37 RECEIVE-ONLY (RO) TELETYPEWRITER SET

NO. 1 ESS-ADF (ADNET) AND 85/86 SELECTIVE CALLING SERVICE

TROUBLESHOOTING

CONTENTS PAGE

1. GENERAL

1.01 This section provides troubleshooting information for the 37 Receive-Only (RO) Teletypewriter Set which is used in No. 1 ESS-ADF (ADNET) and 85/86 Selective Calling Service.

1.02 The RO teletypewriter is capable of operating as a primary receiver (Figure 1) or as an auxiliary receiver (Figure 2). To become a functional station, the RO must interface with the communications channel. A Data Auxiliary Set (DAS) 820-type station controller equipped with a 108A, 108E, 109A, or 109E Data Set must be used in conjunction with the proper DAS 804R-type Attendant Set. The station application and station arrangement determine the type of station controller, attendant set, and specific cable assemblies required.

1.03 The RO teletypewriter logic interfaces the typing unit to the station controller or primary receiver, provides motor control and controller interface signals indicative of RO status. The station controller with its associated attendant set performs the necessary line and supervisory control functions for the station. The station controller also provides regeneration of incoming signals. When used as an auxiliary receiver, the RO receives its signals from the primary receiver. Interfacing to this primary receiver requires the use of an auxiliary cable assembly.

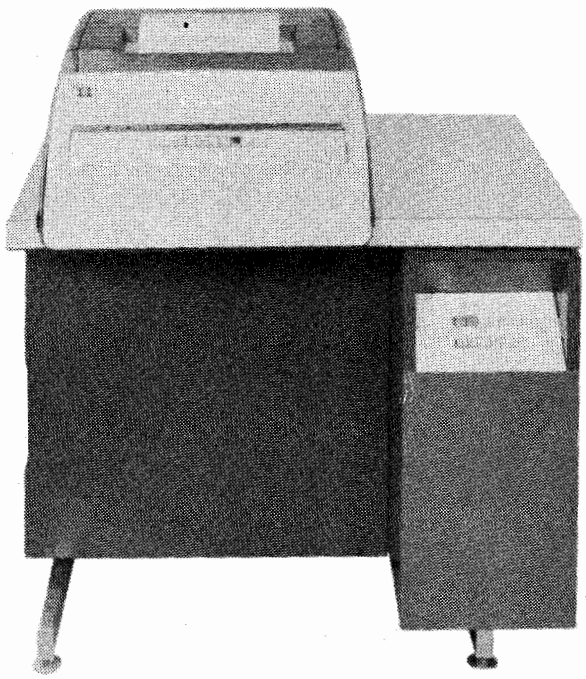


Figure 1 - 37 RO Teletypewriter Set Primary Receiver (with DAS 804R-type Attendant Set)

Prepared for American Telephone and Telegraph Company by Teletype Corporation

1.04 An interface cable (part of RO) and associated 50-pin micro-ribbon connector (P303) is provided for interfacing the RO teletypewriter to its associated 820-type station controller. The proper interface scheme is determined by the station arrangement. Refer to BSTSEA, Volume 1, for complete materials lists for 85A2, 86A2, and 86B2 station control units, cabinets, associated attendant sets, cable assemblies, and proper interfacing scheme.

1.05 The information in this section includes test procedures to check set operation after installation, 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 set does not operate correctly. The trouble analysis reference enables the craftsman to analyze specific troubles, and either gives a direct correction or references a specific adjustment found in an appropriate adjustment section.

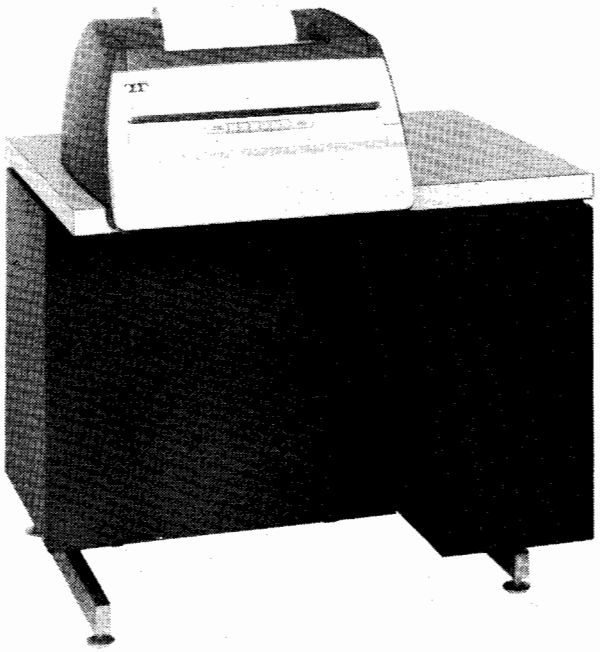


Figure 2 - 37 RO Teletypewriter Set Auxiliary Receiver

1.06 The trouble call analysis procedure that is normally followed during a trouble call is shown in Figure 3. The test room has sectionalized the trouble and the tests indicate the trouble to be at the station. The report is given to a station craftsman who follows the procedures in Figure 3.

1.07 The information in this section contains test procedures which check teletypewriter set operation while disconnected from the station controller, attendant set, or auxiliary receiver.

1.08 Perform each operating test step by step. If the set does not operate properly and a correction is not given in Trouble Analysis, consider the following:

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

(b) Replace defective apparatus.

(c) Repair component using associated BSPs and wiring diagrams.

(d) Temporarily restore any partial service if possible.

Note: Test Procedures (Part 4) is divided into two subparts:
1. Set Logic
2. Typing Unit
Use the subpart division and analysis appropriate to the trouble area being checked.

1.09 An RO set requires routine maintenance which consists of periodic lubrication of the teletypewriter set components. After 300 to 500 hours of operation, the unit should be relubricated to make sure all operating points receive lubrication. At this time all clutch gaps should be rechecked to insure that the gaps have not opened up after all parts have seated themselves. Refer to typing unit adjustment Section 574-320-703 for requirements. Thereafter, the teletypewriter set should be lubricated every 1500 hours of operation or 6 months, whichever occurs first. These figures are for normal operating conditions. More frequent servicing may be required for other than normal operating conditions. See the component lubrication sections for complete lubricating information.

Note 1: Gold-plated contacts should be cleaned at time of lubrication. The interval may be reduced, depending upon the signal circuit configuration, usage, and environment.

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.

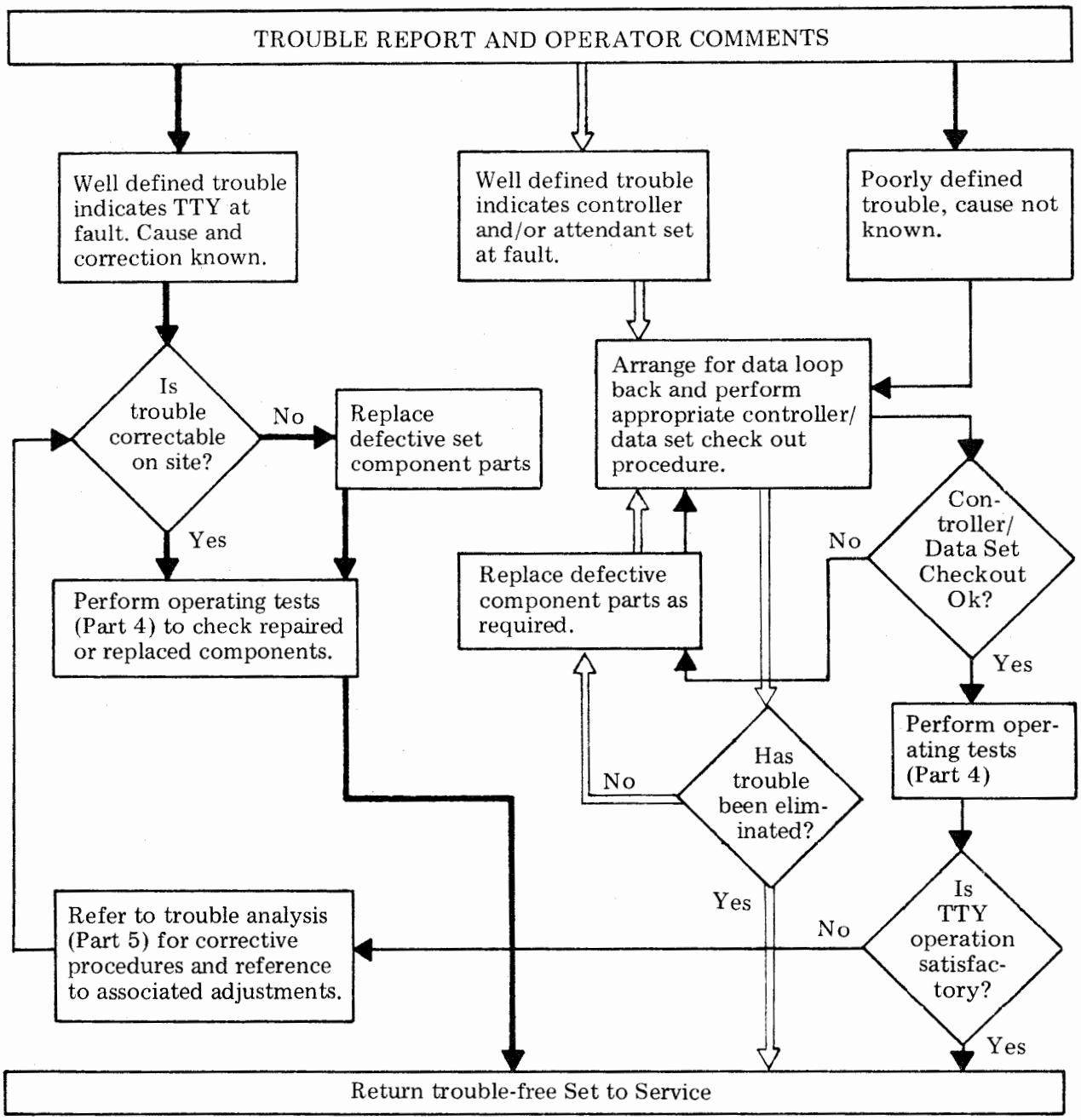


Figure 3 - Trouble Call Analysis Flow Chart

1.10 To gain access to the typing unit for lubrication and adjustment, the cover must be raised or removed. For information on this operation and other component removal and replacement information, see Section 574-300-702. Disassembly and reassembly procedures for component mechanisms are given in the appropriate disassembly and reassembly sections.

1.11 Some of the conditions which may be encountered in the troubleshooting procedures are explained below.

1.12 An open condition refers to a circuit through which current will not flow because of a broken or poor connection, defective contact mechanism, or defective semiconductor device. When a normally open circuit has current flowing through it, a shorted or closed condition exists which may be caused by a sticking or improperly adjusted contact mechanism, or a shorted semiconductor device.

1.13 Running open is an abnormal condition created by a continuously spacing selector which causes continuous operation of the typing mechanism. Since there is no stop bit, the selector clutch does not latch.

1.14 Running closed is an abnormal condition characterized by the selector armature held continuously marking, failing to respond to a signal. The cause may be missing start and spacing bits in the signal, or mechanical failure.

1.15 Mark hold is a normal typing unit condition during an idle line or no signal input condition. The selector armature is attracted, all clutches are latched, and the typing and function mechanisms are at rest.

1.16 Garbling is an abnormal condition in which the response of the typing and function mechanisms does not correspond with the signal input.

1.17 The test equipment used to properly troubleshoot the RO set is listed in Part 3, Test Equipment. Arrangements should be made to obtain pieces of the test equipment that might not be available at the repair site.

2. REFERENCES

Item	Number
85A2 Stations:	
Description and Operation	581-131-101
Installation	581-131-201
Maintenance	581-131-301
Test Procedures	581-131-501
86A2 Stations:	
Description and Operation	581-136-101
Installation	581-136-201
Maintenance	581-136-301
Test Procedures	581-136-501
86B2 Stations:	
Description and Operation	581-136-103
Installation	581-136-203
Maintenance	581-136-303
Test Procedures	581-136-503
Adjustments:	
Motor	570-220-700
Typing Unit	574-320-703
Table	574-323-703
Typing Unit Cover	574-326-703
Base	574-331-100
Disassembly and Reassembly:	
Removal and Replacement of Components (RO Set)	574-300-702
Typing Unit	574-320-705
Lubrication:	
Motor	570-220-701
Typing Unit	574-320-704
Typing Unit Cover	574-326-704
Base	574-331-100
Wiring Diagrams and Wiring Plans:	
Model 37 RO (YESU 815)	WDP0212
Model 37 Circuit Card Set for 85/86 Service	WDP0213
Control Panel Wiring and Labels	8791WD
RO Set Wiring Plan	W-E7RS1 (USOC)

Note: WDP refers to a Wiring Diagram Package. A WDP contains a group of WDs and SDs that are applicable to the circuit card set or teletypewriter set.

Assembly Drawings:	
37 RO Set	A-E7FS1 (USOC)

Item	Number
Material Lists:	
Primary 37 RO Set	M-E7RS1 (USOC)
Auxiliary 37 RO Set	M-E7RS2 (USOC)
Bell System Repair Specification (BSRS):	
General Requirements	456.051
Typing Unit	456.164
Electrical Service Unit	456.167
Cabinets and Tables	456.168
Station	456.942

3. TROUBLESHOOTING

3.01 The station test procedures listed in REFERENCES should be followed prior to and following installation on the customer premises. The test procedures in this section should also be used after routine or emergency maintenance service. After the required services have been completed, the station arrangement should be completely tested before returning to service.

3.02 Using the Trouble Call Analysis Flow Chart (Figure 3) as a guide, determine whether the problem lies in the teletypewriter set or the controller and attendant set. If the problem is in the teletypewriter set, disconnect the set from the controller and attendant set to perform the test procedures.

3.03 Several factors affect the response of the set at the interface connector. Before starting with the Test Procedures, consider the following:

(a) Strap Options — Numerous programmable strap options are incorporated in the RO logic circuits. These options affect the set and interface responses. Refer to W-E7RS1 wiring plan for proper strap option selection.

(b) Control Panel — The control panel wiring may vary, depending on whether or not an auxiliary receiver is used. Refer to 8791WD for proper control panel wiring.

SAFETY PROCEDURES

3.04 Before plugging the RO line cord into the wall receptacle, verify the outlet is properly wired. With the VOM on appropriate AC VOLTS range, check for any voltage between power ground and the outlet mounting screw. Sequentially decrease ac volts range to minimum while constantly monitoring the meter. If zero (0) volts is measured on all ac ranges, place VOM on low ohms range, and measure continuity between power ground and the outlet receptacle mounting screw. With the power ground pin hole on the right (as viewed from front of wall receptacle) verify 0 v ac between power ground and the bottom (wide) pin hole in outlet receptacle. Verify 115 v ac ±10% between power ground and the top (narrow) pin hole in outlet receptacle.

Note: When performing the above tests, avoid contact with the metallic portions of the meter leads and avoid shorting the leads together when measuring the hot side of the ac line.

All of the above tests can be performed by an ac line checker such as the Woodhead 1750 or Dearborn 5012B or equivalent.

3.05 DO NOT UNDER ANY CIRCUMSTANCES REMOVE OR INSERT CIRCUIT CARDS WITH POWER APPLIED TO THE SET. Failure to remove ac power from the set while changing circuit cards can destroy the logic card assemblies.

3.06 DO NOT UNDER ANY CIRCUMSTANCES DISCONNECT THE PRINTER BASE CONNECTOR WITH AC POWER APPLIED. This connector contains 115 v ac and could present a shock hazard or fuse blowing problem if touched or shorted to the base or cabinet/table assembly.

3.07 ALWAYS REMOVE THE AC POWER CORD FROM THE WALL OUTLET RECEPTACLE WHEN PERFORMING CONTINUITY OR RESISTANCE MEASUREMENTS. For meter protection, always discharge the filter capacitors in the power supply prior to any continuity or resistance measurements.

3.08 DO NOT UNDER ANY CIRCUMSTANCES INSERT OR REMOVE FUSES WITH AC POWER APPLIED TO THE SET. There is a possible shock hazard from metal parts on the fuse holder.

3.09 DO NOT UNDER ANY CIRCUMSTANCES SERVICE, LUBRICATE, OR ADJUST ANY ELECTROMECHANICAL DEVICES, MOTORS, OR GEARS WHILE THESE DEVICES ARE IN OPERATION. As an added precaution, remove rings and watches, and secure or remove any loose or dangling clothing

articles which could become entangled in mechanical assemblies or rotating devices. Because of the hazard presented by long hair, a hat, cap, or hair net should be worn where there is danger of hair entanglement in machinery having exposed rotating or moving parts.

INTERFACE PIN ASSIGNMENTS

3.10 The 37 RO interface pin assignments (P303 connector) are listed in Table A. The following nomenclature will be assigned to the interface and auxiliary receiver control signals.

HIGH = +5.0v dc to +5.5v dc = OFF = LOGIC LEVEL "SPACE"
LOW = 0v to +0.5v dc = ON = LOGIC LEVEL "MARK"
EIA MARK = -3.0v dc to -25.0v dc
EIA SPACE = +3.0v dc to +25.0v dc

3.11 The voltage levels present at the P303 connector interface leads are a function of the RO set logic, with the exception of Pin 43, Receive Data lead, and Pin 24, Motor Control lead. On the Primary RO receiver, Pin 43 and Pin 24 voltage levels are a function of the station controller, and on the Auxiliary RO receiver, Pin 43 and Pin 24 voltage levels are a function of the primary receiver logic. When the P303 connector is disconnected from the station controller or primary receiver, Pin 43 voltage level will be at ground, and Pin 24 voltage will be high.

3.12 The interface pin voltage level readings and the test procedures are intended to be made with the RO set disconnected from the station controller or primary receiver, ac power cord plugged in, and power turned on.

3.13 When 37 RO Teletypewriter is used as an auxiliary receiver, its control and data signal leads are not derived from the P303 interface connector of the primary receiver; but from the electrical service unit (ESU) of the primary receiver. To facilitate interconnection, an auxiliary cable (TP327881 or TP327882) is used. Table B contains a description and pin assignments for interfacing an auxiliary RO to the primary receiver.

TEST EQUIPMENT

3.14 To facilitate RO testing, a WECO W50A Cord should be used, providing access to all interface signals on the P303 connector. For these test purposes only, one connector on the W50A Cord is connected to the P303 connector, and the other connector is not used.

3.15 Typing unit problems occasionally require the use of a test sentence generator and/or distortion measuring equipment. A 911 Test Set is recommended for this purpose. If a typing unit trouble is not repairable on the customer premises or a 911 Test Set is not available, the typing unit should be replaced.

3.16 The test equipment recommended for troubleshooting the RO set is as follows:

(a) VOM (20K Ohm/Volt Minimum)
(b) Oscilloscope (if available)
(c) Data Source (150 wpm, 10 unit code) EIA Interface
(d) Patch Cords and WECO W50A Cord
(e) Clip Leads

4. TEST PROCEDURES

4.01 The Test Procedures contain a step by step test procedure and specify the action required for a specific verification or response. A trouble analysis column is provided in case the equipment does not function properly. The trouble analysis enables the repairman to analyze a specific trouble, and gives a corrective action or references a specific adjustment found in the appropriate adjustment section.

4.02 When used as a primary receiver, the teletypewriter signals can be checked at P303 interface connector. When used as an auxiliary receiver, the entire interface does not require testing since only a few selected interface signals control the auxiliary RO. If there is any question as to the RO application or station arrangement perform all logic tests.

4.03 The complete station arrangement should be tested prior to and after installation on customer premises using the station test procedure BSPs. Test Procedures in this BSP should be used for routine or emergency maintenance service. After maintenance services have been completed, the station arrangement should be completely tested before returning to normal service.

4.04 Operating tests for features not used may be omitted from the test procedures. Check the wiring plan and BSTSEA arrangements for the features and options used on your set.

TABLE A

PRIMARY RO SET INTERFACE

P303 PIN NO.	FUNCTION	COMMENTS
1, 2, 3	Circuit Ground	Common return path for all signal circuits.
14	Character Detected	Normally low; High to low transition occurring between the second bit and end of eighth bit, inclusive.
16	Send Data	Held permanently low in RO.
24	Motor Control	Run = Low; Stop = High
25	None	Spare (Floating)
27	Tab, Form-Feed in Process	For Friction Feed Printers without tabbing or form feed, this lead remains permanently high. For printers equipped with tabbing or form feed features, this lead switches low for duration of tab or form-feed in process.
30	Reader on, Taut Tape, Tape Available	Terminated to +5.25 v dc through a 680 ohm isolation resistor.
31	Paper Alarm	Normally high; low when low paper (Friction Feed) or Form Out (Sprocket Feed) condition exists.
33	Unattended	Held permanently low in RO.
34	Mode	Terminated to +5.25 v dc through a 680 ohm isolation resistor.
37	Tape Available	Held permanently low in RO.
42	Unattended	Held permanently low in RO.
43	Receive Data	MARK = -3.0 v dc to -25 v dc, SPACE = +3.0 v dc to +25 v dc
44	Form-Feed Detected	Always low for RO's not equipped with Form-Feed. Normally low (Printers with Form-Feed); high to low transition of approximately 20 milliseconds in duration upon stuntbox detection of Form-Feed.
50	Frame Ground	

TABLE B

AUXILIARY RO SET INTERFACE

AUX. RO P303 PIN	AUX. CABLE J303 PIN	FUNCTION	COMMENTS
1, 2, 3	1, 2, 3	Circuit Ground	Common return path for all signal circuits
24	24	Motor Control	Run = Low; Stop = High
25	25	Feed Out Request	See Note
27	27	Feed Out Indication	See Note
43	43	Receive Data	Mark = 0 v; Space = +5 v

Note: When a 37 RO is used as an auxiliary receiver, the interface signals on Pins 25 and 27 of P303 perform no useful station function. Therefore these leads do not require termination for proper auxiliary RO operation. Pins 25 and 27 of P303 are functional only when the auxiliary receiver is a 37 ROTR.

4.05 SET LOGIC OPERATING TESTS

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
	MOTOR CONTROL AND DC POWER		
1	After connecting P303 interface cable to the WECO W50A Cord, place the RO power switch (S101) in the NORMAL position.	Printer motor off. AUX RCVR lamp off, if so equipped.	1 2
2	Place S101 power switch in the ON position.	Printer motor on. Printer armature attracted. Copylamps on.	3 5,6,7 4
3	Operate AUX RCVR button, if so equipped or Remove paper supply.	AUX RCVR lamp on or PAPER ALARM lamp on.	5,8 5,9,97
4	Operate AUX RCVR button, if so equipped or Replace paper supply. Place S101 power switch in NORMAL position.	AUX RCVR lamp off or PAPER ALARM lamp off. Printer motor off.	10 11 1
5	Depress MOTOR ON button. Release MOTOR ON button.	Printer motor on. Printer armature attracted. Copylamps on. Printer motor off. Copylamps off.	5,12 5,6,7 12,13 14 14

4.05 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
6	Connect patch cord from pin 1 to pin 24, on the WECO W50A Cord.	Printer motor on. Copylamps on. Verify Aux Motor Control (XZ314 Pin 10) @ 0 volts.	5,15 16
	PRINT SUPPRESS AND FEED-OUT CONTROL		
7	Connect data source, if available, to jacks on ESU, "RECEIVE DATA" and "CKT GRD." Transmit DC2 control character followed by test message or Manually operate DC2 stuntbox contact YAZ Stuntbox — slot no. 10 YBB Stuntbox — slot no. 18 YBA Stuntbox — slot no. 18	Verify print, space, and function suppress following DC2.	17,18,19,20,41,61 21 or 22,95,96 21,22,95,96
8	If option strap E is open and option strap D is closed, proceed to Step 9. If option strap E is closed and option strap D open (Z314), proceed as follows: Transmit control character ETX followed by text or Manually operate ETX stuntbox contact YAZ Stuntbox — slot no. 11 YBB Stuntbox — slot no. 3 YBA Stuntbox — slot no. 3. Proceed to Step 10.	 Printer copies text. Feed-Out Request, XZ314 Pin B24 @ 0 v.	 17,18,19,20,41,61 23 or 24 25
9	Transmit control character DC4 followed by text or Manually operate DC4 stuntbox contact YAZ Stuntbox — slot no. 2 YBB Stuntbox — slot no. 2 YBA Stuntbox — slot no. 2.	Printer copies text. Feed-Out Request, XZ314 Pin B24 @ 0 v.	17,18,19,20,26 or 27, 41, 61 28
10	Momentarily connect Feed-Out Indication XZ314 Pin B27 to circuit ground XZ314 Pin B2 with clip lead. If RO is equipped with AUX RCVR button and strap B on Z314 is connected, proceed to Step 11, otherwise proceed to Step 13.	Feed-Out Request, XZ314, Pin B24 @ +5 v dc.	29

4.05 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
11	Operate AUX RCVR button. Transmit control character DC2 or Operate AUX RCVR button. Manually operate DC2 stuntbox contact. Transmit control character ETX (Strap E in) or DC4 (Strap D in) or Manually operate ETX or DC4 stuntbox contacts.	AUX RCVR lamp ON, XZ314, Pin B24 @ +5 v dc. XZ314 Pin B24 @ 0 v.	30 25,28
12	Momentarily ground XZ314 Pin B27.	XZ314 Pin B24 @ +5 v.	29
13	Transmit control character DC2 followed by text or Manually operate DC2 stuntbox contact.	Verify print, space and function suppress following DC2.	17,18,19,20,41,61 21 or 22,95,96 21 or 22,95,96
14	Remove patch cord from Pin 24 on WECO W50A Cord. Reconnect patch cord to Pin 24 of WECO W50A Cord and transmit test message.	Printer motor off. Copylamps off. Verify Auxiliary Motor, XZ314 Pin 10 @ 5 v dc. Printer motor on. Copylamps on. Verify Auxiliary Motor, XZ314 Pin 10 @ 0 v. Printer copies text.	 31 or 32
	AUXILIARY DATA CONTROL		
15	While transmitting a message to RO or If signal source is not available, connect XZ314, Pin B12 to XZ314 Pin B1 (Vcc) with clip lead. Remove strap between Pin B12 and Pin B1. If RO has AUX RCVR button proceed to Step 16, otherwise proceed to Step 17.	Printer receives correct message. Auxiliary Data (XZ314, Pin B11) @ 0 v, mark hold. Printer selector runs OPEN. Auxiliary Data (XZ314, Pin B11) @ 0 v, mark hold. Printer selector mark hold.	17,18,19,20,55 thru 93 33 34

4.05 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
16	While transmitting a test-message to RO operate AUX RCVR button.	Printer receives correct message. AUX RCVR lamp ON. Verify mark/space (0 v/5 v) Transitions on XZ314, Pin B11.	17,18,19,20,55 thru 93 35
	Operate AUX RCVR button or If signal source is not available, connect XZ314 Pin B12 to XZ314 Pin B1 (Vcc) with clip lead. Operate AUX RCVR button.	Printer receives correct message. AUX RCVR lamp OFF. Verify mark hold (0 v) on XZ314, Pin B11 or Printer selector runs open. AUX RCVR lamp on. Verify Auxiliary Data; XZ314, Pin B11, Spacing (+5 v).	17,18,19,20,55 thru 93 33 36
	Operate AUX RCVR button.	Printer selector runs open. AUX RCVR lamp off. Verify Auxiliary Data, XZ314 Pin B11, mark hold (0 v).	34
	Remove strap between Pin B12 and Pin B1.	Printer selector mark hold.	
17	Transmit DC2 followed by test message followed by DC4 or ETX (as applicable) followed by test message or	Following detection of DC2, verify mark/space (0 v/5 v) transitions on Auxiliary Data, XZ314 Pin B11. Following detection of DC4 or ETX (as applicable) verify mark hold (0 v) on Auxiliary Data, XZ314 Pin B11.	37
	Manually operate DC2 stuntbox contact YAZ Stuntbox — slot no. 10 YBB Stuntbox — slot no. 18 YBA Stuntbox — slot no. 18	Printer selector runs open. Verify Auxiliary Data XZ314 Pin B1i spacing (+5 v dc).	
	Momentarily connect XZ314 Pin B12 to Pin B1 (Vcc).		
	Remove above jumper strap between XZ314 Pin B12 and Pin B1.	Printer mark hold. Verify Auxiliary Data XZ314 Pin B11 mark (0 v).	
	Manually operate ETX or DC4 stuntbox contacts.		

4.05 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
17 (cont)	Momentarily connect XZ314, Pin B12 to Pin B1. Remove above jumper strap.	Printer selector runs open. Verify Auxiliary Data XZ314, Pin B11 mark hold (0 v). Printer selector mark hold.	
		SIGNAL BELL	
18	Manually operate bell stuntbox contact. YAZ Stuntbox — slot no. 12 YBB Stuntbox — slot no. 19 YBA Stuntbox — slot no. 19	Signal bell rings.	38
		FORM-FEED	
19	Printers equipped with YAZ Stuntbox or Printers equipped with YBB or YBA Stuntbox. Manually operate form feed contacts, slot no. 42 or Transmit form feed character to RO. Note: Printer is equipped with non-repeat form feed. Intervening line feed enables another form feed.	Pin 44 of WECO W50A Cord @ 0 v with respect to Pin 1. Verify 0 v/5 v/0 v transitions on Pin 44 of WECO W50A Cord with respect to Pin 1. Same as above. Verify function performed.	39 40 40,41
		TABULATION	
20	Printers equipped with YAZ stuntbox. Printers equipped with YBA and YBB Stuntboxes: Manually operate horizontal Tab stuntbox contact, slot no. 17 or Transmit horizontal tab to RO.	Verify +5 v dc on WECO W50A Cord Pin 27 at all times. Verify +5 v/0 v/+5 v transition on WECO W50A Cord pin 27 with respect to pin 1. Verify +5 v/0 v/+5 v transition on WECO W50A Cord Pin 27 with respect to Pin 1. Verify tabulation function is performed.	42 43 41,43

4.05 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
		PAPER ALARM	
21	Remove paper supply.	PAPER ALARM lamp on. PAPER ALARM on Pin 31 of WECO W50A Cord @ 0 v.	5,9,94 5,9,44,94
	Replace paper supply.	PAPER ALARM lamp off. Pin 31 of WECO W50A Cord @ +5 v dc.	11 11
22	With no data input.	Verify Pin 14 of WECO W50A Cord @ 0 v.	45
	Connect data source to jacks on ESU and transmit test message to RO or	Verify high going pulses (0 v/5 v/0 v) of at least 5 milliseconds duration on Pin 14 of WECO W50A Cord. The entire high going pulse should occur between the second and eighth bits of a character, inclusive.	46,47
	If no data source is available, connect XZ314 Pin B12 to Pin B1.	Printer selector runs open. Verify high going pulses (0 v/+5 v/0 v) of at least 5 milliseconds duration on Pin 14 of WECO W50A Cord. The entire high going pulse should occur between the second and eighth bits of a character, inclusive.	46,47
	Remove strap between XZ314 Pin B12 and Pin B1 (Vcc).	Printer selector mark hold. Verify Pin 14 of WECO W50A Cord @ 0 v.	45
23	If strap option C on Z314 is connected, perform the following test.		
	Remove paper supply. Connect data source to jacks on ESU and transmit test messages to RO or	Verify Pin 14 of WECO W50A Cord @ 0 v. Printer copies test message.	48
	Remove paper supply. If no data source is available, connect XZ314 Pin B12 to Pin B1.	Printer selector runs open. Verify Pin 14 of WECO W50A Cord @ 0 v.	48
	Remove strap between XZ314 Pin B12 and Pin B1 (Vcc).	Printer selector mark hold. Verify Pin 14 of WECO W50A Cord @ 0 v.	45

4.05 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
24	Monitor Pin 30 of WECO W50A Cord.	Verify +5 v dc.	5,49
25	Monitor Pin 34 of WECO W50A Cord.	Verify +5 v dc.	5,50
26	Monitor the following pins of WECO W50A Cord. Pin 16 Pin 42 Pin 33 Pin 2 Pin 37 Pin 3	Verify 0 v on all specified pins or Remove ac Power and check for continuity between Pin 1 of WECO W50A Cord and all specified pins.	
27	With ac power off, connect ohmmeter between Pin 50 of WECO W50A Cord and ESU frame.	Verify continuity between ESU frame and Pin 50 of WECO W50A Cord.	
	RED/BLACK PRINTING (Option)		
28	Transmit a test message to RO containing text ESC, 3, text, ESC, 4, text or Manually operate ESC 3 stuntbox contact. Manually operate ESC 4 stuntbox contact.	Verify text following ESC 3 is printed in red. Verify test following ESC 4 is printed in black or Two-color magnet energized (armature attracted). Two-color magnet not energized (armature retracted).	51,54,82,89 52,54,83,89 51 82 52 83
29	Manually operate ESC 3 stuntbox contact. Momentarily remove patch cord from Pin 24 of WECO W50A Cord. Reconnect patch cord to Pin 24 of WECO W50A Cord.	Verify Two-color magnet energized (armature attracted). Printer motor off. Copylamps off. Verify Two-color magnet deenergized (armature retracted). Printer motor on. Copylamps on.	53
30	Place S101 power switch in the OFF position and secure ESU in table assembly with mounting hardware.	Verify continuity between the outlet receptacle mounting screw and any unpainted metallic portion of the table assembly.	100

TYPING UNIT OPERATING TESTS

4.06 This section is primarily intended for functionally testing the printer prior to installation on customer premises. However, this section may also be used at the customer location if a test line and/or data source is available or if a well-defined printer problem leads the craftsman to a particular portion of this section.

4.07 For complete functional testing, the data source (150 wpm, 10 unit code) must be capable of transmitting control characters as well as printable characters. All control characters transmitted must be followed by an adequate number of delete fill characters providing the time required to perform the function. Refer to Section 574-320-703 for all printer adjustments.

4.08 The printer Trouble Analysis section contains a list of the most probable causes of printer malfunctions. Due to printer complexity, it is impossible to cover all possible failures and corrective actions required in this document. Therefore, if the malfunction and corrective action is not specified in this document or the corrective action required is not apparent to the craftsman in the field, the typing unit should be replaced.

4.09 TYPING UNIT OPERATING TESTS

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
1	Operate RETURN pushbutton.	Carriage moves to left margin.	55
2	Operate PAPER ADVANCE pushbutton.	Paper feeds out at three times normal rate.	56
3	Check ribbon feed and reversal in both directions, as reversing guide is manually operated while receiving data.	Ribbon will feed and reverse in both directions freely.	57
4	Send "QUICK BROWN FOX" test message to RO for at least ten lines.	Typing unit prints message. Characters evenly spaced. Left and right margins even and printer stops spacing at right margin.	17,18,19,20,55 thru 93 58,59,63 60,86
HORIZONTAL AND VERTICAL TAB (IF SO EQUIPPED)			
5	TELCO Adjustable Tab Stops (Printer With YBB Stuntbox Only) Manually clear all horizontal tab stops. Set new tabs at known points. Prepare test message containing H Tab, Delete, 1;H Tab, Delete, 2; etc. Carriage Return, Line Feed, Delete; or New Line, Delete; repeat.	Verify proper H Tab stops. Sample Copy 1 2 3 1 2 3 1 2 3	61,62,64,65,71

4.09 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
6	Manually clear all vertical tab stops. Set new stops at known points. Prepare test message containing X, V Tab, Delete; X, V Tab, Delete; etc. Carriage Return, Line Feed, or New Line, Delete. Repeat as required.	Verify proper V Tab stops Sample Copy X X X X X X X X X X X X If typing unit is not equipped with New Line feature (carriage return on V Tab). If typing unit is equipped with New Line feature (carriage return on V Tab).	61,62,64,66,71
	LINE CONTROL OF H TAB STOP AND V TAB STOP (IF SO EQUIPPED)		
7	H Tab Control (Printers With YBA Stuntbox Only) Manually set up H Tab stops at various points along platen. Depress RETURN pushbutton. Prepare test message as follows. Escape and No. 2 Delete, Carriage Return, Line Feed Delete or New Line Delete. 15 Spaces, Escape and No. 1 Delete, 15 Spaces, Escape and No. 1 Delete; 15 Spaces. Escape and No. 1 Delete, Carriage Return, Line Feed Delete, or New Line Delete, X, H Tab, Delete; X, H Tab, Delete; X, H Tab, Delete, X. Repeat entire test message as required.	Carriage moves to left margin. All H TABS cleared as carriage returns to right margin. Carriage return and line feed. H Tabs set @ character positions 15, 30, and 45. Carriage return and line feed. "X" printed in character positions 1, 15, 30, and 45.	55 67,68 61,62,64,71 69,70 61,62,64,71 61,65,69,70

4.09 Continued

STEP	ACTION	VERIFICATION	TROUBLE ANALYSIS REFERENCES
8	V Tab Control (Printers With YBA Stuntbox Only)		
	Manually set up V Tab stops at various points on tab wheel.	Carriage moves to left margin.	55
	Depress RETURN pushbutton.		
	Manually adjust V Tab wheel to coincide with first line of form.		
	Prepare test message as follows: Carriage Return, Line Feed Delete, or New Line Delete, Form Feed, Delete, Escape and No. 6, Delete.	Carriage return and line feed.	61,62,64
		Printer feeds out form.	61
		All V Tab stops cleared.	61,72,73
	1,2,3,4,5; Carriage Return, Line Feed, Delete, or New Line, Delete. Form Feed, Delete. Line Feed, Delete, Line Feed, Delete, Escape, No. 5 (5 times).	1,2,3,4,5 is printed. Carriage Return and Line Feed. Printer feeds out form. Verify V Tab set on lines 3,5,7,9,11 of form.	61,62,64 61 74,75
	1,2,3,4,5; Carriage Return, Delete, Form Feed, Delete. 1,2,3,4,5 V Tab, Delete; (repeat 1,2,3,4,5 V Tab, Delete — 6 times).	1,2,3,4,5 is printed. Carriage Returns. Printer feeds out form (positioned on first line of form). Sample Copy 12345 12345 etc. Note: If typing unit is equipped with New Line feature (Carriage Return on Line Feed) all typing will be at left hand margin: 12345 12345 etc.	76,77,78,79,80 61,62 61 66,76,77,78,79,80

5. TROUBLE ANALYSIS

CAUTION: BEFORE REMOVING A CIRCUIT CARD OR FUSES, TURN OFF S101 POWER SWITCH OR PULL POWER PLUG. DO NOT TURN ON POWER WITH A FUSE REMOVED.

5.01 The circuit card number includes its location in the ESU frame. Example, Z314 is located in vertical row 3 and horizontal position 14. When trouble shooting a logic level interface, an "off" state is indicated by approximately +5 v dc and an "on" state is indicated by 0 v to +0.5 v dc. Any signal level midway between indicates a defective circuit card.

5.02 SET LOGIC TROUBLE ANALYSIS

NO.	TROUBLE	CORRECTIVE PROCEDURE
1	Printer motor on with S101 in the NORMAL position.	Verify NORMAL position of S101. Check XZ314 Pin B9 for +5 v dc if XZ314 Pin B9 is at 0 v, see the following step. Verify presence of Motor On Normally Open (Y-BR) wire on XZ314 Pin B9. Verify motor start XZ314 Pin B8 @ +5 v. Replace defective RO Control Card (Z314).
2	AUX RCVR lamp on when ac power applied.	Replace defective RO Control Card (Z314).
3	Typing unit motor does not start with S101 in the ON position.	Verify S101 is in the ON Position. Check ac power cord is plugged into wall receptacle. Check F103 (4A.SL.BL) fuse in power supply. Check for 115 v ac between TB101 Pin 1 and TB101 Pin 7. Operate thermal overload reset on YMU2 motor assembly (red button). Check all wiring to YMU2 motor assembly. Check for defective spark suppressor between TB101 Pins 6 and 7. Replace defective YMU2 motor assembly.
4	Copylamps off with S101 in the ON position.	Verify S101 is in the ON position. Check ac power cord is plugged into wall receptacle. Check F103 (4A.SL.BL.) fuse in power supply. Continuity check copylamp bulbs. Check for 115 v ac between TB101 Pin 1 and TB101 Pin 7.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
4 (Cont)		Check for approximately 5.5 v ac between TB101 Pin 4 and TB101 Pin 5. Remove ac power, disconnect P103/J103 connector in power supply, and check continuity between J103 Pins 10 and 11. Measure approximately 1/2 to 1 ohm. Replace defective copylamp transformer (T102).
5	Proper voltages absent.	Check ac power cord is plugged into the wall receptacle. Verify +5 v dc on XZ314 Pin B1 and XZ315 Pin 1 with respect to XZ314 Pin B2 and XZ315 Pin 2. Verify +12.5 v dc (NOM) on XZ314 Pin B35 and XZ315 Pin 14 with respect to XZ315 Pin 2 and XZ314 Pin B2. Verify -12.5 v dc (NOM) on XZ314 Pin B36 and XZ315 Pin 14 with respect to XZ314 Pin B2 and XZ315 Pin 2. Check dc fuses F102 (+12.5 v 3A) and F101 (-12.5 v 2-1/2A). Note: -12.5 v dc is used as a reference for the EC150 power supply regulator. If F101 blows, F102 will blow due to regulator crowbar action. Check T101 ac primary fuse F104 (1A SL.BL.). If the -12.5 v dc and +12.5 v dc fuses repeatedly blow; remove RO set power cord from ac outlet. Discharge power supply filter capacitors, C101 and C102, through a resistor. With F101 and F102 removed, measure resistance between XZ314 Pin 36 and XZ314 Pin 2. Resistance measurement should be greater than 5 ohms. Also make resistance measurement between XZ314 Pin 36 and frame ground. Make resistance measurements between XZ314 Pin 35 and XZ314 Pin 2, also between XZ314 Pin 35 and frame ground. Resistance measurement should be greater than 4.2 ohms. If a short is located, remove XZ314 and XZ315 and repeat above measurements to determine if the ESU wiring or circuit cards are at fault. Remove power cord from wall receptacle, discharge filter capacitors C101 and C102 through a resistance, disconnect emitter of Q_1 power pass transistor from the EC150 card, disconnect the base of Q_3 current boost pass transistor from EC150 card, disconnect emitter of Q_3 from base of Q_1, and remove F102 dc

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
5 (Cont)		fuse. Check NPN transistors, Q_1 and Q_3, on low ohms range as follows. Check for diode characteristic between the base/emitter and collector/base junctions of Q_1 and Q_3. Note: Each PN junction must be checked for conduction in one direction only and blocking (high resistance) in the other direction by reversing ohmmeter leads. Also check for blocking (high resistance) between collector/emitter junctions of Q_1 and Q_3. Replace transistors as required. If Q_1 and Q_3 are ok, proceed as follows. Replace EC150 Regulator Circuit Card in power supply.
6	Printer runs open (armature remains unattracted)	Verify printer connector P306 plugged into J306. Verify Z315 (Receiving Device Card) properly seated in card connector XZ315. Check XZ315 Pin 5 for +5 v dc (mark hold). If XZ315 Pin 5 is at 0 v, check for short to circuit ground or frame ground. Replace RO Control Card, Z314. Check XZ315 Pin 6 for -12.5 v dc (NOM) with respect to Pin 2. If Pin 6 is at +12.5 v dc, replace Receiving Device Card, Z315. If Pin 6 is at -12.5 v dc, proceed as follows. Remove ac power, disconnect P306 and J306, and measure approximately 3.5 ohms between J306 Pin 1 and J306 Pin 3.
7	Printer runs open (armature attracted)	Check range finder setting. Check selector magnet bracket adjustment. Check selector clutch adjustments. Refer to Section 574-320-703.
8	AUX RCVR lamp (if so equipped) does not light when AUX RCVR button is operated.	Check for defective lamp. Check XZ314 Pin B15 for -12.5 v dc to +12.5 v dc transitions while operating AUX RCVR button. Remove power, check continuity between XZ314 B15 and S-BL colored wire on control panel connector. Reapply power, if removed, verify 0 v, on XZ314 Pin B17. Depress AUX RCVR button, verify +5 v dc on Pin B17.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
8 (Cont)		Verify +5 v dc on XZ314 Pin B16. Depress AUX RCVR button, verify 0 v on Pin B16. Check continuity to control panel connector. XZ314 Pin B17 to G-BL wire XZ314 Pin B16 to Y-BL wire. Replace RO Control Card, Z314.
9	PAPER ALARM lamp does not light when paper supply is removed.	Check for defective lamp. Check for -12.5 v dc to +12.5 v dc transitions on XZ314 Pin B29 while operating the LOW PAPER or PAPER OUT contact. Remove power, check continuity between XZ314 Pin B29 and BL-W wire control panel. Reapply power, if removed, verify +5 v dc on XZ314 Pin B19 on 0 v on XZ314 Pin B21 with simulated paper supply. With low paper or paper out condition, verify XZ314 Pin B19 @ 0 v and XZ314 Pin B21 @ +5 v dc. Check wiring to LOW PAPER or PAPER OUT switch. Replace defective RO Control Card, Z314.
10	AUX RCVR lamp will not turn off after being manually turned on.	Verify continuity between XZ314 B17 and circuit ground XZ314 Pin B2.
11	PAPER ALARM lamp will not turn off after paper supply is renewed.	Verify continuity between XZ314 B21 and circuit ground.
12	Printer motor will not turn on when MOTOR ON button is depressed.	Verify XZ314 Pin B9 is 0 v. Measure continuity between XZ314 Pin B9 and the Y-BR colored wire on the control panel connector. Verify approximately -11 v dc on XZ315 Pin 9 with respect to XZ315 Pin 2. If XZ314 Pin 9 is +12.5 v dc with MOTOR ON button depressed, replace Receiving Device Card, Z315. If XZ315 Pin 9 is @ -11 v dc, remove power and measure continuity between XZ315 Pin 9 and Pin 3 of K101 in the power supply. Replace K101 relay in power supply or replace power supply, if available.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
13	No copylamp control via MOTOR ON button.	If printer motor control with the MOTOR ON button is verified and copylamps remain off, proceed as follows. Remove and check copy lamp bulbs for continuity. Check for approximately 5.5 v ac between TB101 Pin 4 and TB101 Pin 5. Check for 115 v ac between TB101 Pin 1 and TB101 Pin 7. Replace copylamp transformer, T102, if 115 v ac is present on primary and 5.5 v ac is not present on secondary. If T102, copylamp transformer is ok; remove ac power, disconnect P103/J103 connector in power supply and check continuity between J103 Pins 10 and 11. Measure approximately 1/2 to 1 ohm.
14	Printer motor remains on after releasing MOTOR ON button.	Verify XZ314 Pin B9 @ +5 v dc. Verify XZ315 Pin 9 @ -11 v dc. Replace Receiving Device Card, Z315.
15	No interface printer motor control.	If printer motor control via the MOTOR ON button is verified, proceed as follows; verify 0 v on XZ314 Pin B8. If 0 v is present on XZ314 Pin B8, replace RO Control Card, Z314. If XZ314 Pin B8 is not at 0 v, remove power and check continuity between P303 Pin 24 and XZ314 Pin B8. Check continuity between P303 Pin 1 and XZ314 Pin B2. Check continuity of patch cord.
16	No interface lead Auxiliary Motor Control indication.	If printer motor control is verified at the WECO W50A Cord and Auxiliary Motor Control XZ314 Pin B10 remains high at all times, replace RO Control Card Z314.
17	Garbling at selector.	Check for dirt or oil on selector magnet armature. Check range finder setting (should not be near end of scale). Check Range Finder Knob Phasing adjustment. Check Selector Magnet Bracket adjustment. Check for missing springs in selector.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
17 (cont)		Check for loose selector magnet wires and/or printer connector. Check Intermediate Arm Latch Bail adjustment. Replace Z314 and/or Z315. Refer to Section 574-320-703.
18	Garbling at codebars. Codebar shiftbars position incorrectly.	Check selected levers in selector. Check Transfer Lever Eccentric adjustment. Check Intermediate Arm Backstop Bracket adjustment. Check Front or Rear Codebar Shift Lever adjustment. Refer to Section 574-320-703.
19	Selected codebars not positioned.	Check codebar shiftbar and codebar engagement. Check TP156301 retaining plate. Refer to Section 574-320-703.
20	Codebars bouncing back after being selected.	Check Codebar Detent adjustment. Check Retraction Mechanism adjustment. Refer to Section 574-320-703.
21	DC2 detected by printer but no Print Suppress function, if so equipped.	Check continuity between XZ314 Pin B28 and DC2 normally open contact in stuntbox. YAZ Stuntbox — slot no. 10 YBB Stuntbox — slot no. 18 YBA Stuntbox — slot no. 18 With DC2 contact operated, check continuity between XZ314 Pin B28 and XZ314 Pin B2. Refer to Section 574-320-703 for proper Print Suppress option adjustments. Check solenoid windings for continuity. Replace RO Control Card, Z314.
22	DC2 detected by printer but XZ314 Pin B34 remains @ 0 v (Printer not equipped with Print Suppress magnets).	Check continuity between XZ314 Pin B28 and DC2 normally open contact in stuntbox. YAZ Stuntbox — slot no. 10 YBB Stuntbox — slot no. 18 YBA Stuntbox — slot no. 18

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
22 (cont)		With DC2 contact operated, check continuity between XZ314 Pin B28 and XZ314 Pin B2. Replace RO Control Card, Z314.
23	ETX detected by printer but printer remains in Print Suppress mode.	Check continuity between XZ314 Pin B25 and ETX normally open contact. YAZ Stuntbox — slot no. 11 YBB Stuntbox — slot no. 3 YBA Stuntbox — slot no. 3 With ETX contact operated, check continuity between XZ314 Pin B25 and XZ314 Pin B2. Replace RO Control Card, Z314.
24	ETX detected by printer but XZ314 Pin B34 remains @ -12 v dc (printer not equipped with Print Suppress magnets).	Check continuity between XZ314 Pin B25 and ETX normally open contact. YAZ Stuntbox — slot no. 11 YBB Stuntbox — slot no. 3 YBA Stuntbox — slot no. 3 With ETX contact operated, check continuity between XZ314 Pin B25 and XZ314 Pin B2. Replace RO Control Card, Z314.
25	Feed-Out request not initiated by ETX.	Verify option strap E on Z314 is closed. Verify XZ314 Pin B28 and XZ314 Pin B27 are @ +5 v dc. Replace RO Control Card, Z314.
26	DC4 detected by printer but printer remains in Print Suppress mode.	Check continuity between XZ314 Pin B26 and DC4 normally open stuntbox contact. YAZ Stuntbox — slot no. 2 YBB Stuntbox — slot no. 2 YBA Stuntbox — slot no. 2 With DC4 contact operated, check continuity between XZ314 Pin B26 and XZ314 Pin B2. Replace RO Control Card, Z314.
27	DC4 detected by printer but XZ314 Pin 34 remains @ -12 v dc (printer not equipped with Print Suppress magnets).	Check continuity between XZ314 Pin B26 and DC4 normally open stuntbox contact. YAZ Stuntbox — slot no. 2 YBB Stuntbox — slot no. 2 YBA Stuntbox — slot no. 2 With DC4 contact operated, check continuity between XZ314 Pin B26 and XZ314 Pin B2. Replace RO Control Card, Z314.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
28	Feed-Out request not initiated by DC4.	Verify option strap D on XZ314 is closed. Verify XZ314 Pin B28 and XZ314 Pin B27 are @ +5 v dc. Replace RO Control Card, Z314.
29	Feed-Out indication fails to reset Feed-Out request to +5 v dc.	Replace RO Control Card, Z314.
30	AUX RCVR turning on or DC2 detected causes Feed-Out request (XZ314 Pin B24 @ 0 v).	Replace RO Control Card, Z314.
31	Motor off command from interface fails to remove Print Suppress indication. (solenoid energized).	If magnet remains energized (armature retracted), replace RO Control Card, Z314. If magnet is not energized (armature retracted), and printing remains suppressed, refer to Section 574-320-703 for proper adjustments.
32	Motor off command from interface fails to turn off print suppress magnet driver.	Replace RO Control Card, Z314.
33	Mark/space transitions on auxiliary data lead (XZ314 Pin B11).	Verify mark/space transitions on auxiliary data independent of on/off status of AUX RCVR lamp. Replace RO Control Card, Z314.
34	Auxiliary Data lead (XZ314 Pin B11) spacing (+5 v dc) with AUX RCVR lamp off.	Verify spacing (+5 v dc) condition independent of on/off status of AUX RCVR lamp. Replace RO Control Card, Z314.
35	No mark/space transitions on Auxiliary Data Lead (XZ314 Pin B11) with AUX RCVR lamp on.	Verify AUX RCVR lamp is on. Replace RO Control Card, Z314.
36	Auxiliary Data lead (XZ314 Pin B11) marking (0 v) with AUX RCVR lamp on.	Verify marking condition independent of on/off status of AUX RCVR lamp. Replace RO Control Card, Z314.
37	Improper control of Auxiliary Data lead. DC2 — Auxiliary Data (mark/space) transitions (0 v/5 v dc) or continuous spacing (+5 v). DC4 or ETX — No Auxiliary Data (mark hold) 0 v.	Replace RO Control Card.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
38	No signal bell.	Verify XZ314 Pin A32 @ 0 v with Bell stuntbox contact operated. Remove power and verify continuity between XZ314 Pin A32 and BELL normally open stuntbox contact. With contact operated verify continuity between XZ314 A32 and XZ314 B2. Check for -12.5 v dc on XZ314 Pin B33 when BELL normally open stuntbox contact is held operated. If XZ314 Pin B33 is @ +12.5 v dc, replace RO Control Card, Z314. If XZ314 Pin B33 is @ 0 v with BELL normally open contacts unoperated, remove power, remove brown wire on XZ314 Pin B33 and measure signal bell winding resistance of 110 ohms between brown wire and XZ314 B35. Replace Signal Bell.
39	Form-Feed at interface @ +5 v dc (YAZ Stuntbox)	Verify option strap A on Z314 is connected.
40	No Form-Feed indication at interface (YBB and YBA stuntbox) Form-Feed function performed.	Verify option strap A on Z314 is removed. Verify continuity between XZ314 Pin B3 and XZ314 Pin B2. Verify open circuit on XZ314 Pin B5 with respect to XZ314 Pin B2. Manually operate Form-Feed Contact (Slot No. 42). Verify change of state on Pins B5 and B3. Measure continuity between XZ314 Pin B4 and Pin 44 of WECO W50A Cord. Replace RO Control Card, Z314.
41	No functions.	Check code in selector and codebars. Check selection in stuntbox, use appropriate stuntbox arrangement. Check Function Clutch Trip Lever adjustment. Check Function Reset Bail Blade adjustment. Check Stripper Blade Drive Cam adjustment. Check Function Clutch Shoe Lever adjustment. Check Function Clutch BIDREC Gap requirement.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
41 (cont)	Improper function.	Check selection in selector codebars and stuntbox (Figures 4, 5, 6). Check stuntbox arrangement. Check coding of function bars. See Trouble Nos. 17, 18, 19 and 20. Refer to Section 574-320-703 for adjustments.
42	Tabulation interface signal @ +0 v (YAZ stuntbox).	Verify continuity between XZ314 Pin B6 and XZ314 Pin B2. Replace RO Control Card, Z314.
43	No Tabulation indication at interface (YBB and YBA stuntbox) Function performed.	Verify continuity between XZ314 Pin B6 and XZ314 Pin B2. Verify open circuit between XZ314 Pin A8 and XZ314 Pin B2. Manually operate Tabulation contact (slot no. 17). Verify change of state on Pins B6 and A8. Measure continuity between XZ314 Pin B7 and Pin 27 of WECO W50A Cord. Replace RO Control Card.
44	No Paper Alarm interface indication.	Replace RO Control Card, Z314.
45	Character Detected interface signal @ +5 v dc will printer selector mark hold.	Verify approximately +12 v dc between XZ314 Pin B22 and XZ314 Pin B2. If XZ314 Pin B22 is at 0 v, refer to Section 574-320-703 for verification of proper contact adjustment. Replace RO Control Card, Z314.
46	No Character Detected interface signal.	If option strap C on Z314 is connected, verify no Paper Alarm exists. Verify contact closure to circuit ground during reception of data. If an oscilloscope is not available to verify adequate contact closure time, check contact for proper adjustment per Section 574-320-703. If no contact closures are observed, check contact adjustment per Section 574-320-703. Check continuity between XZ314 Pin B22 to normally open side of Character Detected contact assembly. Check continuity between XZ314 Pin B2 and stationary contact on Character Detected contact assembly.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
46 (cont)		Verify continuity between XZ314 Pin B18 and Pin 14 of WECO W50A Cord. Replace RO Control Card, Z314.
47	Improper timing on Character Detected interface signal.	Readjust contact assembly per Section 574-320-703. Note: Proper timing must be obtained while receiving data @ 150 wpm (10 unit code). Check for defective or broken return spring on contact assembly. Replace RO Control Card, Z314.
48	Character Detected not inhibited by Paper Alarm (Z314 Strap C connected).	Verify strap C connected. Verify PAPER ALARM lamp ON. Replace RO Control Card, Z314.
49	Pin 30 of WECO W50A Cord not at +5 v dc.	Verify continuity between XZ314 Pin A13 and Pin 30 of WECO W50A Cord.
50	Pin 34 of WECO W50A Cord not at +5 v dc.	Verify continuity between XZ314 Pin B13 and Pin 34 of WECO W50A Cord.
51	No red printing.	Verify ESC3 character received by printer. Verify stuntbox detection of ESC3 by monitoring a contact closure on XZ415 Pin 24 with respect to XZ415 Pin 23. Voltage goes to 0 volts. Check continuity between XZ415 Pin 24 and XZ415 Pin 23 with contact manually held operated. Verify XZ415 Pin 33 is @ -12.5 v dc after ESC3 is detected. Verify 250 ohm resistance of ribbon magnet winding. Check function bars for proper coding. Check ribbon height adjustment. Refer to Section 574-320-703. Verify ribbon is in ribbon guide. Replace Two-Color Ribbon Card, Z415.

5.02 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
52	Failure to shift back to black ribbon on ESC4.	Verify ESC4 character received by printer. Verify stuntbox detection of ESC4 by monitoring a contact closure XZ415 Pin 25 with respect to XZ415 Pin 23. Voltage goes to 0 volts. Check continuity between XZ415 Pin 25 and XZ415 Pin 23 with ESC4 contact manually held operated. Replace Two-Color Ribbon Card, Z415.
53	Motor Off Command from interface fails to drop out Two-color ribbon magnet.	Replace Two-Color Ribbon Card, Z415.
54	ESC3 produces black text and ESC4 produces red text (proper magnet control verified).	Check ribbon for proper installation.

5.03 TYPING UNIT TROUBLE ANALYSIS

55	No local carriage return.	Check Local Carriage Return adjustment.
56	No local line feed.	Check Local Line Feed adjustment.
57	Ribbon Ribbon not advancing. Ribbon not reversing.	 Check Ribbon Feed Pawl Drive Clamp (right and left) adjustments. Check Ribbon Feed Brackets (right and left) adjustments. Check Connecting Rod Final adjustment. Check Ribbon Feed Brackets (left and right) adjustments. Check Feed Pawl Drive Clamp (right and left) adjustments. Check the Check Pawl (right and left) adjustments.
58	Vertical Character misalignment.	Check Vertical Clutch Bite adjustment. Check Vertical Aggregate Dampener Synchronization adjustment. Check Print Hammer Latch adjustment.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
59	Improper spacing between characters.	Perform character spacing test (Table G). 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. 63.
60	Left Hand margin not aligned. Right Hand margin not aligned.	Check Left Hand Margin adjustment. Check Dashpot and Side Vent Screw adjustment. Check Right Hand Margin adjustment.
61	No functions.	Check code in selector and codebars. Check stuntbox arrangement (Figure 4, 5, or 6) to determine slot, and then check 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. Check for the presence and operation of the print, space, and function suppress modification kit (magnets mounted on the rear of the stuntbox).
62	No carriage return.	Check code in selector and codebars. Check for disabling clip on slot no. 5 (carriage return) in stuntbox. Check position of carriage return lever to the carriage return latch.
	No Escape No. 10 operation.	Check Blocking Bar adjustment. Check for the presence of the no. 10 blocking bar spring.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
63	Horizontal Character misalignment (incorrect spacing between characters).	Perform typebox alignment test (Table D). Perform typebox horizontal motion test (Table F). Check Oscillating Arm Detent Disc Phasing adjustment. Check Horizontal Aggregate — Dampener Synchronization adjustment. Check Coordinating Cable adjustment. Check Print Hammer Position adjustment. Check Print Hammer Latch adjustment. Check Spacing Gear Phasing adjustment. See Trouble No. 59.
64	No Line Feed. Improper Line Feed.	Check selection in selector, codebars, and stuntbox. See Figures 4 or 5 or 6 and 8. Check Line Feed Clutch Trip Lever Adjusting Screw adjustment. Check Line Feed Clutch Trip Lever Eccentric Post adjustment. Check Line Feed Clutch Phasing adjustment.
65	No Horizontal Tab.	Check selection in selector and codebars. See stuntbox arrangement (Figure 5 or 6) for slot location and check stuntbox for operation. Check Trip Bail adjustment.
66	No Vertical Tab.	Check code in selector and codebars. See stuntbox arrangement (Figure 5 or 6) for slot location and check stuntbox for operation. Check Slide Retainer adjustment. Check Blocking Levers adjustment. Check Line Feed Clutch Trip Lever Adjusting Screw adjustment.
67	No Horizontal Tab Clear.	Check code in selector and codebars. See stuntbox arrangements (Figure 6) for slot location and check stuntbox for operation.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
67 (cont)		Check Tab Clear Arm adjustment. Check Latch Arm adjustment. Check Latch Release adjustment.
68	Horizontal Tab Clear selected, but performs Tab Set operation.	Check horizontal tab set and clear cables for being reversed at the function levers. See stuntbox arrangement (Figure 6) for location.
69	No Horizontal Tab set.	Check selection in selector and codebars. See stuntbox arrangement (Figure 6) for slot location and check stuntbox for operation. Check for missing tab stop on tab ring. Check Eccentric Post adjustment. Check Tab Set Arm Cable adjustment.
70	Horizontal Tab Set selected, but performs Tab Clear operation.	Check horizontal tab set and clear cables for being reversed at the function levers. See stuntbox arrangement (Figure 6) for location.
71	Continuous Line Feed.	Check Line Feed Clutch Trip Lever Adjusting Screw adjustment. Check Line Feed Clutch Trip Lever Eccentric Post adjustment. If the unit is equipped with vertical tab, check that the function lever in slot no. 41 of the stuntbox is inserted in slot of slide located directly under slot no. 41.
72	No Vertical Tab Clear.	Check selection in selector and codebars. See stuntbox arrangement (Figure 6) for slot location and check stuntbox for operation. Check Tab Clear Arm Cable adjustment. Check Latch adjustment. Check Latch Release adjustment.
73	Vertical Tab Clear selected, but performs Tab Set operation.	Check vertical tab set and clear cables for being reversed at the function levers. See stuntbox arrangement (Figure 6) for slot location.
74	Vertical Tab Set selected, but performs Tab Clear operation.	Check vertical tab set and clear cables for being reversed at the function levers. See stuntbox arrangement (Figure 6) for slot location.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
75	No Vertical Tab Set.	Check code in selector and codebars. See stuntbox arrangement (Figure 6) for slot location and check stuntbox for operation. Check Mounting Plate adjustment. Check Tab Set Arm Cable adjustment.
76	No printing.	Check code in selector and codebars. Check Trip Shaft Cam Follower adjustment. Check Print Clutch Trip Arm adjustment. Check Square Shaft Drive Arm adjustment. Check Print Hammer Latch adjustment. Check for a function selection in the stuntbox and see trouble no. 94. Check for the presence and operation of the print suppression modification kit (magnets mounted on the rear of stuntbox). See trouble no. 95.
77	Improper printing.	Check code in selector and codebars. Use typebox arrangement (Figure 7) to determine code and location of character being printed versus character selected. See troubles: 17, 18, 84, 85, 78 and 79.
78	Printing one horizontal character off.	Check typebox arrangement (Figure 7) to determine code and location of character being printed versus character selected. Perform horizontal positioning clutch test (Table C). Check Print Hammer Latch adjustment. Check Print Hammer Position adjustment.
79	Printing one vertical character off.	Check typebox arrangement (Figure 7) to determine code and location of character being printed versus character selected. Check Vertical Print Hammer Alignment adjustment. Check Print Hammer Latch adjustment.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
80	Improper typebox retraction.	Check Retraction Reset Shaft adjustment. Check Retraction Slide adjustment. Check Blocking Pawl adjustment. Check Ratchet Stop adjustment. Check Stop Plate adjustment.
81	Printed character incomplete.	Check Ribbon Guide to Platen adjustment. Check Ribbon Feed Bracket (Right and left) adjustments. Check Ribbon Retract Position adjustment. Check Ribbon Print Position adjustment. Check Oscillator Downstop adjustment.
82	Will not shift-out black position.	Check selection in selector, codebars, and stuntbox. Check Ribbon Print Position-Red adjustment. Check Magnet Assembly to Blocking Slide adjustment. Check for the presence and operation of the TP332374 Escape No. 10 modification kit. See stuntbox arrangement (Figure 6) for slot location. Check the operation of the Escape No. 10 fork-shift mechanism in the stuntbox and the no. 10 Blocking Bar adjustment.
83	Will not shift out of red position.	Check selection in selector, codebars, and stuntbox. Check Ribbon Print Position — Black adjustment. Check the operation of the Escape No. 10 fork-shift mechanism in the stuntbox and no. 10 Blocking Bar adjustment.
84	Horizontal typebox positioning incorrect.	Check typebox arrangement (Figure 7) 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 1, 2, 3, 4 with their clutch trip levers. Perform horizontal positioning clutch test (Table A) to isolate clutch(es) not tripping.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
85	Vertical typebox positioning incorrect.	Check typebox arrangement (Figure 7) to determine code and location of character being printed versus character selected. Check code in selector and codebars. Perform vertical positioning clutch test (Table E) to isolate clutch(es) not tripping. Check Vertical Clutch Bite adjustment. Check alignment of the bellcranks to codebars 5, 6, and 7. Check Vertical Print Hammer Alignment adjustment.
86	No spacing.	Check Trip Shaft Cam Follower adjustment. Check Spacing Clutch Trip Lever adjustment. Check for a function operation in the stuntbox. Check for the presence and operation of print and space suppression modification kit (magnet mounted on the rear of stuntbox).
87	Continuous spacing.	Check Spacing Clutch Trip Lever adjustment. If the unit is equipped with horizontal tab, check that the function lever in slot no. 17 of the stuntbox is inserted in slot of slide located directly under slot no. 17.
88	Improper spacing at left hand margin.	Check Left Hand Margin adjustment.
89	Spacing on functions.	Check the position of the suppression slide to the suppression bail.
90	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. 91.
91	Character density uneven (when using a replacement typebox).	Install the original typebox and check or make the Typebox Alignment adjustment as needed. Remove the typebox.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
91 (cont)		For replacement typebox(es) 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. Install the replacement typebox and type a few characters. It may be necessary to refine bending adjustment of the tab. CAUTION: OVERBENDING OF THE TAB CAN RESULT IN BREAKAGE.
92	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 Synchronization adjustment.
93	Print Indicator Improper vertical alignment. Improper horizontal alignment.	 Check Vertical Position of Indicator Bracket adjustment. Check Horizontal Position of Indicator Bracket adjustment.
94	Improper function.	Check code in selector and codebars. Check stuntbox arrangement (Figure 4, 5, or 6) to determine slot, and then check slot for operation of selected function. Check function bars for coding and/or broken tines. If Escape No. 10 modification kit is used, check No. 10 Blocking Bar adjustment.

5.03 Continued

NO.	TROUBLE	CORRECTIVE PROCEDURE
95	Print Suppression operating, but not selected.	Check for the presence of a spring on print suppress magnets engaging fork. Check the operation of the contact over slot no. 18 in the stuntbox. See trouble no. 94.
96	No Print Suppression.	Check the code in the selector and codebars. Check the operation of the contact over slot no. 18 in the stuntbox. Check Shift Fork Mechanism (slot no. 7) adjustment. Check Shift Fork Mechanism (slot no. 22) adjustment. Check Function Lever to Latch adjustment (slot no. 22). See trouble no. 61.
97	Paper Improper Low Paper switch operation. Improper Paper Out switch operation.	 Check Actuating Lever Clearance adjustment. Check switch wiring. Check Paper Out Lever Clearance adjustment. Check switch wiring.
98	Typing unit feeds out two or more forms in succession without intervening line feed.	Check Blocking Lever adjustment (V Tab).
99	No backspace.	Check code in selector; codebars and stuntbox. Check the position of the suppression slide to the suppression bail. Check trouble no. 61.
100	RO table assembly not grounded.	Verify ac outlet is properly grounded. Check out RO power ground wiring.

SLOT NO.	FUNCTION	FUNCTION BAR	FUNCTION PAWL	FUNCTION LEVER	SPRING PLATE OR LATCH PLATE	CONTACT ASSEM. OR CABLE BRACKET	LATCH RELEASE BAIL OR STUD	FUNCTION BAR BLOCKING PAWL	SPECIAL
1						326104			
2	DC-4	319793	152653	152642	152660				
3									
4	NEW LINE (LF & VT)	306220	152653	152298	154613				CLIP — 157274 (NOT SHOWN)
5	CARRIAGE RET (CR & FF)	319804	152653	152298	154613				
6	ESCAPE, TERMINATE	319796	152653	319481	152660				PRE-STRIPPER 334286
7	ESCAPE NO.9	306214	152653	162059	152089				FORK-SHIFT MECHANISM
8	ESCAPE HOLD	319802	152653	152642	152660				
9	BACK SPACE	306206	152653	152642	152660				
10	DC-2	319791	152653	152642	152660	326103			
11	ETX	319797	152653	152642	152660				
12	BELL	306205	152653	152642	152660				
13	FUNCTION SUPPRESS	319794	152653	152641	152660				
14	DELETE	306221	152653	152641	152660				
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40	LINE FEED	306202	152653	326172	152660				
41									
42									

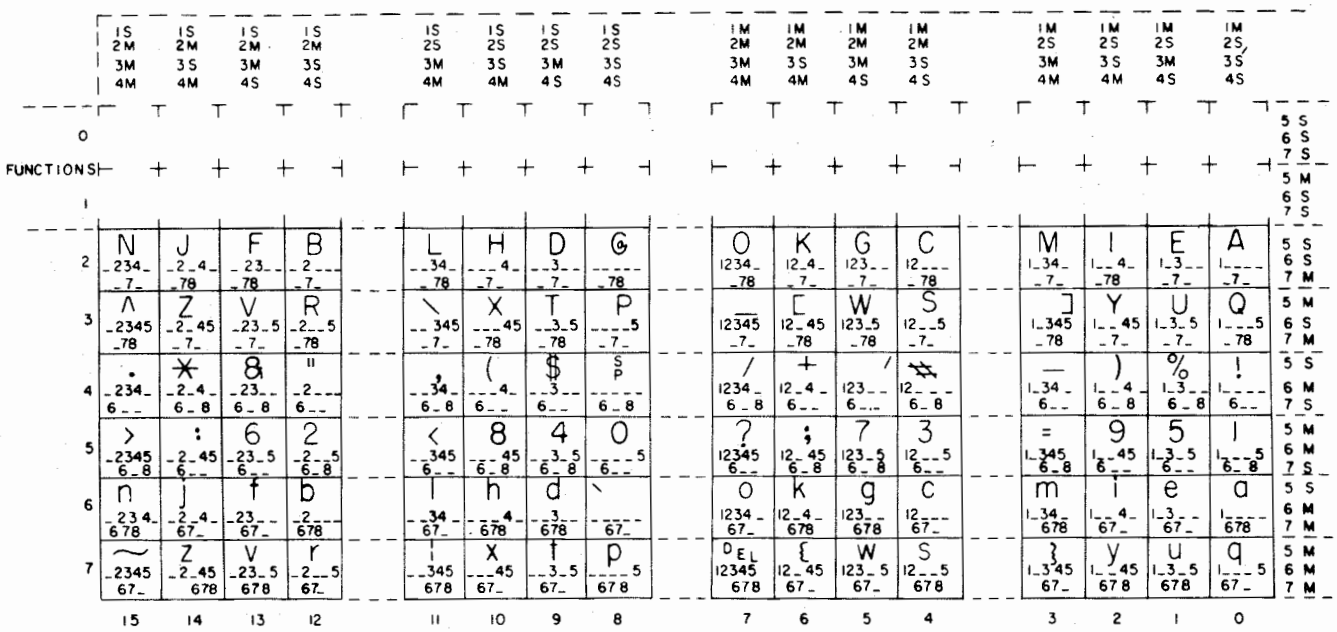
Figure 4 - "YAZ" Stuntbox Arrangement

SLOT NO.	FUNCTION	FUNCTION BAR	FUNCTION PAWL	FUNCTION LEVER	SPRING PLATE OR LATCH PLATE	CONTACT ASSEM. OR CABLE BRACKET	LATCH RELEASE BAIL OR STUD	FUNCTION BAR BLOCKING BAIL	SPECIAL
1						326105			
2	DC-4	319793	152653	152642	152660				
3	ETX	319797	152653	152642	152660				
4	NEW LINE (LF & VT)	306220	152653	152298	154613				CLIP – 157274 (NOT SHOWN)
5	CARRIAGE RET (CR & FF)	319804	152653	152298	154613				
6	ESCAPE, TERMINATE	319796	152653	319481	152660				PRE-STRIPPER 334286
7	ESCAPE NO. 9	306214	152653	162059	152089				FORK-SHIFT MECHANISM
8	ESCAPE HOLD	319802	152653	152642	152660				
9	BACK SPACE	306206	152653	152642	152660				
10									
11									
12									
13	FUNCTION SUPPRESS	319794	152653	152641	152660				
14	DELETE	306221	152653	152641	152660				
15									
16									
17	HORIZONTAL TAB.	306203	153598	338458	152660	326102			PRE-STRIPPER 334286
18	DC-2	319791	152653	152642	152660				
19	BELL	306205	152653	152642	152660				
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38	LINE FEED	306202	152653	326172	152660				
39									
40						326107			
41	VERTICAL TAB.	306212	152653	326172	152660				
42	FORM FEED	306213	152653	326172	152660				

Figure 5 - "YBB" Stuntbox Arrangement

SLOT NO.	FUNCTION	FUNCTION BAR	FUNCTION PAWL	FUNCTION LEVER	SPRING PLATE OR LATCH PLATE	CONTACT ASSEM. OR CABLE BRACKET	LATCH RELEASE BAIL OR STUD	FUNCTION BAR BLOCKING BAIL	SPECIAL
1									
2	DC-4	319793	152653	152642	152660	326105			
3	ETX	319797	152653	152642	152660				
4	NEW LINE (LF & VT)	306220	152653	152298	154613				CLIP — 157274 (NOT SHOWN)
5	CARRIAGE RET (CR & FF)	319804	152653	152298	154613				
6	ESCAPE, TERMINATE	319796	152653	319481	152660				PRE-STRIPPER 334286
7	ESCAPE NO. 9	306214	152653	162059	152089				FORK-SHIFT MECHANISM (B)
8	ESCAPE HOLD	319802	152653	152642	152660				
9	BACK SPACE	306206	152653	152642	152660				
10									
11									
12									
13	FUNCTION SUPPRESS	319794	152653	152641	152660	326152			
14	DELETE	306221	152653	152641	152660				
15	HT SET	319810	152653	326158	152660				
16	HT CLEAR	319811	334282	326158	152660				
17	HORIZONTAL TAB.	306203	153598	338458	152660	326102			PRE-STRIPPER 334286
18	DC-2	319791	152653	152642	152660				
19	BELL	306205	152653	152642	152660				
20									
21									
22									
23									
24									
25	ESCAPE NO 10	306214	152653	162059	154613				FORK-SHIFT MECHANISM (A)
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37						326152			
38	LINE FEED	306202	152653	326172	152660				
39	VERTICAL TAB SET	319812	152653	326158	152660				
40	VERTICAL TAB CLEAR	319813	334282	326158	152660				
41	VERTICAL TAB.	306212	153598	326172	152660	326107			
42	FORM FEED	306213	152653	326172	152660				

Figure 6 - "YBA" Stuntbox Arrangement



Note 1: Carriage Return (CR) and Line Feed (LF) Codes: CR1-34---8 Marking and LF-2-4---- Marking.

Note 2: The 8th BIT MARKING for even parity.

Note 3: Typebox arrangement ASCII 68 (American National Standard Code for Information Interchange) as viewed from print hammer.

Figure 7 - Typebox Arrangement

5.04 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.

TABLE C

HORIZONTAL POSITIONING CLUTCHES								
Character Received	SHIFT Delete	SHIFT ^	SHIFT ^	SHIFT \	SHIFT \	SHIFT UNSHIFT X	UNSHIFT X	UNSHIFT P
Character Selected	Rubout	~	~	¦	¦	x	x	p
Positioning Clutch(es) Tripped	1,2,3,4	1	1	2	2	3	3	4

UNSHIFT Delete	UNSHIFT Q	UNSHIFT Delete	UNSHIFT S	UNSHIFT Delete	UNSHIFT W
Rubout	q	Rubout	s	Rubout	w
1, 2, 3, 4	2,3,4	1,2,3,4	3,4	1, 2, 3, 4	4

Note: If the above clutches do not trip, check the following troubles: 17, 18, 19, and 84.

TABLE D

TYPEBOX ALIGNMENT — HORIZONTAL MOTION		
Character Received	SHIFT A	SHIFT N
Character Selected	A	N

Note: If the above alignment is off, check the following troubles: 59, 63, and 78.

TABLE E

VERTICAL POSITIONING CLUTCHES						
Character Received	UNSHIFT Delete	UNSHIFT 0	UNSHIFT 0	SHIFT ?	SHIFT Delete	SHIFT 0
Character Selected	Rubout	o	o	/	Rubout	0
Positioning Clutch(es)	5,6,7	5	5	7	5,6,7	5,6

Note: If the above clutches do not trip, check the following troubles: 17, 18, 19, and 85.

TABLE F

TYPEBOX ALIGNMENT — HORIZONTAL MOTION-VERTICAL CORRECTION		
	SHIFT	UNSHIFT
Character Received	E	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 G

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

Note: The characters should be evenly spaced as gauged by eye. If not evenly spaced see trouble no. 59.

5.05 Use the following message for a final test:

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

Note: If facilities are not available to perforate this message on a test tape and transmit it to the RO, this test may be eliminated.