	TT-4B TG *TT-698A TG	TT-4B TG, Order No. 19930-Phila-60	TT-4C/ TG *TT-698B/ TG	TT-335/ TG	TT-537/ G	**TT-722/ TG **TT-722A/ TG
Automatic carriage return and line feed.	Not provided	Same as TT-4A/TG	Same as TT-4A/TG	Same as TT-4A/TG.	Same as TT-4A/TG.	Automatically feeds line and returns carriage to left margin when carriage moves past 72d space.	Automatically feeds line and returns carriage to left margin when carriage moves past 72d space.
Telephone-type signal jack.	Not provided	Same as TT-4A/TG	Same as TT-4A/TG	Same as TT-4A/TG.	Same as TT-4A/TG.	Installed on line terminal board to facilitate signal connection.	Same as TT-4A/TG.

* The TT-698/TG, TT-698A/TG, and TT-698B/TG are TT-4A/TG, TT-4B/TG, and TT-4C/TG, respectively, modified for low level signaling operation. With the exception of the added low level signal conversion circuits, each TT-698 (plain, A, or B model) is identical to its predecessor listed above it. The added circuits for low level signal conversion consists of (1) a transmitter module, (2) a receiver module, (3) a TD clutch/selector magnet module, and (4) a 30VDC power supply. Additionally, the transmitter contact assembly and noise suppressor have been redesigned to compliment the added circuits.

** The TT-722/TG and TT-722A/TG are TT-4B/TG and TT-4C/TG, respectively, modified to include an automatic carriage-return and line feed mechanism and special mounting plates to permit use of the teletypewriters in mobile assemblages.

CHAPTER 2

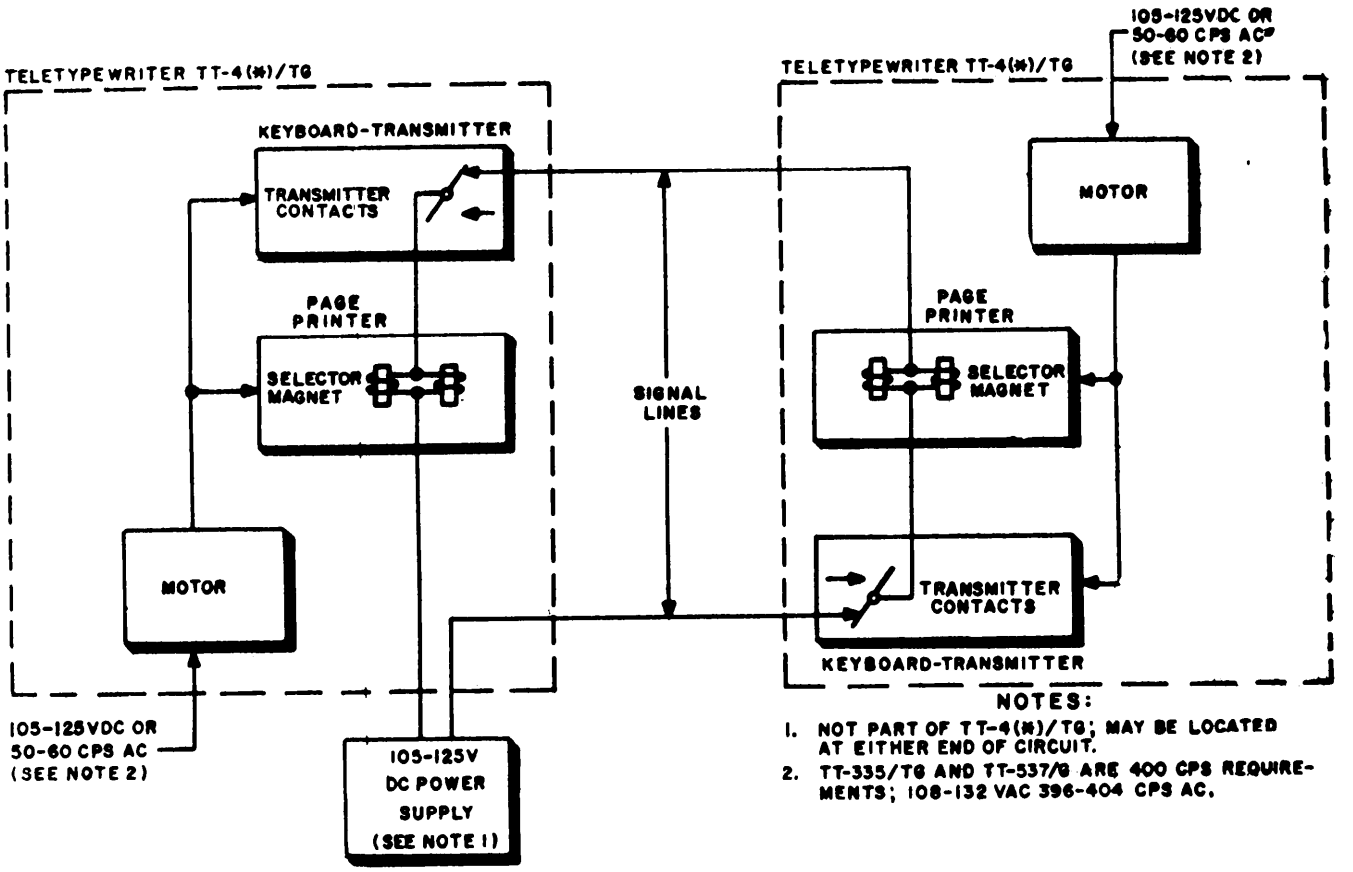
FUNCTIONING OF EQUIPMENT

Section I. GENERAL

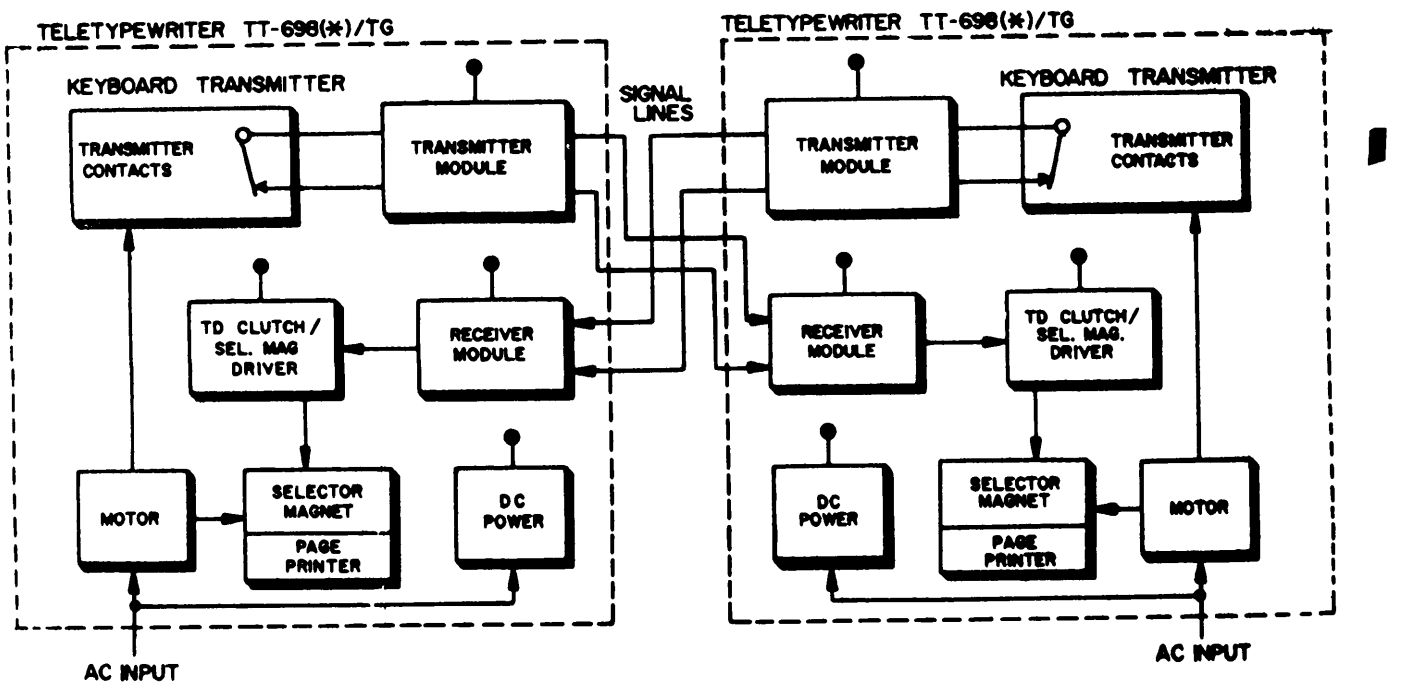
2-1. Basic Teletypewriter Functioning
(fig. 2-1)

The major subdivisions of Teletypewriters TT-4(*)/TG, TT-335/TG, TT-537/G, TT-698(*)/TG and TT-722(*)/TG are the keyboard-transmitter, the page printer, and the motor.

a. Keyboard-Transmitter. Transmission of teletypewriter messages occurs when a teletypewriter operator presses the keys of the keyboard-transmitter. The transmitter contacts open and close the signal circuit to transmit intelligence in the form of teletypewriter code groups (para 2-2).



A. HIGH LEVEL TELETYPEWRITER CIRCUIT.



B. LOW LEVEL TELETYPEWRITER CIRCUIT.

EL5815-206-34-C2-TM-32

Figure 2-1. Basic teletypewriter circuits showing pairs of high and low level teletypwriters interconnected.

b. Page Printer. Operation of the page printer is controlled by teletypewriter code groups which are received by the coils of the selector magnet. Each code group starts a cycle of mechanical operation in the page printer that results either in the printing of a character or in the accomplishment of a non-printing mechanical operation such as the moving of the platen to the figures-shift position for the printing of upper-case symbols.

c. Motor. The motor supplies mechanical power for operation of the keyboard-transmitter and the page printer.

2-2. Start-Stop Five-Unit Teletypewriter Code
(fig. 2-2)

Each teletypewriter code group consists of five code impulses preceded by a start impulse and followed by a stop impulse. The start impulse is always a *spacing* impulse, and the stop impulse is always a *marking* impulse (a and b below). Each of the five code impulses may be either a marking or a spacing impulse, depending on the character to be printed or the function to be accomplished. Each of the 32 possible code impulse combinations is assigned to a specific character or function as shown in figure 2. The difference between marking and spacing impulses for neutral and polar operation is as follows:

a. Marking Impulse. When a neutral marking impulse is to be transmitted, a pair of transmitter contacts close to complete the signal circuit and current flows in the signal circuit for the duration of the marking impulse. When a polar marking impulse is to be transmitted, a pair of transmitter contacts close, applying a short to the input of the transmitter module. The transmitter module converts the input to a + 6V output impulse and it is applied to the send signal line.

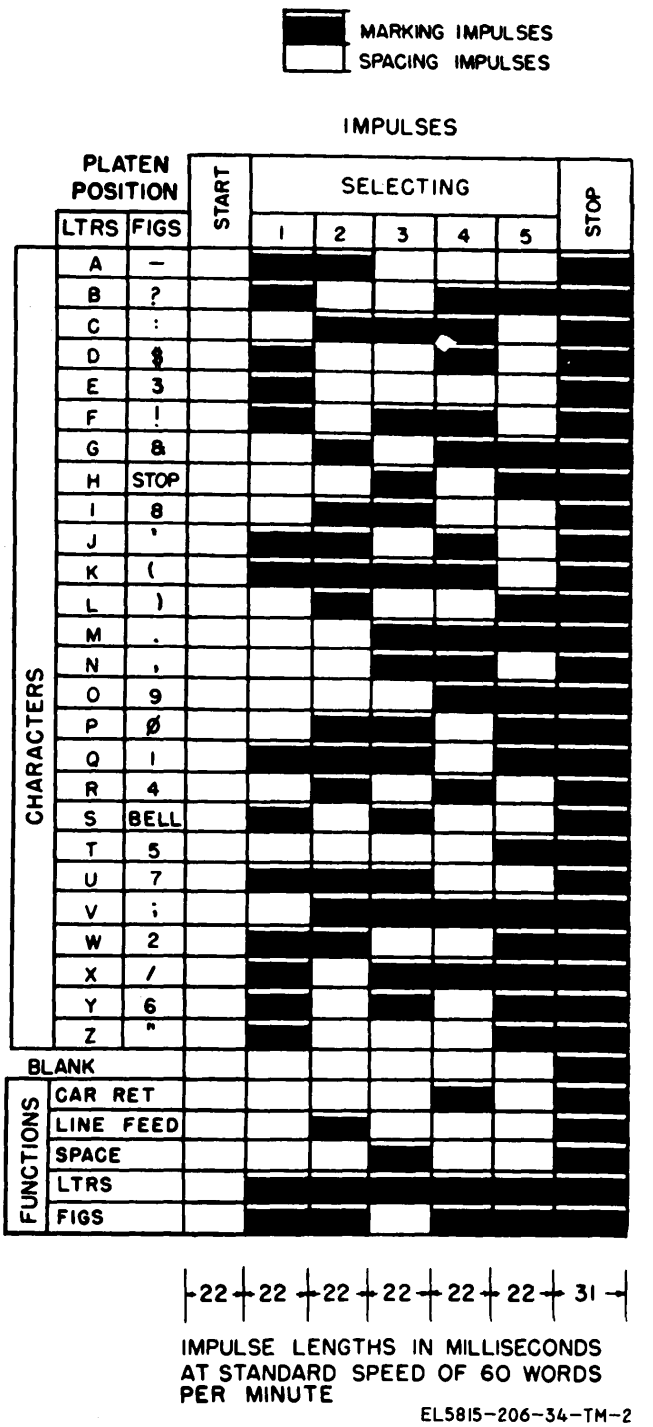


Figure 2-2. Teletypewriter code chart.

b. Spacing Impulse. When a neutral spacing impulse is to be transmitted, the pair of contacts open, and no current flows in the signal circuit for the duration of the spacing impulse. When a polar spacing impulse is to be transmitted, the pair of transmitter contacts open applying an open to the input of the transmitter module. The transmitter module converts the input to a -6V output impulse and it is applied to the signal line.

2-3. Block Diagram, Teletypewriters TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG (fig. 2-3, 2-4, and 2-5)

a. Sending. When a keylever is depressed, five code bars within the keyboard-transmitter are set to positions that correspond to the five code impulses of the code group that is assigned to the character or function indicated on the keylever. Depression of the keylever also causes the transmitter mechanism to operate the transmitter contacts which sends the code group directly or indirectly to the signal line. On the TT-698(*)/TG the code group is processed through a module. The main shaft and intermediate shafts, driven by the motor, provide the mechanical power for operation of the transmitter mechanism.

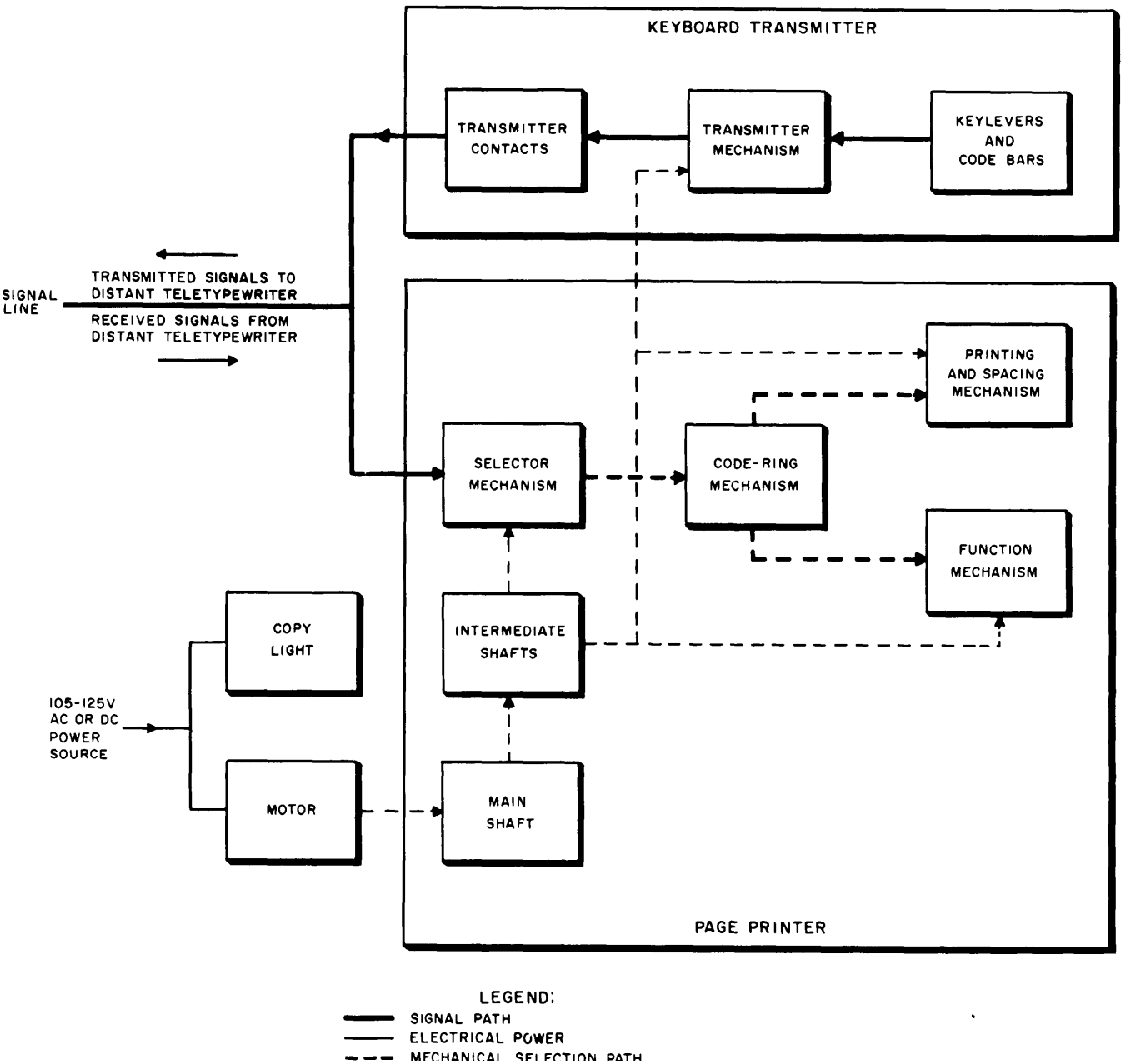


Figure 2-3. Teletypewriter TT-4(*)/TG, block diagram.

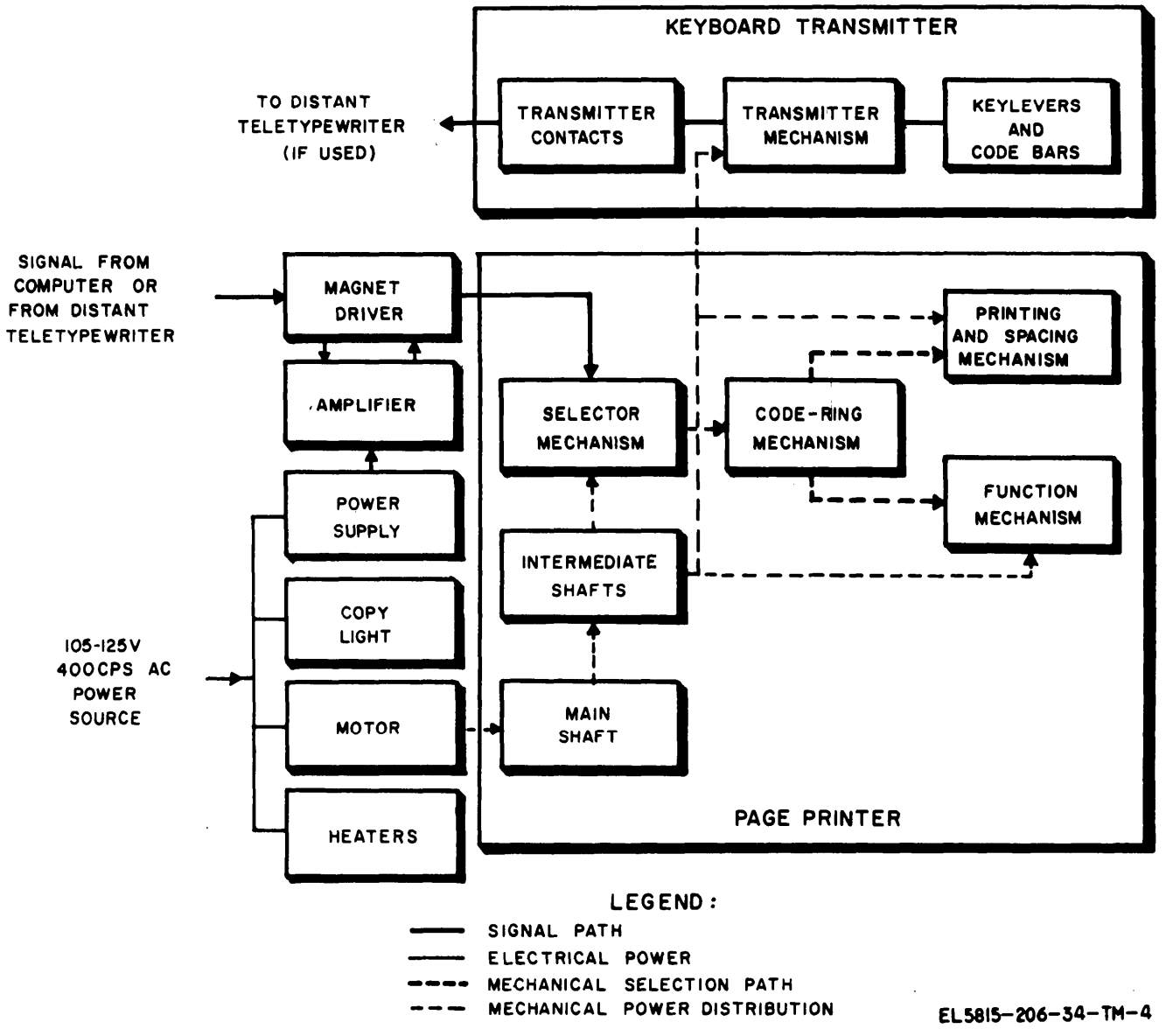


Figure 2-4. Teletypewriter TT-335/TG and TT-537/G, block diagram.

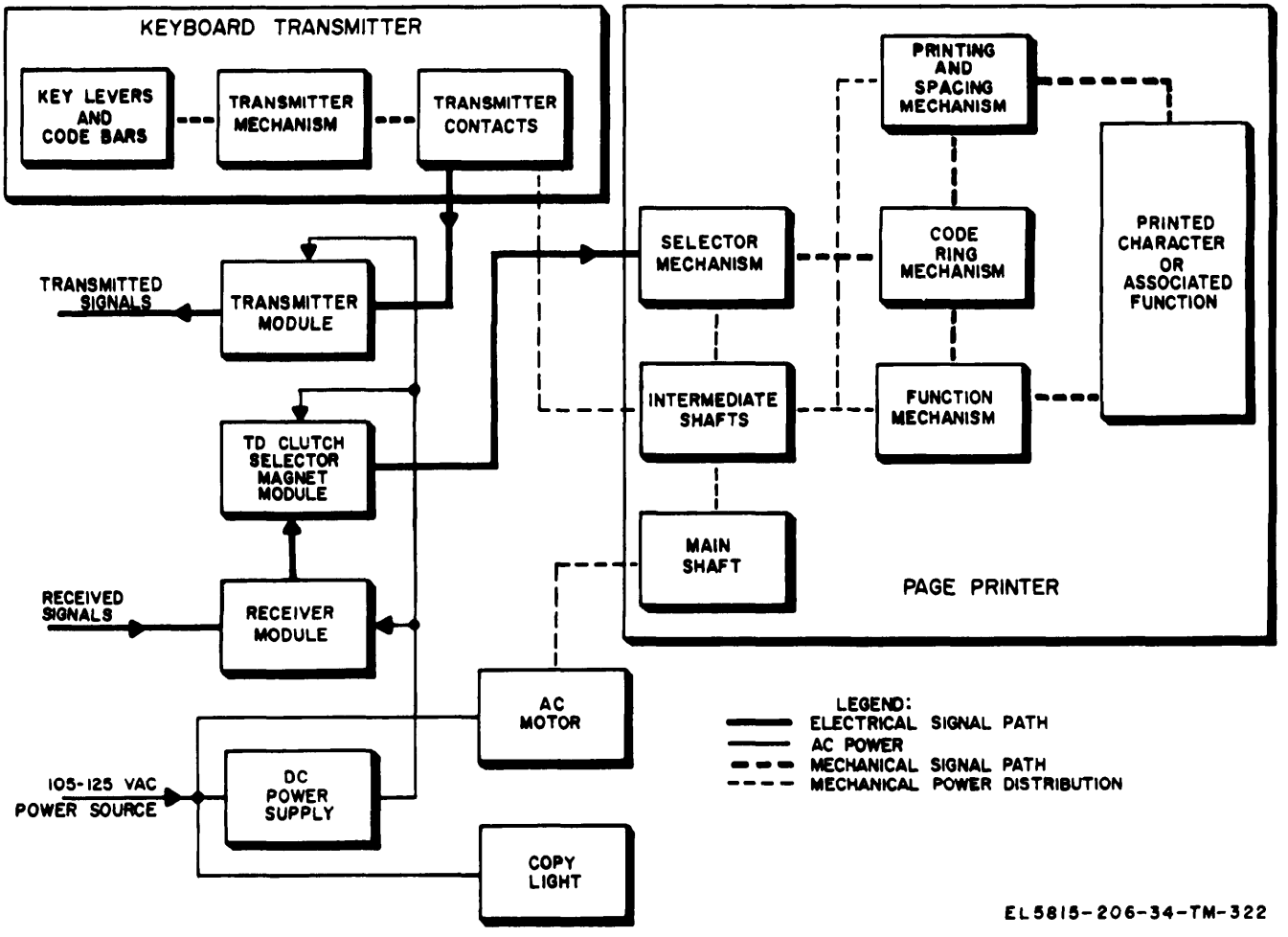


Figure 2-5. Teletypewriter TT-698/TG, block diagram.

b. Receiving. Teletypewriters TT-4(*)/TG and TT-335/TG receive teletypewriter code impulses from the signal line; the impulses are applied to the selector magnet in the selector mechanism. The selector mechanism responds to the code impulses to set up a mechanical parts arrangement that corresponds to the code impulses of the received code group and transfers this mechanical setting to the code-ring mechanism which mechanically selects the character to be printed or the nonprinting operation (function) to be performed. The main shaft and intermediate shafts distribute the mechanical power required to perform the printing or nonprinting operation that is selected by the code-ring mechanism. Teletypewriter TT-537/G (fig. 2-4) receives code impulses from a computer or from the signal line. The signals are applied to the magnet driver which receives power from the power supply through the amplifier. This amplified signal is applied to the selector mechanism which responds as described above. Teletypewriter TT-698(*)/TG (fig. 2-5) receives teletypewriter code impulses from the signal line. The signals are processed through a receiver module and a TD clutch/selector magnet driver module. The signal is then applied to the selector mechanism which responds as described above. The two modules receive power from a 30Vdc power supply.

2-4. Motor TT-4(*)/TG and TT-698(*)/TG

The series-governed type motor used in Teletypewriter TT-4(*)/TG requires 105 to 125 volts, dc or 60-Hz ac. the motor includes an adjustable centrifugal-force governor that is used to maintain a motor speed of exactly 3,600 revolutions per minute (rpm). A tuning fork is required for checking the motor speed.

NOTE

The 30Vdc power supply in the TT-698(*)/TG is designed to operate from an ac source only. The TT/698(*)/TG motor, therefore, will always operate from an ac source.

2-5. Motor, TT-335/TG and TT-537/G

The synchronous motor used in Teletypewriters TT-335/TG and TT-537/G require 108 to 132 volts, single phase ac at 396 to 404-Hz. The motor maintains a constant speed of 12,000 rpm.

2-6. Motor Governor TT-4(*)/TG and TT-698(*)/TG

The motor governor is secured to the motor armature shaft and rotates with the shaft when the motor is operating. Two contacts in the governor are connected in parallel with resistor R1 (fig. FO-1 and FO-7) and the contacts and resistor are connected in series with the field windings and the armature. Tension of the governor spring tends to pull the movable contact against the stationary contact in the governor (A, fig. 2-6). When the motor speed becomes excessive, centrifugal force overcomes the tension of the governor spring and pulls the movable contact away from the stationary contact, adding the resistance of R1 to the motor circuit. This action causes the motor speed to decrease until the spring tension is sufficient to close the contacts, shorting out R1. The motor speeds at which the contacts open and close depend on the tension of the governor spring. Tension is controlled by varying the position of the governor adjustment lever. The governor worm, speed adjustment gear, and governor adjustment screw (B, fig. 2-6) are used to control the position of the governor adjustment lever.

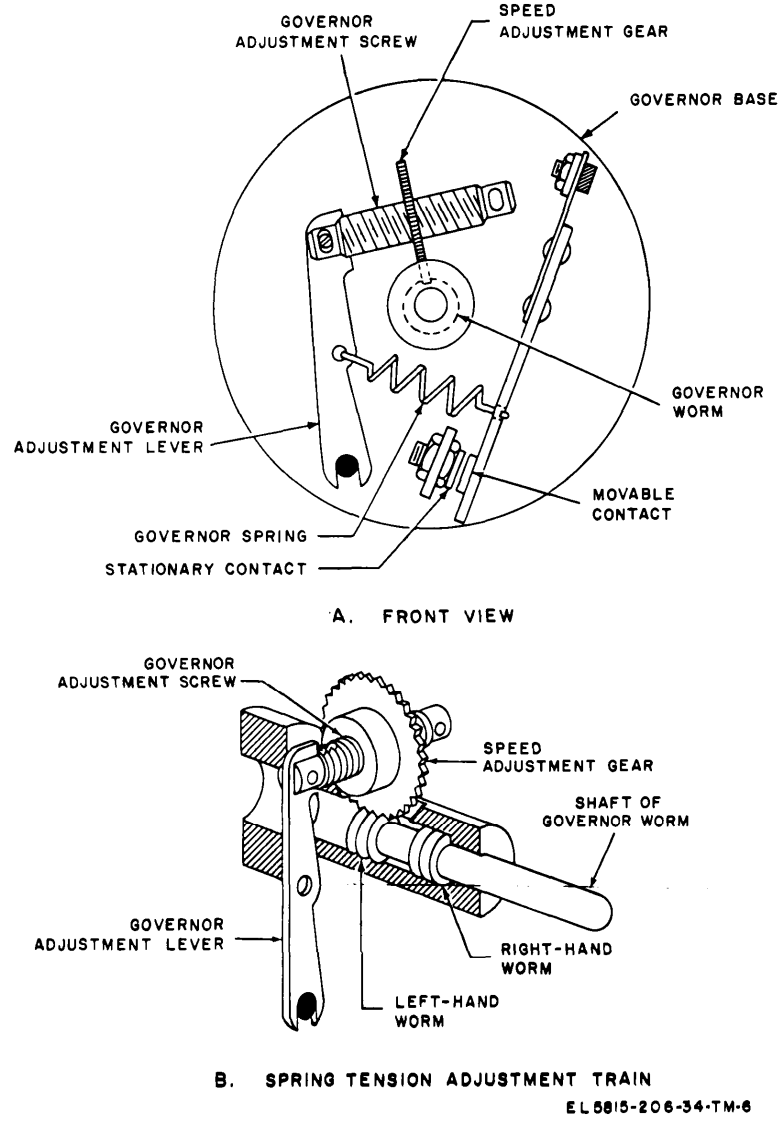


Figure 2-6. Motor Governor, TT-4(*)/TG and TT-698(*)/TG.

2-7. Mechanical Power Distribution
(fig. 2-7)

The main shaft, geared to the motor, rotates continuously when the motor is operating. Four pairs of gears transfer power from the main shaft to the transmitter drive shaft, the carriage-return shaft, the carriage-feed shaft, and the function shaft. A clutch fork, mounted on one end of the main shaft, transfers power to the selector friction clutch.

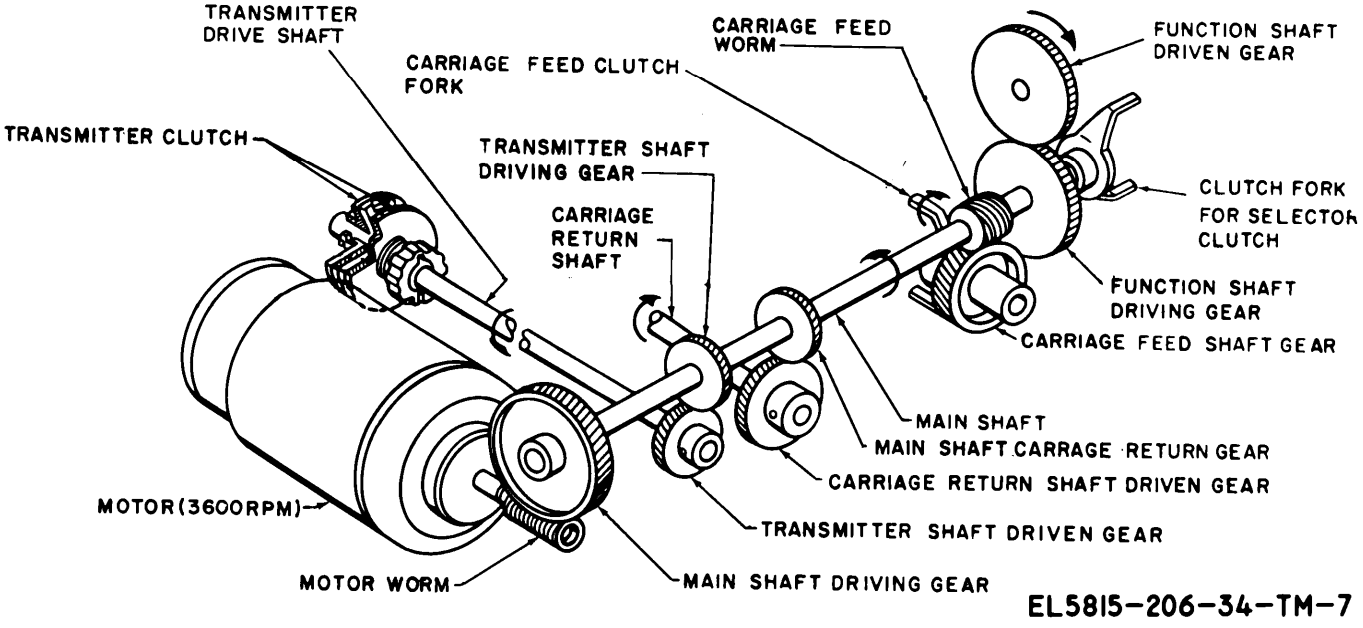


Figure 2-7. Mechanical power distribution.

Section II. MECHANICAL FUNCTIONING OF KEYBOARD

2-8. Keyboard-Transmitter Functions

Operation of the keyboard-transmitter includes: selecting the code group to be transmitted, starting the transmitter mechanism, transmitting the selected code group, and stopping the transmitter mechanism.

a. Thirty-one keylevers, five code bars, and five sensing levers (fig. 2-8) are used to select the code group to be transmitted (para 2-9).

b. Six selector levers, a contact bail, the marking and spacing contacts, and six impulse cams on the transmitter camshaft (D and E, fig. 2-9) are used for transmitting the selected code group (para 2-10).

NOTE

The transmitter contacts (fig. 2-1) include two contact pairs: a pair of marking contacts and a pair of spacing contacts. The marking contacts include a movable contact on the lower arm of the contact bail (fig. 2-9) and its associated fixed contact. The spacing contacts include a movable contact on the upper arm of the contact bail and its associated fixed contact. Only the marking contacts are used for neutral operation; both pairs of contacts are used for high level polar operation (para 2-2). The transmitter contacts (fig. 2-1b) are a single pair used exclusively in low level polar operations. They are the contacts of a reed switch which are caused to open and close by either an inhibited or uninhibited magnetic field.

c. A universal bar, cam-stop-lever, stop cam on the transmitter camshaft (fig. 2-12) and a friction clutch (fig. 2-11) are used to start and stop the transmitter mechanism (para 2-11).

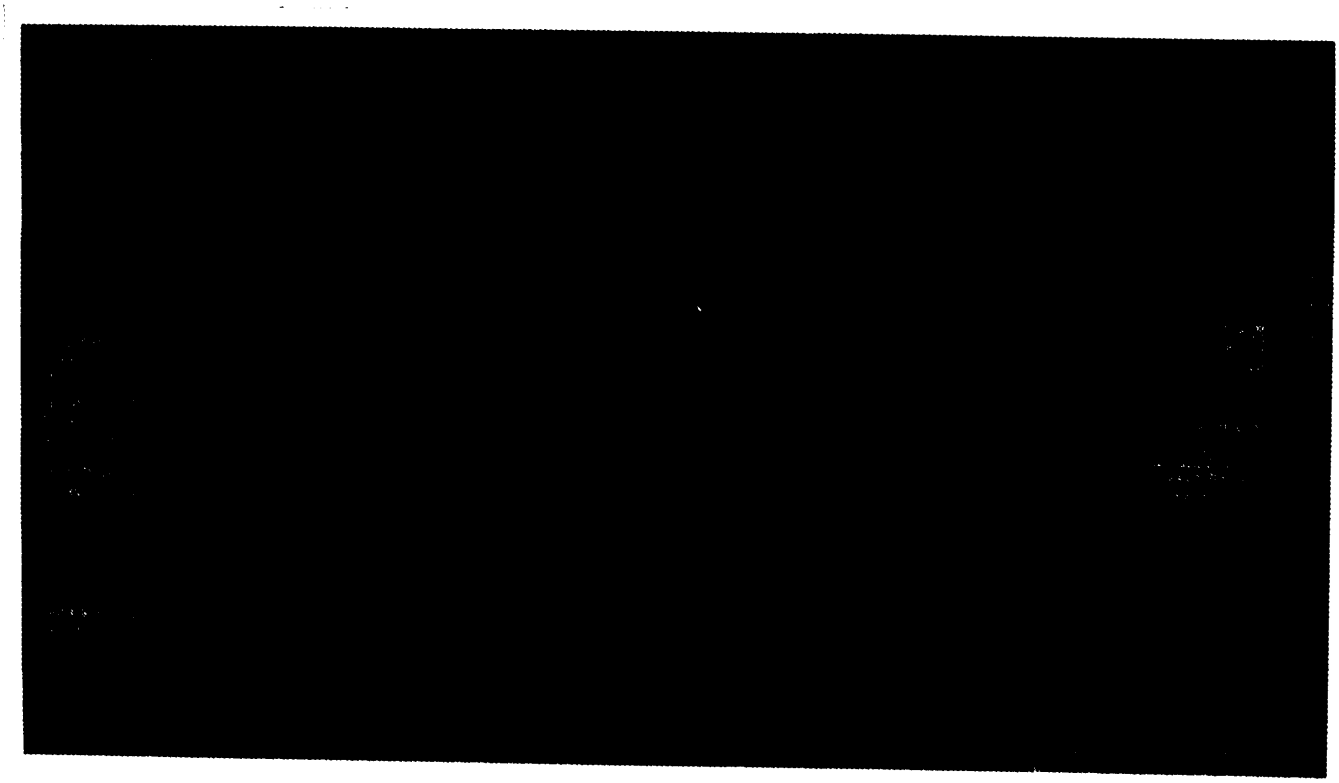


Figure 2-8. Keyboard-transmitter, removed from teletypewriter.

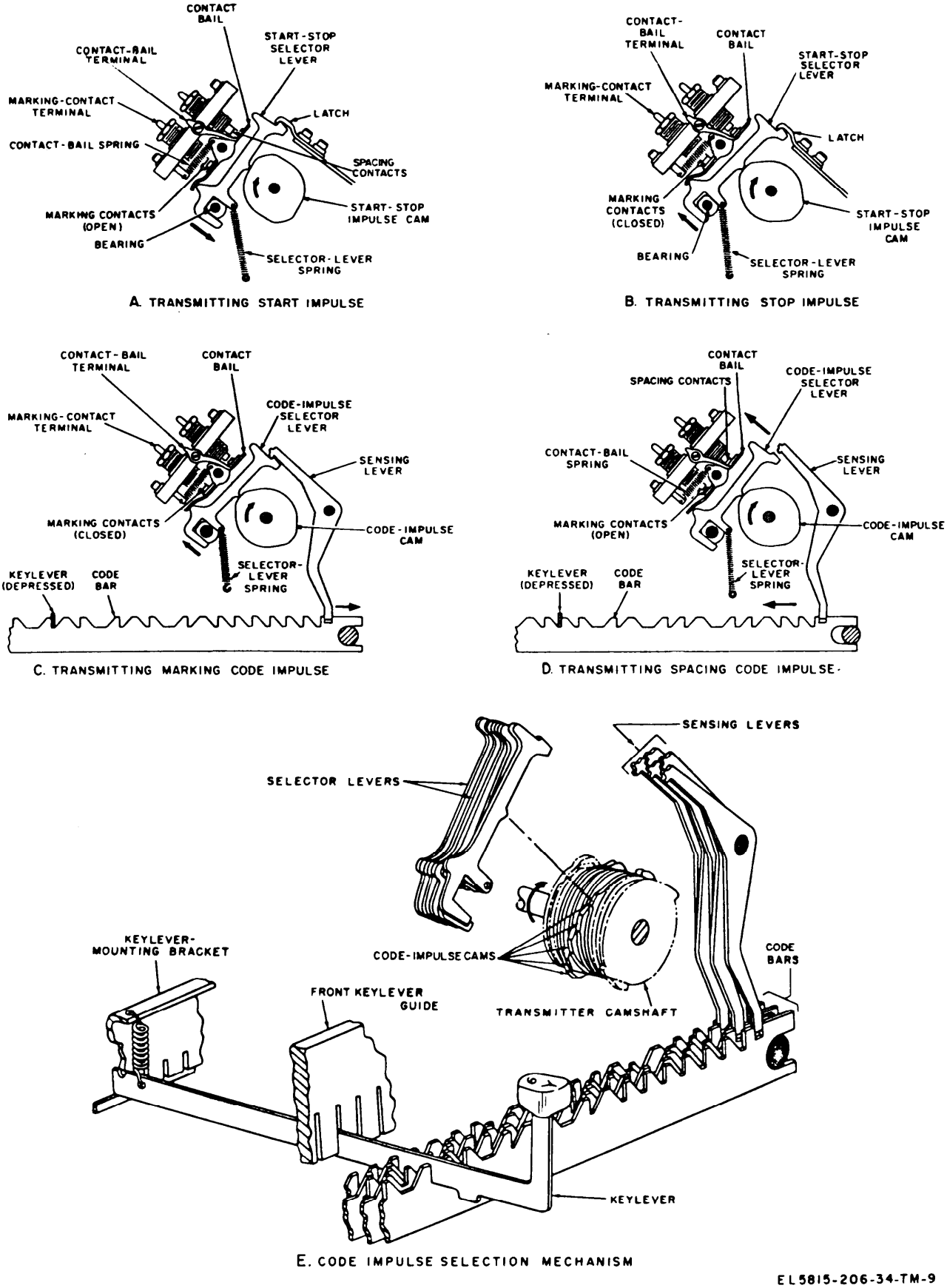


Figure 2-9. Transmission of start, stop, spacing, and marking impulses (all high level units).

Figure 2–10. Deleted

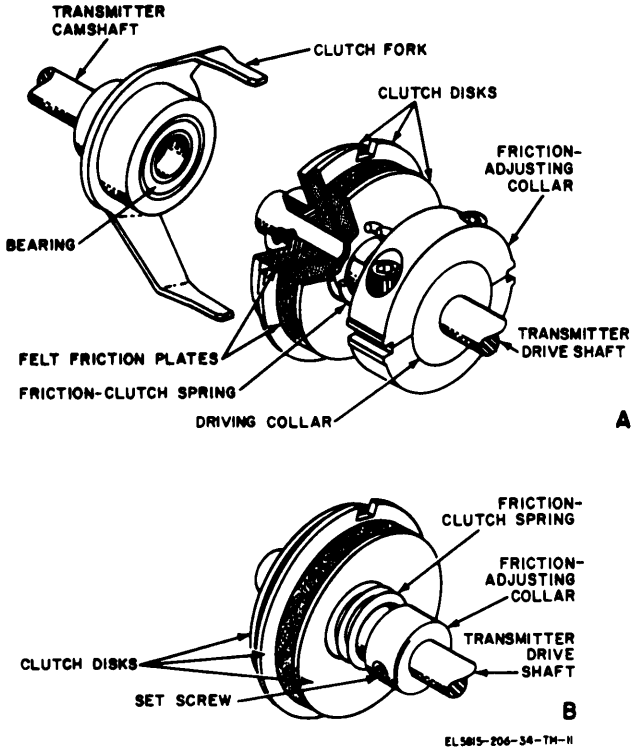


Figure 2-11. Transmitter friction clutch.

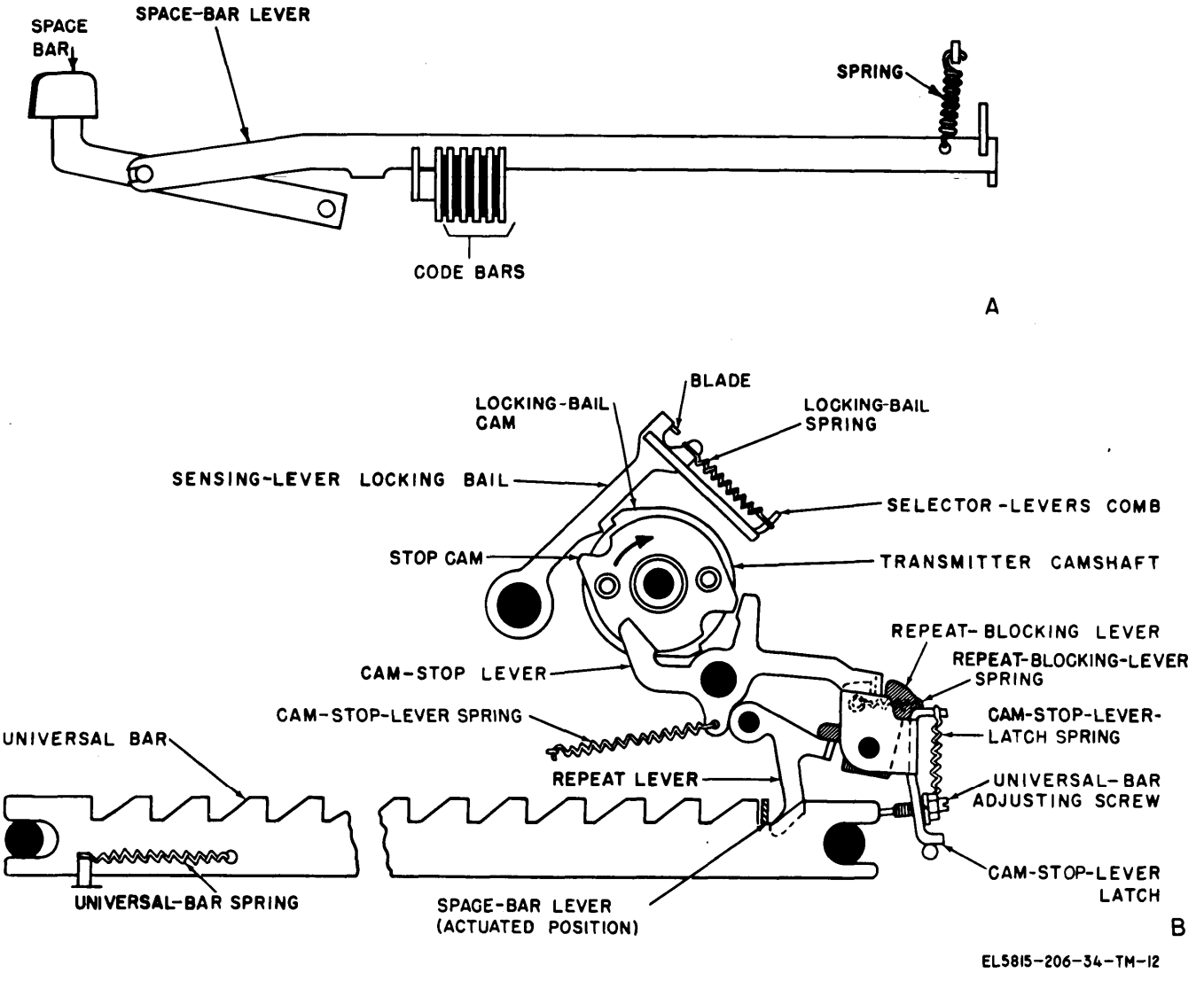


Figure 2-12. Transmitter camshaft control mechanism.

2-9. Keyboard-Transmitter Selection of Code Group for Transmission

Selection of a code group for transmission is made when the operator presses a keylever. The nature (marking or spacing) of each of the five code impulses is established when the downward movement of the keylever positions five code bars (fig. 2-8). The start and stop impulses do not vary from code group to code group; the start impulse is always a spacing impulse and the stop impulse is always a marking impulse. The five code bars (one for each code impulse) are located under the keylevers. The code bars are mounted on studs that are grooved to permit only horizontal movement of the code bars. The code bar closest to the front of the keyboard is used to determine whether the first code impulse is to be a marking or spacing impulse; the second, third, fourth, and fifth code bars are used to control the second, third, fourth, and fifth code impulses respectively. The upper edge of each code bar contains a pattern of notches. Some of the notch surfaces on each code bar are slanted downward to the left, others to the right. The notch pattern of each code bar is different from the pattern of the other code bars. Marking and spacing code impulses are selected by the keylevers and code bars as described in a and b below.

a. Selecting Marking Code Impulse. If the surface of the notch directly below a keylever is slanted downward to the left (C, fig. 2-9) downward movement of that keylever causes the code bar to move to the right, and the associated sensing lever pivots counterclockwise. The upper end of the sensing lever engages its associated code-impulse selector lever, and the code impulse controlled by

that particular code bar will be a marking impulse (para 2-10a (1)).

b. Selecting Spacing Code Impulse. If the surface of a notch directly below a keylever is slanted downward to the right (D, fig. 2-9), downward movement of that keylever causes the code bar to move to the left, and the associated sensing lever pivots clockwise. The upper end of the sensing lever moves away from its code-impulse selector lever and the code impulse controlled by that particular code bar will be a spacing impulse (para 2-10a (2)).

2-10. Transmission of Code Group From Keyboard-Transmitter

a. Code Group Transmission. The marking contacts (A, fig. 2-9) are used to transmit each code group. The contacts, connected in series in the signal circuit, close to sending a marking (current) impulse and open to send a spacing (no-current) impulse. The contacts are closed by cams on the transmitter camshaft, which turns ½ revolution each time a keylever is pressed (para 2-11b). The contacts are opened by the contact-bail spring. The contacts transmit neutral teletypewriter impulses as described below.

(1) *Transmitting Marking Code Impulse (C,* fig. 2-9) If the first code impulse is to be a marking impulse, the first code-impulse selector lever is latched by its sensing lever when the keylever is pressed (para 2-9a). As the transmitter camshaft turns, a lobe on the first code-impulse cam pushes against a projection at the center of the first selector lever. The lower end of the selector lever pivots the contact bail clockwise slightly, closing the marking contacts to complete the signal circuit. The upper end of the selector lever does not move because it is latched by its associated sensing lever. After the code-impulse cam passes the selector lever, the projection of the selector lever moves toward the center of the cam. The selector-lever spring pulls the lower end of the selector lever downward and control of the contact bail passes to the next selector lever. If the next code impulse is to be a marking impulse also, the next selector lever will hold the contact bail in the clockwise position and the contacts will remain closed when the second code-impulse cam operates its selector lever. If the next code impulse is to be a spacing impulse, it will be transmitted as described in (2) below.

(2) *Transmitting Spacing Code Impulse* (D fig. 2-9), If a code impulse is to be a spacing impulse, the selector lever for that impulse is not latched by its sensing lever when the keylever is pressed (para 2-96). As the transmitter camshaft turns, a lobe on the code-impulse cam pushes against the projection in the center of its associated selector lever and the selector lever pivots counterclockwise slightly around its bearing. The selector lever pivots counterclockwise because the upper end of the selector lever is not latched by its sensing lever and the lower end of the selector lever is held in position by the selector-lever spring.

(3) *Transmitting Start and Stop Impulses.* The first impulse of each code group is the start impulse. The five code impulses are transmitted in sequence immediately after the start impulse. The last impulse of each code group is the stop impulse. The start-stop selector lever and the start-stop impulse cam on the transmitter camshaft are used to operate the marking contacts to transmit the start and stop impulses (A and B, fig. 2-9). The start-stop impulse cam and the start-stop selector lever are in alignment directly behind the fifth code-impulse cam and the fifth code-impulse selector lever respectively.

(a) *Signal Circuit condition before transmission.* Before a keylever is pressed to begin transmission of a code group, the transmitter camshaft is held stationary mechanically (para 2-11); the transmitter contacts are held in the closed position by the start-stop impulse cam and the start-stop selector lever (B, fig. 2-9). The top of the start-stop selector lever is latched permanently.

(b) *Transmitting start impulse.* When a keylever is pressed, the transmitter camshaft starts turning (para 2-11). A lobe of the start-stop impulse cam (A, fig. 2-9) moves away from the start-stop selector lever and the selector-lever spring pulls the selector lever downward. The contact-bail spring pivots the contact bail counter-clockwise slightly and the marking contacts open to send the start impulse.

(c) *Transmitting stop impulse.* The stop impulse begins when a lobe of the fifth code-impulse cam on the transmitter camshaft moves away from the fifth code-impulse selector lever and a lobe of the start-stop impulse cam moves against the start-stop selector lever (B, fig. 2-9). Because the top of the selector lever is latched permanently, the bottom of the lever pushes against the contact bail to close the contacts to send the stop impulse. The contacts remain closed until the start impulse of the next code group is transmitted (above). If another key lever is not pressed immediately, rotation of the

transmitter camshaft is stopped mechanically (para 2-11).

b. *Deleted*

2-11. Starting and Stopping Transmission from Keyboard-Transmitter

Transmission begins when the transmitter camshaft starts to turn and ends when rotation of the trans-

(Page 2-15 is deleted.)

mitter camshaft is halted. A friction clutch (fig. 2-11) is used to transfer mechanical power from the constantly rotating transmitter drive shaft to the transmitter camshaft. The stop cam, cam-stop lever, cam-stop-lever latch, and universal bar are used to start and stop rotation of the camshaft.

a. Transmitter Friction Clutch. The friction clutch consists of the clutch fork which is firmly attached to the transmitter camshaft and the friction assembly which is attached to the transmitter drive shaft. Two prongs of the clutch fork engage two notches in the center clutch disk (fig. 2-11). Pressure of the friction clutch spring causes the three clutch disks and two felt friction plates to be compressed, and the friction between the outer disks and the felt friction plates is sufficient to turn the clutch fork when the motor is running and the transmitter camshaft is free to rotate. When the vertical arm of the cam-stop lever (fig. 2-12) moves into the path of one of the two stop lobes of the stop cam on the transmitter camshaft, while the camshaft is turning, the stop lobe strikes against the arm of the cam-stop lever. The camshaft stops turning and the center clutch disk and the felt friction plates are held stationary between the two rotating outer clutch disks. When the arm of the cam-stop lever is moved out of the path of the stop lobe, the transmitter camshaft starts to turn, driven by the friction between the outer clutch disks and the felt friction plates. The TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537G, TT-698A/TG, and TT-698B/TG include a three-piece friction-adjusting assembly (driving collar and two-piece friction-adjusting collar) for adjusting the pressure of the friction-clutch spring (A, fig. 2-11). The TT-4A/TG and TT-698/TG includes a one-piece friction-adjusting collar for spring pressure (B, fig. 2-11).

b. Starting Transmission of Code Group. When a keylever is pressed, it strikes one of the slanted surfaces of the universal bar (fig. 2-12) and the universal bar is cammed to the right. As it moves to the right, it strikes the universal-bar adjusting screw on the cam-stop-lever latch, pivoting the latch counterclockwise, The repeat-blocking-lever spring pulls the repeat-blocking lever counterclockwise until it strikes the right hand arm of the cam-stop lever. The cam-stop-lever latch continues to pivot, forming a slot between it and the repeat-blocking lever. The tension of the cam-stop-lever spring causes the cam-stop lever to pivot clockwise. The end of the right hand arm of the cam-stop lever moves downward, into the slot, and the vertical arm moves away from the stop lobe of the stop cam, permitting the friction clutch to start rotation of the transmitter camshaft (a above).

c. Stopping Transmission. When the transmitter camshaft nears the end of the ½ revolution, one of two projections on the side of the stop cam strikes the left-hand arm of the cam-stop lever, causing the cam-stop lever to pivot counterclockwise. The vertical arm of the cam-stop lever moves to the left, and the transmitter camshaft stops turning when the stop lobe on the stop cam strikes the top of the vertical arm. The cam-stop lever is locked in the counterclockwise position as described in (1) or (2) below.

(1) If the operator has released the depressed keylever, the universal-bar spring pulls the universal bar to the left. The cam-stop-lever-latch spring pivots the cam-stop-lever latch clockwise. The top of the latch moves under the right-hand arm of the cam-stop lever, locking the cam-stop lever in the counterclockwise position.

(2) If the operator has not released the keylever from its downward position, the repeat-blocking-lever spring pulls the repeat-blocking lever counterclockwise. The top of the repeat-blocking lever moves under the right-hand arm of the cam-stop lever, locking the cam-stop lever in the counterclockwise position.

2-12. Space Repeat Operation

When the space bar (fig. 2-8) is pressed and immediately released, one space code group is transmitted. When the space bar is held down, repeated space code groups are transmitted until the space bar is released. Reception of the space code group causes the carriage of the page printer to move one space to the right without printing a character. The space code group is the only code group that can be transmitted repeatedly with one downward movement of a keyboard control.

a. When the space bar is pressed, the space-bar lever (fig. 2-12 and 2-13) positions the five code bars for the space code group (fig. 2-2), and it moves the universal bar to the right to pivot the cam-stop lever latch and the repeat lever counterclockwise, causing the repeat-blocking lever to turn clockwise. Under these conditions, a slot appears below the right-hand arm of the cam-stop lever. The cam-stop lever spring pivots the cam-stop lever clockwise, permitting the friction clutch to turn the transmitter camshaft to transmit repeated space code groups. The repeat lever prevents the repeat-blocking lever from moving under the right hand arm of the cam-stop lever as occurs during transmission of all other code groups (para 2-11c).

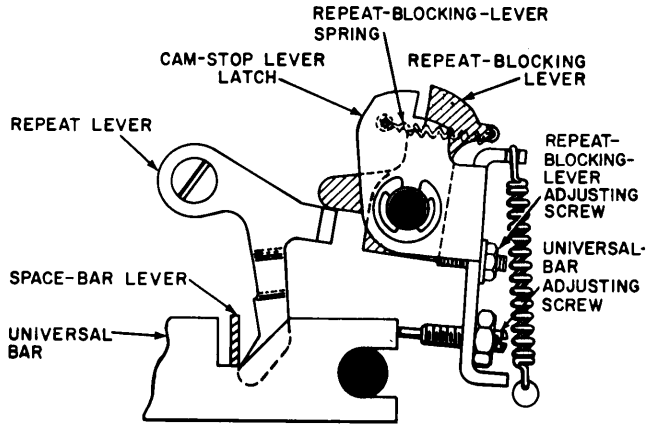


Figure 2-13. Repeat-lever operation.

b. When the space bar is released, transmission is halted as described in paragraph 2-11c.

2-13. Sensing-Lever Locking-Bail Operation

The five sensing levers are positioned each time a keylever the space bar is pressed (para 2-9). During transmission of each code group, the sensing levers are locked in their selected positions by the blade of the sensing-lever locking bail (fig. 2-12). Movement of the sensing-lever locking bail is controlled by the locking-bail spring and the locking-bail cam on the transmitter camshaft. The tension of the spring causes the bail to ride against the outer surface of the cam at all times. Between transmission of code groups, the cam is stationary and the bail is held upward by one of the two lobes of the cam.

a. When a code group is to be transmitted, the transmitter camshaft starts turning and the sensing-lever locking bail pivots clockwise slightly to move against a low portion of the cam (fig. 2-12). In this position, the blade of the bail engages a projection on the top of each of the sensing levers, locking the sensing levers in position. Downward movement of another keylever is not possible while the sensing levers are locked by the bail.

b. During transmission of the stop impulse, a lobe of the locking-bail cam causes the bail to pivot counterclockwise slightly. The blade of the bail moves away from the sensing-lever projections and the sensing levers are free to be repositioned by the downward movement of another keylever.

2-14. Sequence of Keyboard-Transmitter Operations

This example is for a high level teletypewriter. For a low level teletypewriter, a different type contact assembly and a transmitter module would be present. The following chart lists the sequence of operations that occur when a keylever of the keyboard-transmitter is pressed.

Sequence	Impulse control and transmission operations	Starting and stopping operations
1	Keylever pressed downward (E, fig, 9).	
2	Keylever strikes slanted notches of five code bars, camming them individually to left or right according to code to be transmitted (E, fig. 9).	Keylever strikes slanted notch of universal bar, caroming universal bar to right (fig. 2-12).
3	Code bars pivot five sensing levers clockwise or counterclockwise individually (E, fig. 9).	Universal bar strikes its adjusting screw, pivoting cam-stop lever latch counterclockwise (fig. 2-12).
4		Cam-stop lever pivots clockwise; right-hand arm of lever drops into notch between cam-stop-lever latch and repeat-blocking lever, vertical arm of cam-stop lever moves away from stop cam (fig. 2-12).
5		Transmitter camshaft starts turning, driven by friction clutch (fig. 2-11).
6	Sensing-lever locking bail moves to low portion of locking-bail cam, locking sensing levers in selected position (fig. 2-9).	
7	Start - stop selector lever moves to low portion of start-stop impulse cam on transmitter camshaft (A, fig. 2-9).	
8	Contact-bail spring pivots contact bail counterclockwise, opening contacts to send start impulse.	
9	Lobe of No. 1 code-impulse cam pushes No. 1 selector lever. If latched by sensing lever, lower end of selector lever turns contact bail clockwise to send marking impulse (C, fig. 2-9). If not latched by its sensing lever, upper end of selector lever pivots contact ball counterclockwise to send spacing impulses (I), fig. 2-9).	
10	Lobes of No, 2, 3, 4, and 5 code-impulse cams operate in sequence to transmit second, third, fourth, and fifth code impulses (C and D, fig. 2-9),	
11		Projection on side of stop cam strikes left-hand arm of cam-stop lever, pivoting cam-stop lever counterclockwise (fig. 2-12).

Sequence	Impulse control and transmission operations	Starting and stopping operations
12		Cam-stop lever latched in counterclockwise position by cam-stop-lever latch for repeat-blocking lever.
13	Lobe of start-stop impulse cam pivots contact bail clockwise, closing contacts to send stop impulse (B, fig. 2-9).	
14	Lobe of locking-bail cam pivots locking bail counterclockwise: blade of bail moves away from sensing levers (fig. 2-12).	
15		Stop lobe of stop cam strikes vertical arm of cam-stop lever. Transmitter camshaft stops turning.

Section III. MECHANICAL FUNCTIONING OF TELETYPEWRITER

2-15. Page Printer Functioning, General

Operation of the page printer is controlled by the teletypewriter code groups that are received from either the keyboard-transmitter of the same teletypewriter or the transmitter of another teletypewriter that is connected to the same signal circuit as the receiving teletypewriter. The start impulse (first impulse of each code group) causes the page printer to start a cycle of mechanical operation. The five code impulses, received in sequence in the selector magnet of the page printer, are used by the selector mechanism to select the character to be printed or the nonprinting mechanical operation to be performed (line-feed, figures-shift, etc). After the fifth code impulse is received, the selected character is printed, or the selected mechanical operation is performed automatically by the page printer. The stop impulse (last impulse of each code group) is used to stop the page printer until the start impulse of the next code group is received.

2-16. Selector-Magnet Operation

The two coils of the selector magnet are connected to the signal circuit. The selector magnet responds to incoming marking and spacing impulses as described below.

a. Condition During Marking Impulse. When either a marking code impulse or the stop impulse is received current flows through the two selector-magnet coils and a magnetic field is present around the coils (fig. 2-14). The magnetic field is strong enough to overcome the tension of the armature spring and the armature is held against the armature upper-stop screw (marking position of armature).

b. Condition During Spacing Impulse. When either a spacing code impulse or the start impulse is received, current stop flowing in the selector-magnet coils. No magnetic field is present around the coils and the armature spring pulls the armature against its lower-stop screw (spacing position of armature).

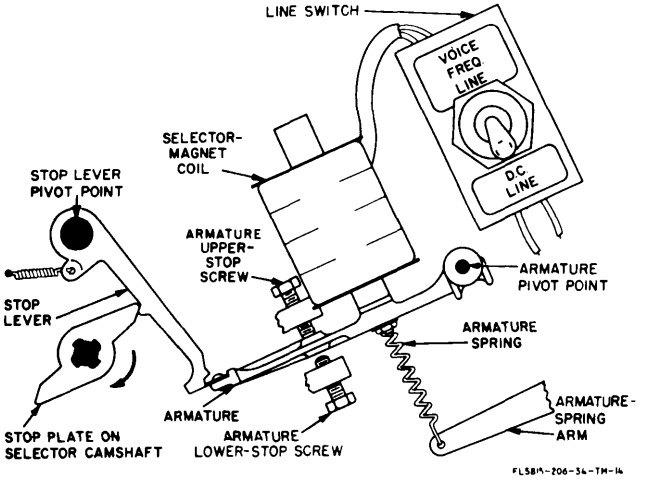


Figure 2-14. Armature held in marking position by energized selector magnet.

2-17. Starting and Stopping Selector Camshaft Rotation

a. Selector Friction Clutch. When the motor is operating, the main shaft and the selector clutch fork that is fastened to one end of the main shaft rotate continuously (fig. 2-7). Two fingers of the clutch fork are engaged with two notches in the center clutch disk of the friction clutch (fig. 2-15). The center clutch disk and the two felt friction plates rotate continuously with the clutch fork. The compressed clutch spring presses one outer clutch disk, the felt friction plates, and the center clutch disk against the other outer clutch disk, causing a constant torque to be applied to the selector cam-shaft. Rotation of the selector camshaft is controlled as described in b through d below.

b. Condition Before Receipt of Start Impulse. Before the start impulse is received, the

armature is in the marking position, against the armature upper-stop screw (para 2-16a). Torque of the selector friction clutch causes one lobe of the stop plate on the selector camshaft to press against the projection in the center of the stop lever, but the lower end of the armature blocks counterclockwise movement of the stop lever and the stop plate and selector camshaft are not permitted to rotate (A, fig. 2-16).

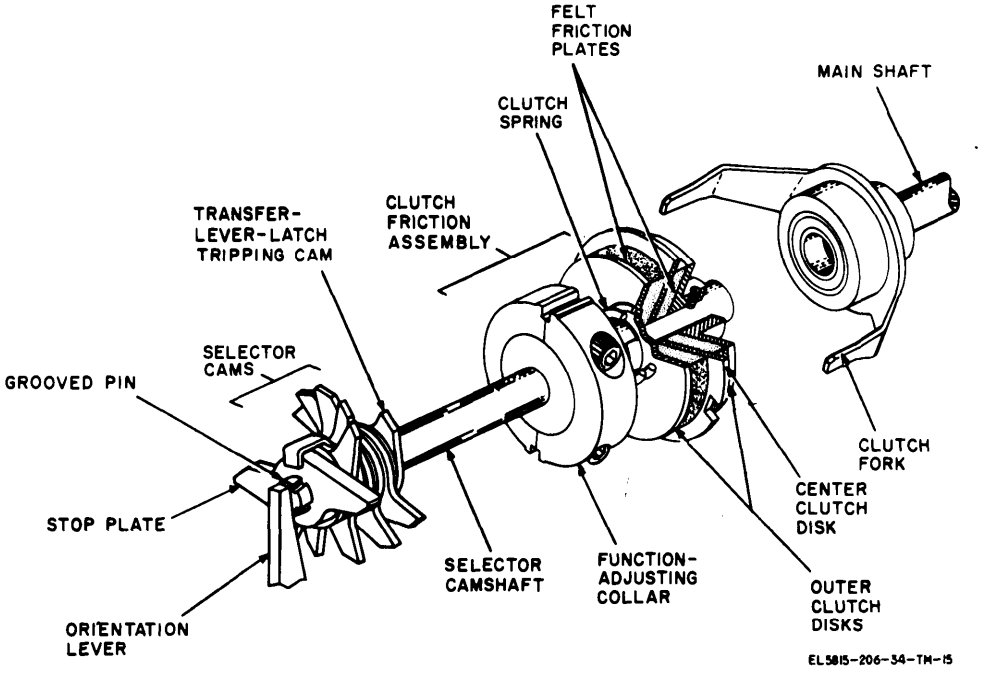


Figure 2-15. Selector camshaft and selector friction clutch.

c. Starting Selector Camshaft Rotation. When the start impulse is received, the armature spring pulls the armature downward, against the armature lower-stop screw (para 2-17b) and the lower end of the armature releases the stop lever (fig. 2-14). Pressure of the stop plate causes the stop lever to pivot counterclockwise slightly, and the selector camshaft is permitted to start turning (B, fig. 2-16).

d. Stopping Camshaft Rotation. Immediately after the selector camshaft starts turning, the five code impulses are received in sequence (para 2-18). When the camshaft nears the end of ½ revolution, the stop impulse is received in the selector-magnet coils. The magnetic field set up by the stop impulse pulls the armature against its upper-stop screw and the lower end of the armature moves upward into the patch of the stop lever. Rotation of the selector camshaft is halted when the lobe of the stop plate strikes the projection of the stop lever (A, fig. 2-16). The stop impulse prevents the selector camshaft from turning more than ½ revolution for each code group. The camshaft remains stationary until the start impulse of the next code group is received (c above).

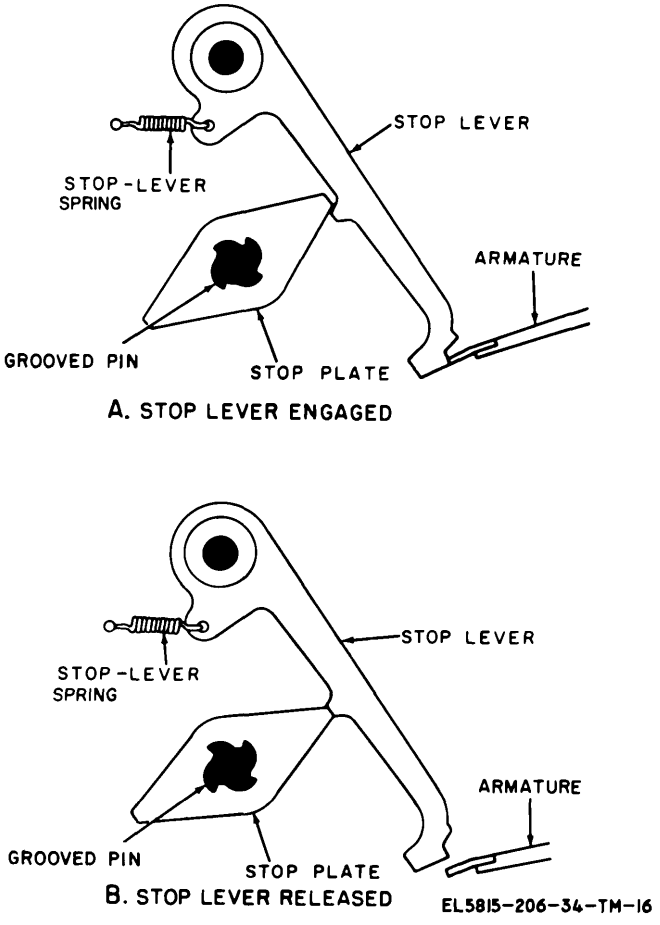


Figure 2-16. Stop-lever in engaged and released positions.

2-18. Recording Code Impulses

The five code impulses of a code group are received in sequence immediately after the selector camshaft starts turning (para 2-17c). Each of the code impulses is either a marking (current) or spacing (no-current) impulse (fig. 2-2), as determined by the code group assigned to the character to be printed, or the nonprinting operation to be performed by the page printer. A marking code impulse always causes the armature to be drawn upward, against its upper-stop screw (fig. 2-14). A spacing code impulse always allows the armature spring to pull the armature downward against its lower-stop screw. Five selector cams (fig. 2-15 and 2-17), five selector levers, and five Y-levers (one of each for each code impulse), are used to record the position of the armature while each of the five code impulses are being received. The selector cams are staggered around one-half the circumference of the selector camshaft (fig. 2-15), which makes ½ revolution for each code group received. The first selector cam and its associated selector lever and Y-lever record the nature (marking or spacing) of the first code impulse; the second selector cam, and its associated selector and Y-levers record the second impulse; and so on, for each of the remaining code impulses.

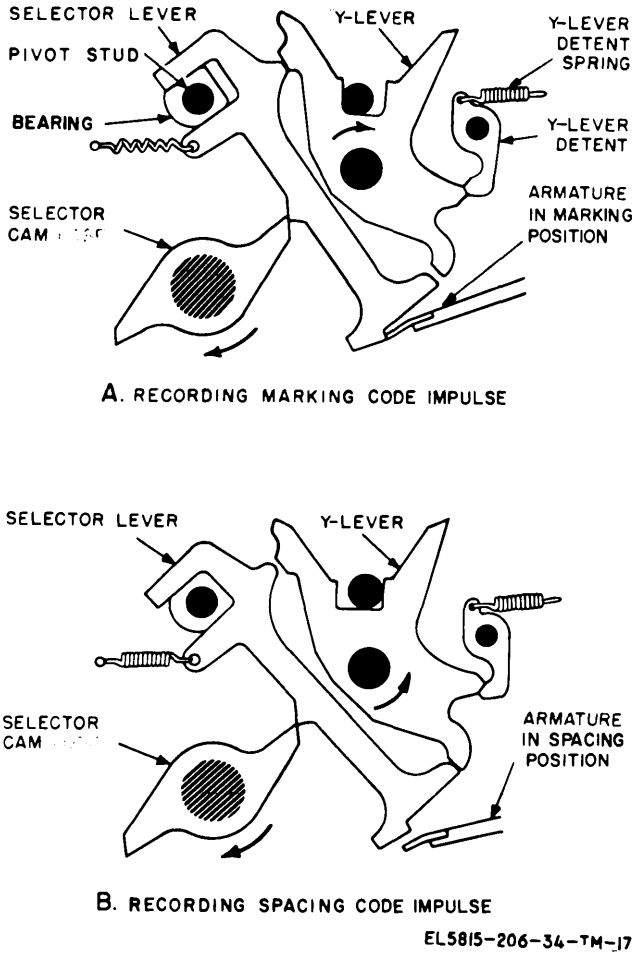


Figure 2-17. Recording marking and spacing code impulses,

a. Recording Marking Code Impulse. When a marking code impulse is received, the armature is held in the marking (upper) position and the broad lower end of the armature latches the lower end of the five selector levers (A, fig. 2-17). A lobe of the selector cam that corresponds to the code impulse being received (first selector cam for first code impulse, etc) rotates to the position shown and pushes against the center of its associated selector lever. Movement of the lower end of the selector lever is prevented by the armature. The upper end of the selector lever moves clockwise, sliding on its bearing, The upper end of the selector lever pushes its associated Y-lever clockwise (unless it was set to the clockwise position by the previous code group). When the cam lobe moves beyond the center of the selector lever, the selector-lever spring pulls the selector lever away from the Y-lever, but the Y-lever is held in the clockwise position by either the Y-lever

detent on the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, or the friction plate on the TT-4A/TG and TT-698/TG (fig. 2-20). In this way, each time a marking code impulse is received, its associated Y-lever is moved to the clockwise position.

b. Recording Spacing Code Impulse. When a spacing code impulse is received, the armature is positioned downward, away from the selector levers (B, fig. 2-17). A lobe of the selector cam associated with the code impulse rotates to the position shown and pushes against the center of its associated selector lever. The armature is not in position to block movement of the lower end of the selector lever and the lower end of the selector lever moves upward, turning its associated Y-lever counterclockwise. The Y-lever detent of the TT-4B/TG, TT-4C/TG , TT-335/TG, TT-537/G , TT-698A/TG, and TT-698B/TG, or the friction plate of the TT-4A/TG and TT-698/TG holds the Y-lever in the counterclockwise position. In this way, each time a spacing code impulse is received, its associated Y-lever is moved to the counterclockwise position.

c. Range finder Mechanism. The time required by each selector cam to position its Y-lever is approximately 20 percent of the total time that the code impulse is present in the selector magnet. Under ideal conditions, maximum reliability of operation is obtained when the Y-lever is positioned during the middle portion of the code impulse. The rangefinder mechanism permits selection of the portion of each code impulse that will be used for the positioning of the Y-lever. The rangefinder mechanism is used to control the angle between the stop plate and the first selector cam on the selector camshaft (fig. 2-18). Decreasing the angle causes the selector cams to position their respective Y-levers during the early part of the code impulses. Increasing the angle causes the cams to position their respective Y-levers during the later part of the code impulses. The angular position of the stop plate is controlled by the position of the grooved pin. When the grooved pin is moved inward, the angle is increased; when the pin is moved outward, the angle is decreased. The position of the grooved pin is controlled by a train of parts which includes the orientation lever, rangefinder cam, rangefinder-cam gear, rangefinder dial gear, and RANGE dial. Clockwise rotation of the RANGE dial causes the grooved pin to move inward; counterclockwise rotation causes the pin to move outward.

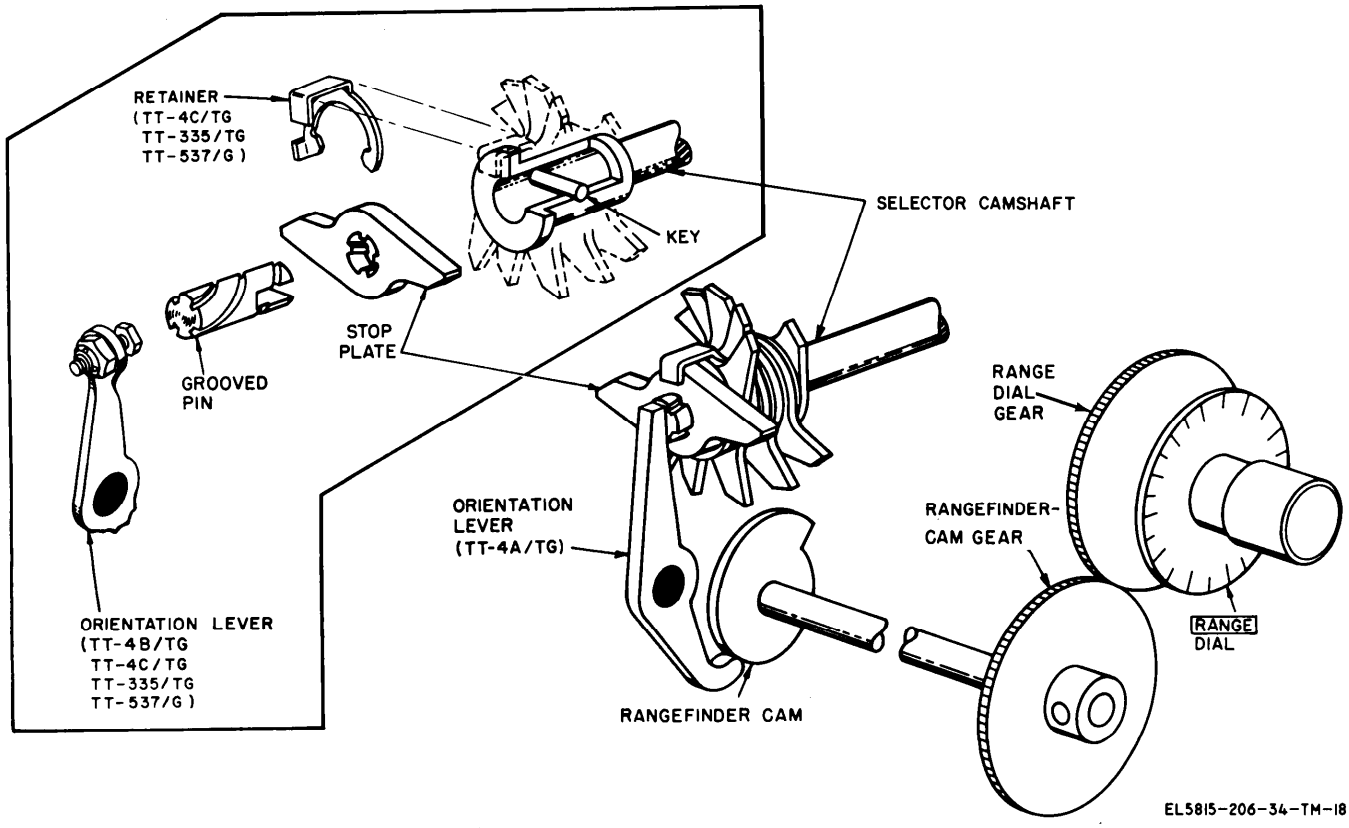


Figure 2-18. Range finder mechanism.

d. Controlling Armature Spring Tension. Tension of the armature spring is a critical factor in the operation of the page printer. The tension should be checked, and if necessary, adjusted for optimum performance of the page printer whenever the signal line current is changed. The spring tension is adjustable to a very fine degree with the armature spring tension adjustment mechanism (fig. 2-19). Rotation of the ARMATURE dial clockwise causes the armature-spring arm to move downward, increasing the tension applied to the armature by its spring. Turning the dial counterclockwise decreases the spring tension.

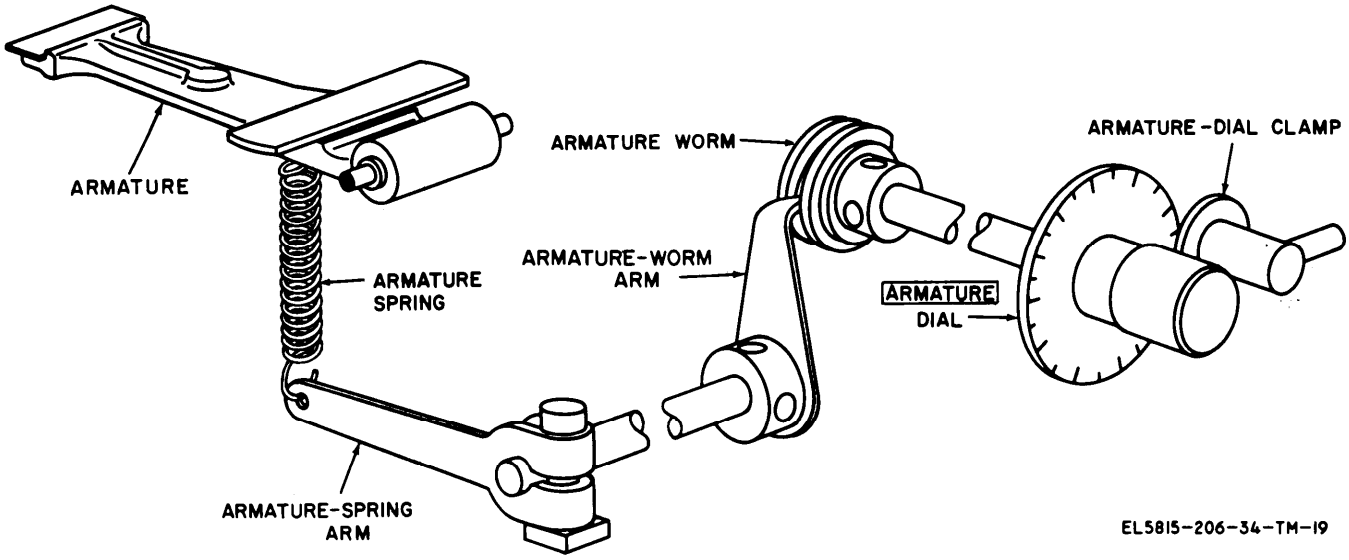


Figure 2-19. Armature spring tension adjustment mechanism.

e. Sequence of Selector Mechanism Operations. The following chart lists the sequence of operations that occur in the selector mechanism of the page printer when a code group is received.

Selector mechanism operation sequence chart

1 Start impulse received in selector-magnet coils (fig. 2-14).
2 Selector-magnet armature drops to spacing position.
3 Stop lever released by armature (B, fig. 2-16).
4 Stop plate released by stop lever;
5 Selector camshaft starts revolving (fig. 2-15).
6 First code impulse pulls armature up or armature remains down, depending on whether impulse is marking or spacing (fig. 2-17).
7 No. 1 code-impulse cam pushes middle of No. 1 selector lever.
8 No. 1 selector lever pivots about end of armature if armature is up (marking), or about selector-lever pivot stud if armature is down (spacing impulse).
9 No. 1 selector lever pushes No. 1 Y-lever clockwise if selector lever is pivoting about armature end (marking impulse) or counterclockwise if selector lever is pivoting about pivot stud (spacing impulse).
10 Second, third, fourth, and fifth code impulses in turn operate the corresponding parts of the selector mechanism, as described above for the first impulse, so that each Y-lever is set clockwise or counterclockwise as determined by its corresponding code impulse.
11 Latch-tripping cam turns transfer latch (para 2-19e).

Selector mechanism operation sequence chart – Continued

12 Stop impulse received in selector-magnet coils.
13 Armature pulled upward to marking position.
14 Stop lever latched by armature (A, fig. 2-16).
15 Stop plate moves against stop lever.
16 Stop plate held by stop lever.
17 Selector camshaft stopped at end of ½ revolution.

2-19. Transfer Operation

The purpose of the transfer operation is to pivot each of the five code rings to a position (marking or spacing) to correspond with the nature (marking or spacing) of each of the five code impulses of a received code group. When positioned, the code rings select a stop bar (para 2-20) which controls the selection of the character to be printed or the function (nonprinting mechanical operation) to be performed. The transfer operation occurs automatically, immediately after the five Y-levers are positioned clockwise or counterclockwise in accordance with the nature of each of the five code impulses of the code group (para 2-18a and b). Five T-levers (fig. 2-20) are used to position the code rings. The T-levers are mounted on a common pivot stud that is attached to one arm of the transfer lever. Each T-lever is mounted above, and in alinement

with, an associated Y-lever. The vertical arm of each T-lever is in engagement with a slot in the tail of an associated code ring. The five code rings (fig. 2-21) pivot around the stop-arm shaft. The code rings are moved to the marking and spacing positions as described in a and b below. During printing, the code rings of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG are locked in their selected positions as described in *d* below. The TT-4/TG and TT-698/TG does not include the code-ring locking feature.

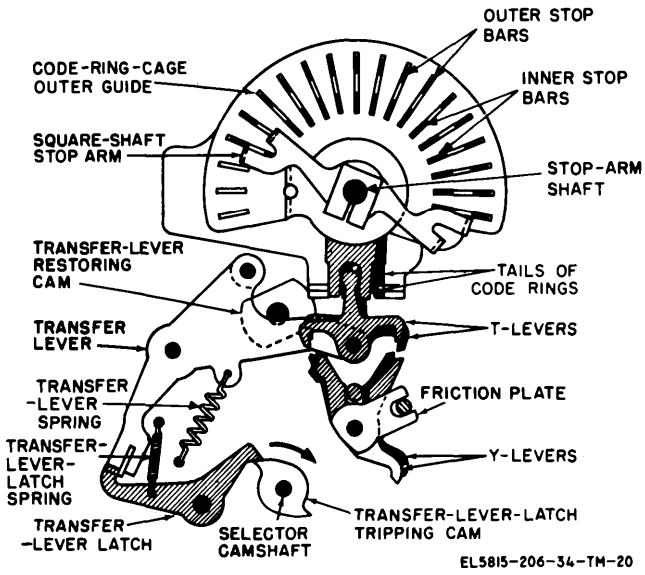


Figure 2-20. Transfer lever in latched position.

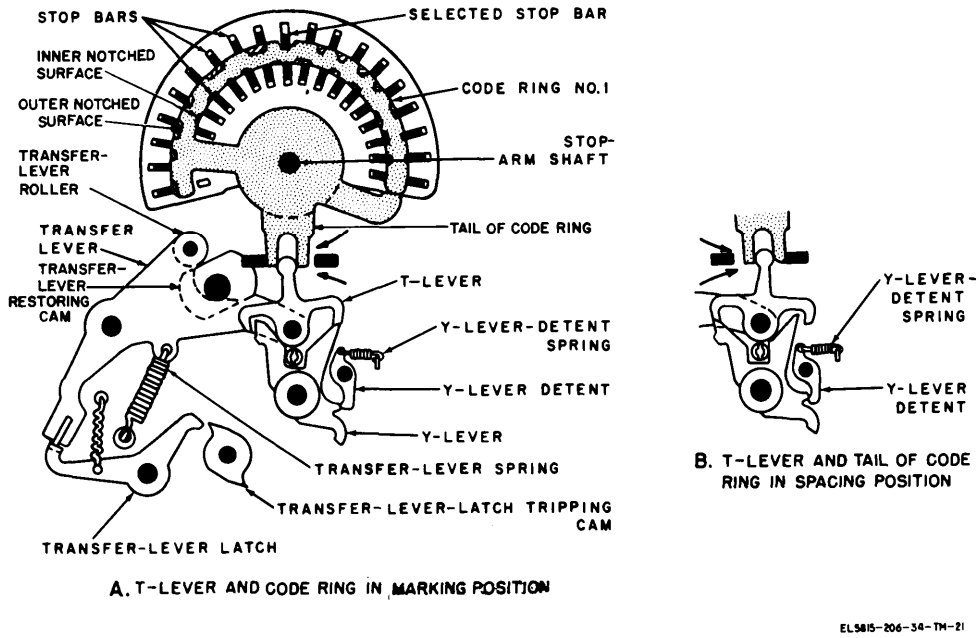


Figure 2-21. T-levers and code rings set to marking and spacing positions.

a. Condition Before Transfer Operation. When the five Y-levers are being positioned (para 2-18), the transfer-lever latch holds the transfer lever in the counterclockwise position against the pull of the transfer-lever spring, and the five T-levers are held above their respective Y-levers (fig. 2-20).

b. Positioning T-levers and Code Rings. Immediately after the fifth selector cam positions the fifth Y-lever, a lobe of the transfer-lever-latch tripping cam (fig. 2-15) pushes against one arm of the transfer-lever latch (fig. 2-20). The latch pivots counterclockwise, releasing the lower arm of the transfer lever. The tension of the transfer-lever spring turns the transfer-lever clockwise and the T-levers move downward, against the upper arms of the Y-levers (fig. 2-21).

(1) *Setting code ring to marking position.* If a Y-lever is in the marking (clockwise) position when its associated T-lever moves downward, the right hand arm of the T-lever strikes the right hand arm of the Y-lever. The left hand arm of the T-lever clears the left hand arm of the Y-lever and the T-lever pivots counterclockwise, causing its associated code

ring to pivot clockwise to the marking position (A, fig. 2-21).

(2) *Setting code ring to spacing position.* If a Y-lever is in the spacing (counterclockwise) position when the T-levers move downward, the left hand arm of its associated T-lever strikes the left hand arm of the Y-lever and the T-lever pivots clockwise, causing its associated code ring to pivot counterclockwise to the spacing position (B, fig. 2-21).

c. Restoring Transfer Lever to Latched Position. When the transfer operation occurs (b above), the transfer lever must be restored to its original position (latched by the transferlever latch) to permit the positioning of the Y-levers in accordance with the code impulses of the next code group.

(1) During the transfer operation, the transfer-lever roller moves toward a low part of the transfer-lever restoring cam (fig. 2-21). Immediately after the transfer operation occurs, the restoring cam starts to turn, ((2) below). A lobe of the restoring cam pushes the roller upward to cause the transfer lever to pivot counterclockwise slightly until it is latched by the transfer-lever latch.

(2) The transfer-lever restoring cam is fastened to one end of the function shaft (fig. 2-27). The function-shaft driving gear on the main shaft and the function-shaft driven gear on the function shaft rotate continuously when the motor is operating. The driven gear rotates freely on the function shaft and the function shaft does not turn while the Y-levers are being positioned. When the transfer lever moves the T-levers downward to accomplish the transfer operation, the function-clutch latch moves downward also, releasing an arm of the function-clutch drum. This action permits the function-clutch spring to push the function-clutch drum along the function shaft until the teeth of the drum are meshed with the teeth cut into the side of the rotating function-shaft driven gear. The clutch drum is keyed to the flexible-coupling disk, the disk is fastened firmly to the function shaft, and the function shaft rotates whenever the function-clutch drum is pushed against the function-shaft driven gear.

(3) When a lobe of the transfer-lever restoring cam pushes the transfer-lever roller upward ((1) above), the function-clutch latch also moves upward, into the path of an arm of the function-clutch drum. When the arm of the drum strikes the roller of the function-clutch latch, the drum is cammed away from the teeth of the function-shaft driven gear, and the function shaft stops turning. The shaft remains stationary until another transfer operation occurs after the next code croup is received.

d. Locking Code Rings in Selected Position. Immediately after the transfer operation occurs, the code-ring locking bail of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG locks the code rings in their selected positions to prevent movement of the code rings during the printing operation (para 2-21). The locking-bail cam on the function shaft (fig. 2-22) controls operation of the code-ring locking bail as described below.

(1) When the Y-levers are being positioned, the function shaft and locking-bail cam are stationary; the cam follower is against a lobe of the locking-bail cam. The cam-follower lever is held in the clockwise position, the locking-bail lever is in the counterclockwise position, and the lower end of the code-ring locking bail is held away from the code rings.

(2) The locking-bail cam on the function shaft begins to turn after the transfer operation (c (2) above) occurs. The cam follower drops to a low part of the cam and the cam-follower lever pivots counterclockwise. The locking-bail lever pivots clockwise and the code-ring locking bail moves against the code rings, locking the code rings in position until the opposite lobe of the locking-bail cam moves against the cam follower to release the code rings for the next transfer operation.

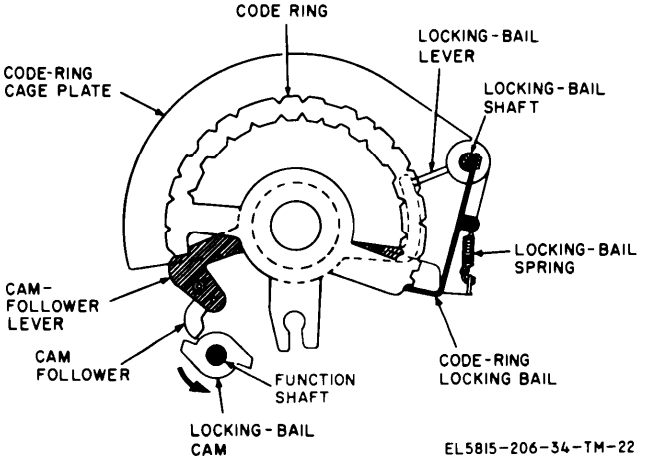


Figure 2-22. Code-ring locking mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

e. Sequence of Transfer Operations. The following chart lists the sequence of operations that occurs in the page printer immediately after the fifth code impulse is received.

Transfer operation sequence chart

1	Transfer-lever-latch tripping cam pivots transfer-lever latch (fig. 2-20).
2	Transfer-lever latch releases transfer lever (fig. 2-21).
3	Transfer-lever spring pulls transfer lever clockwise.

Transfer operation sequence chart – Continued

4	Transfer-lever moves five T-levers downward (fig. 2-21).	Function-clutch latch moves downward, releasing function-clutch drum (fig. 2-27).
5	T-levers transfer settings of Y-levers to code rings.	Function-clutch spring pushes function-clutch drum against function-shaft driven gear.
6	Code rings form groove in line with stop bar to be selected.	Function shaft starts ½ revolution.
7	Stop bar moves into groove in code rings; previously selected stop bar pushed to nonselected position (fig. 2-23).	Locking-bail cam follower moves to low part of cam: locking bail moves against code rings to lock them in selected position (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG).
8	Selected character printed or function accomplished (para 2-21).	
9	Transfer-lever restoring cam on function shaft pivots transfer lever counterclockwise (fig. 2-21).	Lobe of locking-bail cam pivots cam-follower lever to move locking bail away from code rings (fig. 2-22),
10	T-levers move upward, away from Y-levers.	Function-clutch latch moves upward into path of arm on function-clutch drum (fig. 2-27).
11	Transfer-lever latch locks transfer lever in counterclockwise position (fig. 2-20).	Function-clutch latch cams function-clutch drum out of engagement with function-shaft driven gear: function shaft stops (½ revolution completed).

2-20. Selection of Stop Bars by Code Rings

A stop bar is selected by the code rings immediately after the five code rings are set to the marking or spacing positions as determined by the five code impulses of the received code group (para 2-19). Thirty-two of thirty-five stop bars provided are used to control the point at which rotation of the square-shaft stop arm (fig. 2-20) is halted after each code group is received. The remaining three stop bars (fig. 2-24) do not affect rotation of the square-shaft stop arm; they activate mechanism for the linefeed, carriage-return, and figures-shift operations (para 2-22, 2-26 and 2-29).

a. Stop-Bar Location. The stop bars are mounted in slots in the code-ring cage. Thirty-two of the stop bars are arranged in pairs in two semicircles, with one outer stop bar and one inner stop bar mounted in each slot. A compression-type stop-bar spring is mounted between each pair of stop bars (fig. 2-23). The pressure of the springs causes the opposite ends of the 16 outer stop bars to press inward, against the outer surface of the notched, curved portion of the 5 code rings. The same spring pressure causes the 16 inner stop bars to press outward, against the inner, notched surface of the code rings. Each of the 32 possible code combinations (fig. 2-2) is assigned to one of the 32 stop bars. When a code combination is received, its assigned stop bar is selected by the code rings as described in b below.

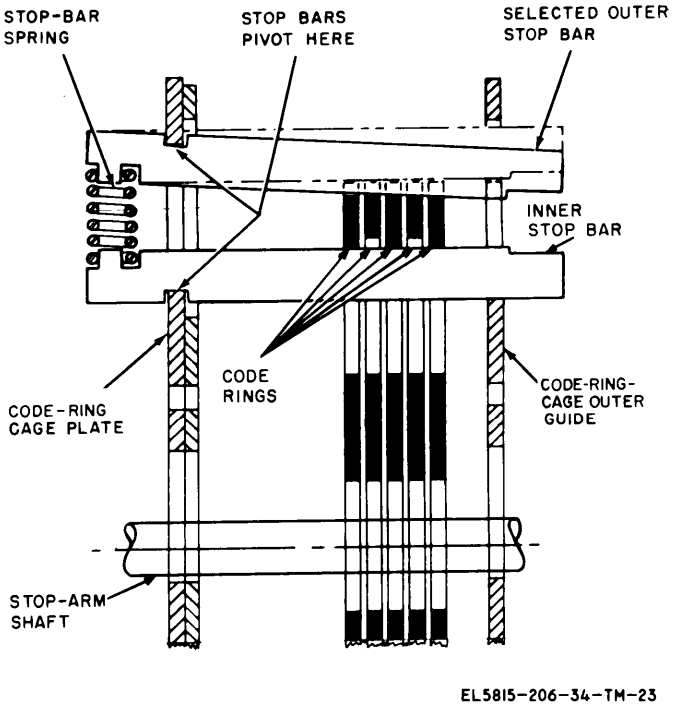


Figure 2-23. Cutaway view of code ring cage, showing selection of outer stop bar by code rings.

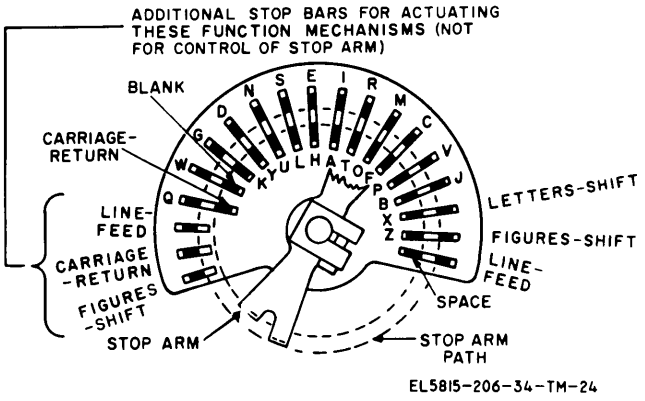


Figure 2-24. Side view of code ring cage, showing location of stop bars.

b. Stop-Bar Selection. The inner and outer surfaces of the curved portion of each of the code rings are notched (fig. 2-21 and 2-22). The pattern of notches in each code ring differs from the notch pattern of the other four code rings. When the transfer operation occurs, each of the code rings is positioned clockwise or counterclockwise, and the five code rings form a groove in line with one of the stop bars. Pressure of the stop-bar spring causes the stop bar to move into the groove formed by the code

rings, and the end opposite the spring moves into the path of one of the projections of the square-shaft stop arm. When the square-shaft stop arm starts rotating, one of its projections strikes against the blocking end of the selected stop bar, and rotation of the stop arm friction-clutch driven is stopped at that point. The point at which the stop arm is halted determines the selection of the character to be printed (para 2-21), or the function to be performed. Figure 2-24 illustrates the location of each of the stop bars. The ends of the three extra function stop bars do not project into the path of the square-shaft stop arm and therefore have no control over rotation of the stop arm.

2-21. Printing Operation

The printing operation occurs immediately after a stop bar is selected by the code rings (para 2-20). The printing operation includes selecting the character (a below) and printing the selected character (b below)

a. Character Selection. Twenty-six type bars and their associated connecting bars are mounted in a semicircle in the carriage of the page printer (fig. 2-25 and 3-7). The type-selecting arm is geared to the square shaft and rotates with it (fig. 2-25). The square shaft starts to turn immediately after the transfer operation occurs and stops when it strikes against the selected stop bar (para 2-20). When the selected stop bar halts rotation of the square shaft, it causes one of the fingers of the type-selecting arm to be aligned with one of the 26 connecting bars. The type-selecting arm then pushes the connecting bar forward to cause printing (b below). Power to rotate the square shaft is obtained from the main shaft (c below). Bouncing of the square-shaft stop arm when it strikes the selected stop bar is prevented by the stop-arm antibounce clutch (d below).

b. Printing of Selected Character. Printing occurs immediately after rotation of the type-selecting arm is halted (a above). A lobe of the print cam (fig. 2-26) causes the print-cam follower to pivot counterclockwise, causing the print-bail blade to move. forward sharply. The print-bail blade is engaged in the groove of the grooved nut on the shaft of the type-selecting arm. The type-selecting arm pushes the alined connecting bar forward to cause the type bar to strike against the platen. The roller of the print-cam follower then moves to a low portion of the print cam, causing the type-selecting arm to return to the rearward position. The print cam is firmly fastened to the function shaft (fig. 2-27) and turns ½ revolution each time the transfer-lever latch tripping cam trips the transfer lever (para 2-19b).

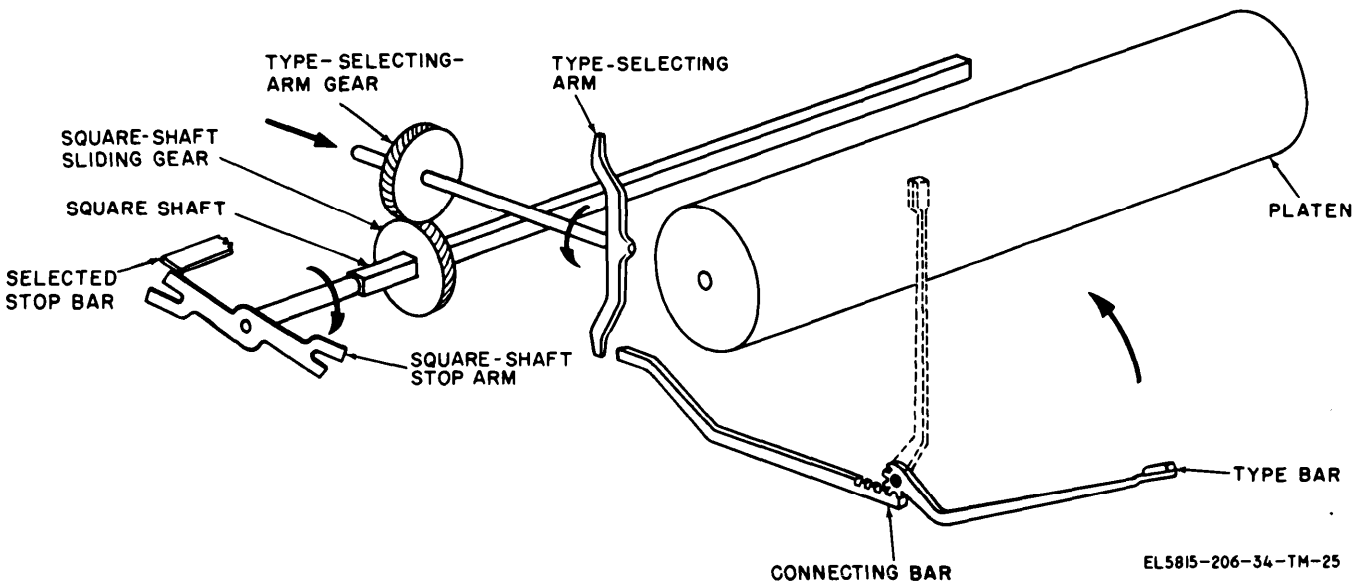


Figure 2-25. Type bar selection, simplified drawing.

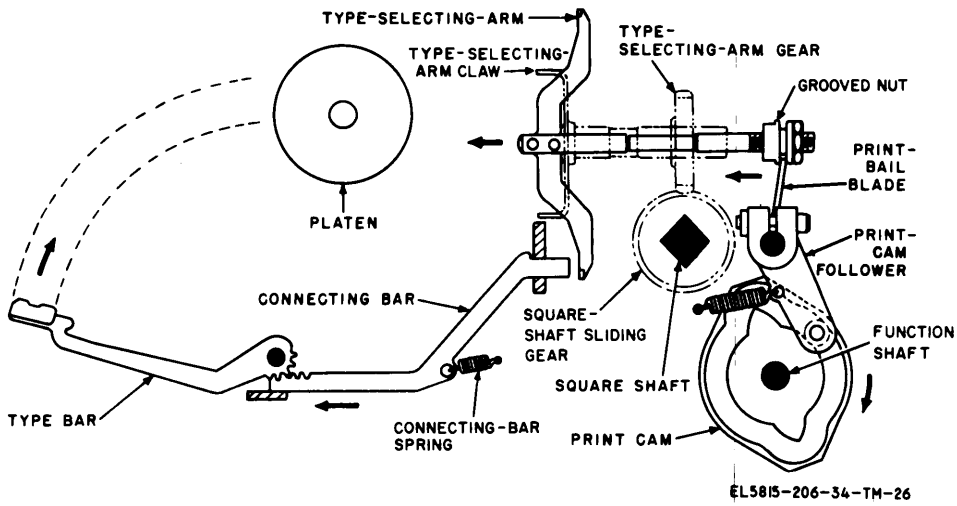


Figure 2-26. Printing mechanism.

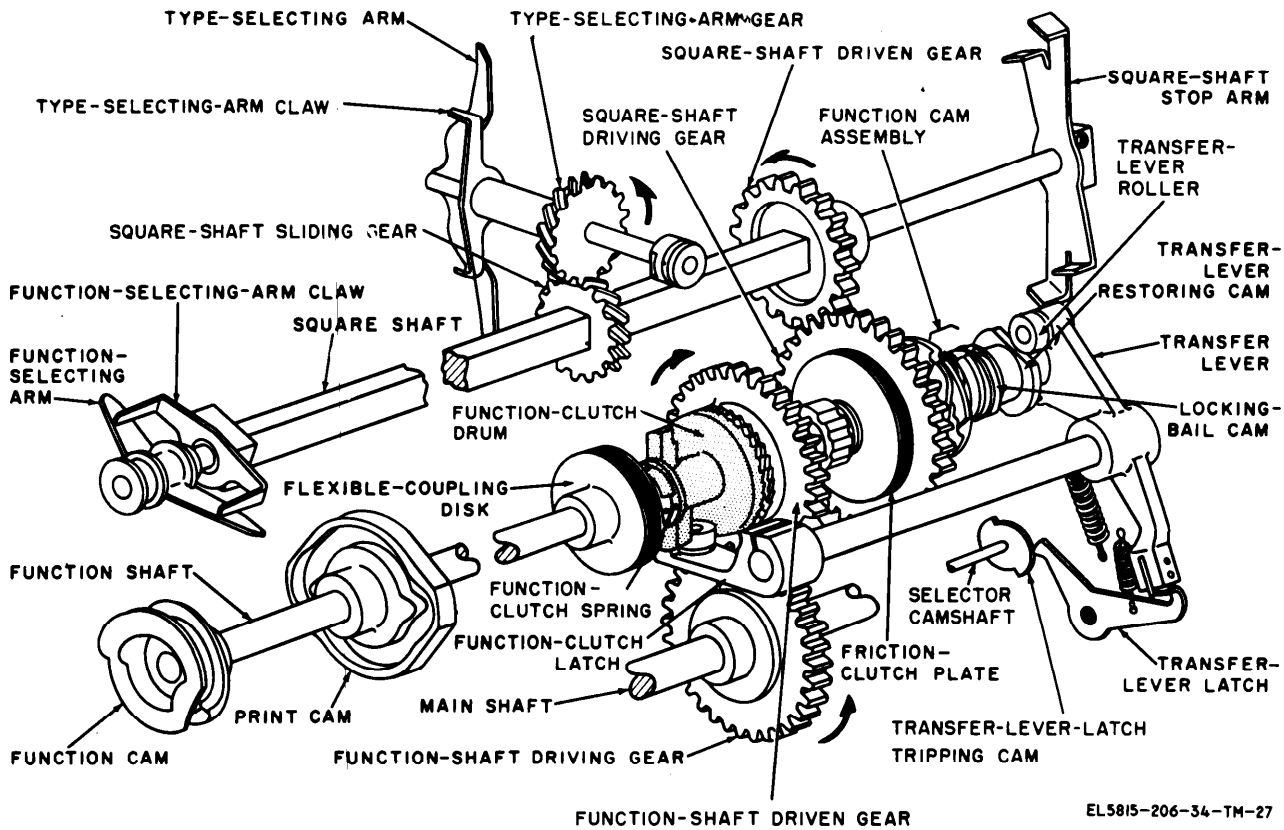


Figure 2-27. Mechanical power transfer from main shaft to function shaft and square shaft.

c. Square-Shaft Rotation. The square shaft does not turn while the code impulses are being received in the page printer and the Y-levers are being positioned. When the last Y-lever is positioned, the transfer-lever-latch tripping cam (fig. 2-27) trips the transfer-lever latch to start the transfer operation, and the function-clutch latch moves downward (para 2-19b). The teeth of the function-clutch drum engage the teeth in the side of the function-shaft driven gear. At this time, the function shaft starts turning because the function-shaft driven gear is in mesh with the constantly rotating function-shaft driving gear on the main shaft. The square-shaft driving gear on the function shaft is driven by a

friction clutch that includes a clutch disk and a felt friction plate on each side of the gear. When the function shaft turns, the friction clutch causes the square-shaft driving gear to turn the square-shaft driven gear and the square shaft until the stop arm strikes the selected stop bar. The function shaft continues to turn until the function-clutch drum is cammed away from the function-shaft driven gear by the function-clutch latch which has been moved upward to the latching position by the transfer-lever restoring cam (para 2-19c).

d. Stop-Arm Antibounce Clutch. The square-shaft stop arm must not bounce backward when the stop arm strikes the selected stop bar (b above). This requirement is necessary because a finger of the type-selecting arm must be in alinement with one of the connecting bars when the type-selecting arm is moved forward to cause printing. Stop-arm bounce is prevented by the antibounce clutch, which consists of the housing, rotating clutch member, four rollers, and four compression-type springs (fig. (2-28). The housing is pinned to the code-ring cage and cannot rotate. The rotating clutch member is part of the stop-arm shaft and rotates clockwise with the shaft until the stop arm strikes the selected stop bar. Stop-arm bounce (counterclockwise movement of the rotating clutch member) is not possible, because the springs keep the rollers wedged between the flat surfaces of the rotating clutch member and the inner circumference of the housing.

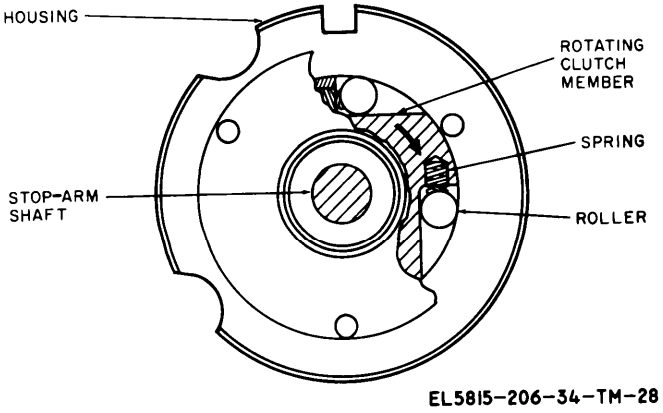


Figure 2-28. Stop-arm antibounce clutch, cutaway view.

e. Sequence of Printing Operations. The following chart lists the sequence of operations that causes the printing of a character by the page printer.

Printing operation sequence chart

1	As a result of transfer operation (para 2-19), selected stop bar moves into groove in code rings; function shaft starts ½ revolution (fig. 2-27).	
2	Square-shaft stop arm and type-selecting arm.	Print cam starts ½ revolution (fig. 2-26).
3	Square-shaft stop arm strikes selected stop bar; type-selecting arm aligned with correct connecting bar.	Lobe of print cam pivots print-cam follower.
4	Print-ball blade pushes type-selecting arm and con. netting bar forward.	
5	Type bar moves upward to print character.	
6	Print-cam follower moves against low part of print cam.	
7	Print-bail blade, type-selecting arm, and connecting bar moved rearward; type bar moves downward.	
8	Print cam and function shaft complete ½ revolution (fig. 2-27).	

2-22. Carriage-Feed Operation

The carriage (fig. 2-29) moves one space to the right automatically each time a character is printed. The carriage-feed operation causes clockwise rotation of the carriage-rack driving gear, to cause the carriage to move to the right. When a carriage-return code group is received, the carriage-rack driving gear rotates counterclockwise and the carriage moves to the left hand margin (para 2-24).

a. Carriage Support. The front of the carriage is supported by the guide rail (17, fig. 3-37). The rear of the carriage is supported by the square-shaft sliding gear which is in mesh with the type-selecting-arm gear on the rear of the carriage (fig. 2-27). Two projections of the carriage-support bracket (11, fig. 3-37) engage the groove in the square-shaft sliding gear, and the gear slides along the length of the square shaft as the carriage moves to the right and left.

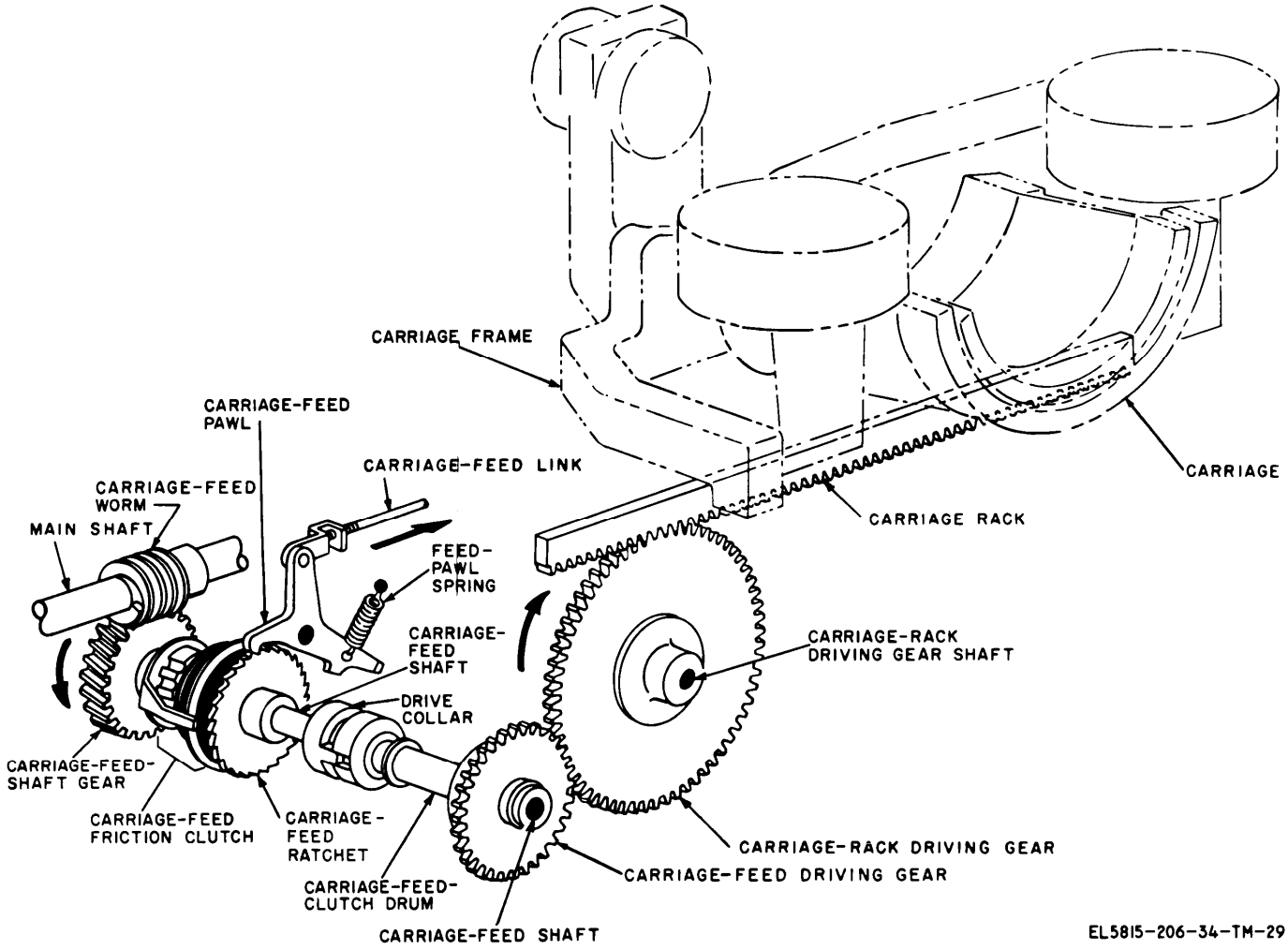


Figure 2-29. Carriage-feed mechanism.

b. Carriage-Feed Shaft Assembly. Power to turn the carriage-feed shaft (fig. 2-29) is obtained from the main shaft (carriage-feed worm in mesh with carriage-feed shaft gear). When the motor is operating, the fork of the carriage-feed friction clutch and the center clutch disk rotate continuously, exerting a counterclockwise torque against the carriage-feed ratchet, which is firmly fastened to the carriage-feed shaft. When the carriage-feed pawl releases the carriage-feed ratchet (c below), the torque of the friction clutch turns the carriage-feed shaft, the drive collar, and the carriage-feed-clutch drum. The carriage-feed driving gear turns counterclockwise to cause the carriage-rack driving gear to turn clockwise to feed the carriage to the right.

c. Carriage-Feed Control. Movement of the carriage-feed pawl is controlled by the carriage-feed link (fig. 2-29) and the function-selecting arm mechanism (fig. 2-30).

(1) The function-selecting arm is attached to the square shaft (fig. 2-27) and rotates and stops with the square-shaft stop arm. The function cam, on one end of the function shaft, starts to turn ½ revolution each time the transfer operation occurs (para 2-19). When a lobe of the function cam pushes the roller end of the function-cam follower (fig. 2-30) the upper arm of the follower pushes the function-selecting arm toward the punch-bar guide block.

(a) If one of the fingers of the function-selecting arm is alined with a slot in the guide block, the function-selecting arm moves *into the slot* and carriage feeding does *not* occur.

(b) If the finger moves against a solid portion of the guide block, further movement of the function-selecting arm and the upper arm of the function-cam follower is halted. Continued movement of the function-cam-follower roller to the right causes the support lever to pivot clockwise slightly and the lower arm of the support lever turns the carriage-feed lever counterclockwise, pulling the carriage-feed link horizontally.

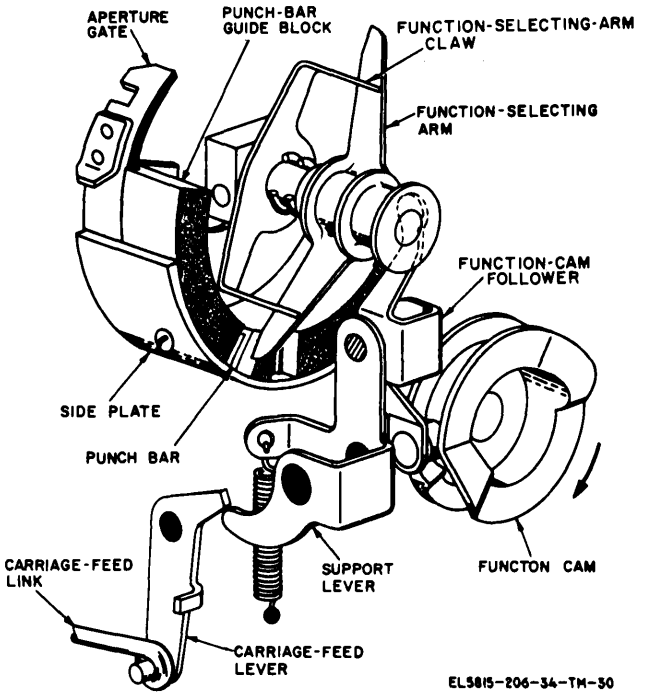


Figure 2-30. Function-selecting arm and associated mechanism.

(2) When the carriage-feed link is pulled horizontally (fig. 2-29), it pivots the carriage-feed pawl slightly. The latching arm of the carriage-feed pawl releases the carriage-feed ratchet, and the friction clutch rotates the ratchet. Continue rotation of the function cam (fig. 2-30) permits the roller of the function-cam follower to move into a low portion of the cam. The support lever is pulled counterclockwise by its spring which permits the feed-pawl spring (fig. 2-29) to pull the latching arm of the carriage-feed pawl downward into the path of the next tooth on the carriage-feed ratchet. The carriage feed friction clutch again turns the carriage-feed ratchet slightly until it is stopped by the latching arm of the carriage-feed pawl.

(3) Total rotation of the carriage-feed ratchet during operation of the carriage-feed pawl ((2) above), equals the distance between two teeth of the ratchet. When the ratchet rotates an amount equal to this distance, the carriage-feed driving gear and the carriage-rack driving gear rotate sufficiently to move the carriage one space to the right.

d. Carriage-Feed Blocking. When the carriage reaches the right hand margin, carriage feeding is halted by the carriage-feed blocking lever (fig. 2-31 and 2-32). The blocking lever is mounted on the carriage-rack driving gear shaft and rotates with the carriage-rack driving gear during carriage feeding, Carriage feeding stops when the arm of the carriage-feed blocking lever moves into the path of the lower arm of the carriage-feed pawl. Under these conditions, the blocking lever prevents the lower latching arm of the carriage-feed pawl from releasing the carriage-feed ratchet until the carriage-return operation occurs (par. 2-24).

e. Sequence of Carriage-Feed Operations. The following chart lists the sequence of operation for carriage feeding.

1	Code group received: character selected for printing (para 2-21).
2	Function-cam lobe moves function-cam follower (fig. 2. 32).
3	Function-cam follower pivots about its upper end (function-selecting arm blocked).
4	Support lever pivots clockwise.
6	Carriage-feed lever pivots counterclockwise.
6	Carriage-feed link pulled (fig. 2-29).
7	Carriage-feed pawl pivots.
8	Carriage-feed ratchet starts turning (friction drive).
9	Carriage moves slightly to right.
10	Function cam restores function-cam follower. (fig. 2-30).
11	Support lever pivots counterclockwise.
12	Carriage-feed lever pivots clockwise.
13	Carriage-feed link moves horizontally (fig. 2-29).
14	Carriage-feed pawl upper latching arm moves downward.
15	Carriage-feed ratchet tooth engages carriage-feed pawl.
16	Carriage-feed ratchet wheel held stationary and carriage stopped. (Carriage has moved one space to right.)

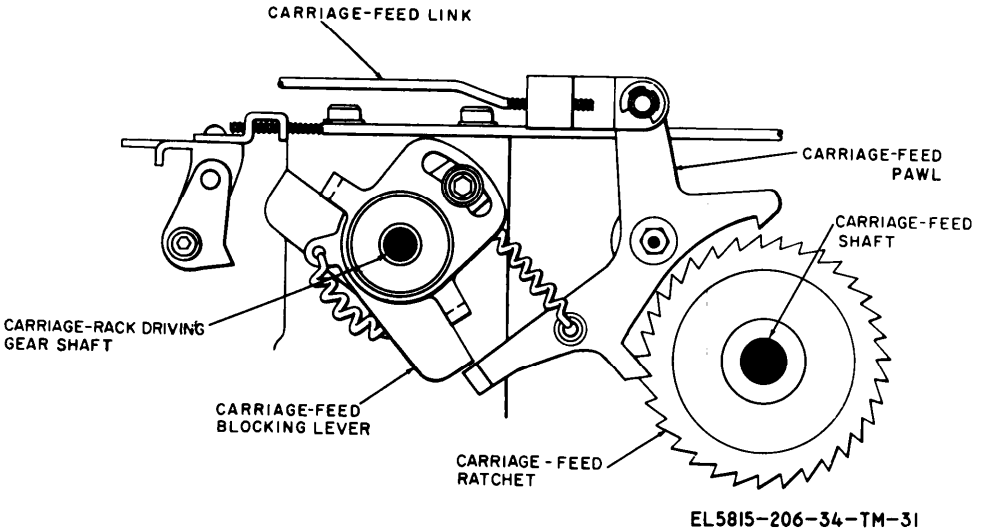


Figure 2-31. Carriage-feed blocking mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

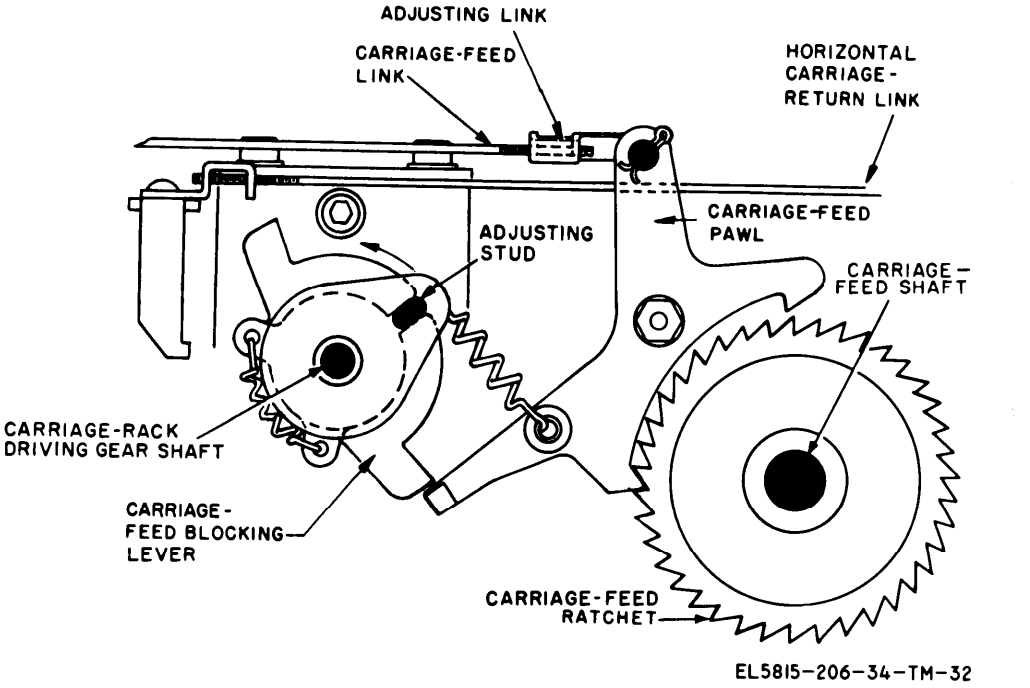


Figure 2-32. Carriage-feed blocking mechanism, TT-4A/TG, and TT-698/TG.

2-23. Sensing Levers Operating Mechanism, TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG

(fig. 2-33)

On the Teletypewriters TT-4C/TG, TT-335/TG, and TT-698B/TG the figures-shift, line-feed, carriage-return, and line-feed-on-carriage-return sensing levers are operated by two sets of rollers (180° opposed in the restoring rollers and draw-bar cam assembly). Another roller is mounted low on the side of the draw-bar assembly, which is spring-held against the actuating cam surface. With every one-half revolution (one operating cycle) of the function shaft, the draw-bar assembly is pulled down by the cam lobe, and released upward, as it follows the low cam surface. The reciprocating draw-bar assembly in turn, operates the linkage connected to the line-feed and platen-shifting mechanisms.

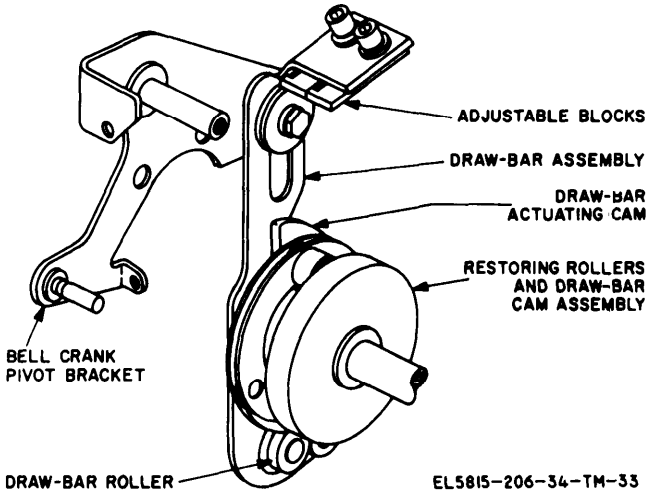


Figure 2-33. Restoring rollers and draw-bar cam assembly (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

2-24. Carriage-Return Operation

The carriage returns to the left margin when the page printer receives the carriage-return code group (fig. 2-2), or when the manual carriage-return button on the right side of the page printer is pressed. The carriage-rack driving gear (fig. 2-29) rotates counterclockwise to move the carriage to the left. This movement is caused by pivoting the carriage-return-clutch lever in the direction shown in B, figures 2-34 and 2-35. When the lever pivots as shown, the carriage-return clutch drum engages the constantly rotating carriage-return-clutch disk (A, fig. 2-34 and 2-35) and the carriage-feed-clutch drum is disengaged simultaneously from the carriage-feed driving gear (B, fig. 2-34 and 2-35). When the carriage-return clutch members are engaged, the carriage-return driving gear turns clockwise, the carriage-return driven gear and carriage-rack driving gear turn counterclockwise, and the carriage moves to the left.

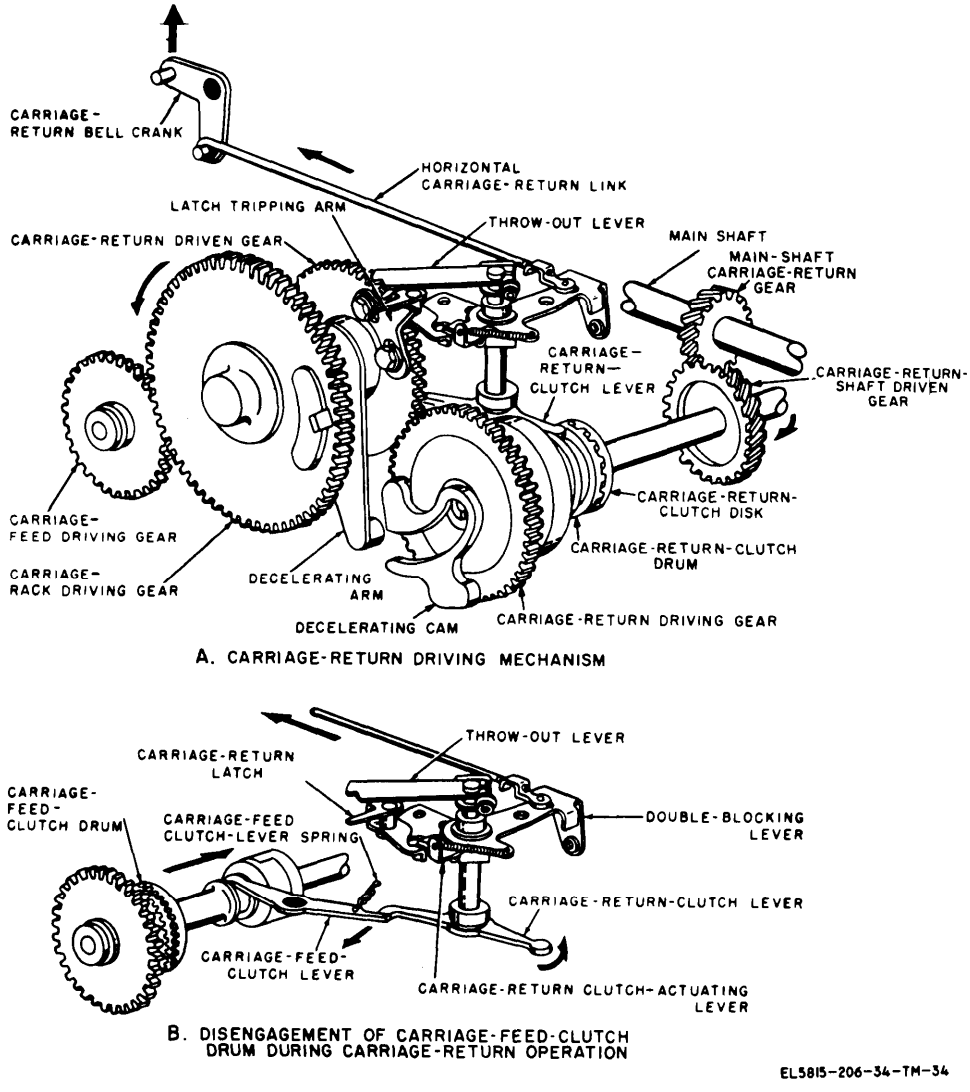
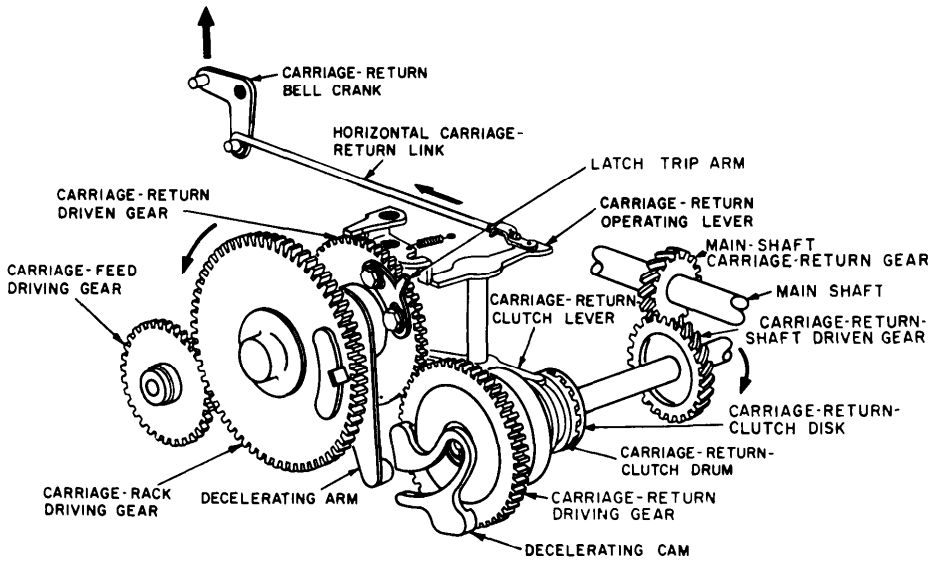
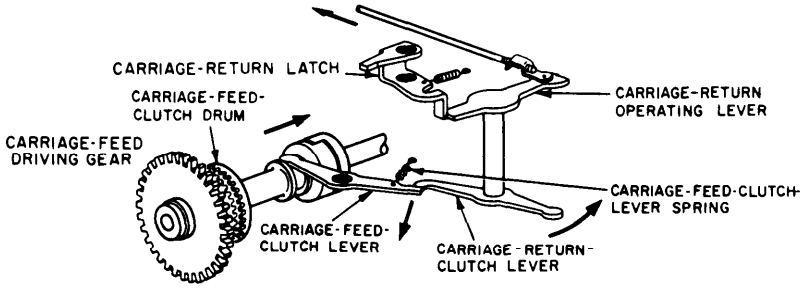


Figure 2-34. Carriage-return mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).



A. CARRIAGE-RETURN DRIVING MECHANISM



B. DISENGAGEMENT OF CARRIAGE-FEED CLUTCH DRUM DURING CARRIAGE-RETURN OPERATION

EL5815-206-34-TM-35

Figure 2-35. Carriage-return mechanism, TT-4A/TG, and TT-698/TG.

a. Code Group Selection of Carriage-Return Operation. When the transfer operation (para 2-19) occurs after the fifth code impulse of the carriage-return code group is received, the carriage-return stop bar, located between the figures-shift and line-feed stop bars (fig. 2-24) moves into the groove formed by the code-rings. The opposite end of the stop bar moves away from the upper latching arm of the carriage-return sensing lever (fig. 2-36). The carriage-return sensing-lever cam starts turning when the transfer operation occurs. As a lobe of the cam moves away from the lower arm of the sensing lever, the sensing-lever spring causes the vertical carriage-return link to move upward, moving the horizontal carriage-return link in the direction shown in figure 2-36 and in A, figures 2-34 and 2-35. The horizontal link pulls the double-blocking lever of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG (B, fig. 2-34) or the carriage-return operating lever of the TT-4A/TG and TT-698/TG (B, fig. 2-35) pivoting the carriage-return-clutch lever to push the carriage-return drum into engagement with the carriage-return clutch disk. One arm of the carriage-return latch locks the carriage-return-clutch lever in the counterclockwise position until the latch-tripping arm on the carriage-return driven gear pivots the carriage-return latch *(c* below).

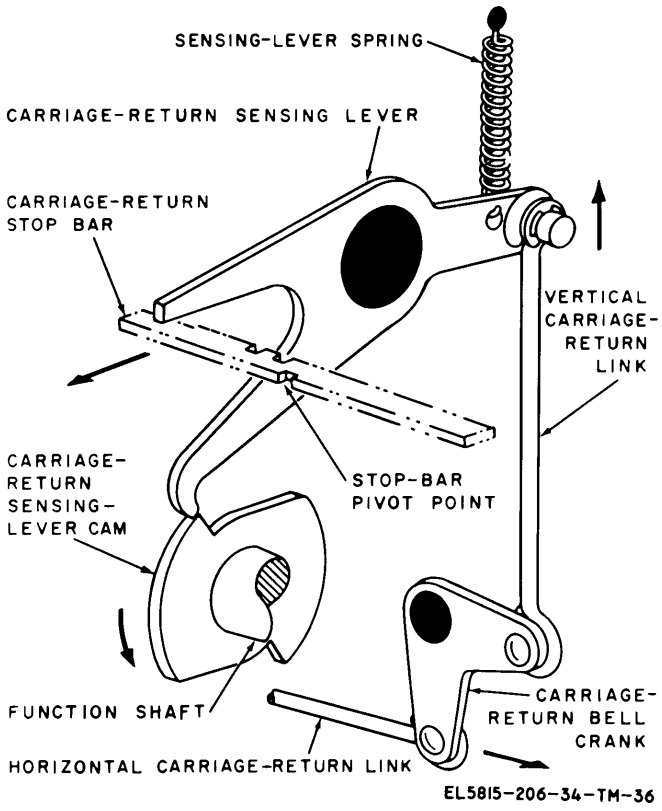


Figure 2-36. Carriage-return sensing mechanism (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG).

b. Manual Carriage-Return Operation. The carriage-return operating lever of the TT-4A/TG and TT-698/TG (A, fig. 2-38) and the double-blocking lever of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG (B, fig. 2-38) may be moved manually to cause return of the carriage. When the manual carriage-return button on the right side of the page printer is pushed to the left, the manual carriage-return lever pivots counterclockwise and the trip pawl pushes the carriage-return operating lever of the TT-4A/TG and TT-698/TG or the double-blocking lever of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG to start the carriage-return operation.

c. Completion of Carriage-Return Operation. The carriage-return-clutch members must remain engaged and the carriage-feed clutch members disengaged (fig. 2-34 and 2-35) until the carriage reaches the left margin. This condition is accomplished by keeping the carriage-return-clutch lever (B, fig. 2-34 and 2-35) locked in the counterclockwise position ((1) through (3) below) until the carriage reaches the left margin.

(1) When the rear arm of the carriage-return operating lever of the TT-4A/TG and TT-698/TG is pulled counterclockwise (B, fig. 2-35) the carriage-return latch pivots to lock the front arm of the operating lever in the counterclockwise position.

(2) When the rear arm of the double-locking lever of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG is moved counterclockwise (B, fig. 2-34), it pivots the carriage-return clutch-actuating lever counterclockwise also and the actuating lever is locked in this position by the carriage-return latch.

(3) The carriage-return driven gear rotates counterclockwise during the carriage-return operation. When the carriage reaches the left margin, the latch-tripping arm on the carriage-return driven gear pivots the carriage-return latch to release the carriage-return operating lever of the TT-4A/TG and TT-698/TG and the carriage-return clutch-actuating lever of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG. Tension of the carriage-feed clutch-lever spring causes the carriage-return-clutch lever to pivot, placing the carriage-return operating lever or the carriage-return-blocking lever in the normal clockwise position. The TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG includes a throw-out lever that is fastened to the top of the shaft on which the double-blocking lever is mounted. If, for any reason, the piloting of the carriage-return latch does not cause disengagement of the carriage-return clutch, the latch-tripping arm moves against the throw-out lever to disengage the clutch.

d. Restoring Carriage-Return Sensing Lever. On the TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG, a lobe of the carriage-return sensing-lever cam pushes the carriage-return sensing lever upward (fig. 2-36); on the TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG a restoring roller on the restoring roller and draw-bar cam assembly pushes the carriage-return sensing-lever upward (fig. 2-37) immediately after the carriage starts to move to the left. If the next code group received is not a carriage-return code group, the code rings are repositioned to form a groove in line with a stop bar other than the carnage-return stop bar, and the code-ring end of the carriage-return stop bar is pushed in a direction to cause the opposite end of the stop bar to move under the arm of the carriage-return sensing lever. In this position, the stop bar prevents downward movement of the sensing lever until the next carriage-return code group is received. When the sensing lever is restored to its upper position, the horizontal carriage-return link moves in a direction opposite to that shown in figures 2-34 through 2-36. The carriage-return operating lever of the TT-4A/TG

and TT-698/TG and the double-blocking lever of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG do not move with the horizontal link because of the latching action of the carriage-return latch *(c* above). A slot in both levers permits a slight movement to the right of the horizontal link without movement of its associated operating lever of double-blocking lever.

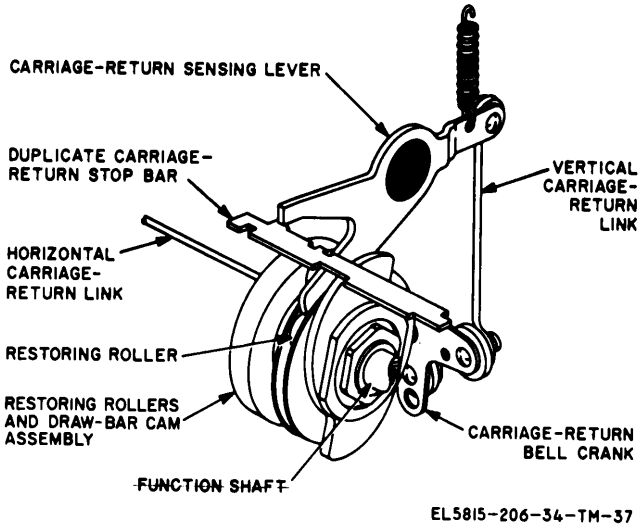


Figure 2-37. Carriage-return sensing mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

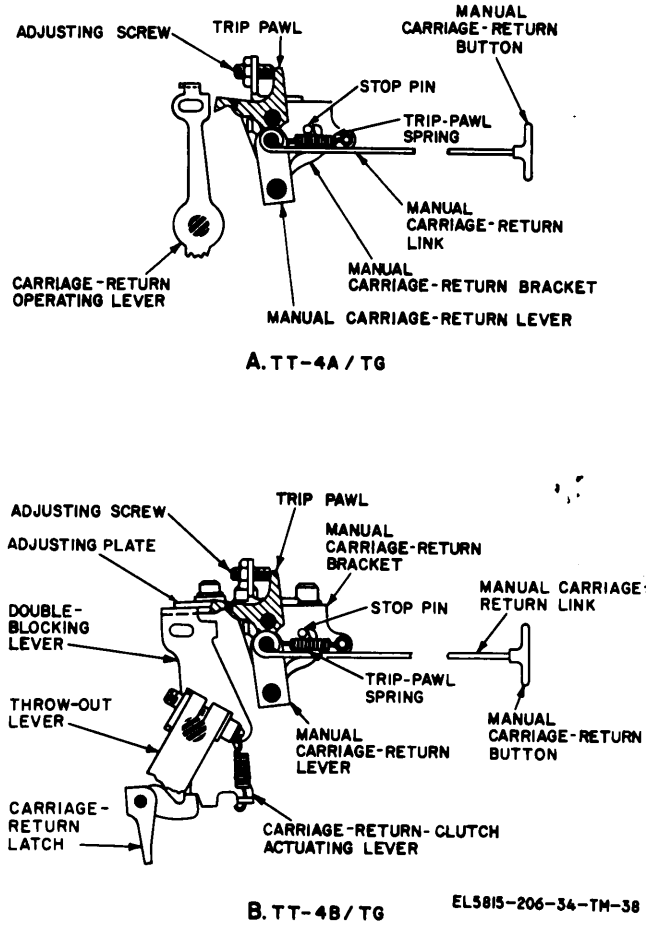


Figure 2-38. Manual carriage-return mechanism.

e. Deceleration of Carriage. When the carriage approaches the left margin during the carriage-return operation, the decelerating arm and decelerating cam (A, fig. 2-34 and 2-35) slow down movement of the carriage to reduce shock and prevent damage. The decelerating arm is pinned securely to the carriage-return driven gear, and the decelerating cam is bolted to the carriage-return driving gear. The projection on the end of the decelerating arm enters the notch in the cam when the carriage is approximately seven-eighths inch from the left margin. No teeth are provided on that portion of the carriage-return driven gear that would be in mesh with the driving gear when the arm enters the notch in the cam. As the driving gear continues to turn clockwise, the cam raises the decelerating arm to move the carriage to the left margin. As the arm enters deeper into the cam notch, the rate of carriage movement is decreased until the latch-tripping arm on the driven gear causes disengagement of the carriage-return clutch members *(c* above).

f. Carriage-Return Friction Clutch. The carriage-return driving gear (fig. 2-35 and 2-39) is driven by two clutches on the carriage-return shaft. The carriage-return jaw clutch consists of the carriage-return-clutch drum and the carriage-return-clutch disk. The disk rotates continuously when the motor is operating, The clutch drum rotates only when it is moved into engagement with the clutch disk. The carriage-return friction clutch transfers power from the clutch drum to the carriage-return driving gear. The friction clutch is included as a safety feature to prevent equipment damage caused by a sudden stop of the carriage. The spring of the clutch causes the driving gear to be pressed tightly between the clutch sleeve and felt friction plate on one side, and another felt friction plate and a friction disk on the opposite side. The adjusting collar permits adjustment control of the spring compression to control the amount of torque the clutch supplies before slippage occurs.

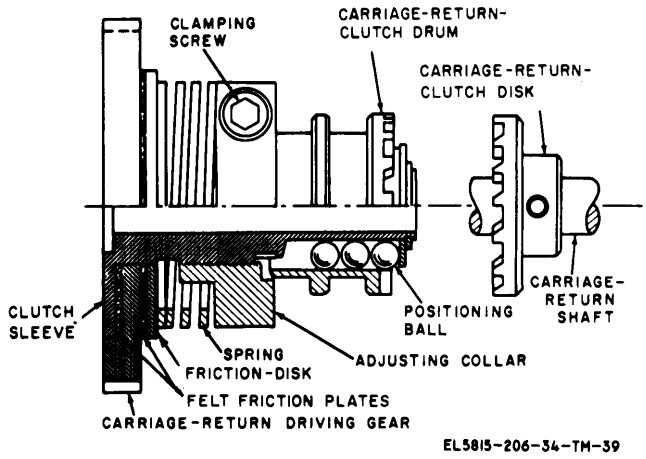


Figure 2-39. Carriage-return clutches,

g. Carriage-Return Blocking Feature. The carriage-return blocking lever is used to prevent engagement of the carriage-return clutch when the carriage is at the left hand margin and a carriage-return code group is received. The carriage-return blocking lever is mounted on, and rotates with, the carriage-rack driving gear shaft (fig. 2-40 and 2-41). When the carriage is at the left-hand margin, the blocking lever blocks movement of the double-blocking lever of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-698A/TG, and TT-698B/TG (fig. 2-40) and the carriage-return operating lever of the TT-4A/TG and TT-698/TG (fig. 2-41). Under these conditions, the carriage-return-clutch drum (fig. 2-34 and 2-35) does not move into engagement with the carriage-return clutch disk.

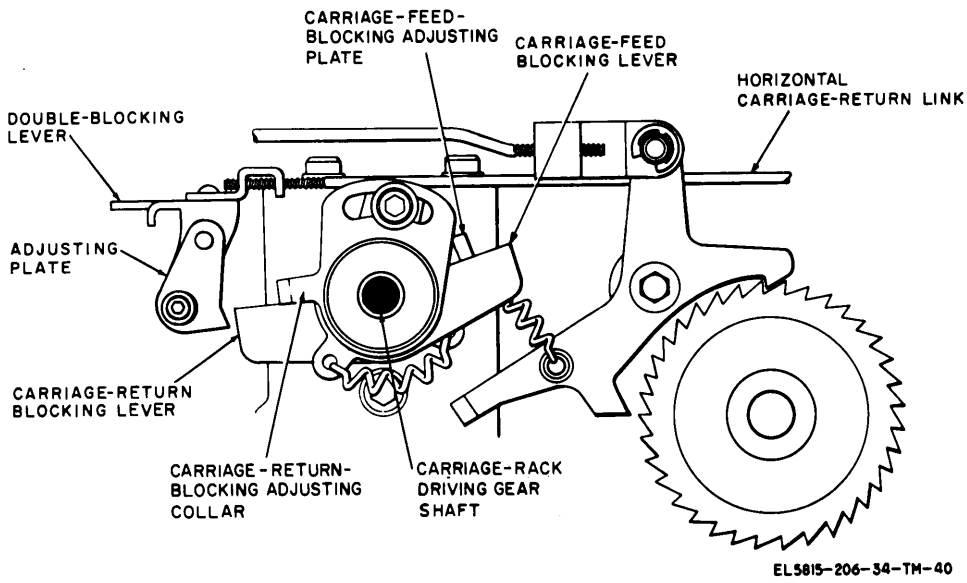


Figure 2-40. Carriage-return blocking mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

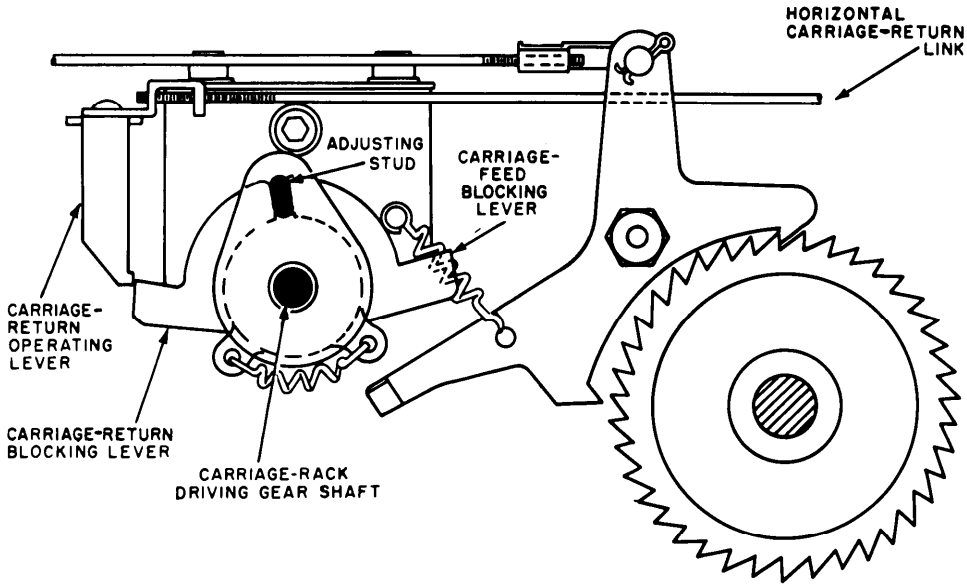


Figure 2-41. Carriage-return blocking mechanism, TT-4A/TG, and TT-698/TG.

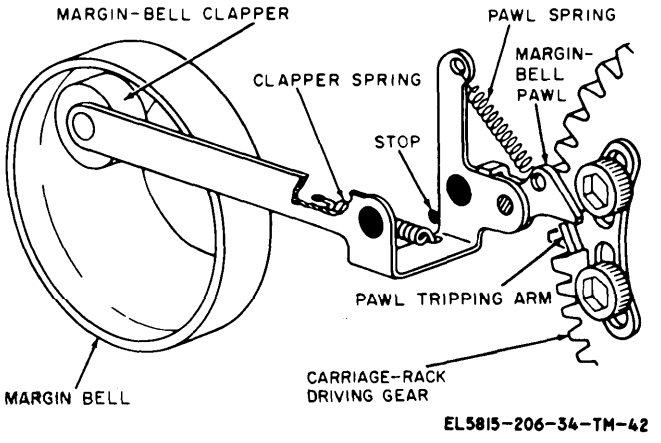


Figure 2-42. Margin-bell mechanism.

h. Sequence of Carriage-Return Operations. The sequence of operations that occur when the carriage-return code group is received is described in the following chart.

Carriage-return sequence chart

1	Carriage-return code group received: Y-levers positioned accordingly (para 2-20a and b).	
2	Transfer lever released by transfer-lever latch (para 2-19).	
3	Code rings form grooves for carriage-return stop bars (para 2-20).	Function shaft starts revolving.
4	Carriage-return stop bars moved into grooves.	On the TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG lobe of carriage-return sensing lever cam moves past carriage-return sensing lever (fig. 2.36), On the TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG, a restoring roller moves past the sensing lever (fig. 2-37).
5	Carriage-return sensing lever moves downward.	
6	Vertical carriage-return link moves upward.	
7	Carriage-return bell crank pivots.	
8	Horizontal carriage-return link moves to left (fig. 2-34 and 2-35).	
9	Double-blocking lever of TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG pivots; carriage-return clutch-actuating lever latched by carriage-return latch. Carriage-return latch engages carriage-return operating lever of TT-4A/TG and TT-698/TG.	
10	Carriage-return-clutch lever pivots; carriage-feed-clutch lever pivots.	Carriage-return sensing lever raised by carriage-return sensing-lever cam (fig. 2-36).
11	Carriage-return-clutch drum engages clutch disk; carriage-feed-clutch drum moves away from carriage-feed driving gear.	Carriage-return bell crank pivots and horizontal carriage-return link moves to left (fig. 2-36).

Carriage-return sequence chart–Continued

12	Carriage-return driving gear turns carriage-return driven gear and carriage-rack driving gear: carriage moves to left; carriage-feed driving gear idles (fig. 2-34 and 2-35).	Function shaft stops after completing ½ revolution.
13	Carriage nears left margin.	Carriage-return stop bar latches carriage-return sensing lever when next code group is received (page 2-36b).
14	Decelerating arm engages decelerating cam. (fig. 2-34 and 2-35).	
15	Carriage-return driven gear teeth clear carriage-return drive gear teeth.	
16	Carriage decelerates as it reaches left margin.	
17	Latch-tripping arm strikes carriage-return latch.	
18	Carriage-return latch releases carriage-return-clutch actuating lever or TT-4B/TG, TT-4C/TG , TT-335/TG , TT-537/G, TT-698A/TG, and TT-698B/TG, or carriage-return operating lever of TT-4A/TG and TT-698/TG.	Latch-tripping arm of TT-4B/TG, TT-4C/TG, TT-335/GB, TT-537/G, TT-698A/TG, and TT-698B/TG contacts throw-out lever.
19	Carriage-feed clutch spring pulls carriage-feed-clutch lever and carriage-return-clutch lever.	
20	Carriage-return clutch drum moves away from carriage-return-clutch disk.	Carriage-feed clutch drum moves into engagement with carriage-feed driving gear.
21	Carriage stopped at left margin.	

2-25. Margin-Bell Operation

The margin bell rings automatically to warn the operator that the carriage of the page printer is six spaces from the right margin. During carriage feeding (para 2-22), the carriage rack driving gear rotates clockwise to move the carriage to the right, and the pawl tripping arm, attached to the carriage-rack driving gear (fig. 2-42) rotates with the gear. As the carriage nears the right margin, the pawl tripping arm lifts the margin-bell pawl; this causes the margin-bell clapper to pivot counter-clockwise. Further rotation of the gear causes the pawl to slip past the pawl tripping arm and the clapper spring pulls the clapper upward sharply to strike the margin bell. During the carriage-return operation (para 2-24), the carriage-rack driving gear rotates counterclockwise. The pawl tripping arm moves downward, pivoting the pawl until the tripping arm moves beyond the pawl and the pawl spring pulls the pawl to the normal (upper) position.

2-26. Figures-Shift Operation (TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG

Twenty-four of the type bars in the page printer print a letter when the platen is in the letters-shift (lower) position and print a numeral or punctuation mark when the platen is in the figures-shift (upper) position (fig. 2-2). Printing does not occur when either the letter S or the letter H code group is received while the platen is in the figures-shift position (paras 2-34 and 2-35). The platen is moved to the figures-shift position as described below.

a. Selecting Figures-Shift Operation. The figures-shift code group must be received by the page printer to cause the platen to move to the figures-shift position. When the transfer operation occurs (para 2-19), the code rings are positioned to form a groove in line with each of *two* figures-shift bars (fig. 2-24). Each stop bar moves into its associated groove.

(1) When the outer end of the figures-shift stop bar that is mounted next to the carriage-return stop bar (fig. 2-24), moves into its groove, the inner end of the stop bar moves *away* from the latching arm of the figures-shift sensing lever (fig. 2-43). When the stop bar is in this position, the sensing lever is free to follow the contour of the figures-shift sensing-lever cam when the cam rotates *(b* below).

(2) When the outer end of the figures-shift stop bar, which shares a slot in the code-ring cage with the stop bar for the letter Z, moves into its groove in the code rings, it moves into position to stop rotation of the square-shaft stop arm. When the square-shaft stop arm strikes the stop bar, the following action occurs:

a) The type-selecting arm stops at a point where it is *not* alined with a connecting bar and no symbol is printed by the page printer when the type-selecting arm is moved forward by the print-bail blade (para 2-21).

(b) The function-selecting arm stops at a point adjacent to a notch in the punch-bar-guide block (fig. 2-56). When stopped at this point, carriage-feeding (para 2-22) is prevented and the carriage remains motionless when the platen is moved upward to the figures-shift position.

b. Moving Platen to Figures-Shift Position. The figures-shift sensing-lever cam starts turning when the transfer operation occurs (para 2-19). Tension of the sensing-lever spring causes the figures-shift sensing lever to move downward when a low part of the cam moves adjacent to the sensing lever. The upper arm of the sensing lever also moves downward against the slanted portion of two projections of the figures-shift-cam follower. Continued downward movement of the sensing lever causes the lower end of the figures-shift-cam follower to move horizontally until the roller attached to the lower end of the follower is under the figures-shift cam. Continued rotation of the function shaft causes a lobe of the figures-shift cam to push the cam follower downward. The figures-shift bell crank pivots counterclockwise, pulling the figures-shift link in the direction shown in figure 2-43. The platen frame pivots counterclockwise, moving the platen upward to the figures-shift position. The platen is locked in the figures-shift position as described in *d* below.

c. Releasing Platen Lower-Case Latch (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG). The platen-blocking arm and the platen lower-case latch (fig. 2-44) are used to lock the platen in the letters-shift position until the figures-shift sensing lever moves to a low portion of its cam *(b* above). When the sensing lever pivots, the curved arm of the sensing lever moves upward against one arm of the platen lower-case latch. The upper arm of the latch moves away from the latching end of the platen-blocking arm, and the arm is free to move downward when the platen (on the opposite side of the platen-frame pivot point) moves upward.

d. Latching Platen in Figures-Shift Position. When the platen frame pivots to move the platen upward, one end of the platen-latching arm (A, fig. 2-43) moves downward; this causes the aperture gate to move in the direction indicated. When the gate is moved to this position, the platen latch (fig. 2-45) engages a projection of the gate to lock the platen-latching arm in the lower position, and the platen in the figures-shift position.

e. Sequence of Figures-Shift Operations. The following chart lists the sequence of operations that occur when the page printer receives the figures-shift code group.

Figures-shift operation sequence chart

1	Figures-shift code group received: Y-levers positioned accordingly (para 2-18a and b).	
2	Transfer-lever-latch tripping cam trips transfer-lever latch (para 2-19).	
3	T-levers and code rings positioned for figures-shift selection.	Function-clutch drum released by function-clutch latch (fig. 2-27).
4	Code rings form groove in line with both figures-shift stop bars.	Function-clutch drum pushed into engagement with function-driving gear by function-clutch spring.
5	Figures-shift stop bars move into grooves in code rings.	Function shaft and square shaft start turning.
6	Figures-shift sensing lever moves to low part of figures-shift sensing-lever cam (fig. 2-43).	Square shaft rotates until square-shaft stop arm strikes figures-shift stop bar.

Figures-shift operation sequence chart – Continued

7	Figures-shift sensing lever moves lower end of figures-shift-cam follower toward figures-shift cam.	Curved arm of figures-shift sensing lever pivots platen lower-case latch, TT-4A/TG and TT-4B/TG.
8	Roller of figures-shift-cam follower moves under figures-shift cam.	Upper arm of platen lower-case latch moves away from platen-blocking arm, TT-4A/TG and TT-4B/TG.
9	Lobe of rotating figures-shift cam pushes figures-shift-cam follower downward.	
10	Figures-shift bell crank pivots, pulling figures-shift link rearward.	
11	Platen frame pivots; platen moved upward to figures-shift position.	

Figures-shift operation sequence chart – Continued

12	Platen-latching arm and aperture gate move downward; latch in lower position by platen latch.	Platen-blocking arm moves downward, below latching surface of platen lower-case latch, TT-4A/TG and TT-4B/TG.
13	Lobe of figures-shift sensing-lever cam pivots figures-shift sensing lever to original position (fig, 2-43).	
14	Lower end of figures-shift-cam follower moves away from figures-shift cam.	Arm of function-clutch drum strikes function-clutch latch, drum moves away from function-shaft driving gear; function shaft stops turning (fig. 2-27).

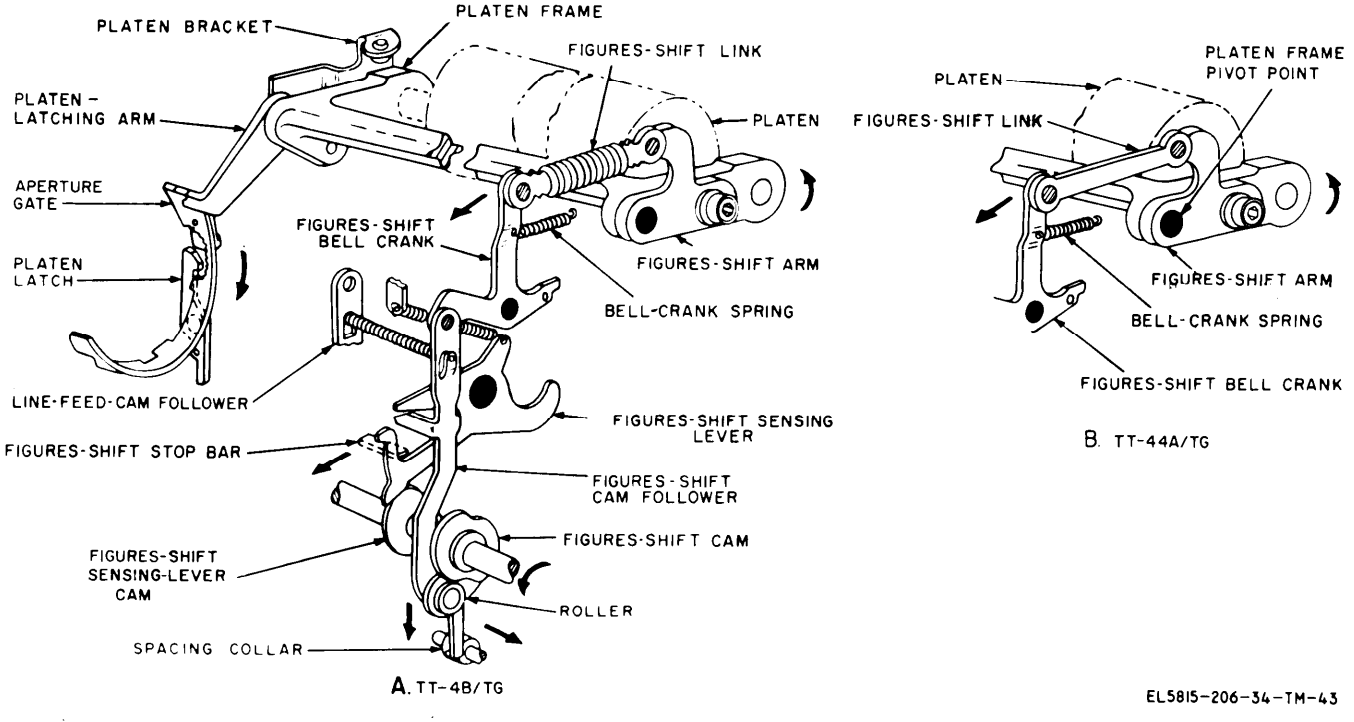


Figure 2-43. Figures-shift mechanism

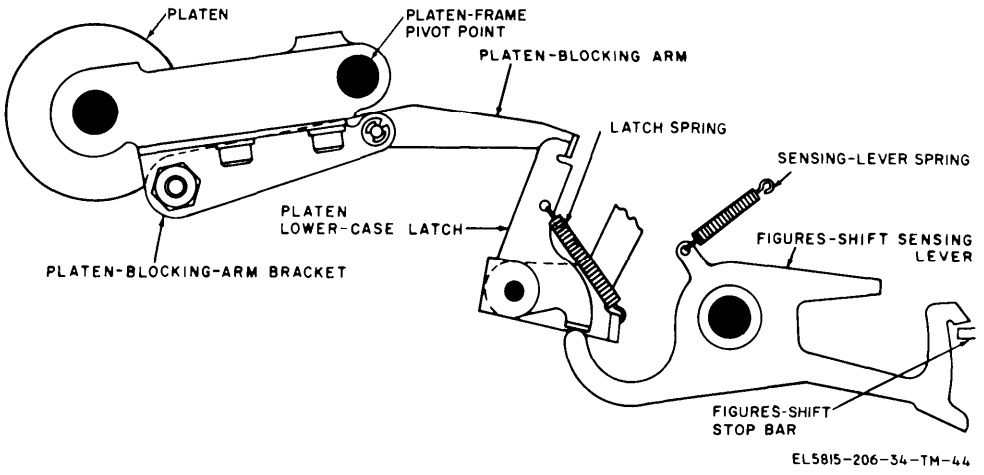


Figure 2-44. Platen-blocking mechanism.

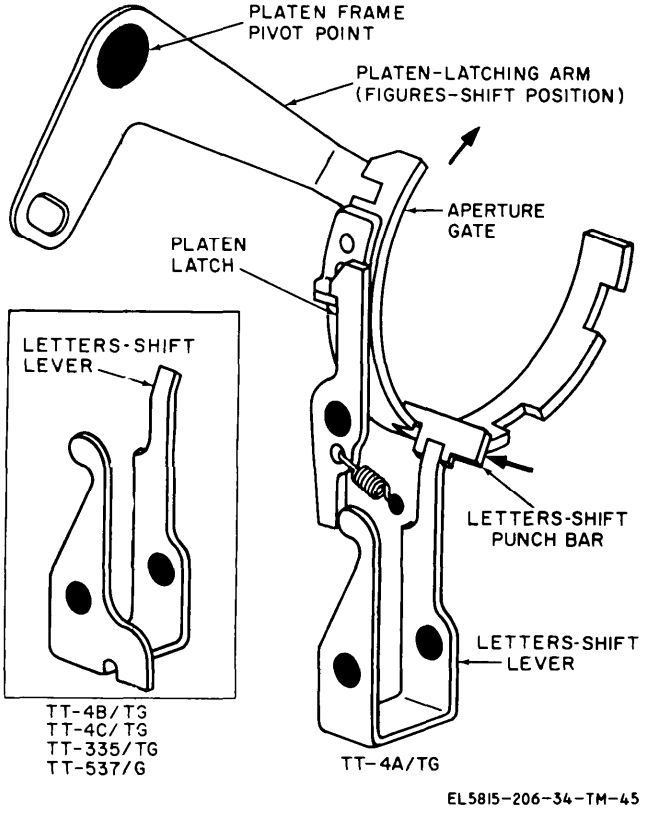


Figure 2-45. Letters-shift mechanism.

2-27. Figures-Shift Mechanism, TT-4C/TG and TT-335/TG, TT-537/G, and TT-698B/TG

(fig. 2-46)

a. When the figures code group is received, the duplicate figures stop bar moves out of the path of the figures-shift sensing lever. The restoring roller rotates out of engagement with the sensing lever which pivots counterclockwise under pressure of the spring-loaded figures pawl. The figures pawl, having pivoted clockwise, is positioned in the path of an adjustable block on the draw-bar assembly. As the actuating cam turns, the draw-bar is cammed downward and the adjustable block engages and pulls the figures pawl down. The figures pawl causes the platen-shift bellcrank to pivot counterclockwise and pull the platen-shift link toward the rear of the page printer. The platen-shift link pivots the platen-shift arm, raising the platen support frame and platen. The platen is latched in the figures position as described in paragraph 2-26d.

b. The figures-shift sensing lever is restored to its original position when one of the restoring rollers rotates into engagement and cams the lever upward. The opposite, curved arm trips the platen lower-case latch as shown in figure 2-44, while the platen-shift bellcrank is restored to its original position. When a code group, other than figures is received, the duplicate figures stop bar is restored and prevents the figures-shift sensing lever and related linkages from operating.

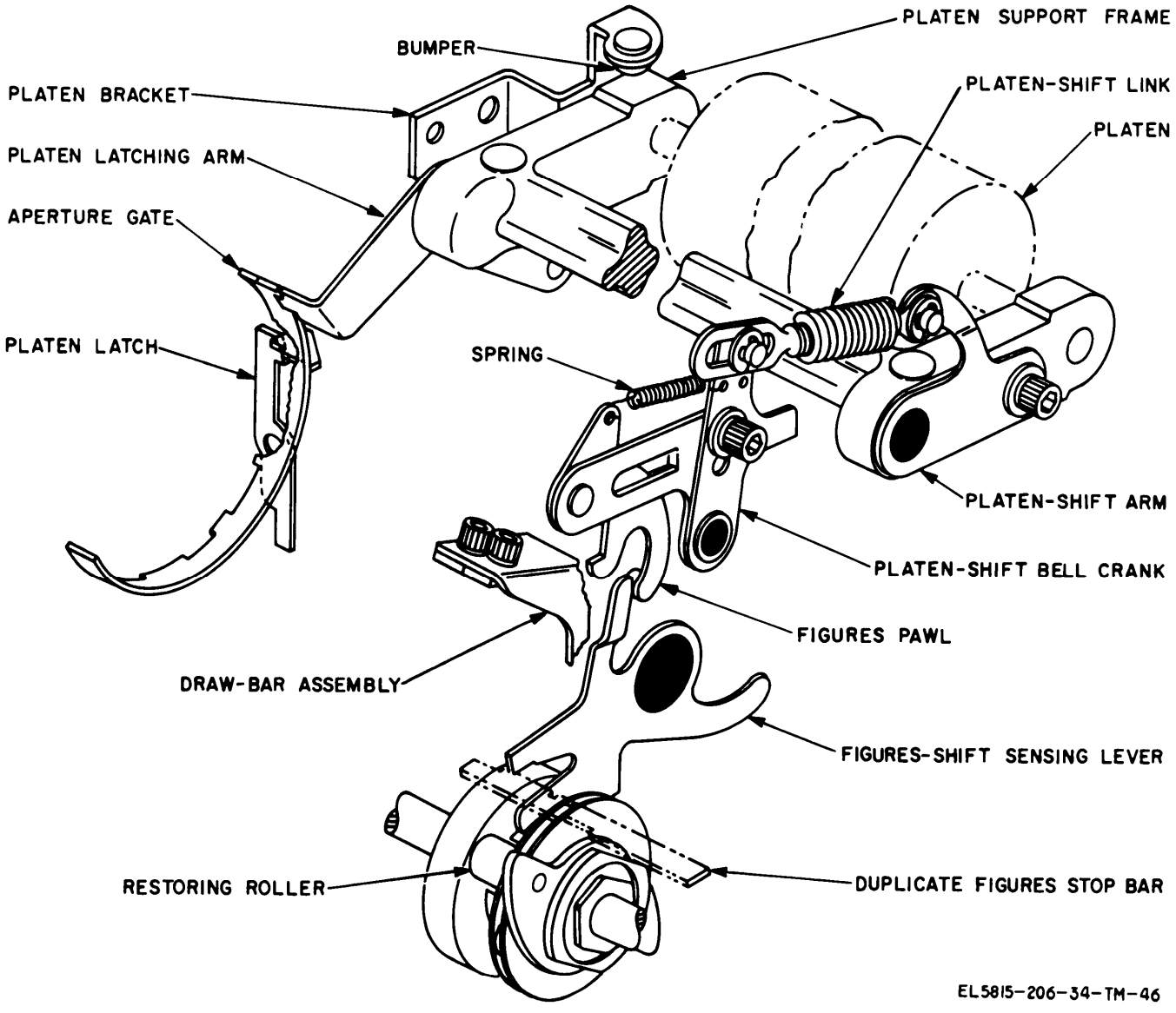


Figure 2-46. Figures-shift mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698/TG).

c. The following chart lists the figures-shift sequence of operation.

Figures-Shift Operation Sequence Chart

1	Figures code group received: Y-levers positioned accordingly (para 2-18a and b).	
2	Transfer-lever-latch tripping cam trips transfer-lever latch (para 2-19).	
3	T-levers and code rings positioned for selection; code rings form groove in line with both figures-shift stop bars.	Function-clutch drum released and pushed into engagement with function-shaft driving gear by function clutch spring.
4	Figures-shift stop bars move into grooves in code rings.	Function shaft and square shaft start turning.

Figures-Shift Operation Sequence Chart – Continued

5	Restoring roller rotates out of engagement with figures-shift sensing lever; lever drops.	Square-shaft turns until square-shaft stop arm strikes figures-shift stop bar.
6	Figures pawl moves into path of adjustable block on draw bar.	Curved arm of figures-shift sensing lever causes platen lower-case latch to pivot.
7	Draw-bar moves downward and pulls figures pawl with it.	Platen-shift bell crank pivots; platen-shift link moves and pivots platen support frame and platen to raised position.
8	Aperture gate (fig. 2-45) repositions and is latched.	Platen blocking arm (fig. 2-44) moves into position behind latching surface of lower case latch.

Figures-Shift Operation Sequence Chart –Continued

	The next (180° opposing) restoring roller cams figures-shift sensing lever upward as draw-bar assembly follows off lobe of its actuating cam and moves up.	Curved arm of figures-shift sensing lever releases spring-loaded lower-case latch to engage and hold platen in figures position.
10	Figures-shift stop bar is restored by selection of next code group other than figures.	Function shaft stops turning. Platen remains latched in figures position until the letters code group is received.

2-28. Letters-Shift Operation

When the letters-shift code group is received, the letters-shift mechanism moves the platen to the letters-shift (lower) position as described below.

a. Selecting Letters-Shift Operation. When the letters-shift code group is received (all five code impulses marking), the five Y-levers are set to the marking position. When the transfer operation (para 2-19) occurs:

(1) The code rings are positioned to form a groove into which the letters-shift stop bar moves (fig. 2-24).

(2) The square shaft rotates until the square-shaft stop arm strikes the letters-shift stop bar. When this occurs:

(a) The function-selecting arm stops at a point where it is aligned with the letters-shift punch bar in the punch-bar guide block (fig. 2-30).

(b) The type-selecting arm stops at a point where it is *not* alined with a connecting bar. No symbol is printed by the page printer when the letters-shift code group is received.

b. Moving Platen to Letters-Shift Position. Immediately after the function-selecting arm is stopped at a point where it is alined with the letters-shift punch bar, a lobe of the function cam (fig. 2-30), causes the function-cam follower to pivot counterclockwise. The top of the function-selecting cam follower causes the function-selecting arm to push the letters-shift punch bar toward the center of the page printer (fig. 2-45). This action causes the letters-shift lever to pivot counterclockwise. The platen latch pivots clockwise, releasing the aperture gate. The weight of the platen causes it to move downward. The platen-latching arm and aperture gate move upward where they remain until the next figures-shift code group is received.

c. Locking Platen in Letters-Shift Position. When the platen moves downward to the letters-shift position *(b* above), the latching end of the platen-blocking arm (fig. 2-44) moves upward. The platen-blocking arm is held in the upper position by the platen lower-case latch until the next figures-shift code group received causes the curved arm of the figures-shift sensing lever to pivot the platen lower-case latch counterclockwise when the platen is to be raised to the figures-shift position (para 2-26b).

d. Sequence of Letters-Shift Operations. The following chart lists the sequence of operations that occur when the letters-shift code group is received by the page printer.

Letters-shift operation sequence chart

1	Letters-shift code group received; Y-levers positioned accordingly (para 2-18a and b).	
2	Transfer-lever-latch tripping cam trips transfer-lever latch (para 2-19),	
3	T-levers and code rings positioned for selection of letters-shift operation.	Function-clutch drum released by function-clutch latch (fig. 2-27).
4	Code rings form groove in line with letters-shift stop bar.	Function-clutch drum pushed into engagement with Function-shaft driving gear by function-clutch spring.
5	Letters-shift stop bar moves into groove in code rings.	Function shaft and square shaft start turning.
6	Square shaft rotates until square-shaft stop arm strikes letters-shift stop bar; finger of function-selecting arm aligned with letters-shift punch bar in punch-bar guide block.	
7	Lobe of function cam pivots function-cam follower counterclockwise (fig. 2-30).	
8	Function-selecting arm pushes letters-shift punch bar toward center of page printer (fig. 2-45).	
9	Letters-shift lever pivots counterclockwise: platen latch pivots clockwise.	
10	Gravity causes platen to move to letters-shift position; platen-latching arm and aperture gate move upward.	
11	Platen-blocking arm of TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG moves upward; locked in upper position by platen lower-case latch (fig. 2-44).	
12	Low portion of function cam pivots function-cam follower clockwise (fig. 2-30).	
13	Function-selecting arm moves away from letters-shift punch bar.	
14	Spring pulls platen latch counterclockwise; letters-shift lever pivots clockwise: letters-shift punch bar moves to the right to the unoperated position.	
15	Arm of function-clutch drum strikes function-clutch latch: drum moves away from function-shaft driving gear. Function shaft stops turning (fig. 2-27).	

2-29. Line Feed Operation (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG)

The line-feed mechanism (fig. 2-47) is used to turn the platen one or two line spaces when the line-feed code group is received. The position of the single-double line-feed lever determines the amount of platen rotation (fig. 2-48).

a. Selecting Line Feed Operation. When the line-feed code group is received by the page printer, the five Y-levers are positioned in accordance with the

code impulses of the code group (fig. 2-2). After the fifth Y-lever is positioned, the transfer operation occurs (para 2-19). The code rings are positioned to form a groove in line with each of *two* line-feed stop bars (fig. 2-24). Each stop bar moves into its associated groove.

(1) When the outer end of the line-feed stop bar that is mounted between the carriage-return stop bar and the letter Q stop bar moves into its groove in the code rings, the inner end of the stop bar moves away from the upper arm of the line-feed sensing lever (fig. 2-47). When the stop bar is in this position, the sensing lever is free to follow the contour of the line-feed sensing-lever cam when the cam rotates *(b)* below).

(2) When the outer end of the line-feed stop bar that shares a slot in the code ring cage with the stop bar for the space code group (fig. 2-24) moves into its groove, it moves into position to stop rotation of the square-shaft stop arm. When the square-shaft stop arm strikes the stop bar; the following action occurs:

(a) The type-selecting arm stops at a point where it is *not* alined with a connecting bar and no symbol is printed by the page printer when the type-selecting arm is moved forward by the print-bail blade (para 2-21).

(b) The function-selecting arm stops at a point adjacent to a notch in the punch-bar-guide block (fig. 2-56). When stopped at this point, carriage-feeding (para 2-22) is prevented and the carriage remains motionless when the line-feed operation occurs.

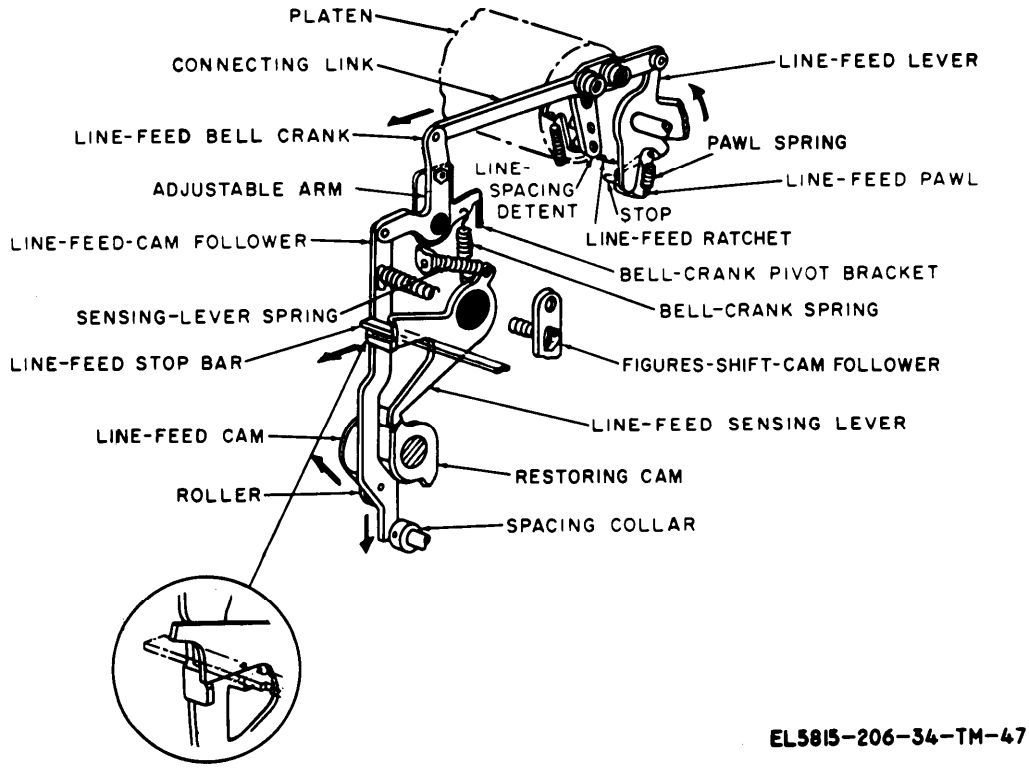


Figure 2-47. Line feed mechanism (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG).

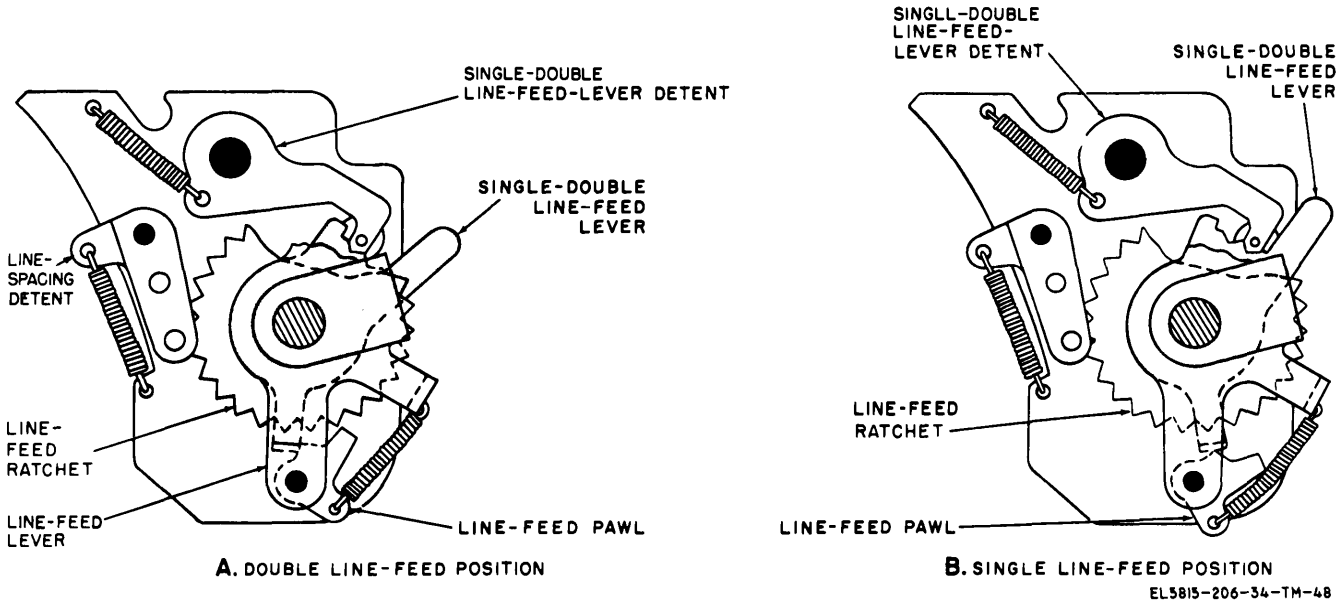


Figure 2-48. Positions of single-double line feed lever.

b. Rotating Platen. The line-feed sensing-lever cam and line-feed cam on the function shaft (fig. 2-47) starts turning at the same time that the transfer operation occurs (para 2-19). Tension of the sensing-lever spring causes the line-feed sensing lever to move downward when a low part of the cam moves adjacent to the sensing lever. The upper arm of the sensing lever moves past the line-feed stop bar and strikes the slanted portion of two projections of the line-feed-cam follower. Continued downward movement of the sensing lever causes the lower end of the cam follower to move horizontally until the roller attached to the lower end of the cam follower is under the line-feed cam. Continued rotation of the function shaft causes a lobe of the line-feed cam to push the cam follower downward. The line-feed bell crank pivots, pulling the line-feed connecting link rearward; this causes the line-feed lever to pivot counterclockwise. The line-feed pawl, attached to the lower arm of the line-feed lever, moves upward, engages a tooth of the line-feed ratchet, and turns the ratchet and the platen counterclockwise. The line-spacing detent prevents rotation of the platen while the page printer prints a line of copy. When the single-double line-feed lever is in the single line-feed position (B, fig, 2-48) the line-feed pawl passes the nearest tooth of the detent, engages the next tooth, and then rotates the platen the width of one detent tooth. When the single-double line-feed lever is in the double line-feed position (A, fig. 2-48) the pawl engages the nearest tooth and the platen rotates the width of two line spaces.

c. Sequence of Line-Feed Operations. The following chart lists the sequence of operations that occur when the page printer receives the line-feed code group.

Line-feed operation sequence chart

1	Line-feed code group received; Y-levers positioned accordingly (para 2-18a and b).	
2	Transfer-lever-latch tripping cam trips transfer-lever-latch (para 2-19).	
3	T-levers and code rings positioned for selection of line-feed operation.	Function-clutch drum released by function-clutch latch (fig. 2-27).
4	Code rings form groove in line with both line-feed stop bars.	Function-clutch drum pushed into engagement with function-clutch driving gear.
5	Line-feed stop bars move into grooves in code rings.	Function shaft and square-shaft start turning.
6	Line-feed sensing lever moves to low part of line-feed sensing-lever cam (fig. 2.47).	Square shaft rotates until square-shaft stop arm strikes line-feed stop bar.
7	Line-feed sensing lever moves lower end of line-feed-cam follower toward line-feed-cam; roller on cam follower moves under cam.	
8	Lobe of line-feed cam pushes line-feed-cam follower downward.	
9	Line-feed connecting link rearward.	
10	Line-feed lever pivots counterclockwise.	
11	Line-feed pawl engages line-feed ratchet; ratchet moves one or two line spaces.	
12	Lobe of line-feed sensing-lever cam pushes line-feed sensing lever upward.	
13	Lower end of line-feed-cam follower moves away from line-feed cam.	Arm of function-clutch drum strikes function-clutch latch; drum moves away from function-shaft driving gear; function shaft stops turning (fig. 2-27).

2-30. Line-Feed and Line-Feed-On-Carriage-Return Mechanism, TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG

(fig. 2-49)

The line-feed mechanism, as on the TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG, is used to turn the platen one or two line spaces when the line-feed code group is received. The position of the single-double-line-feed lever determines the amount of platen rotation.

a. Line-Feed Operation. When a line-feed code is selected, the line-feed and duplicate line-feed stop bars are actuated as described in paragraph 2-29a. The duplicate stop bar allows the line-feed sensing lever to clear it and drop when the restoring roller is rotated out of engagement with the lever. The sensing lever allows the spring-loaded line-feed bellcrank pawl to pivot into the path of an adjustable block on the draw-bar assembly. As the function shaft continues turning, the draw-bar actuating cam begins to pull the draw-bar assembly downward. One of the adjustable blocks engages the line-feed bellcrank pawl, which causes the line-feed bellcrank to pull the connecting link and associated line-feed lever. The platen is turned one or two line spaces, depending upon the setting of the single-double line-feed lever (para 2-29b). The line-feed mechanism is restored to its original position as the restoring roller raises the line-feed sensing lever and the draw-bar assembly is spring-returned upward.

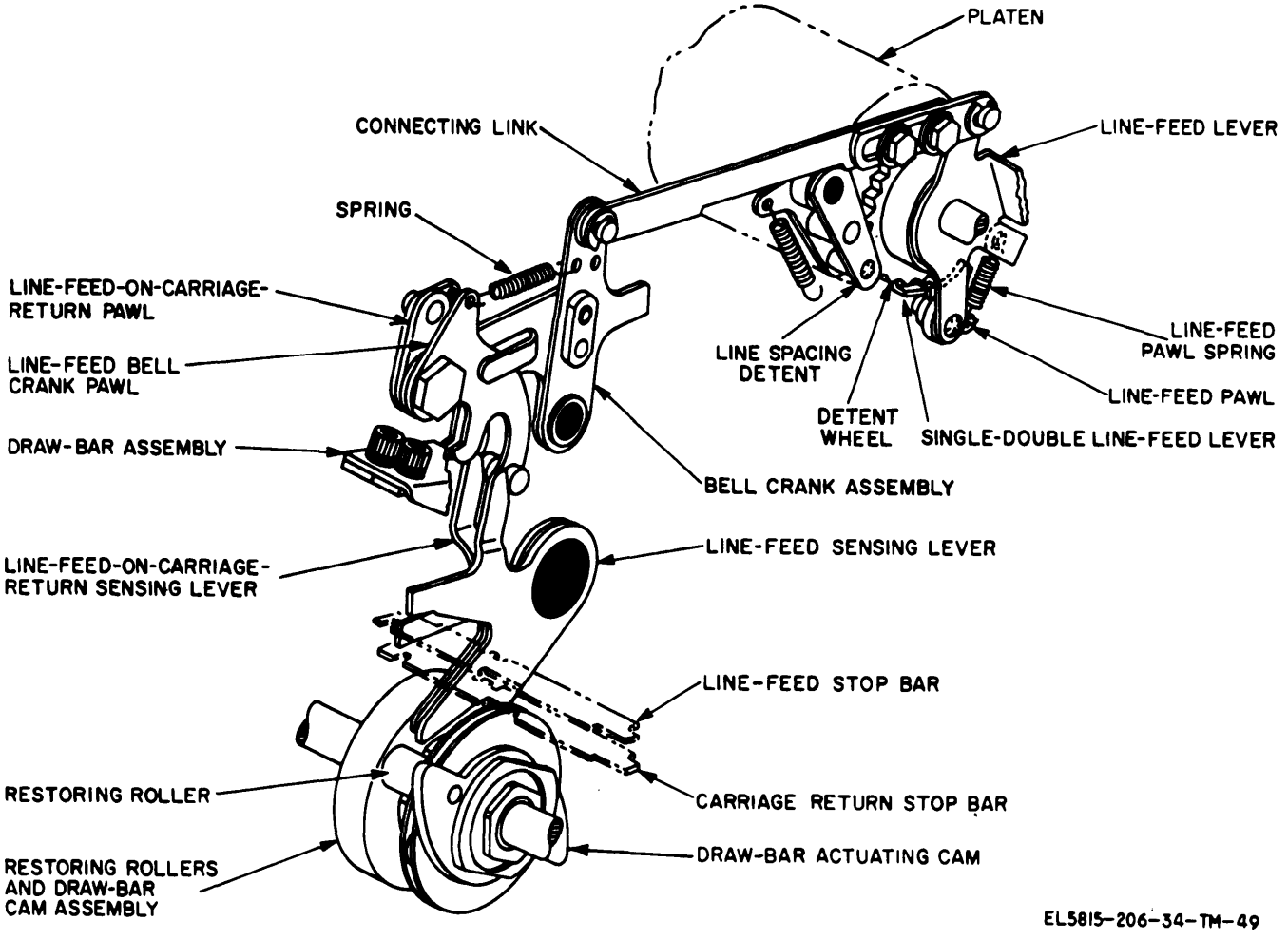


Figure 2-49. Line feed mechanism (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

b. Line-Feed-On-Carriage-Return Operation. When a carriage-return code group is selected, the carriage-return and duplicate carriage-return stop bars are actuated as described in paragraph 2-24a. As the restoring rollers rotate out of engagement with them, both the carriage-return and line-feed-on-carriage-return sensing levers are operated. If the line-feed-on-carriage-return pawl is adjusted (para 3-231 and 3-233) for engagement with the draw-bar assembly, the line-feed function will take place with every selection of the carriage-return code group. First, the carriage-return sensing lever drops down, off its restoring roller, to operate the vertical carriage-return link and associated mechanism.

After about 70° of rotation, the line-feed-on-carriage-return sensing lever is actuated by dropping off its restoring roller. The line-feed-on-carriage-return pawl is pivoted for engagement by the downward moving draw-bar assembly. The remaining sequence of operation is similar to the normal line-feed function *(a* above). The line-feed-on-carriage-return and line-feed bellcrank pawls are connected to the same bellcrank assembly and line-spacing mechanism.

c. Line-Feed and Line-Feed-On-Carriage-Return Sequence. The following chart lists the line-feed and line-feed-on-carriage-return sequence of operation.

Line-Feed and Lone-Feed-On-Carriage-Return Sequence Chart

1	Line-feed or carriage-return code group is selected.	Code rings align for both line-feed stop bars or for both carriage-return stop bars.
2	Function shaft and square-shaft start turning.	
3	Carriage-return sensing lever moves past the carriage-return stop bar as it drops off its restoring roller.	See carriage-return sequence chart (para 2-24h, items 6-21).
4	Line-feed-on-carriage-return sensing lever moves past the carriage-return stop bar or the line-feed sensing lever moves past the line-feed stop bar: either lever drops off common restoring roller.	

2-31. Automatic Carriage Return and Line Feed Operation (TT-537/G and TT-722(*)/TG)

(fig. 2-50)

Automatic carriage return and line feed is initiated when the carriage reaches the right-hand margin. At the 73d character, the right-hand margin trip plate, mounted on the type selecting arm bearing cap of the carriage frame, rotates the stop bar shift lever. This causes the stop bar shift link, stop bar shift blade, and stop bar shift stop to move in a horizontal direction to the left (when viewed from front). The stop bar shift blade moves the carriage return and line feed function stop bars into the code ring cage and away from their sensing levers, while the spring collar compresses the stop bar return spring against the stop bar shift link bracket. The entire mechanism actuated by the right-hand margin trip plate then is held in this operated position by the delaying latch which engaged the stop bar shift stop. Since the carriage return and line feed sensing levers are now free to operate, both carriage return and line feed, take place on the next operation of the function shaft. When the carriage reaches the left-hand margin, the left-hand margin trip plate rotates the delaying lever. This moves the delaying latch away from the stop bar shift stop. The stop bar return spring then returns the automatic carriage return and line feed mechanism to its normal unoperated position and moves the function stop bars back under their associated sensing levers.

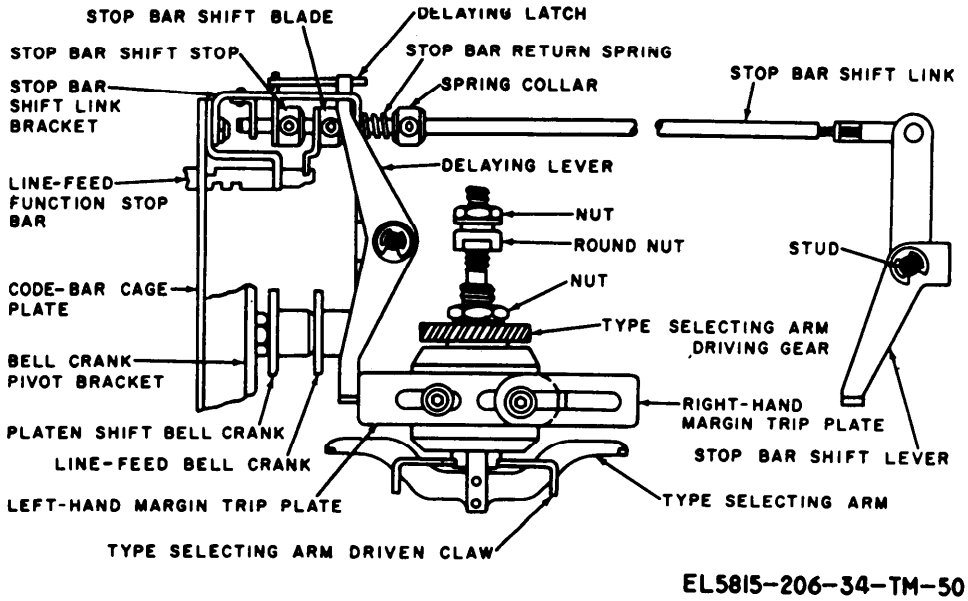


Figure 2-50. Automatic carriage-return and line feed mechanism (TT-537/G and TT-722(*)/TG).

2-32. Ribbon Feed and Ribbon Reverse Operations

Two ribbon spools and enough ribbon to fill one of the spools are mounted on the carriage (fig. 2-51). During operation of the page printer, one of the spools turns slowly to pull the ribbon from the opposite spool *(a* below). When the ribbon is almost completely wound on one spool, the ribbon-reverse operation *(b* below) reverses the direction of ribbon feed.

a. Ribbon-Feed Operation.

(1) Each end of the ribbon is attached to the hub of a ribbon spool which is mounted on the upper end of a ribbon-spool shaft. Two slotted spool-shaft gears are mounted on the lower end of the ribbon-spool shafts. The slots in each gear engage a drive key that is fastened to the bottom of the shaft and the shaft turns whenever the gear is turned.

(2) Teeth of the helical gear on the ribbon-feed shaft engage teeth of the carriage-guide rail (17, fig. 3-37) and when the carriage feeds to the right, the helical gear moves from one tooth of the guide rail to the next tooth, rotating slightly with each movement. The ribbon-feed clutch is used to cause the ribbon-feed shaft to rotate with the helical gear as the carriage moves to the right.

(3) On the TT-4C/TG, TT-335/TG, TT-537/G, TT-698B/TG the ribbon mechanism (fig. 2-52) is identical with that described in (1) and (2) above, except —

(a) The detent and detent block are on the right side of the beam, but the operation is unaffected.

(b) A ratchet wheel is mounted on the drive shaft with an associated detent spring. The ratchet wheel and detent insure that the jaw clutch teeth slip during the carriage-return operation as described in (1) and (2) above.

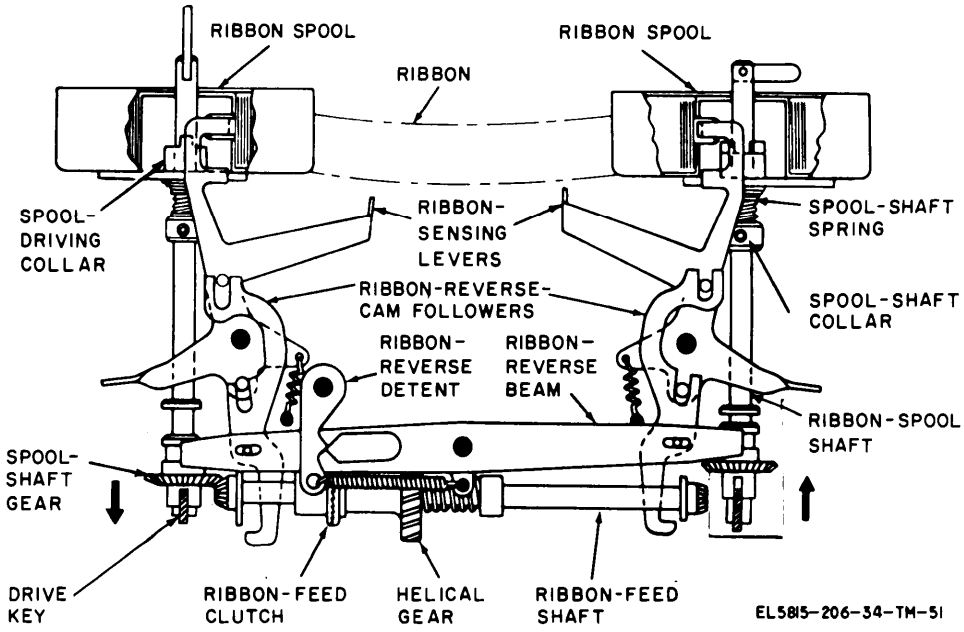


Figure 2-51. Ribbon-feed mechanism positioned for feeding ribbon from right ribbon spool to left ribbon spool (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG).

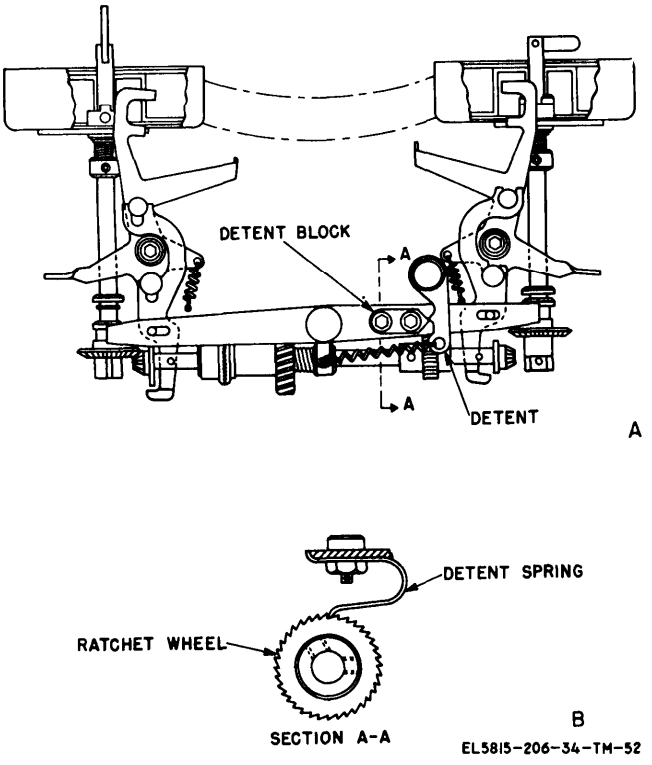


Figure 2-52. Ribbon feed mechanism (TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG).

b. Ribbon-Reverse Operation. The ribbon-reverse beam, ribbon-reverse cam, ribbon-reverse cam follower, and ribbon-sensing lever on each side of the ribbon-feed mechanism (fig. 2-51) are used to reverse the direction of ribbon feed.

(1) When the left end of the beam is in the downward position, the left spool-shaft gear is in mesh with its associated bevel gear on the end of the ribbon-feed shaft. Operation of the page printer causes the left ribbon spool to rotate, pulling the ribbon from the ribbon spool on the right side of the ribbon-feed mechanism.

(2) When the final turn of ribbon is being unwound from the right ribbon spool, the upper end of the right ribbon-sensing lever (fig. 2-53) moves to the left, through an opening in the hub of the ribbon spool. The lower end of the cam follower moves under the ribbon-reverse cam on the right end of the ribbon-feed shaft. Continued rotation of the shaft causes the cam to push the cam follower downward, pulling the right end of the ribbon-reverse beam downward. The right spool-shaft gear also moves downward into engagement with its associated gear on the ribbon-feed shaft; the left spool-shaft gear moves upward out of engagement with its associated gear; and the direction of ribbon feed is reversed.

(3) When the carriage moves to the left margin during the carriage-return operation, the helical gear rotates very rapidly in a direction opposite the normal ribbon-feeding direction. The ribbon-feed shaft remains motionless during the carriage-return operation because the helical gear moves to the right against the pressure of its spring, and the ribbon-feed clutch members are kept out of engagement until the carriage stops at the left margin.

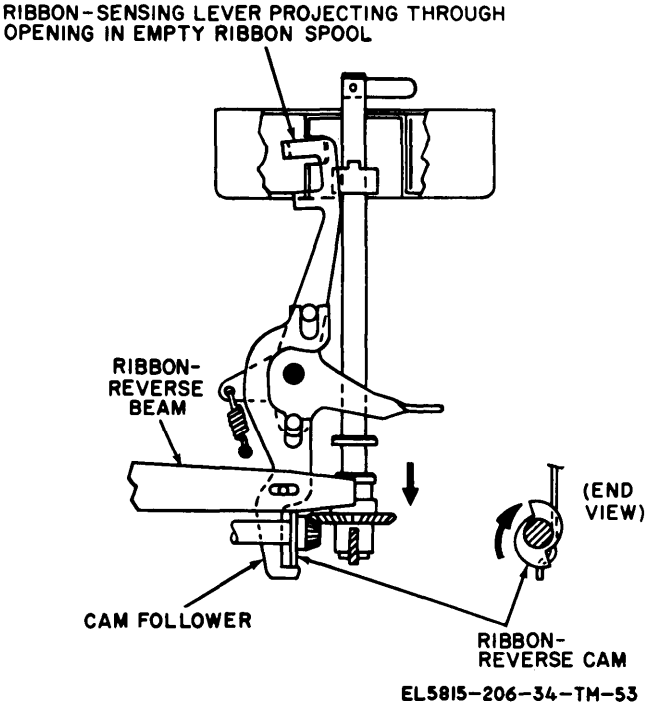


Figure 2-53. Ribbon reverse mechanism.

2-33. Ribbon Lifter Operation

The ribbon moves upward an instant before a type-bar strikes the platen and returns to its normal lower position after the character is printed. The ribbon is threaded through the ribbon guide (fig. 2-54 and 2-55) and moves upward and downward with the guide as described below.

a. Each time the type selecting arm moves forward (para 2-21), it causes the ribbon-lifter levers to rotate slightly about their pivot points. When this occurs, the turnbuckle of the TT-4A/TG and TT-698/TG (fig. 2-54) or the adjusting links of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG (fig. 2-55) moves forward, pivoting the ribbon-lifter bell crank, and the ribbon guide and ribbon move upward.

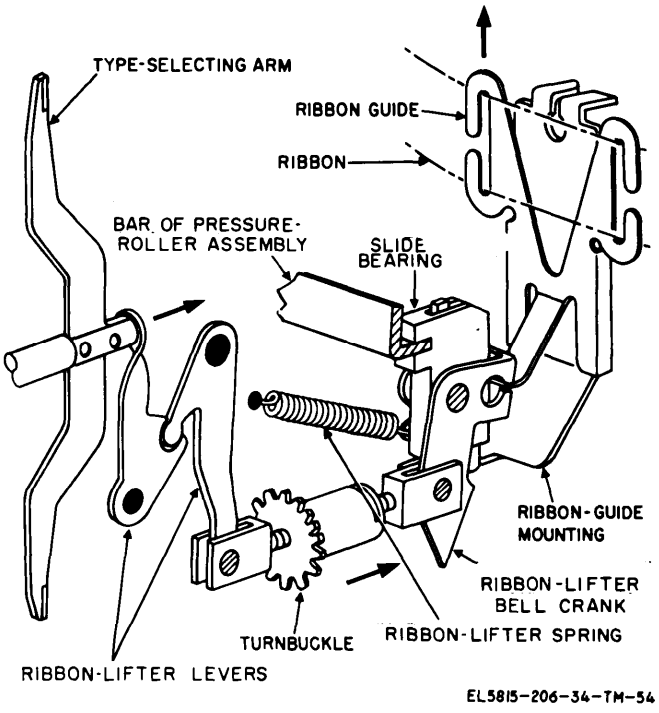


Figure 2-54. Ribbon lifter mechanism (TT-4A/TG and TT-698/TG).

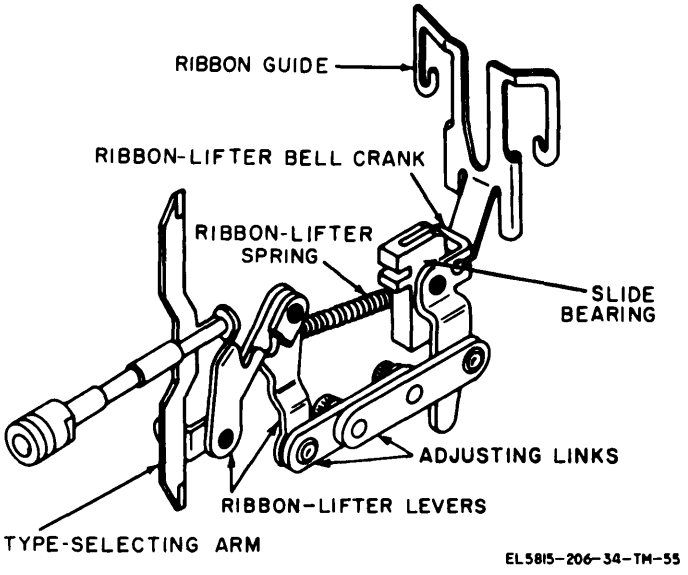


Figure 2-55. Ribbon lifter mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG).

b. When the type-selecting arm moves rearward after the character is printed, the ribbon-lifter spring pivots the ribbon-lifter bell crank downward, causing the ribbon guide to move to the lower position, where it remains until the type-selecting arm moves forward again.

2-34. Signal-Bell Operation

The signal-bell operation is used by operators for audible signaling. The signal bell sounds when the page printer receives the letter S code group while the platen is in the figures-shift position. Neither printing (para 2-21) nor carriage feeding (para 2-22) occurs when the signal-bell operation occurs. The signal bell mechanism operates as follows:

a. Selection of Signal-Bell Operation. When the letter S code group is received and the transfer operation occurs, the first and third code rings are set to the marking position and the second, fourth, and fifth code rings are set to the spacing position. The code rings form a groove in line with the S stop bar, which stops rotation of the square-shaft stop arm. When the square-shaft is stopped in this position, the type-selecting arm is in line with the connecting bar which is geared to the S type bar, and the function-selecting arm (fig. 2-27 and 2-30) is in line with the signal-bell punch bar in the punch-bar-guide block (fig. 2-56).

b. Ringing Signal Bell. Immediately after the function-selecting arm is positioned *(a* above), a lobe of the function cam (fig. 2-30) causes the function-cam follower to pivot counterclockwise, moving the function-selecting arm against the signal-bell punch bar (fig. 2-57). The signal-bell punch bar moves inward, pivoting the signal-bell clapper against the signal bell. After the bell rings, the function cam moves the function-selecting arm away from the signal-bell punch bar; the signal-bell-clapper spring pulls the clapper away from the bell and the signal-bell punch bar moves to its normal outward position.

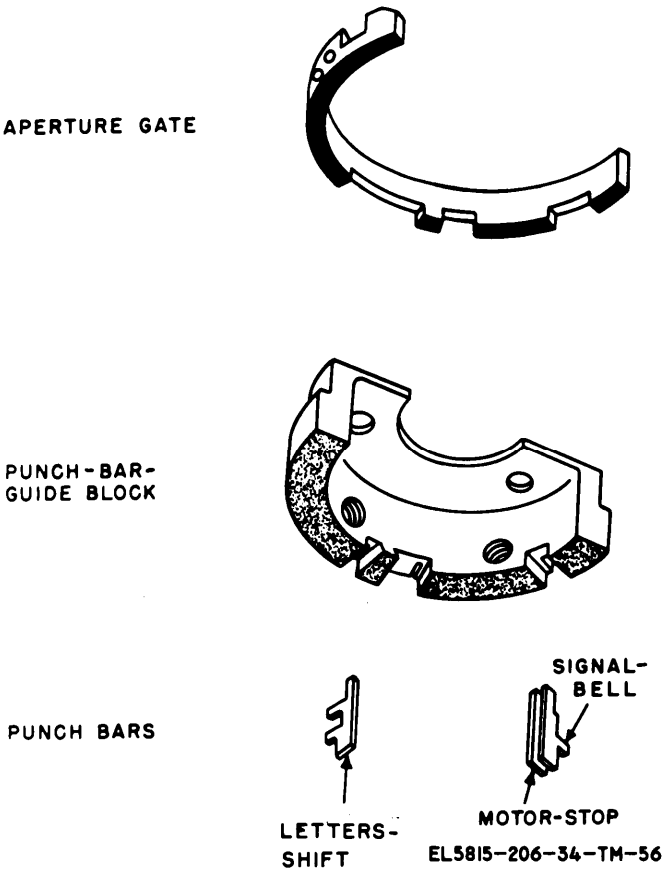


Figure 2-56. Punch-bar-guide block assembly, exploded view.

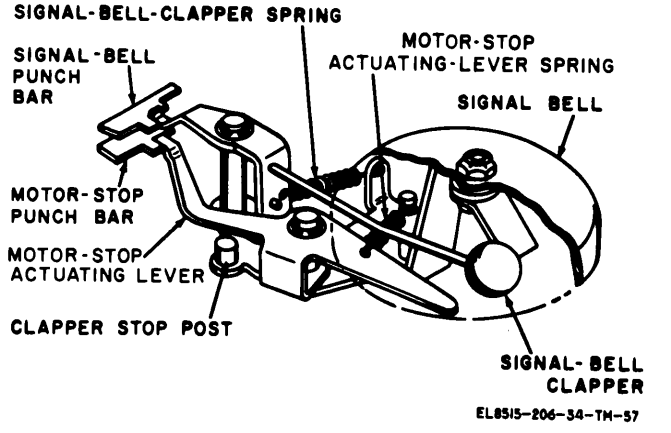


Figure 2-57. Signal bell mechanism.

c. Type Selecting Arm Operation. When the function-selecting arm causes the signal bell to be rung *(b* above), the type-selecting arm moves forward to push the connecting bar for the letter S type bar and the S type bar swings upward toward the platen. Nothing is printed at this time because the upper-case portion of the type bar contains no symbol. The type bar is stopped by the type-bar guide before the upper-case part of the type bar reaches the platen.

d. Suppression of the Signal-Bell Operation. When the platen is in the letters-shift position, the aperture gate also is in the letters-shift position (A, fig. 2-58 and A, 2-59). When the letter S code group is received under this condition, the type-selecting arm causes the letter S to be printed (para 2-21). The function-selecting arm is not permitted to push the signal-bell punch bar inward to ring the signal bell because a blocking portion of the aperture gate blocks inward movement of the punch bar. The lobe of the function cam causes the lower end of the function-cam follower to move counterclockwise, and the carriage-feed operation occurs (para 2-22). When the platen is in the figures-shift position, the aperture gate also is in the figures-shift position (B, fig. 2-58 and B, 2-59) of the signal-bell mechanism and the motor-stop mechanism (para 2-35).

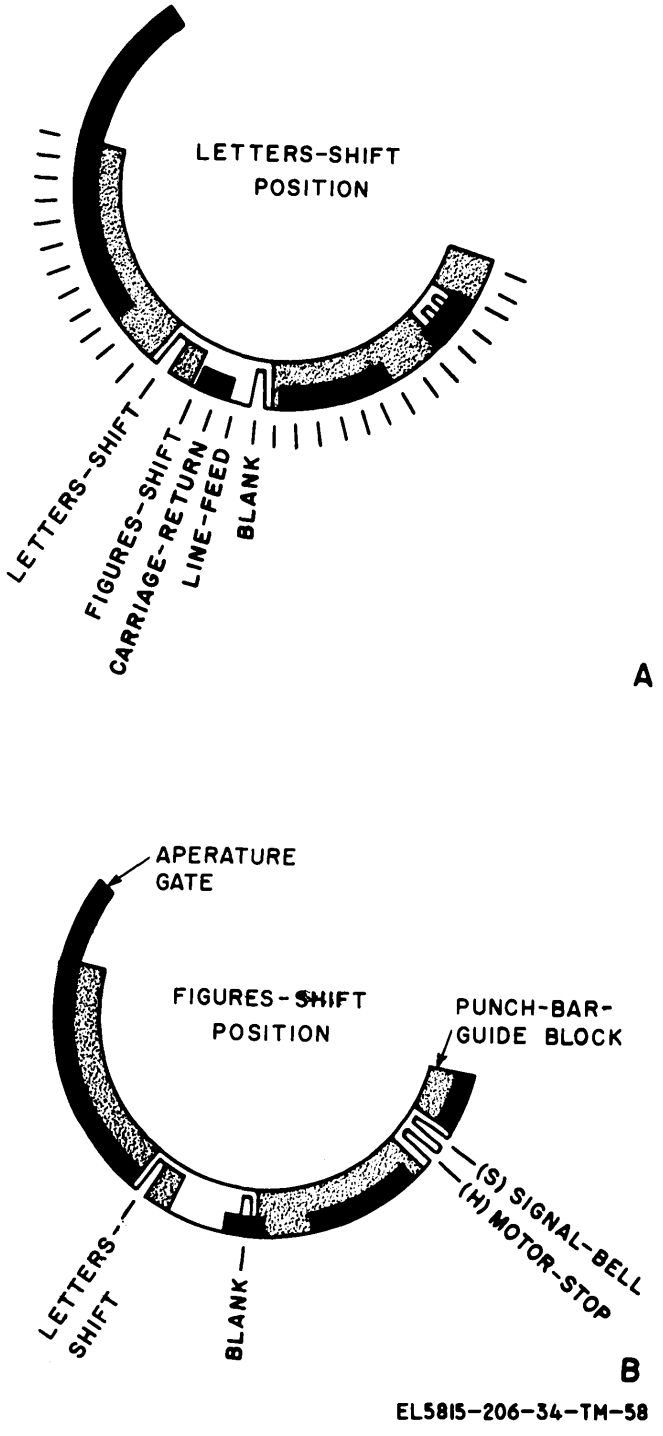


Figure 2-58. Location of stopped positions of function-selecting arm after receipt of function code groups.

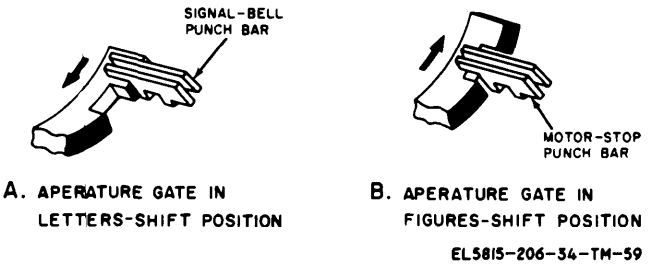


Figure 2-59. Signal-bell and motor-stop punch bars blocked and not blocked by aperture gate.

e. Sequence of Signal-Bell Operations. The chart below list the sequence of operations that occur when the S code group is received while the platen of the page printer is in the figures-shift position.

Signal-bell operation sequence chart

1	Letter S code group received; platen in figures-shift position.	
2	Y-levers positioned for selection of signal-bell operation (para 2-18a and b).	
3	Transfer-lever-latch tripping cam trips transfer-lever latch; transfer operation occurs (para 2- 19).	
4	T-levers and code rings positioned for selection of S stop bar.	Function-clutch latch releases function-clutch drum; function-clutch latch members move into engagement (fig. 2-27).
5	S stop bar moves into groove in code rings.	Function shaft and square shaft start turning.
6	Square-shaft stop arm strikes S stop bar; square shaft stops turning.	
7	Type-selecting arm positioned in alignment with connecting bar geared to letter S type bar.	Function-selecting arm positioned in alignment with signal-bell punch bar in punch-bar-guide block.
8	Lobe of print cam causes type-selecting arm to move forward (fig. 2-26).	Lobe of function cam pivots function-cam-follower, causing function-selecting arm to push signal-bell punch bar inward (fig. 2-57).
9	Letter S type bar swings upward; motion of type bell. bar halted before blank portion of type bar strikes platen; nothing printed.	Signal-bell clapper strikes

Signal-bell operation sequence chart – Continued

10	Print cam completes ½ revolution; returns type-selecting arm to normal (rearward) position.	Function cam completes ½ revolution, returns function-selecting arm to normal (outward) position.
11	Transfer-lever restoring cam causes transfer lever to move T-levers upward, away from Y-levers.	Function clutch latch engages arm of function-clutch drum.
12	Function-clutch drum disengaged from function-shaft driven gear; function shaft stops turning (½ revolution completed).	

2-35. Motor-Stop Operation

The motor-stop mechanism (not applicable to TT-698(*)/TG) permits the operator at any station to start and stop the motor of all teletypewriters that are connected to the same signal circuit. When the letter H code group is transmitted while the platen of each teletypewriter is in the figures-shift position, the motors of all interconnected teletypewriters stop (including the motor of the transmitting teletypewriter). Under this condition, an operator at any of the stations can start all motors by pressing and releasing the BREAK switch on the side of the teletypewriter keyboard. The motor-stop mechanism starts and stops the motor as described below.

a. Selection of Motor-Stop Operation. When the transfer operation occurs after the letter H code group is received, the third and fifth code rings are set to the marking (clockwise) position and the first, second, and fourth code rings are set to the spacing (counterclockwise) position (para 2-21). The code rings form a groove in line with the H stop bar. The H stop bar moves into the groove to halt rotation of the square-shaft stop arm. When the stop arm is halted at this point, the type-selecting arm is in line with the connecting bar that is geared to the H type bar, and the function-selecting arm (fig. 2-27 and 2-30), is in line with the motor-stop punch bar in the punch-bar-guide block (fig. 2-56 and 2-57).

b. Stopping Motor. The motor stops when the motor-stop mechanism opens a pair of contacts that are connected in series with the motor. The contacts are opened as described below.

(1) Immediately after the function-selecting arm is positioned *(a* above), a lobe of the function cam (fig. 2-30), causes the function-cam follower to pivot counterclockwise, and move the function-selecting arm against the motor stop punch bar (fig. 2-57). The motor-stop punch bar moves inward (platen in figures-shift position), pivoting the motor-stop actuating lever. One end of the actuating lever pushes the top of the contact lever away from the motor-stop relay (fig. 2-60 and 2-62).

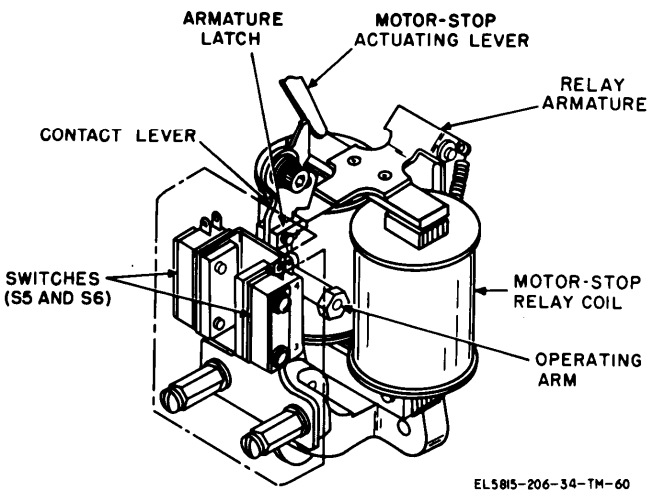


Figure 2-60. Motor-stop relay mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG and TT-537/G).

(2) The contact lever includes two operating arms that move with the contact lever. When the contact lever is pushed by the actuating lever, the following action occurs:

(a) The operating arms of the TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G (fig. 2-60 and 2-61) push the plungers of switches S5 and S6, and cause the circuit through each switch to open. Switch S6 is in series with the motor (fig. FO-2) and the motor stops. Switch S5 opens to remove a short circuit across the motor-stop relay, and the signal circuit current flows through the relay. The energized relay pulls the relay armature downward (A, fig. 2-61) to lock the contact lever in the operated position (away from the relay) until the motor start operation occurs *(c* below).

(b) The operating arms on the contact lever of the TT-4A/TG (fig. 2-62) open two pairs of contacts. One pair is in series with the motor and the motor stops. The other pair of contacts opens to remove a short circuit around the motor-stop relay (fig. FO-1), and the signal circuit flows through the coils of the relay. The magnetic field produced by the current in the signal circuit pulls the relay armature downward, and the contact lever is latched in the operated position by the armature (A, fig. 2-63).

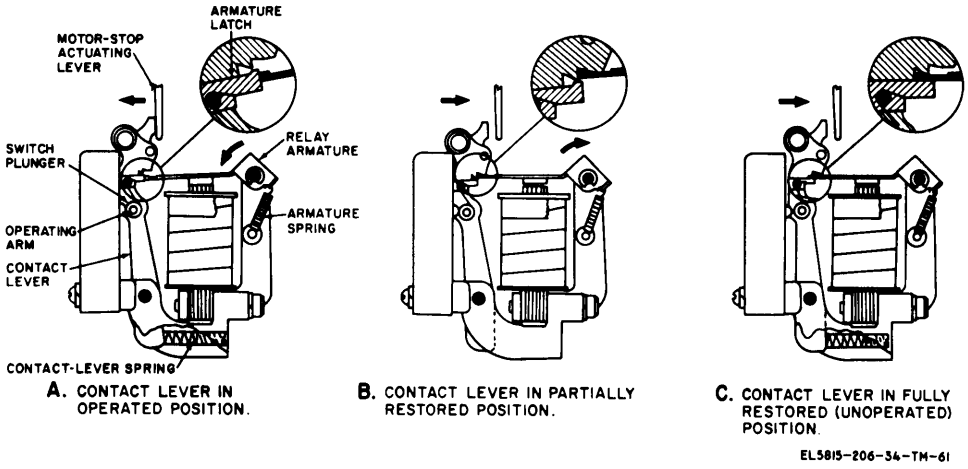


Figure 2-61. Positions of TT-4B/TG contact lever.

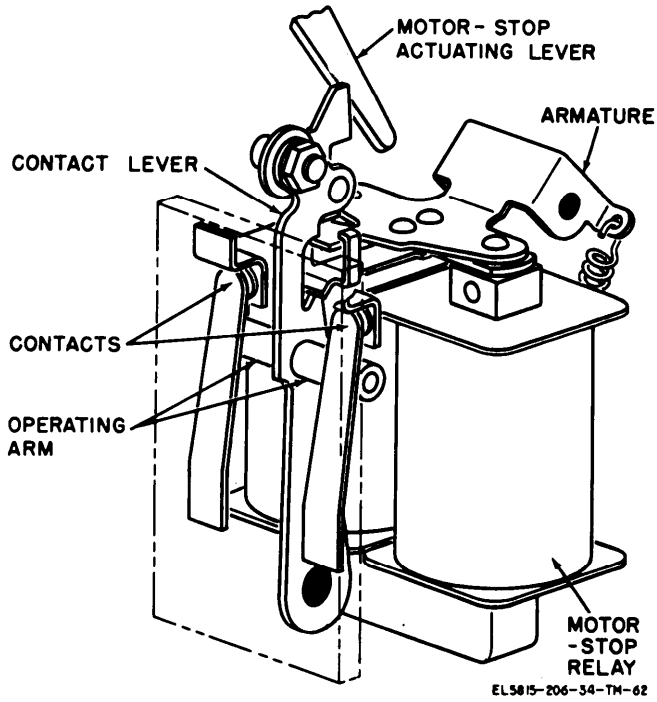


Figure 2-62. Motor-stop relay mechanism (TT-4A/TG).

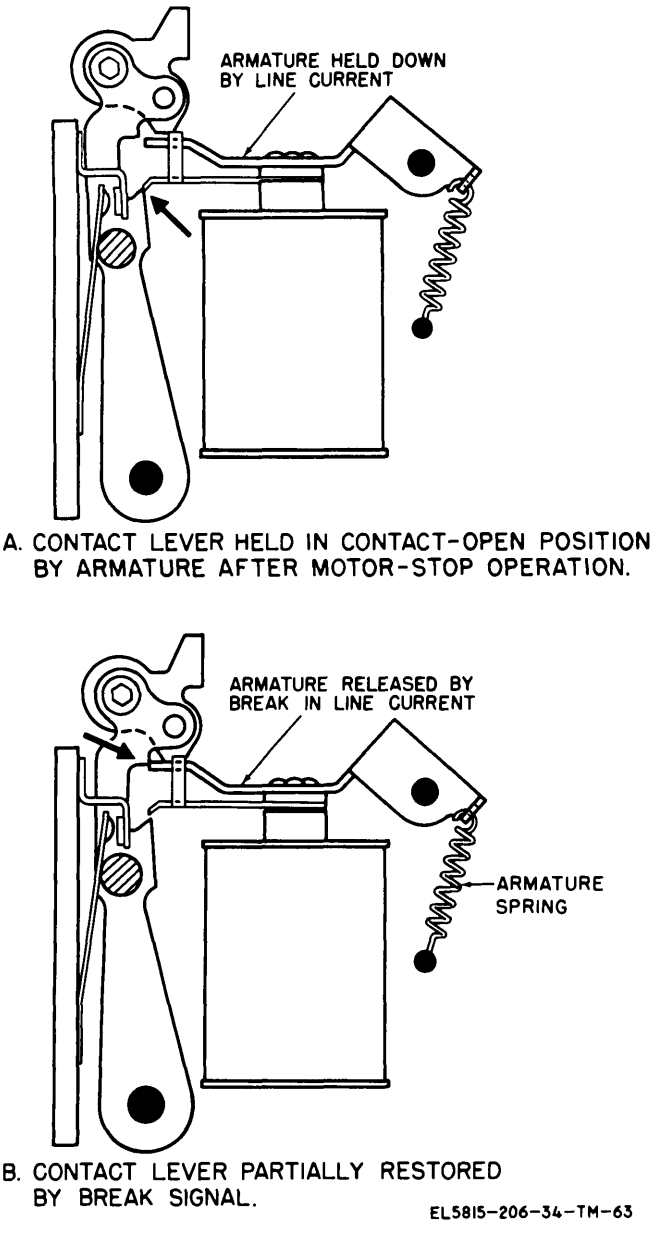


Figure 2-63. Position of TT-4A/TG contact lever.

c. Starting Motor. Depression of the BREAK switch at any of the interconnected teletypewriters opens the signal circuit (fig. FO-1 and FO-2) and the motor-stop relay of each page printer is deenergized. The armature spring (fig. 2-61 and 2-63) pivots the armature upward and the contact lever moves *slightly* toward the restored position (position before motor-stop operation) (B, fig. 2-61 and 2-63). When the BREAK switch is released, the motor-stop relay is energized again. The armature moves downward and the contact lever moves to the fully restored position (C, fig. 2-61).

(1) The plungers of the TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G, and switches S5 and S6 move to their normal (outward) position. Switch S6 (fig. FO-2) closes to complete the motor circuit, and the motor begins operating. Switch S5 closes to place a short circuit across the motor-stop relay and the signal circuit is completed through S5 instead of through the coils of the relay.

(2) The two pairs of contacts of the TT-4A/TG move to their normal (closed) position. One pair of contacts completes the motor circuit (fig. FO-1) and the motor begins operating. The other pair closes to place a short circuit across the motor-stop relay, and the signal circuit is completed through the contacts.

d. Suppression of Motor-Stop Operation. When the platen of the page printer is in the letters-shift position, the aperture gate (fig. 2-58 and 2-59) is in the letters-shift position also. When the letter H code group is received under this condition, the type-selecting arm causes the letter H to be printed (para 2-21). The function-selecting arm is not permitted to push the motor-stop punch bar inward to stop the motor, because a blocking portion of the aperture gate blocks inward movement of the punch bar. The lobe of the function cam causes the lower end of the function-cam follower to move counterclockwise, and carriage feeding occurs (para 2-22).

e. Sequence of Motor-Stop Operations. The chart below lists the sequence of operations that occur when the letter H code group is received while the platen of the page printer is in the figures-shift position.

Motor-stop operation sequence chart

1	Letter H code group received while platen is in figures-shift position.	
2	Y-levers positioned for selection of motor-stop operation (para 2-18a and b).	
3	Transfer-lever-latch tripping cam trips transfer-lever latch; transfer operation occurs (para 2-19).	
4	T-levers and code rings positioned for selection of H stop bar.	Function-clutch latch releases function-clutch drum; function-clutch members move into engagement (fig. 2-27).
5	H stop bar moves into groove formed in code rings.	Function shaft and square shaft start turning.
6	Square-shaft stop arm strikes stop bar; square shaft stops turning.	
7	Type-selecting arm positioned in line with connecting bar geared to letter H type bar.	Function-selection arm positioned in line with motor-stop punch bar in punch-bar-guide block.
8	Lobe of print cam causes type-selecting arm to move forward (fig. 2-26).	Lobe of function cam pivots function-cam follower, causing function-selecting arm to push motor-stop punch bar inward (fig. 2-30 and 2-56),
9	Letter H type bar swings upward: motion of type bar halted be-	Motor-stop punch bar pivots motor-stop actuating lever (fig. 2-57); actuating lever

Motor-stop operation sequence chart – Continued

	fore blank portion of type bar strikes platen; nothing printed.	moves contact lever to operated position (A, fig. 2-61 and 2-62); motor circuit opened to stop motor; short circuit across motor-stop relay remove to energize relay; energized relay holds contact lever in operated position.
10	Print cam completes ½ revolution; returns type-selecting arm to normal (rearward position).	Function cam completes ½ revolution, returns function-selecting arm to normal (out. ward) position.
11	Transfer-lever restoring cam causes transfer lever to move T-levers upward, away from Y-levers.	Function-clutch latch engages arm of function-clutch drum (para 2-26).
12	Function-clutch drum disengaged from function-shaft driven gear; function shaft stops turning (½ revolution completed).	

NOTE

When the operator at any of the interconnected teletypewriters presses and releases the BREAK switch, the following occurs:

13 BREAK switch pressed; signal circuit and motor-stop relay deenergized; armature moved upward from motor-stop relay.

14 Contact lever moved slightly toward restored position (B, fig. 2-61 and 2-63).

Motor-stop operation sequence chart – Continued

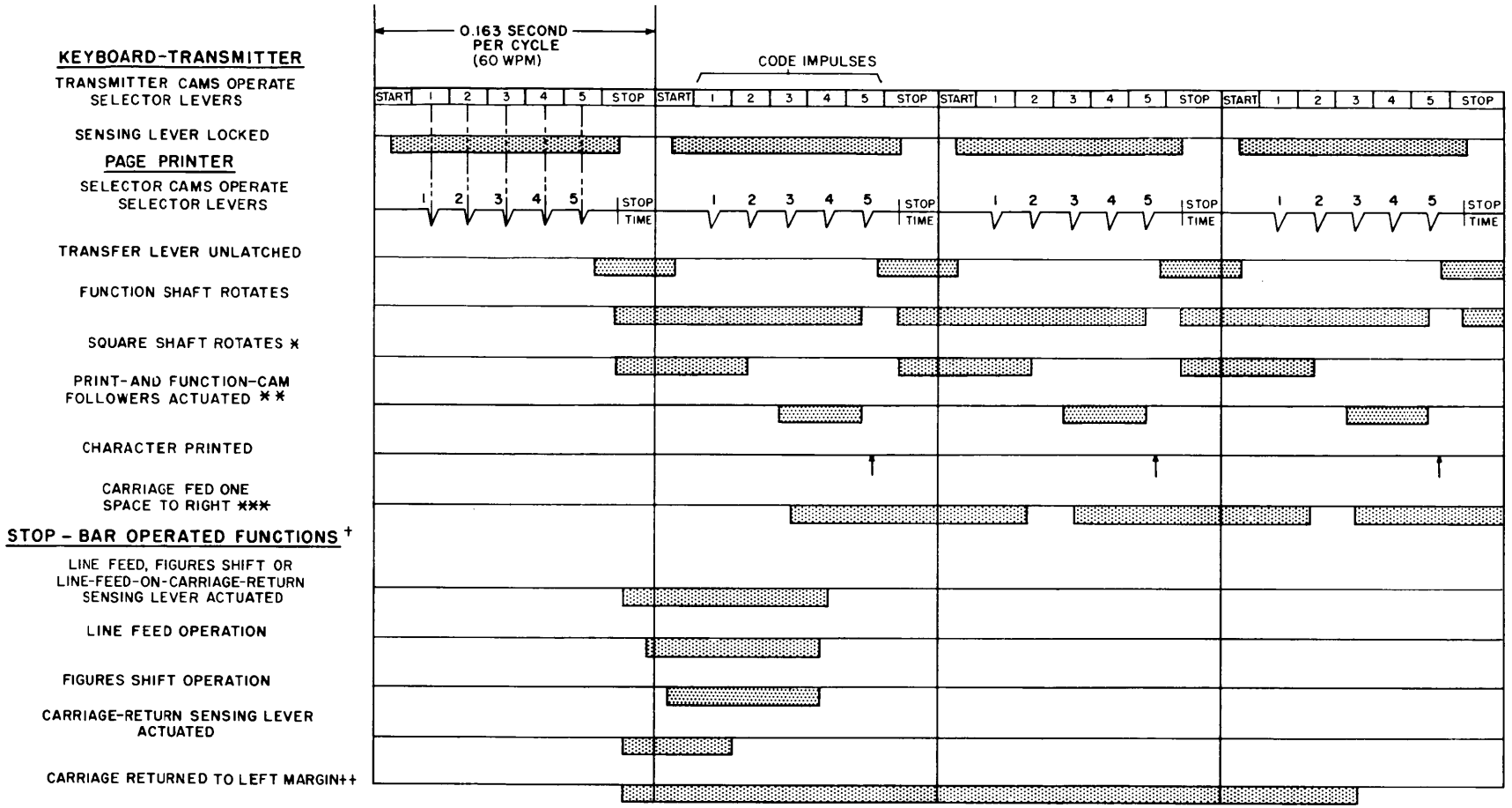
15 BREAK switch released; signal circuit and motor-stop relay energized; armature moves downward toward motor-stop relay.

16 Contact lever moved to fully restored position; motor circuit completed to start motor; short circuit placed across motor-stop relay to reenergize relay.

2-36. Teletypewriter Timing Chart

The timing chart (fig. 2-64) shows the precise sequence of the major operations of the teletypewriter. Supplementary information is provided in *a* through *c* below.

a. Overlap. Overlap permits the receipt of a new code group and the positioning of the Y-levers for a new selection while the printing or function operation selected by the preceding code group is being accomplished. Overlap is possible because the T-levers are lifted upward, away from the Y-levers, immediately after the code-rings are positioned. The Y-levers are then free to be repositioned in accordance with the code impulses of the next code group without interference with the accomplishment of the preceding selection.



* TIME SHOWN IS MAXIMUM POSSIBLE, BUT CAN BE ANY AMOUNT (EVEN ZERO) DEPENDING ON SEQUENCE OF CHARACTERS.

** EITHER PRINTING OR ONE OF FOLLOWING FUNCTIONS OCCUR, UNLESS STOP-BAR OPERATED FUNCTION IS SELECTED: LETTERS-SHIFT SPACE, SIGNAL BELL, MOTOR STOP, BLANK.

*** ONLY FOR PRINTED CHARACTERS AND SPACING.

† ONLY ONE FUNCTION STARTS IN ANY CYCLE; THREE FUNCTIONS ARE SHOWN FOR COMPARISON.

†† TIME SHOWN IS FOR RETURN FROM 72ND SPACE.

EL5815-206-34-TM-64

Figure 2-64. Teletypewriter timing chart.

b. Carriage-Return Time Requirement. The time required for completion of the carriage-return operation exceeds 2½ times the time length of a complete code group. If a character-selecting code group is received immediately after the carriage-return code group, the character is printed while the carriage is returning to the left margin. For this reason, when the end of a line of printing is reached, operators normally press the CAR RET key first, and then the LINE FEED key. Under this condition, the end of the carriage-return operation and the complete line-feed operation occur simultaneously, and both operations are completed before the next character is printed.

c. Transmitted Code Impulses and Page Printer Selecting Intervals. The time intervals between the high points of the code impulse cams in the keyboard-transmitter and the selector cams in the page printer are equal. However, the selector levers of the transmitter are held in the operated position by the code impulse cams for the full length of the impulse, but the selector levers of the page printer require less than ¼ the length of each code impulse to position the associated Y-lever. This feature permits reliable teletypewriter communication with less than perfect impulses.

Section IV. CIRCUITS OF TELETYPEWRITERS TT-4(*)/TG, TT-335/TG, TT-537/G, TT-698(*)/TG and TT-722(*)/TG

2-37. General

The circuits of the TT-4(*)/TG, TT-336/TG, TT-537/G, TT-698(*)/TG and TT-722(*)/TG include the send circuit (para 2-38), the receive circuit (para 2-39) and the motor and copy light circuits (para 2-42). These circuits are shown in both schematic and wiring diagram form in figures 2-65 through 2-74 and foldouts FO1 through FO-7. The send and receive circuits of the TT-698(*)/TG require a 30V dc power supply (para 2-45). Note that the reference designations of some of the parts in the TT-4A/TG differ from the designations of the same parts in the TT-4B/TG, TT-335/TG, and TT-537/G. The chart below shows the reference designations of the electrical parts that are not assigned the same designation in both teletypewriters.

NOTES

1. The circuits of the TT-722/TG are identical to the circuits of the TT-4B/TG. Also, the circuits of the TT-722A/TG are identical with the circuits of the TT-4C/TG.
2. All original Teletypewriters TT-537/G included a keyboard; however, some units were reworked on Work Order No. C9409887 and do not include a keyboard or remote motor control circuitry. Schematic and wiring diagrams for these reworked teletypewriters are located in the back of the manual and are identified as FO-4.1 and FO-6.1.

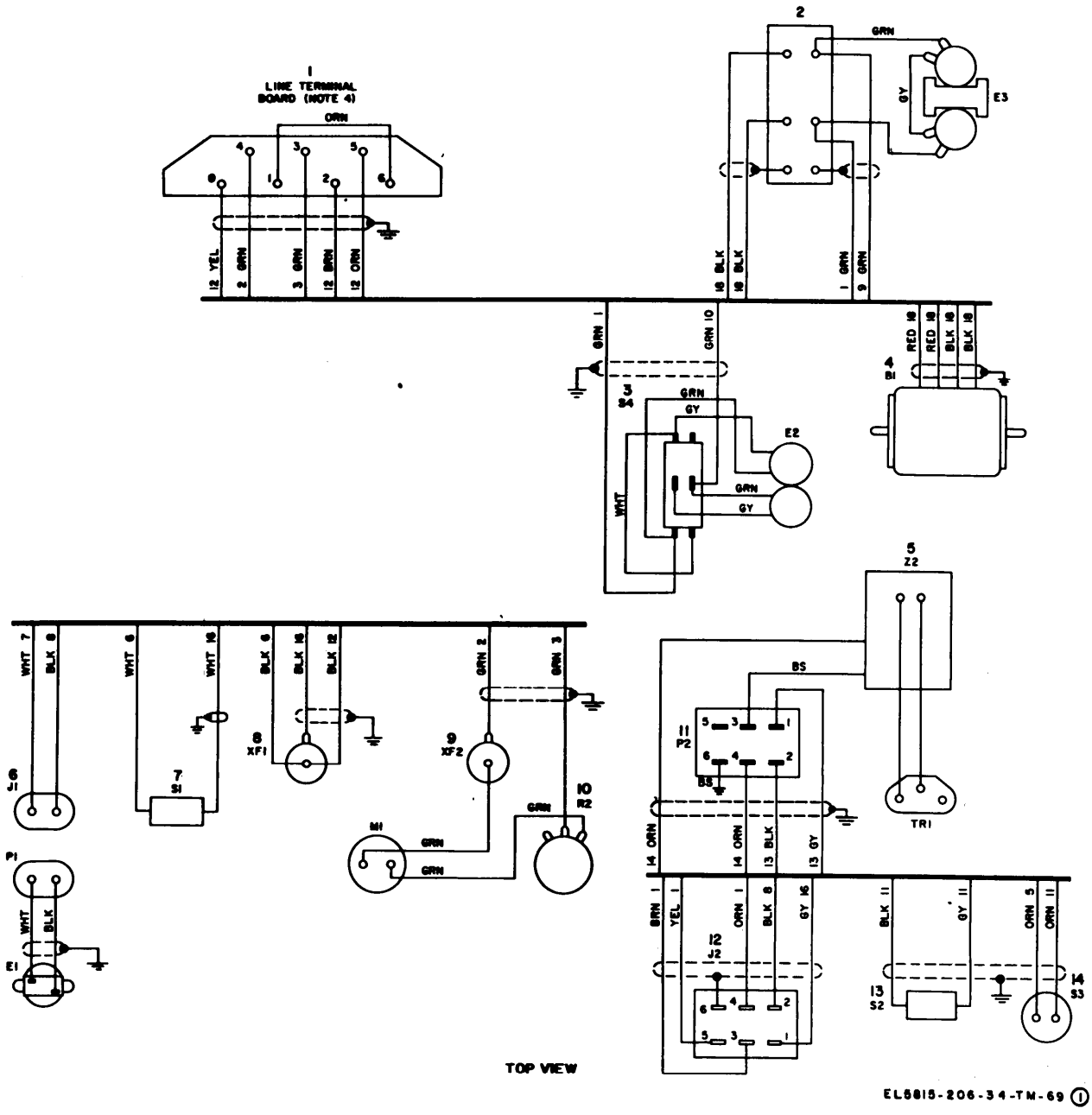
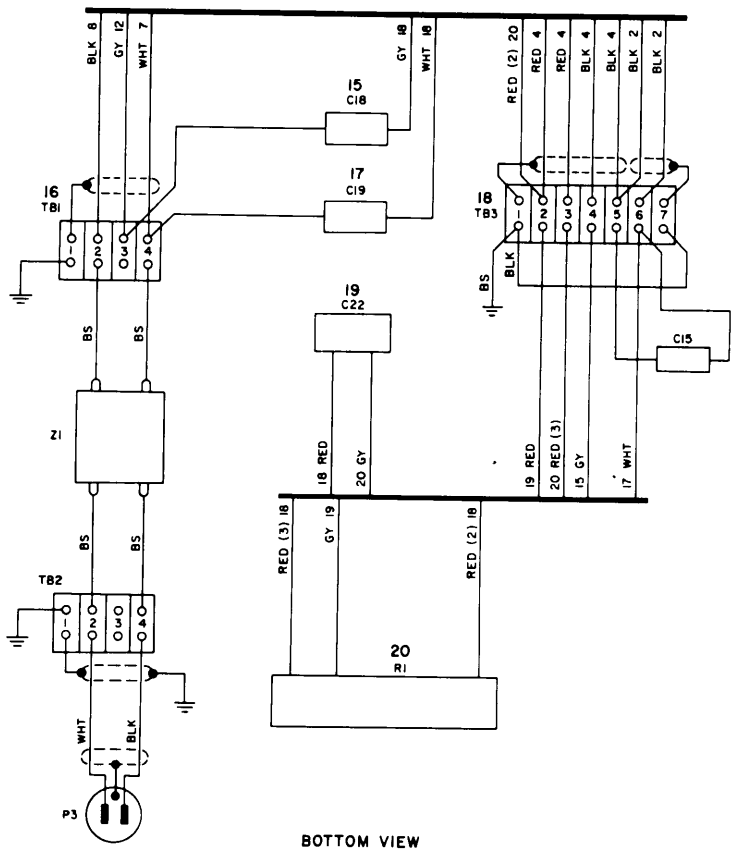


Figure 2-65. ① *Teletypewriter TT-4A/TG, wiring diagram (sheet 1 of 2).*



NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. BS DENOTES BARE TINNED COPPER STRAP.
3. DENOTES SHIELDED CONNECTION.
4. LINE TERMINAL BOARD IS USED FOR THE SIGNAL LINE AND LINE CURRENT CONNECTIONS.

EL5815-206-34-TM-69 ②

Figure 2-65.② Teletypewriter TT-4A/TG, wiring diagram (sheet 2 of 2).

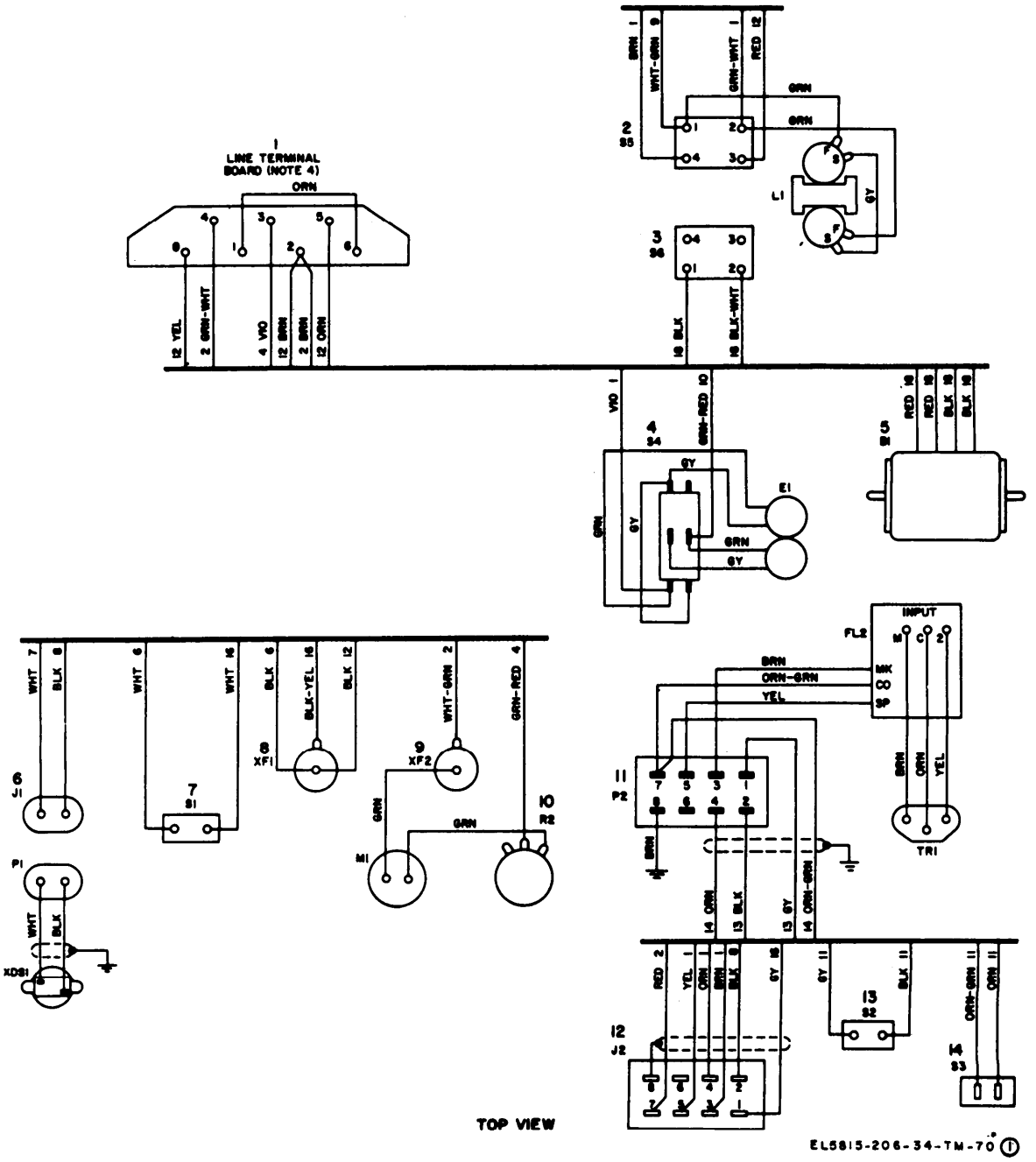


Figure 2-66. ① *Teletypewriter TT-4B/TG and TT-4C/TG, wiring diagram (Sheet 1 of 2).*

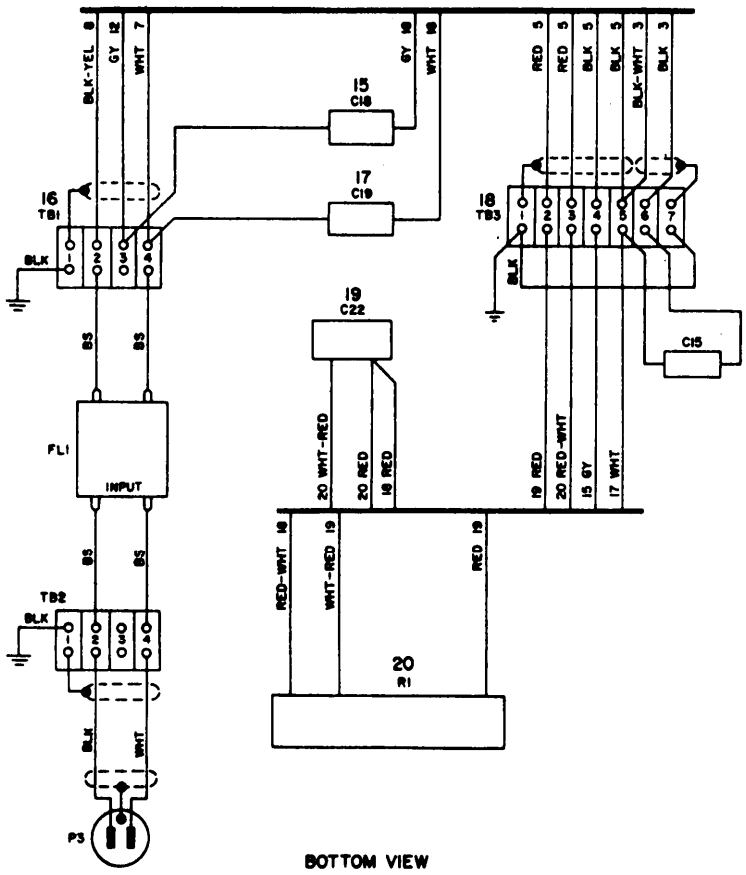


Figure 2-66. ② *Teletypewriter TT-4B/TG and TT-4C/TG, wiring diagram (sheet 2 of 2).*

Reference Designation Chart

Part	Designations			
	TT-4A/TG and TT-698/TG	TT-4B/TG TT-4C/TG TT-698A/TG TT-698B/TG TT-722(*)/TG	TT-335/TG	TT-537/G (with keyboard)
Copy lamp	E1	DS1	DS1	DS1
Motor stop contact assembly *	50969A	Not included	Not included	Not included
Motor stop relay *	E3	L1	L1	L1
Motor stop relay switch (relay coil shorting) *	Not included	S5	S5	S5
Motor stop relay switch (motor circuit) *	Not included	S6	S6	S6
Power input filter	Z1	FL1	Not included	Not included
Selector magnet	E2	E1	E1	E1
Transmitter filter	Z2	FL2	FL2	FL1
Rf suppression capacitor *	C15	C15	C5	C5
Thermal switch	Not included	Not included	S7	S7
Heaters	Not included	Not included	HR1,HR2,HR3	HR1,HR2,HR3

* See footnote at end of table.

Reference Designation Chart-Continued

Part	Designations			
	TT-4A/TG and TT-698/TG	TT-4B/TG TT-4C/TG TT-698A/TG TT-698B/TG TT-722(*)/TG	TT-335/TG	TT-537/G (with keyboard)
Amplifier assembly	Not included	Not included	Not included	Z101
Power supply assembly	Not included	Not included	Not included	Z102
Magnet driver assembly	Not included	Not included	Not included	A103

* Nonapplicable to the TT-698(*)/TG

2-38. Send Circuit

The send circuit *(a* below) is used to transmit intelligence in the form of groups of coded electrical impulses. The send circuit of the TT-4B/TG is shorted *(c* below) when the motor-stop operation occurs (para 2-35).

a. Send Circuit TT-4(*)/TG, TT-335/TG, and TT-537/G (FO-1, FO-2, FO-3, and FO-4) The send circuit can be traced from line terminal 1 through the shorting bar (between line terminals 5 and 6), connectors J2 and P2, BREAK switch S3, transmitter filter Z2 (TT-4A/TG) or FL2 (TT-4B/TG), TT-4C/TG, TT-335/TG, and TT-537/G, contact bail E4, the mark contact of TR1, the transmitter filter, connectors P2 and J2 to line terminal 2. The contact bail is moved mechanically away from the mark contact to open the signal circuit for transmission of a spacing impulse, and is moved against the marking contact for transmission of a marking impulse (para 2–9 and 2-10). BREAK switch S3 is used to open and close the signal circuit manually to start the motors of interconnected teletypewriters after they have been placed in the stopped condition as a result of the motor-stop operation (para 2-35). If power for the signal circuit is supplied locally, the shorting bar between line terminals 5 and 6 is disconnected and 105- to 125-volt dc power is connected to these terminals (positive polarity to terminal 6).

b. Send Circuit TT-698(*)/TG (fig. 2-67). The send circuit is used to transmit polar mark and space impulses to external signal lines which are connected to terminals 1 and 2 of terminal board A1TB1. The send circuit's low-level coded impulses are generated by the transmitter contacts which are mechanically operated (para 2-10b). The low-level impulses pass through noise suppressor Z1 and BREAK switch S3 to the transmitter module. The BREAK switch is used for testing purposes to simulate a space condition by opening the line. Noise suppressor Z1 is a resistor capacitor network which eliminates the effects of contact bounce during the opening and closing of the transmitter contacts.

(1) *Transmitter Module (fig. 2-68).* The transmitter module generates a ±6 volt polar output for transmission to the line. The purpose of the driver U1 is to provide sufficient signal drive to operate output transistors Q1 and Q2. Resistors R5 and R8 and 6.2 volt zener diodes CR4 and CR5 act as a voltage divider across the 30 volt power source. This fixes the voltage at pin B (reference line) at +15

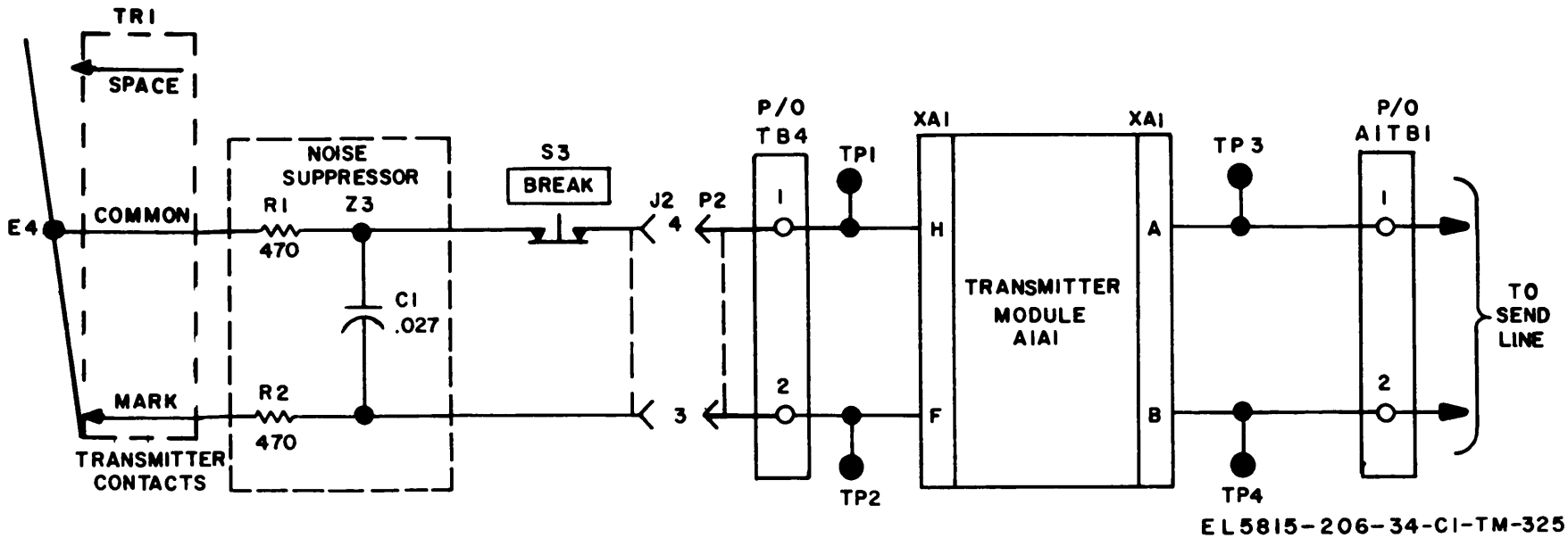


Figure 2–67. Keyboard transmitter send circuits, simplified schematic diagram TT–698(*)/TG.

volts with reference to the negative return line of the 30 volt power supply. The reference line, which is fixed at 15 volts, is the point from which all signal levels are referenced.

(2) The input voltage needed to operate U1 is provided by the voltage dividing network consisting of resistors R1, R2, R3, and diodes CR1, CR2, and CR3. During a SPACE operation, the contacts of the contact assembly are opened and the action of the voltage divider network causes pin 2 of U1 to be .4 volt above pin 3. This condition causes the output of U1 (pin 6) to drop to approximately -12 volts with reference to pin B (TP4). This -12 volt pulse from U1, turns transistor Q2 on. Q2 acts as a switch and effectively connects the 6.2 volt zener diode CR5 across output resistor R9, thereby establishing a 6.2 volt potential across R9. In this condition, the current flow through R9 is from TP3 to TP4, thus putting the signal line 6.2 volts below the signal line.

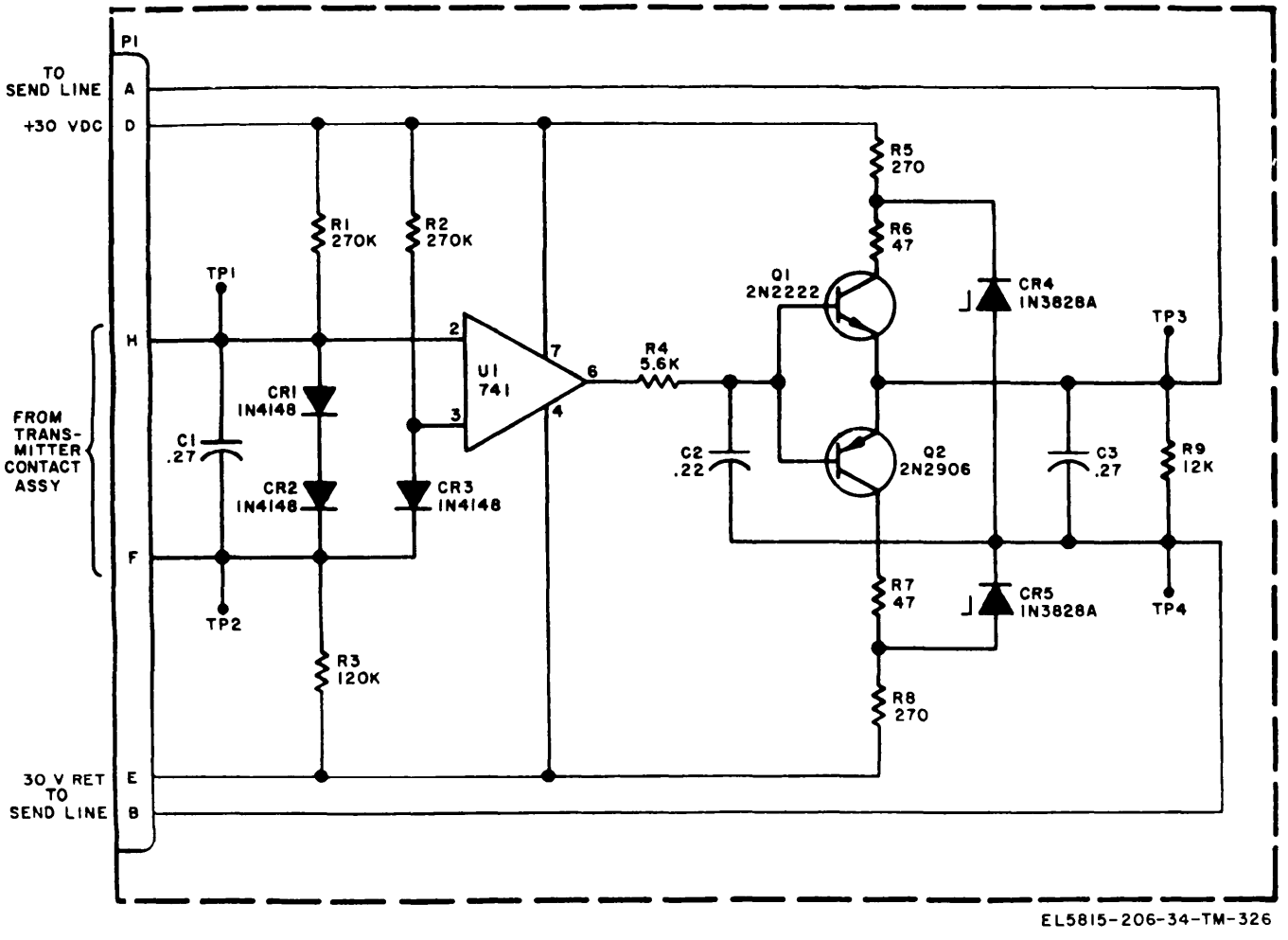


Figure 2-68. Transmitter module, simplified schematic diagram TT-698(*)/TG.

(3) During a MARK operation, the contacts of the contact assembly are closed, shorting out CR1 and CR2 of the voltage divider. This condition changes the input potential to U1 such that pin 3 is now 0.4 volt above pin 2, causing the output of U1 (pin 6) to increase approximately +12 volts with reference to pin B (TP4). This +12 volt pulse from U1 turns transistor Q1 on, which connects the 6.2 volt zener diode CR4 across R9 to establish a 6.2 volt potential across R9. In this condition, the current flow through R9 is from TP4 to TP3, thus putting the signal line 6.2 volts above the reference line. The resultant output at R9, caused by the transmitter contacts closing and opening, is a ±6 volts for a MARK and SPACE respectively.

(4) The output impedance of the transmitter is fixed at approximately 80 ohms. The output of the transmitter assembly may be connected to a patch panel where it can be patched into a receiver or special equipment for processing.

c. The TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G (fig. FO-2) include a motor-stop-relay switch (S5) that places a short circuit across the mark contact and contact bail E4 when the motor-

stop operation occurs (para 2-35). The inclusion of the shorting circuit insures that if the motor should stop when the contact bail is against the *space* contact; the signal circuit (and motor-stop relay) will remain energized and the motor can be started again by operation of the BREAK switch.

2-39. Receive Circuit

The receive circuit is used to permit electrical control of the page printer mechanisms. The receive circuit of highlevel teletypewriters normally is connected in series with the send circuit (shorting bar across line terminals 2 and 3), and a copy of each transmitted message is printed by the page printer of the sending teletypewriter.

a. Receive Circuit During Message Reception (TT-4(*)/TG and TT-335/TG. The receive circuit of the TT-4(*)/TG and TT-335/TG is capable of operating with *neutral* teletypewriter impulses only. The signal current level in the receive circuit may be either 60 ma (LINE switch in DC LINE position) or 20 ma (LINE switch in VOICE FREQ LINE position).

The receive circuit can be traced from line terminal 3 through LINE switch S4 and the coils of the selector magnet. When S4 is in the VOICE FREQ LINE position, the two coils of the selector magnet are in series with each other and in series with the receive circuit. When S4 is in the DC LINE position, the coils are connected in parallel with each other. The circuit continues through LINE INCREASE variable resistor R2, DC MILLIAMPERES meter Ml, LINE fuse F2, switch S5 (TT-4B/TG) or motor-stop-relay contacts, (TT-4A/TG), and is completed at line terminal 4.

b. Receive Circuit TT-698(*)/TG (fig. 2-69). The receive circuit is used to accept polar mark and space impulses from external signal lines connected to terminals 4 and 5 of terminal board A1TB1. The coded impulses are applied to the receiver module, which amplifies the impulses. The amplified impulses are sent to the TD clutch selector magnet driver module which controls the selector magnet, which in turn governs the position of mechanical parts within the selector mechanism.

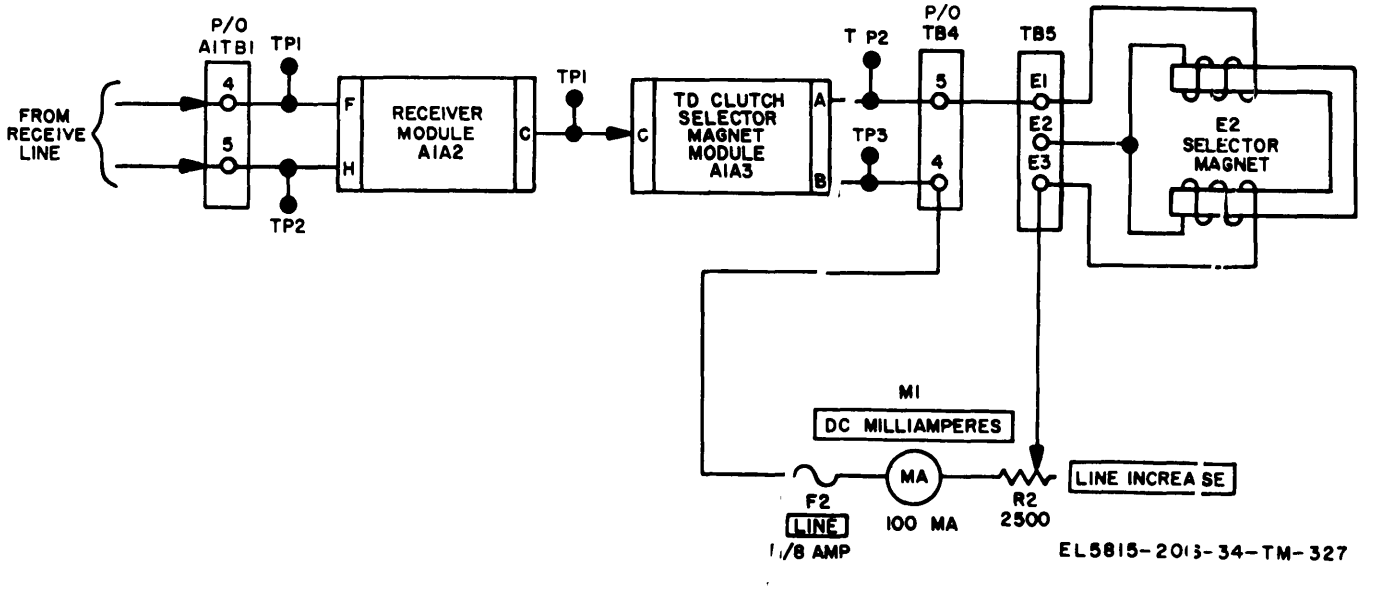


Figure 2-69. Page printer receive circuit, simplified schematic diagram, TT-698(*)/TG.

(1) *Receiver module* (fig. 2-70). The receiver module accepts the ±6 volt MARK/SPACE signals from the receive line. The input impedance of the receiver is approximately 56 K-ohms, which limits the signal line currents to approximately 100 microamperes for low-level operation.

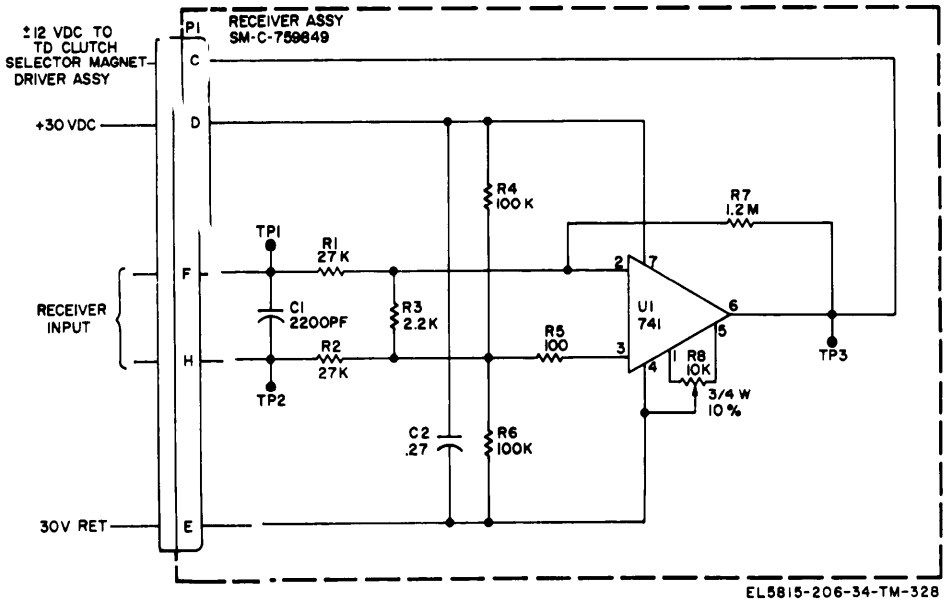


Figure 2-70. Receiver module, simplified schematic diagram, TT-698(*)/TG.

(a) Resistors R4 and R6 act as a voltage divider between the 30-volt power source which fixes pin 3 of driver U1 at +15 volts (reference point) with respect to the negative power supply return line. With no signal input, potentiometer R8 is adjusted to also fix the output of U1 (pin 6) at +15 volts above the return line. This is done to establish the same receiver signal reference point as in the transmitter output line. Resistor R7 is used as a feedback to fix pin 2 of U1 at a +15 volts with no signal input.

(b) Amplifier U1 provides the necessary signal drive to the selector magnet module. In a SPACE condition, the signal line connected to pin 2 of U1 is -6 volts with respect to the reference line connected to pin 3. This causes the output at pin 6 (TP3) to increase to approximately +12 volts with respect to the reference line. A MARK input forces pin 2 to +6 volts with respect to pin 3, which causes the output at pin 6 to drop to approximately -12 volts with respect to the reference line.

(c) The +12 volt SPACE/MARK output of the receiver is used to drive the TD clutch selector magnet module.

(2) TD Clutch/Selector Magnet Driver Module. (fig. 2-71). A -12 volts from the receiver, resulting from a mark input, causes the base of Q1 to drop negative with respect to the Q1 emitter. THIS SWITCHES Q1 on. With Q1 on, a positive voltage appears on the base of Q2, which switches transitor Q2 on. Since Q2 is in series with the selector magnet coil, a path is completed from the return line through Q2 and the selector magnet coil to the +30 volt line. The direction of current flow through the coil causes TP2 to be positive with respect to TP3. The selector magnet windings are arranged in series and the full value of the selector magnet driver current passes through each winding. The LINE INCREASE potentiometer is in series with the selector magnet to allow for optimum adjustment of selector magnet current. A +12 volts from the receiver, resulting from a space input, causes the base of Q1 to rise positive with respect to the Q1 emitter. This switches Q1 off. With Q1 off, a negative voltage appears on the base of Q2, which switches Q2 off. Since Q2 is in series with the selector magnet coil, current does not flow in the selector magnet coil.

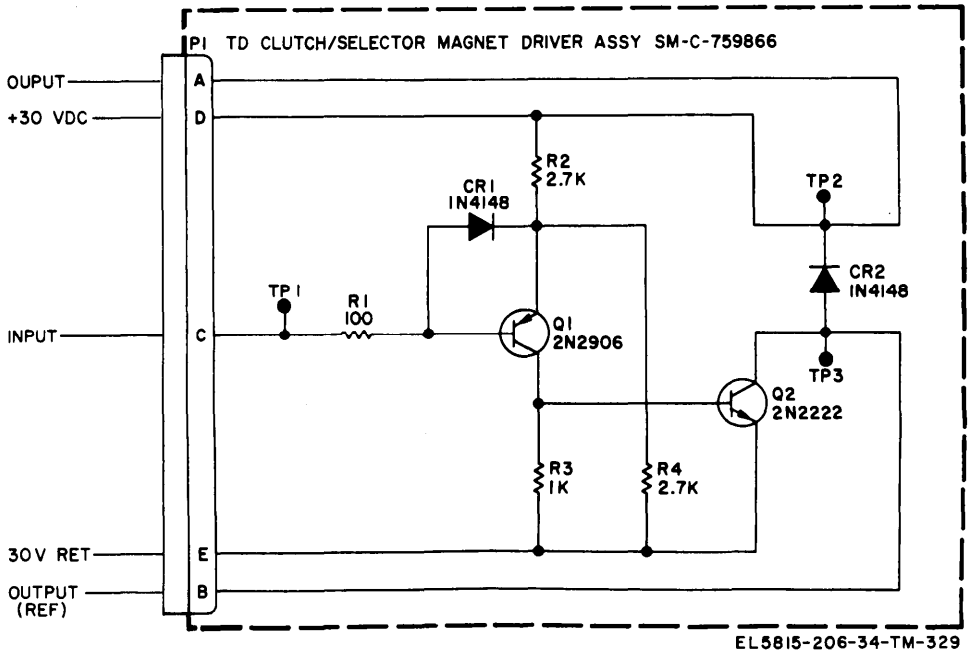


Figure 2-71. TD clutch/selector magnet driver module, simplified schematic diagram.

c. Receive Circuit After Motor Stop Operation TT-4(*)/TG, and TT-337/TG. After the motor-stop operation is completed (para 2-35) the receive circuit is as described in *a* above with the following exceptions:

(1) The circuit through terminals 1 and 2 of switch S5 (TT-4B/TG, TT-4C/TG, and TT-337/TG), or the motor-stop-relay contacts (TT-4A/TG) is open.

(2) The two coils of the motor-stop-relay are connected in series with the receive circuit.

2-40. Receive Circuit (TT-537/G)

a. The receive circuit provides electrical control of the page printer mechanism. The receive circuit of the TT-537/G is designed to operate with the neutral teletypewriter impulses only (para 2-2). The signal voltage may range from a nominal 6 volts to 125 volts dc. The current level, controlled by LINE INCREASE resistor R2, is maintained at 20 ma. LINE switch S4 remains locked in the VOICE FREQ LINE position during all FADAC teletypewriter operation.

b. The signal circuit is applied to the teletypewriter either through terminals 3 and 4 of the line terminal board or through the signal line cable which terminates with P4 and P5. When the cable is used, P5 is inserted into telephone type jack J5. This jack is parallel-connected with line terminal board terminals 3 and 4.

c. The receive circuit is traced from terminal 3 of the line terminal board, through 1/8-ampere line fuse F2, milliammeter M1, which indicates the current level, and line increase potentiometer R2, which adjusts the line current level, to terminal 4 of magnet driver Z103, out of terminal 5 of magnet driver Z103 to terminal 4 of the line terminal board.

2-41. Amplified Signal Circuits

a. Power supply Z102 is energized by the ac input circuit (para 2-44) and supplies dc power to amplifier Z101. Amplifier Z101 supplies the required voltage level to magnet driver Z103. Magnet driver Z103, under control of the input signals of the receive circuit, provides amplified signal output from terminal 2.

b. The amplified signal circuit is traced from terminal 2 of magnet driver Z103, through the windings of motor stop relay L1 connected in series, through resistor R3, through the windings of selector magnet E1 connected in parallel, and to power supply Z102 to complete the circuit.

2-42. Motor and Copy Light Circuits (TT-4(*) /TG and TT-698(*)/TG)

The motor and copy light circuits require 105- to 125-volts either dc or ac (50- to 60-Hz). Power for both circuits is supplied through plug P3.

a. Motor Circuit. The motor circuit can be traced from a blade of plug P3 through power input filter Z1 (TT-4A/TG and TT-698/TG) or FL1 (TT-4B/TG, TT-4C/TG, TT-698B/TG, and TT-698C/TG), motor

fuse F1, MOTOR switch, S2, feedthrough capacitor C18, one of the field windings of the motor, to one of the governor brushes. When the governor contacts are closed during operation of the governor (para 2-6) the circuit continues through the governor contacts and the other governor brush to one of the armature brushes. When the governor contacts open, the circuit continues through resistor R1 to the armature brush. The circuit continues through the armature, the other armature brush, the other field winding of the motor, through either switch S6 (TT-4B/TG) and TT-4C/TG) or a pair of contacts of the TT-4A/TG motor-stop relay, and is completed through feed-through capacitor C18 and the power input filter to the other blade of plug P3. The motor stop feature is not present on the TT-698(*)/TG.

(1) When the motor-stop operation occurs (para 2-35), switch S6 of the TT-4B/TG and TT-4C/TG, or the contacts of the TT-4A/TG motor-stop relay open to stop the motor. Operation of the BREAK key on the teletypewriter keyboard causes the motor circuit to be completed through S6, or the motor-stop relay contacts, and the motor starts.

(2) The motor-stop feature is not included in TT-698(*)/TG Teletypewriters.

b. Copy Light Circuit. The copy light circuit is traced from one blade of plug P3, through the power input filter, MOTOR fuse F1, copy light, LIGHT switch S1, through the power input filter to the other blade of plug P3.

2-43. Motor, Copy Light and Heater Circuits, TT-335/TG

The motor, copy light, and heater circuits require 108 to 132 volts ac (400 Hz single phase).

a. Motor Circuit. The motor circuit can be traced from the top blade of plug P3 through MOTOR fuse F1 and MOTOR switch S2 to one side of motor B1. The phase of the currents through alternate coils of the motor field is shifted by capacitor C6. From the other side of the motor, the circuit continues through switch S6 to the bottom blades of plug P3.

(1) When the motor-stop operation occurs (para 2-35) switch S6 opens to stop the motor. Operation of the BREAK switch on the teletypewriter keyboard causes S6 to complete the circuit and start the motor.

(2) Capacitor C5 suppresses radiofrequency interference.

b. Copy Light. The copy light circuit is traced from the top blade of plug P3, through the MOTOR fuse F1, copy lamp DS1, LIGHT switch S1 to the bottom blade of plug P3.

c. *Heaters.*

(1) General. The heater circuit is traced from the top blade of plug P3 to thermal switch S7. When the thermal switch closes (at 32° F. ±5°), the circuit continues through the HEATER fuse F3 to LIGHT-HEATER switch S1. When the operator moves the switch to LIGHT HEATER, the circuit is completed to the bottom blade of plug P3.

(2) *Thermal switch operation.* Thermal switch S7 closes when the surrounding temperature drops to 35°F. ±5° and reopens at 50° F. ±5°.

2-44. Ac Input Circuits, TT-537/G

The ac input circuits require 105- to 125-volt, 400HZ, single-phase alternating current to supply power for the motor, copy light, heaters, and power supply.

a. Motor Circuit. The motor circuit is traced from pin A of plug P3, through motor fuse F1, through MOTOR switch S2, to one side of motor B1. The phase of the current through alternate coils of the motor field is shifted by capacitor C6. From the other side of the motor, the circuit continues through switch S6 to pin D on plug P3.

b. Copy Light. The copy light circuit is traced from pin A of plug P3, through motor fuse F1, copy light DS1, and LIGHT-HEATER switch S1, to pin D of plug P3.

c. Heaters.

(1) General. The heater circuit is traced from pin B of plug P3 to thermal switch S7. When the thermal switch closes (at 35° F ±5°), the circuit continues through HEATER fuse F3 to LIGHT-HEATER switch S1. When the operator moves the switch to LIGHT-HEATER, the circuit is completed through heaters HR1, HR2, and HR3 to pin D of plug P3 .

(2) *Thermal switch operation.* Thermal switch S7 closes when the surrounding temperature drops to 35° F ±5° and reopens at 50° F ±5°.

d. Power Supply. The power supply is energized only when the motor switch S2 is on. The circuit is traced from pin A of plug P3, through motor fuse F1, through MOTOR switch S2, through power supply Z102, to pin D of plug P3.

2-45. Power Supply Circuit, 30 vdc (TT-698(*)/TG

(fig. 2-72)

The power supply assembly supplies 30 V dc to the electronic circuits of the transmitter, receiver, and TD clutch/selector magnet driver modules. When motor/power switch S2, is placed in the ON position, 115 V ac is applied to the original circuits and to the primary of a step-down transformer. Voltage on the secondary winding of T1 is stepped down to approximately 35 V ac, rectified by rectifier bridge, CR1, and filtered by capacitors, C1 and C2. The voltage output from the power supply is 34 V dc, which is regulated at 30 V dc by resistor, R1, and zener diode, VR1. This 30 V dc level is applied to the modules which are protected by fuse F1.

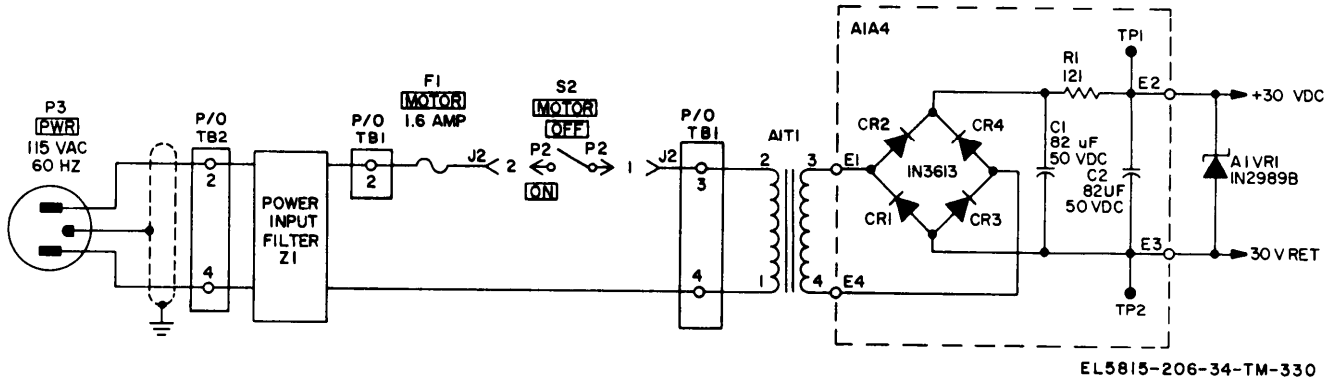


Figure 2-72. Power supply, 20 Vdc, schematic diagram TT-698(*)/TG.

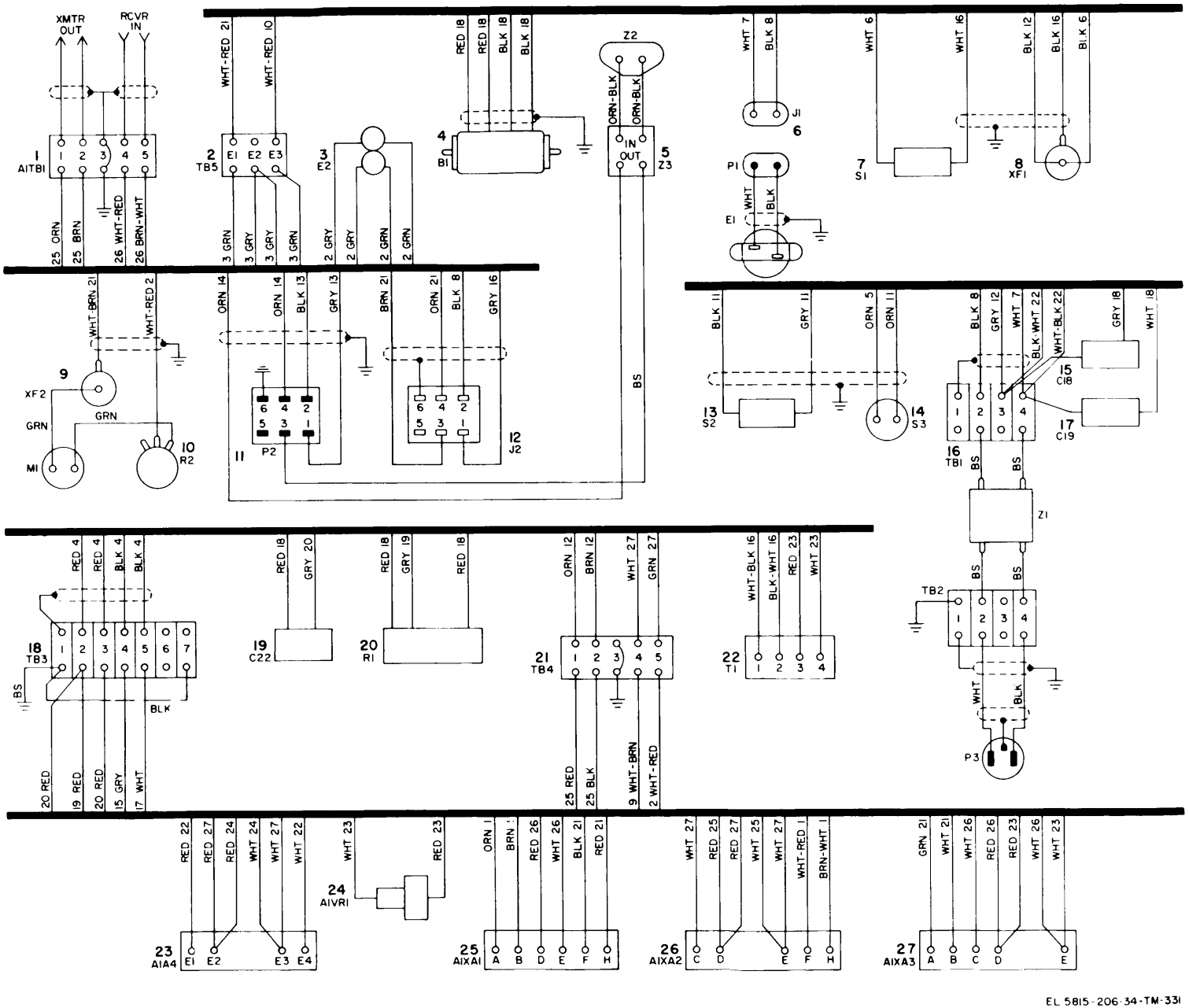


Figure 2-73. Teletypewriter, TT-698/TG, wiring diagram.

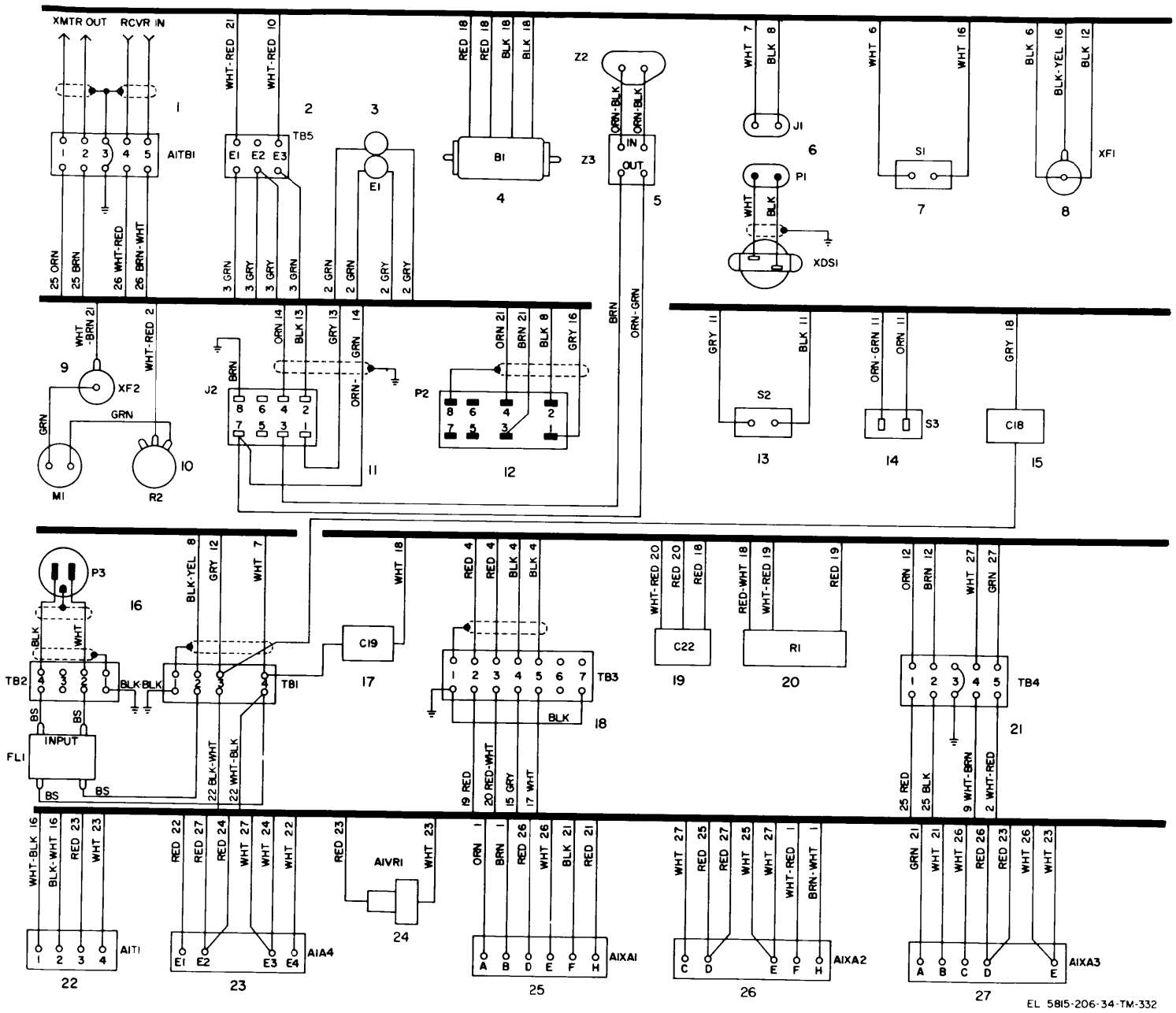


Figure 2-74. Teletypewriter, TT-698A/TG and TT-698B/TG, wiring diagram.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

3-1. Scope of Direct Support Maintenance Procedures

a. Direct support maintenance includes all preventive and corrective maintenance operations and testing procedures assigned to direct support maintenance personnel. The maintenance procedures described in the organizational maintenance manual, TM 11-5815-206-12, are also part of direct support maintenance.

b. Direct support maintenance of the set includes:

(1) Preventive maintenance (para 3-4 through 3-8).

(2) Cleaning instructions (para 3-9 and 3-10).

(3) Lubrication (para 3-11 through 3-15).

(4) Troubleshooting (para 3-16 through 3-20).

(5) Removal and replacement (para 3-21 through 3-32) .

(6) Disassembly and reassembly (para 3-33 through 3-113).

(7) Adjustments (para 3-116 through 3-272).

3-2. Maintenance Tools, Equipment, and Materials

a. Tools.

(1) Tool Equipment TE-50-B.

(2) Tool Equipment TE-111.

b. Test Equipment.

The following chart lists the test equipment required for direct support maintenance of the teletypewriter equipment.

Test equipment	Technical manual	Use
Multimeter TS-352B/U	TM 11-6625-366-15	Used to test the circuits of the teletypewriters.
Ohmmeter ZM-21A/U	TM 11-2050	Used to test breakdown voltage of insulation.
Test Set, Teletypewriter TS-2(*)/TG	TM 11-2208	Used to check bias and end distortion tolerance of receiving mechanisms. (Use on high-level equipment only.)
Test Set, Teletypewriter AN/UGM-1	TM 11-6625-620-12	Used in lieu of Test Set TS-2(*)/TG on high-level equipment only.
Test Set, Telegraph AN/GGM-15(V)	TM 11-6625-1668-12	Used to check bias and end distortion Tolerance of receiving mechanisms, and quality of signals originated by the transmitted mechanisms. (Used on both high or low-level equipments.)

CAUTION

Use Test Set, Telegraph AN/GGM-15(V) on high-level, or low-level equipments. Use of the Test Sets TS-2(*)/TG, or AN/UGM-1 in testing of low-level equipment will cause damage to the electronic components.

c. Maintenance Materials. The required direct support maintenance materials are listed in the following chart:

Item	Stock No.
Orangestick*	5120-00-409-4036
Brush, toothbrush style*	7510-00-550-8446
Cheesecloth, bleached* 36 inches wide	8305-00-267-3015
Cloth, abrasive, #9*9- x 11-inch sheets	5350-00-161-9066
Paper, cleaning, bell seal* bond, ¼- x 2½-inch	7530-00-408-0256
Sandpaper, flint, #000*9- x 10-inch	5350-00-235-0124
Trichlorethane	6810-00-292-9625 (qt)
Compound, antiseize	8030-00-292-1102
Brush, oval, No. 2*	8020-00-244-0153
Tape TL-636/U*	5970-00-296-1175
Tape TL-83*	5970-00-184-2003
Grease	9150-00-223-4003
Oil, lubricating	9150-00-223.4129

* Part of Tool Equipment TE-50-B.

3-3. Maintenance Parts

a. Teletypewriters TT-4A/TG, TT-4B/TG, TT-4C/TG, TT-698/TG, TT-698A/TG, TT-698B/TG. Refer to TM 11-5815-206-20P and TM 1-5815-206-35P/1 for information on those repair parts authorized for maintenance of the TT-4A/TG, TT-4B/TG, TT-4C/TG, TT-698/TG, TT-698A/TG, TT-698B/TG, TT-722/TG and TT-722A/TG.
TT-722/TG and TT-722A/TG.

b. Teletypewriter TT-335/TG. Refer to TM 11-5815-206-20P and TM 11-5815-206-35P/2 for information on those repair parts authorized for maintenance of the TT-335/TG.

c. Teletypewriter TT-537/TG. Refer to TM 11-5815-206-20P, TM 11-5815-206-35P/2 and the lists in (1) and (2) below for information on repair parts authorized for maintenance of the TT-537/G.

(1) *Interim Repair Parts Kit.* The following kit of parts is required for interim maintenance of the TT-537/G until the parts are individually available for requisitioning and issue through normal supply channels:

Elec ref desig.	Item name	Item location	Proc ref		Qty in use	Recommended procurement quantity (per equip)	Illustration	
			Mfr code	Part No.			Fig. No.	Item No.
P3	CONNECTOR, PLUG	P/O CABLE ASSY (AD)	82423	24654	1	1	3-77	
Z102	POWER SUPPLY	P/O JUNCTION BOX ASSY	82423	51778A	1	1	3-77	
Z101	AMPLIFIER ASSY SELECTOR MAGNET	PART OF JUNCTION BOX ASSY	82423	51467A	1	1	3-77	
Z103	DRIVER	PART OF JUNCTION BOX ASSY	82423	51493A	1	1	3-77	
P4, P5	CABLE ASSY	SIGNAL CABLE WITH CONNECTIONS	82423	51908A	1	7	3-78	
R3	RESISTOR, FIXED, WIRE WOUND	LOCATED ON FRONT PANEL (800 ohm, 5W)	82423	23492	1	2	3-22	

(2) *Parts Currently Available in Supply System.* The following parts, together with those parts listed in TM 11-5815-206-20P and TM 11-5815-206-35P/2 are required for maintenance of the TT-537/G and are currently available for issue through normal supply channels.

Source code			National stock No.	Description	Proc ref		Qty in use	Recommended site quantity	Illustration	
S	M	R			Mfr code	Part No.			Fig. No.	Item No.
P1	F		5305-00-531-9034	SCREW, CAP, SOCKET HEAD	82423	10003	1	2	3-45	
P1	F		5305-00-545-8374	SCREW, CAP, SOCKET HEAD	82423	10032	4	2	3-74	
P1	F		5305-00-546-6876	SCREW, CAP, SOCKET HEAD	82423	10052	3	2		
P1	F		5305-00-333-4262	SETSCREW	82423	10203	5	2	3-45	
P1	F		5310-00-809-8544	WASHER, FLAT	82423	10450	2	2	3-45	
P1	F		5310-	WASHER, FLAT	82423	10459	3	22	3-56	
P1	F		5340-00-282-0813	RING, RETAINING	82423	10949	2	2	3-45	
P1	F		5340-00-256-2867	RING, RETAINING	82423	10960	2	2	3-45	
P1	F		5935-00-665-8035	CONNECTOR, RECEPTACLE	82423	20413 (P2)	1	1	3-77	
P1	F		5935-00-234-1597	JACK, TELEPHONE	82423	24437J5	1	4	3-78	
P1	F		5815-00-598-4983	SPRING, HELICAL, EXTEN	80063	SC-B-69326-8	1	2	3-45	
P1	F		5815-00-392-9541	CONNECTOR	82423	51783	1	2	3-45	
	F		5815-00-392-7884	SHIFT LEVER	82423	52945A	1	1	3-45	
P1	F		5815-00-392-7886	DELAYING LEVER	82423	52960A	1	1	3-45	
P1	F		5815-00-392-7887	LATCH	82423	52963	1	1	3-45	
P1	F		5310-00-558-3153	SPACER	82423	52988	1	1	3-45	
P1	F		5815-00-591-0870	COLLAR	82423	55736	1	1	3-45	
P1	F		5340-00-608-5824	STOP	82423	55740A	1	1	3-45	
P1	F		5815-00-570-3492	BLADE	82423	56613A	1	1	3-45	
P1	F		5815-00-600-2948	SHIFT LINK	82423	56622A	1	1	3-45	
P1	F		5815-00-594-4064	LINE FEED SEL. BAR	82423	57928	1	1	3-56	
P1	F		5815-00-594-4100	SHIFT LINK BRKT	82423	57997A	1	1	3-45	
P1	F		5815-00-957-7685	SPRING, HELICAL, COMP	82423	59620	1	2	3-45	
P1	F		5330-00-841-7414	FELT, WASHER	82423	61483	2	5	3-45	
P1	F		5815-00-863-5380	CARR. RET. SEL. BAR	82423	62142	1	1	3-56	

Section II. MAINTENANCE

3-4. Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all maintenance categories concerned with the equipment, and includes the inspection, testing and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. The direct support preventive maintenance checks and services described in this chapter should be performed *monthly* and *quarterly* unless otherwise directed by appropriate authority. These preventive maintenance checks and services should be performed in addition to the organizational preventive maintenance described in TM 11-5815-206-12.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-570. Paragraph 1-3 of TM 11-5815-206-12 contains additional information concerning maintenance records.

3-5. Monthly Maintenance

Perform the maintenance procedure indicated in the monthly preventive maintenance checks and services chart (para 3-6) once each month. A month is defined as approximately 30 calendar days of 8-hour-a-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance intervals should be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance. Equipment in limited storage (requires service before operation) does not require monthly preventive maintenance.

3-6. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Interior surfaces	Open the dust cover and inspect the interior of the dust cover base assembly, and the printer assembly for general condition. Remove dirt, dust, grease, moisture, and fungus from accessible areas and components.	Para 3-9 and 3-19
2	Motor	The motor should turn freely and quietly when turned by hand or when under power. Check for evidence of overheating. This may be indicated by discoloration or by an odor of burned insulation material.	Para 3-10*d*
3	Wiring, cabling, and electrical parts	Check all visible wiring and electrical parts for cracked or deteriorated insulation, frayed or cut insulation at connecting points, kinks, and strain caused by improper placement. Tighten loose fasteners, clamps, and wiring connections. Repair loose or broken connections. Remove corrosion, rust, dirt, and dust from ground connections. Be sure that the outer insulating cover on electrical parts, cords, and cable is wiped clean. Do not use mineral oil, solvent, or soap compounds on rubber insulation.	Para 3-9
4	Terminal boards	Adjust the wiring so that it does not interfere with the operation of mechanical parts. Resolder defective connections, and replace defective wiring, electrical parts, and conductors. Terminal boards used as receiving, connecting, and distributing points for electrical circuits usually are made of a strip of insulating material and one or more types of electrical connectors. These devices may be solder- or screw-type terminals, contact springs, or contact lugs. They normally require little preventive maintenance unless wiring is changed. Inspect the terminal board for cracks, breaks, and loose connections or mounting screws. Examine the connections for mechanical defects (broken or stripped screws and threads), dirt, grease, and corrosion. Tighten loose screws, lugs, and mounting bolts. Be extremely careful	Para 3-9

Sequence No.	Item to be inspected	Procedure	References
		not to strip the threads by exerting too much force. Use tools of the correct size. Solder loose or broken connections.	
5	Mode panel switches	Inspect the mechanical action of each switch. Look for dirt or corrosion. Operate each switch to see that it moves freely and snaps into position. Tighten loose mounting parts. Remove loose connections that are dirty or corroded; clean and reinstall them correctly. Tighten switch connections and repair soldered connections.	Para 3-9*b*
6	Lubrication	Lubricate the equipment.	Para 3-11 through 3-15
7	Ground connections	Check the chassis grounds of the teletypewriter.	
8	Operation	Operate the teletypewriter set in accordance with the daily and weekly preventive maintenance checks and services chart.	TM 11-5815-206-12, para 4-5 and para 4-6

3-7. Quarterly Maintenance

Quarterly maintenance checks and services on the teletypewriter set are required. Periodic daily and monthly checks and services constitute a part of the quarterly preventive maintenance checks and services and must be performed concurrently. All deficiencies or shortcomings will be recorded in accordance with requirements of TM 38-750. Perform all the checks and services listed in the quarterly preventive maintenance checks and services chart (para 3-8) in the sequence listed.

3-8. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Preservation	Check all surfaces for evidence of fungus. Remove rust and corrosion and spot-paint bare spots.	Para 3-9*a*
2	Publications	Check to see that all publications are complete, serviceable, and current.	DA Pam 310-4
3	Modifications	Check DA Pam 3-107 to determine if new applicable MWO's have been published. ALL URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	DA Pam 310-7
4	Spare parts	Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages should be on valid requisitions.	TM 11-5815-206-12

3-9. General Cleaning Instructions

When cleaning the teletypewriter set, the following general instructions should be helpful. Refer to TM 11-5815-206-12 for additional general cleaning instructions.

a. Use No. 0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning purposes.

(1) When necessary use a cloth moistened with trichloroethane to clean metallic parts (except electrical contacts). Wipe the trichloroethane and dirt from the part with a clean, dry cloth.

(2) A flushing action normally is best when cleaning electrical contacts. Dip an orange stick in trichloroethane and allow the liquid to drip from the stick through the contacts. Remove the trichloroethane carefully with a clean, dry cloth.

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT USE NEAR AN OPEN FLAME. Trichloroethane is not flammable, but exposure of the fumes to an open flame or hot metal surface forms highly toxic phosgene gas.

c. Vacuum cleaning equipment is suitable for removing loose paper lint and dirt. Compressed dry air may be used provided the pressure is kept low enough to prevent damage to the equipment.

3-10. Special Cleaning Instructions

a. Parko-Lubrized and Parkerized Parts. Do not keep parko-lubrized and parkerized parts (those with a black finish) in cleaning compound for any ex-

tended period, because the protective impregnated oils and waxes will be removed. Clean all parko-lubrized and parkerized parts with an oil-soaked cloth.

b. Oil-Impregnated Bronze Parts. Do not immerse oil-impregnated bronze (oilite) bearings and other oil-impregnated parts in trichloroethane because the oils will dissolve. To clean, use a stiff brush or wipe with an oil-soaked cloth.

c. Ball Bearings. The ball bearings used on the teletypewriter are sealed. Do not attempt to lubricate or clean them; wipe them with a clean, dry cloth. Replace any bearings that do not spin freely.

d. Motor. To clean the external surfaces of the motor, use a clean, dry sash brush to remove dust and dirt. Remove all oil and gummy deposits with a clean, lint-free cloth dampened with trichloroethane.

e. Selector-Magnet Coils. Clean the coils of the selector magnet with a clean cloth dampened with trichloroethane. Clean rust from the pole pieces with #000 sandpaper, and then recoat them with a thin film of lacquer.

f. Felt Friction Plates. Replace dirty or gritty felt friction plates. Do not attempt to clean them. When overhauling the teletypewriter, replace all felt friction plates with new ones.

g. Base. Clean the base thoroughly. Wipe away all deposits of oil or grease which may have dropped from the mechanical assemblies. Brush away all loose dirt and paper lint from the hard-to-get-at places such as connecting jacks and terminal boards. If grimy deposits are difficult to remove with a dry cloth, moisten the cloth with trichloroethane.

Section III. LUBRICATION

3-11. Recommended Lubricants

Use the following lubricants to lubricate the operating mechanical parts:

a. Oil general lubricating, National stock No. 9150-00-223-4129 (1 qt can).

b. Presaturated, split-type, friction clutch felts are recommended for use except where the oil from these felts can transfer to nearby metal bearing surfaces; for example, on the keyboard transmitter clutch and the selector clutch. Use Oil, general lubricating, National stock No. 9150-00-223-4129 on the felts adjacent to these parts.

c. Grease, gear and cam lubricant, 1 lb. container, National stock No. 9150-00-223-4003.

3-12. Methods of Applying Lubricants

a. Applying Grease, NSN 9150-00-223-4003. Use the grease gun supplied in the TE-50-B to lubricate gears. Hold the nozzle of the grease gun against the gear teeth at a 45° angle. Operate the handle and turn the gear slowly until the amount of grease specified in the lubrication charts below is applied.

b. Oiling Teletypewriter Mechanisms. To apply only 1 or 2 drops of oil, use the penshaped lubricator supplied in the TE-50-B or dip a piece of #22 wire into the oil 1/2 inch and immediately touch it to the desired lubrication point. This method prevents over-lubrication. When more than 1 or 2 drops are required, use the hand oiler which is also supplied in the TE-50-B.

CAUTION

After lubrication, always wipe away all excess lubricant. The presence of excess lubricant is a common cause of damage to rubber parts, wire insulation and other nonmetallic parts.

3-13. Recommended Lubrication Schedule

a. The recommended lubrication intervals for each of the four operating speeds are indicated in the following chart. Check each lubrication point carefully; lubricate only when necessary.

Operating speed (wpm)	Operating time (hours per day)	Lubrication interval (days)
60	8 or less	30
	8 to 12	20
	12 to 16	15
	16 to 24	10
66	8 or less	27
	8 to 12	18
	12 to 16	13
	16 to 24	9
75	8 or less	24
	8 to 12	16
	12 to 16	12
	16 to 24	8
100	8 or less	18
	8 to 12	12
	12 to 16	9
	16 to 24	6

b. The above intervals between lubrication checks apply to teletypewriters in which felt washers are used only as part of friction clutch assemblies. Teletypewriters that include lubricating felts at additional lubrication points require less frequent lubrication at *those particular lubrication points.* Lubricate the felts only when necessary; *avoid oversaturation.*

3-14. Preparation for Lubrication

To prepare the teletypewriter for lubrication, remove it from service and partially disassemble it *(a* below).

a. Disassembly for Lubrication.

(1) Disconnect the power and signal line cables.

(2) Remove the dust cover (para 3-22).

(3) Remove the roll of paper and the paper shaft (para 3-23).

(4) Remove one paper-shaft mounting bracket and the paper chute (para 3-23).

(5) Remove the spare worm gear bracket, gear cover, and gasket (para 3-26a).

(6) Remove the keyboard-transmitter (para. 3-27).

(7) Remove the transmitter contact cover.

(8) Remove the motor-governor cover (para. 3-42a (7) and (8)).

b. Old Lubricants. Remove all old grease and oil with a clean, dry, lint-free cloth. Wrap the cloth around the end of a screw driver or the orange stick to remove the old lubricants from hard-to-reach places.

3-15. Detailed Lubrication Instructions

The points to be lubricated, the type of lubricant to be used, and the quantity to be applied are listed in *a* through *e* below.

NOTE

All ball bearings in the teletypewriter are sealed and require no lubrication.

a. Gears and Racks. Wipe the old grease from the gears and racks with a clean, dry, lint-free cloth. Apply fresh grease or oil, as stated.

Fig. No.	Name of part	Method and quantity
3-1	Carriage-return driving and driven gears	Apply grease sparingly around gear teeth.
3-1	Rangefinder gear train	
3-1	Square-shaft sliding gear	
3-2	Motor worm and main-shaft driving gear (inside motor-gear housing)	Work grease around worm and gear, and cover gear teeth liberally.
3-3	Carriage-rack driving gear	Apply grease sparingly around teeth.
3-3	Function-shaft driving gear	
3-3	Square-shaft driving gear	
3-3	Function-shaft driving gear	
3-3	Carriage-feed worm	
3-3	Carriage-return-shaft drive gears	
3-3	Transmitter-shaft driving gear	
3-4	Carriage rack retainer	Apply grease to top of carriage rack and bottom of retainer.
3-4	Draw-bar actuating cam	Apply grease sparingly to cam surface.
3-4	Restoring rollers	Apply grease sparingly to outer surfaces of rollers.
3-6	Ribbon drive gear	Apply grease sparingly around teeth.
3-6	Guide rail	Apply grease sparingly to rail-teeth.
3-7	Carriage rack	Apply grease sparingly to rack teeth.
3-11(A)	Stop bar shift lever*	One drop of oil at pivot.
3-11(A)	Stop bar shift link*	Thin film of grease.
3-11(B)	Delaying lever*	One drop of oil at pivot.
3-11(B)	Stop bar shift link*	Apply grease sparingly to latching surface.
3-11(B)	Delaying latch*	One drop of oil at pivot; apply grease sparingly to latching surface.

b. Friction Clutches. Apply oil as indicated in the following chart. *Do not* release the compression of the friction clutch spring during routine lubrication. If spring compression has been released as a result of another maintenance procedure (replacement of clutch part, etc), proceed as follows:

(1) Oil the felt friction plates of the clutch.

(2) Adjust the clutch for the required spring compression (para 3-125, 3-126, 3-158, 3-159, 3-204, 3-205, 3-210).

(3) Operate the teletypewriter for approximately ten minutes.

(4) Recheck, and, if necessary, readjust the spring compression to obtain the proper clutch torque.

Fig. No.	Name of part	Method and quantity
3-1	Carriage-feed friction clutch	
3-1	Keyboard-transmitter friction	10 to 15 drops around periphery of each felt friction plate; apply oil sparingly to clutch spring and drive collar.
3-3	Selector-camshaft clutch	
3-3	Function-shaft friction clutch	
3-1	Carriage-return friction clutch	Several drops around periphery of each felt friction plate.

c. *Oil Holes.* Apply oil at the following places:

Fig. No	Name of part	Method and quantity
3-3	Function-shaft clutch drum*	At least 5 drops in hole on either side of drum,*
3-3	Code-ring cage	At least 5 drops in hole on top of center bearing sleeve (underneath stop bars).
3-3	Carriage-feed driven gear	At least 5 drops in hole in gear hub.*
3-7	Type-selecting-arm bearing cap	At least 5 drops in hole cap. *

* On teletypewriters with felt lubricating washers, lubricate the washers to the point of saturation only,

d. Sleeve Bearings. Apply oil at the following bearings:

Fig. No.	Name of part	Method and quantity
3-1	Square-shaft bearings	Several drops at one end of each bearing.*
3-1	Platen-casting eccentric pivots	Several drops between each pivot and bearing. *
3-1	Carriage-rack drive shaft bearing	Several drops at both ends of bearing.*
3-2	Function-selecting-arm claw bearing	Several drops at both ends of bearing.*
3-2	Printing-bail shaft bearings	Several drops at one end of each bearing. *
3-3	Transfer-lever shaft bearings	Several drops at one end of each bearing.*
3-6	Platen bearings and shaft	Several drops at one end of each bearing and thin film on shaft. *
3-9	Cam-stop-lever post	Several drops at either end.*

* On teletypewriters with felt lubricating washers, lubricate the washers to the point of saturation only.

e. Moving Parts. Apply oil at the following places:

Fig. No.	Name of part	Method and quantity
3-1	Square shaft	Thin film all sides, lubricate entire length of shaft.
3-1	Carriage-return operating mechanism	2 drops at each pivot point.
3-1	Manual carriage-return mechanism	Apply sparingly to all pivots and rubbing surfaces.
3-1	Carriage-return-clutch drum	Apply sparingly to teeth and grooves, 2 or 3 drops in each group of spline balls inside clutch.
3-1	Decelerating cam and roller	Thin film on working surfaces.
3-1	Carriage-return latch	2 drops on pivot; thin film on working surfaces. [a]
3-1	Carriage-feed-clutch lever	2 drops at pivot; thin film at each end. [a]
3-1	Margin-bell clapper and pawl	1 or 2 drops at each pivot point and at tip of pawl.
3-1	Carriage-feed clutch	Apply sparingly to clutch teeth. [a]
3-1	Armature and range dials	1 or 2 drops at bearings.
3-1	Armature worm	Thin film on teeth; 1 or 2 drops between worm and mounting.
3-1	Carriage-feed-clutch drum and drive collar	Apply sparingly to rubbing surfaces.
3-1	Platen lower-case latch	1 drop at pivot; apply sparingly to latching surface. [a]
3-1	Line-feed and figures-shift bell crank pivots [b]	Several drops between levers and washers.
3-2	Connecting link	1 drop at each end.
3-2	Function-selecting arm	Apply sparingly to all working surfaces.
3-2	Motor-stop function-lever and signal-bell clapper pivots.	2 drops at each pivot point
3-2	Motor-stop contact lever	Thin film on latching surface.

See footnotes at end of paragraph.

Fig. No.	Name of part	Method and quantity
3-2	Function cam follower	Apply sparingly to cam groove and bearing of roller. [a]
3-2	Felt lubricating washer (on carriage-feed link)	Oil to saturation point only.
3-2	Letters-shift and carriage-feed levers	2 drops at each pivot. [a]
3-2	Support lever	2 drops at each pivot. [a]
3-2	Punch bars	Several drops between each bar and guide block.
3-2	Platen latch	2 drops at pivot; thin film on working surface at each end. [a]
3-2	Aperture gate	2 drops in notch; several drops between gate and guide block.
3-2	Felt lubricating washer (on platen trough hub)	Oil to saturation point only.
3-3	Print-bail blade	Thin film both sides along entire edge.
3-3	Function-clutch spring	Apply sparingly to spring.
3-3	Function-shaft driven gear	Several drops at bearing and clutch teeth.
3-3	Felt lubricating washer (on function shaft driven gear)	Oil to saturation point only.
3-3	Figure-shaft and line-feed links. [b]	2 drops at each end of both links.
3-3	Line-feed and platen-shift bellcrank pivots [b]	Several drops at each pivot. [a]
3-3	Line-feed and platen-shift cam-follower pivots [b]	2 drops at each pivot.
3-3	Code rings	Thin film all along inner and outer working surfaces on each code ring.
3-3	Line-feed and platen-shift cam followers. [b]	Apply sparingly to rollers, pivots, and all rubbing surfaces.
3-3	Rangefinder cam	Thin film on working surfaces.
3-3	Function-sensing cams [b]	Thin film on all exposed surfaces. [a]
3-3	Function-clutch latch	Apply sparingly to roller and latching surfaces.
3-3	Carriage-feed pawl and ratchet	Apply sparingly to ratchet teeth; 2 drops at each pawl pivot. [a]
3-3	Carriage-return blocking lever	1 or 2 drops at pivot; apply sparingly to latch surfaces.
3-3	Print-cam follower	Apply sparingly to cam groove and bearing of roller and to spring hook.
3-3	Motor-stop contact lever pivot	Several drops between pivot shaft and lever sleeve.
3-3	Function-shaft bearing (felt lubricating washer on each side of bearing blocks)	1 or 2 drops at bearing. [a]
3-3	Printing-bail shaft bearings	Several drops at either end of both bearings.
3-4	Sensing levers [a]	Several drops at pivot point and rubbing surfaces.
3-4	Platen-shift and line-feed bellcrank and pawl assemblies [c]	Several drops at all pivot points. [a]
3-4	Line-feed and figures-pawl springs [c]	Apply 1 drop to each end of the springs.
3-4	Adjustable blocks [c]	Apply sparingly to working surfaces.
3-4	Draw-bar slot and roller [c]	Apply sparingly to working surfaces.
3-4	Restoring rollers [c]	Apply sparingly to each end of rollers (inside pin surfaces).
3-5	T-levers	Apply sparingly on working surfaces.
3-5	Stop bars in code-ring cage	2 drops at each end of all stop bars.
3-5	Code-ring locking bail	Thin film on latching surface.
3-5	Code-ring locking bail shaft.	1 drop at each pivot.
3-5	Line spacing detent stud.	Apply sparingly to working surface. [a]
3-5	Line-feed ratchet	Several drops at lever point; thin film on ratchet teeth.
3-5	Single-double line-feed lever	1 drop at pivot and detent surface. [a]
3-5	Armature-spring arm shaft	1 drop at both ends of shaft.
3-5	Selector-magnet armature bearing	Apply sparingly.
3-5	Y-levers, Y-lever detents, friction plates	Apply sparingly to all rubbing surfaces. [a]
3-5	Selector-magnet armature edge	Apply sparingly.
3-5	Selector-lever guide comb	Apply sparingly to all rubbing surfaces.
3-5	Selector-levers, pivot post bearings and washers	Apply sparingly to all rubbing and bearing surfaces. [a]
3-5	Orientation-lever pivot and range-finder cam	1 or 2 drops at pivot; thin film on cams surface.
3-5	Grooved pin	Several drops between pin and camshaft.
3-5	Selector cams and stop plate	Thin film on working surfaces.
3-5	Transfer-lever latch	2 drops on pivot; thin film on latching surface.
3-5	T-levers and separating washers	Apply sparingly to all rubbing and bearing surfaces. [a]
3-5	Transfer-lever restoring cam	1 drop on cam surface.
3-5	Transfer-lever roller stud	Apply sparingly to working surfaces.
3-5	Stop-arm-shaft clutch (felt lubricating washer on stop-arm shaft)	Several drops in clutch. [a]
3-6	Platen-shift link	1 or 2 drops at each pivot.
3-6	Line-feed connecting link	1 or 2 drops at each pivot.

See footnotes at end of paragraph.

Fig. No.	Name of part	Method and quantity
3-6	Connecting link	1 or 2 drops at each pivot.
3-6	Line-feed lever	2 or 3 drops at pivot.
3-6	Line-feed lever detent	2 or 3 drops at pivot.
3-6	Ribbon-reverse beam pivot stud	1 or 2 drops at pivot.
3-6	Ribbon-reverse beam detent	1 drop at pivot; apply sparingly to latching surfaces.
3-6	Ribbon-feed clutch	Apply sparingly to clutch teeth.
3-6	Ribbon-drive shaft	Apply sparingly to bearings, cam surfaces, and gear teeth at both ends.
3-6	Ribbon-sensing levers	1 or 2 drops at each bearing and pin.
3-6	Ribbon-spool-shaft gears	Apply sparingly to groove, teeth, and driving jaws.
3-6	Ribbon-spool shafts	1 or 2 drops at bearings top and bottom.
3-6	Ball bearings and guide rail	Apply sparingly to rolling surfaces.
3-6	Line-feed pawl	2 drops at pivot.
3-6	Carriage-return bell crank linkage	2 drops at each pivot. [a]
3-6	Vertical carriage-return link (felt washer on carriage-return sensing lever stud)	2 drops at pivot. [a]
3-7	Ribbon-spool lock	1 drop at handle pivots. [a]
3-7	Ribbon guide	Thin film on sliding surfaces.
3-7	Hinge pin	2 or 3 drops at each pivot; apply sparingly to gear teeth.
3-7	Ribbon-lifter bellcrank, [b] turnbuckle [a]	1 or 2 drops at pivots.
3-7	Connecting-bar guide plate	1 or 2 drops at each guide plate.
3-7	Type-selecting arm	Apply sparingly between arm and claw.
3-7	Ribbon-lifter links	1 or 2 drops at each pivot.
3-7	Ribbon-lifter pivot bearing	Thin film on sliding surfaces. [a]
3-8	Keylevers	1 drop at each pivot. [a]
3-8	Space-bar lever pivots	1 drop each.
3-8	Code bars and guide studs	Thin film all along notched edge of each bar; 2 or 3 drops in each groove.
3-9	Selector levers, bearings and spacers	Apply sparingly to all rubbing and bearing surfaces.
3-9	Contact-bail pivot	2 or 3 drops between bail and pivot stud.
3-9	Sensing-lever locking bail	1 or 2 drops on bail surface and between levers and comb.
3-9	Transmitter camshaft	Thin film on all cam lobes and stop teeth. [a]
3-9	Sensing levers	Apply sparingly at working surfaces at each end of pivot.
3-9	Cam-stop-lever latch stud	2 or 3 drops at pivot points; thin film on latching surface.
3-9	Front keylever guide	1 drop in each guide slot.
3-9	Keyboard lock	Thin film on sliding surfaces.
3-9	Cam-stop lever post	1 or 2 drops at pivot. [a]
3-10	Governor adjustment lever [e]	1 or 2 drops at each end. [a]
3-10	Governor adjustment screw [e]	Apply sparingly to entire thread.
3-10	Speed adjustment gear [e]	Apply sparingly to gear teeth.
3-10	Governor worm [e]	2 or 3 drops in governor hub opening. [a]
3-11(A)	Stop bar shift lever [d]	One drop at pivot.
3-11(A)	Stop bar shift link [d]	Thin film.
3-11(B)	Delaying lever [d]	One drop at pivot.
3-11(B)	Stop bar shift link [d]	Apply sparingly to latching surface.
3-11(B)	Delaying latch [d]	One drop at pivot; apply sparingly to latching surface.

[a] On teletypewriters with felt lubricating washers, lubricate the washers to the point of saturation only..

[b] Used on TT-4A/TG, TT-4B/TG, TT-696/TG, and TT-696A/TG.

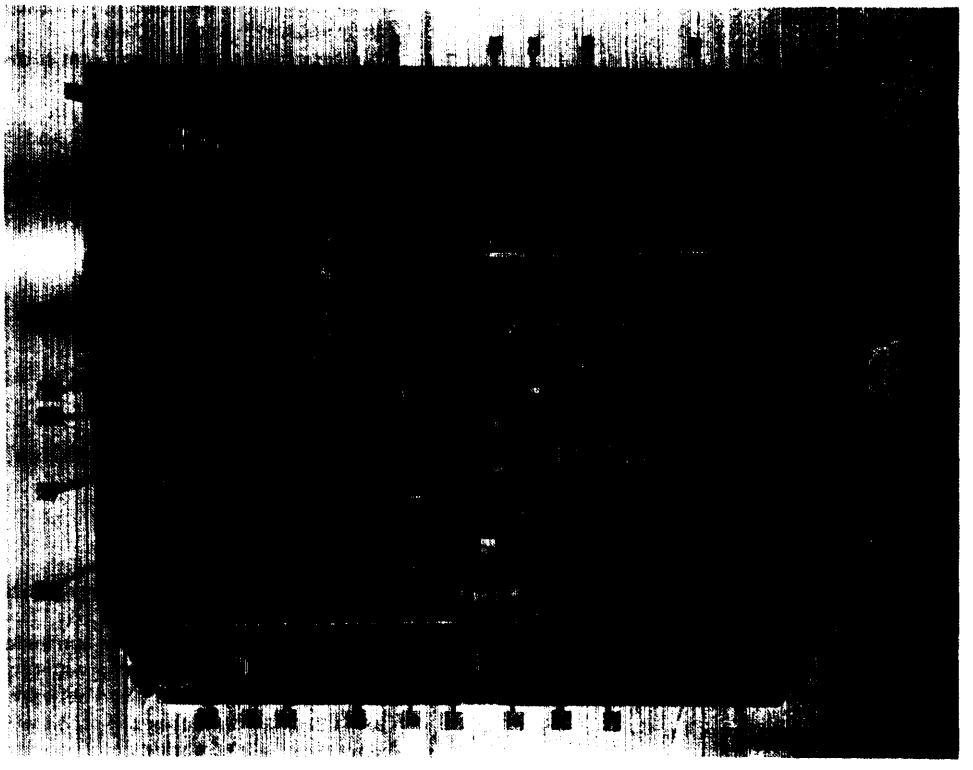
[c] Used on TT-4C/TG, TT-335/TG, TT-537/G, and TT-696B/TG.

[d] Used on TT-537/G and TT-722(*)/TG.

[e] Used on TT-4(*)/TG, and TT-696(*)/TG.

[f] Deleted

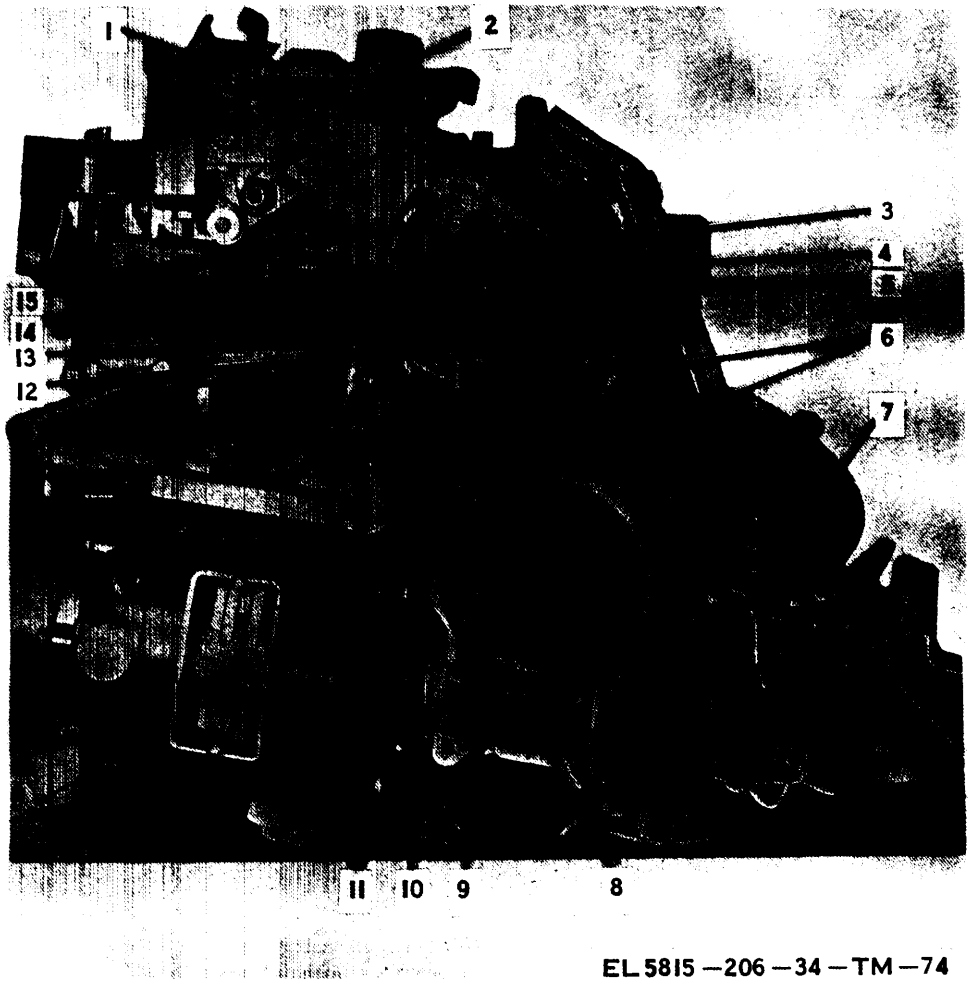
[g] Not used on TT-696(*)/TG.



1 Square-shaft sliding gear
2 Carriage-feed friction clutch
3 Square shaft *
4 Carriage-return operating mechanism *
5 Manual carriage-return mechanism
6 Square-shaft bearings
7 Platen-casting eccentric pivots
8 Carriage-return clutch drum
9 Carriage-return friction clutch
10 Keyboard-transmitter friction clutch
11 Decelerating cam and roller
12 Carriage-return driving and driven gears
13 Carriage rack drive shaft bearing
14 Carriage-return latch *
15 Carriage-feed clutch lever *
16 Margin-bell clapper and pawl
17 Carriage-feed clutch *
18 Armature and range dials
19 Rangefinder gear train
20 Armature worm
21 Carriage-feed clutch drum and drive collar
22 Platen lower-case latch *
23 Line-feed and platen-shift bellcrank pivots *

* Felt washers provided at this lubrication point on some teletypewriters.

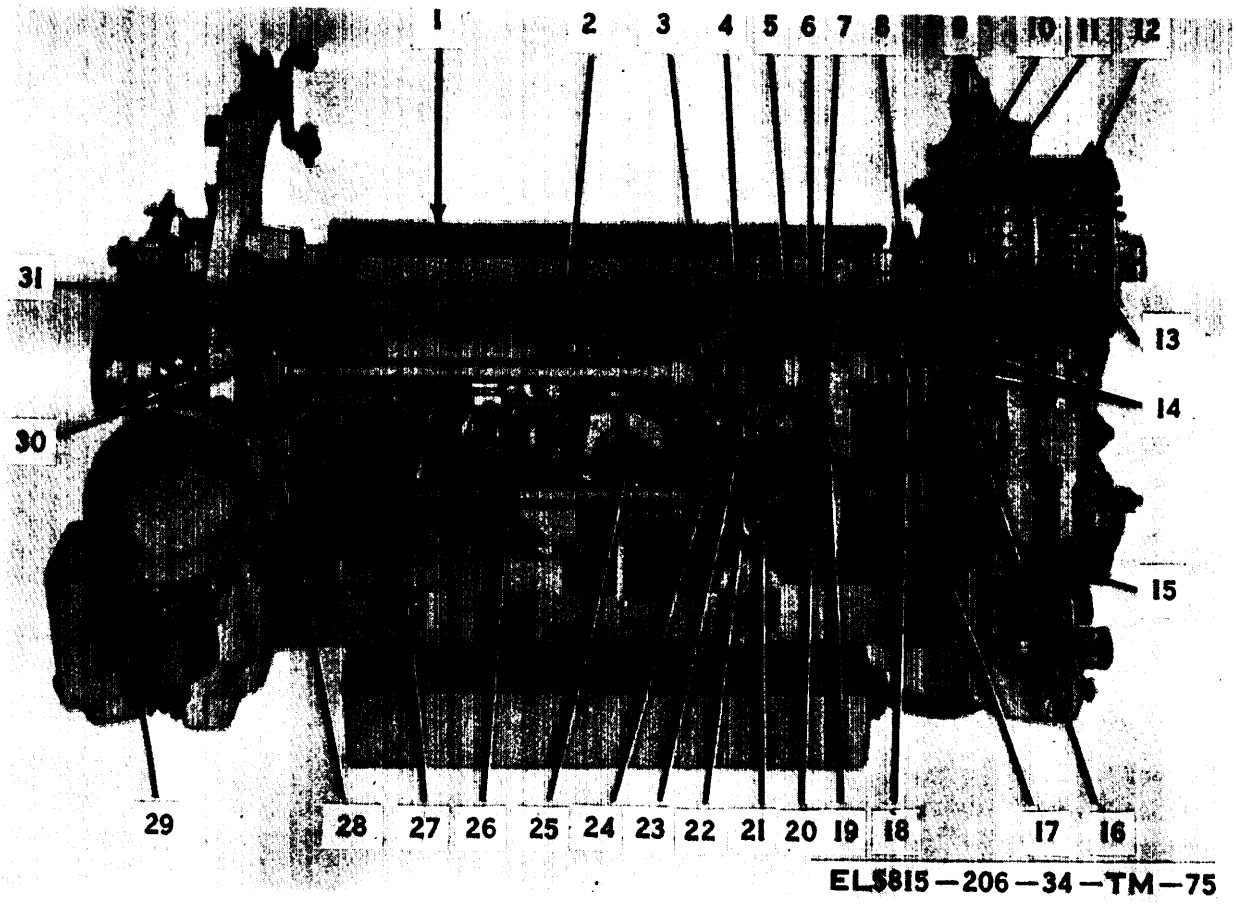
Figure 3-1. Teletypewriter, top view, partially disassembled to show lubrication points.



1 Connecting link
2 Connecting link
3 Function-selecting arm
4 Function-selecting arm claw bearing*
5 Printing-bail shaft bearings*
6 Motor-stop function-lever and signal-bell clapper pivots
7 Motor-stop contact lever
8 Motor worm and main-shaft driving gear (inside motor-gear housing)
9 Function cam follower*
10 Felt lubricating washer (on carriage-feed link)
11 Letters-shift and carriage-feed levers*
12 Support lever*
13 Punch bars
14 Platen latch*
15 Aperture gate
16 Felt lubricating washer (on platen trough hub)

* Felt washers provided at this lubrication point on some teletypewriters.

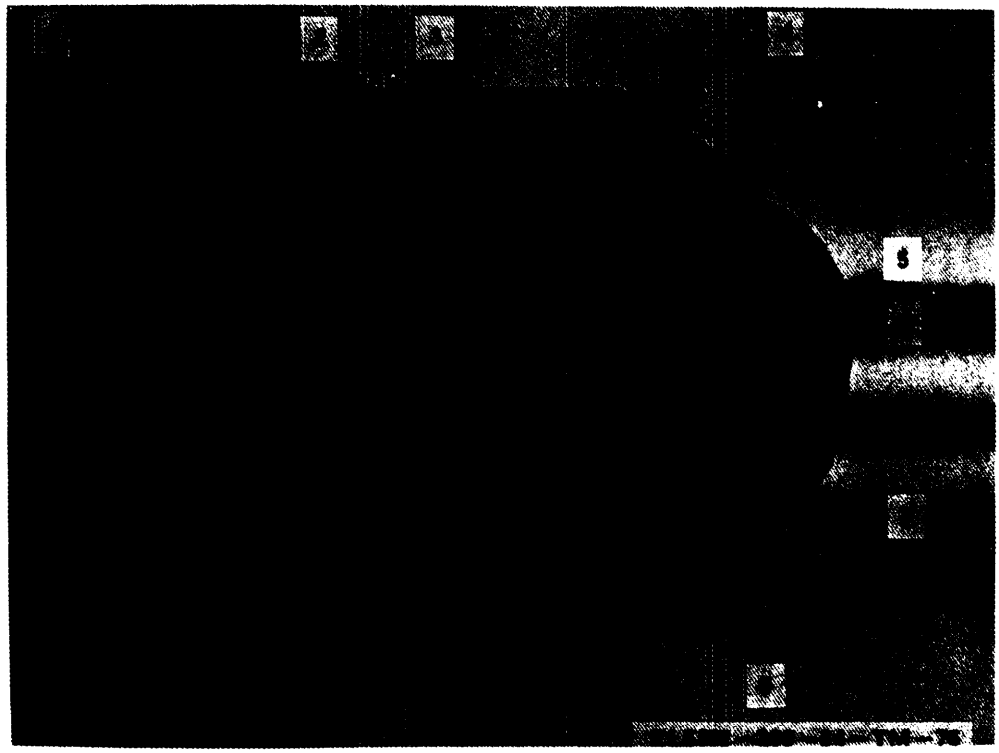
Figure 3-2. Teletypewriter, motor side, lubrication points.



1 Print-bail blade
2 Carriage-rack driving gear
3 Function-clutch spring
4 Function-shaft clutch drum*
5 Function-shaft driven gear
6 Function-shaft driving gear
7 Felt lubricating washer (on function shaft driving gear)
8 Square-shaft driving gear
9 Figures-shift and line-feed links
10 Line-feed and platen-shift bell crank pivots*
11 Line-feed and platen-shift cam-followers pivots
12 Code-ring cage
13 Code rings
14 Line-feed and platen-shift cam followers
15 Rangefinder cam
16 Function-sensing cams*
17 Selector-camshaft friction clutch
18 Function-shaft friction clutch
19 Transfer-lever shaft bearings*
20 Function-shaft driving gear
21 Carriage-feed driven gear*
22 Carriage-feed worm and driven gear
23 Function-clutch latch
24 Carriage-feed pawl and ratchet*
25 Carriage-return blocking lever
26 Carriage-return shaft drive gears
27 Transmitter-shaft drive gears
28 Print-cam follower
29 Motor-stop contact lever pivot
30 Function-shaft bearing (felt lubricating washer on each side of bearing blocks)*
31 Printing-bail shaft bearings*

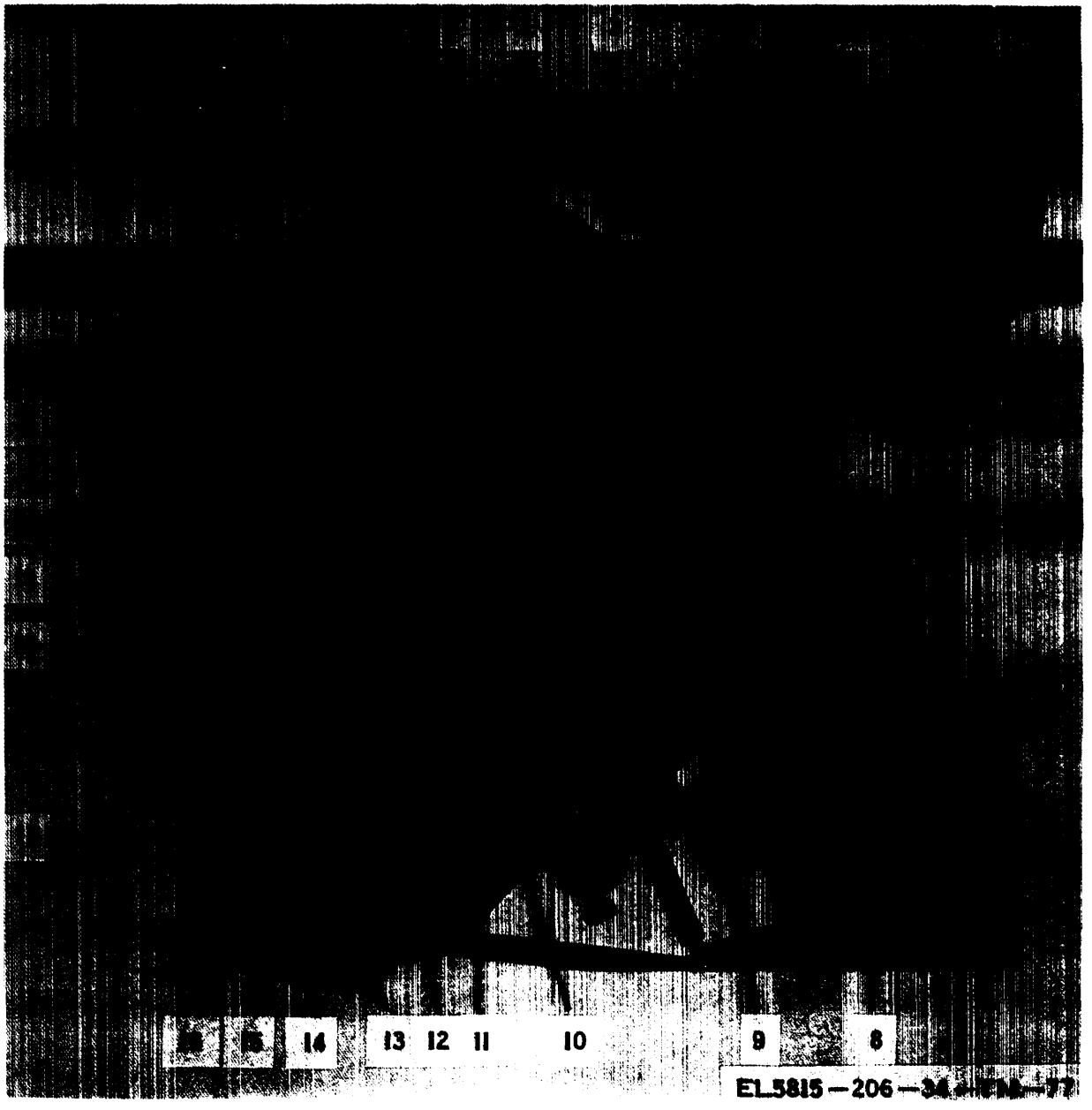
* Felt washers provided at this lubrication point on some teletypewriters.

Figure 3-3. Teletypewriter, rear view, lubrication points.



1 Carriage-rack retainer
2 Sensing levers
3 Platen-shift and line-feed bellcrank and pawl assemblies
4 Line-feed and figures-pawl springs
5 Adjustable blocks
6 Draw-bar slot and roller
7 Draw-bar actuating cam
8 Restoring rollers

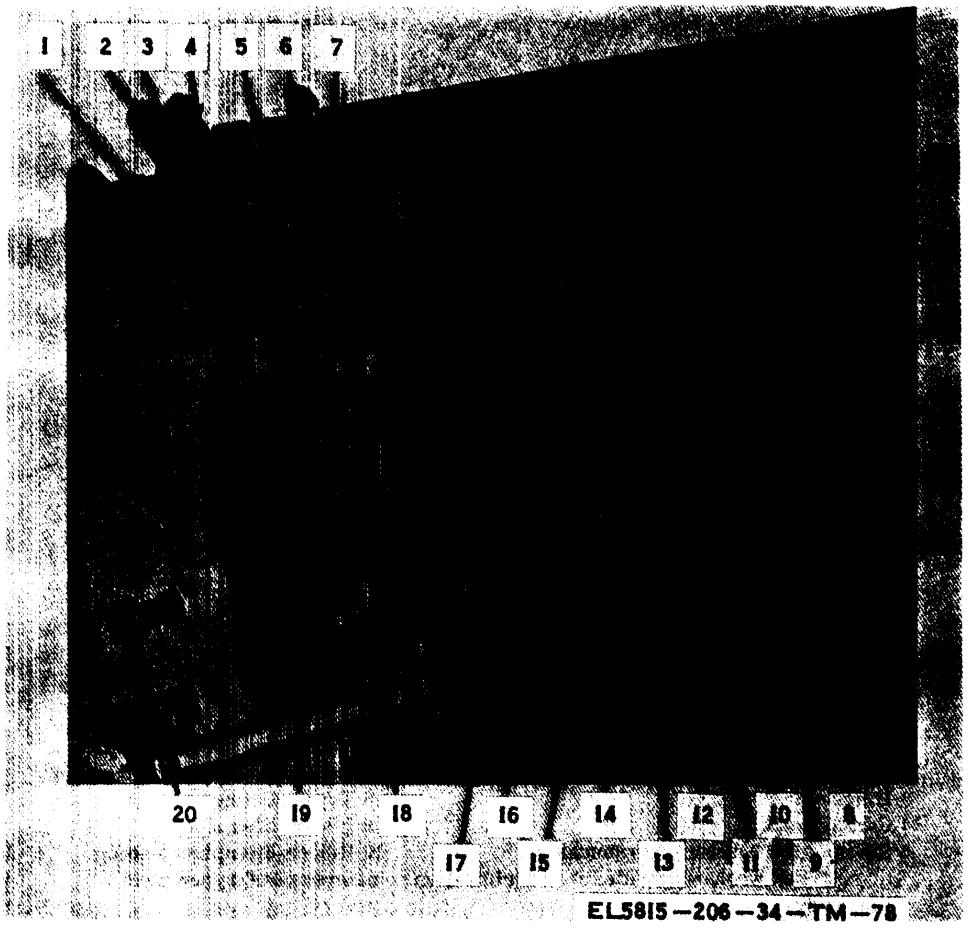
Figure 3-4. Teletypewriter (TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG) rear view, lubrication points.



1 T-levers
2 Stop bars in code-ring cage
3 Code-ring locking bail
4 Code-ring locking bail shaft
5 Line spacing detent stud*
6 Line-feed ratchet
7 Single-double line-feed lever*
8 Armature-spring arm shaft
9 Selector-magnet armature bearing
10 Y-levers and Y-levers detents*, friction plates
11 Selector-magnet armature edge
12 Selector-lever-guide comb
13 Selector-levers, pivot post, bearings and washers*
14 Orientation-lever pivot and rangefinder cam
15 Grooved pin
16 Selector cams and stop plate
17 Transfer-lever latch*
18 T-levers and separating levers*
19 Transfer-lever restoring cam
20 Transfer-lever roller stud
21 Stop-arm-shaft clutch* (felt lubricating washer on stop arm shaft)

* Felt washers provided at this lubrication point on some teletypewriters.

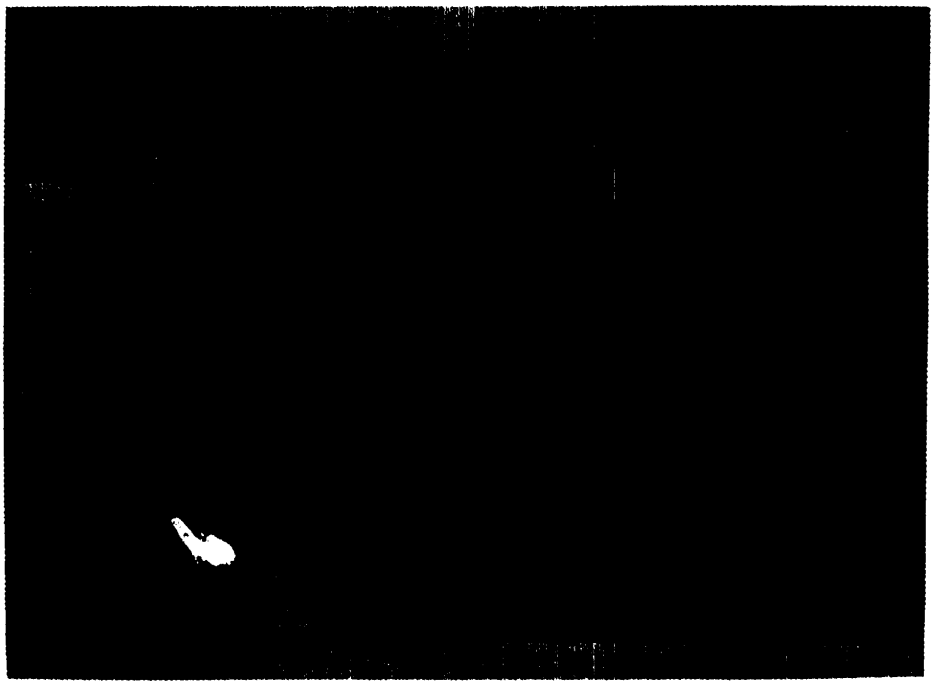
Figure 3-5. Teletypewriter, selector mechanism side, lubrication points.



1 Platen bearings and shaft
2 Platen-shift link
3 Platen-shift link
4 Line-feed connecting link
5 Connecting link
6 Line-feed lever
7 Line-feed lever detent
8 Ribbon-reverse beam pivot stud
9 Ribbon drive gear
10 Ribbon-reverse beam detent
11 Ribbon-feed clutch
12 Ribbon-drive shaft
13 Ribbon-sensing levers
14 Ribbon-spool-shaft gears
15 Ribbon-spool shafts
16 Ball bearings and guide rail
17 Guide rail
18 Line-feed pawl*
19 Carriage-return bellcrank linkage*
20 Vertical carriage-return link*

* Felt washers provided at this lubrication point on some teletypewriters.

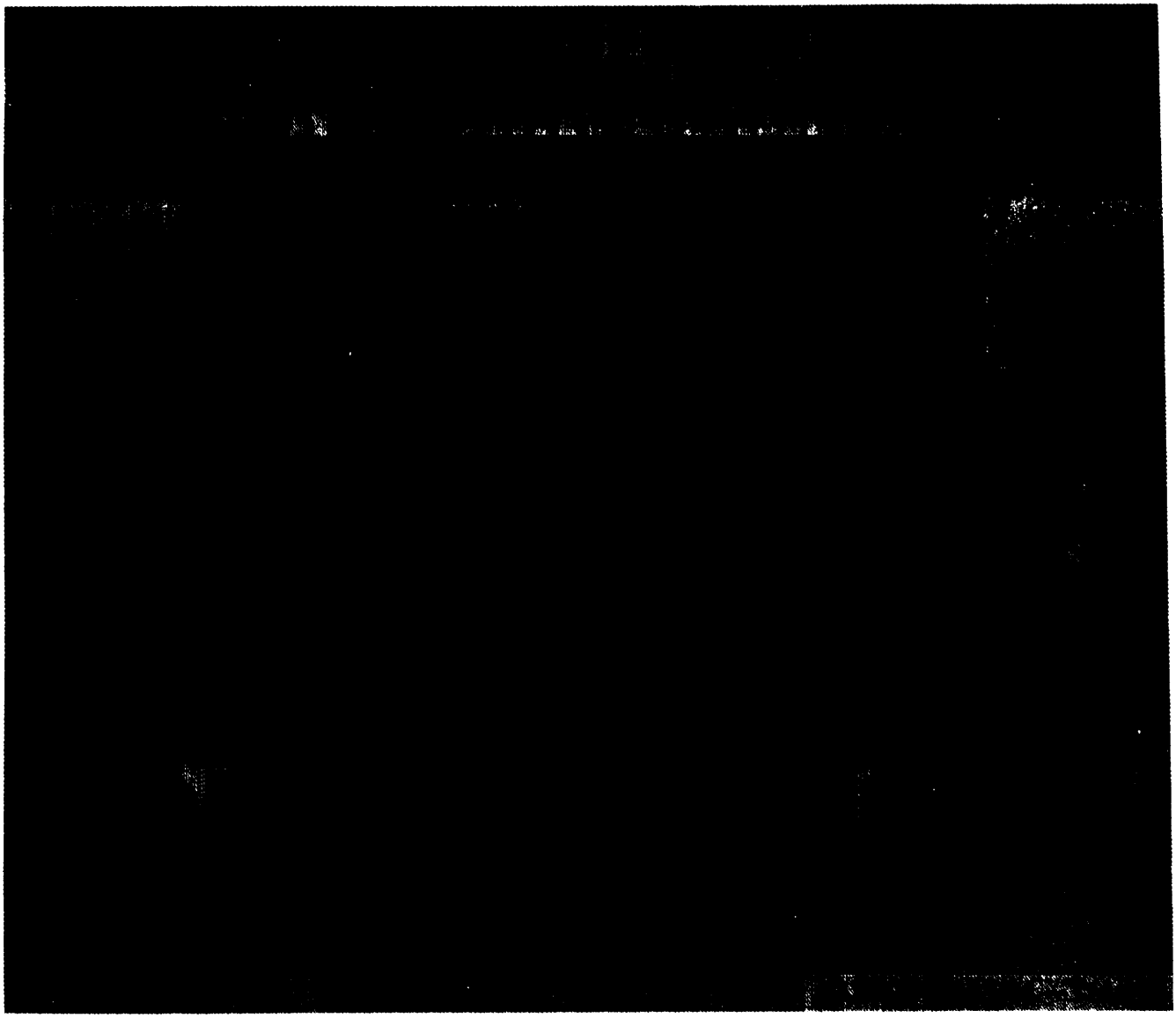
Figure 3-6. Teletypewriter, left front view, lubrication points.



1 Ribbon spool lock
2 Ribbon guide
3 Hinge pin
4 Carriage rack
5 Ribbon-lifter bellcrank, turnbuckle
6 Connecting-bar guide plate
7 Type-selecting-arm bearing cap
8 Type-selecting arm*
9 Ribbon-lifter links*
10 Ribbon-lifter pivot bearing

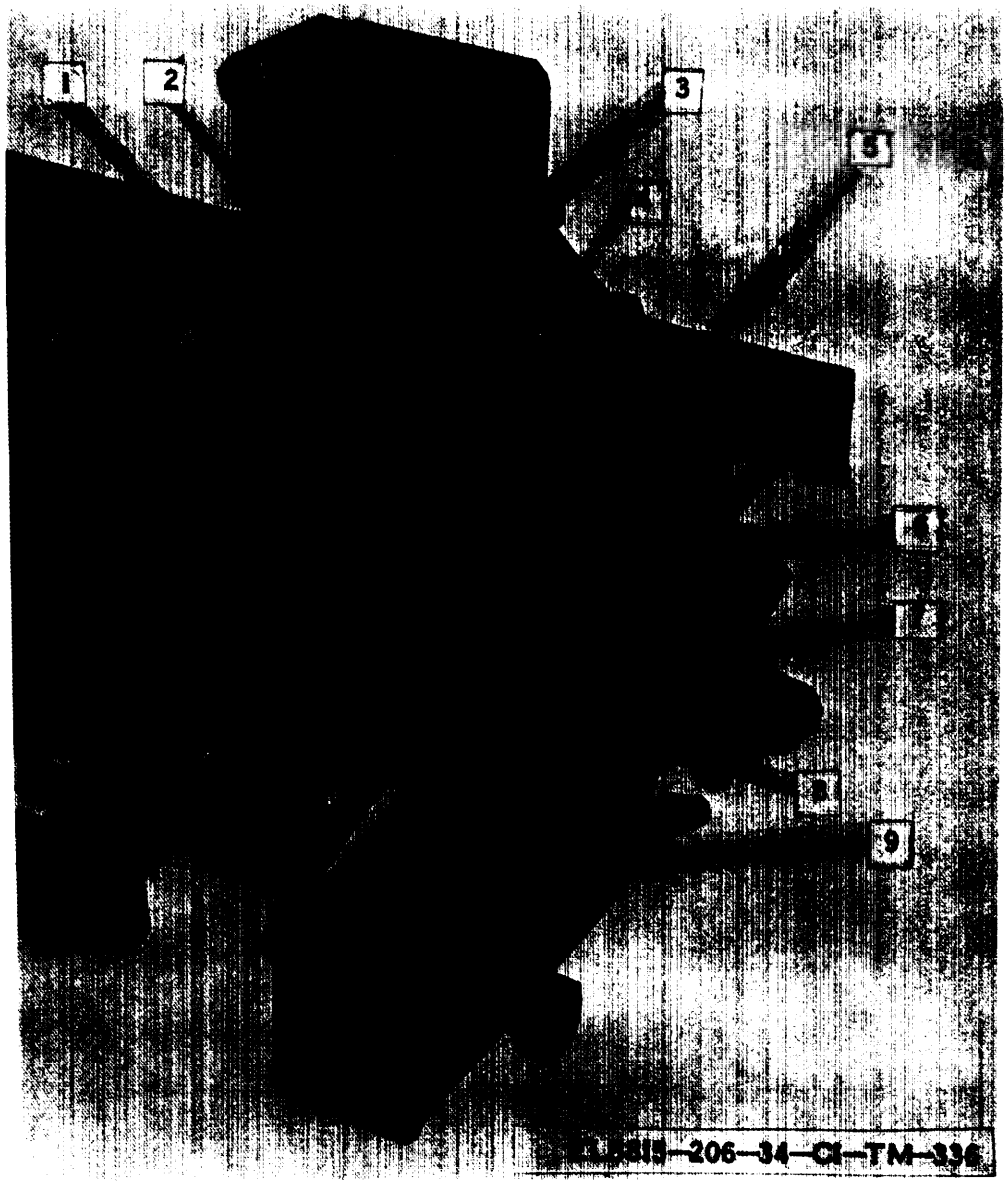
* Felt washers provided at this lubrication point on some teletypewriters.

Figure 3-7. Carriage, rear view, lubrication points.



1 Keylevers
2 Space-bar lever pivots
3 Code bars and guide studs

Figure 3-8. Keyboard-transmitter, top view, lubrication points.



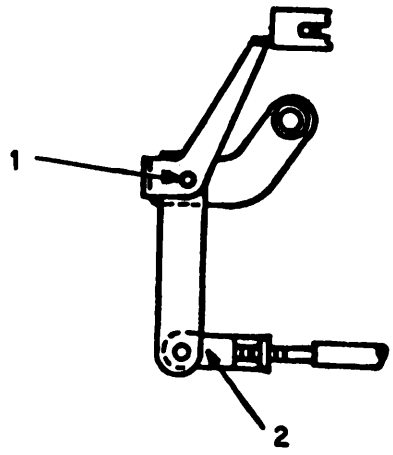
1 Selector levers, bearings and spacers *
2 Contact-bail pivot
3 Sensing-lever locking bail
4 Transmitter camshaft
5 Sensing levers *
6 Cam-stop lever post *
7 Cam-stop-lever latch stud *
8 Front keylever guide
9 Keyboard lock
* Felt washers provided at this lubrication point on some teletypewriters.

Figure 3-9. Keyboard-transmitter, right front view, lubrication points.

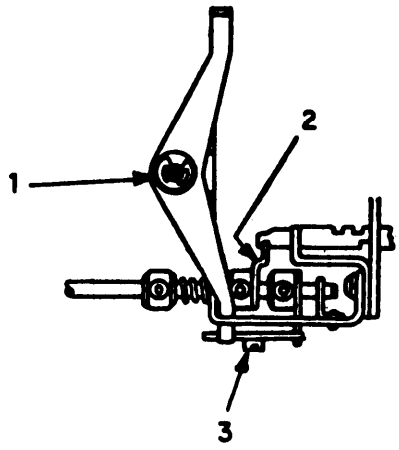


1 Governor adjustment lever
2 Governor adjustment screw
3 Speed adjustment gear
4 Governor worm

Figure 3-10. Governor lubrication points (TT-4(*)/TG and TT-698(*)/TG).



A. LEFT SIDE VIEW



B. RIGHT REAR VIEW

EL5815-206-34-TM-84-C2

1 Stop bar shift lever
2 Stop bar shift link

Legend for fig 3–11 B
1 Delaying lever
2 Stop bar shift link
3 Delaying latch

Figure 3-11. Left side and right rear view of automatic carriage-return of TT-537/G showing lubrication points.

Section IV. TROUBLESHOOTING

3-16. General

Troubleshooting at field and depot levels includes all the troubleshooting techniques outlined for organizational maintenance (TM 11-5815-206-12) and any special or additional techniques required to isolate a defective circuit, part, or adjustment. The systematic troubleshooting procedure, which begins with the operational checks performed at organizational level, must be completed by means of sectionalization, localization, and isolation procedures. Sectionalization, the first step in troubleshooting, means tracing the trouble to the major component that is responsible for abnormal operation. Localization, the second step, means tracing the trouble to a particular subassembly or circuit within the major component. Isolation, the third step, means tracing the trouble to the defective part or adjustment.

3-17. Sectionalizing Trouble

When a teletypewriter that is connected for *half-duplex* operation in a teletypewriter communications system does not operate properly, use the substitution method to sectionalize the trouble *(a* below). If a substitute teletypewriter is not available, follow the procedures described in *b* below. If it is suspected that a fault exists in a teletypewriter that is not connected to a communications system, locate the trouble as described in *c* below. If the teletypewriter is connected for *full-duplex* operation, and the fault is not immediately apparent, remove the teletypewriter from service and perform a local test of the teletypewriter *(c* below). If it meets all performance requirements, the fault is in either the external signal circuit or in other equipment in the system.

a. Substitution Method. Substitute a teletypewriter, which is known to be in good operating condition, for the local teletypewriter in the system.

(1) If the trouble still exists, the fault is either in the signal circuit or in other teletypewriter equipment in the communications system.

(2) If use of the substitute teletypewriter restores communication, the teletypewriter that was removed from the system is defective. In this case, follow the instructions in subparagraph *c* below.

b. Test Signal Exchange Method. If a substitute teletypewriter is not available, transmit test signals (alternate R and Y code groups) from the local keyboard and note the operation of the page printer. Then have an operator at any of the other stations in the system transmit test signals and note the operation of the page printer.

(1) If the local page printer operates properly when test signals are transmitted from the local keyboard-transmitter but does not operate properly when the test signals are transmitted from another station, the fault is either in the signal circuit or in the teletypewriter equipment at the other station.

(2) If the local page printer does not operate properly when the test signals are transmitted from the local keyboard-transmitter but does operate properly when the test signals are transmitted from any of the other stations in the system, the fault is in the local keyboard-transmitter.

(3) If the local page printer does not operate properly regardless of the source of test signals, the trouble is in the local page printer.

(4) If the fault is determined to be in the local teletypewriter, follow the instructions in *c* below.

c. Local Test Method. Connect high level teletypewriters for local test as shown in fig. 3-12 or low level teletypewriters as described in paragraph 3-18b. Check the performance of the teletypewriter as described in paragraphs 3-7, 3-8, and 3-9 of TM 11-5815-206-12. If the performance checks do not reveal the fault, make the tests described in paragraphs 3-18, 3-19 and 3-20.

3-18. Localizing Electrical Troubles

Most electrical troubles occur at the various contacts and connection points in the teletypewriter. Test all connection points in a circuit for looseness. The circuits of the teletypewriter include binding posts and connectors at points that are appropriate meter test points. When testing for loose connections and making meter tests, do not disturb the wiring more than is necessary for the test. Make the following tests to locate an electrical trouble.

a. TT-4(*)/TG, TT-335/TG, and TT-537/G Electrical Troubles

(1) *Power Sources.*

(a) Check to be sure that the voltage of the signal circuit power source is 105- to 125-volts dc.

(b) Check to be sure that the voltage for the motor circuit is 105- to 125-volts either dc or 50- to 60-Hz ac for TT-4(*)/TG or 108 to 132 volts, 400 cycles, single-phase ac for the TT-335/TG and TT-537/G.

(2) *Local Test Connections.* Turn the LINE INCREASE knob fully counterclockwise and make the following connections:

(a) Signal circuit TT-4(*)/TG, TT-335/TG and TT-537/G (fig. 3-12).

1. Connect 105- to 125-volt dc to terminals No. 1 and 4 (positive polarity to terminal 4).

2. Connect one shorting bar across terminals No. 5 and 6.

3. Connect the other shorting bar across terminals No. 2 and 3.

(b) Motor circuit. Connect the motor power cord to a source of 105- 125-volts either dc or 50- to 60-Hz ac for TT-4(*)/TG or 108 to 132 volts, 400 cycles, single-phase ac for the TT-335/TG and TT-537/G.

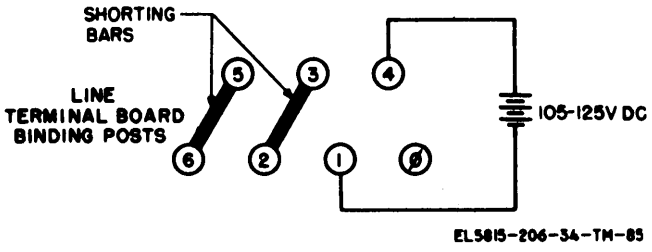


Figure 3-12. Teletypewriter test connections.

(3) *Open in Signal Circuit.* When the teletypewriter is connected for local test *(b* above), the D. C. MILLIAMPERES meter should indicate a flow of current. If no current flows, the signal circuit within the teletypewriter is not complete. Disconnect power from the teletypewriter and check the continuity of the send and receive circuits *(e* below).

(4) *Short in Signal Circuit.* When the teletypewriter is connected for local test *(b* above) and the page printer and the pointer of the D. C. MILLIAMPERES meter remain motionless when the keys of the keyboard-transmitter are pressed, check for a short circuit across the transmitter contacts in the send circuit. If the pointer of the meter moves toward zero each time a keylever is pressed, but the page printer remains motionless, check for a short circuit across the selector-magnet coils.

(5) *Resistance and Continuity Test.* Use Multimeter TS-352B/U or a suitable substitute test set when making continuity and resistance tests. Be sure to disconnect parallel electrical paths across the points under test.

(a) Continuity test. Use the continuity test to locate an open in a circuit. Before making a point-to-point check of the complete circuit, check for continuity across those portions of the circuit where an open is most likely to occur (switch contacts, plug and receptacle connections, etc). If the location of the open is not located quickly in this manner, start at one end of the circuit and make a point-to-point check of the complete circuit.

(b) Component resistance tests. The resistance measured across the test points listed below must be within 10 percent of the value indicated in the chart.

Component	Test points (see applicable schematic diagram)	Resistance (ohms)		
		TT-4A TG	TT-4B/TG TT-4C/TG TT-335/TG TT-722(*)/TG	TT-537/G (with keyboard)
Selector-magnet coils.	Line terminal 3 and center terminal of R2 with:			
	LINE switch at VOICE FREQ.	360	360	90
	LINE switch at D.C.	90	90	90
Motor-stop-relay coils	Line terminal 4 and either terminal of fuse holder XF2 with motor-stop-relay contacts 1 and 4 (TT-4A/TG) and contacts 1 and 2 of S5 (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G):			
	Open	360	300	300
	Closed	0	0	0

(c) Casting heater tests, TT-335/TG and TT-537/TG.

1. Disconnect plug P1 from the power supply outlet.

2. Remove the dust cover.

3. Move the toggle switch on the control panel to the LIGHT HEATER position.

4. Measure the resistance across the two center terminals of the toggle switch, and interpret the readings as follows:

Approximate resistance (ohms)	Indication
52	All three heaters good.
67	Keyboard heater (HR1) has open circuit.
85	Either selector side frame heater (HR2) or worm gear cover heater (HR3) has open circuit.

(d) To further isolate a defective heater, remove the junction box cover, disconnect each heater lead in turn at terminal board TB1 (FO-3 or 4), and check to see that the individual heater resistance is as follows:

Heater	Approximate resistance (ohms)
HR1	230
HR2	140
HR3	140

CAUTION

Before testing a capacitor, always place a momentary short circuit across the capacitor terminals to remove any charge present in the capacitor. Be extremely careful when discharging the capacitor; severe electrical shock may be received from a charged capacitor.

(6) *Capacitor Test.* Disconnect one lead from the capacitor and connect the Multimeter TS-352 B/U (arranged to read maximum resistance) across the capacitor terminals. If the pointer of the test set moves toward zero quickly and then slowly returns toward the infinity mark, the capacitor is good. If the pointer does not move toward zero, or if it does move, but does not return to the infinity mark, replace the capacitor.

b. TT-698(*)/TG Electrical Troubles.

The TT-698(*)/TG teletypewriter is equipped with low-level conversion circuits. These circuits are contained in printed circuit board modules. Most electrical troubles that are found in the electronic modules are at various electrical contacts in the unit. Troubleshooting is facilitated by various test points. When the trouble occurs in the teletypewriter and the cause is not immediately apparent, obtain as much information as possible from the teletype operator regarding the equipment performance at the time the trouble occurred. Make a visual inspection of the unit to determine if the trouble is caused by loose line or power connections, improperly set switches, erratic motor speed, or improper rangefinder adjustment. To systematically localize the trouble, arrange the teletypewriter to operate in a local test configuration. After the trouble has been localized, the checks and tests of individual circuit boards and components outlined in (3) through (6) below may be made.

(1) *Power Source.*

Check to see that the voltage for the motor circuit is 105 to 125 volts ac, single phase 50-60Hz.

(2) *Local Test Connection.*

Disconnect the external transmitting and receiving lines from terminal board A1TB1 and connect jumpers from terminals 1 and 2 to 4 and 5, respectively.

(3) *Power Supply Checks.*

(a) Check for 30 (±3) V dc cross terminals E2 and E3.

(b) Make a thorough physical inspection of all electrical components.

(c) Be sure all power is turned off. Make resistance checks of the electrical components.

(4) *Continuity Testing.* Continuity testing with a multimeter is used to locate a suspected open circuit to or from a module board. In making continuity tests, be sure that parallel current paths are disconnected to make the tests. Check the continuity through the circuit suspected to be faulty by connecting the test leads so that current can go only through the suspected circuit. Be sure no other part of the circuit is shunting the circuit being tested. If necessary, disconnect certain leads or module boards. Check all likely circuits in this manner. If, after checking all possible causes, the fault cannot be located, check the module boards as instructed below.

(5) *Module Board Testing.* The easiest method of determining whether a module is the cause of a malfunction is to substitute a good module for a suspected module. If substitution is not possible, the following checks can be made to determine the operability of the modules:

(a) Transmitter Module. With the transmitter contacts operating properly, the transmitter module should supply a ±6 volt pulse output (+6 volts for a mark and -6 volts for a space). The mark and space pulses should have pulse widths of equal time duration. The output may be checked by placing an oscilloscope (Test Set AN/GGM-15 or equivalent) across terminals TP3 and TP4. Operation of the transmitter contacts may be simulated by shorting across TP1 and TP2 on the transmitter module to simulate a mark input or removing the short (open) to simulate a space input.

(b) Receiver Module. The receiver module receives ±6 volt mark and space signals. These signals are amplified to 12 volt mark and space signals. Check this module as follows:

1. Disconnect any input signal to the module.

2. Apply power to the module.

3. Obtain a DC voltmeter and connect it to TP2 and TP3 of the module.

4. Adjust R8 for zero volts.

5. Connect a 6-volt mark or space signal to the input. Check the output between TP3 (output) and TP2 (reference) for a 12 (±2) volt mark or space signal. Compare the mark and space amplitudes to see if they are within 1 volt of each other. If necessary, adjust R8 for equal amplitudes.

(c) TD Clutch/Selector Magnet Driver Module. The TD clutch/selector magnet driver module receives the ±12 volt mark and space signals from the receiver module. It's output, which is in series with the selector magnet coil, either causes current to flow (mark input to receiver module) in the selector magnet coil, or cuts off current flow (space input). Check this module for proper output as follows:

1. Connect a continuous mark to the input (a negative 12(±2) volts). Connect a dc voltmeter between TP2 and TP3. The voltmeter should read 29 (±3) volts.

2. Connect a continuous space to the input (a positive 12 (±2) volts). Connect a dc voltmeter between TP2 and TP3. The voltmeter should read zero volts.

NOTE

The receiver module inverts the polarity of the mark and space signals. Hence the input to the TD clutch/selector magnet driver appears to operate on incorrect polarity mark and space signals.

(6) *Testing Electrolytic Capacitors.* Electrolytic capacitors may cause trouble by being shorted or by leaking. To test, discharge the capacitor with an insulated shorting jumper. Then disconnect one lead and connect the capacitor to an ohmmeter. Use the highest reading scale.

(a) A good capacitor will be indicated by the ohmmeter pointer first moving up the scale rapidly, then returning slowly to the infinity mark.

(b) A capacitor in an open circuit will give a reading of infinite ohms. A shorted capacitor will give a reading of constant value between zero and infinity, depending upon the resistance of the short.

WARNING

Be extremely careful when handling charged capacitors. A severe electrical shock may be received from the capacitor, or leads connected to a power supply in operation.

3-19. Localizing Mechanical Troubles

When the cause of a mechanical trouble is not apparent:

a. Turn the motor off.

b. Press a keylever and turn the governor target clockwise manually to rotate the motor.

c. As rotation of the motor causes the transmission of each impulse of the code group, make the following checks:

(1) Check the operation of the keyboard-transmitter train of parts that is associated with the impulse.

(2) Check the effect of each impulse on the D. C. MILLIAMPERES meter and on the position of the selector-magnet armature.

(3) Check the operation of the selector mechanism train of parts that is associated with the impulse.

(4) Check the transfer operation.

(5) Check the positioning of the type-selecting arm and the function-selecting arm.

(6) If the keylever that is pressed is assigned to a character, check the printing operation; if it is assigned to one of the nonprinting operations, check the movement of the train of parts for that operation.

3-20. Troubleshooting Charts.

The most common failures in the teletypewriters, together with the probable cause of the trouble and the corrective actions to be taken, are listed in *a* and *b* below.

a. Keyboard-Transmitter Troubleshooting Chart.

Malfunction	Probable cause	Corrective action
1. Downward movement of a key lever does not cause transmission.	Send circuit shorted.	Check send circuit (fig. FO-1 and FO-2.
	Keyboard-transmitter contacts out of adjustment. (high level units)	Adjust contacts (para 3-127).
	Signal output leads not properly connected at terminals 1 and 2. (TT-698(*)/TG).	Connect leads.
	Defective transmitter module. (TT-698(*)/TG).	Check transmitter module (para 3-18*b* (5) and replace if necessary.
	Transmitter contact assembly out of adjustment. (low level units)	Adjust transmitter contact assembly (para 3-128*b*).

Malfunction	Probable cause	Corrective action
1—Continued	Keyboard-transmitter plug (J2) disconnected.	Connect keyboard-transmitter plug to connector P2.
	Keyboard-transmitter friction clutch out of adjustment.	Adjust friction clutch (para 3-125 and 3-126).
	Cam-stop level binding.	Clean cam-stop lever at its post (fig. 3-20).
2. Transmitter camshaft rotates continuously.	Locking-lever-latch spring broken or disconnected.	Replace or connect locking-lever-latch spring (fig. 3-19).
	Universal-bar adjusting screw out of adjustment.	Adjust settings of universal-bar adjusting screw (para 3-119).
	Repeat-blocking-lever broken or disconnected.	Replace or connect repeat-blocking-lever spring (fig. 3-19).
3. Transmitter mechanism transmits incorrect code groups.	Friction clutch dry or out of adjustment.	Lubricate (para 3-15) and adjust (para 3-125 and 3-126). Replace felt friction plate if necessary.
	Transmitter contacts dirty or out of adjustment.	Clean and adjust transmitter contacts (para 3-127 for high level units; para 3-128b for low level units)
	Contact-bail spring weak	Replace contact-bail spring.
	Binding in selector levers or sensing levers.	Clean and adjust sensing levers and selector levers (para 3-121 through 3-124).
	Sensing-lever locking-bail spring weak.	Replace spring.
4. Keyboard-transmitter operates but causes noise in local radio receivers.	Faulty RF filter (TT-4(*)/TG, TT-335/TG and TT-537/G or faulty noise suppressor (TT-698(*)/TG).	Check filter or noise suppressor; replace if defective (para 3-39).
	Faulty RF filter or noise suppressor connections.	Check and replace defective bonding straps; tighten connections.

b. Page Printer Troubleshooting Chart.

Malfunction	Probable cause	Corrective action
1. Motor fails to start.	MOTOR fuse blown.	Replace MOTOR fuse (fig. 3-21).
	Failure of power source.	Correct defect or use another power source.
	Motor-stop contacts dirty or do not close. (Not applicable to TT-698(*)/TG).	Clean and burnish motor stop contacts.
	Defective motor brushes.	Clean commutator (para 3-42*d*).
	Defective motor switch S2 (TT-4(*)/TG and TT-698(*)/TG).	Replace S2 (fig. 3-20).
	Defective motor brushes.	Replace brushes (para 3-42*c*).
	Open in field or armature winding (TT-4(*)/TG and TT-698(*)/TG).	Repair or replace motor (para 3-26).
	Mechanical bind.	Locate and correct trouble in mechanism.
2. Motor runs but speed is erratic.	Governor contacts dirty or pitted.	Clean, burnish, or replace contacts (para 3-44).
	Governor spring broken TT-4(*)/TG and TT-698(*)/TG	Replace spring (para 3-44).
	Motor-stop contacts weak or broken (TT-4(*)/TG only).	Install new motor-stop contacts (para 3-98).
	Dirty commutator on motor.	Clean commutator (para 3-42*d*).
3. Page printer runs open (mechanism runs when line current should be steady marking).	Line fuse blown (TT-4(*)/TG and TT-698(*)/TG.	Replace line fuse (fig. 3-21).
	External line circuit open or shorted.	Check line from teletypewriter terminals for continuity or short.
	No line current.	Correct or replace source of voltage; adjust line current.
	Space instead of mark impulse received (TT-698(*)/TG).	Reverse input signal line leads.

Malfunction	Probable cause	Corrective action
3—Continued	Defective receiver or TD clutch/ selector magnet driver module (TT-698(*)/TG).	Check modules (para 3-18*b*[5]) and replace if necessary.
	Malfunction at transmitter source.	Check for proper transmitting voltages.
	Receive circuit in teletypewriter open or shorted.	Check for continuity or short and repair fault.
	Selector-magnet armature not holding stop lever.	Readjust selector mechanism (para 3-167).
	Transfer-lever trip latch spring broken.	Replace transfer-lever trip latch spring.
	Selector camshaft stop plate or stop lever worn or broken.	Replace stop plate or stop lever.
4. Page printer prints errors or scrambles letters and functions.	Rangefinder dial improperly set.	Adjust rangefinder dial.
	Selector camshaft friction clutch slipping.	Adjust friction clutch (para 3-158 and 3-159).
	Dirty, binding, or sticking selector mechanism.	Clean or adjust selector parts (para 3-121 through 3-124).
	Worn or broken Y-or T-levers.	Replace defective levers.
	Selector camshaft stop plate loose.	Replace worn parts.
	Selector-lever spring broken.	Replace selector-lever spring.
	Square-shaft friction clutch slipping.	Adjust friction clutch (para 3-210).
	Selector-magnet mounting loose.	Readjust and tighten mounting screws (para 3-169).
	Square-shaft stop arm or function-selecting-arm claw loose.	Readjust and tighten (para 3-209).
5. Page printer prints same character or performs same function regardless of signals being sent.	Transfer-lever-trip latch spring or transfer-lever spring broken.	Replace a broken spring.
	Antibounce clutch on stop-arm shaft jammed.	Replace stop-arm shaft.
	Function-selecting arm sticking in punch-bar guide block.	Clean and readjust if necessary.
6. Certain characters or functions will not print (or operate).	Stop bar sticking.	Clean stop-bar guide plate and code rings.
	Stop-bar spring broken or missing.	Replace spring.
7. Page printer operates, but range (rangefinder measurement) is narrow.	Line current too high or too low (TT-4(*)/TG, TT-335/TG, and TT-537/G).	Readjust line current.
	Selector magnet drive circuit current too low (TT-698(*)/TG).	Check for correct output voltage from TD clutch magnet driver (para 2-39*b* (2) and replace if necessary.
	Motor speed incorrect at transmitter.	Have transmitter motor speed checked.
	Selector mechanism improperly adjusted.	Check requirements of selector mechanism adjustments and readjust as required.
8. Page printer prints but sticks in print position.	Connecting-bar spring weak or missing.	Replace spring.
	Print mechanism binding.	Clean and adjust print mechanism.
9. Platen will not shift.	Figures-shift sensing-lever spring broken.	Replace spring.
	Platen-latching arm loose.	Readjust arm and tighten mounting screws (para 3-226).
	Figures-shift sensing lever or cam follower bent or broken.	Replace defective parts.
10. Platen will not shift from figures- to the letters-shift position.	Function aperture gate stuck.	Clean function group parts.
	Signal-bell or motor-stop punch bar stuck in operated position.	Clean function group parts.
11. Platen cannot be prevented from returning to figures-shift position.	Cam-follower spacing collar on mounting stud dirty or improperly placed.	Clean and adjust collar (para 3-140).
	Line-feed and figures-shift cam-follower spring broken. (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG).	Replace broken line-feed and figures-shift cam-follower spring.

Malfunction	Probable cause	Corrective action
12. Carriage will not feed.	Carriage-feed link improperly adjusted.	Readjust link (para 3-182).
	Carriage-feed clutch slipping.	Readjust clutch; replace felt friction plates, if necessary (para 3-204).
	Driving collar loose (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG).	Tighten set screw.
	Carriage-feed-clutch-lever spring broken (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG).	Replace spring.
	Ribbon-driving mechanism jammed.	Readjust ribbon-driving mechanism (para 3-244).
	Carriage-feed pawl spring broken.	Replace spring.
13. Carriage-return function inoperative.	Carriage-return link improperly adjusted.	Adjust link (para 3-185).
	Carriage-return sensing-lever spring broken.	Replace spring.
	Carriage-return safety clutch mechanism out of adjustment (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG).	Adjust (para 3-204).
14. Carriage does not make complete return.	Carriage-return latch-tripping arm improperly adjusted.	Readjust latch-tripping cam (para 3-188).
	Mechanism binding (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG).	Clean and adjust carriage mechanism.
15. Line-feed function does not operate.	Line-feed sensing-lever spring broken.	Replace spring.
	Line-feed pawl spring broken.	Replace spring.
16. Page printer prints same character or performs same function regardless of signals being sent.	Transfer-lever-trip latch spring or transfer-lever spring broken.	Replace a broken spring.
	Antibounce clutch on stop-arm shaft jammed.	Replace stop-arm shaft.
	Function-selecting arm sticking in punch-bar guide block.	Clean and readjust if necessary.
17. Certain characters or functions will not print (or operate).	Stop bar sticking.	Clean stop-bar guide plate and code rings.
	Stop-bar spring broken or missing.	Replace spring.
18. Page printer operates, but range (rangefinder measurement) is narrow.	Line current too high or too low.	Readjust line current.
	Motor speed incorrect at transmitter.	Have transmitter motor speed checked.
	Selector mechanism improperly adjusted.	Check requirements of selector mechanism adjustments and readjust as required.
19. Page printer prints but sticks in print position.	Connecting-bar spring weak or missing.	Replace spring.
	Print mechanism binding.	Clean and adjust print mechanism.
20. Platen will not shift.	Figures-shift sensing-lever spring broken.	Replace spring.
	Platen-latching arm loose.	Readjust arm and tighten mounting screws (para 3-226).
	Figures-shift sensing lever or cam follower bent or broken.	Replace defective parts.
21. Platen will not shift from figures- to the letters-shift position.	Function aperture gate stuck.	Clean function group parts.
	Signal-bell or motor-stop punch bar stuck in operating position.	Clean function group parts.
22. Platen cannot be prevented from returning to figures-shift position.	Cam-follower spacing collar on mounting stud dirty or improperly placed.	Clean and adjust collar (para 3-140).
	Line-feed and figures-shift cam-follower spring broken (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG).	Replace broken line-feed and figures-shift cam-follower spring.
23. Carriage will not feed.	Carriage-feed link improperly adjusted.	Readjust link (para 3-182).

Malfunction	Probable cause	Corrective action
23—Continued	Carriage-feed clutch slipping.	Readjust clutch; replace felt friction plage if necessary (para 3-204).
	Driving collar loose.	Tighten set screws.
	Carriage-feed-clutch-lever spring broken.	Replace spring.
	Ribbon-driving mechanism jammed.	Readjust ribbon-driving mechanism (para 3-244).
	Carriage-feed pawl spring broken.	Replace spring.
24. Carriage-return function inoperative	Carriage-return link improperly adjusted.	Adjust link (para 3-185).
	Carriage-return sensing-lever spring broken.	Replace spring.
	Carriage-return safety clutch mechanism out of adjustment.	Adjust (para 3-204).
25. Carriage does not make complete return.	Carriage-return latch-tripping arm improperly adjusted.	Readjust latch-tripping cam (para 3-188).
	Mechanism binding.	Clean and adjust carriage mechanism.
26. Line-feed function does not operate.	Line-feed sensing-lever spring broken.	Replace spring.
	Line-feed pawl spring broken.	Replace spring.
	Line-feed mechanism stuck.	Clean detent parts.
27. Line feed occurs on every operation or is erratic.	Cam-follower spacing collar and stud dirty or spacing collar improperly placed.	Clean collar and stud and reset collar if necessary.
	Line-feed and figures-shift cam-follower spring broken.	Replace spring.
28. Signal bell does not ring.	Clapper bent (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG).	Straighten clapper.
	Signal-bell punch bar sticks.	Clean function group parts.
29. Motor stop fails to operate. (Not applicable to TT-698(*)/TG.)	Motor-stop contact lever improperly adjusted (TT-4A/TG and TT-4B/TG only).	Readjust position of lever lug (para 3-255).
	Motor-stop contacts bent or broken.	Straighten or replace.
	Motor-stop punch bar sticks.	Clean function group parts.
30. Only part of characters print.	Ribbon lifter not raising far enough.	Adjust ribbon lifter (para 3-212).
	Stop screw for platen bracket not properly adjusted.	Adjust platen bracket stop screw (para 3-224 and 3-225).
31. Printing too light or too heavy.	Grooved nut on type-selecting arm improperly adjusted.	Adjust (para 3-212).
32. Lines are not printed straight.	Platen bracket stop screw loose.	Tighten the screw.
	Platen casting eccentric mounting screw not properly adjusted.	Adjust (para 3-221).
33. Margins printing unevenly.	Carriage-return blocking mechanism improperly adjusted.	Adjust carriage-return bloc.. mechanism (para 3-195).
34. Ribbon lifter not working properly.	Broken lifter tension spring.	Replace spring.
	Dirty, bent, or broken parts.	Clean and replace broken part
35. Ribbon does not feed or does not reverse.	Ribbon spool not seated correctly on driving collar or collar loose on shaft.	Check seating of spool and tighten collar set screw.
	No spring tension on ribbon-feed clutch.	Reset collar for proper spring tension (para 3-245).
	Ribbon-spool gears not meshing.	Replace ribbon-reversing detent spring.
	Ribbon-sensing lever bent, dirty, or has broken spring.	Clean, adjust, and replace parts as necessary.
36. Margin bell does not ring properly.	Margin-bell-pawl trip arm improperly set or pawl broken.	Reset arm or replace broken part.
	Pawl spring broken.	Replace pawl spring.
	Clapper spring broken.	Replace clapper spring.
	Clapper bent.	Straighten clapper.
37. Paper tension roller cannot be released.	Pin on roller bent or broken.	Replace defective pin.
	Paper release mechanism binding.	Clean and adjust mechanism (para 3-218 and 3-219).
38. Page printer emits grinding or whining noise.	Motor drive gears improperly meshed.	Adjust position of motor (para 3-262).
	Fouled bearings in motor, main shaft, or function shaft.	Clean and lubricate or replace bearings if necessary.
	Motor shaft or main shaft bent.	Replace bent shaft.

Section V. REMOVAL AND REPLACEMENT OF TELETYPEWRITER COMPONENTS

3-21. General

a. This section describes removal and replacement procedures for the major components of Teletypewriters TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698/TG, TT-698A/TG, TT-698B/TG (fig. 3-13 and 3-15). These procedures are used in conjunction with disassembly and reassembly procedures described in paragraphs 3-33 through 3-113.

b. All repairs should be made by qualified teletypewriter maintenance personnel. Equipment operating with minor faults may fail completely as the result of efforts by inexperienced personnel to correct apparently simple defects.

c. Inspection, cleaning, and lubrication instructions are given in paragraphs 3-10 through 3-15. Whenever repairs are made, the teletypewriter should be completely readjusted in accordance with paragraphs 3-114 through 3-272.

TT-722/TG and TT-722A/TG



Figure 3-13. Components of Teletypewriter TT-4(*)/TG, except for motor, TT-335/TG and TT-537/G, and A1 Terminal Box Assembly TT-698(*)/TG.

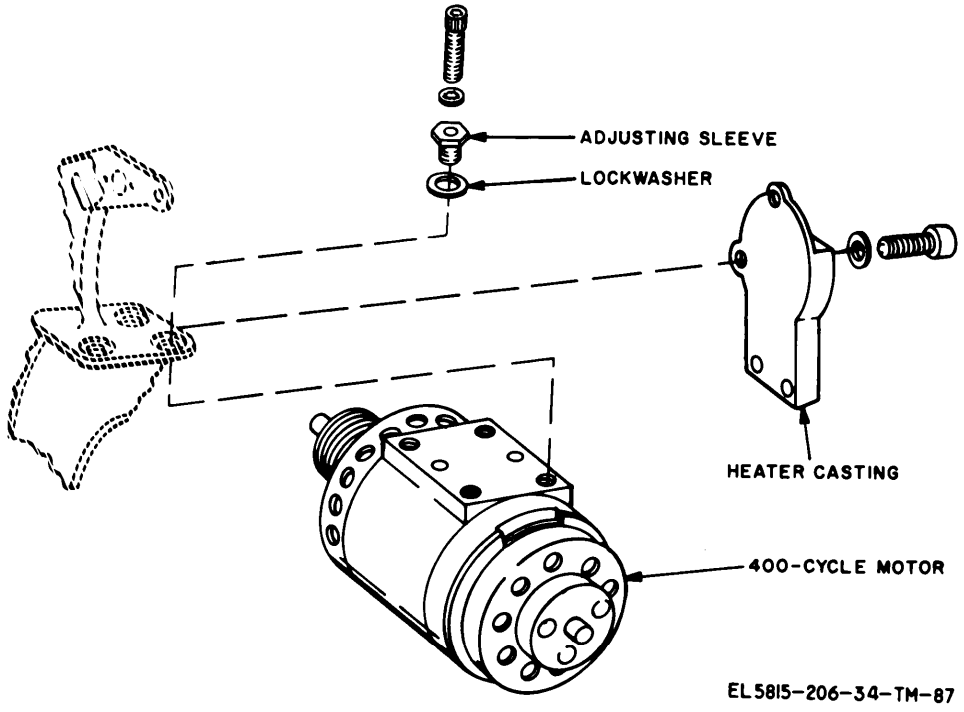


Figure 3-14. 400-cycle motor mounting arrangements (TT-335/TG and TT-537/G).

3-22. Removal and Replacement of Dust Cover
(fig. 3-13)

a. Removal.

(1) Push the platen knob (on the lefthand side) inward until it clears the dust cover.

(2) Loosen the thumb nuts (fig. 3-81) and disconnect the dust cover grounding leads.

(3) On the TT-4A/TG and TT-698/TG grasp the dust cover at the lower rear corners and tilt the cover forward carefully. When the cover is clear of the two rear studs, lift it free from the two front studs.

(4) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698/TG and TT-698B/TG, turn the cam latches on the left- and right-hand side of the dust cover to the open position; lift the dust cover from the mounting base.

b. Replacement. Replace the dust cover by reversing the procedures described in *a* above.

3-23. Removal and Replacement of Paper Shaft, Paper-Shaft Brackets and Paper Chute TT-4(*)/TG and TT-698(*)/TG

a. Removal.

(1) Remove the dust cover (para 3-22).

(2) Raise the two retaining springs on the two paper-shaft brackets (fig. 3-73) that hold the paper shaft on the paper-shaft brackets; remove the paper shaft and roll of recording paper.

(3) Remove the two machine screws and lock washers that hold the paper-shaft bracket to the teletypewriter frame; slide the assembled paper chute and paper-shaft bracket away from the two rubber mounts of the paper-shaft bracket. Remove the paper chute from the paper-shaft bracket.

(4) Remove the two machine screws and lock-washers that hold the paper-shaft bracket; and remove the paper-shaft bracket.

b. Replacement.

(1) Replace the paper shaft, paper-shaft brackets, and paper chute by reversing the procedures outlined in a(2), above.

(2) Replace the dust cover (para 3-22b).

3-24. Removal and Replacement of Paper Shaft, Paper-Shaft Brackets, and Paper Chute (TT-537/G)
(fig. 3-74)

a. Removal.

(1) Remove the dust cover (para 3-22).

(2) Push aside the retaining levers on the two paper-shaft brackets that hold the paper shaft on the paper shaft-brackets; remove the paper shaft and roll of recording paper.

(3) Remove the two machine screws and lock-washers that hold the paper shaft bracket to the teletypewriter frame; slide the assembled paper chute and paper shaft bracket away from the two rubber mounts of the paper shaft bracket and remove the two spacers. Remove the paper chute from the paper shaft bracket.

(4) Remove the two machine screws and lock-

washers that hold the paper shaft bracket to the teletypewriter frame; remove the paper shaft bracket and spacers.

b. Replacement.

(1) Replace the paper shaft, paper shaft brackets, and paper chute by reversing the procedures outlined in *a* (2), (3), and (4) above. Be sure to install spacers in the positions shown in figure 3-74.

(2) Replace the dust cover (para 3-22b).

3-25. Removal and Replacement of Mounting Base

a. Removal.

(1) Remove the dust cover (para 3-22a).

(2) Remove the two machine screws (fig. 3-21) that hold the copy-light connector to the mounting base; remove the copy-light connector and insulator.

(3) On the TT-4A/TG and TT-698/TG, remove the four plain hexagonal nuts (fig. 3-79), lockwashers, and flat washers that hold the feet of the frame assembly to the mounting base studs.

(4) On the TT-4B/TG and TT-698A/TG, remove the two machine screws and lockwashers that hold the frame feet and grounding straps to the mounting base. Back out the machine screws that hold the mounting base on the left hand side.

(5) On the TT-4A/TG and TT-698/TG, lift the ends of the four grounding straps (fig. 3-82) clear of the mounting studs.

(6) Lift the machine clear of the mounting studs; be careful not to snag the lugs of the space bar on the space-bar stops.

b. Replacement.

(1) Replace the mounting base by reversing the procedures outlined in *a* above.

(2) Replace the dust cover (para 3-22a).

3-26. Removal and Replacement of Motor Gear Set and Motor

a. Removal of Motor Gear Set.

(1) On the TT-4(*)/TG and TT-698(*)/TG remove the four machine screws (fig. 3-79) and lockwashers that hold the gear cover and accessory gear set to the frame; remove the gear cover and gasket.

(2) On the TT-335/TG and TT-537/G remove the four machine screws (fig. 3-80) and lockwashers that hold the gear heater casting to the frame; remove the heater casting.

(3) On the TT-4A/TG and TT-698/TG, remove the machine screw (fig. 3-53), lockwashers and mainshaft gear from the main shaft.

(4) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the machine screw, (fig. 3-53) lockwasher, main-shaft gear, and drive keys from the main shaft.

(5) Remove motor *(c* below).

(6) Remove machine screws (8, fig. 3-23), lockwasher, and worm gear.

b. Replacement of Motor Gear Set.

(1) On the TT-4A/TG and TT-698/TG, install the main-shaft gear (fig. 3-53) on the main-shaft; replace the machine screw and lockwasher. Do not tighten the machine screw.

(2) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG install the drive key (fig. 3-54) on the main-shaft gear; install the main-shaft gear and drive key on the main shaft; and replace machine screws and lockwasher. Do not tighten the machine screws.

(3) Install the worm gear on the armature; replace the machine screw (fig. 3-23) and lockwasher; tighten the machine screw.

(4) Replace the motor (below).

(5) Tighten the machine screws (fig. 3-53 or 3-54).

(6) On the TT-4(*)/TG and TT-698(*)/TG reinstall the gasket (fig. 3-79) and gear cover and accessory gear set and secure with the four machine screws and lockwashers.

(7) On the TT-335/TG and TT-537/G reinstall the heater casting (fig. 3-80) with four machine screws and lockwashers.

c. Removal of Motor.

(1) Remove the mounting base (para 3-25).

(2) Carefully turn the machine until it rests on the selector side (left side).

(3) On the TT-4(*)/TG and TT-698(*)/TG, remove the four machine screws (fig. 3-75) and lockwashers that hold the filter box cover on the filter box; remove the filter box cover.

(4) On the TT-335/TG, remove the four machine screws (fig. 3-76) and lockwashers that hold the junction box cover to the junction box. Remove the cover.

(5) On the TT-537/G, remove the machine screws (fig. 3-77) and lockwashers that hold the cover to the second cover of the junction box; remove the cover. Remove the four machine screws, lockwashers, and flat washers that hold the second cover to the studs of the junction box; remove the cover.

(6) Remove the four motor leads from the terminal board; tag the leads to facilitate replacement.

(7) Turn the machine right side up.

(8) On the TT-4A/TG and TT-698/TG, remove the four machine screws and lockwashers that hold the motor to the frame; remove the motor and the shims.

(9) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the three

machine screws (fig. 3-23) and lockwashers that hold the motor to the frame; remove the motor.

(10) On the TT-335/TG, remove the three machine screws (fig. 3-24) and lockwashers that hold the motor to the frame; remove the motor.

d. Replacement of Motor.

(1) Replace the motor by reversing the procedures described in *c* (2) through (10) above. Be sure that the motor of the TT-4A/TG is properly shimmed to provide running clearance between the gears. Position the grease seals (fig. 3-23) between the rear of the motor and the frame. Be sure that the main-shaft gear and the worm gear are meshing properly before tightening the mounting screws.

(2) Replace the mounting base (para 3-25b).

3-27. Removal and Replacement of Keyboard-Transmitter

a. Removal.

(1) Remove the dust cover (para 3-22a).

(2) Pull the assembled keyboard plug cover and plug (fig. 3-21 or 3-22) from the receptacle connector (fig. 3-20).

(3) On the TT-4A/TG and TT-698/TG, remove the two machine screws (fig. 3-18) and lockwashers that hold the space bar to the space-bar arm; remove the space bar.

(4) On the TT-4B/TG and TT-698A/TG, remove the two machine screws (fig. 3-18) and lockwashers that hold the space bar to the space-bar arm; remove the space bar.

(5) On the TT-335/TG and TT-537/G, remove the machine screws (fig. 3-17) and lockwashers that secure the heater casting to the keyboard frame; remove the heater casting. Loosen the setscrew and slide heater HR1 from the casting.

(6) Remove the machine screw (fig. 3-21), lockwasher, selflocking hexagonal nut, and lockwasher that hold the keyboard-transmitter to the instrument panel.

(7) Remove the two machine screws (fig. 3-20) and lockwashers that hold the keyboard frame to the teletypewriter frame.

(8) Pull the keyboard forward to remove it from the frame; be careful not to bend the clutch fork (fig. 3-20).

b. Replacement.

(1) Replace the keyboard-transmitter by reversing the procedures described in *a* above.

(2) Replace the dust cover as described in paragraph 3-22b.

3-28. Removal and Replacement of Platen Assembly

a. Removal.

(1) Remove the dust cover (para 3-22a).

(2) Loosen the nut wing (fig. 3-79) and disengage the platen lock from the platen-locking stud (fig. 3-25).

(3) On the TT-4A/TG and TT-698/TG, remove the cotter pin (fig. 3-47) and flat washer that hold the platen-shift link to the stud on the platen-shift arm.

(4) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the retainer ring (fig. 3-47) that holds the platen-shift link to the stud on the platen-shift arm (fig. 3-25).

(5) On the TT-4A/TG and TT-698/TG, remove the cotter pin (fig. 3-47) and flat washer that hold the connecting link to the stud on the line-feed lever (fig. 3-25).

(6) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the retainer ring (fig. 3-48) that holds the connecting link to the stud on the line-feed lever (fig. 3-25).

(7) On the TT-4A/TG and TT-698/TG, remove the platen-shift bellcrank spring (fig. 3-47) from the hole in the bracket link (fig. 3-27).

(8) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the platen-shift bellcrank spring (fig. 3-48) from the hole in the bracket link (fig. 3-28).

(9) On the TT-4A/TG and TT-698/TG, remove the two machine screws (fig. 3-27) and lockwashers that hold the bracket link to the teletypewriter frame.

(10) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the two machine screws (fig. 3-28), lockwashers and flat washers that hold the bracket link to the teletypewriter frame.

(11) On the TT-4A/TG and TT-698/TG, remove the two cotter pins (fig. 3-27) and flat washers that hold the two connecting links to the platen trough; remove the connecting links.

(12) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the two retainer rings (fig. 3-28) that hold the two connecting links to the platen trough; remove the connecting links.

(13) Remove the two setscrews (fig. 3-25) that hold the two eccentric pivots in each end of the teletypewriter frame.

(14) Hold the platen assembly and pull out the eccentric pivots enough to clear the platen frame. On the TT-4A/TG and TT-698/TG, move the platen assembly back enough to clear the pressure-roller control shaft (fig. 3-27) from the ribbon-lifter bell crank (fig. 3-34). On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, move the platen assembly back so that the pressure-roller operating shaft (fig. 3-28) clears

the ribbon-lifter bellcrank (fig. 3-35). The platen-latching arm (fig. 3-25) must also clear the aperture gate (fig. 3-46).

(15) Remove the platen assembly by moving it toward the selector side frame, permitting the links to disengage from their mating studs.

b. Replacement.

(1) Replace the platen assembly by reversing the procedures described in *a* (2) through (15) above.

(2) Adjust the platen assembly as described in paragraphs 3-220 through 3-234.

(3) Replace the dust cover as described in paragraph 3-22b.

3-29. Removal and Replacement of Carriage

a. Removal.

(1) Remove the dust cover (para 3-22a).

(2) Remove the paper shaft, paper-shaft bracket, and paper chute (para 3-23a).

(3) Move the carriage to the left margin stop and mark the two teeth on the carriage-rack driving gear (fig. 2-29) that engage the last tooth on the carriage rack (fig. 3-29).

(4) Remove the machine screws (fig. 3-29) and lockwashers that hold the carriage guide rail to the frame.

(5) Remove the two machine screws, flat washers, and lockwashers that hold the bearing cap and the type-selecting arm assembly (fig. 3-30) to the carriage frame; remove the bearing cap and type-selecting arm assembly.

(6) Remove the two machine screws (fig. 3-29) and lockwashers that hold the carriage rear-support bracket to the carriage frame; slide the bracket and square-shaft sliding gear toward the right-hand end of the square shaft and remove the bracket.

(7) Lift the carriage forward and upward to remove it from the frame.

b. Replacement.

(1) Position the carriage on the frame so that the two marked teeth of the carriage-rack driving gear are meshed with the last tooth on the left end of the carriage rack.

NOTE

Be sure the bar of the pressure roller assembly (fig. 2-54) is engaged in the groove of the slide bearing of the ribbon-lifter assembly.

(2) Align the carriage guide rail with the two holes in the frame; secure the rail with machine screws and lockwashers.

(3) Turn the square-shaft sliding gear bearing (fig. 3-156) until the flat part of the bearing is adjacent to the function-shaft driven gear. Carefully insert the fingers of the carriage rear-support bracket (fig. 3-29) into the groove in the sliding gear. *Be sure the bracket fingers are aligned with the two flat surfaces in the groove.* Slide the assembled gear and bracket along the square shaft until the holes in the bracket are aligned with the holes in the carriage frame. Fasten the bracket to the frame with two machine screws and lockwashers.

(4) Press the blank keylever and turn the motor manually until the square shaft stops turning. Install the type-selecting arm assembly so that the type-selecting arm is aligned with the last notch in the right-hand side of the guide plate.

(5) Position the bearing cap on the carriage frame; secure with the two machine screws, lockwashers and flat washers.

(6) Adjust the carriage (para 3-190, 3-191 and 3-192).

(7) Replace the paper shaft, paper-shaft bracket, and paper chute (para 3-23b).

(8) Replace the dust cover (para 3-22b).

3-30. Removal and Replacement of Line Terminal Board (not applicable to TT-698(*)/TG)

a. Removal.

(1) Remove the dust cover (para 3-22a)

(2) Remove the machine screw (fig. 3-78), lockwasher, and the knurled nut that hold the terminal board to the teletypewriter frame; remove the terminal board.

(3) Remove the plain hexagonal nut and lockwasher from the set screw.

(4) Remove the five plain hexagonal nuts and lockwashers that hold the electrical leads to the two shorting bars and three of the five binding posts; remove the leads and tag them to facilitate reassembly.

b. Replacement.

(1) Replace the line terminal board by reversing the procedures described in *a* (2) through (4) above.

(2) Replace the dust cover (para 3-22b).

3-31. Removal and Replacement of Instrument Panel (TT-4(*)/TG and TT-698(*)/TG

a. Removal.

(1) Remove the dust cover (para 3-22b).

(2) Pull the assembled keyboard plug cover and plug (fig. 3-21) from the receptacle connector (fig. 3-20).

(3) Remove the line terminal board (para 3-30).

(4) Remove the mounting base (para 3-25a).

(5) Carefully turn the machine onto the selector side.

(6) Remove the four machine screws (fig. 3-75) and lockwashers that hold the filter box cover on the filter box; remove the filter box cover.

(7) On the TT-4A/TG and TT-698/TG, remove the electrical leads of the keyboard cable (fig. 3-21) from the filter box; tag the leads to facilitate reassembly.

(8) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the electrical leads of the instrument-panel cable (fig. 3-21) from the filter box; tag the leads to facilitate reassembly.

(9) Turn the machine right side up.

(10) On the TT-4A/TG and TT-698/TG, remove the two self-locking hexagonal nuts (fig. 3-71) and lockwashers that hold the motor-stop contact shield on the mounting studs; remove the motor-stop contact shield and lockwashers.

(11) On the TT-4A/TG and TT-698/TG, remove all electrical leads of the selector-magnet and motor-stop cable (fig. 3-21); tag the leads to facilitate reassembly.

(12) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the two machine screws, (fig. 3-72) and lockwashers that hold the motor-stop-switch cover to the cover mounting studs; remove the motor-stop-switch cover.

(13) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove all electrical leads of the instrument-panel cable (fig. 3-21) from the motor stop and selector magnet; tag the leads to facilitate reassembly.

(14) On the TT-4A/TG and TT-698/TG, remove the machine screw (fig. 3-21) and lockwasher that hold the cable clamp to the frame. Remove the machine screw and lockwasher that hold the grounding lug of the keyboard cable to the frame. Remove the two machine screws and lockwashers that hold the grounding lug of the selector-magnet and motor-stop cable and the armature-dial-shaft bracket to the frame.

(15) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the two machine screws and lockwashers that hold the grounding lug of the instrument-panel cable and the armature-dial-shaft bracket to the frame. Remove the three machine screws and lockwashers that hold the cable clamps to the frame.

(16) Remove the two machine screws, lockwashers, machine screw, lockwasher, self-locking hexagonal nut, and lockwasher that hold the instrument panel to the frame; remove the instrument panel.

b. Replacement.

(1) Replace the instrument panel by reversing the procedures described in *a* above.

(2) Replace the line terminal board (para 3-30b).

(3) Insert the assembled keyboard plug cover and plug (fig. 3-21) into the receptacle connector (fig. 3-20).

(4) Replace the mounting base (para 3-25b).

3-32. Removal and Replacement of Instrument Panel, TT-335/TG, and TT-537/G

a. Removal.

(1) Remove the dust cover (para 3-22a).

(2) Pull the assembled keyboard plug cover and plug (fig. 3-22) from the receptacle connector (fig. 3-20).

(3) Remove the line terminal board (para 3-30a).

(4) Remove the mounting base (para 3-25a).

(5) Carefully turn the machine onto the selector side.

(6) Remove the four machine screws (fig. 3-76) and lockwashers that hold the junction box cover on the junction box; remove the junction box cover.

(7) Remove the electrical leads of the heater and instrument panel cables (fig. 3-22) from the junction box; tag the leads to facilitate reassembly.

(8) Turn the machine right side up,

(9) Remove the two machine screws (fig. 3-72) and lockwashers that hold the motor-stop-switch cover to the cover mounting studs; remove the motor-stop-switch cover.

(10) Remove all electrical leads of the instrument-panel cable (fig. 3-22) from the motor stop and selector magnet; tag the leads to facilitate reassembly.

(11) Remove the two machine screws and lockwashers that hold the grounding lug of the instrument-panel cable and the armature-dial-shaft bracket to the frame.

(12) Remove the two machine screws, lockwashers, machine screw, self-locking hexagonal nut, and lockwashers that hold the instrument panel to the frame; remove the instrument panel.

b. Reinstallation.

(1) Reinstall the instrument panel by reversing the procedures described in *a* above.

(2) Reinstall the mounting base (para 3-25b).

(3) Reinstall the line terminal board (para 3-30b).

(4) Insert the assembled keyboard plug cover and plug (fig. 3-22) into the receptacle connector (fig. 3-20).

Section VI. DISASSEMBLY AND REASSEMBLY OF TELETYPEWRITER COMPONENTS

This section describes disassembly and reassembly procedures for Teletypewriters (TT-4(*)/TG, TT-337/TG, TT-537/G and TT-698(*)/TG). These procedures are used in conjunction with the removal and replacement procedures described in paragraphs 3-21 through 3-32.

3-33. General Disassembly and Reassembly Procedures

a. Preparation for Disassembly. Before starting to disassemble the teletypewriter proceed as follows:

(1) Arrange a clean place on a bench or table to work. Be certain that dust or dirt will not fall or be blown into the mechanism while it is disassembled.

(2) Obtain several small, clean containers to store removed parts.

(3) Arrange the necessary tools and materials so that they will be readily accessible during the progress of the repair work.

b. Disassembly Procedure.

(1) Disconnect the power and signal line cables from the teletypewriter.

(2) Remove the dust cover (para 3-22a).

(3) Remove the inking ribbon and paper from the teletypewriter.

(4) Disassemble the various parts and assemblies; use the correct tool for each specific operation. Do not disassemble the teletypewriter or its assemblies beyond the point necessary to thoroughly inspect and clean the mechanism, and to repair and replace any parts.

(5) When small parts are disassembled, place them in a container and mark them to identify their origin. Vary the sequence of disassembly to meet any particular situation. Use the procedure that will require the least amount of time without sacrificing quality.

c. General Reassembly Procedures

Reassemble all parts, subassemblies, and units in accordance with the following provisions:

(1) Replace all worn or broken parts that cause malfunctioning of the teletypewriter and adjust them according to the directions in the appropriate paragraphs. While the equipment is disassembled for checking and repair, replace any parts that are likely to cause trouble before the next scheduled overhaul of the machine.

(2) Tighten all screws, nuts, and bolts carefully, but not excessively. Threaded holes in aluminum or magnesium alloy castings and will be stripped if too much force is used. When installing screws in aluminum or magnesium alloy castings, treat them with Anti-seize Compound, NSN 8030-00-292-1102, before installation.

(3) Be careful to install the correct springs in the friction clutches. Some springs are similar in appearance, but they are not identical. Installation of incorrect springs can result in faulty operation and cause premature failure of the clutches.

(4) Be sure to install tapered pins so that the taper of the hole in the shaft and the hole in the part being pinned is matched and that the tapered pin is inserted in the proper direction. Before driving the pins, place a support under the parts to prevent bending or distortion.

(5) If a set screw is used to secure a part to a shaft, remove the set screw from the part and sight down the tapped hole in the part to make sure the hole is in line with the flat on the shaft. If two set screws are used to secure a part to the shaft, be sure *each* tapped hole is aligned with a flat on the shaft.

(6) Some bent and distorted parts may be restored to shape and re-used, if no cracks result from the straightening process and if the hardened surfaces are not softened by the repairs.

(7) If the locking edges of lock washers are rounded, install new lockwashers.

(8) Replace screws or nuts that have damaged heads or threads.

3-34. Disassembly and Reassembly of A1 Terminal Box Assembly

a. Disassembly of A1 Terminal Box Assembly (TT-698(*)/TG) (fig. 3-15).

(1) Disconnect all electrical leads to and from the terminal box.

(2) Remove the three screws, lockwashers, and flatwashers, that hold the terminal box cover (7) to the terminal box; remove the cover.

(3) Remove the two machine screws, lockwashers, and flatwashers that hold the terminal box to the frame assembly; remove the terminal box from the frame assembly.

(4) Remove the transmitter (1, fig. 3-15), receiver (2), and TD clutch/selector magnet driver circuit card (3) assemblies from the terminal box by pulling them out of their connectors, XA1, XA2, and XA3.

(5) Tag and unsolder all wires from connectors (12) XA1, XA2, and XA3.

(6) Remove the two nuts and lockwashers that hold connectors XA1, XA2, and XA3 to the terminal box; remove connectors XA1, XA2, and XA3.

(7) Tag and then unsolder the four wires from transformer T1 (10).

(8) Remove the two machine screws, lockwashers, flat-washers, and hex-nuts from transformer T1; remove the transformer.

(9) Unsolder the red wire from voltage regulator VR1 (13).

(10) Remove the hex-nut and washers from VR1; remove VR1.

(11) Tag and unsolder the three wires going to the power supply assembly (8) that come from the cable assembly.

(12) Remove the two machine screws, lockwashers, flatwashers, and hex-nuts from the power supply assembly SM-C-785990; remove the power supply assembly.

(13) Tag and unsolder the five wires from terminal board TB1 (11).

(14) Remove the four machine screws, lockwashers, flatwashers, and two terminal board mounting plates that hold terminal board TB1 to the terminal box; remove TB1.

(15) Remove the machine screw lockwasher and flatwasher that secures the cable clamp (29).

(16) Remove the grommet.

b. Reassembly. Reassemble the components of the terminal box as indicated in figure 3-15. The sequence for assembling the parts is the reverse of the disassembly sequence. Refer to the schematic diagram as shown in figure FO7, for the proper electrical connections.

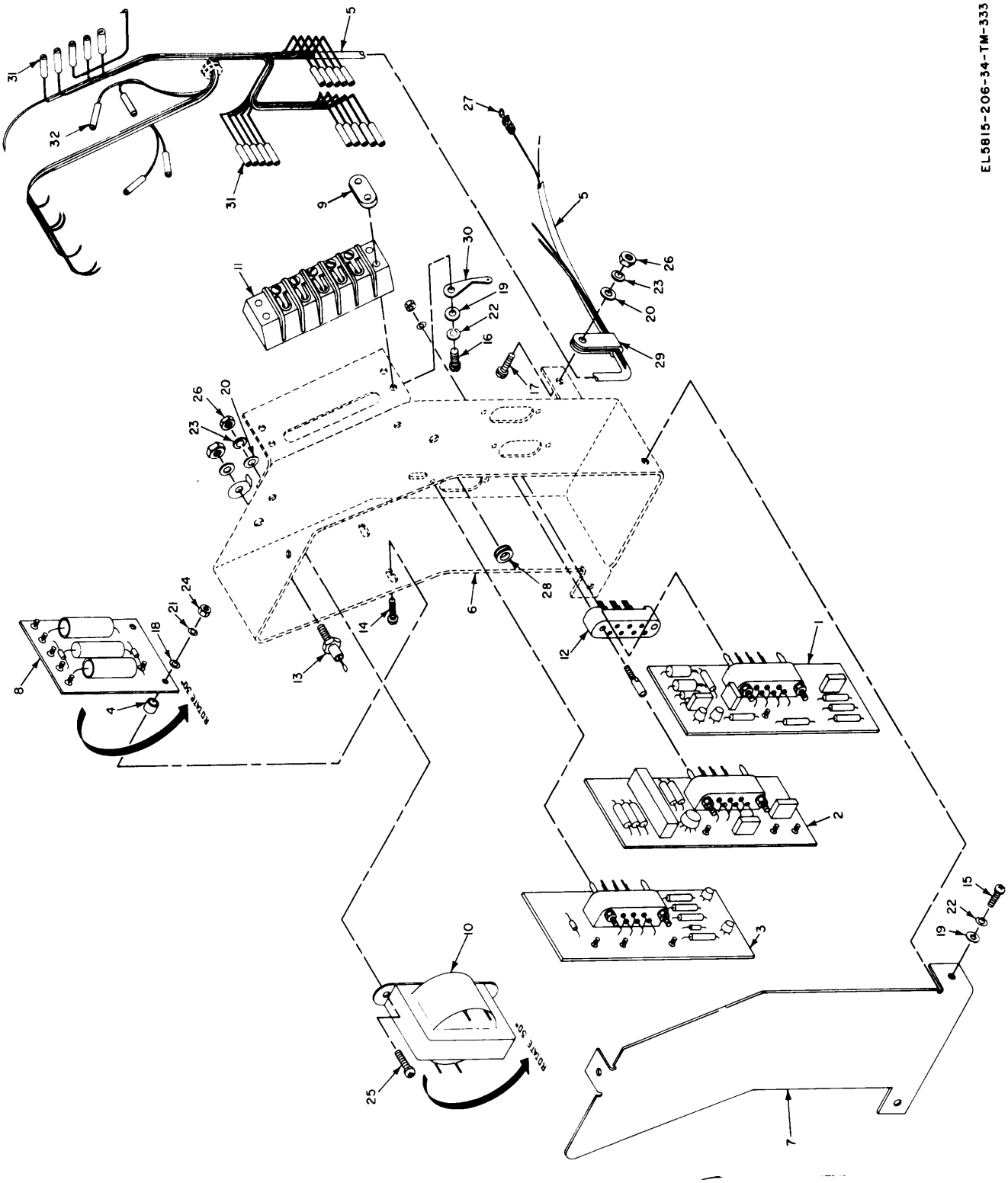


Figure 3-15. A1 terminal box assembly, exploded view.

1 Transmitter circuit card assembly, SM-C-759840
2 Receiver circuit card assembly, SM-C-759849
3 TD clutch/circuit card assembly, SM-C-759866
4 Spacer, round, SM-B-785948-1
5 Cable, SM-C-785959
6 Welded assy, SM-D-785972
7 Cover, SM-D-785973
8 Power supply circuit card assembly, SM-C-785990
9 Terminal board mounting plate, SM-B-785996
10 Transformer, SM-C-786100
11 Terminal board, 40TB5
12 Electrical connector receptacle, M55302/17-13
13 Semiconductor device. JAN1N2989B
14 Screw, pan hd, 4-40 x 1/2, MS51957-17
15 Screw, pan hd, 6-32 x 7/16, MS51957-29
16 Screw, pan hd, 6-32 x 5/8, MS51957-31
17 Screw, pan hd, 8-32 x 1/2, MS51957-45
18 Washer, flat, No. 4, MS15795-803
19 Washer, flat, No. 6, MS15795-805
20 Washer, flat, No. 8, MS15795-807
21 Washer, lock, No. 4, MS35338-135
22 Washer, lock, No. 6, MS35338-136
23 Washer, lock, No. 8, MS35338-137
24 Hex nut, No. 4-40, MS35649-244
25 Screw, pan hd, 8-32 x 5/16, MS51957-42
26 Hex nut, No. 8-32, MS35649-284
27 Terminal, lug, MS25036-101
28 Grommet, MS35489-4
29 Wire support clamp, MS25281-F3
30 Terminal, lug, MS77066-2
31 Insulated sleeving, .125 diameter
32 Insulated sleeving, .250 diameter

3-35. Disassembly and Reassembly of Transmission Contacts and Contact Assembly

a. Disassembly (fig. 3-16).

(1) Remove the two machine screws and lockwashers that hold the contact cover (3) to the keyboard frame; remove the contact cover and two lockwashers.

(2) Unhook the end of the contact-bail spring (7) from the spring post on the contact plate (17) and from the hole in the contact bail (11).

(3) Remove the machine screw, lockwasher, and the two electrical terminal lugs from the side of the contact plate.

(4) Remove the retainer ring (10) that holds the contact bail to the spring post on the keyboard frame; remove the contact bail.

(5) Remove the two machine screws and lockwashers, and unsolder the two contact wires that hold the two contact terminals to the contact plate; remove the two contact terminals.

(6) Remove the two contacts (15) from the contact plate.

(7) Remove the two machine screws and lockwashers that hold the contact plate to the keyboard frame; remove the contact plate.

NOTE

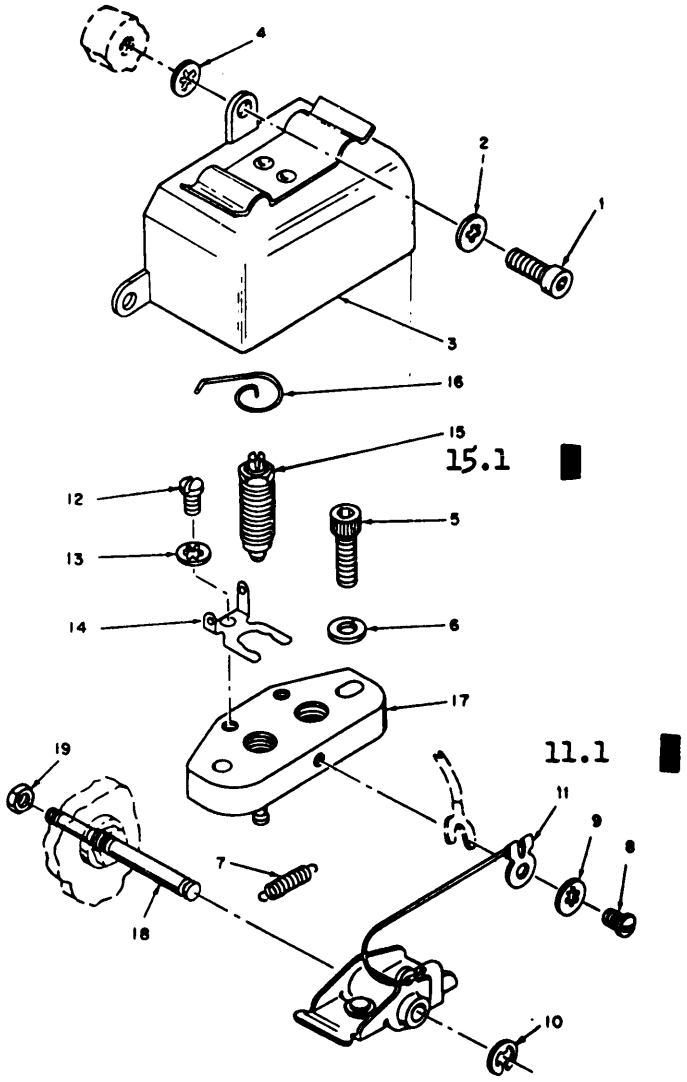
On low level units only, contact bail (11.1), NSN 5999-00-411-3141, must be used. Contact (15.1), NSN 5999-00-444-2223, must also be used only on low level units.

b. Reassembly (fig. 3-16).

(1) Reassemble the contacts as indicated in fig. 3-16; the sequence for assembling the parts is the reverse of disassembly, except that the two contact terminals should be inserted in the threads of the contacts, 1/2 to 1-1/2 threads above the contact plate.

(2) Adjust the contacts (para 3-127).

c. and *d.* Deleted.



EL5815-206-34-C2-TM-335

Figure 3-16. Transmitter contact assembly, exploded view.

1 Machine screw, 10055
2 Lockwasher, 12403
3 Contact cover, 51579A
4 Lockwasher, 10430
5 Machine screw, 10009
6 Lockwasher, 10430
7 Contact-bail spring, 51548
8 Machine screw, 12308
9 Lockwasher, 12403
10 Retainer ring, 10949
11 Contact bail E4, 51582A (high level)
11.1 Contact bail, SMB-930672 (low level)
12 Machine screw 12301
13 Lockwasher, 12403
14 Contact terminal, 51697
15 Contact, 51588A (high level)
15.1 Contact, SMB-930674 (low level)
16 Contact wire, 51610
17 Contact late, 51595A
18 Post 51581
19 Self-locking hexagonal nut, 10501

NOTE

Items 12 through 16 are part of transmitter contact plate.

3-36. Disassembly and Reassembly of Keyboard-Transmitter Sensing and Selector Lever Assembly

(fig. 3-17)

a. Disassembly.

(1) Remove the keyboard-transmitter from the teletypewriter (para 3-27a).

(2) Remove the set screw (l, fig. 3-17) and remove the sensing-lever pivot stud (2). Catch the laminated washer(3) and six spacers (4) as they are released by the stud. Remove the five sensing levers (5). Catch the felt lubricating washer, when supplied, as it is released by the stud.

(3) Remove the sensing-lever locking-bail spring (15) from the sensing-lever-locking bail (16) and from the selector-lever-spring bracket (43). Remove the six selector-lever springs (15) from the selector levers and from the selector-lever-spring bracket. Disconnect the cam-stop-lever spring from the selector-lever-spring bracket (fig. 3-17).

(4) Remove the two machine screws and lockwashers. On the TT-335/TG, disconnect the keyboard heater leads at terminal board TB1 in the junction box, and remove the heater casting assembly (46). On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-698/TG and TT-698B/TG, remove the adjusting plate (52) from the selector lever comb (57).

(5) Remove the setscrew that holds the heater assembly (48) in the heater casting. Remove the heater assembly.

(6) Unsolder the terminals. Remove the grommet (49) and tubing (51) from the heater.

(7) Remove the two machine screws, lockwashers and flat washers that hold the stop-selector-lever latch (56) to the selector-lever comb; remove the stop-selector-lever latch.

(8) Remove the self-locking hexagonal nut (17). Remove the eccentric bearing (18) and sensing-lever-locking bail (19).

(9) Remove the spacing collar (20) and the six selector levers (21), the six selector-lever bearings (22), and five flat washers from the selector-lever pivot post, alternating selector lever, bearing, and flat washer until all are removed. On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT698B/TG, an additional selector-lever spacer and felt lubricating washer, when supplied, must be removed from the selector-lever pivot post.

(10) Remove the self-locking hexagonal nut and remove the selector-lever pivot post.

(11) Remove the two machine screws and lockwashers. Remove the selector-lever-spring bracket (43).

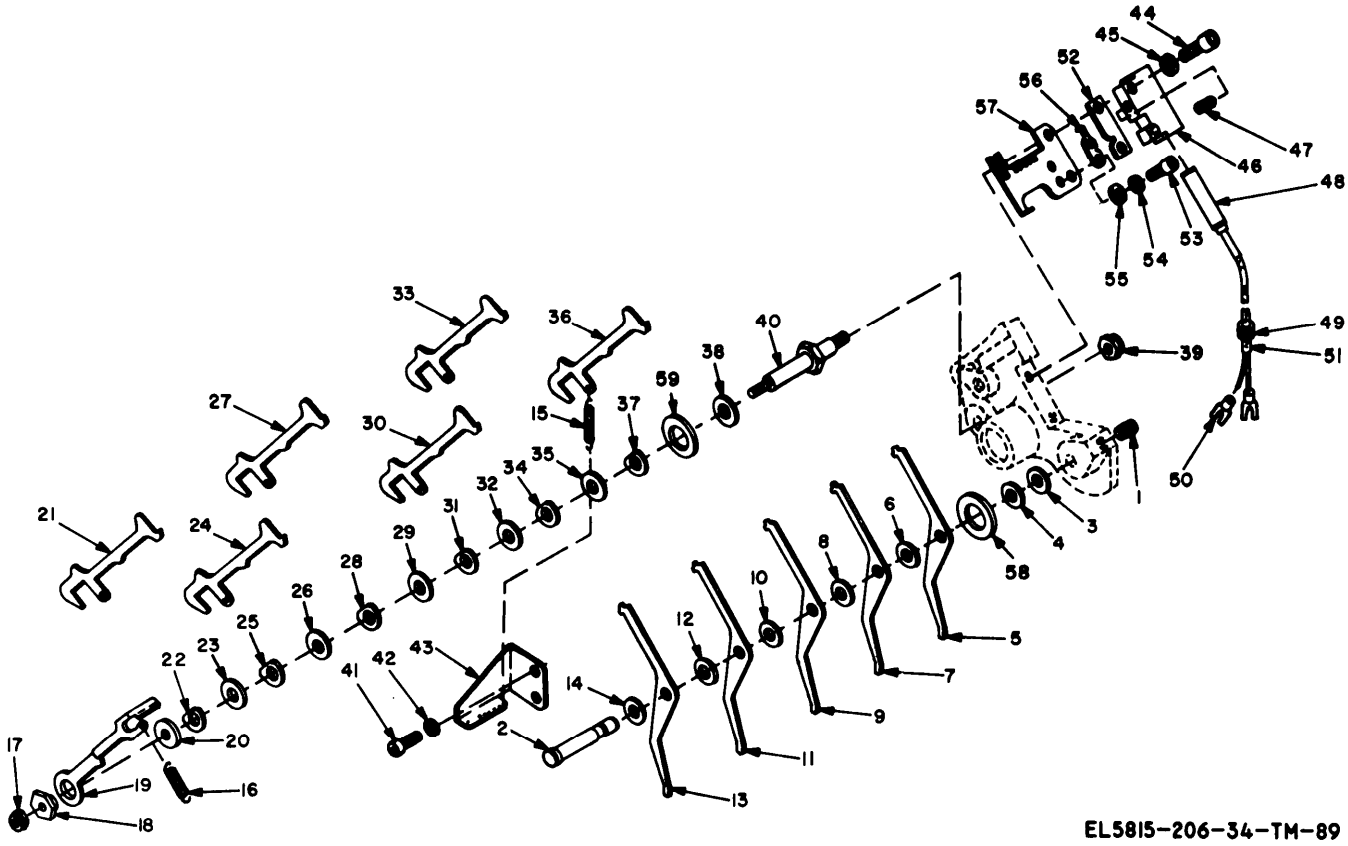


Figure 3-17. Keyboard-transmitter sensing and selector lever assembly, exploded view (TT-4(*)/TG, TT-335/TG, TT-537/G and TT-698(*)/TG).

Key to fig. 3-17:

1 Setscrew, 10210
2 Sensing-lever pivot stud, 51562
3 Laminated washer, 53526
4 Spacer, 50147 (Set of 6)
5 Sensing lever, 51573A (Set of 5)
6 Spacer, 50147
7 Sensing lever, 51573A
8 Spacer, 50147
9 Sensing lever, 51573A
10 Spacer, 50147
11 Sensing lever, 51573A
12 Spacer, 50147
13 Sensing lever, 51573A
14 Spacer, 50147
15 Selector-lever spring, 50902
16 Sensing-lever-locking bail spring, 51574
17 Self-locking hexagonal nut 10500 (10513 on TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG)
18 Eccentric bearing, 51557
19 Sensing-lever-locking bail, 51567
20 Spacing collar, 51555
21 Selector lever, 51598A
22 Bearing, 50019A (set of 6)
23 Flat washer, 50147 (or 53526 laminated spacer)
24 Selector lever, 51598A
25 Bearing, 50019A
26 Flat washer, 50147
27 Selector lever, 51598A
28 Bearing, 50019A
29 Flat washer, 50147
30 Selector lever, 51598A
31 Bearing, 50019A
32 Flat washer, 50147
33 Selector lever, 51598A
34 Bearing, 50019A
35 Flat washer, 50147
36 Selector lever, 51598A
37 Bearing, 50019A
38 Selector-lever spacer, 51047 [a]
39 Self-locking hexagonal nut 10501
40 Selector-lever pivot post, 51561
41 Machine screw, 10003
42 Lockwasher, 10429
43 Selector-lever-spring bracket, 51559
44 Machine screw, 10008 (10009 on TT-335/TG and TT-537/G)
45 Lockwasher, 10430
46 Heater casting, 64939A*
47 Setscrew 10231 *
48 Heater (HR1), 23240*
49 Grommet, 20725*
50 Terminal, 21065.0002
51 Plastic tubing
52 Adjusting plate, 55869*
53 Machine screw, 10001
54 Lockwasher, 10429
55 Flat washer, 10459
56 Stop-selector-lever latch, 55870
57 Selector-lever comb, 51558
58 Felt lubricating washer, 61466*
59 Felt lubricating washer, 61467* (61488 on TT-537/G)

* Used in TT-335/TG and TT-537/G.

NOTE
Some equipments have lubricating washers

b. Reassembly.

(1) Reassemble the keyboard-transmitter sensing and selector lever assembly as indicated in figure 3-17. The sequence for assembling the parts is the reverse of the disassembly sequence.

NOTE
All bearings must have chamfered face in same direction.

(2) Replace the keyboard-transmitter on the teletypewriter (para 3-27b).

(3) Adjust the keyboard-transmitter sensing and selecting lever assembly (para 3-121 through 3-124, and 3-127).

3-37. Disassembly and Reassembly of Keylevers and Code Bars (TT-4(*)/TG TT-337/TG, TT-537/ G and TT-698(*)/TG)

(fig. 3-18)

a. Disassembly.

(1) Remove the keyboard-transmitter from the teletypewriter (para 3-27a).

(2) On the TT-4A/TG and TT-698/TG, remove the two retainer rings that hold the space-bar-arm shaft (9, Fig. 3-18) in the front keylever guide (37). Remove the space-bar-arm shaft that holds the space-bar arm (11) to the front keylever guide; remove the space-bar-arm.

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the two retainer rings that hold the space-bar-arm shaft in the front keylever guide. Remove the space-bar-arm shaft that holds the space-bar arm (12) to the front keylever guide; remove the space-bar spring (10) and the space-bar arm.

(4) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the three machine screws and lockwashers that hold the keylever-locking bar (15) to the keylever mounting bracket (26); remove the keylever-locking bar.

(5) Remove the 31 keylever springs (16) from the keylevers and from the keylever mounting bracket.

(6) Remove the space-bar-lever spring (17) from the space-bar lever (23) and from the keylever mounting bracket.

(7) Remove the assembled keytops (18) and short keylevers (19), keytops and medium keylevers

(20), and keytops and long keylevers (21) (TT-4B/TG , TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG). If a keytop of the TT-4A/TG or TT-698/TG is damaged, remove the damaged keytop and replace it with the appropriate keytop ((a) through (c) below). If a keytop of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG is damaged, replace the keylever and keytop assembly.

(a) Short keylevers and keytop chart.

Part reference designation		
TT-4A TG and TT-698 TG round keytop	TT-4B TG, TT-4C TG, TT-335 TG, TT-537 G, TT-698A TG and TT-698B TG square keytop with keylever	Keytop symbols
50777	54033A	Q 1
50778	54034A	W 2
50779	54035A	E 2
50780	54036A	R 4
50781	54037A	T 5
50782	54038A	Y 6
50783	54039A	U 7
50784	54040A	I 8
50785	54041A	O 9
50786	54042A	P Ø

(b) Medium keylevers and keytop chart.

Part reference designation		
TT-4A TG and TT-698 TG round Keytop	TT-4B TG, TT-4C TG, TT-335 TG, TT-537 G, TT-698A TG and TT-698B TG square keytop with keylever	Keytop symbols
50787	54044A	A
50788	54045A	S BELL
50789	54046A	D $
50790	54047A	F !
50791	54048A	G &
50792	54049A	H STOP
50793	54050A	J
50794	54051A	K (
50795	54052A	L)
50796	54053A	CAR RET

(c) Long keylevers and keytop chart.

Part reference designation		
TT-4A TG and TT-698 TG round keytop	TT-4B TG, TT-4C TG, TT-335 TG, TT-537 G, TT-698A TG and TT-698B TG square keytop with keylever	Keytop symbols
50797	57805A	FIGS
50798	60218A	Z "
50799	57807A	X /
50800	57808A	C :
50801	60219A	V ;
50802	57810A	B ?
50803	57811A	N ,
50804	57812A	M . .
50805	57813A	LTRS
50806	57814A	LINE FEED
50807	60220A	

(8) Remove the space-bar lever.

(9) On the TT-4A/TG and TT-698/TG, unsolder the leads to the filter (8, fig. 3-20). Remove the machine screw, lockwasher, and self-locking hexagonal nut that hold the filter to the keyboard frame; remove the filter and the lockwasher.

(10) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, unsolder the leads to the filter (9, fig. 3-20). Remove the two machine screws and lockwashers that hold the filter to the keyboard frame and to the keylever mounting bracket (fig. 3-18). Remove the filter and the lockwasher (fig. 3-20).

(11) Remove the four machine screws (fig. 3-18) and lockwashers that hold the keylever mounting bracket to the keyboard frame; remove the keylever mounting bracket.

(12) Remove the machine screw and lockwasher that hold the assembled switch-box cover (fig. 3-20) to the front keylever guide (fig. 3-18).

(13) Lift up the assembled switch-box cover to remove the machine screw and lockwasher; remove the machine screw and lockwasher that hold the loop of the cable (fig. 3-20).

(14) Remove the two machine screws (fig. 3-18) and lockwashers that hold the cable clamps to the front keylever guide; remove the cable clamps from the cable (fig. 3-20).

(15) Remove the universal-bar return spring (34, fig. 3-18) from the spring post on the front keylever guide and from the spring post on the universal bar.

(16) Remove the machine screw and lockwasher that hold the front keylever guide (37) to the code-bar guide studs (41); remove the front keylever guide.

(17) Remove the two machine screws and lockwashers that hold the two code-bar guide studs; remove the code-bar guide studs.

(18) Remove the middle keylever guide (40) from the code-bar guide studs.

(19) Remove the two code-bar guide studs from the five code bars and the universal bar (47).

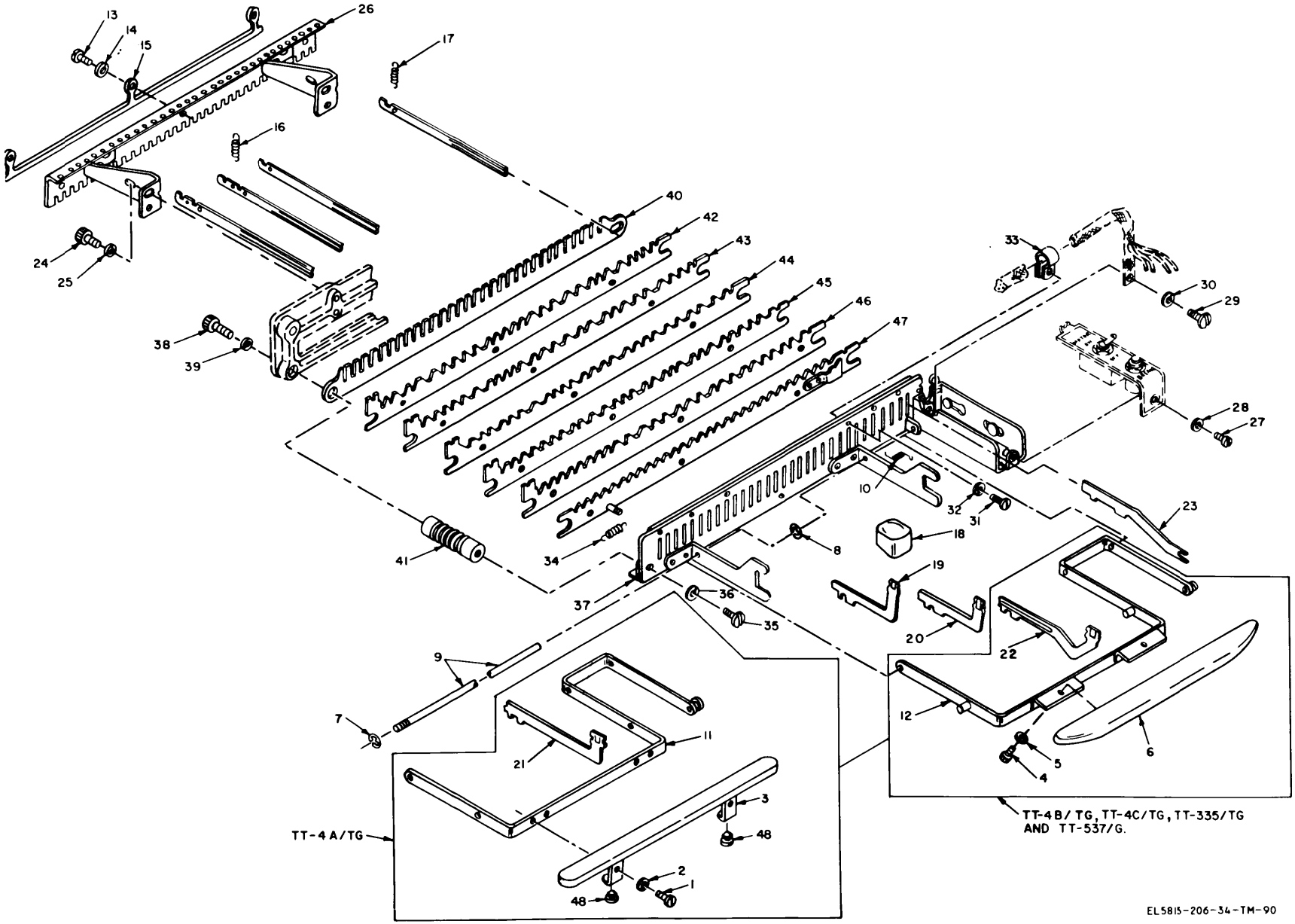


Figure 3-18. Keylevers and code bars, exploded view.

Key to fig. 3-18:

1 Machine screw, 10002
2 Lockwasher, 10429
3 Spacebar, 50845
4 Machine screw, 10001
5 Lockwasher, 10429
6 Spacebar, 53944A
7 Retainer ring, 51099[a], 10969[b]
8 Retainer ring, 51099[a], 10969[b]
9 Space-bar-arm shaft, 50808[a], 55862[b]
10 Space-bar spring, 56688[b]
11 Space-bar arm, 50687A
12 Space-bar arm, 57793A
13 Machine screw, 10304[b]
14 Lockwasher, 10429[b]
15 Keylever-locking bar, 53210[b]
16 Keylever spring, 50941
17 Space-bar-lever spring, 50942, 53974[b]
18 Keytop (see keytop chart)
19 Short keylever, 52582[a], 55917[b]
20 Medium keylever, 52583[a], 55918[b]
21 Long keylever, 52584
22 Long keylever, 57815
23 Spacebar lever, 55916
24 Machine screw, 10015
25 Lockwasher, 10405[a], 10431[b]
26 Keylever mounting bracket, 52918A[a], 57279A[b]
27 Machine screw, 12308
28 Lockwasher, 10403
29 Machine screw, 50207[a], 12308[b]
30 Lockwasher, 10403
31 Machine screw, 12308
32 Lockwasher, 10403
33 Cable clamp, 20729
34 Universal-bar return spring, 51136
35 Machine screw, 50207[a], 10024[b]
36 Lockwasher, 10405
37 Front keylever guide, 57791A[b]
38 Machine screw, 10017
39 Lockwasher, 10405[a], 10431[b]
40 Middle keylever guide, 52915
41 Code-bar guide stud, 51560
42 Code bar, 53299
43 Code bar, 53298
44 Code bar, 53297
45 Code bar, 53296
46 Code bar, 53295
47 Universal bar, 51134A
48 Bumper, rubber, 10905

[a] Used on TT-4A/TG and TT-698/TG.
[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG.

b. Reassembly.

(1) Reassemble the keylevers and code bars by reversing the procedures outlined in a above.

(2) Replace the keyboard-transmitter on the teletypewriter as described in paragraph 3-27b.

(3) Adjust the keylever-locking bar and the universal bar as described in paragraphs 3-116 and 3-119.

3-38. Disassembly and Reassembly of Keyboard-Transmitter-Camshaft Locking Mechanism

(fig. 3-19)

a. Disassembly.

(1) Remove the keyboard-transmitter (para 3-27a).

(2) Unhook the locking-lever-latch spring (1, fig. 3-19) from the locking-lever latch (9) and from the spring post on the keyboard frame.

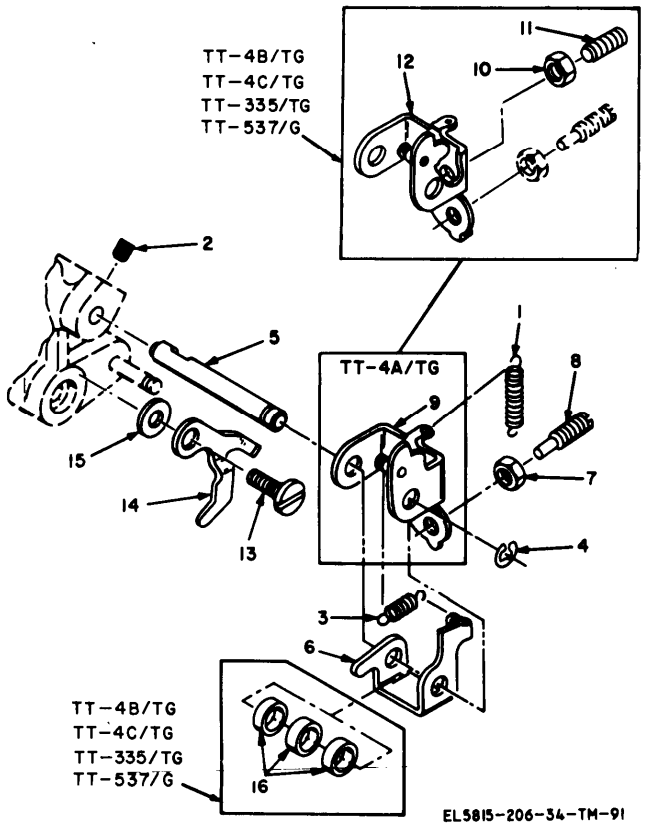
(3) Remove the set screws (2) that holds the locking-lever-latch stud assembly (5) in the keyboard frame; remove the locking-lever-latch stud assembly.

(4) Unhook the repeat-blocking-lever spring (3) from the repeat-blocking lever (6) and from the spring post on the-locking-lever latch.

(5) Remove the retainer ring (4) from the locking-lever-latch stud; remove the locking-lever-latch stud and repeat-blocking lever from the locking-lever latch. Catch the three felt lubricating washers (16) when supplied, as they fall free of the locking-lever-latch stud.

(6) Remove the plain hexagonal nut and universal-bar adjusting screw from the locking-lever latch. On the TT-4B/TG, TT-4C/TG, TT-337/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the plain hexagonal nut (10) and setscrew (11) from the locking-lever latch (12).

(7) Remove the repeat-lever pivot stud, (13), repeat lever (14), and flat washer from the keyboard frame.



1 Locking-lever-latch spring, 51544
2 Setscrew, 10210
3 Repeat-blocking-lever spring, 50944
4 Retainer ring, 10949
5 Locking-lever-latch stud, 51564
6 Repeat-blocking lever, 59477
7 Plain hexagonal nut, 10507
8 Universal-bar adjusting screw, 50658
9 Locking-lever latch, 51570A
10 Plain hexagonal nut, 10507
11 Setscrew, 10233
12 Locking-lever latch, 59475A
13 Repeat-lever pivot stud, 51568
14 Repeat lever, 50615
15 Flat washer, 50414
16 Felt lubricating washer, 61468

Figure 3-19. Keyboard-transmitter-camshaft locking mechanism, exploded view.

b. Reassembly.

(1) Reassemble the keyboard-transmitter-camshaft locking mechanism as indicated in figure 3-19; the sequence for assembling the parts is the reverse of disassembly.

(2) Replace the keyboard-transmitter (para 3-27b).

(3) Adjust the keyboard-transmitter-camshaft locking mechanism (para 3-118, 3-119, and 3-120).

3-39. Disassembly and Reassembly of Transmitter Camshaft and Filter

(fig. 3-20)

a. Disassembly.

(1) Remove the keyboard-transmitter from the teletypewriter (para 3-27a).

(2) Remove the keylevers and code bars (para 3-27a).

(3) Remove the two machine screws and lockwashers that hold the receptacle connector, (14, fig. 3-20), jumper wire (13), and grounding lug of the cable to the keyboard frame (37); remove the jumper wire and the connector.

(4) Unsolder the electrical leads of the cable from the assembled BREAK switch (17) and MOTOR switch (21); remove the cable.

(5) Remove the plain hexagonal nut (16) that holds the BREAK switch to the switch-box cover; remove the BREAK switch.

(6) Remove the plain hexagonal nut (18) that holds the switch-box cover to the MOTOR switch; remove the switch-box cover and the plain hexagonal nut.

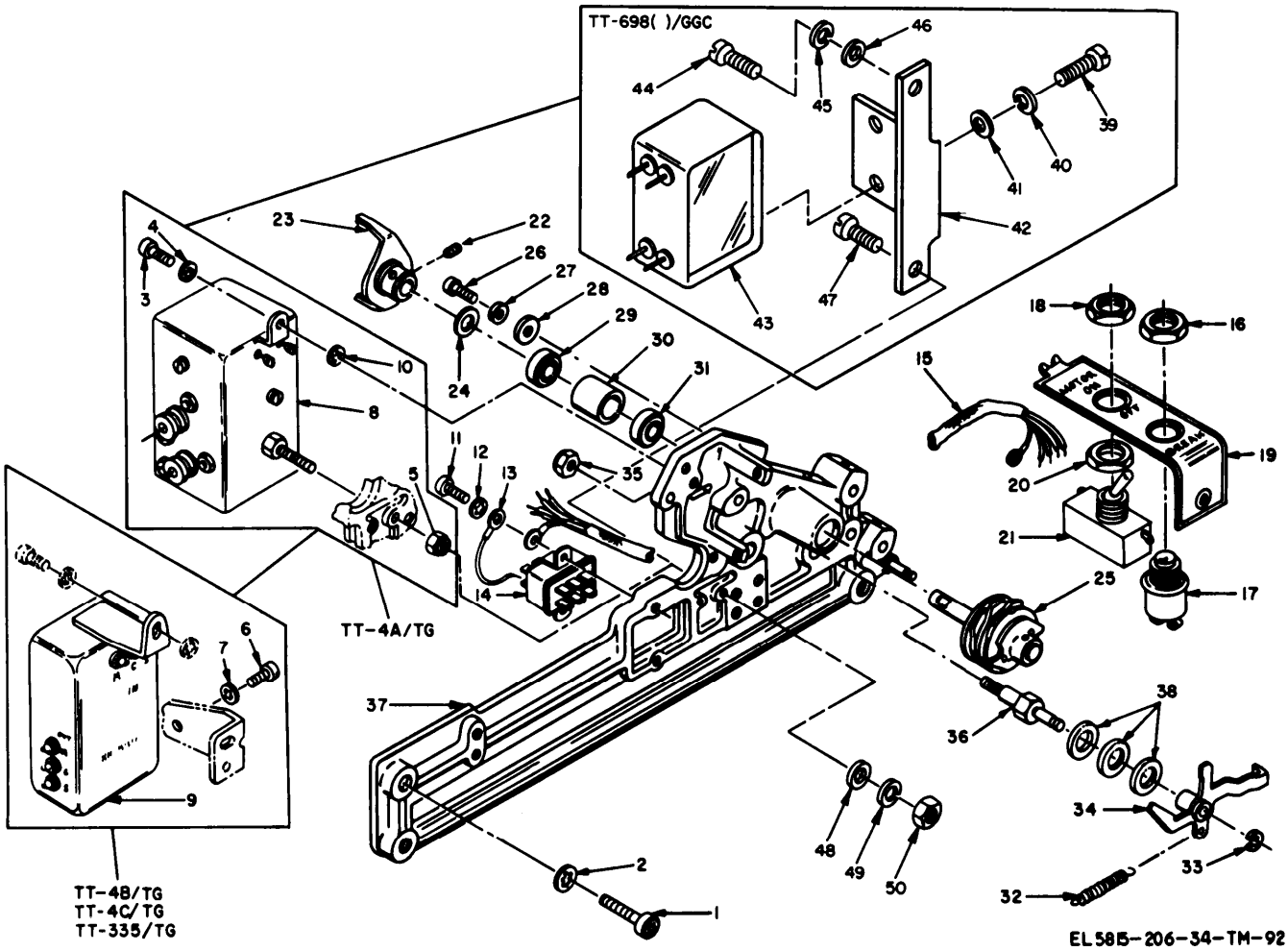
(7) Remove the two setscrews (22) that hold the clutch fork (23) to the transmitter camshaft; remove the clutch fork and spacer from the transmitter camshaft. Remove the transmitter camshaft from the keyboard frame.

(8) Remove the two machine screws, lockwashers, and flat washers that hold the ball bearing (29), collar (30), and ball bearing (31) in the keyboard frame; remove the two ball bearings and collar.

(9) Remove the cam-stop-lever spring (32) from the cam-stop lever (34).

(10) Remove the retainer ring (33) that holds the cam-stop lever to the cam-stop-lever post (36); remove the cam-stop-lever. Remove the three felt washers, when supplied, from the cam-stop-lever post.

(11) Remove the self-locking hexagonal nut (35) that holds the cam-stop-lever post in the keyboard frame; remove the cam-stop-lever post.



1 Machine screw, 10027
2 Lockwasher, 10400
3 Machine screw, 10001[a], 10055[b]
4 Lockwasher, 10403
5 Self-locking hexagonal nut, 10500
6 Machine screw, 12301
7 Lockwasher, 10403
8 Filter 22, 54576
9 Filter FL2, 54576
10 Lockwasher, 10403
11 Machine screw, 10003[a], 10064[b]
12 Lockwasher, 10403
13 Jumper wire, 51665A
14 Receptacle connector J2, 20400[a], 20259[b]
15 Cable, 51624A
16 Plain hexagonal nut
17 BREAK switch S3, 20101 (includes item 16)
18 Plain hexagonal nut
19 Switch-box cover, 50703
20 Plain hexagonal nut
21 MOTOR switch S2, 20102, (includes items 18 and 20)
22 Setscrew, 10209
23 Clutch fork, 50484A
24 Spacer, 51552
25 Transmitter camshaft, 51545A
26 Machine screw, 10003
27 Lockwasher, 10429
28 Flat washer, 10458
29 Ball bearing, 10753
30 Collar, 51599
31 Ball bearing, 10753
32 Cam-stop-lever spring, 51575
33 Retainer ring, 10949
34 Cam-stop lever, 51549A
35 Self-locking hexagonal nut, 10501
36 Cam-stop-lever post, 51563
37 Keyboard frame, 57295A, 60510[b]
38 Felt lubricating washer, 61469[b]
39 Pan head screw, 6-32 x 3/8, MS51957-28
40 Lock washer no. 6, MS35338-136
41 Flat washer No. 6, MS15795-805
42 Noise suppressor bracket, SM-C-785977
43 Noise suppressor, SM-D-759881
44 Pan head screw, 6-40 x 1/2, MS51958-30
45 Lock washer No. 6, MS35338-136
46 Flat washer, MS15795-805
47 Pan head, 6-32 x 5/8, MS51957-31
48 Flat washer No. 6, MS15795-805
49 Lock washer, MS35338-136
50 Hex nut, 6-32 UNC, MS35649-264

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG and TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG.

Figure 3-20. Transmitter camshaft and filter, exploded view.

b. Reassembly.

(1) Reassemble the transmitter camshaft as indicated in figure 3-20; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the keylevers and code bars (para 3-37b).

(3) Replace the keyboard-transmitter on the teletypewriter (para 3-27b).

(4) Adjust the transmitter camshaft and filter (para 3-117).

3-40. Disassembly and Reassembly of Instrument Panel (TT-4(*)/TG and TT-698(*)/TG (fig. 3-21)

a. Disassembly.

(1) Remove the instrument panel (para 3-31a).

(2) Remove the two setscrews that hold the armature worm (28, fig. 3-21) on the armature-dial shaft (48); remove the armature worm and the armature-dial-shaft bracket (29).

(3) Remove the armature spring (30) from the armature-spring arm (33) and from the selector-magnet armature (fig. 3-38).

(4) Remove the machine screw (31, fig. 3-21) and clamp nut (32) that hold the armature-spring arm to the armature-worm shaft (36); remove the armature-spring arm.

(5) Remove the two setscrews that hold the armature-worm arm (35) to the armature-worm shaft; remove the armature-worm arm. Remove the armature- worm shaft from the frame.

(6) Remove the two setscrews that hold the rangefinder cam (38) to the rangefinder shaft (43); remove the rangefinder cam.

(7) Remove the two setscrews that hold the collar (40) to the rangefinder shaft; remove the collar.

(8) Remove the two setscrews that hold the rangefinder gear (42) to the rangefinder shaft; remove the rangefinder gear.

(9) Remove the machine screw and dial-clamp nut (45) that hold the dial clamp (46) to the panel; remove the dial clamp.

(10) Remove the taper pin from the armature-dial shaft in the panel; remove the armature-dial shaft.

(11) Remove the two setscrews that hold the rangefinder gear (50) to the rangefinder dial (54); remove the rangefinder gear.

(12) Remove the machine screw and dial-clamp nut (52) that hold the dial clamp (53) to the panel; remove the dial clamp and the rangefinder dial.

(13) On the TT-4A/TG and TT-698/TG, remove the plain hexagonal nut (55), lock washers, and machine screw (58) that hold the grounding lug of the selector-magnet and motor-stop cable (63).

(14) On the TT-4A/TG and TT-698/TG, unsolder the electrical leads of the selector-magnet and motor-stop cable; tag the leads to facilitate reassembly.

(15) Remove the drive screw (64) that holds the plug (65) in the keyboard plug cover; remove the plug and unsolder the electrical leads of the keyboard cable (73), or instrument-panel cable (78). Tag the leads to facilitate reassembly.

(16) On the TT-4A/TG and TT-698/TG, unsolder the electrical leads of the keyboard cable; tag the leads to facilitate reassembly.

(17) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-398B/TG unsolder the leads of the instrument-panel cable; tag the leads to facilitate reassembly.

(18) Remove the plain hexagonal nut that holds the switch (80) to the panel; remove the switch. Do not remove the electrical leads from the switch to the copy-light connector unless necessary.

(19) Remove the setscrew that holds the knob (83) on the shaft of the resistor (86); remove the knob.

(20) Remove the plain hexagonal nut and lockwasher that hold the resistor to the panel; remove the resistor.

(21) Remove the fuse cap (87) that holds the fuse (88) in the fuse holder (92); remove the fuse.

(22) On the TT-4A/TG and TT-698/TG, remove the plain hexagonal nut (89) that holds the fuse holder to the panel; remove the fuse holder and the rubber washer (91).

(23) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the plain hexagonal nut and lockwasher that hold the fuse holder to the panel; remove the fuse holder and the rubber washer.

(24) Remove the fuse cap (93) that holds the fuse (94) in the fuse holder (98); remove the fuse.

(25) On the TT-4A/TG and TT-698/TG, remove the plain hexagonal nut (95) that holds the fuse holder on the panel; remove the fuse holder and the rubber washer (97).

(26) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the plain hexagonal nut and lockwasher that hold the fuse holder to the panel; remove the fuse holder and the robber washer.

(27) On the TT-4A/TG and TT-698/TG, remove the three plain hexagonal nuts, lockwashers, and machine screws that hold the milliammeter (102) to the panel; remove the milliammeter.

(28) On the TT-4B/TG, TT-4C/TG, TT-698A/TG, and TT-698B/TG, remove the four plain hexagonal nuts, lockwashers, and machine screws that hold the milliammeter to the panel: remove the milliammeter.

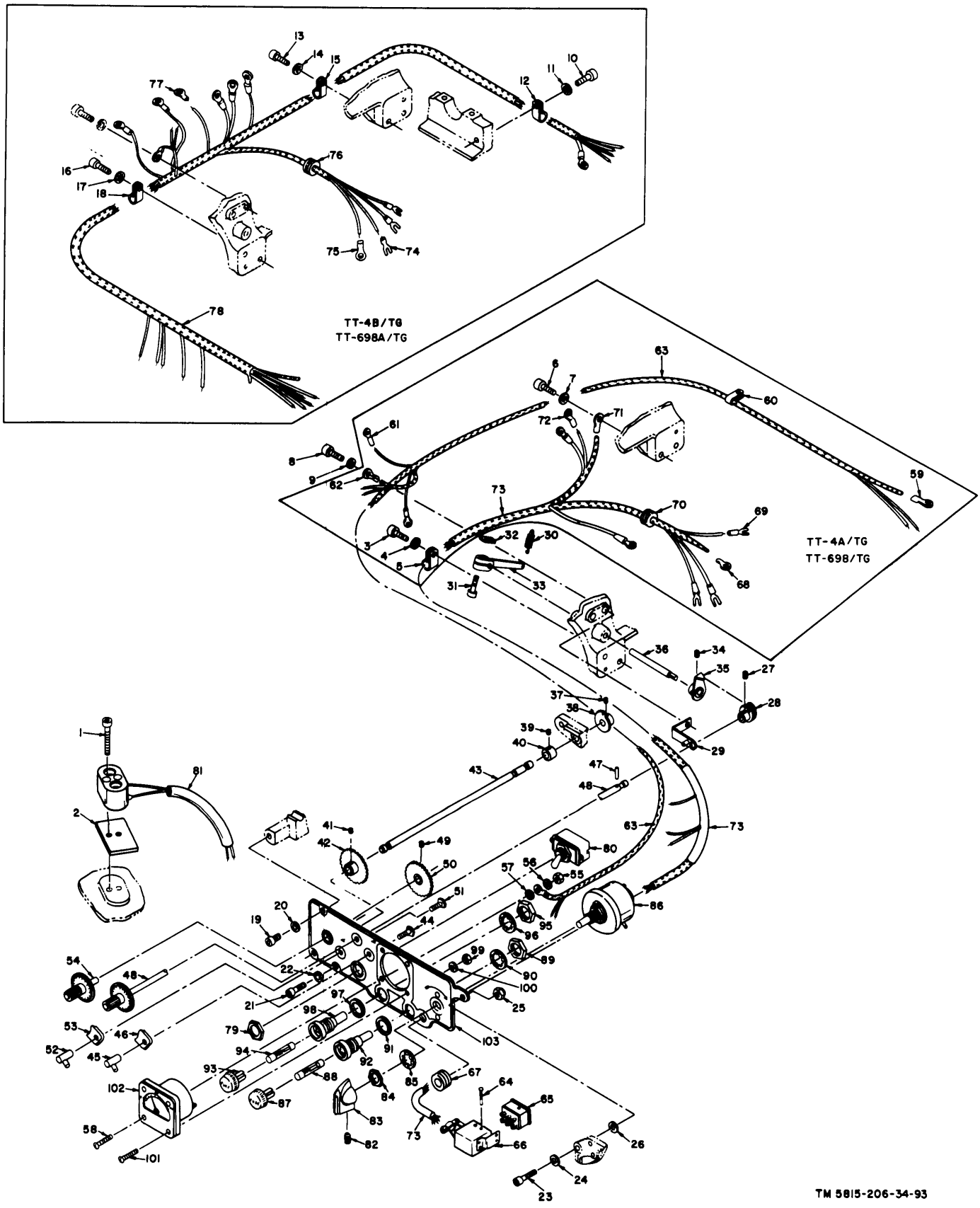


Figure 3-21. Instrument panel, exploded view (TT-4(*)/TG and TT-698(*)/TG).

Key to fig. 3-21:

1 Machine screw, 10012
2 Insulator, 51656
3 Machine screw, 10026-01
4 Lockwasher, 10405
5 Cable clamp. 51084
6 Machine screw, 10026-01
7 Lockwasher, 10405
8 Machine screw, 10009
9 Lockwasher, 10404
10 Machine screw, 10017-01
11 Lockwasher, 10405
12 Cable clamp, 51044
13 Machine screw, 10026-01
14 Lockwasher, 10405
15 Cable clamp, 51044
16 Machine screw, 10026-01
17 Lockwasher, 10405
18 Cable clamp, 51044
19 Machine screw, 10008-01
20 Lockwasher, 10404
21 Machine screw, 10008-01
22 Lockwasher, 10404
23 Machine screw, 10010-01
24 Lockwasher, 10404
25 Self-locking hexagonal nut, 10501
26 Lockwasher, 10404
27 Setscrew, 10203
28 Armature worm, 50992
29 Armature-dial-shaft bracket, 50984A
30 Armature spring, 50908
31 Machine screw, 10006
32 Clamp nut, 50174
33 Armature-spring arm, 50017
34 Setscrew, 10203
35 Armature-worm arm, 50888
36 Armature-worm shaft, 50900
37 Setscrew, 10203
38 Rangefinder cam, 50317
39 Setscrew, 10203
40 Collar, 50391
41 Setscrew, 10203
42 Rangefinder gear, 50312A
43 Rangefinder shaft, 50328
44 Machine screw, 10307
45 Dial-clamp nut, 50895A
46 Dial clamp, 51609
47 Taper pin, 10855
48 Armature-dial shaft, 51605A
49 Setscrew, 10203
50 Rangefinder gear, 50312A
51 Machine screw, 10307
52 Dial-clamp nut, 50895A
53 Dial clamp, 51609
54 Rangefinder dial, 51607A
55 Plain hexagonal nut, 10517
56 Lockwasher, 10408
57 Lockwasher, 10408[a]
58 Machine screw 10318
39 Terminal, 20708
60 Cable clamp, 51083
61 Terminal, 20707
62 Terminal, 20710
63 Selector-magnet and motor-stop cable, 51076A (includes items 59, 60, 61, and 62)
64 Drive screw
65 Plug P2
66 Keyboard connector w/cover, 20409[a], 20413[b] (includes item 65)
67 Grommet, 20726
68 Terminal, 20708
69 Terminal, 20709
70 Grommet, 20726
71 Terminal, 20710
72 Terminal, 20707-0001
73 Keyboard cable, 51075 (includes items 68, 69, 70, 71, and 72)
74 Terminal, 20706-0002
75 Terminal, 20708
76 Grommet, 20726
77 Terminal, 20707-0001
78 Instrument-panel cable, 60247A (includes items 74, 75, 76, and 77)
79 Plain hexagonal nut
80 Switch S120131
81 Copy-light connector, 51379A (includes items 79 and 80)
82 Setscrew
83 Knob, 20704 (includes item 82)
84 Plain hexagonal nut
85 Lockwasher
86 Resistor R2, 20008 (includes items 84 and 85)
87 Fuse cap, 20460
88 Fuse F2 (1/8 amp), 20451
89 Plain hexagonal nut 10582
90 Lockwasher 10439
91 Rubber washer, 10484
92 Fuse holder, XF1, 20458 (includes items 87, 89, and 91), 20458 [b](includes items 87, 89, 90 and 91)
93 Fuse cap, 20460
94 Fuse F1 (1.6 amp), 20455
95 Plain hexagonal nut 10582
96 Lockwasher 10439
97 Rubber washer 10484
98 Fuse holder XF2, 20458 (includes items 93, 95, and 97), 20458 [b](includes items 93, 95, 96, and 97)
98 Plain hexagonal nut 10517
100 Lockwasher, 10408
101 Machine screw 10318
102 Milliammeter M1, 20577 (includes items 55, 58,99, and 101)
103 Panel, 50340A

[a]Used on TT-4A/TG and TT-698/TG.
[b]Used on TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG.

b. Reassembly.

(1) Reassemble the instrument panel as indicated in figure 3-21; the sequence for reassembling the parts is the reverse of disassembly.

(2) Replace the instrument panel (para 3-31b).

3-41. Disassembly and Reassembly of Instrument Panel, TT-335/TG and TT-537/G

(fig. 3-22)

a. Disassembly.

(1) Remove the instrument panel (para 3-32a).

(2) Remove the two setscrews that hold the armature worm (22, fig 3-22) on the armature-dial shaft (45); remove the armature worm and the armature-dial-shaft bracket (24).

(3) Remove the armature spring (28) from the armature-spring arm (30) and from the selector-magnet armature (fig. 3-38).

(4) Remove the machine screw (fig. 3-22) and clamp nut that hold the armature-spring arm (30) to the armature-worm shaft (31); remove the armature-spring arm.

(5) Remove the two setscrews that hold the armature-worm arm to the armature-worm shaft; remove the arm. Remove the armature-worm shaft from the frame.

(6) Remove the two setscrews that hold the rangefinder cam (33) to the shaft; remove the rangefinder cam.

(7) Remove the two setscrews that hold the collar (35) to the rangefinder shaft (36); remove the collar.

(8) Remove the two setscrews that hold the rangefinder gear (38) to the rangefinder shaft; remove the rangefinder gear.

(9) Remove the two machine screws and dial-clamp nuts that hold the dial clamps (41) to the panel; remove the dial clamps.

(10) Remove the two setscrews that hold the rangefinder gear (43) to the rangefinder dial (46); remove the rangefinder gear and dial.

(11) Remove the taper pin from the armature-dial shaft in the panel; remove the armature-dial shaft.

(12) Remove the drive screw that holds the plug (51) in the keyboard-plug cover (52); remove the plug and unsolder the electrical leads of the instrument-panel cable. Tag the leads to facilitate reassembly.

(13) Remove the machine screw (fig. 3-80), hexagonal nut; two lockwashers, heater, and grounding lead of the instrument-panel cable (55, fig. 3-22).

(14) Remove the hexagonal nut that holds the toggle switch (58) to the panel; remove the toggle switch. Unsolder the electrical leads of the heater cable assembly (56). Do not remove the electrical leads from the switch to the copy-light connector unless necessary.

(15) Remove the setscrew that holds the knob on the shaft of the resistor (64); remove the knob.

(16) Remove the hexagonal nut and lockwasher that hold the resistor to the panel; remove the resistor.

(17) Remove the fuse caps that hold the fuse in the fuseholders; remove the fuses.

(18) Remove all hexagonal nuts and lockwashers that hold the fuseholders to the panel; remove the fuseholders and rubber washers.

(19) Remove the four hexagonal nuts, lockwashers, and machine screws that hold the milliammeter (86) to the panel; remove the milliammeter.

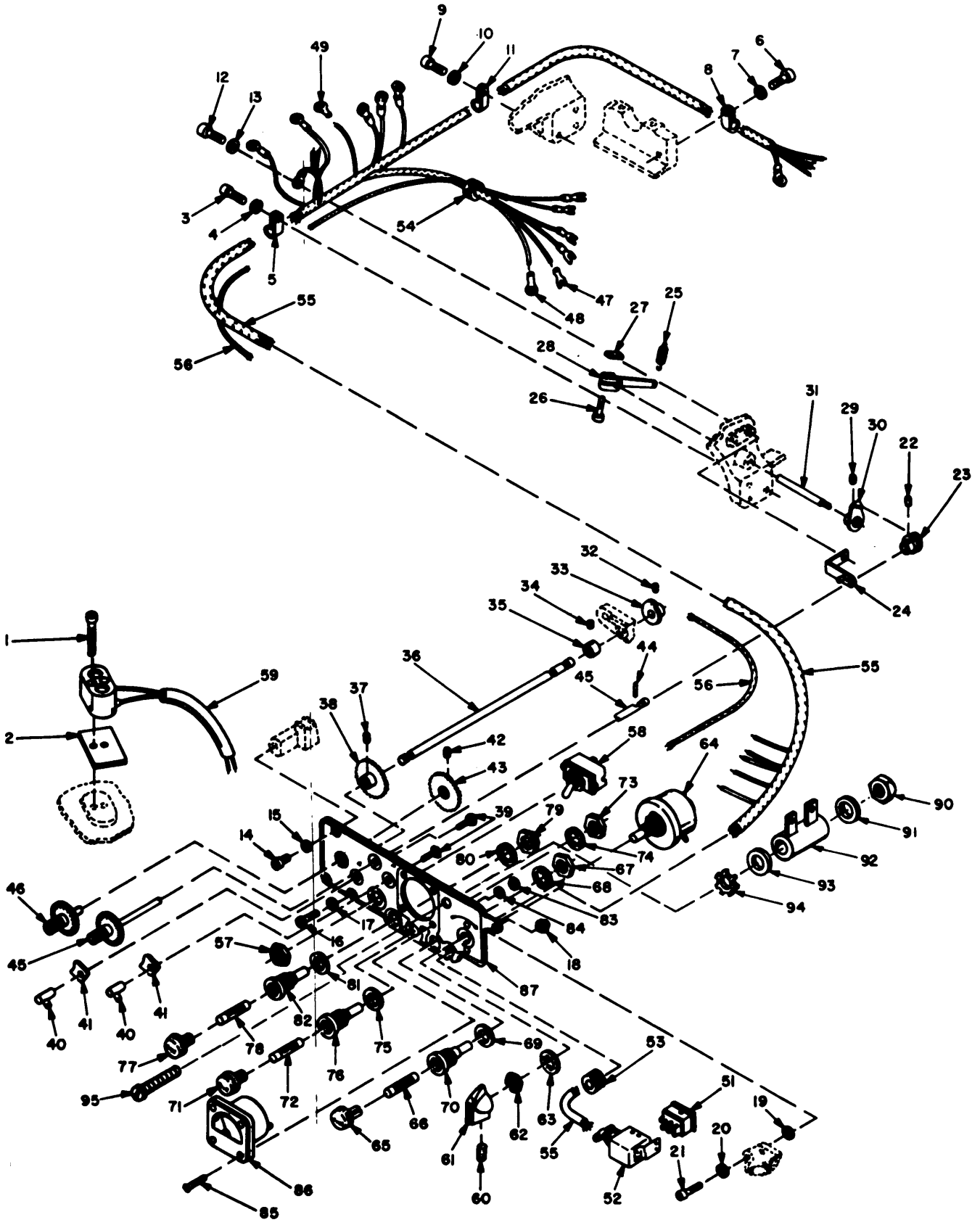


Figure 9-22. Instrument panel (TT-335/TG and TT-537/G), exploded view.
with keyboard

Key to fig. 3-22:

1 Machine screw, 10012
2 Insulator, 51656
3 Machine screw, 10018,01
4 Lockwasher, 10405
5 Cable clamp, 51044
6 Machine screw, 10017-01
7 Lockwasher, 10405
8 Cable clamp, 51044
9 Machine screw, 10018.01
10 Lockwasher, 10405
11 Cable clamp, 51044
12 Machine screw, 10009
13 Lockwasher, 10430
14 Machine screw, 10008-01
15 Lockwasher, 10431
16 Machine screw, 10008.01
17 Lockwasher, 10431
18 Self-locking hexagonal nut, 10501
19 Lockwasher, 10431
20 Lockwasher, 10431
21 Machine screw, 10010-01
22 Setscrew, 10203
23 Armature worm, 50992
24 Armature-dial-shaft bracket, 50984A
25 Armature spring, 50908
26 Machine screw, 10006
27 Clamp nut, 50174
28 Armature-spring arm, 50017
29 Setscrew, 10203
30 Armature-worm arm, 50888
31 Armature-worm shaft, 50900
32 Setscrew, 10203
33 Rangefinder cam, 50317
34 Setscrew, 10203
35 Collar, 50391
36 Rangefinder shaft, 50328
37 Setscrew, 10203
38 Rangefinder gear, 50312A
39 Machine screw, 10307
40 Dial-clamp nut, 50895A
41 Dial clamp, 51609
42 Setscrew, 10203
43 Rangefinder gear, 50312A
44 Taper pin, 10855
45 Armature-dial shaft, 51605A
46 Rangefinder dial, 51607A
47 Terminal, 20706[a] 21045-0001[b]
48 Terminal, 20708[a] 21065-0001[b]
49 Terminal, 20707[a] 21069[b]
50 Not used
51 Plug P2
52 Keyboard connector, 20413 (includes item 51)
53 Grommet, 20726
54 Grommet, 20726
55 Instrument panel cable, 60247A [a] (includes items 47,48,49, 53 and 54). Instrument panel cable 51906A [b] (includes items 47, 48, 49, 53, 54, and 88)
56 Heater cable assembly, 64960A [a]
57 Hexagonal nut
58 Toggle switch S1, 20131
59 Copy-light cable assembly, 64947A (includes items 58 and 89)
60 Setscrew
61 Knob, 20704 (includes item 60)
62 Hexagonal nut
63 Lockwasher
64 Resistor R2, 20008 (includes items 62 and 63)
65 Fuse cap, 20460
66 Fuse F2 (1/8 amp), 20451
67 Hexagonal nut
68 Lockwasher
69 Rubber washer
70 Fuseholder XF2, 20458 (includes items 65,67, 68 and 69)
71 Fuse cap, 20460
72 Fuse F3 (3 amp, slow-blow), 20481
73 Hexagonal nut, 10582
74 Lockwasher, 10439
75 Rubber washer, 20484
76 Fuseholder XF3, 20458 (includes items 71, 73,74 and 75)
77 Fuse cap, 20460
78 Fuse F1 (2 amp, slow-blow), 20474
79 Hexagonal nut, 10582
80 Lockwasher, 10439
81 Rubber washer, 20484
82 Fuseholder XF1, 20458 (includes items 77, 79, 80 and 81)
83 Hexagonal nut
84 Lockwasher, 10408
85 Machine screw
86 Milliammeter M1, 20577 (includes items 83 and 85)
87 Panel, 64958A [a], 51990A [b]
88 Terminal, 20705[b], 20765 [b]
89 Connector, copylite, 51379A
90 Self-locking hexagonal nut, 10841 [b]
91 Flatwasher, 10454[b]
92 Resistor, R3, 23492[b]
93 Flatwasher, 10454[b]
94 External tooth lockwasher, 12404 [b]
95 Machine screw, 12130 [b]

[a] Used on TT-335/TG.
[b] Used on TT-357/G.

b. Reassembly.

(1) Reassemble the instrument panel by reversing the procedures described in *a* above.

(2) Reinstall the instrument panel (para 3-32b).

3-42. Disassembly and Reassembly of Motor (TT-4A/TG and TT-698/TG)

(fig. 3-23)

a. Disassembly.

(1) Remove the motor (para 3-26c).

(2) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the three sleeves (6, fig. 3-23) and lockwashers from the teletypewriter frame.

(3) On the TT-4A/TG and TT-698/TG, remove the machine screw and lockwasher that hold the worm gear on the shaft of the armature; remove the worm gear (10 or 11).

(4) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the machine screw and lockwasher that hold the worm gear on the shaft of the armature; remove the worm gear.

(5) Remove the pin (12) that holds the grease seals on the armature; remove the grease seals (13 and 14).

(6) Remove the four machine screws and lock. washers that hold the gear end bell (17) on the motor housing (61); remove the gear end bell, thrust pad (18), thrust washer, and ball bearing (20).

(7) Remove the setscrew that holds the governor target (22) to the shaft of the governor base; remove the governor target.

(8) Remove the two machine screws and lockwashers that hold the governor cover (25) to the motor housing; remove the governor cover.

(9) Remove the two setscrews that hold the governor base (46) to the shaft of the armature (53); remove the assembled governor.

(10) Remove the governor-worm spring (27), governor worm (28), and contact brush (29) from the governor.

(11) Remove the two contact brushes (29 or 30) from the motor housing.

(12) Remove the two brush shields (47) and brush caps (48) that hold the brushes (49) in the motor housing; remove the brushes.

(13) Remove the armature from the motor housing.

(14) Remove the flat washer, ball bearing (51), and flat washer from the armature.

KEY to fig. 3-23:

1 Machine screw, 10017-01
2 Lockwasher, 10405
3 Shim, 0.002 in. -51509 (0.005 in. - 51510)
4 Machine screw, 10018-01
5 Lockwasher, 10405
6 Sleeve, 57493
7 Lockwasher, 10482
8 Machine screw, 50207
9 Lockwasher, 10406
10 Worm gear, 50350
11 Worm gear, 50350
12 Pin, 50359
13 Grease seal, 50949
14 Grease seal, 50949
15 Machine screw, 10172
16 Lockwasher, 10444
17 Gear end bell, 20751[a], 60505[b], 64752 [c]
18 Thrust pad, [abc] 20748
19 Thrust washer, 60501
20 Ball bearing, 10760
21 Setscrew, 10204
22 Governor target, 50303A
23 Machine screw, 10321
24 Lockwasher, 10412
25 Governor cover, 50311
26 Setscrew, 10204
27 Governor worm spring, 51855
28 Governor worm, 56555
29 Contact brush, 51154A
30 Contact brush, 51543A [ab] 63649A [c]
31 Governor spring, 50334
32 Grooved pin, 50302
33 Self-locking hexagonal nut, 10840
34 Machine screw, 10055
35 Flatwasher, 10459
36 Contact, 50281
37 Plain hexagonal nut, 10507
38 Lockwasher, 10404
39 Contact, 50338
40 Cotter pin, 10800
41 Governor adjustment lever, 50301
42 Cotter pin, 10800
43 Governor adjustment screw, 50299
44 Flat washer, 50148
45 Speed adjustment gear, 50278A
46 Governor base, 51249A
47 Brush shield, 51155[a], 60495 [bc]
48 Brush cap, 20750[a] 60496 [bc]
49 Brush, 56834[a], 60503 [bc]
50 Flat washer, 20748
51 Ball bearing, 10760[a], 10765 [bc]
52 Flat washer, 60493 [abc]
53 Armature, 60492 [b], 64751 [c] (items 20, 12, and 51)
54 Machine screw, 10333[a], 10172 [bc]
55 Lockwasher, 10412[a], 10442 [bc]
56 Not used.
57 Not used.
58 Machine screw, 10374
59 Capacitor C16 or C17, 20212
60 Lockwasher, 10408
61 Motor housing, 64200A [abc] (main component of motor which includes items 15 through 20, 47 through 60, 62, 64, and 65)
62 Governor end bell, 51804[a], 60490 [b], 64754 [c], (64797A) on Order No. 35250-PC-62)
63 Terminal, 21065-0002
64 Terminal, 20708
65 Field housing, 51188[a], 60499A[b], 64753A [c]
66 Insulator bushing, 50293
67 Flat washer, 61427
68 Shim washer, 60506
69 Rubber grommet, 20726

[a] Used on Bodine motor.
[b] Used on 1/23 hp Howard motor.
[c] Used on 1/20 hp Howard motor.

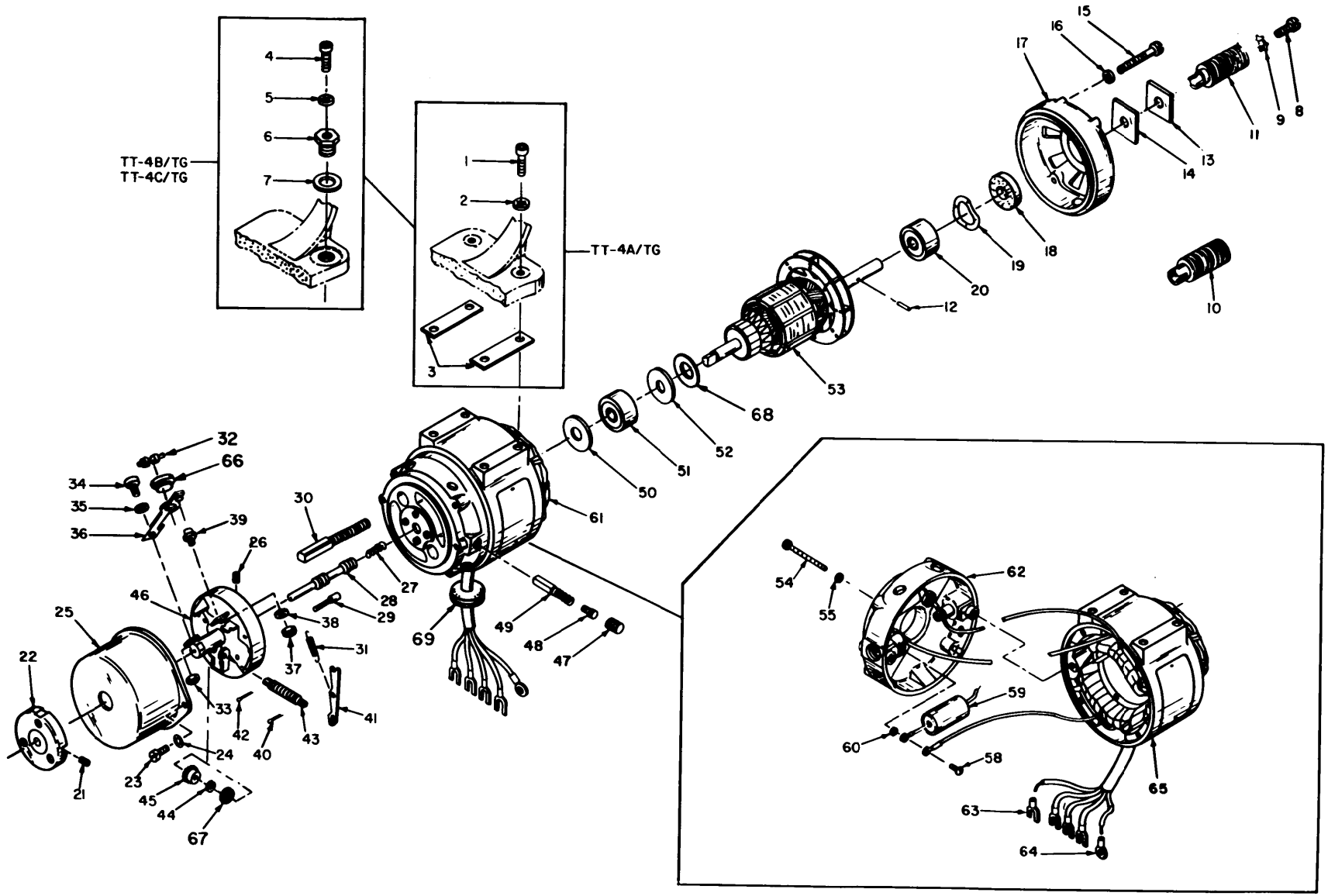


Figure 3-23. Motor and governor, exploded view (TT-4 (*)/TG and TT-698(*)/TG).

b. Removal of Motor Capacitors.

(1) Disassemble the motor (para 3-42a).

(2) On the TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG, remove the four machine screws and lockwashers that hold the governor end bell (62) to the motor field housing (65); separate the end bell and housing carefully.

(3) On the TT-4C/TG and TT-698B/TG, remove the two machine screws and lockwashers that hold the motor field housing to the governor end bell; separate the housing and end bell carefully.

(4) Unsolder the two capacitors (59) from the brush holder in the end bell and remove the machine screws that hold the capacitors in the end bell; remove the capacitors and lockwashers.

c. Repair or Replacement of Series-governed Motor Brushes. The contact surfaces of the motor brushes must be curved to fit the commutator surface. Slope the surface of the brush as follows:

(1) Disassemble the motor *(a* above).

(2) Wrap a piece of #0000 sandpaper around the armature and under the brush holder, with the abrasive side out. Allow the normal pressure of the brush spring to press the brush against the sandpaper.

(3) Pull back and forth, following the curvature of the commutator. The last stroke of sandpaper should be in the direction of normal armature rotation.

(4) Remove the brush from its holder and bevel the edges slightly with sandpaper.

(5) Wipe the brush with a piece of cloth slightly moistened with trichloroethane.

(6) Clean the brush holder with a cloth moistened with trichloroethane and wrapped around a small screwdriver blade or similarly shaped tool.

(7) Reinsert the brushes in their holders.

(8) Reassemble the motor *(e* below).

d. Repair of Motor Commutator. Resurface the commutator as follows:

(1) Remove the motor (para 3-26c).

(2) Disassemble the motor *(a* above).

(3) Mount the motor armature in a lathe so that the shaft does not run out of line more than 0.0005 inch. Make a series of light cuts across the commutator with a sharp cutting tool. Do not cut closer than 1/8 inch from the leads soldered to the commutator. Continue the cuts until enough metal is removed to eliminate the pits, grooves, and rough spots in the surfaces. Do not remove more metal than is necessary.

(4) Polish the commutator with a strip of fine sandpaper (#000 or #0000) held in flat contact with the commutator as it revolves in the lathe.

CAUTION

Do not attempt to smooth a rough commutator with sandpaper unless a lathe is available. Do not use emery cloth or carborundum paper. Particles of these abrasives can cause trouble in electrical circuits.

(5) After resurfacing, do not touch the commutator with the hands; see that the surfaces of the mica separators are below the surfaces of the copper segments of the commutator.

(6) Reassemble the motor *(e* below).

e. *Reassembly.* Check the brushes. Clean them if they are dirty or glazed; replace them if they are worn, chipped, or saturated with oil.

(1) Reassembly the motor as indicated in figure 3-23; the sequence for assembling the parts is the reverse of the disassembly sequence *(a* and *b* above).

(2) Replace the motor (para 3-26d).

(3) Adjust the motor (para 3-262 through 3-266).

3-43. Disassembly and Reassembly of Motor, (TT-335/TG and TT-537/G).

(fig. 3-24)

a. Disassembly.

(1) Remove the motor (para 3-26c).

(2) Remove the three sleeves (3, fig. 3-24) and lockwashers from the teletypewriter frame.

(3) Remove the machine screw and lockwasher that hold the worm (8) on the rotor shaft (47); remove the worm.

(4) Remove the pin, seals and felts from the rotor shaft.

(5) Unsolder the four terminals (15) from the motor. Unsolder the terminal from the shielding.

(6) Remove the grommet (16) from the shielding (18).

(7) Remove the cap (19) that holds the shielding and eyelet (20) to the nipple (21).

(8) Remove the nipple and lockwasher from the end cap.

(9) Remove the four machine screws (23), hexagonal nuts, and lockwashers that hold the end cap (27) on the stator assembly.

(10) Remove the end cap from the rotor shaft. Remove the retainer ring (28) from the end cap.

(11) Remove the shim (29), spacer, grease seal, and ball bearing (32) from the rotor shaft.

(12) Remove the setscrew that holds the target (35) on the rotor shaft; remove the target.

(13) Remove the two machine screws and lockwashers that hold the fan cover (38) on the end cap: remove the fan cover,

(14) Remove the two setscrews that hold the fan (40) on the rotor shaft; remove the fan.

(15) Remove the end cap (41) from the rotor

shaft. Remove the retainer ring (42) from the end cap.

(16) Remove the shim (43), spacer, grease seal, and ball bearing (46) from the rotor shaft,

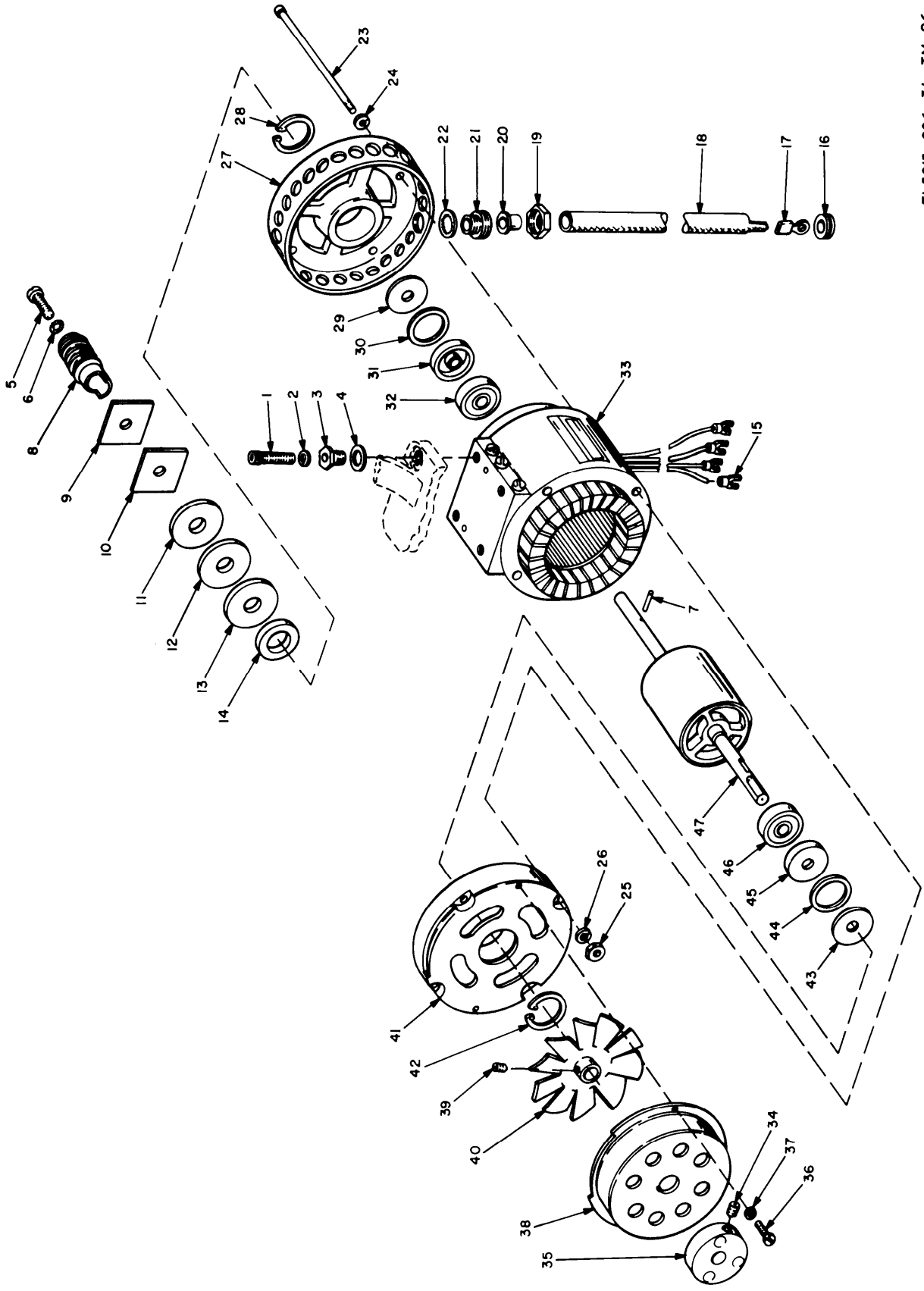


Figure 3-24. Motor assembly, exploded view (TT-335/TG and TT-537/G).

KEY to fig. 3-24:

1 Machine screw, 10018-01
2 Lockwasher, 10431
3 Sleeve, 57493
4 Lockwasher, 10482
5 Machine screw, 50207
6 Lockwasher, 10406
7 Pin, 50359
8 Worm 64863
9 Seal, 50949
10 Seal, 50949
11 Felt, 61484
12 Felt, 61484
13 Felt, 61484
14 Felt, 61678
15 Terminal, 21065-0002
16 Grommet, 20726
17 Terminal, 20708
18 Shielding
19 Cap, 51171
20 Eyelet, 59383A
21 Nipple, 51172
22 Lockwasher, 10478
23 Machine screw, 11'703
24 Lockwasher, 10415
25 Hexagonal nut, 10521
26 Lockwasher, 10415
27 End cap, 65365
28 Retainer ring, 11157
29 Shim, 65368
30 Spacer, 65367
31 Grease seal, 65370
32 Ball bearing, 10757
33 Stator assembly, 65366
34 Setscrew, 10204
35 Target, 54217
36 Machine screw, 11704
37 Lockwasher, 10415
38 Fan cover, 65363
39 Setscrew, 10203
40 Fan, 65371
41 End cap, 65372
42 Retainer ring, 11157
43 Shim, 65362
44 Spacer, 65367
45 Grease seal, 65370
46 Ball bearing, 10757
47 Rotor assembly, 65361

b. Reassembly.

(1) Reassemble the motor by reversing the procedures described in *a* above.

(2) Reinstall the motor on the teletypewriter (para 3-26b).

3-44. Disassembly and Reassembly of Governor (TT-4(*)/TG and TT-698(*)/TG)

(fig. 3-23)

a. Disassembly.

(1) Remove the governor from the motor (para 3-42a).

(2) Remove the governor spring (31, fig. 3-23) from the governor adjustment lever (41) and from the grooved pin (32); remove the grooved pin.

(3) Remove the self-locking hexagonal nut (33), machine screw (34), and lockwasher that hold the contact (36) to the governor base; remove the contact.

(4) Remove the plain hexagonal nut (37) and lockwasher that hold the contact (39) to the governor base; remove the contact.

(5) Remove the cotter pin (40) that holds the governor adjustment lever (41) to the governor adjustment screw (43); remove the governor adjustment lever.

(6) Remove the cotter pin (42) that holds the governor adjustment screw in the governor base; remove the governor adjustment screw and catch the flat washer and speed adjustment gear (45) as they fall.

b. Reassembly. If necessary, clean or burnish the contacts before reassembly. Remove the built up or pitted portions of the contacts with a contact file; be careful not to remove any more metal then necessary.

(1) Reassemble the governor as indicated in figure 3-23; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the governor on the motor by reversing the procedure described in paragraph 3-42a.

(3) Replace the motor (para 3-26d).

(4) Adjust the motor (para 3-262 through 3-266).

3-45. Removal and Replacement of Platen Frame Assembly

(fig. 3-25)

a. Disassembly.

(1) Remove the platen assembly from the teletypewriter frame (para 3-28a).

(2) Remove the machine screw, lockwasher, and flat washer that hold the platen-latching arm (6, fig. 3-25) to the platen frame (41); remove the platen-latching arm.

(3) Remove the platen-locking stud (7) from the platen frame.

(4) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the self-locking hexagonal nut, machine screw, and flat washer that hold the platen-blocking arm (12) to the platen-blocking-arm bracket (16); remove the platen-blocking arm.

(5) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the machine screw, lockwasher, and flat washer that hold the platen-blocking-arm bracket to the platen frame; remove the platen-blocking-arm bracket.

(6) Remove the machine screw and lockwasher that hold the platen-shift arm (19) to the platen frame; remove the platen-shift arm.

(7) Remove the two machine screws and lockwashers that hold the platen know (22) to the platen-knob spring (23); remove the platen knob and platen-knob spring from the platen shaft.

(8) On the TT-4A/TG and TT-698/TG, remove the four setscrews that hold the platen (29) to the platen shaft (28).

(9) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the two setscrews that hold the platen (30) to the platen shaft.

(10) Remove the two setscrews that hold the line-feed ratchet (32) to the platen shaft.

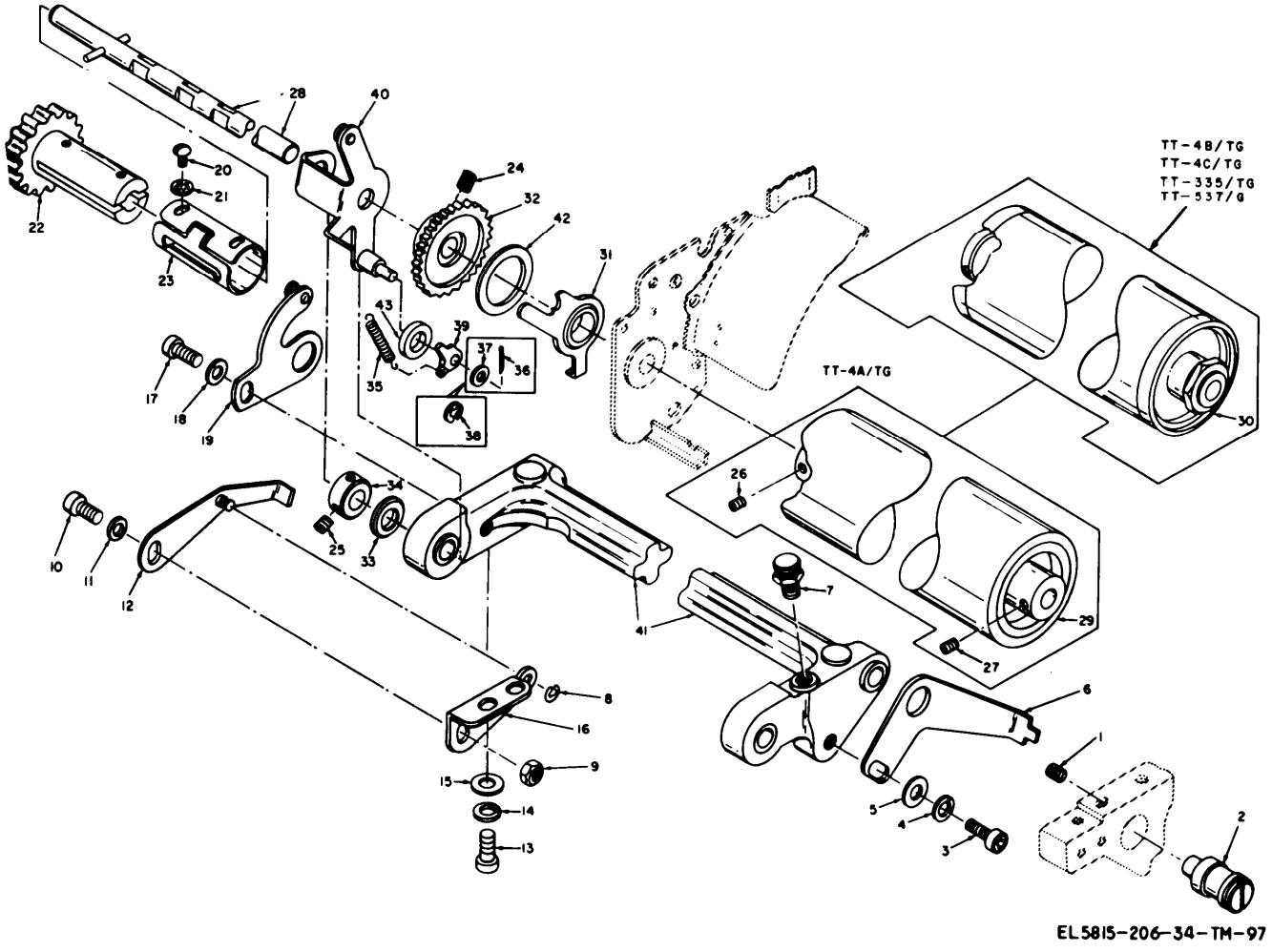
(11) Remove the two setscrews that hold the shaft collar (34) to the platen shaft.

(12) Slide the platen shaft from the assembly, removing the platen, platen through, single-double line-feed lever (31), line-feed ratchet (32), bearing (33), shaft collar (34), the assembled line-feed lever, and line-feed pawl (39) from the shaft as it is withdrawn.

(13) Remove the line-feed-pawl spring (35) from the line-feed pawl and from the line-feed lever (40).

(14) On the TT-4A/TF and TT-698/TG, remove the cotter pin (36) and flat washer (37) that hold the line-feed pawl to the line-feed lever; remove the line-feed pawl.

(15) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG, remove the retainer ring (38) that holds the line-feed pawl to the line-feed lever; remove the line-feed pawl, and felt lubricating washer (43), when supplied.



1 Setscrew, 10211
2 Eccentric pivot, 50239
3 Machine screw, 10015
4 Lockwasher, 10431
5 Flat washer, 10481
6 Platen-latching arm, 50214
7 Platen-locking stud, 50762
8 Retainer ring, 10969
9 Self-locking hexagonal nut, 10501
10 Machine screw, 10008
11 Flat washer, 10467
12 Platen-blocking arm, 53095A
13 Machine screw, 10008
14 Lockwasher, 10430
15 Flatwasher, 10467
16 Platen-blocking-arm bracket, 52307
17 Machine screw, 10015
18 Lockwasher, 10405[a], 10431
19 Platen-shift arm, 53134A
20 Machine screw, 10305
21 Lockwasher, 10403
22 Platen knob, 51690
23 Platen-knob spring, 51689
24 Setscrew, 10209
25 Setscrew, 10209
26 Setscrew, 10209
27 Setscrew, 10209
28 Platen shaft, 51687A
29 Platen, 50167A
30 Platen, 57781A
31 Single-double line-feed lever, 51762A
32 Line-feed ratchet, 51772[a], 52807[b]
33 Bearing, 10707
34 Shaft collar, 50209
35 Line-feed-pawl spring, 50333
36 Cotter pin, 10806[a]
37 Flatwasher, 50320[a]
38 Retainer ring, 10969
39 Line-feed pawl, 50165
40 Line-feed lever, 51759A[a], 53137A
41 Platen frame, 53305A
42 Felt lubricating washer, 61471
43 Felt lubricating washer, 61473

[a] Used on TT-4A/TG and TT-698/TG.
[b] Used on TT-4B/TG and TT-698A/TG.

Figure 3-25. Platen frame assembly, exploded view (TT-4(*)/TG, TT-335/TG, TT-537/G and TT-698(*)/TG).

b. Reassembly.

(1) Reassemble the platen frame assembly as indicated in figure 3-25; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the platen assembly on the teletypewriter frame (para 3-28b).

(3) Adjust the platen assembly (para 3-213 through 3-234).

3-46. Disassembly and Reassembly of Platen-Trough Assembly (TT4A/TG and TT-698/TG)

(figs. 3-26 and 3-27)

a. Disassembly.

(1) Remove the platen assembly from the teletypewriter frame (para 3-28a).

(2) Remove the platen-trough assembly from the platen frame (para 3-45a).

(3) Remove the two cotter pins and flat washers (5 and 11, fig. 3-27) that hold the connecting links (7 and 12) to the studs on the bracket link (13); remove the two connecting links.

(4) Remove the line-feed-lever-detent spring (14) from the line-feed-lever detent (16) and from the spring post on the platen trough (41).

(5) Remove the flat washer, line-feed-lever detent, and flat washer from the stud on the platen trough.

(6) Remove the line-spacing-detent spring (18) from the line-spacing detent and from the spring post on the platen trough.

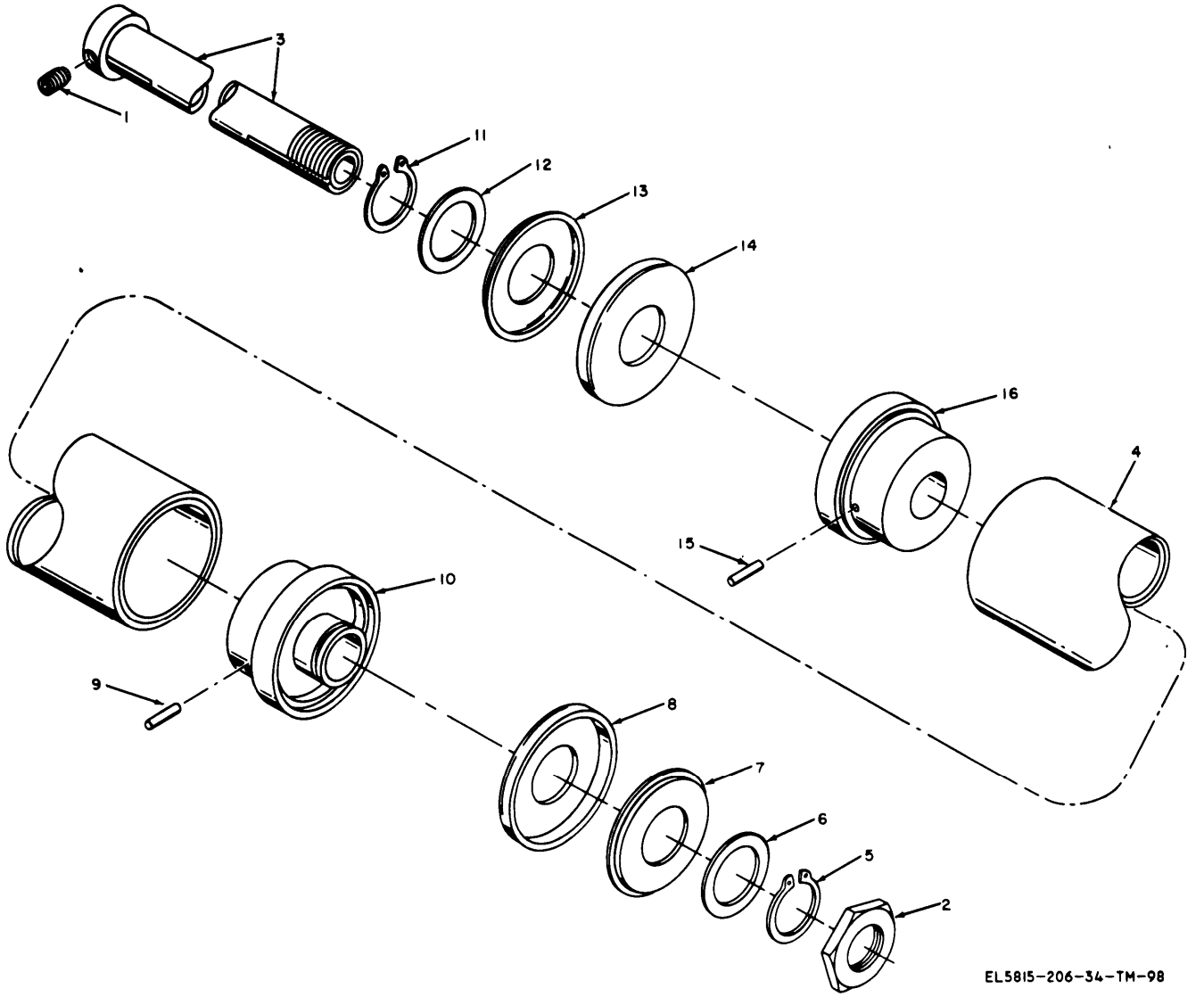
(7) Remove the cotter pin and flat washer that hold the line-spacing detent (21) to the line-spacing-detent eccentric stud (23); remove the line-spacing detent.

(8) Remove the self-locking hexagonal nut (22) that holds the line-spacing-detent eccentric stud (23) to the platen trough; remove the line-spacing-detent eccentric stud.

(9) Remove the two setscrews that hold the pressure-roller lever (25) to the pressure-roller control shaft (27); remove the pressure-roller lever.

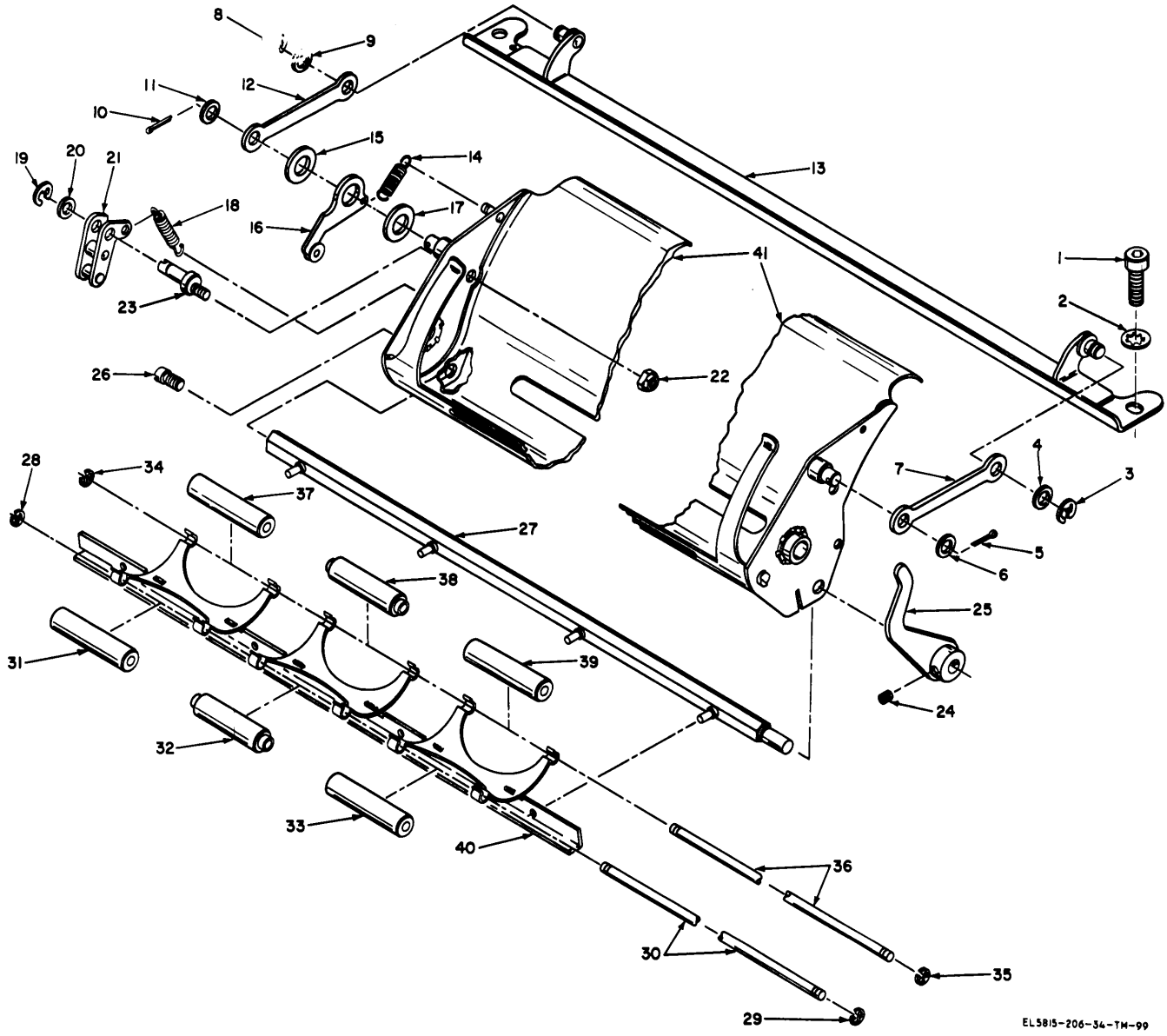
(10) Remove the pressure-roller-control shaft screw (26) that holds the pressure-roller control shaft to the platen trough; remove the pressure-roller control shaft and the assembled pressure-roller mounting bar (40).

(11) Remove the four retainer rings that hold the two pressure-roller shafts (30 and 36) in the pressure-roller mounting bar; withdraw the two pressure-roller shafts, removing the six platen pressure rollers from the pressure-roller mounting bar.



1 Setscrew, 10209
2 Hexagonal nut, 52806
3 Shaft, 52755A
4 Platen roller, 55079A
5 Retainer ring, 11046
6 Flat washer, 55169
7 Sprocket friction plate, 55160
8 Flanged washer, 61421
9 Locking pin, 55161
10 Bushing, 61420A
11 Retainer ring, 11046
12 Flat washer, 55169
13 Sprocket friction plate, 55160
14 Flanged washer, 61421
15 Locking pin, 55161
16 Bushing, 51420A

Figure 3-26. Platen, exploded view (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG).



1 Machine screw, 10015
2 Lockwasher, 10405
3 Ring, retaining 10949
4 Flat washer, 50315
5 Cotter pin, 10802
6 Flat washer, 50315
7 Connecting link, 50215
8 Ring, retaining 10949
9 Flat washer, 50315
10 Cotter pin, 10802
11 Flat washer, 50315
12 Connecting link, 50215
13 Bracket link, 53138A
14 Line-feed-lever-detent spring, 51851
15 Flat washer, 51768
16 Line-feed-lever detent, 53202A
17 Flat washer, 51768
18 Line-spacing-detent spring, 50332
19 Ring, retaining 10960
20 Flat washer, 50319
21 Line-spacing detent, 50108A
22. Self-locking hexagonal nut, 10500
23 Line-spacing-detent eccentric stud, 52931
24 Setscrew, 10201
25 Pressure-roller lever, 50177A
26 Pressure-roller-operating-shaft screw, 50238
27 Pressure-roller operating shaft, 50230A
28 Retainer ring, 51099
29 Retainer ring, 51099
20 Pressure-roller shaft, 50234
31 Platen pressure roller, 52122
32 Platen pressure roller, 50161A
33 Platen pressure roller, 52122
34 Retainer ring, 51099
35 Retainer ring, 51099
36 Pressure-roller shaft, 50234
37 Platen pressure roller, 52122
38 Platen pressure roller, 50161A
39 Platen pressure roller, 52122
40 Pressure-roller mounting bar, 50229A
41 Platen trough, 51756A

Figure 3-27. Platen-trough assembly (TT-4A/TG and TT-698/TG), exploded view.

b. Reassembly.

(1) Reassemble the platen-trough assembly as indicated in figure 3-27; the sequence for assembling the parts is the reverse of the disassembly sequence. Be sure that the hub of the pressure-roller lever is tight against the shoulder on the pressure-roller operating shaft before tightening the two setscrews.

(2) Replace the platen-trough assembly on the platen frame (para 3-45b).

(3) Replace the platen assembly on the platen frame (para 3-28b).

(4) Adjust the platen-trough assembly (para 3-214, 3-215, 3-219 through 3-224, 3-226, and 3-229 through 3-234).

3-47. Disassembly and Reassembly of Platen-Trough Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698/TG)

(fig. 3-28)

a. Disassembly.

(1) Remove the platen assembly from the teletypewriter frame (para 3-28a). Also, when supplied, remove the felt lubricating washer from the hub of the platen-shaft bearing on the platen trough.

(2) Remove the platen-trough assembly from the platen frame (para 3-45a).

(3) Remove the retainer rings that hold the connecting link (6, fig. 3-26) to the platen trough (42) and to the link bracket (12); remove the connecting link.

(4) Remove the platen lever-latch spring (7) from the spring post on the platen trough and from the platen lever latch (8). Remove the flat washer, platen lever latch, and flat washer from the stud on the platen trough.

(5) Remove the retainer rings that hold the connecting link (11) to the link bracket and the stud on the platen trough; remove the connecting link and link bracket.

(6) Remove the line-feed-lever-detent spring (13) from the line-feed-lever detent (15) and from the spring post on the platen trough.

(7) Remove the flat washer, line-feed-lever detent, and flat washer from the stud on the platen trough.

(8) Remove the line-spacing-detent spring (17) from the line-spacing detent (19) and from the spring post on the platen trough.

(9) Remove the retainer ring that holds the line-spacing detent to the line-spacing detent stud; remove the line-spacing detent. Remove the felt washer, when supplied, from the line-spacing-detent stud.

(10) Remove the plain round nut and lockwasher that hold the line-spacing-detent stud (22) on the platen trough; remove the line-spacing-detent stud.

(11) Remove the two setscrews that hold the pressure-roller lever (24) to the pressure-roller-operating shaft (30); remove the pressure-roller lever and flat washer.

(12) Remove the pressure-roller-operating-shaft screw (25) that holds the pressure-roller-operating shaft to the plate trough; remove the pressure-roller operating shaft.

(13) Remove the two retainer rings that hold the pressure-roller shaft (28) in the pressure-roller operating shaft; remove the pressure-roller shaft and the platen pressure roller (29) from the pressure-roller operating shaft.

(14) Remove the two paper-guide springs (31) from the two paper guides (37 and 38) and from the spring posts on the platen trough.

(15) Remove the pivot screw that holds the paper-guide shaft (35) to the platen trough; remove the paper-guide shaft.

(16) Remove the two setscrews that hold the two paper guides to the paper-guide shaft; remove the paper-guide shaft.

(17) Remove the hinge pin that holds the two platen-trough springs (39 and 40) and platen-trough guide (41) to the platen trough; remove the platen-trough springs and platen-trough guide.

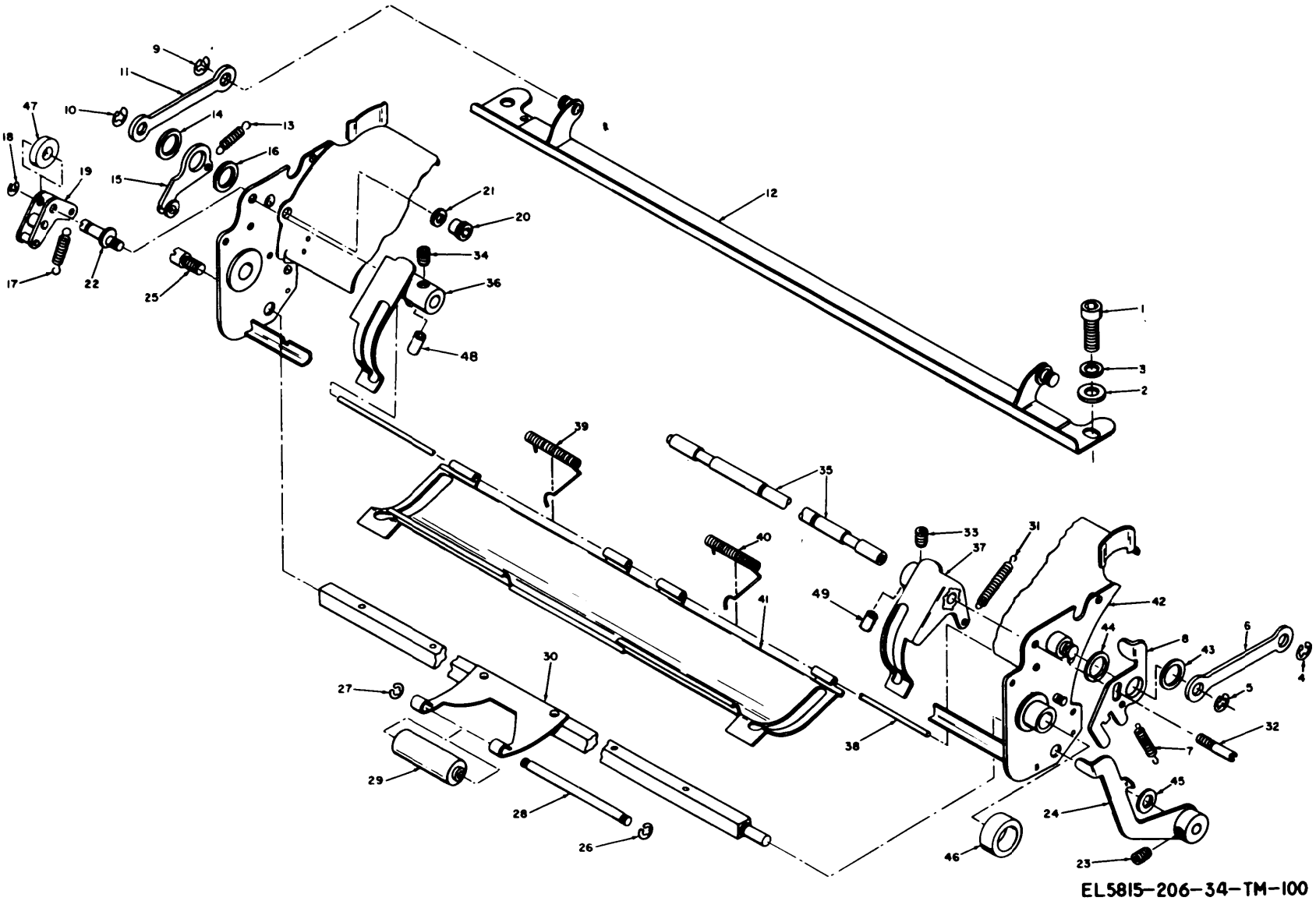


Figure 3-28. Platen-trough assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), exploded view.

KEY to fig. 3-28:

1 Machine screw, 10024
2 Flat washer, 10464
3 Lockwasher, 10431
4 Retainer ring, 10949
5 Retainer ring, 10949
6 Connecting link, 50215
7 Platen lever-latch spring, 53149
8 Platen lever latch, 54951
9 Retainer ring, 10949
10 Retainer ring, 10949
11 Connecting link, 50215
12 Link bracket, 53138A[a], 57971A[b]
13 Line-feed-lever-detent spring, 51851
14 Flat washer, 51768
15 Line-feed-lever detent, 53202A
16 Flat washer, 51768
17 Line-spacing-detent spring, 51851
18 Retainer ring, 10960
19 Line-spacing detent, 50108A
20 Plain round nut, 10513
21 Lockwasher, 10429
22 Line-spacing-detent stud, 52931
23 Setscrew, 10201
24 Pressure-roller lever, 54954A
25 Pressure-roller-operating-shaft screw, 50238
26 Retainer ring, 51099
27 Retainer ring, 51099
28 Pressure-roller shaft, 54968
29 Platen pressure roller, 50161A
30 Pressure-roller operating shaft, 55530A
31 Paper-guide spring, 52169
32 Pivot screw, 55139
33 Setscrew, 10201[a], 10203[b]
34 Setscrew, 10201[a], 10203[b]
35 Paper-guide shaft, 63199A2[b]
36 Left paper guide 55144A[a], 61074A[b]
37 Right paper guide, 55141A[a], 61074[b]
38 Hinge pin, 55146
39 Platen-trough spring, 54967
40 Platen-trough spring, 54967
41 Platen-trough guide, 54962
42 Platen trough, 55136A (items 38 through 42 are part of platen-trough assembly, 59432A)
43 Flat washer, 51768
44 Flat washer, 51768
45 Flat washer, 50315
46 Felt lubricating washer, 61472
47 Felt lubricating washer, 61474
48 Roll pin, 11058 c
49 Roll pin, 11058[c]

[a] Used on TT-4B/TG and TT-698A/TG.
[b] Used on TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG.

b. Reassembly.

(1) Reassemble the platen-trough assembly as indicated in figure 3-28; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the platen-trough assembly on the platen frame (para 3-45b).

(3) Replace the platen assembly on the teletypewriter frame (para 3-28b).

(4) Adjust the platen-trough assembly (para 3-213 through 3-218, 3-220 through 3-223, and 3-225 through 3-232).

3-48. Removal and Replacement of Type-Selecting Arm

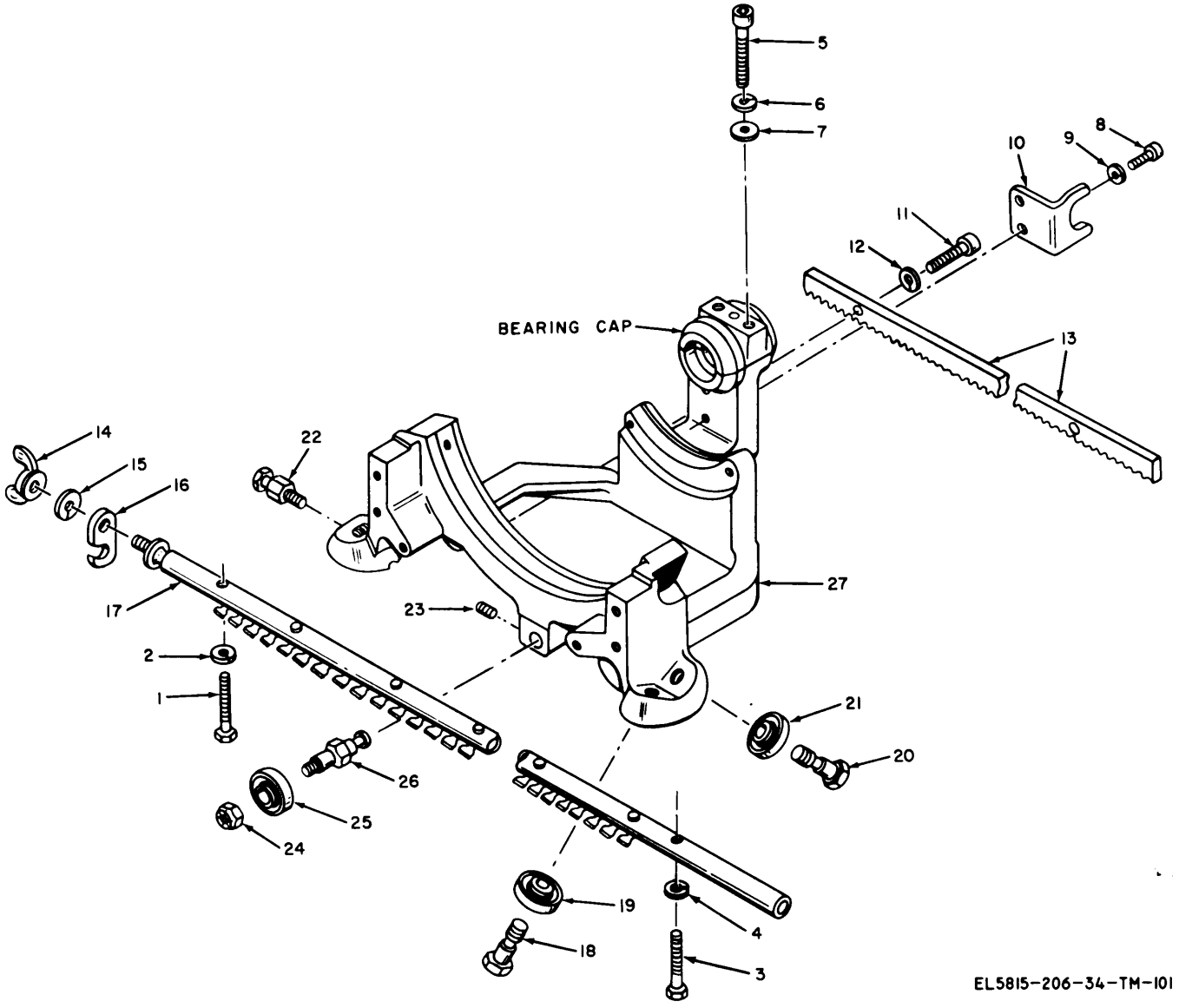
(fig. 3-29)

a. Removal.

(1) Set all five code rings to the counterclockwise position, trip the function-shaft clutch, and turn the motor manually until the square-shaft stop arm strikes the blank stop bar.

(2) On the TT-4A/TG and TT-698/TG, remove the two machine screws and lockwashers that hold the bearing cap (fig. 3-29) to the carriage frame (27); remove the bearing cap and the type-selecting arm (fig. 3-30).

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the two machine screws (fig. 3-29), lockwashers and flat washers that hold the bearing cap to the carriage frame; remove the bearing cap and the type-selecting arm.



1 Machine screw, 10319
2 Lockwasher, 10403
3 Machine screw, 10320[a], 11235[b]
4 Lockwasher, 10403
5 Machine screw, 10012[a], 10063[b]
6 Lockwasher, 10430
7 Flat washer, 10467[b]
8 Machine screw, 10003
9 Lockwasher, 10429
10 Carriage rear-support bracket, 50571
11 Machine screw, 10011
12 Lockwasher, 10430
13 Carriage rack, 56830
14 Plain wing nut, 10508
15 Lockwasher, 10431
16 Platen-locking arm, 50598
17 Carriage guide rail, 50394A (includes items 14, 15, and 16)
18 Carriage-roller screws, 50591
19 Ball bearings, 10752
20 Carriage-roller screws, 50591
21 Ball bearing, 10752
22 Carriage-locking stud, 50594
23 Setscrew, 10204
24 Self-locking hexagonal nut, 10501
25 Ball bearing, 10752
26 Roller-mounting stud, 50593
27 Carriage frame, 50545A

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-698A/TG and TT-698B/TG.

Figure 3-29. Carriage frame assembly, exploded view.

b. Replacement.

(1) Manually select the blank code group and turn the motor by hand until the square shaft stops turning. Install the type-selecting arm so that the type-selecting arm is in the blank code group position (the last notch in the right side of the guide plate).

(2) Replace the type-selecting arm by reversing the procedure described in *a* above.

(3) Check and adjust the type-selecting arm (para 3-208 through 3-212).

3-49. Disassembly and Reassembly of Type-Selecting Arm

(fig. 3-30)

a. *Disassembly.*

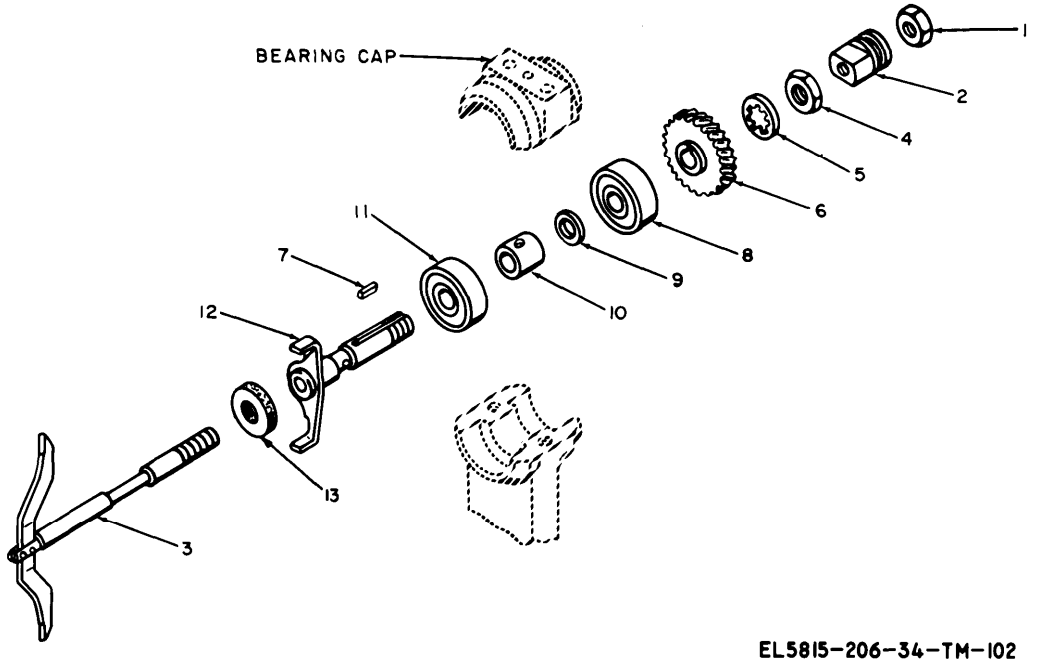
(1) Remove the type-selecting arm (para 3-48a).

(2) Remove the plain hexagonal nut and the grooved nut (2, fig. 3-30) from the type-selecting arm (3); remove the type-selecting arm from the type-selecting arm claw (12).

(3) Remove the plain hexagonal nut and lockwasher from the type-selecting-arm claw.

(4) Remove the type-selecting-arm gear (6) and machine key (7) from the type- selecting arm claw.

(5) Remove the ball bearing (8), flat washer, spacing collar, and ball bearing (11) from the type-selecting-arm claw.



EL5815-206-34-TM-102

1 Plain hexagonal nut, 10509
2 Grooved nut, 50564
3 Type-selecting arm 50560A
4 Plain hexagonal nut, 50559
5 Lockwasher, 10401
6 Type-selecting-arm gear, 50556
7 Machine key, 50558
8 Ball bearing, 10757
9 Flat washer, 50552
10 Spacing collar, 50557
11 Ball bearing, 10757
12 Type-selecting-arm claw, 50553A
13 Felt lubricating washer, 61476

NOTE
Some equipments have lubricating washers.

Figure 3-30. Type-selecting arm assembly, exploded view (TT-4(*)/TG, TT-335/TG, TT-537/G and TT-698(*)/TG).

b. Reassembly.

(1) Reassemble the type-selecting arm as indicated in figure 3-30; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the type-selecting arm (para 3-48b).

3-50. Disassembly and Reassembly of Ribbon Lifter Assembly (TT-4A/TG and TT-698/TG)

(fig. 3-31)

a. Disassembly.

(1) Remove the carriage (para 3-29a).

(2) Remove the ribbon guide (1, Fig. 3-31) from the ribbon-lifter bell crank (15).

(3) Remove the bell-crank spring (4) from the ribbon-lifter-lever assembly (7) and from the ribbon-lifter bell crank.

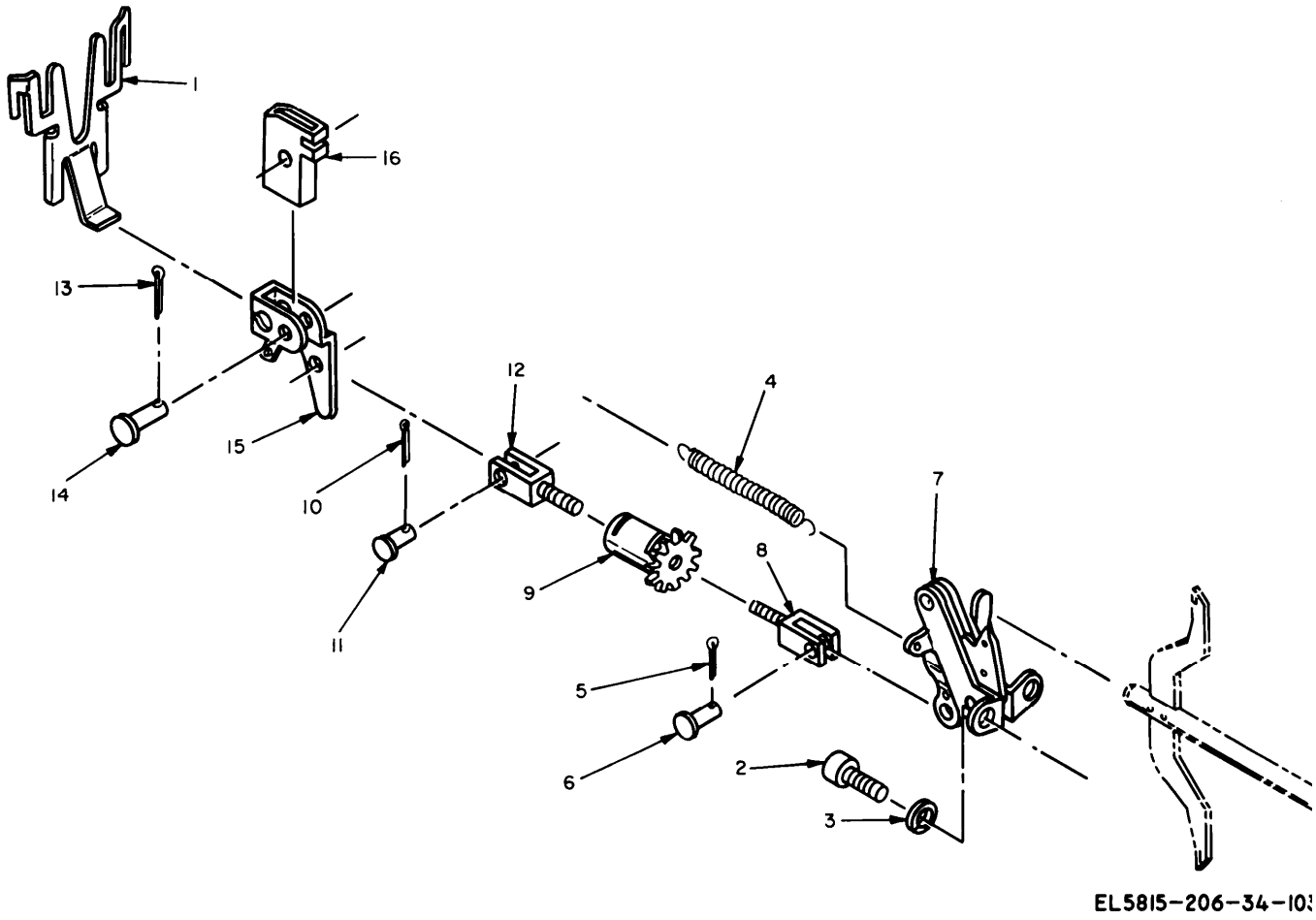
(4) Remove the two machine screws and lockwashers that hold the ribbon-lifter-lever assembly to the carriage; remove the ribbon-lifter-lever assembly.

(5) Remove the cotter pin and pin (6) that hold the ribbon-lifter-lever assembly to the link (8): remove the ribbon-lifter-lever assembly.

(6) Remove the ribbon-lifter turnbuckle (9) from the links.

(7) Remove the cotter pin and pin (11) that hold the link (12) to the ribbon-lifter bell crank: remove the link.

(8) Remove the cotter pin and pin (14) that hold the ribbon-lifter bell crank to the slide bearing (16); remove the ribbon-lifter bell crank.



1 Ribbon guide, 50590
2 Machine screw, 10001
3 Lockwasher, 10429
4 Bell-crank spring, 50575
5 Cotter pin, 10806
6 Pin, 50578
7 Ribbon-lifter-lever assembly, 53906A
8 Link, 50577
9 Ribbon-lifter turnbuckle, 50586
10 Cotter pin, 10805
11 Pin, 50578
12 Link, 50584
13 Cotter pin, 10806
14 Pin, 50588
15 Ribbon-lifter bell crank, 50586
16 Slide bearing, 50587

Figure 3-31. Ribbon lifter assembly (TT-4A/TG and TT-698/TG), exploded view.

b. Reassembly.

(1) Reassemble the ribbon lifter assembly as indicated in figure 3-31; the sequence for assembling the parts is the reverse of the disassembly sequence.

NOTE

Be sure to insert the end of the ribbon guide into the notch in the ribbon-lifter bell crank; also, be sure that the lip of the pressure-roller mounting bar (fig. 3-27) engages the notch in the slide bearing (fig. 3-31).

(2) Replace the carriage (para 3-29b).

(3) Adjust the ribbon lifter assembly (para 3-212).

3-51. Disassembly and Reassembly of Carriage Lock Mechanism (TT-537/G)

(fig. 3-32)

a. Disassembly.

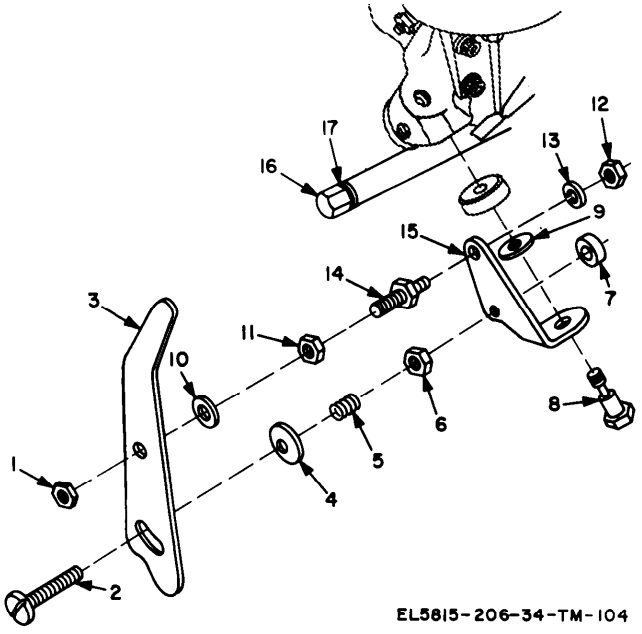
(1) Remove the nut and machine screw that hold the carriage lock lever (3, Fig. 3-32) to the bracket (15); remove the carriage lock lever. Catch the detent (4), spring, nut, and spacer (7) which will be released as the carriage lock lever is removed.

(2) Remove the stud (8) that holds the bracket to the carriage frame; remove the bracket and

assembled parts. The washer (9) and the carriage rail ball bearing will also be released.

(3) Remove the washer, nuts, lockwasher, and stud (14) from the bracket.

(4) Remove the capnut (16) and lockwasher from the end of the carriage rail.



1 Special spacer nut, 51958
2 Machine screw, 11229
3 Carriage lock lever, 51948
4 Detent, 51947
5 Spring, 51985
6 Plain hexagonal nut, 10825
7 Spacer, 51957
8 Stud, 51960
9 Flat washer, 65676
10 Flat washer, 10481
11 Plain hexagonal nut, 10825
12 Plain hexagonal nut, 10825
13 Lockwasher, 10447
14 Stud, 51959
15 Bracket, 51944
16 Capnut, 51956
17 Lockwasher, 10447

Figure 3-32. Carriage lock mechanism (TT-537/G), exploded view.

b. Reassembly.

(1) Reassembly the carriage lock mechanism as show in figure 3-32; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the carriage lock mechanism (para 3-269).

3-52. Disassembly and Reassembly of Platen Lock Mechanism (TT-537/G)

(fig. 3-33)

a. Disassembly.

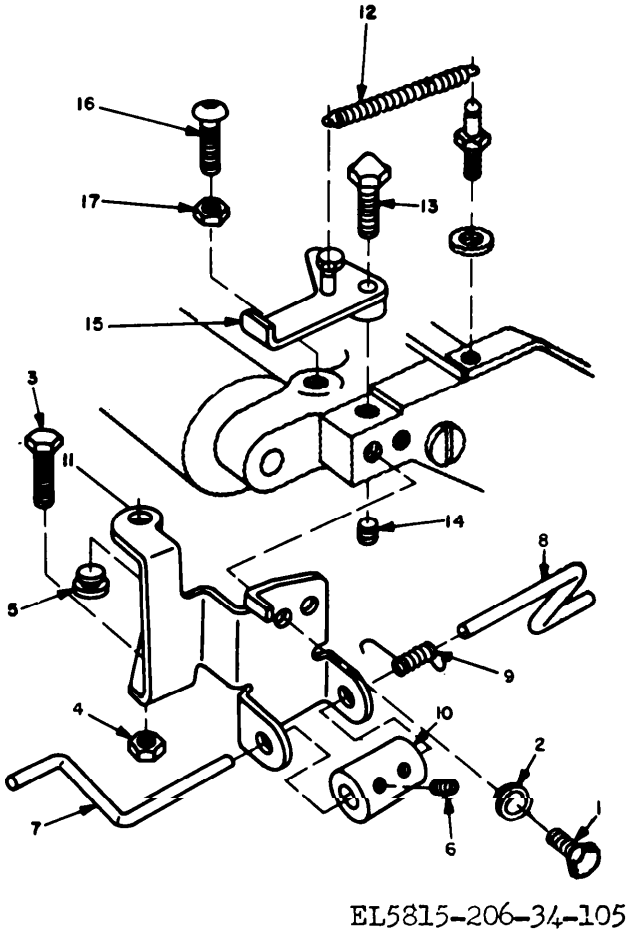
(1) Remove the spring (12, fig. 3-33). Remove the two machine screws and lockwashers that hold the assembled platen bracket (11) to the function side of the teletypewriter frame; remove the assembled platen bracket.

(2) Remove the bumper (5), machine screw, and plain hexagonal nut from the bracket.

(3) Loosen the setscrews that retain the release arms (7 and 8) in the connector (10); disassemble the release arms, spring (9), connector and bracket.

(4) Remove the stud (13) that holds the platen lock lever (15) to the teletypewriter frame; remove the platen lock lever. Remove the setscrew from the frame.

(5) Remove the machine screw and plain hexagonal nut from the platen frame.



1 Machine screw, 10076
2 Lockwasher, 10430
3 Machine screw, 11209
4 Plain hexagonal nut, 10516
5 Bumper, 20762
6 Setscrew, 10221
7 Release arm, 51933
8 Release arm, 51933
9 Spring, 51982
10 Connector, 51946
11 Platen bracket, 51943
12 Spring, 51932
13 Stud, 51962
14 Setscrew, 10234
15 Platen lock lever, 51949
16 Machine screw, 10267
17 Plain hexagonal nut, 10825

Figure 3-33. Platen lock mechanism (TT-537/G), exploded view.

b. Reassembly.

(1) Reassemble the platen lock mechanism as shown in figure 3-33; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the platen lock mechanism (para 3-270, 3-271 and 3-272).

3-53. Disassembly and Reassembly of Ribbon Lifter Assembly (TT4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG)

(fig. 3-34)

a. Disassembly.

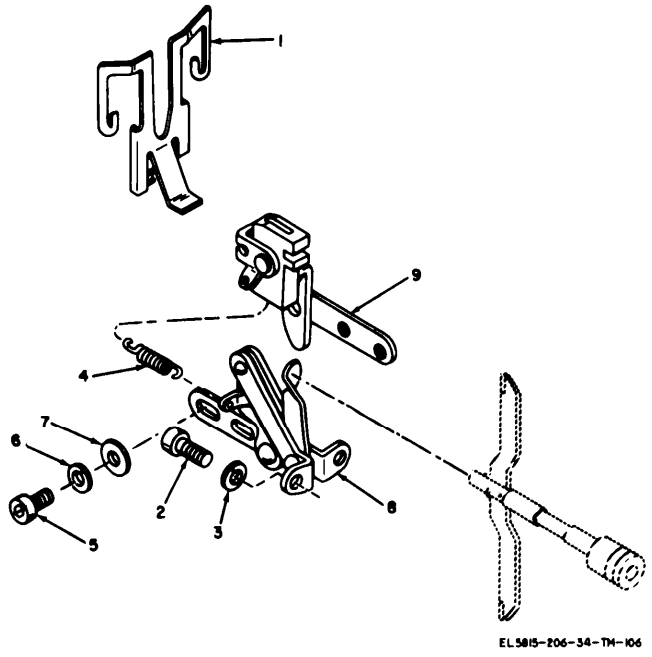
(1) Remove the carriage (para 3-29a).

(2) Remove the ribbon guide (1, fig. 3-34) from the ribbon-lifter bell crank (9).

(3) Remove the ribbon-lifter spring (4) from the ribbon-lifter-lever assembly (8) and from the ribbon-lifter bell crank.

(4) Remove the two machine screws and lockwashers that hold the ribbon-lifter-lever assembly to the carriage; remove the assembled ribbon-lifter-lever assembly.

(5) Remove the two machine screws, lockwashers, and flat washers that hold the ribbon-lifter-lever assembly to the ribbon-lifter bell crank; remove the ribbon-lifter-lever assembly.



1 Ribbon guide, 55036
2 Machine screw, 10001
3 Lockwasher, 10429
4 Ribbon-lifter spring, 51544
5 Machine screw, 10050
6 Lockwasher, 10432
7 Flat washer, 50320
8 Ribbon-lifter-lever assembly, 55790A
9 Ribbon-lifter bell crank, 55795A

Figure 3-34. Ribbon lifter assembly, exploded view (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG).

b. Reassembly.

(1) Reassemble the ribbon lifter assembly as indicated in figure 3-34; the sequence for assembling the parts is the reverse of the disassembly sequence.

NOTE

Be sure the end of the ribbon guide engages the notch in the front of the ribbon-lifter bell crank; also, be sure the lip of the cross rail of the platen trough, (fig. 3-28) engages the notch in the rear of the bearing of the ribbon-lifter bell crank (fig. 3-34).

(2) Replace the carriage (para 3-29b).

(3) Adjust the ribbon lifter assembly (para 3-212).

3-54. Disassembly and Reassembly of Ribbon-Feed Mechanism

(fig. 3-35)

a. Disassembly.

(1) Remove the ribbon from the ribbon guide (1, fig. 3-31 or 3-34).

(2) On the TT-4A/TG, TT-698/TG, lift the ribbon-spool lock (30, fig. 3-35) and press down on the ribbon-sensing levers (31) to remove the ribbon spools (1) from the ribbon-spool shafts (24); remove the ribbon spools and printing ribbon.

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, lift the ribbon-spool lock and press in the ribbon-sensing levers toward the outside of the levers to remove the ribbon spools from the ribbon-spool shafts; remove the ribbon spools and the printing ribbon.

(4) Remove the six machine screws (four machine screws on the TT-4A/TG and TT-698/TG) and lockwashers that hold the ribbon-feed mechanism to the carriage frame; remove the ribbon-feed mechanism.

(5) Remove the four machine screws, lock. washers, and two retainer plates (6) that hold the type-bar backstop (7) to the two ribbon-spool mounting brackets (29); remove the type-bar backstop.

(6) On the TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG, remove the two self-locking hexagonal nuts and two machine screws that hold the ribbon-drive assembly (14) to the two ribbon-spool mounting brackets; disengage the ribbon-drive assembly from the pins on the ribbon-reverse-cam followers (19) and from the two ribbon-spool mounting brackets.

(7) On the TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG, remove the two self-locking hexagonal nuts, the ribbon-feed shaft detent spring (33), and two machine screws that hold the ribbon-drive assembly to the two ribbon-spool mounting brackets. Disengage the ribbon-drive assembly from the pins on the ribbon-reverse-cam followers and from the ribbon-spool mounting brackets.

(8) On the TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG, remove the ribbon-reverse-detent

spring (34) from the detent lever and the frame of the ribbon-drive assembly.

(9) On the TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG, remove the ribbon-reverse-detent spring from the detent lever on the frame of the ribbon-drive assembly.

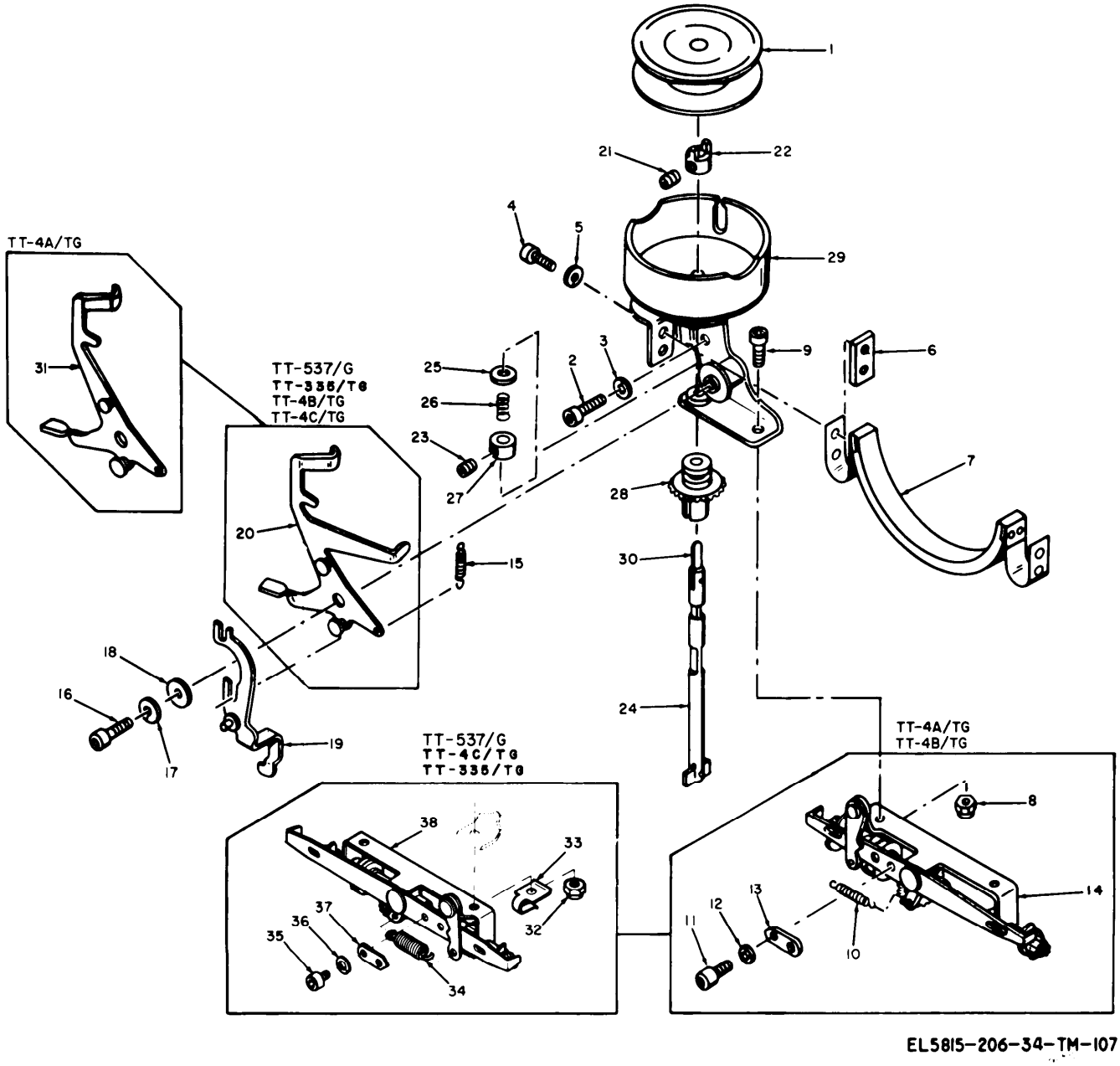


Figure 3-35. Ribbon feed mechanism, exploded view.

KEY to fig. 3-35:
1 Ribbon spool, 10900
2 Machine screw, 10004
3 Lockwasher, 10429
4 Machine screw, 10001
5 Lockwasher, 10429
6 Retainer plate, 50434
7 Type-bar backstop, 50429A
8 Self-locking hexagonal nut, 10500
9 Machine screw, 10003
10 Ribbon-reverse-detent spring, 50403
11 Machine screw, 10002
12 Lockwasher, 10429
13 Ribbon-reverse detent, 50393
14 Ribbon-drive assembly, 50400A (includes items 11, 12, and 13)
15 Ribbon-sensing-lever spring, 50447
16 Machine screw, 10003
17 Flat washer, 50414
18 Lockwasher, 10429
19 Ribbon-reverse-cam follower, 50423A (lb), 50424A (th)
20 Ribbon-sensing lever, 55026A (lb), 55028A (rh)
21 Set screw, 10201
22 Spool-driving collar, 50392
23 Setscrew, 10201
24 Ribbon-spool shaft, 50435A
25 Flat washer, 50315
26 Spool-shaft spring, 53961
27 Shaft collar, 50391
28 Ribbon-spool-shaft gear, 50448
29 Ribbon-spool mounting bracket, 50451A (lb), 50453A (rh)
30 Ribbon-spool lock
31 Ribbon-sensing lever, 50421A (lb), 50422A (rh)
32 Self-locking hexagonal nut, 10500
33 Ribbon-feed shaft detent spring, 61288
34 Ribbon-reverse-detent spring, 50403
35 Machine screw, 10002
36 Lockwasher, 10429
37 Ribbon-reverse detent, 50393
38 Ribbon-drive assembly 63503A (includes items 35, 36, and 37)

(10) On the TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG, remove the two machine screws and lockwashers that hold the ribbon-reverse detent (13) to the ribbon-drive assembly; remove the ribbon-reverse detent.

(11) Remove the two machine screws and lockwashers that hold the ribbon-reverse detent to the ribbon-drive assembly; remove the ribbon-reverse detent.

(12) Remove the two ribbon-sensing-lever springs (15) from the two ribbon-sensing levers and from the two ribbon-spool mounting brackets.

(13) On the TT-4A/TG, and TT-698/TG, remove the two machine screws, lockwashers and flat washers that hold the two ribbon-sensing levers to the two ribbon-spool mounting brackets; remove the ribbon-sensing levers and slide off the two ribbon-reverse-cam followers.

(14) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the two machine screws, lockwashers, and flat washers that hold the two ribbon-sensing levers to the two ribbon-spool mounting brackets; remove the ribbon-sensing levers and slide off the two ribbon-reverse-cam followers.

(15) Remove the four setscrews that hold the two spool-driving collars (22) to the ribbon-spool shafts; remove the spool-driving collars.

(16) Remove the four setscrews that hold the two shaft collars (27) to the two ribbon-spool shafts; slide the ribbon-spool shafts from the two ribbon-spool mounting brackets. Remove the two flat washers, and two spool-shaft springs (26), (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), and shaft collars from the shafts as they are removed.

(17) Remove the two ribbon-spool-shaft gears (28) from the two ribbon-spool shafts.

b. Reassembly.

(1) Reassemble the ribbon-feed mechanism as indicated in figure 3-35; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the ribbon-feed mechanism (para 3-243 and 3-251).

3-55. Disassembly and Reassembly of Type-Bar Group

(fig. 3-36)

a. Disassembly.

(1) Remove the carriage assembly (para 3-29a).

(2) On the TT-4A/TG and TT-698/TG, remove the ribbon lifter assembly (para 3-50a).

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the ribbon lifter assembly (para 3-53).

(4) Remove the ribbon-feed mechanism (para 3-54a).

(5) Remove the 26 connecting-bar springs (1, fig. 3-36) from the connecting bars (4) and from the mounting plate (17).

(6) Loosen the two plain hexagonal nuts and setscrews to remove the hinge pin (2) that holds the type bars in the type-bar segment; remove the type bars (3) and the connecting bars from the guide plate (18).

(7) Remove the two plain hexagonal nuts, lockwashers, and setscrews that hold the type-bar segment key (8) and type-bar segment (14) to the carriage frame; remove the type-bar segment key and type-bar segment.

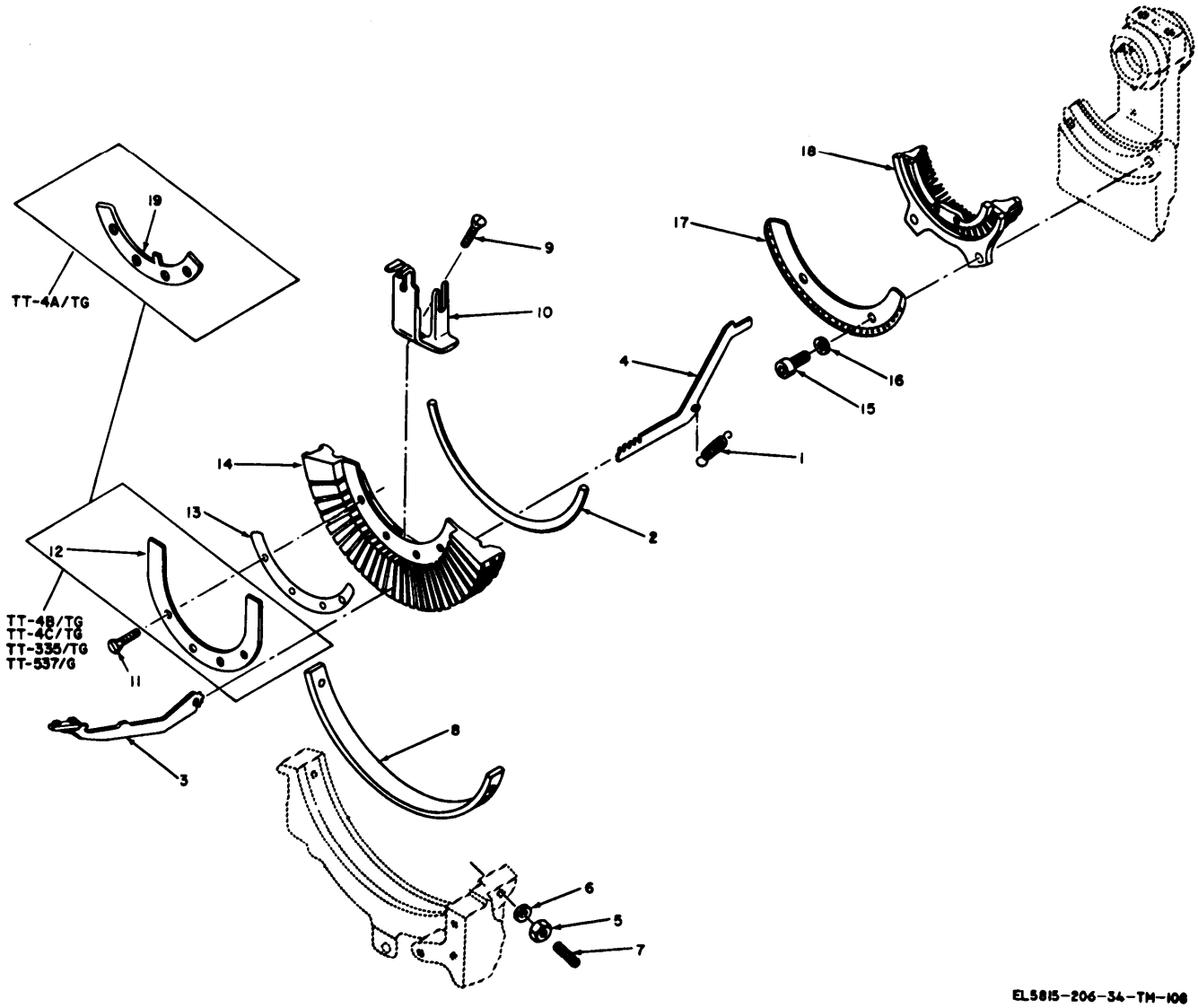
(8) Remove the two machine screws that hold the ribbon-guide mounting bracket (10) to the type-

bar segment; remove the ribbon-guide mounting bracket.

(9) On the TT-4A/TG and TT-698/TG, remove the four machine screws that hold the type-bar bumper plate (19) and the bumper-plate shim (13) to the type-bar segment; remove the type-bar bumper plate and bumper-plate shim.

(10) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the four machine screws that hold the type-bar bumper plate and the bumper-plate shim to the type-bar segment; remove the type-bar bumper plate and bumper-plate shim.

(11) Remove the two machine screws and lock-washers that hold the mounting plate and the guide plate to the carriage frame; remove the mounting plate and guide plate.



1 Connecting-bar spring 50595
2 Hinge pin, 50572
3 Type bar. (See type-bar and connecting-bar chart.)
4 Connecting bar. (See type-bar and connecting-bar chart.)
5 Plain hexagonal nut, 10509
6 Lockwasher, 10431
7 Setscrew, 10214
8 Type-bar segment key, 50550
9 Machine screw, 10306
10 Ribbon-guide mounting bracket, 50589 [a], 55147 [b]
11 Machine screw, 51132
12 Ribbon stop, 55791
13 Bumper-plate shim 51244 to 51247 (TT-4A/TG only)
14 Type-bar segment, 50549
15 Machine screw, 10025
16 Lockwasher, 10430
17 Mounting plate, 50548
18 Guide plate, 50547
19 Type-bar bumper plate, 51131

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG.

Figure 3-36. Type-bar group, exploded view.

b. Reassembly.

(1) Reassemble the type-bar group as indicated in figure 3-36. The sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Position the connecting bars and the type bars in the type-bar segment with the connecting bars in the guide plate. Numbers 1 through 26 are stamped on both the connecting bars and the type

bars. Install the bars in matched pairs; install the No. 1 pair on the left side of the carriage. Bar identification data is given in the following chart:

Type-Bar and Connecting-Bar Chart

Number stamped in bar	Connecting-bar reference No.	TT-4(*) TG TT-335 TG TT-537 G and TT-698(*) TG Reference No.	Type-bar letter	Upper-case symbol
1	50022	62211	Z	"
2	50023	62212	J	'
3	50024	62213	X	/
4	50025	62214	V	;
5	50026	62215	B	?
6	50027	62216	C	:
7	50028	62217	P	0
8	50029	62218	M	.
9	50030	62219	F	!
10	50031	62220	R	4
11	50032	62221	O	9
12	50033	62222	I	8
13	50034	62223	T	5
14	50035	62224	E	3
15	50036	62225	A	-
16	50037	62261	S	
17	50038	62260	H	
18	50039	62228	N	,
19	50040	62229	L	)
20	50041	62230	D	$
21	50042	62231	U	7
22	50043	62232	G	&
23	50044	62233	Y	6
24	50045	62234	W	2
25	50046	62235	K	(
26	50047	62236	Q	1

(3) Thread the hinge pin in the type-bar segment through the holes in the 26 type bars; tighten the two setscrews against the hinge pin with from ½ - to 1½ inch-pound torque and secure the plain hexagonal nuts.

(4) Install the connecting-bar springs on the mounting plate and on the connecting bars.

(5) Replace the ribbon-feed mechanism (para 3-54b).

(6) On the TT-4A/TG and TT-698/TG, replace the ribbon lifter assembly (para 3-50b).

(7) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, replace the ribbon lifter assembly (para 3-53b).

(8) Replace the carriage assembly (para 3-29b).

3-56. Disassembly and Reassembly of Carriage Frame Assembly (TT-4(*)/TG, TT-335/TG and TT-698(*)/TG

(fig. 3-29)

a. Disassembly.

(1) Remove the carriage assembly from the teletypewriter frame (para 3-29a).

(2) Remove the two machine screws and lock. washers that hold the carriage rack (13, fig. 3-29) to the carriage frame (27); remove the carriage rack,

(3) Only if necessary remove the plain wing nut (14) and lockwasher that hold the platen-locking arm (16) on the threaded end of the carriage guide rail (17); remove the platen-locking arm from the carriage guide rail.

(4) Remove the carriage guide rail from the assembled ball bearings, by moving the carriage guide rail to the left, out of the ball bearings.

(5) Remove the two carriage-roller screws (18 and 20) that hold the ball bearings (19 and 21) to the carriage frame; remove the ball bearings.

(6) Remove the carriage-locking stud (22) from the carriage frame.

(7) Remove the self-locking hexagonal nut that holds the ball bearing (25) to the roller-mounting stud (26); remove the ball bearing.

(8) Remove the setscrew (23) that holds the roller-mounting stud in the carriage frame; remove the roller-mounting stud.

b. Reassembly.

(1) Reassemble the carriage frame assembly as indicated in figure 3-29; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the carriage assembly on the teletypewriter (para 3-29b).

(3) Adjust the carriage frame assembly (para 3-191 and 3-192).

3-57. Disassembly and Reassembly of Carriage (TT-537/G only)

(fig. 3-37)

a. Disassembly.

(1) Remove the carriage from the teletypewriter (para 3-29a).

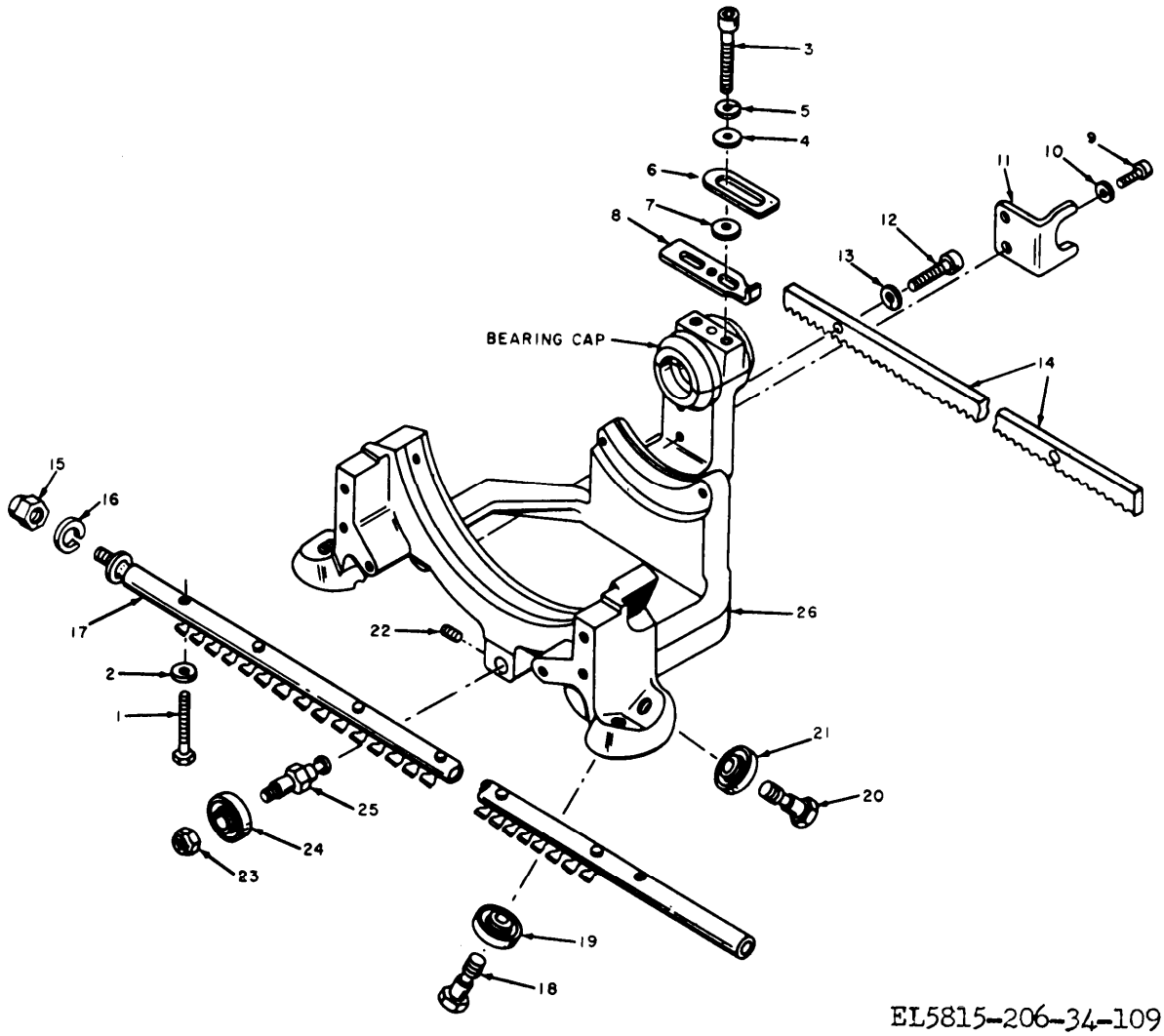
(2) Remove the two machine screws and lock-washers and remove the carriage feed and return driving rack (14, fig. 3-37).

(3) Remove the capnut (15) and lockwasher from the threaded end of the carriage guide rail (17). Remove the carriage guide rail from the rollers.

(4) Remove the capscrews (18 and 20) and ball bearings (19 and 21).

(5) Remove the setscrew (22), the assembled roller mounting stud (25), and ball bearing (24).

(6) Remove the self-locking hexagonal nut (23) and the ball bearing from the roller mounting stud.



1 Machine screw, 10319
2 Lockwasher, 10404
3 Machine screw, 10063
4 Flat washer, 10467
5 Lockwasher, 10430
6 Right-hand margin trip plate, 52257
7 Flat washer, 10467
8 Left hand margin trip plate, 52253
9 Machine screw, 10003
10 Lockwasher, 10429
11 Carriage rear support bracket, 50571
12 Machine screw, 10010
13 Lockwasher, 10426
14 Carriage feed and return driving rack, 57951
15 Capnut, 51956
16 Lockwasher, 10447
17 Carriage guide rail, 56830
18 Capscrew, 50591
19 Ball bearing, 10752
20 Capscrew, 50591
21 Ball bearing, 10752
22 Setscrew, 10204
23 Self-locking hexagonal nut, 10501
24 Ball bearing, 10752
25 Roller mounting stud, 50593
26 Carriage frame, 50545A

Figure 3-37. Carriage frame assembly, exploded view (TT-537/G only).

b. Reassembly.

(1) Reassemble the carriage by reversing the steps and procedures outlined in *a* above.

(2) Replace the carriage on the teletypewriter (para 3-29b).

(3) Adjust the carriage (para 3-191, 3-192 and 3-194).

3-58. Disassembly and Reassembly of Selector-Magnet Assembly

(fig. 3-38)

a. Disassembly.

(1) Remove the armature spring (fig. 3-21) from

the armature-spring arm and from the selector-magnet armature (8, fig. 3-38).

(2) Remove the two machine screws and lockwashers that hold the armature bracket (9) to the teletypewriter frame; remove the armature bracket.

(3) Remove the setscrew that holds the armature adjustable bushing (6) in the armature bracket; remove the armature adjustable bushing, bearing ball (7), and selector-magnet armature.

(4) Unsolder the electrical leads to the switch; tag the leads to facilitate reassembly.

(5) Remove the two machine screws and lockwashers that hold the selector-magnet bracket (20) to the teletypewriter frame; remove the selector-magnet bracket.

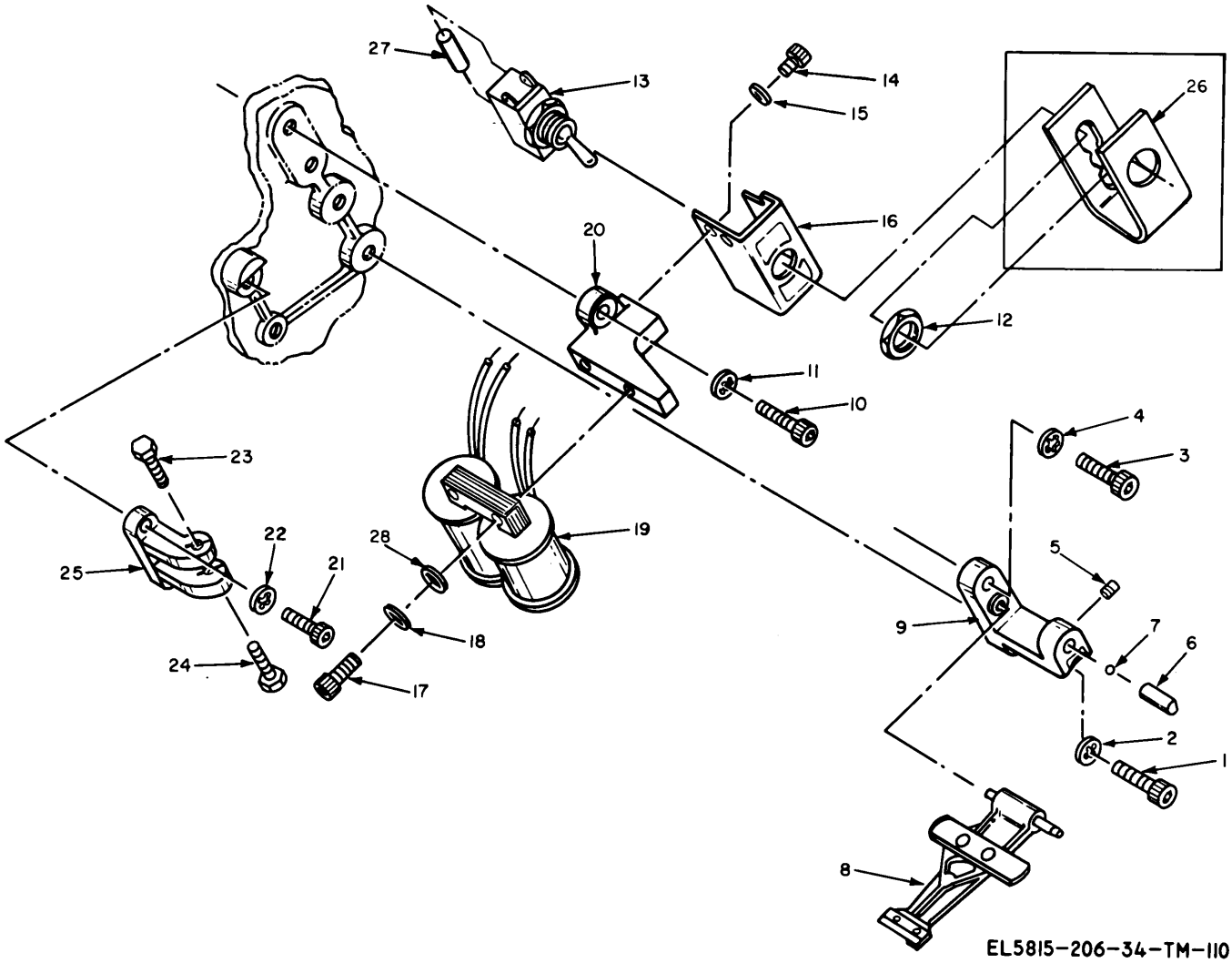
(6) Remove the plain hexagonal nut that holds the switch (13) to the switch cover (16); remove the switch.

(7) Remove the two machine screws and lockwashers that hold the switch cover to the selector-magnet bracket; remove the switch cover.

(8) Remove the two machine screws and lockwashers that hold the selector-magnet coil assembly (19) to the selector-magnet bracket; remove the selector-magnet coil assembly.

(9) Remove the two machine screws and lockwashers that hold the stop-screw bracket (25) to the teletypewriter frame; remove the stop-screw bracket.

(10) Remove the two stopscrews (23 and 24) from the stop-screw bracket.



1 Machine screw, 10018
2 Lockwasher, 10431
3 Machine screw, 10011
4 Lockwasher, 10430
5 Setscrew, 10203
6 Armature adjustable bushing, 50310
7 Bearing ball, 10924
8 Selector-magnet armature, 50049A
9 Armature bracket 50307A (includes items 5, 6, and 7)
10 Machine screw, 10011
11 Lockwasher, 10430
12 Plain hexagonal nut [b]
13 Switch S4, 20103 [b] (includes item 12)
14 Machine screw, 10004
15 Lockwasher, 10429
16 Switch cover, 50994 [b]
17 Machine screw, 10085
18 Lockwasher, 10430
19 Selector-magnet coil assembly 50271A
20 Selector-magnet bracket, 50270
21 Machine screw, 10009
22 Lockwasher, 10434
23 Stop screw, 63279
24 Stop screw, 63279
25 Stop-screw bracket, 50504A
26 Switch lock, 67051
27 Capacitor C7, 23746 [a]
28 Plain washer, 10467

[a] TT-537/G.
[b] Not applicable to the TT-698(*)/TG.

Figure 3-38. Selector-magnet assembly, exploded view.

b. Reassembly.

(1) Reassemble the selector-magnet assembly as indicated in figure 3-38; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the selector-magnet assembly (para 3-164 through 3-170).

3-59. Removal and Replacement of Rangefinder (figs. 3-21 and 3-39)

a. Removal.

(1) Remove the two setscrews (37, fig. 3-21) that hold the rangefinder cam (38) to the rangefinder shaft; remove the rangefinder cam.

(2) Loosen the two setscrews that hold the rangefinder gear (42) to the rangefinder shaft (43); slide the rangefinder shaft forward to disengage the selector-lever-comb bracket (14, fig. 3-39).

(3) Remove the two machine screws and lock-

washers that hold the assembly to the teletypewriter frame: remove the rangefinder.

b. Replacement.

(1) Replace the rangefinder by reversing the procedure described in *a* above.

(2) Adjust the rangefinder (para 3-160, 3-162 and 3-163).

3-60. Disassembly and Reassembly of Rangefinder (fig. 3-39)

a. Disassembly.

(1) Remove the rangefinder from the teletypewriter (para 3-59a).

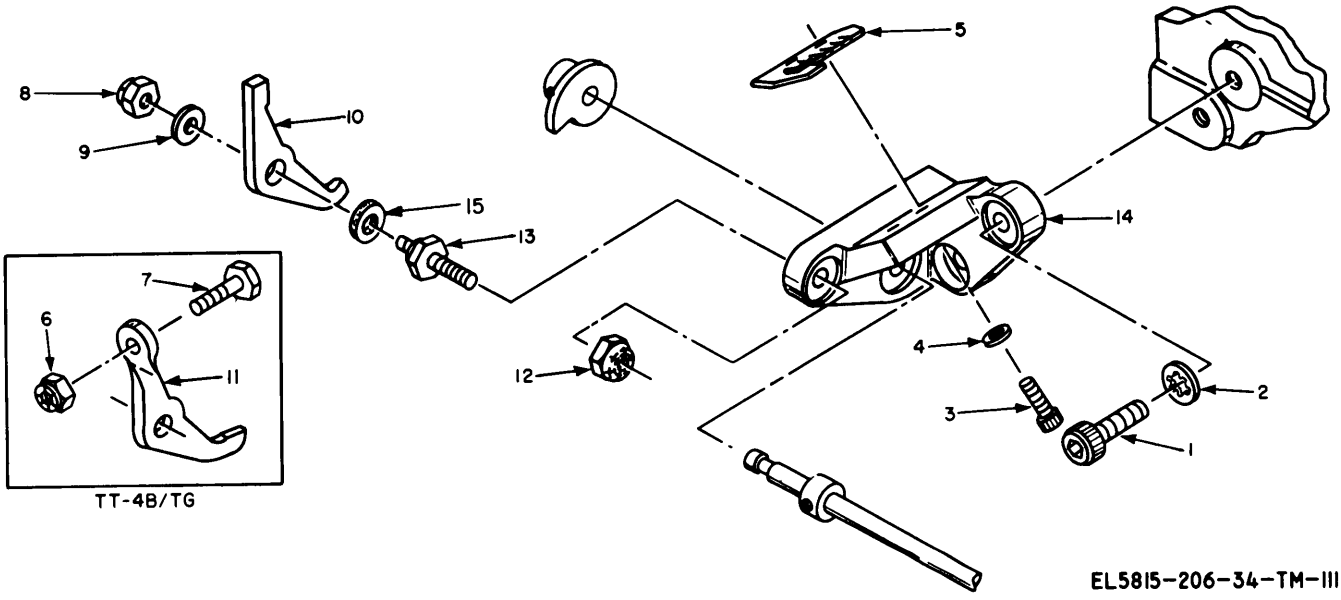
(2) Remove the two machine screws and lockwashers that hold the selector-lever comb (5, fig. 3-39) to the selector-lever-comb bracket (14); remove the selector-lever comb.

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the self-locking hexagonal nut (6) that holds the machine screw (7) securely in the orientation lever (11); remove the machine screw.

(4) Remove the self-locking hexagonal nut (8) and flat washer that hold the orientation lever (10) to the orientation-lever stud (13); remove the orientation lever.

(5) On the TT-4A/TG and TT-698/TG, remove the self-locking hexagonal nut (12) that holds the orientation-lever stud to the selector-lever-comb bracket (14); remove the orientation-lever stud.

(6) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the orientation-lever stud from the selector-lever comb bracket.



1 Machine screw, 10017
2 Lockwasher, 10405
3 Machine screw, 10003
4 Lockwasher, 10429
5 Selector-lever comb, 50511
6 Self-locking hexagonal nut, 10500 [b]
7 Machine screw, 10090 [b]
8 Self-locking hexagonal nut, 10500
9 Flat washer, 50414
10 Orientation lever, 50324 [a]
11 Orientation lever, 53112 [b]
12 Self-locking hexagonal nut, 10501 [a]
13 Orientation-lever stud, 50330 [a], 53111 [b]
14 Selector-lever-comb bracket, 50510A [a], 57709A [b]
15 Felt lubricating washer, 61480

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698/TG.

NOTE

Figure 3-39. Selector-lever comb bracket assembly, exploded view.

b. Reassembly.

(1) Reassemble the rangefinder as indicated in figure 3-39; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the rangefinder (para 3-59b).

(3) Adjust the rangefinder cam follower (para 3-161).

3-61. Disassembly and Reassembly of Selector Levers and Y-levers (TT-4A/TG and TT-698/TG)

(fig. 3-40)

a. Disassembly.

(1) Remove the six selector-lever springs (1, fig. 3-40) from the spring post and from the stop lever (22) and five selector levers.

(2) Remove the plain hexagonal nut from the spring post (2) and unscrew the spring post from the teletypewriter frame.

(3) Remove the two setscrews that hold the spacing collar (5) on the Y-lever stud (38); remove the collar and the friction-plate spring (6).

(4) Remove the six friction plates, five Y-levers and collar (18) from the Y-lever stud.

(5) Remove the set of five selector levers from the five bearings.

(6) Remove the self-locking hexagonal nut, stop-lever eccentric bearing (21), stop lever and stop-lever spacer (23) from the selector-lever stud (36).

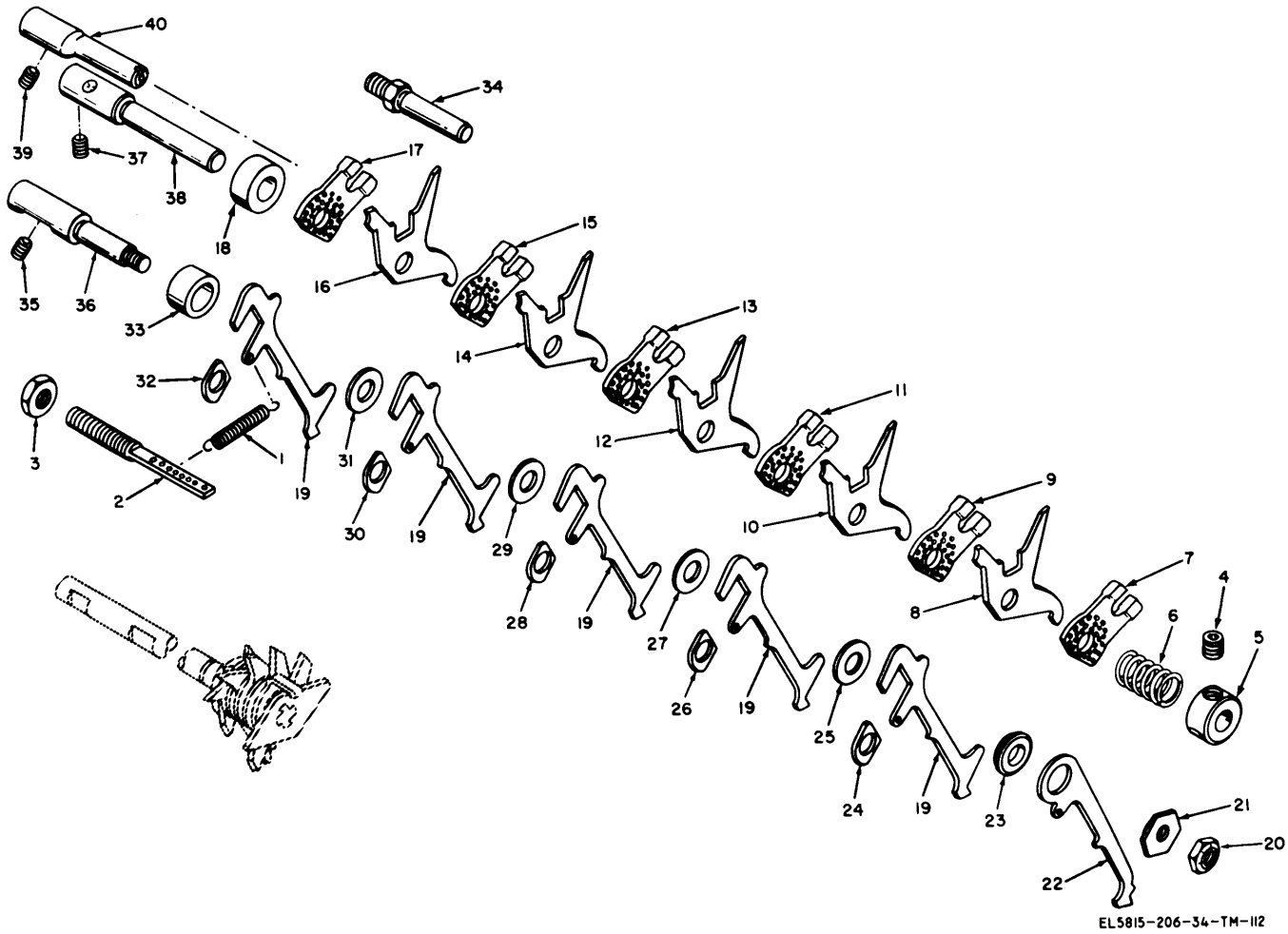
(7) Remove the five bearings, four flat washers and collar (33) from the selector-lever stud.

(8) Remove the Y-lever friction-plate stud (34) from the teletypewriter frame.

(9) Remove the setscrew (35) that holds the selector-lever stud in the teletypewriter frame; remove the selector-lever stud.

(10) Remove the setscrew (37) that holds the Y-lever stud in the teletypewriter frame; remove the Y-lever stud.

(11) Remove the setscrew (39) that holds the Y-lever eccentric stop (40) in the teletypewriter frame; remove the Y-lever eccentric stop.



1 Selector-lever spring, 50902
2 Spring post, 50325
3 Plain hexagonal nut, 10509
4 Setscrew, 10209
5 Spacing collar, 50149
6 Friction-plate spring, 50910
7 Friction plate, 50818
8 Y-lever set 53540A (set of 5), items, 8, 10, 12, 14, 16
9 Friction plate, 50818
10 Y-lever
11 Friction plate, 50815
12 Y-lever
13 Friction plate, 50818
14 Y-lever
15 Friction plate, 50818
16 Y-lever
17 Friction plate, 50818
18 Collar, 50414
19 Selector lever, 51598A (consists of set of 5)
20 Self-locking hexagonal nut, 10500
21 Stop-lever eccentric bearing, 50146
22 Stop lever, 50014
23 Stop-lever spacer, 50053
24 Bearing, 50019A (consists of set of 5, items 24, 26, 28, 30, and 32)
25 Flat washer, 50147
26 Bearing
27 Flat washer, 50147
28 Bearing
29 Flat washer, 50247
30 Bearing
31 Flat washer, 50147
32 Bearing
33 Collar, 51416
34 Y-lever friction-plate stud, 50151
35 Setscrew, 10211
36 Selector-lever stud, 53268
37 Setscrew, 10211
38 Y-lever stud, 53269
39 Setscrew, 10211
40 Y-lever eccentric stop, 61001

Figure 3-40. Selector levers and Y-levers (TT-4A/TG and TT-698/TG), exploded view.

b. Reassembly.

(1) Reassemble the selector levers and Y-levers as indicated in figure 3-40; the sequence for assembling the parts is the reverse of the disassembly sequence.

NOTE

When replacing either selector levers or Y-levers, replace an entire set. Do not use a combination of new and old levers.

(2) Adjust the selector levers and Y-levers (para 3-157, 3-162, and 3-166).

3-62. Disassembly and Reassembly of Selector Levers and Y-levers (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG)

(fig. 3-41)

a. Disassembly.

(1) Remove the six selector-lever springs (1, fig. 3-41) from the spring post (2) and from the five selector levers and the stop lever (41).

(2) Remove the plain hexagonal nut from the spring post and unscrew the spring post from the frame.

(3) Remove the five Y-lever detent springs (4) from the five Y-lever detents and from the detent-spring bracket (54).

(4) Remove the plain hexagonal nut(s), lockwasher, and centering sleeve (7) from the detent stud (53). Remove the thrust washers and five Y-lever detents alternately and from the centering sleeve.

(5) Remove the detent stud and the detent-spring bracket from the frame.

(6) Remove the machine screw (19), flat washer, and clamp nut (21) that hold the Y-lever stud bracket (26) to the Y-lever stud (58); remove the Y-lever stud bracket from the Y-lever stud and the Y-lever eccentric stop (60).

(7) Remove the two machine screws (22), lockwashers, and flat washers that hold the Y-lever eccentric tie (25) to the Y-lever-stud bracket; remove the Y-lever eccentric tie.

(8) Remove the spacer (27), five Y-levers, four flat washers, felt lubricating washer (63), when supplied, and collar (37) from the Y-lever stud.

(9) Remove the five selector levers from the bearings.

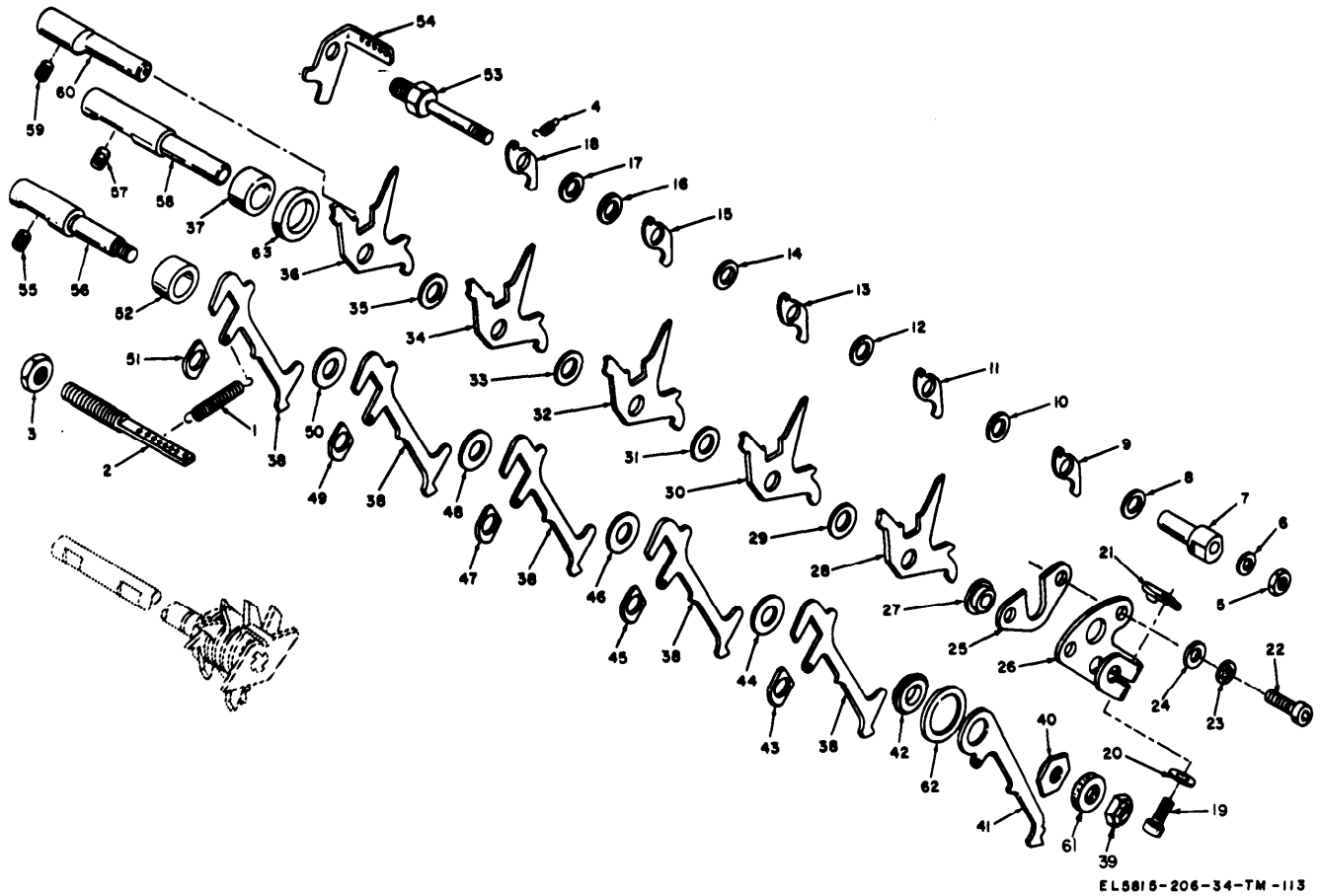
(10) Remove the self-locking hexagonal nut (39), stop-lever eccentric bearing (40), stop lever, and stop-lever spacer (42) from the selector-lever pivot stud (56).

(11) Remove the five bearings, four flat washers and collar (52) from the selector-lever pivot stud.

(12) Remove the setscrew (55) that holds the selector-lever pivot stud in the frame; remove the selector-lever pivot stud.

(13) Remove the setscrew (57) that holds the Y-lever stud in the frame; remove the Y-lever stud.

(14) Remove the setscrew (59) that holds the Y-lever eccentric stop in the frame; remove the Y-lever eccentric stop.



1 Selector-lever spring, 68126
2 Spring post, 50325
3 Plain hexagonal nut, 10509
4 Y-lever-detent spring, 61000
5 Plain hexagonal nut, 10504
6 Lockwasher, 10434
7 Centering sleeve, 55007
8 Thrust washer, 55001
9 Y-lever detent, 55004A (consists of set of 5, items 9, 11, 13, 15, and 18)
10 Thrust washer, 55001
11 Y-lever detent
12 Thrust washer, 55001
13 Y-lever detent
14 Thrust washer, 55001
15 Y-lever detent
16 Thrust washer, 55001
17 Flat washer, 55076
18 Y-lever detent
19 Machine screw, 10006
20 Flat washer, 10459
21 Clamp nut, 50174
22 Machine screw, 10001
23 Lockwasher, 10429
24 Flat washer, 50319
25 Y-lever eccentric tie, 60678
26 Y-lever stud bracket, 60677
27 Spacer, 60679
28 Y-lever, 53540 (set of 5)
29 Flat washer, 50148
30 Y-lever
31 Flat washer, 50148
32 Y-lever
33 Flat washer, 50148
34 Y-lever
35 Flat washer, 50248
36 Y-lever
37 Collar, 51416
38 Selector lever, 51598A (consists of set of 5)
39 Hexagonal nut, 10513
40 Stop-lever eccentric bearing, 55024
41 Stop lever, 50014
42 Stop-lever spacer, 50053
43 Bearing, 50019A (consists of set of 5, items 43, 45, 47, 49, and 51)
44 Flat washer, 50147
45 Bearing
46 Flat washer, 50147
47 Bearing
48 Flat washer, 50147
49 Bearing
50 Flat washer, 50147
51 Bearing
52 Collar, 51416
53 Detent stud, 55008
54 Detent-spring bracket, 55002
55 Setscrew, 10211
56 Selector-lever pivot stud, 53268
57 Setscrew, 10211
58 Y-lever stud, 53269
59 Setscrew, 10211
60 Y-lever eccentric stop, 61001
61 Lockwasher, 10421
62 Felt lubricating washer, 61479
63 Felt lubricating washer, 61479

NOTE
Some equipments have felt lubricating washers.

Figure 3-41. Selector levers and Y-levers (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), exploded view.

(15) On the TT-4A/TG and TT-698/TG, remove the self-locking hexagonal nut (36) that holds the assembled transfer-lever-roller stud (38) to the transfer-lever shaft assembly; remove the assembled

transfer-lever-roller stud. Remove the plain hexagonal nut and lockwasher that hold the ball bearing to the transfer-lever-roller stud; remove the ball bearing.

(16) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the self-locking hexagonal nut that holds the transfer-lever roller stud assembly to the transfer-lever shaft assembly; remove the transfer-lever-roller stud assembly.

(17) Remove the transfer-lever-latch spring (43) from the transfer-lever latch (47) and from the spring post.

(18) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer that hold the transfer-lever latch to the transfer-lever-latch stud (48); remove the transfer-lever latch.

(19) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the retainer ring (46) that holds the transfer-lever latch to the transfer-lever latch stud; remove the transfer-lever latch. Remove the three felt lubricating washers (45) when supplied.

(20) Remove the transfer-lever-latch stud from the frame.

(21) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the machine screws, lockwasher, and flat washer that hold the eccentric spring post (52) in the frame; remove the eccentric spring post.

b. Reassembly.

(1) Reassemble the selector levers and Y-levers as indicated in figure 3-41; the sequence for assembling the parts is the reverse of the disassembly sequence.

NOTE

When replacing either selector levers or Y-levers, replace an entire set. Do not use a combination of new and old levers.

(2) Adjust the selector levers and Y-levers (para 3-157, 3-162 and 3-166).

3-63. Disassembly and Reassembly of Transfer-Lever Shaft Assembly TT4(*)/TG, TT-335/TG, TT-537/G and TT-698(*)/TG)

(fig. 3-42)

a. Disassembly.

(1) Remove one paper-shaft bracket and the paper chute (para 3-23a).

(2) On the TT-4A/TG and TT-698/TG, remove the transfer-lever spring (1, Fig. 3-42) from the spring stud (35) and from the spring post on the frame.

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the transfer-lever spring from the spring stud and from the eccentric spring post.

(4) Remove the self-locking hexagonal nut (2), flat washer, and shim that hold the five T-levers and four flat washers to the T-lever pivot stud (16); alternately remove the T-levers and flat washers. Remove the felt lubricating washer (39), when supplied, from the T-lever pivot stud.

(5) Remove the machine screw that holds the clutch latch (22) to the transfer-lever shaft assembly (42); remove the assembled clutch latch and ball bearing (21).

(6) Remove the plain hexagonal nut (18), lockwasher, and machine screw (20) that hold the ball bearing to the clutch latch; remove the ball bearing.

(7) On the TT-4A/TG and TT-698/TG, remove the two setscrews that hold the shaft collar (24) to the transfer-lever shaft assembly; remove the shaft collar.

(8) Remove the four setscrews that hold the two shaft collars (27 and 28) to the transfer-lever shaft assembly.

(9) Pull the transfer-lever shaft assembly from the frame; catch the two shaft collars as they fall from the shaft.

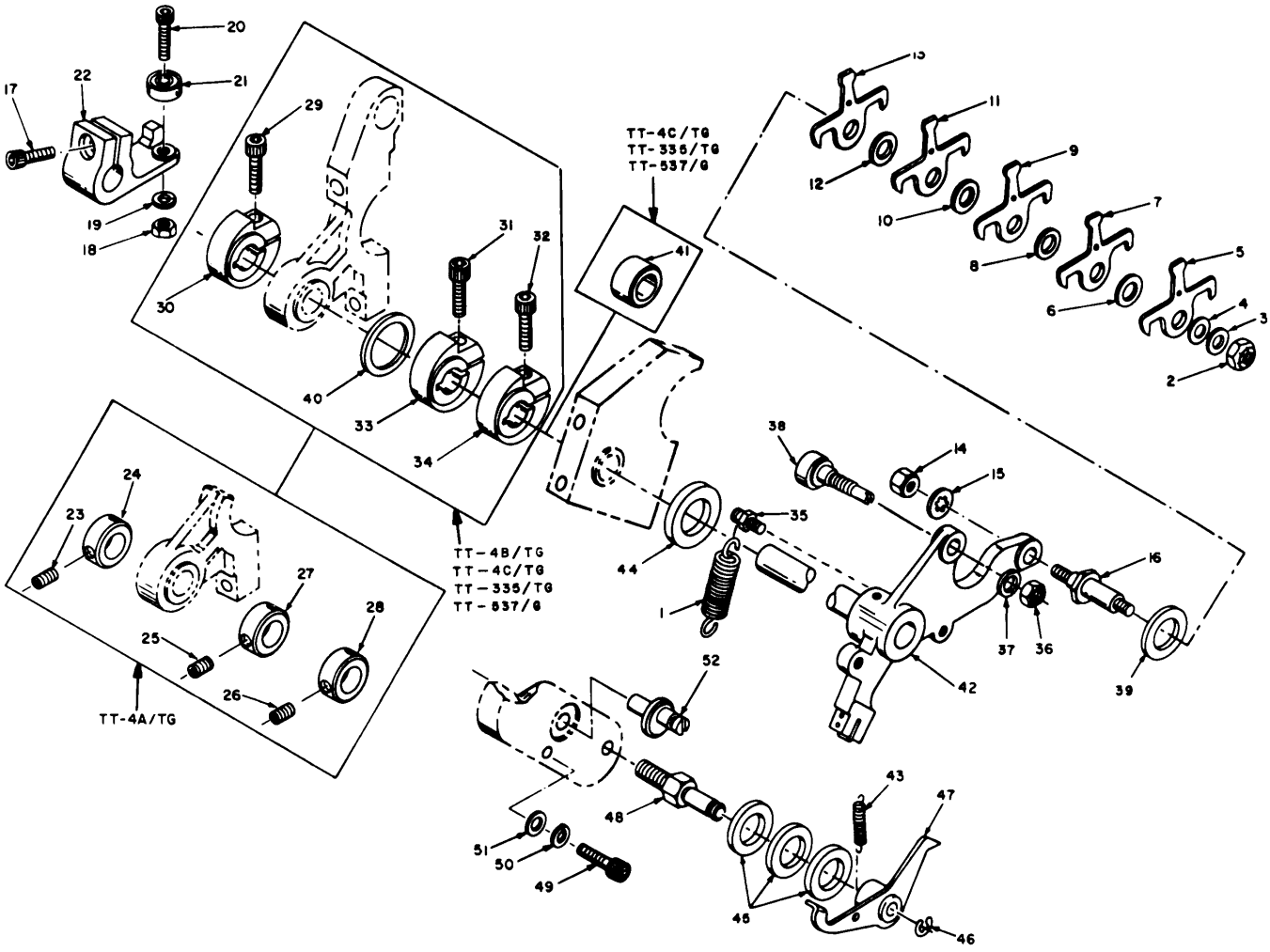
(10) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the machine screw (29) that holds the shaft collar (30) to the transfer-lever shaft assembly; remove the shaft collar.

(11) Remove the two machine screws that hold the two shaft collars (33 and 34) to the transfer-lever shaft assembly.

(12) Pull the transfer-lever shaft assembly from the frame; catch the two shaft collars and spacer (41) as they fall from the shaft. Catch the felt lubricating washers (40 and 44), when supplied, as they fall free of the shaft.

(13) Remove the plain hexagonal nut (14) and lockwasher that hold the T-lever pivot stud to the transfer-lever shaft assembly; remove the T-lever pivot stud.

(14) Remove the spring stud (35) from the transfer-lever shaft assembly.



EL5815-206-34-TM-114

1 Transfer-lever spring, 50903
2 Self-locking hexagonal nut, 10500
3 Flat washer, 50414
4 Shim (.002-in.), 57072, or Shim (.003-in.
5 T-lever, 56766A (consists of set of 5, items 5, 7, 9, 11, and 13)
6 Flat washer, 50148
7 T-lever
8 Flat washer, 50148
9 T-lever
10 Flat washer, 50148
11 T-lever
12 Flat washer, 50148
13 T-lever
14 Plain hexagonal nut, 50651
15 Lockwasher, 10404
16 T-lever pivot stud, 50650
17 Machine screw, 10008
18 Plain hexagonal nut, 10504
19 Lockwasher, 10434
20 Machine screw, 10000
21 Ball bearing, 10754
22 Clutch latch, 50535A
23 Setscrew, 10209
24 Shaft collar, 50327
25 Setscrew, 10209
26 Setscrew, 10209
27 Shaft collar, 50327
28 Shaft collar, 50327
29 Machine screw, 10010
30 Shaft collar, 53973
31 Machine screw, 10010
32 Machine screw, 10010
33 Shaft collar, 53973
34 Shaft collar, 53973
35 Spring stud, 50649
36 Hexagonal nut, 10505
37 Lockwasher, 10430
38 Transfer-lever-roller stud assembly, 56185A
39 Felt lubricating washer, 61480
40 Felt lubricating washer, 61488
41 Spacer collar, 57922
42 Transfer-lever shaft assem 52394A [a] [b]
43 Transfer-lever-latch spring, 50904
44 Felt lubricating washer, 61489
45 Felt lubricating washer, 61467
46 Retainer ring, 10949
47 Transfer-lever latch, 50020A
48 Transfer-lever-latch stud, 52319, 50220A, 15, R/W 52319, plus item 46
49 Machine screw, 10003 [b]
50 Lockwasher, 10429 [b]
51 Flat washer, 50839 [b]
52 Eccentric spring post, 56076 [b]

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG.

Figure 3-42. Transfer-lever shaft assembly, exploded view.

b. Reassembly.

(1) Reassemble the transfer-lever shaft assembly as indicated in figure 3-42; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the paper-shaft bracket and paper chute on the frame (para 3-23b).

(3) Adjust the transfer-lever shaft assembly (para 3-145 through 3-148, 3-150 and 3-152 through 3-154).

3-64. Disassembly and Reassembly of Print-Bail Shaft Assembly

(fig. 3-43)

a. Disassembly.

(1) Remove one paper-shaft bracket and the paper chute (para 3-23a).

(2) Remove the transfer-lever shaft assembly from the teletypewriter (para 3-63a.).

(3) Remove the two setscrews (fig. 3-51) that hold the print cam to the function shaft. Slide the print cam to the selector side of the teletypewriter. Be careful not to lose the bushing (2, fig. 3-43) from the print-cam-follower-roller stud (3).

(4) Remove the print-cam follower spring (1) from the print-cam follower (8) and the spring post on the teletypewriter frame.

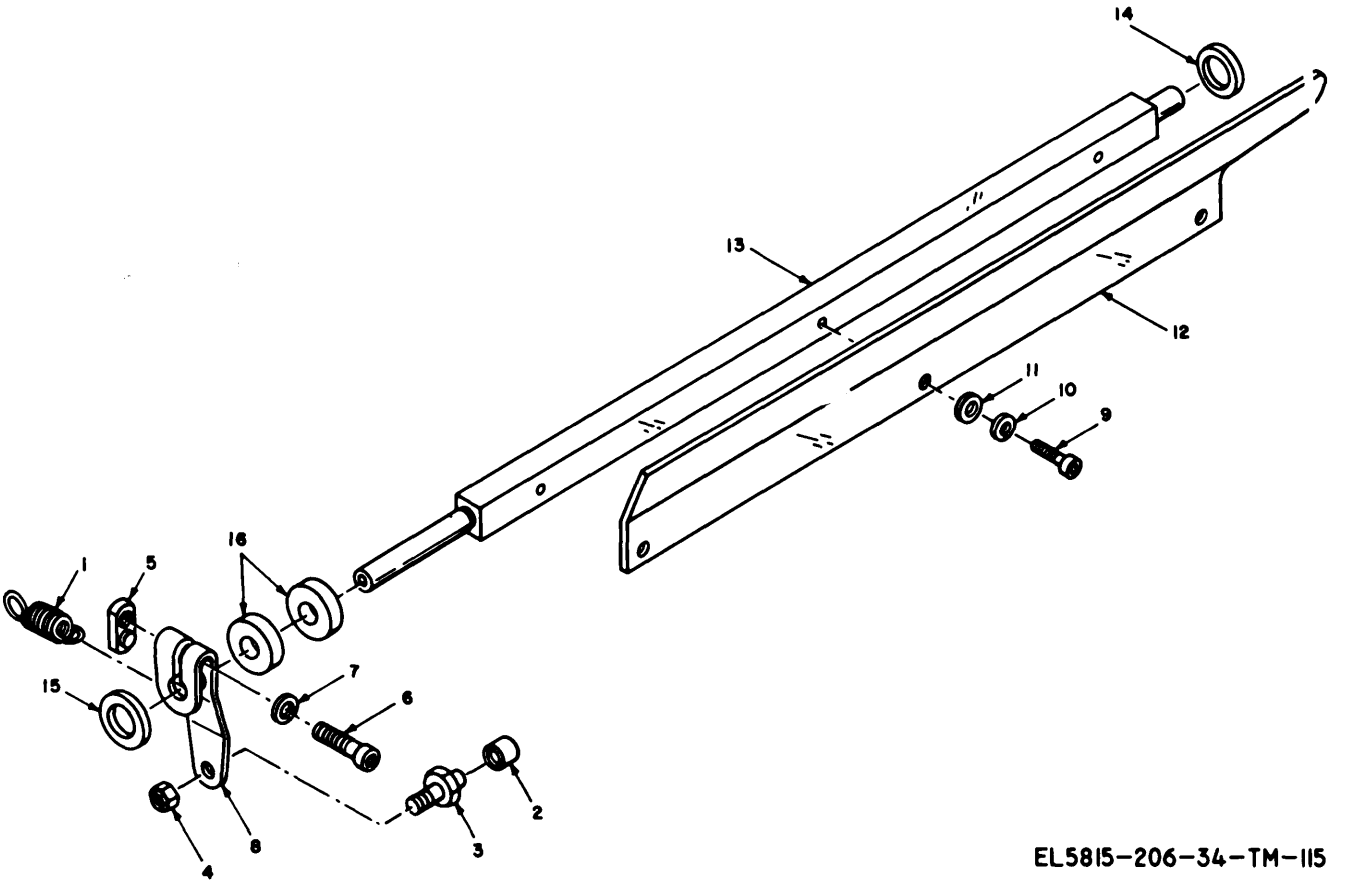
(5) Remove the two machine screws (fig. 3-51) and lockwashers that hold the middle bearing cap to the frame assembly; remove the middle bearing cap by sliding it to the selector side.

(6) Remove the assembled print-bail-shaft (13, fig. 3-43), print-bail blade (12) and print-cam follower by moving the shaft to the selector side. Remove the felt lubricating washers, when supplied, from the print-bail shaft.

(7) Remove the bushing, print-cam-follower-roller stud, and self-locking hexagonal nut (4) from the print cam follower.

(8) Remove the clamp nut (5), machine screw, and flat washer that hold the print-cam follower to the print-bail shaft; remove the print-cam follower. Remove the two felt lubricating washers, when supplied, from the print-bail shaft.

(9) Remove the three machine screws, lockwashers, and flat washers that hold the print-bail blade to the print-bail shaft; remove the print-bail blade.



1 Print-cam-follower spring, 50921
2 Bushing, 50843
3 Print-cam-follower-roller stud, 50886
4 Self-locking hexagonal nut, 10501
5 Clamp nut, 50174
6 Machine screw, 10046
7 Flat washer, 10459
8 Print-cam follower. 50948
9 Machine screw, 10004
10 Lockwasher, 10429
11 Flat washer, 10450
12 Print-bail blade, 50533
13 Print-bail shaft, 50534
14 Felt lubricating washer, 61482
15 Felt lubricating washer, 61480
16 Felt lubricating washer, 61481

Figure 3-43. Print-bail shaft assembly, exploded view.

b. Reassembly.

(1) Reassemble the print-bail shaft as indicated in figure 3-43; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the transfer-lever shaft assembly (para 3-63b).

(3) Adjust the print-bail shaft (para 3-211 and 3-212).

(4) Replace the paper-shaft bracket and paper chute (para 3-23b).

3-65. Disassembly and Reassembly of Signal-Bell Assembly

(fig. 3-44)

a. Disassembly.

(1) Remove the two machine screws (1, fig. 3-44) and lockwashers that hold the signal-bell assembly to the frame; remove the assembly by sliding it downward until the signal-bell clapper (11) and the motor-stop actuating lever (14) are clear of their punch bars (fig. 3-46).

(2) Remove the self-locking hexagonal nut (3, fig. 3-44) that holds the signal bell (4) to the machine screw (6); remove the signal bell.

(3) On the TT-4A/TG and TT-698/TG, remove the self-locking hexagonal nut (5), machine screw and lockwasher that hold the signal-bell clapper stop (8) to the signal-bell bracket (15); remove the signal-bell clapper stop.

(4) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the self-locking hexagonal nut and machine screw that hold the signal-bell clapper stop to the signal-bell bracket; remove the signal-bell clapper stop.

(5) Remove the signal-bell-clapper spring (9)

from the signal-bell clapper and from the signal-bell bracket.

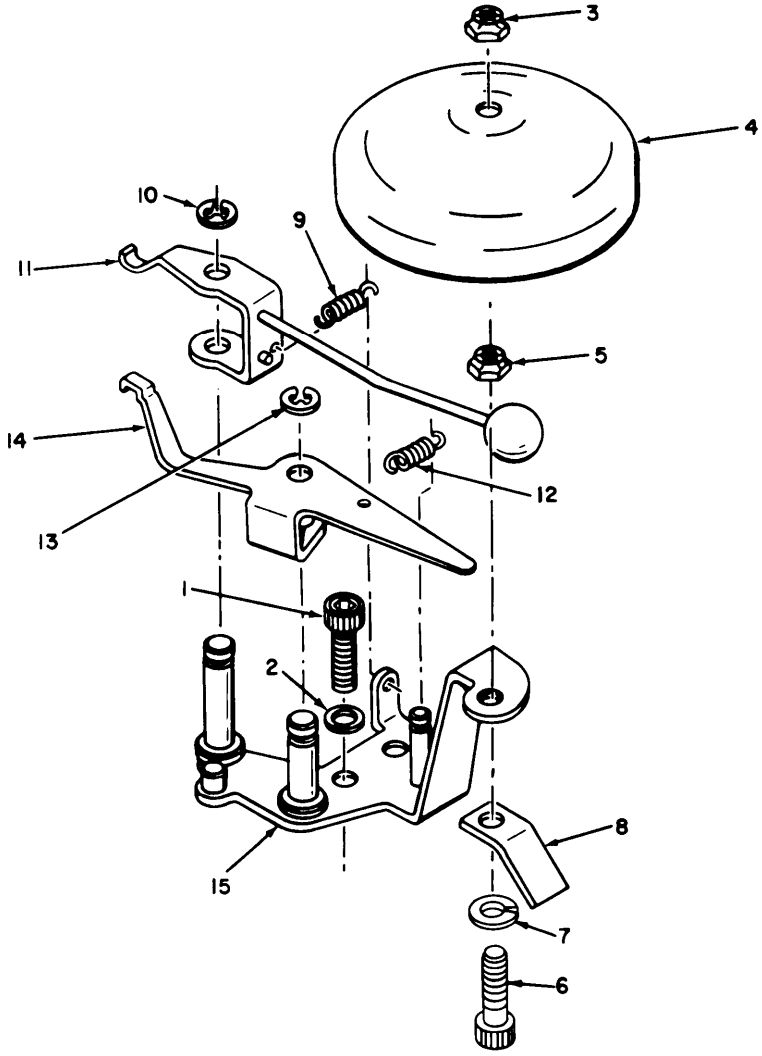
(6) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer that hold the signal-bell clapper to the stud on the signal-bell bracket; remove the signal-bell clapper.

(7) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the retainer ring (10) that holds the signal-bell clapper to the stud on the signal-bell bracket; remove the signal-bell clapper.

(8) Remove the motor-stop actuating-lever spring (12) from the motor-stop actuating lever and from the spring post on the signal-bell bracket.

(9) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer that hold the motor-stop actuating lever to the stud on the signal-bell bracket; remove the motor-stop actuating lever.

(10) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698/TG, remove the retainer ring (13) that holds the motor-stop actuating lever to the stud on the signal-bell bracket: remove the motor-stop actuating lever.



1 Machine screw, 10008
2 Lockwasher, 10404[a], 10403[b]
3 Self-locking hexagonal nut, 10501
4 Signal bell, 51080
5 Self-locking hexagonal nut, 10501
6 Machine screw, 10010
7 Lockwasher, 10404[a]
8 Signal-bell clapper stop, 51102
9 Signal-bell-clapper spring, 50920
10 Retainer ring, 10949
11 Signal-bell clapper, 50879A
12 Motor-stop actuating-lever spring, 50919
13 Retainer ring, 10949
14 Motor-stop actuating lever, 50874
15 Signal-bell bracket, 53157A[b]

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG.

Figure 3-44. Signal-bell assembly, exploded view.

b. Reassembly.

(1) Reassemble the signal-bell assembly as indicated in figure 3-44; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the signal-bell assembly (para 3-252 through 3-254).

3-66. Automatic Carriage Return and Line Feed Linkage (TT-537/G only)

(fig. 3-45)

a. Disassembly.

(1) Remove the retaining ring (1, fig. 3-45) that

holds the delaying lever (2) to the bracket assembly (29); remove the delaying lever and felt washer.

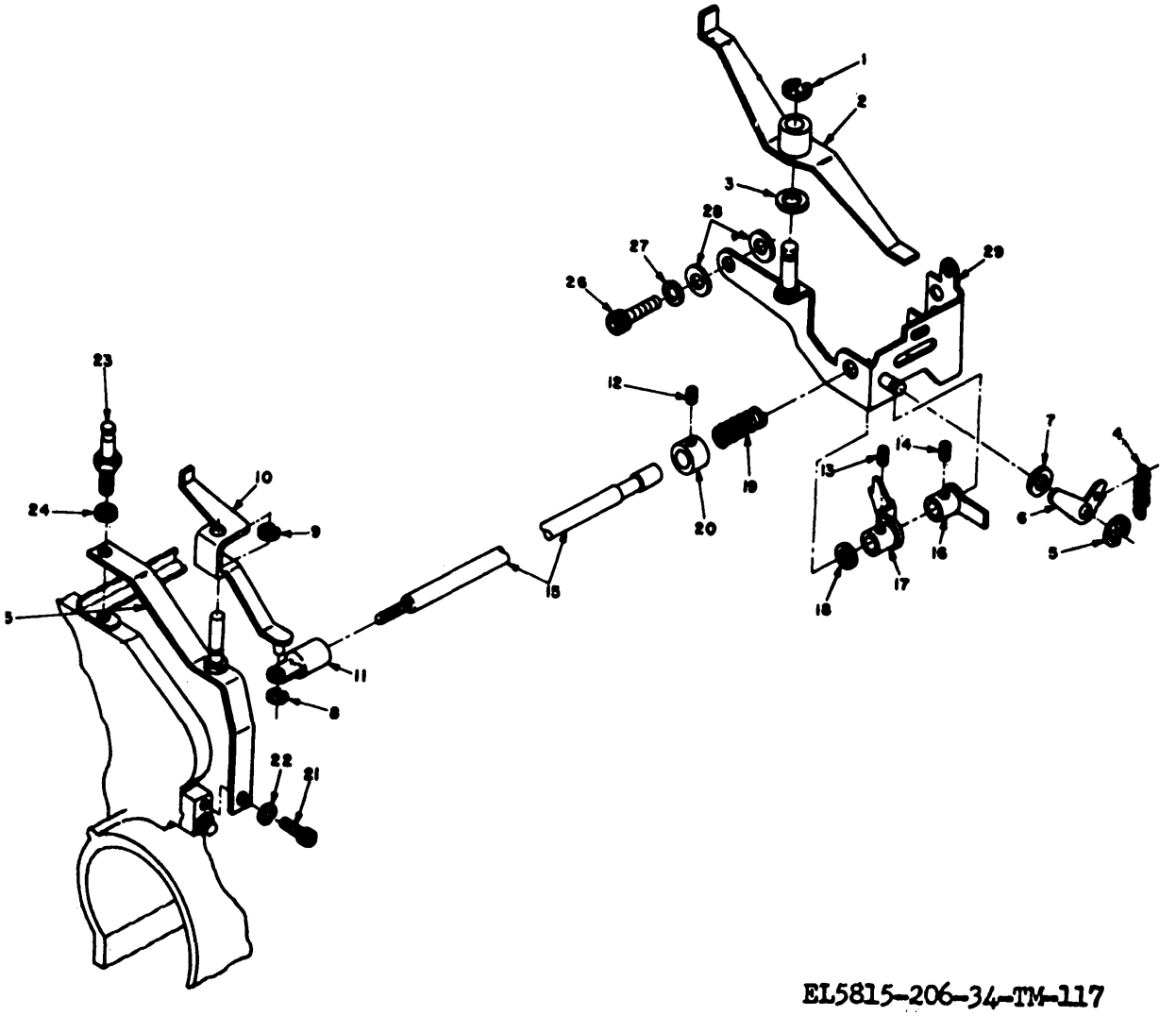
(2) Remove the spring (4) from the delaying latch (6). Remove the retaining ring (5) that holds the delaying latch to the stud on the bracket assembly; remove the delaying latch and felt washer.

(3) Remove the retaining ring (8) that holds the link connector (11) to the stop bar shift lever (10). Disengage the link connector. Remove the retaining ring (9) that holds the stop bar shift lever to the bracket assembly (25); remove the shift lever.

(4) Unscrew the link connector from the end of the stop bar shift link (15).

(5) Loosen the setscrews in the spring collar (20), stop bar shift blade (17), and stop bar shift stop (16). Pull out the stop bar shift link, catching the stop bar shift stop, stop bar shift blade, spacer (18), spring (19), and spring collar.

(6) Remove the machine screw (21) lockwasher, spring stud (23), and flat washer that secure the bracket assembly to the page printer frame assembly; remove the bracket assembly.



1 Retaining ring, 10949
2 Delaying lever, 52960A
3 Felt washer, 51483
4 Spring 50916
5 Retaining ring, 10960
6 Delaying latch, 52963
7 Felt washer, 61483
8 Retaining ring, 10960
9 Retaining ring, 10949
10 Stop bar shift lever, 52945
11 Link connector, 51783
12 Setscrew, 10203
13 Setscrew, 10203
14 Setscrew, 10203
15 Stop bar shift link, 56622A
16 Stop bar shift stop, 55240A
17 Stop bar shift blade, 56613A
18 Spacer, 52988
19 Spring, 59620
20 Spring collar, 55736
21 Machine screw (part of frame assembly)
22 Lockwasher (part of frame assembly)
23 Spring stud, 51961
24 Flat washer, 10464
25 Bracket assembly, 51453A
26 Machine screw, 10003
27 Lockwasher, 10429
28 Flat washer, 10450
29 Bracket assembly, 57997A

Figure 3-45. Automatic carriage-return and line-feed mechanism, exploded view (TT-537/G, TT-722(*)/TG)

b. Reassembly.

(1) Reassemble the automatic carriage return and line feed linkage as indicate in figure 3-44; the sequence of assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the linkage (para 3-239 through 3-242).

3-67. Disassembly and Reassembly of Function-Selecting Mechanism
(fig. 3-46)

a. Disassembly.

(1) Remove the manual carriage-return button (fig. 3-59) from the end of the manual carriage-return link.

(2) Remove the two machine screws (1, fig. 3-46) and lockwashers that hold the function bracket (30) to the function side of the frame.

(3) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer (4) that hold the carriage-feed link (fig. 3-60) to the stud on the carriage-feed lever (26, fig. 3-46); remove the carriage-feed link from the carriage-feed lever. Remove the function bracket mechanism from the frame; be careful to disengage the cam-follower roller (15) from the function cam (fig. 3-51), the function-cam follower (19, fig. 3-46) from the function-selecting arm (fig. 3-50) and the function bracket (3-46) from the manual carriage-return link (fig. 3-59).

(4) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the retainer ring (5, fig. 3-46) that holds the carriage-feed link (fig. 3-60) and felt lubricating washer (4), when supplied to the stud on the carriage-feed lever (fig. 3-46); remove the carriage-feed link from the carriage-feed lever. Remove the function bracket mechanism from the frame; be careful to disengage the cam-follower roller from the function cam (fig. 3-51), the function-cam follower (fig. 3-46) from the function-selecting arm (fig. 3-50) and the function bracket (fig. 3-46) from the manual carriage-return link (fig. 3-59).

(5) Remove the platen-latch spring (6, fig. 3-46) from the platen latch (10) and from the spring post on the function bracket.

(6) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer that hold the platen latch to the stud on the function bracket; remove the platen latch.

(7) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the retainer ring (9) that holds the platen latch to the stud on the function bracket; remove the platen latch.

(8) Remove the support-lever spring (11) from the support lever (22) and from the spring post on the function bracket.

(9) On the TT-4A/TG and TT-698/TG, remove the cotter pin and the pin that hold the assembled function-cam follower and support lever to the function bracket; remove the assembled function-cam follower and support lever.

(10) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the retainer ring (13) and pin (14) that hold the assembled function-cam follower and support lever to the function bracket; remove the assembled function-cam follower and support lever Catch the two felt lubricating washers (12), when supplied, as they fall free of the pin.

(11) Remove the cam-follower roller from the function-cam follower.

(12) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer that hold the function-cam follower on the function-cam-follower stud; remove the function-cam follower.

(13) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the retainer ring (18) that holds the function-cam follower on the function-cam-follower stud; remove the function-cam follower. Catch the two felt lubricating washers (16), when supplied, as they fall free of the stud.

(14) Remove the self-locking hexagonal nut (20) that holds the function-cam-follower stud to the support lever; remove the function-cam-follower stud.

(15) On the TT-4A/TG and TT-698/TG, remove the two setscrews that hold the shaft collar (25) to the pivot (24); remove the pivot from the function bracket and catch the shaft collar, carriage-feed lever, spacer (27), and unshift lever (28) as they fall from the pivot.

(16) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the two setscrews that hold the shaft collar to the pivot; remove the pivot from the function bracket and catch the shaft collar, felt lubricating washer, when supplied, carriage-feed lever, spacer, and the unshift lever (29) and three felt lubricating washers (7), when supplied, as they fall from the pivot.

(17) Remove the two machine screws and lockwashers that hold the punch-bar guide block (17) to the function side of the teletypewriter frame; remove the punch-bar guide block from the frame; be careful to disengage the aperture gate (36) from the platen latching arm (fig. 3-25) and the signal-bell clapper (fig. 3-44), motor-stop actuating lever, and the

function-selecting arm (fig. 3-50) from the punch-bar guide block.

(18) Remove the two machine screws (fig. 3-46) and lockwashers that hold the side plate to the punch-bar guide block; remove the side plate (35), aperture gate, signal-bell punch bar (37) and letters and motor-stop punch bars (38) from the punch-bar guide block.

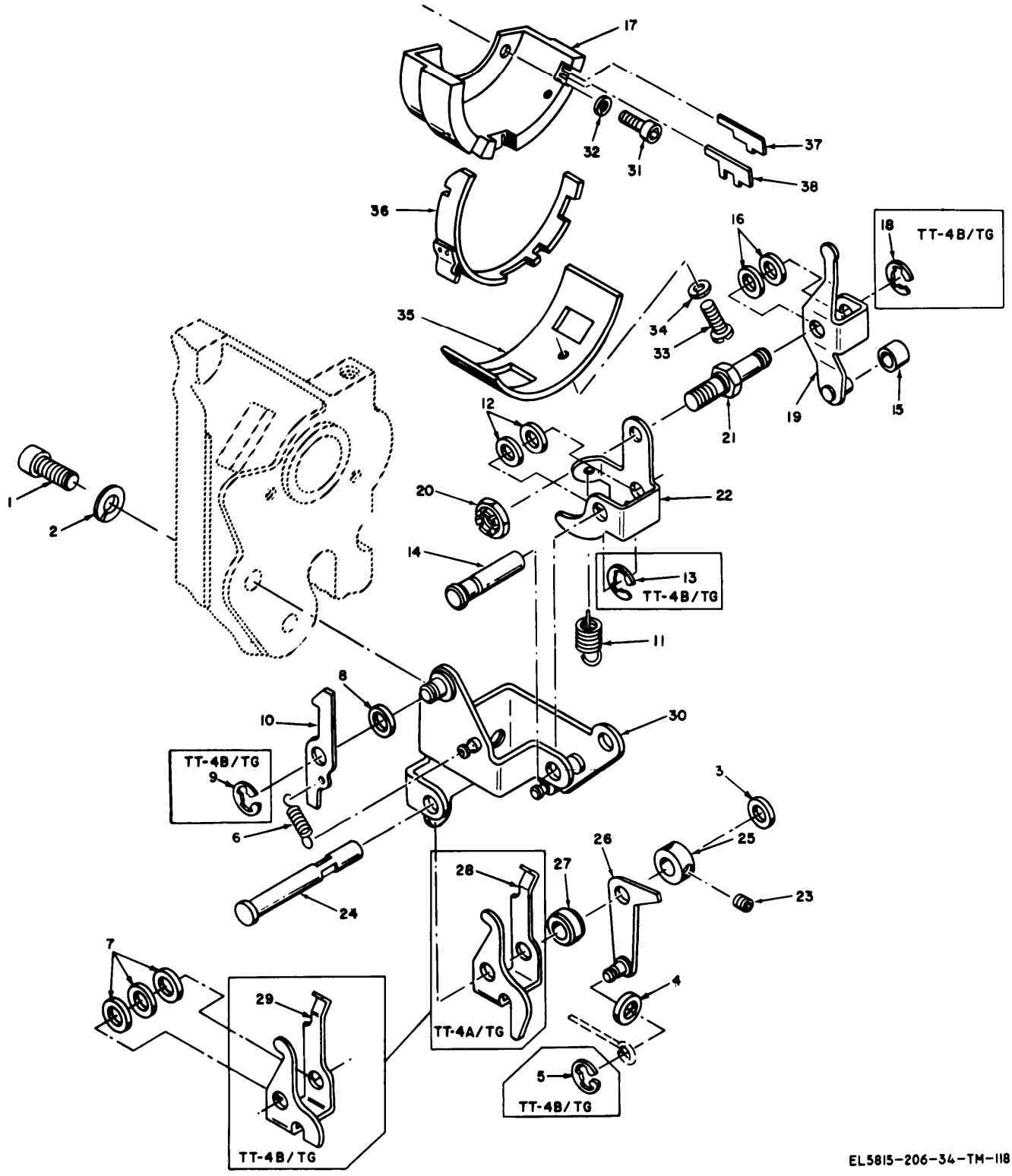


Figure 3-46. Function-selecting mechanism, exploded view.

KEY to fig. 3-46:

1 Machine screw, 10015
2 Lockwasher, 10405[a], 10431[b]
3 Felt lubricating washer, 61475
4 Felt lubricating washer, 61486
5 Retainer ring, 10960
6 Platen-latch spring, 50916 [a]52501 [b]
7 Felt lubricating washer, 61475
8 Felt lubricating washer, 61492
9 Retainer ring, 10949
10 Platen latch, 50821
11 Support-lever spring, 50915
12 Felt lubricating washer, 61475
13 Retainer ring, 10949
14 Pin, 53131
15 Cam-follower roller, 50843
16 Felt lubricating washer, 61475
17 Punch bar guide block, 51428
18 Retainer ring, 10949
19 Function-cam follower, 50822A
20 Self-locking hexagonal nut, 10501
21 Function-cam-follower stud, 52553
22 Support lever, 50760
23 Setscrew, 10201
24 Pivot, 50829
25 Shaft collar, 50391
26 Carriage-feed lever, 53129A
27 Spacer, 51424
28 Letters-shift lever, 52454
29 Letters-shift lever, 59631
30 Function bracket, 52543A
31 Machine screw, 10004
32 Lockwasher, 10403[a], 10429[b]
33 Machine screw, 10304
34 Lockwasher, 10429
35 Side plate, 50735
36 Aperture gate, 50743A
37 Signal-bell punch bar, 50881
38 Letters and motor-stop punch bars, 50755

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG.

b. Reassembly.

(1) Reassemble the function-selecting mechanism as indicated in figure 3-46; in sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the function-selecting mechanism (para 3-171, 3-172, 3-173, and 3-252).

3-68. Disassembly and Reassembly of Line-Feed and Platen Shift Mechanism (TT-4A/TG and TT-698/TG)

(fig. 3-47)

a. *Disassembly.*

(1) Remove the bell-crank spring (1, fig. 3-47) from the line-feed bell crank (17) and from the bell-crank bracket (31).

(2) Remove the cam-follower spring (2) from the platen-shift-cam follower (21) and from the line-feel-cam follower (5).

(3) Remove the cotter pin (3) and flat washer that hold the line-feed-cam follower to the pivot stud on the line-feed bell crank; remove the line-feed-cam follower by sliding it down to unhook it from the function shaft.

(4) Remove the cotter pin (6) and flat washer that hold the connecting link (13) to the stud of the line-feed lever (fig. 3-25).

(5) Remove the cotter pin (8, fig 3-47) and flat washer that hold the connecting link (14) to the stud on the line-feed bell crank; remove the connecting link.

(6) Remove the two machine screws (10), lockwashers and flat washers that hold the connecting link (13) to the connecting link (14); separate the connecting links.

(7) Remove the cotter pin (15) and flat washer that hold the line-feed bell crank to the bell-crank bracket; remove the line-feed bell crank.

(8) Remove the platen-shift bell-crank spring (18) from the platen-shift bell crank (27) and from the bracket link.

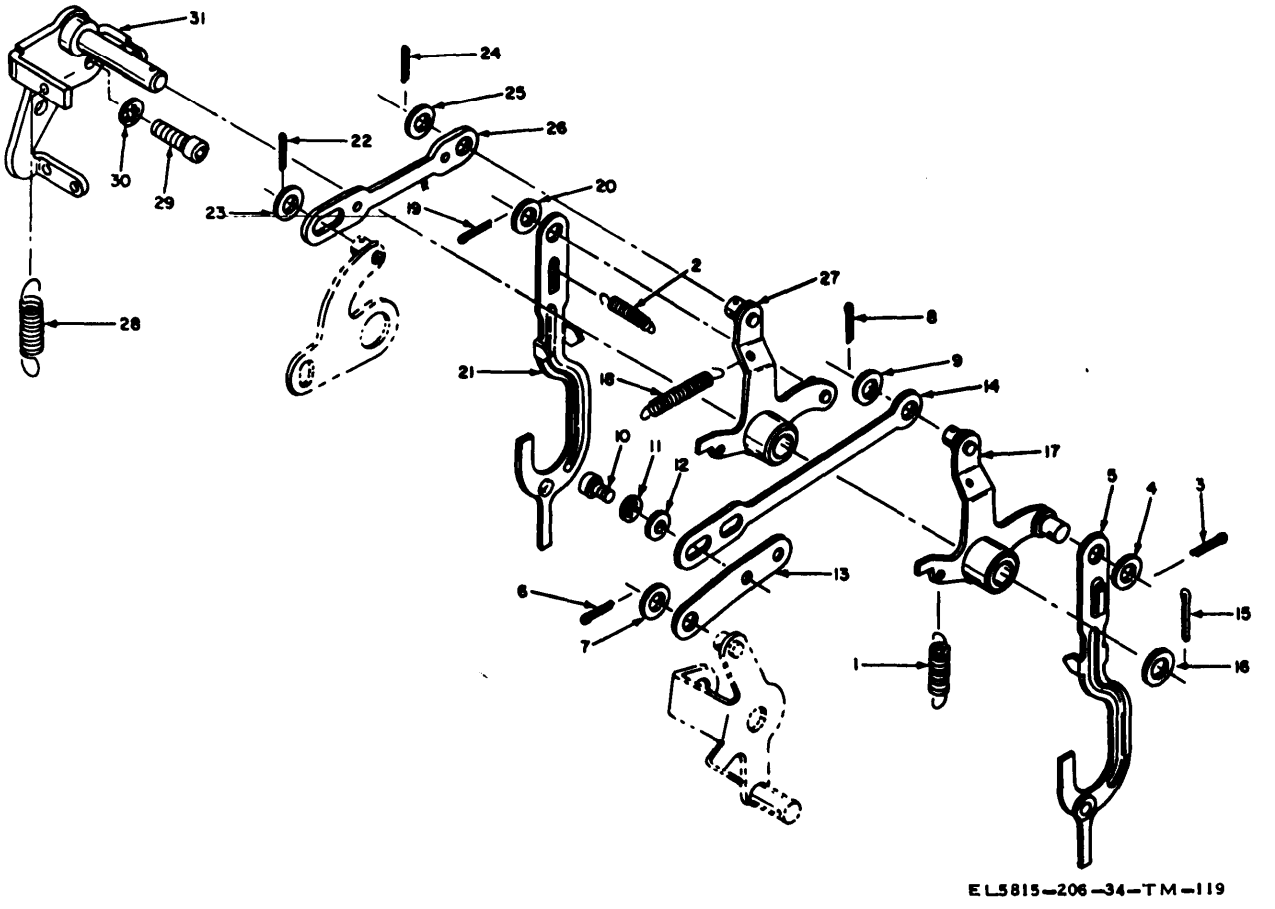
(9) Remove the cotter pin (19) and flat washer that hold the platen-shift-cam follower to the pivot stud on the platen-shift bell crank; remove the platen-shift-cam follower by sliding it down to unhook it from the function shaft.

(10) Remove the cotter pin (22) and flat washer that hold the platen-shift link (26) to the stud on the platen-shift arm.

(11) Remove the cotter pin (24) and flat washer that hold the platen-shift link to the stud on the platen-shift bell crank; remove the platen-shift link and remove the platen-shift bell crank from the bell-crank bracket.

(12) Remove the carriage-return bell-crank spring (28) from the bell-crank bracket (31) and from the carriage-return sensing lever.

(13) Remove the two machine screws (29) and lockwashers that hold the bell-crank bracket to the frame: remove the bell-crank bracket.



1 Bell-crank spring, 51755
2 Cam-follower spring, 50901
3 Cotter pin, 10801
4 Flat washer, 50315
5 Line-feed-cam follower, 51714A
6 Cotter pin, 10801
7 Flat washer, 50315
8 Cotter pin, 10801
9 Flat washer, 50315
10 Machine screw, 10002
11 Lockwasher, 10403
12 Flat washer, 10458
13 Connecting link, 51771
14 Connecting link, 50474
15 Cotter pin, 10802
16 Flat washer, 50494
17 Line-feed bell crank, 51753A
18 Platen-shift bell-crank spring, 51645
19 Cotter pin, 10801
20 Flat washer, 50315
21 Platen-shift-cam follower, 51712A
22 Cotter pin, 10802
23 Flat washer, 50315
24 Cotter pin, 10802
25 Flat washer, 50315
26 Platen-shift link, 51693
27 Platen-shift bell crank, 53135A
28 Carriage-return bell-crank spring, 50906
29 Machine screw, 10008
20 Lockwasher, 10404
31 Bell-crank bracket, 50478A

Figure 3-47. Line-feed and platen-shift mechanism (TT-4A/TG and TT-698/TG), exploded view.

b. Reassembly.

(1) Reassemble the line-feed and platen-shift mechanisms as indicated in figure 3-47; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the line-feed and platen-shift mechanisms (para 3-230 through 3-234).

3-69. Disassembly and Reassembly of Line-Feed and Platen-Shift Mechanisms (TT-4B/TG and TT-698A/TG)

(fig. 3-48)

a. Disassembly.

(1) Remove the bell-crank spring (1, fig. 3-48) from the adjusting arm (18) and from the bell-crank bracket (33).

(2) Remove the cam-follower spring (2) from the line-feed-cam follower (4) and from the platen-shift-cam follower (22).

(3) Remove the retainer ring (3) that holds the line-feed-cam follower to the pivot stud on the line-feed bellcrank (19); remove the line-feed-cam follower by sliding it down to unhook it from the function shaft.

(4) Remove the retainer ring (5) that holds the connecting link (10) to the stud of the line-feed lever.

(5) Remove the retainer ring (6) that holds the connecting link (11) to the stud on the line-feed bellcrank; remove the connecting links.

(6) Remove the two machine screws (7), lockwashers, and flat washers that hold the connecting link (10) to connecting link (11); separate the connecting links.

(7) Remove the machine screw (12), lockwasher, and flat washer that hold the line-feed bellcrank to the bell-crank bracket; remove the line-feed bellcrank. Remove felt lubricating washer (34), when supplied.

(8) Remove the self-locking hexagonal nut (15), machine screw and flat washer that hold the adjusting arm to the line-feed bellcrank; remove the adjusting arm.

(9) Remove the platen-shift bell-crank spring (20) from the platen-shift bellcrank (26) and from the bracket link.

(10) Remove the retainer ring (21) that holds the platen-shift-cam follower (22) to the pivot stud of the platen-shift bellcrank; remove the platen-shift-cam follower by sliding it down to remove it from the function shaft.

(11) Remove the retainer ring (23) that holds the platen-shift link (25) to the stud on the platen-shift arm (fig. 3-25).

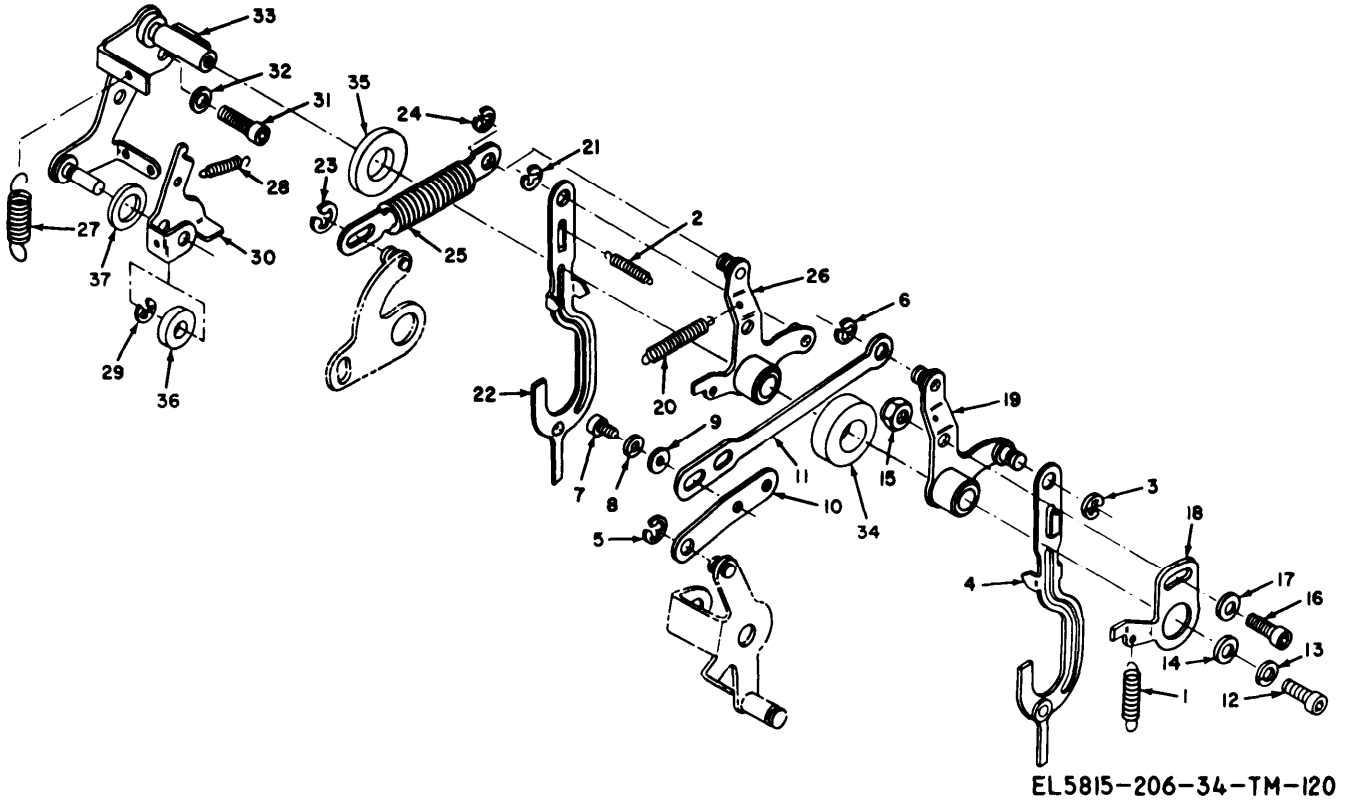
(12) Remove the retainer ring (24, fig. 3-48) that holds the platen-shift link to the stud on the platen-shift bellcrank; remove the platen-shift link and platen-shift bellcrank from the bell-crank bracket. Remove felt lubricating washer (35), when supplied.

(13) Remove the carriage-return bell-crank spring (27) from the bell-crank bracket and from the carriage-return sensing lever (fig. 3-57).

(14) Remove the platen lower-case latch spring (28, fig. 3-48) from the platen lower-case latch (30) and from the bell-crank bracket.

(15) Remove the retainer ring (29) that holds the platen lower-case latch (30) to the pivot post on the bell-crank bracket; remove the platen lower-case latch. Catch the felt lubricating washer (36), when supplied, as it falls from the pivot post on the bell-crank bracket. Remove the felt lubricating washer (37), when supplied, from the pivot post on the bell-crank bracket.

(16) Remove the two machine screws (31) and lockwashers that hold the bell-crank bracket to the teletypewriter frame; remove the bell-crank bracket.



1 Bell-crank spring, 51755
2 Cam-follower spring, 50901
3 Retainer ring, 10949
4 Line-feed-cam follower, 51714A
5 Retainer ring, 10949
6 Retainer ring, 10949
7 Machine screw, 10001
8 Lockwasher, 10429
9 Flat washer, 10458
10 Connecting link, 51771
11 Connecting link, 50474
12 Machine screw, 10003
13 Lockwasher, 10429
14 Flat washer, 10450
15 Self-locking hexagonal nut, 10500
16 Machine screw, 10003
17 Flat washer, 10450
18 Adjusting arm, 53462
19 Line-feed bell crank, 53463A (includes items 15 through 18)
20 Platen-shift bell-crank spring, 51645
21 Retainer ring, 10949
22 Platen-shift-cam follower, 51712A
23 Retainer ring, 10949
24 Retainer ring, 10949
25 Platen-shift link, 56676A
26 Platen-shift bell crank, 53135A
27 Carriage-return bell-crank spring, 50906
28 Platen lower-case latch spring, 50920
29 Retainer ring, 10960
30 Platen lower-case latch, 52748
31 Machine screw, 10025
32 Lockwasher, 10430
33 Bell-crank bracket, 52303A
34 Felt lubricating washer, 61669
35 Felt lubricating washer, 61668
36 Felt lubricating washer, 61474
37 Felt lubricating washer, 61483

Figure 3-48. Line-feed and platen-shift mechanism (TT-4B/TG and TT-698A/TG), exploded view.

b. Reassembly.

(1) Reassemble the line-feed and platen-shift mechanism as indicated in figure 3-48; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the line-feed and platen-shift mechanisms (para 3-230 and 3-232).

3-70. Disassembly and Reassembly of Line-Feed and Platen-Shift Assembly (TT-4C/TG, TT-335/TG, and TT-537/G and TT-698B/ /TG)

(fig. 3-49)

a. Disassembly.

(1) Remove the machine screw (1, fig. 3-49), lockwasher, flat washers, and felt washers (4).

(2) Remove the retainer ring (5) and platen-shift link (6) from the pivot post on the platen-shift bellcrank (43).

(3) Remove the retainer ring (7) that holds the connecting link (8) on the pivot post of the bellcrank assembly (20); remove the machine screw (9), lockwasher, and adjusting link (12) from the connecting link and remove the connecting link from the pivot post on the bellcrank assembly.

(4) Remove the pawl spring (13), bell-crank spring (14), and bellcrank (43), pawl spring (15).

(5) Remove the assembly of combined items; remove the felt washer (35).

(6) Remove the bellcrank spring *(33)* and pawl spring (34) from the platen-shift bellcrank (43).

(7) Remove the assembly of combined items from the bell-crank pivot bracket (61); remove the felt washer (65).

(8) Remove the bellcrank post (16), lockwasher, flat washer, line-feed bellcrank assembly (19), bell-crank assembly, and nut plate (21).

(9) Remove the hexagonal nut (22), lockwasher, flat washer, plate assembly (26), bushing (27) and line feed bellcrank pawl (28) from the shoulder screw (29).

(10) Remove the hexagonal nut (30), flat washer, and line-feed-on-carriage-return pawl (32).

(11) Remove the retainer ring (36) and figures pawl (37) from the platen-shift bellcrank assembly (38).

(12) Remove the machine screw (39), lock-washer, flat washer, nut plate, and plate-shift bell-crank from the platen-shift bell-crank assembly.

(13) Remove the function shaft as described in paragraph 3-72.

(14) Remove the draw-bar spring (50) from the function stop bar guide (fig. 3-56) and the draw bar (51, fig. 3-49).

(15) Remove the machine screw (44), lock-washer, flat washer, spacer, flat washers, draw bar, flat washers, and spacer from the bellcrank pivot bracket.

(16) Remove the two machine screws (52), lock-washers, flat washers, and adjustable blocks (55) from the draw bar.

(17) Remove the platen lower-case latch spring (62) from the platen lower-case latch (64) and from the bellcrank pivot bracket.

(18) Remove the retainer ring (63) that holds the platen lower-case latch on the pivot post of the bellcrank pivot bracket; remove the felt washer (66), the platen lower-case latch, and felt washer (67) from the bellcrank pivot bracket post.

(19) Remove the two machine screws (59) and lockwashers; remove the bellcrank pivot bracket from the teletypewriter frame.

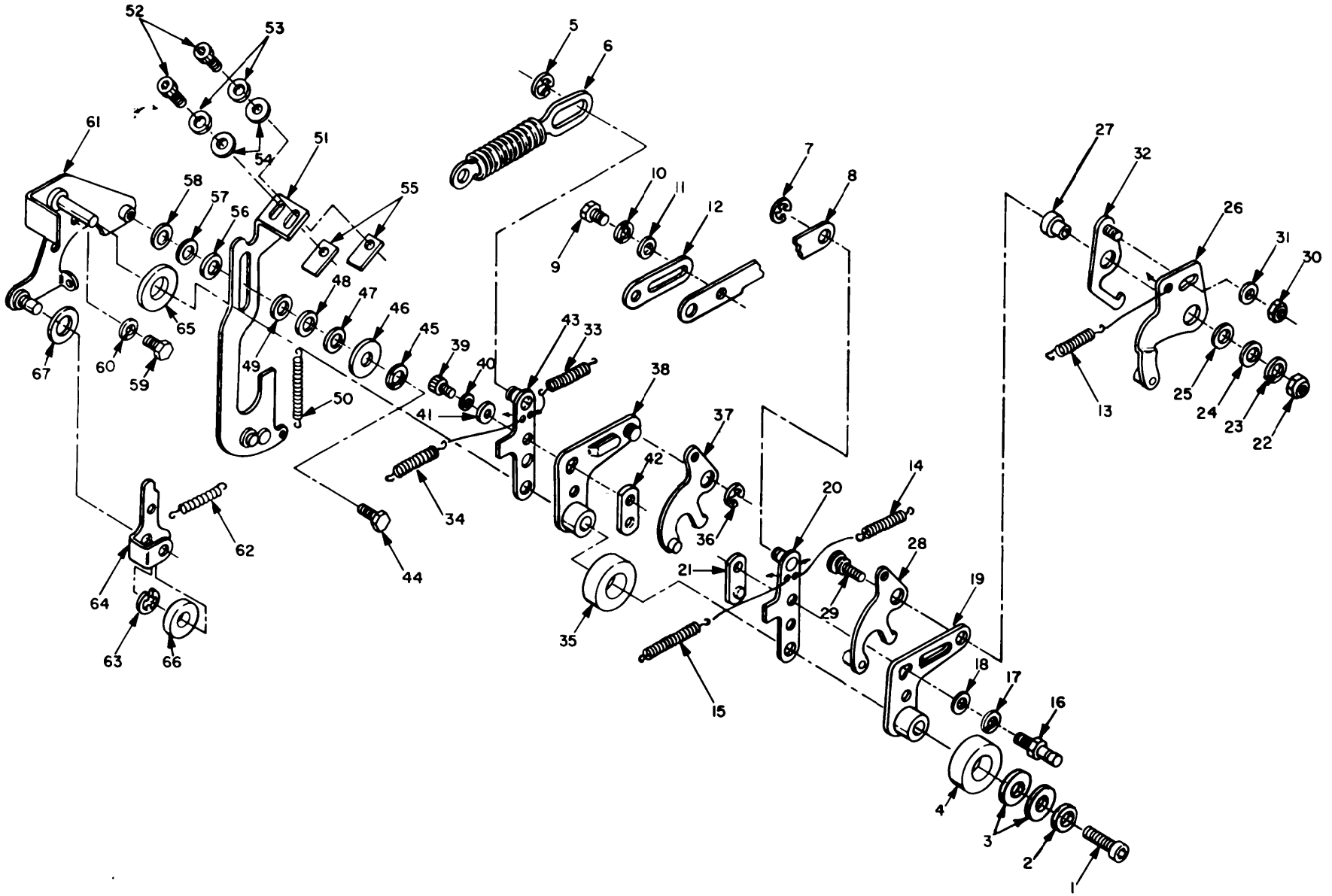


Figure 3-49. Line-feed and platen-shift mechanism (TT-4C/TG, TT-335/TG, TT-537/TG and TT-698B/TG), exploded view.

KEY to fig. 3-49:
1 Machine screw, 10003
2 Lockwasher, 10429
3 Flat washer, 10450
4 Felt washer, 61671
5 Retainer ring, 10949
6 Platen-shift link, 62611A
7 Retainer ring, 10949
8 Connecting link, 57979
9 Machine screw, 10303
10 Lockwasher, 10429
11 Flat washer, 10458
12 Adjusting link, 62590
13 Pawl spring, 62154
14 Bellcrank spring, 57875
15 Bellcrank pawl spring, 62169
16 Bellcrank post, 62130
17 Lockwasher, 10430
18 Flat washer, 10454
19 Line-feed bell crank assembly, 62114A
20 Bell crank assembly, 57920A
21 Nut plate, 52073
22 Hexagonal nut, 10507
23 Lockwasher, 10426
24 Flat washer, 10467
25 Flat washer, 63577
26 Plate assembly, 62138A
27 Bushing, 62146
28 Line-feed bellcrank pawl, 57945A
29 Shoulder screw, 52145
30 Hexagonal nut, 10551
31 Flat washer, 50320
32 Line-feed-on-carriage-return pawl, 62113A
33 Bellcrank spring, 57875
34 Pawl spring, 59310
35 Felt washer, 61671
36 Retainer ring, 10959
37 Figures pawl, 57947A
38 Platen-shift bellcrank assembly, 57914A
39 Machine screw, 10032
40 Lockwasher, 10430
41 Flat washer, 10454
42 Nut plate, 52073
43 Platen-shift bellcrank 57920
44 Machine screw, 10398
45 Lockwasher, 10429
46 Flat washer, 57872
47 Spacer, 57873
48 Flat washer, 57873
49 Flat washer, 57924
50 Draw-bar spring, 57871
51 Draw-bar, 57939A
52 Machine screw, 10003
53 Lockwasher, 10429
54 Flat washer, 68132
55 Adjustable block, 62151
56 Flat washer, 57924
57 Flat washer, 57873
58 Spacer, 57873
59 Machine screw, 10076
60 Lockwasher, 10430
61 Bellcrank pivot bracket, 57910A
62 Platen lower-case latch spring, 50920
63 Retainer ring, 10960
64 Platen lower-case latch, 52748
65 Felt washer, 61670
66 Felt washer, 61474
67 Felt washer, 61483

b. Reassembly.

(1) Reassemble the line-feed and platen-shift mechanism as indicated in figure 3-49; reassembly sequence is the reverse of the disassembly described in *a* above.

(2) Adjust the line-feed and platen-shift mechanism as described in paragraphs 3-132, 3-134, and 3-233.

3-71. Disassembly and Reassembly of Square-Shaft Assembly

(fig. 3-50)

a. Disassembly.

(1) Loosen the four setscrews (10) that hold the square-shaft driven gear (11) to the square shaft (13).

(2) Remove the support lever (fig. 3-46) and the function-cam follower as described in paragraph 3-67a.

(3) Remove the function-selecting arm (1, fig. 3-50) and the function-selecting-arm spring (2) from the square shaft.

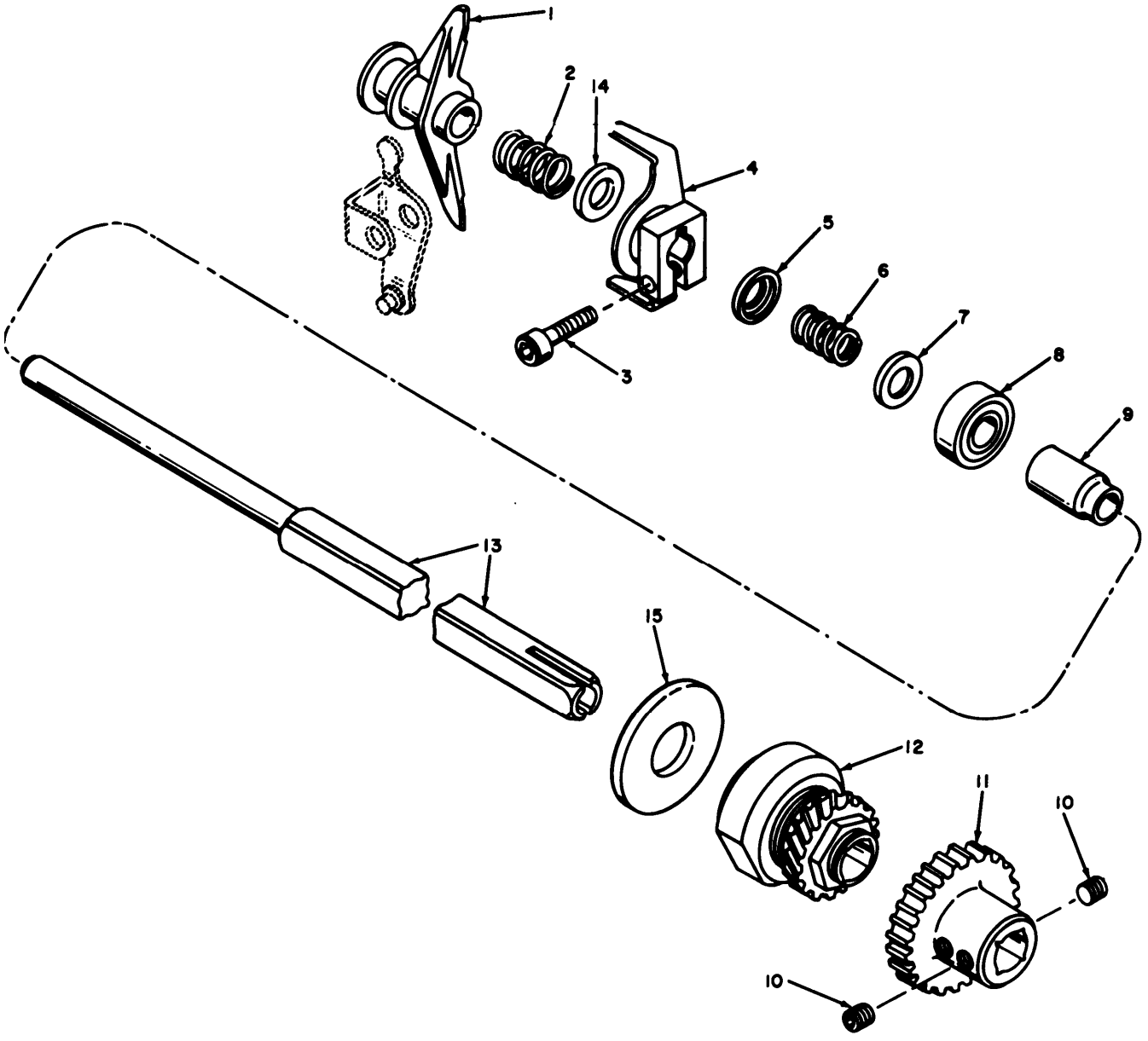
(4) Remove the machine screw (3) that holds the function-selecting arm claw (4) on the square shaft; remove the function-selecting arm claw.

(5) On the TT-4A/TG and TT-698/TG, move the square shaft axially toward the function side to dislodge the two ball bearings from their seats in the frame; remove the two ball bearings.

(6) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/TG, TT-698A/TG, and TT-698B/TG, remove the spring retainer (5), square-shaft-bearing spring (6), and spring retainer (7) from the square shaft.

(7) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, move the square shaft axially toward the function side to dislodge the ball bearing (8) from its seat in the frame; remove the ball bearing and the spacing collar (9).

(8) Pull the square shaft from the opening in the frame; remove the square-shaft driven gear and the square-shaft sliding gear (12) and felt lubricating washer (15), when supplied, from the square shaft as it is removed.



1 Function-selecting arm, 50936
2 Function-selecting-arm spring, 50917
3 Machine screw, 10009
4 Function-selecting-arm claw, 50841A (includes item 3)
5 Spring retainer, 56277 [b]
6 Square-shaft-bearing spring, 56279 [b]
7 Spring retainer, 56277 [b]
8 Ball bearing, 10753
9 Spacing collar, 56278 [b]
10 Setscrew, 10234
11 Square-shaft driven gear, 62136
12 Square-shaft sliding gear, 50565A
13 Square shaft, 50456 [a], 57711 [b]
14 Felt lubricating washer, 61487
15 Felt lubricating washer, 61484

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG.

Figure 3-50. Square-shaft assembly, exploded view.

b. Reassembly.

(1) Reassemble the square-shaft assembly as indicated in figure 3-50; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the support lever and the function-cam follower as described in paragraph 3-67b.

(3) Tighten the four setscrews that hold the square-shaft driven gear to the square shaft.

(4) Adjust the square-shaft assembly (para 3-207, 3-137, 3-138, and 3-209).

3-72. Removal and Replacement of Function-Shaft Assembly

(fig. 3-51)

a. Removal.

(1) Remove the teletypewriter from the mounting base (para 3-25a).

(2) Remove the signal-bell and motor-stop actuating levers from the function side of the frame (para 3-65a).

(3) Remove the transfer-lever shaft assembly (para 3-63a).

(4) Remove the cam-follower spring (para 3-68a or 3-69a).

(5) Remove the line-feed-cam follower (para 3-68a or 3-69a).

(6) Remove the setscrew (fig. 3-79) that holds the spacing collar to the cam-follower stop stud; remove the collar and the stop stud.

(7) Remove the platen-shift-cam follower (para 3-68a or 3-69a).

(8) Remove the two machine screws (1, fig. 3-51) and lockwashers that hold the bearing cap to the frame; remove the bearing cap.

(9) Remove the machine screws (3 and 5) and lockwashers that hold the center bearing cap to the frame. Slide the center bearing cap toward the selector side of the frame to clear the print-bail shaft before removing the bearing cap.

(10) Remove the two machine screws (7) and lockwashers that hold the bearing cap to the frame; remove the bearing cap.

(11) Loosen the two setscrews (41) that hold the print cam (42) to the function shaft (46). Slide the print cam on the shaft to disengage it from the bushing on the print-cam follower.

(12) Remove the assembled function shaft by pulling it upward and outward from the three bearing supports in the frame.

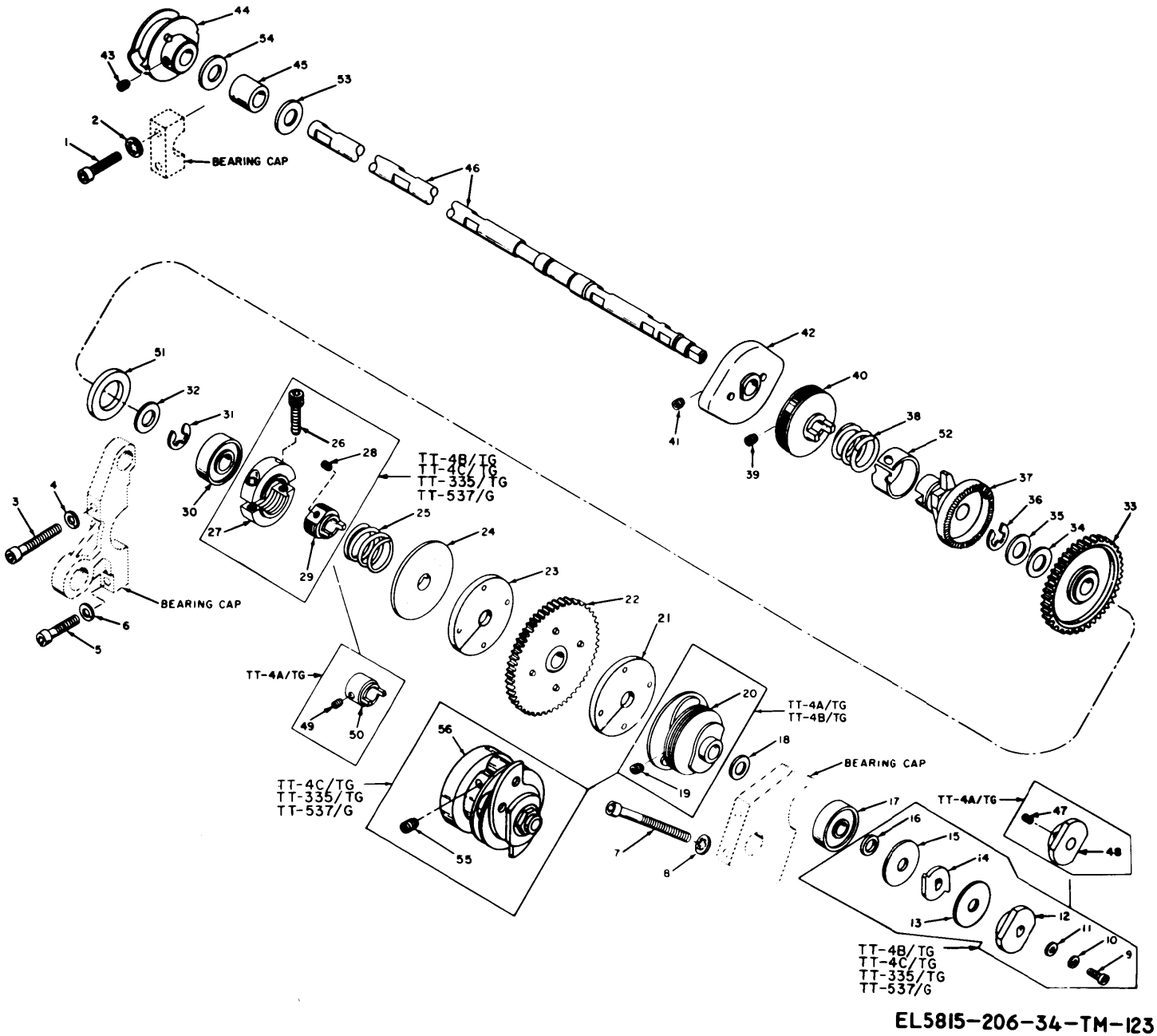


Figure 3-51. Function-shaft assembly, exploded view.

KEY to fig. 3-51:

1 Machine screw, 10011
2 Lockwasher, 10404[a], 10430 [bc]
3 Machine screw, 10013[a], 10012[bc]
4 Lockwasher, 10430
5 Machine screw, 10011
6 Lockwasher, 10430
7 Machine screw, 10014
8 Lockwasher, 10404[a], 10430[bc]
9 Machine screw, 10003[bc]
10 Lockwasher, 10429[bc]
11 Flat washer, 50839 [bc]
12 Transfer-lever restoring cam, 53878 [bc]
13 Flat washer, 53885[bc]
14 Locking-bail cam, 53881[bc]
15 Flat washer, 53885[bc]
16 Flat washer, 50494[bc]
17 Ball bearing, 10756
18 Laminated washer, 50552
19 Setscrew, 10208 [ab]
20 Function cam assembly, 56618A [ab]
21 Friction plate, 61343A (set of 2)
22 Square-shaft driving gear, 56274A
23 Felt friction plate, 61343A
24 Friction-clutch disk, 50491 [a] 54929 [bc]
25 Friction-clutch spring, 50847[a], 54933[bc]
26 Machine screw, 10043[bc]
27 Friction-adjusting collar, 56832A (includes item 26) [bc]
28 Setscrew, 10208 [bc]
29 Drive collar, 54927 [bc]
30 Ball bearing, 10757
31 Retainer ring, 10959
32 Flat washer, 50515
33 Function-shaft driven gear, 50512A
34 Spacer (.004-in.), 51847 Spacer (.006-in.), 51848
35 Flat washer, 50515
36 Retainer ring, 10959
37 Function-clutch drum, 57893
38 Clutch spring, 50848
39 Setscrew, 10209
40 Flexible-coupling disk, 51167A
41 Set screw, 10209
42 Print cam, 50753A
43 Setscrew, 10209
44 Function cam, 50752A
45 Sleeve bearing, 50852
46 Function shaft, 50655, 55522
47 Setscrew, 10209
48 Transfer-lever restoring cam, 50536
49 Setscrew, 10209
50 Friction-adjusting collar, 50492
51 Felt lubricating washer, 61491
52 Felt lubricating washer, 61496
53 Felt lubricating washer, 61490
54 Felt lubricating washer, 61490
55 Setscrew, 10209 [c]
56 Restoring rollers and draw-bar cam assembly, 62115A [c]

[a] Used on TT-4A/TG and TT-698/TG.
[b] Used on TT-4B/TG and TT-698A/TG.
[c] Used on TT-4C/TG, TT-335/TG, TT-537/G, TT-698B/TG.

b. Replacement.

(1) Replace the function-shaft assembly as indicated in figure 3-51; the sequence for replacing the parts is the reverse of the removal sequence.

(2) Replace the platen-shift-cam follower (para 3-68b or 3-69b).

(3) Replace the cam-follower stop stud (fig. 3-79) on the frame.

(4) Replace the line-feed cam follower (para 3-6b or 3-69b).

(5) Replace the cam-follower spring (para 3-68b or 3-69b).

(6) Replace the transfer-level shaft assembly (para 3-61b).

(7) Replace the signal bell and motor-stop actuating lever on the function side of the frame (para 3-65b).

(8) Adjust the function shaft (para 3-145, 3-136, 3-139, 3-210, and 3-152 through 3-154).

(9) Replace the teletypewriter on the mounting base (para 3-25b).

3-73. Disassembly and Reassembly of Function-Shaft Assembly

(fig. 3-51)

a. Disassembly.

(1) Remove the function-shaft assembly from the teletypewriter (para 3-72a).

(2) On the TT-4A/TG and TT-698/TG, remove the two setscrews (47) that hold the transfer-level restoring cam (48) to the function shaft (46); remove the cam, ball bearing (17), and laminated washer (18).

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the machine screw (9), lockwasher, and flat washer that hold the transfer-lever restoring cam (12) to the function shaft; remove the transfer-lever restoring cam, flat washer, locking-bail cam (14), flat washers, flat washer, ball bearing, and laminated washer.

(4) On the TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG, remove the two setscrews (19) that hold the function-cam assembly (20) to the function shaft; remove the cam assembly, friction plate (21), square-shaft driving gear (22), felt friction plate (23), friction-clutch disk (24), and friction-clutch spring (25).

(5) On the TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG, remove the two setscrews (55) that hold the restoring rollers and draw-bar cam assembly (56) to the function shaft; remove the cam assembly, friction plate, square-shaft driving gear, felt friction plate, friction clutch disk, and friction-clutch spring.

(6) On the TT-4A/TG and TT-698/TG, remove the two setscrews (49) that hold the friction-adjusting collar (50) to the function shaft; remove the friction-adjusting collar.

(7) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, loosen the two machine screws (26) that hold the friction-adjusting collar (27) to the drive collar (29); unscrew and remove the friction-adjusting collar from the drive collar.

(8) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the two setscrews (28) that hold the drive collar to the function shaft; remove the drive collar.

(9) Remove the ball bearing (30) from the function shaft.

(10) Remove the retainer ring (31) that holds the function-shaft driven gear (33) on the function shaft: remove the flatwasher, felt lubricating washer (51), when supplied function-shaft driven gear, spacer, and flat washer.

(11) Remove the retainer ring (36) that holds the function-clutch drum (37) on the function shaft; remove the function-clutch drum felt lubricating washer (52), when supplied, and the clutch spring (38).

(12) Remove the two set screws (39) that hold the flexible-coupling disk (40) to the function shaft: remove the flexible-coupling disk.

(13) Remove the two setscrews (41) that hold the print cam (42) to the function shaft; remove the print cam.

(14) Remove the two setscrews (43) that hold the function cam (44) to the function shaft; remove the function cam. Remove the felt lubricating washer (54), when supplied.

(15) Remove the sleeve bearing (45) and felt lubricating washer (53), when supplied, from the function shaft.

b. Reassembly.

(1) Reassemble the function-shaft assembly as indicated in figure 3-51; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the function-shaft assembly on the teletypewriter frame (para 3-72b).

3-74. Disassembly and Reassembly of Selector Camshaft Assembly

(fig. 3-52)

a. Disassembly.

(1) Remove one paper-shaft bracket and the paper chute (para 3-23a).

(2) Remove the self-locking hexagonal nut (fig. 3-39) and flat washer that hold the orientation lever to the orientation-lever stud; remove the orientation lever.

(3) Remove the two machine screws (1, fig. 3-52) and lockwashers that hold the ball bearing (17) to the selector side of the frame.

(4) Remove the two setscrews that hold the clutch disk (8) to the selector camshaft (22).

(5) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the two machine screws that hold the friction-adjusting collar (5) to the driving collar (15); remove the friction-adjusting collar.

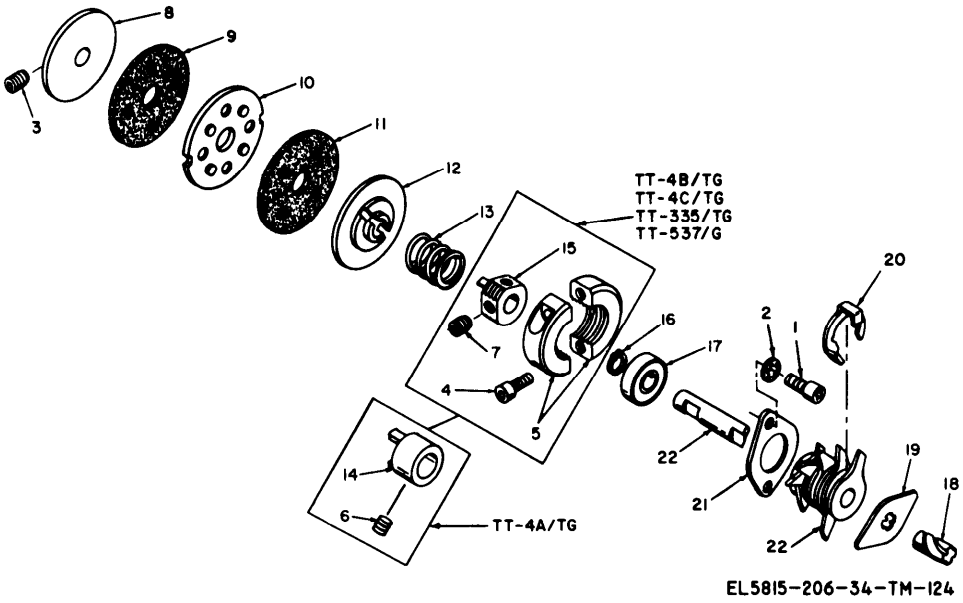
(6) On the TT-4A/TG and TT-698/TG; remove the two setscrews (6) that hold the friction-adjusting collar (14) to the selector camshaft. Remove the selector camshaft and ball bearing from the frame; catch the clutch disks, felt friction plates (9 and 11), friction-clutch spring (13), and friction-adjusting collar as they fall from the selector camshaft.

(7) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the two setscrews (7) that hold the driving collar to the selector cam-shaft. Remove the selector camshaft and ball bearing from the frame; catch the clutch disks felt friction plate, friction-clutch spring, and drive collar as they fall from the selector camshaft.

(8) Remove the retainer ring (16) that holds the ball bearing to the selector camshaft; remove the ball bearing.

(9) On the TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG, bend the tab on the end of the selector camshaft (22) to release the stop plate (19); remove the grooved pin (18) and stop plate from the camshaft. Remove the grooved pin from the stop plate.

(10) On the TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG, remove the E-Ring type stop plate retainer (20) from the selector cam assembly. Remove the stop plate and grooved pin.



1 Machine screw, 10003
2 Lockwasher, 10403
3 Setscrew, 10234
4 Machine screw, 10043
5 Friction-adjusting collar, 56832 (includes item 4)
6 Setscrew, 10209
7 Setscrew, 10208
8 Clutch disk, 50200
9 Felt friction plate, 56765, 613441 (set of 2)
10 Clutch disk, 51117
11 Felt friction plate, 56765, 613441
12 Clutch disk, 50198 [a] 54931 [b c]
13 Friction-clutch spring, 50914 [a], 54932 [b c]
14 Friction-adjusting collar, 50199
15 Drive collar, 54928
16 Retainer ring, 10462
17 Ball bearing, 10753
18 Grooved pin, 50133
19 Stop plate, 50134
20 Retaining clip, 67007 [c]
21 Retainer, 50115
22 Selector camshaft 67006A (includes items 16 through 21)

[a] Used on TT-4A/TG and TT-698/TG.
[b] Used on TT-4B/TG and TT-698A/TG.
[c] Used on TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG.

Figure 3-52. Selector camshaft assembly, exploded view.

b. Reassembly.

(1) Reassemble the selector camshaft assembly as indicated in figure 3-53; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the selector camshaft assembly (para 3-158 and 3-159).

(3) Replace the paper-shaft bracket and paper chute (para 3-23b).

3-75. Disassembly and Reassembly of Main Shaft Assembly (TT-4A/TG and TT-698/TG)

(fig. 3-53)

a. Disassembly.

(1) Remove the teletypewriter from the mounting base (para 3-25a).

(2) Remove the one paper-shaft bracket and the paper chute (para 3-23a).

(3) Remove the gear cover, worm gear bracket, and gasket from the frame (para 3-26a).

(4) Remove the machine screw (1, fig. 3-53) and lockwasher that hold the main-shaft gear (3) to the main shaft (31). Loosen the four motor mounting machine screws (fig. 3-23) and remove the main-shaft gear.

(5) Remove the machine screw (4), lockwasher, and flat washer that hold the ball bearing (29) in the frame.

(6) Remove the self-locking hexagonal nut (7) and lockwasher that hold the grounding wiper (9) to the machine screw: remove the grounding wiper, lockwasher, machine screw, lockwasher, and flat washer.

(7) Block-up the main shaft with pieces of wood placed between the shaft and the frame. Remove the

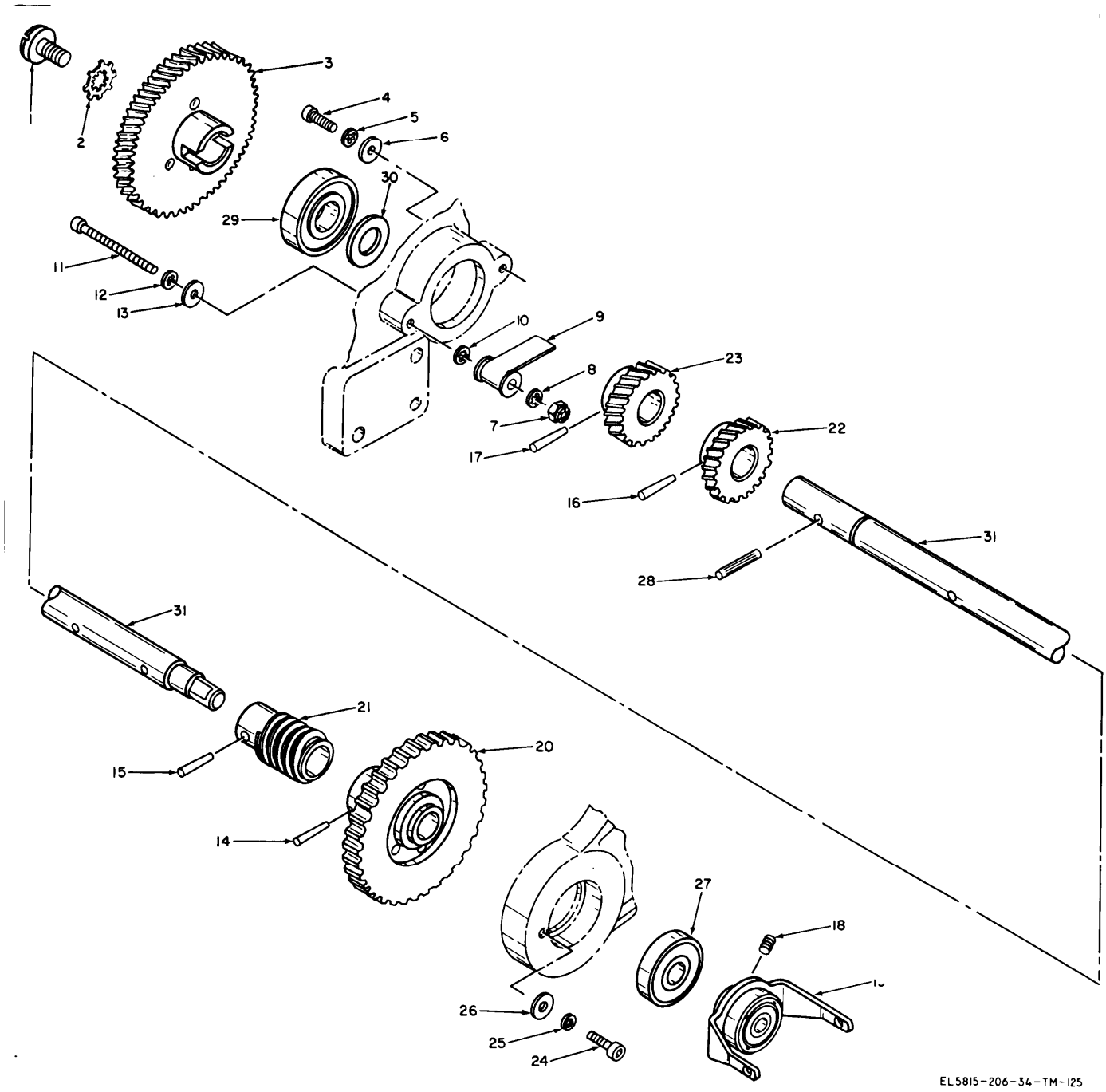
four taper pins that hold the function-shaft driving gear (20), carriage-feed worm (21), carriage-return-shaft drive gear (22), and transmitter-shaft drive gear (23) to the main shaft.

(8) Remove the two setscrews (18) that hold the selector-friction-clutch fork (19) to the main shaft.

(9) Remove the main shaft by pulling it out of the frame from the motor end; remove the selector-friction-clutch fork, function-shaft driving gear, carriage-feed worm, carriage-return shaft drive gear, and transmitter-shaft drive gear from the main shaft as it is removed.

(10) Remove the machine screw (24), lock-washer, and flat washer that hold the ball bearing (27) in the frame; remove the ball bearing,

(11) Remove the main-shaft-gear pin (28), ball bearing, and flat washer from the main shaft.



1 Machine screw, 50207
2 Lockwasher, 10406
3 Mainshaft gear, 50352A
4 Machine screw, 10003
5 Lockwasher, 10403
6 Flat washer, 10450
7 Self-locking hexagonal nut, 10500
8 Lockwasher, 10403
9 Grounding wiper, 51160A
10 Lockwasher, 10403
11 Machine screw, 10023
12 Lockwasher, 10403
13 Flat washer, 10450
14 Taper pin, 10852
15 Taper pin, 10850
16 Taper pin, 10852
17 Taper pin, 10852
18 Setscrew, 10209
19 Slector-friction-clutch fork, 50484A
20 Function-shaft driving gear, 50354A
21 Carriage-feed worm 50268
22 Carriage-return-shaft drive gear, 55167
23 Transmitter-shaft-drive gear, 55166
24 Machine screw, 10004
25 Lockwasher, 10429
26 Flat washer, 10450
27 Ball bearing, 10757
28 Main shaft gear pin, 50359
29 Ball bearing, 10758
30 Flat washer, 50746
31 Main shaft, 50652 (includes items 28, 29, and 30)

Figure 3-53. Main shaft assembly (TT-4A/TG and TT-698/TG), exploded view.

b. Reassembly.

(1) Reassemble the main shaft assembly as indicated in figure 3-53; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the gear cover, worm gear bracket, and gasket on the teletypewriter frame (para 3-26b).

(3) Replace the paper-shaft bracket and paper chute (para 3-23b).

(4) Replace the teletypewriter on the mounting base (para 3-25b).

3-76. Removal and Replacement of Main Shaft Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-54)

a. Removal.

(1) Remove the teletypewriter from the mounting base (para 3-25a).

(2) Remove the paper-shaft bracket and paper chute (para 3-23a).

(3) Remove the gear cover, worm gear bracket, and gasket from the frame (para 3-26b).

(4) Remove the machine screw (1, fig. 3-54) and lockwasher. Loosen the four motor mounting machine screws (fig. 3-23) and remove the main-shaft gear (3, fig. 3-54).

(5) Remove the drive keys (4) from the main-shaft gear.

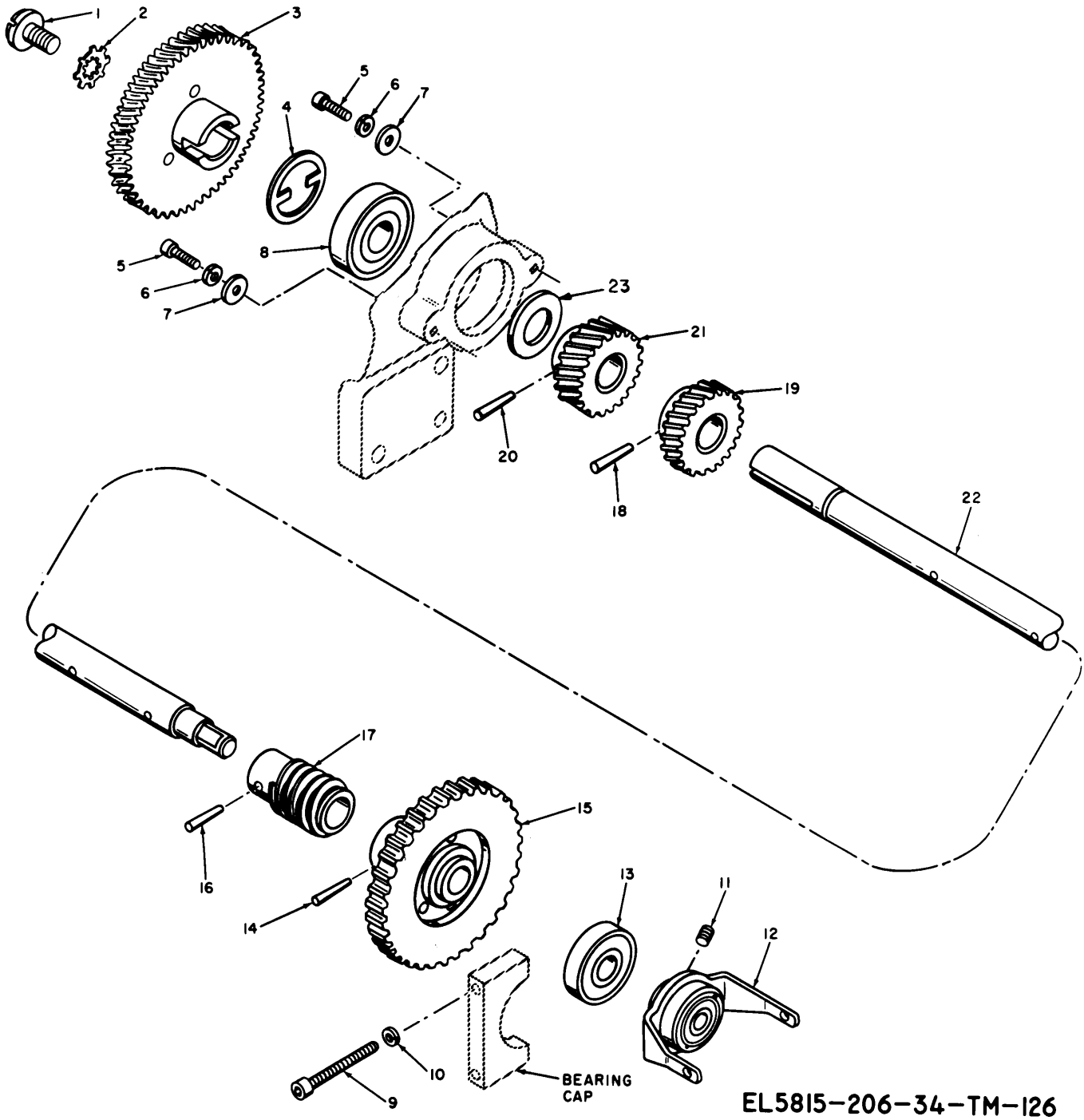
(6) Remove the two machine screws (5), lockwashers, and flat washers that hold the ball bearing (8); remove the ball bearing.

(7) Remove the two machine screws (9) and lockwashers that hold the bearing cap to the frame; remove the bearing cap.

(8) Remove the orientation lever (fig. 3-39) from the rangefinder mechanism.

(9) Remove the two machine screws (fig. 3-52 and lockwasher. Pull the selector camshaft out of the frame far enough to allow the selector-friction-clutch fork (12, fig. 3-54) to clear the felt friction plate (fig. 3-52) on the selector camshaft.

(10) With the function shaft in the stop position, remove the main shaft (22, fig. 3-54).



1 Machine screw, 50207
2 Lockwasher, 10406
3 Main-shaft gear, 50352A, 64862A*
4 Drive key, 54566
5 Machine screw, 10003
6 Lockwasher, 10429
7 Flat washer, 10450
8 Ball bearing, 10758
9 Machine screw, 10012
10 Lockwasher, 10430
11 Setscrew, 10234
12 Selector-friction-clutch fork, 50484A
13 Ball bearing, 10757
14 Taper pin, 10852
15 Function-shaft driving gear, 50354A
16 Taper pin, 10850
17 Carriage-feed worm, 50268
18 Taper pin, 10852
19 Carriage-return-shaft drive gear, 55167
20 Taper pin, 10852
21 Transmitter-shaft drive gear, 55166
22 Main shaft, 54563
23 Flatwasher, 50746

* Used on TT-335/TG and TT-537/G.

Figure 3-54. Main shaft assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), exploded view.

b. Replacement.

(1) Insert the left end of the main shaft (fig. 3-54) in the hole in the function side of the frame.

(2) Position the ball bearing in the bearing seat in the selector side of the frame. Position the bearing cap on the bearing and on the frame. Secure the cap with the two machine screws and lockwashers.

(3) Install the ball bearing on the function side of the main shaft and in the bearing seat in the frame. Secure it with two machine screws, lockwashers, and flat washers.

(4) Position the five drive keys on the main-shaft gear.

(5) Install the main-shaft gear on the main shaft and secure it with a machine screw and lockwasher.

NOTE

Be sure to install the correct gear for the operating speed desired.

(6) Install the orientation lever (fig. 3-39) on the rangefinder mechanism.

(7) Move the selector camshaft (fig. 3-53) in so that the felt friction plate of the friction clutch engages the selector-friction-clutch fork (fig. 3-54) on the main shaft.

(8) Install the two machine screws (fig. 3-52) and lockwashers that hold the selector camshaft to the selector side of the frame.

(9) Replace the gasket, gear cover, and worm gear bracket on the frame (para 3-26b).

(10) Replace the paper-shaft bracket and paper chute (para 3-23b).

(11) Replace the teletypewriter on the mounting base (para 3-25b).

3-77. Disassembly and Reassembly of Main Shaft Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG)

(fig. 3-54)

a. Disassembly.

(1) Remove the main shaft assembly (para 3-76a).

(2) Remove the two setscrews that hold the selector-friction-clutch fork (12) to the main shaft; remove the clutch fork.

(3) Remove the ball bearing (13) from the main shaft.

(4) Drive out the taper pin that holds the function-shaft driving gear (15) to the main shaft; remove the function- shaft driving gear.

(5) Drive out the taper pin that holds the carriage-feed worm (17) to the main shaft; remove the carriage-feed worm.

(6) Drive out the taper pin that holds the carriage-return-shaft drive gear (19) to the main shaft; remove the carriage-return-shaft drive gear.

(7) Drive out the taper pin that holds the transmitter-shaft driver gear (21) to the main shaft; remove the transmitter-shaft drive gear.

b. Reassembly.

(1) Reassemble the main shaft assembly as indicated in figure 3-54; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the main shaft assembly (para 3-76b).

3-78. Removal and Replacement of Code-Ring Cage

(fig. 3-55 or 3-56)

a. Removal.

(1) Remove the four setscrews (fig. 3-50) and the stop-arm shaft and square-shaft stop arm (4, fig. 3-55 or 3-56).

(2) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-698A/TG and TT-698B/TG, remove the three machine screws (6, fig. 3-56), flat washers, and lockwashers that hold the two fulcrums (line-feed and carriage-return functions) (9), the fulcrum (figures-shift) (10), and the bracket (13) to the function stop-bar guide (15); remove the three fulcrums and the bracket.

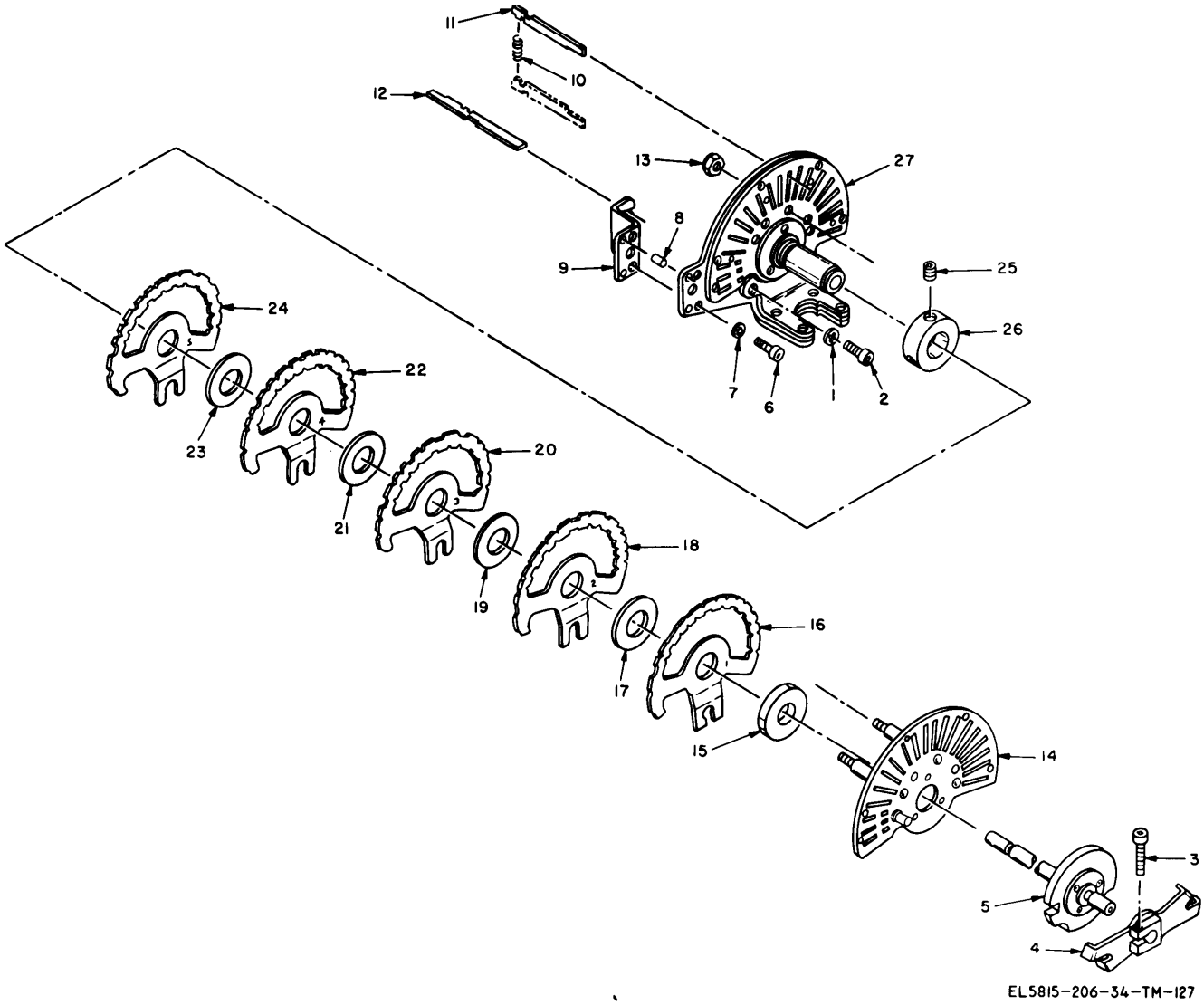
NOTE

There are three fulcrums, even though only two are shown in figure 3-56.

(3) Remove the sensing levers (para 3-36a).

(4) Remove the two machine screws (1) and lockwashers (fig. 3-55 and 3-56) that hold the code-ring cage to the selector side of the frame.

(5) Remove the code-ring cage by pulling it away from the teletypewriter casting.



1 Machine screw, 10024
2 Lockwasher, 10405
3 Machine screw, 10009
4 Square-shaft stop arm, 53802A (includes item 3)
5 Stop-arm shaft, 50377A
6 Machine screw, 10002
7 Lockwasher, 10403
8 Dowel, 50458
9 Function stop-bar guide, 50500
10 Stop-bar spring, 50154
11 Stop-bar, 50502
12 Stop bar, 50503
13 Self-locking hexagonal nut, 10500
14 Cage outer guide, 51399A
15 Spacer (.134-in.), 51395
16 Code ring, 51631*
17 Spacer (.029-in.), 51396
18 Code ring, 51632*
19 Spacer (.029-in.), 51396
20 Code ring, 51633*
21 Spacer (.029-in.), 51396
22 Code ring, 51634*
23 Spacer (.029-in.), 51396
24 Code ring, 51635*
25 Setscrew, 10209
26 Collar, 51397
27 Code-ring cage plate, 57748A

* Code ring set of 561057A, includes items 16, 18, 20, 22, and 24.

Figure 3-55. Code ring cage (TT-4A/TG and TT-698/TG), exploded view.

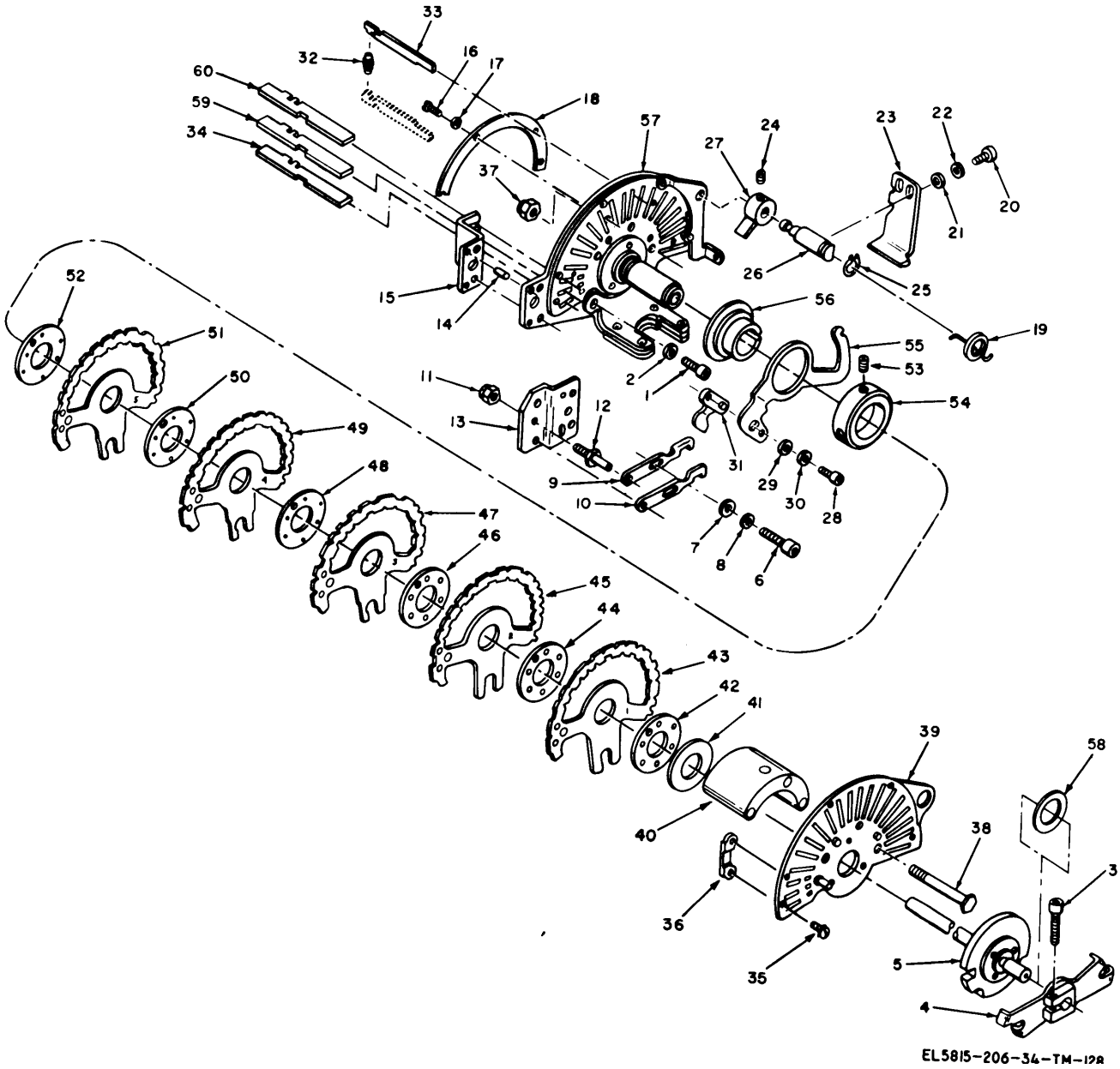


Figure 3-56. Code ring cage (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), exploded view.

KEY to fig. 3-56:

1 Machine screw, 10024
2 Lockwasher, 10431
3 Machine screw, 10009
4 Square-shaft stop arm, 53802A (includes item *3)*
5 Stop-arm shaft, 57712A
6 Machine screw, 10005
7 Flat washer, 10459
8 Lockwasher, 10429
9 Fulcrum, 56178 (line-feed and carriage-return functions)
10 Fulcrum, 56176 (figures-shift function)
11 Self-locking hexagonal nut, 10500
12 Eccentric stud, 55738
13 Bracket, 55737
14 Dowel
15 Function stop-bar guide, 57927 [abc]
16 Machine screw, 10317
17 Lockwasher, 10433
18 Retainer plate, 56177
19 Locking-bail spring, 57749
20 Machine screw, 10004
21 Flat washer, 68132
22 Lockwasher, 10429
23 Code-ring locking bail, 57718
24 Setscrew, 10201
25 Retainer ring, 10451
26 Locking-bail shaft, 53871
27 Locking-bail lever, 53875A
28 Machine screw, 10001
29 Flat washer, 10459
30 Lockwasher, 10429
31 Cam follower, 53882
32 Stop-bar spring, 52940
33 Stop bar, 50502
34 Line feed stop bar, 56179 [abc]
35 Machine screw, 10362
36 Stop bracket, 59332
37 Self-locking hexagonal nut, 10840
38 Cage tie bolt, 53972
39 Cage outer guide 53439A[d](includes item 40)
40 Cage spacer, 53445
41 Flat washer, 53453
42 Ball retainer, 53647A
43 Code ring, 53641A, 61058A [e]
44 Ball retainer, 53647A
45 Code ring, 53642A
46 Ball retainer, 53647A
47 Code ring 53643A [e]
48 Ball retainer, 53647A
49 Code ring, 53644A [e]
60 Ball retainer, 53647A
51 Code ring, 53645A [e]
52 Ball retainer, 53647A
53 Setscrew, 10223
54 Code-ring collar, 53868
55 Cam-follower lever, 53869
56 Sleeve bearing, 53867
57 Code-ring cage plate 57748 [d]
58 Felt lubricating washer 61485[abc]
59 Carriage return stop bar 56179[a], 63576 [ab],62142 [c]
60 Figures stop bar, 56179 [ab],57928 [c]

[a] Used on TT-4B/TG.

[b] Used on TT-4C/TG and TT-335/TG.

[c] Used on TT-537/G.

[d] Code ring cage 63196A (includes items 57 and 39).

[e] 61058A comprises a set of five.

b. Replacement.

(1) Position the code-ring cage on the selector side of the teletypewriter frame.

(2) Replace the sensing levers (para 3-36b).

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, position the two fulcrums (line-feed and carriage-return functions) (fig. 3-56), fulcrum (figures-shift), and bracket on the code-ring cage. Secure them with the three machine screws, flat washers, and lockwashers.

(4) Insert the stop-arm shaft (5, fig. 3-55 or 3-56) in the opening in the center of the code-ring cage and in the hole in the square-shaft driven gear (fig. 3-50). Secure the stop-arm shaft to the gear with the four setscrews.

(5) Install the two machine screws and lockwashers (fig. 3-55 or 3-56) that hold the code-ring cage to the selector side of the frame.

(6) Adjust the code-ring cage (para 3-121, 3-140 through 3-145, and 3-206).

3-79. Disassembly and Reassembly of Code-Ring Cage (TT-4A/TG and TT-698/TG)

(fig. 3-55)

a. *Disassembly.*

(1) Remove the code-ring cage from the frame (para 3-78a).

(2) Remove the machine screw (3, fig. 3-55) that holds the square-shaft stop arm (4) to the stop-arm shaft (5); remove the square-shaft stop arm.

(3) Remove the two machine screws (6) and lockwashers that hold the function stop-bar guide (9) to the cage outer guide (14); remove the dowels (8) and the function stop-bar guide.

(4) Remove the 19 stop-bar springs (10) from the 32 stop bars (11) and from the three stop bars (12); remove the stop bars.

(5) Remove the three self-locking hexagonal nuts (13) that hold the outer guide to the code-ring cage plate (27) remove the cage outer guide.

(6) Remove alternately the five spacers and the

five code rings from the stud of the code-ring cage plate.

(7) Remove the two setscrews (25) that hold the collar (26) to the stud of the code-ring- cage plate; remove the collar,

b. Reassembly.

(1) Reassemble the code-ring cage as indicated in figure 3-55; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the code-ring cage (para 3-78b).

3-80. Disassembly and Reassembly of Code-Ring Cage (TT4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG

(fig. 3-56)

a. Disassembly.

(1) Remove the code-ring cage (para 3-78a).

(2) Remove the machine screw (3, fig. 3-56) that holds the square-shaft stop arm (4) to the stop-arm shaft (5); remove the square-shaft stop arm. Catch the felt lubricating washer (58), when supplied, as it falls from the stop-arm shaft.

(3) Remove the three self-locking hexagonal nuts (11) that hold the eccentric studs (12) to the bracket (13); remove the eccentric studs.

(4) Remove the two dowels (14) from the function stop-bar guide (15) and from the code-ring cage plate (57); remove the function stop-bar guide.

(5) Remove the three machine screws (16) and lockwashers that hold the retainer plate (18) to the code-ring cage plate; remove the retainer plate.

(6) Unhook the locking-bail spring (19) from the code-ring locking bail (23) and from the cage outer guide (39).

(7) Remove the two machine screws (20), flat washers, and lockwashers that hold the code-ring locking bail to the locking-bail shaft (26); remove the code-ring locking bail.

(8) Remove the two setscrews (24) that hold the locking-bail lever (27) to the locking-bail shaft.

(9) Remove the retainer ring (25) and the locking-bail shaft. Catch the locking-bail spring and the locking-bail lever as they fall from the shaft.

(10) Remove the machine screw (28), flat washer, and lockwasher that hold the cam follower (31), to the cam-follower lever (55); remove the cam follower.

(11) Remove the 19 stop-bar springs (32) from the stop bars (33) in the code-ring cage. Remove the stop bars and the three stop bars,

(12) Remove the two machine screws (35) that hold the stop bracket (36) to the cage outer guide; remove the stop bracket.

(13) Remove the three self-locking hexagonal nuts (37 and cage tie bolts (38) that hold the cage outer guide to the code-ring cage plate; remove the cage outer guide and cage spacer (40).

(14) Remove the flat washer (41) from the stud on the code-ring cage plate. Remove the six ball retainers and the five code rings from the stud on the code-ring cage plate; alternately remove a ball retainer and a code ring until all are removed.

(15) Remove the two setscrews (53) that hold the code-ring collar (54) to the stud on the code-ring cage plate; remove the code-ring collar, cam-follower lever (55), and sleeve bearing (56) from the code-ring cage plate.

b. Reassembly.

(1) Reassemble the code-ring cage as indicated in figure 3-56; the sequence for assembling the parts is the reverse of disassembly sequence.

(2) Replace the code-ring cage (para 3-78b).

3-81, Disassembly and Reassembly of Function Sensing Lever Group (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-698A/TG)

(fig. 3-57)

a. Disassembly.

(1) Remove the square-shaft assembly (para 3-71a).

(2) Remove the line-feed and platen-shift mechanisms (para 3-68a or 3-69a).

(3) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer that hold the adjusting link (2, fig. 3-57) to the carriage-return clutch actuating lever; disconnect the adjusting link.

(4) On the TT-4B/TG and TT-698A/TG, remove the retainer ring (1) from the pivot stud on the adjusting link. Disengage one end on the felt lubricating washer (23), when supplied, from the horizontal carriage-return link (4). Remove the adjusting link from engagement with the double-blocking lever (fig. 3-63) and from the horizontal carriage-return link (fig. 3-57). Remove the felt lubricating washer, when supplied, from the horizontal carriage-return link.

(5) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer (fig. 3-57) that hold the horizontal carriage-return link to the stud on the carriage-return bell crank (9); remove the horizontal carriage-return link.

(6) On the TT-4B/TG and TT-698A/TG, remove the retainer ring (3) that holds the horizontal carriage-return link to the stud on the carriage-return bell crank; remove the horizontal carriage-return link. Remove the felt lubricating washer (24), when supplied.

(7) On the TT-4A/TG and TT-698/TG, remove the two cotter pins and flat washers that hold the vertical carriage-return link (7) to the studs on the carriage-return bell crank and the carriage-return

sensing lever (15); remove the vertical carriage-return link. Remove felt lubricating washers (26) when supplied.

(8) On the TT-4B/TG and TT-698A/TG, remove the retainer rings (5 and 6) that hold the vertical carriage-return link to the studs on the carriage-return bell crank and the carriage return sensing lever; remove the vertical carriage-return link.

(9) On the TT-4A/TG and TT-698/TG, remove the cotter pin and flat washer that hold the carriage-return bell crank to the carriage-return bell-crank stud (10); remove the carriage-return bell crank.

(10) On the TT-4B/TG and TT-698A/TG, remove the retainer ring (8) that holds the carriage-return bell crank to the carriage-return bell-crank stud; remove the felt lubricating washer (21) when supplied; remove the carriage-return bell crank.

(11) Remove the carriage-return bell-crank stud from the frame.

(12) Remove the flat washer (11) from the stop arm shaft.

(13) Remove the line-feed sensing-lever spring (12) from the line-feed sensing lever (13) and from the bell-crank pivot bracket.

(14) Remove the line-feed sensing lever, flat washer, carriage-return sensing lever, and flat washer (16) from the stop-arm shaft.

(15) Remove the figures-shift sensing-lever spring (17) from the figures-shift sensing lever (18) and from the bell-crank pivot bracket.

(16) Remove the figures-shift sensing lever; the two felt lubricating washers (22), when supplied, spacing collar (19), and laminated washer from the stop-arm shaft.

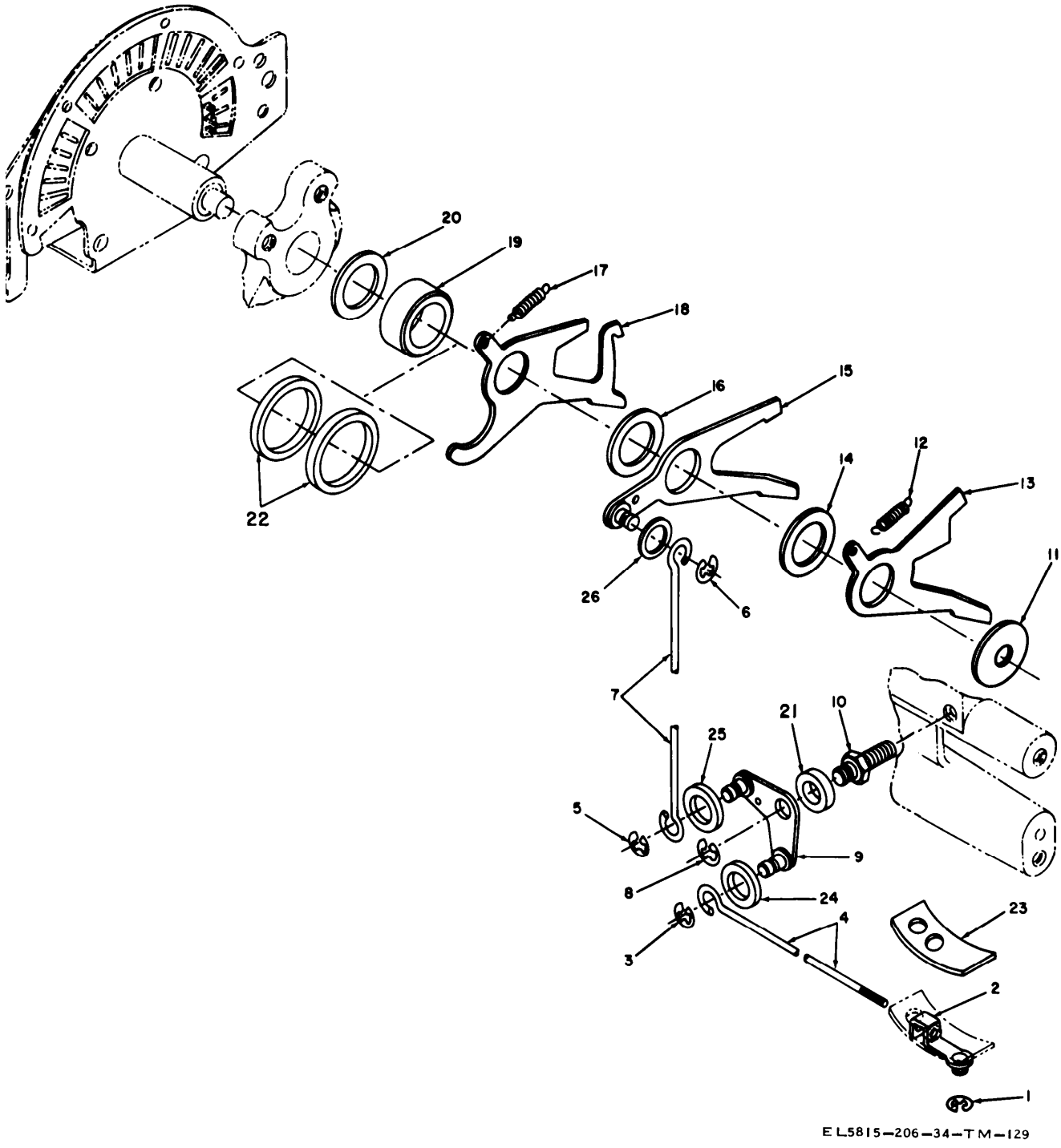


Figure 3-57. Function-sensing lever group (TT-4A/TG, TT-4B/TG, TT-698/TG and TT-693A/TG), exploded view.

Key to fig. 3-57:
1 Retainer ring, 10960
2 Adjusting link, 53161A
3 Retainer, ring, 10960
4 Horizontal carriage-return link, 50864
5 Retainer ring, 10960
6 Retainer ring, 10960
7 Vertical carriage return link, 50483
8 Retainer ring, 10949
9 Carriage-return bell crank, 52121A
10 Carriage-return bell-crank stud, 52552
11 Flat washer, 50374
12 Line-feed sensing-lever spring, 51754
13 Line-feed sensing lever, 53106
14 Flat washer, 50384
15 Carriage-return sensing lever, 52659A
16 Flat washer, 50384
17 Figures-shift sensing-lever spring, 51754
18 Figures-shift sensing lever, 52749
19 Spacing collar, 50505
20 Laminated washer, 51100
21 Felt lubricating washer, 61673
22 Felt lubricating washer, 61497
23 Felt lubricating washer, 61677
24 Felt lubricating washer, 61483
25 Felt lubricating washer, 61483
26 Felt lubricating washer, 61672

NOTE
Some models may have felt lubricating washers.

b. Reassembly.

(1) Reassemble the function sensing lever group as indicated in figure 3-57; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the line-feed and platen-shift mechanisms (para 3-68b or 3-69b).

(3) Replace the square-shaft assembly (para 3-71b).

(4) Adjust the function sensing lever group (para 3-139, 3-140, and 3-141).

3-82. Disassembly and Reassembly of Function-Sensing Lever Group (TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG)

(fig. 3-58)

a. Disassembly.

(1) Remove the square shaft (para 3-71a).

(2) Remove the line-feed and platen-shift mechanism (para 3-70a).

(3) Remove the retainer ring (1, fig. 3-58) from the pivot stud on the connector link (2). Disconnect the connector link from the double-blocking lever, (fig. 3-63). Disengage the end of the felt strip (3, fig. 3-58) the end of the horizontal carriage-return link (5). Remove the connector link and felt.

(4) Remove the retainer ring (4) and horizontal carriage-return link.

(5) Remove the retainer rings (6 and 7). Remove the vertical carriage-return link (8).

(6) Remove the felt (9) from the carriage-return sensing lever (24). Remove the felts (10 and 11) from the carriage-return bellcrank (13).

(7) Remove the retainer ring (12) and carriage-return bellcrank from the carriage-return bellcrank pivot (15).

(8) Remove the felt (14) and carriage-return bellcrank pivot.

(9) Remove the flat washer (16), line-feed-on-carriage-return sensing lever (17), and flat washers, line-feed sensing lever (19), and figures-shift sensing lever (21).

(10) Remove the carriage-return sensing lever spring (23) from the carriage-return sensing lever,

(11) Remove the carriage-return sensing lever and sleeve (25).

(12) Remove the two felts (26) from the spacing collar (27). Remove the spacing collar.

(13) Remove the tolerance takeup flat washer (28) from the stop-arm shaft.

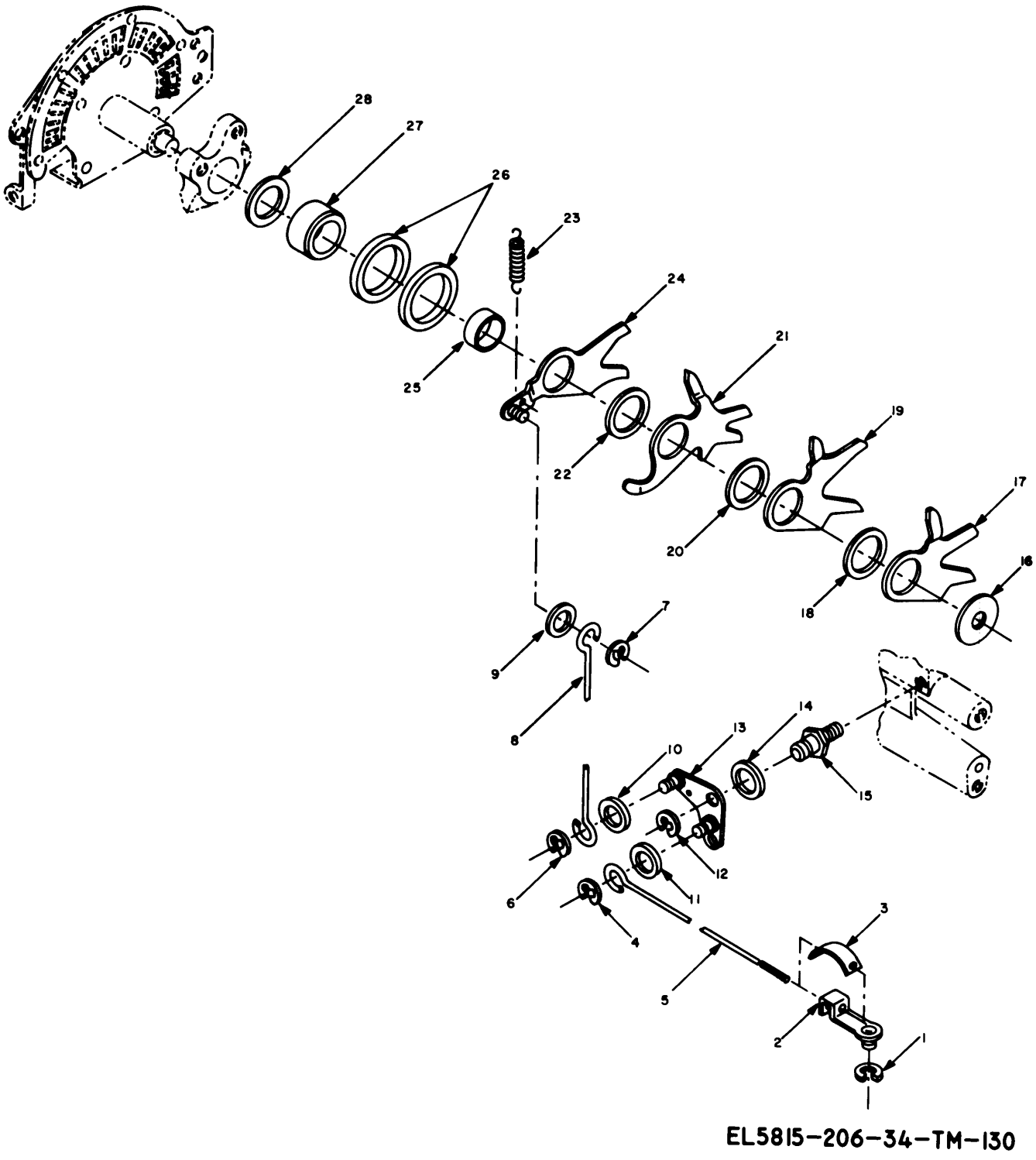


Figure 3-58. Function-sensing lever group (TT-4C/TG, TT-335/TG, TT-537/G AND TT-698B/TG), exploded view.

KEY to fig. 3-58:
1 Retainer ring, 10960
2 Connector link, 53161A
3 Felt strip, 61677
4 Retainer, ring, 10960
5 Horizontal carriage-return link, 50864
6 Retainer ring, 10960
7 Retainer ring, 10960
8 Vertical carriage-return link, 50483
9 Felt, 61672
10 Felt, 61483
11 Felt, 61483
12 Retainer ring, 10949
13 Carriage-return bellcrank, 59441A
14 Felt, 61673
15 Carriage-return bellcrank pivot, 52552
16 Flat washer, 50374
17 Line-feed-on-carriage-return sensing lever, 62140
18 Flat washer, 62134
19 Line-feed sensing lever, 62139
20 Flat washer, 62134
21 Figures-shift sensing lever, 62141
22 Flat washer, 62135
23 Carriage-return sensing lever spring, 59442
24 Carriage-return sensing lever, 62128A
25 Sleeve, 62594
26 Felts, 61497
27 Spacing collar, 57923
28 Tolerance takeup flat washer, 51100

b. Reassembly.

(1) Reassemble the function-sensing lever group by reversing the procedures outlined in *a* above.

(2) Adjust the function sensing levers group (para 3-133, 3-134, 3-139, 3-141 and 3-231).

3-83. Disassembly and Reassembly of Manual Carriage-Return Mechanism

(fig. 3-59)

a. Disassembly.

(1) Remove one paper-shaft bracket and the paper chute (para 3-23a).

(2) Unscrew the manual carriage-return button (1, fig. 3-59) from the manual carriage-return link (4).

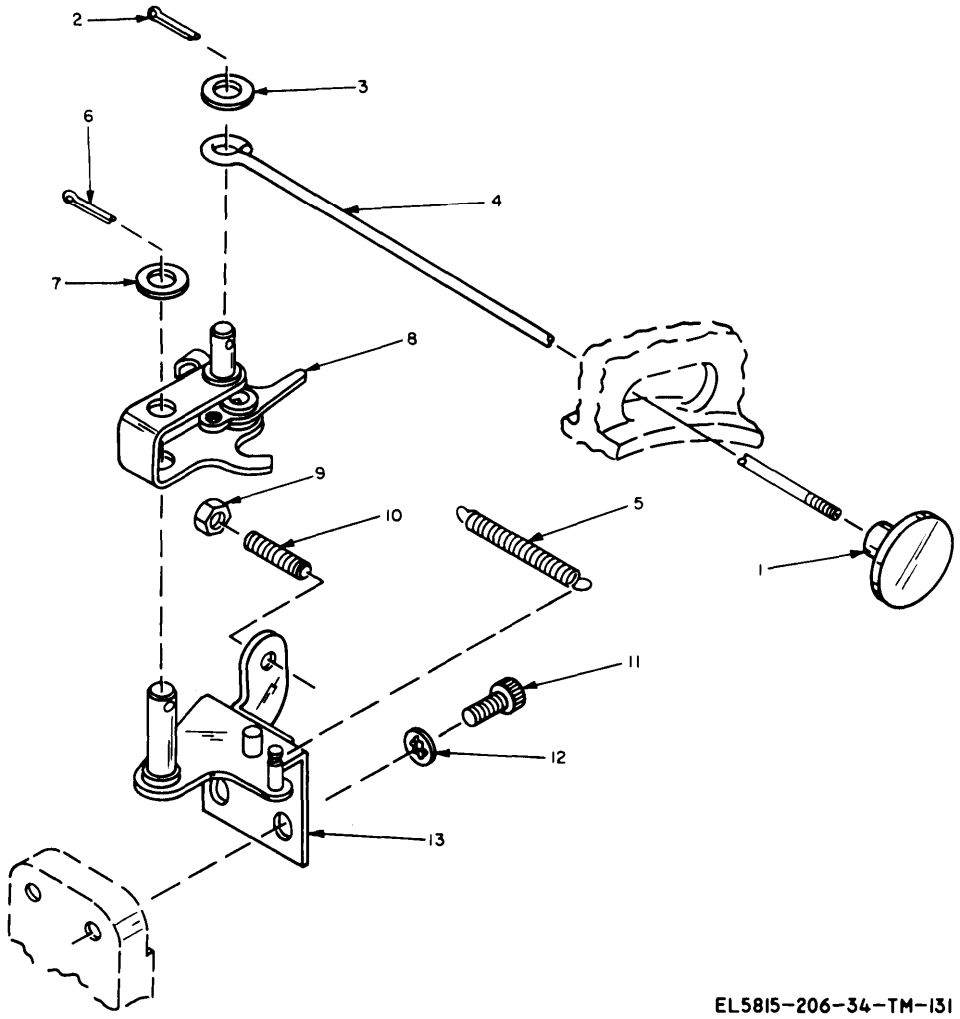
(3) Remove the cotter pin (2) and flat washer that hold the manual carriage-return link to the stud on the manual carriage-return lever (8); remove the manual carriage-return link.

(4) Remove the trip-pawl spring (5) from the trip pawl on the manual carriage-return lever and from the spring post on the manual carriage-return bracket (13).

(5) Remove the cotter pin (6) and flat washer that hold the manual carriage-return lever to the stud on the manual carriage-return bracket; remove the manual carriage-return lever.

(6) Remove the plain hexagonal nut (9) from the setscrew; remove the setscrew from the manual carriage-return bracket.

(7) Remove the two machine screws (11) and lockwashers that hold the manual carriage-return bracket to the frame; remove the manual carriage-return bracket.



1 Manual carriage-return button, 50335
2 Cotter pin, 10801
3 Flat washer, 50319
4 Manual carriage-return link, 50530
5 Trip-pawl spring, 52164
6 Cotter pin, 10801
7 Flat washer, 50315
8 Manual carriage-return lever, 50155A
9 Plain hexagonal nut, 10505
10 Setscrew, 10206
11 Machine screw, 10008
12 Lockwasher, 10404
13 Manual carriage-return bracket, 50180A

Figure 3-59. Manual carriage-return mechanism (TT-4A/TG, and TT-698/TG), exploded view.

b. Reassembly.

(1) Reassemble the manual carriage-return mechanism as indicated in figure 3-59: the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the manual carriage-return mechanism (para 3-236, 3-237 or 3-238).

(3) Replace the paper-shaft bracket and paper chute (para 3-23b).

3-84. Disassembly and Reassembly of Carriage-Feed Mechanism (TT-4A/TG and TT-698/TG)

(fig. 3-60)

a. Disassembly.

(1) Remove the cotter pin (fig, 3-46) and flat washer that hold the carriage-feed link (4, fig. 3-60) to the carriage-feed lever (fig. 3-46); remove the carriage-feed link from the carriage-feed lever.

(2) Remove the cotter pin (1, fig. 3-60) and flat washer that hold the adjusting link (3) to the stud on the carriage-feed pawl (8); remove the adjusting link. Remove the adjusting link from the carriage-feed link.

(3) Remove the carriage-feed-pawl spring (5) from the carriage-feed pawl and from the spring post on the frame.

(4) Remove the self-locking hexagonal nut (6) and the flat washer that hold the carriage-feed pawl to the pawl mounting stud (9); remove the carriage-feed pawl and the pawl mounting stud.

(5) Remove the carriage-feed clutch-lever spring (10) from the carriage-feed-clutch lever (13) and from the spring post on the teletypewriter frame.

(6) Remove the cotter pin (11) and flat washer that hold the carriage-feed-clutch lever to the carriage-feed clutch-lever stud; remove the carriage-feed-clutch lever.

(7) Remove the setscrew (14) that holds the carriage-feed clutch-lever stud (15) in the frame; remove the carriage-feed clutch lever stud.

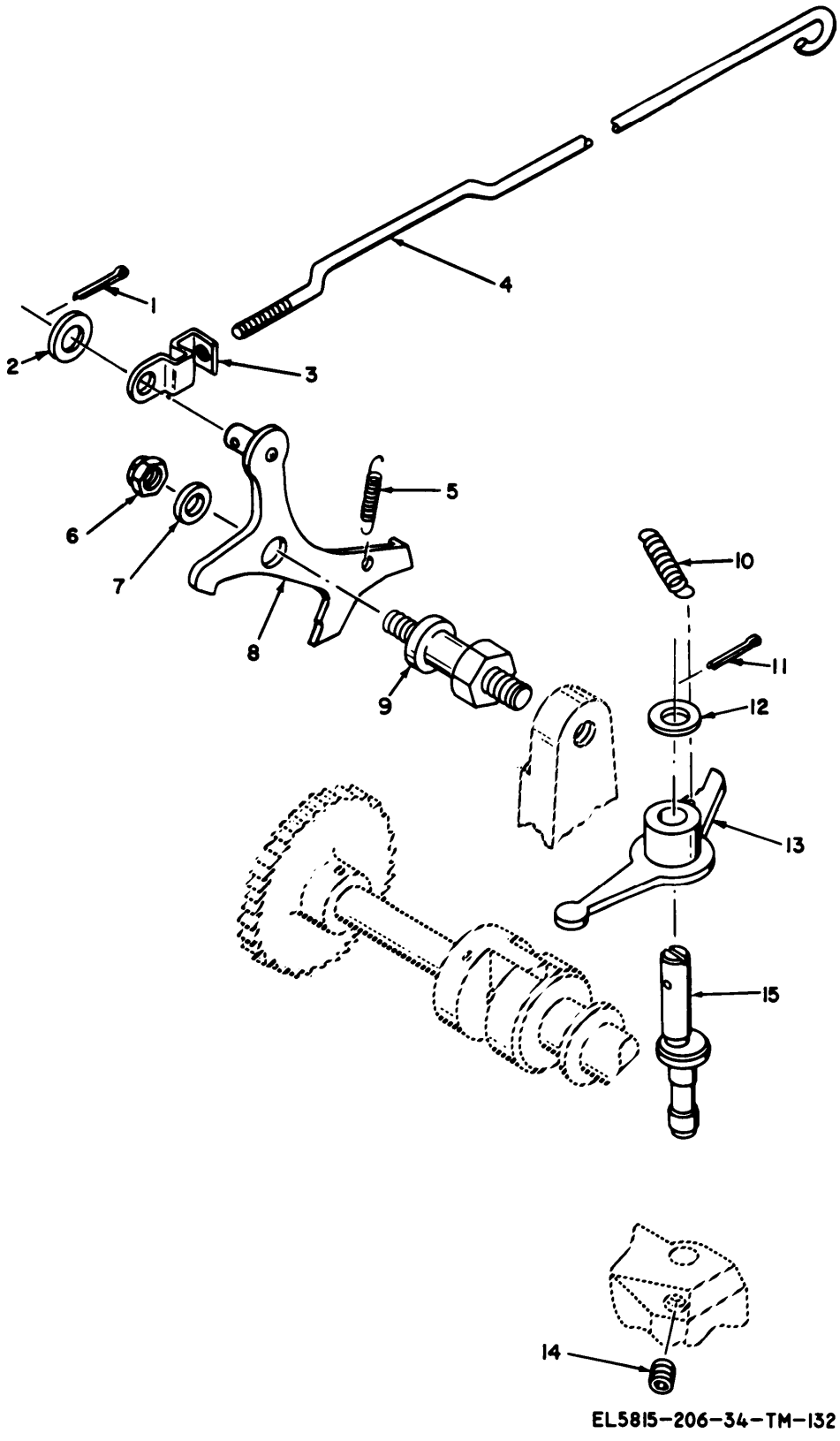


Figure 3-60. Carriage-feed mechanism (TT-4A/TG and TT-698/TG), exploded view.

KEY to fig. 3-60:
1 Cotter pin, 10801
2 Flat washer, 50319
3 Adjusting link, 51783
4 Carriage-feed link, 51782
5 Carriage-feed-pawl spring, 50912
6 Self-locking hexagonal nut, 10500
7 Flat washer, 50414
8 Carriage-feed pawl, 52138A
9 Pawl mounting stud, 55788
10 Carriage-feed clutch-lever spring, 50911
11 Cotter pin, 10801
12 Flat washer, 50315
13 Carriage-feed-clutch lever, 50005A
14 Setscrew, 10204
15 Carriage-feed clutch-lever stud, 52318

b. Reassembly.

(1) Reassemble the carriage-feed mechanism as indicated in figure 3-60; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the carriage-feed mechanism (para 3-197).

3-85. Disassembly and Reassembly of Carriage-Feed Mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698/TG)

(fig. 3-61)

a. Disassembly.

(1) Remove the retainer ring that holds the carriage-feed link (3, fig. 3-61) to the carriage-feed lever (fig. 3-46); remove the carriage-feed link from the carriage-feed lever.

(2) Remove the retainer ring (1, fig. 3-61) that holds the adjusting link (2, fig. 3-61) to the stud on the carriage-feed pawl (9); remove the adjusting link. Remove the adjusting link from the carriage-feed link.

(3) Remove the carriage-feed-pawl spring (4) from the carriage-feed pawl and from the spring post on the frame.

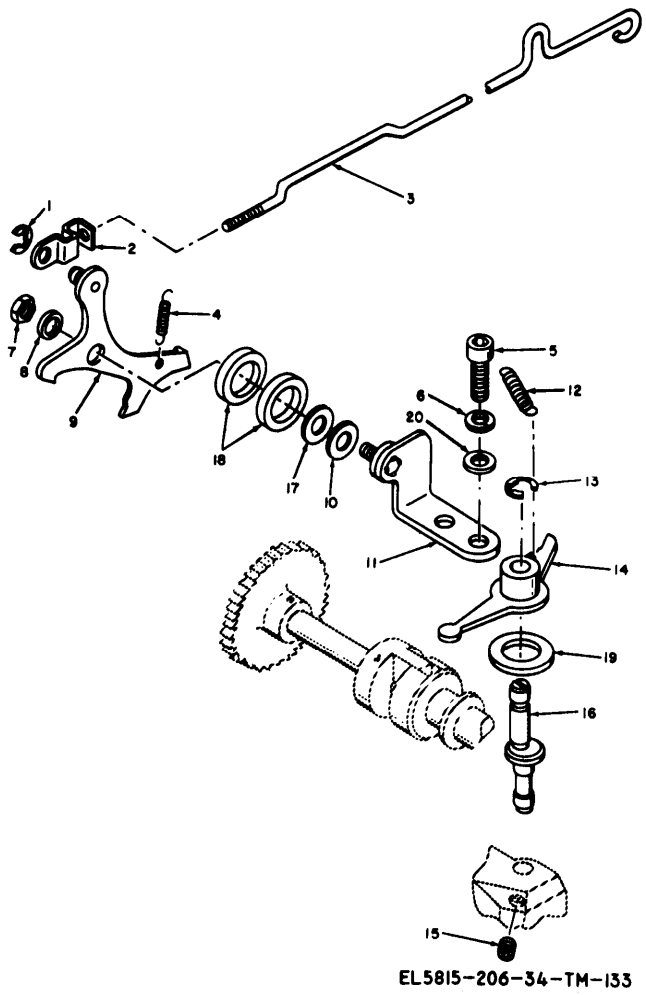
(4) Remove the two machine screws (5) and lockwashers that hold the assembled carriage-feed pawl and pawl mounting bracket (11) to the frame; remove the assembled carriage-feed pawl and pawl mounting bracket.

(5) Remove the self-locking hexagonal nut (7) and flat washer that hold the carriage-feed pawl to the pawl mounting bracket; remove the carriage-feed pawl, felt lubricating washer (18), when supplied, spacer and flat washer.

(6) Remove the carriage-feed clutch-lever spring (12) from the carriage-feed-clutch lever (14) and from the spring post on the frame.

(7) Remove the retainer ring (13) that holds the carriage-feed-clutch lever. Remove the felt lubricating washer (19), when supplied, to the carriage-feed clutch-lever stud (16); remove the carriage-feed-clutch lever.

(8) Remove the setscrew (15) that holds the carriage-feed clutch-lever stud in the frame; remove the carriage-feed clutch-lever stud.



1 Retainer ring, 10960
2 Adjusting link, 51783
3 Carriage-feed link, 55504
4 Carriage-feed-pawl spring, 50912
5 Machine screw, 10009
6 Lockwasher, 10430
7 Self-locking hexagonal nut, 10500
8 Flat washer, 10450
9 Carriage-feed pawl, 52138A
10 Flat washer, 50827
11 Pawl mounting bracket, 55788A
12 Carriage-feed clutch-lever spring, 50911
13 Retainer ring, 10949
14 Carriage-feed-clutch lever, 50005A
15 Setscrew, 10204
16 Carriage-feed clutch-lever stud, 52318
17 Spacer, 57072 or 57073
18 Felt lubricating washer, 61673
19 Felt lubricating washer, 61480
20 Flat washer, 10467

Figure 3-61. Carriage-feed mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), exploded view.

b. Reassembly.

(1) Reassemble the carriage-feed mechanism as indicated in figure 3-61; the sequence for assembling the parts is the reverse of the disassembly sequence.

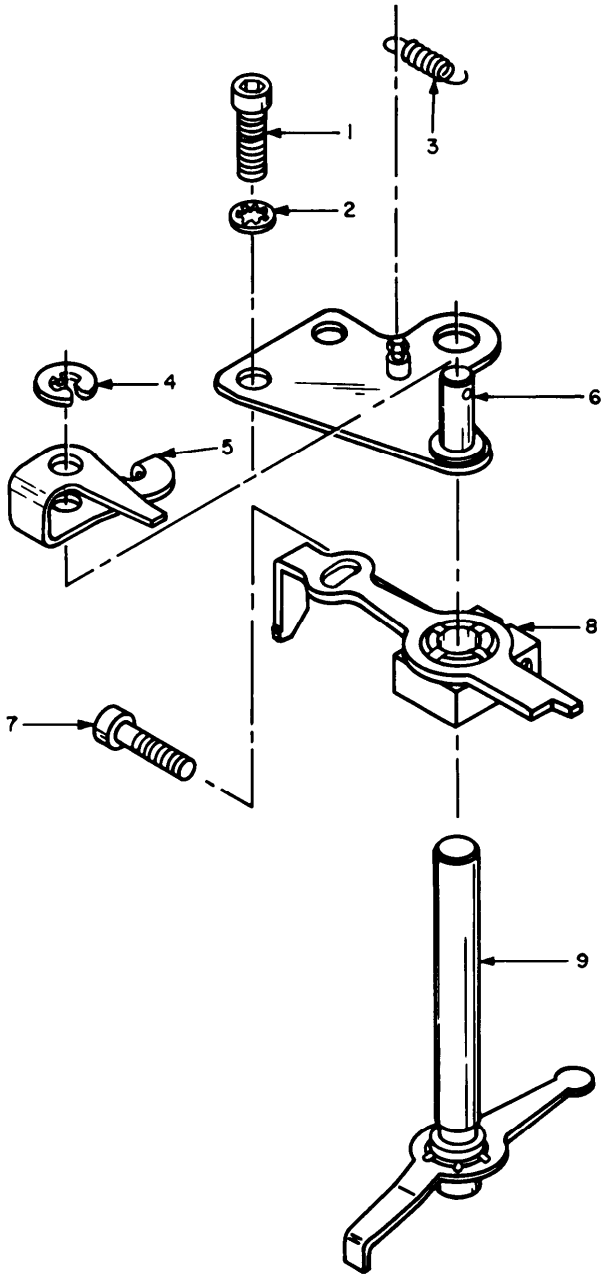
(2) Adjust the carriage-feed mechanism (para 3-195 and 3-197).

3-86. Removal and Replacement of Carriage-Return Operating Mechanism (TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG)

a. Removal.

(1) Remove the horizontal carriage-return link (fig. 3-57) as described in paragraph 3-56a.

(2) Remove the two machine screws (1, fig. 3-62) and lockwashers that hold the assembled carriage-return operating mechanism on the frame; remove the mechanism.



1 Machine screw, 10008
2 Lockwasher, 10430
3 Lever spring, 50946
4 Ring retaining, 10949
5 Carriage-return clutch latch lever, 50011
6 Latch mounting plate, 53163A
7 Machine screw, 10009
8 Carriage-return operating lever, 51682A (includes item 8)
9 Carriage-return clutch lever, 56243A

Figure 3-62. Carriage-return operating mechanism (TT-4A/TG and TT-698/TG), exploded view.

b. Replacement.

(1) Position the assembled carriage-return operating mechanism on the teletypewriter frame so that the carriage-return-clutch lever engages the groove in the carriage-return-clutch drum (fig. 3-69). Secure the carriage-return operating mechanism to the teletypewriter with two machine screws (fig. 3-62) and lockwashers.

(2) Install the horizontal carriage-return link (para 3-56b).

(3) Adjust the carriage-return operating mechanism (para 3-201 through 3-203).

3-87 Disassemble and Reassembly of Carriage-Return Operating Mechanism (TT-4A/TG and TT-698/TG)

(fig. 3-62)

a. Disassembly.

(1) Remove the carriage-return operating mechanism (para 3-86a).

(2) Remove the lever spring (3, fig. 3-62) from the carriage-return clutch latch lever (5) and from the latch mounting plate (6).

(3) Remove the cotter pin and flat washer (or retaining ring) that hold the carriage-return clutch latch lever to the stud on the latch mounting plate; remove the carriage-return clutch latch lever.

(4) Remove the latch mounting plate from the shaft of the carriage-return-clutch lever (9).

(5) Remove the machine screw (7) that locks the carriage-return operating lever (8) to the shaft of the carriage-return-clutch lever; remove the carriage-return operating lever.

b. Reassembly.

(1) Reassemble the carriage-return operating mechanism as indicated in figure 3-62; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the carriage-return operating mechanism (para 3-86b).

3-88. Disassembly and Reassembly of Carriage-Return Operating Mechanism (TT4B/TG, TT-4C/TG, TT-335/TG, TT-698A/TG and TT-698B/TG)

(fig. 3-63)

a. Disassembly.

(1) Remove the carriage-return operating mechanism (para 3-86a). Remove the felt lubricating washer, when supplied.

(2) Remove the machine screw (3, fig. 3-63) clamp nut (4), and flat washer that lock the throw-out lever (6) to the shaft of the carriage-return-clutch lever (22): remove the throw-out lever. Remove the lubricating washer (24), when supplied, from the hub of the double-blocking lever (12).

(3) Remove the carriage-return-clutch actuating-lever spring (7) from the double-blocking lever and from the carriage-return-clutch actuating lever (18).

(4) Remove the assembled double-blocking lever and adjusting plate (11) from the shaft of the carriage-return-clutch lever.

(5) Remove the machine screw (8), flat washer, and lockwasher that hold the adjusting plate to the double-blocking lever; remove the adjusting plate.

(6) Remove the double-blocking-lever spring (13) from the carriage-return latch (15) and from the latch mounting plate (16).

(7) Remove the retainer ring (14) that secures the carriage-return latch to the stud on the latch mounting plate; remove the carriage-return latch. Catch the two felt lubricating washers (25), when supplied, as they fall from the carriage-return latch,

(8) Remove the latch mounting plate from the shaft of the carriage-return-lever.

(9) Remove the machine screw (17) that locks the carriage-return-clutch actuating lever to the shaft of the carriage-return-clutch lever; remove the carriage-return-clutch actuating lever.

(10) Remove the two setscrews (19) that lock the shaft collar (20) to the shaft of the carriage-return-clutch lever; remove the collar and the carriage-return-clutch-lever spring (21).

KEY to fig. 3-63:
1 Machine screw, 10008
2 Lockwasher, 10430
3 Machine screw, 10011
4 Clamp nut, 52073
5 Flat washer, 10467
6 Throw-out lever, 56283
7 Carriage-return-clutch actuating-lever spring, 56258
8 Machine screw, 10003
9 Flat washer, 10458
10 Lockwasher, 10429
11 Adjusting plate, 56265A
12 Double-blocking lever, 56237
13 Double-blocking-lever spring, 50946
14 Retainer ring, 10949
15 Carriage-return latch, 50011
16 Latch mounting plate, 53163A
17 Machine screw, 10009
18 Carriage-return-clutch actuating lever, 56241A (includes item 17)
19 Setscrew, 10209
20 Shaft collar, 50209
21 Carriage-return-clutch-lever spring, 52259
22 Carriage-return-clutch lever, 56243A
23 Felt lubricating washer, 61485
24 Felt lubricating washer, 61667
25 Felt lubricating washer, 61474

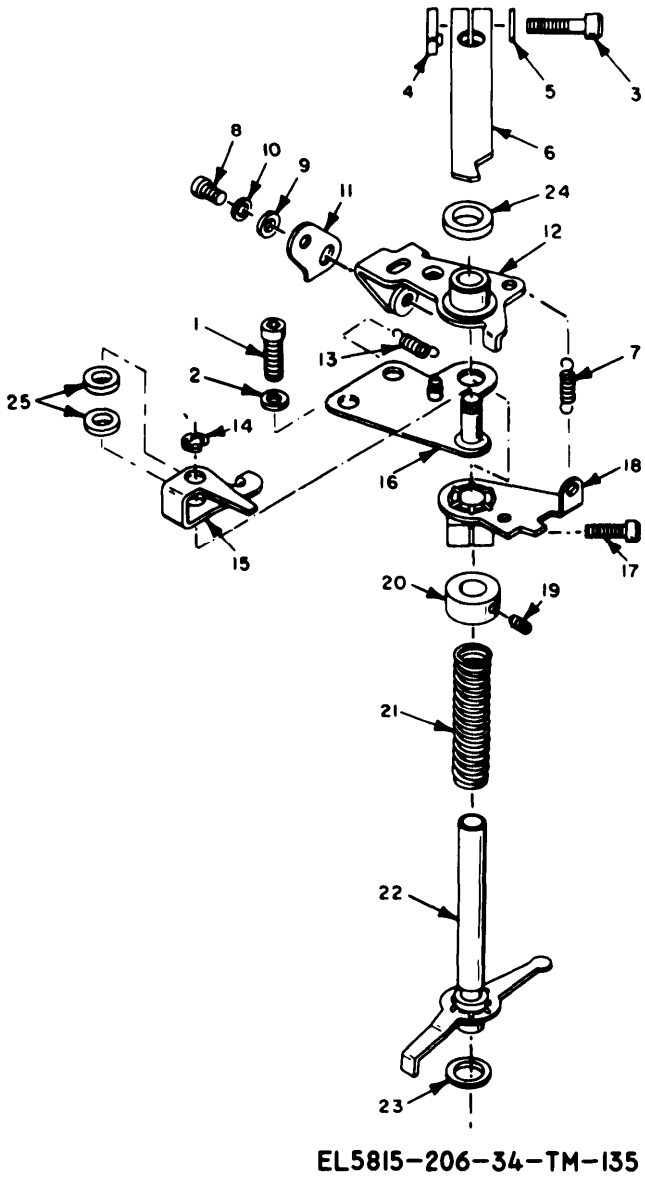


Figure 3-63. Carriage-return operating mechanism (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG), exploded view.

b. Reassembly.

(1) Reassemble the carriage-return operating mechanism as indicated in figure 3-63; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the carriage-return operating mechanism (para 3-86b).

(3) Adjust the carriage/return operating mechanism (para 3-183, 3-184, 3-185, 3-188, 3-195, 3-199, 3-200, and 3-205).

3-89. Disassembly and Reassembly of Carriage-Rack Drive-Shaft Assembly

(fig. 3-64)

a. Disassembly,

(1) Remove the paper-shaft bracket and the paper chute (para 3-23a).

(2) Remove the mounting hardware for the instrument panel (para 3-31a).

(3) Remove the keyboard-transmitter (para 3-27a).

(4) Remove the carriage assembly (para 3-29a).

(5) On the TT-4A/TG and TT-698/TG, remove the plain hexagonal nut, lockwasher and adjusting stud from the carriage-return adjusting collar.

(6) On the TT-4A/TG and TT-698/TG, remove the two setscrews (6, fig. 3-64) that lock the carriage-return adjusting collar (7) to the carriage-rack driving gear and shaft (45); remove the carriage-return adjusting collar and flat washer.

(7) Remove the carriage-return blocking lever spring (9) from the two blocking levers (10 and 12) of the TT-4A/TG and TT-698/TG.

(8) Remove the carriage-return blocking lever (10), flat washer and carriage-feed blocking lever (12) from the shaft of the carriage-rack driving gear and shaft of the TT-4A/TG and TT-698/TG.

(9) Remove the two setscrews (13) that lock the collar (14) to the shaft of the carriage-rack driving gear and shaft of the TT-4A/TG and TT-698/TG: remove the collar.

(10) On the TT-4B/TG and TT-698A/TG, remove the two machine screws (1) and lockwashers that hold the bearing cap (46) to the front of the frame.

(11) On the TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG, remove the two self-locking hexagonal nuts (47) that hold the carriage-rack retainer (48) to the retainer posts (51); remove the carriage-rack retainer, two flat washers and shims.

(12) On the TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG, remove the two retainer posts and lockwashers that hold the bearing cap to the front of the teletypewriter frame.

(13) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the machine screw (15), lockwasher, and flat washer from the carriage-return adjusting collar (20),

(14) Remove the two setscrews (18 and 19) that lock the carriage-return adjusting collar of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG to the shaft of the carriage-rack driving gear and shaft; remove the carriage-feed adjusting lever (21) and flat washer from the shaft.

(15) Remove the carriage-return blocking-lever spring (23) from the two blocking levers (24 and 27) of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698/TG.

(16) Remove the carriage-return blocking lever (24), flat washer, spacer, and carriage-feed blocking lever (27) from the shaft of the carriage-rack driving gear and shaft of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG.

(17) Remove the two setscrews (28 and 29) that lock the collar (30) of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG to the carriage-rack driving gear and shaft; remove the collar from the shaft.

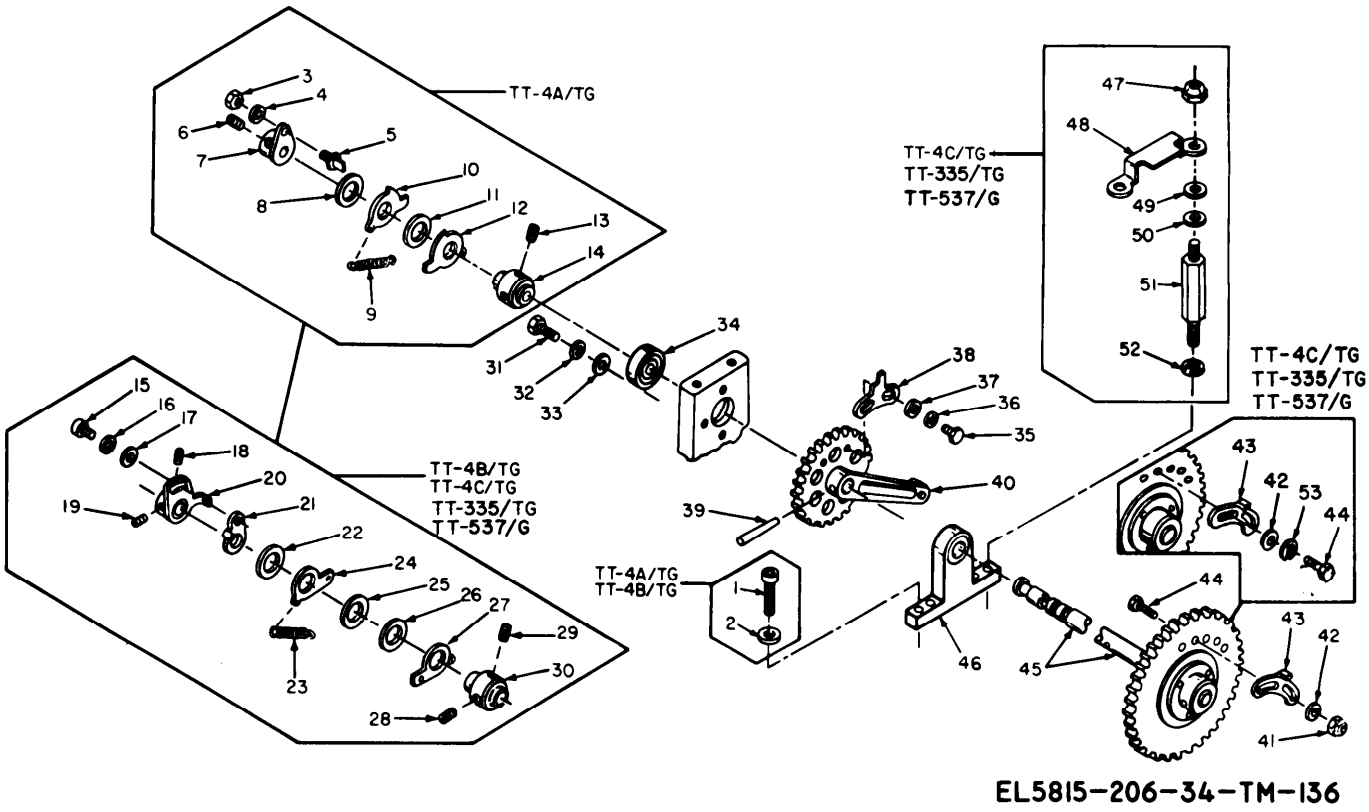
(18) Remove the two machine screws (31), lockwashers, and flat washers that hold the ball bearing (34) in the bearing housing in the frame; pull the carriage-rack driving gear and shaft forward until it clears the ball bearing, and remove the ball bearing.

(19) Remove the two machine screws (35), lockwashers, and flat washers that hold the latch-tripping arm (38) to the carriage-return driven gear (40); remove the latch-tripping arm from the gear.

(20) Remove the taper pin (39) that locks the carriage-return driven gear to the shaft of the carriage-rack driving gear and shaft; remove the carriage-return driven gear.

(21) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the assembled carriage-rack driving gear and shaft and the pawl tripping arm (43) from the bearing cap (46).

(22) Remove the two self-locking hexagonal nuts (41), flat washers, and machine screws (44) that hold the pawl tripping arm to the gear of the carriage-rack driving gear and shaft; remove the pawl tripping arm from the gear.



1 Machine screw, 10011[b]
2 Lockwasher, 10430[b]
3 Plain hexagonal nut, 10513
4 Lockwasher, 10403
5 Adjusting stud, 51673
6 Setscrew, 10208
7 Carriage-return adjusting collar, 51671
8 Flat washer, 51670
9 Carriage-return blocking-lever spring, 50916
10 Carriage-return blocking-lever, 51669
11 Flat washer, 51681
12 Carriage-feed blocking lever, 51669
13 Setscrew, 10209
14 Collar, 51668
15 Machine screw, 10002
16 Lockwasher, 10429
17 Flat washer, 10458
18 Setscrew, 10209
19 Setscrew 10223
20 Carriage-return adjusting collar, 55090
21 Carriage-feed adjusting lever, 53787
22 Flat washer, 51681
23 Carriage-return blocking-lever spring, 50916
24 Carriage-return blocking-lever, 53785
25 Flat washer, 57717
26 Spacer (.062-in.), 55652
27 Carriage-feed blocking lever, 53785
28 Setscrew, 10209
29 Setscrew, 10223
30 Collar, 57715
31 Machine screw, 10003
32 Lockwasher, 10429
33 Flat washer, 10458
34 Ball bearing, 10759
35 Machine screw, 10303
36 Lockwasher, 10429
37 Flat washer, 10458
38 Latch-tripping arm, 55524
39 Taper pin, 10851
40 Carriage-return driven gear, 51747A
41 Self-locking hexagonal nut, 10500
42 Flat washer, 10450
43 Pawl tripping arm, 50124
44 Machine screw, 10080[a b] 10303[c]
45 Carriage-rack driving gear and shaft, 51741[a], 61742A[c], 63547[b c]
46 Bearing cap[b c]
47 Self-locking hexagonal nut, 10501
48 Carriage-rack retainer, 62268
49 Flat washer, 10454
50 Shim, 59561 and/or 59562, as required
51 Retainer post, 62267
52 Lockwasher, 10404
53 Lockwasher, 10428[c]

[a] Used on TT-4A/TG and TT-698/TG.
[b] Used on TT-4B/TG and TT-698A/TG.
[c] Used on TT-4C/TG, TT-335/TG, TT-537/G and TT-698B/TG.

Figure 3-64. Carriage-rack drive shaft assembly, exploded view.

b. Reassembly.

(1) Reassemble the carriage-rack drive-shaft assembly as indicated in figure 3-64; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Install the carriage assembly (para 3-29b).

(3) Install the keyboard-transmitter (para 3-27b).

(4) Install the instrument panel (para 3-31b).

(5) Install the paper-shaft bracket and the paper chute (para 3-23b).

(6) Adjust the carriage-rack-shaft assembly (para 3-187, 3-190, and 3-193 through 3-197).

3-90. Disassembly and Reassembly at Margin-Bell Assembly (TT-4(*)/TG, TT-335/TG, TT-537/ G, and TT-698(*)/TG

(fig. 3-65)

a. Disassembly.

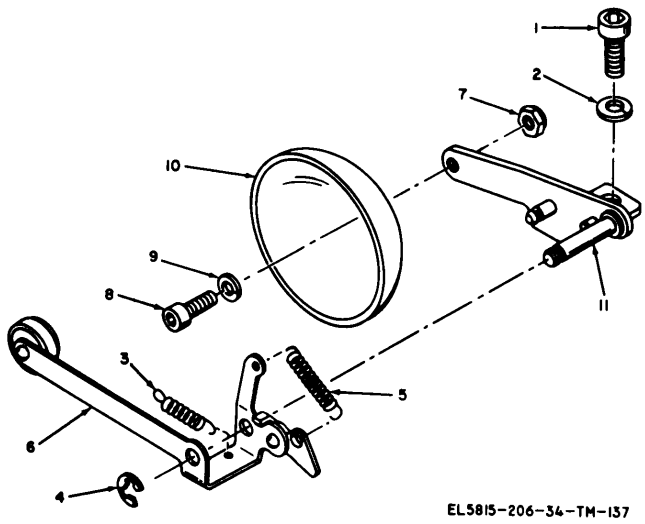
(1) Remove the two machine screws (1, fig. 3-65) and lockwashers that hold the margin-bell assembly to the frame; remove the margin-bell assembly.

(2) Remove the margin-bell-clapper spring (3) from the margin-bell clapper (6) and from the spring post on the margin-bell bracket (11).

(3) Remove the retainer ring (4) that holds the margin-bell clapper to the margin-bell bracket; remove the margin-bell clapper.

(4) Remove the margin-bell-pawl spring (5) from the margin-bell clapper.

(5) Remove the self-locking hexagonal nut (7), machine screw, and lockwasher that hold the margin bell (10) to the margin-bell bracket; remove the bell from the bracket.



1 Machine screw, 10008
2 Lockwasher, 10430
3 Margin-bell-clapper spring, 50231
4 Retainer ring, 19060
5 Margin-bell-pawl spring, 50232
6 Margin-bell clapper, 50244A
7 Self-locking hexagonal nut, 10500
8 Machine screw, 10003
9 Lockwasher, 10429
10 Margin bell, 51403
11 Margin-bell bracket, 53164A

Figure 3-65. Margin-bell assembly, exploded view.

b. Reassembly.

(1) Reassemble the margin-bell assembly as indicated in figure 3-65; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the margin-bell assembly (para 3-235).

3-91. Removal and Replacement of Carriage-Feed Shaft Assembly

(fig. 3-66)

a. Removal.

(1) Remove the instrument panel (para 3-31a).

(2) Remove the paper shaft, one paper-shaft bracket, and the paper chute (para 3-23a).

(3) Remove the carriage-feed mechanism (para 3-84a or 3-85a).

(4) Remove the margin-bell assembly (para 3-90a).

(5) Remove the machine screw (1, fig. 3-66) and lockwasher that hold the assembled bearing block and ball bearing (6) to the frame. Remove the felt lubricating washer (38), when supplied. Remove the assembled bearing block and ball bearing.

(6) Remove the two machine screws (3), lockwashers, and flat washers that hold the ball bearing in the bearing block; remove the ball bearing.

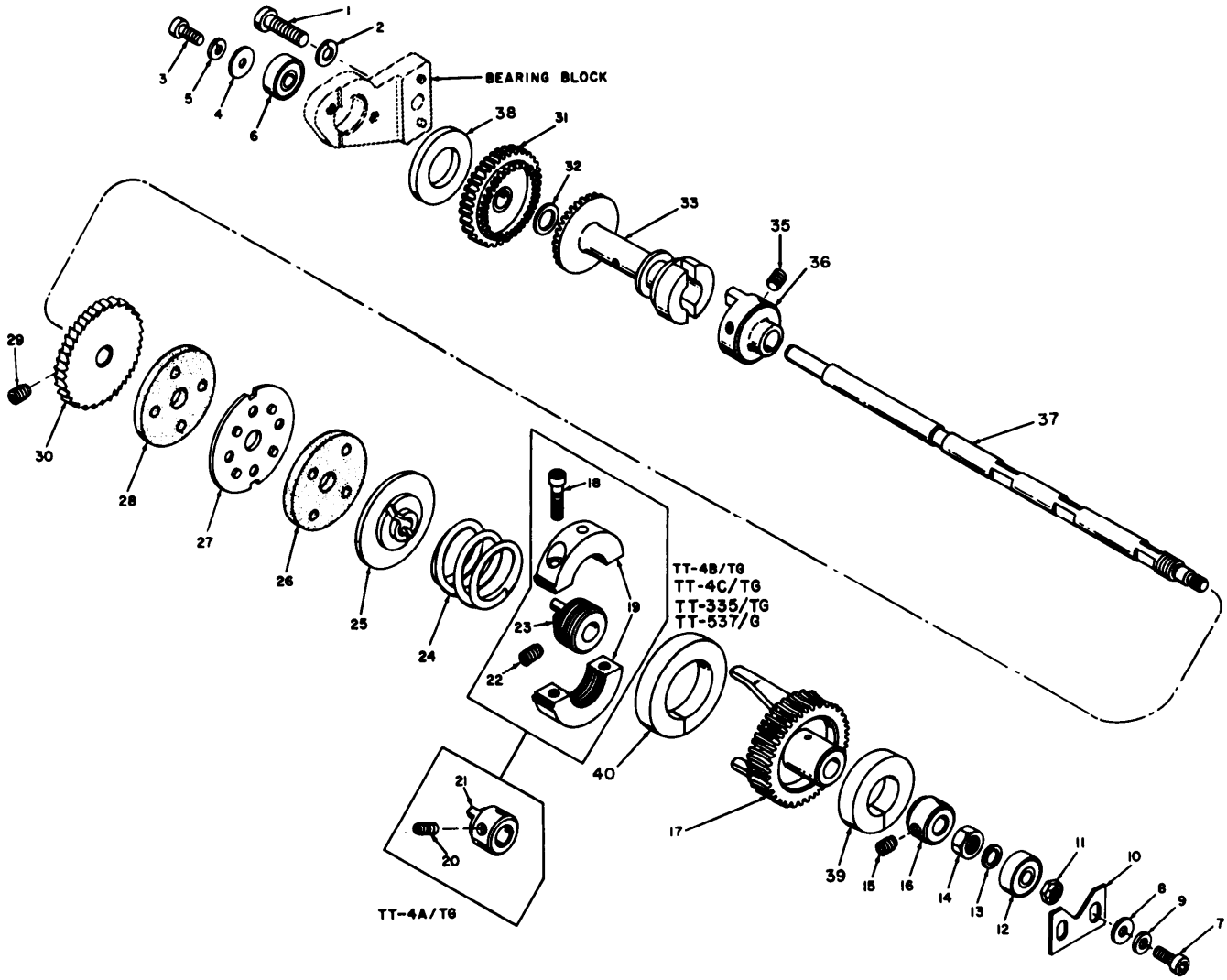
(7) Remove the two machine screws (7), lockwashers, and flat washers from the teletypewriter frame. On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG, remove the bearing retainer (10).

(8) Remove the self-locking hexagonal nut (11) from the end of the carriage-feed shaft (37).

(9) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG pull the carriage-feed shaft far enough forward to clear the ball bearing. Remove the carriage-feed shaft from the teletypewriter.

(10) On the TT-4A/TG and TT-698/TG, remove the setscrews that hold the shaft collar (16), friction-adjusting collar (21), carriage-feed ratchet (30), and drive collar (36) to the carriage-feed shaft. Remove the flat washer (13) and adjusting nut (14), and withdraw the shaft from the front of the teletypewriter; catch the loose parts as they fall from the shaft.

(11) Remove the ball bearing (12) from the bearing seat in the teletypewriter frame.



1 Machine screw, 10017
2 Lockwasher, 10405
3 Machine screw, 10003
4 Flat washer, 10450
5 Lockwasher, 10403 [a] 10429 [b]
6 Ball bearing, 10755
7 Machine screw, 10003
8 Flat washer, 10458 [a], 10459 [b]
9 Lockwasher, 10403 [a], 10429 [b]
10 Bearing retainer, 57716 [b]
11 Self-locking hexagonal nut, 10500
12 Ball bearing, 10755
13 Flat washer, 51408
14 Adjusting nut, 51079
15 Setscrew, 10209
16 Shaft collar, 50209
17 Carriage-feed gear and fork, 54930A
18 Machine screw, 10005
19 Friction-adjusting collar, 56832A (includes item 18)
20 Setscrew, 10209
21 Friction-adjusting collar, 50199
22 Setscrew, 10208
23 Drive collar, 54928
24 Friction-clutch spring, 50859 [a], 54934 [b]
25 Friction-clutch disk, 50198 [a], 54931 [b]
26 Felt friction plate, 61344A (set of 2)
27 Clutch driving disk, 51117, 61344A, (set of 2)
28 Felt friction plate, 61344A
29 Setscrew, 10209
30 Carriage-feed ratchet, 50201A
31 Carriage-feed driving gear, 50884A
32 Flat washer, 50887
33 Carriage-feed-clutch drum, 50331
34 Setscrew, 10209
35 Setscrew, 10209
36 Drive collar, 59447
37 Carriage-feed shaft, 50525
38 Felt lubricating washer, 61678
39 Felt lubricating washer, 61494
40 Felt lubricating washer, 61495

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG.

Figure 3-66. Carriage-feed shaft assembly, exploded view.

b. Replacement.

(1) Replace the carriage-feed shaft assembly as indicated in figure 3-66; the sequence for replacing the parts is the reverse of the removal sequence.

(2) Replace the carriage-feed mechanism (3-84b or 3-85b).

(3) Replace the platen (para 3-28b).

(4) Replace the keyboard-transmitter (para 3-27b).

(5) Adjust the carriage-feed shaft assembly (para 3-178, 3-179, 3-181 and 3-186).

3-92. Disassembly and Reassembly of Carriage-feed shaft Assembly

(fig. 3-66)

a. Disassembly.

(1) Remove the carriage-feed shaft assembly (para 3-91a).

(2) Remove the flat washer (13) and the adjusting nut (14) from the carriage-feed shaft (37). Loosen the two setscrews (15) that lock the shaft collar (16) to the carriage-feed shaft, and remove the shaft collar. Remove the felt lubricating washer (39), when supplied.

(3) Slide the carriage-feed gear and fork (17) from the clutch driving disk (27) and the carriage-feed shaft. Remove the felt lubricating washer (40), when supplied, from the carriage-feed gear and fork.

(4) Loosen the machine screw (18) that locks the friction-adjusting collar (19) to the carriage-feed shaft; back off and remove the collar.

(5) Remove the two setscrews (22) that lock the drive collar (23) to the carriage-feed shaft; remove the drive collar.

(6) Remove the friction-clutch spring (24), friction-clutch driving desk (25), felt friction plate (26), clutch driving disk and felt friction plate (28) from the carriage-feed shaft.

(7) Remove the two setscrews that lock the carriage-feed ratchet (30) to the carriage-feed shaft; remove the ratchet.

(8) Remove the carriage-feed driving gear (31), flat washer, and carriage-feed-clutch drum (33) from the carriage-feed shaft.

(9) Remove the setscrew that locks the drive collar (36) to the carriage-feed shaft; remove the drive collar.

b. Reassembly.

(1) Reassemble the carriage-feed shaft assembly as indicated in figure 3-66; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Install the carriage-feed shaft assembly (para 3-91b).

3-93. Disassembly and Reassembly of Carriage-Return Shaft Assembly (TT-4A/TG and TT-698/TG

(fig. 3-67)

a. Disassembly.

(1) Remove *one* paper-shaft bracket and the paper chute (para 3-23a).

(2) Remove the keyboard-transmitter (para 3-*27a).*

(3) Remove the carriage-return operating mechanism (para 3-86a).

(4) Mark the two teeth on the carriage-return driving gear that engage the last tooth on the carriage-return driven gear.

(5) Move the carriage to the position that permits a wrench to be inserted into the two machine screws (1, fig. 3-67) that hold the decelerating cam (2) to the carriage-return clutch assembly (12); remove the two machine screws and remove the decelerating cam. If necessary, remove the two dowel pins (3) from the carriage-return clutch assembly.

(6) Support the carriage-return shaft with wooden blocks and drive the taper pins (5 and 6) from the carriage-return shaft (18).

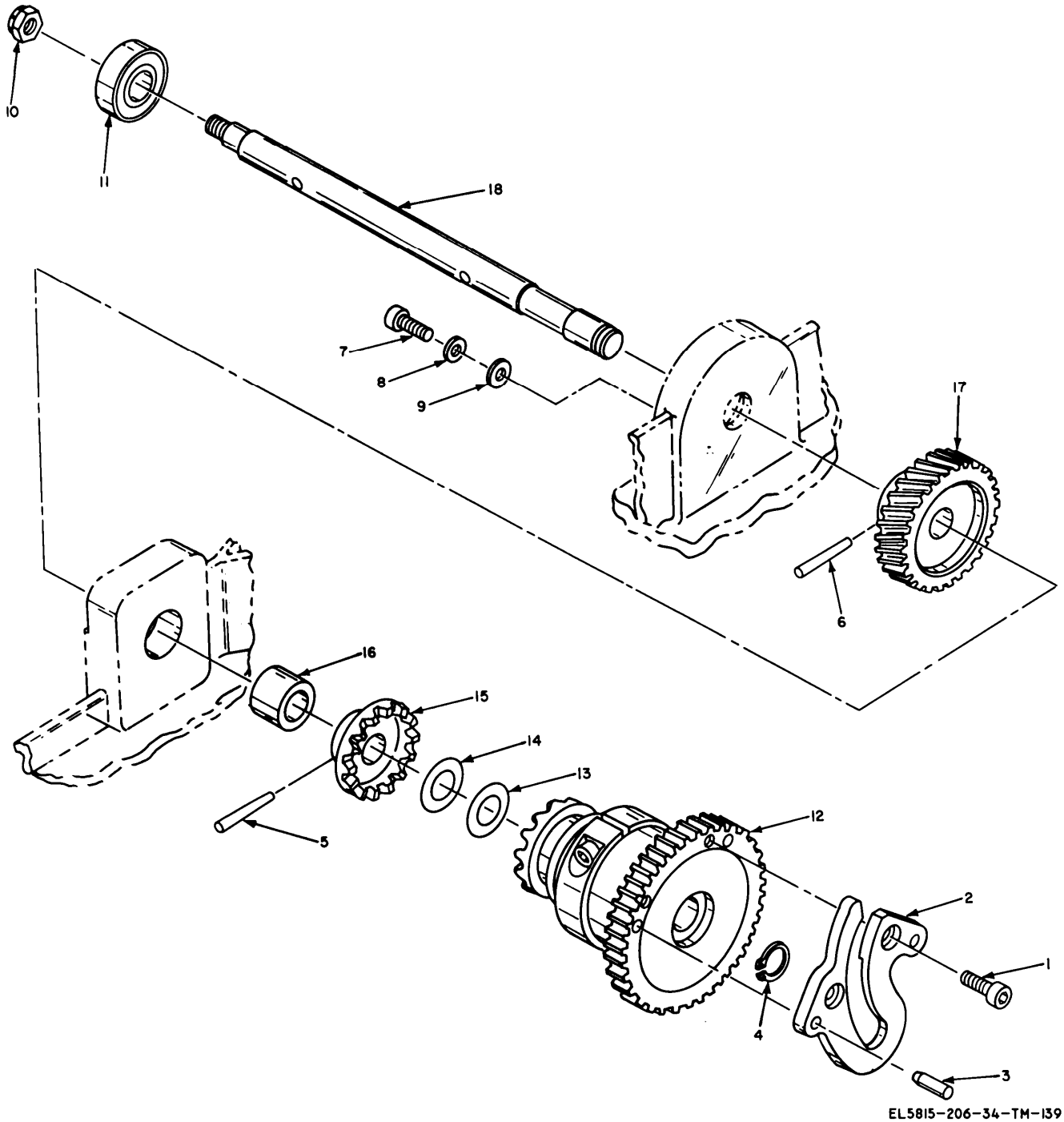
(7) Remove the retainer ring (4) that secures the carriage-return clutch assembly to the carriage return shaft; remove the carriage-return clutch assembly.

(8) Remove the two machine screws (7), lockwashers, and flat washer that hold the ball bearing (11) in the rear casting.

(9) Remove the self-locking hexagonal nut (10) from the carriage-return shaft and remove ball bearing from the rear casting.

(10) Remove the spacers and carriage return driving disk (15) from the carriage return shaft.

(11) Remove the carriage-return shaft by passing it through the rear casting; remove the bearing and the carriage-return-shaft driven gear (17) as they fall from the shaft.



1 Machine screw, 10001
2 Decelerating cam, 50364
3 Dowel pin, 10917
4 Retainer ring, 10451
5 Taper pin, 10852
6 Taper pin, 10852
7 Machine screw, 10003
8 Lockwasher, 10403
9 Flat washer, 10458
10 Self-locking hexagonal nut, 10500
11 Ball bearing, 10759
12 Carriage-return clutch assembly, 51642A
13 Spacer, 52117
14 Spacer, 50552
15 Carriage-return-driving disk, 50211
16 Bearing, 10711
17 Carriage-return-shaft driven gear, 55164
18 Carriage-return shaft, 51639

Figure 3-67. Carriage-return shaft assembly (TT-4A/TG and TT-698/TG), exploded view.

b. Reassembly.

NOTE

If a new decelerating cam is used, secure the new cam to the carriage-return clutch assembly with two machine screws. Drill from the back of the clutch, through the holes in the clutch, to provide holes in the cam for the dowel pins.

(1) Reassemble the carriage-return shaft assembly as indicated in figure 3-67; the sequence for assembling the parts is the reverse of the disassembly sequence. Be sure that the last tooth on the carriage-return driven gear is engaged with the teeth on the carriage-return driving gear that were marked during disassembly.

(2) Replace the carriage-return operating mechanism (para 3-86b).

(3) Replace the keyboard-transmitter (para 3-27b).

(4) Replace the paper-shaft bracket and the paper chute (para 3-23b).

3-94. Disassembly and Reassembly of Carriage-Return Shaft Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-68)

a. Disassembly.

(1) Remove the paper-shaft bracket and the paper chute (para 3-23a).

(2) Remove the keyboard-transmitter (para 3-27a).

(3) Remove the manual carriage-return link (para 3-83a).

(4) Remove the carriage-return operating mechanism (para 3-86a).

(5) Mark the teeth on the carriage-return driving gear that engage the last tooth on the carriage-return driven gear.

(6) Remove the two machine screws (1, fig. 3-68), lockwashers, and flat washers that secure the bearing retainer (4); remove the bearing retainer.

(7) Remove the two machine screws (5) and lockwashers that hold the rear bearing cap to the frame; remove the rear bearing cap.

(8) Remove the two machine screws (7) and lockwashers that hold the front bearing cap to the frame; remove the front bearing cap.

(9) Remove the self-locking hexagonal nut (9) and ball bearing (10) from the carriage-return shaft (23).

(10) Lift the front of the carriage-return shaft slightly and slide the bearing (20) toward the front of the shaft to clear the bearing seat in the teletypewriter frame.

(11) Tilt the carriage-return shaft far enough forward to clear the carriage-return clutch lever, and pivot the lever so that it is parallel with the carriage-return shaft. Pull the carriage-return shaft upward and forward to remove it from the teletypewriter.

(12) Remove the retainer ring (11) and remove the assembled carriage-return clutch assembly (15) and decelerating cam (13).

(13) Remove the two machine screws (12) that hold the decelerating cam to the carriage-return clutch assembly; remove the cam from the clutch. If necessary, remove the two dowel pins (14) from the carriage-return clutch assembly.

(14) Remove the spacers (16 and 17) from the carriage-return shaft.

(15) Tap the taper pin (18) from the carriage-return driving desk (19), and remove the driving disk and the bearing from the carriage-return shaft.

(16) Tap the taper pin (21) from the carriage-return-shaft driven gear (22) and remove the gear from the carriage-return shaft.

KEY to fig. 3-68:
1 Machine screw, 10003
2 Lockwasher, 10429
3 Flat washer, 10459
4 Bearing retainer, 57716
5 Machine screw, 10012
6 Lockwasher, 10430
7 Machine screw, 10011
8 Lockwasher, 10430
9 Self-locking hexagonal nut, 10500
10 Ball Bearing 10759
11 Retainer ring, 10451
12 Machine screw, 10001
13 Decelerating cam, 59364
14 Dowel pin, 10917
15 Carriage-return clutch assembly, 51642[a], 57929A [b]
16 Spacer, 52117
17 Spacer, 50552
18 Taper pin, 10852
19 Carriage-return driving disk, 50211[a], 57933 [b]
20 Bearing, 10711
21 Taper pin, 10852
22 Carriage-return-shaft driven gear, 55164
23 Carriage-return shaft 55171[a], 65496 [b]

[a] Used on TT-4B/TG and TT-698A/TG.

[b] Used on TT-4C/TG, TT335/TG, TT-537/G, and TT-698B/TG.

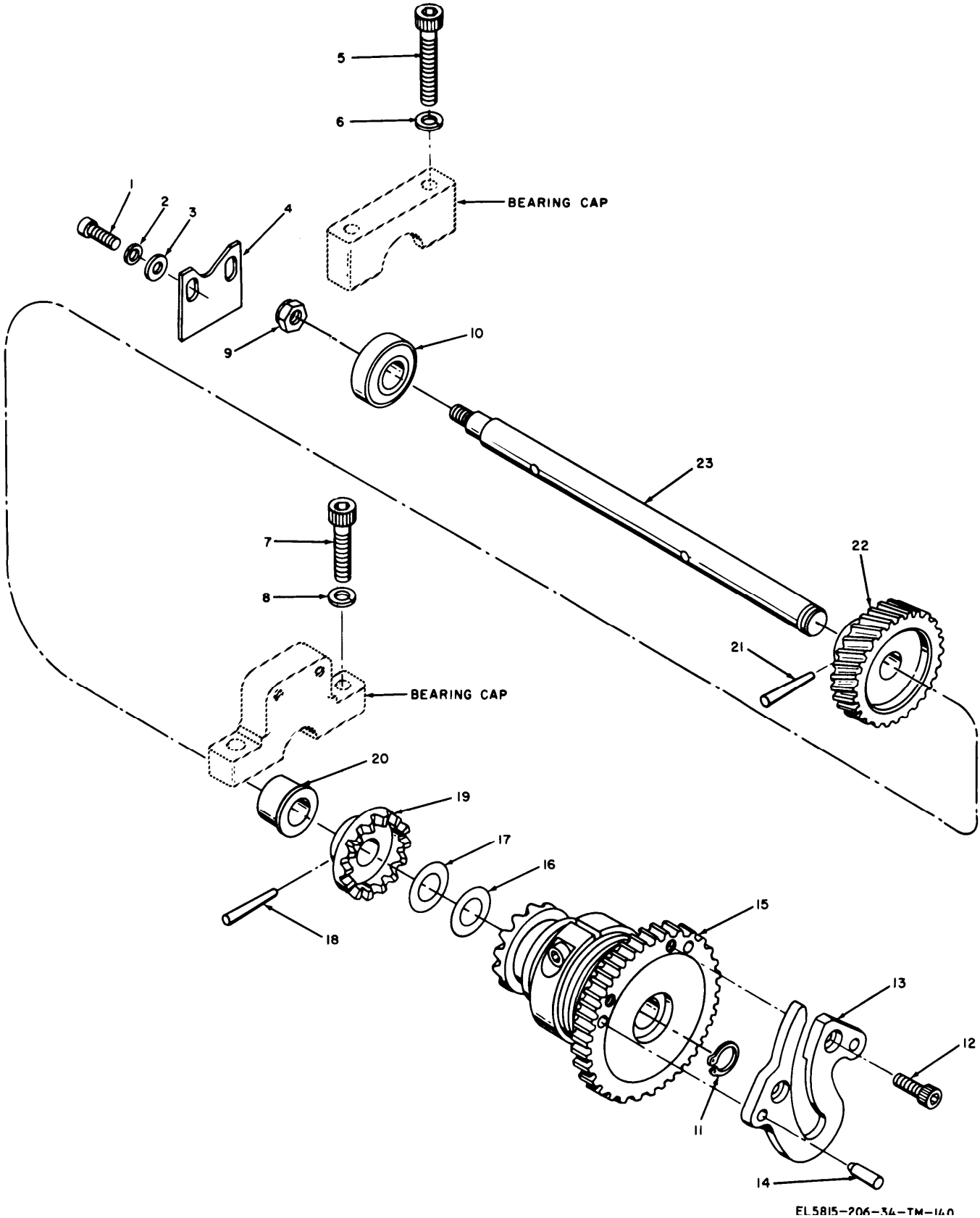


Figure 3-68. Carriage-return shaft assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/TG, TT-698A/TG and TT-698B/TG), exploded view.

b. Reassembly.

NOTE

If a new decelerating cam is used, secure the new cam to the carriage-return clutch assembly with two machine screws. Drill from the back of the clutch, through the holes in the clutch, to provide holes in the cam for the dowel pins.

(1) Reassemble the carriage-return shaft assembly as indicated in figure 3-68; the sequence for assembling the parts in the reverse of the disassembly sequence. Be sure the last tooth on the carriage-return driven gear is engaged with the teeth on the carriage-return driving gear that were marked during disassembly.

(2) Replace the carriage-return operating mechanism (para 3-86b).

(3) Replace the manual carriage-return link (para 3-83b).

(4) Replace the keyboard-transmitter (para 3-27b).

(5) Replace the paper-shaft bracket and the paper chute (para 3-23b).

3-95. Disassembly and Reassembly of Carriage-Return Clutch Assembly

(fig. 3-69)

a. Disassembly.

(1) On the TT-4A/TG and TT-698/TG, remove the carriage-return clutch assembly (fig. 3-67) from the carriage-return shaft (para 3-93a).

(2) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG remove the carriage-return clutch assembly (fig. 3-68) from the carriage-return shaft (para 3-94a).

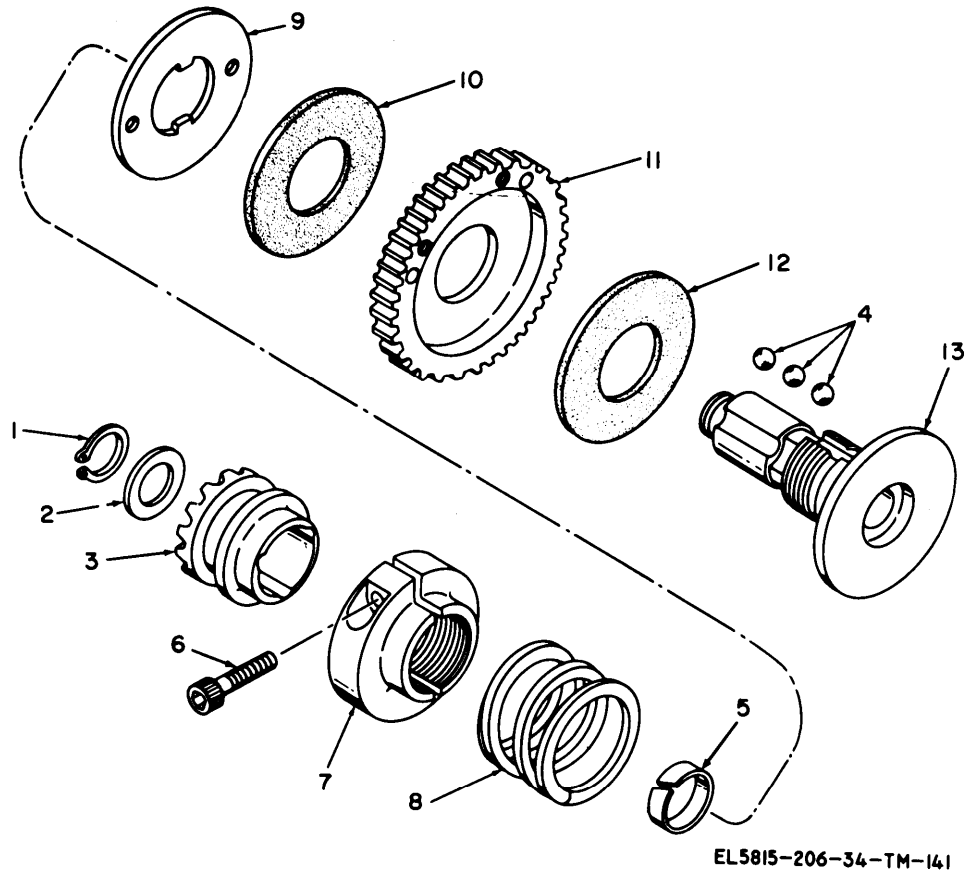
(3) Remove the retainer ring (1, fig. 3-69) and flat washer that hold the carriage-return clutch drum (3) on the end of the clutch sleeve (13).

(4) Carefully remove the carriage-return-clutch drum from the clutch sleeve; catch the nine positioning balls (4) as the drum is removed.

(5) On the TT-4A/TG and TT-698/TG, remove the machine screw (6) that holds the adjusting collar (7) to the clutch sleeve; remove the collar. Friction-clutch spring (8), ball retainer ring (5), and friction disk (9).

(6) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, remove the machine screw that holds the adjusting collar to the clutch sleeve; remove the adjusting collar, friction-clutch spring, ball retainer ring, and friction disk.

(7) Remove the felt friction plate (10), carriage-return driving gear (11), and felt friction plate (12) from the clutch sleeve.



1 Retainer ring, 10453
2 Flat washer, 50306
3 Carriage-return-clutch drum, 50186 [a], 57931A [b]
4 Positioning ball, 10908
5 Ball retainer ring, 51651 [a]
6 Machine screw, 10010
7 Adjusting collar, 51697
8 Friction-clutch spring, 55042
9 Friction disk, 51678
10 Felt friction plate, 50260
11 Carriage-return driving gear, 50257
12 Felt friction plate, 50260
13 Clutch sleeve, 51641A [a b]

[a] Part of clutch sleeve and driving member assembly 51643A.

[b] Part of clutch sleeve and driving member assembly 57930A.

Figure 3-69. Carriage-return clutch assembly, exploded view.

b. Reassembly.

NOTE

The carriage-return-clutch drum and the clutch sleeve are matched parts. If replacement is necessary, replace both as a matched set.

(1) Reassemble the carriage-return clutch assembly as indicated in figure 3-69; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Install the carriage-return clutch assembly on the carriage-return shaft assembly (para 3-93b) (TT-4A/TG and TT-698/TG); (para 3-96b) (TT-4B/TG, TT-4C/TG, TT-335/TG , TT-537/G , TT-698A/TG, and TT-698B/TG).

(3) Adjust the carriage-return clutch assembly (para 3-205).

3-96. Disassembly and Reassembly of Keyboard-Transmitter Drive Shaft Assembly

(fig. 3-70)

a. *Disassembly.*

(1) Remove the keyboard-transmitter (para 3-27a).

(2) Remove one paper-shaft bracket and the paper chute (para 3-23a).

(3) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the two machine screws (1, fig. 3-70) and

lockwashers that hold the bearing cap to the frame; remove the bearing cap.

(4) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-698A/TG and TT-698B/TG remove the two self-locking hexagonal nuts (3), blocking plate (27), plain hexagonal nut, and lockwashers that hold the mounting bracket (26) to the frame.

(5) Remove the two machine screws (16), flat washers, and lockwashers. On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG remove the bearing retainer (19) from the frame.

(6) Remove the self-locking hexagonal nut (20) from the end of the transmitter drive shaft (25). On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the spacer (21). Remove the ball bearing (22); remove the transmitter drive shaft assembly.

(7) Remove the two setscrews (5) that hold the clutch disk (6) to the transmitter drive shaft; remove the clutch disk, felt friction plate (7), clutch disk (8), felt friction plated (9), clutch disk (10), and friction-clutch spring (11).

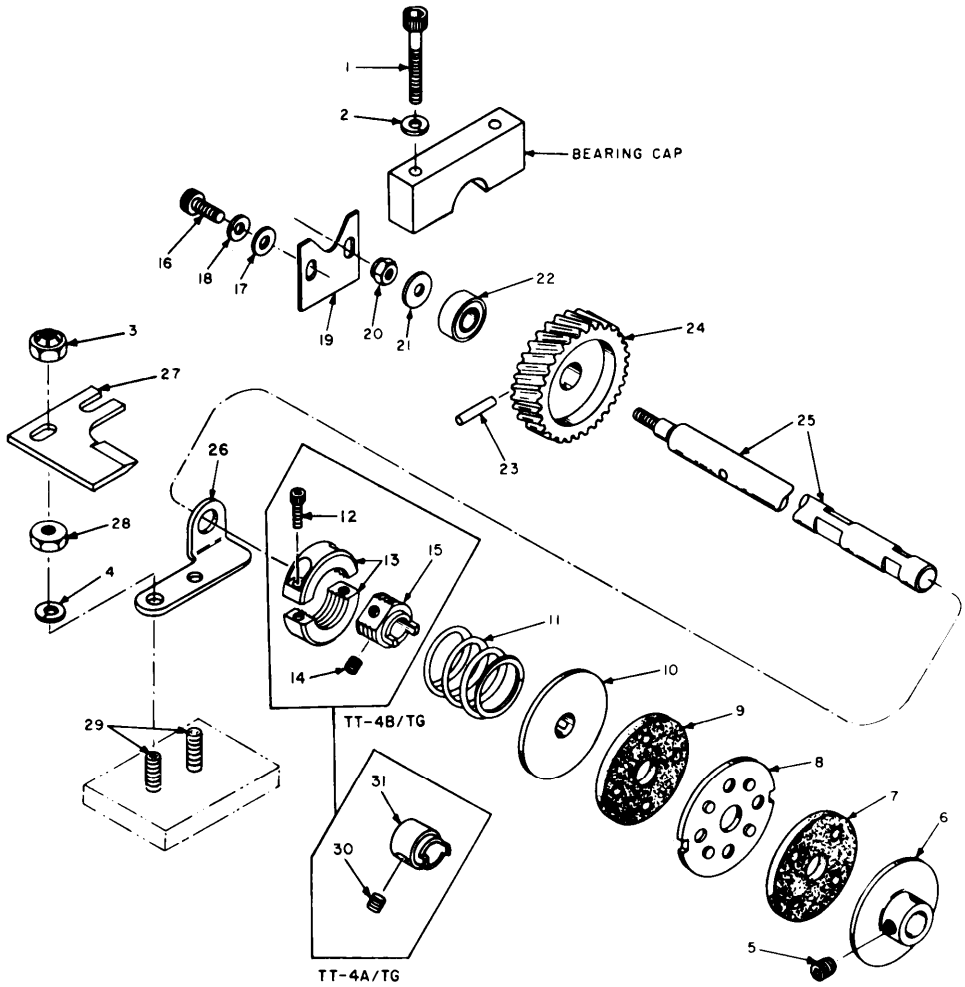
(8) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the machine screw (12) that locks the friction-adjusting collar (13) to the drive collar (15); remove the friction-adjusting collar (31).

(9) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the setscrews (14) that lock the drive collar to the transmitter drive shaft; remove the drive collar and mounting bracket.

(10) On the TT-4A/TG and TT-698/TG remove the two setscrews (30) that hold the friction-adjusting collar on the transmitter drive shaft; remove the collar.

(11) Tap the taper pin (23) from the transmitter-shaft driven gear (24); remove the transmitter-shaft driven gear from the transmitter drive shaft.

(12) Remove the mounting studs (29) from the frame.



1 Machine screw, 10012 [b]
2 Lockwasher, 10430 [b]
3 Self-locking hexagonal nut, 10501
4 Lockwasher, 10430 [b]
5 Setscrew, 10209
6 Clutch disk, 50200
7 Felt friction plate, 61344A (set of 2)
8 Clutch disk, 51117
9 Felt friction plate, 61344A (set of 2)
10 Clutch disk, 50198 [a], 54931 [b]
11 Friction-clutch spring, 50914 [a], 54932 [b]
12 Machine screw, 10005
13 Friction-adjusting collar, 56832A (includes item 12)
14 Setscrew, 10208
15 Drive collar, 54928
16 Machine screw, 10003
17 Flat washer, 10458 [a], 10459 [b]
18 Lockwasher, 10403 [a], 10429 [b]
19 Bearing retainer, 57716 [b]
20 Self-locking hexagonal nut, 10500
21 Spacer, 50414 [b]
22 Ball bearing, 10755
23 Taper pin, 10854
24 Transmitter-shaft driven gear, 55163
25 Transmitter drive shaft, 55172
26 Mounting bracket, 55787 [b]
27 Blocking plate, 56707 [b]
28 Plain hexagonal nut, 10505 [b]
29 Mounting stud, 10237 [b]
30 Setscrew, 10209
31 Friction-adjusting collar, 50199

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG.

Figure 3-70. Keyboard-transmitter drive shaft assembly, exploded view.

b. Reassembly.

(1) Reassemble the keyboard-transmitter drive shaft assembly on the teletypewriter as indicated in figure 3-70; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Install the keyboard-transmitter (para 3-27b).

(3) Replace the paper-shaft bracket and the paper chute (para 3-23b).

(4) Adjust the keyboard-transmitter friction clutch (para 3-125 or 3-126).

3-97. Removal and Replacement of Motor-Stop Assembly (TT-4A/TG)

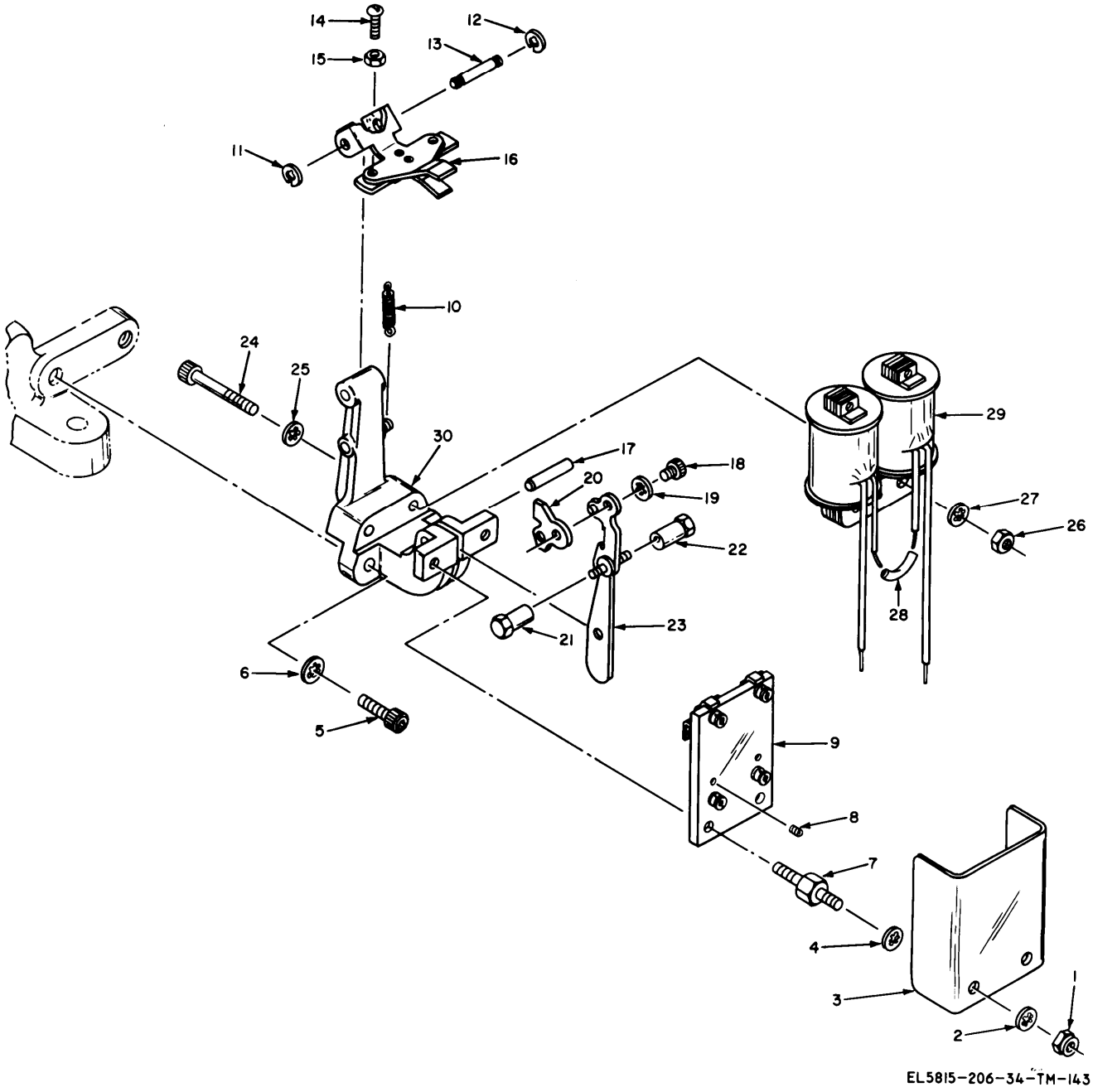
(fig. 3-71)

a. Removal.

(1) Remove the two self-locking hexagonal nuts (1) and lockwashers that hold the motor-stop contact shield (3) to the mounting studs (7); remove the motor-stop contact shield and two lockwashers.

(2) Disconnect the four cable leads from the motor-stop contact block (9); tag the leads.

(3) Remove the two machine screws (5) and lockwashers that hold the motor-stop bracket (30) to the frame; remove the motor-stop assembly.



1 Self-locking hexagonal nut, 10500
2 Lockwasher, 10403
3 Motor-stop contact shield, 50967
4 Lockwasher, 10403
5 Machine screw, 10010-01
6 Lockwasher, 10404
7 Mounting stud, 50968
8 Setscrew, 10203
9 Motor-stop contact block, 50969A (includes item 8)
10 Relay armature spring, 50965A
11 Retainer ring, 51099
12 Retainer ring, 51099
13 Armature shaft, 50963
14 Machine screw, 10350
15 Plain hexagonal nut, 10520
16 Motor-stop armature, 60612A
17 Contact-lever shaft, 50962
18 Machine screw, 10002
19 Lockwasher, 10403
20 Contact lever lug, 50975
21 Eccentric sleeve, 50957
22 Eccentric sleeve, 50957
23 Contact lever, 50955A (includes items 21 and 22)
24 Machine screw, 10012
25 Lockwasher, 10404
26 Plain hexagonal nut, 10505
27 Lockwasher, 10404
28 Tubing, 20732A
29 Relay coil, E3, 50271A
30 Motor-stop bracket, 50951A

Figure 3-71. Motor-stop assembly (TT-4A/TG), exploded view.

b. Replacement.

(1) Replace the motor-stop assembly as indicated in figure 3-71; the installation sequence is the reverse of the removal sequence.

(2) Adjust the motor-stop assembly (para 3-255).

3-98. Disassembly and Reassembly of Motor-Stop Assembly (TT-4A/TG)

(fig. 3-71)

a. Disassembly.

(1) Remove the motor-stop assembly (para 3-97a).

(2) Remove the two mounting studs (7, fig. 3-71) that hold the motor-stop contact block (9) to the motor-stop bracket; remove the motor-stop contact block. If necessary, remove the two setscrews (8) from the motor-stop contact block (30).

(3) Remove the relay armature spring (10) from the motor-stop armature (16) and from the spring post on the motor-stop bracket (30).

(4) Remove the two retainer rings (11 and 12) and armature shaft (13) that hold the motor-stop armature to the motor-stop bracket; remove the motor-stop armature.

(5) Remove the two machine screws (14) and plain hexagonal nuts from the motor-stop armature.

(6) Remove the contact-lever shaft that holds the contact lever to the motor-stop bracket; remove the contact lever.

(7) Remove the machine screw (18) and lockwasher that hold the contact lever lug (20) to the contact lever (23); remove the contact lever lug.

(8) Remove the two eccentric sleeves (21 and 22) from the contact lever.

(9) Remove the two machine screws (24), lockwashers, plain hexagonal nuts, and lockwashers that hold the relay coil (29) to the motor-stop bracket. Unsolder the coil leads and remove the tubing (28), if necessary.

b. Reassembly.

(1) Reassemble the motor-stop assembly as indicated in figure 3-71; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the motor-stop assembly (para 3-97b).

(3) Adjust the motor-stop assembly (para 3-256).

3-99. Removal and Replacement of Motor-Stop Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)

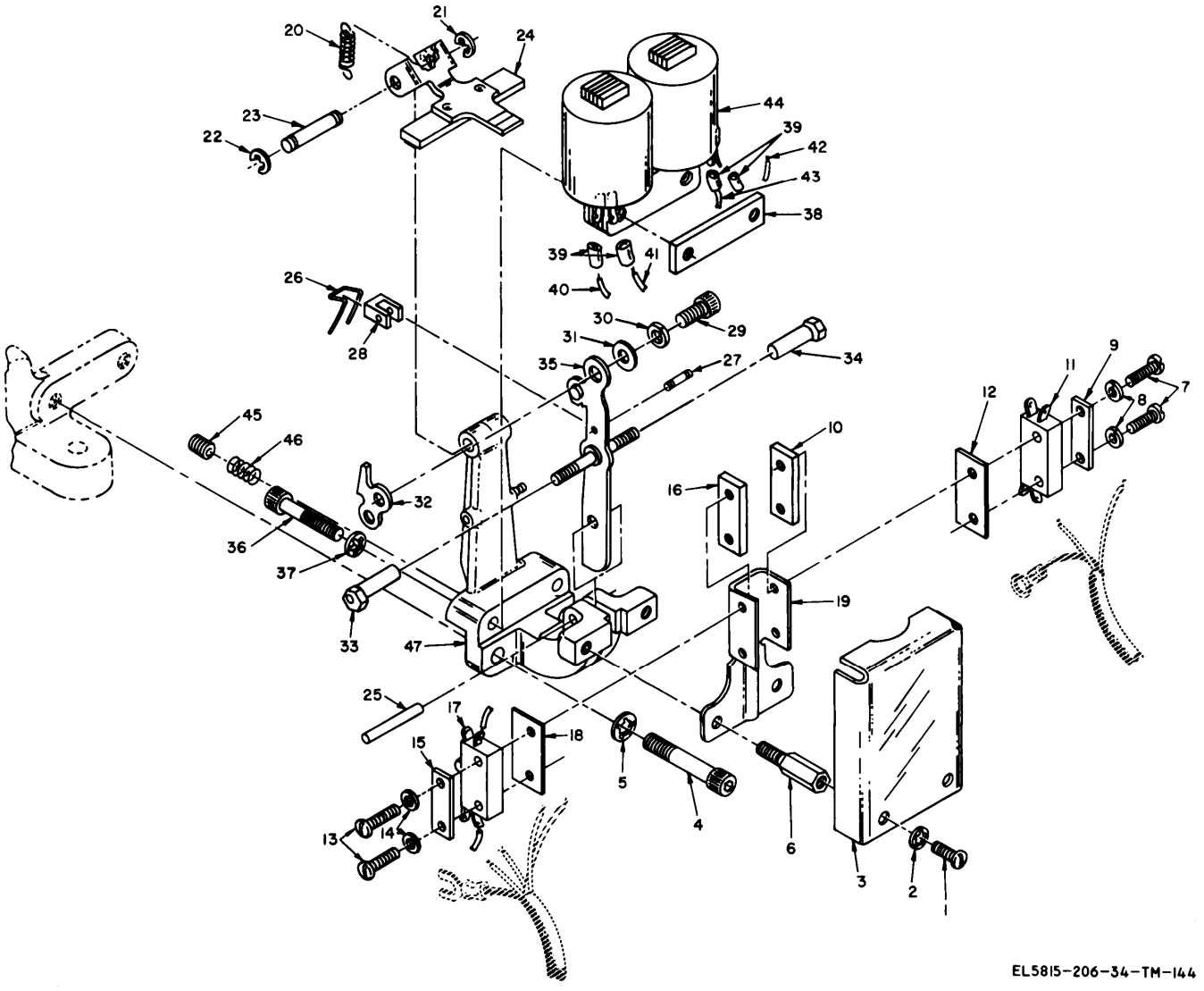
(fig. 3-72)

a. Removal.

(1) Remove the two machine screws (1) and lockwashers that hold the motor-stop-switch cover (3) to the cover mounting studs (6); remove the motor-stop-switch cover.

(2) Disconnect the cable leads; tag the leads to facilitate reassembly.

(3) Remove the two machine screws (4) and lockwashers that hold the motor-stop bracket (47) to the frame; remove the motor stop.



1 Machine screw, 10393
2 Lockwasher, 10403
3 Motor-stop-switch cover, 60618
4 Machine screw, 10012
5 Lockwasher, 10404
6 Cover mounting stud, 60619
7 Machine screw, 10139
8 Lockwasher, 10433
9 Switch plate, 60609
10 Switch nut plate, 60298
11 Switch S6, 20144
12 Switch insulator, 60617
13 Machine screw, 10139
14 Lockwasher, 10433
15 Switch plate, 60609
16 Switch nut plate, 60298
33 Eccentric sleeve, 50957
34 Eccentric sleeve, 50957
35 Contact lever, 60626A (includes items 33 and 34)
36 Machine screw, 10012
37 Lockwasher, 10404
38 Nut plate, 60613
39 Tubing, 20754-00.50
40 Wire, 22055-04.43
41 Wire, 22000-02.03
42 Wire, 22055-03.43
43 Wire, 22000-02.03
44 Relay coil, L1, 60604A
45 Setscrew, 10211
46 Contact-lever spring, 60607
47 Motor-stop bracket, 50951A
17 Switch S5, 20144
18 Switch insulator, 60617
19 Switch bracket, 60627
20 Relay armature spring, 50965
21 Retainer ring, 10969
22 Retainer ring, 10969
23 Armature shaft, 60614
24 Relay armature, 60612A
25 Contact-lever pivot shaft, 10978
26 Armature latch spring, 60625
27 Armature latch pin, 60624
28 Armature latch, 60608
29 Machine screw, 10001
30 Lockwasher, 10429
31 Flat washer, 10458
32 Contact-lever lug, 50975

Figure 3-72. Motor-stop assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G), exploded view.

b. Replacement.

(1) Replace the motor-stop assembly as indicated in figure 3-72; the sequence for assembling the parts is the reverse of the removal sequence.

(2) Adjust the motor-stop assembly (para 3-257).

3-100. Disassembly and Reassembly of Motor-Stop Assembly (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)

(fig. 3-72)

a. Disassembly.

(1) Remove the motor-stop assembly (para 3-99a).

(2) Remove the two cover mounting studs (6, fig. 3-72) that hold the switch bracket (19) to the motor-stop bracket (47); remove the switch bracket.

(3) Remove the two machine screws (7), lockwashers, switch plate (9), and switch nut plate (10) that hold the switch (11) to the switch bracket; remove the switch and switch insulator (12).

(4) Remove the two machine screws (13), lock. washers, switch plate (15), and switch nut plate (16) that hold the switch (17) to the switch bracket; remove the switch and switch insulator (18).

(5) Remove the relay armature spring (20) from the relay armature (24) and from the spring post on the motor-stop bracket.

(6) Remove the two retainer rings (21 and 22) and armature shaft (23) that hold the relay armature (24) to the motor-stop bracket; remove the relay armature.

(7) Remove the set screw (45) that holds the switch lever spring (46) in the motor-stop bracket; remove the switch lever spring.

(8) Remove the contact-lever pivot shaft (25) that holds the contact lever (35) on the motor-stop bracket; remove the contact lever.

(9) Remove the armature latch spring (26) from the armature latch pin (27) and from the armature latch (28).

(10) Remove the armature latch pin (27) that holds the armature latch to the contact lever; remove the armature latch.

(11) Remove the machine screw (29), lockwasher, and flat washer that hold the contact-lever lug (32) to the contact lever; remove the contact-lever lug.

(12) Remove the two eccentric sleeves (33 and 34) from the contact lever.

(13) Remove the two machine screws (36), lockwashers, and nut plate (38) that hold the relay coil (44) to the motor-stop bracket; remove the relay coil.

(14) Remove the tubing and wires, if necessary.

b. Reassembly.

(1) Reassemble the motor-stop assembly as indicated in figure 3-72; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the motor-stop assembly (para 3-99b).

(3) Adjust the motor-stop assembly (para 3-258 through 3-261).

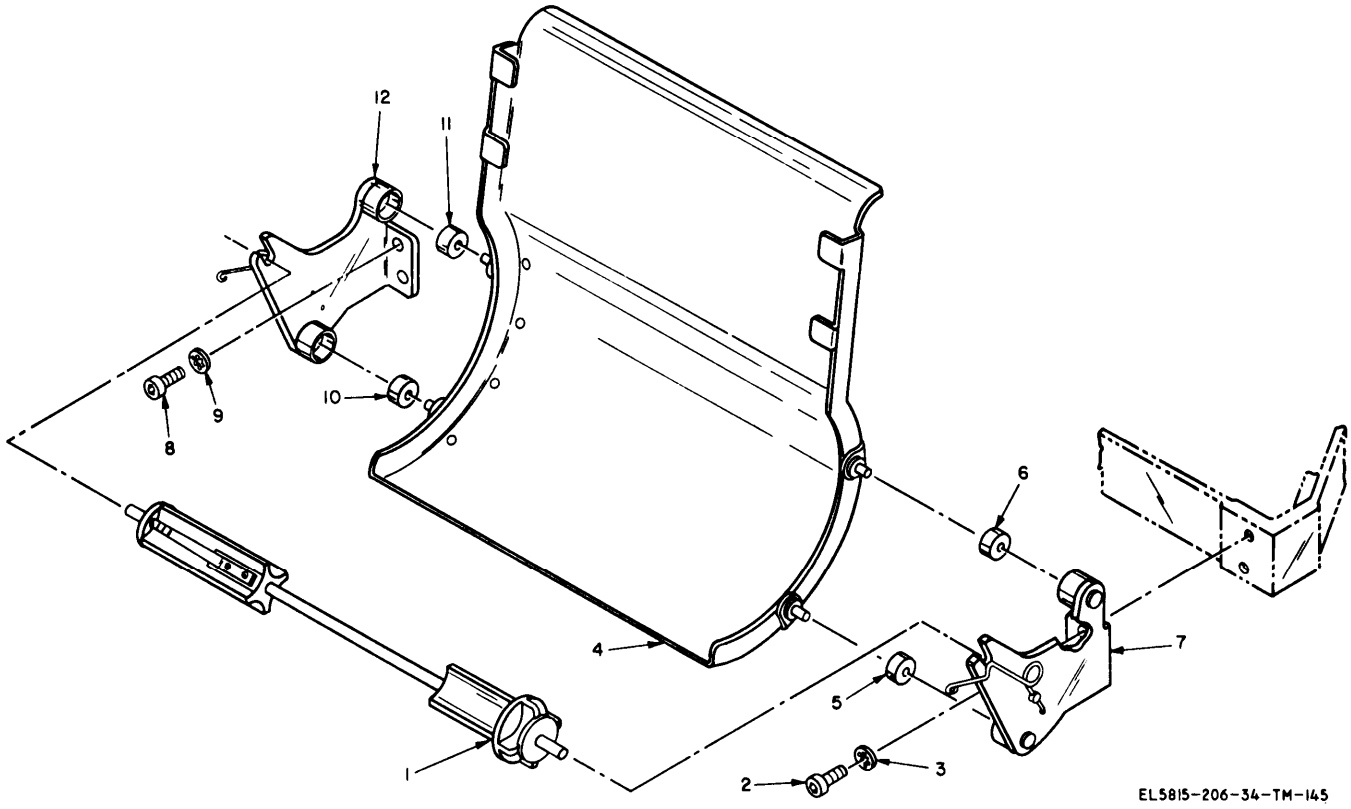
3-101. Disassembly and Reassembly of Paper Shaft, Paper-Shaft Brackets, and Paper Chute (TT4(*)/TG, TT-335/TG and TT-698(*)/TG)

(fig. 3-73)

a. Disassembly.

(1) Remove the paper shaft, both paper-shaft brackets, and the paper chute (para 3-23a).

(2) Remove the four rubber mounts from the paper-shaft brackets (7 and 12, fig. 3-73).



1 Paper shaft, 50605A
2 Machine screw, 10009
3 Lockwasher, 10404[a], 10430[b]
4 Paper chute, 50261A
5 Rubber mount, 50252
6 Rubber mount, 50252
7 Paper-shaft bracket (lH), includes items 5 and 6), 50250A
8 Machine screw, 10009
9 Lockwasher, 10404[a], 10430[b]
10 Rubber mount, 50252
11 Rubber mount, 50252
12 Paper-shaft bracket (rH) 50255A (includes items 10 and 11)

[a] Used on TT-4A/TG and TT-598/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-698A/TG and TT-698B/TG.

Figure 3-73. Paper shaft, paper shaft brackets, and paper chute (TT-4(*)/TG, TT-335/TG and TT-698(*)/TG), exploded view.

b. Reassembly.

(1) Reassemble the paper shaft, paper-shaft brackets, and paper chute as indicated in figure 3-73; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the paper shaft, paper-shaft brackets, and paper chute (para 3-23b).

3-102. Disassembly and Reassembly of Paper Shaft, Paper-Shaft Bracket, and Paper Chute (TT-537/G only)

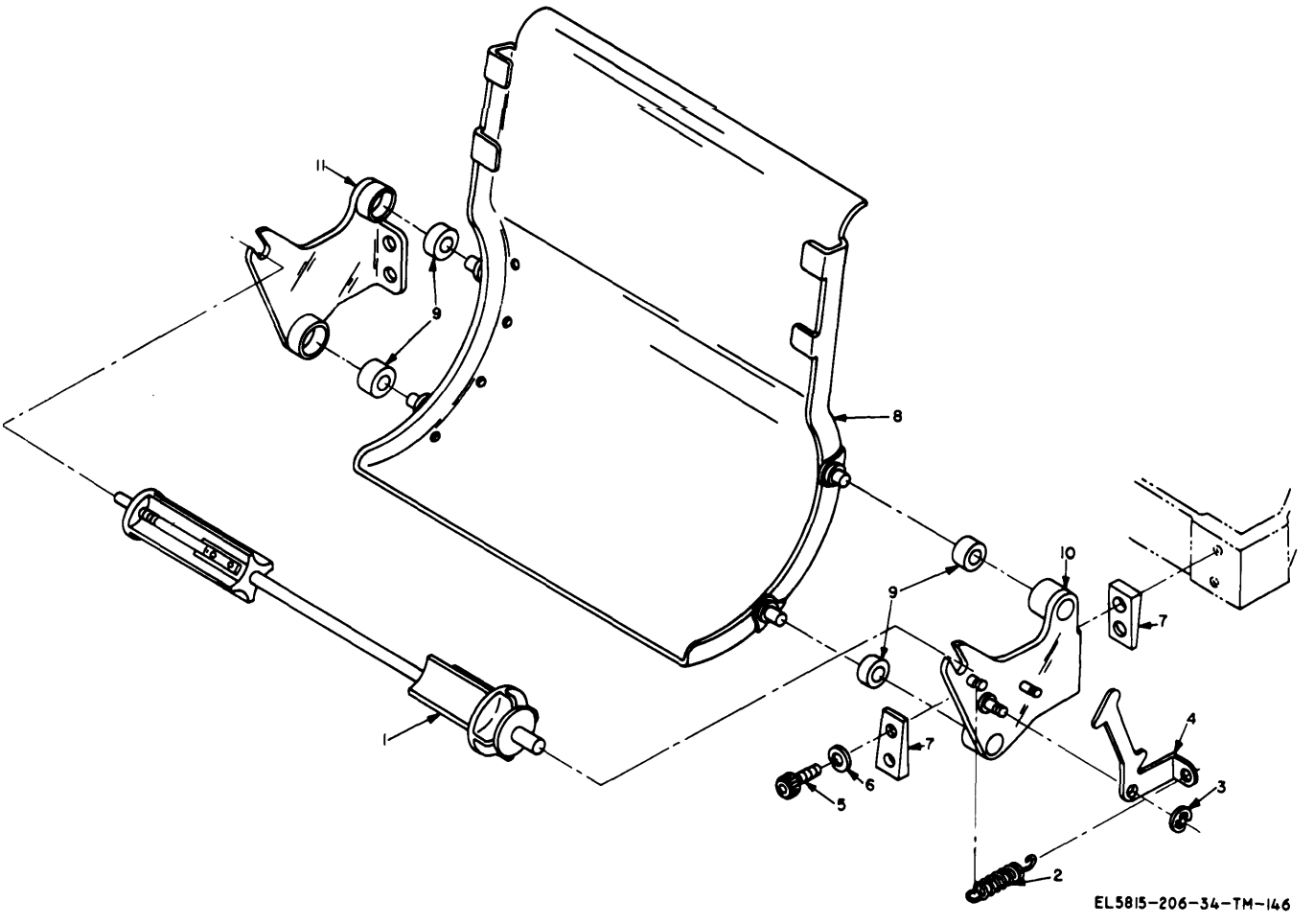
(fig. 3-74)

a. Disassembly.

(1) Remove the paper shaft, both paper-shaft brackets, and paper chute (para 3-24a),

(2) Remove the springs (2, fig. 3-74) from each of the paper-shaft brackets (10 and 11) and their associated retaining levers (4). Remove the retaining rings (3) that hold the retaining levers to the brackets; remove the retaining levers.

(3) Remove the rubber mounts (9) from the paper-shaft brackets.



1 Paper roll shaft, 50605A
2 Spring, 51986
3 Retaining ring, 10949
4 Retaining lever (RH), 51984, (LH) 51983
5 Machine screw, 10032
6 Lockwasher, 10430
7 Spacer, 55743
8 Paper chute, 50261A
9 Rubber mount, 50252
10 Paper-shaft bracket (RH), 51934
11 Paper-shaft bracket (LH), 51939

Figure 3-74. Paper shaft, paper shaft bracket, and paper chute, exploded view (TT-537/G only).

b. Reassembly.

Reassemble the paper shaft, paper-shaft brackets, and paper chute as indicated in figure 3-74; the sequence for assembling the parts is the reverse of the disassembly sequence.

3-103. Removal and Replacement of Motor Filter Box Assembly (TT-4(*)/TG and TT-698(*)/TG)

(fig. 3-75)

a. Removal.

(1) Remove the teletypewriter from the mounting base (para 3-25a).

(2) Remove the four machine screws (1, fig. 3-75) and lockwashers that hold the filter box cover (3) to the mounting studs (15); remove the filter box cover,

(3) Disconnect the electrical leads of the motor power cable (9); from the terminal board TB2 (48); tag the leads to facilitate reassembly. Remove the strain relief (4) that holds the motor power cable to the filter box (62); remove the motor power cable.

(4) Disconnect the electrical leads of the motor-stop cable (13) and the motor cable from terminal board TB3 (38); tag the leads to facilitate reassembly.

(5) Remove the four mounting studs and lockwashers that hold the filter box (62) to the frame; remove the assembled filter box and electrical components, and remove the four lockwashers that are installed between the filter box and frame.

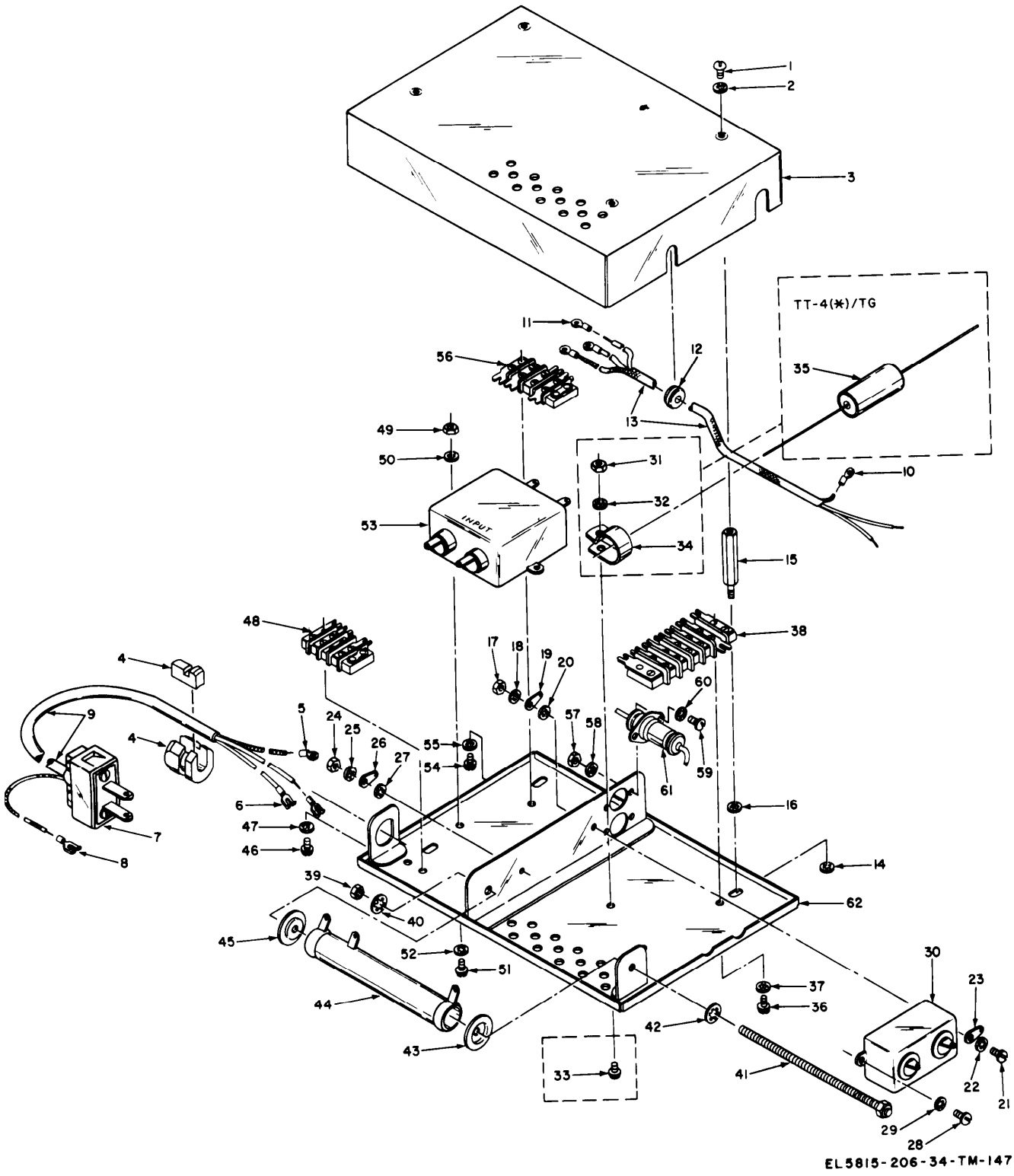


Figure 3-75. Motor filter box assembly (TT-4(*)/TG and TT-698(*)/TG), exploded view.

KEY to fig. 3-75:
1 Machine screw, 12308
2 Lockwasher, 10403
3 Filter box cover, 51654
4 Strain relief, 20713
5 Terminal, 20708
6 Terminal, 21065-0003
7 Plug P3 ,20404
8 Terminal, 20721
9 Motor power cable, 51653A (includes items 5, 6, 7 and 8)
10 Terminal, 20708
11 Terminal, 21065-0002
12 Grommet, 20725
13 Motor-stop cable, 51165A (includes items 10, 11, and 12)
14 Lockwasher, 10406
15 Mounting stud, 51058
16 Lockwasher, 10404
17 Plain hexagonal nut, 10511
18 Lockwasher, 10403
19 Terminal lug, 20795
20 Lockwasher, 10403
21 Machine screw, 12308
22 Lockwasher, 10403
23 Terminal lug, 20795
24 Plain hexagonal nut, 10511
25 Lockwasher, 10403
26 Terminal lug, 20735
27 Lockwasher, 10403
28 Machine screw, 12308
29 Lockwasher, 10403
30 Capacitor C22, 20200
31 Plain hexagonal nut, 10511
32 Lockwasher, 10403
33 Machine screw, 12308
34 Clamp 20774
35 Capacitor C15, 20212[a]
36 Machine screw, 12301
37 Lockwasher, 10402
38 Terminal board TB3, 20360
39 Plain hexagonal nut, 10516
40 Lockwasher, 10404
41 Resistor mounting stud, 11700
42 Lockwasher, 10404
43 Centering washer, 10456
44 Resistor R1, 51628
45 Centering washer, 10456
46 Machine screw, 12301
47 Lockwasher, 10402
48 Terminal board TB2, 20359
49 Plain hexagonal nut, 10511
50 Lockwasher, 10403
51 Machine screw, 12301
52 Lockwasher, 10402
53 Filter Z1 (TT-4A/TG); FL1, 20210 (TT-4B and C/TG)
54 Machine screw, 12301
55 Lockwasher, 10402
56 Terminal board TB1, 20358
57 Plain hexagonal nut, 10511
58 Lockwasher, 10403
59 Machine screw, 12308
60 Lockwasher, 10403
61 Capacitor C18 and C19, 20208
62 Filter box, 51647A

[a] Not applicable to TT-698(*)/TG.

b. Replacement.

(1) Replace the motor filter box assembly as indicated in figure 3-75; the replacement sequence is the reverse of the removal sequence.

(2) Reconnect all electrical leads that have been disconnected.

(3) Replace the teletypewriter on the mounting base (para 3-25b).

3-104. Removal and Replacement of Junction Box Assembly (TT-335/TG)

(fig. 3-76)

a. Removal.

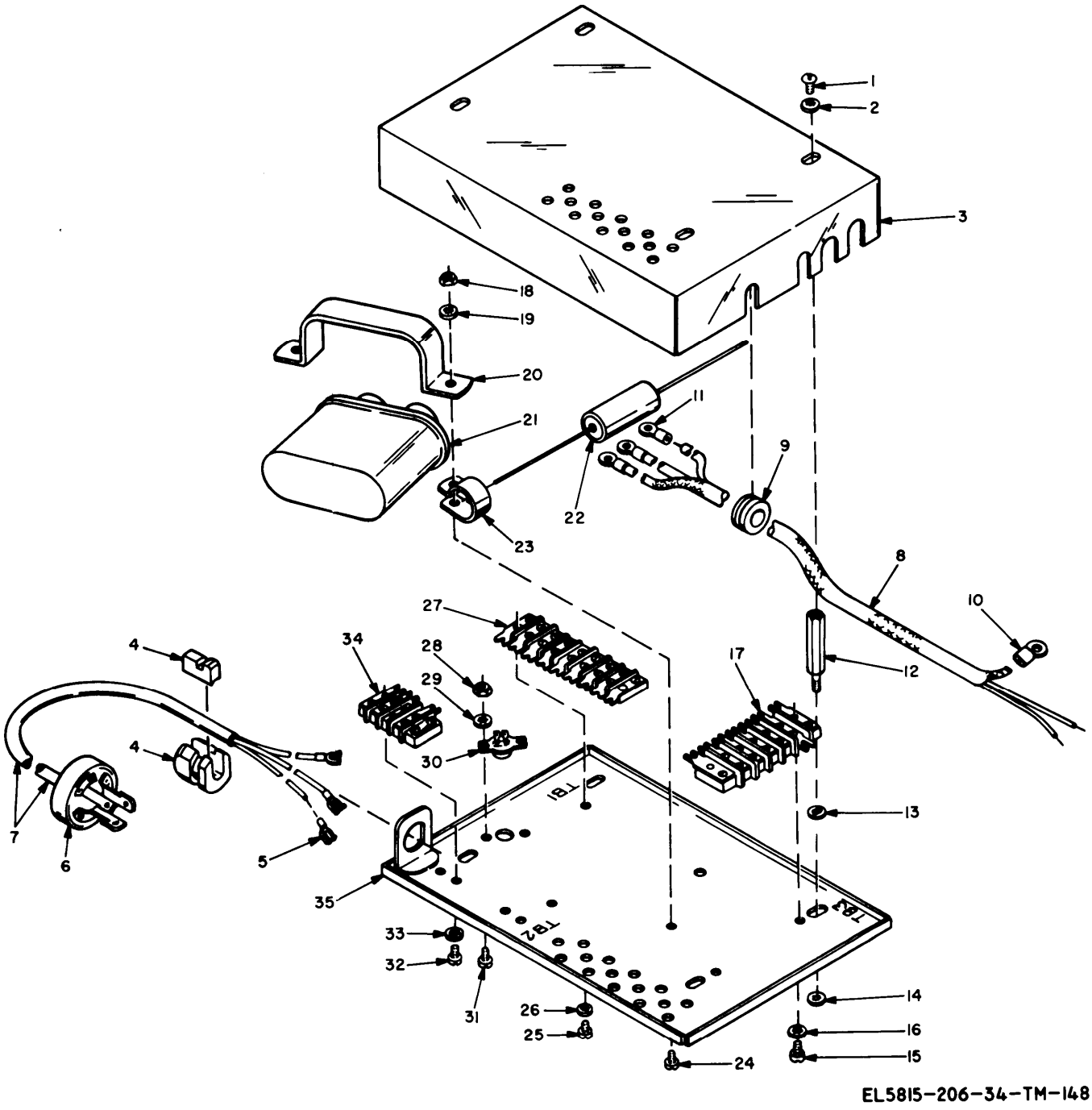
(1) Remove the teletypewriter from the mounting base (para 3-25a).

(2) Remove the four machine screws (1) and lockwashers that hold the junction box cover (3) on the mounting studs (12); remove the junction box cover.

(3) Disconnect the electrical leads of the power cable assembly (7) from terminal board TB2 (34), and tag the leads to facilitate reassembly. Remove the strain relief (4) that holds the power cable assembly to the junction box; remove the power cable assembly.

(4) Disconnect the electrical leads of the motor-stop cable (8) and motor cable from terminal board TB2 in the junction box, and tag the leads to facilitate reassembly.

(5) Remove the four mounting studs and lockwashers that hold the junction box to the frame; remove the assembled junction box and electrical components, and remove the four lockwashers that separate the junction box from the frame.



1 **Machine screw**, 12308
2 Lockwasher, 10403
3 Junction box cover, 64950
4 Strain relief, 20713
5 Terminal, 21065-0003
6 Plug P3, 23147
7 Power cable assembly, 64948A (includes items 5 and 6)
8 Motor-stop cable, 51165A (includes items 9, 10 and 11)
9 Grommet, 20725
10 Terminal, 20708
11 Terminal, 21065-0002
12 Mounting stud 51058
13 Lockwasher, 10404
14 Lockwasher, 10406
15 Machine screw, 12301
16 Lockwasher, 10402
17 Terminal board TB3, 20360
18 Plain hexagonal nut, 10511
19 Lockwasher, 10403
20 Capacitor mounting bracket, 23412
21 Capacitor C6, 23411
22 Capacitor C5, 20212
23 Capacitor clamp, 20774
24 Machine screw, 12308
25 Machine screw, 12301
26 Lockwasher, 10402
27 Terminal board TB1, 21094
28 Plain hexagonal nut, 10511
29 Lockwasher, 10403
31 Thermostat S7, 23239
31 Machined screw, 12308
32 Machine screw, 12301
33 Lockwasher, 10402
34 Terminal board TB2, 20359
35 Junction box, 64957A

Figure 3-76. Junction box assembly (TT-335/TG), exploded view.

b. Replacement.

(1) Reinstall the junction box by reversing the procedures outlined in *a* above.

(2) Resolder all the electrical leads that were unsoldered.

(3) Reinstall the teletypewriter on the mounting base (para 3-25g).

3-105. Disassembly and Reassembly of Junction Box Assembly (TT-537/G only)

(fig. 3-77)

a. Disassembly.

(1) Remove the two machine screws (1, fig. 3-77) and lockwashers that hold the cover panel (3) to the cover; remove the cover panel.

(2) Remove the four machine screws (4), lockwashers, and flat washers that hold the cover (7) to the studs; (8); remove the cover.

(3) Remove the studs and lockwashers that secure the junction box assembly (78) to the frame.

(4) Unsolder the leads of the capacitor (13). Remove the plain hexagonal nut (10) and lockwasher that hold the clamp (12) and capacitor to the standoff (21); remove the capacitor and clamp.

(5) Remove the plain hexagonal nuts (14) and lockwashers that hold the magnet driver (16) to the mounting bracket (27); remove the magnet driver.

(6) Remove the plain hexagonal nuts (17), lockwashers, and flat washers that hold the cable clamps (20) to the mounting bracket (27); remove the clamps.

(7) Remove the amplifier assembly (28) from the junction box.

(8) Remove the plain hexagonal nuts (29), lockwashers, and machine screws (31), machine screw: (34) and lockwashers that secure the power supply assembly (33) to the junction box assembly; remove the power supply assembly.

(9) Remove the machine screws (34) and lockwashers that secure the terminal board (36) to the junction box assembly; remove the terminal board and marker strip (37).

(10) Remove the machine screws (38), lockwashers, and flat washers that hold the terminal board TB1 (41) to the mounting bracket (44); remove the terminal board and marker strip (42). Remove the spacers and, mounting bracket.

(11) Remove the machine screws (45) and link. washers that hold the standoffs (47) to the junction box assembly; remove the standoffs.

(12) Release the strain relief (48) and remove the ac cable assembly (52).

(13) Remove the machine screws (53) and lockwashers that hold the terminal board TB2 (55) to the junction box assembly; remove the terminal board and marker strip (56).

(14) Disconnect and remove the cable assemblies (63 and 66).

(15) Remove the machine screws (67), lockwashers, and plain hexagonal nut that hold the thermal switch (69) to the mounting bracket (76); remove the thermal switch S7.

(16) Remove the machine screws (72), lockwashers, and nut plate (75) that hold the mounting bracket to the junction box assembly; remove the bracket and capacitor (77).

CAUTION

Before installing capacitor C6 (77), bend terminals approximately 90° inside insulator, thus removing the possibility of a short to the standoff (47).

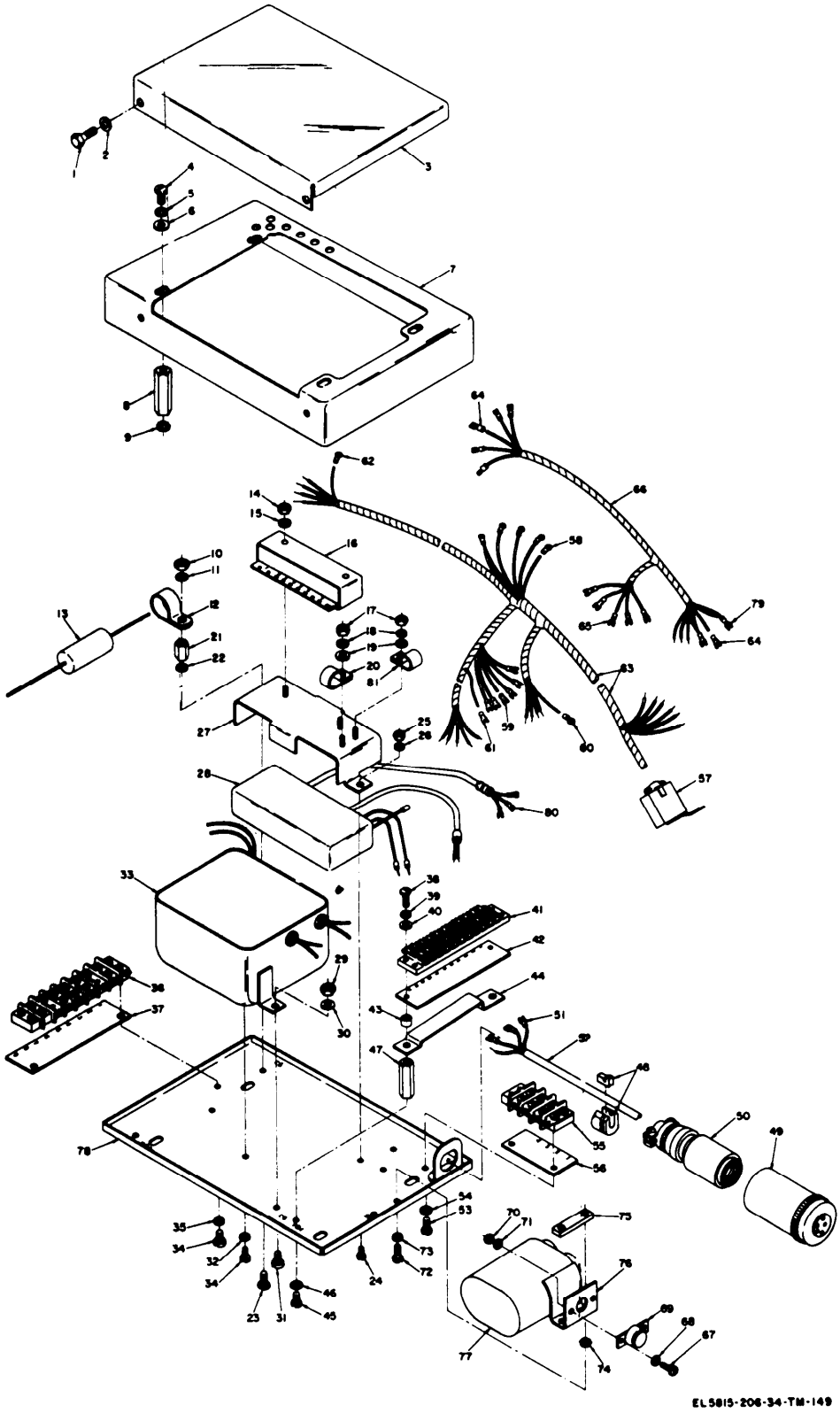


Figure 3-77. Junction box assembly, exploded view (TT-537/G only).

KEY to fig. 3-77:
1 Machine screw, 10077
2 Lockwasher, 10429
3 Cover panel, 51419A
4 Machine screw, 12308
5 Lockwasher, 10429
6 Flat washer, 10450
7 Cover, 51448A
8 Stud, 51058
9 Lockwasher, 10406
10 Plain hexagonal nut, 10511
11 Lockwasher, 10429
12 Clamp, 20774
13 Capacitor C5, 20212
14 Plain hexagonal nut, 10521
15 Lockwasher, 10421
16 Magnet driver assembly Z103, 51493A
17 Plain hexagonal nut, 10511
18 Lockwasher, 10429
19 Flat washer, 10472
20 Clamp, 20541
21 Standoff, 51904
22 Lockwasher, 10429
23 Machine screw, 12309
24 Machine screw, 12308
25 Plain hexagonal nut, 10511
26 Lockwasher, 10429
27 Mounting bracket, 51629A
28 Amplifier assembly Z101, 51467
29 Plain hexagonal nut, 10515
30 Lockwasher, 10430
31 Machine screw, 12252
32 Lockwasher, 10403
33 Power supply assembly Z102, 51778A
34 Machine screw, 12137
35 Lockwasher, 10402
36 Terminal board TB3, 21094
37 Marker strip, 51928
38 Machine screw, 12147
39 Lockwasher, 10432
40 Flat washer, 20854
41 Terminal board TB1, 23644
42 Marker strip, 51997
43 Spacer, 57571
44 Mounting bracket, 51506
45 Machine screw, 12308
46 Lockwasher, 10403
47 Standoff, 51905
48 Strain relief, 20713
49 Connector, 24654 P3
50 Clamp assembly, 51720A
51 Terminal, 21065-0002
52 AC power cable, 51700A (includes items 49, 50, and 51)
53 Machine screw, 12137
54 Lockwasher, 10402
55 Terminal board TB2, 20359
56 Marker strip, 51929
57 Connector, 20413 P2
58 Terminal, 21069
59 Terminal, 21045-0001
60 Terminal, 21069
61 Terminal; 21065-0001
62 Terminal, 20705
63 Cable assembly, 51906A (includes items 57 and 62)
64 Terminal, 21065-0002
65 Terminal, 21045-0002
66 Cable assembly, 51925A (includes items 64 and 65)
67 Machine screw, 12308
68 Lockwasher, 10403
69 Thermal switch S7, 23239
70 Plain hexagonal nut, 10511
71 Lockwasher, 10403
72 Machine screw, 12308
73 Lockwasher, 10403
74 Lockwasher, 12403
75 Nut plate, 51750
76 Mounting bracket, 51507
77 Capacitor C6, 23411
78 Box assembly, 51499A
79 Terminal, 21065-0003
80 Terminal, 21045-0002
81 Clamp, 20562

b. Reassembly.

(1) Reassemble the junction box as indicated in figure 3-77; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Refer to the wiring diagram in figure FO-6 to assure proper reconnection of the electrical leads of the junction box.

3-106. Disassembly and Reassembly of Motor Filter Box Assembly

(fig. 3-75)

a. Disassembly.

(1) Remove the motor filter box assembly (para 3-103a).

(2) Unsolder the leads that are connected to capacitor C22 (30, fig. 3-75). Remove the two plain hexagonal nuts (17 and 24), lockwashers, terminal lugs (19 and 26), lockwashers and terminal lug (23) that hold capacitor C22 to the bracket on the filter box (62); remove capacitor C22, two machine screws (21 and 28), two lockwashers and terminal lug.

(3) Unsolder the leads that are connected to capacitor C15 (35). Remove the plain hexagonal nut (31), lockwasher, machine screw (33), and clamp (34) that hold capacitor C15 to the filter box; remove the capacitor.

(4) Disconnect the leads from terminal board TB3 (38). Remove the two machine screws (36) and lockwashers that hold terminal board TB3 to the filter box; remove the terminal board.

(5) Unsolder the leads from resistor R1 (44). Remove the plain hexagonal nut (34), lockwasher, resistor mounting stud (41), and lockwasher that hold resistor R1 to the brackets on the filter box; remove the centering washer (43), resistor, and centering washer (45).

(6) Disconnect all leads from terminal board TB2 (48). Remove the two machine screws (46) and lockwashers that hold terminal board TB2 to the filter box; remove the terminal board.

(7) Unsolder the leads from filter Z1 or FL1 (53).

Remove the two plain hexagonal nuts (49), lockwashers, machine screws (51), and lockwashers that hold the filter to the filter box; remove the filter.

(8) Disconnect the leads from terminal board TB1 (56). Remove the two machine screws (54) and lockwashers that hold the terminal board to the filter box; remove the terminal board.

(9) Remove the four plain hexagonal nuts (57), lockwashers, machine screws (59), and lockwashers that hold capacitors C18 and C19 (61) to the filter box; remove the capacitors.

b. Reassembly. Reassemble the motor filter box assembly by reversing the procedures described in *a* above. Replace the motor filter box assembly (para 3-103b).

NOTE

Rotate resistor R1 to obtain a ¼ -inch gap between the resistor terminal and the machine screw (28) that secure the capacitor (30).

3-107. Disassembly and Reassembly of Junction Box Assembly (TT-335/TG)

(fig. 3-76)

a. Disassembly.

(1) Remove the junction box assembly (para 3-104a).

(2) Disconnect the leads from capacitor C6 (21, fig. 3-76). Unsolder the leads from capacitor C5 (22). Remove the two plain hexagonal nuts (18), lockwashers, machine screws, capacitor mounting bracket (20), and capacitor clamp (23) that hold capacitors C6 and C5 to the junction box. Remove the capacitors.

(3) Disconnect the leads from terminal board TB3 (17). Remove the two machine screws (15) and lockwashers that hold terminal board TB3 to the junction box (35); remove the terminal board.

(4) Disconnect all leads from terminal board TB2 (34). Remove the two machine screws (32) and lockwashers that hold terminal board TB2 to the junction box; remove the terminal board.

(5) Disconnect the leads from the terminal board TB1 (27). Remove the two machine screws (25) and lockwashers that hold the terminal board to the junction box; remove the terminal board.

b. Reassembly. Reassemble the junction box assembly by reversing the procedures outlined in *a* above. Reinstall the junction box assembly (para 3-10b).

3-108. Disassembly and Reassembly of Line Terminal Board

(fig. 3-78)

a. Disassembly.

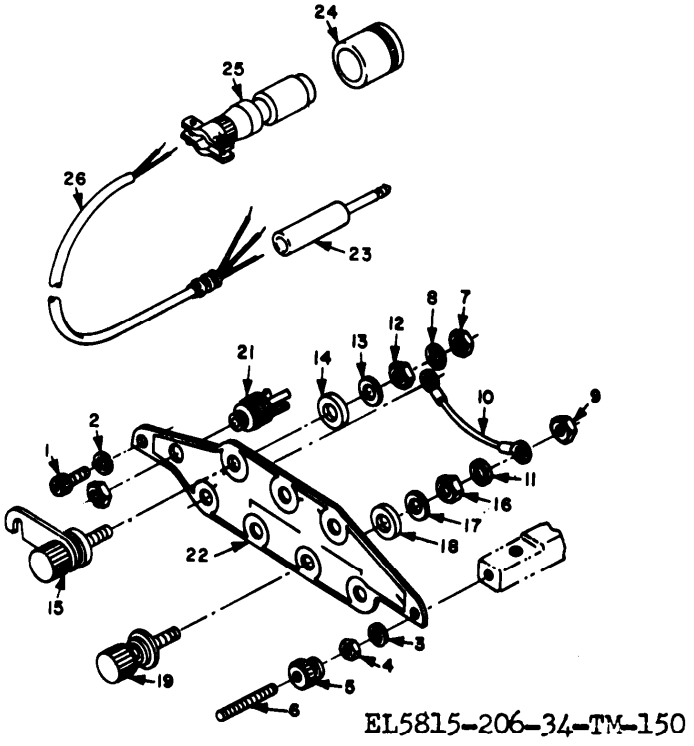
(1) Remove the line terminal board (para 3-30a).

(2) Remove the plain hexagonal nuts (9, fig. 3-78) that hold the jumper wire (10) to two of the five binding posts (19); remove the jumper wire and the two lockwashers.

(3) Remove the two plain hexagonal nuts (12), flat washers, and insulating washers (14) that hold the two shorting bars (15) to the terminal board (22); remove the two shorting bars.

(4) Remove the five plain hexagonal nuts (16), flat washers, and insulating washers (18) that hold the five binding posts to the terminal board; remove the binding posts.

(5) On TT-537/G, remove the nut (20) that holds the telephone-type jack (21) to the terminal board, remove the jack.



1 Machine screw, 10024
2 Lockwasher, 10431
3 Lockwasher, 10406
4 Plain hexagonal nut, 10509
5 Knurled nut, 10518
6 Setscrew, 10203
7 Plain hexagonal nut, 10515
8 Lockwasher, 10404
9 Plain hexagonal nut, 10515
10 Jumper wire, 51163A
11 Lockwasher, 10404
12 Plain hexagonal nut, 10515
13 Flat washer, 10463
14 Insulating washer, 50909
15 Shorting bar, 56197A
16 Plain hexagonal nut, 10515
17 Flat washer, 10463
18 Insulating washer, 50909
19 Binding post, 20877
20 Plain hexagon nut (part of item 21) [a]
21 Telephone-type jack J5, 24437 [a]
22 Terminal board, 50602 (51992A [a])
23 Plug P5, 24625 [a]
24 Connector P4, 24655 [a]
25 Clamp assembly, 51909 [a]
26 Signal cable assembly, 51908A [a]
(includes item 23-25)
27 Terminal, 21069-0001
28 Lockwasher, 12419 [a]

[a] Used on TT-537/G only.

Figure 3-78. Line terminal board and signal cable assembly, exploded view (TT-4(*)/TG, TT-335/TG, and TT-537/G).

b. Reassembly.

(1) Reassemble the line terminal board as indicated in figure 3-78, the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the line terminal board (para 3-30b).

3-109. Disassembly and Reassembly of Teletypewriter Frame Assembly

(fig. 3-79)

a. *Disassembly.*

(1) Remove the dust cover (para 3-22a).

(2) Remove the paper shaft, paper-shaft bracket, and paper chute (para 3-23a).

(3) Remove the assembled teletypewriter from the mounting base (para 3-25a).

(4) Remove the teletypewriter motor (para 3-26a).

(5) Remove the keyboard-transmitter (para 3-27a).

(6) Remove the platen assembly (para 3-28a).

(7) Remove the two machine screws (15, fig. 3-79) and lockwashers that hold the platen bracket (20) to the frame assembly. Remove the bumper (17), machine screw (18), and plain hexagonal nut from the platen bracket.

(8) Loosen the plain hexagonal nut (21) and remove assembled items from the frame assembly. Remove the plain hexagonal nut, platen lock (22), lockwasher, and wing nut (24) from the setscrew.

(9) Remove the carriage assembly (para 3-29a).

(10) Remove the line terminal board (para 3-30a).

(11) Remove the instrument panel (para 3-31a).

(12) Remove the selector-magnet assembly (para 3-58a).

(13) Remove the rangefinder (para 3-59a (TT-4A/TG and TT-698/TG) or 3-60a (TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG)).

(14) Remove the selector levers and Y-levers (para 3-61a (TT-4A/TG and TT-698/TG) or 3-62a (TT-4B/TG, TT-4C/TG, TT-698A/TG, and TT-698B/TG)).

(15) Remove the transfer-lever shaft assembly (para 3-63a).

(16) Remove the print-bail-blade shaft assembly (para 3-64a).

(17) Remove the signal bell assembly (para 3-65a).

(18) Remove the function-selecting mechanism (para 3-67a).

(19) Remove the line-feed and platen-shift mechanisms (para 3-68a (TT-4A/TG and TT-698/TG) or 3-69a (TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG)).

(20) Remove the square-shaft assembly (para 3-71a).

(21) Remove the function-shaft assembly (para 3-72a).

(22) Remove the selector camshaft assembly (para 3-74a).

(23) Remove the main shaft assembly (para 3-75a (TT-4A/TG and TT-698/TG) or 3-76a (TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG)).

(24) Remove the code-ring cage (para 3-78a).

(25) Remove the function sensing lever group (para 3-81a).

(26) Remove the manual carriage-return mechanism (para 3-83a).

(27) Remove the carriage-feed mechanism (para 3-84a (TT-4A/TG and TT-698/TG) or 3-85a (TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG)).

(28) Remove the carriage-return operating mechanism (para 3-86a).

(29) Remove the carriage-rack drive-shaft assembly (para 3-89a).

(30) Remove the margin-bell assembly (para 3-90a).

(31) Remove the carriage-feed shaft assembly (para 3-91a (TT-4A/TG and TT-698/TG) or 3-92a (TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG)).

(32) Remove the carriage-return shaft assembly (para 3-93a (TT-4A/TG and TT-698/TG) or 3-94a (TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG)).

(33) Remove the keyboard-transmitter drive shaft assembly (para 3-96a).

(34) Remove the motor-stop assembly (para 3-97a (TT-4A/TG and TT-698/TG) or 3-99a (TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG)).

(35) Remove the motor filter box assembly (para 3-103a).

(36) On the TT-4A/TG and TT-698/TG, remove the two machine screws (30 and 31, fig. 3-79) and two plain hexagonal nuts from the frame assembly.

(37) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG remove the machine screw (31) and plain hexagonal nut from the frame assembly.

(38) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG remove the self-locking hexagonal nut (45) that holds the eccentric post (46) to the eccentric post bracket (49); remove the eccentric post.

(39) On the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG remove the two machine screws (47) and lockwashers that hold the eccentric post bracket to the plate; remove the eccentric post bracket.

(40) Remove the machine screws and lockwashers that hold the frame assembly (50) together; disassemble the frame assembly if necessary.

NOTE

Do not disassemble the frame assembly unless a portion of it has been damaged and must be replaced.

KEY to fig. 3-79:

1 Plain hexagonal nut, 10502[a]
2 Lockwasher, 10400[a]
3 Flat washer, 50272[a]
4 Machine screw, 10035-01 [bc]
5 Lockwasher, 10405[bc]
6 Machine screw, 10004
7 Lockwasher, 10429
8 Gasket, 50725
9 Cotter pin, 10805
10 Main shaft gear, 50597A
11 Gear cover, 50853A
12 Cotter pin, 10805
13 worm, 50596
14 Worm bracket, 50858A
15 Machine screw, 10076[bc]
16 Lockwasher, 10430 [bc]
17 Bumper, 20762[bc]
18 Machine screw, 10009[a], 11209 [b]
19 Plain hexagonal nut, 10516 [bc]
20 Platen bracket, 51464[bc]
21 Plain hexagonal nut, 10509
22 Plate lock, 50598
23 Lockwasher, 10431
24 Wing nut, 10508
25 Setscrew, 10212
26 Setscrew, 10201
27 Spacing collar, 51717[ab]
28 Cam follower stop stud, 51719
29 Plain hexagonal nut, 10502[a]
30 Machine screw, 10021[a]
31 Machine screw, 10021
32 Plain hexagonal nut, 10502
33 Machine screw, 10024-01
34 Lockwasher, 10405
35 Machine screw, 10017-01
36 Lockwasher, 10405
37 Machine screw
38 Lockwasher, 10405
39 Machine screw, 10018-01[a], 10017-01
40 Lockwasher, 10405
41 Machine screw, 10017
42 Lockwasher, 10405
43 Machine screw, 10018
44 Lockwasher, 10405[a], 10431 [b]
45 Self-locking hexagonal nut, 10534 [bc]
46 Eccentric post, 57894 [bc]
47 Machine screw, 10018[bc]
48 Lockwasher, 10431[bc]
49 Eccentric post bracket, 57895 [b]
50 Frame assembly, 51031A [a](includes bearing caps, three main castings, plate, dowels, and spring posts).
51 Bushing, 57493, 57753A[b], 63194A [c]
52 Lockwasher, 10422

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG and TT-698A/TG.

[c] Used on TT-4C/TG and TT-698B/TG.

NOTE

The four bearing caps on the base frame (center) and the smaller of the two bearing caps in the plate (center, left) are in the TT-4B/TG, TT-4C/TG, TT-698A/TG and TT-698B/TG only. A complete frame assembly including most items P/N 67242A will fit the A, B, and C model.

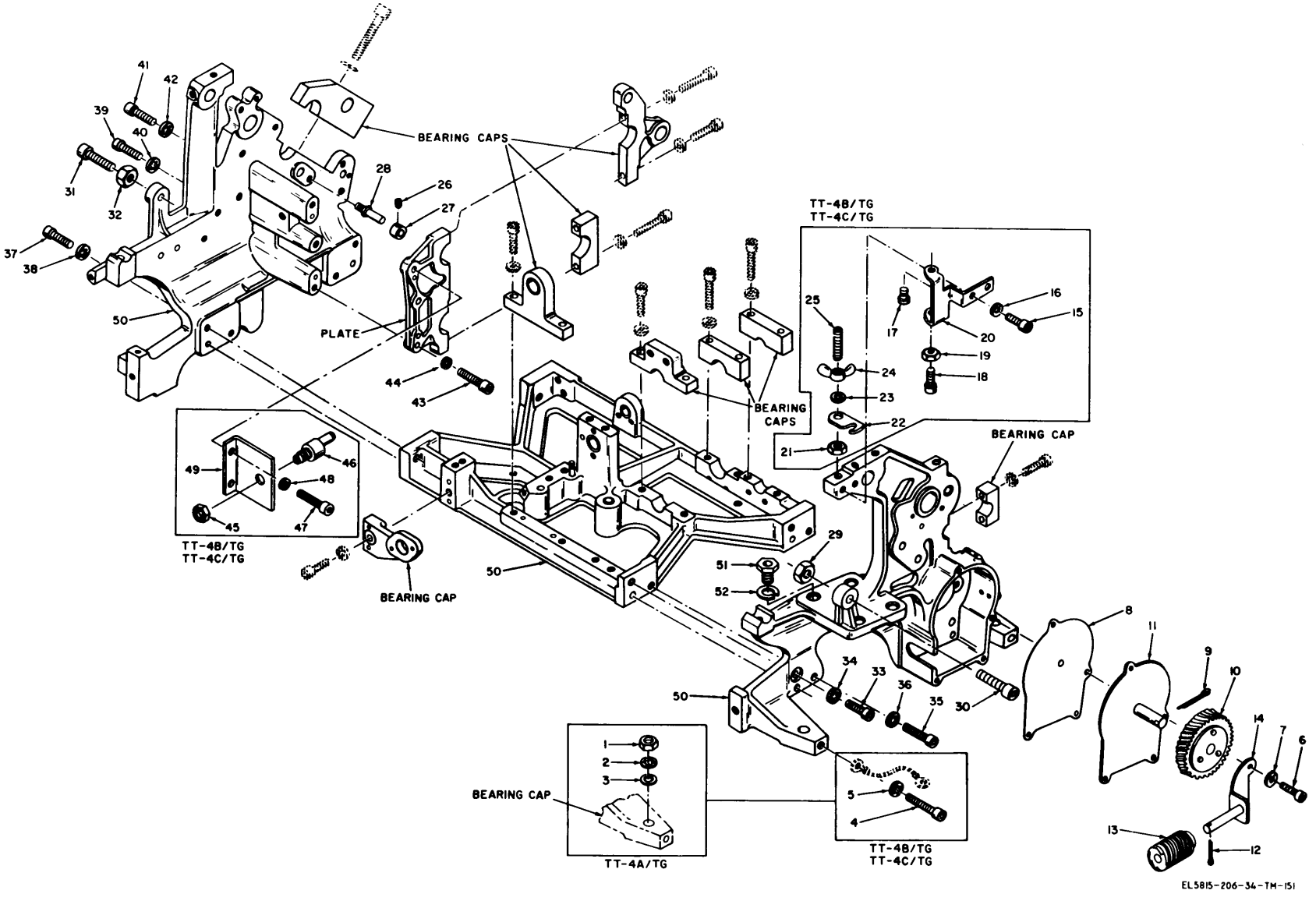


Figure 3-79. Teletypewriter frame assembly (TT-4A/TG, TT-4B/TG, TT-4C/TG, TT-698/TG, TT- 698A/TG and TT-698B/TG), exploded view.

b. Reassembly. Reassemble the teletypewriter frame assembly as indicated in figure 3-79; the sequence for assembling the parts is the reverse of the disassembly sequence.

3-110. Disassembly and Reassembly of Teletypewriter Frame Assembly TT-335/TG and TT-537/G

(fig. 3-80)

a. Disassembly.

(1) Remove the dust cover (para 3-22a).

(2) Remove the paper shaft, paper-shaft bracket, and paper chute (para 3-23a).

(3) Remove the assembled teletypewriter from the mounting base (para 3-25a).

(4) Remove the teletypewriter motor (para 3-26a).

(5) Remove the keyboard-transmitter (para 3-27a).

(6) Remove the platen assembly (para 3-28a).

(7) On TT-335/TG only, remove the two machine screws (11, fig. 3-80) and lockwashers that hold the platen bracket (16) to the frame assembly. Remove the bumper (13), machine screw (14), and hexagonal nut from the platen bracket.

(8) On TT-335/TG only, loosen the hexagonal nut (17) and remove the assembled items from the frame assembly. Remove the hexagonal nut, platen lock, lockwasher, and wingnut (20) from the setscrew.

(9) Remove the carriage assembly (para 3-29a).

(10) Remove the line terminal board (para 3-30a).

(11) Remove the instrument panel (para 3-32a).

(12) Remove the selector-magnet assembly (para 3-58a).

(13) Remove the rangefinder (para 3-59a).

(14) Remove the selector levers and Y-levers (para 3-62a).

(15) Remove the transfer-lever-shaft assembly (para 3-63a).

(16) Remove the print-bail-blade shaft assembly (para 3-64a).

(17) Remove the signal-bell assembly (para 3-65a).

(18) Remove the function-selecting machinism (para 3-67a).

(19) Remove the line-feed and platen-shift mechanism (para 3-70a).

(20) Remove the square-shaft assembly (para 3-71a).

(21) Remove the function-shaft assembly (para 3-72a).

(22) Remove the selector-camshaft assembly (para 3-74a).

(23) Remove the main-shaft assembly (para 3-76a).

(24) Remove the code-ring cage (para 3-78a).

(25) Remove the function-sensing-lever group (para 3-81a).

(26) Remove the manual-carriage-return mechanism (para 3-83a).

(27) Remove the carriage-feed mechanism (para 3-85a).

(28) Remove the carriage-return-operating mechanism (para 3-86a).

(29) Remove the carriage-rack-drive-shaft assembly (para 3-89a).

(30) Remove the margin-bell assembly (para 3-90a).

(31) Remove the carriage-feed shaft assembly (para 3-92a).

(32) Remove the carriage-return shaft assembly (para 3-94a).

(33) Remove the keyboard-transmitter drive-shaft assembly (para 3-96a).

(34) Remove the motor-stop assembly (para 3-99a).

(35) Remove the junction box assembly (para 3-104a).

(36) Remove the machine screw (25, fig. 3-80) and hexagonal nut from the frame assembly.

(37) Remove the self-locking hexagonal nut (39) that holds the eccentric post (40) to the eccentric post bracket (43); remove the eccentric post.

(38) Remove the two machine screws (41) and lockwashers that hold the eccentric post bracket to the plate; remove the eccentric post bracket.

(39) Remove the selector-side frame heater (para 3-41a).

(40) Remove the machine screws (fig. 3-80) and lockwashers that hold the frame assembly (24 and 53) together; disassemble the frame assembly if necessary.

NOTE

Do not disassemble and frame assembly unless a portion of it has been damaged and must be replaced.

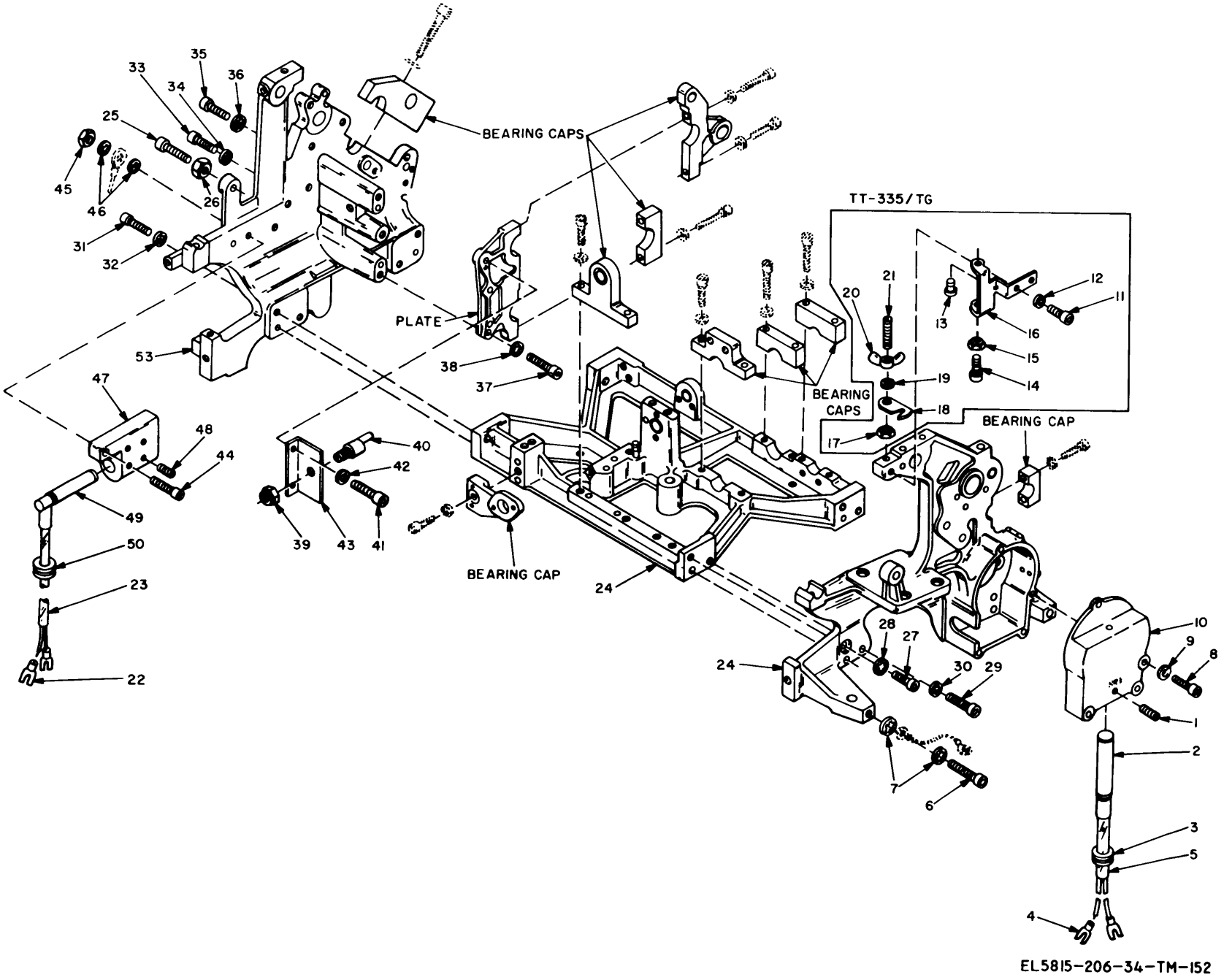


Figure 3-80. Teletypewriter frame assembly (TT-335/TG and TT-537/G), exploded view.

KEY to fig. 3-80:

1 Setscrew, 10220
2 Heater (HR3), 23241
3 Grommet, 20725
4 Terminal, 21065-0002
5 Plastic tubing
6 Machine screw, 10035-01
7 Lockwasher, 10431
8 Machine screw, 10006
9 Lockwasher, 10429
10 Heater casting, 64937A
11 Machine screw, 10076 [a]
12 Lockwasher, 10430 [a]
13 Bumper, 10762[a]
14 Machine screw, 11209[a]
15 Hexagonal nut, 10516 [a]
16 Platen bracket, 51464[a]
17 Hexagonal nut, 10509 [a]
18 Platen lock, 50598 [a]
19 Lockwasher, 10431 [a]
20 Wingnut, 10508 [a]
21 Setscrew, 10212[a]
22 Terminal, 21065-0002
23 Plastic tubing
24 Frame assembly, 61096A (includes bearing caps, three main castings, plate, dowels, and spring posts)
25 Machine screw, 10021
26 Hexagonal nut, 10502
27 Machine screw, 10024-01
28 Lockwasher, 10405
29 Machine screw, 10017-01
30 Lockwasher, 10405
31 Machine screw, 10017-01
32 Lockwasher, 10405
33 Machine screw, 10017-01
34 Lockwasher, 10405
35 Machine screw, 10017-01
36 Lockwasher, 10405
37 Machine screw, 10018
38 Lockwasher, 10431
39 Self-locking hexagonal nut, 10534
40 Eccentric post, 57894
41 Machine screw, 10018
42 Lockwasher, 10431
43 Eccentric post bracket, 57895
44 Machine screw, 10028
45 Hexagonal nut, 10515
46 Lockwasher, 10436
47 Heater casting, 64941A
48 Setscrew, 10235
49 Heater HR2, 64962
50 Grommet, 20725

[a] Used on TT-335/TG only.

[b] Used on TT-537/G only.

NOTE

Complete frame assembly including most items P/N 67242A can replace item 53.

b. Reassembly. Reassemble teletypewriter frame assembly by reversing the procedures outlined in *a* above.

3-111. Disassembly and Reassembly of Dust Cover (fig. 3-81)

a. Disassembly.

(1) Remove the dust cover (para 3-22a).

(2) Remove the thumb nut (1, fig. 3-81), plain hexagonal nut, lockwasher, and machine screw (4) that hold the ground loop of the copy light cable.

(3) Remove the thumb nut (5), plain hexagonal nut, lockwasher, machine screw (8), and lockwasher from the dust cover.

(4) Remove the holder slide spring (10) from the copy holder (14) and from the holder slide (15).

(5) Remove the machine screw (11) and slide the assembled holder slide from the dust cover (46).

(6) Remove the cotter pin (12) and pin (13) that hold the copy holder to the holder slide; remove the copy holder.

(7) Remove the two plain hexagonal nuts (16 and 20), four lockwashers, and two machine screws (19 and 24) that hold the grounding bond (22) to the dust cover door and to the dust cover.

(8) Remove the three machine screws (25) and nuts that hold the dust cover door (27) to the dust cover; remove the dust cover door.

(9) Remove the four machine screws (28) and nuts that hold the assembled window frame (35) to the dust cover; remove the assembled window frame.

(10) Remove the four machine screws (30) that hold the window channel (31) to the window frame; remove the window channel and slide the window glass (32) from the window frame.

(11) Remove the four machine screws (33) that hold the window channel (34) to the window frame; remove the window channel.

(12) Remove the two lamps (36 and 37) from their sockets in the dust cover.

(13) Remove the two plain hexagonal nuts (38) that hold the electrical leads of the copy light cable to the two copy light screws (44); remove the electrical leads and the four flat washers.

(14) Remove the two assembled copy light screws from their seat in the dust cover. Remove the two bushings (41), flat washers, and plain hexagonal nuts from the copy light screws.

(15) Remove the grommet (45) from the dust cover.

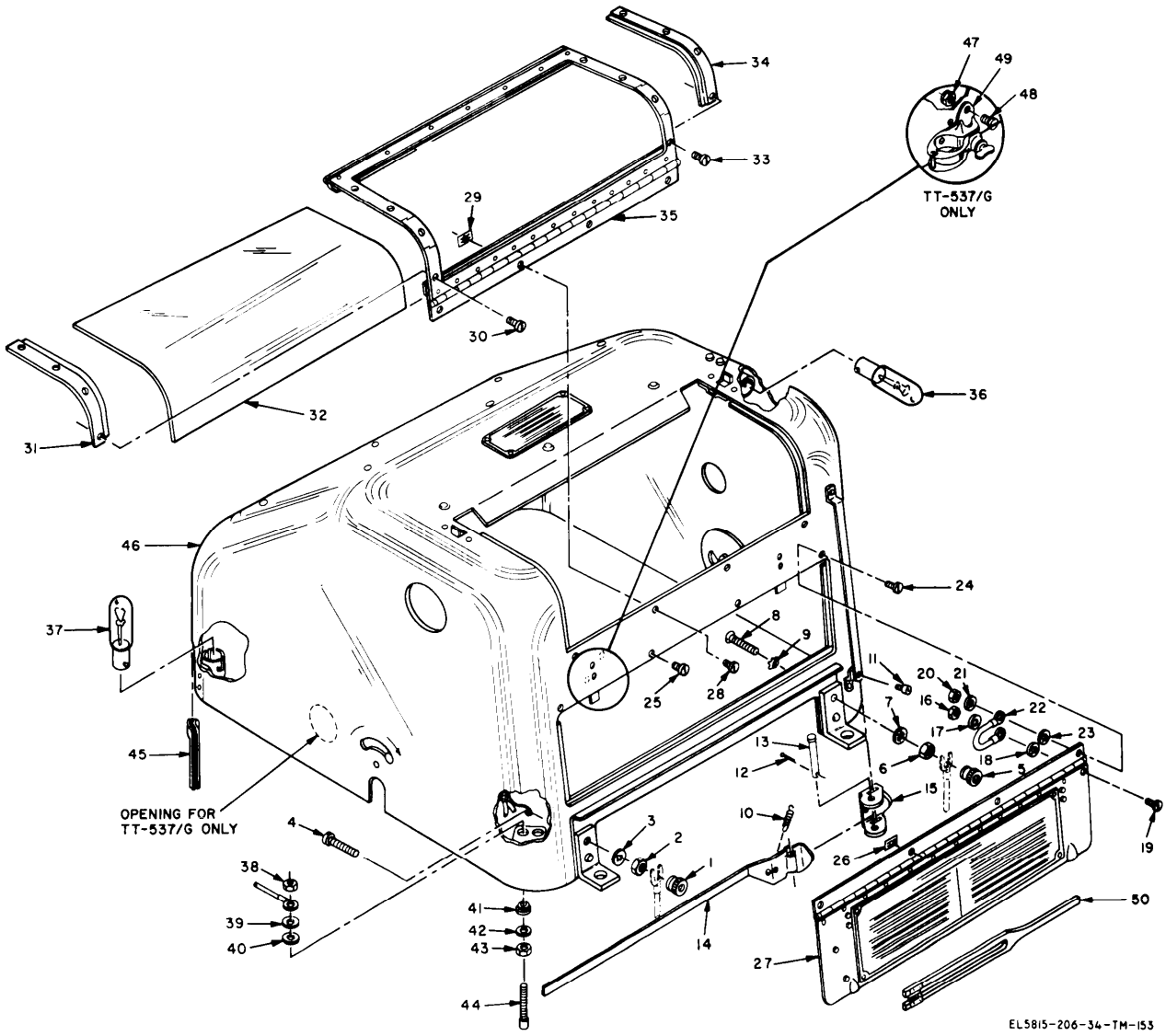


Figure 3-81. Dust cover, exploded view.

KEY to fig. 3-81:
1 Thumb nut, 10518
2 Plain hexagonal nut, 10509
3 Lockwasher, 10405
4 Machine screw, 10323[a], 12138 [bcde]
5 Thumb nut, 10518
6 Plain hexagonal nut, 10509
7 Lockwasher, 10405
8 Machine screw, 10323
9 Lockwasher, 10411
10 Holder slide spring, 54948
11 Machine screw, 10002
12 Cotter pin, 10801
13 Pin, 50935
14 Copy Holder, 53192
15 Holder slide, 50675
16 Plain hexagonal nut, 10517
17 Lockwasher, 10408
18 Lockwasher, 10408
19 Machine screw, 12335
20 Plain hexagonal nut, 10517
21 Lockwasher, 10408
22 Grounding bond, 51191A
23 Lockwasher, 10408
24 Machine screw, 12335
25 Machine screw, 12151
26 Nut, 10510
27 Dust cover door, 51472A [abcd]
28 Machine screw, 12151, 64935A[de]
29 Nut, 10510
30 Machine screw, 12300
31 Window channel (lb), 50834
32 Window glass, 50833
33 Machine screw, 12300
34 Window channel (rh), 50837
35 Window frame, 50665A (includes items 30 through 35)
36 Lamp, 20701 [ab], 23213[cde]
37 Lamp, 20701 [ab], 23213[cde]
38 Plain hexagonal nut, 10515
39 Flat washer, 10463
40 Flat washer, 51481
41 Bushing, 51106
42 Flat washer, 10463
43 Plain hexagonal nut, 10515
44 Copy light screw, 55022
45 Grommet, 51483
46 Dust cover, 60515A (includes items 1 through 45) 64919[d]51456 [e](also includes items 47, 48, and 49)
47 Self-locking hexagonal nut, 10573
48 Machine screw, 12122
49 Connector clamp, 51989A
50 Tuning fork, 50996A (only for AN/PGC-1 and AN/PGC-3)

[a]Used on TT-4A/TG and TT-698/TG.
[b]Used on TT-4B/TG and TT-698A/TG.
[c]Used on TT-4C/TG and TT-698B/TG
[d]Used on TT-335/TG.
[e]Used on TT-537/G.

b. Reassembly.

(1) Reassemble the dust cover as indicated in figure 3-81; the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Adjust the copy light screws as described in paragraph 3-267.

(3) Replace the dust cover (para 3-22b).

3-112. Disassembly and Reassembly of Teletype writer Base Assembly

(fig. 3-82)

a. Disassembly.

(1) Remove the dust cover (para 3-22a).

(2) Remove the mounting base (para 3-25a).

(3) Remove the two self-locking hexagonal nuts (1, fig. 3-82) lockwashers, machine screws (3), and lockwashers that hold the grounding straps (5) to the base (24); remove the grounding straps and the lockwashers.

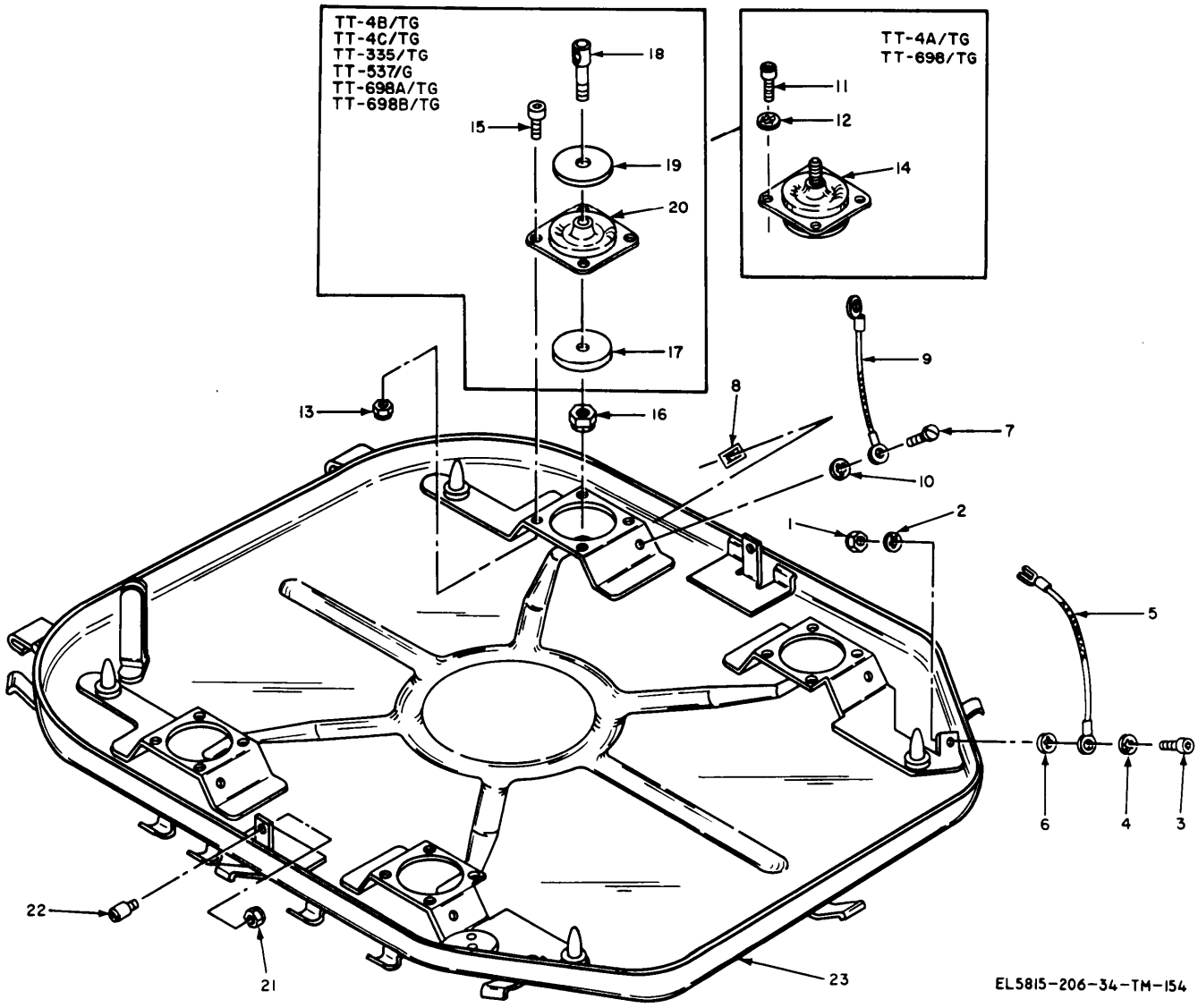
(4) Remove the four machine screws (7) and nuts that hold the four grounding straps (9) to the base; remove the grounding straps and the lockwashers.

(5) On the TT-4A/TG and TT-698/TG, remove the four machine screws (11), lockwashers, and self-locking hexagonal nuts that hold each of the four shock mounts (14) to the base; remove the shock mounts.

(6) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the four machine screws (15), lockwashers, and self-locking hexagonal nuts that hold each of the four assembled shock mounts to the base; remove the assembled shock mounts.

(7) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the snubbing washer (17) and lockwasher that hold the mounting stud (18) in the shock mount (20); remove the mounting stud and flat washer from the shock mount.

(8) On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG remove the two self-locking hexagonal nuts (21) that hold the two eccentric posts (22) to the base; remove the eccentric posts.



1 Self-locking hexagonal nut, 10501
2 Lockwasher, 10404
3 Machine screw, 10008-01
4 Lockwasher, 10404
5 Grounding strap, 51137A
6 Lockwasher, 10404
7 Machine screw, 10351
8 Nut, 10522
9 Grounding strap, 50730A[a], 64979A[b]
10 Lockwasher, 10404
11 Machine screw, 10008
12 Lockwasher, 10404
13 Self-locking hexagonal nut, 10501
14 Shock mount, 50860A
15 Machine screw, 10008
16 Self locking hexagonal nut, 10534[b]
17 Snubbing washer 61995
18 Mounting stud, 59367
19 Flat washer, 50727
20 Shock mount, 10911
21 Self-locking hexagonal nut, 10500
22 Eccentric post, 59358[b]
23 Base, 51470A[a], 57731A[b] (includes items 1 through 23)

[a] Used on TT-4A/TG and TT-698/TG.

[b] Used on TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-698B/TG.

Figure 3-82. Teletypewriter base assembly, exploded view.

b. Reassembly.

(1) Reassemble the teletypewriter base assembly as indicated in figure 3-82: the sequence for assembling the parts is the reverse of the disassembly sequence.

(2) Replace the mounting base (para 3-25b).

(3) Replace the dust cover (para 3-22b).

(4) Adjust the eccentric posts as described in paragraph 3-268.

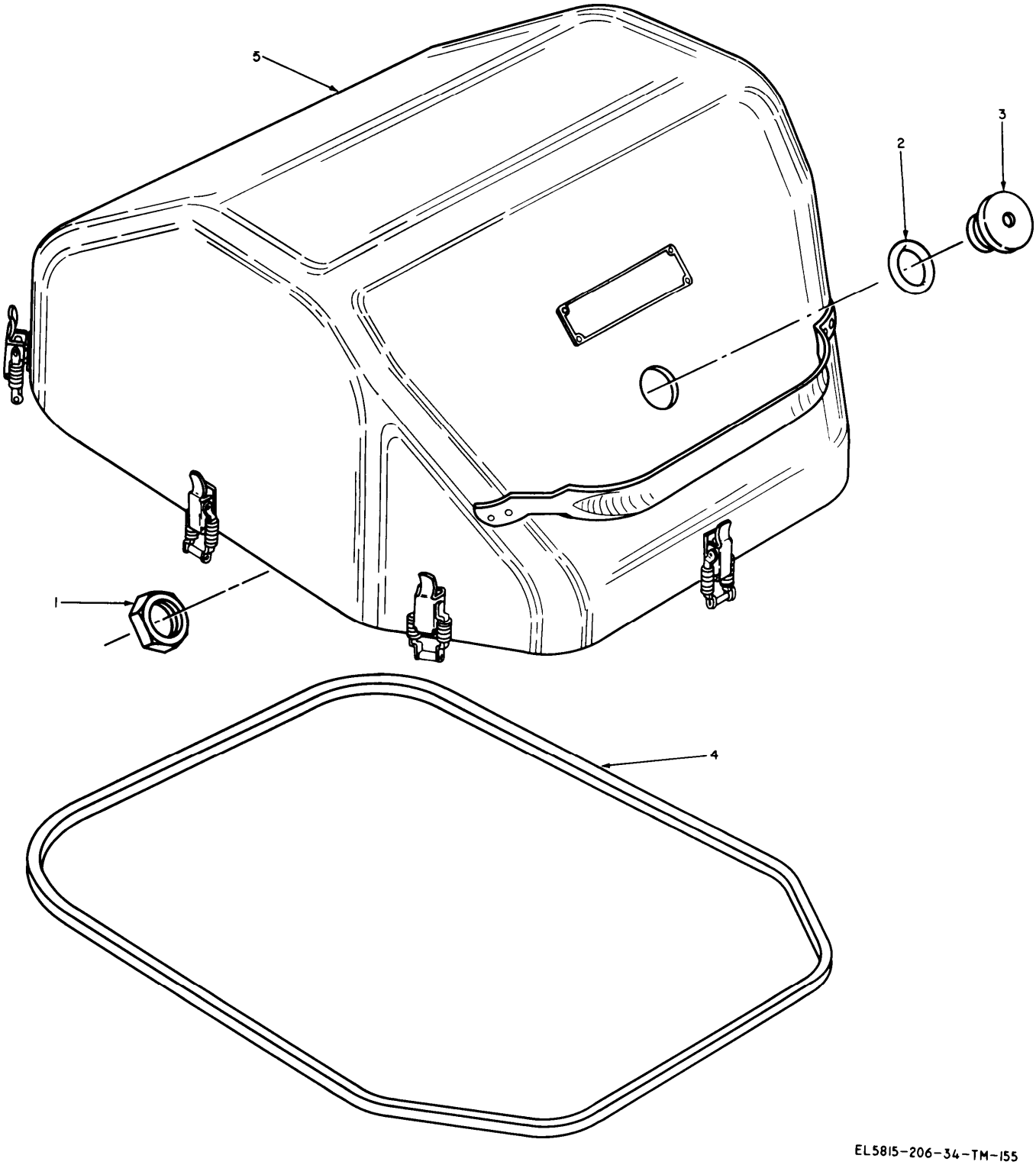
3-113. Disassembly and Reassembly of Immersion-proof Cover

(fig. 3-83)

a. Disassembly.

(1) Remove the retaining nut (1, fig. 3-83) that holds the air-relief valve (3) to the immersionproof cover (5): remove the outer seal (2) and the air-relief valve.

(2) Remove the gasket (4) from the immersionproof cover if loose or defective.



1 Retaining nut
2 Outer seal
3 Air-relief valve, 51139A (includes
4 Gasket, 51096
5 Immersion proof cover, 57720A (includes items 1 through 4)

Figure 3-83. Immersionproof cover (TT-4(*)/TG, TT-335/TG, TT-537/G and TT-698(*)/TG), exploded view.

b. Reassembly. Reassemble the immersionproof cover as indicated in figure 3-83; the sequence for assembling the parts is the reverse of the disassembly sequence.

NOTE

Use gasket cement (Permatex No. 2, or equal), as an adhesive when replacing the gasket. Replace a defective air-relief valve that does not have a cracking pressure of 3.5 pounds per square inch (psi) ±20 percent, and a reseating pressure of 2.5 psi ±10 percent.

Section VII. TELETYPEWRITER ADJUSTMENT PROCEDURES

3-114. General

This section contains the requirements and adjustment procedures for Teletypewriters TT-4(*)/TG, TT-335/TG, TT-537/G, TT-698(*)/TG, TT-722/TG and TT-722A/TG. Adjustment procedures are arranged in the proper sequence for a complete readjustment of the teletypewriter. When making individual adjustments, check all related adjustments. When it is necessary to remove parts or subassemblies in order to make an adjustment, refer to the specific removal and replacement instructions in paragraphs 3-21 through 3-113. Adjustments applicable to only the TT-4A/TG, TT-4B/TG, TT-335/TG, TT-537/G, TT-698/TG, or TT-698A/TG are so identified; otherwise adjustments apply to all models.

3-115. Sequence Chart of Adjustment for TT4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG.

NOTE

An asterisk in the column of the following chart indicates that an adjustment procedure exists for that teletypewriter. An [a] following the name of an adjustment indicates it is not applicable to TT-698(*)/TG models.

Paragraph No.	Name	TT-4A/TG and TT-698/TG	TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, TT-698B/TG, TT-722(*)/TG
3-116	Keylever-locking-bar adjustment.		(*)
3-117	Transmitter-camshaft end-play adjustment.	(*)	(*)
3-118	Cam-stop lever-latch end-play adjustment.	(*)	(*)
3-119	Universal-bar adjustment.	(*)	(*)
3-120	Repeat-blocking-lever adjustment.		(*)
3-121	sensing-levers alignment and end-play adjustments.	(*)	(*)
3-122	Selector-levers and sensing-levers clearance adjustment.	(*)	(*)
3-123	Selector-levers end-play adjustment.	(*)	(*)
3-124	Sensing-lever locking-bail adjustment.	(*)	(*)
3-125	Transmitter friction-clutch adjustment.	(*)	(*)
3-126	Transmitter friction-clutch adjustment.		(*)
3-127	Transmitter contact adjustment.	(*)	(*)
3-128	Start-stop selector-level-latch adjustment.	(*)	(*)
3-129	Keyboard-transmitter impulse length adjustment. [a]	(*)	(*)
3-130	Code-ring and locking-bail cam-follower-lever end-play adjustment.		(*)
3-131	Function sensing-lever end-play adjustment.	(*)	(*)
3-132	Function-sensing levers end-play adjustments (TT-4C/TG, TT-335/TG, TT-537/TG, and TT-698B/TG).		(*)
3-133	Draw-bar shimming adjustment (TT-4C/TG, TT-335/TG, TT-537/TG, and TT-698B/TG).		(*)
3-134	Restoring rollers and draw-bar assembly adjustment (TT-4C/TG, TT-335/TG, TT-537/TG, and TT-698B/TG).		(*)
3-135	Code-ring cage adjustment (TT-4C/TG, TT-335/TG, TT-537/TG, and TT-698/TG,		(*)
3-136	Function-shaft driven gear end-play adjustment.	(*)	(*)
3-137	Function-cam assembly alignment.	(*)	
3-138	Function-cam assembly alignment.		(*)
3-139	Function-shaft drive-collar adjustment.		(*)
3-140	Line-feed and figures-shift cam-followers clearance adjustment.	(*)	(*)
3-141	Function stop-bar guide adjustment.	(*)	(*)
3-142	Code-ring locking-bail cam-follower adjustment.		(*)
3-143	Locking-bail shaft adjustment.		(*)
3-144	Code-ring locking-bail adjustment.		(*)
3-145	T-lever alignment adjustment.	(*)	(*)
3-146	Transfer-lever-shaft end-play adjustment.	(*)	(*)

3-114 Continued

Paragraph No.	Name	TT-4A/TG and TT-698/G	TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, TT-698B/TG, TT-722(*)/TG
3-147	Transfer-lever roller-stud adjustment.	(*)	(*)
3-148	Transfer-lever-spring tension adjustment.		(*)
3-149	Y-lever eccentric-stop preliminary adjustment.	(*)	(*)
3-150	T-lever pivot stud adjustment.	(*)	(*)
3-151	Y-lever stud bracket adjustment.		(*)
3-152	Function-clutch clearance adjustment.	(*)	(*)
3-153	Function-clutch latch adjustment	(*)	(*)
3-154	Function-clutch eccentric post adjustment.		(*)
3-155	Y-lever detent end-play adjustment.		(*)
3-156	Y-lever detent and Y-lever adjustment.		(*)
3-157	Y-lever friction adjustment.	(*)	
3-158	Selector friction-clutch adjustment.	(*)	
3-159	Selector friction-clutch adjustment.		(*)
3-160	Rangefinder shaft adjustment.	(*)	(*)
3-161	Orientation lever adjustment.	(*)	(*)
3-162	Selector-lever adjustment.	(*)	(*)
3-163	Selector-lever comb adjustment.	(*)	(*)
3-164	Selector-magnet armature adjustment.	(*)	
3-165	Selector-magnet armature adjustment.		(*)
3-166	Stop-lever adjustment.	(*)	(*)
3-167	Armature upper-stop-screw adjustment.	(*)	(*)
3-168	Armature lower-stop-screw adjustment.	(*)	(*)
3-169	Selector-magnet adjustments.	(*)	(*)
3-170	Selector-magnet armature and selector-lever clearance adjustment.	(*)	(*)
3-171	Function punch-bar and side-plate adjustment.	(*)	(*)
3-172	Function-lever-bracket adjustment.	(*)	(*)
3-173	Letters-shift-lever shaft end-play adjustment.	(*)	(*)
3-174	Function-clutch tension adjustment.	(*)	
3-175	Function-shaft flexible-coupling disk adjustment.		(*)
3-176	Adjustment of angular relationship of function-shaft parts.		(*)
3-177	Function-cam adjustment.	(*)	(*)
3-178	Carriage-feed ratchet adjustment.	(*)	(*)
3-179	Carriage-feed shaft drive-collar adjustment.		(*)
3-180	Carriage-feed driving gear end-play adjustment.	(*)	(*)
3-181	Carriage-feed driven gear adjustment.	(*)	(*)
3-182	Carriage-feed pawl adjustment.	(*)	(*)
3-183	Carriage-return clutch-lever shaft clearance adjustment.	(*)	(*)
3-184	Carriage-return clutch-actuating-lever adjustment.		(*)
3-185	Carriage-return clutch adjustment.		(*)
3-186	Carriage-feed-clutch drum adjustment.	(*)	(*)
3-187	Decelerating cam and carriage-feed-clutch positioning adjustment.		(*)
3-188	Carriage-return latch-tripping-arm adjustment.		(*)
3-189	Square-shaft sliding-gear bearing adjustment.	(*)	(*)
3-190	Carriage position adjustment.	(*)	(*)
3-191	Ball bearing adjustment.	(*)	(*)
3-192	Carriage-rack adjustment.	(*)	(*)
3-193	Carriage-rack drive-shaft position adjustment.	(*)	(*)
3-194	Carriage-rack retainer adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).		(*)
3-195	Carriage-feed blocking adjusting lever and carriage-return blocking-lever clearance adjustment.		(*)
3-196	Carriage-return blocking-lever adjustment,		(*)
3-197	Carriage-feed blocking-lever adjustment.	(*)	(*)
3-198	Right-margin stop-screw adjustment.	(*)	
3-199	Carriage-return adjusting plate adjustment.		(*)
3-200	Throw-out lever adjustment.		(*)
3-201	Carriage-return-clutch adjustment.	(*)	
3-202	Carriage-return-link adjustment.	(*)	
3-203	Carriage-return latch-tripping arm adjustment.	(*)	
3-204	Carriage-feed friction-clutch adjustment.	(*)	(*)
3-205	Carriage-return friction-clutch adjustment.	(*)	(*)
3-206	Fulcrum adjustment.		(*)
3-207	Square-shaft driven-gear adjustment	(*)	(*)
3-208	Carriage rear-support bracket adjustment.	(*)	(*)
3-209	Type-selecting-arm and function-selecting-arm adjustment.	(*)	(*)

3-115–Continued

Paragraph No.	Name	TT-4A/TG and TT-698/TG	TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G. TT-698A/TG, and TT-698B/TG. TT-722(*)/TG
3-210	Square-shaft stop-arm torque adjustment.	(*)	(*)
3-211	Print-bail-blade adjustment.	(*)	(*)
3-212	Print-bail and ribbon-lifter adjustments.	(*)	(*)
3-213	Platen-trough-spring adjustment.	(*)	(*)
3-214	Platen-shaft end-play adjustment.	(*)	(*)
3-215	Platen-trough end-play adjustment.	(*)	(*)
3-216	Paper-guide adjustment.		(*)
3-217	Paper-guide adjustment.		(*)
3-218	Platen-pressure roller adjustment.		(*)
3-219	Platen pressure rollers adjustment.	(*)	
3-220	Platen-assembly end-play and positioning adjustment.	(*)	(*)
3-221	Character-printing density adjustment.	(*)	(*)
3-222	Figures-shift preliminary adjustment.	(*)	(*)
3-223	Figures-shift position adjustment.	(*)	(*)
3-224	Letters-shift position adjustment.	(*)	
3-225	Letters-shift position adjustment.	. . . . .	(*)
3-226	Platen-shift final adjustment.	(*)	(*)
3-227	Platen-blocking-arm adjustment.	. . . . .	(*)
3-228	Platen-blocking-arm bracket adjustment.	. . . . .	(*)
3.229	Line-feed detent adjustment,	(*)	(*)
3-230	Line-feed bellcrank adjustment.	. . . . .	(*)
3-231	Adjustable block and pawl adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).	. . . . .	(*)
3-232	Line-feed connecting-link adjustment.	. . . . .	(*)
3-233	Line-feed connecting-link adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).	. . . . .	(*)
3-234	Line-feed connecting-link adjustment.	(*)	
3-235	Margin-bell and bracket adjustment.	(*)	(*)
3-236	Manual carriage-return bracket adjustment.	. . . . .	(*)
3-237	Carriage-return trip-pawl adjustment.	(*)	
3-238	Carriage-return trip-pawl adjustment.	. . . . .	(*)
3-239	Left-hand margin trip plate adjustment (TT-537/G).	. . . . .	(*)
3-240	Automatic carriage return shift link adjustment (TT-537/G).	. . . . .	(*)
3-241	Automatic carriage return shift stop adjustment (TT-537/G).	. . . . .	(*)
3-242	Automatic carriage return stop-bar return spring adjustment.	. . . . .	(*)
3-243	Ribbon-feed mounting adjustment.	(*)	(*)
3-244	Ribbon-spool shaft adjustment.	(*)	(*)
3-245	Ribbon-feed-clutch spring adjustment.	(*)	(*)
3-246	Ribbon-reverse beam adjustment.	(*)	(*)
3-247	Ribbon-reverse detent-plate adjustment.	(*)	(*)
3-248	Ribbon-spool driving-collar adjustment.	(*)	(*)
3-249	Ribbon-spool friction-spring adjustment.	. . . . .	(*)
3-250	Ribbon-sensing-lever adjustment.	(*)	(*)
3-251	Ribbon-reverse cam-follower adjustment.	(*)	(*)
3-252	Signal-bell bracket adjustment.	(*)	(*)
3-253	Signal-bell preliminary adjustment.	(*)	(*)
3-254	Signal-bell final adjustment.	(*)	(*)
3-256	Motor-stop contact-lever lug adjustment. [a]	(*)	
3-256	Motor-stop contacts and eccentric sleeves adjustments. [a]	(*)	
3-257	Motor-stop contact-lever spring adjustment. [a]	. . . . .	(*)
3-258	Motor-stop-relay coil adjustment.	. . . . .	(*)
3-259	Motor-stop switches and eccentric sleeves preliminary adjustments. [a]	. . . . .	(*)
3-260	Motor-stop contact-lever lug adjustment. [a]	. . . . .	(*)
3-261	Motor-stop eccentric sleeves final adjustment. [a]	. . . . .	(*)
3-262	Motor gears backlash adjustment.	. . . . .	(*)
3-263	Motor-governor brush holder adjustment.	. . . . .	(*)
3-264	Motor-governor contacts alignment.	(*)	(*)
3-265	Governor-assembly locating adjustment.	(*)	(*)
3-266	Governor target adjustment.	(*)	(*)
3-267	Copy-light screws adjustment.	(*)	(*)
3-268	Dust-cover cam-lock adjustment.	. . . . .	(*)
3-269	Carriage lock-lever adjustment (TT-537/G).	. . . . .	(*)
3-270	Platen lock clamp lever end-play adjustment (TT-537/G).	. . . . .	(*)
3-271	Platen clamp adjustment TT-537/G).	. . . . .	(*)
3-272	Platen lock release arm adjustment (TT-537/G).		(*)

3-116. Keylever-Locking-Bar Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-84)

a. Requirement. There should be a .005- to .030-inch clearance between the keylever-locking bar and the keylevers.

b. Adjustment. Loosen the three mounting screws and move the keylever-locking bar up or down to meet the requirement. Check both ends of the bar and tighten the mounting screws. Recheck the clearance.

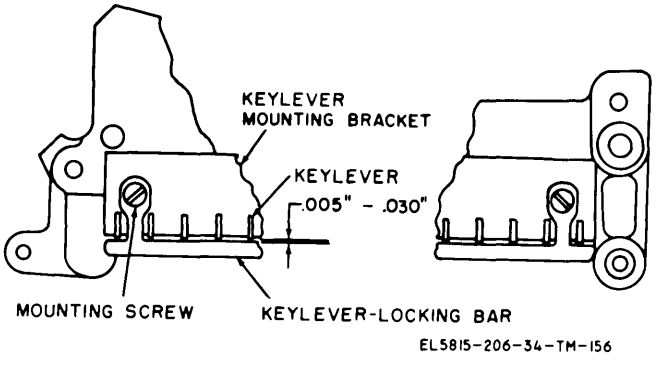


Figure 3-84. Keylever-locking-bar adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

3-117. Transmitter-Camshaft End-Play Adjustment

(fig. 3-85)

a. Requirement. There should be a .001- to .005-inch clearance between the spacer and the adjacent ball bearing when the cam end of the transmitter camshaft is pressed toward the keyboard casting.

b. Adjustment. Loosen the setscrews in the clutch fork and insert a .003-inch gage between the spacer and the bearing. Press the transmitter camshaft and the clutch fork toward each other; align the setscrews with the flats on the cam shaft; and tighten the setscrews Remove the feeler gage.

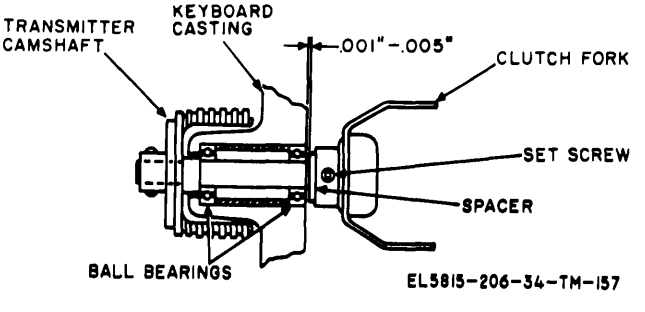


Figure 3-85. Transmitter-camshaft end-play adjustment.

3-118. Cam-Stop Lever-Latch End-Play Adjustment

(fig. 3-86)

a. Requirement. There should be a .002- to .005-inch clearance between the cam-stop-lever latch and the keyboard casting.

b. Adjustment. Loosen the setscrew and position the cam-stop-lever-latch stud to meet the requirement in *a* above. Tighten the setscrew and recheck the requirement.

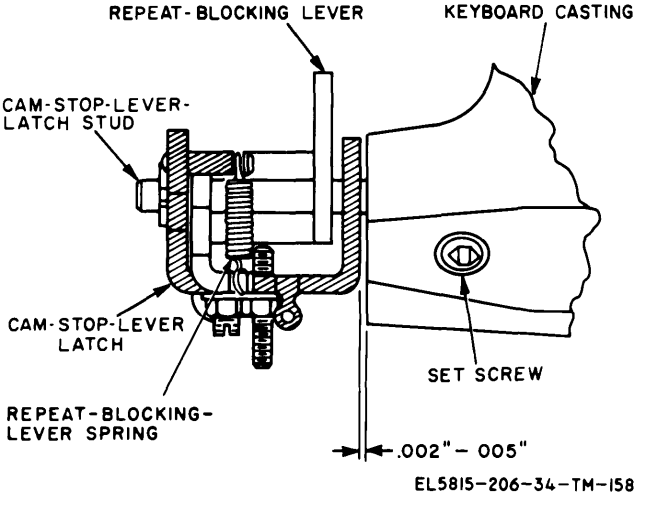


Figure 3-86. Cam-stop lever-latch end-play adjustment.

3-119. Universal-Bar Adjustment

(fig. 3-87)

a. Requirement. There should be a .005- to .015-inch clearance between the cam-stop-lever and the cam-stop-lever latch when any keylever is in the depressed position.

b. Method of Checking. Depress each keylever and see that the clearance between the cam-stop-lever and the cam-stop-lever latch meets the requirement.

c. Adjustment. Loosen the locknut and turn the universal-bar adjusting screw in or out to meet the requirement. Tighten the lock nut and recheck the clearance.

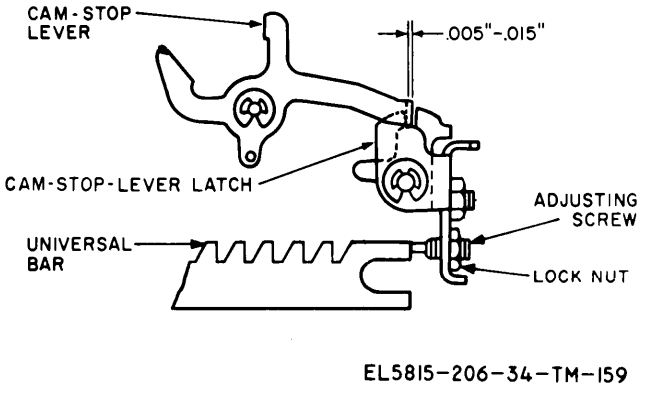


Figure 3-87. Universal-bar adjustment.

3-120. Repeat-Blocking-Lever Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/ G, TT-698A/TG, and TT-698B/TG

(fig. 3-88)

a. Requirement. There should be .045- to .050-inch clearance between the upper *edges* of the repeat-blocking lever and cam-stop-lever latch when the cam-stop lever is in the restored (counterclockwise) position.

b. Method of Checking. Rotate the transmitter camshaft manually until the cam-stop-lever is in the restored position and the camshaft no longer turns. Measure the clearance between the repeat-blocking lever and cam-stop-lever latch.

c. Adjustment. Loosen the locknut that secures the repeat-blocking-lever adjusting screw and turn the screw in or out to meet the requirement. Tighten the nut and recheck the clearance.

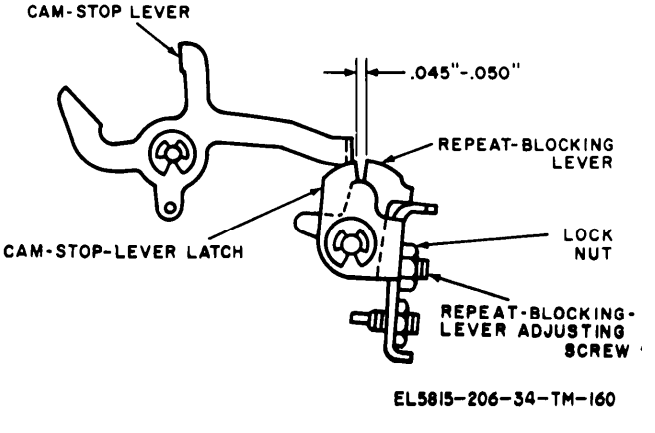


Figure 3-88. Repeat-blocking-lever adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

3-121. Sensing-Levers Alignment and End-Play Adjustments

(fig. 3-89)

a. *Requirements.*

(1) Each sensing lever should be in alignment (visual check) with its associated code bar.

(2) There should be a .001- to .003-inch clearance between the No. 1 sensing lever and the outer spacer when the No. 1 sensing lever is pressed toward the keyboard casting.

b. Adjustments.

(1) Loosen the setscrew in the keyboard casting and slowly pull the pivot stud outward until the laminated washer can be removed.

(a) If the sensing levers, as a group, were too *close* to the keyboard casting, insert a new laminated washer, peeled to size, to meet requirement of *a* (2) above.

(b) If the sensing levers were too *far* from the keyboard casting, peel laminations from the old washer and install the old washer to obtain the required alignment.

(2) Insert a .002 -inch feeler gage between the outer spacer and the No. 1 sensing lever; press the pivot stud toward the keyboard casting; tighten the setscrew; and remove the feeler gage.

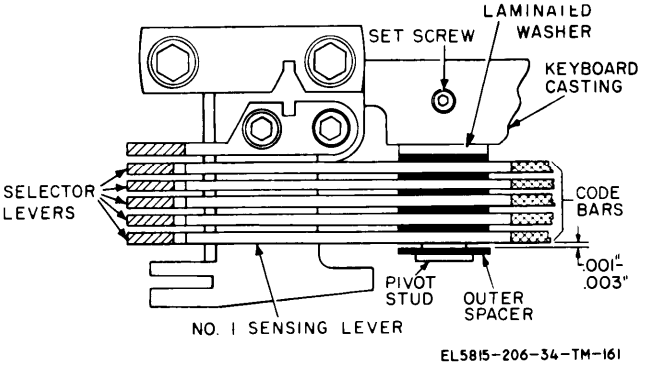


Figure 3-89. Sensing-levers alignment and end-play adjustment.

3-122. Selector-Levers and Sensing-Levers Clearance Adjustment

(fig. 3-90)

a. Requirement. There should be a .005-inch minimum clearance between each selector lever and its associated sensing lever when the selector lever is against a low part of its associated code-impulse cam and the sensing lever is in the counterclockwise position.

b. Adjustment. Loosen the mounting screws: position the selector-lever comb to meet the requirement; and tighten the mounting screws. Check the start-stop selector-lever latch adjustment (para 3-128).

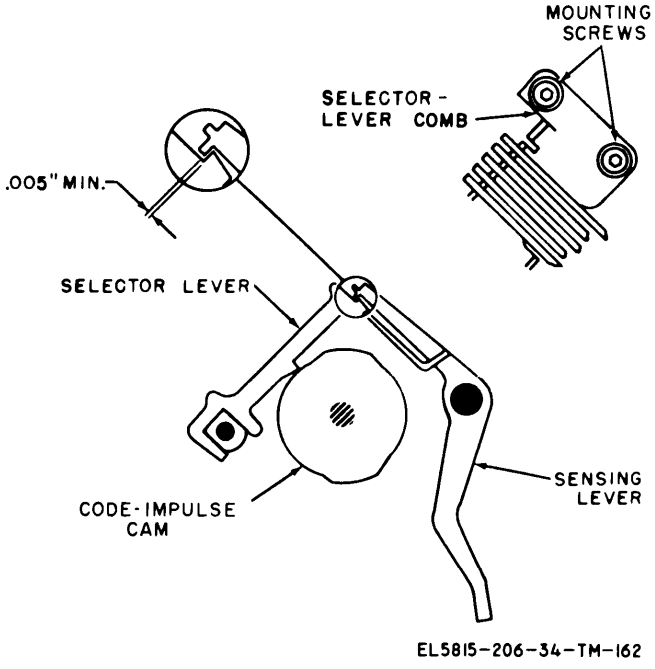


Figure 3-90. Selector-levers and sensing-levers clearance adjustment.

3-123. Selector-Levers End-Play Adjustment

(fig. 3-91)

a. Requirement. There should be a .001 - to .007-inch clearance between the laminated spacer and the No. 1 selector lever.

b. Adjustment. Remove parts as necessary to gain access to the laminated washer. Either remove laminations from the washer or insert a new laminated washer, peeled to size, to meet the requirement. Reassemble the parts and recheck the clearance. Check the sensing-lever locking-bail adjustment (para 3-124).

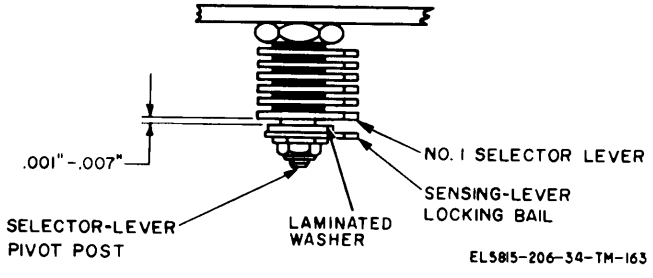


Figure 3-91. Selector-levers end-play adjustment.

3-124. Sensing-Lever Locking-Bail Adjustment

(fig. 3-92)

a. Requirement. There should be equal clearance between the blade of the sensing-lever-locking bail and the projections on the upper end of the sensing-levers.

b. Method of Checking. Depress R or Y keylever. Turn the transmitter camshaft clockwise by hand until the blade of the sensing-lever-locking bail engages the sensing levers. Check the clearances visually.

c. Adjustment. Loosen the locknut and turn the eccentric bearing clockwise or counterclockwise until the clearances are equal. Tighten the locknut and recheck the clearances.

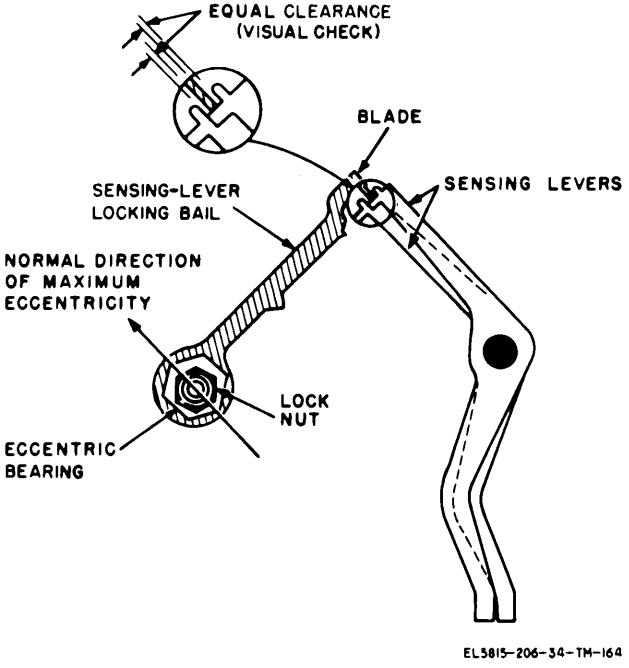


Figure 3-92. Sensing-lever locking-bail adjustment.

3-125. Transmitter Friction-Clutch Adjustment (TT4A/TG and TT-698/TG)

(fig. 3-93)

a. Requirements.

(1) There should be a .005- to .025-inch clearance between the collar of the friction-clutch disk and the bearing of the clutch fork.

(2) On the TT-4A/TG a pull of 25 to 30 ounces should be required to prevent the clutch fork from turning when the motor is on and the transmitter camshaft is not operating any levers.

(3) On the TT-698/TG a pull of 38 to 44 ounces should be required to prevent the clutch fork from turning when the motor is on and the transmitter camshaft is not operating any levers.

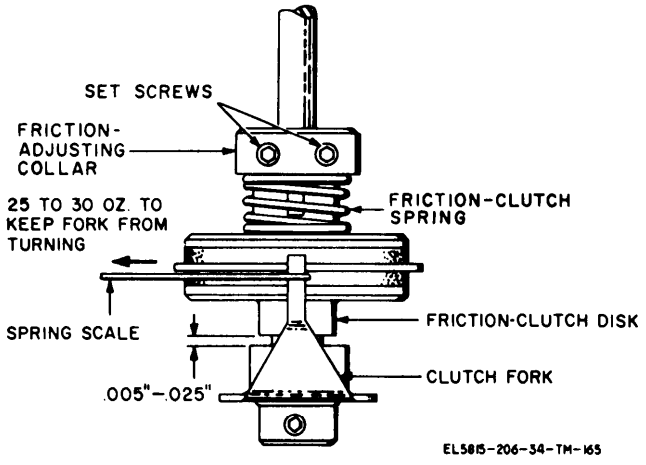


Figure 3-93. Transmitter friction-clutch adjustment (TT-4A/TG and TT-698/TG).

b. Method of Checking.

(1) Insert a flat feeler gage between the collar of the friction-clutch disk and the bearing of the clutch fork to determine the clearance.

(2) Engage one arm of the clutch fork with the hooked end of a spring scale. Hold the scale tightly and turn the motor on. Press the space bar; allow the transmitter camshaft to turn slightly until none of the cams are operating a lever; and read the scale.

c. Adjustments.

(1) Loosen the two setscrews in the collar of the friction-clutch disk; position the disk until requirement *(a* (1) above) is met; and tighten the two setscrews.

(2) Loosen the setscrews in the friction-adjusting collar and move the collar to increase or decrease compression of the friction-clutch spring, as necessary, to meet requirement *(a* (2) above). Tighten the setscrews and recheck the requirement.

3-126. Transmitter Friction-Clutch Adjustment (TT4B/TG, TT-4C/TG, TT-335/TG, TT-TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-94)

a. Requirements.

(1) There should be a .005- to .025-inch clearance between the collar of the friction-clutch disk and the bearing of the clutch fork.

(2) On the TT-4B/TG and TT-4C/TG a pull of 25 to 30 ounces should be required to prevent the clutch fork from turning when the motor is on and the transmitter camshaft is not operating any levers.

(3) On the TT-698A/TG and TT-698B/TG a pull of 38 to 44 ounces should be required to prevent the clutch fork from turning when the motor is on and the transmitter camshaft is not operating any levers.

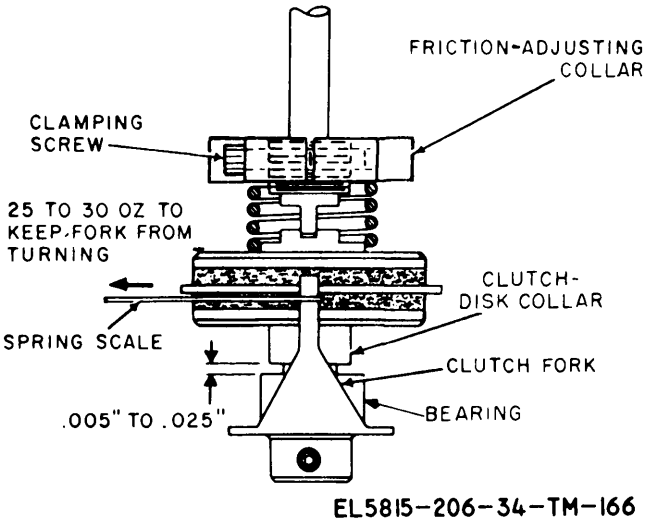


Figure 3-94. Transmitter friction-clutch adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, TT-698B/TG).

b. Method of Checking.

(1) Insert a flat feeler gage between the collar of the friction-clutch disk and the bearing of the clutch fork to determine the clearance.

(2) Engage one arm of the clutch fork with the hooked end of a spring scale. Hold the scale rigid; depress the space bar; allow the camshaft to turn slightly until none of the cams is operating a lever; and read the scale.

c. Adjustments.

(1) Loosen the two setscrews in the collar of the friction-clutch disk and position the disk until requirement of *a* (1) above is met. Tighten the two setscrews.

(2) Loosen the clamping screws in the friction-adjusting collar and turn the adjusting collar clockwise or counterclockwise to obtain requirement *(a* (2) above). Tighten the clamping screws and recheck the equipment.

3-127. Transmitter Contact Adjustment (High Level Units)

(fig. 3-95)

a. Requirement. There should be slight, but minimum, breaks in the signal circuit between successive marking impulses when the transmitter camshaft is turned manually.

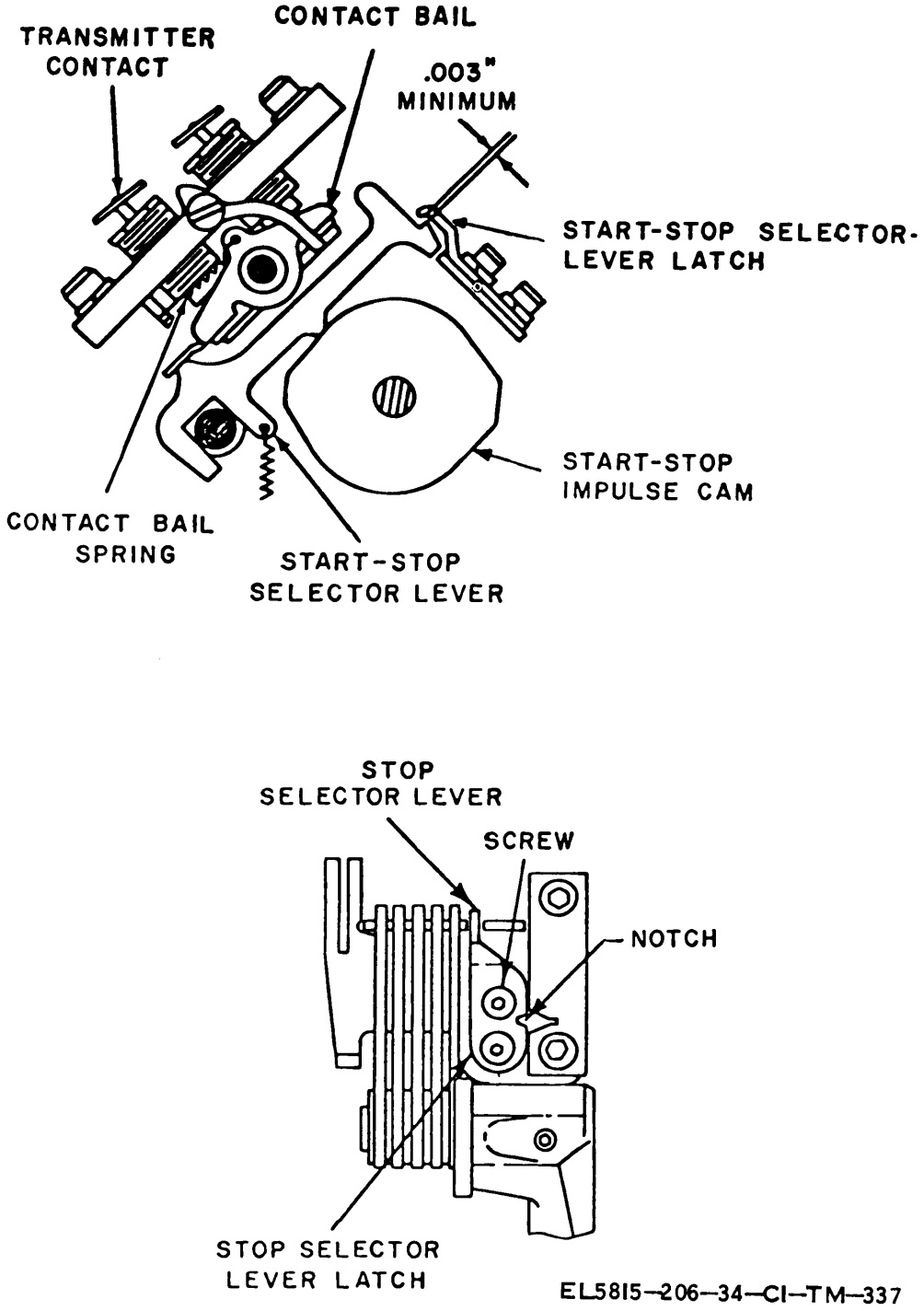


Figure 3-95. Start-stop selector-lever-latch and transmitter contact adjustment.

b. Method of Checking. Connect a milliameter in series with the signal circuit. Press the LTRS keylever; slowly turn the motor by hand and observe the meter pointer as the transmitter camshaft revolves slowly.

c. Adjustment. Turn the transmitter contact toward the contact bail until no breaks occur between successive marking impulses. Then slowly turn the contact away from the contact bail until a slight break occurs between marking impulses. If Distortion Test Set TS-383/GG is available, perform the transmitter impulse length adjustment (para 3-129).

3-128. Start-Stop Selector-lever-latch and Transmitter Contact Adjustment

(fig. 3-95)

a. Start-Stop Selector-Lever-Latch Adjustment (High-Level Units Not Applicable to TT-698(*)/TG).

(1) *Requirement.* There should be a slight, but minimum, break in the signal circuit between transmission of a fifth code impulse (marking) and the stop impulse when the transmitter camshaft is turned manually. There should be a .003-inch minimum clearance between the start-stop selector lever and the start-stop selector-lever latch when the selector lever is against a low portion of its cam.

(2) *Method of Checking.* Connect a millimeter in series with the signal circuit. Press the T keylever; turn the motor slowly by hand; and observe the meter as the fifth code impulse end and the stop impulse begins. Check the clearance between the start-stop selector-lever and the start-stop selector-lever latch with a feeler gage.

(3) *Adjustment.* Loosen the machine screws that hold the start-stop selector-lever latch. Move the latch to the right or left until a minimum break is obtained between the marking fifth code impulse and the stop impulse. Move the latch to the right to decrease the break, and to the left to increase the

break. When the start-stop selector lever is against a low part of its cam, check the clearance between the selector lever and its latch. If the clearance is less than .003 inch, repeat the selector-levers and sensing-levers clearance adjustment (para 3-122). Then reposition the start-stop selector-lever latch to meet requirement (a (2) above).

b. Stop Selector Lever Latch and Transmitter Contact Assembly Adjustment (Low Level Units TT-698(*)/TG (fig. 3-95).

(1) *Requirement.*

(a) The stop selector lever latch should be adjusted to give the correct stop pulse length. There should be a .003-inch minimum clearance between the stop selector lever and stop selector lever latch when the stop selector lever is on a low point of its cam.

(b) The mark and space impulses from the sequential keyboard transmitter should be of equal time duration.

(2) *Methods of Checking.* An oscilloscope (Test Set AN/GGM-15(V)) should be used to measure signals transmitted by the keyboard transmitter.

(3) *Adjustment.*

(a) On the A1 terminal box assembly, connect an oscilloscope (Test Set AN/GGM-15(V)) to terminals 1 (+) and 2 (-) of terminal board A1TB1.

(b) Loosen the socket head screws that secure the selector lever latch. Turn the motor on and push the BLANK key repeatedly. With a screwdriver in the notch of the selector lever latch and latch bracket, move the selector lever latch to obtain the required stop signal length (19.2 milliseconds at 100 wpm) on the oscilloscope. Move it to the left to decrease, and to the right to increase the pulse length; tighten the screws and recheck the signal length.

NOTE

The notch is not present on the TT-698/TG.

(c) Type the R character repeatedly. Adjust the transmitter contact on the contact assembly until a wave shape appears with negative and positive transitions (bits) of equal time duration.

3-129. Transmitter Impulse Length Adjustment (Not Applicable to TT-698(*)/TG)

(fig. 3-96)

NOTE

This adjustment requires the use of Distortion Test Set TS-383/GG and normally is performed at depot maintenance shops only.

a. Requirements.

(1) The time length of each of the five code impulses (neutral operation) should be 100 (±5) divisions on the measuring scale of the TS-383/GG.

(2) The time length of the stop impulse (neutral operation) should be 142 (±7) divisions.

(3) Each impulse should begin within five divisions of the zero marking on the measuring scale of the test set and should end within five divisions of the zero marking for the next impulse.

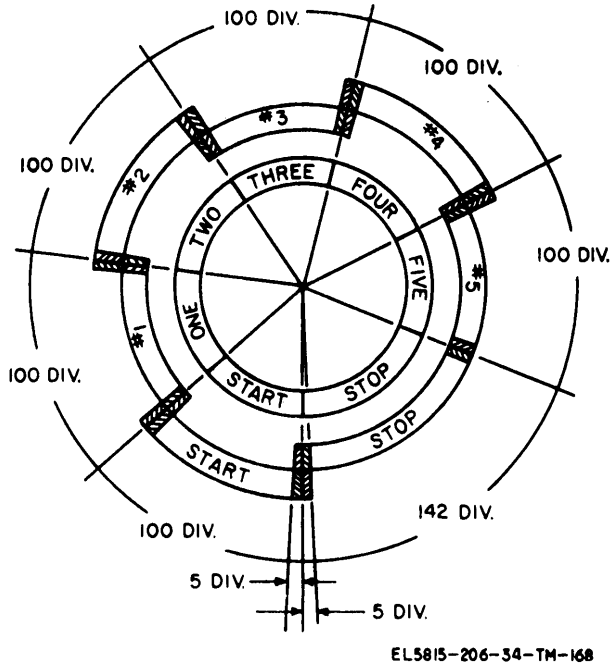


Figure 3-96. Transmitter impulse length requirements.

b. Method of Checking.

(1) Prepare the teletypewriter and the distortion test set for 100-wpm operation.

(2) Check the keyboard-transmitter friction clutch adjustment (para 3-125 and 3-126); readjust the clutch if necessary.

(3) Remove the repeat-blocking-lever spring (fig. 3-86).

(4) Turn on the motor of the teletypewriter and the motor of the test set. Press the LTRS keylever and turn the measuring scale of the test set to align the visible impulses with their respective segments on the measuring scale. Check each impulse for its applicable requirements *(a* above).

(5) If the requirements are met, replace the repeat-blocking-lever spring (fig. 3-86) and restore the teletypewriter for 60-wpm operation (unless it is to be used for 100-wpm operation).

c. Adjustments.

(1) Perform *b* (1), (2), and (3) above.

(2) Adjust the mark transmitter contact until requirements *a* (1) and (3) above are met.

(3) Adjust the position of the start-stop

selector-lever latch to meet requirements *a* (2) and (3) above.

(4) Perform step *b* (5) above.

3-130. Code Ring and Locking-Bail Cam-Follower-Lever End-Play Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

NOTE

This adjustment should be made only when the code-ring cage has been removed from the machine (para 3-78a).

a. Requirements.

(1) There should be .002- to .004 -inch clearance between the code-ring collar and the ball retainer.

(2) There should be a .002- to .010-inch clearance between the sleeve bearing and the locking-bail cam-follower lever.

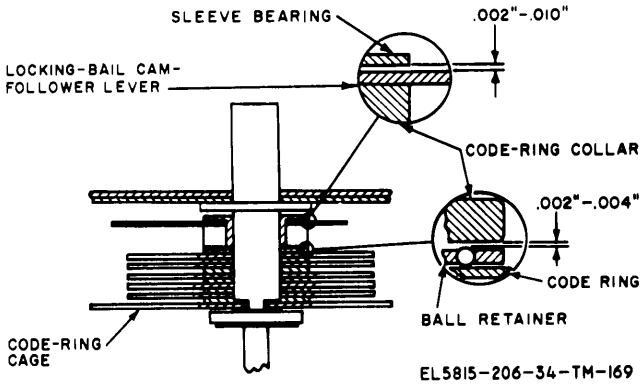


Figure 3-97. Code-ring and locking-bail cam-follower lever end-play adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking.

(1) Insert a flat feeler gage upward from the bottom of the code-ring cage into the space between the code-ring collar and the bail retainer.

(2) Insert a flat feeler gage upward from the bottom of the code-ring cage into the space between the sleeve bearing and the locking-bail cam-follower lever.

c. Adjustment. Loosen the two setscrews that clamp the code-ring collar and the sleeve bearing to the shaft of the code-ring cage. (One setscrew is accessible from the bottom of the code-ring cage. To loosen the other setscrew, insert a wrench between the top center stop bars and through the access hole in the code-ring cage spacer.) Insert a .003-inch flat feeler gage between the ball retainer and code-ring collar; hold the gage in place, shift the sleeve bearing to meet the requirement in *a* (2) above; and tighten the setscrews. Recheck the clearance.

3-131. Function-Sensing-Levers End-Play Adjustment

(fig. 3-98)

NOTE

Perform this adjustment whenever the code-ring cage is changed, replaced, or removed.

a. Requirement. There should be a .001- to .005-inch clearance between the flat washer and the line-feed sensing lever.

b. Method of Checking. Use flat feeler gages to check the clearance between the line-feed sensing lever and the flat washer.

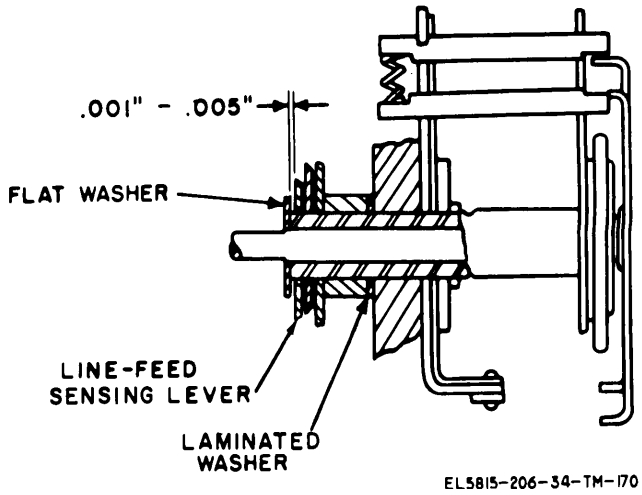


Figure 3-98. Function-sensing-levers end-play adjustment.

c. Adjustment. Remove the code-ring cage and either peel as many laminations as necessary from the laminated washer or install a new laminated washer, peeled to size. Remove all burs from the laminated washer. Reassemble the parts, recheck the clearance, and remove additional laminations, if necessary. Check related adjustments (para 3-141, 3-142, 3-150, and 3-207).

3-132. Function Sensing-Levers End-Play Adjustment (TT-4C, TT-335/TG, TT-537/G, and TT-698B/TG)

(fig. 3-99)

Perform this adjustment whenever the code-ring cage, sensing levers, or spacers are changed, replaced, or removed (para 3-78a).

a. Requirement. The sensing lever sleeve should project 0.025 to 0.050 inch beyond the hub of the code-ring cage.

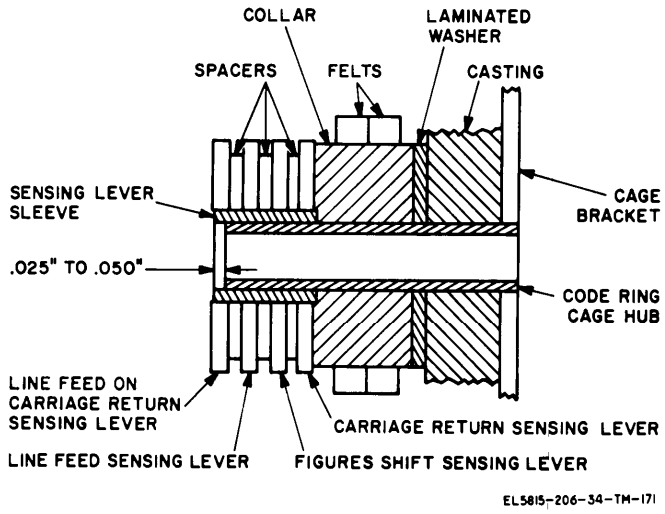


Figure 3-99. Function-sensing-levers end-play adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

b. Method of Checking. Remove the necessary parts to gain access to the sensing levers. Remove the thrust bearing and line-feed-on-carriage-return sensing lever. Remove the antibounce clutch shaft. Place a straightedge against the end of the sensing-lever sleeve and check the requirement with wire feeler gages.

c. Adjustment. Remove the remaining sensing levers, spacers, sensing-lever sleeve, and collar. Replace the laminated washer with one which is peeled to the correct thickness and has all burs removed. Reinstall the collar and sleeve, and recheck the requirement. Make sure the carriage-return sensing lever does not rub against the stop-bar support when installed against the collar. Reinstall the sensing levers and components. Check the related adjustments (para 3-207 and 3-209).

3-133. Draw-Bar Shimming Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)

(fig. 3-100)

NOTE

This is a preliminary setting; for final adjustment, refer to paragraph 3-134. The function shaft assembly must be removed from the machine before this setting can be performed.

a. Requirement.

(1) The draw-bar assembly should be centered on the draw-bar stud.

(2) The draw-bar assembly should be free to move up and down, and end play must not exceed 0.010 inch.

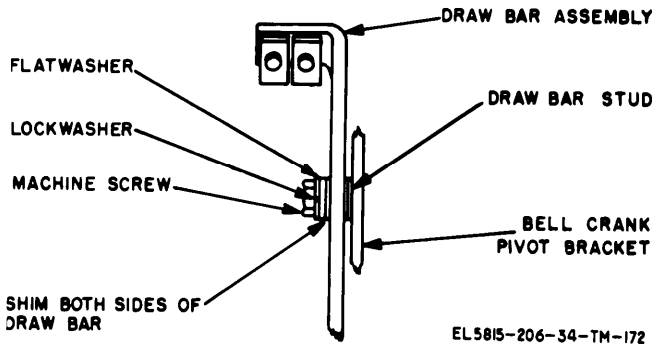


Figure 3-100. Draw-bar shimming adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-693B/TG).

b. Adjustment. Remove the machine screw, lockwasher, and flat washer. Install shims equally on both sides of the draw bar to meet requirements *(a* above). Reassemble with the machine screw, lockwasher, and flat washer. Reinstall the function-shaft assembly on the teletypewriter.

3-134. Restoring Rollers and Draw-Bar Cam Assembly Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)

(fig. 3-101)

a. Requirements.

(1) When the restoring rollers and draw-bar cam assembly is against the laminate washer, the carriage-return sensing lever should ride on its restoring rollers without rubbing the spacers on either side; the figures-shift sensing lever should not rub the spacer adjacent to it.

(2) The draw bar should operate freely on the draw-bar actuating cam.

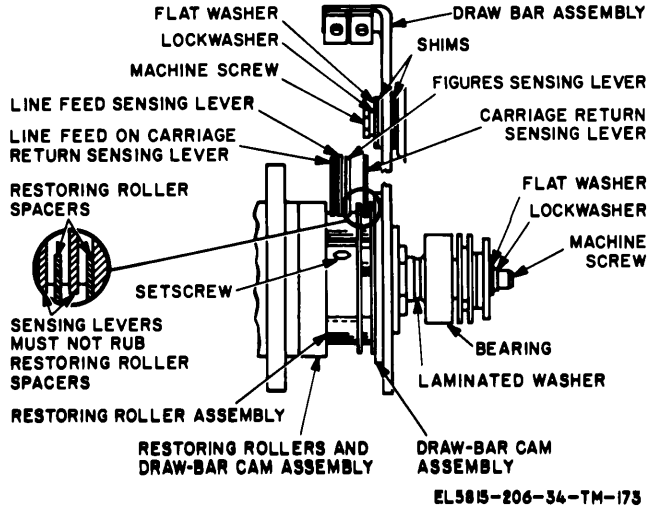


Figure 3-101. Restoring rollers and draw-bar cam assemb!y adjustment (TP-4C/TG, TT-335/TG, TT-637/G, and TT-698B/TG).

b. Method of Checking.

(1) With the function shaft in the stop position, check the requirement visually.

(2) Operate the draw bar manually, and check for free movement. Manually rotate the function shaft and check the requirement in various cammed positions.

c. Adjustments.

(1) Loosen the two setscrews in the restoring rollers and draw-bar cam assembly to allow the friction clutch spring to move the assembly toward the selector side of the machine. Determine with feeler gages the required thickness of a laminated washer. Locate the two setscrews on their respective flats and tighten them. Carefully remove the function shaft assembly from the machine. Remove the machine screw, lockwasher, and plain washer from the end of the function-shaft assembly. Disassemble the necessary parts and install a laminated washer of the required thickness. Reinstall the parts in the reverse order of removal on the function-shaft assembly and secure with the machine screw, lockwasher, and plain washer. Temporarily install the function-shaft assembly in the equipment and check the requirements: readjust if necessary.

(2) Remove the temporarily installed function-shaft assembly and remove the machine screw, lockwasher, and flat washer that hold the draw-bar and shim spacers. Install shim spacers to meet requirement *(a* above). Reinstall the machine screw, lockwasher, flat washer, and function-shaft assembly. Perform the related adjustment (para 3-17b).

3-135. Code-Ring Cage Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)

(fig. 3-102)

a. Requirement. There should be a 0.005-inch minimum clearance between the stop bars and their associated function-sensing levers, when the sensing lever concerned is at maximum displacement by the restoring roller.

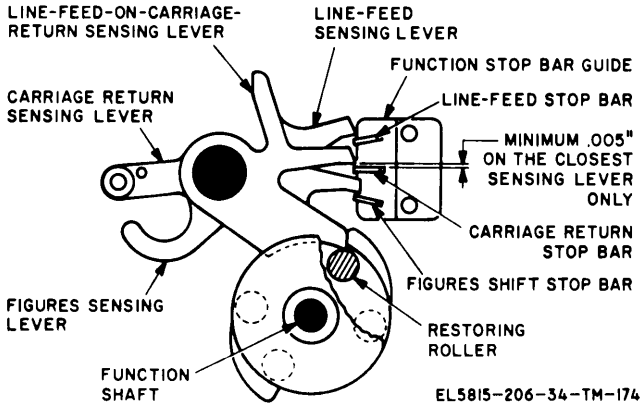


Figure 3-102. Code-ring cage adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

b. Method of Checking. Position the function shaft until the sensing levers are at maximum displacement by the restoring roller and check the requirement with a 0.005-inch feeler gage.

c. Adjustment. Loosen the two machine screws that hold the code-ring cage, and partially rotate the code-ring cage to meet the requirement. Perform the related adjustment (para 3-142, 3-153, and 3-209).

3-136. Function-Shaft Driven Gear End-Play Adjustment

(fig. 3-103)

a. Requirement. There should be a .001- to .004-inch clearance between the function-shaft driven gear and the inner flat washer when the driven gear is pressed against the outer flat washer.

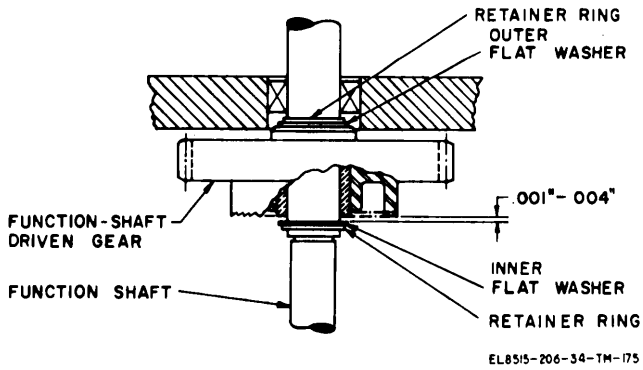


Figure 3-103. Function-shaft driven gear end-play adjustment.

b. Adjustment.

(1) Remove the function-shaft assembly (para 3-72a).

(2) Remove the function cam (fig. 3-51), sleeve bearing, print cam, flexible coupling disk, clutch spring, function clutch drum, retainer ring, and flat washer.

(3) Add or remove spacers as required; replace the flat washer and retainer ring; and recheck the clearance.

(4) Reassemble and install the function-shaft assembly (para 3-72b).

(5) Check all related adjustments (para 3-145, 3-139, 3-210, and 3-152, through 3-154).

3-137. Function-Cam Assembly Alignment (TT-4A/TG and TT-698/TG)

(fig. 3-104)

a. Requirement. The function-sensing levers must be aligned with their respective cams on the function-cam assembly.

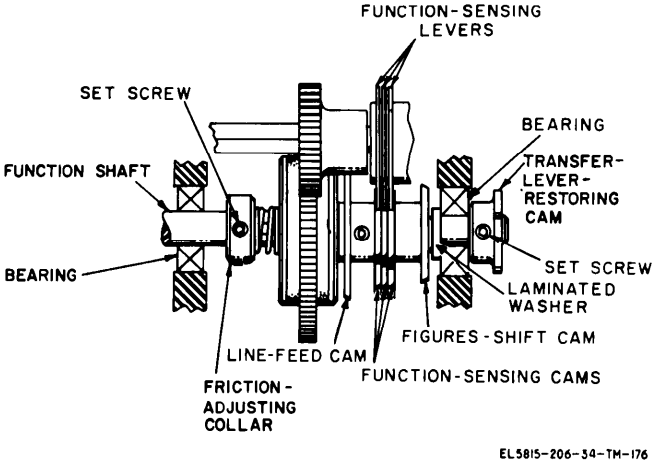


Figure 3-104. Function-cam assembly adjustment (TT-4A/TG and TT-698/TG).

b. Adjustment. Remove the function-shaft assembly (para 3-72a). Loosen the setscrews in the transfer-lever-restoring cam and remove the cam, bearing, and laminated washer from the end of the function shaft. Either peel laminations from the washer or install a new laminated washer, peeled to the proper thickness, to meet the requirement in *a* above. Remove all burs from the laminated washer; replace the parts on the function shaft; and install the function-shaft assembly on the teletypewriter (para 3-72b). Recheck the alignment *(a* above) and readjust if necessary. Check related adjustments (para 3-140, 3-177, 3-145, 3-146, and 3-212).

3-138. Function-Cam Assembly Alignment (TT-4B/TG and TT-698A/TG)

(fig. 3-105)

a. Requirement. The function-sensing levers must be aligned with their respective cams on the function-cam assembly.

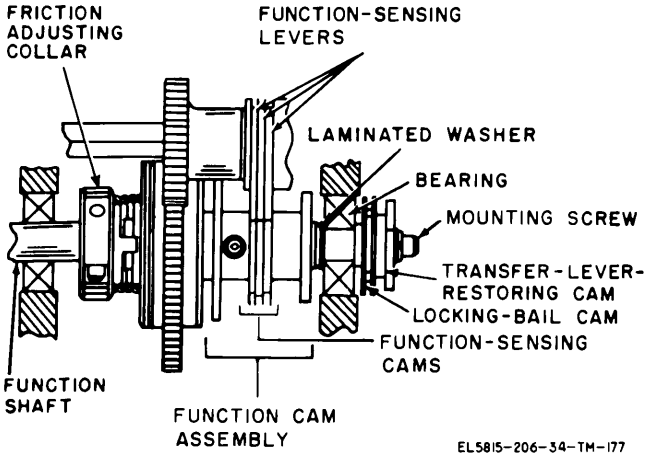


Figure 3-105. Function-cam assembly alignment (TT-4B/TG and TT-698A/TG).

b. Adjustment. Remove the function-shaft assembly (para 3-72a). Remove the mounting screw transfer-lever-restoring cam, locking-bail cam, bearing and laminated washer from the end of the function shaft. Either peel the laminated washer or install a new laminated washer, peeled to the proper thickness, to meet the requirement in *a* above. Remove all burs from the laminated washer; replace the parts on the function shaft; tighten the mounting screw and install the function-shaft assembly in the teletypewriter (para 3-72b). Recheck the alignment *(a* above) and readjust if necessary. Check related adjustments (para 3-140, 3-176, 3-177, 3-145, 3-146, and 3-212).

3-139. Function-Shaft Drive-Collar Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/-G, TT-698A/TG, and TT-698B/TG)

(fig. 3-106)

NOTE

This adjustment should be made only during disassembly and reassembly of the function shaft.

a. Requirement. There should be .015- to .030-inch clearance between the drive collar and the friction-clutch plate.

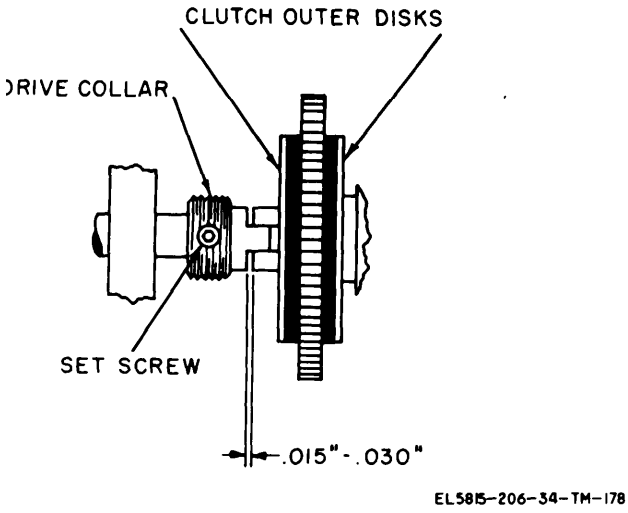


Figure 3-106. Function-shaft drive-collar adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Remove the friction-adjusting collar (fig. 3-105). Loosen the setscrews in the drive collar, and position the drive collar to meet the requirement in *a* above. Tighten the setscrews and recheck the clearance. Replace the friction-adjusting collar and make the square-shaft stop-arm torque adjustment (para 3-210).

3-140. Line-Feed and Figure-Shift Cam-Followers Clearance Adjustment (TT4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG)

(fig. 3-107)

a. Requirement. The clearance between the roller of the line-feed cam follower and the line-feed cam should equal the clearance between the roller of the figures-shift cam follower and the figures-shift cam.

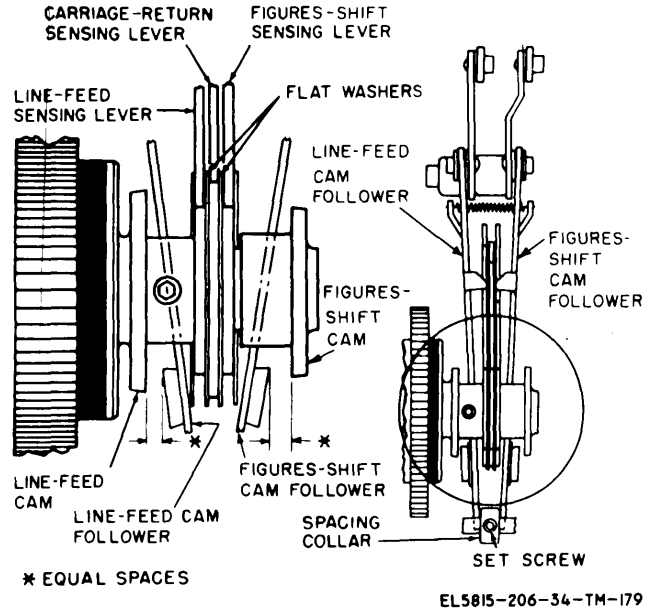


Figure 3-107. Line-feed and figures-shift cam-followers clearance adjustment (TT-4A/TG, TT-4B/TG, TT-698/TG, and TT-698A/TG).

b. Adjustment. Loosen the setscrews in the spacing collar. Shift the collar right or left until the requirement in *a* above is met. Tighten the setscrews.

3-141. Function Stop-Bar Guide Adjustment

(fig. 3-108)

a. Requirements. When the teletypewriter is in the stopped position there should be a .010- to .020-inch clearance between the carriage-return sensing lever (middle lever) and its associated function stop bar, and a .005 -inch minimum clearance between the line-feed sensing lever and the figures-shift sensing lever and their associated function stop bars.

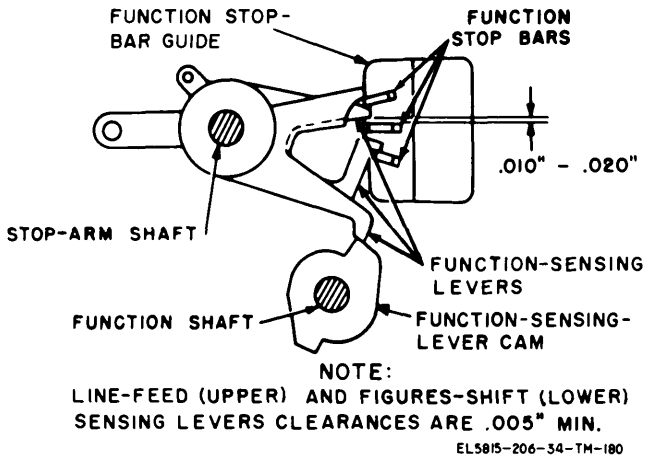


Figure 3-108. Function stop-bar guide adjustment.

b. Adjustment. Loosen the two mounting screws that secure the code-ring cage to the side casting (fig. 3-116). Turn the code-ring cage either clockwise or counterclockwise until the requirements in *a* above are met. Tighten the screws. Check related adjustments (para 3-142, 3-149, 3-150, and 3-209).

3-142. Code-Ring Locking-Bail Cam-Follower Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-109)

a. Requirement. The blade of the locking-bail lever should operate between the letters and J stop bars without touching either stop bar.

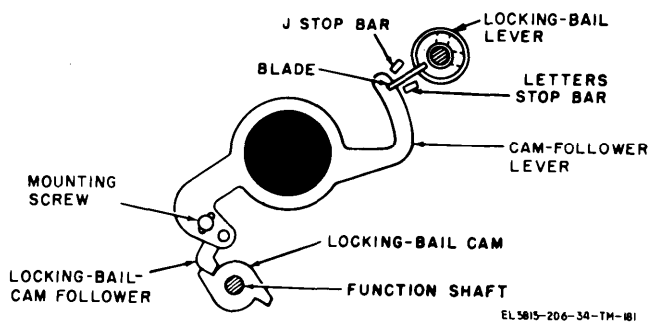


Figure 3-109. Code-ring locking-bail cam-follower adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Loosen the mounting screw that holds the cam-follower to the cam-follower lever. Position the cam follower until the requirement in *a* above is met. Tighten the mounting screw. Set up, alternately, letters and J code groups on the code rings and check the requirement visually. Readjust if necessary. Check the related adjustment (para 3-143).

3-143. Locking-Bail Shaft Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-110)

a. Requirements.

(1) There should be .010- to .020-inch clearance between the code-ring locking bail and the code-ring projections (B, fig. 3-110) when the function shaft is in the stopped position.

(2) There should be .002 - to .005-inch end play in the locking-bail shaft (A, fig. 3-110).

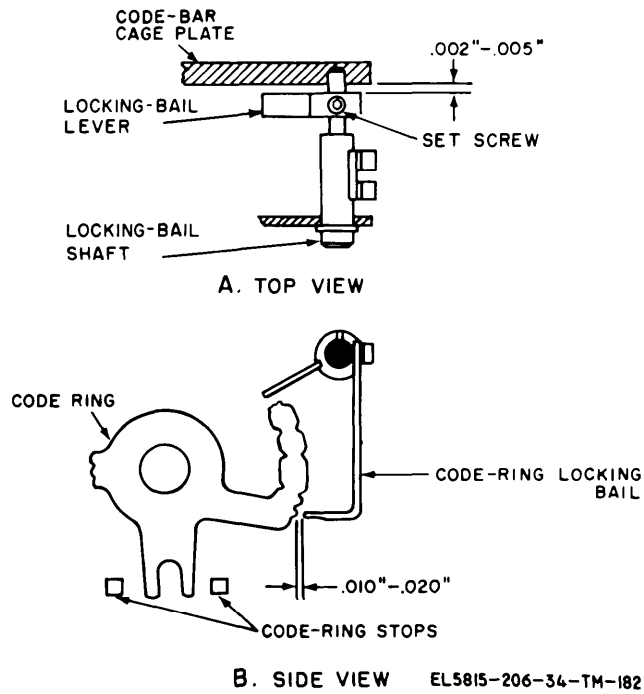


Figure 3-110. Locking-bail shaft adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking.

(1) Set the function shaft to the stopped position and place the No. 1 code ring so that its projection is aligned with the locking edge of the code-ring locking bail. Check requirement *(a* (1) above) with a feeler gage.

(2) Insert a flat feeler gage between the collar of the locking-bail lever and the code-bar cage plate to determine the end play.

c. Adjustment. Loosen the setscrews in the collar of the locking-bail lever. Rotate the locking-bail shaft until the requirement in *a* (1) above is met. Position the locking-bail lever to obtain the requirement in *a* (2) above. Tighten the setscrews in the collar of the locking-bail lever and recheck both clearance requirements.

3-144. Code-Ring Locking-Bail Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-111)

a. Requirement. The clearance between the code-ring locking bail and the locking projection on each code ring should be equal for both marking and spacing positions of the code ring.

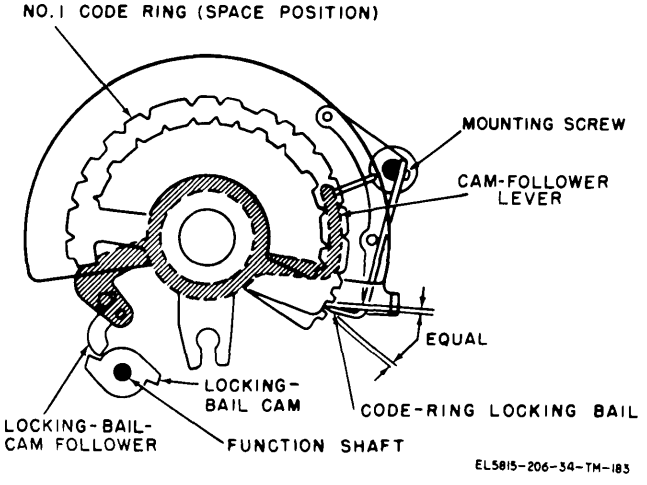


Figure 3-111. Code-ring locking-bail adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Position the Y-levers for either R or Y code combination and pull the transfer-lever latch downward (fig. 3-114). Turn the motor by hand until the locking-bail spring pulls the code-ring locking bail against the code rings. Loosen the mounting screws and position the code-ring locking bail until the requirement is met. Tighten the mounting screws and recheck the clearances.

3-145. T-lever Alignment Adjustment

a. Requirement. The T-levers should be aligned as closely as possible with their respective Y-levers and code rings. Any offset between the Y-levers and code rings should be equally divided between the T-levers and Y-levers and between the T-levers and code rings B, fig. 3-112).

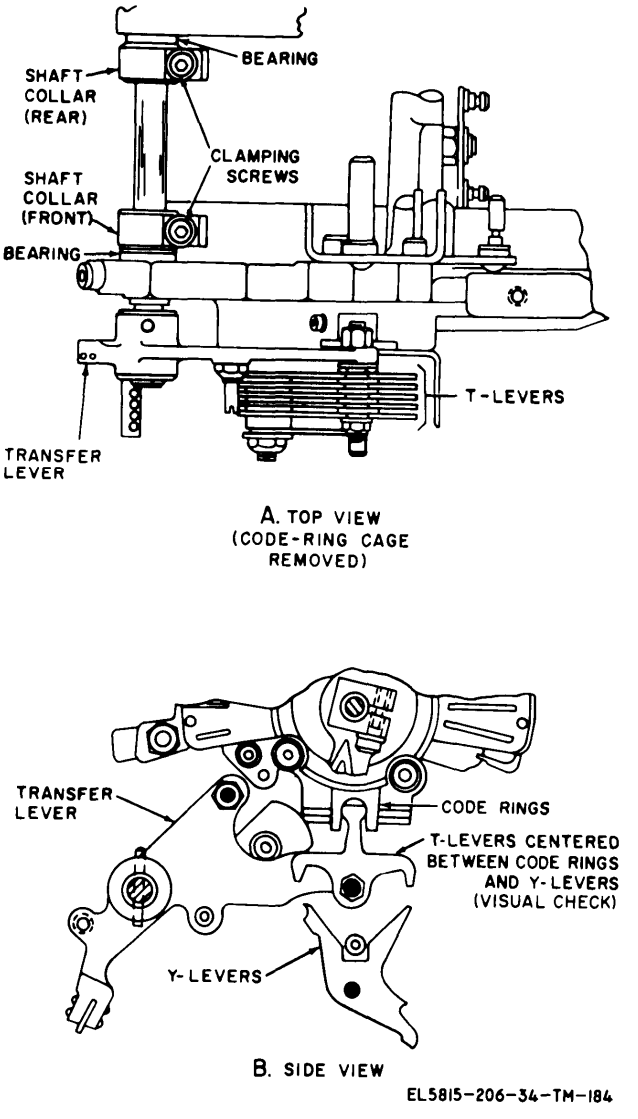


Figure 3-112. T-lever alignment adjustment.

b. Adjustment. On the TT-4A/TG and TT-698/TG, loosen the two setscrews in the front and rear collars on the transfer-lever shaft. On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, loosen the clamping screws in the front and rear shaft collars (A, fig. 3-112). Slide the transfer lever in or out to meet the

requirement in *a* above; slide the *front* shaft collar against the bearing; and tighten the clamping screw. Perform the transfer-lever-shaft end-play adjustment (para 3-146) and check the related adjustment (para 3-152).

3-146. Transfer-Lever-Shaft End-Play Adjustment (fig. 3-113)

a. *Requirement.* There should be a .002- to .005-inch clearance between the rear shaft collar on the transfer-lever shaft and the frame.

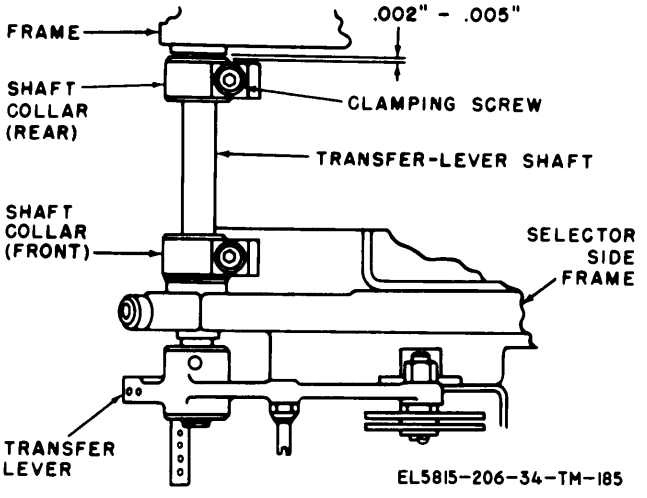


Figure 3-113. Transfer-lever-shaft end-play adjustment.

b. Adjustment. On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, loosen the clamping screw in the rear shaft collar. On the TT-4A/TG, loosen the setscrews in the rear shaft collar. Hold the front collar against the frame; move the rear collar to meet the requirement in *a* above; and tighten the clamping screw or setscrews.

3-147. Transfer-Lever Roller-Stud Adjustment (fig. 3-114)

a. Requirement. There should be a .007- to .020-inch clearance between the transfer lever and the latching surface of the transfer-lever latch when the transfer-lever roller is against a lobe of the transfer-lever restoring cam.

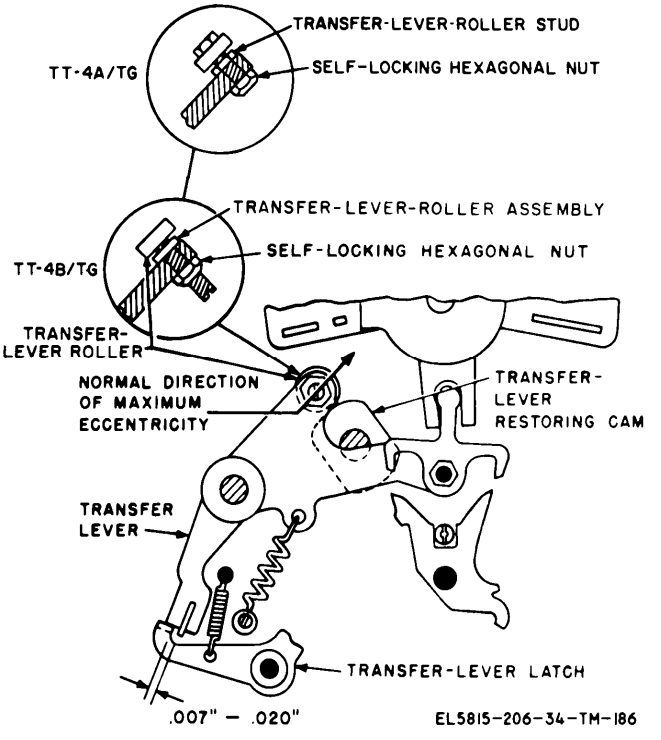


Figure 3-114. Transfer-lever roller stud adjustment.

b. Adjustment. Loosen the self-locking hexagonal nut and set the transfer-lever-roller stud for maximum eccentricity. Rotate the motor of the teletypewriter by hand until the roller is against a lobe of the transfer-lever restoring cam. Turn the stud in a counterclockwise direction until the required clearance is obtained and tighten the self-locking hexagonal nut.

3-148. Transfer-Lever-Spring-Tension Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG) (fig. 3-115)

a. Requirement. A pull of 4½ to 5½ pounds should be required to start the transfer lever moving away from the transfer-lever restoring cam.

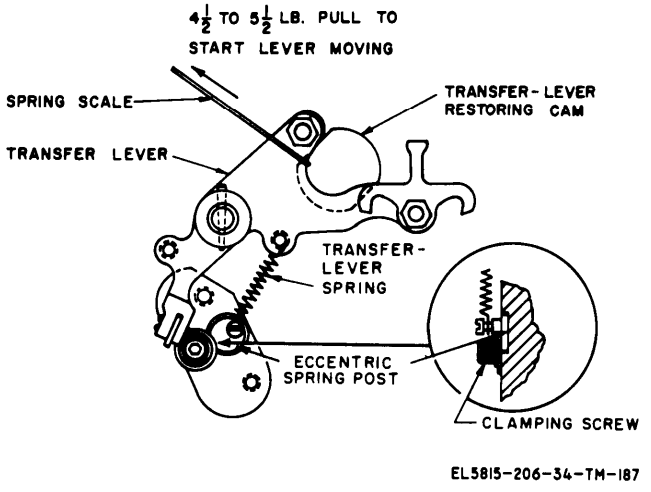


Figure 3-115. Transfer-lever-spring -tension adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Loosen the clamping screw; turn the eccentric spring post to meet the requirement in *a* above; and tighten the clamping screws.

3-149. Y-lever Eccentric Stop Preliminary Adjustment.

(fig. 3-116)

a. Requirement. The Y-lever eccentric stop should be positioned midway between the Y-levers.

NOTE

When making the following adjustment, be very careful to prevent damage to the function shaft when inserting the tool into the setscrew.

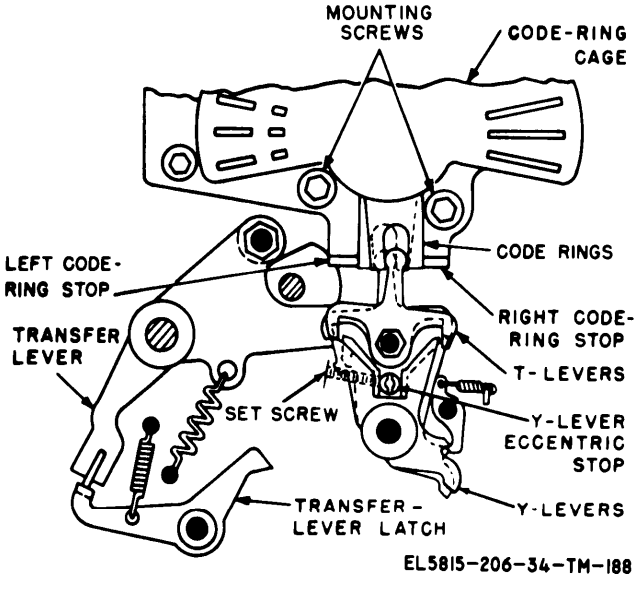


Figure 3-116. Y-lever eccentric stop preliminary adjustment.

b. Adjustment. Set the Y-levers for either R or Y code combination. Loosen the setscrew which locks the Y-lever eccentric stop. Pull the transfer-lever latch downward to cause the T-levers to engage the Y-levers. Turn the eccentric clockwise until it contacts the Y-levers that are in the space position. Note the position of the slot in the end of the stop. Now turn the eccentric stop counterclockwise until it contacts the Y-levers that are in the mark position. Note the position of the slot in the end of the stop. Turn the stop to a position midway between the two noted positions and tighten the setscrew. Check related adjustments (para 3-153, 3-156, and 3-169).

3-150. T-lever Pivot Stud Adjustment

(fig. 3-117)

a. Requirement. The T-levers should engage the Y-levers an equal amount for both mark and space positions of the Y-levers.

b. Method of Checking. Turn the motor manually until the transfer lever is latched and the function shaft is in the stopped position. Set the Y-levers to the R code combination positions. Set the Y-levers to the R code combination positions. Pull the transfer-lever latch downward to cause the T-levers to engage the Y-levers. Check the amount of engagement visually. Turn the motor manually to restore the transfer lever and the T-levers. Set the Y-levers to the Y code combination positions. Trip the transfer lever and check the amount of engagement visually.

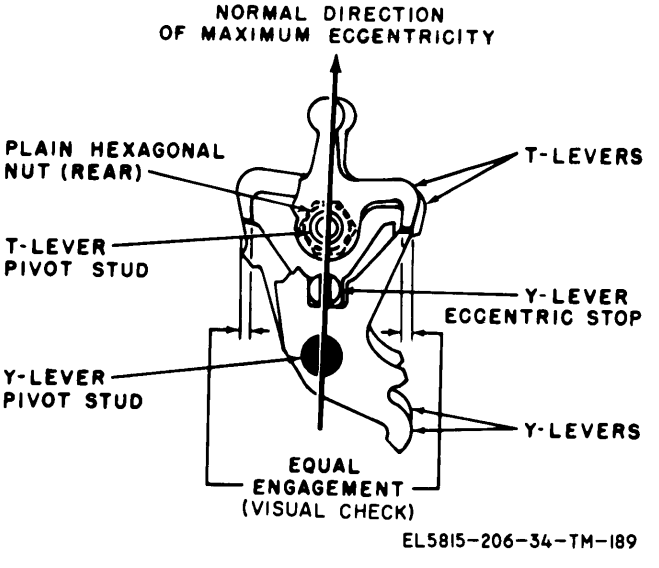


Figure 3-117. T-lever pivot stud adjustment.

c. Adjustment. Loosen the plain hexagonal nut on the rear of the T-lever pivot stud. Position the T-lever pivot stud to the normal direction of maximum eccentricity, as shown in figure 3-117. Then reposition the pivot stud to meet the requirement in

a above. Tighten the nut. Check related adjustments (para 3-149 and 3-153).

3-151. Y-lever Stud Bracket Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

NOTE

The Y-lever eccentric stop preliminary adjustment (para 3-149) should be completed before this adjustment is performed.

a. Requirement.

(1) There should be 0.002- to 0.005-inch clearance between the spacer and the flat washer (A, fig. 3-118).

(2) The Y-lever eccentric stop and the Y-lever pivot stud should be locked in place by the Y-lever eccentric tie (B, fig. 3-118).

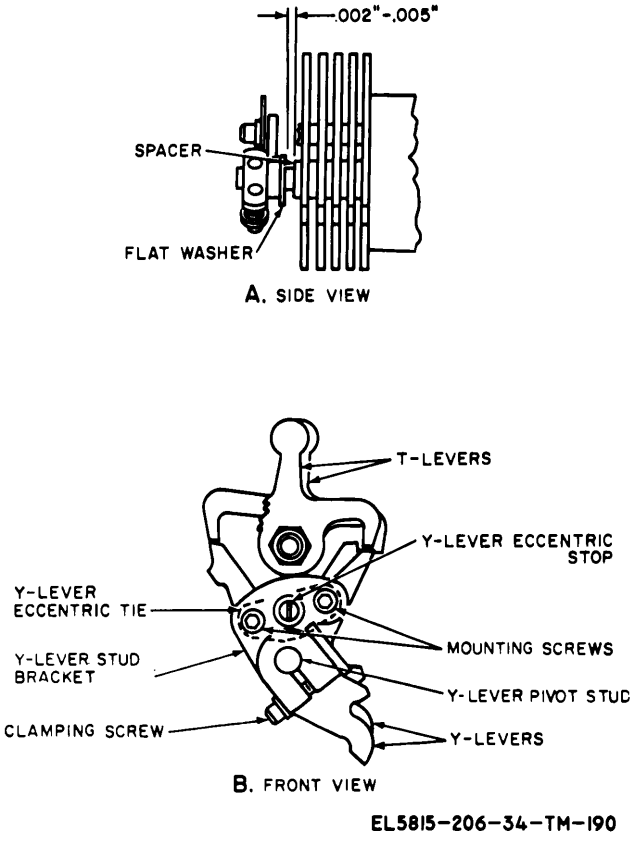


Figure 3-118. Y-lever stud bracket adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Check the requirement in *a* (1) with feeler gages; check the requirement in *a (2)* visually to make sure that the Y-lever eccentric tie is engaging the Y-lever eccentric stop. Check to make sure that the clamping screw of the Y-lever stud bracket and the mounting screws of the Y-lever eccentric tie are tight.

c. Adjustment.

(1) Loosen the mounting screws of the Y-lever eccentric tie and the clamping screw of the Y-lever stud bracket. Position the bracket to meet the requirement in *a* (1) above. Tighten the clamping screw.

(2) Shift the Y-lever eccentric tie to engage the Y-lever eccentric stop. Tighten the mounting screws.

3-152. Function-Clutch Clearance Adjustment (fig. 3-119)

a. Requirement. There should be 0.010- to 0.020-inch clearance between the function-clutch drum and the clutch teeth of the function-shaft driven gear when the function-clutch latch engages an arm of the function-clutch drum and the function-shaft driven gear is pressed toward the clutch drum.

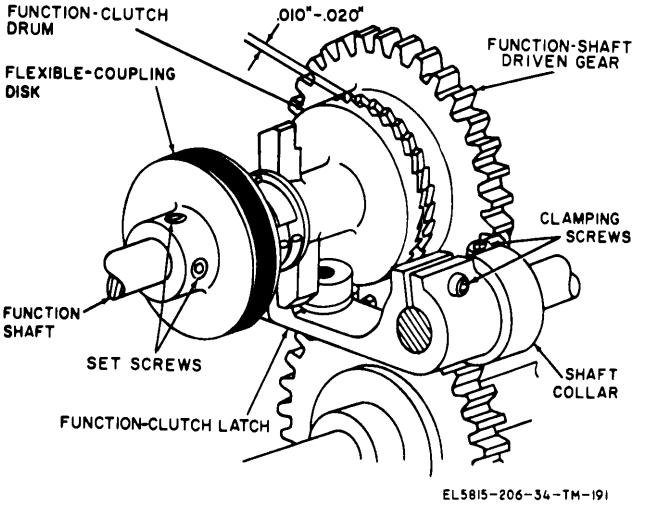


Figure 3-119. Function-clutch clearance adjustment.

b. Method of Checking. Place the teletypewriter in the stopped position. Press the function-shaft driven gear toward the function-clutch drum and insert a flat feeler gage between the gear and the clutch drum. Repeat the check when the opposite arm of the clutch drum is engaged by the function-clutch latch.

c. Adjustment. Loosen the clamping screw in the function-clutch latch. Loosen the two setscrews in the shaft collar of the TT-4A/TG and TT-698/TG, On the TT-4B/TG and TT-698A/TG, loosen the clamping screw in the shaft collar. Press the latch and shaft collar together and adjust the position of both to meet the requirement. Tighten only the clamping screw or setscrews in the shaft collar. Then perform the function- clutch latch adjustment (para 3-153).

3-153. Function-Clutch Latch Adjustment (fig. 3-120)

a. *Requirement.* There should be 0.015- to 0.020 -

inch clearance between the function-clutch latch or its ball bearing, whichever is higher, and the adjacent arm of the function-clutch drum when the clutch is engaged.

b. Method of Checking. Then the motor manually until the transfer lever is latched and the function shaft is in the stopped position. Pull the transfer-lever latch downward to disengage the function-clutch latch from an arm of the function-clutch drum. Check the clearance with a feeler gage. Turn the motor manually and check the clearance when the opposite arm is adjacent to the latch.

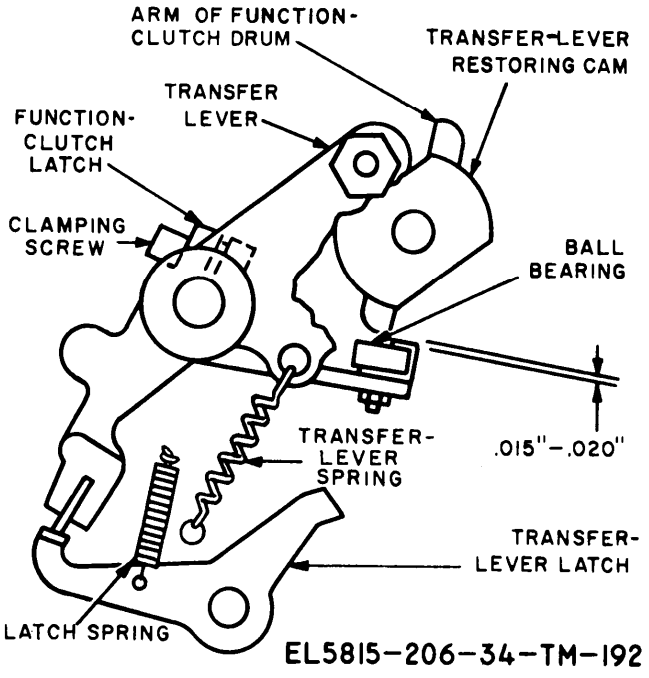


Figure 3-120. Function-clutch latch adjustment.

c. Adjustment. Loosen the clamping screw in the function-clutch latch. Position the latch to meet the requirement. Tighten the clamping screw and recheck the clearance.

3-154. Function-Clutch Eccentric Post Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-121)

a. Requirement. When the clutch is engaged, there should be a 0.003- to 0.015-inch clearance between the eccentric post and an adjacent high part of the function clutch drum.

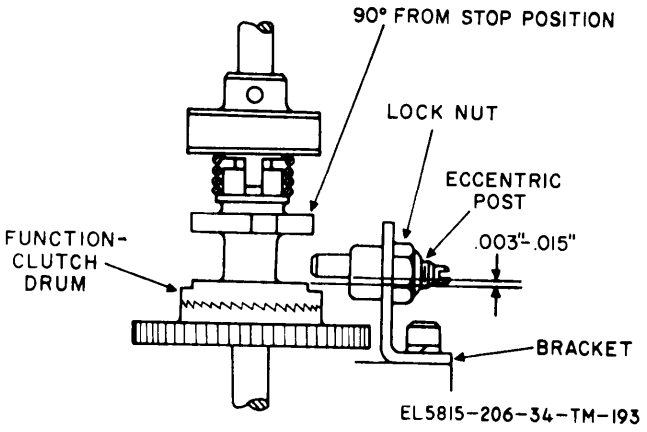


Figure 3-121. Function-clutch eccentric post adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Engage the clutch members and loosen the locknut. Adjust the eccentric post to meet the requirement in *a* above. Rotate the function shaft ½-turn and recheck the clearance. When both clearances are within the required tolerance, tighten the locknut.

3-155. Y-lever Detent End-Play Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-122)

a. Requirement. Each Y-lever detent should engage its associated Y-lever by at least 25 percent of the thickness of the Y-lever detent. There should be a .002- to .005 -inch clearance between the first thrust washer and the centering sleeve.

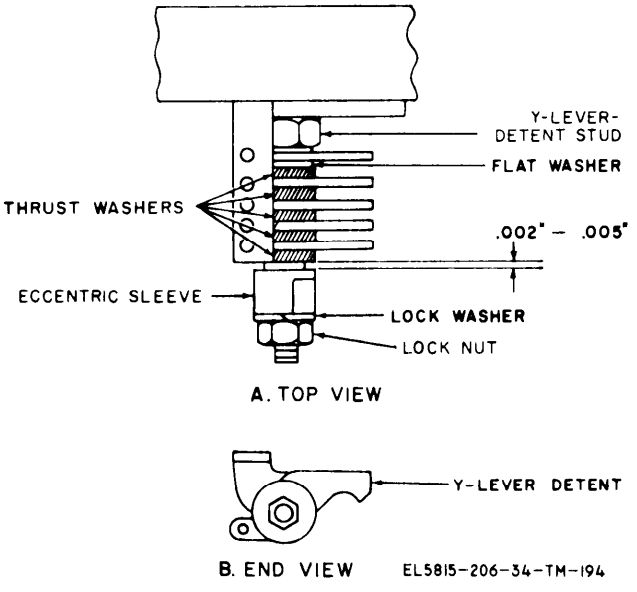


Figure 3-122. Y-lever detent end-play adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Move the Y-lever detents back and forth while checking the engagement requirement visually. Check the clearance requirement with a feeler gage.

c. Adjustment. Remove the plain hexagonal nut and lockwasher, Slide the centering sleeve and detents off the Y-lever-detent pivot. Replace the flat washer with a laminated washer peeled to meet the requirement. Replace the parts on the pivot, tighten the nut, and check the requirement.

NOTE

Do not insert a peeled laminated washer less than .005 inch thick. Laminated washers may become bowed when peeled. Make certain that washers are flat before inserting.

3-156. Y-lever Detent Engagement Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-123)

a. Requirement.

(1) There should be an equal engagement of the Y-lever detent with the Y-lever when the Y-lever is in either mark or space position (visual check).

(2) A force of 30 to 60 grams should be required to start each Y-lever moving.

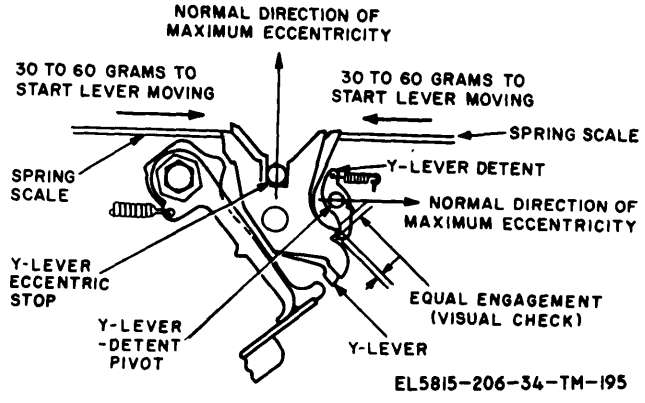


Figure 3-123. Y-lever detent and Y-lever adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment.

(1) Loosen the plain hexagonal nut (fig. 3-123) and turn the centering sleeve to meet requirement *(a* above).

(2) Replace a Y-lever-detent spring which does not meet the tension requirement (para 3-163). If the spring tension is satisfactory, check for binding between the Y-lever and its adjacent washers and between the Y-lever detent and its adjacent washers; remove the cause of binding.

3-157. Y-lever Friction Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-124)

a. Requirement. A force of 40 to 50 grams, applied with a spring scale at the point shown in figure 3-124, should be required to start each Y-lever moving from the counterclockwise to the clockwise position.

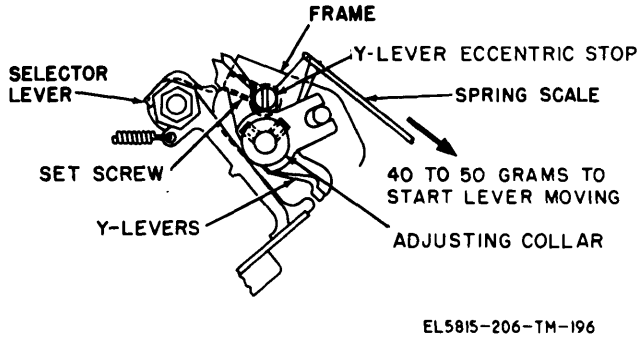


Figure 3-124. Y-lever function adjustment (TT-4A/TG and TT-698/TG).

b. Adjustment. Loosen the two setscrews in the adjusting collar. Move the collar toward or away from the Y-levers until the requirement is met. Tighten the setscrews and recheck the requirement.

3-158. Selector-Friction Clutch Adjustment (TT-4A/TG and TT-698/TG)

a. Requirements.

(1) There should be 0.005- to 0.025-inch clearance between the clutch disk collar and the bearing of the selector-clutch fork (A, fig. 3-125).

(2) A pull of 40 to 46 ounces, applied at the point shown in B, figure 3-125, should be required to hold the stop plate away from the stop lever when the motor is on.

b. Method of Checking.

(1) Insert a flat feeler gage between the selector-clutch disk and the bearing of the selector-clutch fork to determine the clearance *(a* (1) above).

(2) Hook the end of a spring scale on the stop-plate retainer of the selector camshaft. Turn the motor on; pull the spring scale until the stop plate moves away from the stop lever; and read the scale.

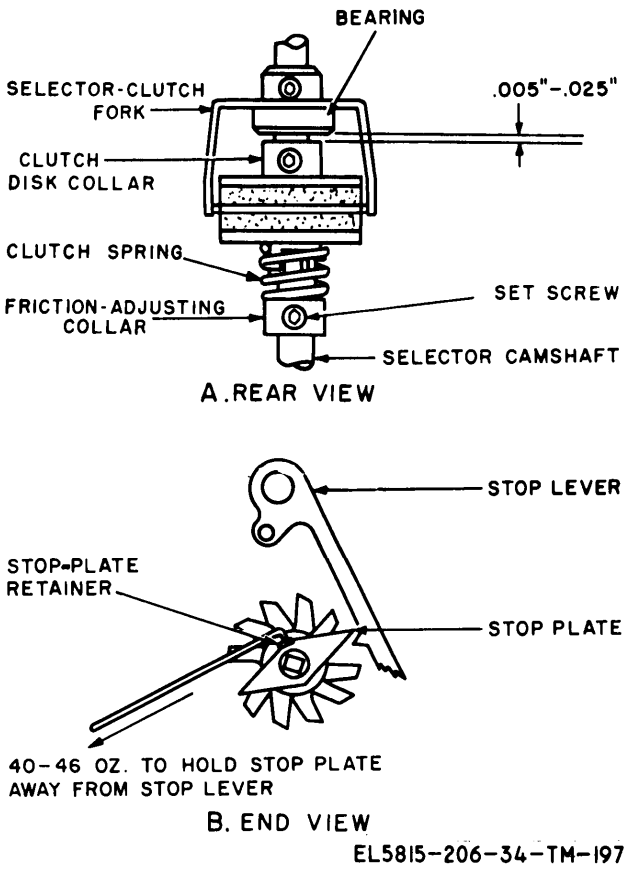


Figure 3-125. Selector friction-clutch adjustment (TT-4A/TG and TT-698/TG).

c. Adjustments.

(1) Loosen the two setscrews in the collar of the clutch disk and position the clutch disk until requirement *(a* (1) above) is met. Tighten the two setscrews and recheck the clearance.

(2) Loosen the two setscrews in the friction-adjusting collar and shift the collar in the proper direction until requirement *(a* (2) above) is met. Tighten the two setscrews and recheck the requirement.

3-159. Selector Friction-Clutch Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

a. Requirements.

(1) There should be .005- to .025-inch clearance between the collar of the clutch disk and the bearing of the selector-clutch fork (A, fig. 3-126).

(2) A pull of 48 to 54 ounces, applied at the point shown in B, figure 3-126, should be required to hold the stop plate away from the stop lever when the motor is on.

b. Method of Checking.

(1) Insert a flat feeler gage between the friction clutch disk and the bearing of the selector-clutch fork to determine the clearance *(a* (1) above).

(2) Hook the end of a spring scale on the stop-plate of the selector or camshaft. Turn the motor on: pull the spring scale until the stop plate moves away from the stop lever; and read the scale.

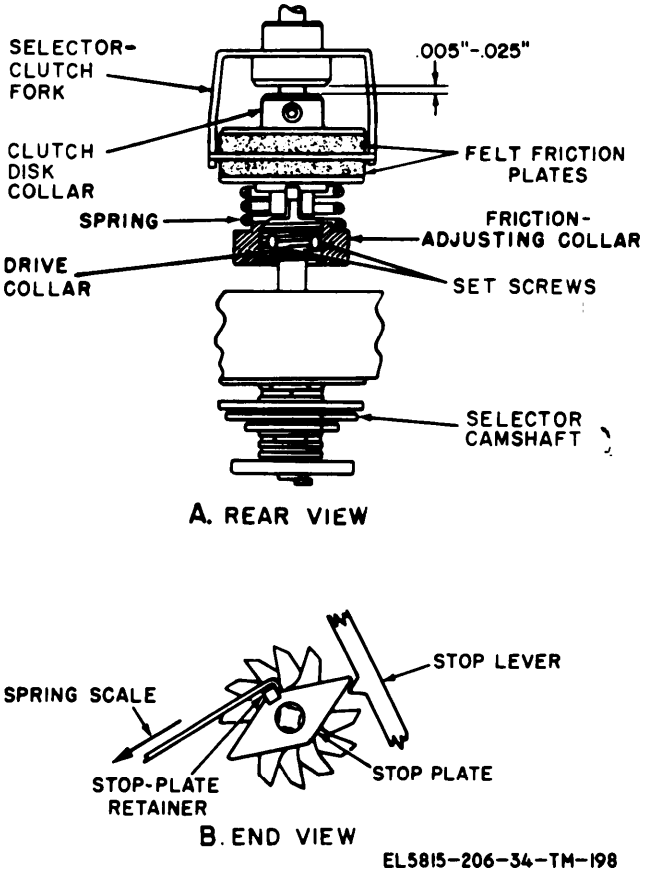


Figure 3-126. Selector-friction-clutch adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

c. Adjustments.

(1) Loosen the two setscrews in the collar of the clutch disk and position the clutch disk until requirement *(a* (1) above) is met. Tighten the set-screws, and recheck the clearance.

(2) Loosen the clamping screws in the friction-adjusting collar and turn the friction-adjusting collar clockwise or counterclockwise to obtain requirement *(a* (2) above). Tighten the clamping screws and recheck the requirement.

3-160. Rangefinder Shaft Adjustment

a. Requirements.

(1) There should be a 0.001- to 0.005-inch end play in the range-dial shaft, rangefinder cam shaft, and the armature-worm shaft (A, fig. 3-127).

(2) The RANGE dial should be set at 60 (B, fig. 3-127) when the *high* part of the rangefinder cam is against the lower arm of the orientation lever (A, fig. 3-128).

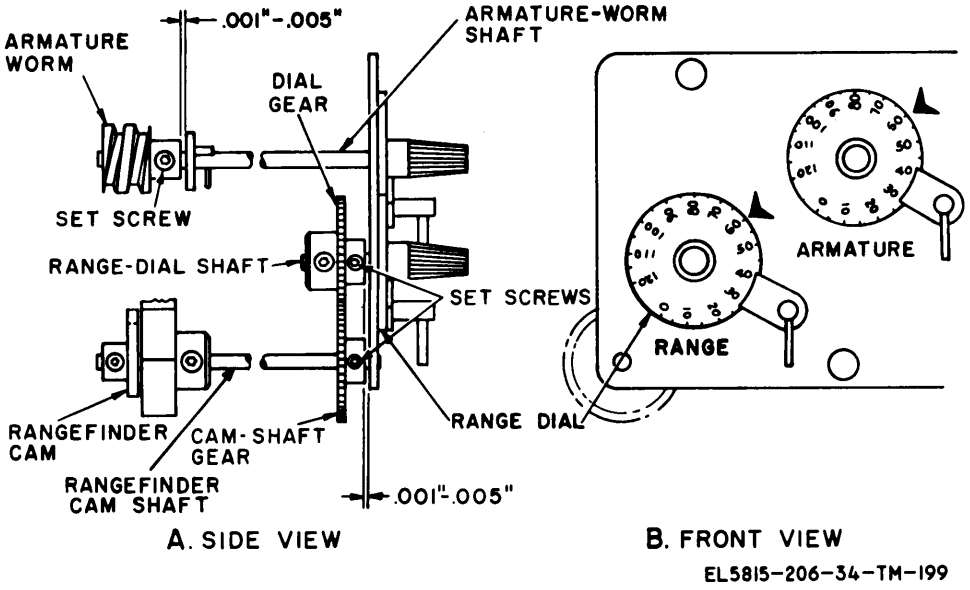


Figure 3-127. Rangefinder shaft adjustment.

b. Adjustments.

(1) Loosen the setscrews in the gears; position the gears to obtain the end play requirement; and tighten the setscrews.

(2) Loosen the setscrews in the armature worm; position the worm to meet the requirement; and tighten the setscrews.

(3) Position the RANGE dial at 60. Loosen the setscrews in the rangefinder cam; position the cam to meet the requirement; and tighten the setscrews.

3-161. Orientation Lever Adjustments (TT-4B/TG, TT4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG) TG)

a. Requirement. There should be a 9/64- to 11/64-inch clearance between the stop plate and the adjusting screw in the orientation lever when the lever is held against the midpoint of the rangefinder cam (A, fig. 3-128).

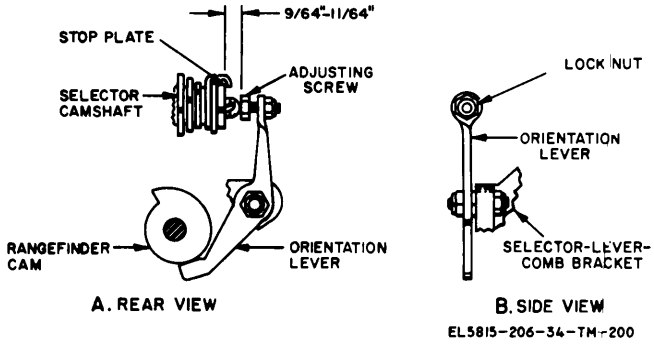


Figure 3-128. Orientation lever adjustment requirements (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Loosen the locknut (B, fig. 3-128); hold the orientation lever against the rangefinder cam; turn the adjusting screw in or out to meet the requirement; and tighten the locknut.

3-162. Selector-Lever Adjustment

a. Requirement. There should be a 0.002- to 0.005-inch clearance between the flat washer and the first selector lever (A, fig. 3-129).

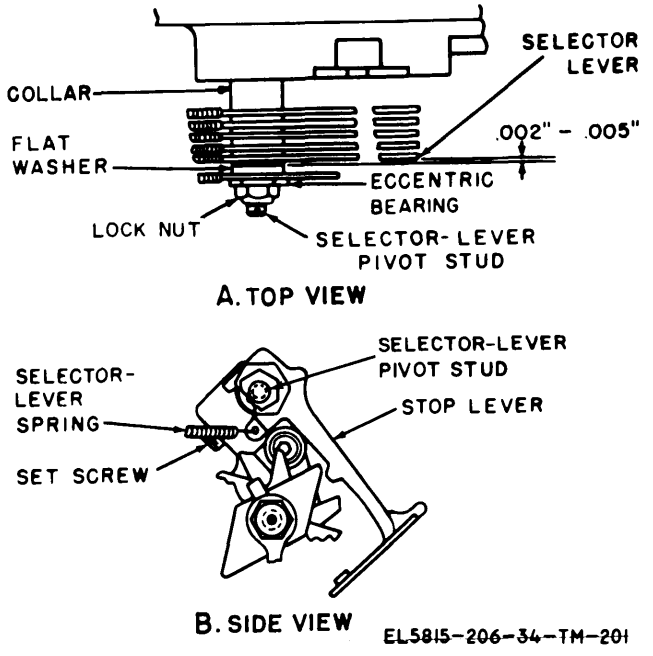


Figure 3-129. Selector-lever adjustment.

b. Adjustment. Loosen the setscrew (B, fig. 3-129) in the casting; slide the selector-lever pivot stud in or out to meet the requirement; and tighten the setscrew.

3-163. Selector-Lever Comb Adjustment

a. Requirement. The selector levers and Y-levers should be aligned, and there should be no binding between the selector levers and the selector lever comb (A, fig. 3-130).

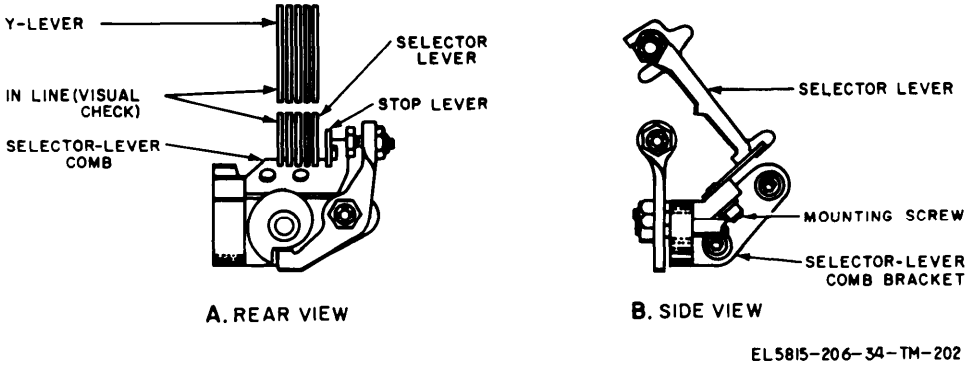


Figure 3-130. Selector-lever comb adjustment.

b. Adjustment. Loosen the two mounting screws (B, fig. 3-130); position the selector-lever comb to meet requirement *(a* above) (be certain that the comb is against the milled surface of the selector-lever-comb bracket); and tighten the mounting screws. Check the related adjustment (para 3-170).

3-164. Selector-Magnet Armature Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-131)

NOTE

The Y-lever eccentric stop adjustment (para

3-149) should be completed before this adjustment is performed.

a. Requirement. There should be a 0.002- to 0.005-inch clearance between the No. 1 Y-lever and the Y-lever eccentric stop when the No. 1 selector lever is in the marking position.

b. Method of Checking. Back off the upper armature stopscrew far enough to permit the selector levers to be engaged. Hold the armature against the upper stopscrew and rotate the selector camshaft until the No. 1 selector lever is on the highest part of its respective cam. Check the clearance requirement with feeler gages.

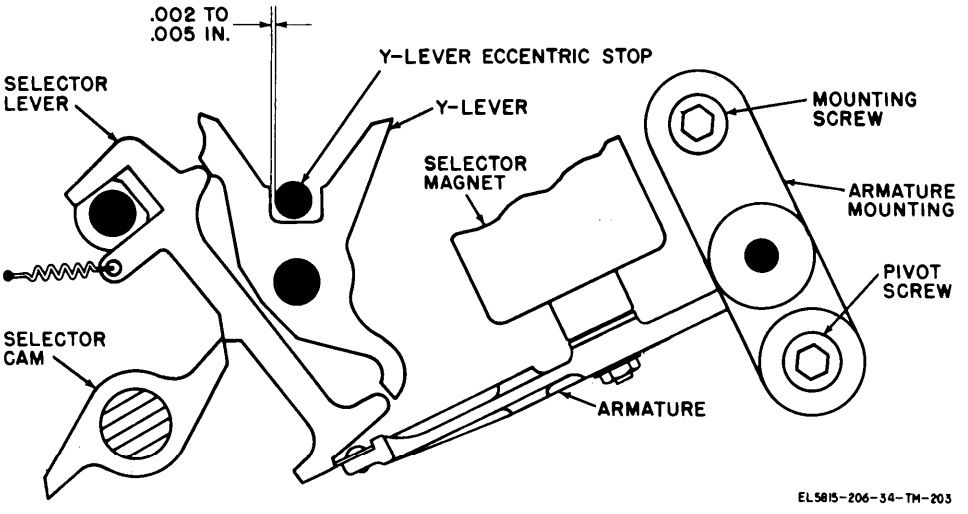


Figure 3-131. Selector-magnet armature adjustment (TT-4A/TG and TT-698/TG).

c. Adjustment. Loosen the pivot and mounting screws, and turn the mounting to the right or left until the requirement *(a* above) is met. Tighten the two screws.

3-165. Selector-Magnet Armature Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/ G, TT-698A/TG, and TT-698B/TG) (fig. 3-132)

NOTE

The Y-lever eccentric stop preliminary adjustment (para 3-149) should be completed before this adjustment is started.

a. Requirement. There should be a 0.004- to 0.010-inch clearance between the No. 1 selector lever and the No. 1 Y-lever when the levers are positioned as follows:

(1) No. 1 Y-lever positioned for mark against its eccentric stop.

(2) No. 1 selector lever positioned for mark on the high part of its selector cam.

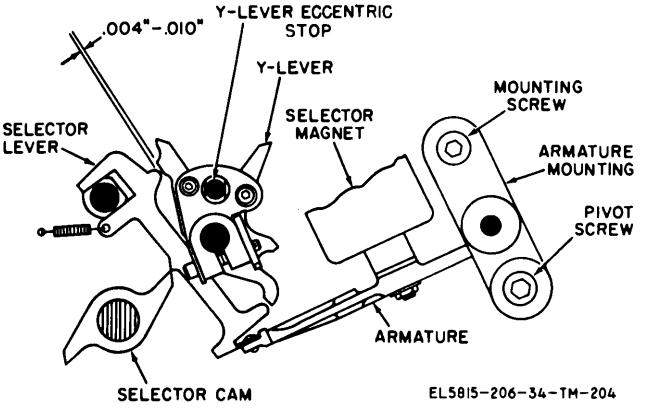


Figure 3-132. Selector-magnet armature adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Back off the upper armature stopscrew to permit the selector levers to engage the armature. Position the No. 1 Y-lever to mark. Hold the armature against the upper stopscrew and rotate the selector camshaft until the No. 1 selector lever is on the highest part of the No. 1 selector cam. Check the clearance with a feeler gage.

c. Adjustment. With the teletypewriter conditioned as described in *b* above, loosen the pivot screw and the mounting screw. Turn the mounting to the right or left until the requirement *(a* above) is met. Tighten the two screws.

NOTE

When this adjustment (para 3-165) is completed, all related adjustments in the sequence should be performed (para 3-166 through 3-169).

3-166. Stoplever Adjustment

(fig. 3-133)

a. Requirement. All five selector levers should clear the armature when the armature is dropped to permit the stoplever to clear.

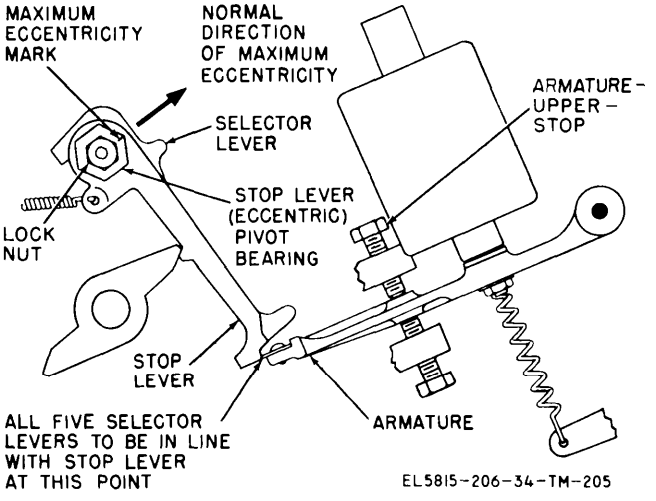


Figure 3-133. Stop-lever adjustment.

b. Method of Checking. With the selector magnet energized, and the motor on, turn down the armature upper stopscrew to the point where the stoplever is released by the armature. All five selector levers should also be released at this point because all the Y-levers have been moved to the spacing (counterclockwise) position. Turn the upper stopscrew back to cause the armature to re-engage the stop lever. At least one of the five selector levers should also be engaged by the armature. Check this by trying to move the lower end of each selector lever.

c. Adjustment. Loosen the locknut and turn the stoplever (eccentric) pivot bearing in the direction shown.

3-167. Armature Upper-Stop Screw Adjustment

(fig. 3-134)

NOTE

The stoplever adjustment (para 3-166) should be completed before this adjustment is performed.

a. Requirement. The engagement of the armature with the selector levers when the armature is raised should be equal to the armature movement obtained from a one-eighth turn of the armature upper-stop screw.

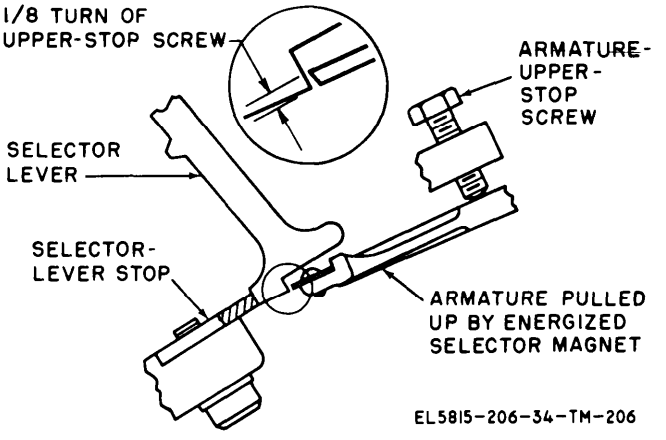


Figure 3-134. Armature upper-stop screw adjustment.

b. Adjustment. With the selector magnet energized and the motor on, turn down the upper-stop screw until the armature releases the stop and selector levers. Back off the upper-stop screw slowly until the armature makes contact with the stop and selector levers; continue to turn the screw one-eighth turn. If all adjustments in the sequence are not being made, make the armature lower-stop screw adjustment (para 3-168) and the selector magnet adjustment (para 3-169).

3-168. Armature Lower-Stop Screw Adjustment

(fig. 3-135)

NOTE

The armature upper-stop screw adjustment (para 3- 167) should be completed before this adjustment is performed.

a. Requirement. The clearance between the armature and the selector levers when the armature has been released should be equal to the armature movement obtained from a one-eighth turn of the armature lower-stop screw.

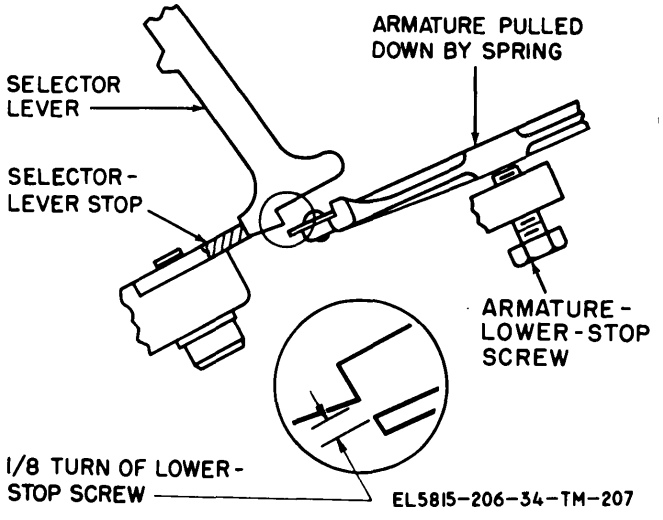


Figure 3-135. Armature lower-stop screw adjustment.

b. Adjustment. Energize the selector magnet and start the motor. Turn the lower-stop screw until it contacts the armature. Reenergize the selector magnet and turn the lower stop-screw down slowly until the armature does not engage the stop and selector levers. Continue to turn the screw one-eighth turn.

3-169. Selector-Magnet Adjustments
(fig. 3-136)

NOTE

The armature upper and lower stop screw adjustments (para 3-167 and 3-168) should be completed before this adjustment is attempted.

a. Requirements.

(1) There should be a 0.003- to 0.004-inch clearance between the pole faces of the selector magnet and the armature when the magnet is energized.

(2) The clearance under the two pole faces should be equal.

b. Method of Checking.

(1) Use a long narrow piece of 0.004-inch thick paper as a feeler to get the two pole faces.

(2) The drag of the paper under both pole faces should be equal.

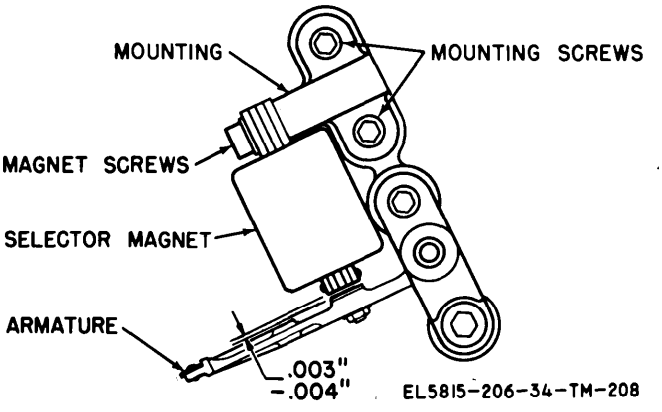


Figure 3-136. Selector-magnet adjustments.

c. Adjustments.

(1) Loosen the two mounting screws and shift the mounting up or down until the requirement *(a* above) is met. Tighten the two mounting screws. Check the requirements.

(2) If the drag under the pole faces is not equal, remove the mounting with the magnet attached. Loosen the magnet screws and shift the position of the magnet, with regard to its mounting, in the direction needed for equalizing the clearance under the pole faces. Tighten the two magnet screws and replace the mounting. Repeat the adjustment for the required clearance. Repeat the above procedure until both requirements *(a* above) are met.

3-170. Selector-Magnet Armature and Selector-Lever Clearance Adjustment
(fig. 3-137)

a. Requirement. There should be 0.018- to 0.025-inch clearance between the selector-magnet armature and the selector levers when the armature is in the *mark* (energized) position and the selector levers are at rest (unoperated) in the selector-lever comb.

b. Method of Checking. Place the teletypewriter in the stopped position (selector levers at rest) and the selector-magnet armature in the mark (energized) position, and check the requirement *(a* above). Use feeler gages.

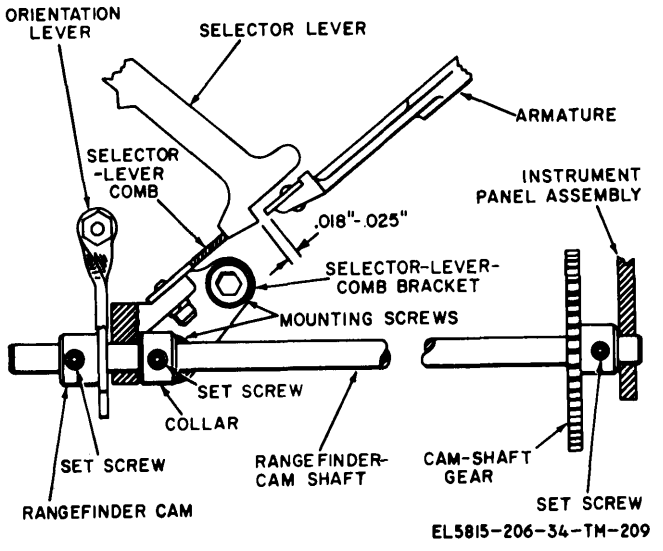


Figure 3-137. Selector-magnet armature and selector lever clearance adjustment.

c. Adjustment. Loosen the setscrews in the rangefinder cam and cam-shaft gear far enough to clear the grooves in the rangefinder-cam-shaft. Remove the cam and slide the shaft towards the front of the teletypewriter until the rear end of the shaft is clear of the lower selector-lever-comb bracket mounting screws and position the bracket to meet the requirement *(a* above). Tighten the mounting screws and recheck the requirement. Replace the rangefinder-cam-shaft and remount the rangefinder cam.

CAUTION

When tightening the rangefinder cam and the cam-shaft gear on the shaft, the setscrews must engage the groove in the shaft. Align the rangefinder cam with the orientation lever and tighten the setscrews. Engage the cam-shaft gear with its associated gear and tighten the setscrews on the cam-shaft gear.

3-171. Function Punch-Bar and Side-Plate Adjustment

(fig. 3-138)

NOTE

This adjustment should be performed when either the punch-bar-guide block or the side-plate have been disassembled.

a. Requirement. There should be 0.001- to 0.008-inch clearance between the punch bars and the aperture gate when the aperture gate is aligned with each punch bar.

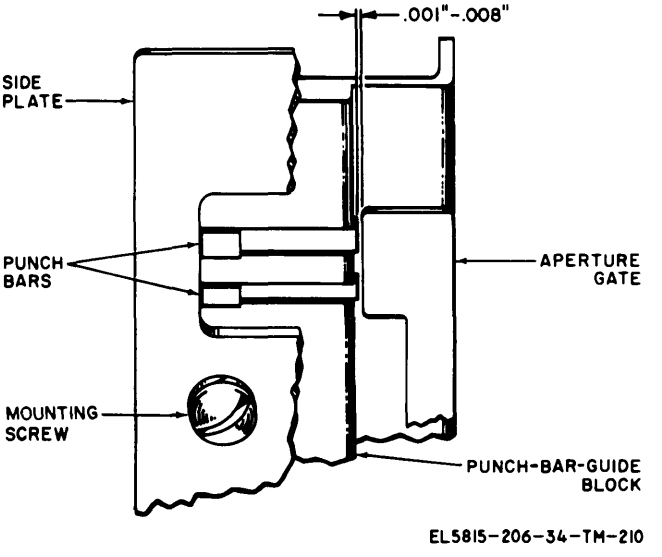


Figure 3-138. Function-punch-bar and side-plate adjustment.

b. Method of Checking. Align the aperture gate with the punch bars and check the requirement with feeler gages.

c. Adjustment. Loosen the side-plate mounting screws. Position the side-plate to meet the requirement *(a* above), and tighten the mounting screws. Recheck the requirement.

3-172. Function-Lever-Bracket Adjustment

(fig. 3-139)

a. Requirements.

(1) The upper end of the function-cam follower should be centered in the groove of the function-selecting arm.

(2) The roller on the lower end of the function-cam follower should be engaged in the groove of the function cam. The engagement should be at least 7570 of the width of the roller and the roller must *not* be in contact with the bottom of the groove.

(3) The letters-shift lever must engage the letters-shift punch bar and the lever must be free to move without bind.

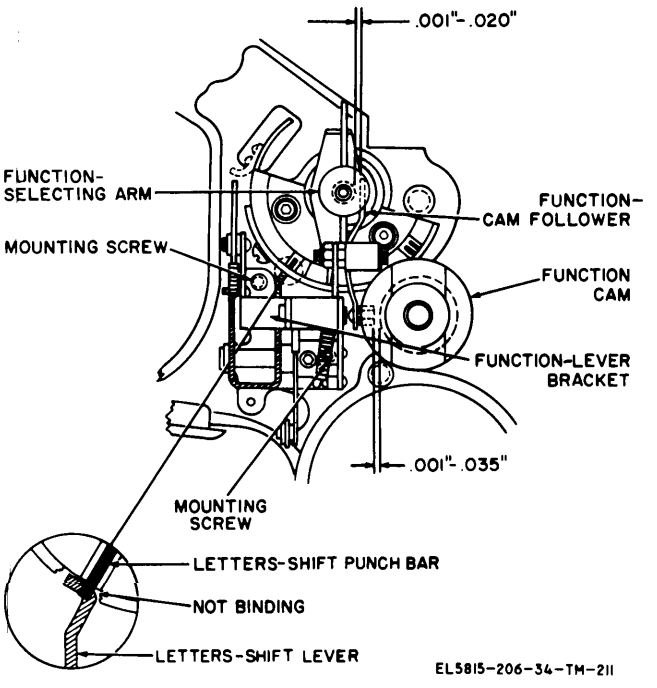


Figure 3-139. Function-lever-bracket adjustment.

b. Adjustment. Loosen the two bracket-mounting screws (accessible from the inner side of the casting.) Position the bracket to meet all three requirements and tighten the mounting screws.

3-173. Letters-Shift-Lever Shaft End-Play Adjustment

(fig. 3-140)

a. Requirement. The letters-shift lever and the platen latch should be in visual alignment. The carriage-feed lever and the support lever should be in alignment. There should be clearance up to a maximum of .005 inch between the collar and the carriage-feed lever.

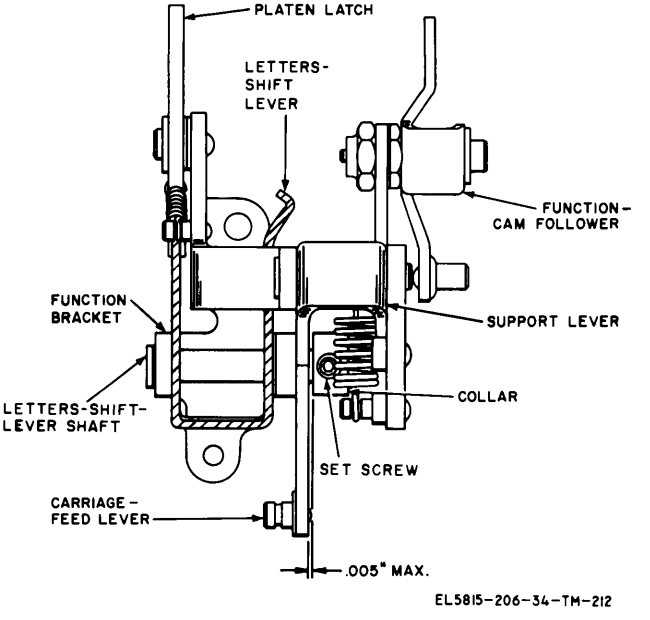


Figure 3-140. Letters-shift-lever shift end-play adjustment.

b. Adjustment. Hold the letters-shift-lever shaft against the bracket and loosen the setscrews in the collar. Position the collar to meet the requirement (a above) and tighten the setscrews.

NOTE

The letters-shift-lever must be held parallel to the bracket while the adjustment is being performed and the requirement is being measured.

3-174. Function-Clutch Tension Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-141)

a. Requirement. There should be a clearance of 0.080- to 0.100-inch between the flexible-coupling

disk and the function-clutch drum when the clutch drum is engaged with the function-shaft driven gear.

b. Method of Checking. Trip the transfer-lever latch and turn the motor by hand until the function-clutch drum has engaged the function-shaft driven gear. Insert a flat feeler gage through the clutch spring and between the flexible-coupling disk and the function-clutch drum to determine the clearance.

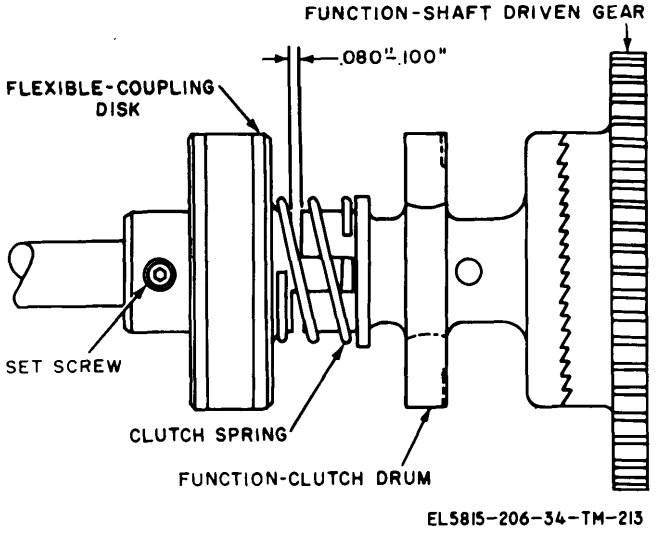


Figure 3-141. Function-clutch tension adjustment (TT-4A/TG and TT-698/TG).

c. Adjustment. Loosen the two setscrews in the flexible-coupling disk and shift the disk in the proper direction to obtain the required clearance. Tighten the two setscrews.

3-175. Function-Shaft Flexible-Coupling Disk Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-142)

NOTE

The function clutch clearance adjustment (para 3-152) should be completed before performing this adjustment.

a. Requirement. There should be a clearance of 0.010- to 0.040-inch between the flexible-coupling disk and the function-clutch drum when the teletypewriter is in the stopped position and the drum is disengaged from the function-shaft driven gear.

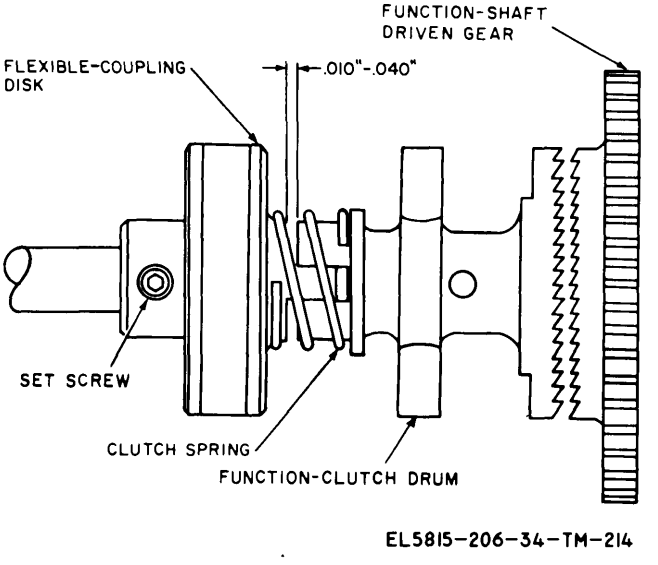


Figure 3-142. Function-shaft flexible-coupling disk adjustment (TT-4B/TG, TT-4C/TG TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. When the teletypewriter is in the stopped position, the function-clutch drum should be disengaged from the function-shaft driven gear. Insert feeler gages through the clutch spring to check the requirement.

c. Adjustment. Loosen the two setscrews in the flexible coupling disk and shift the flexible-coupling disk in the proper direction to obtain the required clearance. Tighten the two setscrews. Check related adjustment (para 3-176).

3-176. Adjustment of Angular Relationship of Function-Shaft Parts TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG)

a. Requirements.

(1) When an arm of the function-clutch drum is fully engaging the function-clutch latch (fig. 3-119), the locking-bail cam follower (fig. 3-109) should be at the high point of the locking-bail cam (fig. 3-143).

(2) When an arm of the function-clutch drum is fully engaging the function-clutch latch, the roller of the print-cam follower (fig. 3-178) should be in the low part of the print cam (fig. 3-143).

(3) Immediately after the transfer operation has occurred and the function-clutch drum has engaged the function-shaft driven gear (fig. 3-141), the function sensing levers (fig. 3-104) should fail to the

low point of the associated cams within 1/3 to 2/3 revolution of the motor.

(4) When an arm of the function-clutch drum is fully engaging the function-clutch latch, the roller on the function-cam follower (fig. 3-144) should be just beyond a high point of the function cam (fig. 3-143).

b. Method of Checking

(1) Turn off the motor. Manually rotate the function shaft to be sure that an arm of the function-clutch drum has fully engaged the function-clutch latch. Visually check the requirement *(a* (1) above).

NOTE

Be sure that the requirement is met before proceeding with the remaining adjustment checks.

(2) Turn the motor on. Depress any keylever. When the operation is complete, turn the motor off. Manually attempt to rotate the function shaft in its normal direction; there should be no movement. Trip the transfer-lever latch (fig. 3-115) and manually rotate the motor. Observe the print bail blade to be sure that there is no backward movement before the blade starts its forward travel.

(3) Turn off the motor. Manually rotate the function shaft to be sure that an arm of the function-clutch drum has fully engaged the function-clutch latch. Position the Y-levers for the line-feed code combination and trip the transfer-lever latch. Slowly rotate the motor by hand until the function-clutch drum has engaged the function-shaft driven gear and note the position of a target spot on the motor. Rotate the motor 1/3 to 2/3 revolution more while checking to make certain that the line-feed sensing lever is pulled to the low part of its cam during this operation.

(4) Manually rotate the function shaft to make certain that an arm of the function-clutch drum fully engages the function-clutch latch. Trip the transfer-lever latch and rotate the motor by hand. Observe the function-selecting arm to be sure that there is no outward movement before the function-selecting arm (fig. 3-144) starts its inward thrust.

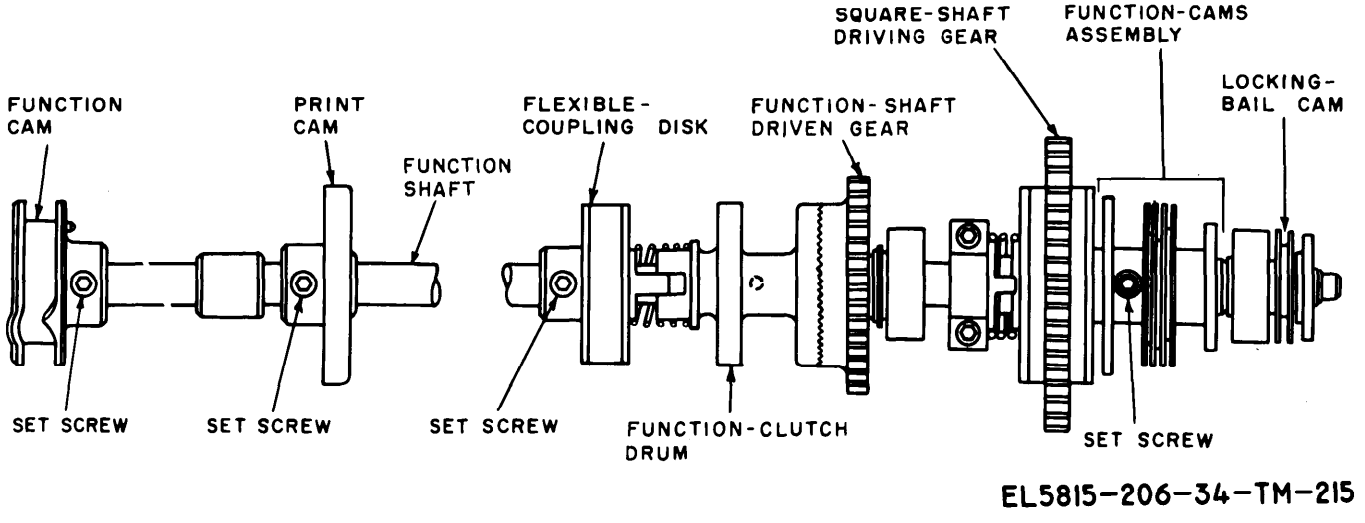


Figure 3-143. Location of parts on function shaft (TT-4(*)/TG, TT-335/TG, TT-537/G, and TT-698(*)/TG).

c. Adjustments.

NOTE

When securing parts of the function shaft, be sure that all setscrews are tightened against the flats of the shaft.

(1) Loosen the setscrews in the flexible-coupling disk. Hold the function-clutch drum firmly against the function-clutch latch and rotate the function shaft to meet the requirement *(a* (1) above). Tighten the setscrews, and then perform the adjustments listed below.

(2) Loosen the setscrews in the print cam. While holding an arm of the function-clutch drum in firm engagement with the function-clutch latch, rotate the print cam to the point where any backward rotation of the print cam starts to move the print-cam follower. Tighten the setscrews.

(3) Loosen the setscrews in the function-cams assembly and rotate it (fig. 3-143) to meet the requirement *(a* (3) above). Tighten the setscrews.

(4) Loosen the setscrews in the function cam (fig. 3-143) and rotate the cam to meet the requirement *(a* (4) above). Tighten the setscrews.

3-177. Function-Cam Adjustment

(fig. 3-144)

a. Requirement. There should be a 0.008- to 0.020-inch clearance between the function-selecting arm and the punch bar guide block when the function-selecting arm is in its unoperated position.

NOTE

If a punch bar protrudes beyond the punch-bar-guide block, there should be a 0.002-inch minimum clearance between the punch bar

and the function-selecting arm, but the maximum tolerance given in the requirement *(a* above) should not be exceeded.

b. Method of Checking, Check visually to determine if a punch bar (or bars) protrudes beyond the punch-bar-guide block. If this condition exists, depress the keylever to align the function-selecting arm with that punch bar. Check for the 0.002-inch minimum clearance between the function-selecting arm and punch-bar and the 0.008- to 0.020-inch clearance between the function-selecting arm and the punch-bar-guide block. If no punch bar protrudes beyond the punch-bar-guide block, align the function-selecting arm with any portion of the punch-bar-guide block and check the requirement *(a* above) with feeler gages. Check both sides of the function-selecting arm.

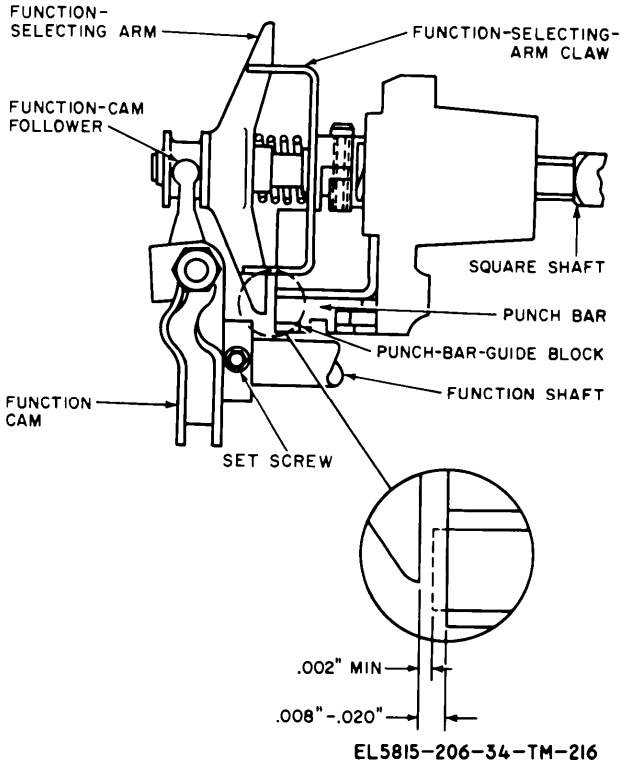


Figure 3-144. Function-cam adjustment.

c. Adjustment. Loosen the setscrew in the function cam. Move the function cam in the proper direction along the function shaft until the requirement is met. Tighten the setscrews and recheck the requirement and the related adjustment (para 3-176).

3-178. Carriage-Feed Ratchet Adjustment

(fig. 3-145)

a. Requirement. There should be a 0.010- to 0.020-inch clearance between the carriage-feed ratchet and the end of the flat on the carriage-feed shaft.

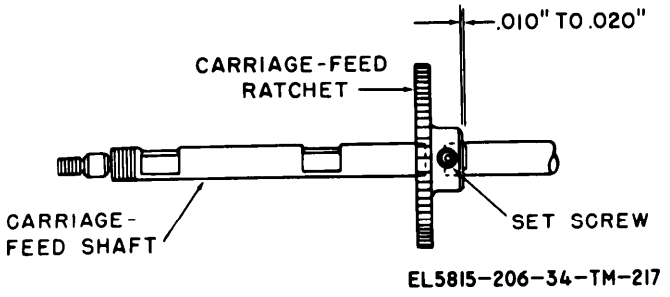


Figure 3-145. Carriage-feed ratchet adjustment.

b. Adjustment. Loosen the setscrews on the ratchet and position it to meet the requirement *(a* above). Tighten the setscrews.

3-179. Carriage-Feed-Shaft Drive-Collar Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-146)

a. Requirement. The friction-clutch assembly should be compressed against the carriage-feed ratchet with a 1- to 1½ -pound pressure.

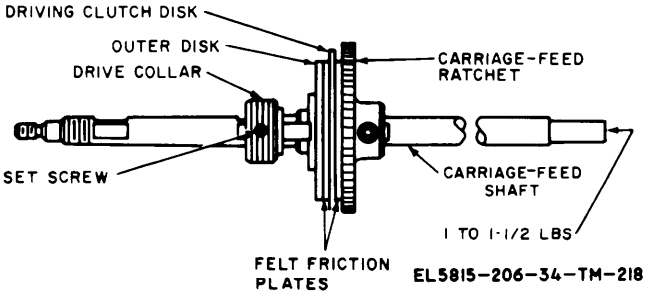


Figure 3-146. Carriage-feed-shaft drive-collar adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Loosen the setscrews in the drive collar; apply a 1¼-pound pressure on the end of the carriage-feed shaft and against the drive collar; and tighten the setscrews.

3-180. Carriage-Feed Driving Gear End-Play Adjustment

(fig. 3-147)

a. Requirement. There should be a 0.001- to 0.005-inch clearance between the flat washer and the shoulder on the carriage-feed shaft, when the carriage-feed driving gear is held tightly against the ball bearing.

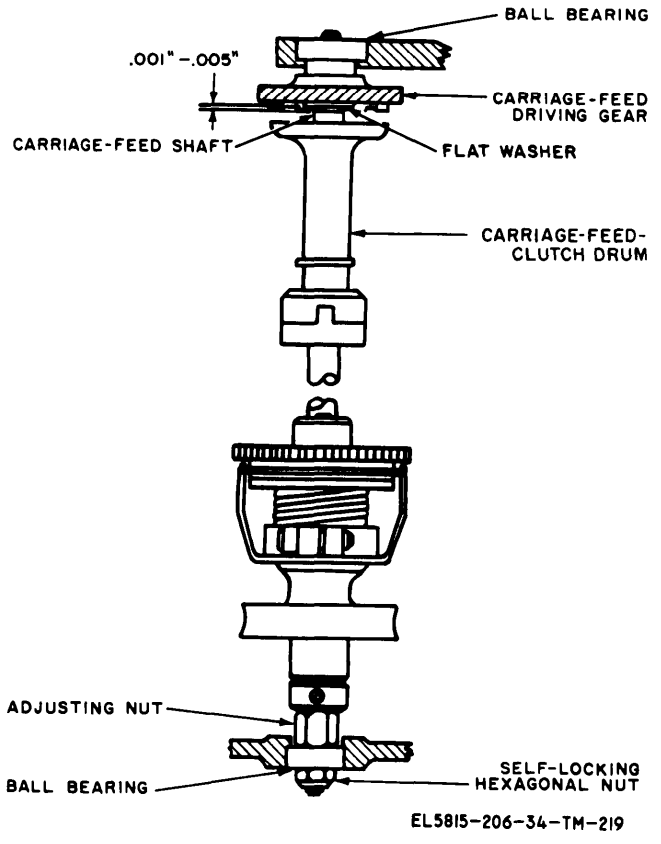


Figure 3-147. Carriage-feed driving gear end-play adjustment.

b. Method of Checking. Push the carriage-feed-clutch drum and the carriage-feed driving gear apart and check the clearance with a feeler gage.

c. Adjustment. Loosen the self-locking hexagonal nut on the end of the carriage-feed shaft. Rotate the adjusting nut in proper direction until the requirement *(a* above) is met. Tighten the self-locking hexagonal nut and recheck the clearance.

3-181. Carriage-Feed Driven Gear Adjustment

(fig. 3-148)

a. Requirement. The carriage-feed driven gear should be centered with the carriage-feed worm on the shaft.

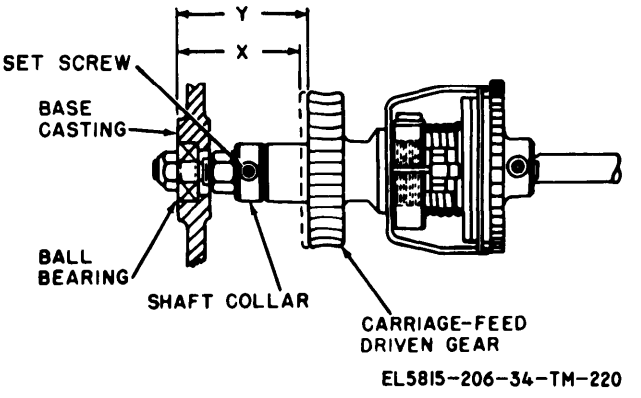


Figure 3-148. Carriage-feed driven gear adjustment,

b. Adjustment. Loosen the setscrews in the shaft collar. Push the carriage-feed driven gear forward until tight. Measure distance Y as shown. Pull the carriage-feed driven gear rearward until tight and measure distance X as shown. Divide the difference between the two measurements and add to X. Using this dimension, position the carriage feed driven gear, slide the shaft collar against the gear, and tighten the setscrews in the collar.

3-182. Carriage-Feed Pawl Adjustment

(fig. 3-149)

a. Requirement. There should be a 0.005- to 0.015-inch clearance between the carriage-feed pawl and the carriage-feed blocking lever when:

(1) The carriage is in the 72nd space from the left margin.

(2) The platen is in the letters-shift position and the S or H code group is set up on the code rings.

(3) The carriage-feed pawl is fully operated.

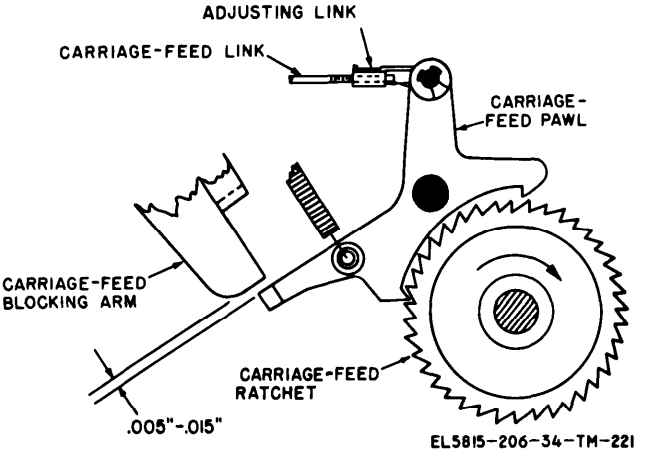


Figure 3-149. Carriage-feed pawl adjustment.

b. Adjustment. Detach the adjusting link from the carriage-feed pawl and turn the link one or more half-turns as necessary to meet the requirement *(a* above). Attach the link to the pawl and recheck the requirement.

3-183. Carriage-Return Clutch-Lever-Shaft Clearance Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-150)

a. Requirements.

(1) There should be a 0.002- to 0.005-inch clearance between the carriage-return clutch-actuating lever and the clutch-latch mounting plate.

(2) There should be a 0.002- to 0.005-inch clearance between the throw-out lever and the double-blocking lever.

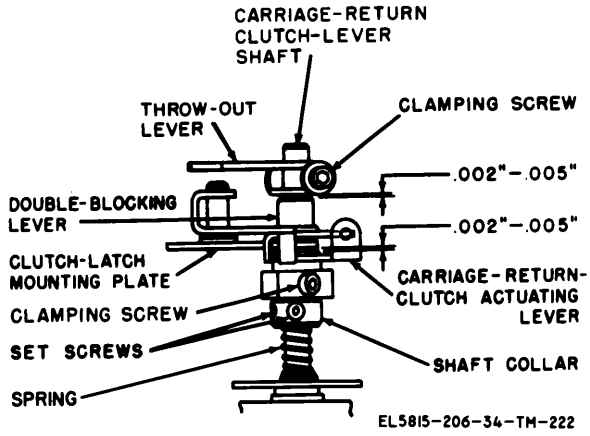


Figure 3-150. Carriage-return clutch-lever-shaft clearance adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustments.

(1) Loosen the clamping screw on the carriage-return clutch-actuating lever. Loosen the setscrews on the carriage-return clutch-lever shaft collar. Insert a flat feeler gage between the carriage-return clutch-actuating lever and the clutch-latch mounting plate. Press the top on the shaft and, while the feeler gage is held between the carriage-return clutch-actuating lever and the clutch-latch mounting plate, tighten the setscrews in the shaft collar. Make the carriage-return clutch-actuating lever adjustment (para 3-184) before tightening the clamping screw in the carriage-return clutch-actuating lever.

(2) Loosen the clamping screw in the throw-out lever. Insert a flat feeler gage between the throw-out lever and the double-blocking lever and tighten the clamping screw.

3-184. Carriage-Return Clutch-Actuating-Lever Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537, TT-698A/TG, and TT-698B/TG)

(fig. 3-151)

a. Requirement. When the carriage is two or more spaces from the left-hand margin and the carriage-return-clutch members are fully engaged, there should be some, but not more than 0.005-inch clearance between the carriage-return clutch-actuating lever and the carriage-return latch.

b. Method of Checking. When the carriage is two or more spaces from the left-hand margin and the motor is off, select the carriage-return operation. Release the transfer lever and turn the motor by hand until the carriage-return clutch is fully engaged. Manually hold the carriage-return-clutch-lever (fig. 3-153) in a counterclockwise direction and check clearance with a feeler gage.

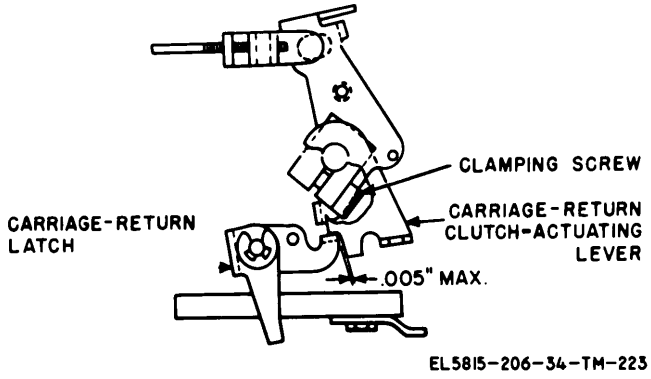


Figure 3-151. Carriage-return clutch actuating-lever adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

c. Adjustment. Disconnect the carriage-feed clutch-lever spring (fig. 3-153) and the horizontal carriage-return link (fig. 3-169). Manually hold the carriage-return-clutch members in full engagement. Loosen the clamping screw (fig. 3-151) and rotate the carriage-return clutch-actuating lever to meet the requirement *(a* above). Hold the carriage-return clutch-actuating lever down against the shaft collar and tighten the clamping screw. Reconnect the carriage-feed clutch-lever spring and make the carriage-return clutch adjustment (para 3-185). Check the related adjustments (para 3-199, 3-200, and 3-238).

3-185. Carriage-Return Clutch Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/ G, TT-698A/TG, and TT-698B/TG)

(fig. 3-152)

a. Requirements. The carriage-return clutch should be fully engaged before the carriage-return sensing lever strikes the lowest portion of the restoring cam, (drops off the restoring roller on the TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG) and the carriage-feed clutch should not bounce when characters other than carriage return are selected.

b. Method of Checking. Depress the space bar and the repeat keylever. While the carriage is moving to the right, watch the carriage-feed clutch. The clutch should remain fully closed while the carriage is moving. When the carriage is one or more spaces from the left-hand margin, turn off the motor. Select any keylever except the carriage return, trip the transfer-lever latch and turn the motor by hand until the carriage-return sensing lever touches the carriage-return stop bar. The double-blocking lever should be rotated to the point where it just contacts the carriage-return-clutch actuating lever.

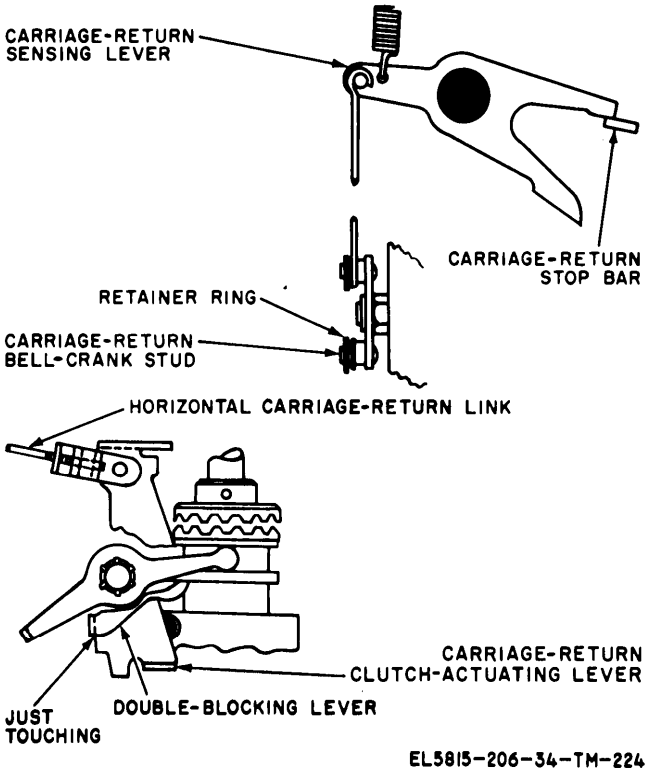


Figure 3-152. Carriage-return clutch adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

c. Adjustment. Select any character except the carriage return. Trip the transfer-lever latch and rotate the motor by hand until the carriage-return sensing lever touches the carriage-return stop bar. Detach and adjust the horizontal carriage-return link so that when it is fitted over the stud on the carriage-return bellcrank, the double-blocking lever is just touching the carriage-return-clutch actuating lever.

3-186. Carriage-Feed-Clutch Drum Adjustment

(fig. 3-153)

a. Requirement. With the members of the carriage-return clutch engaged, there should be 0.035- to 0.045-inch clearance between the carriage-feed-clutch drum and the carriage-feed driving gear.

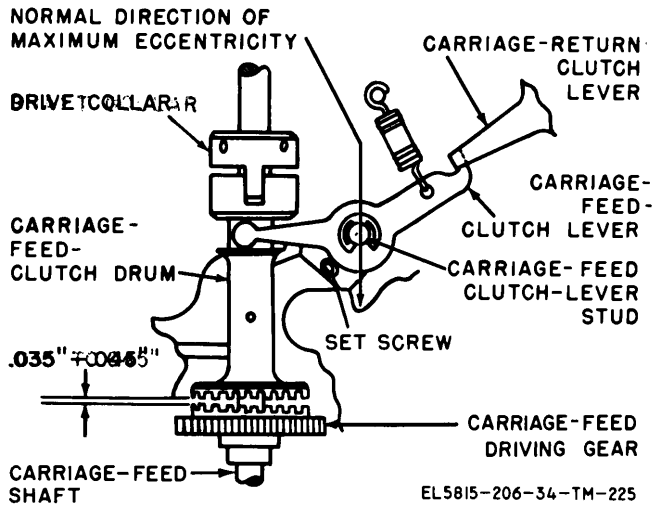


Figure 3-153. Carriage-feed-clutch drum adjustment.

b. Method of Checking. With the carriage one or more spaces from the left-hand margin, turn off the motor. Select the carriage return, release the transfer lever, and turn the motor by hand until the carriage-return clutch is fully engaged. Check for the requirement (a above).

c. Adjustment. Loosen the setscrew and turn the carriage-feed-lever stud until the requirement (a above) is met. Tighten the setscrew.

3-187. Decelerating Cam and Carriage-Feed-Clutch Positioning Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

a. Requirement. With the carriage at the left-hand margin, the finger of the decelerating cam should be centered (plus or minus 1/16 inch) with the adjacent hole in the carriage-return driven gear (B, fig, 3-154).

b. Method of Checking. Return the carriage to the left-hand margin and check the finger position visually.

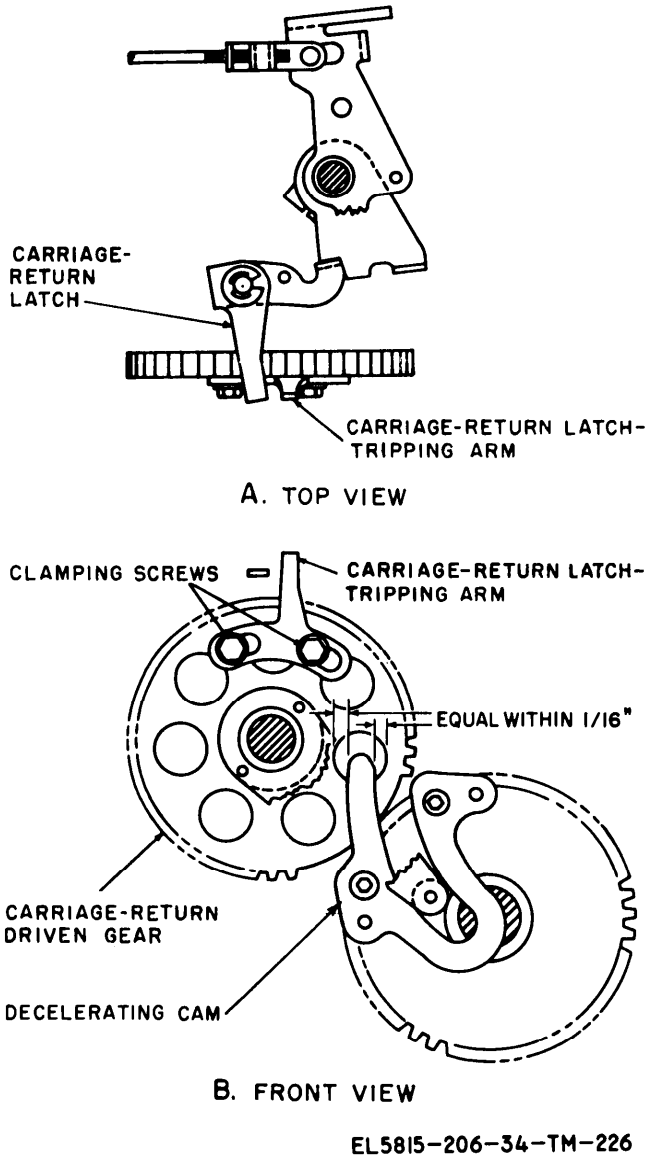


Figure 3-154. Decelerating cam and carriage-feed-clutch positioning adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

NOTE

The following adjustment can most easily be made when the motor is operating. Extreme care should be exercised to prevent injury.

c. Adjustment. Make the adjustment in the following steps:

(1) Loosen the mounting screws A, fig. 3-158) far enough to disengage the carriage rack from the carriage-rack driving gear. Move the carriage to the right hand margin.

(2) Loosen the clamping screws (B, fig. 3-154) and rotate the carriage-return latch-tripping arm as far clockwise as possible.

(3) Loosen *one* of the two setscrews that hold the drive collar (fig. 3-153) to the carriage-feed shaft and turn the shaft until the other setscrew in the collar is straight up. Remove the double-blocking lever spring (A, fig. 3-155) and manually disengage the carriage-feed clutch (fig. 3-153). Rotate the carriage-rack driving gear (A, fig. 3-158) until the decelerating cam (B, fig. 3-154) is set as closely as possible to the position described in *a* above. Engage the carriage-feed clutch and replace the double-blocking lever spring.

(4) Loosen the other setscrew in the drive collar on the carriage-feed shaft. Turn the carriage-feed ratchet until a tooth of the ratchet presses firmly against the upper latching arm of the carriage-feed pawl (fig. 3-149). Rotate the drive collar until the cam is positioned within the requirement *(a* above) and tighten both setscrews. Make the carriage-return latch-tripping arm adjustment (para 3-188). Then make the related adjustments (para 3-190 and 3-192).

3-188. Carriage-Return Latch-Tripping-Arm Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-155)

a. Requirement. The carriage-return latch-tripping arm should trip the carriage-return latch when the decelerating cam reaches the position shown in B, figure 3-154, and the carriage-feed clutch members (fig. 3-153) are aligned to mesh.

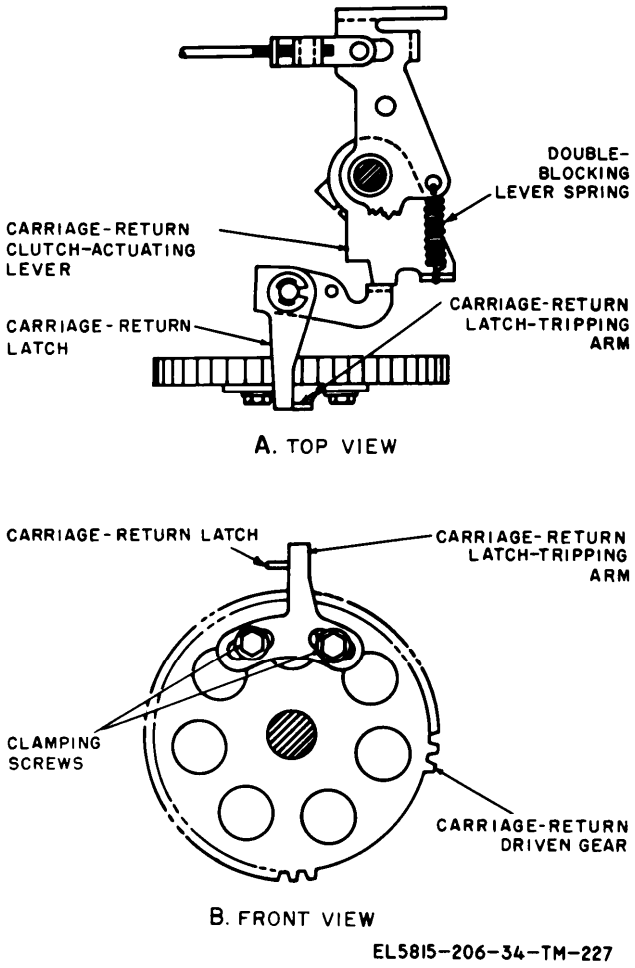


Figure 3-155. Carriage-return latch-tripping-arm adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Move the carriage 10 or more spaces from the left-hand margin and turn the motor off. Press the CAR RET keylever and turn the motor by hand until the carriage nears the left-hand margin. When the carriage-return latch-tripping arm touches the carriage-return latch (A, fig. 3-155) turn the motor slowly. Watch the alignment of the carriage-feed-clutch teeth and the position of the decelerating cam at the time of disengagement.

c. Adjustment. Loosen the clamping screw in the throw-out lever (fig. 3-167). Position the decelerating cam and the carriage-feed clutch (fig. 3-154). Loosen the two clamping screws (B, fig. 3-155) and position the carriage-return latch-tripping arm flush with the carriage-return latch when the latch is flush with the carriage-return clutch-actuating lever (A, fig. 3-155). Tighten one of the clamping screws and recheck the requirement (a above). If the carriage-return latch is tripped too soon, position the latch-tripping arm clockwise. If the latch is tripped too late, position the latch-tripping arm counterclockwise. Tighten both clamping screws. Perform the related adjustment (para 3-200).

3-189. Square-Shaft Sliding-Gear Bearing Adjustment

(fig. 3-156)

NOTE

This adjustment should be performed during installation of the carriage on the teletypewriter.

a. Requirement. The flat portion of the square-shaft sliding-gear bearing should be positioned downward and towards the rear to provide clearance for the function-shaft driven gear.

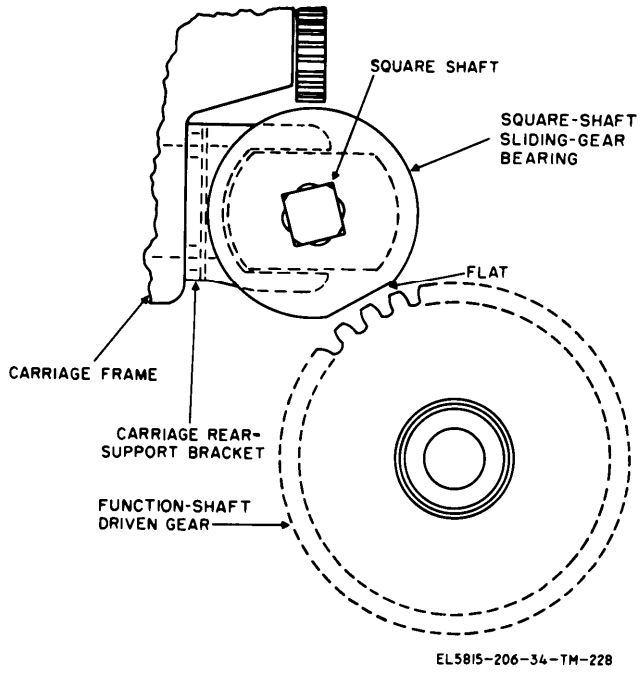


Figure 3-156. Square-shaft sliding-gear bearing adjustment.

b. Method of Checking. Check the requirement visually.

c. Adjustment. When installing the type-bar carriage, the rear support fork of the carriage frame should engage the square-shaft sliding-gear bearing so that the flat side of the bearing is towards the function-shaft driven gear.

3-190. Carriage Position Adjustment

(fig. 3-157)

a. Requirement. There should be a 2-3/8- to 2½-inch clearance between the rear side of the code-ring-cage plate and the centerline of the carriage when the carriage is at the left-hand margin and the decelerating cam is positioned as shown in figure 3-154.

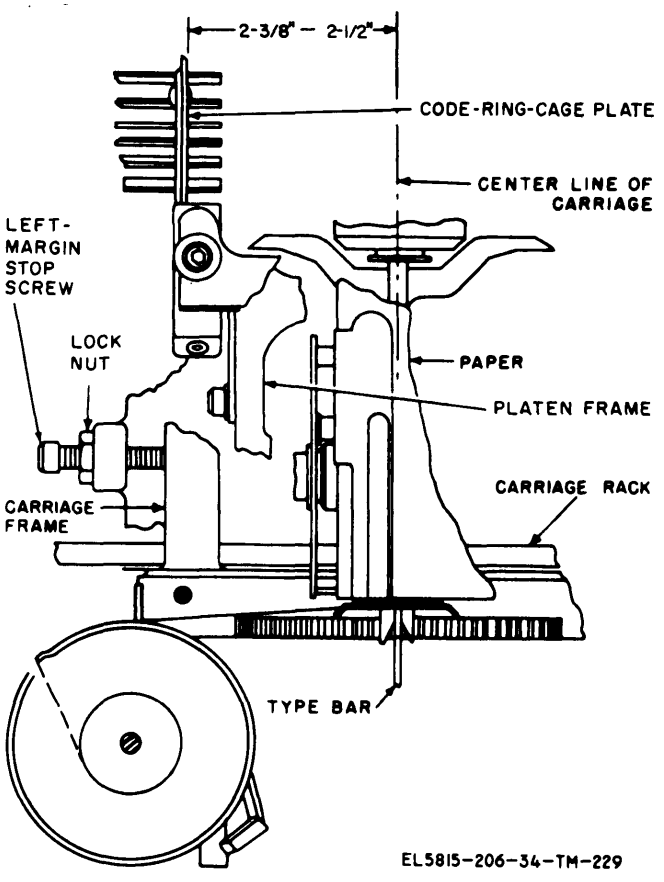


Figure 3-157. Carriage position adjustment.

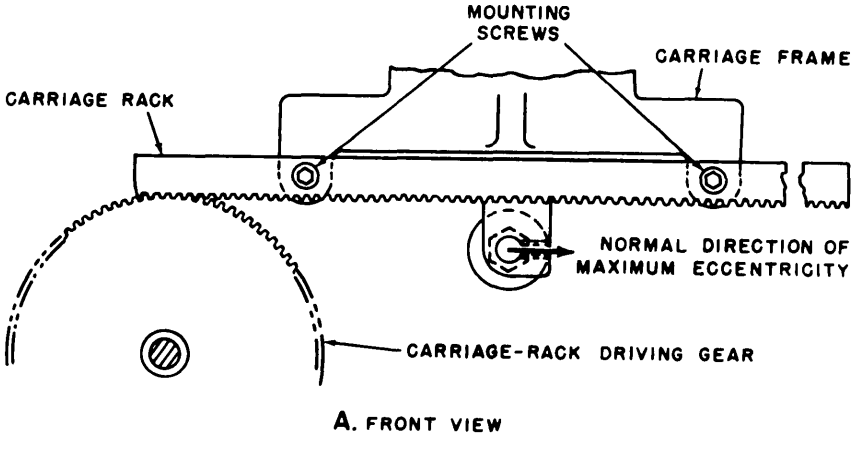


Figure 3-158. Ball bearing adjustment.

b. Adjustment. Remove the carriage rack (A, fig. 3-158). Loosen the setscrew that holds the roller mounting stud of the ball bearing; turn the stud until the requirement *(a* above) is met; and tighten the setscrew. Replace and adjust the carriage rack as described in paragraph 3-192.

b. Adjustment. Position the carriage at the left-hand margin. Loosen the locknut and back the left-margin stop screw away from the carriage frame, Loosen the carriage-rack mounting screws to disengage the rack from the carriage-rack driving gear (fig. 3-158). Position the carriage and reengage the rack with the gear. Tighten the locknut. Check related adjustment (para 3-191 and 3-192).

3-191. Ball Bearing Adjustment

a. *Requirement.* The carriage should roll from one end of the guide rail to the other with no clearance between the ball bearing and the guide rail (B, fig. 3-158).

3-192. Carriage-Rack Adjustment

(fig. 3-159)

a. Requirement. There should be minimum backlash between the carriage-rack driving gear and the carriage rack.

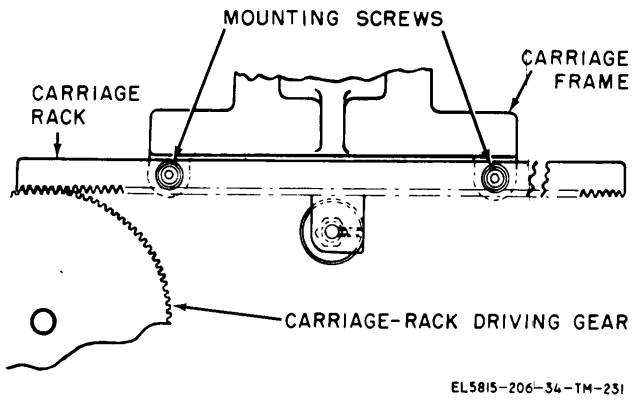


Figure 3-169. Carriage-rack adjustment.

b. Adjustment. Move the carriage to the left-hand margin. Loosen the two carriage-rack mounting screws and position the carriage rack for minimum backlash. Tighten the screw that is nearer the carriage-rack driving gear. Move the carriage to the right-hand margin. Position the carriage rack for minimum backlash and tighten the second screw. There should be equal and minimum backlash on both ends of the carriage rack.

3-193. Carriage-Rack Drive-Shaft Adjustment

(fig. 3-160)

a. Requirement. There should be some clearance but not more than 0.010-inch clearance between the collar and the ball bearing when the shoulder of the carriage-rack drive shaft is tight against the ball bearing.

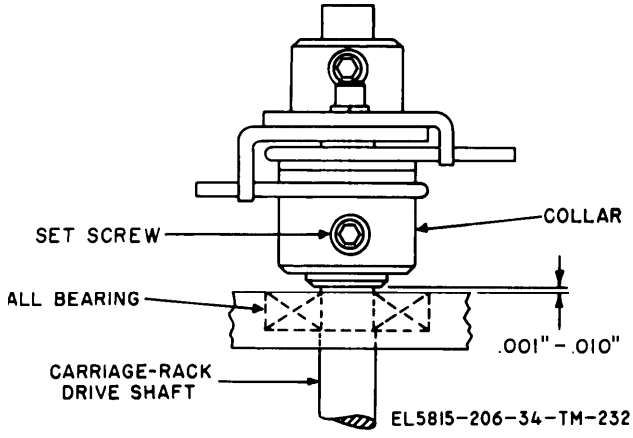


Figure 3-160. Carriage-rack drive-shaft adjustment.

b. Method of Checking. Push and pull the carriage-rack driveshaft lengthwise to determine whether there is end play between the carriage-rack drive-shaft and the ball bearing.

c. Adjustment. Loosen the setscrew in the collar. Push the carriage-rack drive shaft toward the collar until the shoulder of the carriage-rack drive-shaft is against the ball bearing. Hold the driveshaft and push the collar against the ball bearing. Tighten the setscrew.

3-194. Carriage-Rack Retainer Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)

(fig. 3-161)

NOTE

The adjustments in paragraphs 3-191 and 3-192 should be performed prior to performing this adjustment.

a. Requirement. There should be 0.001- to 0.015-inch clearance between the carriage-rack and the carriage-rack retainer when checked with a feeler gage.

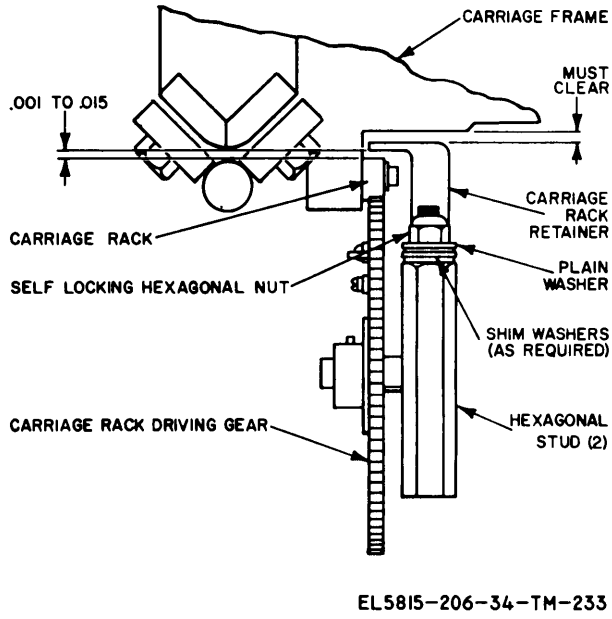


Figure 3-161. Carriage-rack retainer adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

b. Adjustment. Remove the two self-locking hexagonal nuts and washers that hold the carriage-rack retainer to the retainer posts. Add or remove shims (ref. No. 59561, .005-in. or 59562, .010-in.) to meet the requirement. Replace the retainer, washers, and self-locking hexagonal nuts; tighten and recheck the requirement.

3-195. Carriage-Feed Blocking Adjusting Lever and Carriage-Return Blocking-Lever Clearance Adjustments (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-160 and 3-162)

a. Requirements.

(1) The carriage-return blocking lever should be

centered with the adjusting plate on the double-blocking lever.

(2) There should be 0.002- to 0.010-inch clearance between the carriage-return blocking lever and the carriage-feed blocking adjusting lever.

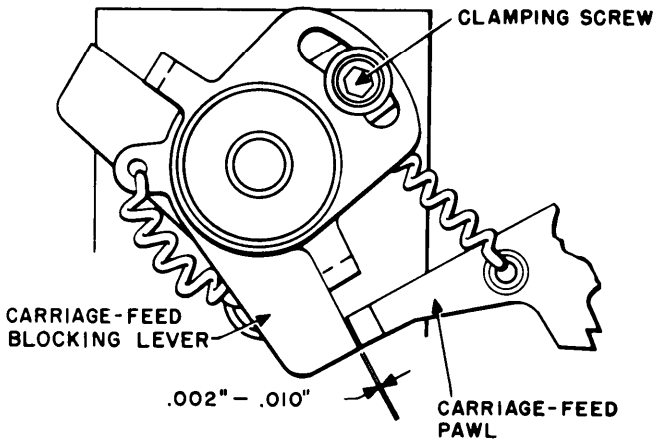


Figure 3-162. Carriage-feed blocking adjusting lever and carriage-return blocking-lever clearance (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustments.

(1) Remove the carriage-return blocking adjusting lever, carriage-feed blocking adjusting lever, carriage-return blocking lever, and the laminated washer. Peel the laminated washer to meet the requirement *(a* (1) above). Reassemble the above items in reverse order and check the requirement.

(2) Loosen the setscrews in the carriage-return blocking adjusting lever. Insert a 0.005-inch feeler gage between the carriage-feed blocking adjusting lever and the carriage-return blocking lever. Move the carriage-feed blocking adjusting lever against the feeler gage and tighten one setscrew friction-tight. Perform the carriage-return blocking adjusting lever adjustment (para 3-196) before tightening the setscrews. Tighten the setscrews. Perform the carriage-feed blocking adjusting arm adjustment (para 3-197).

3-196. Carriage-Return Blocking-Lever Adjustment (TT-4B/ TG, TT-4C/TG, TT-335/TG, TT-537/ G, TT-698A/TG, and TT-698B/TG) (fig. 3-163)

a. Requirement. There should be 0.010- to 0.020 - inch clearance between the carriage-return blocking adjusting lever and the adjusting plate when the carriage is one space out from the left margin.

b. Method of Checking. With the carriage one space from the left margin, position the code rings for carriage return and turn the motor manually until the carriage-return sensing lever drops to the low point of its cam. The double-blocking lever will position the adjusting plate over the carriage-return blocking adjusting lever. Measure the clearance with feeler gages.

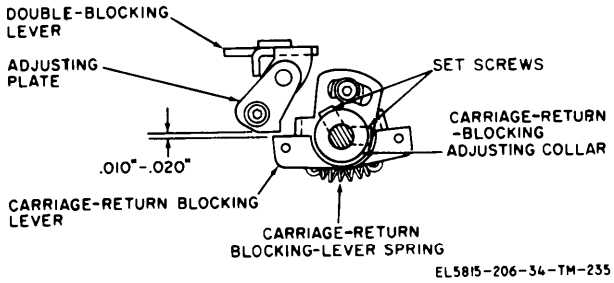


Figure 3-163. Carriage-return blocking-lever adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

c. Adjustment. Loosen the two setscrews in the carriage-return blocking adjusting lever and rotate the lever to meet the requirement. Before tightening the setscrews, check the requirement given in paragraph 3-195. Tighten the setscrew. Check related adjustment (para 3-197).

3-197. Carriage-Feed Blocking-Lever Adjustment (fig. 3-164)

a. Requirement. There should be 0.002- to 0.010 - inch clearance between the carriage-feed blocking-lever and the extension of the carriage-feed pawl when the carriage is in the 68th space.

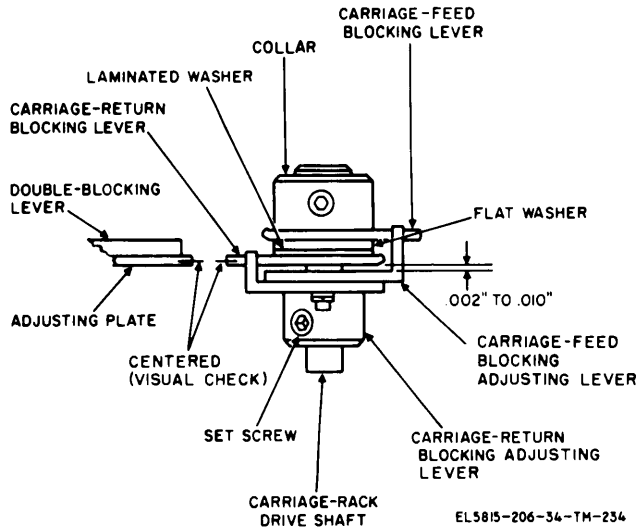


Figure 3-164. Carriage-feed blocking-lever adjustment.

b. Adjustment. Move the carriage 68 spaces from the left-margin stopscrew and loosen the clamping

screw. Rotate the carriage-feed blocking lever until the requirement *(a* above) is met. Tighten the screw.

3-198. Rights-Margin Stop-Screw Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-165)

a. Requirement. The right-margin stop screw should halt the carriage in the 72nd space.

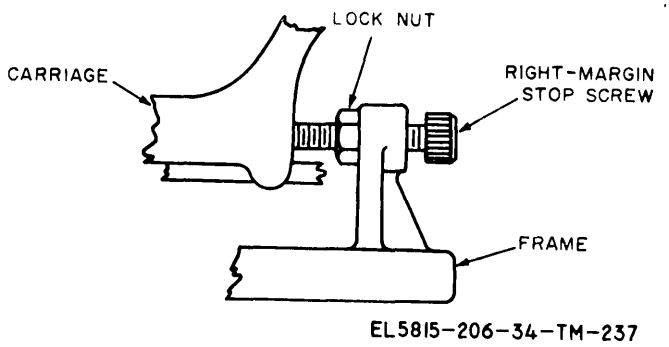


Figure 3-165. Right-margin stop-screw adjustment (TT-4A/TG and TT-698/TG).

b. Adjustment. Loosen the locknut that holds the right-margin stopscrew and turn the screw counterclockwise for a few turns. Move the carriage 72 spaces from the left-margin stopscrew. Turn the right-margin stopscrew until it is 0.010 to 0.020 inch from the carriage. Tighten the locknut.

3-199. Carriage-Return Adjusting-Plate Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-166)

a. Requirement. There should be 0.015- to 0.025-inch clearance between the carriage-return blocking lever and the adjusting plate when the carriage is at the left margin. The carriage-return-clutch drum and the carriage-return-clutch disk (fig. 3-168) should not touch each other when the carriage-return operation is selected while the carriage is against the left-margin stopscrew.

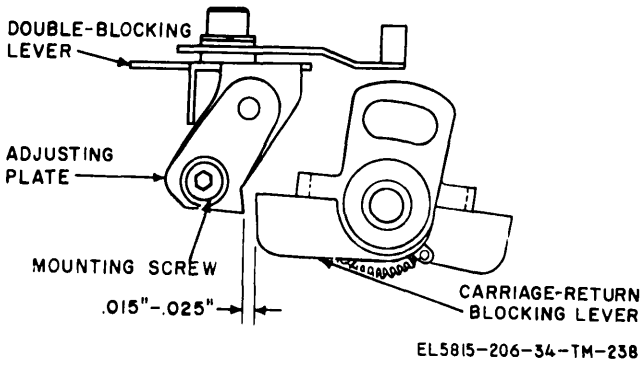


Figure 3-166. Carriage-return adjusting-plate adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Position the carriage at the left margin and turn off the motor. Use a feeler gage to check the gap between the carriage-return blocking lever and the adjusting plate.

c. Adjustment. Position the carriage at the left margin. Loosen the mounting screw and move the adjusting plate to meet the requirement *(a* above). Tighten the mounting screw. Position the code rings for the carriage-return operation. Turn the motor manually and check to see that the members of the carriage-return clutch do not engage.

3-200. Throw-Out Lever Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

a. Requirement. There should be 0.010- to 0.020-inch clearance between the throw-out lever and the carriage-return latch-tripping arm (A, fig. 3-167) when the carriage is in the left-hand margin position.

b. Method of Checking. Turn the motor on and press the CAR RET keylever, causing the carriage to move to the left-hand margin. Turn the motor off and trip the transfer-lever latch. Hold the carriage-return blocking lever (fig. 3-166) downward and turn the motor slowly by hand until the carriage-return clutch members move against each other (tooth

meets against tooth) (B, fig. 3-167). If the clutch teeth start to engage, hold the carriage-return-clutch drum out of engagement; continue turning the motor until the teeth are in line; and release the clutch drum. Use a feeler gage to check the requirement *(a* above).

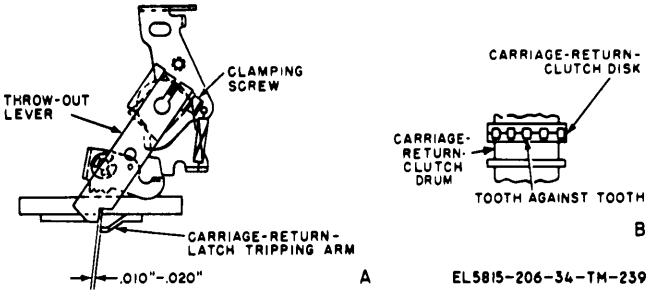


Figure 3-167. Throw-out lever adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

c. Adjustment. Loosen the clamping screw in the throw-out lever, Move the throw-out lever to obtain the 0.010- to 0.020-inch gap while maintaining the requirement given in paragraph 199a(2); and tighten the clamping screw. Recheck the requirement *(a* above).

3-201. Carriage-Return-Clutch Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-168)

a. *Requirement.* When the members of the carriage-return clutch are engaged, there should be 0.005- to 0.010-inch clearance between the carriage. return latch and the latching end of the carriage-return operating lever.

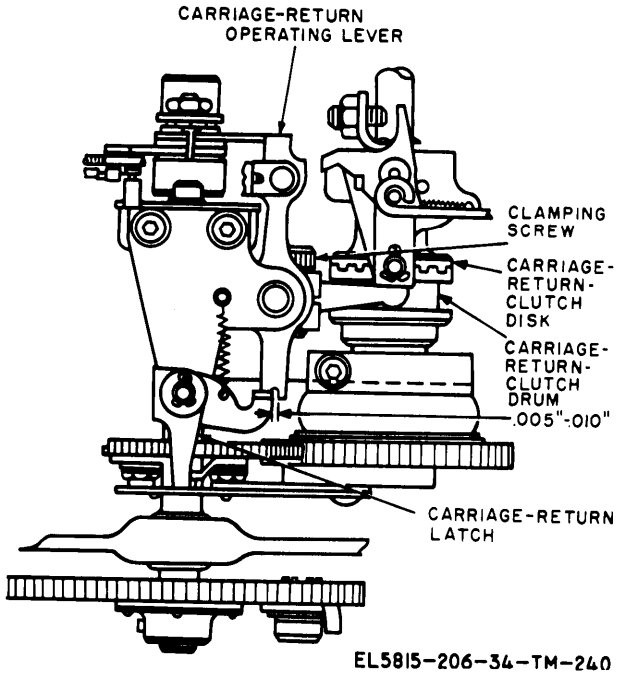


Figure 9-168. Carriage-return-clutch adjustment (TT-4A/TG and TT-698/TG).

b. Adjustment. Loosen the clamping screw that holds the carriage-return operating lever. Position the lever to meet requirement *(a* above). Tighten the clamping screw. Check related adjustments (para 3-202 and 3-237).

3-202. Carriage-Return-Link Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-169)

NOTE

The carriage-return clutch adjustment (para 3-201) should be completed before this adjustment is performed.

a. Requirement. The driven member of the carriage-return-clutch drum should move into engagement with the carriage return clutch disk when the carriage-return sensing lever drops to a low point of its cam.

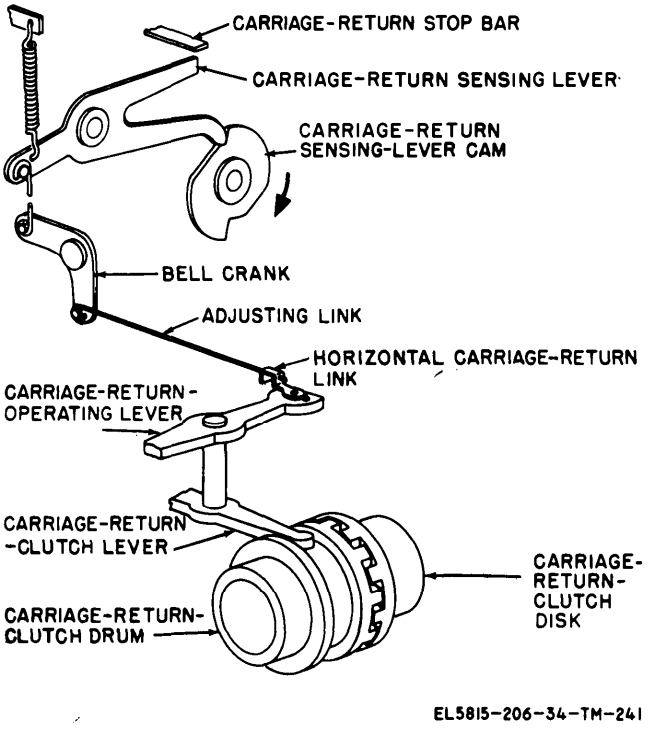


Figure 3-169. Carriage-return-link adjustment (TT-4A/TG and TT-698/TG).

b. Adjustment. Detach the adjusting link from the bellcrank. Adjust the length of the link until the requirement *(a* above) is met. Reattach the adjusting link to the bellcrank.

3-203. Carriage-Return Latch-Tripping-Arm Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-170)

a. Requirement. The latch-tripping arm should trip the carriage-return latch as the carriage strikes the left-margin stopscrew and the teeth of the carriage-feed clutch members (fig. 3-153) are aligned to mesh.

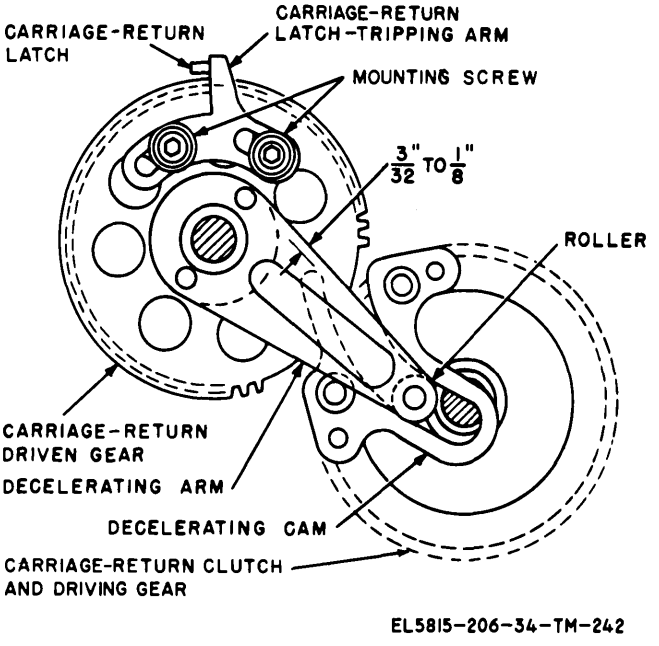


Figure 3-170. Carriage-return latch-tripping-arm adjustment (TT-4A/TG and TT-698/TG).

b. Adjustment. Make this adjustment after the carriage-feed and carriage-return clutches have been adjusted. Move the carriage to the left against the left-margin stop screw. Loosen the screws that hold the latch-tripping arm to the carriage-return driven gear. Disengage the carriage-feed clutch. Rotate the carriage-return gears until the protruding end of the decelerating cam is 3/32 to 1/8 inch from the top edge of the decelerating arm. It may be necessary to disengage the carriage rack from the carriage-return drive gear to permit sufficient rotation to get the proper adjustment. To do this, loosen the screws that hold the guide rail to the frame. Raise the carriage and disengage the rack from the gear. When the decelerating cam is 3/32 inch to 1/8 inch from the top edge of the decelerating arm, engage the rack and gear and tighten the rail mounting screws. Move the latch-tripping arm against the carriage-return latch and when the carriage-return operating lever unlatches, tighten the mounting screws. Check the carriage-feed clutch adjustment (para 3-204).

3-204. Carriage-Feed Friction-Clutch Adjustment

(fig. 3-171)

a. Requirement. A force of 44 to 48 ounces should be required to hold the carriage motionless when the carriage-feed mechanism operates.

b. Method of Checking. Turn the motor on and

position the carriage 10 spaces from the left-hand margin, Hook a 64-ounce spring scale at the point shown on figure 3-171. Hold the spring scale and press the space bar. The carriage will move to the right until the pull of the spring scale stops it. Move the spring scale slowly to the right and read it when the carriage starts to move again. Continue reading the spring scale in this manner until the carriage has reached the right hand margin. Note the point at which the reading of the spring scale is the lowest. At this point, the reading should equal the requirement *(a* above).

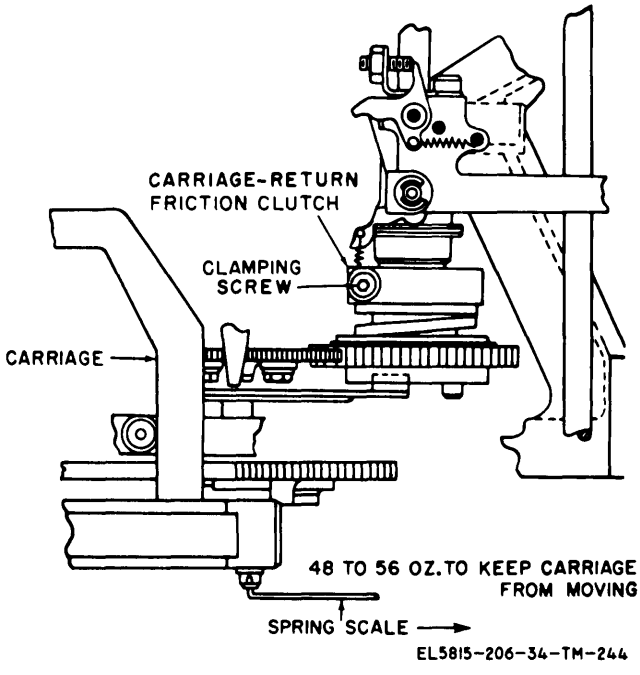


Figure 3-171. Carriage-feed friction-clutch adjustment,

c. Adjustment. Turn the motor off. On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, loosen the clamping screw in the friction-adjusting collar, turn the collar to meet the requirement *(a* above) and tighten the clamping screw. On the TT-4A/TG and TT-698/TG, loosen the setscrews in the friction-adjusting collar, slide the collar to meet the requirement *(a* above) and tighten the setscrews. Recheck the requirement and readjust if necessary.

3-205. Carriage-Return Friction-Clutch Adjustment

(fig. 3-172)

a. *Requirement.* Tension of 48 to 56 ounces should be required to prevent the carriage from moving when the carriage-return mechanism is operating.

b. Method of Checking. Turn the motor on and move the carriage to the right-hand margin. Hook a spring scale to the right hand side of the carriage. Hold the scale and securely press the CAR RET keylever. The carriage should move toward the left until the pull of the spring scale stops it. Move the scale slowly to the left and read it when the carriage starts to move again. Continue reading the scale while moving the carriage until the carriage is 10 spaces or more from the left-hand margin. The lowest reading should equal the requirement *(a* above).

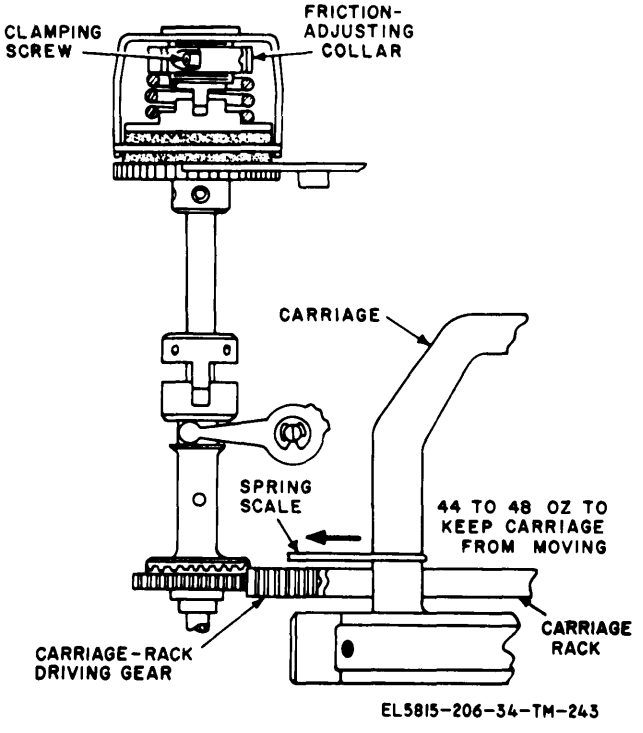


Figure 3-172. Carriage-return friction-clutch adjustment.

c. Adjustment. Turn on the motor and move the carriage away from the left margin until a socket head wrench can be inserted into the machine screw. Turn the motor off and insert the wrench into the clamping screw and loosen it. Depress the manual carriage-return pushbutton and hold the carriage from moving while turning the motor manually until the carriage-return friction clutch is adjusted to meet the requirement *(a* above). Turn the motor clockwise manually to increase the tension; turn it counterclockwise to decrease the tension, Tighten the clamping screw, remove the wrench, and recheck.

3-206. Fulcrum Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

a. Requirement. There should be 0.010- to 0.015-inch clearance between a selected function stop bar

and its associated function-sensing lever when the sensing lever has dropped and is level with its stop bar (A, fig. 3-173).

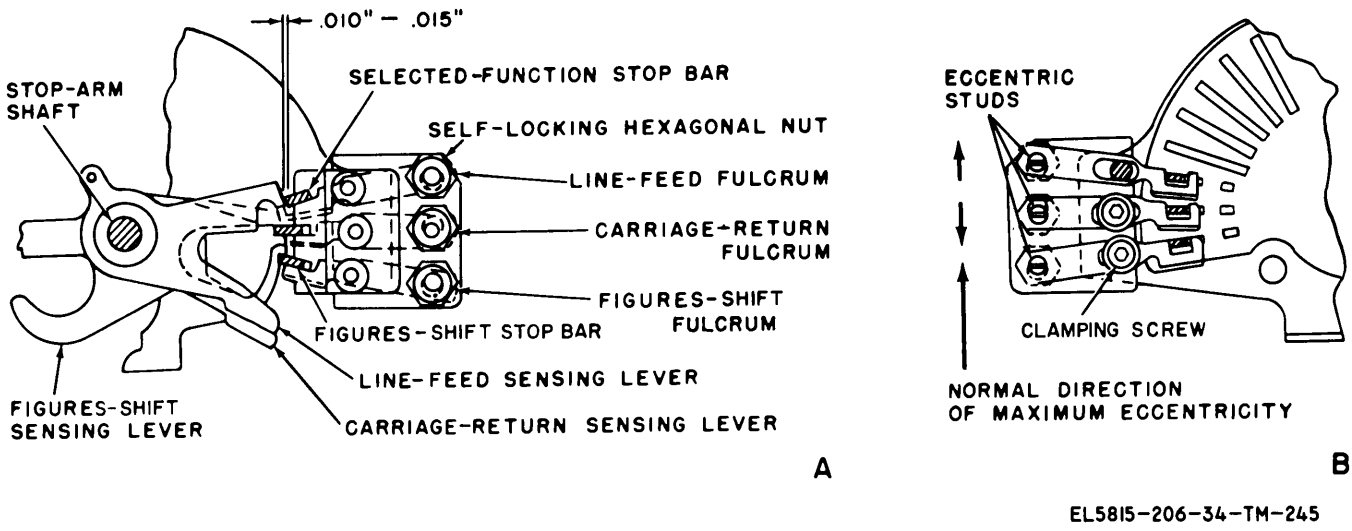


Figure 3-173. Fulcrum adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Position the code rings for the figures-shaft operation and turn the motor manually until the figures-shift sensing lever is in line with the figures-shift stop bar. Loosen the clamping screw that holds the figures-shift fulcrum (B, fig. 3-173). Loosen the self-locking hexagonal nut that holds the eccentric stud for the figures-shift fulcrum. Turn the eccentric stud until the requirement *(a* above) is met and tighten the locknut. Tighten the clamping screw and recheck the clearance. Use the same procedure for adjusting the carriage-return and line-feed fulcrums.

3-207. Square-Shaft Driven-Gear Adjustment
(fig. 3-174)

a. Requirement. There should be a 0.002- to 0.005-inch clearance between the square-shaft driven gear and the flat washer.

b. Method of Checking. Insert a flat feeler gage between the square-shaft driven gear and the flat washer to determine the clearance.

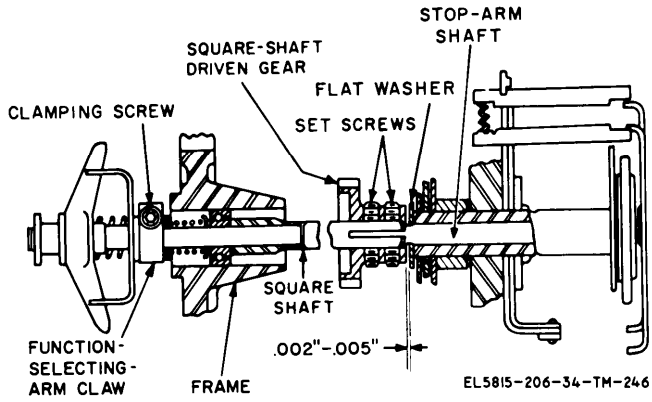


Figure 3-174. Square-shaft driven-gear adjustment.

c. Adjustment. Loosen the four setscrews in the square-shaft driven gear. Loosen the clamping screw of the function-selecting-arm claw. Hold the stop-arm shaft against the code ring cage and press

the square shaft toward the cage. Place a 0.020-inch flat feeler gage between the function-selecting-arm claw and the casting. Tighten the clamping screw of the function-selecting-arm claw. Replace the 0.020-inch flat feeler gage with a similar gage 0.030-inch thick. Press the function-selecting-arm claw against the feeler gage and press the stop-arm shaft against the code-ring cage. Position the square-shaft driven gear to obtain the requirement *(a* above) and tighten the four setscrews. Check the type-selecting and function-selecting arm adjustment (para 3-209).

3-208. Carriage-Rear-Support Bracket Adjustment
(fig. 3-175)

a. Requirement. There should be minimum backlash between the square-shaft sliding gear and the type-selecting-arm gear.

b. Method of Checking. Attempt to rotate the type-selecting-arm gear back and forth at various positions of the square shaft.

c. Adjustment. Move the carriage frame to the left-hand margin for access to the carriage-rear-support bracket mounting screws. Loosen the two mounting screws and raise or lower the rear of the carriage to meet the requirement *(a* above). Tighten the screws and recheck the requirement. Check related adjustment (para 3-209) for type-selecting arm alignment.

3-209. Type-Selecting-Arm and Function-Selecting-Arm Adjustments
(fig. 3-176)

a. Requirements.

(1) The type-selecting arm and the function-selecting arm should be in a definite positional relationship with the square-shaft stop arm.

(2) There should be a 0.015- to 0.046-inch clearance between the casting and the function-selecting-arm claw.

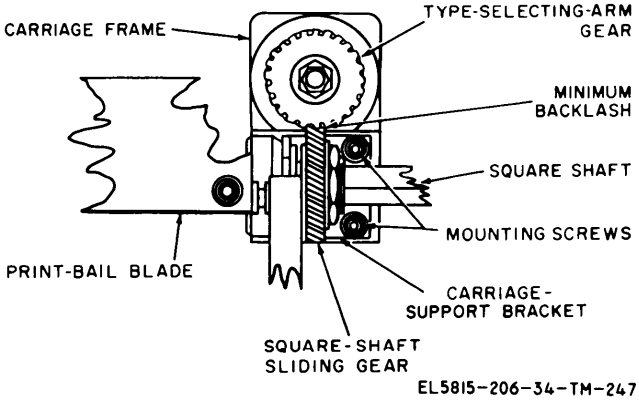


Figure 3-175. Carriage-rear-support bracket adjustment.

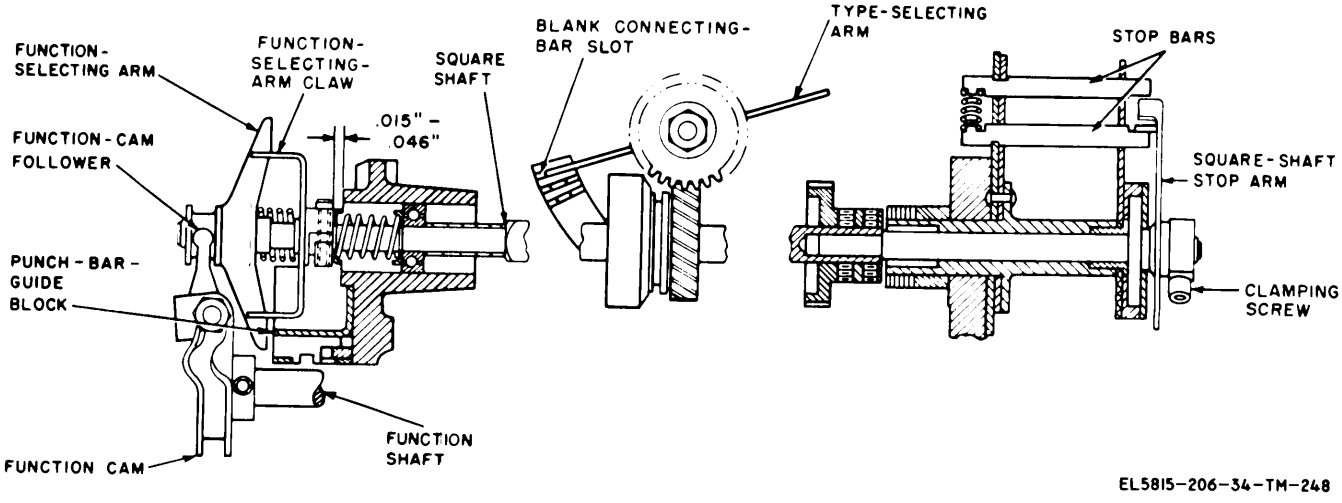


Figure 3-176. Type-selecting arm and function-selecting-arm adjustment.

b. Method of Checking.

(1) Start the motor and press the Q keylever. Note the alinement of the typeselecting arm and the Q connecting-bar slot in the guide plate. Press the Z keylever and note the alinement of the type-selecting arm and the Z connecting-bar slot.

(2) Press the square-shaft stop arm toward the center of the page printer and check the requirement *(a* (2) above) with a feeler gage.

c. Adjustments.

(1) Start the motor and press the Q keylever. Loosen the clamping screw of the square-shaft stop arm and turn the square shaft until the type-selecting arm is alined with the Q connecting-bar slots in the guide plate. Hold the square shaft in this position, turn the square-shaft stop arm until it is against the Q stop bar, and tighten the clamping screw.

(2) Press the Z keylever and check the alinement of the Z connecting bar and the type-selecting bar. If not alined, loosen the stop-arm clamping screw, turn the square shaft to move the type-selecting arm one-half the distance toward alinement and tighten the clamping screw. Press the Q and Z keylevers and check for equal alinement of the type-selecting arm and the Q and Z slots respectively.

(3) Loosen the clamping screw in the function-selecting-arm claw. Set the code rings for the motor-stop operation (third and fifth code rings clockwise, others counterclockwise), and turn the square shaft until the square-shaft stop arm touches the H stop bar. Turn the function-selecting arm until it is alined with the motor-stop punch bar. Position the function-selecting-arm claw on the shaft to meet requirement (a(2) above). Tighten the clamping screw and recheck the adjustment.

3-210. Square-Shaft Stop-Arm Torque Adjustment (fig. 3-177)

a. Requirement. When the motor is running and the function shaft is turning, a force of 12 to 17 ounces should be required to hold the square-shaft stop arm stationary.

b. Method of Checking. Start the motor and press the LTRS keylever. Engage one end of the square-shaft stop arm with the hook end of a spring scale and pull with a force exceeding 17 ounces. Press the LINE FEED keylever repeatedly and gradually decrease pull on the spring scale. When the square-shaft starts to move, check the reading of the scale.

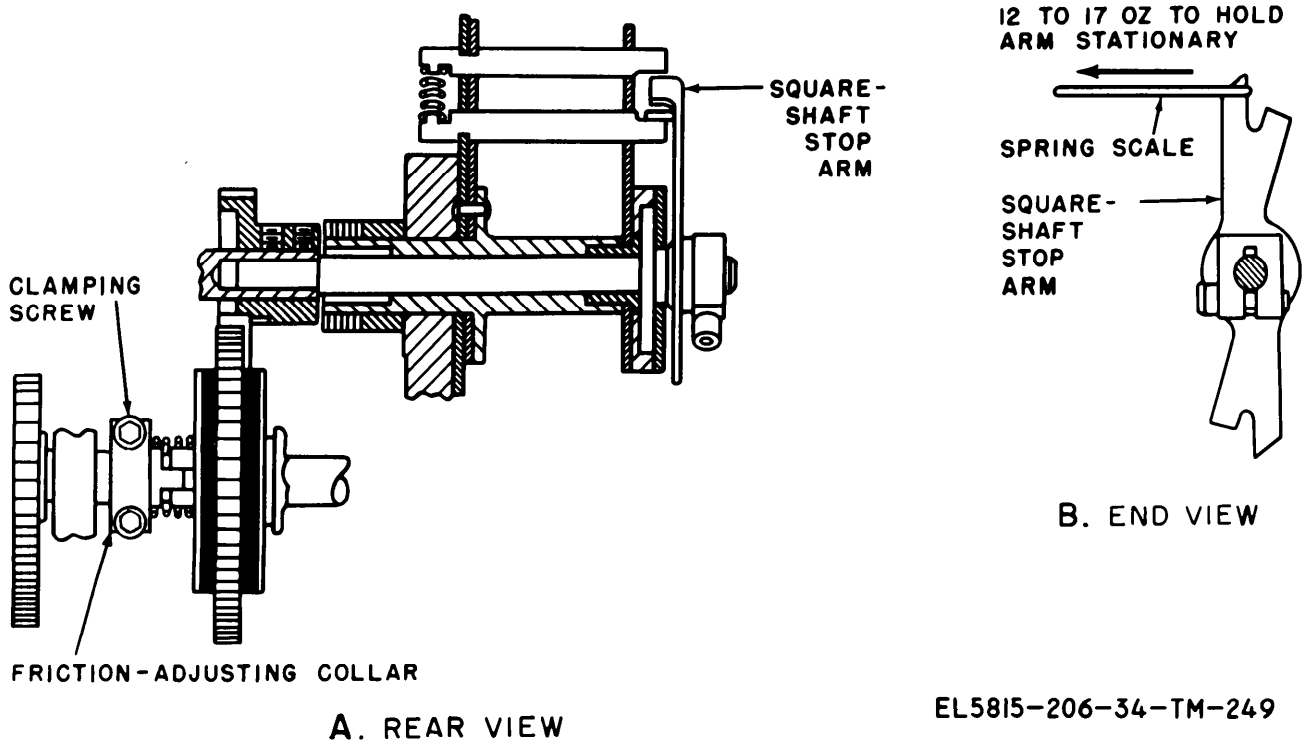


Figure 3-177. Square-shaft stop-arm torque adjustment.

c. Adjustment. Turn the motor off. Loosen the clamping screw in the friction-adjusting collar of the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG. Turn the collar in the proper direction to obtain the requirement *(a* above), and tighten the clamping screw. Loosen

the two setscrews in the friction-adjusting collar of TT-4A/TG, slide the collar to obtain the requirement, and tighten the setscrews. Recheck the requirement.

3-211. Print-Bail-Blade Adjustment
(fig. 3-178)

NOTE

The requirement given in paragraph 3-212a must be met before this adjustment is made.

a. Requirement. There should be 50 percent minimum engagement of the print-bail blade in the grooved nut for the entire length of the blade. The blade should fit freely and remain in the confines of the grooved nut when the print-cam follower is against any portion of the print cam.

b. Method of Checking.

(1) While manually moving the carriage from one end of the blade to the other, place the cam follower in various positions and note the engagement of the blade in the groove. Check the blade for freedom of movement in the groove. Check the entire length of the blade.

(2) Place the cam follower in various positions and remove play in the type-selecting arm in an upward direction. Rock the blade back and forth to make certain it is contained in the groove for the entire length of the blade.

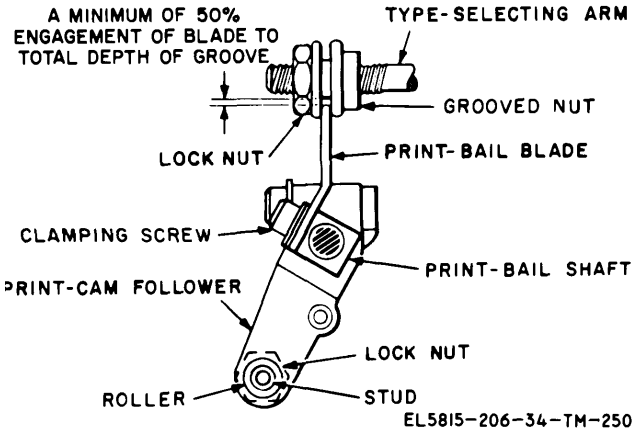


Figure 3-178. Print-bail-blade adjustment.

c. Adjustment. Loosen the screws that hold the print-bail blade and move the blade up or down until the requirement *(a* above) is met. Tighten the screws. Check requirements given in paragraph 3-212a(2) and (3).

3-212. Print-Bail and Ribbon-Lifter Adjustments
(fig. 3-179 and 3-180)

a. *Requirements.*

(1) The travel of the print-bail blade should be equal in both directions from the vertical center line of the print-bail blade shaft.

(2) There should be nominally 0.030-inch clearance between the type-selecting arm and the guide plate for the connecting bars when the function shaft is in the midcycle position (1/4 turn from the stopped position). This clearance may be increased or decreased to obtain lighter or heavier printing. The minimum clearance is 0.008 inch.

(3) There should be a 0.010- to 0.030-inch clearance between the front end of the type-selecting arm and the ribbon-lifter lever when the roller of the print-cam follower is against a low point of the print cam.

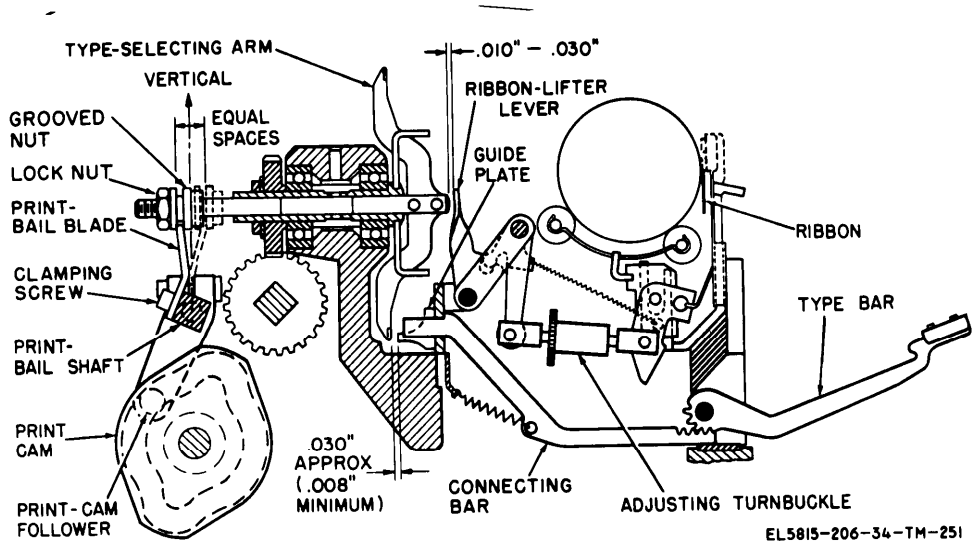


Figure 3-179. Print-bail and ribbon-lifter adjustments (TT-4A/TG and TT-698/TG).

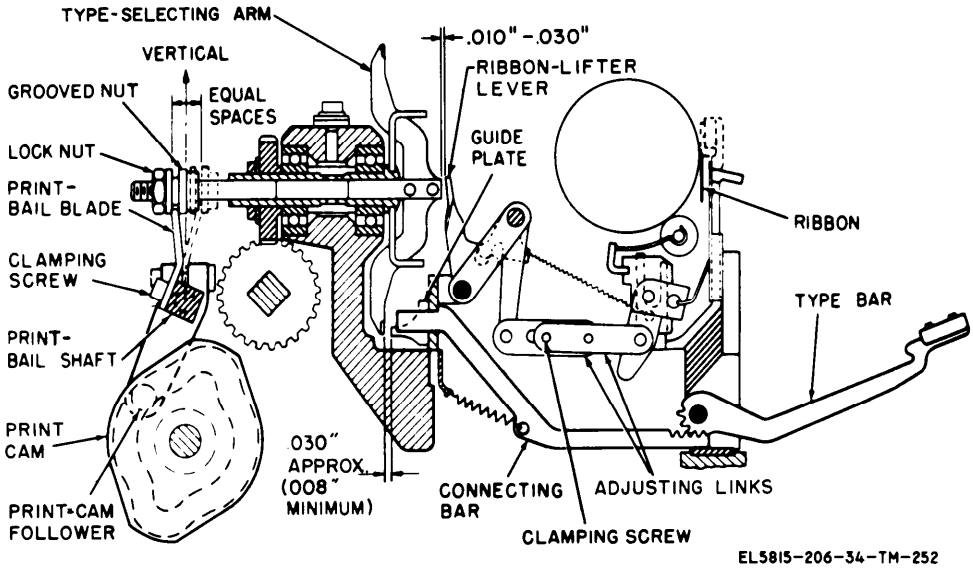


Figure 3-180. Print-bail and ribbon-lifter adjustments (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment.

(1) Loosen the clamping screw on the print-cam follower and position the print-bail shaft to meet the requirement *(a* (1) above). Tighten the clamping screw.

(2) Loosen the locknut on the rear of the type-selecting arm shaft. Rotate the grooved nut clockwise or counterclockwise until the requirement *(a* (2) above) is met. Tighten the locknut.

(3) With the motor off and the teletypewriter in the stopped position, trip the transfer-lever latch and turn the motor manually until the roller of the print-cam follower is against a high point of the print cam. To obtain the required clearance on the TT-4A/TG and TT-698/TG, use a screw driver, inserted from the front of the carriage, to turn the adjusting turnbuckle to obtain the required clearance. On the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, loosen the two clamping screws in the adjusting links. Hold the ribbon-lifter lever away from the front of the type-selecting arm. Insert a flat feeler gage between the front of the type-selecting arm and the ribbon-lifter lever, position the adjusting links to meet the requirement *(a* (3) above), and tighten the two clamping screws.

NOTE

The adjustment given in *b* (2) above should always be made when changing the operating speed of the teletypewriter.

3-213. Platen-Trough-Spring Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-181)

a. Requirement. A force of 3 to 6 ounces, applied as shown in B, figure 3-181, should be required to start the platen trough guide moving downward.

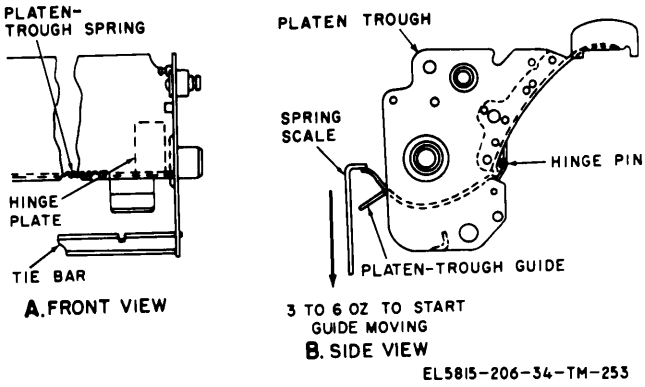


Figure 3-181. Platen-trough-spring adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Remove the hinge pin; wind or unwind the platen trough spring (A, fig. 3-181) to meet the requirement *a* above); and replace the pin.

3-214. Platen-Shaft End-Play Adjustment

(fig. 3-182)

a. Requirement. There should be 0.002- to 0.005-inch clearance between the shaft collar and the bearing when the platen shaft is held all the way to the left.

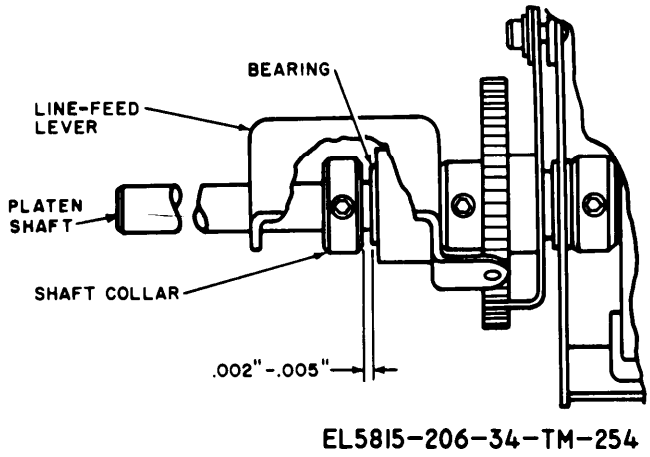


Figure 3-182. Platen-shaft end-play adjustment.

b. Adjustment. Loosen the setscrews in the shaft collar and position the collar to meet the requirement *(a* above). Tighten the setscrews and recheck the requirement.

3-215. Platen-Trough End-Play Adjustment

(fig. 3-183)

a. Requirement. There should be a .002- to .005-inch clearance between the platen trough and the platen collar when the platen trough and the platen shaft are held to the left.

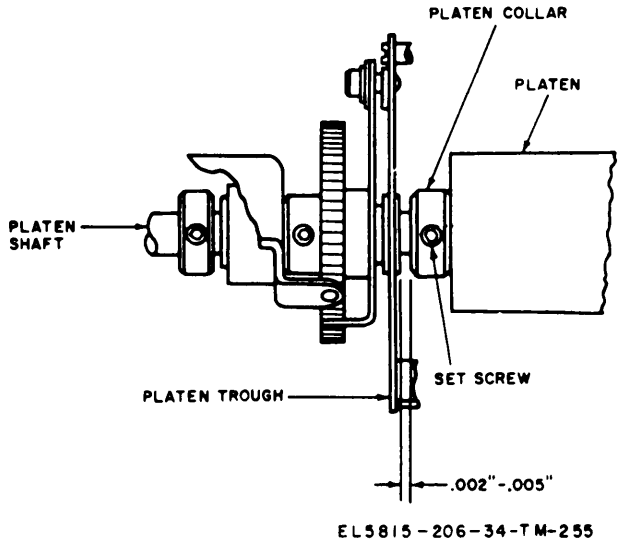


Figure 3-183. Platen-trough end-play adjustment.

b. Adjustment. Loosen the two setscrews that hold the platen to the platen shaft. Position the platen to meet the requirement *(a* above). Tighten the setscrews and recheck the requirement.

3-216. Paper-Guide Adjustment (TT4B/TG and TT-698A/TG)

a. Requirement. The slot of each paper guide should be centered against each metal end of the platen (A, fig. 3-184). Both paper guides should be in contact with the platen (B, fig. 3-184).

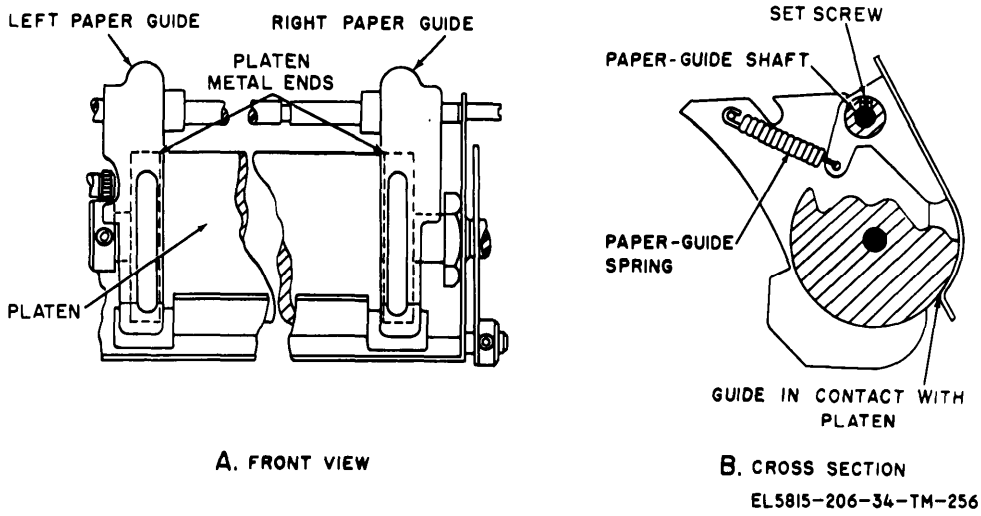


Figure 9-184. Paper-guide adjustment (TT-4B/TG and TT-698A/TG).

b. Adjustment. Loosen the setscrew in each paper guide. Position the right-hand paper guide to meet the requirement *(a* above) and tighten its setscrew. Position the left-hand paper guide in the same manner. Make certain each paper guide is in contact with the platen before tightening its setscrew.

3-217. Paper-Guide Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG) (fig. 3-185)

a. Requirements.

(1) The slots in the paper guides should be central with the metal ends of the platen.

(2) There should be 0.010- to 0.035-inch clearance between the paper guides and the platen.

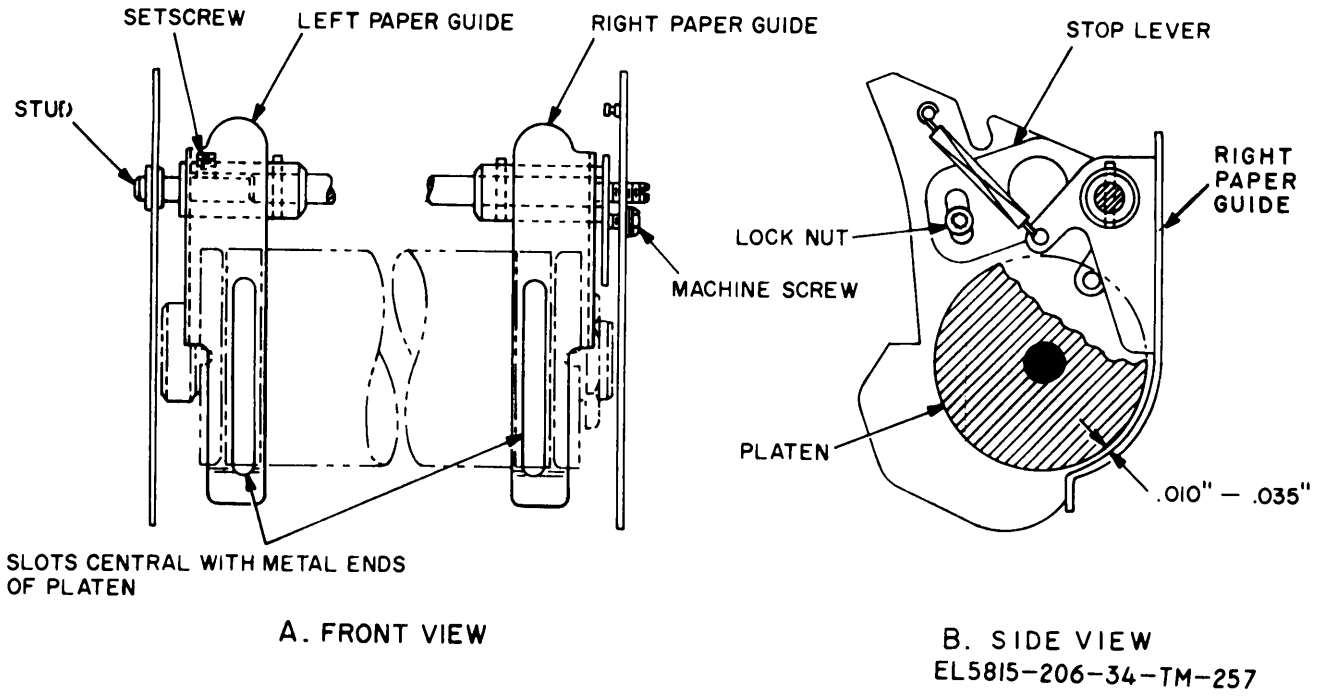


Figure 3-185. Paper-guide adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

b. Adjustments.

(1) Loosen the setscrew in the left-hand paper guide and position the paper guide to meet requirement in *a* (1) above. Tighten the setscrew and recheck the requirement.

(2) Loosen the machine screw and locknut that hold the stop lever. Position the stop lever with a feeler gage to meet the requirement in *a* (2) above. Tighten the machine screw and locknut and recheck the requirement.

3-218. Platen Pressure-Roller Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-186)

a. Requirement. There should be sufficient pressure against the platen by the pressure roller to pull the paper one or two spaces when the line-feed operation takes place. There should be no pressure applied to the copy when the pressure-roller is in the unlatched position.

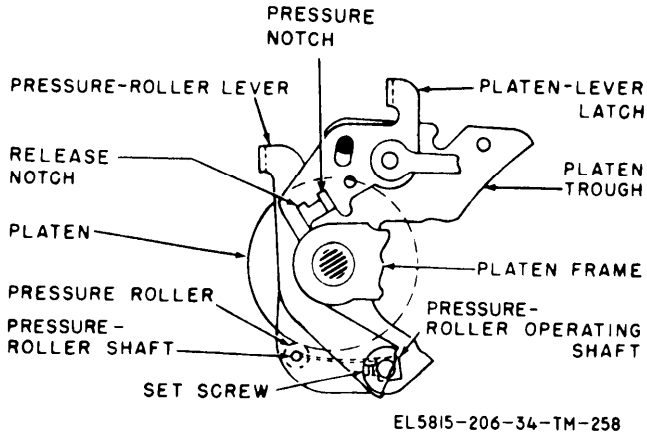


Figure 3-186. Platen pressure-roller adjustment (TT-4B/TG. TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Place the leading edge of the tab of the pressure-roller lever in line with the edge of the notch in the platen-lever latch. Loosen the setscrews and rotate the pressure-roller operating shaft so that

the pressure roller touches the platen. Tighten the setscrews. Be certain the roller clears the copy in the unlatched position.

3-219. Platen Pressure-Rollers Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-187)

a. Requirement. There should be sufficient pressure against the platen by the pressure rollers to pull the paper one or two line spaces when the line-feed operation takes place.

b. Adjustment. Pull the pressure-roller lever to the released position and loosen the setscrews. Push the rollers against the platen manually. Leave the lever in the released position and tighten the setscrews.

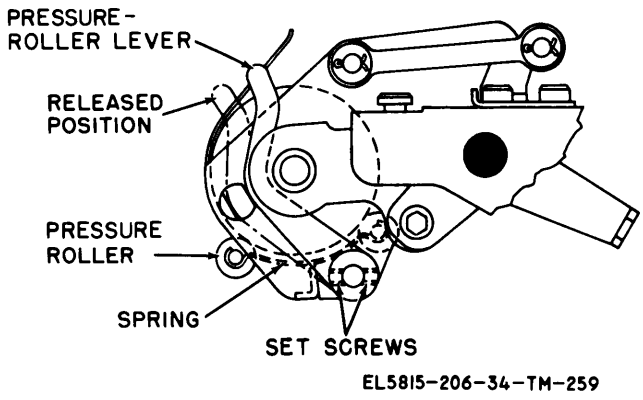


Figure 3-187. Platen pressure-rollers adjustment (TT-4A/TG and TT-698/TG).

3-220. Platen-Assembly End-Play and Positioning Adjustment

(fig. 3-188)

a. Requirement with Platen Assembled.

(1) There should be 1/64- to 3/64-inch clearance between the end of the platen-latching arm and the end of the slot in the aperture gate.

(2) There should be 0.002- to 0.005-inch end play of the platen assembly.

(3) The platen shift link and line feed connetting link should be straight and free on their pivots.

b. Method of Checking. Take up the platen end play to the left (selector side) and check requirements as follows:

(1) With a scale.

(2) With feeler gages.

(3) Visually.

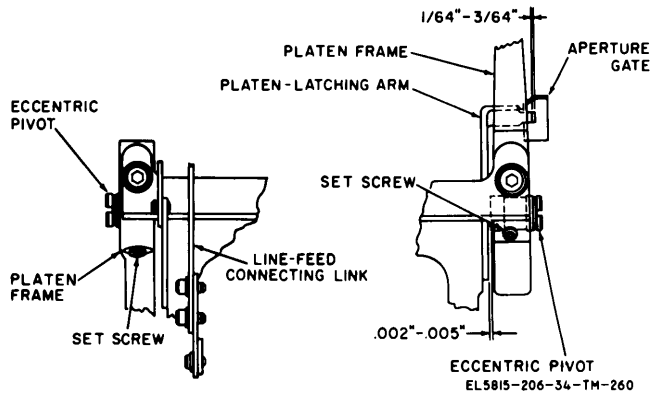


Figure 3-188. Platen-assembly end-play and positioning adjustment.

c. Adjustments. With platen assembled, loosen the platen eccentric pivot setscrews.

(1) Take up the end play of platen to the left and position the platen to meet the requirements *(a* (1) above). Push left-hand eccentric pivot against the assembly and tighten the setscrew. Recheck requirement.

(2) Hold the platen against the left-hand eccentric pivot, and position the right eccentric pivot to meet the requirement *(a* (2) above). Tighten its setscrew and recheck the requirement.

(3) Take up the end play of the platen to the left and position the platen to meet the requirement *(a* (3) above). Push the left-hand eccentric pivot against the assembly and tighten the setscrew. Recheck the requirement.

NOTE

Check related adjustment, paragraph 3-221.

3-221. Character-Printing Density Adjustment

a. Requirement. All characters of a line should be printed equally dark.

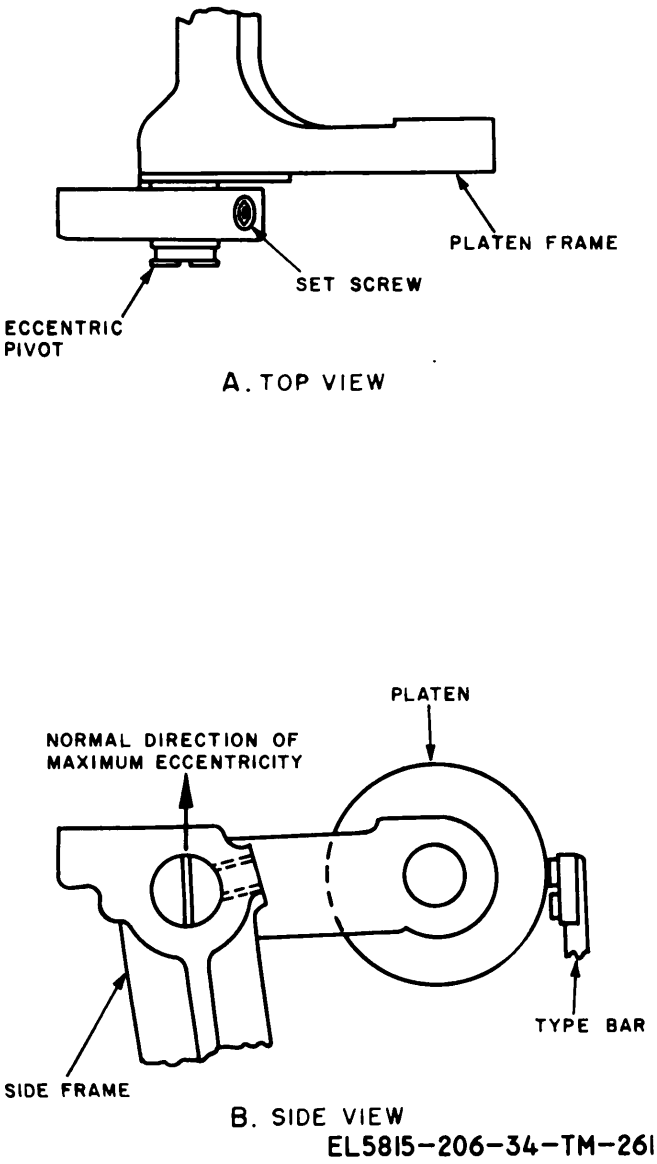


Figure 3-189. Character-printing density adjustment.

b. Adjustment. Print a full line of the same character. If all characters are not printed equally dark, loosen the setscrews (A, fig. 3-189) in each side frame; position the eccentric pivots for maximum eccentricity in the direction shown in B, figure 3-189; press the pivots inward; tighten the setscrews; and print another line of characters. If printing density still varies, readjust the pivots as necessary to eliminate the variation. Check the related adjustments (para 3-223, 3-225, and 3-227).

3-222. Figures-Shift Preliminary Adjustment
(fig. 3-190)

a. Requirement. The platen latch (A, fig. 2-43) should engage the lug on the aperture gate when the figures-shift-cam follower is moved downward as far as possible by the figures-shift-cam. The spring of the figures-shift link on the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG must not stretch when the figures-shift-cam follower is in the fully downward position.

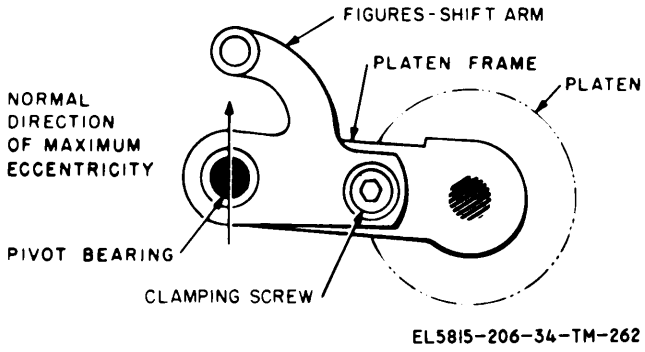


Figure 3-190. Figures-shift preliminary adjustment.

b. Adjustment. Loosen the clamping screw (fig. 3-190); position the figures-shift arm to meet the requirement; tighten the clamping screw; and recheck the requirement. Check the related adjustment (para 3-223).

3-223. Figures-Shift Position Adjustment
(fig. 3-191)

NOTE

The figures-shift preliminary adjustment (para 3-222) must be made before this adjustment is performed.

a. Requirement. Characters should be printed evenly without being cut off at the top or the bottom when the platen is in the figures position.

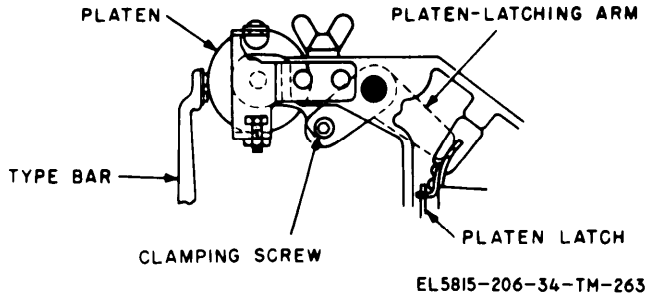


Figure 3-191. Figures-shift position adjustment.

b. Method of Checking. With the platen in the figures position, send repeated R and Y signals and inspect the typed result for meeting the requirement *(a* above).

c. Adjustment. Loosen the platen-latching arm mounting screw. Position the platen-latching arm up

or down to meet the requirement *(a* above). Tighten the clamping screw. If all adjustments in sequence are not being made, check the letters-shift position adjustment (para 3-224 and 3-225) and the platen shift final adjustment (para 3-226).

3-224. Letters-Shift Position Adjustment (TT-4A/TG and TT-698/TG)

(fig. 3-192)

a. Requirement. Characters printed with the platen in the letters-shift position must be aligned with characters printed with the platen in the figures-shift position.

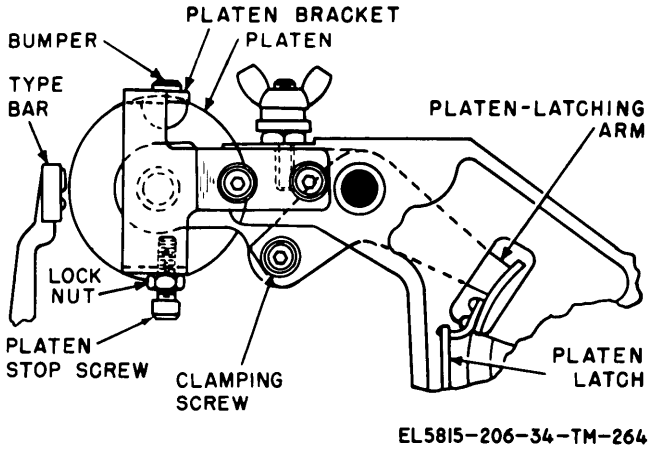


Figure 3-192. Letters-shift position adjustment (T'T-4A/TG and TT-698/TG).

b. Method of Checking. With the platen first in the figures position and then in the letters position, send repeated T and No. 5 signals and inspect the typed result for alignment.

c. Adjustment. Loosen the locknut that holds the platen stop screw. If the letters print below the figures, turn the stop screw counterclockwise. If the letters print above the figures, turn the stop screw clockwise. It may be necessary to alter the figures-shift position adjustment (para 3-223) to be able to align the characters. Recheck the requirement *(a* above). Readjust if necessary until the requirement is met. Tighten the locknut.

3-225. Letters-Shift Position Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-193)

a. Requirement. Characters printed when the platen is in the letters-shift position should be aligned with characters printed when the platen is in the figures-shift position.

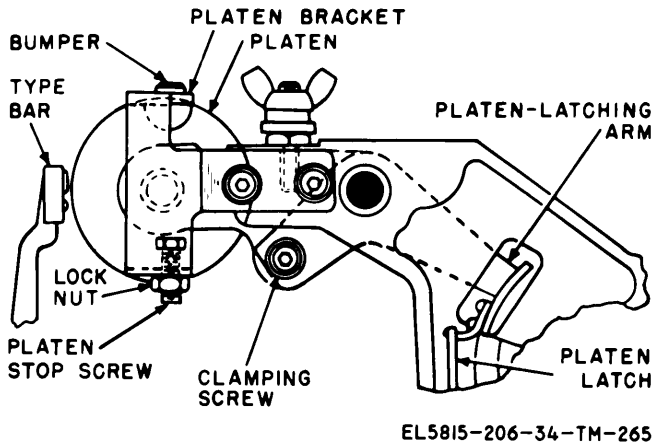


Figure 3-193. Letters-shift position adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG and TT-696B/TG).

b. Method of Checking. Turn the motor on and operate the keys of the keyboard-transmitter to cause the symbols T and 5 to be printed alternately. Inspect the typed result for character alignment.

c. Adjustment. Loosen the locknut that holds the platen stop screw. If the letter T was printed *below* the figure 5, turn the platen stopscrew counterclockwise. If the letter T was printed *above* the figure 5, turn the platen stop screw clockwise. It may be necessary to alter the figures-shift position adjustment (para 3-223) to obtain the proper alignment. Tighten the locknut. Perform the platen-shift final adjustment (para 3-226).

3-226. Platen-Shift Final Adjustment

(fig. 3-194)

NOTE

Complete the figures-shift position adjustment (para 3-223) before starting this adjustment.

a. Requirement. There should be 0.005- to 0.020-inch clearance between the platen latch and the lug on the aperture gate when the roller of the figures-shift cam follower is against a lobe of the figures-shift cam.

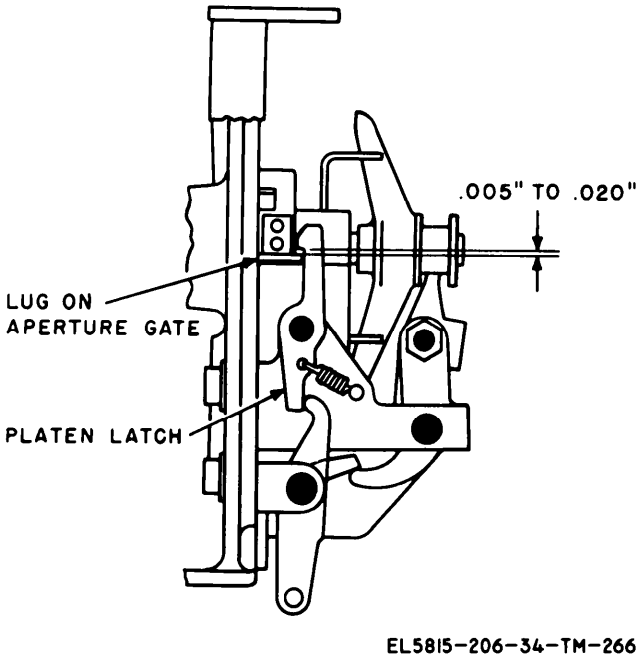


Figure 3-194. Platen-shift final adjustment.

b. Method of Checking. Select the figures code group and turn the motor by hand until the roller of the figures-shift cam follower is against a lobe of the figures-shift cam. Check the requirement *(a* above) with feeler gages.

c. Adjustment. Loosen the clamping screw. Reposition the platen-latching arm to meet the requirement. Tighten the clamping screw. It may be necessary to repeat the figures position adjustment (para 3-223) to be able to get the required clearance.

NOTE

For operation at 100 words per minute, decrease the requirement to 0.001 to 0.005 inch.

3-227. Platen-Blocking-Arm Adjustment TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-195)

a. Requirement. There should be 0.010- to 0.020 - inch clearance between the platen-stop screw and the lower surface of the platen frame (B, fig. 3-195) when the platen is raised manually to the figures-shift position.

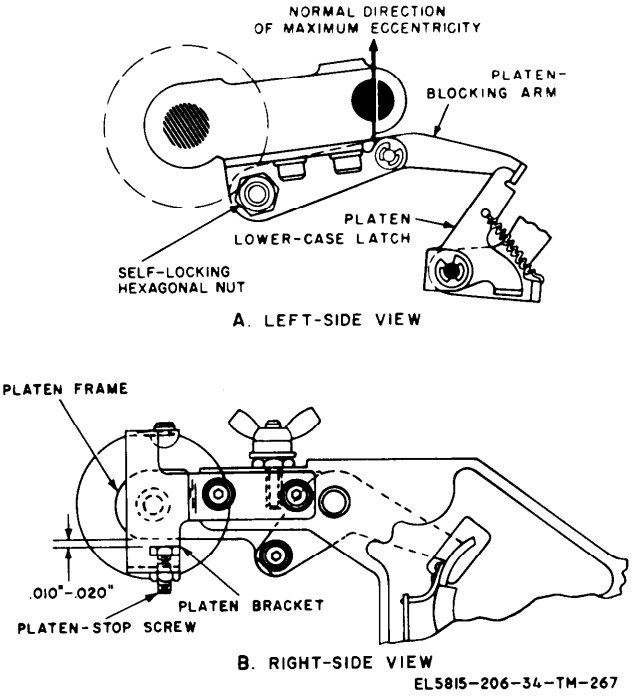


Figure 3-195. Platen-blocking-arm adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Loosen the self-locking hexagonal nut (A, fig. 3-195); position the platen-blocking arm to meet the requirement; and tighten the locknut.

3-228. Platen-Blocking-Arm Bracket Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-196)

a. Requirement. There should be 0.005- to 0.020-inch clearance between the figures-shift sensing lever and the platen lower-case latch when other than the figures or letters combination is selected and when the function cam-shaft is rotated so that the figures-shift sensing lever is in contact with the figures-shift stop bar.

b. Method of Checking. Select a code combination other than figures or letters. Trip the transfer-lever latch by hand and rotate the motor until the figures-shift sensing lever drops off the high portion of its restoring cam and is blocked by the figures-shift

stop bar. Measure the clearance between the figures-shift sensing lever and the platen lower-case latch.

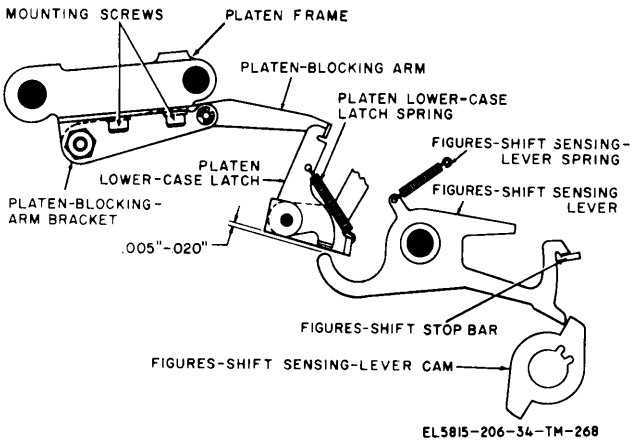


Figure 3-196. Platen-blocking-arm bracket adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

c. Adjustment. Loosen the mounting screws of the platen-blocking-arm bracket. Position the bracket until the requirement *(a* above) is met. Tighten the mounting screws. Recheck for clearance.

3-229. Line-Feed Detent Adjustment

(fig. 3-197)

a. Requirement. With the single-double line-feed lever in the double line-feed position, the line-feed pawl should enter squarely into the notches of the line-feed ratchet.

b. Method of Checking. Manually move the line-feed connecting link toward the rear of the machine and check the requirement as the line-feed pawl moves into a notch in the line-feed ratchet.

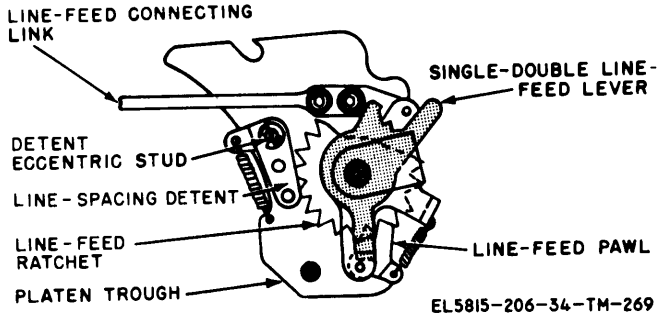


Figure 3-197. Line- feed detent adjustment.

c. Adjustment. Loosen the plain round nut that holds the detent eccentric stud in position on the platen trough. Turn the eccentric stud in the proper direction to meet the requirement *(a* above). Tighten the plain round nut. Recheck the requirement.

3-230. Line-Feed Bellcrank Adjustment (TT-4B/TG and TT-698A/TG)

(fig. 3-198)

a. Requirement. The roller of the line-feed-cam follower should move under the line-feed cam when the line-feed sensing lever is pulled to the low point of the line-feed restoring cam.

b. Method of Checking. Set up the line-feed code combination in the Y-levers (rotate the No. 2 Y-lever clockwise and the remaining Y-levers counterclockwise) and manually trip the transfer-lever latch. Rotate the motor by hand until the line-feed sensing lever is pulled to the low point of the line-feed restoring cam. At this time, the roller of the line-feed-cam follower should just move under the line-feed operating cam. Check the requirement at both low points of the line-feed operating cam.

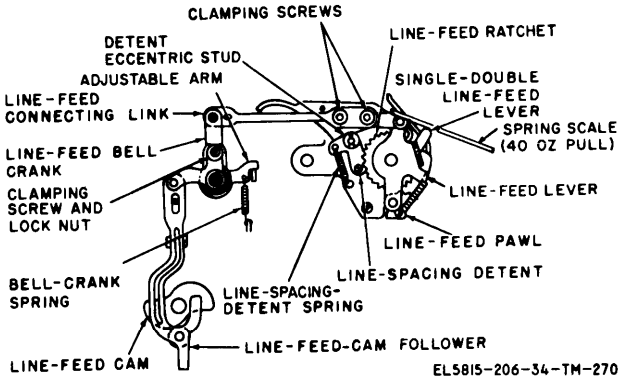


Figure 3-198. Line-feed bell-crank adjustment (TT-4B/TG and TT-698A/TG).

c. Adjustment. Loosen the hexagonal nut and position the adjustable bellcrank until the requirement *(a* above) is met. Tighten the nut. Recheck the requirement. Check related adjustment (para 3-232).

3-231. Adjustable Block and Pawl Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)

(fig. 3-199)

NOTE

When this adjustment is being checked or performed, the arms of the bellcrank assemblies should be seated down against the stop.

a. Requirement.

(1) With the platen in the letters position, there should be 0.030- to 0.0060-inch clearance between the bottom of the adjustable block and the latching

surface of the platen-shift pawl when the figures-shift sensing lever drops off its restoring roller.

(2) There should be 0.030- to 0.060-inch clearance between the bottom of the adjustable block and the latching surface of the line-feed pawl when the line-feed sensing lever drops off its restoring roller.

(3) There should be 0.030- to 0.060-inch clearance between the bottom of the adjustable block and the latching surface of the line-feed-on-carriage-return pawl when the line-feed-on-carriage-return sensing lever drops off its restoring roller.

(4) When any character, other than line-feed, carriage-return, or figures is selected, and the function shaft is rotated until the sensing levers drop off the restoring rollers, and the draw bar is pulled down until the adjustable blocks are near their respective pawls, there should be 0.015- to 0.025-inch clearance between the adjustable blocks and the line-feed-on-carriage-return pawl and the platen-shift pawl.

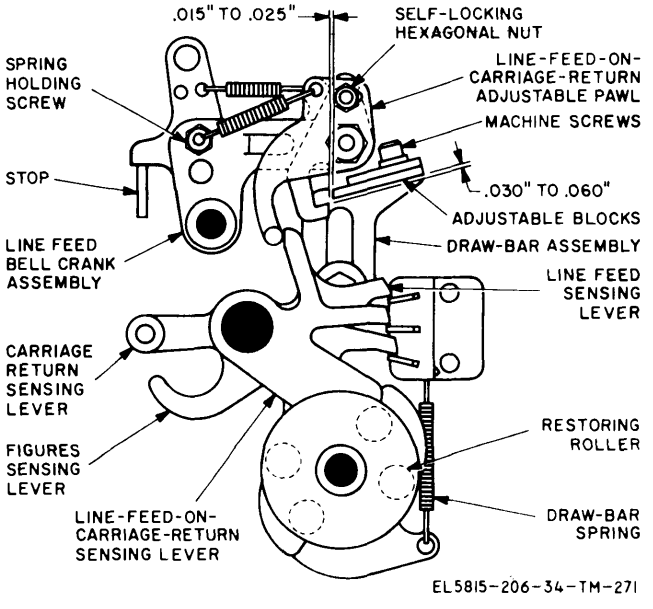


Figure 3-199. Adjustable block and pawl adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

b. Method of Checking.

(1) With the platen in the letters position, select figures, rotate the function shaft manually until the figures-sensing lever drops off the restoring roller. Check the requirement with feeler gages.

(2) Select line feed, rotate the function shaft manually until the line-feed sensing lever drops off the restoring roller, check requirement with feeler gages.

(3) Select carriage-return, rotate the function shaft manually until the line-feed-on-carriage-return sensing lever drops off the restoring roller. Check the requirement with feeler gages.

(4) Select any character other than carriage-return, line-feed, or figures. Rotate the function shaft manually until all the sensing levers drop off the restoring rollers and the adjustable blocks are adjacent to their respective pawls. Check the requirement with feeler gages.

c. Adjustment.

(1) Position the mechanism as described in *b* (1) above. Loosen the machine screw that clamps the platen-shift bellcrank assembly to meet the requirement. Retighten the machine screw.

(2) Loosen the spring-holding screw in the line-feed bellcrank assembly. Position the mechanism as described in *b* (2) above. Position the line-feed bellcrank assembly to meet the requirement and retighten the spring-holding screw.

(3) Position the mechanism as described in b(3) above. Loosen the self-locking hexagonal nut that holds the line-feed pawl. Position the line-feed pawl to meet the requirement and retighten the nut.

(4) Position the mechanism as described in b(4) above. Loosen the two machine screws that hold the adjustable blocks. Position the adjustable blocks to meet the requirement and retighten the machine screws.

3-232. Line-Feed Connecting-Link Adjustment (TT-4B/TG and TT-698A/TG)

(fig. 3-198)

a. Requirements.

(1) A pull of 40 ounces applied to the line-feed lever should not prevent the line-feed mechanism from turning the platen when the single-double line-feed lever is in either the single or double line-feed position.

(2) When the line-feed operation is completed, the line-feed pawl should be clear of the line-feed ratchet.

b. Method of Checking.

(1) Hook a spring scale on the upper arm of the line-feed lever and exert a downward and forward pull of 40 ounces on the spring scale while receiving repeated line-feed code combinations. This should not prevent the line-feed mechanism from turning the platen.

(2) When the teletypewriter is in the stopped position, attempt to rotate the platen forward and backward. It should rotate freely.

c. Adjustment. Loosen the clamping screws that hold the line-feed connecting link and position the single-double line-feed lever for double line feed operation. Select the line-feed code combination and turn the motor by hand until the line-feed-cam follower is on the high part of the line-feed cam. Rotate the line-feed lever (fig. 3-198) until the platen has advanced two line spaces. Tighten the clamping screws to hold the connecting link in this position,

Continue to turn the motor until the line-feed operation is completed and the parts are restored to their normal position. Be certain that the requirement *(a* (2) above) is met.

3-233. Line-Feed Connecting Link Adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG)

(fig. 3-200)

NOTE

This adjustment should be checked when the teletypewriter operating speed is changed.

a. Requirement. With the single-double line-feed lever in the double line-feed position, the detent wheel should turn two spaces, in the letters or figures mode of operation. When the equipment is operating under power, overtravel of the detent wheel is permissible, if extra line-feed spacing does not occur.

b. Method of Checking. Move the single-double line-feed lever to double line-feed position. With the equipment operating under power, depress the LINE FEED key several times, in both letters and figures positions, and visually check the requirement.

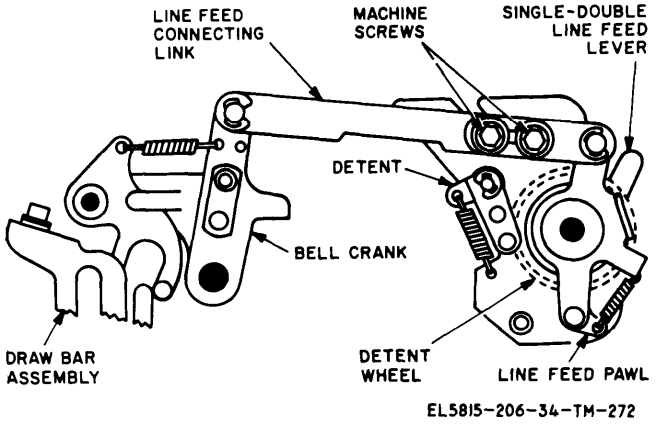


Figure 3-200. Line-feed connecting link adjustment (TT-4C/TG, TT-335/TG, TT-537/G, and TT-698B/TG).

c. Adjustment. Loosen the machine screws that hold the line-feed connecting and adjusting links together. Increase or decrease the overall length of the connecting link assembly to meet the requirement, and retighten the machine screws.

3-234. Line-Feed Connecting-Link Adjustment (TT-4A/TG)

(fig. 3-201 and 3-202)

NOTE

Complete the line-feed detent adjustment (para 3-229) before starting this adjustment.

a. Requirements.

(1) Selection of the line-feed combination should cause the line-feed mechanism to turn the platen one line space when the single-double line-feed lever is in the position shown in B, figure 3-202, and two lines spaces when it is in the position shown in A, figure 3-202.

(2) When the line-feed operation is completed, the line-feed pawl should be clear of the line-feed ratchet.

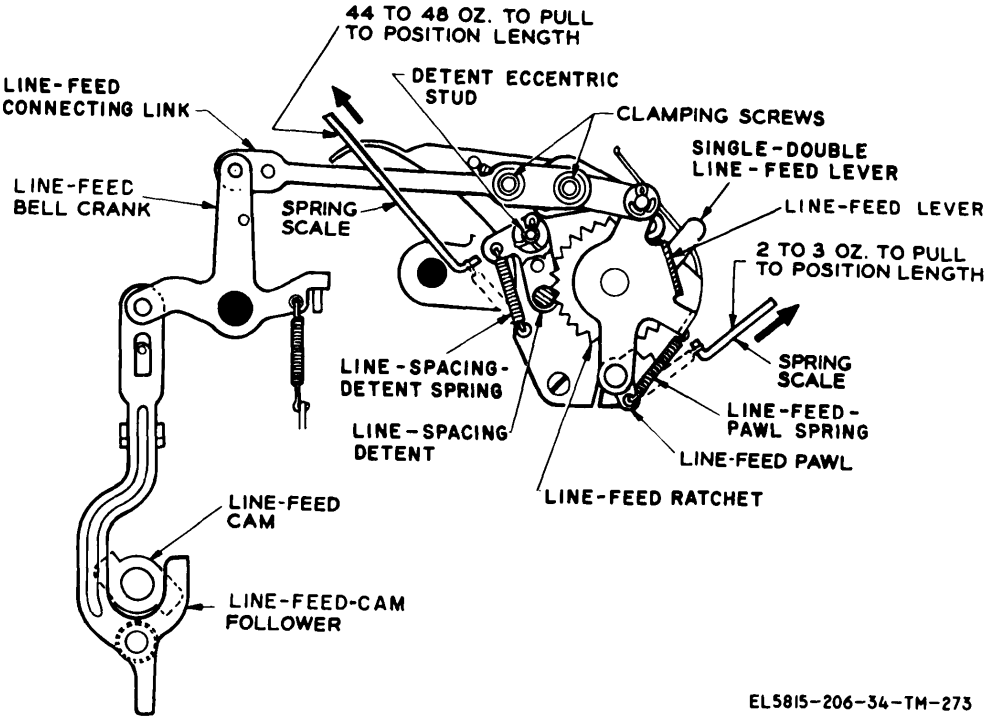


Figure 3-201. Line-feed mechanism, side view (TT-4A/TG and TT-698/TG).

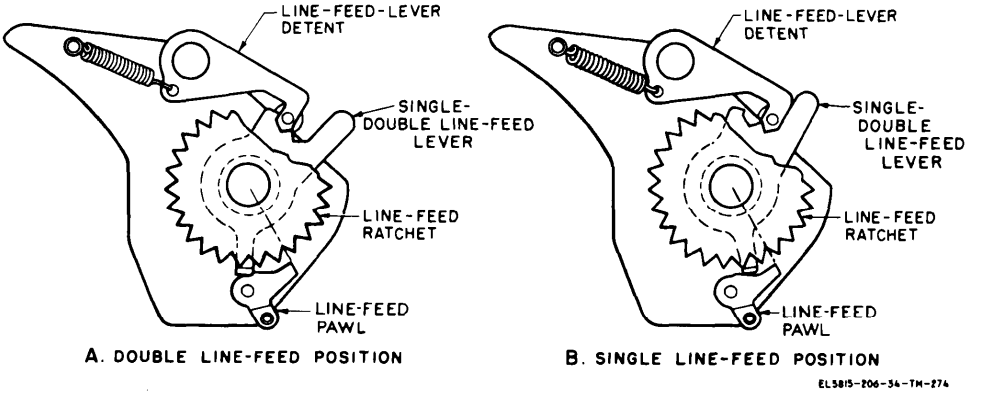


Figure 3-202. Positions of single-double line-feed lever.

b. Adjustments.

(1) Loosen the clamping screws (fig. 3-201). Select the line-feed combination and turn the motor manually until the line-feed-cam follower is against a high part of its cam. Rotate the line-feed lever until the platen has advanced one line space. Tighten the clamping screws. Continue turning the motor until line-feed operation is completed.

(2) Check the requirement *(a* (2) above) visually.

3-235. Margin-Bell and Bracket Adjustment

(fig. 3-203)

a. Requirements.

(1) The margin bell should ring when the carriage has moved 66 spaces from the left-hand margin.

(2) There should be a clearance of 0.020- to 0.025-inch between the margin-bell pawl and the pawl trip arm at their closest point when the carriage is 66 spaces from the left-hand margin.

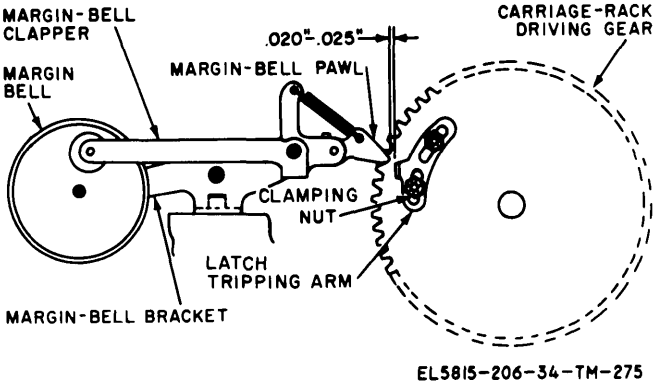


Figure 3-203. Margin-bell and bracket adjustment.

b. Method of Checking.

(1) Space the carriage 65 spaces from the left-hand margin. Depress the space bar; the margin bell should ring.

(2) With the carriage 66 spaces from the left-hand margin, move the margin-bell clapper up and down to determine the closest point between the margin-bell pawl and the pawl trip arm. Check the minimum clearance.

c. Adjustments.

(1) On the TT-4A/TG and TT-698/TG, loosen the two clamping screws, or on the TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG, loosen the two clamping nuts which hold the margin-bell latch-tripping arm to the carriage-rack driving gear. Position the latch-tripping arm to meet the requirement *(a* (1) above) and tighten the clamping nuts.

(2) Loosen the clamping screws that hold the margin-bell bracket to the teletypewriter frame and position the bracket to meet the requirement *(a* (2) above). Maintain a clearance between the pawl and the face of the driving gear.

3-236. Manual Carriage-Return Bracket Adjustment (TT4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698/TG)

(fig. 3-204)

a. Requirement. There should be 0.005- to 0.015-inch clearance between the pawl and the double-blocking lever (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG), or the carriage-return clutch-actuating lever (TT-4A/TG and TT-698/TG), when both the pawl and lever are in the unoperated position.

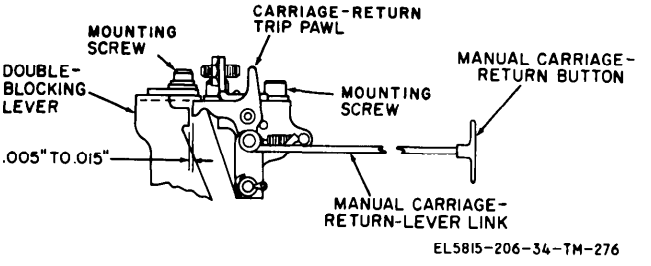


Figure 3-204. Manual carriage-return bracket adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Place the pawl and the double-blocking lever (or carriage-return clutch-actuating lever) in the unoperated position. Check the requirement with feeler gages.

c. Adjustment. Loosen the mounting screws and position the manual carriage-return bracket to meet the requirement *(a* above). Tighten the mounting screws and recheck the requirement.

3-237. Carriage-Return Trip-Pawl Adjustment (TT-4A/TG, and TT-698/TG)

(fig. 3-205)

NOTE

Complete the carriage-feed clutch drum adjustment (para 3-186) before performing this adjustment.

a. Requirement. When the manual carriage-return button is pushed, the carriage-return clutch should first latch in the engaged position and the carriage-return trip pawl should then clear the corner of the carriage-return operating lever.

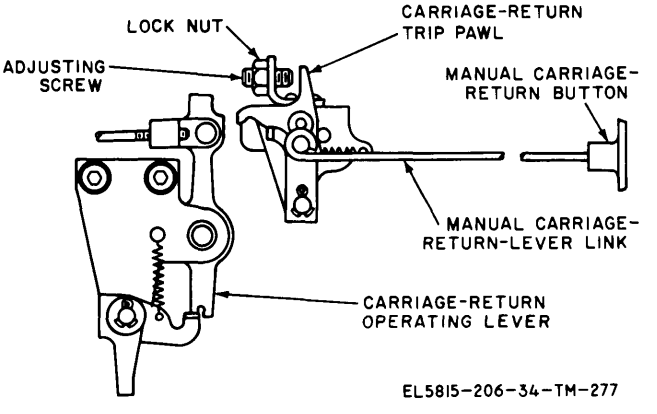


Figure 3-205. Carriage-return trip-pawl adjustment (TT-4A/TG and TT-698/TG).

b. Adjustment. Turn the adjusting screw in, for less engagement, or out, for more engagement.

3-238. Carriage-Return Trip-Pawl Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-206)

a. Requirement. The carriage-return trip pawl should touch and then move past the double-blocking lever when the lever is held manually in the fully operated position (carriage-return clutch engaged) and the manual carriage-return button is operated.

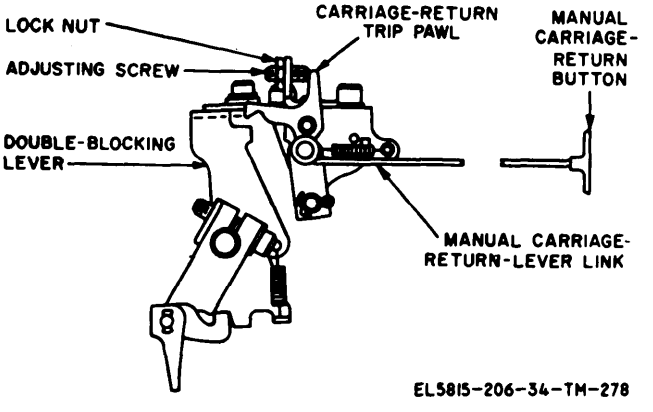


Figure 3-206. Carriage-return trip pawl adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Manually rotate the double-blocking lever to engage the carriage-return clutch. Hold the double blocking lever in the operated position and manually operate the manual carriage-return button. Check the requirements.

c. Adjustment. Loosen the locknut and position the adjusting screw to meet the requirements in *a* above. Tighten the locknut, and recheck the requirement.

3-239. Left-Hand Margin Trip Plate Adjustment (TT-537/G and TT-722(*)/TG)

(fig. 3-207)

a. Requirement. There must be some clearance between the delaying latch and both stops when the carriage is in the left-hand position.

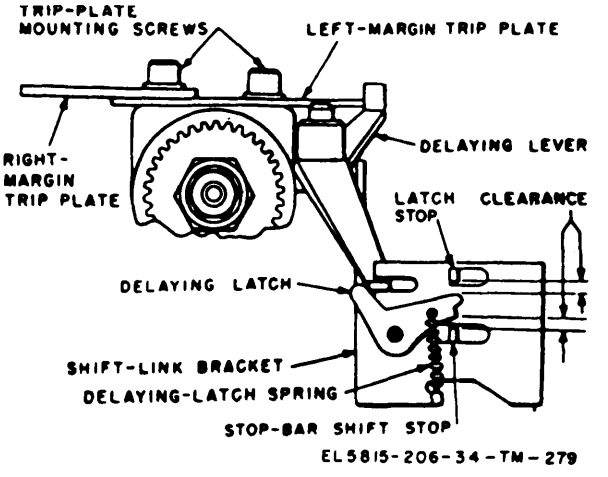


Figure 3-207. Left-hand margin trip late adjustment (TT-537/G, TT-722(*)/TG)

b. Adjustment.

screws. Position the left-hand margin trip plate to meet the requirement. Tighten the screws and recheck the adjustment.

3-240. Automatic Carriage Return Shift Link Adjustment (TT-537/G and TT-722(*)/TG)

(fig. 3-208)

NOTE

Perform the adjustment in paragraph 3-239 before performing this adjustment.

a. Requirement.

(1) The end of the shift link must be flush with the link support when the shift blade is against the shift link bracket.

(2) There must be approximately 0.030-inch clearance between the shift lever and the bracket when the shift blade is against the shift link bracket.

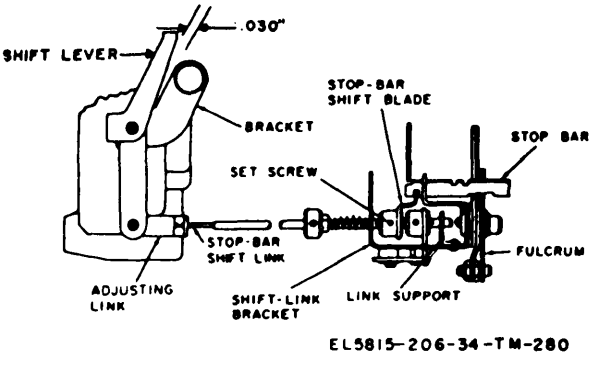


Figure 3-208. Automatic carriage-return shift link adjustment (TT-537/G and TT-722(*)/TG)

b. Adjustment.

(1) Loosen the setscrews. Remove the connector link from the shift lever. Position the link and the shift blade to meet the requirement of *a* (1) above. Tighten the setscrews.

(2) Locate the connector link on the shift link. Reconnect the connector link to the shift lever to meet the requirement of *a* (2) above.

3-241. Automatic Carriage Return Shift Stop Adjustment (TT-537/(G and TT-722(*)/TG)

(fig. 3-209)

a. Requirement.

(1) When the carriage is in the 73 space position, the right-hand margin trip plate must position the notch in the carriage return stop bar flush with or inside of the stop bar bracket. The shift blade must not hit the stop bar support bracket.

(2) The delaying latch must engage the stop bar shift stop and maintain the required position of the stop bar until the carriage is returned to the left-hand margin.

(3) The shift blade must not restrict the line-feed stop bar from engaging fully the No. 1 code ring when line-feed is selected. The shift blade must engage the line feed stop bar when the line-feed code group is not selected.

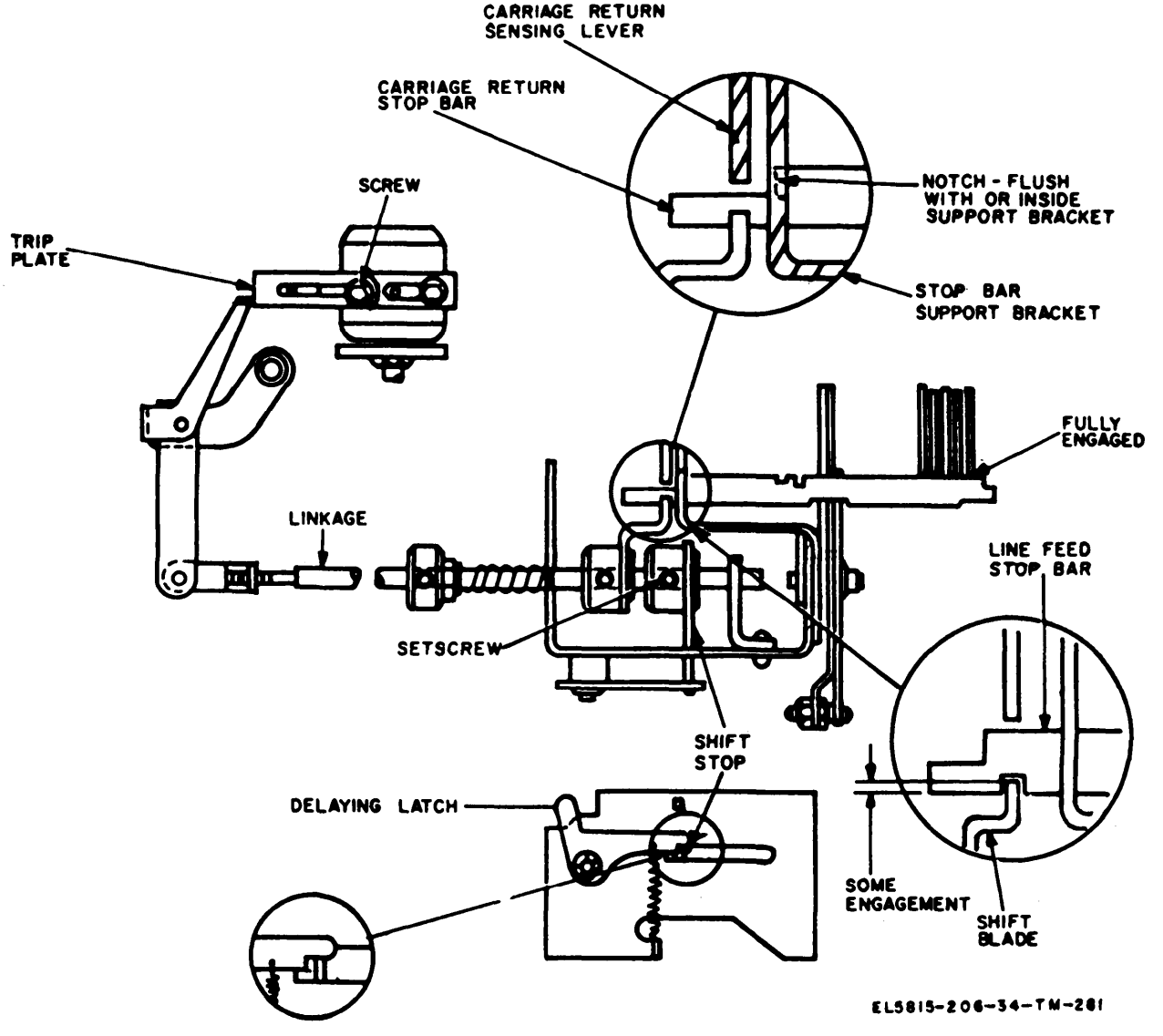


Figure 3-209. Automatic carriage-return shift stop adjustment (TT-537/G and TT-722(*)/TG).

b. Adjustment.

(1) Move the carriage to the 73 space. Loosen the plate screw and position the trip plate so that the notch in the carriage return stop bar is flush with, or inside of the support bracket. Check that the shift blade does not hit the stop bar support bracket. Tighten the trip plate screw.

(2) Position the code rings to select the line-feed

code group. Loosen the setscrew in the shift stop and adjust the shift stop and shift blade to meet the requirements of *a* (2) and (3) above. Select the blank code group to check that the shift blade does not engage the line feed stop bar.

3-242. Automatic Carriage Return Stop Bar Return Spring Adjustment (TT-537 and TT-722(*)/TG)

(fig. 3-210)

a. Requirement. It should require 13 to 16 ounces to start the stop bar shift lever moving when the carriage has been spaced 73 spaces from the left-hand margin.

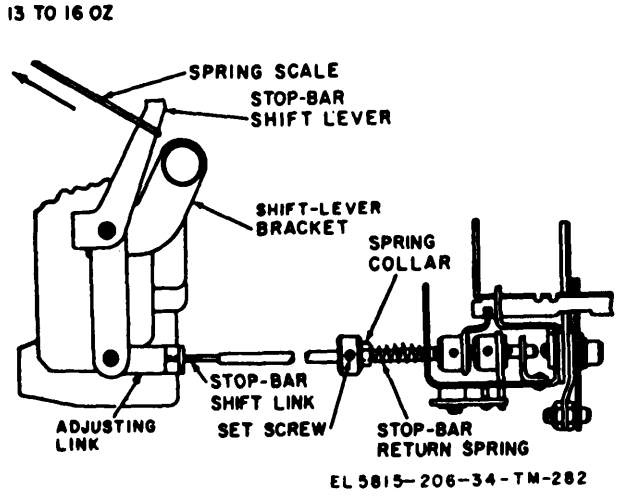


Figure 3-210. Automatic carriage-return stop bar return spring adjustment (TT-537G and TT-722(*)/TG).

b. Adjustment. Loosen the setscrew in the spring collar. Position the collar on the link to meet the requirement. Tighten the setscrew and recheck the adjustment.

3-243. Ribbon-Feed Mounting Adjustment

(fig. 3-211)

NOTE

Perform this adjustment only when assembling the ribbon-feed mechanism to the type-bar carriage.

a. Requirement. The ribbon-spool shafts should be 5 inches apart and parallel within 0.010 inch.

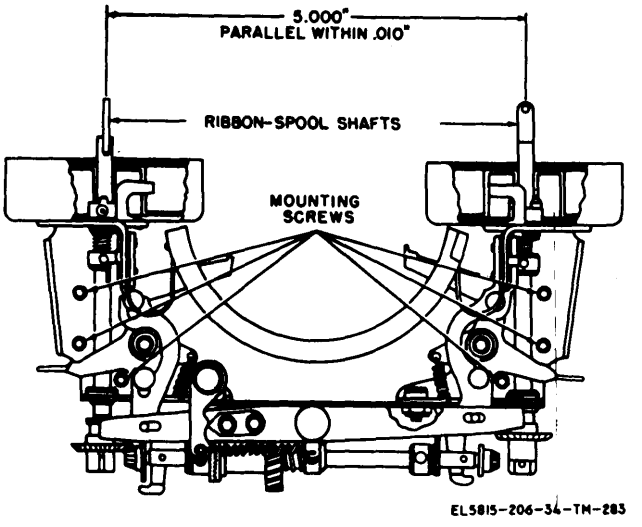


Figure 3-211. Ribbon-feed mounting adjustment.

b. Adjustment. Loosen the six screws (4 or TT-4A/TG and TT-698/TG) mounting the ribbon-feed mechanism. Position the mechanism to meet the requirement *(a* above). Tighten the mounting screws and recheck the requirement.

3-244. Ribbon-Spool Shaft Adjustment

(fig. 3-212)

a. Requirement. There should be equal engagement of the bevel gears at each end of the ribbon-spool shaft.

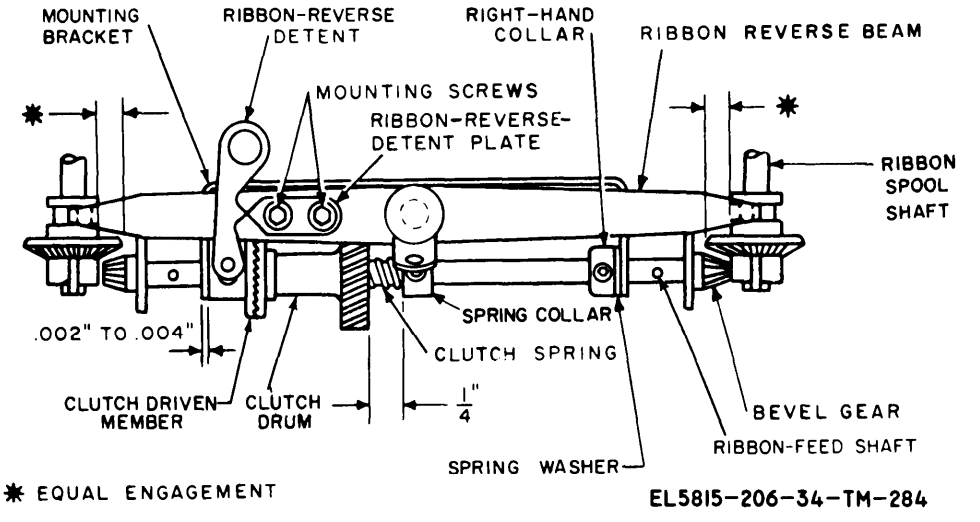


Figure 3-212. Ribbon-spool shaft adjustment.

b. Adjustment. Loosen the setscrews in the right-hand collar, spring collar, and driven clutch member. Move the shaft in the proper direction to meet the requirement *(a* above) and tighten the setscrew in the driven clutch member. Place a 0.002- to 0.004-inch feeler gage between the driven clutch member and the mounting bracket. Hold the shaft to the left, push the right-hand collar to the right to compress the spring washer, and tighten the setscrew in the right-hand collar. Check related adjustment (para 3-247).

3-245. Ribbon-Feed-Clutch Spring Adjustment (fig. 3-212)

a. Requirement. When the carriage is returned to the left-hand margin, the teeth of the jaw clutch should slip. This prevents the ribbon from being reversed when the carriage is returned.

b. Adjustment. With the teeth of the jaw clutch engaged, loosen the setscrews in the spring collar. Position the collar approximately ¼ inch from the back surface of the clutch drum. Tighten the setscrews and recheck the requirement *(a* above). If necessary, increase this clearance to insure that the clutch slips when the carriage is returned.

3-246. Ribbon-Reverse Beam Adjustment (fig. 3-213)

a. Requirement. There should be 0.0015- to 0.005-inch clearance between the ribbon-reverse beam and the groove in each spool bevel gear.

b. Method of Checking. Check the requirement on both sides of the ribbon-reverse beam with feeler gages.

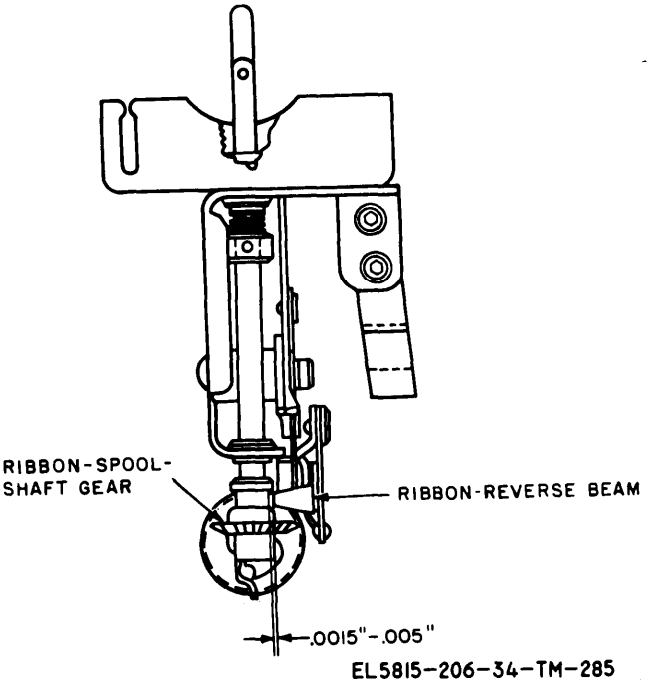


Figure 3-213. Ribbon-reverse beam adjustment.

c. Adjustment. Form the ends of the ribbon-reverse beam to meet the requirement *(a* above).

3-247. Ribbon-Reverse Detent-Plate Adjustment (fig. 3-214)

a. Requirement. There should be equal

engagement on each side of the ribbon-reverse-detent plate in both ribbon driving positions.

b. Method of Checking. Remove the detent spring. Position the ribbon-reverse beam so that the high points of the detent and the ribbon-reverse-detent plate meet. Clearances should be equal, or the engagement between the detent and ribbon-reverse-detent plate should be equal in both positions of the beam.

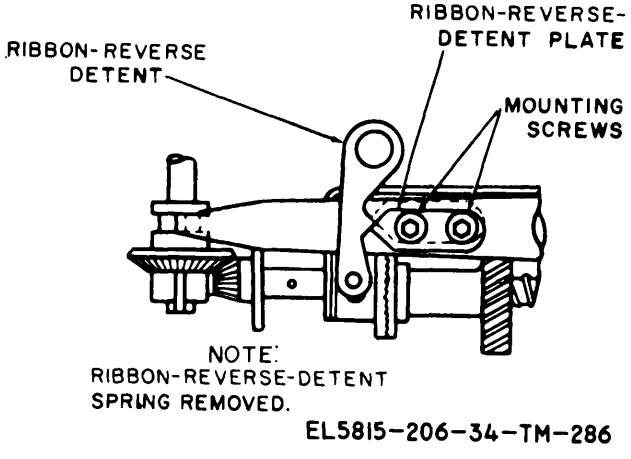


Figure 3-214, Ribbon-reverse detent-plate adjustment.

c. Adjustment. Loosen the two mounting screws of the ribbon-reverse-detent plate. Hold the ribbon-reverse-detent plate in position on the beam. Shift the beam until requirement *(a* above) is met. Tighten the two mounting screws. Check both latched beam positions for equal engagement.

3-248. Ribbon-Spool Driving-Collar Adjustment

(fig. 3-215)

a. Requirement. There should be 0.010- to 0.020-inch clearance between the top of the groove in the ribbon-spool-shaft gear and the top of the key on the ribbon-spool shaft when the bevel gears are engaged. Check both sets of gears for this requirement.

b. Method of Checking. Engage the right-hand bevel gears and check the requirement with feeler gages. Change the position of the ribbon-reverse beam to engage the left-hand bevel gears and check the requirement with feeler gages.

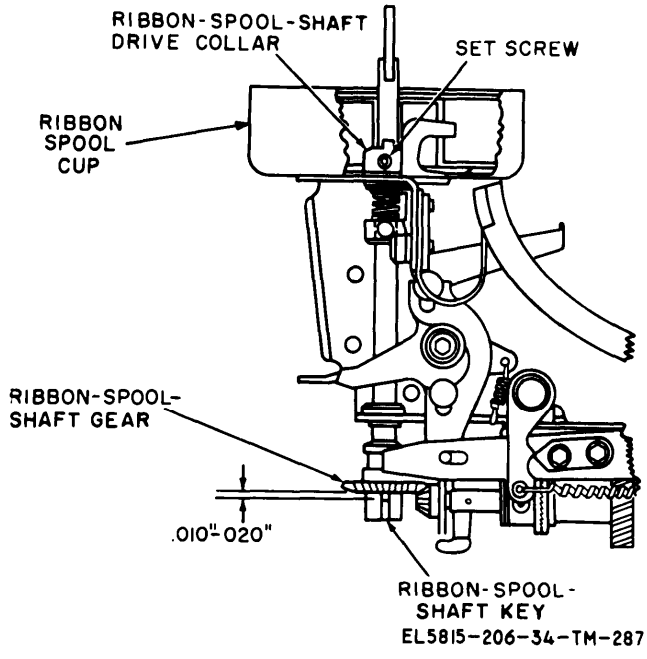


Figure 3-215. Ribbon-spool driving-col!ar adjustment.

c. Adjustment. Remove the ribbon spool and loosen the setscrews in the ribbon-spool-shaft drive collar. Hold the collar against the ribbon-spool cup and position the shaft to meet the requirement *(a* above). Tighten the setscrews and recheck the requirement. Adjust the opposite spool shaft in the same manner if necessary. Replace the ribbon spools and check related adjustment (para 3-249).

3-249. Ribbon-Spool Friction-Spring Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-216)

a. *Requirement.* A force of 1 to 2 ounces should be required to rotate each ribbon-spool shaft when measured at the tip of the ribbon-spool lock in the lower locked position.

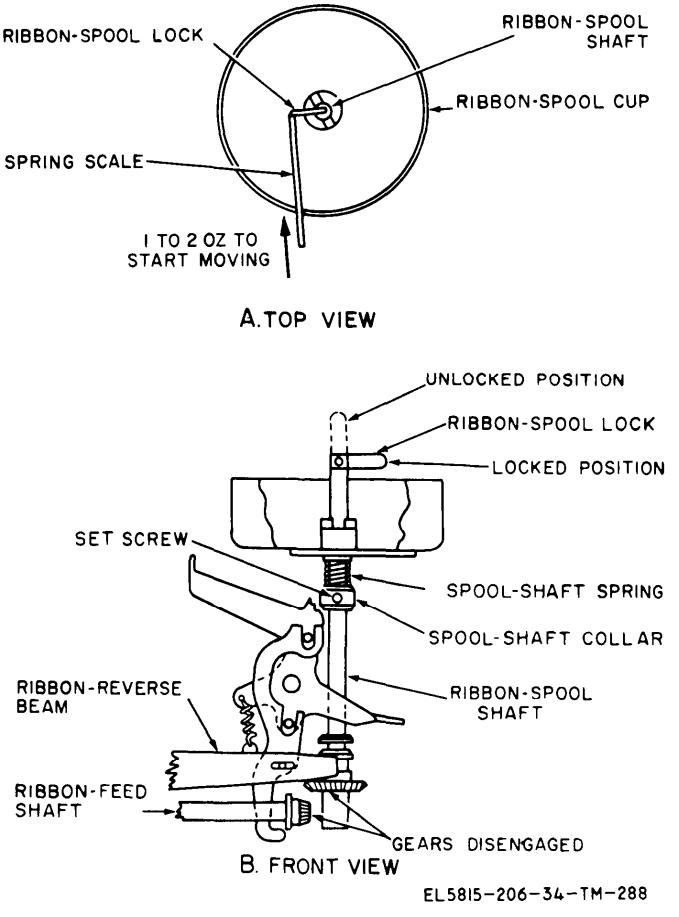


Figure 3-216. Ribbon-spool friction-spring adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G. TT-698A/TG, and TT-698B/TG).

b. Method of Checking. Remove the two ribbon spools from their shafts. Position the ribbon-reverse beam to disengage the bevel gears. Check the requirement *(a* above) with a spring scale.

c. Adjustment. Loosen the setscrews in the spool-shaft collar. Position the collar up or down to meet the requirement *(a* above). Tighten the setscrews and recheck the requirement. Adjust the other spool-shaft collar in the same manne.

3-250. Ribbon-Sensing-Lever Adjustment (fig. 3-217)

a. Requirement. There should be a 0.030-inch minimum clearance between the tip of each ribbon-reverse-cam follower and the side of each ribbon-reverse cam when the ribbon-sensing lever is sensing ribbon on the ribbon spool.

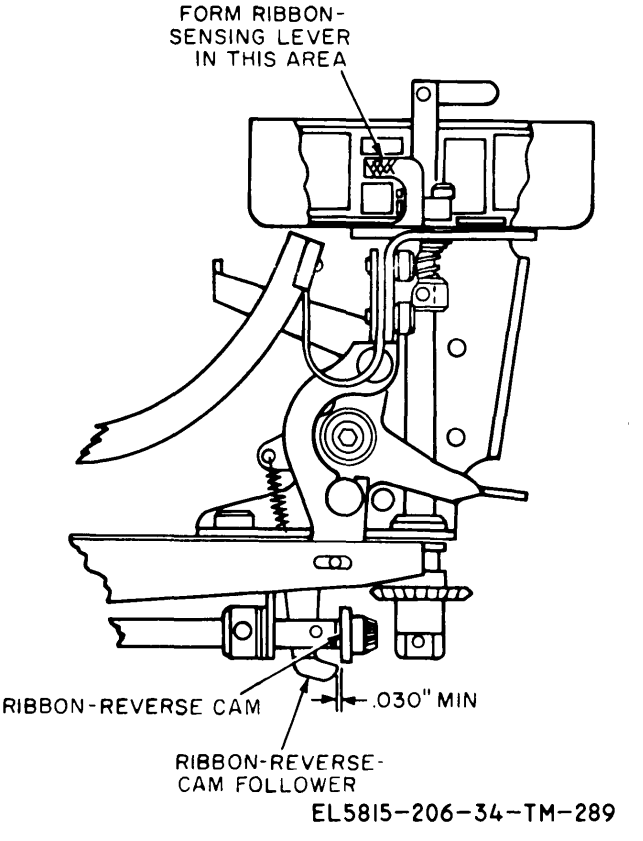


Figure 3-217. Ribbon-sensing-lever adjustment.

b. Method of Checking. Disengage the bevel gears. With ribbon on the ribbon spool, turn the ribbon-spool shaft until the ribbon-reverse-cam follower is positioned as close as possible to the ribbon-reverse cam. Check the requirement *(a* above) with a feeler gage. Repeat on the opposite side.

c. Adjustment. Form the ribbon-sensing lever to meet the requirement, as shown.

3-251. Ribbon-Reverse Cam-Follower Adjustment (fig. 3-218)

a. Requirement. The tip of the ribbon-reverse-detent plate should be past the tip of the detent when the ribbon-reversing-cam follower has reached a point on the cam 0.027- to 0.057-inch from the highest point on the ribbon-reverse cam.

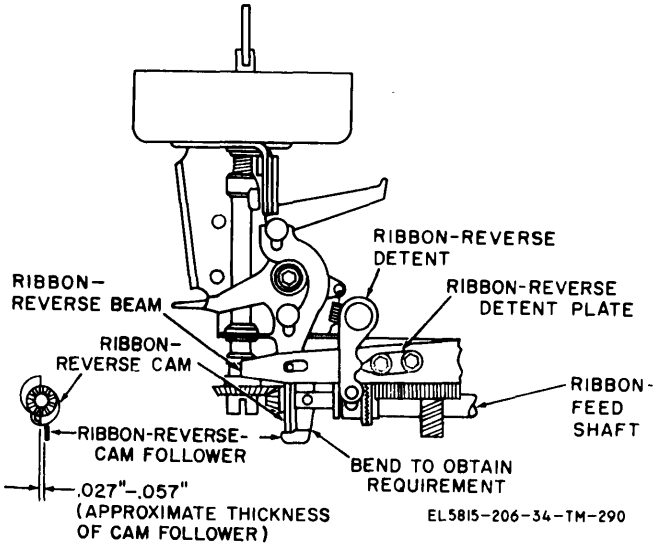


Figure 3-218. Ribbon-reverse cam-follower adjustment.

b. Method of Checking. Remove the ribbon spool and move the carriage support frame until the ribbon-reverse-cam follower is in the position on the ribbon-reverse cam as stated above. Check the requirement *(a* above). Check both right and left ribbon-reverse-cam followers. Replace the ribbon spool.

c. Adjustment. Bend the ribbon-reverse-cam follower to meet the requirement.

3-252. Signal-Bell Bracket Adjustment

(fig. 3-219)

a. Requirement. The motor-stop function lever and the signal-bell clapper should move freely when the punch bars are actuated.

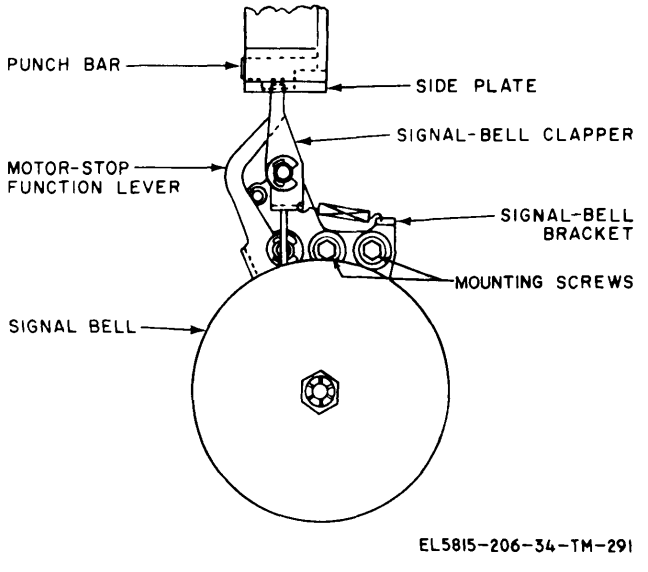


Figure 3-219. Signal-bell bracket adjustment.

b. Method of Checking. Shift the platen to the figures position. Actuate the punch bars manually and check for any tightness of binding.

c. Adjustment. Loosen the two mounting screws and position the signal bracket to meet the requirement. Tighten the mounting screws and recheck the requirement *(a* above). If the levers bind in the side plate, bend the levers as necessary to remove the bind.

3-253. Signal-Bell Preliminary Adjustment

(fig. 3-220)

a. Requirement. The clapper stud should stop the clapper 1 /32 to 3 /32 inch from the signal bell.

b. Method of Checking. Manually move the clapper against the clapper stud. Check the clearance.

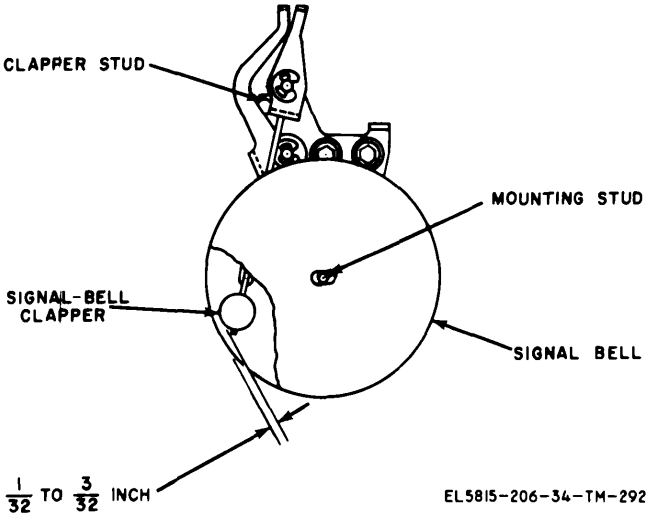


Figure 3-220. Signal-bell preliminary adjustment.

c. Adjustment. Remove the nut that holds the signal bell to the mounting stud. Position the bell so that the mounting stud is in the center of the elongated hole. Bend the rod of the signal-bell clapper to meet requirement *(a* above), then perform the signal bell adjustment (para 3-254).

3-254. Signal-Bell Final Adjustment

(fig. 3-221)

a. Requirements.

(1) There should be 1/16- to 3/32-inch clearance between the signal-bell clapper and the clapper stop when the clapper is held to the right by its spring. The signal bell should not operate when the teletypewriter is operating in the letters-shift position.

(2) The signal bell should sound loud and clear when the teletypewriter is operating in the figures position and the S code group is received.

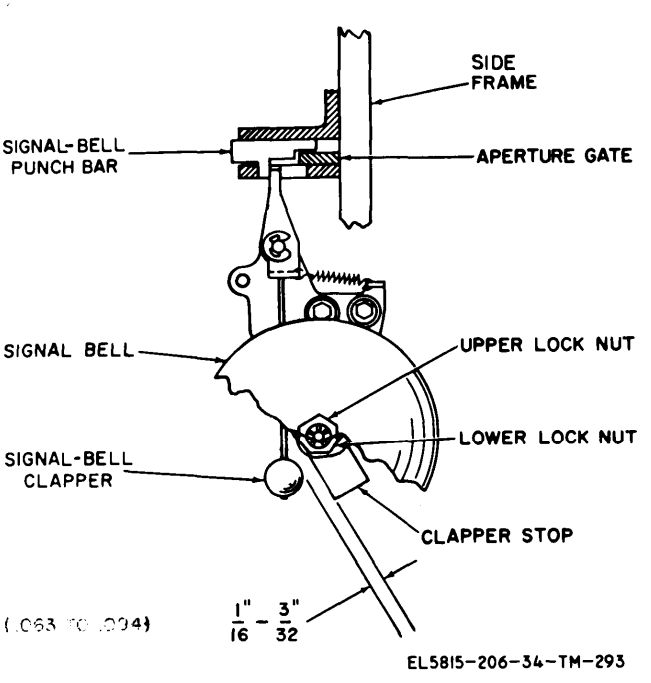


Figure 3-221. Signal-bell final adjustment.

b. Adjustments.

(1) Remove the upper locknut and the signal bell. Loosen the lower locknut. Be sure the signal bell clapper is held to the right as far as possible by its spring. Position the clapper stop to meet the requirement.

(2) Replace the signal bell and upper locknut, Position the signal bell to meet requirement *(a* (2) above). Tighten the upper locknut.

3-255. Motor-Stop Contact-Lever Lug Adjustment (TT-4A/TG)

(A, fig. 3-222)

a. Requirement. There should be 0.006- to 0.015-inch clearance between the motor-stop actuating lever and the contact-lever lug when the contacts are closed.

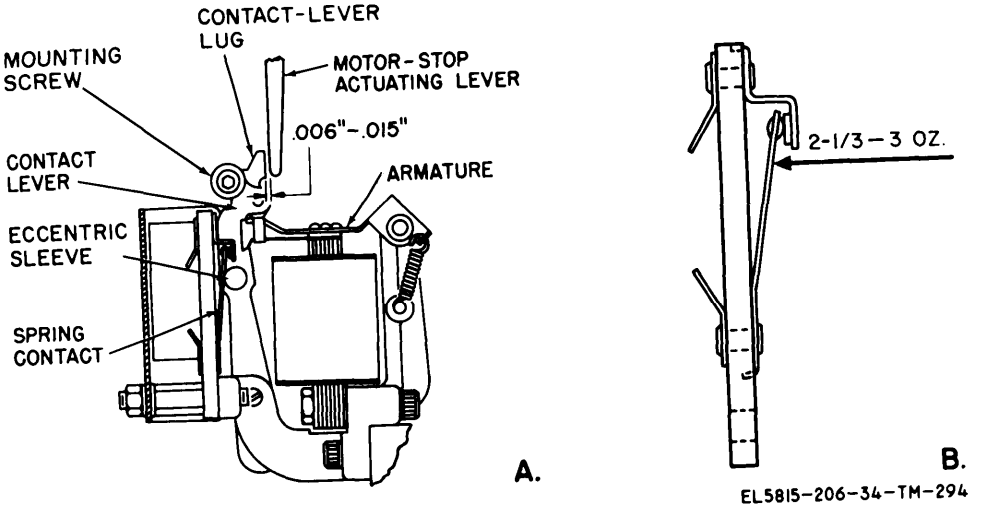


Figure 3-222. Motor-stop contact-lever lug and relay contacts adjustment (TT-4A/TG).

b. Adjustment. Loosen the mounting screw that holds the contact-lever lug to the contact lever. Turn the lug to meet the requirement *(a* above). Tighten the machine screw.

3-256. Motor-Stop Contacts and Eccentric Sleeves Adjustments (TT-4A/TG)

(B, fig. 3-222)

a. Requirements.

(1) A force of 2 1/3 to 3 ounces should be required to separate each pair of motor-stop contacts.

(2) There should be a 0.005- to 0.015-inch clearance between each motor-stop spring contact and its associated eccentric sleever.

b. Adjustments.

(1) Use long-nosed pliers to bend the lower portion of the spring contacts to meet requirement *a* (1) above.

(2) Turn the eccentric sleeves to obtain the proper clearance *(a* (2) above).

3-257. Motor-Stop Contact-Lever Spring Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, AND TT-537/G)

(A, fig. 3-223)

NOTE

This adjustment should be made only when the motor-stop-switch bracket is removed from the motor-stop bracket and the complete motor-stop assembly is removed from the teletypewriter.

a. Requirement.

(1) The contact lever should not bind in the motor-stop bracket.

(2) A force of 3/4 to 1¼ ounces should be required to start the contact-lever lug moving in the direction shown.

b. Method of Checking.

(1) Move the contact lever about its pivot pin to check the requirement *(a* (1) above).

(2) Use a spring scale to check the requirement *(a* (2) above).

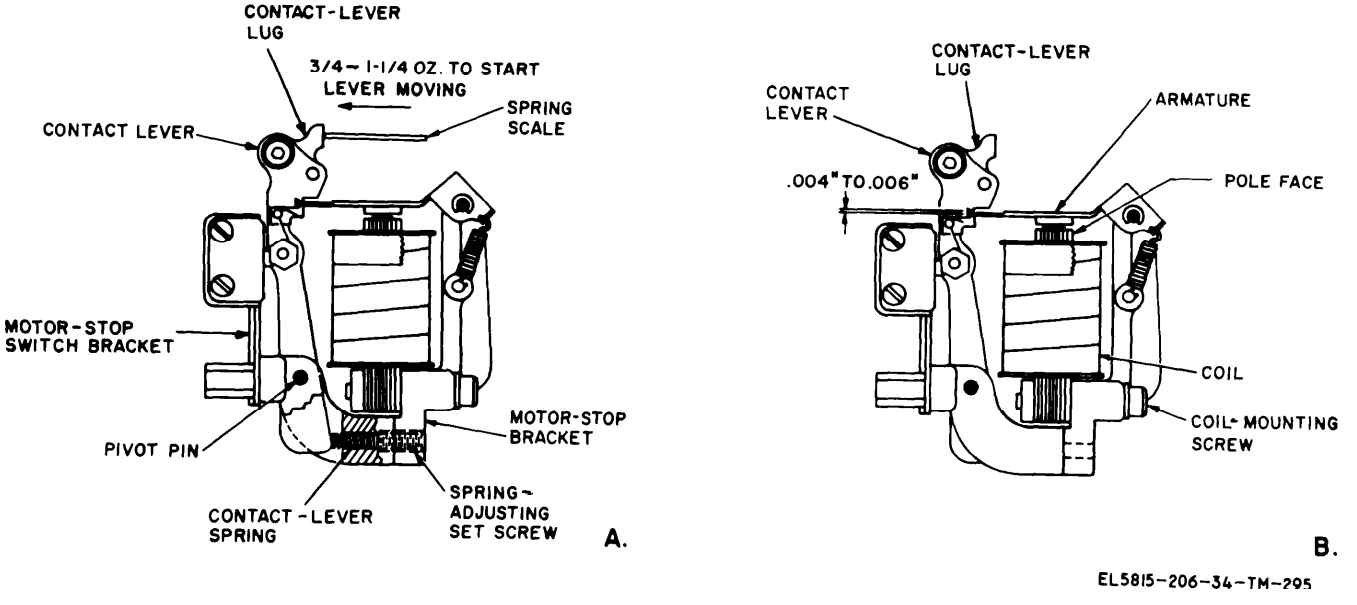


Figure 3-223. Motor-stop contact-lever spring assembly and relay coil adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G).

c. Adjustment.

(1) Remove the motor-stop bracket, the pivot pin of the contact lever, and the contact lever. Check the contact lever for straightness. Also check the slot in the bracket for accumulation of dirt. Clean and lubricate the slot. Replace the contact lever and the pivot pin and check the requirement *(a* (2) above).

(2) Turn the spring-adjusting setscrew (A, fig. 3-223) to obtain requirement *(a* (2) above).

NOTE

The setscrew must not protrude beyond the surface of the motor-stop bracket.

3-258. Motor-Stop-Relay Coil Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)

(B, fig. 3-223)

a. Requirement. There should be a clearance of 0.004- to 0.006- inch between the armature and the stop of the contact lever lug when the armature is against both pole faces.

b. Method of Checking. Move the armature against the pole faces and check requirement (a above) with feeler gages.

c. Adjustment. Loosen the coil-mounting screws and position the coils to meet the requirement *(a* above). Tighten the screws and recheck the requirement.

3-259. Motor-Stop Switches and Eccentric Sleeves Preliminary Adjustments (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)

a. Requirement.

(1) Maximum eccentricity of the eccentric sleeves should be in the direction shown in A, figure 3-224.

(2) Each switch plunger should be centered with its sleeve (visual check) and a .010-inch maximum clearance should be present between the plunger and its associated sleeve when the contact lever and armature are as shown (A, fig. 3-224).

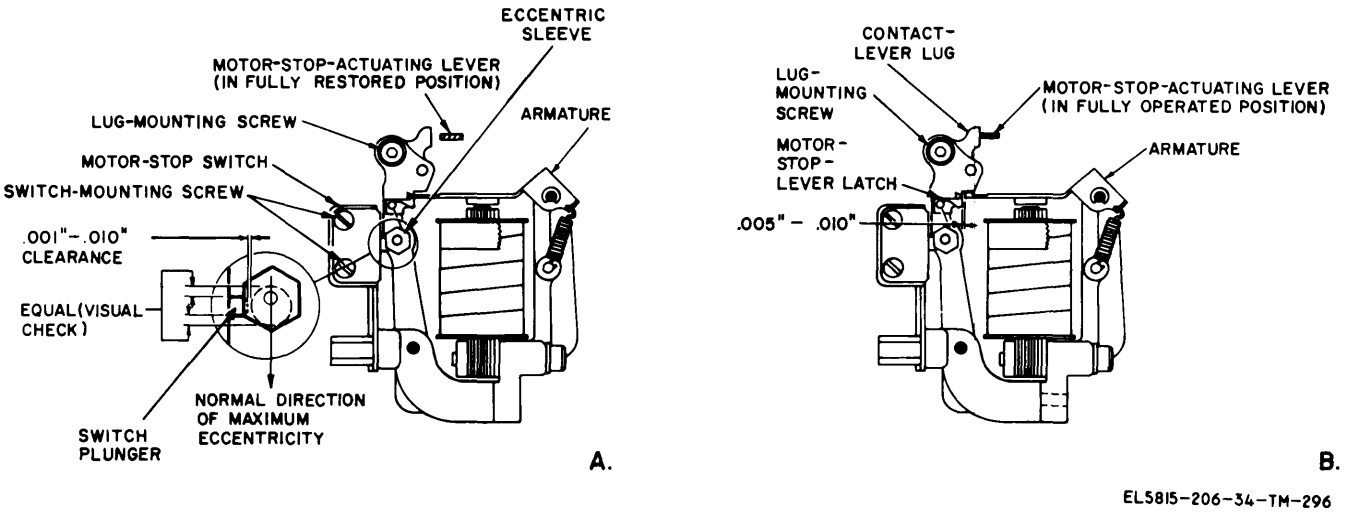


Figure 3-224. Motor-stop switches eccentric sleeves, and contact lever lug adjustments (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G).

b. Adjustment.

(1) Turn each eccentric sleeve to meet requirement (a (1) above).

(2) Loosen the switch-mounting screws and position each switch to meet requirement *(a* (2) above). Tighten the screws and recheck the requirement.

3-260. Motor-Stop Contact-Lever Lug Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G)

(B, fig. 3-224)

a. Requirement. There should be a .005- to 0.010- inch clearance between the armature and the latch when the contact lever is held in the fully operated position by the motor-stop actuating lever.

b. Method of Checking. Place the platen in the figures-shift position, turn the motor off, and position the Y-levers for the H code group. (No. 3 and No. 5 clockwise, No. 1, No. 2, and No. 4 counterclockwise). Trip the transfer-level latch and turn the motor manually until the motor-stop actuating lever is in the fully operated position. Check the requirement *(a* above) with feeler gages.

c. Adjustment. Position the mechanism as described in *b* above. Loosen the lug mounting screw and position the contact-level lug to meet the requirement *(a* above). Tighten the lug mounting screw and recheck the requirement.

3-261. Motor-Stop Eccentric Sleeves Final Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G).

a. Requirement. There should be a 0.001- to 0.010-inch clearance between each eccentric sleeve and its associated switch plunger when the contact-lever is in the maximum clockwise position (A, fig. 3-224).

b. Method of Checking. Set the contact lever to the maximum clockwise position and check the clearance between each eccentric sleeve and its associated switch plunger with the feeler gage.

c. Adjustment. Turn each eccentric sleeve in the direction required to meet the requirement.

3-262. Motor Gears Backlash Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-225)

NOTE

This adjustment should be made when the operating speed is changed.

a. Requirement. There should be a minimum backlash with no binding between the main-shaft driven gear and the worm gear.

b. Method of Checking. Grasp the main shaft and gently rotate the motor shaft back and forth by turning the governor target to determine the gear backlash. Check with the main shaft held in various positions.

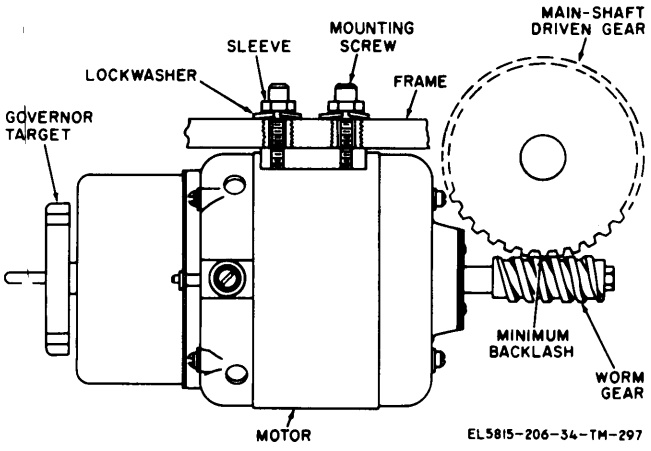


Figure 3-225. Motor gears backlash adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

c. Adjustment. Loosen the motor mounting screws and position the threaded portion of the sleeves flush with the frame. Position the motor to center the worm gear on the main-shaft driven gear. Tighten the screws friction-tight. Check the requirement *(a* above). Loosen the motor mounting screws and turn the three sleeves until there is a minimum backlash with no binding between the main-shaft driven gear and the worm gear. Tighten the mounting screws and check the requirement *(a* above).

3-263. Motor-Governor Brush Holder Adjustment

(fig. 3-226)

a. Requirements.

(1) The governor brush holders should be fully seated.

(2) Two side surfaces of the square hold in each governor brush holder should be aligned (within 1/64 inch) with the same surfaces of the other brush holder (fig. 3-226).

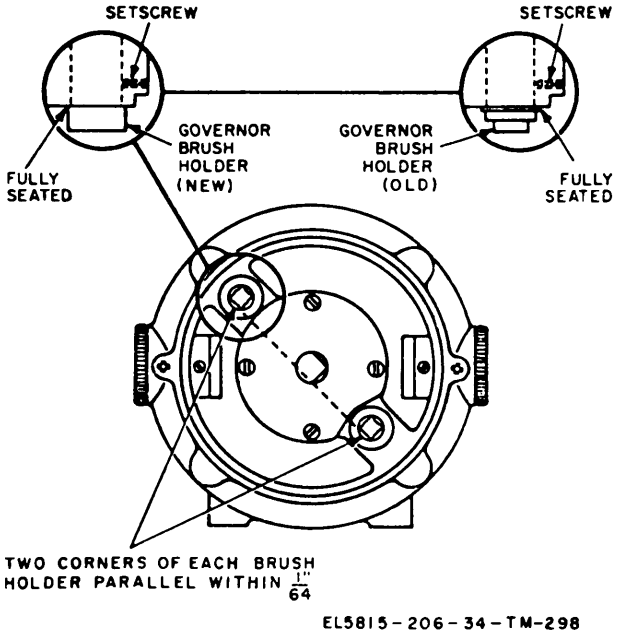


Figure 3-226. Motor-governor brush holder adjustment.

b. Method of Checking.

(1) Visually check requirement *(a* (1) above).

(2) Use a 6-inch steel rule to check requirement *(a* (2) above) visually.

c. Adjustment. Loosen the setscrew that retains each governor brush holder and position each brush holder to meet the requirements. Tighten the setscrews and recheck the requirements.

3-264. Motor-Governor Contacts Alignment (TT-4(*)/TG and TT-698(*)/TG)

(fig. 3-227)

a. Requirements.

(1) The contacts should be centered and adjusted for maximum area of engagement.

(2) A force up to 8 ounces should be required to turn the speed adjustment gear at any point within the operating range of the motor.

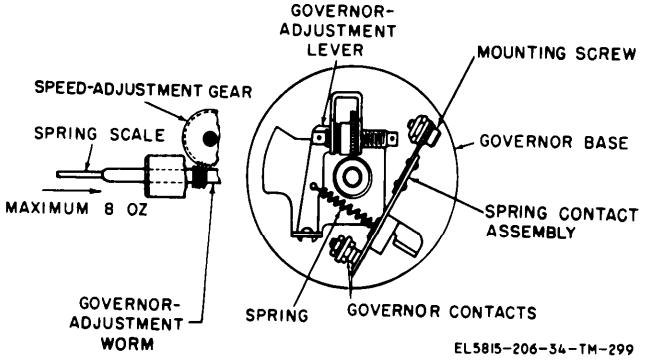


Figure 3-227. Motor-governor contacts alignment (TT-4(*)/TG and TT-698(*)/TG).

b. Adjustment.

(1) Loosen the mounting screw that secures the spring contact assembly and position the assembly to meet the requirement *(a* (1) above). Tighten the mounting screw.

(2) Check for dirt or bind between the governor adjustment worm and the speed adjustment gear to meet the requirement *(a* (2) above).

3-265. Governor-Assembly Locating Adjustment (TT-4(*)/TG and TT-698(*)/TG)

(fig. 3-228)

NOTE

This adjustment should be performed only when mounting the governor assembly on the motor.

a. *Requirement.* There should be a clearance of 1/32 to 3/32 inch between the governor slipring and brush holder.

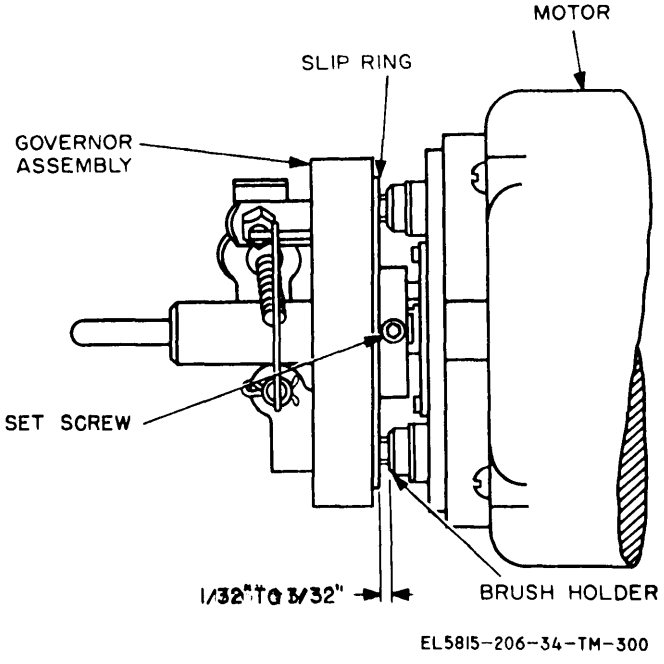


Figure 3-228. Governor-assembly locating adjustment (TT-4(*)/TG and TT-698(*)/TG).

b. Adjustment. Loosen the two setscrews and position the governor assembly to meet the requirement. Tighten one setscrew fingertight. Tighten the other setscrew. This insures that the governor base is properly in line with the shaft of the motor.

NOTE

The governor sliprings must be clean and smooth to insure proper brush contact. The area between the sliprings must be clean and free of foreign material.

3-266. Governor Target Adjustment (TT-4(*)/TG and TT-698(*)/TG)

(fig. 3-229)

a. Requirement. There should be a 0.020-inch maximum clearance between the governor target and the governor cover.

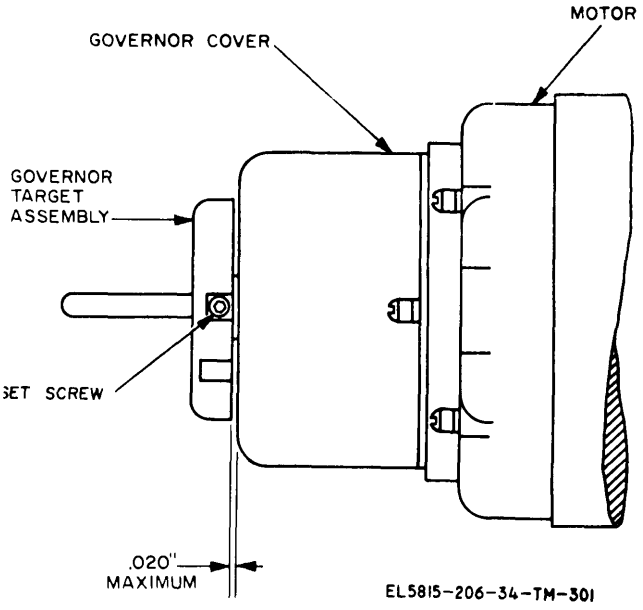


Figure 3-229. Governor target adjustment (TT-4(*)/TG and TT-698(*)/TG).

b. Adjustment. Loosen the setscrew and position the governor target assembly to meet the requirement *(a* above). Tighten the setscrew.

3-267. Copy-Light Screws Adjustment

(fig. 3-230)

a. Requirement. There should be 15/32- to 17/32-inch clearance between the bottom edge of the dust cover and the bottom of the copy-light screws.

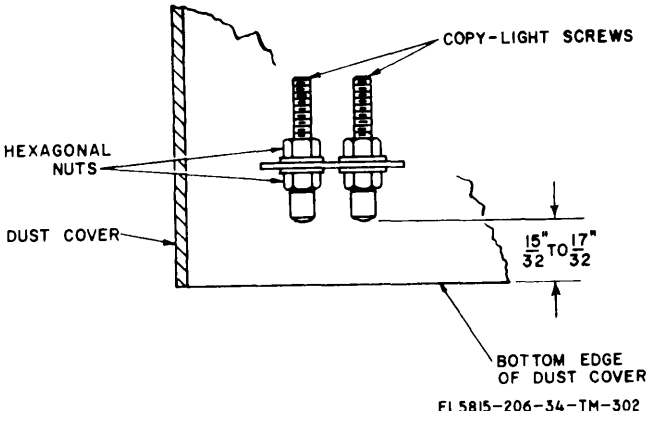


Figure 3-230. Copy-light screws adjustment.

b. Adjustment. Loosen the hexagonal nuts and position the copy-light screws in or out to meet the requirement *(a* above). Tighten the nuts and recheck the clearance.

3-268. Dust-Cover Cam-Lock Adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/ G, TT-698A/TG, and TT-698B/TG)

(fig. 3-231)

a. Requirement. There should be 1/32-inch clearance between the cam-lock stud and the slot in the dust cover when the dust cover is seated against the mounting base.

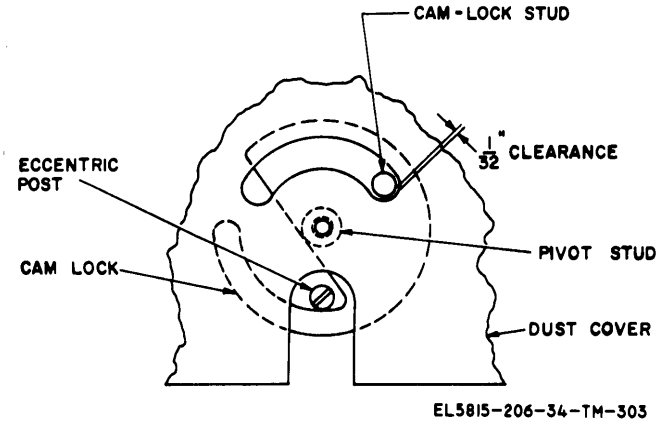


Figure 3-231. Dust-cover cam-lock adjustment (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

b. Adjustment. Loosen the locknut and position the eccentric post until requirement *(a* above) is met. Tighten the locknut and recheck the requirement.

3-269. Carriage-Lock-Lever Adjustment (TT-537/G)

(fig. 3-232)

a. Requirement. The carriage must be held tight when the carriage lock is detented over the end of the carriage rail.

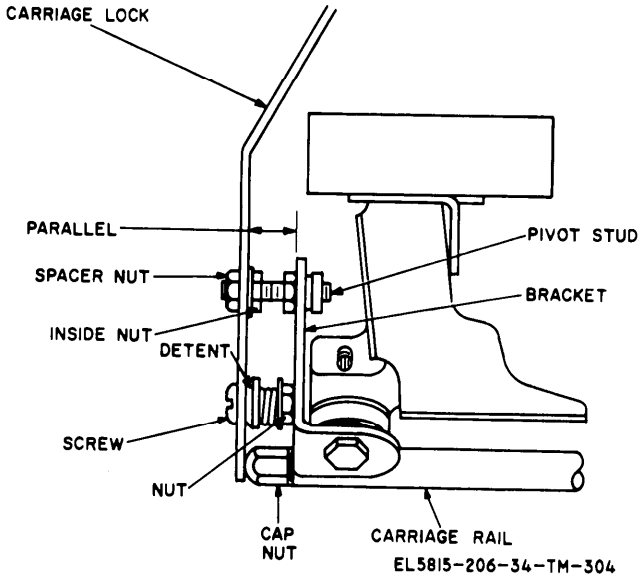


Figure 3-232. Carriage-lock-lever adjustment (TT-537/G).

b. Adjustment. Place the carriage at the left margin. Loosen the lower nut. Loosen the spacer nut and the inside nut. Move the carriage over the capnut. Turn in the screw until the lever contacts the capnut; tighten the screw an additional quarter turn. Tighten the lower nut. Position the inside nut so that the lever is parallel to the bracket. Tighten the spacer nut.

3-270. Platen Lock Clamp Lever End-Play Adjustment (TT-537/G)

(fig. 3-233)

a. Requirement. The clamp lever must be free with up to 0.005-inch end play.

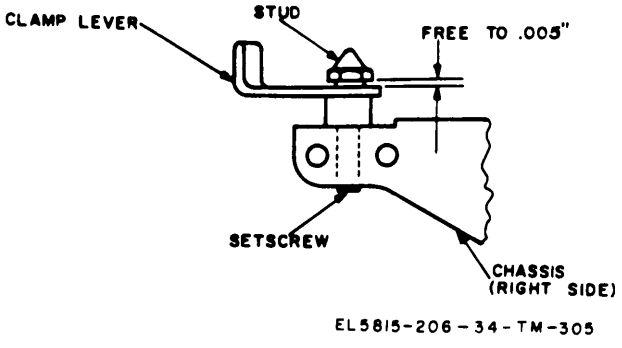


Figure 3-233. Platen lock clamp lever end-play adjustment (TT-537/G).

b. Adjustment. Loosen the setscrew in the frame casting. Position the stud to allow up to 0.005-inch end play. Tighten the setscrew and recheck the adjustment.

3-271. Platen Clamp Adjustment (TT-537/G)
(fig. 3-234)

a. Requirement. The platen clamp must secure the platen in the letters-shift position when the clamp lever is completely over the setscrew.

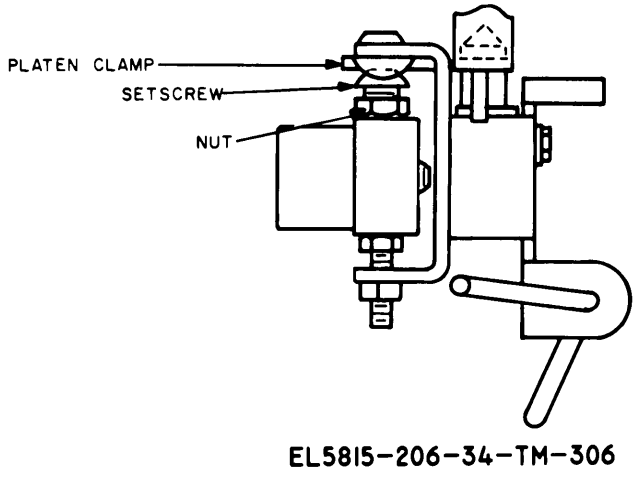


Figure 3-234. Platen clamp adjustment (TT-537/G).

b. Adjustment. Loosen the nut. Position the setscrew to meet the requirement. Tighten the nut and recheck the adjustment.

3-372. Platen Lock Release Arm Adjustment (TT-537/G)
(fig. 3-235)

a. Requirement.

(1) The platen latch must disengage the lug on the aperture gate when the front release arm is depressed.

(2) The front release arm must be parallel with the platen casting when the rear release arm is against the casting.

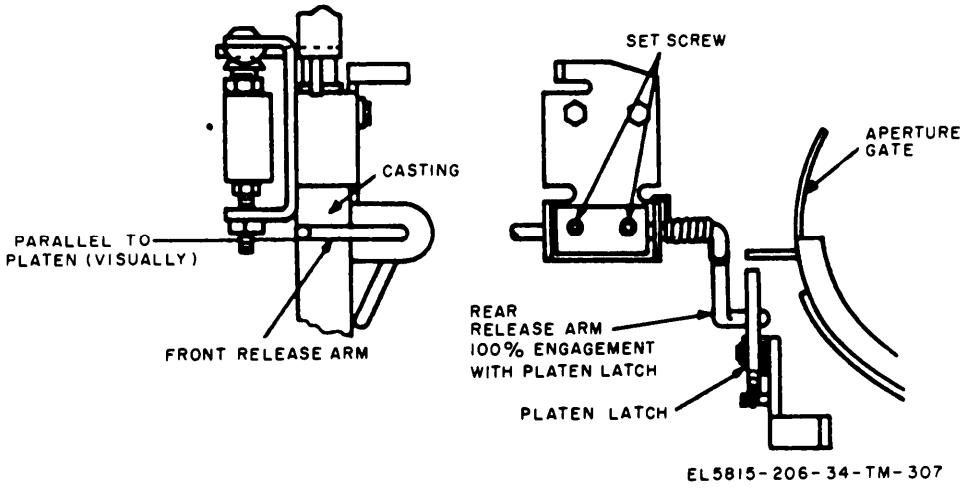


Figure 3-235. Platen-lock release arm adjustment (TT-537/G).

b. Adjustment.

(1) Loosen the setscrews that secure the release arm in the coupler. Position the rear release arm to fully engage the platen latch. Tighten the setscrew of the rear arm.

(2) Position the front release arm so that it is parallel with the platen when the rear release arm is against the casting. Tighten the setscrew of the front release arm.

Section VI II. SPRING DATA

3-273. General

a. This section contains data on the coil springs used in the teletypewriters. This information is useful when inspecting or overhauling the determine which springs must be replaced. It is also useful as a check list when reassembling, adjusting, or troubleshooting, and as a means of identifying springs.

b. The charts in paragraphs 3-274 through 3-277 give the dimensional and strength characteristics required of each spring used in the teletypewriters. Each type of spring is illustrated in figures 3-236 through 3-244. The free length is measured between the inside surfaces of the end hooks. A spring that fails to pass its strength check should be replaced.

NOTE

In some cases, spring tensions are indicated in grams for more accurate adjustments than are possible with ounce scales. If it is necessary to convert from ounces to grams, or from grams to ounces, remember that 1 ounce equals 28.35 grams.

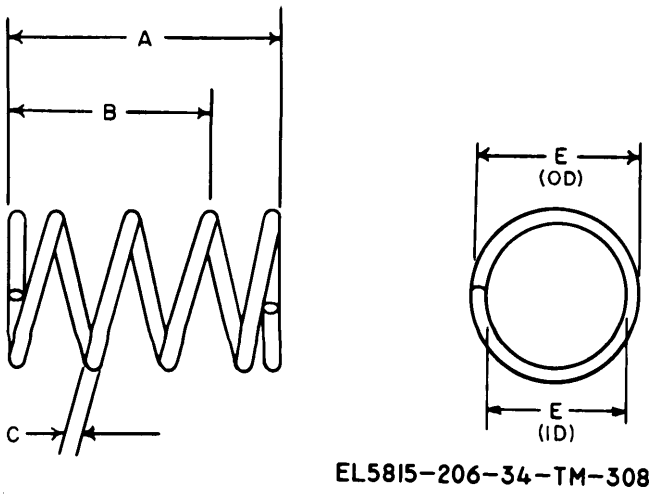


Figure 3-236. Compression spring.

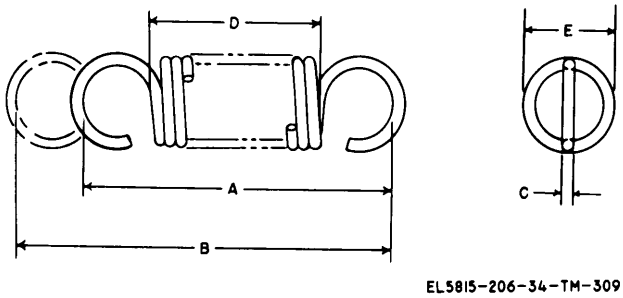


Figure 3-237. Parallel-end and random-end springs.

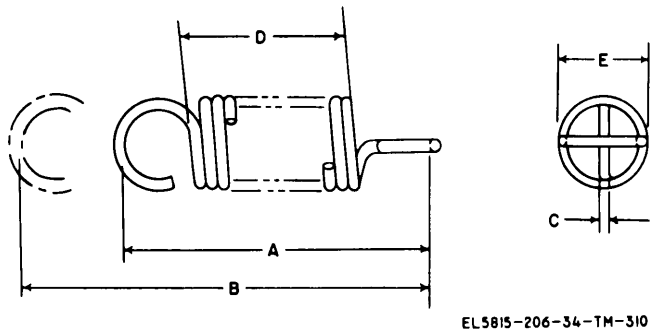


Figure 3-238. Crossed-end springs.

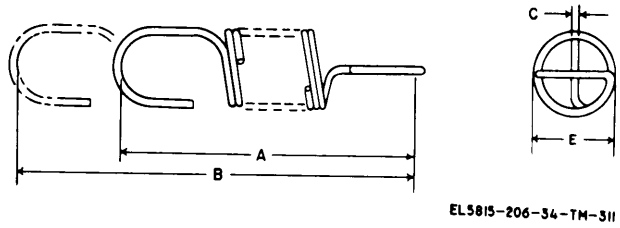


Figure 3-239. Selector-lever spring.

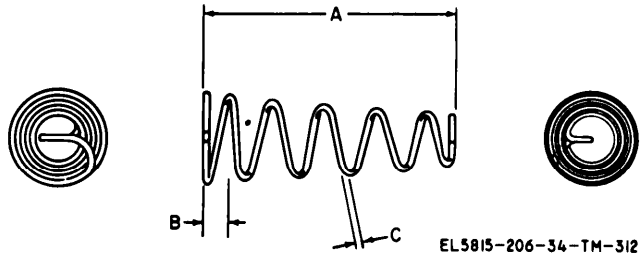


Figure 3-240. Governor worm spring.

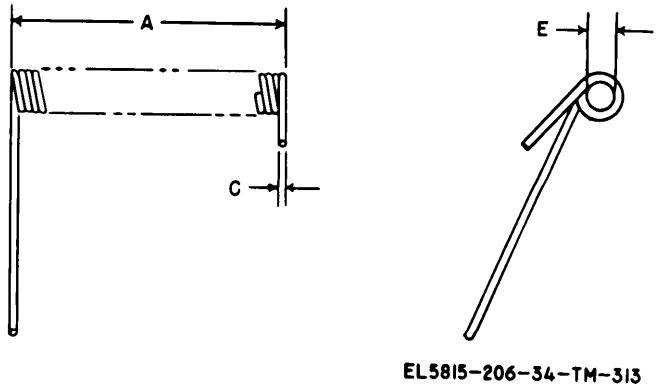


Figure 3-241. Platen trough spring.

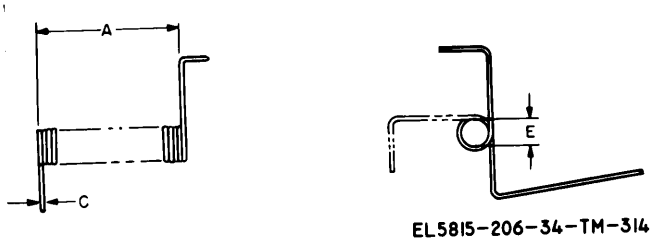


Figure 3-242. Key bar bail spring.

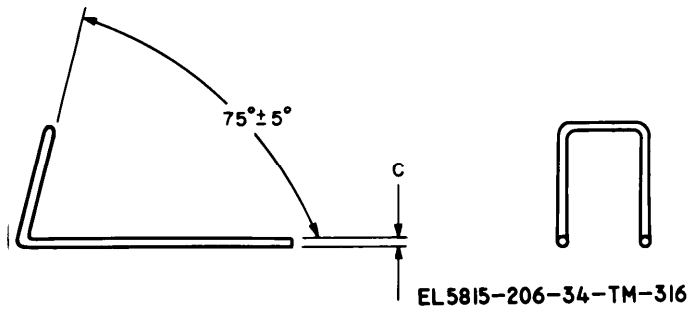


Figure 3-244. Armature latch spring.

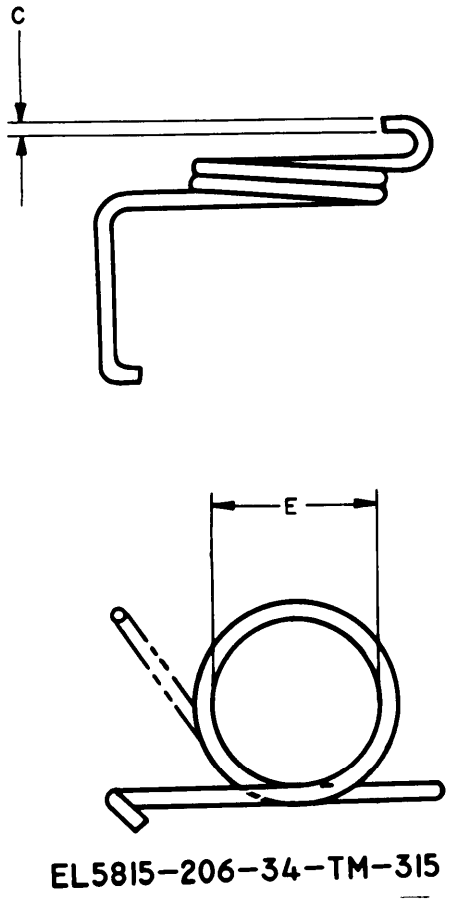


Figure 3-243. Code-ring locking bail spring.

3-274. Compression Spring Data

Reference No.	Name	A Free length (in.)	B Compressed length (in.)	Required tension compressed length	C Wire thickness (in.)	D No. of coils	E Outside diameter (in.)
50154	Stop bar	31/64	.375	13 oz ± 3 oz	0.020 ± 0.0003	10	0.183
50847	Clutch pressure	1/2	9/32	10 lb ± 8 oz	.053 ± .0005	4	.453 ID
50848	Function-shaft clutch	1-9/64	7/16	21 lb 10 oz ± 4 oz	.041 ± .0005	6	.597 ID
50859	Friction clutch	3/8	5/16	8 lb ± 12 oz	.057 ± .0005	3¾	.390 ID
50910	Friction plate	17/32	5/16	32 oz ± 3 oz	.028 ± .0005	6½	.250 ID
50914	Friction clutch	13/32	9/32	6 lb ± 10 oz	.0490 ± .0005	4	.390 ID
50917	Function-selecting arm	9/16	13/32	6 oz ± ½ oz	.0240 ± .0005	5	.390 ID
51120	Lamp connector receptacle contact	3¼	17/32	10 oz ± 2 oz	.0320 ± .0005	5½	.468
52259	Carriage-return-clutch lever	1-7/16	31/32	6 oz ± 1 oz	.0220 ± .0003	16	.281 ID
52940	Stop bar	37/64	.375	8 oz ± ½ oz	.0160 ± .0005	11½	.183
53961	Spool friction	1/2	1/4	20 oz ± 4 oz	.0210 ± .0003	7	.198 ID
54932	Friction clutch	13/32	9/32	6 lb ± 10 oz	.067 ± .001	3½	.6875 ID
54933	Clutch pressure	1/2	9/32	10 lb 8 oz ± 12 oz	.067 ± .001	3½	.6875 ID
54934	Friction clutch	3/8	5/16	8 lb ± 12 oz	.080 ± .001	3½	.6875 ID
55042	Safety clutch	1/2	5/16	30 lb ± 6 lb.	.109 ± .005	2½	.953 ID
56279	Square-shaft bearing	17/32	5/16	32 oz ± 3 oz	.028 ± .0005	6½	.257 ID
60607	Switch lever	7/8	1/2	7¾ oz ± 10%	.014 ± .003	23	.140
51985	Locking lever spring	3/8	9/32	6 lb ± 10%	0.637 ± .001	4½	.284
59620	Shift rod spring	1	15/32	7 oz ± 20 gm	.014 ± .0003	14	.172

3-275. Parallel-End and Random-End Spring Data

(fig. 3-237)

Reference No.	Name	A Free length (in.)	B Compressed length (in.)	Required tension compressed length	C Wire thickness (in.)	D No. of coils	E Outside diameter (in.)
50231	Margin-bell clapper	1-1/16	3/4	8 oz ± 1 oz	0.016 ± 0.0003	30	0.125
50232	Margin-bell pawl	5/8	11/16	1 oz ± ¼ oz	.010 ± .0003	40	.125
50333	Line-feed pawl	5/8	3/4	2½ oz ± ½ oz	.010 ± .0003	39¾	.125
50575	Ribbon vibrator	1-1/8	1-3/8	1¼ oz ± ¼ oz	.0100 ± .0003	88	.125
50595	Connecting bar	9/16	7/8	3½ oz ± ¼ oz	.0200 ± .0003	30	.138
50901	Line-feed and figures-shift-cam follower.	9/16	7/8	8 oz ± ½ oz	.0110 ± .0003	26	.095
50903	Transfer lever	1-3/32	1-1/4	5 lb 13 oz ± 3 oz	.042 ± .0005	14	.281
50919	Motor-stop actuating lever	1/2	5/8	2½ oz ± ¼ oz	.0110 ± .0003	25¾	.125
50920	Signal-bell clapper	23/32	27/32	1-1/2 oz ± ¼ oz	.010 ± .0003	49	.125
51136	Universal code bar return	11/16	1	15-20 grams	.0090 ± .0003	46	.150
51544	Locking-lever latch	7/8	1-1/8	1½ oz ± ¼ oz	.010 ± .0003	57	.125
51574	Sensing-lever locking bail	5/8	27/32	2½ oz ± ¼ oz	.0120 ± .0003	31	.156
51575	Cam stop lever	13/16	1-3/16	3 oz ± ½ oz	.0120 ± .0003	43	.156
51645	Platen shift bell crank	1	1-1/2	8 oz ± 1 oz	.0160 ± .0003	46½	.156
51755	Line-feed bell crank	15/16	1-5/16	28 oz ± 2½ oz	.0230 ± .0003	27¾	.187
52164	Manual carriage-return trip pawl	17/32	3/4	10 oz ± 10%	.016 ± .0003	16½	.156
54948	Blank holder slide	7/16	5/8	2 lb ± 4 oz	.0220 ± .0003	9	.172
51932	Platen lock spring	1-1/4	1-9/16	6 lb ± 10%	.034 ± .001	28	.182
51986	Paper lever spring	9/16	15/16	1¾ lb ± 10%	.025 ± .001	12	.175
57871	Draw bar spring	1-9/64	1-11/16	14 oz ± 1 oz	.016 ± .0003	56	.144
57875	Bellcrank spring	39/64	13/16	1 lb ± 2 oz	.020 ± .0003	15	.182
59310	Pawl spring	1-1/32	1-7/32	9 oz ± 26 gm	.019 ± .0003	38	.180

3-276. Crossed-End Spring Data

fig. 3-238)

Reference No.	Name	A Free length (in.)	B Compressed Length (in.)	Required tension compressed length	C Wire thickness (in.)	D No. of coils	E Outside diameter (in.)
50332	Platen detent	3/4	7/8	48 oz ± 4 oz	0.025 ± 0.0005	29	0.156
50334	Adjustment lever	51/64	1	32 oz ± 3 oz	.023 ± .0005	23½	.156
50403	Ribbon-reverse detent	1	1¼	5 oz ± ¾ oz	.013 ± .0003	60	.125
50447	Ribbon-sensing lever	13/32	15/32	2 oz ± ½ oz	.0100 ± .0003	12	.156
50904	Transfer-lever trip latch	35/64	13/16	2½ oz ± ¾ oz	.0110 ± .0003	15¾	.156
50906	Carriage-return bell crank	11/16	13/16	4½ lb ± 6 oz	.034 ± .0005	9¼	.250
50908	Selector-magnet armature	1	1-3/16	8 oz ± ½ oz	.020 ± .0005	16¾	.190
50911	Carriage-feed-clutch lever	25/32	15/16	40 oz ± 4 oz	.0250 ± .0005	15¾	.200
50912	Carriage-feed pawl	1/2	21/32	17½ oz ± 1½ oz	.0180 ± .0005	12¾	.156
50915	Supporting lever	21/32	23/32	4 lb ± 6 oz	.036 ± .0008	7¾	.250
50916	Platen latch	3/8	1/2	10 oz ± 1 oz	.0130 ± .0003	13¾	.125
50921	Print-cam follower	7/8	1-1/16	6½ lb ± 8 oz	.0390 ± .0005	11¾	.250
50941	Key lever	1/2	5/8	20 oz ± 2 oz	.020 ± .0003	8¾	.187
50942	Space bar	1/2	5/8	60 oz ± 6 oz	.0280 ± .0005	5¾	.218
50944	Repeat-blocking lever	3/8	9/16	2½ oz ± ½ oz	.0100 ± .0003	14¼	.125
50946	Double-blocking lever	19/32	11/16	28 oz ± 3 oz	.0240 ± .0003	11¾	.1875
50965	Motor-stop armature	31/32	11/16	12 oz ± 10%	.0160 ± .0003	14	.152
51548	Contact bail spring	7/16	9/16	11 oz ± 1 oz	.0150 ± .0003	14	.125
51754	Line-feed sensing lever	37/64	7/8	34 oz ± 10%	.0180 ± .0003	21¼	.125
51851	Platen-spacing detent	21/32	25/32	54 oz ± 6 oz	.0250 ± .0005	17¼	.160
52169	Paper guide	51/64	1	34½ oz ± 10%	.0220 ± .0003	24¾	.141
52501	Platen latch	23/64	1/2	12 oz ± 2 oz	.0140 ± .0003	10¾	.125
53149	Platen-lever latch	25/32	7/8	20 oz ± 1 oz	.0200 ± .0003	27¼	.156
53974	Space bar	1/2	5/8	86 oz ± 9 oz	.0310 ± .0005	5¾	.218
56258	Carriage-return clutch-actuating lever.	31/64	3/4	70 oz ± 1 oz	.0130 ± .0003	7¾	.168
61000	Y-lever detent	7/32	11/32	80 g ± 5 g	.0080 ± .0003	9¾	.083
59442	Sensing spring	3/4	1-1/16	4 lb	.035 ± .001	10¼	.257
62154	Pawl spring	11/16	1-1/16	18 oz ± 15 gm	.020 ± .0003	18¼	.196
62169	Pawl spring	57/64	1-17/32	36 oz ± 12 gm	.026 ± .0005	17¼	.260
68126	Selector lever spring	15/16	1-1/4	9 oz ± 10%	.012 ± .001	14¼	.122

3-277. Special Spring Data

Reference No.	Name	A Free length (in.)	B Compressed length (in.)	Required tension compressed length	C Wire thickness (in.)	D No. of coils	E Outside diameter (in.)
50902	Sector lever	1	1-1/4 (extended)	8 oz ± 1 oz	0.0120 ± 0.0003	55	0.085 OD
51855	Governor worm	5/8	.047 (compressed)		.0140 ± .0003	6 ± ½	
54967	Platen trough	1-3/16			.027	43½	.179 ID
56688	Keybar bail	3/8			.028 ± .001	12	.156 ID
57749	Code-ring locing bail				.0400 ± .0005	2	15/32 ID
60625	Armature latch				.0100 ± .0003		
51982	Platen-lock lever spring	7/16		4 in. ± 20% gm	.014 ± .001	28½	.163

3-278. Felt Lubricating Washer Data (TT-4B/TG, TT-4C/TG, TT-335/TG, and TT-537/G, TT-698A/TG, and TT-698B/TG)

(fig. 3-245)

a. Type A Plain Round Washer

Reference No.	Outside diameter (in.)	Inside diameter (in.)	Thickness (in.)
61466	3/4	15/32	1/16
61467	5/8	3/8	1/8
61468	5/16	7/32	1/8
61469	33/64	3/8	1/8
61471	13/16	5/8	1/16
61472	9/16	3/8	1/4
61473	7/16	1/4	1/8
61474	7/16	3/16	1/8
61475	15/32	3/16	1/8
61476	1/2	3/16	1/16
61477	7/16	1/4	1/32
61479	5/8	7/16	1/16
61480	5/8	3/8	1/16
61481	5/8	3/16	1/8
61482	9/16	3/8	1/16
61483	33/64	5/16	1/16
61484	1-1/8	3/8	1/8
61485	3/4	1/2	1/16
61486	15/32	9/32	1/16
61487	3/4	5/16	1/4
61488	3/4	9/16	1/16
61489	3/4	7/16	1/8
61490	5/8	5/16	1/16
61491	15/16	9/16	1/8
61492	1/2	5/16	1/32
61497	15/16	3/4	1/8
61667	5/8	3/8	1/4
61668	3/4	3/8	1/8
61669	3/4	3/8	1/4
61672	15/32	5/16	1/32
61673	9/16	3/8	1/8
61678	15/16	1/2	7/8

b. Type B Split Round Washer

Reference No.	Outside diameter (in.)	Inside diameter (in.)	Thickness (in.)
61494	1	1/2	1/4
61495	1-1/4	3/4	1/4

c. Type C Rectangular Washer

Reference No.	Outside diameter (in.)	Inside diameter (in.)	Thickness (in.)
61496	2-1/2	3/8	1/16
61677	1-5/16	1/2	1/16

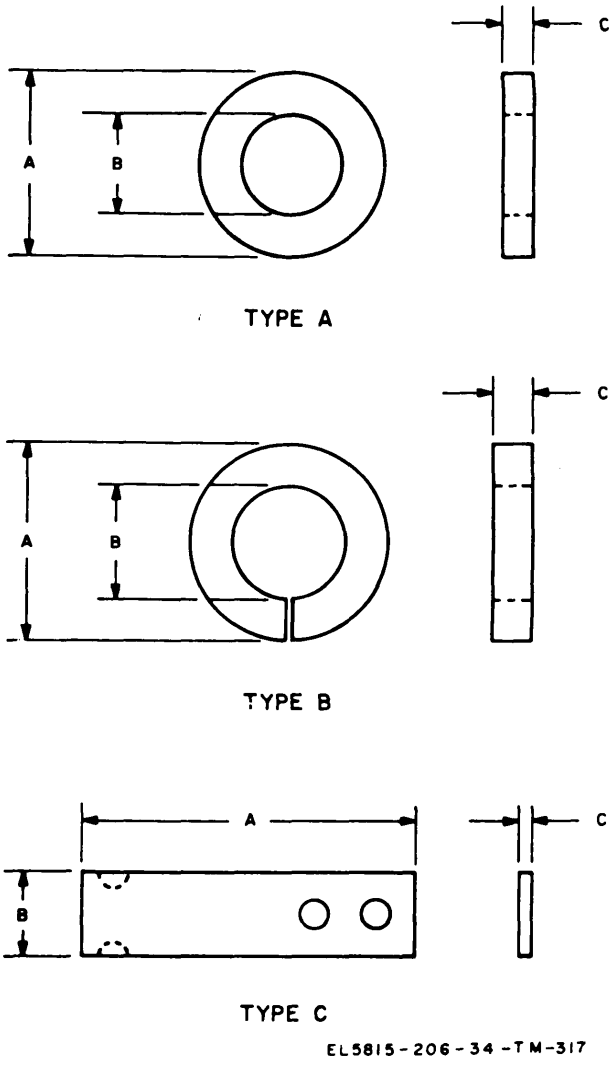


Figure 3-245. Felt lubricating washer data (TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, and TT-698B/TG).

CHAPTER 4

GENERAL SUPPORT MAINTENANCE PROCEDURES

Section I. GENERAL SUPPORT MAINTENANCE PROCEDURES FOR ALL MODELS EXCEPT TT-698(*)/TG

4-1. Scope of General Support Maintenance Procedures

General support maintenance includes all preventive and corrective maintenance operations and testing procedures assigned to general support maintenance personnel. The maintenance procedures described in the organizational maintenance manual, TM 11-5815-206-12, and Chapter 3 (Direct Support Maintenance Instructions) of this manual are also part of general support maintenance.

4-2. General Support Testing Procedures

a. Testing procedures are prepared for use by organizations responsible for general support maintenance to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that repaired signal equipment. These procedures set forth specific requirements that repaired signal equipment *must* meet before it is returned to the using organization. The testing procedures may also be used as a guide for testing equipment repaired at direct support maintenance level if the proper tools and test equipment are available. A summary of the performance standards is given in paragraph 4-9.

b. Each test depends on the preceding one for certain operating procedures and, where applicable, for test equipment calibrations. Comply with the instructions preceding the body of each chart before proceeding to the chart. Perform each test in sequence. Do not vary the sequence. For each step, perform all the actions required in the *Test equipment control settings* and *Equipment under test control settings* columns; then perform each specific test procedure and verify it against its performance standard.

c. All test equipment and other equipment required to perform the testing procedures given in this section are listed in the following charts.

(1) Test equipment.

Nomenclature	National stock No.	Technical manual
Distortion Test Set TS-383(*)/GG[a]	6625-00-222-1714	TM 11-2217
Multimeter TS-352(*)/U[b]	6625-00-242-5023	TM 11-6625-366-15

[a] Indicates Distortion Test Set TS-383/GG or TS-383A/GG.

[b] Indicates Multimeter TS-352/U, TS-352A/U, or TS-352B/U.

(2) Other equipment.

Nomenclature	National stock No.	Technical reference
Rectifier RA-87-(*)[a]	6130-00-230-7257	TM 11-5815-270-15
D. C. Control Device	None	(para 4-2c (3) below)
Clip, battery (2 ea)	5940-00-177-1719	None
Scale, dial indicating (P/O TE-50~B)	6670-00-001-9013	None

[a] Indicates Rectifier RA-87 or RA-87-A.

(3) A locally fabricated direct current control device (fig. 4-1) is required for general support maintenance to test all high-level teletypewriters covered in this manual. Components for the dc control device are listed in the following chart:

Name of part and description	Function of part	National stock No.
CABLE, power; 2 #18 AWG stranded cond.	Power cable	6145-00-188-3657
CONNECTOR, plug, 2 flat parallel, male	Connects dc power	5935-00-518-9653
SWITCH, toggle: spst	Connects dc to circuit	5930-00-636-1227
RESISTOR, 1000 ohms, 10 watts [a]	Fixed current limiter	5905-00-556-4739
FUSE, cartridge; 1/8 amp, 250 V; one time; glass body	Protects circuit	5920-00-356-2188
HOLDER: extractor post type; black bakelite; 2¼" lg x 11/16" dia overall.	Hold fuse	5920-00-285-0755
RESISTOR, variable (rheostat): wire wound, 2500 ohms, ± 10%; 25 w	Adjusts current in circuit	5905-00-195-2353
KNOB: black plastic; for ¼" dia shaft	Turns rheostat	5355-00-160-6096
AMMETER, 0-100 ma (milliammeter) [b]	Used to check current in circuit.	6625-00-542-1736
JACK, telephone; for 2 cond. .250" dia. plug	Means for connecting tele-typewriter to control device.	5935-00-549-5312
BOX, aluminum; 8" lg x 6" wd x 5" thk (approx.)	Mount control device components.	

[a] If this resistor cannot be obtained, multiple high-wattage resistors can be substituted provided the result is 1000 ohms, 10 watts. Higher wattage resistors are acceptable.

[b] If this milliammeter cannot be obtained, Multimeter TS-352(*)/U can be used (in the proper current reading setting) if test lead jacks are installed in the circuit where the meter is located. Correct polarity must be observed.

CAUTION

Under no circumstance should this device ever be used for testing low-level teletypewriter equipment; severe damage to the electronic components will result.

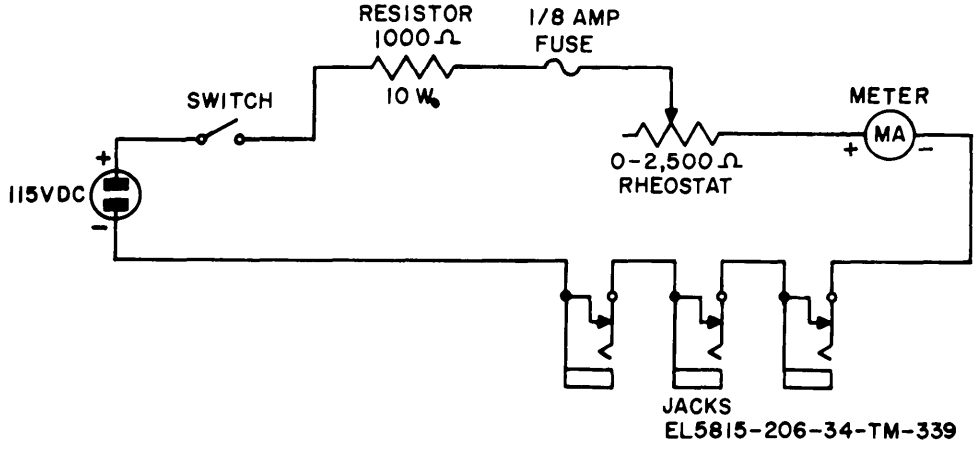


Figure 4-1. Direct current control device for testing high-level teletypewriters, schematic diagram.

4-3. Special Instructions

All test are to be made at the speed (words per minute) the equipment was set for when it was received for servicing unless other instructions accompany the equipment.

4-4. Modification Work Orders

The performance standards listed in the text (para 4-5 through 4-9) assume that current modification work orders (MWO) have been performed. Any MWO's pertaining to this equipment that may have been published after the data of this publication will be listed in DA Pam 310-7 and changes thereto. MWO's other than those classed URGENT should not be reason for rejection.

4-5. Physical Test and Inspection.

a. Test Equipment and Materials. None.

b. Test Connections and Conditions. The immersionproof cover and the dust cover should be removed to allow access to the teletypewriter mechanism.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	N/A	Controls may be in any position.	*a.* Inspect the teletypewriter for dirt, corrosion, rust, presence of lubricants or excessive amounts of lubricants.	*a.* Entire unit should be clean, free of rust, corrosion, and excessive amounts of lubricants.
			b. Check the teletypewriter for loose, missing, or damaged parts.	*b.* All parts must be intact. None missing or damaged.
			c. Inspect the base for damaged cleats, loose shock mounts, and loose ground connections (one at each cleat).	*c.* Cleats, shock mounts, and ground connections should be tight and in good condition.
			d. Inspect all wiring for breaks, cuts, or worn and frayed insulation.	*d.* Wiring should show no evidence of breaks, cuts or worn and frayed insulation.
			e. Inspect the motor power cord and plug. Check the cord for dirt, cuts and breaks. Check the plug for dirt, corrosion, and bent or broken contacts.	*e.* Cord and plug should be in good condition and show no evidence of cuts, breaks, or corrosion. Plug contacts should be straight and clean.
2	N/A	Controls may be in any position.	*a.* Check the ARMATURE dial control for mechanical operation.	*a.* ARMATURE dial control should operate freely throughout the indicated range.
			b. Check the LINE INCREASE control for mechanical operation.	*b.* LINE INCREASE control should operate freely from limit to limit.
			c. Operate the LIGHT switch. Check for proper mounting, lever action, and signs of damage.	*c.* LIGHT switch should operate properly without binding. Lever should snap to each position. No damage should be evident.
			d. Check fuseholders and the MOTOR and LINE FUSES. Inspect holders for breaks and burns. Check for proper fuse values.	*d.* Fuseholders should show no evidence of breaks, cracks, or burns. The MOTOR FUSE should be 1.6 ampere high speed instantaneous, and the LINE FUSE should be 1/8 ampere normal.
			e. Operate the MOTOR switch. Check for proper mounting, lever action, and signs of damage.	*e.* MOTOR switch should operate properly without binding. Lever should snap to each position. No damage should be evident.
			f. Depress the BREAK key. Check for proper spring action when the key is released.	*f.* BREAK key should return to its normal position when released.
3	N/A	Controls may be in any position.	*a.* Inspect the dust cover and immersion-proof cover, dust cover hinges, latches on the doors, and the plexiglass copy window.	*a.* Door hinges and latches should be in good condition with no evidence of broken or missing parts, Plexiglass window should be free of cracks or broken places. The dust cover and immersion proof cover should be free of dents, cracks, and tears.
			b. Inspect the dust cover and immersionproof cover finish. Look for scratches, worn spots, and chipped places in the finish which show bare metal. **NOTE** Touchup painting is recommended instead of complete refinishing whenever practicable.	*b.* No bare metal should be evident.
4	N/A	Controls may be in any position.	*a.* Inspect Case CY-694A/PGC-1 for chipped paint, dirt, and corrosion. **NOTE** Touchup painting is recommended instead of complete refinishing whenever practicable.	*a.* The case should be clean and free of chips and cracks.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
			b. Inspect shock pads, straps and buckles, blocks and chains, hinges, handles, and latches for damage and proper mounting.	*b.* All parts should be in good condition, securely mounted, and there should be no loose screws.
5	N/A	Controls may be in any position.	Inspect Bag CW-356/U for dirt, worn spots, cuts or tears, damaged straps or buckles, and mildew.	The bag should be clean and there should be no evidence of damage or mildew.
			NOTE If a roll of paper is in the teletypewriter, omit *a* and *b* below.	
6	N/A	Control may be in any position.	*a.* Remove the paper roller shaft by pushing the two retaining springs upward. Insert paper roller shaft into a roll of recording paper. Hold the roll so that the end pins in the paper roller shaft will raise the springs and slide into the slots in the mounting when the roll is pushed upward.	*a.* None.
			NOTE The paper should unroll upward between the roll and the paper chute.	
			b. Feed the paper through the chute and down behind the platen. Turn the platen knob until several inches come up in front of the platen.	*b.* None.
			c. Move the pressure roller lever to the released position (toward front) and check the pressure on the recording paper and center paper on the platen.	*c.* There should be no pressure on the recording paper when the pressure roller lever is in the released position.
			d. Restore the pressure roller lever to the pressure position.	*d.* The paper should be held with enough pressure to prevent slippage.
			e. Turn the platen knob several revolutions in both directions.	*e.* The paper should move as the platen knob is turned without slipping or tearing and the detent action should be correct and distinct.
			f. Press the platen knob inward and then restore it to its normal position.	*f.* When the platen knob is pressed inward, it should allow enough clearance for removing or installing the dust cover and should move without binding.
			g. Check the carriage lock at the left end of the carriage-guide rail.	*g.* The carriage lock should be secured in a disengaged position with the notch below the carriage-guide rail.
			h. Check the platen lock at the right end of the platen.	*h.* The platen lock should be secured in a disengaged position with the notch to the right of the wingnut.
7	N/A	Control may be in any position.	*a.* Use a scale to check pressure at which air-relief valve on the immersionproof cover cracks (opens) and re-seats. Note the indication on the scale dial.	*a.* Valve should crack (open) at not less than 2 ¾ lb and not more than 4¼ lb and should re-seat at not less than 2¼lb and more than 2¾ lb.
			b. Inspect the gasket for cracks, cuts, and gouges.	*b.* No damage should be evident.

4-6. Operational Test (High-Level Teletypewriters Only)

(fig. 4-2)

a. Test Equipment and Materials.

Distortion Test Set TS-383(*)/GG
Rectifier RA-87-(*)
Direct Current Control Device (0-100 ma)
Multimeter TS-352(*)/U
Tuning Fork, 180 vps (p/o TT-4(*)/TG)

b. Test Connections and Conditions. Remove dust cover after completing step 1. Do not make connections to the teletypewriter until instructed to do so in the test procedure.

c. Test Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
1	N/A	MOTOR switch: OFF LIGHT switch: OFF	*a.* Connect the power cord of the unit under test to 115-volt, 60-cycle ac.	*a.* None.
			b. Place the LIGHT switch in the ON position, then in the OFF position; repeat several times.	*b.* Both lights should light each time the switch is in the ON position.
			c. Disconnect the power cord.	*c.* None.
1	TS-352(*)/U: Functional switch: OHMS Range switch: RX10000	MOTOR switch: ON	*a.* Calibrate the TS-352(*)/U resistance scale by touching the test leads together and adjusting the OHMS ZERO ADJ. control for a 0-ohm indication on the meter.	*a.* None.
			b. Connect the TS-352(*)/U as shown in A, figure 4-1. Note the indication on the meter.	*b.* The meter should indicate not less than 5 megohms.
			c. Move the TS-352(*)/U test lead from the power plug of the teletypewriter to line terminal binding post 2 and note the indication of the meter.	*c.* Same as *b* above.
3	RA-87-(*): POWER switch: ON Direct Current Control Device: Set rheostat in midpoint position	MOTOR switch: ON LINE INCREASE knob: Maximum conterclockwise LINE switch: VOICE FREQ. LINE	*a.* Connect the equipment as shown in B, figure 4-1.	*a.* None.
			b. Check the motor speed with a 180 vps tuning fork as follows: (1) Strike the tuning fork against the palm of the hand to start it vibrating. (2) Hold the tuning fork so that the motor governor target can be viewed through the vibrating shutters of the fork. Note the appearance of the target.	*b.* The motor governor target should appear to be motionless. (When not more than 3 spots pass a given point in 10 seconds, this requirement is considered to have been met.)
	TS-383(*)/GG: MOTOR switch: OFF RUN-STOP switch: STOP LINE-DIST switch: DIST BIAS-END DIST. switch: Neutral VIEW-TRANSMIT switch: TRANSMIT MARK-ZERO SPACE switch: ZERO Character selecting switch: R or Y STOP PULSE switch: ON		*c.* Adjust the LINE INCREASE control on the teletypewriter and the DC Control Device rheostat for a 60-milliampere indication on the D. C. MILLIAMPERES meter on the teletypewriter.	*c.* None.
			d. Check the keyboard lock. Loosen the thumbscrew and slide the lock to the rear. Tighten the thumbscrew. Press any of the keys and observe the transmitter action.	*d.* The transmitter should not operate when the keys are pressed.
			e. Place the TS-383(*)/GG MOTOR switch in the ON position and the RUN-STOP switch in the RUN position.	*e.* None.
			f. Unlock the RANGE dial lock on the teletypewriter by turning the lock one turn counterclockwise. Rotate the RANGE dial to 60 and lock it in place.	*f.* None.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
			g. Unlock the ARMATURE dial lock by turning the lock one turn counterclockwise. Rotate the dial counterclockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*g.* None.
			h. Rotate the ARMATURE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*h.* None.
			i. Add the figure recorded in *g* above to the figure recorded in *h* above, divide the sum by 2, set the dial at this figure, and lock it in place.	*i.* None.
			j. Unlock the RANGE dial lock by turning the lock one turn counterclockwise. Rotate the dial slowly counter-clockwise until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*j.* None.
			k. Rotate the RANGE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*k.* None.
			l. Add the figure recorded in *j* above to the figure recorded in *k* above; divide the sum by 2, set the dial at this figure, and lock it in place.	*l.* None.
			m. Repeat the test procedures in *g* through *l* above before proceeding to the next test.	*m.* none.
			n. After performing the step in *m* above, subract the figure recorded in *j* above from the figure recorded in *k* above to obtain the orientation range.	*n.* The range should not be less than: (1) 72 divisions on the RANGE dial for 60-wpm operation. (2) 60 division of the RANGE dial for 100-wpm operation.
4	RA-87-(*): Power switch: ON TS-383(*)/GG: MOTOR switch: ON RUN-STOP switch: STOP BIAS-END DIST. switch: Neutral VIEW-TRANSMIT switch: TRANSMIT MARK-ZERO-SPACE switch: ZERO	MOTOR switch: ON LINE switch: D.C. LINE LINE INCREASE knob: Midpoint of rotation	*a.* Adjust the rheostat on the DC control unit and the LINE INCREASE control on the teletypewriter until the line current is 60 ma. Place the TS-383(*)/GG RUN-STOP switch in the RUN position.	*a.* None.
			b. Unlock the RANGE dial lock on the teletypewriter by turning the lock one turn counterclockwise. Rotate the dial counterclockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*b.* None.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
	STOP PULSE switch: ON Character selecting switch: R or Y Direct Current Control Device: Rheostat set in midpoint position		*c.* Rotate the RANGE dial slowly clockwise until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*c.* None.
			d. Add the figure recorded in *b* above to the figure in *c* above and divide the sum by 2; set the RANGE dial to this figure and lock the dial.	*d.* None.
			e. Unlock the ARMATURE dial lock by turning the lock one turn counterclockwise. Rotate the dial counterclockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*e.* None.
			f. Rotate the ARMATURE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*f.* None.
			g. Add the figure recorded in *e* above to the figure recorded in *f* above and divide the sum by 2; set the ARMATURE dial at this figure and lock the dial.	*g.* None.
			h. Repeat *b*, *c*, and *d* above. Record the figure arrived at in *d* above for use in paragraph 4-8, step 1*i*.	*h.* None.
			i. After completing the steps outlined in *h* above, subtract the figure recorded in *b* above from the figure recorded in *c* above.	*i.* The range should not be less than— (1) 72 divisions on the RANGE dial for 60-wpm operation. (2) 60 divisions on the RANGE dial for 100-wpm operation.
			j. Place the TS-383(*)/GG MOTOR switch in the OFF position and the RUN-STOP switch in the STOP position.	*j.* None.
			k. Release the keyboard lock on the teletypewriter by loosening the thumbscrew and sliding the lock toward the front of the keyboard. Tighten the thumbscrew with the keyboard in the unlocked position.	*k.* None.
5	Same as at the end of step 4.	Same as at the end of step 4.	*a.* Adjust the line-feed control lever (on the left side of the platen) for double-line-feed operation by moving it toward the keyboard. Press the M key and the LINE FEED key alternately several times and note the paper movement.	*a.* The paper should advance two lines each time the LINE FEED key is pressed.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
			b. Adjust the line-feed control lever for single line-feed operation by moving it away from the keyboard (toward the rear of the teletypewriter). Press the M key and LINE FEED key alternately several times and note the paper movement.	*b.* The paper should advance one line each time the LINE FEED key is pressed.
			c. Press the FIGS key, then press the S (BELL) key several times.	*c.* The signal bell should ring each time the S (BELL) key is pressed.
			d. Press the following keys in the order given: FIGS, CAR RET, 1, 2, 3, 4, CAR RET, LINE FEED, 1, 2, 3, CAR RET, LINE FEED, 1, 2, CAR RET, LINE FEED, 1 CAR RET. Note the position of the figure 1 in each line.	*d.* The figure 1 should be in a straight line vertically at the left margin.
			e. Press the CAR RET key several times and note the operation of the teletypewriter.	*e.* With the carriage in the left margin, there should be no carriage-return function performed by the teletypewriter.
			f. Press the FIGS key; press the H (STOP) key and observe the motor operation.	*f.* The motor should stop when the H (STOP) key is pressed.
			g. Depress the BREAK switch (at the right side of the keyboard). Release the BREAK switch and observe the motor operation.	*g.* The motor should not start until the BREAK switch is released.
			h. Repeat the operations described in *f* and *g* above several times.	*h.* Same as in *f* and *g* above.
			i. Depress and hold the space bar down. Note the spacing operation.	*i.* The spacing operation should continue while the space bar is held down.
			j. Operate the manual carriage-return button (on the right side of the equipment). Check for proper carriage return.	*j.* The carriage should return to the left margin when the manual carriage-return button is pressed.
			k. Wind the ribbon manually, almost to the end of the spool. Press keys (at random) and observe the ribbon-reverse operation. This is to be done in both directions. **NOTE** This can be done by holding one end of the ribbon-reverse beam midway between its upper and lower positions; then turn one of the ribbon spool locks by hand. Do this in each direction.	*k.* The ribbon-reverse mechanism should operate and reverse the direction of movement of the ribbon as soon as the spool empties in either direction:
			l. Press keys at random and note the movement of the ribbon lifter and ribbon feed.	*l.* The ribbon lifter should lift the ribbon high enough to provide inking for each printing operation and return the ribbon below the line being printed and should feed smoothly.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
			m. Press the FIGS key, then press the LTRS key. Do this several times and note the action of the platen each time a key is pressed.	*m.* Each time the FIGS key is pressed, the platen should rise to the figures position and when the LTRS key is pressed, the platen should move down to the letters position.
			n. Press the FIGS key, then press the following keys in the order given: CAR RET, LINE FEED, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. Repeat the number sequence until the margin bell rings. Count the figures printed; then continue with the number sequence until the carriage no longer moves to the right.	*n.* The margin bell should ring when the 66th character (number) is printed. There should be 72 legible characters printed and pileup should occur in the 73d character space.
			o. Repeat the procedures outlined in *n* above 4 times.	*o.* Same as *n* above.
			p. Press the following keys in the order given: LTRS CAR RET, LINE FEED. Type the following test sentence: THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK -$!&'()":;?,. Repeat this sequence 4 times and note the printed copy.	*p.* Each line of the printed characters should be straight and evenly spaced. The characters should be in straight vertical lines.

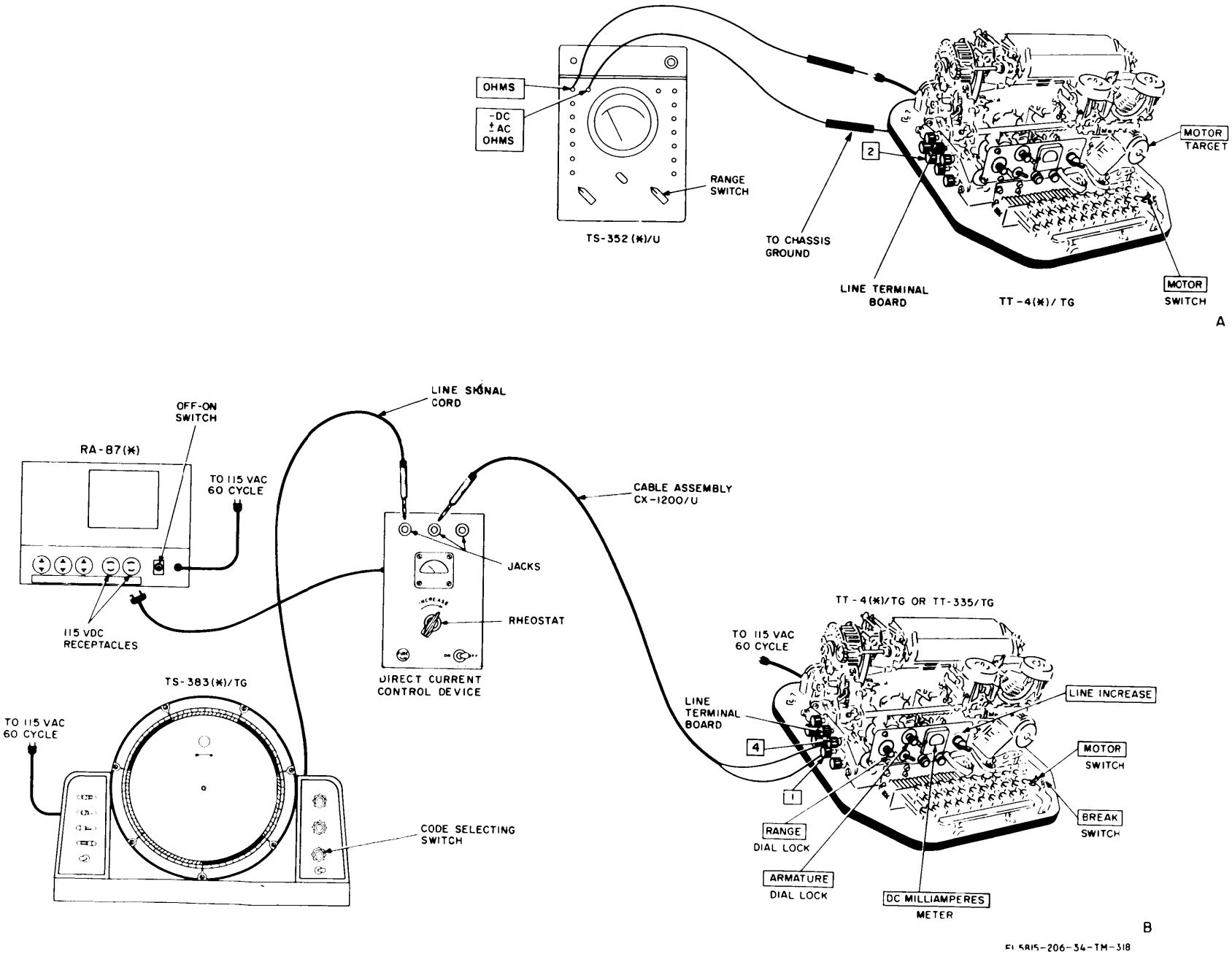


Figure 4-2. Operational tests (high-level teletypewriters only).

4-7. Receiving Bias and End Distortion Test (High-Level Teletypewriters Only)

a. Test Equipment and Materials.

Distortion Test Set TS-383(*)/GG
Rectifier RA-87-(*)
Direct Current Control Device (0-100 ma)

b. Test Connections and Conditions. Connect the equipment as shown in figure 4-3.

c. Test Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
1	RA-87-(*): Power switch: ON TS-383(*)/GG: MOTOR switch: ON RUN-STOP switch: STOP LINE-DIST. switch: DIST. BIAS-END DIST. switch: BIAS VIEW-TRANSMIT switch: VIEW MARK-ZERO-SPACE switch: MARK STOP PULSE switch: ON Character selecting switch: R or Y Direct Current Control Device: Rheostat set in midpoint position.	MOTOR switch: ON LINE switch: D.C. LINE LINE INCREASE knob: Set it for 60-ma indication on the D.C. MILLIAMPERES meter.	*a.* Adjust the TS-383(*)/GG distortion control until the mark pulses (portions of the scale where the lamp is lighted) occupy: (1) 135 scale divisions for 60-wpm operation. (2) 130 scale divisions for 100-wpm operation. *b.* Set the TS-383(*)/GG RUN-STOP. switch to the RUN position, the character selecting switch to TEST MESSAGE, and the VIEW-TRANSMIT switch to TRANSMIT. *c.* Unlock the RANGE dial lock on the teletypewriter by turning the lock one turn counterclockwise. Rotate the RANGE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication. *d.* Place the TS-383(*)/GG MARK-ZERO-SPACE switch in the SPACE position. *e.* Rotate the RANGE dial on the teletypewriter counterclockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication. *f.* Add the figure recorded in *c* above to the figure recorded in *e* above and divide the sum by 2 to arrive at the bias tolerance orientation point. Record this figure, set the RANGE dial at this figure, and lock the dial. *g.* Find the maximum bias that may be received by using the following formula: (1) For 60-wpm operation: $35 + \frac{\text{maximum bias} = \text{upper range} - \text{lower range}}{(c \text{ above}) \qquad (e \text{ above})}{2}$	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* The maximum bias should not be less than— (1) 40% for 60-wpm operation.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
			(2) For 100-wpm operation: Maximum bias = $30 + \frac{\text{upper range (}c\text{ above)} - \text{lower range (}e\text{ above)}}{2}$	(2) 35% for 100-wpm operation.
2	TS-383(*)/GG(RUN-STOP switch: STOP LINE-DIST. switch: DIST. BIAS-END DIST. switch: END DIST. VIEW-TRANSMIT switch: VIEW MARK-XERO-SPACE switch: SPACE Character selecting switch: R or Y STOP PULSE: ON RA-87-(*): Power switch: ON Direct Current Control Device: Rheostat set in midpoint position.	Same as at the end of step 1	*a.* Adjust the TS-383 (*)/GG distortion control until the mark pulses (portions of the scale where the lamp is lighted) occupy— (1) 65 scale divisions for 60-wpm operation. (2) 70 scale divisions for 100-wpm operation.	*a.* None.
			b. Place the TS-383(*)/GG RUN-STOP switch in the RUN position, the character selecting switch to TEST MESSAGE, and the VIEW-TRANSMIT switch to TRANSMIT.	*b.* None.
			c. Unlock the RANGE dial on the teletypewriter by turning the lock one turn counterclockwise. Rotate the RANGE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*c.* None.
			d. Place the TS-383(*)/GG MARK-ZERO-SPACE switch in the MARK position.	*d.* None.
			e. Rotate the RANGE dial on the teletypewriter counterclockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*e.* None.
			f. Add the figure recorded in *c* above to the figure recorded in *e* above and divide the sum by 2 to arrive at the end distortion orientation point. Set and lock the dial at this figure; record the figure.	*f.* None.
			g. Find the maximum end distortion that may be received by using the following formula: (1) For 60-wpm operation: maximum end distortion $= 35 + \frac{\text{upper range (}c\text{ above)} - \text{lower range (}e\text{ above)}}{2}$	*g.* The maximum end distortion should not be less than— (1) 35% for 60-wpm operation.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
			(2) For 100-wpm operation: maximum end distortion = upper range − lower range 30 + $\frac{(c \text{ above}) \quad (e \text{ above})}{2}$	(2) 30% for 100-wpm operation.
3	N/A	N/A	The internal bias can be determined by comparing the bias tolerance orientation point figure obtained in step 1*f* with the end distortion orientation point figure obtained in step 2*f*.	The difference between the two figures should not exceed 6 points.

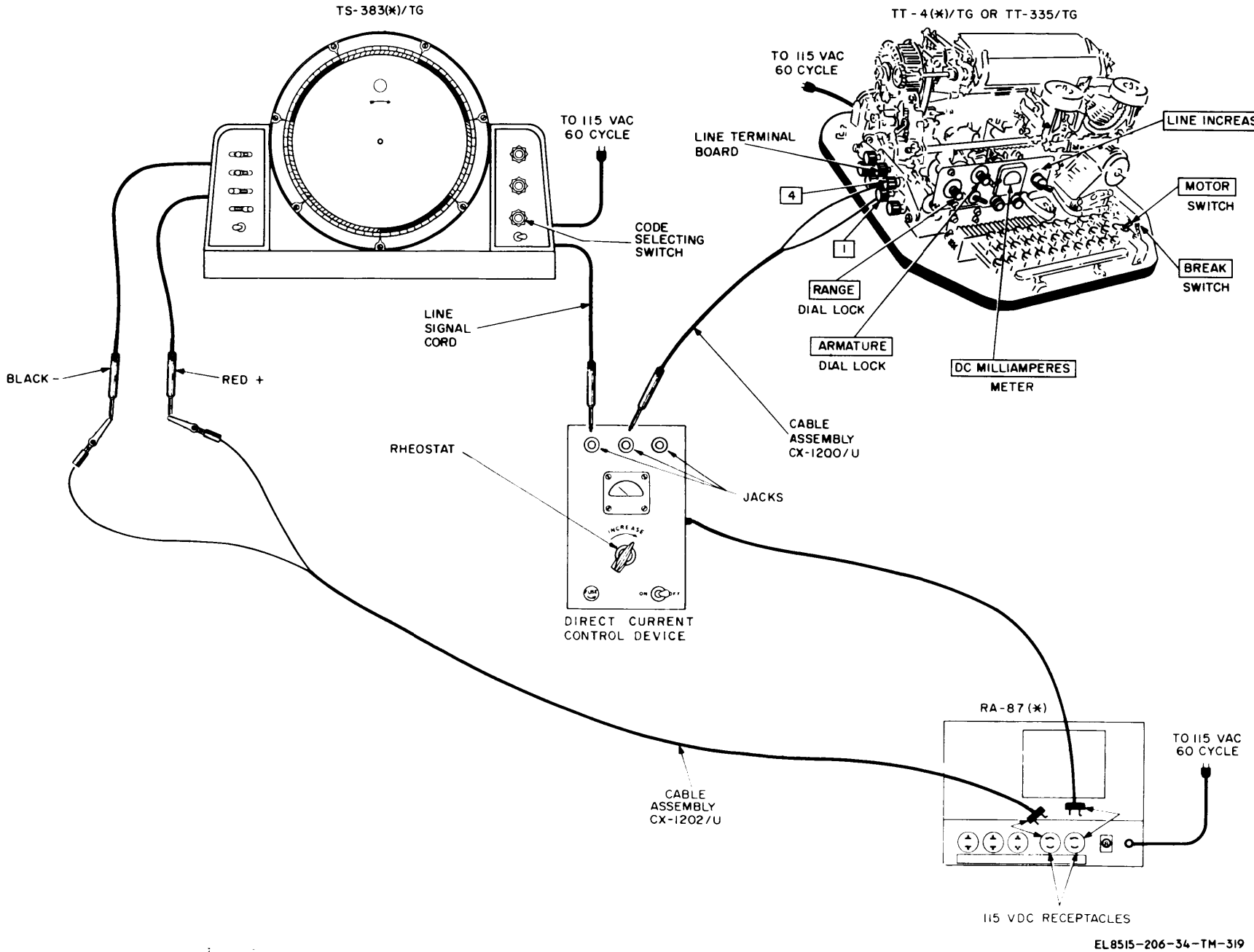


Figure 4-3. Receiving circuit, bias and end distortion tests (high-level teletypewriters only).

4-8. Keyboard Bias Test (High-Level Teletypewriters Only)

(fig. 4-4)

a. Test Equipment and Materials.

Rectifier RA-87-(*)

Direct Current Control Device (0-100 ma)

b. Test Connections and Conditions. Connect the equipment as shown in figure 4-4.

c. Test Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
			NOTE The following tests are to be made while continuously and alternately typing R and Y.	
1'	RA-87-(*): power switch: ON Direct Current Control Device: Rheostat set in midpoint position.	MOTOR switch: ON LINE INCREASE knob: Set for 60-ma indication on the D.C. MILLIAMPERES LINE switch: D.C. LINE	*a.* Unlock the ARMATURE dial lock on the teletypewriter by turning the lock one turn counterclockwise. Turn the ARMATURE dial counterclockwise slowly until errors begin to appear in the copy; stop turning the dial and record the dial indication.	*a.* None.
			b. Turn the ARMATURE dial slowly clockwise until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*b.* None.
			c. Add the figure recorded in *a* above to the figure recorded in *b* above, divide the sum by 2, set the ARMATURE dial at this figure, and lock the dial.	*c.* None.
			d. Unlock the RANGE dial lock by turning the dial lock one turn counterclockwise. Turn the RANGE dial counterclockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the figure.	*d.* None.
			e. Turn the RANGE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*e.* None.
			f. Add the figure recorded in *c* above to the figure recorded in *e* above and divide the sum by 2. Set the RANGE dial at this figure, lock the dial, and record the figure.	*f.* None.
			g. Repeat the steps outlined in *a* through *f* above before proceeding to the next step.	*g.* None.
			h. Use the dial indications obtained as a result of *g* above, and subtract the dial indication recorded in *d* above from the dial indication recorded in *e* above and record this figure.	*h.* None.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
			i. The keyboard bias is determined by computing the difference in the range obtained in *h* above and that obtained in paragraph 280.7, step 3*h*.	*i.* The difference should not exceed 5 points.

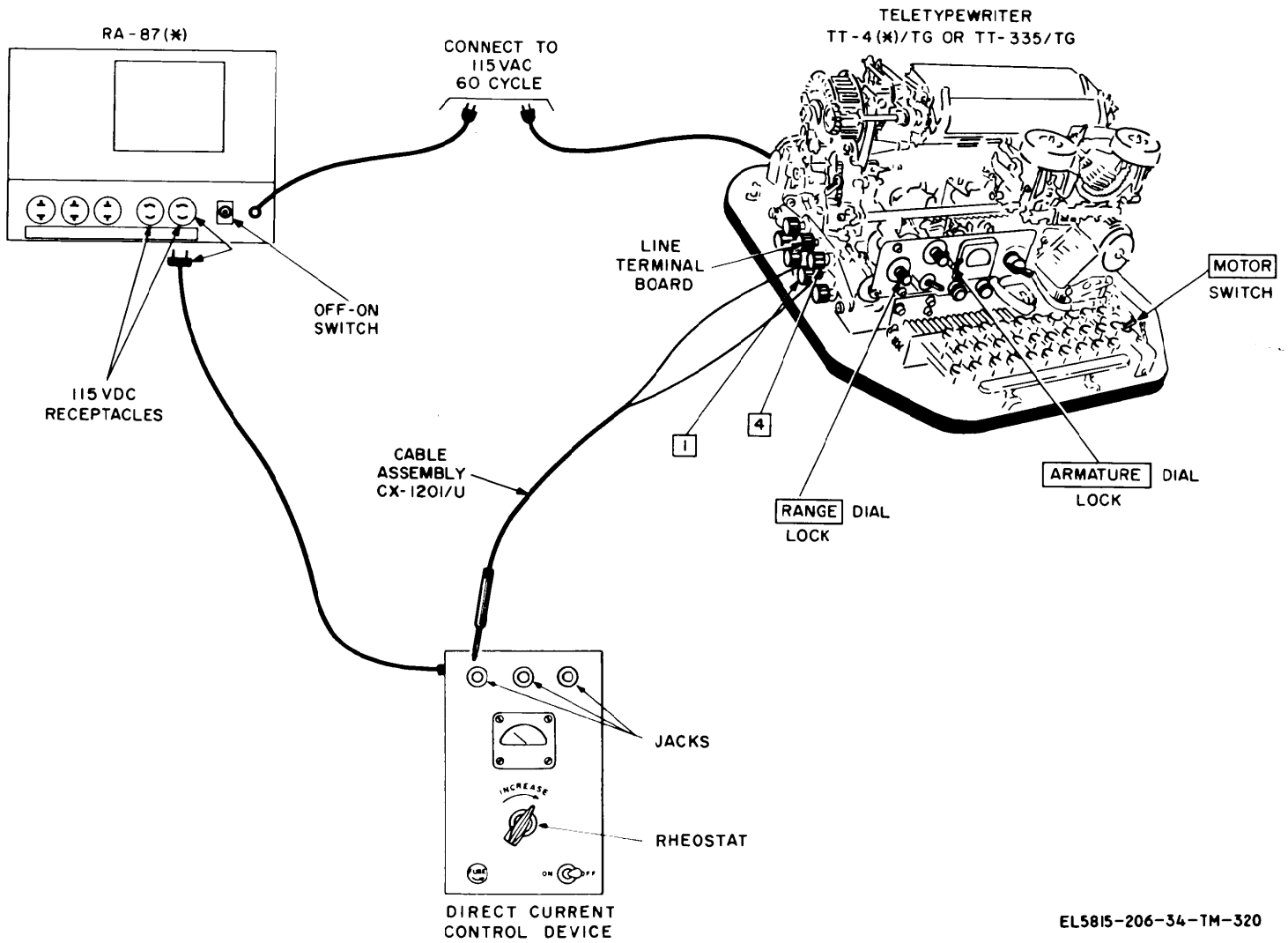


Figure 4-4. Keyboard bias test (high-level teletypewriters only).

4-9. Summary of Performance Standards

Personnel may find it convenient to arrange the checklist in a manner similar to that shown below:

TELETYPEWRITER TT-4(*)/TG OR TT-335/TG AND TT-537/G with keyboard

Test	Performance standard
1. INSULATION RESISTANCE TEST	
a. Between the base casting and each prong of the input plug.	*a.* Not less than 5 megohms resistance.
b. Between the base casting and LINE TERMINAL binding post 2.	*b.* Not less than 5 megohms resistance.
2. MOTOR TEST	
a. Motor speed adjustment (TT-4(*)/TG)	*a.* Not more than three white target spots pass any given point in any direction in 10 seconds.
b. Motor stop	*b.* The motor should stop when the H (STOP) key is pressed after the FIGS key is pressed.
c. Motor start	*c.* After *b* above, the motor should start when the BREAK key is pressed and released.
3. OPERATIONAL TEST	
a. Printing	*a.* Teletypewriter should print at least 10 lines of perfect copy.
b. Type alignment	*b.* Each line of the printed character should be straight and evenly spaced.
c. Keyboard lock	*c.* With the keyboard lock on, there should be no transmitter operation when a key is pressed.
d. Orientation range limits (60-ma operation)	*d.* Orientation range limits should not be lees than: (1) 72 scale divisions at 60 wpm. (2) 60 scale divisions at 100 wpm.
e. Single line-feed operation.	*e.* The paper should advance one line when the LINE FEED key is pressed.
f. Double line-feed operation	*f.* The paper should advance two lines when the LINE FEED key is pressed.
g. Signal bell operation	*g.* The signal bell should ring each time the S (BELL) key is pressed after the FIGS key is pressed.
h. Carriage-return operation	*h.* The character printed following carriage-return and line-feed operations should be in a straight line vertically.
i. Continuous spacing	*i.* The spacing operation should be continuous when the space bar is held down.
j. Manual carriage return	*j.* The carriage should return to the left margin position when the manual carriage button is pressed.
k. Ribbon reverse	*k.* The ribbon should reverse direction as soon as either spool empties.
l. Ribbon lift and feed	*l.* The ribbon should be lifted high enough to provide inking for each printing operation and return below the line being printed and should feed evenly with each typing operation.
m. LTRS and FIGS shift...	*m.* The platen should rise each time the FIGS key is pressed and should move down (after FIGS) when the LTRS key is pressed.
n. Margin bell	*n.* The margin bell should ring when the 66th character is printed.
4. BIAS AND END DISTORTION TEST	
a. Range (zero distortion).	*a.* At least 72 points.
b. Bias tolerance	*b.* Not less than 40% for 60-wpm operation and not less than 35% for 100-wpm operation.
c. End distortion tolerance	*c.* Not less than 35% for 60-wpm operation not less than 30% for 100-wpm operation.
d. Internal bias tolerance	*d.* Not more than 6 points.
e. Keyboard bias	*e.* Not more than 5 points.

Section II. GENERAL SUPPORT MAINTENANCE PROCEDURES FOR TT-698(*)/TG

4-10. General

a. Testing procedures are prepared for use by signal field maintenance shops and signal service organizations responsible for general support maintenance of signal equipment to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that repaired signal equipment must meet before it is returned to the using organization. The testing procedures may also be used as a guide for testing equipment repaired at direct support level if the proper tools and test equipment are available. A summary of the performance standards is given in paragraph 4-16.

b. Comply with the instructions preceding each chart before proceeding to the chart. Perform each test in sequence. Do not very sequence. For each step, perform all the actions required in the control settings column; then perform each specific test procedure and verify it against its performance standard.

4-11. Test Equipment and Other Equipment Required

All test equipment and other equipment required to perform the testing procedures given in this section are listed in the following chart.

Nomenclature	National Stock No.	Technical Manual
Multimeter TS-352B/U.	6625-00-242-5023	TM 11-6625-366-15
Telegraph Test Set AN/GGM-15(V)	6625-00-442-6131.	TM 11-6625-1666-12

4-12. Modification Work Orders (TT-698(*)/FG)

Any MWO's pertaining to the equipment that may have been published since the date of this manual will be listed in DA Pam 310-7. MWO's other than those classified as URGENT should not be a basis for rejection.

4-13. Special Instructions

All tests are to be made at the words-per-minute operation that the equipment was set for when it was received for servicing, unless other instructions accompany the equipment.

4-14. Physical Tests and Inspection

Perform all tests in paragraph 4-5.

4-15. Operational Test (Low-Level Teletypewriters)

(fig. 4-5)

a. *Test Equipment and Materials.*

Multimeter TS-352B/U
Tuning fork, 180 vps (p/o TT-698(*)/TG)
Telegraph Test Set AN/GGM-15(V)

b. Test Connections and Conditions. Remove dust cover after completing Step 1. Do not make connections to the teletypewriter until instructed to do so in the test procedure.

c. Test Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	N/A	MOTOR switch: OFF LIGHT switch: OFF	*a.* Connect the power cord of the unit under test to 115-volt, 60-cycle AC.	*a.* None.
			b. Place the LIGHT switch in the ON position, then in the OFF position; repeat several times.	*b.* Both lights should light each time the switch is in the ON position.
			c. Disconnect the power cord.	*c.* None.
2	TS-352(*)/U: FUNCTIONAL switch: OHMS RANGE switch: RX10000		*a.* ~~Calibrate~~ the TS-352(*)/U resistance scale by touching the test leads together and adjusting the OHMS ZERO ADJ. control for a 0-ohm indication on the meter.	*a.* None.
			b. Connect the TS-352 (*)/U as shown in A, figure 4-1. Note the indication on the meter.	*b.* The meter should indicate not less than 5 megohms.
			c. Move the TS-352 (*)/U test lead from the power plug of the teletypewriter to line terminal binding post 2 and note the indication of the meter.	*c.* Same as *b* above.
3	N/A	MOTOR switch: ON	*a.* Check the motor speed with a 180 vps tuning fork as follows: (1) Strike the tuning fork against the palm of the hand to start it vibrating. (2) Hold the tuning fork so that the motor governor target can be viewed through the vibrating shutters of the fork. Note the appearance of the target.	*a.* The motor governor target should appear to be motionless. (When not more than 3 spots pass a given point in 10 seconds, the requirement is considered to have been met.)
			b. Check the keyboard lock. Loosen the thumbscrew and slide the lock to the rear. Tighten the thumbscrew. Press any of the keys and observe the transmitter action.	*b.* The transmitter should not operate when the keys are pressed.
			c. Unlock keyboard.	*c.* None.
4	N/A	MOTOR switch: OFF	*a.* Set to operate on local test by connecting a jumper pair from terminals 1 and 2 to 4 and 5 on terminal board A1TB1.	*a.* None.
		MOTOR switch: ON	*b.* Adjust the LINE INCREASE control for 20 ma selector magnet current.	*b.* Exactly 20ma on the MILLIAMPERE scale.
			c. Unlock the RANGE dial lock on the teletypewriter by turning the lock one turn counterclockwise. While alternately typing R and Y, rotate the RANGE dial to 60 and lock it in place.	*c.* None.
			d. Continue typing R and Y. Unlock the ARMATURE dial lock by turning the lock one turn counterclockwise. Rotate the dial counterclockwsie slowly until errors begin to appear in the printed	*d.* None.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
			copy; stop turning the dial and record the dial indication.	
			e. Rotate the ARMATURE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*e.* None.
			f. Add the figure recorded in *d* above to the figure recorded in *e* above, divide the sum by 2, set the dial at this figure, and lock it in place.	*f.* None.
			g. Continue typing R and Y. Unlock the RANGE dial lock by turning the lock one turn counterclockwise. Rotate the dial slowly counterclockwise until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*g.* None.
			h. Rotate the RANGE dial clockwise slowly until errors begin to appear in the printed copy; stop turning the dial and record the dial indication.	*h.* None.
			i. Add the figure recorded in *g* above to the figure recorded in *h* above; divide the sum by 2, set the dial at this figure, and lock it in place.	*i.* None.
			j. Repeat the test procedures in *d* through *i* above before proceeding to the next test.	*j.* None.
			k. After performing the step in *j* above, subtract the figure recorded in *g* above from the figure recorded in *h* above to obtain the orientation range.	*k.* The range should not be less than: (1) 72 divisions on the RANGE dial for 60-wpm operation. (2) 60 division on the RANGE dial for 100-wpm operation.
5	N/A	Same as at the end of step 3.	*a.* Adjust the line-feed control lever (on the left side of the platen) for double-line-feed operation by moving it toward the keyboard. Press the M key and the LINE FEED key alternately several times and note the paper movement.	*a.* The paper should advance two lines each time LINE FEED key is pressed.
			b. Adjust the line-feed control lever for single-line-feed operation by moving it away from the keyboard (toward the rear of the teletypewriter). Press the M key and LINE FEED key alternately several times and note the paper movement.	*b.* The paper should advance one line each time the LINE FEED key is pressed.
			c. Press the FIGS key, then press the S (BELL) key several times.	*c.* The signal bell should ring each time the S (BELL) key is pressed.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
			d. Press the following keys in the order given: FIGS, CAR RET, 1, 2, 3, 4, CAR RET, LINE FEED, 1, 2, 3, CAR RET, LINE FEED, 1, 2, CAR RET, LINE FEED, 1 CAR RET. Note the position of the figure 1 in each line.	*d.* The figure 1 should be in a straight line vertically at the left margin.
			e. Press the CAR RET key several times and note the operation of the teletypewriter.	*e.* With the carriage in the left margin, there should be no carriage-return function performed by the teletypewriter.
			f. While the motor is running, place the BREAK switch in the BREAK position, hold it there for several seconds and note the operation of the teletypewriter being tested.	*f.* The teletypewriter being tested should run open, without typeing, as long as the switch is held in the BREAK position.
			g. Operate the manual carriage-return button (on the right side of the equipment). Check for proper carriage return.	*g.* The carriage should return to the left margin when the manual carriage-return button is pushed.
			h. Wind the ribbon manually, almost to the end of the spool. Press keys (at random) and observe the ribbon-reverse operation. This is to be done in both directions. **NOTE** This can be done by holding one end of the ribbon-reverse beam midway between its upper and lower positions; then turn one of the ribbon spool locks by hand. Do this in each direction.	*h.* The ribbon-reverse mechanism should operate and reverse the direction of movement of the ribbon as soon as the spool empties in either direction.
			i. Press keys at random and note the movement of the ribbon lifter and ribbon feed.	*i.* The ribbon lifter should lift the ribbon high enough to provide inking for each printing operation and return the ribbon below the line being printed and should feed smoothly.
			j. Press the FIGS key, then press the LTRS key. Do this several times and note the action of the platen each time a key is pressed.	*j.* Each time the FIGS key is pressed, the platen should rise to the figures position, and when the LTRS key is pressed, the platen should move down to the letters position.
			k. Press the FIGS key, then press the following keys in the order given: CAR RET, LINE FEED, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. Repeat the number sequence until the margin bell rings. Count the figures printed; then continue with the number sequence until the carriage no longer moves to the right.	*k.* The margin bell should ring when the 66th character (number) is printed. There should be 72 legible characters printed and pileup should occur in the 73rd character space.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Preformance standard
			l. Repeat the procedures outlined in *k* above 4 times. *m.* Press the following keys in the order given: LTRS, CAR RET, LINE FEED. Type the following test sentence: THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK -$&'()":;?,. Repeat this sequence 4 times and note the printed copy.	*l.* Same as *k* above. *m.* Each line of the printed characters should be straight and evenly spaced. The characters should be in straight vertical lines.

4-16. Final Receiving Test

a. Connect the Telegraph Test Set AN/GGM-15(V) to an ac source.

b. Set the following Signal Generator SG-860-GGM-15(V) controls in accordance with figure 4-5 as shown below:

CONTROL	POSITION
POWER switch	ON
DISTORTION SELECT	NO DIST
PERCENT DISTORTION	0-0
MESSAGE SELECT	MSG
CODE LEVEL	5
CHARACTER LENGTH	7
CHARACTER RELEASE	FREE RUN
OSC	INT
ALARM RESET	ON
BAUD RATE	75

c. Connect the DATA ± 6/12 V signal generator output to terminals 4 and 5 of TB-1 on the teletypewriter.

d. Connect the teletypewriter to an ac source.

e. Set the following teletypwriter controls as shown below:

CONTROL	POSITION
POWER switch	ON
MOTOR switch	ON
KEYBOARD LOCK	FORWARD

f. Send low-level test message signals with the CHARACTER RELEASE switch in the FREE RUN position. Stop the test message signal by placing the CHARACTER RELEASE switch to the MANUAL position.

g. While sending low-level test messages, turn the RANGE dial slowly clockwise and then counterclockwise to find the highest and lowest positions of the dial at which the test message is printed without error. Record both readings. Subtract the lower reading from the higher reading. The minimum permissible difference is 72 for 60-wpm operation and 60 to 100-wpm operation. Set the RANGE dial midway between the high and low readings obtained above. If the difference between the highest and lowest readings is less than the minimum permissible difference, check the adjustments of the receiving mechanism (para. 3-130 through 3-170).

4-17. Final Sending Test

a. Connect the Telegraph Test Set AN/GGM-15(V) to an ac source.

b. Connect the keyboard transmitter output terminals 1 and 2 of A1TB1 to the BRIDGING input on the Signal Distortion Analyzer TS-2862/GGM-15(V) as shown in figure 4-5.

NOTE

The BRIDGING input of the TS-2862/GGM (V) also serves as the input to the oscilloscope OS-206/GGM-15 (V). The TS-2862/GGM (V) does *not* serve any other purpose during this test.

c. On the oscilloscope OS-206/GGM-15 (V) set the POWER switch to ON and adjust the FOCUS ASTIG, INTENSITY, VERT and HORIZONTAL position for the best display.

d. Set the following oscilloscope OS-206/GGM-15 (V) controls in accordance with figure 4-5 as shown below:

CONTROL	POSITION
VERTICAL VOLTS	5
DISPLAY RELEASE RATE	NORMAL
TRIGGER & SWEEP SELECT	FREE RUN
TIME MILLISEC	50-5

e. Set the following teletypewriter controls as shown below:

CONTROL	POSITION
POWER switch	ON
MOTOR switch	ON
KEYBOARD LOCK	FORWARD

f. Test the quality of impulses transmitted from the keyboard transmitter by transmitting a code group repeatedly. This is accomplished by holding the selected keylever in the fully depressed position and the repeat-blocking lever (fig. 2-13) in the clockwise position.

g. The maximum permissible deviation from perfect impulse length is ±5 percent. At 100-wpm the positive and negative transitions should be equal in time duration, 13 (±0.5) milliseconds. If the length of the transmitted impulses exceeds the maximum tolerance, remove the cover from the transmitter contact assembly and locate the adjustable hexnut. Observe the oscilloscope and adjust the hexnut until the waveshape has negative and positive transitions of equal and correct time duration.

Figure 4-5. Operational tests (low-level teletypewriters).
(Located in back of manual)

4-18. Summary of Performance Standards

Personnel may find it convenient to arrange the checklist in a manner similar to that shown below:

TELETYPEWRITER TT-698(*)/TG

Test	Performance standard
1. INSULATION RESISTANCE TEST	
a. Between the base casting and each prong of the input plug.	*a.* Not less than 5 megohms resistance
b. Between the base casting and LINE TERMINAL binding post 2.	*b.* Not less than 5 megohms resistance
2. MOTOR TEST	
a. Motor speed adjustment	*a.* Not more than three white target spots pass any given point in any direction in 10 seconds.
b. Break operation	*b.* Teletypewriter should run open without typing as long as the BREAK switch is depressed.
3. OPERATIONAL TEST	
a. Printing	*a.* Teletypewriter should print at least 10 lines of perfect copy.
b. Type alignment	*b.* Each line of the printed characters should be straight and evenly spaced.
c. Keyboard lock	*c.* With the keyboard lock on, there should be no transmitter operation when a key is pressed.
d. Orientation range limits	*d.* Orientation range limits should not be less than: (1) 72 scale divisions at 60 wpm. (2) 60 scale divisions at 100 wpm.
e. Single line-feed operation	*e.* The paper should advance one line when the LINE FEED key is pressed.
f. Double line-feed operation	*f.* The paper should advance two lines when the LINE FEED key is pressed.
g. Signal bell operation	*g.* The signal bell should ring each time the S (BELL) key is pressed after the FIGS key is pressed.
h. Carriage-return operation	*h.* The characters printed following carriage-return and line-feed operations should be in a straight line vertically.
i. Continuous spacing	*i.* The spacing operation should be continuous when the space bar is held down.
j. Manual carriage return	*j.* The carriage should return to the left margin position when the manual carriage button is pressed.
k. Ribbon reverse	*k.* The ribbon should reverse direction as soon as either spool empties.
l. Ribbon lift and feed	*l.* The ribbon should be lifted high enough to provide inking for each printing operation and return below the line being printed and should feed evenly with each typing operation.
m. LTRS and FIGS shift	*m.* The platen should rise each time the FIGS key is pressed and should move down (after FIGS) when the LTRS key is pressed.
n. Margin bell	*n.* The margin bell should ring when the 66th character is printed.

APPENDIX A

REFERENCES

The following publications are applicable to direct support and general support maintenance of Teletypewriter Set AN/PGC-1 and Teletypewriters TT-4A/TG, TT-4B/TG, TT-4C/TG, TT-335/TG, TT-537/G, TT-698A/TG, TT-698B/TG, TT-722/TG and TT-722A/TG.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9) Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work Orders.
TM 11-2050	Test Set I-48 B and Ohmmeter ZM-21A/U.
TM 11-2208	Test Sets TS-2/TG, TS-2A/TG, TS-2B/TG and TS-2C/TG (Teletypewriter Signal Distortion) (TO 33A1-8-55-1).
TM 11-2217	Distortion Test Sets TS-383/GG, TS-383A/GG, and TS-338B/GG.
TM 11-5815-270-15	Organizational DS, GS, and Depot Maintenance Manual Including Organizational Repair Parts and Special Tools Lists: Rectifiers RA-87 and RA-87A.
TM 11-6625-366-15	Operator's Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B/U.
TM 11-6625-1668-12	Operator and Organizational Maintenance Manual Including Repair Parts and Special Tool Lists: Test Sets, Telegraph AN/GGM-15(V)1 and AN/GGM-15(V)2.
TM 11-6625-620-12	Organizational Maintenance Manual: Test Set Teletypewriter AN/UGM-1.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment
TM 750-244-2	Procedure for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

GLOSSARY

Bias tolerance. A computed measurement of the ability of a teletypewriter receiving mechanism to operate properly while receiving teletypewriter code groups that contain signal bias.

End distortion. Signal distortion which affects the *end* of marking code impulses (mark-to-space transitions) with respect to the *beginning* of the start impulse.

End distortion tolerance. A computed measurement of the ability of a teletypewriter receiving mechanism to operate properly while receiving teletypewriter code groups that contain end distortion.

Internal bias. A computed measurement of the effect of maladjustment, wear, or other mechanical fault in a teletypewriter receiving mechanism. It is used as a measure of the mechanical efficiency of the receiving unit.

Marking bias. Signal distortion which *advances* the *beginning* of marking code impulses (space-to-mark transitions) with respect to the *beginning* of the start impulse.

Marking end distortion. Signal distortion which *delays* the *end* of marking code impulses (mark-to-space transitions) with respect to the *beginning* of the start impulse.

Signal bias. Distortion in the teletypewriter signals which affects the *beginning* of marking code impulses (space-to-mark transitions) with respect to the *beginning* of the start impulse.

Spacing bias. Signal distortion which *delays* the *beginning* of marking code impulses (space-to-mark transitions) with respect to the *beginning* of the start impulse.

Spacing end distortion. Signal distortion which *advances* the *end* of marking code impulses (mark-to-space transitions) with respect to the *beginning* of the start impulse.

Zero bias. A term used to indicate that no bias or distortion is present in teletypewriter signals.

INDEX

	Paragraph	Page
Adjustments:		
Angular relationship of function-shaft parts	3-176	3-204
Armature lower-stop-screw	3-168	3-200
Armature upper-stop-screw	3-167	3-200
Automatic carriage return shift link	3-240	3-240
Automatic carriage return shift stop	3-241	3-237
Automatic carriage return stop bar return spring	3-242	3-238
Ball bearing	3-191	3-212
Cam-followers and spacing-collar	3-140	3-188
Cam-stop lever-latch end-play	3-118	3-178
Carriage:		
Positioning	3-190	3-211
Rack	3-192	3-212
Rackdrive-shaft	3-193	3-213
Rear-support bracket	3-208	3-220
Carriage feed:		
Blocking adjusting lever and return blocking-lever clearance	3-195	3-213
Blocking lever	3-197	3-214
Clutch drum	3-186	3-209
Driven gear	3-181	3-207
Driving gear end-play	3-180	3-206
Friction-clutch	3-204	3-217
Pawl	3-182	3-207
Ratchet	3-178	3-206
Shaft drive-collar	3-179	3-206
Carriage-return:		
Adjusting-plate	3-199	3-215
Blocking-lever	3-196	3-214
Clutch	3-185, 3-201	3-209, 3-216
Clutch actuating-lever	3-184	3-208
Clutch-lever shaft clearance	3-183	3-208
Friction-clutch	3-205	3-218
Latch-tripping-arm	3-188, 3-203	3-210, 3-217
Link	3-202	3-217
Character density	3-221	3-227
Code-ring:		
Cage	3-135	3-186
Locking bail	3-144	3-190
Locking-bail cam follower	3-142	3-189
Locking-bail shaft	3-143	3-189
Coverings and locking-bail cam-follower-lever end-play	3-130	3-184
Copy-light screws	3-267	3-247
Decelerating cam and carriage-feed-clutch positioning	3-187	3-209
Dust-cover cam-lock	3-268	3-248
Figure-shift position	3-223	3-228
Figures-shift preliminary	3-222	3-228
Fulcrum	3-206	3-218
Function-cam	3-137, 3-138, 3-187, 3-177	3-187, 3-205
Function-level-bracket	3-172	3-202
Function punch-bar and side-plate	3-171	3-202
Function sensing-levers grid-play	3-131, 3-132	3-184
Function shaft:		
Clutch	3-154	3-194
Clearance	3-152	3-193
Coupling	3-175	3-204
Latch	3-153	3-193
Tension	3-174	3-203
Driven gear end-play	3-136	3-186
Drive-collar	3-139	3-187

	Paragraph	Page
Adjustments – continued		
Governor:		
Assembly, locating	3-265	3-247
Target	3-266	3-247
Keylever-locking-bar	3-116	3-178
Letters-shift:		
Lever shaft end-play	3-173	3-203
Position	3-224, 3-225	3-229
Line-feed:		
Bellcrank	3-230	3-231
Connecting-link	3-232, 3-233, 3-234	3-232, 3-233, 3-234
Detent	3-229	3-231
Lower-stop-screw, armature	3-168	3-200
Manual carriage return:		
Bracket	3-236	3-235
Trip-pawl	3-237, 3-238	3-235, 3-236
Margin-bell and bracket	3-235	3-234
Motor gears backlash	3-262	3-245
Motor-stop:		
Contact-lever lug	3-255, 3-260	3-243, 3-245
Eccentric sleeves final	3-261	3-245
Contact-lever spring	3-257	3-244
Contacts and eccentric sleeves	3-256, 3-259	3-243, 3-244
Motor-stop-relay:		
Coil	3-258	3-244
Switches preliminary	3-259	3-244
Orientation lever	3-161	3-197
Paper-guide alignment	3-216, 3-217	3-225
Platen:		
Assembly end-play and positioning	3-214, 3-220	3-224, 3-227
Blocking-arm	3-227	3-230
Blocking-arm bracket	3-228	3-230
Clamp	3-271	3-249
Lock clamp end-play	3-270	3-270
Lock release arm	3-272	3-249
Pressure-rollers	3-218, 3-219	3-226, 3-227
Shaft end-play	3-214	3-224
Platen shift final	3-226	3-229
Platen-trough:		
End-play	3-215, 3-220	3-224, 3-227
Spring	3-213	3-224
Print-bail and ribbon-lifter	3-212	3-222
Print-bail-blade	3-211	3-222
Range finder shaft	3-160	3-196
Repeat-blocking-lever	3-120	3-179
Ribbon:		
Feed-clutch spring	3-245	3-239
Feed mounting	3-243	3-243
Reverse beam	3-246	3-239
Reverse cam-follower	3-251	3-241
Reverse detent-plate	3-247	3-239
Sensing-lever	3-250	3-241
Ribbon spool:		
Driving collar	3-248	3-240
Friction-spring	3-749	3-240
Shaft	3-244	3-244
Right-margin stopscrew	3-198	3-215
Selector friction-clutch	3-158, 3-159	3-195, 3-196
Selector-lever	3-162	3-198
Selector-lever comb	3-163	3-198
Selector-levers and sensing-levers clearance	3-122	3-179
Selector-levers end-play	3-123	3-180
Selector-magnet	3-169	3-201
Armature	3-164, 3-165	3-198, 3-199
Armature and selector-lever clearance	3-170	3-201
Sensing-lever locking-bail	3-124	3-180

	Paragraph	Page
Adjustments–continued		
Sensing-levers alignment and end-play	3-121	3-179
Signal-bell bracket	3-252	3-242
Signal-bell final	3-254	3-242
Signal-bell preliminary	3-253	3-242
Square-shaft driven-gear	3-207	3-219
Square-shaft sliding-gear bearing	3-189	3-211
Square-shaft stop-arm torque	3-210	3-221
Start-stop selector-lever-latch	3-128	3-182
Stop-lever	3-166	3-200
Throw-outlever	3-200	3-215
T-lever pivot stud	3-150	3-192
T-lever alignment	3-145	3-190
Transfer lever:		
Roller-stud	3-147	3-191
Shaft end-play	3-146	3-191
Spring tension	3-148	3-191
Transmitter:		
Camshaft end-play	3-117	3-178
Contact	3-127	3-181
Contact Assembly (TT-698(*)/TG)	3-128	3-182
Friction-clutch	3-125, 3-126	3-180, 3-181
Impulse length (not applicable to TT-698(*)/TG)	3-129	3-183
Type-selecting-arm and function-selecting-arm	3-209	3-220
Universal-bar	3-119	3-178
Y-Lever:		
Detent and Y-Lever	3-156	3-195
Detent end-play	3-155	3-194
Eccentric stop, preliminary	3-149	3-192
Friction	3-157	3-195
Stud bracket	3-151	3-193
Armature-spring mechanism	2-18	2-20
Ballbearing adjustment	3-191	3-212
Bell, margin, theory	2-25	2-38
Bell, signal, theory	2-34	2-50
Block diagram, TT-4(*)/TG,TT-335/TG, and TT-537/G	2-3	2-4
Cam-follower and spacing-collar adjustment	3-140	3-188
Camshaft:		
Keyboard-transmitter	2.8	2-8
Transmitter, stopping and starting	2-11	2-15
Carriage:		
Carriage lock lever	3-269	3-269
Carriage rack retainer	3-192, 3-194	3-212, 3-213
Frame, disassembly and reassembly	3-56, 3-57	3-82
Positioning adjustment	3-190	3-211
Rear-support bracket adjustment	3-208	3-220
Removal and replacement	3-29	3-34
Carriage-feed:		
Adjustment:		
Blocking adjusting lever and carriage-return blocking lever clearance	3-195	3-213
Blocking-lever	3-195, 3-197	3-213, 3-214
Clutch and decelerating cam positioning	3-187	3-209
Clutch drum	3-186	3-209
Driven gear	3-181	3-207
Driving gearend-play	3-180	3-206
Friction-clutch	3-204	3-127
Mechanism, disassembly and reassembly	3-84, 3-85	3-128, 3-131
Operation	2-22	2-28
Pawl	3-182	3-207
Shaft:		
Assembly, disassembly and reassembly	3-92	3-140
Assembly, removal and replacement	3-91	3-138
Drive-collar adjustment	3-179	3-206
Ratchet adjust	3-178	3-206

	Paragraph	Page
Carriage-rack:		
Adjustment	3-192	3-212
Drive-shaft assembly, disassembly and reassembly	3-89	3-135
Drive-shaft position adjustment	3-193	3-213
Carriage-return:		
Adjustment:		
Adjusting plate	3-199	3-215
Automatic carriage return shift link	3-240	3-240
Automatic carriage return shift stop	3-241	3-237
Automatic carriage return stop bar return spring	3-242	3-238
Blocking-lever	3-196	3-214
Clutch	3-185, 3-201	3-209, 3-216
Clutch-actuating lever	3-184	3-208
Clutch-lever-shaft clearance	3-183	3-208
Friction-clutch	3-205	3-218
Latch-tripping arm	3-188, 3-203	3-210 ,3-217
Left-hand margin trip plate	3-239	3-239
Link	3-202	3-217
Right-hand margin stop screw.	3-198	3-215
Assembly, disassembly and reassembly	3-95	3-144
Friction-clutch	2-24	2-32
Operating mechanism, disassembly and reassembly	3-87, 3-88	3-133
Operating mechanism, removal and replacement	3-86	3-132
Operation	2-24	2-32
Shaft assembly, disassembly and reassembly.	3-93, 3-94	3-140, 3-142
Character density adjustment	3-221	3-227
Charts, troubleshooting	3-20	3-24
Circuit descriptions	2-37	2-58
Circuits:		
Amplified signal circuit TT-537/G	2-41	2-67
Motor and copylight	2-42	2-67
Receive (TT-4(*)/TG, TT-335/TG, and TT-698(*)/TG	2-39	2-65
Receive TT-537/G	2-40	2-67
Send	2-38	2-63
Cleaning instructions:		
General	3-9	3-4
Special	3-10	3-4
Clutch, carriage-return, friction	2-24	2-32
Code:		
Bars and keylevers, disassembly and reassembly.	3-37	3-43
Impulses, recording	2-18	2-20
Signaling	2-2	2-3
Code ring:		
Cage adjustment	3-131, 3-132	3-184
Cage, disassembly and reassembly	3-79, 3-80	3-121, 3-122
Cam-follower locking lever and code rings end-play adjustment	3-130	3-184
Locking bail:		
Adjustment	3-144	3-190
Cam-follower adjustment	3-142	3-189
Shaft adjustment	3-143	3-189
Compression spring data	3-274	3-252
Copy-light screws adjustment	3-267	3-247
Crossed-end spring data	3-276	3-253
Dc circuits	2-38, 2-39, 2-40,2-41	2-63, 2-65, 2-67
Decelerating cam and carriage-feed-clutch positioning adjustment	3-187	3-209
Differences in models	1-4	1-1
Disassembly and reassembly:		
Carriage-feed mechanism	3-84, 3-85	3-128, 3-131
Carriage-feed shaft	3-92	3-140
Carriage frame assembly	3-56	3-82
Carriage-rack drive-shaft assembly	3-89	3-135
Carriage-return:		
Clutch assembly	3-95	3-144
Operating mechanism	3-86, 3-87	3-132, 3-133
Shaft assembly	3- 93, 3-94	3-140, 3-142
Code bars and keylevers	3-37	3-43

	Paragraph	Page
Disassembly and reassembly – continued		
Code-ring cage	3-80	3-122
Dust cover	3-111	3-169
Function-selecting mechanism	3-67	3-98
Function sensing-lever group	3-81	3-122
Function-shaft assembly	3-73	3-111
Governor	3-44	3-63
Immersionproof cover	3-113	3-173
Instrument panel TT-4(*)/TG	3-40	3-50
Instrument panel TT-335/TG, TT-537/G	3-41	3-53
Keyboard transmitter:		
Camshaft locking mechanism	3-38	3-47
Drive shaft assembly	3-96	3-145
Sensing and selector levers	3-36	3-41
Keylevers and code bars	3-37	3-43
Line-feed and platen-shift mechanism	3-68, 3-69, 3-101, 3-102, 3-70	3-104
Line terminal board	3-108	3-162
Main shaft assembly	3-75, 3-77	3-113, 3-118
Manual carriage-return mechanism	3-83	3-127
Margin-bell assembly	3-90	3-137
Motor TT-4(*)/TG	3-42	3-57
Motor TT-335/TG, TT-537/G	3-43	3-60
Motor stop assembly TT-4A/TG	3-98	3-150
Motor stop assemblyTT-4B/TG,TT-4C/TG, TT-335/TG and TT~537/G	3-100	3-152
Motor filter box assembly	3-106	3-161
Mounting base	3-112	3-171
Paper shaft, paper-shaft brackets, and paper chute	3-101, 3-102	3-152, 3-153
Platen:		
Frame assembly	3-45	3-63
Platen lock mechanism	3-52	3-75
Trough assembly	3-46, 3-47	3-65, 3-68
Print-bail shaft assembly	3-64	3-93
Rangefinder	3-60	3-86
Ribbon-feed mechanism	3-54	3-76
Ribbon lifter assembly	3-52, 3-53	3-75, 3-76
Selector camshaft assembly	3-74	3-112
Selector levers and Y-levers	3-61, 3-62	3-87, 3-88
Selector magnet assembly	3-58	3-83
Signal-bell assembly	3-65	3-94
Square-shaft assembly	3-71	3-107
Teletypewriter frame assembly	3-109, 3-110	3-163, 3-166
Terminal box, A1	3-34	3-36
Transfer-level shaft assembly	3-63	3-91
Transmitter camshaft and filter	3-39	3-48
Transmitter contact assembly	3-35	3-39
Type-bar group	3-55	3-79
Type-selecting arm	3-51	3-74
Y-levers and selector levers	3-61, 3-62	3-87, 3-88
Dust cover:		
Camlock adjustment	3-268	3-248
Disassembly and reassembly	3-111	3-169
Removal and replacement	3 -22	3-31
Electrical troubles, localizing	3-18	3-21
Equipment:		
Shop	3-2	3-1
Test	3-3	3-2
Feed:		
Carriage, operation	2-22	2-28
Line, operation	2-29	2-43
Figures-shift:		
Cam alignment	3-137, 3-138	3-187
Operation	2-26, 2-27	2.39, 2-41
Position adjustment	3-229	3-231
Forms, preventive maintenance	3-4	3-3
Fulcrum adjustment	3-206	3-218

	Paragraph	Page
Function cam adjustment	3-177	3-205
Function lever bracket positioning adjustment	3-172	3-202
Function punch-bar and side-plate adjustment	3-171	3-202
Function-selecting-arm and type-selecting-arm adjustments	3-209	3-220
Function-selecting mechanism, disassembly and reassembly, ,	3-67	3-98
Function sensing-levers:		
Disassembly and reassembly	3-81, 3-82	3-122, 3-125
End-play adjustment	3-131, 3-132	3-184
Function shaft:		
Angular relationship of parts	3-176	3-204
Clutch:		
Clearance adjustment	3-152	3-193
Coupling adjustment	3-174, 3-175	3-203, 3-205
Disassembly and reassembly	3-73	3-111
Driven gear end-play adjustment	3-136	3-186
Eccentric post adjustment	3-154	3-194
Latch adjustment	3-153	3-193
Operation	2-19	2-22
Removal and replacement	3-72	3-109
Tension adjustment	3-174, 3-175	3-203, 3-204
Functions, function cam and function-selecting arm	2-22	2-28
General:		
Disassembly and Reassembly procedure	3-33	3-36
Removal and replacement	3-21	3-29
Governor:		
Assembly locating adjustment	3-265	3-247
Disassembly and reassembly	3-44	3-63
Target assembly adjustment	3-266	3-247
TT-4(*)/TG and TT-698(*)/TG	2-6	2-7
Immersionproof cover, disassembly and reassembly	3-113	3-173
Impulses, recording code	2-18	2-20
Inking ribbon, operation:		
Feeding	2-32	2-48
Lifting	2-33	2-49
Reversing	2-32	2-48
Instrument panel:		
Disassembly and reassembly	3-40, 3-41	3-50, 3-53
Removal and replacement	3-31, 3-32	3-34, 3-35
Keyboard-transmitter:		
Camshaft	2-10	2-14
Camshaft locking mechanism, disassembly and reassembly	3-38	3-47
Drive shaft, disassembly and reassembly	3-96	3-145
Impulse length adjustment	3-129	3-183
Operation, general	2-8	2-8
Removal and replacement	3-27	3-33
Selector and sensing levers, disassembly and reassembly	3-36	3-41
Keylever-locking-bar adjustment	3-116	3-178
Keylevers and code bars, disassembly and reassembly	3-37	3-43
Letters-shift:		
Lever shaft end-play adjustment	3-173	3-203
Operation	2-28	2-43
Position adjustment	3-224, 3-225	3-229
Lever adjustment, orientation	3-161	3-197
Line-feed:		
Adjustment	3-232, 3-233, 3-234	3-232, 3-233, 3-234
Bellcrank adjustment	3-230	3-231
Connecting link adjustment	3-232, 3-233, 3-234	3-232, 3-233, 3-234
Detent adjustment	3-229	3-231
Operation	2-29, 2-30	2-43, 2-46
Platen-shift mechanism, disassembly and reassembly	3-68, 3-69, 3-70	3-101, 3-102, 3-104
Line terminal board:		
Disassembly and reassembly	3-108	3-162
Removal and replacement	3-30	3-34

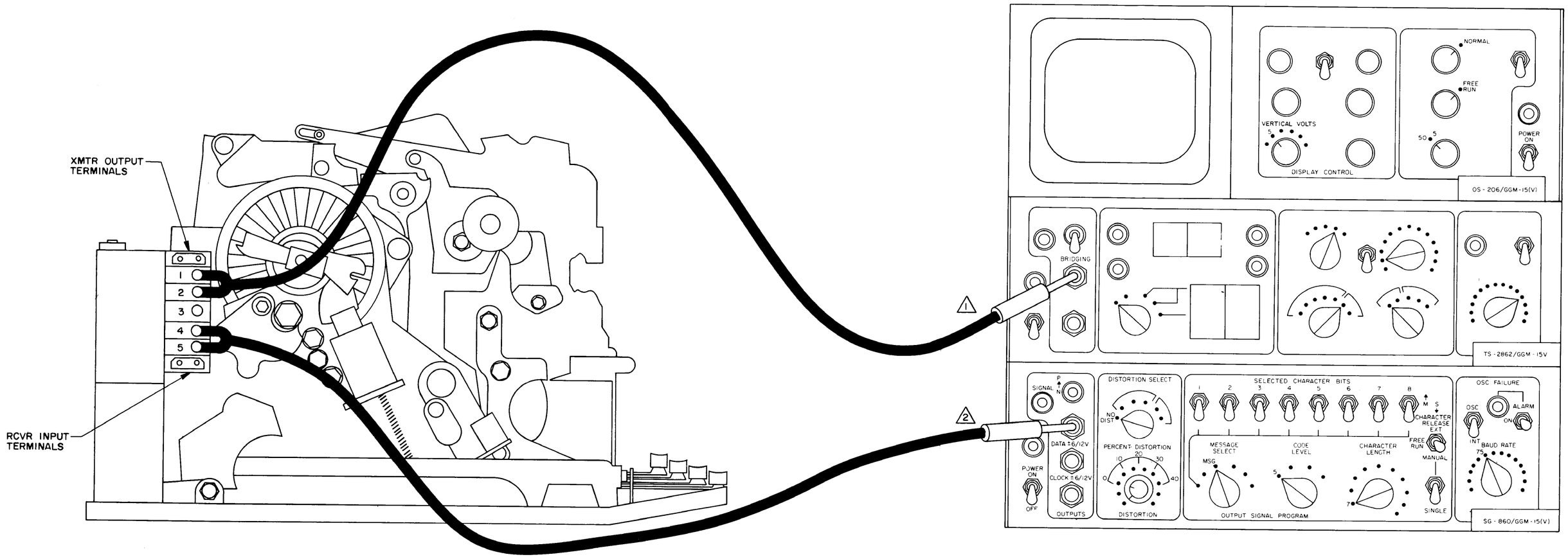
	Paragraph	Page
Localizing troubles:		
Electrical	3-18	3-21
Mechanical	3-19	3-24
Lower-stop-screw armature, adjustment	3-168	3-200
Lubricants:		
Methods of applying	3-12	3-5
Recommended	3-11	3-5
Lubrication:		
Detailed instructions	3-15	3-6
Preparation for	3-14	3-6
Main shaft assembly:		
Disassembly and reassembly	3-75, 3-77	3-113, 3-118
Removal and replacement	3-76	3-116
Maintenance instructions	3-1, 4-1,	4-103-1, 4-1, 4-10
Manual carriage-return:		
Bracket adjustment	3-236	3-235
Mechanism, disassembly and reassembly	3-83	3-127
Trip pawl adjustment	3-237, 3-238	3-235, 3-236
Margin bell:		
Assembly, disassembly and reassembly	3-90	3-137
Bracket adjustment	3-235	3-234
Operation	2-25	2-38
Mechanical power distribution	2-7	2-8
Mechanical troubles, localizing	3-19	3-24
Mechanism:		
Armature-spring	2-18	2-20
Figures-shift	2-27	2-41
Function-shaft	2-19	2-22
Letters-shift	2-28	2-43
Rangefinder	2-18	2-20
Transmitting	2-8	2-8
Methods of applying lubricants	3-12	3-5
Models, differences	1-4	1-1
Motor:		
Disassembly and reassembly	3-42, 3-43	3-57, 3-60
Filter box assembly, removal and replacement	3-106	3-161
Gears backlash adjustment	3-262	3-245
Governor	2-6	2-7
Governor contacts alignment	3-264	3-246
Motor gear set, removal and replacement	3-26	3-32
Motor-stop:		
Coil adjustment	3-258	3-244
Contacts and eccentric sleeves	3-256, 3-261	3-243, 3-245
Contact-lever adjustment	3-260	3-245
Contact-lever lug adjustment	3-260	3-245
Contact-lever spring adjustment	3-267	3-244
Disassembly and reassembly	3-42, 3-43	3-57, 3-60
Eccentric sleeves final adjustment	3-261	3-245
Relay switches preliminary adjustment	3-259	3-244
Removal and replacement	3-97, 3-98	3-148, 3-150
Series-governed type	2-7	2-8
Mounting base:		
Disassembly and reassembly	3-112	3-171
Removal and replacement	3-25	3-32
Operation:		
Carriage-feed	2-22	2-28
Carriage-return	2-24	2-32
Figures-shift	2-26	2-39
Inking ribbon:		
Feeding	2-32	2-48
Lifter	2-33	2-49
Reversing	2-32	2-48
Keyboard-transmitter, general	2-8	2-8
Keyboard-transmitter, sequence	2-14	2-17
Letters-shift	2-28	2-43
Line feed	2-29	2-43
Margin signal bell	2-25	2-38
Motor-stop	2-35	2-53
Page printer, general	2-15	2-18

	Paragraph	Page
Operation–continued		
Printing	2-21	2-26
Selector-magnet	2-16	2-18
Selector mechanism	2-18	2-20
Sensing-lever locking-bail	2-13	2-17
Signal bell	2-34	2-50
Space repeat	2-12	2-16
Transfer	2-19	2-22
Operations of teletypewriter	2-21	2-26
Orientation lever adjustment	3-136	3-186
Paper-guide alignmentadjustment	3-216, 3-217	3-225
Paper shaft, paper-shaft bracket, and paper chute:		
Disassembly and reassembly	3-101, 3-102	3-152, 3-153
Removal and replacement	3-24	3-31
Parallel-end and random-end spring data	3-275	3-252
Performance standards	4-9, 4-18	4-19, 4-26
Platen:		
Adjustment:		
Assembly end-play and positioning	3-220	3-227
Blocking arm	3-227	3-230
Blocking-armbracket (TT-4B/TG and TT-698A/TG)	3-228	3-230
Clamp	3-271	3-249
Lock clamp lever end-play	3-270	3-270
Lock release arm	3-272	3-249
Pressure-rollers (TT-4B/TG and TT-698A/TG)	3-218	3-226
Pressure-rollers (TT-4A/TG and TT-698/TG)	3-219	3-227
Shaft end-play	3-214	3-224
Trough end-play	3-215	3-224
Trough spring (TT-4B/TG and TT-698A/TG)	3-213	3-224
Assembly, removal and replacement	3-28	3-33
Frame assembly, disassembly and reassembly	3-45	3-63
Trough assembly, disassembly and reassembly	3-46, 3-47	3-65, 3-68
Platen-shift:		
Final adjustment	3-226	3-229
Premliminary adjustment	3-222	3-228
Power distribution, mechanical	2-7	2-8
Preparation:		
Lubrication	3-14	3-6
Preventive maintenance:		
Form, use	3-6, 3-8	3-3, 3-4
Procedure, general	3-4	3-3
Printing bail:		
Blade adjustment	3-211	3-222
Ribbon-lifter adjustments	3-212	3-222
Shaft, assembly, disassembly and reassembly of	3-64	3-93
Printing operation	2-21	2-26
Procedures:		
Direct support maintenance	3-1	3-1
General support maintenance (for all models except TT-698(*)/TG)	4-1	4-1
General support maintenance (for TT-698(*)/TG)	4-10	4-20
Random-end and parallel-end spring data	3-275	3-252
Rangefinder:		
Cam-follower adjustment	3-161	3-197
Disassembly and reassembly	3-60	3-86
Mechanism	2-18	2-20
Removal and replacement	3-59	3-85
Shaft adjustment	3-160	3-196
Receiving test, final (low-level operation)	4-16	4-25
Recording code impulses	2-18	2-20
Records, maintenance forms	3-6	3-3
Removal and replacement:		
Carriage	3-29	3-34
Carriage-feed shaft assembly	3-91	3-138
Carriage-return operating mechanism	3-86	3-132
Dust cover	3-22	3-31
Function-shaft assembly	3-72	3-109

	Paragraph	Page
Removal and replacement — continued		
Instrument panel	3-31, 3-32	3-34, 3-35
Keyboard-transmitted	3-27	3-33
Line terminal board	3-30	3-34
Mainshaft assembly (TT-4B/TG and TT-698A/TG)	3-76	3-116
Motor filter box assembly	3-103	3-154
Motor gear set and motor	3-26	3-32
Motor stop assembly:		
TT-4A/TG	3-97	3-148
TT-4B/TG	3-99	3-150
Mounting base	3-25	3-32
Paper shaft, paper-shaft bracket, and paper chute	3-24	3-31
Platen assembly	3-28	3-33
Rangefinder	3-59	3-87
Type-selecting arm	3-48	3-71
Repeat-blocking-lever adjustment (TT-4B/TG and TT-698A/TG)	3-120	3-179
Repeat operation, space	2-12	2-16
Retum operation, carriage	2-24	2-32
Reverse cam-follower adjustment, ribbon	3-251	3-241
Ribbon:		
Adjustment:		
Feed-clutch spring	3-245	3-239
Feed mounting,	3-243	3-243
Reverse beam	3-246	3-239
Reverse detent-plate	3-247	3-239
Sensing-lever	3-250	3-241
Spool shaft	3-244	3-244
Spool driving-collar	3-248	3-240
Spool friction-spring	3-249	3-240
Disassembly and reassembly:		
Feed mechanism	3-54	3-76
Lifter assembly	3-53	3-76
Right-margin stopscrew adjustment (TT-4A/TG) and TT-698/TG	3-198	3-215
Sectionalizing trouble	3-17	3-21
Selector camshaft assembly, disassembly and reassembly	3-74	3-112
Selector friction-clutch adjustment	3-158, 3-159	3-195, 3-196
Selector-lever:		
Adjustment	3-162	3-198
Comb adjustment	3-163	3-198
Selector-magnet armature clearance adjustment	3-170	3-201
Selector-levers and sensing levers adjustment	3-122	3-179
Selector-levers and Y-levers, disassembly and reassembly	3-61, 3-62	3-87 ,3-88
Selector-magnet:		
Adjustments	3-169	3-201
Armature adjustment	3-164, 3-165	3-198, 3-199
Armature and selector-lever clearance adjustment	3-170	3-201
Assembly, disassembly and reassembly	3-58	3-83
Sending test, final (low-level operation)	4-17	4-25
Sensing-levers, adjustment:		
End-play clearance and alignment	3-121	3-179
Locking-bail	3-124	3-180
Selector-levers	3-122	3-179
Sequence chart of adjustments for TT-4A/TG and TT-4B/TG, TT-698/TG and TT-698A/TG	3-115	3-175
Series-governed type motor	2-4	2-6
Shaft operation, function	2-19	2-22
Shop equipment and tools	3-2	3-1
Side-plate and function punch-bar adjustment	3-171	3-202
Signal-bell:		
Adjustment, final	3-254	3-242
Adjustment, preliminary	3-253	3-242
Disassembly and reassembly	3-65	3-94
Operation	2-34	2-50
Signaling code	2-2	2-3
Space repeat operation	2-12	2-16
Spacing-collar and cam-followers adjustment	3-140	3-188
Special spring data	3-277	3-253

	Paragraph	Page
Spring mechanism, armature	2-18	2-20
Spring data:		
Compression	3-274	3-252
Crossed-end	3-276	3-253
Parallel-end and random-end	3-275	3-252
Random-end and parallel-end	3-275	3-252
Special	3-277	3-253
Square-shaft:		
Disassembly and reassembly,	3-71	3-107
Driven-gear adjustment	3-207	3-219
Stop-arm torque adjustment	3-210	3-221
Starting and stopping transmitter camshaft	2-11	2-15
Stop:		
Lever adjustment	3-166	3-200
Motor, operation	2-35	2-53
Start-stop selector-lever-latch and transmitter contact adjustments	3-128	3-182
T-levers:		
Alignment adjustment	3-145	3-190
Pivot stud adjustment	3-150	3-192
Teletypewriter frame assembly,disassembly and reassembly	3-109, 3-110	3-163, 3-166
Teletypewriter TT-4(*)/TG, block diagram	2-3	2-4
Terminal box, A1, assembly, disassembly and reassembly	3-34	3-36
Test equipment	3-2, 4-2, 4-11	3-1, 4-1, 4-20
Tests:		
Physical and inspection	4-5	4-2
Operational	4-6, 4-15	4-4,4-20
Receiving bias and end distortion	4-7	4-11
Keyboard bias	4-8	4-15
Throw-out lever adjustment (TT-4B/TG and TT-698A/TG)	3-200	3-215
Tools and shop equipment	3-2	3-1
Transfer lever:		
Roller-stud adjustment	3-147	3-191
Shaft assembly, disassembly and reassembly	3-63	3-91
Shaft end-play adjustment	3-146	3-191
Spring tension adjustment (TT-4B/TG and TT-698A-TG)	3-148	3-191
Transfer operation	2-19	2-22
Transmitter:		
Camshaft:		
Contact adjustment	3-127	3-181
Contact assembly (TT-698(*)/TG)	3-128	3-182
End-play adjustment	3-117	3-178
Filter, disassembly and reassembly	3-39	3-140
Starting and stopping,	2-11	2-15
Contacts, assembly, disassembly and reassembly	3-35	3-39
Friction-clutch adjustment	3-125, 3-126	3-180, 3-181
Stationary contact adjustment	3-129	3-183
Transmitting mechanism	2-8	2-8
Troubles:		
Electrical, localizing	3-18	3-21
Mechanical, localizing	3-19	3-24
Sectionalizing	3-17	3-21
Troubleshooting:		
Charts	3-20	3-24
General	3-16	3-21
TT-4(*)/TG and TT-698(*)/TG:		
Block diagram	2-3	2-4
Differences in models	1-4	1-4
General	2-37	2-58
Operations	2-21	2-26
Type-bar group, disassembly and reassembly	3-55	3-79
Type-selecting arm:		
Disassembly and reassembly	3-49	3-73
Removal and replacement	3-48	3-71
Type-selecting-arm and function-selecting-arm adjustments	3-209	3-220
Universal-bar adjustment	3-119	3-178
Upper-stopscrew armature adjustment	3-167	3-200

	Paragraph	Page
Use of preventive maintenance form	3-6, 3-8	3-3, 3-4
Y-lever:		
Adjustment:		
Detent and Y-lever (TT-4B/TG and TT-698A/TG)	3-156	3-195
Eccentric stop, preliminary	3-149	3-192
Friction (TT-4A/TG and TT-698/TG)	3-157	3-195
Stud-bracket (TT-4B/TG and TT-698A/TG)	3-151	3-193
Selector levers, disassembly and reassembly	3-61, 3-62	3-87, 3-88

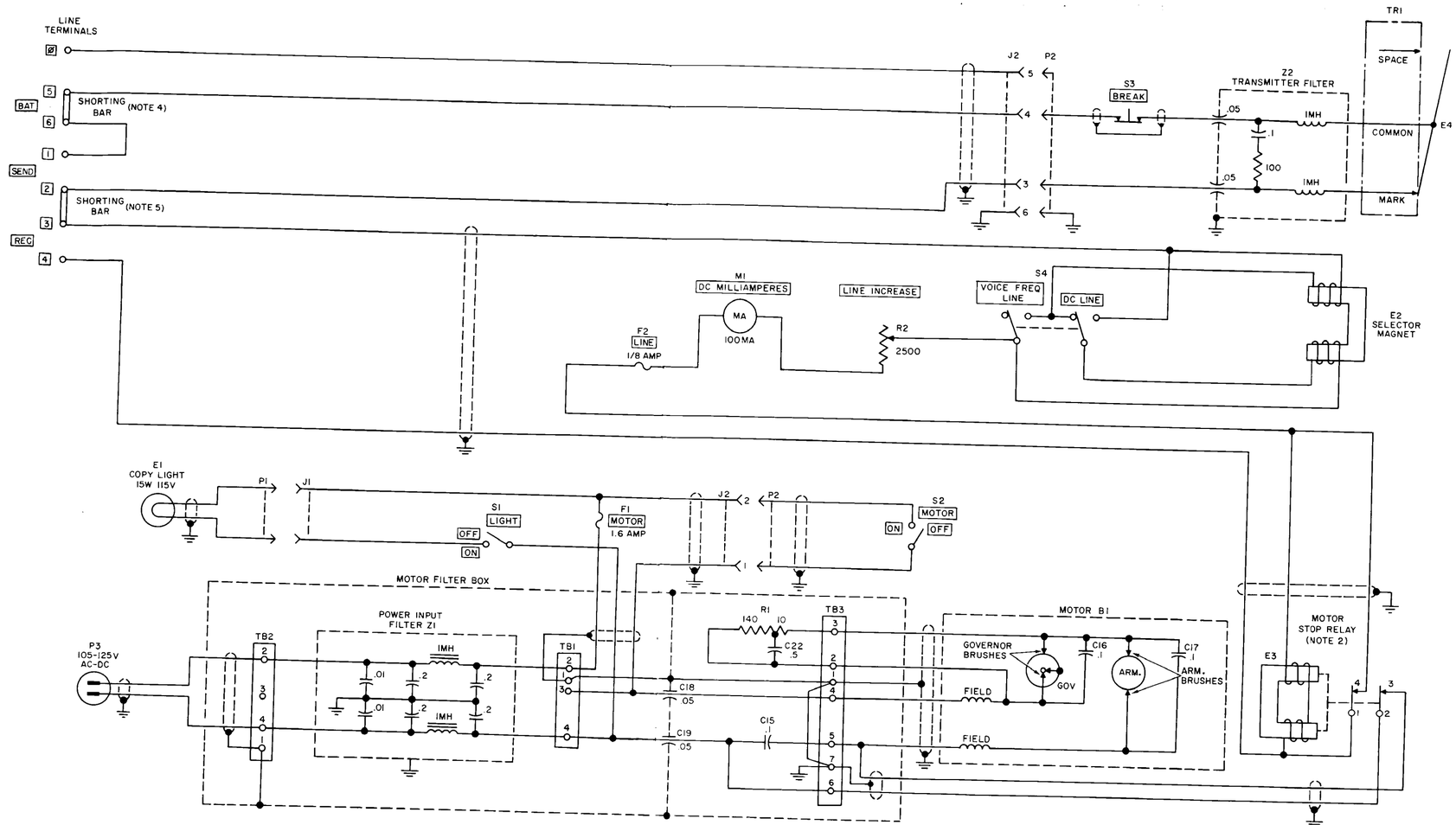


NOTES:

1. TOP TWO UNITS REQUIRED TO VIEW TRANSMITTER WAVEFORM.
2. SIGNAL GENERATOR ONLY REQUIRED TO TEST RECEIVER SYSTEM.

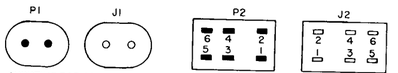
EL 5815-206-34-TM-340

Figure 4-5. Operational tests (low-level teletypewriters).



NOTES;

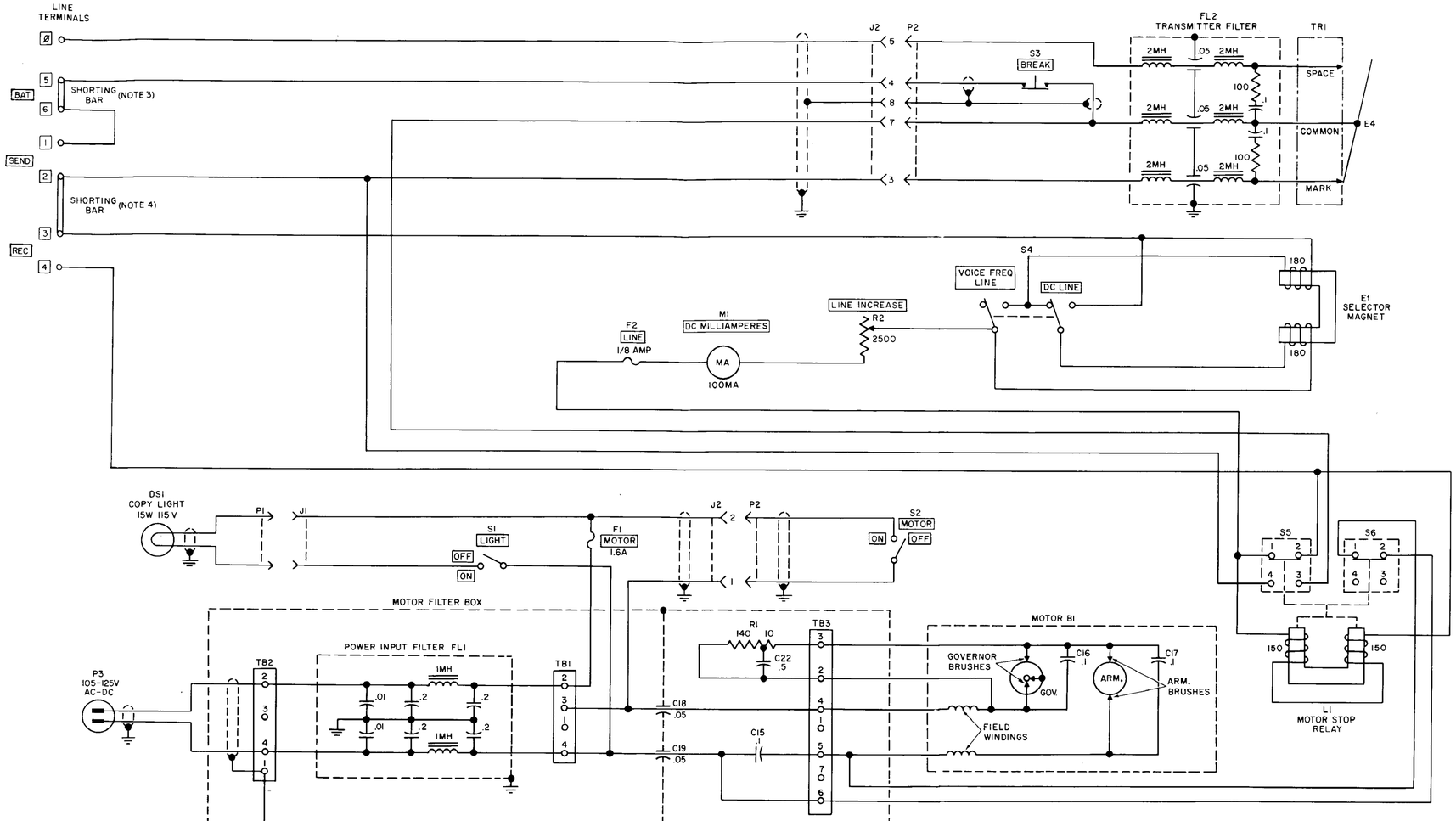
1. UNLESS OTHERWISE INDICATED RESISTORS ARE IN OHMS; CAPACITORS ARE IN UF.
2. MOTOR STOP RELAY CONTACTS LATCH MECHANICALLY IN CLOSED POSITION AND OPEN BY OPERATION OF MOTOR-STOP MECHANISM. ONCE OPEN, CONTACTS REMAIN SO, AS LONG AS RELAY IS ENERGIZED. CONTACTS CLOSE AND LATCH AGAIN UPON BREAK AND MAKE OF LINE CURRENT.
3. END VIEW OF PLUGS AND JACKS.



4. SHORTING BAR CONNECTED ACROSS LINE TERMINALS 5 AND 6 WHEN POWER FOR SIGNAL CIRCUIT IS NOT SUPPLIED LOCALLY. DISCONNECT SHORTING BAR WHEN USING LOCAL POWER SOURCE.
5. SHORTING BAR CONNECTED ACROSS LINE TERMINALS 2 AND 3 FOR HALF-DUPLEX OPERATION. DISCONNECT SHORTING BAR WHEN INSTALLING FOR FULL-DUPLEX OPERATION.

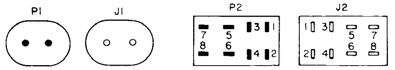
EL5815-206-34-TM-65

Figure FO-1. Teletypewriter TT-4A/TG, schematic diagram.



NOTES:

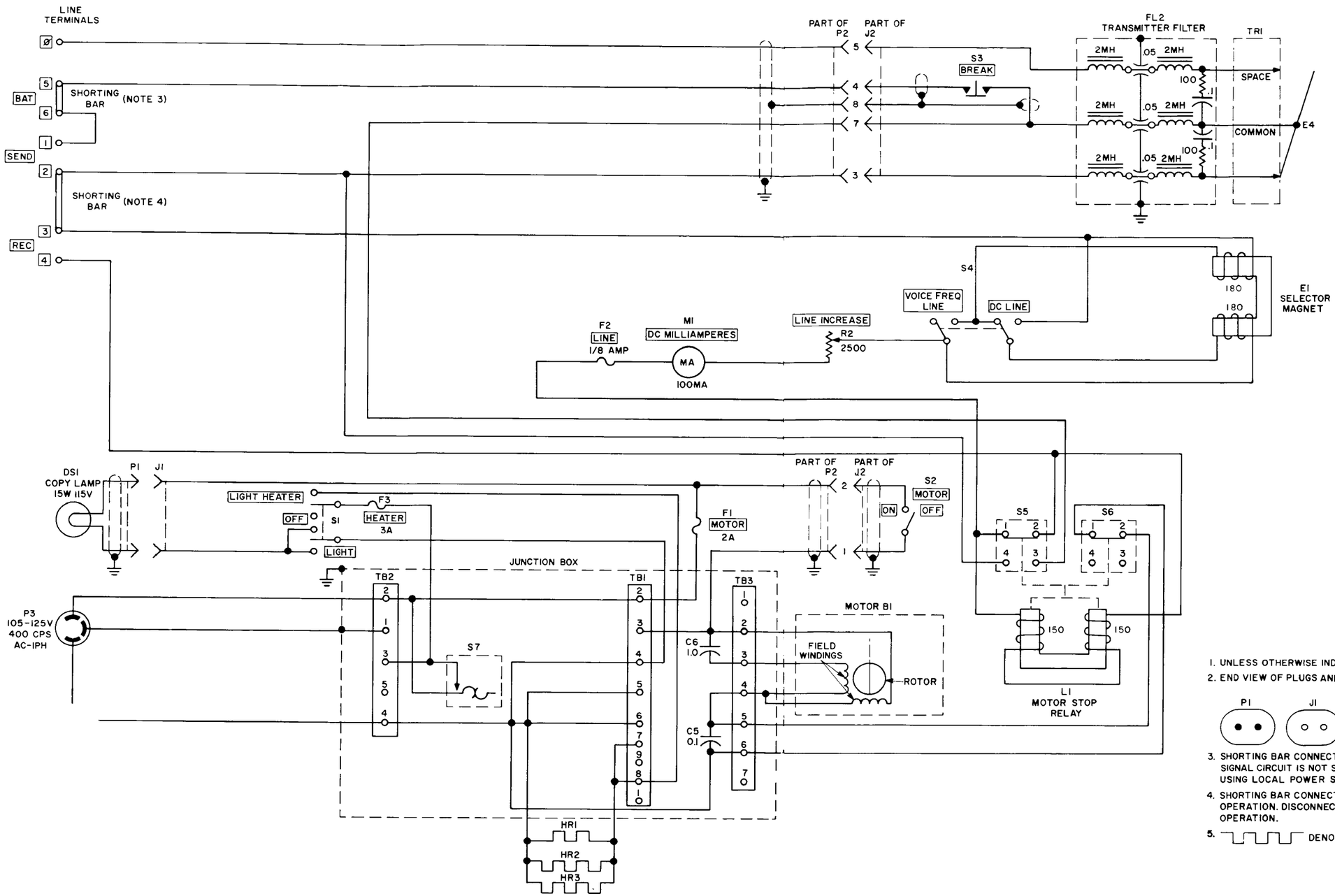
1. UNLESS OTHERWISE INDICATED RESISTORS ARE IN OHMS; CAPACITORS ARE IN UF.
2. END VIEW OF PLUGS AND JACKS.



3. SHORTING BAR CONNECTED ACROSS LINE TERMINALS 5 AND 6 WHEN POWER FOR SIGNAL CIRCUIT IS NOT SUPPLIED LOCALLY. DISCONNECT SHORTING BAR WHEN USING LOCAL POWER SOURCE.
4. SHORTING BAR CONNECTED ACROSS LINE TERMINALS 2 AND 3 FOR HALF-DUPLEX OPERATION. DISCONNECT SHORTING BAR WHEN INSTALLING FOR FULL-DUPLEX OPERATION.

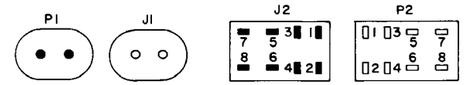
EL5815-206-34-TM-66

Figure FO-2. Teletypewriter TT-4B/TG, and TT-4C/TG, schematic diagram.



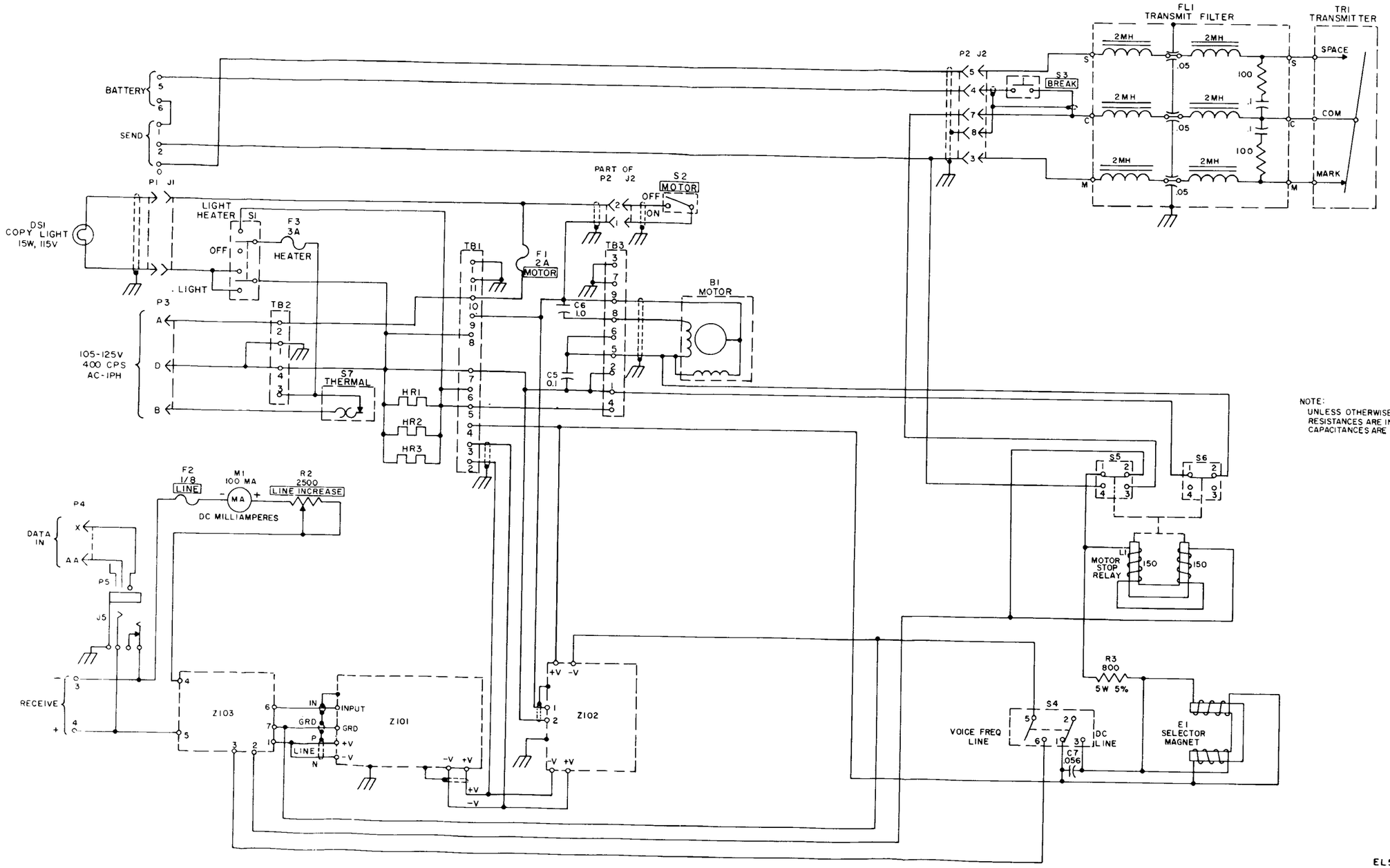
NOTES:

1. UNLESS OTHERWISE INDICATED RESISTORS ARE IN OHMS; CAPACITORS ARE IN UF.
2. END VIEW OF PLUGS AND JACKS.



3. SHORTING BAR CONNECTED ACROSS LINE TERMINALS 5 AND 6 WHEN POWER FOR SIGNAL CIRCUIT IS NOT SUPPLIED LOCALLY. DISCONNECT SHORTING BAR WHEN USING LOCAL POWER SOURCE.
4. SHORTING BAR CONNECTED ACROSS LINE TERMINALS 2 AND 3 FOR HALF-DUPLEX OPERATION. DISCONNECT SHORTING BAR WHEN INSTALLING FOR FULL-DUPLEX OPERATION.
5. ⎍ DENOTES CASTING HEATER.

EL5815-206-34-TM-67



NOTE:
UNLESS OTHERWISE SPECIFIED
RESISTANCES ARE IN OHMS ±5% AND ARE 1/4 WATT
CAPACITANCES ARE IN MICROFARADS

EL5815-206-34-TM-68

Figure FO-4. Teletypewriter TT-537/G, schematic diagram.
(with keyboard)

NOTE :
UNLESS OTHERWISE SPECIFIED:
RESISTANCES ARE IN OHMS ±5% AND ARE 1/4 WATT.
CAPACITANCES ARE IN MICRO-FARADS.

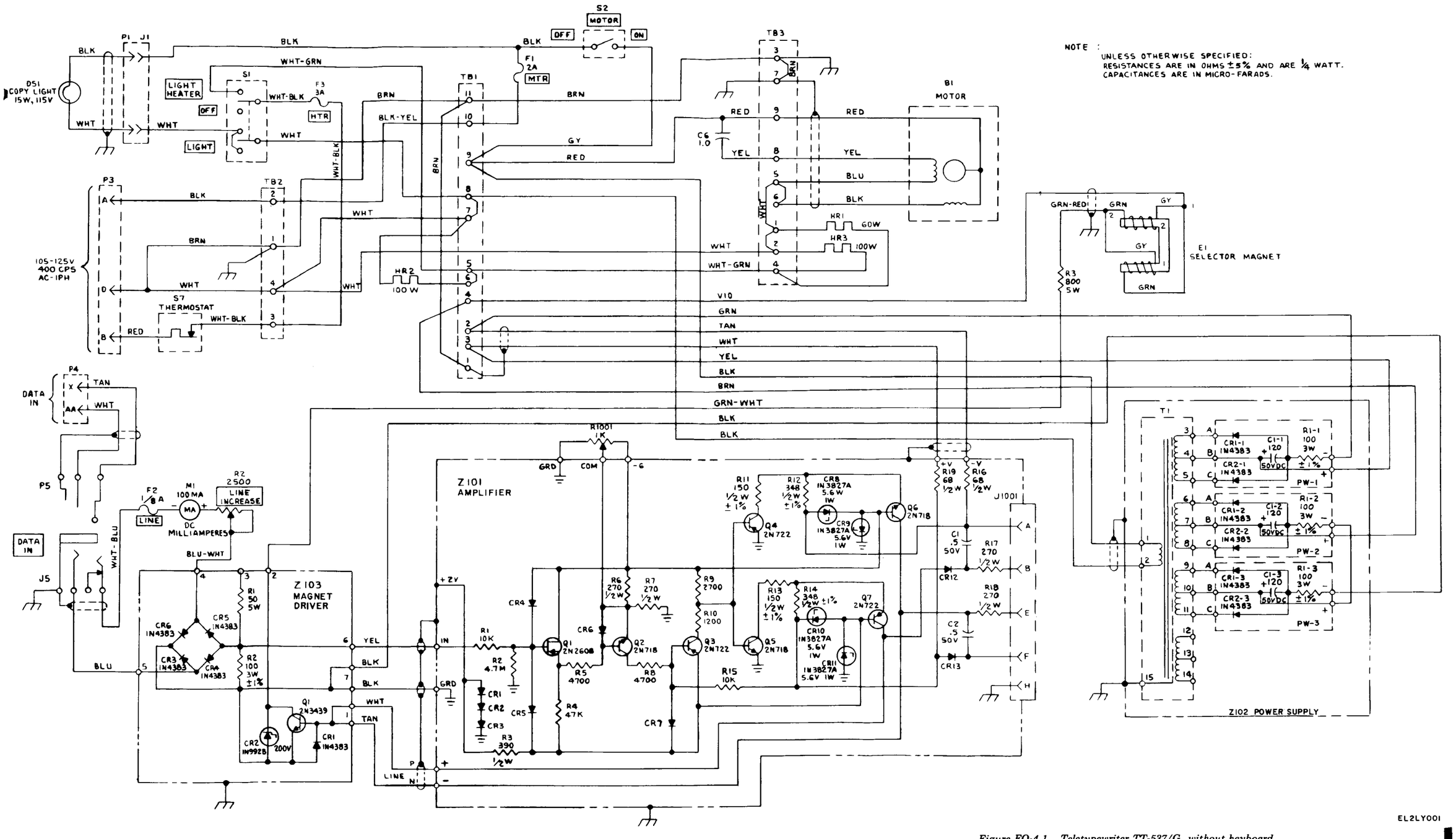
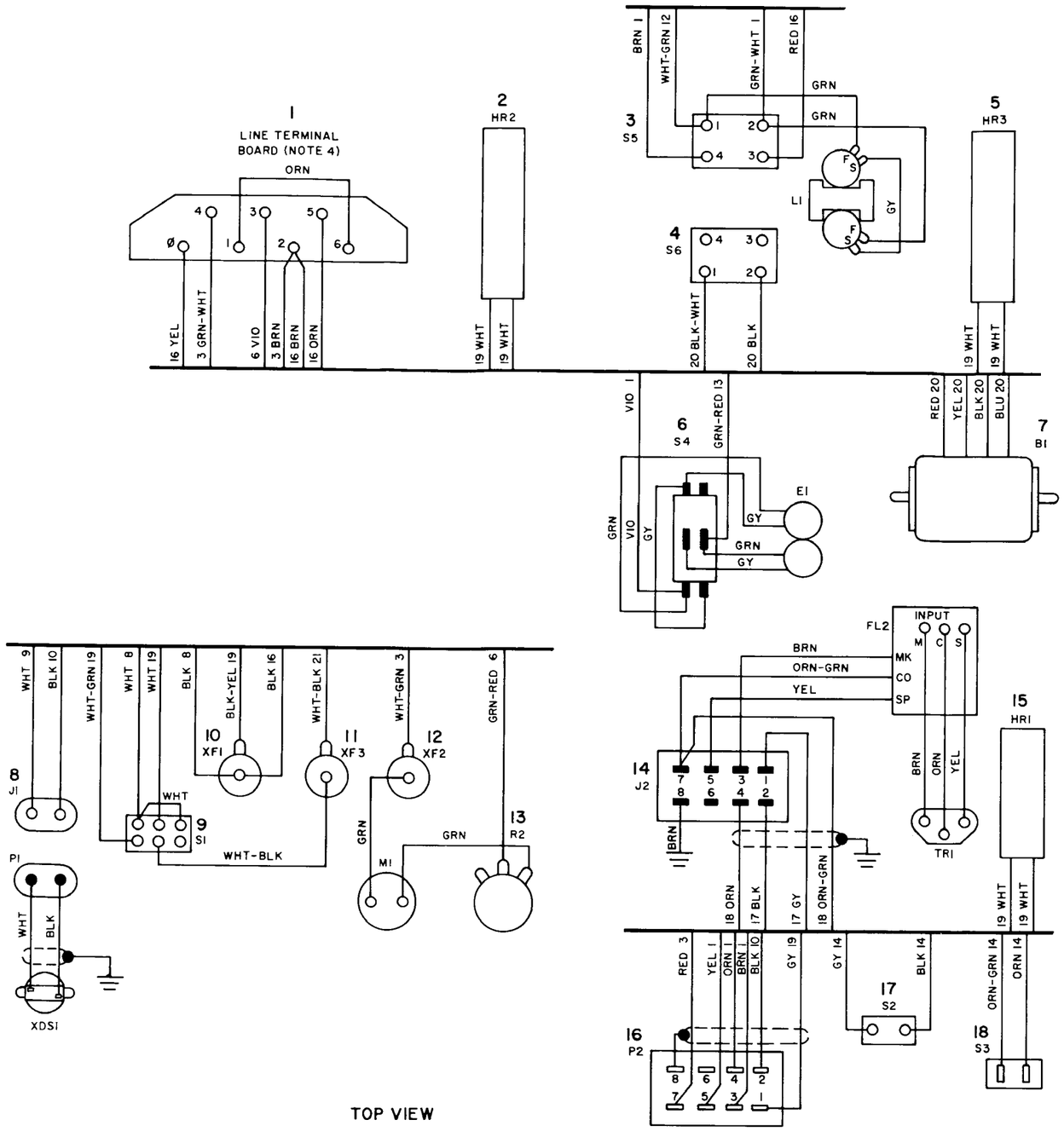


Figure FO-4.1. Teletypewriter TT-537/G, without keyboard, (Work Order No. C9409887), schematic diagram.

EL2LY001

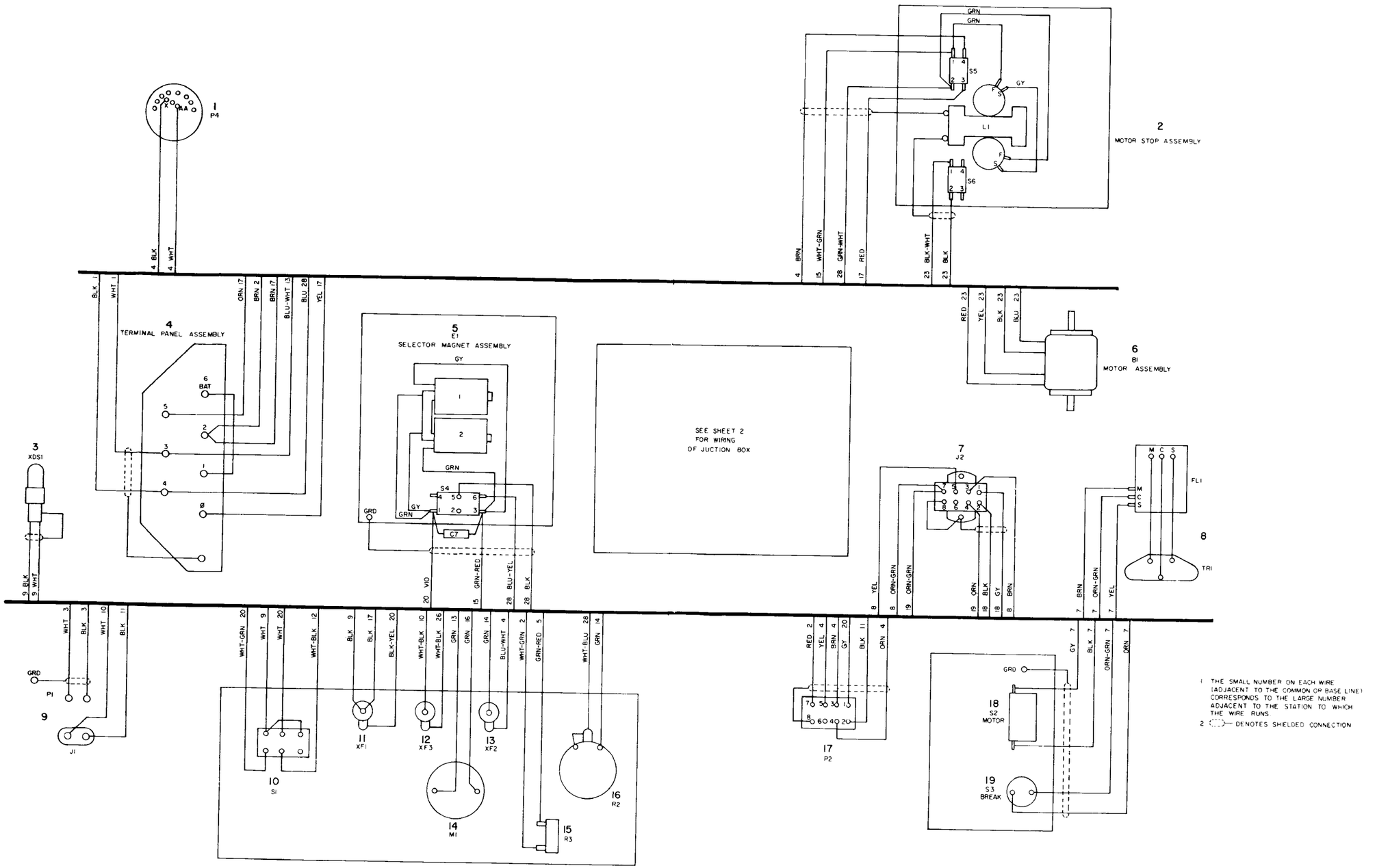


NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. BS DENOTES BARE TINNED COPPER STRAP.
3. ⌒ DENOTES SHIELDED CONNECTION.
4. LINE TERMINAL BOARD IS USED FOR THE SIGNAL LINE AND LINE CURRENT CONNECTIONS.

EL5815-206-34-TM-71

Figure FO-5. Teletypewriter TT-335/TG, wiring diagram.



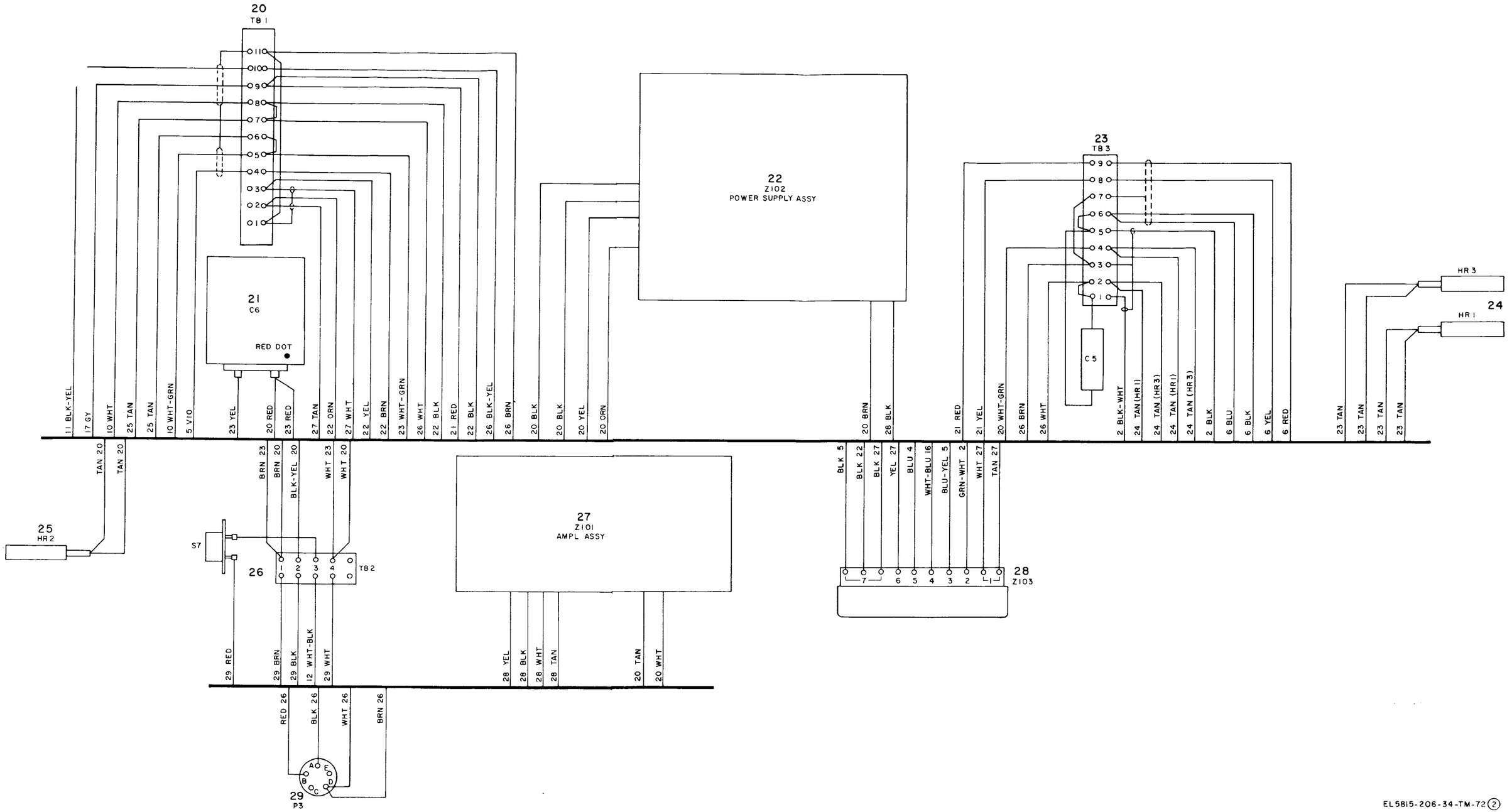
1 THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS

2 ⊂⊃ DENOTES SHIELDED CONNECTION

EL5815-206-34-TM-72①

Figure FO-6 ①. Teletypewriter TT-537/G, wiring diagram (sheet 1 of 2).
(with keyboard)

Change 1



EL5815-206-34-TM-72 (2)

Figure FO-6 (2). Teletypewriter TT-537/G, wiring diagram (sheet 2 of 2).
(with keyboard)

Change 1

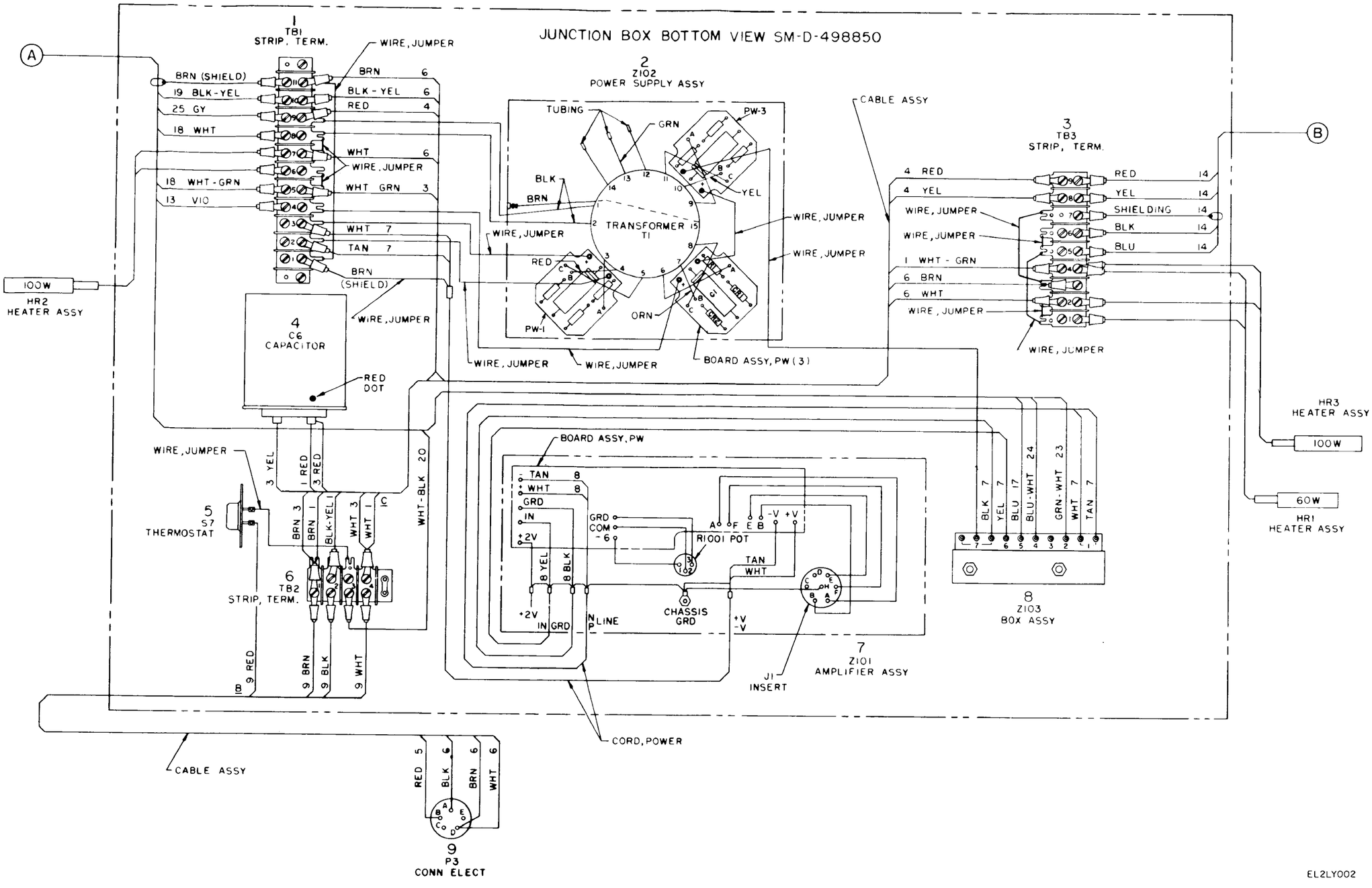


Figure FO-6.1 ①. Teletypewriter TT-537/G, without keyboard, (Work Order No. C9409887), wiring diagram (sheet 1 of 2).

EL2LY002

Change 1

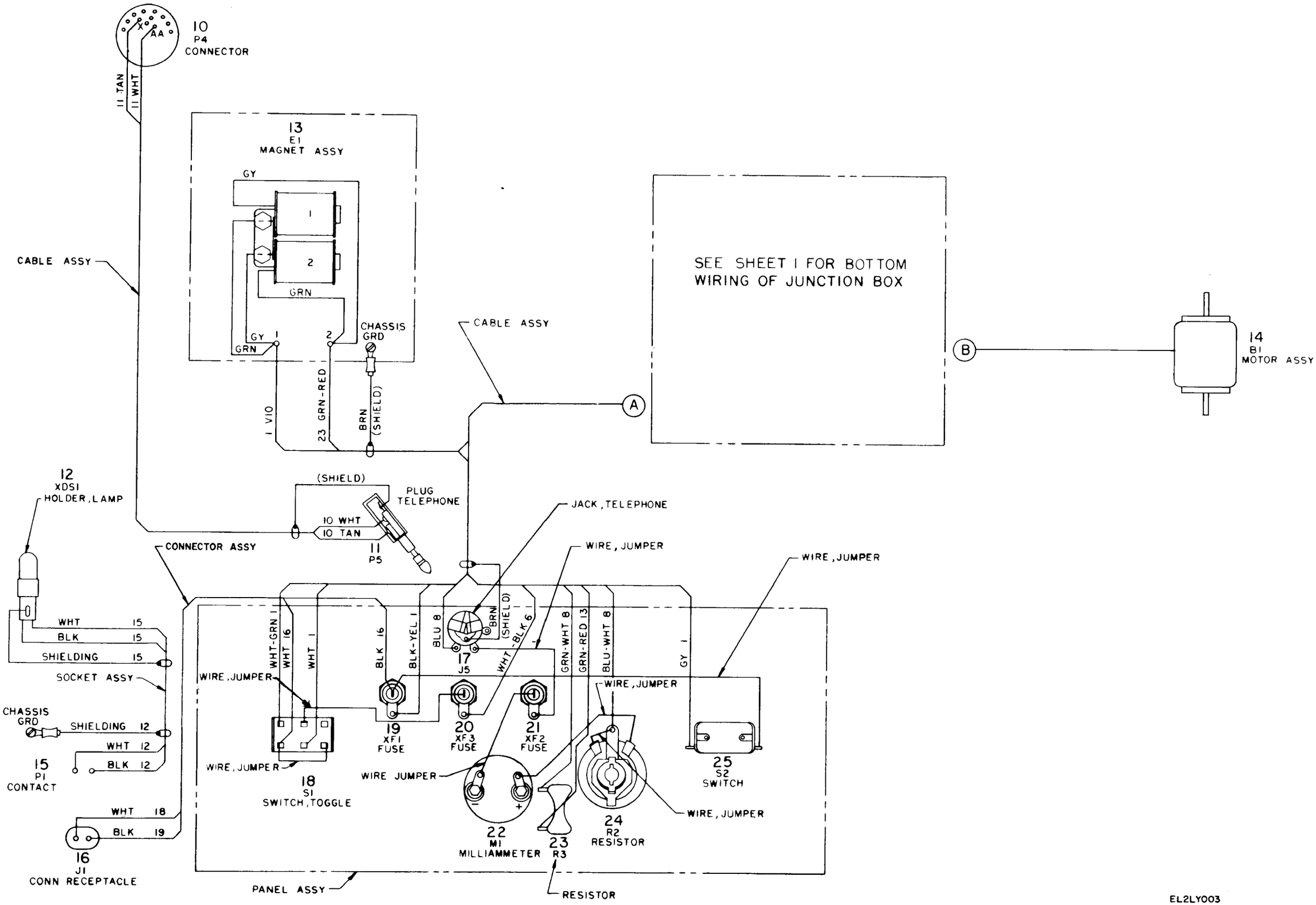
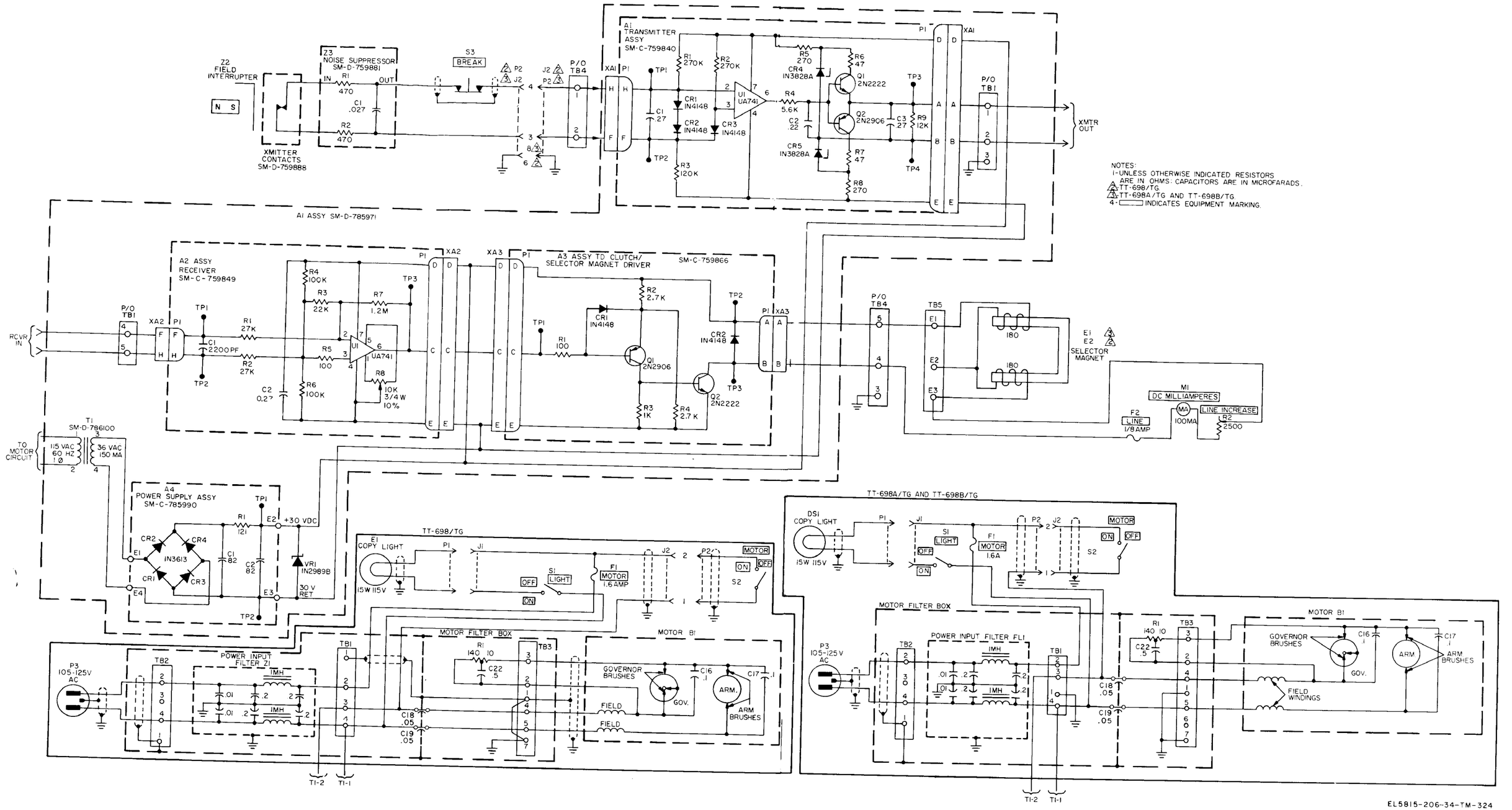


Figure FO-6.1 ②. Teletypewriter TT-537/G, without keyboard, (Work Order No. C9409887), wiring diagram (sheet 2-2).



NOTES:
1-UNLESS OTHERWISE INDICATED RESISTORS ARE IN OHMS: CAPACITORS ARE IN MICROFARADS.
△1 TT-698/TG.
△2 TT-698A/TG AND TT-698B/TG.
4-□ INDICATES EQUIPMENT MARKING.

Figure FO-7. Teletypewriter TT-698(*)/TG, schematic diagram.

By Order of the Secretaries of the Army and the Air Force:

FRED C. WEYAND
General, United States Army
Chief of Staff

Official:
PAUL T. SMITH
Major General, United States Army
The Adjutant General

DAVID C. JONES, *General, USAF*
Chief of Staff

Official:
F. MICHAEL ROGERS, *General USAF*
Commander Air Force Logistics Command

Distribution:
Active Army:

USASA (2)	USAIS (2)
COE(1)	USAES (2)
TSG (1)	USAINTCS (3)
USAARENBD (1)	MAAG (1)
AMC (1)	USARMIS (1)
TRADOC (2)	Sig FLDMS (1)
ARADCOM (2)	USAERDAA (1)
ARADCOM Rgn (2)	USAERDAW (1)
OS Maj Cored (4)	Units org under fol TOE
LOGCOMDS (3)	(1 copy each unit):
MICOM (2)	11-35
TECOM (2)	11-36
USACC (4)	11-38
MDW(1)	11-39
Armies (2)	11-45
Corps (2)	11-46
HISA (Ft Monmouth) (33)	11-85
Svc Colleges (1)	11-95
USASESS (5)	11-97
USAADS (2)	11-98
Instals (2) except	11-116
LBAD (14)	11-117
SAAD (30)	11-215
TOAD (14)	11-217
SHAD (3)	11-218
Ft Gillem (10)	11-237
Ft Gordon (10)	11-500(AA-AC)
Ft Huachuca (10)	29-134
Ft Richardson (ECOM Ofc) (2)	29-136
Ft Carson (5)	32-52
USAFAS (2)	32-56
USAARMS (2)	32-67

NG: State AG (3); units – same as Active Army except allowance is one copy per unit.
USAR: None.
For explanation of abbreviation used, see AR 310-50.

★U.S. GOVERNMENT PRINTING OFFICE: 1988 -201-421/ 80269

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PPC-76

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE: SSG I. M. DeSpiritof

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

EL5815-206-34-TM-338

TEAR ALONG DOTTED LINE

Figure 1-1. DA Form 2028-2 (TEST)—Sample.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER	DATE	TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

TEAR ALONG DOTTED LINE

DA FORM 1 AUG 74 2028-2 *(TEST)*

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD-314

Commander
US Army Electronics Command
ATTN: DRSEL-MA-Q
Fort Monmouth, New Jersey 07703

TEAR ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

THE METRIC SYSTEM AND EQUIVALENTS

NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

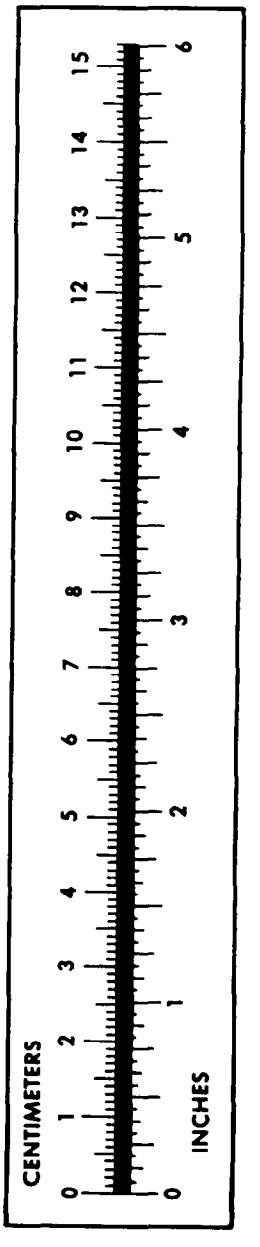
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



PIN : 031264-000

This fine document...

Was brought to you by me:



Liberated Manuals -- free army and government manuals

Why do I do it? I am tired of sleazy CD-ROM sellers, who take publicly available information, slap “watermarks” and other junk on it, and sell it. Those masters of search engine manipulation make sure that their sites that sell free information, come up first in search engines. They did not create it... They did not even scan it... Why should they get your money? Why are not letting you give those free manuals to your friends?

I am setting this document FREE. This document was made by the US Government and is NOT protected by Copyright. Feel free to share, republish, sell and so on.

I am not asking you for donations, fees or handouts. If you can, please provide a link to liberatedmanuals.com, so that free manuals come up first in search engines:

<A HREF=http://www.liberatedmanuals.com/>Free Military and Government Manuals</A>

- Sincerely
  Igor Chudov
  http://igor.chudov.com/
- Chicago Machinery Movers