

BELL SYSTEM PRACTICES
Teletypewriter and Data Stations

SECTION P34.402
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AT&T Co Standard

28 TYPING UNIT

(INCLUDING SELECTOR MECHANISM)

DISASSEMBLY AND REASSEMBLY ROUTINES

CONTENTS	PAR. NO.
1. GENERAL	1.01-1.03
2. DISASSEMBLY AND REASSEMBLY	2.01-2.18
Codebar assembly	2.09
Codebar-positioning mechanism	2.16
Draw-wire rope (lower)	2.11(b)
Draw-wire rope (upper)	2.11(a)
Front plate assembly	2.06
Function bar	2.08(a)
Function lever	2.08(c)
Function-lever spring plate (latch)	2.08(d)
Function pawl	2.08(b)
Main shaft assembly	2.10
Platen (friction-feed typing unit)	2.12
Platen (sprocket-feed typing unit)	2.13(a)
Printing carriage	2.04
Range-finder assembly	2.17
Selector-cam clutch assembly	2.14
Selector-magnet assembly	2.18
Selector mechanism	2.15
Sprocket pin (sprocket-feed typing unit)	2.13(b)
Stuntbox assembly (28 and 28A-1 typing units) ..	2.07(a)
Stuntbox assembly (28 typing units except 28A and 28A-1)	2.07(b)
Type pallet	2.03
Type-pallet spring	2.03

28 TYPING UNIT
DISASSEMBLY
AND REAS-
SEMBLY
ROUTINES

P34.402

Page 1

CONTENTS

PAR. NO.

Typebox	2.02-2.03
Typebox carriage	2.05
Typing unit	2.01

3. ASSOCIATED BELL SYSTEM PRACTICES .. 3.01

1. GENERAL

1.01 This section contains specific instructions for removing a 28 typing unit from its associated teletypewriter apparatus and for disassembling its various mechanisms, and where necessary, includes detailed information for reassembling the unit. The material herein, together with that in the section entitled Teletypewriter Apparatus, Disassembly and Reassembly, General Information and Routines, provides the complete disassembly and reassembly procedures necessary for the maintenance of the 28 typing unit.

1.02 The 28 typing unit may be safely placed in any of the three following positions for servicing: (1) in an upright position on its four feet, (2) tilted backward so that it rests on its rear feet and on the rear points of the side frames, (3) bottom upward so that it rests on the two upper points of each side frame. In addition to these maintenance positions, the typing unit may be placed on its end for servicing by use of a TP159358 maintenance parts kit which contains the special tools required to rest the typing unit safely in this position.

1.03 Where a routine calls for a clutch to be **disengaged**, the clutch shoe-lever must be fully latched between its triplever and latchlever so that the clutch shoes release their tension on the clutch drum. When **engaged**, the clutch shoe-lever is unlatched and the clutch shoes are wedged firmly against the clutch drum.

Note: When the main shaft of the typing unit is rotated by hand, the clutches do not fully disengage upon reaching their stop positions. In order to relieve the drag on the clutches and permit the main shaft to rotate freely, use a screwdriver to apply pressure on the stop lug of each clutch disc to cause it to engage its latchlever, and thus disengage the internal expansion clutch to prevent the shoes from dragging on the clutch drum. This procedure should always be followed before placing the typing unit on the base and switching on the power.

2. DISASSEMBLY AND REASSEMBLY

2.01 Removal of Typing Unit

- (1) Disconnect the cable plug connector (or connectors) from the right side of the typing unit.
- (2) Remove the four screws that secure the typing unit to the base.
- (3) Lift the typing unit from the base.

2.02 Removal of Typebox

- (1) Move the typebox latch to the right.
- (2) Lift the right end of the typebox upward to an angle of approximately 45 degrees and pull the typebox toward the right to disengage it from the left-hand bearing stud.

Reassembly Note: To avoid springing the typebox latch, before moving the latch to its locked position, firmly seat the typing unit on the bearing studs (engage the left end first) and place the point of the typebox latch in the notch of the typebox plate.

2.03 Disassembly of Typebox and Removal of Type-pallet Spring and Type Pallet

- (1) Remove the typebox in accordance with 2.02.
- (2) Remove the screws and nuts that secure the front plate to the rear plate assembly. Separate the two plates.
- (3) Remove the spring from the pallet by compressing the spring slightly and pulling the formed end out of the slot in the pallet.

Note: This spring should be discarded once it has been removed from its assembly.

- (4) Remove the pallet. (Omit this step if replacing the pallet spring only.)

Reassembly Notes

1. Insert a new pallet if necessary. Install a new pallet spring, making sure that the formed end of the spring extends through the slot in the pallet.
2. Line up the front plate with the rear plate assembly and draw the two plates together until the head of the pallet leaves the rear plate by approximately 1/16 inch. This may be done by using two 6-40 screws (at least 11/32 inch long) and nuts instead of the screws and nuts that were removed in 2.03(2) and tightening them only enough to hold the pallet in the position previously specified. (Do not clamp the plates together until all the pallets have been moved into their correct positions.)

28 TYPING UNIT

DISASSEMBLY

AND REAS-

SEMBLY

ROUTINES

P34.402

3. Manipulate the pallets until they fall into their respective openings in the front plate, and then firmly press the front and rear plates together.
4. Remove the two 6-40 screws and nuts that were temporarily used to hold the front and rear plates together, and reinstall the screws and nuts that were retained in accordance with 2.03(2).
5. To avoid springing the typebox latch, before moving the latch to its locked position, firmly seat the typing unit on the bearing studs (engage the left end first) and place the point of the typebox latch in the notch of the typebox plate.

2.04 Removal of Printing Carriage

- (1) Loosen the two screws in the printing-carriage clamp plate and disengage the carriage from the upper draw-wire rope.
- (2) Move the carriage to the left of its track and tilt the lower part of the carriage forward to disengage the rollers from the printing track.

Reassembly Notes

1. Make certain that the printing arm is correctly re-engaged with the printing-hammer operating bail and the printing track, as specified in the section giving the requirements for the 28 typing unit.
2. Position the carriage clamp on the upper draw-wire rope for the correct printing-carriage position specified in the section giving the requirements for the 28 typing unit.

2.05 Removal of Typebox Carriage

- (1) Move the typebox carriage to its extreme right-hand position.
- (2) Hold the codebar shiftbars in the marking position and rotate the main shaft so that the typebox is in its uppermost position.
- (3) Remove the ribbon from the ribbon guide.
- (4) Remove the retaining ring from the stud in the right-hand end of the typebox-carriage link and disengage the link from the carriage.
- (5) Hold the ribbon guide forward and the right ribbon (reverse) lever back, and pull the carriage toward the right to disengage it from the carriage track.

Reassembly Note: Adjust the typebox carriage in accordance with the section giving the requirements for the 28 typing unit.

2.06 Removal of Front Plate Assembly

- (1) Remove the typing unit in accordance with 2.01.
- (2) Manually move the typebox carriage to the extreme right. Select any character on the bottom row of the typebox and rotate the main shaft until the typebox carriage is in its uppermost position.
- (3) Remove the retaining ring from the stud in the right-hand end of the typebox-carriage link and disengage the link from the carriage.
- (4) Remove the two screws that secure the main-bail-drive bracket to the rocker shaft.
- (5) Remove the spacing-shaft gear.
- (6) Remove the four screws that secure the front plate assembly to the side frames of the typing unit.
- (7) Pull the front plate assembly forward to disengage it from its connecting parts in the typing unit.

Reassembly Notes

1. Make certain that the upper and lower codebar bell-cranks, the FIGS-LTRS shift slide, the reversing-slide shift lever, the automatic carriage-return line-feed bellcrank if so equipped, and the carriage-return lever extension are properly engaged with their mating parts before tightening the front-plate mounting screws.
2. Adjust the phasing of the spacing-shaft gear in accordance with the section giving the requirements for the 28 typing unit.

2.07 **Removal of Stuntbox Assembly:** These routines are intended for normal maintenance purposes where it is not necessary to disconnect the wiring.

(a) 28A and 28A-1 Typing Units

- (1) Remove the typing unit in accordance with 2.01.
- (2) Remove the rear tie-bar (rod) from the side frames of the typing unit.
- (3) Remove the line-feed function-pawl stripper from the stripper blade.
- (4) Remove the single-double line-feed lever screw and disengage the lever from the notch in the stripper blade.

- (5) Hold the stripper blade toward the right side of the typing unit and unhook the left stripper-bail arm from the blade.
- (6) Pull the stripper blade toward the left side of the typing unit to disengage the stripper blade from the right stripper-bail arm and remove the stripper blade from the typing unit.
- (7) Remove the screws that secure the stuntbox assembly in the typing unit.
- (8) Lift the stuntbox assembly upward to disengage it from its locating brackets, and pull toward the rear to disengage the FIGS-LTRS codebar fork from its codebar. Ordinarily contact assemblies should not be removed; however, if the stuntbox is to be replaced by another stuntbox, remove the contact assembly, and if present the cable clamp, from the stuntbox.

Reassembly Notes

1. Push the stuntbox assembly forward in its guide rails to within 1/8 inch of its final position. Manually disengage the function pawls from their function bars and push the stuntbox assembly forward and downward until it is latched in place on its locating brackets.
 2. Check that the FIGS-LTRS codebar fork properly engages the post on its codebar.
- (b) **All 28 Typing Units Except 28A and 28A-1**
- (1) Remove the typing unit in accordance with 2.01.
 - (2) Remove the rear tie-bar (rod) from the side frames of the typing unit.
 - (3) Remove the screw and the TP119652 retaining ring from the TP153291 cam-shaft drive arm and slide the drive arm to disengage it from the TP153300 strip-blade drive arm.
 - (4) Remove the screws that secure the stuntbox assembly in the typing unit.
 - (5) Lift the stuntbox assembly upward to disengage it from its locating brackets and pull toward the rear to disengage all the codebar forks from the codebars. Ordinarily contact assemblies should not be removed; however, if the stuntbox is to be replaced by another stuntbox, remove the contact assembly, and if present the cable clamp, from the stuntbox.

Reassembly Notes

1. Rotate the main shaft until the TP153300 stripper-blade drive arm is in its lowest position. Set the stuntbox in its guide rails. Rotate the main shaft until the function-reset blade is in its forward position.
2. Push the stuntbox assembly forward in its guide rails to within 1/8 inch of its final position. Manually disengage the function pawls from their function bars and push the stuntbox assembly forward and downward until it is latched in place on its locating brackets.
3. Check that each codebar fork properly engages the post on its respective codebar.

2.08 Removal of Function Bar, Pawl, Lever, and Spring Plate or Latch from Stuntbox

(a) Removal of Function Bar

- (1) Remove the stuntbox assembly in accordance with 2.07.
- (2) Unhook the function-bar spring.
- (3) Hold the function bar toward the rear of the stuntbox and disengage its function pawl from the function bar.
- (4) Pull the function bar toward the front to remove it from the stuntbox.

(b) Removal of Function Pawl

- (1) Remove the function bar in accordance with (a)(1) through (a)(4).
- (2) Remove the function-pawl spring.
- (3) Hold back the associated function-lever.
- (4) Remove the function pawl from the top of the stuntbox.

(c) Removal of Function Lever

- (1) Remove the function bar and function pawl in accordance with (a)(1) through (a)(4), and (b)(1) through (b)(4), respectively.
- (2) Remove the screw from the left cam on the stripper-blade cam shaft (as viewed from the rear). Slide the cam to the right and remove the cam shaft. Remove the left stripper-blade operating arm and remove the stripper blade.

- (3) Remove the shaft-retaining plate on the right end of the stuntbox.
 - (4) Remove the upper shaft of the two held by the shaft-retaining plate.
 - (5) Unhook the function-lever spring from the function-lever spring plate or latch.
 - (6) Remove the function lever.
- (d) **Removal of Function-lever Spring Plate or Latch**

- (1) Remove the function bar, function pawl, and function lever in accordance with (a)(1) through (a)(4), (b)(1) through (b)(4), and (c)(1) through (c)(6), respectively.
- (2) Loosen the screws that fasten the three guide blocks on the lower side of the guide bar.
- (3) Remove the spring from the function-lever spring plate or latch.
- (4) Pull downward on the function-lever spring plate or latch to snap it out of engagement with the retainer shaft.

Note: If it is desired to remove a function-lever spring plate or latch without removing the function lever, it will be necessary to remove the function-lever spring from the function lever in order to remove the spring plate or latch.

2.09 **Removal of Codebar Assembly**

- (1) Remove the typing unit in accordance with 2.01.
- (2) Remove the front plate assembly in accordance with 2.06.
- (3) Remove the stuntbox assembly in accordance with 2.07.
- (4) Remove the screws and lockwashers that secure the codebar assembly to the side frame.
- (5) Remove the codebar-shiftbar retaining plate from the right codebar-guide bracket.
- (6) Remove the codebar shiftbars and the springs from the codebars and pull the codebar assembly forward and to the left.

Reassembly Notes

1. When reinstalling the codebar assembly, insert the mounting screws but do not tighten them.
2. Hook the short extension of the spring in the spring hole of the codebar shiftbar. (The short extension of the spring should be hooked from the bottom of the codebar and the long extension should be hooked over the top of the codebar shiftbar.)

3. Loosen the codebar-assembly tie-bar screws. Firmly hold the codebar-guide brackets back and downward against their locating surfaces on the side frame and fully tighten the four mounting screws. Then tighten the two tie-bar screws.

2.10 Removal of Main Shaft Assembly

- (1) Remove the typing unit in accordance with 2.01.
- (2) Remove the selector-cam clutch assembly in accordance with 2.14.
- (3) Set the typing unit upside down.
- (4) Return the printing carriage to its left-hand position.
- (5) Remove the screw that secures the spacing shaft in the spacing collar.
- (6) Remove the spacing shaft with gear.
- (7) Remove the screw that secures the collar and the collar clamp from the right end of the main shaft. Remove the main-shaft right-hand bearing retainer.
- (8) Remove the retaining plate at the typebox-clutch sleeve bearing and remove the rocker-shaft drive link.
- (9) Remove the two screws from the main-shaft left-hand ball-bearing clamp.
- (10) Unhook the springs from the triplevers and latchlevers associated with all clutches. Position the codebar clutch so that the low part of the clutch cam clears the spring arm on the camfollower. Unhook the codebar-clutch camfollower-arm spring.
- (11) Remove the function-clutch arm by removing the two screws, and the retaining ring if present.
- (12) Unhook the springs from the function-bar reset bail.
- (13) Move the main shaft assembly toward the left to disengage the codebar-clutch and function-clutch links from their connecting pins.
- (14) Lift the left end of the main shaft assembly out of the side frame and position the shaft so that the function-clutch link passes the suppression-assembly bracket.
- (15) Remove the main shaft assembly.

Reassembly Notes

1. To avoid breakage of the line-feed-clutch spur gear when reassembling the main shaft assembly, the gear should be positioned with its flat side toward the line-feed clutch spacer and with the indentation

28 TYPING UNIT

DISASSEMBLY

AND REAS-

SEMBLY

ROUTINES

P34.402

Page 9

in the gear toward the special washer between the line-feed-clutch spur gear and the main-shaft ball bearing.

2. When assembling the clutches that have cams and discs marked **O** for identification, the marked side of each part should face away from the clutch side of the assembly. The function and codebar clutches should have their driving links assembled so that the longer end of the hub faces away from the clutch side of the assembly.
3. Make sure that the latchlevers and eccentric-cam-follower arms are in their correct positions as the main shaft is being reinstalled.
4. Phase the spacing gears and the line-feed gears as specified in the section giving the requirements for the 28 typing unit.
5. Remake the stripper-blade drive cam adjustment as specified in the section giving the requirements for the 28 typing unit.

2.11 Removal of Draw-wire Ropes

Caution: Beware of broken strands in the wire ropes.

(a) Upper Draw-wire Rope (Carriage Wire Rope)

- (1) Return the printing carriage to the left-hand position.
- (2) Loosen the nut on the front end of the spring-drum stud. Operate the ratchet-escapement lever to unwind the carriage-return spring.
- (3) Remove the upper draw-wire rope from the clamp plate on the printing carriage and from the oscillating-rail slide on the oscillating rail.
- (4) Loosen the clamp screw that secures the upper draw-wire rope to the spring drum, and remove the wire rope from the drum.
- (5) Remove the screw which secures the ends of the upper draw-wire rope in the spacing drum and remove the wire rope from the drum.

(b) Lower Draw-wire Rope

- (1) Remove the screw that secures the lower draw-wire rope to the spacing drum, and remove the end of the rope from the drum.
- (2) Loosen the screws that secure the margin-indicator cam disc on the spring drum and position the disc to expose the lower draw-wire-rope mounting screw.

(3) Remove the lower draw-wire-rope mounting screw and remove the wire rope from the spring drum.

(4) Loosen the screws in the pulley bearing studs that mount the draw-wire rope pulleys and move the studs toward the center of the typing unit.

Reassembly Notes

1. Make sure that each draw-wire rope is in its correct track around the drums. (The lower draw-wire rope should be in front of the upper draw-wire rope, toward the front of the drums.)

2. Adjust the lower draw-wire rope tension and the position of the typebox and printing carriage to meet the requirements specified in the section giving the requirements for the 28 typing unit.

2.12 Removal of Platen from Friction-feed Typing Unit

(1) Remove the platen spur gear.

(2) Remove the left and right platen retainers.

(3) Remove the paper-straightener shaft.

(4) Hold off the platen-detent bail and lift the platen out of the side frame.

Reassembly Notes

1. When remounting each platen retainer (left and right), first put its upper screw in place. Leave the screw slightly loose.

2. Press the lower end of the platen retainer downward and hook it into the elongated hole in the side frame. Insert the lower screw.

3. Tighten both screws.

2.13 Removal of Platen and Sprocket Pin from Sprocket-feed Typing Unit

Caution: Spring-loaded sprocket pins may be ejected with considerable speed when the feed cam is removed. If the platen-hub assembly is disassembled for any reason, the TP153673 shaft tool and the TP153797 retaining tool (sprocket-pin depressor) must be used to hold the spring-loaded sprocket pins in place when the feed cam is removed.

(a) Removal of Platen

(1) Remove the paper fingers or guide-bracket assembly.

(2) Remove the spur gear from the left end.

28 TYPING UNIT
DISASSEMBLY

AND REAS-
SEMBLY

P34.402

Page 11

ROUTINES

- (3) Remove the left and right platen retainers.
- (4) Hold off the detent bail and remove the platen.

Reassembly Notes

1. Where a unit is equipped with a right sleeve-bearing that has a chamfer, place the bearing on the shaft with the chamfer facing the end of the shaft. Where a unit is equipped with a right sleeve-bearing that has no chamfer, but has an **O** stamped on the side of the bearing, place the bearing on the shaft with the **O** facing the end of the shaft. Neither of these right sleeve-bearings is concentric, as are the bearings on friction-feed typing units. To avoid installing them incorrectly, make sure that the wide part of each eccentric bearing is placed toward the front of the unit.
 2. When remounting each platen retainer (left and right), first put its upper screw in place. Leave the screw slightly loose.
 3. Press the lower end of the platen retainer downward and hook it into the elongated hole in the side frame. Insert the lower screw.
 4. Tighten both screws.
- (b) Removal of Sprocket Pin**
- (1) Remove the platen in accordance with (a)(1) through (a)(4).
 - (2) Remove the platen-hub assembly from the platen assembly.
 - (3) Insert the TP153673 shaft tool into the platen hub and fasten it with the screw of the spur gear that was removed in (a)(2).
 - (4) Remove the right feed-cam clamp and the right feed cam from the platen-hub assembly.
 - (5) Place the TP153797 retaining tool (sprocket-pin depressor) over the platen hub and cover the notches in the retaining tool to prevent the sprocket pins from accidentally being released.
 - (6) Rotate the platen-hub assembly within the TP153797 retaining tool by means of a tommy wrench inserted in the TP153673 shaft tool until the desired sprocket pin is opposite the notch in the TP153797 retaining tool.
 - (7) Remove the desired sprocket pin, and substitute another pin if necessary.
 - (8) Pack the sprocket-hub assembly with grease.

Reassembly Note: To prevent sprocket pins from accidentally being ejected, **observe the same caution in reassembling the platen-hub assembly as in disassembling it.**

2.14 **Removal of Selector-cam Clutch Assembly**

- (1) Lift the pushlever reset-bail camfollower from its cam and latch it in its raised position on the pushlever guide. Lift the selector levers and the marking locklever by moving the marking locklever forward until the armature drops behind it.
- (2) Remove the screw which mounts the selector-clutch drum and position the cam clutch so that the stop lug on the clutch-cam disc is in the uppermost position.
- (3) Place the pushlever-reset bail in its raised position. Hold the stop arm and the marking locklever to the left, grasp the cam clutch by the cam disc (not by the drum) and pull it forward while slowly rotating the cam clutch. The cam clutch should come off easily. Do not force it.

Reassembly Notes

1. As the cam clutch approaches its fully installed position, move the tripshaft lever and the cam-clutch latchlever so that they ride on their respective cams.
2. Restore the pushlever reset bail and the armature to their operating position.

2.15 **Removal of Selector Mechanism**

- (1) Remove the selector-cam clutch assembly in accordance with 2.14.
- (2) Remove the screw that secures the selector mechanism to the intermediate bracket on the codebar-positioning mechanism.
- (3) Remove from the selector mechanism the common-transfer lever spring which connects with the common-transfer lever on the codebar-positioning mechanism.
- (4) Remove the remaining three selector-mounting screws and lift the selector from the main-shaft bearing housing.

Reassembly Note: Readjust the selector mechanism to meet the requirements in the section giving the requirements for the selector mechanism of the 28 typing unit.

2.16 Removal of Codebar-positioning Mechanism

- (1) Remove from the selector the common-transfer lever spring attached to the common transfer lever, and restore any operating pushlevers to the spacing position by raising the pushlever reset bail.
- (2) Loosen the clamp screw on the shift-lever drive arm and remove the two screws which mount the mechanism (one to the side frame and one to the selector-mounting plate).
- (3) Manipulate the transfer levers and the codebar shift-bars while gently twisting the mechanism off the codebar shiftbars.

Reassembly Note: With the main shaft in the stop position, push the codebar shiftbars to the marking position (left, front view). Manipulate the codebar shiftbars and transfer levers so that the shiftbars line up with their respective slots in the shift-lever guide bracket, and slide the shiftbars through the slots, one at a time (leaving the bottom slot vacant).

2.17 Removal of Range-finder Assembly

- (1) Remove the typing unit in accordance with 2.01.
- (2) Remove the two screws and the nut that mounts the range-finder plate to the selector-mounting plate.
- (3) Move the stoparm forward, so that its bail disengages from the startlever extension and clears the clutch disc, while withdrawing the range-finder assembly by rocking it back and forth.

Reassembly Notes

1. Reinsert the range-finder assembly and re-engage the stoparm bail with the startlever extension.
2. Reinstall the screws and the nut. If the apparatus is not equipped with the bail-lever guide, tighten the screws and nut. If the apparatus is equipped with the bail-lever guide, do not tighten the nut until after remounting the bail-lever guide.
3. Where present, the bail-lever guide should be adjusted to meet the requirements specified in the section giving the requirements for the selector mechanism for the 28 typing unit.

2.18 Removal of Selector-Magnet Assembly

- (1) Remove the range-finder assembly in accordance with 2.17.

- (2) Remove the selector-magnet cable from the coil terminal screws.
- (3) Remove the two selector-magnet mounting screws and lift out the selector-magnet assembly.

3. ASSOCIATED BELL SYSTEM PRACTICES

3.01 The following Bell System Practices provide additional information that may be required for use with this section.

Subject	Section
General Information and Routines for Disassembling and Reassembling Teletypewriter Apparatus	P30.013
General Requirements and Adjusting Procedures for Teletypewriter Apparatus	P30.012
Preparation of Teletypewriter Apparatus for Installation	P33.014
Specific Requirements and Adjusting Procedures for Teletypewriter Apparatus	P10.200
Teletypewriter Tools and Maintenance Supplies	P30.301
28 Teletypewriter (KSR and RO), Disassembly and Reassembly Routines	P34.401
28 Teletypewriter Apparatus, Index of Associated Bell System Practices	P34.001 (When Issued)