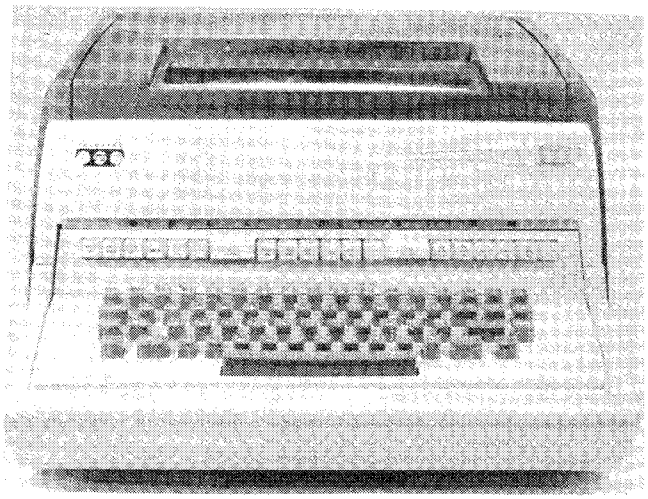
37 KEYBOARD SEND-RECEIVE (KSR) TELETYPEWRITER SET

USED IN TELEGRAPH TEST BOARDS AND SERVICE BOARDS

TROUBLESHOOTING

CONTENTS PAGE



1. GENERAL

1.01 This section provides troubleshooting information for the 37 Keyboard Send-Receive (KSR) TTY (teletypewriter) Set, used in test board and service board applications. Since the previous issue of this section was not available for general distribution, marginal arrows normally used to indicate changes and additions have been omitted.

1.02 The information in this section includes Test Procedures (Part 3) to check set operation before or after installation into the test board service, routine maintenance, or emergency maintenance. Each step of a test gives an action, the required verification, and a trouble analysis reference for use in case the equipment does not operate correctly. The trouble analysis part enables one to analyze specific troubles and gives a correction directly or references a specific adjustment found in appropriate adjustment section.

1.03 Perform each operating test step-by step. If the equipment does not operate correctly and a correction is not given in Trouble Analysis (Part 4), consider the following:

(a) Use locally specified procedures (assistance, call supervisor, etc).

(b) Replace defective apparatus.

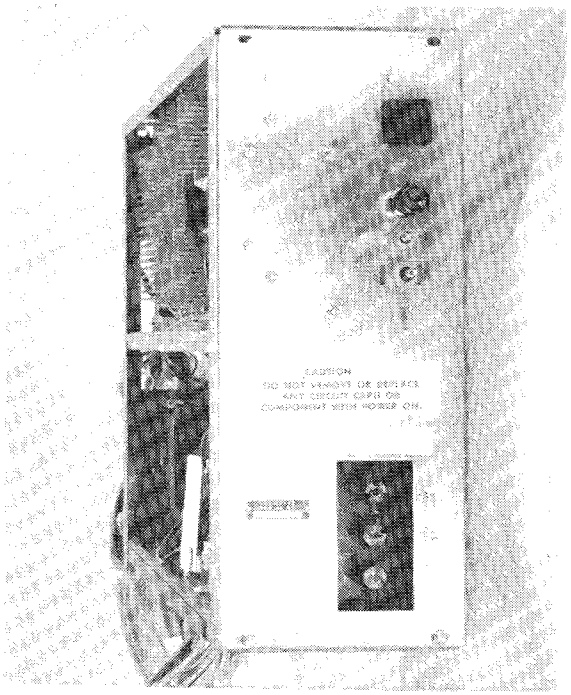


Figure 1 - 37 Keyboard Send-Receive (KSR) Teletypewriter Set Used in Test Board Service

Prepared for American Telephone and Telegraph Company by Teletype Corporation

(c) Repair component using associated adjustment section or wiring diagrams.

Use the subpart division and analysis appropriate to the trouble area being checked.

CAUTION: BEFORE REMOVING OR REPLACING CIRCUIT CARDS OR FUSES, PLACE MAINT ON POWER OFF NORM ON SWITCH OF THE YESU TO POWER OFF POSITION, OR PULL AC POWER PLUG TO REMOVE ELECTRICAL POWER. DO NOT TURN ON POWER WITH A FUSE REMOVED.

1.04 A KSR TTY set requires routine maintenance which includes periodic lubrication of the set. In general, the lubrication interval for operation at 150 words per minute is after the first 300 to 500 hours of operation. Thereafter, the TTY set should be lubricated every 1500 hours of operation or 6 months, whichever occurs first. These figures are for normal operating conditions. The interval may be modified depending upon the usage and environment. See the component lubrication sections for complete information.

Note 1: Gold-plated contacts are used in the keyboard and stunt box in printer. They should be cleaned each time the TTY set is lubricated.

Note 2: Use twill jean cloth (KS2423) to clean gold-plated contacts. Do not use burnishers, files, etc, which will remove gold plating. Other materials and tools necessary to maintain this equipment can be found in Section 570-005-800.

2. REFERENCES

ITEM	SECTION NUMBER
904G/H Data Test Center	
Description and Operation	668-400-100
Station Tests	668-400-300
Inspection and Maintenance Tests	668-400-500
918A Multispeed and Code Converter	
Description and Operation	103-814-100
No. 2 Telegraph Service Board	
Operation and Test Methods	666-101-100
No. 9B Telegraph Service Board	
Operation and Test Methods	666-102-100
Long Lines Data Observing and Testing Center	
Description	666-198-900

3. TEST PROCEDURES

LOCAL OPERATING TESTS

Note: The Local Operating Test procedures should be followed only after completing the operations specified in Section 574-304-200 installation.

Keyboard Tests

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
1	AC power cord plugged into 115 v ac source. NORM ON POWER OFF MAINT ON switch to MAINT ON. LOCAL ON-LINE switch to LOCAL. CONTL BLACK in, MOTOR OFF in. All other buttons out (released).	Motor and copylights go on.	4, 3, 1
2	Depress ABC keytops.	a. abc characters are printed in lower case. b. No keytop binds. c. No double trip by keyboard. d. Typing will be limited to 59 wpm through operation of reset mechanism.	12, 8, 7, 9, 11, 13, 17 9 8
3	Depress the SHIFT LOCK key.	Key remains locked down after release.	
4	Depress ABC keytops.	ABC characters are printed in upper case.	12, 13, 17
5	Depress SHIFT key.	SHIFT LOCK key releases.	
6	Depress CONTRL and L (FF) keys simultaneously.	$\frac{F}{F}$ is printed, typing unit carriage returns and line feeds. The unit does not perform form feed-out operation.	18c, 17
7	Depress spacebar and then CONTRL and K (VT) keys simultaneously.	$\frac{V}{T}$ is printed, typing unit carriage returns and line feeds. The unit does not perform vertical tab operation.	18c, 17
8	Depress A, then 5, then N to their maximum downward position.	Characters will be repeatedly printed.	10, 17
9	Depress LOCAL RETURN located on the control panel with the carriage at various positions.	Typing unit carriage returns to the left margin without carriage bounce.	17i, 23
10	Depress PAPER ADVANCE located on the control panel.	Typing unit line feeds at three times the normal rate.	22

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
Keyboard Counter and Typing Unit Tests			
11	a. Depress RETURN keytop followed by each lower case alpha keytop (a through z) one time.	Typing unit prints proper character in lower case.	12, 8, 13a, 14, 15, 16, 17
	b. Depress SHIFT LOCK and each alpha keytop (A through Z) one time.	Typing unit prints proper character in upper case.	12, 8, 13a, 14, 15, 16, 17
	c. Unlock the SHIFT key and depress the numeric keytops (1 through 0) one time.	Typing unit prints proper number.	12, 8, 13a, 14, 15, 16, 17
	d. Depress BACK SPACE ten times.	a. Typing unit prints $\frac{B}{S}$ ten times. b. Carriage will space forward.	12, 17, 16
	e. Depress NULL five times.	a. Typing unit prints $\frac{N}{L}$ five times. b. Carriage spaces forward.	12, 17, 16
	f. Depress DELETE three times.	a. Typing unit prints $\frac{D}{E}$ three times. b. Carriage spaces forward.	12, 13, 17, 18, 16
	g. Depress CONTRL G (BELL) twice.	a. Typing unit prints $\frac{B}{L}$ twice. b. Carriage spaces forward. c. Bell will not ring.	12, 13, 17, 16
	h. Depress ESCAPE, 3 escape, 4.	a. Typing unit prints $\frac{E}{S}3\,\frac{E}{S}4$. b. Carriage spaces forward.	12, 13, 17, 16
	i. Depress spacebar once.	Typing unit automatically carriage returns and line feeds.	17j

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
Keyboard Counter and Typing Unit Tests (Continued)			
12	a. Depress RETURN and the numeric keytops (1 through 0) for 79 characters.	a. Typing unit prints $\frac{C}{R}$ and the proper numbers. b. KYBD E.O.L. lamp should not be lighted.	12, 17, 16, 5
	b. Depress BACK SPACE twice, NULL once, DELETE once, 1 and 2.	a. Typing unit prints all characters. b. KYBD E.O.L lamp should not be lighted.	12, 13, 17, 16 6
	c. Depress spacebar one time.	Typing unit spaces and KYBD E.O.L. lamp lights.	5, 2b, 12, 13
	d. Depress NEW LINE key.	a. Typing unit carriage returns, line feeds, and prints $\frac{L}{F}$ on the fly. b. KYBD E.O.L. lamp goes out.	5, 18, 17, 12, 13 5
	e. Repeat SPACE until KYBD E.O.L. lamp lights.	a. Typing unit will space, but not print any character. b. KYBD E.O.L. lamp lights.	12, 13, 18 5
	f. Depress RETURN key.	a. Typing unit carriage returns, line feeds, and prints $\frac{C}{R}$ on the fly. b. KYBD E.O.L. lamp goes out.	13, 18f, 17, 12 5
13	a. Return the carriage to left hand margin. Type five capital B's and five small g's.	Printing density should be uniform at the top and bottom of the characters.	17e
	b. Position the carriage near the right hand margin. Type five capital B's and five small g's.	Printing density should be uniform at the top and bottom of the characters.	17e
14	Depress RETURN, 1 2 3 RETURN 1 2 3 etc, to 40 characters, RETURN 1 2 3 etc, to 80 characters RETURN 1 2 3.	Left margin should be even, as gauged by eye.	17i

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
Keyboard Counter and Typing Unit Tests (Continued)			
15	Depress the following characters simultaneoulsy with the CONTRL key:	Typing unit should space after printing the following:	12, 17, 16, 13
	Z (SUB)	S B	12, 17, 16
	X (CAN)	C N	12, 17, 16
	C (ETX)	E X	12, 17, 16
	V (SYN)	S Y	12, 17, 16
	B (STX)	S X	12, 17, 16
	N (SO)	S O	12, 17, 16
	A (SOH)	S H	12, 17, 16
	S (DC3)	D 3	12, 17, 16
	D (EOT)	E T	12, 17, 16
	F (ACK)	A K	12, 17, 16
	Q (DC1)	D 1	12, 17, 16
	W (ETB)	E B	12, 17, 16
	E (ENQ)	E Q	12, 17, 16
	R (DC2)	D 2	12, 17, 16
	T (DC4)	D 4	12, 17, 16

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
Keyboard Counter and Typing Unit Tests (Continued)			
	Y (EM)	E M	12, 17, 16
	U (NAK)	N K	12, 17, 16
	O (SI)	S I	12, 17, 16
	P (DLE)	D L	12, 17, 16
	=(US)	U S	12, 17, 16
	}⌐ (GS)	G S	12, 17, 16
	~^ (RS)	R S	12, 17, 16
	| \ (FS)	F S	12, 17, 16
	Depress TAB keytop.	Typing unit prints $\frac{H}{T}$, but does not horizontally tabulate.	12, 17, 16
16	Type the character a.	Observe retraction of the typebox approximately 1/2-second after the character a is printed.	19
Ribbon Control Tests			
17	Operate CONTL BLACK pushbutton to released (out) position.		
18	Alternately send several control characters including DELETE and alpha characters.	Alpha characters are printed in black. Control characters are printed in red.	20e, 12 20d, 12
19	Depress CONTL BLACK pushbutton on control panel.	Button locks in.	

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
Ribbon Control Tests (Continued)			
20	Alternately send several control characters including DELETE, and alpha characters. End of Local Operating Tests	Alpha and control characters are printed in black.	20e, 12

ON-LINE OPERATING TESTS (using the 918A converter)

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
1	a. Place NORMAL ON OFF MAINT ON switch of the YESU to NORMAL ON. b. Place the LOCAL-ON-LINE switch of the YESU to ON-LINE. c. Depress 150 WPM (8) pushbutton of the control panel. All other pushbuttons should be out (released).		
2	Depress the switches on the test board that activate the TTY set.	Motor and copy lamps go ON.	24, 4, 3, 1
3	Depress MOTOR OFF pushbutton on the control panel.	Motor and copy lamps go OFF.	25
4	Depress (release) MOTOR OFF pushbutton on the control panel.	Motor and copy lamps go ON.	24

ON-LINE OPERATING TESTS (using the 918A converter) (Continued)

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCE
5	Contact a compatible test board and request that they send traffic, including control and delete characters, with some parity errors such as odd parity.	a. Local typing unit will not receive copy transmitted to distant station. b. Copy received will have control and delete characters printed in red, parity errored characters will be printed in red, all other characters will be printed in black. c. ERROR RESET lamp will light.	27 26, 18 2b
6	Depress ERROR RESET pushbutton.	ERROR RESET lamp extinguishes.	
7	Depress CONTL BLACK pushbutton.	Pushbutton locks in depressed position.	
8	Request that a test board send traffic including control and delete characters and some characters with parity errors.	a. Characters with parity errors will be printed in red. All other characters including control and delete characters will be printed in black. b. ERROR RESET lamp goes ON.	20, 26 2b
9	Depress ERROR RESET pushbutton.	ERROR RESET lamp extinguishes.	
10	Depress the switches on the test board that deactivate the TTY set. End of On-Line Operating Tests	Motor and copy lamps go OFF.	

4. TROUBLE ANALYSIS

CAUTION: BEFORE REMOVING OR REPLACING CIRCUIT CARDS OR FUSES, TURN YESU SWITCH TO POWER OFF OR PULL POWER PLUG.

Note: To minimize the chance of placing a card in the wrong position, remove only one card at a time. Check that the proper circuit card is in the proper slot, as shown in 9079WD-4 in WDP0283. The corrective procedures should be performed in the order shown.

Set (Local)

NO.	TROUBLE	CORRECTIVE PROCEDURE
1	Proper voltages absent.	Check ac power cord is plugged into the wall receptacle. Check set power switch is ON. Check set fuses F1, F2, F3, and F4 with power off. Check all cable connectors and circuit cards are secure. Check 115 v ac across TB2 terminal board posts 8 and 9. Check voltage across the following power supply TB1 terminal board posts: +5 v dc across 1 and 5, -12 v dc across 3 and 5, and +12 v dc across 4 and 5.
2	a. All control panel lamps do not light. b. Individual lamps fail.	Check voltage as in trouble no. 1. Replace defective lamp. Check wiring to lamps.
3	Copylights do not light.	Replace defective lamp(s). Check 115 v ac across TB2 terminal board posts 4 and 5. Check 5-1/2 v ac across TB2 terminal board posts 1 and 2. Check 24 v ac at TB1 terminal board post 4 and wiring field post F14 if absent, replace Receiving Device card (Z207).
4	Typing Unit motor does not start.	Check 115 v ac across TP2 terminal board posts 4 and 5. Check for 24 v dc at TB1 terminal board post 4 and wiring field post F14 if absent, replace Receiving Device card (Z207). Depress red overload button (along side of motor). Replace Receiving Device card (Z207). Replace Timer and Interface card (Z08).
5	KYBD E.O.L. lamp does not light properly or is not turned off by only RETURN or NEW LINE.	Replace Keyboard Control and Character Counter cards and/or Counter Control card (Z10 and Z06). Check optional straps on Counter Control card for 80 character line length. See trouble no. 2.
6	Character counter counts control characters or DELETE characters causing KYBD E.O.L. lamp to light.	Replace Character Counter card and/or Counter Control card (Z10 and Z06). See trouble no. 12.

NO.	TROUBLE	CORRECTIVE PROCEDURE
Keyboard		
7	Garbled or no copy from keyboard.	Check that YESU switch is at LOCAL. Check that all connectors are in place and that proper cards are in YESU. Check Keyboard Trip Arm adjustment. Check voltage as in trouble no. 1. Check keyboard contacts for dirt. Replace Keyboard Control card (Z10) and/or Receiving Device card (Z207) and/or Distributor card (Z09). Check trouble no. 12.
8	Keyboard fails to trip, double trips, or runs continuously.	Check that "H" plate and spring are on keyboard trip arm. Check Keyboard Trip Arm adjustment. Check Reset Mechanism Trip Lever adjustment. Check Reset Mechanism Clutch Shoe Lever adjustment. Check universal codebar and tie link operation.
9	Keytop binds.	Check for broken keytop guideplate, displaced keylever or return spring underneath the keyboard frame or bind in action of codebars and "Tee" levers.
10	Fully depressed keytop fails to generate repeat characters.	Check for presence of optional nonrepeat clip (in frame under keylevers). Check for bind in keytop. Check for bind in universal tie link and/or nonrepeat lever.
11	Keyboard nonoperative with typing unit motor running.	Check and engage, if necessary, intermediate gear overload clutch.
12	Copy errors. Many characters garbled.	Check that contact wires are properly located on "Tee" levers. Remove keylever guideplate and check that all codebars and their tie links are engaged with "Tee" levers. Check Keyboard Trip Arm and Keyboard Reset Mechanism Trip Lever adjustments. Check that keyboard contacts are clean. Replace Keyboard Control card (Z10). Check trouble no. 7.
	No upper case characters.	Check shift codebars and associated contact wires.
	No control characters.	Check control codebar and associated contact wires.

NO.	TROUBLE	CORRECTIVE PROCEDURE
Typing Unit Note 1: Disable retraction mechanism (by strapping back the reset slide) for manual operation. Note 2: If after isolating a trouble and meeting the required adjustment, the trouble is still present, check associated springs per their individual requirement.		
13	Selector Mechanism	
	a. Garbling at selector.	Check range finder setting. Check for loose selector magnet wires and/or connectors. Check for missing springs in selector. Check for dirt or oil on selector magnet armature. Check Selector Magnet Bracket adjustment. Check armature extension for cracks. Replace Distributor and/or Receiving Device cards (Z09, Z207).
	b. Typing unit running open (armature remains unattracted).	Check range finder setting. Check for 500 ma at selector magnet terminals. Check Selector Magnet Bracket adjustment. Replace Receiving Device card (Z207).
	c. Typing unit locked up marking (armature remains attracted).	Check range finder setting. Check Armature Downstop Bracket adjustment. Check Selector Magnet Bracket adjustment. Replace Receiving Device card (Z207).
14	Codebar Mechanism	
	a. Garbling at codebars (codebar shiftbars positioned incorrectly).	Check code in selector. Check typebox arrangement chart to determine correct pallet is selected for codebars positioned. See Figure 2. Check Codebar Shift Lever and Cam Follower Arm adjustment. Check Front and Rear Codebar Shift Levers adjustment. Check Intermediate Arm Backstop Bracket adjustment.
	b. Selected codebars not positioned.	Check Front and Rear Codebar Shift Lever adjustment. Check the position of the TP156301 retaining plate. Check operation of the retraction mechanism.
	c. Codebars bouncing back after being selected.	Check Codebar Detent adjustment. Check operation of retraction mechanism.

NO.	TROUBLE	CORRECTIVE PROCEDURE
Typing Unit (Continued)		
15	Positioning	
	a. Horizontal – Typebox positioning incorrectly (wrong column).	Check typebox arrangement chart (Figure 2) to determine code and location of character being printed versus character selected. Check code in selector and codebars. Check alignment of the codebar forks on codebars nos. 1, 2, 3, and 4 with their clutch trip levers. See Figure 4. Perform horizontal positioning clutch test (Table A) to isolate clutch(es) not tripping.
	b. Horizontal – Character misalignment (incorrect spacing between characters).	Perform typebox alignment test in Table B. Perform typebox horizontal motion test Table D. Check Oscillating Arm Detent Disc Phasing adjustment. Check Horizontal Aggregate – Dampener Synchronization adjustment. Check Coordinating Cables adjustment. Check Print Hammer Position adjustment. Check Print Hammer Latch adjustment. Check Spacing Gear Phasing adjustment. See trouble no. 16b.
	c. Vertical – Typebox positioning incorrectly (wrong row).	Check typebox arrangement chart to determine code and location of character being printed versus character selected (Figure 2). Check code in selector and codebars. Perform Vertical Positioning Clutch Test in Table C, to isolate clutch(es) not tripping. Check Vertical Clutch Bite adjustment. Check alignment of the bellcranks to codebars nos. 5, 6, and 7. See Figure 4. Check Vertical Print Hammer Alignment adjustment.
	d. Vertical – Character misalignment.	Check Vertical Clutch Bite adjustment. Check Vertical Aggregate – Dampener Synchronization adjustment. Check Print Hammer Latch adjustment.
16	Spacing	
	a. No spacing.	Check Trip Shaft Cam Follower adjustment. Check Spacing Clutch Trip Lever adjustment.
	b. Improper spacing between characters.	Perform Character Spacing Test (Table E). Check for missing spacing pawl spring. Check Spacing Gear Phasing adjustment. Check Spacing Clutch Trip Lever adjustment. Check Typebox Rail Alignment adjustment. Check Coordinating Cable adjustment. See trouble no. 15b.

NO.	TROUBLE	CORRECTIVE PROCEDURE
Typing Unit (Continued)		
16 (contd)	c. Continuous spacing.	Check Spacing Clutch Trip Lever adjustment.
	d. Improper spacing at left hand margin.	Check Left Hand Margin adjustment.
17	Printing	
	a. No printing.	Check code in selector and codebars. See Figure 3. Check Trip Shaft Cam Follower adjustment. Check Print Clutch Trip Arm adjustment. Check Square Shaft Drive Arm adjustment. Check Print Hammer Latch adjustment.
	b. Improper printing.	Check code in selector and codebars. See Figure 3. Use typebox arrangement chart to determine code and location of character being printed versus character selected. See trouble nos. 14a, 15a and c, and 17a, c and d.
	c. Printing one horizontal character off.	Check Typebox Arrangement Chart to determine code and location of character being printed versus character selected. Perform Horizontal Positioning Clutch test (Table A). Check Print Hammer Latch adjustment. Check Print Hammer Position adjustment.
	d. Printing one vertical character off.	Check Typebox Arrangement Chart to determine code and location of character being printed versus character selected (Figure 2). Check Vertical Print Hammer Alignment adjustment. Check Print Hammer Latch adjustment.
	e. Character density uneven (top or bottom).	Check Typebox Alignment adjustment. Check Vertical Print Hammer Alignment adjustment. Check Ribbon Retract Position adjustment. Check Ribbon Print Position adjustment. See trouble no. 20c. For a typebox providing light density on the top of a printed character; adjust typebox plate tab (located on the bottom of the typebox) by slightly bending tab towards the rear of the typing unit. For light density on the bottom of a printed character; adjust typebox plate tab (located on the bottom of typebox) by slightly bending tab towards the front of the typing unit. CAUTION: OVERBENDING OF THE TAB CAN RESULT IN BREAKAGE.

NO.	TROUBLE	CORRECTIVE PROCEDURE
Typing Unit (Continued)		
17 (contd)	f. Breaking off type pallets.	Check Retraction Reset Slide adjustment. Check Stop Plate adjustment. Check Print Hammer Position adjustment. Check Vertical Print Hammer Alignment adjustment. Check Print Hammer Latch adjustment. Check Vertical Aggregate – Dampener Synchronization adjustment. Check Aggregate – Dampener Sychronization adjustment.
	g. Print position pointer binding.	Check Pointer Clearance adjustment.
	h. Print position pointer improperly aligned.	Check Print Position Pointer adjustment.
	i. Left hand margin not aligned.	Check Left Hand Margin adjustment. Check Dashpot and Side Vent Screw adjustment.
	j. Improper or no automatic carriage return mechanism operation or right hand margin not aligned.	Check Automatic Carriage Return Line Feed Mechanism adjustment. Check to see if the transfer lever in back of the spacing drum is engaged with the fork of the no. 11 blocking bar (codebar).
18	Functions	
	a. No functions.	Check code in selector and codebars. See Figure 3. Check stunt box slot for operation of selected function. Check Trip Shaft Cam Follower adjustment. Check Function Clutch Trip Arm adjustment. Check Stripper Blade adjustment. Check Function Reset Bail Blade adjustment.
	b. Improper function.	Check code in selector and codebars. See Figure 3. Check stunt box slot for operation of selected function. Check function bars for coding and/or broken tines.
	c. No line feed.	Check selection in selector, codebars, and stunt box. Check Line Feed Clutch Trip Lever Adjusting Screw adjustment. Check Line Feed Clutch Trip Lever Eccentric Post adjustment.
	d. Improper line feed.	Check Line Feed Clutch Phasing adjustment.
	e. Continuous line feed.	Check Line Feed Clutch Trip Lever Adjusting Screw adjustment. Check Line Feed Clutch Trip Lever Eccentric Post adjustment.

NO.	TROUBLE	CORRECTIVE PROCEDURE
Typing Unit (Continued)		
18 (contd)	f. No carriage return.	Check code in selector and codebars. See Figure 3. Check position of carriage return lever to the carriage return latch.
19	Retraction Improper or no typebox retraction.	 Check Retraction Reset Shaft adjustment. Check Retraction Slide adjustment. Check Blocking Pawl adjustment. Check Ratchet Stop adjustment. Check Stop Plate adjustment.
20	Ribbon	
	a. Ribbon not advancing.	Check Ribbon Feed Pawl Drive Clamp (Right and Left) adjustment. Check Ribbon Feed Brackets (Right and Left) adjustment.
	b. Ribbon not reversing.	Check Connecting Rod (Final) adjustment. Check Ribbon Feed Brackets (Left and Right) adjustment. Check Feed Pawl Drive Clamp (Right and Left) adjustment. Check-Check Pawl (Right and Left) adjustment.
	c. Printed character incomplete.	Check Ribbon Guide to Platen adjustment. Check Ribbon Feed Bracket (Right and Left) adjustment. Check Ribbon Retact Position adjustment. Check Ribbon Print Position adjustment. Check Oscillator Downstop adjustment. See trouble no. 17e.
	d. Will not shift into red position.	Check that the CONTL BLACK switch is not depressed. Check Ribbon Print Position – Red adjustment. Check Magnet Assembly (Armature Attracted) adjustment. Check Magnet Assembly to Blocking Slide adjustment. Check magnet wire connection. Replace Two-Color Ribbon circuit card Z107. Check for operation of switch in stunt box at each control and delete character. See trouble no. 26.
	e. Will not shift into black position.	Check Ribbon Print Position – Black adjustment. Check Magnet Assembly (Armature Not Attracted) adjustment. Replace Two-Color Ribbon circuit card Z107. Check magnet wire connection. Check for ground on EIA connector terminal 25.

NO.	TROUBLE	CORRECTIVE PROCEDURE
Typing Unit (Continued)		
21	Print Indicator a. Improper vertical alignment. b. Improper horizontal alignment.	 Check Vertical Position of Indicator Bracket adjustment. Check Horizontal Position of Indicator Bracket adjustment.
22	No local paper advance.	Check Local Line Feed Bail adjustment in Section 574-326-703.
23	No local carriage return.	Check Local Carriage Return Bail adjustment in Section 574-326-703.
24	Motor and copy lamps are not turned on by operation of the test board switches that activate the TTY set.	If a ground is not supplied on EIA lead no. 6, then this is due to a trouble in the test board. Refer to the schematic diagrams for the test board. If a ground is supplied on EIA lead no. 6 then replace Timer and Interface card (Z08) or Receive Device card Z207. Check that the Request To Send and Data Terminal Ready (EIA leads no. 30 and 31) are connected to +5 volts through resistance and that Ring Indicator and Clear To Send (EIA leads no. 28 and 27) are connected to ground through resistance. If not proper then replace Timer and Interface card Z08.
25	Depressing MOTOR OFF switch does not turn off motor during on-line mode of operation.	Check wiring of MOTOR OFF switch. Replace Timer and Interface card (Z08).
26	Parity errors not printed in red during on-line mode of operation with 918A Converter.	Check to see if ground is supplied by 918A Converter to EIA lead no. 25. If not supplied the trouble is in the 918A Converter. See trouble no. 20d. Replace Timer and Interface card (Z08).
27	Local station copies traffic sent to distant station during on-line mode of operation.	Check to see that ON LINE-LOCAL switch on YESU is at ON LINE position. Replace Timer and Interface card (Z08).

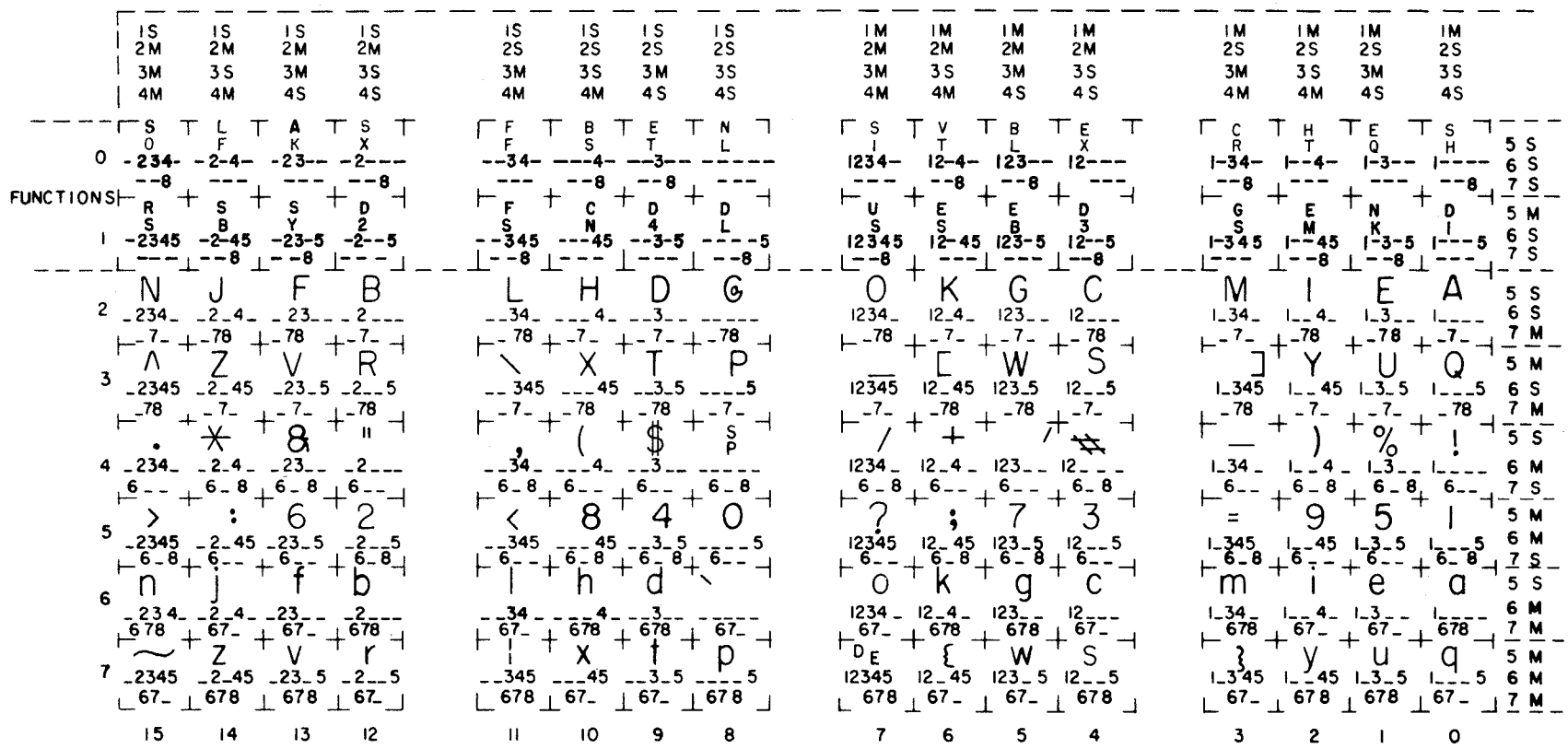
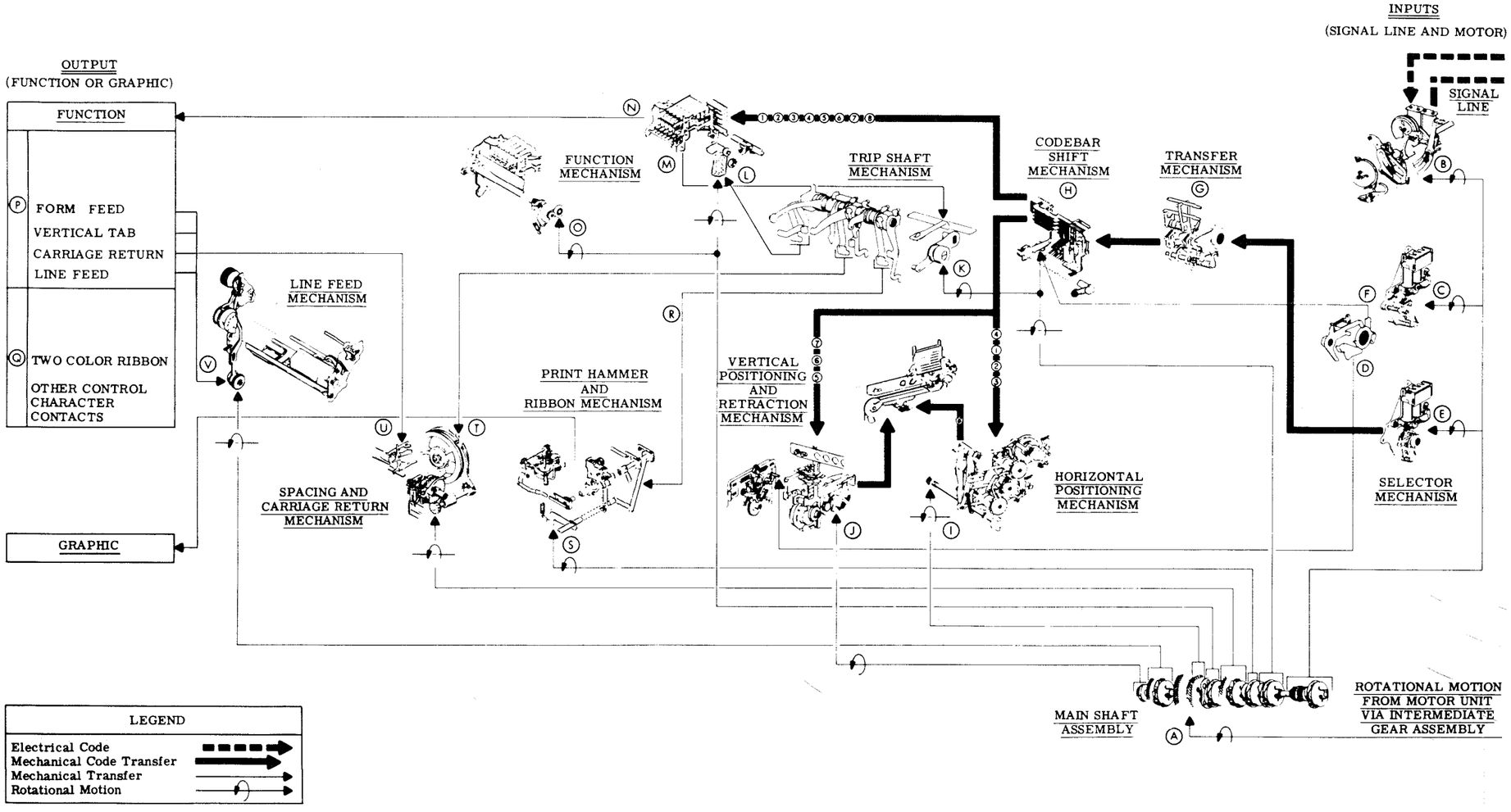


Figure 2 - 8-Row Typebox Arrangement

Note: Typebox arrangement ASCII 68 (American National Standard Code for Information Interchange) as viewed from print hammer.



OPERATION

Ⓐ Main shaft continuously rotating. Main shaft driven gear, positioning drive gears, and clutch drums pinned to main shaft. Cams and gears not pinned to shaft, engage as each associated clutch is released.

Ⓑ Character start bit (always spacing) permits selector cam sleeve to engage rotating main shaft.

Ⓒ Strip previous character from push levers.

Ⓓ Strip count on retraction mechanism.

Ⓔ Sequentially operate selector levers to arrange character in push levers.

Ⓕ Trip codebar mechanism.

Ⓖ Transfer positions of push levers to codebar shiftbars.

Ⓗ Shift code information from codebar shiftbars to codebars.

Ⓘ Codebars ④, ①, ②, and ③ select one of sixteen vertical rows of type pallets. Positions typebox horizontally.

Ⓙ Codebars ⑤, ⑥, and ⑦ select one of eight horizontal rows of type pallets. Positions typebox vertically.

Ⓚ First indent of trip shaft cam engages function mechanism. Second indent engages print hammer and ribbon mechanism clutch and spacing mechanism clutch.

Ⓛ Function bars sense tines behind codebars ①, ⑦, ③, ④, ⑤, ⑥, ⑦, and ⑧. (First indent of trip shaft cam.)

Ⓜ If character is a function, inhibit print hammer and spacing mechanism.

Ⓝ Selected function bar initiates function.

Ⓞ Strip selected function bar.

Ⓟ Basic unit functions.

Ⓠ Variable feature functions.

Ⓡ If character is a graphic, release print hammer and ribbon mechanism. (Second indent of trip shaft cam.)

Ⓢ Trip print hammer and advance ribbon.

Ⓣ Space print hammer and typebox carriage. (Second indent of trip shaft cam.)

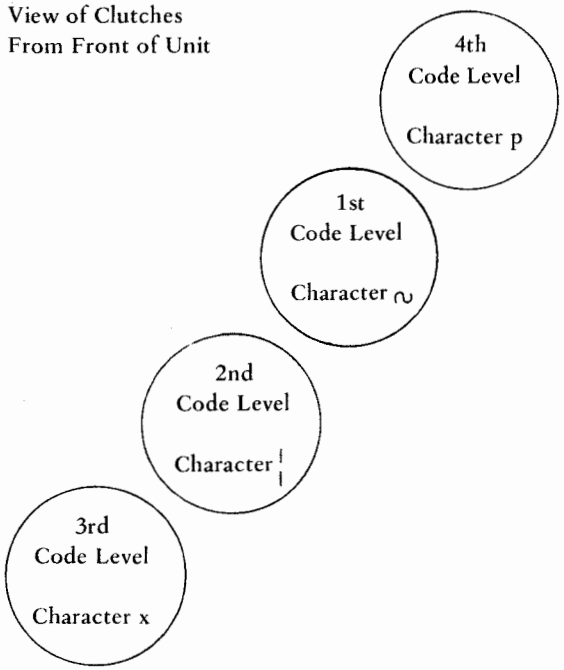
Ⓤ Function allows print hammer and typebox to return to left margin.

Ⓥ Function engages line feed clutch to advance platen.

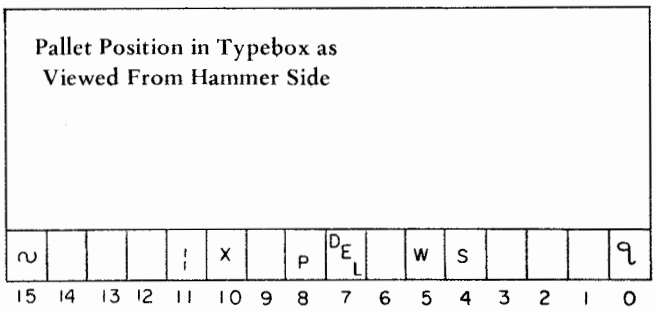
Figure 3 - Typing Unit Operation

HORIZONTAL CLUTCH POSITIONING TEST

View of Clutches
From Front of Unit



TYPEBOX



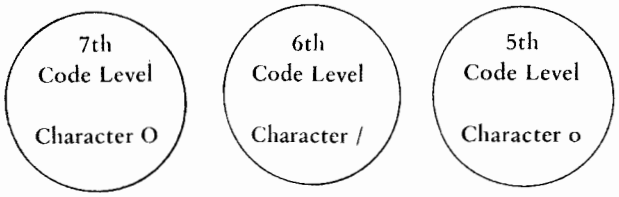
Horizontal Clutches Tripped –
1, 2, 3 & 4 – DEL
4 – w
3 & 4 – s
2, 3 & 4 – q

If selected clutch trips, but incorrect character is printed, check for proper typebox arrangement (**Figure 2**) and check Print Hammer **Position adjustment. See trouble no. 15 and 16.**

If selected clutch does not trip, check selected codebars and push levers.

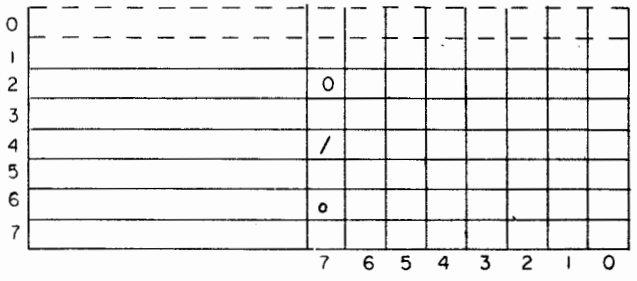
VERTICAL CLUTCH POSITIONING TEST

View of Clutches on Side of Unit



(Front of Unit)

TYPEBOX



If selected clutch trips, but incorrect character is printed, check Vertical Print Hammer Position adjustment. (See trouble no. 15.)

If selected clutch does not trip, check selected codebars and push levers.

Figure 4 - Horizontal and Vertical Clutch Positioning Tests

The following analysis is to verify proper clutch operation in the horizontal and vertical positioning mechanisms, typebox alignments, and spacing. Disable the retraction mechanism and alternately select each of the paired characters shown – produce a "rolling" action (example: to check no. 1 clutch, select Rubout ~ Rubout ~ – etc). Observe indicated clutch(es) operation, typebox alignment(s) and character spacing in the following tables. Perform all actions at least three times.

TABLE A

HORIZONTAL POSITIONING CLUTCHES								
Depress Keytop	SHIFT Delete	SHIFT ^	SHIFT ^	SHIFT \	SHIFT \	UNSHIFT X	UNSHIFT X	UNSHIFT P
Character Selected	Rubout	~	~	|	|	x	x	p
Clutch Being Checked	1M	1S	2M	2S	3M	3S	4M	4S

Note: If the above clutches do not trip, check the following troubles, no. 13a, 14a and b, and 15a.

TABLE B

TYPEBOX ALIGNMENT - HORIZONTAL MOTION		
Depress Keytops	SHIFT A	SHIFT N
Character Selected	A	N

Note: If the above alignment is off check the following troubles, no. 15b, 16b, and 17c.

TABLE C

VERTICAL POSITIONING CLUTCHES						
Depress Keytop	UNSHIFT Space	UNSHIFT 0	UNSHIFT ^	SHIFT ^	CONTROL RS	UNSHIFT ^
Character Selected	Space	o	^	~	None	^
Clutch Being Checked	5S	5M	6S	6M	7S	7M

Note: If the above clutches do not trip, check the following troubles, no. 13a, 14a and b, and 15c.

TABLE D

TYPEBOX ALIGNMENT – HORIZONTAL MOTION-VERTICAL CORRECTION		
Depress Keytops	SHIFT E	UNSHIFT U
Character Selected	E	U

Note 1: Disable the retraction mechanism and alternately select each of the paired characters shown for one complete line length.

Note 2: Check the right and left halves of the page separately. The characters must be evenly spaced as gauged by eye.

Note 3: If the characters are offset as follows: E UE UE UE, the U is misplaced to the right; see Typebox Rail Final adjustment.

Note 4: If the characters are offset as follows: EU EU EU EU, the U is misplaced to the left; see Typebox Rail Final adjustment.

TABLE E

CHARACTER SPACING (For One Complete Line Length)		
Depress Keytop	UNSHIFT X	
Character Selected	X	XXXXXXX

Note: The characters should be evenly spaced as gauged by eye. If not evenly spaced see trouble no. 16b.

Use the following message for FINAL TEST:

ThE qUiCk BrOwN fOx JuMpEd OvEr ThE lAzY dOg'S bAcK 123456789 tImEs.