38 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SETS

TROUBLESHOOTING

CONTENTS PAGE

1. GENERAL

1.01 This section provides troubleshooting information for the 38 Automatic Send-Receive (ASR) Teletypewriter Sets. It includes checkout procedures and trouble analysis for routine or emergency maintenance. It is reissued to make corrections in the supplied schematic diagrams. Marginal arrows indicate the corrections.

1.02 A complete checkout procedure is provided in three tables. Table 1 covers off-line operation of the teletypewriter. Tables 2 and 3 cover on-line operation with a remote terminal.

1.03 Troubleshooting information is also provided in three tables. Table 4 covers troubleshooting routines for off-line failures, whereas Tables 5 and 6 cover on-line problems.

2. CHECKOUT PROCEDURE

2.01 Each step of the checkout routine consists of an operation, a normal response, and a trouble reference for use if the equipment does not respond as indicated. The trouble references key the checkout steps to the corresponding troubleshooting tables.

2.02 The checkout tables are arranged to verify one phase or mode of operation before proceeding to the next. It is important to perform the checkout in the order given.

2.03 Where an option affects the operation of the unit, the option is summarized in the table. Refer to Installation and Servicing Manual 341 for details on these options.

2.04 Where the variable features of the 38 teletypewriter affect the checkout procedure, the features are specified in the table (ie, sprocket feed vs friction feed). If no restrictions are listed, the checkout steps apply to all units.

2.05 Two electrical service units are available for the 38 teletypewriter. The WESU001 electrical service unit adapts the teletypewriter for use on a 20 ma or 60 ma dc signal line, or provides an interface compatible with 100 series data sets or equivalent EIA devices. Sets with this ESU are referred to as DC/EIA units in the checkout and troubleshooting tables. They have a single row of controls to the right of the keyboard.

2.06 The WESU002 electrical service unit includes a frequency shift keying modem which permits data interchange with a remote data set or equivalent device. Sets with this ESU are referred to as FSK units in the checkout and troubleshooting tables. They have a double row of controls to the right of the keyboard. For operation on a switched network, the FSK modem is commonly used with a data access arrangement (DAA) and telephone handset.

2.07 Before starting the checkout procedure, depress the STOP or CLEAR button on the control strip and place the tape punch and reader levers in the OFF and STOP positions, respectively. Load the typing unit with paper, and load the punch with tape. Make sure the ribbon is in good condition, and is correctly loaded in the typing unit. For sprocket feed units, set the rocker on the right end of the platen for single line feed (press lower arm of rocker). If an FSK set has an auto answer DAA, place the DAA in the voice mode.

2.08 For all installations, proceed with the off-line checkout of Table 1. When the terminal responds favorably to all of the off-line tests, proceed to either Table 2 or Table 3 for the on-line tests. If it is impossible to observe the operation of the remote terminal, contact the remote operator (ie, by telephone, or by talk mode of data set if so equipped) and determine the most convenient method of checking the data

interchange during the on-line tests. Be sure to identify the features of the remote terminal (ie, half-duplex vs full duplex, answer-back capabilities, etc).

3. TROUBLESHOOTING

3.01 Troubleshooting information is presented in three tables. Table 4 covers off-line failures. For convenience, troubles are grouped according to component (ie, typing unit, answer-back, etc). Tables 5 and 6 cover on-line troubles in DC/EIA and FSK terminals, respectively. In each table, the trouble symptom is described, and the methods of analyzing and correcting the trouble are listed.

3.02 In some cases a variety of troubles can lead to the same symptom. In these cases, the analysis either checks the most likely trouble points first or provides a series of steps to isolate the trouble to a given area.

3.03 Troubles related to only sprocket feed units, wide platen units, etc, are clearly indicated in the tables. Also, if the analysis differs for units equipped with the DC/EIA or FSK interface, the differences are indicated in the tables.

3.04 Voltage or continuity tests are required in troubleshooting some problems. Unless otherwise specified, dc voltages are measured between the indicated test points and ground (DC/EIA interface — J11, pin 7; FSK interface J14, pin 5). Voltage tests are made with the power on and the unit operating (to the extent possible) as specified in the test procedure. Caution must be observed in the placement of the voltmeter test probes to avoid shorts between terminals.

3.05 Continuity tests are made with the power off. Simplified schematic diagrams are provided in this section to aid in tracing the circuits and checking continuity. Wiring diagrams of the complete set are available in the wiring diagram package supplied with the unit.

3.06 Adjustments are made and mechanical operation is best observed with the power off. The unit can be cycled manually to check the mechanical operation and to check contact operations for continuity tests.

CAUTION: TO MINIMIZE SHOCK HAZARD AND AVOID DAMAGE TO COMPONENTS, REMOVE AC POWER BEFORE REPLACING FUSES OR PERFORMING CONTINUITY TESTS.

3.07 Field troubleshooting is intended to locate a trouble area and restore operation as quickly as possible. The repair should be limited to adjustments, lubrication, spring replacements, and other minor routines as stated in the troubleshooting charts. For major repairs, the failing component is usually replaced to restore operation, then repaired in the service shop or returned to a service center with suitable facilities. For troubles not covered in the troubleshooting tables, consider the following:

(1) Exercise locally established routines (contact supervisor, contact service center, etc).

(2) Review operating principles of unit and observe operation of failing component to determine where failure occurs.

(3) Restore any phase of operation that can be provided until the source of trouble has been located and repaired (ie, if receive operation is normal but send operation fails, inform outlying stations that the unit will be operating as a receive-only terminal until the repair is complete).

(4) If extensive repair is required, replace the entire unit to restore operation until repairs are made.

3.08 A complete set of wiring diagrams is supplied with the 38 teletypewriter. These diagrams show all electrical connections, including options and variable features, and are essential in troubleshooting the electrical circuits of the unit. To further assist in electrical troubleshooting, simplified schematic diagrams are included in this section (Figures 5 thru 18). These simplified diagrams show the components and connections related to various functions of the 38 teletypewriter, and in many cases are referred to in the troubleshooting tables.

4. REFERENCES

4.01 In addition to the wiring diagrams, and the installation and servicing manual supplied with the 38 teletypewriter, the following publications are recommended for reference in troubleshooting.

Set	
Description and Operation	574-400-100TC
Removal and Replacement of Components	574-400-702TC

TABLE 1

CHECKOUT PROCEDURE — OFF-LINE OPERATION

NOTE: Trouble references in this table apply to Table 4.

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
	CONTROL PANEL		
1	Depress LOCAL button on control strip.	LOCAL button lights and locks in depressed position. Motor turns on.	1, 2, 3
2	Units Equipped With Answer-Back Depress HERE IS button on control strip.	Answer-back mechanism goes through one cycle and answer-back sequence is printed out.	44-48
3	Depress BREAK button on control strip.	Typing unit cycles as long as button is held depressed, but no printing or spacing occurs. *NOTE: Random character or space may occur when button is released.*	8
	KEYBOARD AND TYPING UNIT		
4	Depress LOCAL RETURN button on front of cover.	Carriage returns to left margin with no excessive bounce.	37
5	Wide Platen Units Momentarily depress PAPER ADVANCE button on front of cover.	Paper advances as long as button is depressed.	34
6	Depress ESCAPE key and then 4 key in sequence.	Typing unit cycles for each key, but no printing or spacing occurs.	9, 42
7	Depress each graphic key on keyboard to its normal downstop position.	Keyboard trips for each key depressed. No evidence of binding or double tripping. Typing unit prints selected characters. If two-color ribbon is used, characters are the color of the upper field of the ribbon.	9 10, 11 13, 17 24

TABLE 1

CHECKOUT PROCEDURE — OFF-LINE OPERATION (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
7 (contd)		Option: Printed alphabetics will be lower case unless keyboard circuit card is programmed to convert lower case to capital alphabetics.	
		Characters are printed with uniform shading and spacing.	25-32
8	Depress user-selected "repeat" keys to the repeat position (beyond normal downstop position). Allow typing unit to print one complete line of a repeat graphic character.	Characters are repeated as long as keys are held depressed. Depending on characters, printing or spacing may or may not occur.	12
		Repeated graphic should be uniformly spaced across entire line.	31
		End of line bell rings when typing carriage approaches right end of line.	41
		Option: If automatic carriage return and line feed feature is used, carriage returns to left margin and line feed occurs when carriage reaches right end of line. If feature is not used, characters pile up at right end of line unless line feed and carriage return are keyed.	40
9	Depress SHIFT (either side) and SHIFT LOCK keys.	SHIFT keys are locked in depressed position.	16
10	Depress each graphic key to normal downstop position.	Typing unit prints upper case character for each key depressed. *NOTE: Numeral 0 key cannot be depressed in shift mode because it has no shifted equivalent.*	14
11	Depress and release SHIFT LOCK key.	SHIFT keys return to normal position.	16
12	Depress ESCAPE key and 3 key in sequence.	Typing unit cycles for each key, but no printing or spacing occurs.	9, 42
13	Depress several graphic keys to normal downstop positions.	Printed characters are the color of the lower field of the ribbon.	24

TABLE 1

CHECKOUT PROCEDURE — OFF-LINE OPERATION (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
14	Depress ESCAPE key and then 4 key to restore upper field of ribbon.	Typing unit cycles but no printing or spacing occurs.	9, 42
15	Depress LINE FEED key.	Single line feed occurs each time LINE FEED key is depressed. Option: If carriage return on line feed feature is used, carriage return will occur during line feed.	33
16	Sprocket Feed Units Set rocker on right side of platen for double line feed (press upper arm of rocker), then depress LINE FEED key.	Double line feed occurs each time LINE FEED key is depressed.	33
17	Sprocket Feed Units Restore single/double line feed rocker to single line feed position.		
18	Sprocket Feed Units Depress CONTROL and FF keys simultaneously.	Paper advances rapidly to end of form and stops. *NOTE: Depressing CONTROL and FF a second time will not cause another form feed. At least one line feed must occur on the new form before another form feed can be produced.*	35
19	Depress spacebar several times, or if spacebar is repeatable, hold bar in repeat position to produce several spaces.	Typing carriage moves one space to right for each space.	38
20	Depress BACK SPACE key.	Typing unit cycles but no printing or spacing occurs.	9, 42
21	Depress CONTROL key and BELL key simultaneously.	Bell rings for each depression. No printing or spacing occurs.	41 42
22	Depress NULL key.	Typing unit cycles but no printing or spacing occurs.	42
23	Depress DELETE key.	Typing unit cycles but no printing or spacing occurs.	42

TABLE 1

CHECKOUT PROCEDURE — OFF-LINE OPERATION (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
24	Depress TAB key.	Typing unit cycles but no printing or spacing occurs.	42
25	Friction Feed Units Lift roll of paper at rear of cabinet to simulate a "low paper" condition.	ALARM lamp lights (red) when roll of paper is lifted.	43
26	Sprocket Feed Units Tear off next form to simulate a "paper out" condition. Feed form by depressing CONTROL and FF keys or manually rotating platen.	ALARM lamp lights (red) when last form is fed into platen area.	43
27	Sprocket Feed Units Reload paper in typing unit.	ALARM lamp goes out.	4
	TAPE PUNCH		
28	Set punch lever to ON position.	No noticeable effect.	
29	Depress DELETE key at least 20 times, or if DELETE key is repeatable, hold key depressed until at least 20 deletes are produced.	Typing unit cycles for each delete character. No printing or spacing occurs. Tape feeds one position for each delete character, and series of all marking codes are punched in tape. *NOTE: Eighth bit will be punched if unit is programmed for even parity or eighth bit always marking.* Punched holes should be spaced 10 per inch.	9 42 49, 50, 51 54
30	Depress NULL key several times, or if repeatable, hold key depressed until several nulls are produced.	Typing unit cycles for each null character. No printing or spacing occurs.	9 42

TABLE 1

CHECKOUT PROCEDURE — OFF-LINE OPERATION (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
30 (contd)		Tape feeds one position for each null character, and no holes (other than feed holes) are punched in tape. *NOTE: Eighth bit will be punched if unit is programmed for odd parity or eighth bit always marking.*	49, 50, 51
31	Type the following test message: DELETE DELETE DELETE CR LF DELETE The quick brown fox jumped over the lazy dogs back 1234567890 times. CR LF DELETE ESCAPE 3 THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK 123456789 TIMES. CR LF DELETE ESCAPE 4 The quick brown fox jumped over the lazy dogs back 1234567890 times. CR LF DELETE DC3 The quick brown fox jumped over the lazy dogs back 1234567890 times. CR LF DELETE EOT	Typing unit prints graphics. Tape advances one character position for each keyboard operation. Code characters are punched in tape according to ASCII chart of Figure 1. *NOTE: Presence or absence of eighth bit depends on parity of unit.* Option: If keyboard circuit card is programmed to convert lower case to capital alphabetics, all graphics (printed and punched) will be capitals in either shifted or unshifted mode.	
32	Type a series of alternate r and y characters.	Typing unit prints and tape unit punches the r and y characters.	
33	Move the punch lever to the B.SP. position three times.	Tape backspaces three positions. No effect on typing unit.	52
34	Type a series of at least three delete characters.	Tape advances one position for each delete character. Previously punched characters are repunched to form all marking delete characters, with no evidence of tearing of feed holes or punch holes. Typing unit cycles but does not print or space.	54
35	Depress CONTROL and DC4 keys simultaneously.	Typing unit cycles but does not print or space.	9, 42

TABLE 1

CHECKOUT PROCEDURE — OFF-LINE OPERATION (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
36	Type a series of delete characters.	Typing unit cycles but does not print or space. Punch disabled by DC4 character.	9, 42 55
37	Depress CONTROL and DC2 keys simultaneously.	Typing unit cycles but does not print or space.	9, 42
38	Type a series of delete characters.	Typing unit cycles but does not print or space. Tape advances and delete characters are punched in tape.	9, 42 53
39	Punch Equipped for Low Tape Alarm Lift tape roll at rear of punch to simulate a tape-out condition.	ALARM lamp lights (red). Lamp goes out when tape roll is replaced.	56
40	Move punch lever to OFF position.		
	TAPE READER		
41	Load previously prepared test tape into reader.		
42	Operate typing unit as necessary to begin a new line (friction feed) or new form (sprocket feed).		
43	Move reader control lever to START position.	Tape moves through reader. Typing unit prints out characters punched on test tape. For nonprint characters, typing unit cycles but does not print. Depending on character, spacing may or may not occur. Line feeds, carriage returns, etc, occur as punched in tape. If equipped for two-color printing, color changes after receipt of ESCAPE 3 or ESCAPE 4 sequence.	57 61

TABLE 1

CHECKOUT PROCEDURE — OFF-LINE OPERATION (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
43 (contd)		If reader is strapped for automatic operation, reader stops upon recognition of DC3 or EOT, and is resumed by depressing CONTROL/DC1 on keyboard or by moving reader control lever to START position. Reader and typing unit stop when tight-tape condition occurs.	66, 59 65
44	Move reader control lever to STOP position and remove test tape from reader.		
45	Tear off test tape at last character of printed message, and load piece of punched tape into reader.		
46	Move reader control lever to START position and allow several characters to pass through reader, then move lever to STOP position.	Typing unit prints characters until lever is placed in STOP position.	
47	Move reader control lever to STEP position several times.	Tape advances one character position for each step. Typing unit responds to each character, step by step.	60
48	Move reader control lever to START position and allow remainder of test tape to feed through reader. *NOTE: For automatic readers, restart as necessary after reader detects DC3 or EOT.*	Typing unit reproduces message. Reader and typing unit stop when last character of tape is about four character positions from reader head.	
49	Move reader control lever to FREE position.	Tape can be moved freely in either direction through reader head.	63
50	Remove tape from reader and move control lever to OFF position.		
51	Depress OFF (or CLEAR) button on control strip.	LOCAL button unlatches and lamp goes out. Motor turns off.	7

TABLE 2

CHECKOUT PROCEDURE — ON-LINE WITH DC OR EIA INTERFACE

NOTE: Trouble references in this table apply to Table 5.

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
1	If other terminal is located remotely, contact operator at remote terminal (ie, by telephone) and arrange for a checkout. Have operator set remote terminal to line mode. *NOTE: If EIA terminal is operating through 100 series data set or equivalent, perform standard call procedure for data set.*		
2	Depress LINE button on control strip.	LINE button lights and locks in depressed position. Motor turns on.	1
3	Send message to remote terminal from keyboard, tape reader, or if local terminal has answer-back, by depressing HERE IS button.	Local terminal prints out message as it is transmitted to remote terminal.	
4	Verify accuracy of message received by remote terminal.	Received message should be error-free.	5
5	If remote terminal has send capability, have remote terminal transmit message to local terminal.	Received message should be error-free.	6
6	If local terminal is equipped with answer-back, and remote terminal has send capability, have remote terminal transmit ENQ to local terminal.	Answer-back sequence is printed out at local terminal and sent to remote terminal.	9
7	Depress LINE FDX button on control strip.	LINE button unlatches and extinguishes. LINE FDX button lights and locks in depressed position.	
8	Transmit message to remote terminal.	Message should be received and processed with no errors by remote terminal. *NOTE: If local terminal uses dc interface strapped for half-duplex operation, local terminal prints out message as it is transmitted. If*	6

TABLE 2

CHECKOUT PROCEDURE — ON-LINE WITH DC OR EIA INTERFACE (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
8 (contd)		*local terminal uses EIA interface, or dc interface strapped for full-duplex operation, local terminal does not print out message.*	
9	Terminals Strapped for Full-Duplex Operation With local terminal set to LINE FDX and remote terminal set for full duplex, arrange for local and remote terminals to send messages simultaneously.	Each terminal receives message sent by other terminal. No interference occurs between messages.	6
10	Depress LOCAL button on control strip.	LINE FDX button unlatches and extinguishes. LOCAL button lights and locks in depressed position.	
11	If remote terminal has send capability, have remote terminal attempt to send message to local terminal.	No response should be noted at local terminal (nor should any messages generated by local terminal be received by remote terminal). On-line send and receive functions are disabled in local mode.	

TABLE 3

CHECKOUT PROCEDURE — ON-LINE WITH FSK INTERFACE

NOTE: Trouble references in this table refer to Table 6.

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
1	Lift telephone handset and dial remote terminal. *NOTE: If local terminal DAA is equipped for auto answer, lift exclusion key on telephone before dialing.*	Remote terminal sends f2m carrier (2225 Hz tone) when it has gone into answer mode. *NOTE: If remote terminal has auto answer capability, f2m carrier is automatically sent. If manual answer, remote operator must manually place remote terminal in answer mode.*	
2	Depress ORIG button. *NOTE: If local terminal DAA is equipped for auto answer, hang up handset. If manual answer, lift exclusion key and leave handset off-hook.*	Motor turns on and ORIG lamp lights. Local terminal sends f1m carrier (1270 Hz tone) to remote terminal to complete hookup. If remote terminal is equipped for auto answer-back, its answer-back sequence will be received and printed out by local terminal.	1-5
3	Transmit test message to remote terminal. Include a "return-to-voice" request at end of message to alert remote operator that voice communications are desired upon receipt of message.	Test message is printed out at local terminal and sent to remote terminal with no errors.	7
4	If local terminal DAA is equipped for auto answer, take telephone handset off-hook and lift exclusion key. If manual answer, depress exclusion key to middle position. Verify accuracy of test message, and ask remote operator to go into full duplex and send test message. Depress ORIG button as in Step 2.		
5	Depress FDX button.	FDX button locks and lights. ORIG lamp lights upon receipt of f2m from remote terminal.	

TABLE 3

CHECKOUT PROCEDURE — ON-LINE WITH FSK INTERFACE (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
6	Transmit message to remote terminal. *NOTE: Verify results of test by reverting to voice as in Step 4.*	Message does not print locally, but is sent to remote terminal with no errors. Message sent by remote terminal is simultaneously received and printed by local terminal with no errors.	13
7	Depress FDX button.	FDX button unlatches and extinguishes.	
8	Depress CLEAR button.	ORIG lamp extinguishes. *NOTE: On manual answer terminals, hang up telephone handset to complete disconnect.*	12
9	Have remote operator originate a call to local terminal.	Terminal Equipped for Auto Answer Telephone rings at local terminal. Motor turns on and local terminal sends f2m carrier to remote terminal. Remote terminal responds by sending f1m carrier to local terminal, and ANS button lights. If local terminal is equipped for auto answer-back operation, answer-back is sent to remote terminal. Terminal Equipped for Manual Answer Telephone rings at local terminal.	 4 4 15
10	Manual Answer Terminal Lift telephone handset and agree by voice communications to go into answer mode. Depress ANS pushbutton and lift exclusion key on telephone.	Motor turns on and local terminal sends f2m carrier to remote terminal. Remote terminal responds by sending f1m carrier to local terminal, and ANS button lights.	4

TABLE 3

CHECKOUT PROCEDURE — ON-LINE WITH FSK INTERFACE (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
10 (contd)		If local terminal is equipped for answer-back operation, answer-back is sent to remote terminal.	15
11	Transmit message to remote terminal.	Test message is printed locally and sent to remote terminal with no errors.	6, 7
12	Have remote terminal set up for full duplex, then depress FDX button on local terminal.	FDX button locks and lights.	
13	Send message to remote terminal while simultaneously receiving message from remote terminal.	Transmitted message is received by remote terminal with no errors but does not print at local terminal. Message received from remote terminal is printed out with no errors.	13
14	Depress FDX button.	FDX button unlatches and extinguishes.	
15	Depress ECHO button.	ECHO button locks and lights.	
16	Have remote terminal transmit message to local terminal. *NOTE: Remote terminal must remain in full duplex for the test.*	Message sent by remote terminal is printed out by local terminal and simultaneously returned to remote terminal for printout. Message returned to remote terminal should be identical to message originally sent to local terminal.	8, 14
17	Depress ANS button.	ECHO button unlatches and extinguishes.	
18	Depress FDX button and transmit EOT to remote terminal.	Remote terminal turns off carrier. When loss of remote carrier is detected by local terminal, motor turns off and ANS lamp extinguishes. Auto answer terminal is now disconnected, but manual answer terminal must hang up handset to complete disconnect.	11, 12

TABLE 3

CHECKOUT PROCEDURE — ON-LINE WITH FSK INTERFACE (Continued)

STEP	OPERATION	RESPONSE	TROUBLE REFERENCE
19	Auto Answer Terminals Depress LOCAL button.	LOCAL button locks and lights and motor turns on.	
20	Auto Answer Terminals Have remote station originate a call.	ANS button flashes with incoming ring signal.	10
21	Auto Answer Terminals Depress ANS button to go into answer mode.	LOCAL button unlatches and extinguishes. ANS button lights when carrier is received from remote terminal.	
22	Depress CLEAR button.	ANS button extinguishes and motor turns off.	12

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION

NOTE: Circuit common for voltage measurements is terminal 8 or 9 of card 303846.

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
	GENERAL OPERATION	
1	Terminal completely inoperative. No indicator lamps light when buttons are depressed; motor does not turn on when LOCAL button is depressed.	(a) Make sure power cord is plugged into ac outlet. (b) Measure voltage at convenience outlet to verify presence of 115 v ac supply voltage. (c) Check ac supply fuse F1 and dc supply fuse F2 and replace if necessary. (d) Check for +24 v at P14, pin 6 of power supply. If not present, power supply may be defective. If present, trouble may be in circuit card 303847 (DC/EIA interface) or 322491 (FSK interface).
2	Individual indicator lamp does not light. (Lamp energized by control buttons only.)	Check for 24 v across lamp when corresponding control button is depressed. Refer to wiring diagram 1194SD (DC/EIA interface) or 1196SD (FSK interface) for connector pins. If voltage is present, indicator lamp may be defective. If not present, trouble may be in related switch contact or interface circuit card 303847 (DC/EIA) or 322491 (FSK).
3	Motor does not turn on when LOCAL button is depressed. LOCAL lamp lights.	(a) Depress LINE button (units with DC/EIA interface) or ANS button (units with FSK interface). If motor turns on, check LOCAL switch contacts and connector. (b) If motor hums but does not turn, check for binding or frozen main shaft. (c) If motor is completely inoperative, check motor fuse F4 (synchronous motors only). (d) Check voltage across motor. If 115 v ac is present, motor may be defective. (e) Check operation of motor control relay. (f) Trouble may be in interface circuit card 303847 (DC/EIA interface) or 322491 (FSK interface). See Figures 5 thru 8 for electrical check points.
4	ALARM lamp remains lit at all times.	(a) Determine if lamp is being held on by closure of paper alarm contacts. If punch is equipped for low tape alarm, also inspect low tape contacts.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
4 (contd)		(b) If above contacts function when operated manually, make sure paper and/or tape is correctly installed. (c) Refer to wiring diagrams of 1194SD or 1196SD for electrical connections related to paper alarm, tape out, and low tape (if included in punch). (d) If paper alarm contact operation is normal, circuit card 303847 (DC/EIA interface) or 322491 (FSK interface) may be defective.
5	Typing unit runs open (continuously) when terminal is turned on.	(a) Make sure selector armature is aligned correctly, and is free to operate. (b) Make sure H-plate between keyboard and typing unit is in place. (c) Check Shoe Lever Gap and Trip Lever Engagement adjustment in Section 574-422-700TC. DC/EIA Interface (d) Refer to Figure 5 or 6 for electrical check points. (e) Check voltage at J13, pin 9. If +24 v is present, BREAK switch contact may be open or there may be a poor contact in one of the cable connectors. (f) Check voltage at J15, pin 11. If +24 v is not present, check normally closed FDX contact. Check voltage at J12, pin 15. If +24 v is present, circuit card 303847 may be defective. FSK Interface (g) Refer to Figure 16 for electrical check points. (h) Check voltage at J15, pin 15. If +24 v is present, BREAK switch contact may be open. (i) Check voltage at J4, pin 9. If +24 v is present, circuit card 322491 may be defective. If no voltage is present, selector magnet coil may be defective.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
6	Terminal fails to operate from all sources (keyboard, answer-back, reader).	Check the following adjustments in Section 574-422-700TC: Shoe Lever Gap and Trip Lever Engagement Enable Contact Trip Lever Clearance Character Suppression Contact Wire Gap DC/EIA Interface (a) Refer to Figure 5 or 6 for electrical check points. (b) Check voltage at J15, pin 11 and J12, pin 15. If voltage is zero, circuit card 303847 may be defective. FSK Interface (a) Refer to Figure 16 for electrical check points. (b) While depressing BREAK button, check voltage at J4, pin 9. If positive voltage is present, circuit card 322491 may be defective.
7	Terminal does not turn off when OFF or CLEAR button is depressed.	(a) Determine if OFF or CLEAR switch mechanism is unlocking previously selected mode switch. If not, check mechanical locking arrangement between switches. Switch mechanism may be defective. (b) Check operation of OFF or CLEAR switch contacts. Refer to wiring diagram 1194SD and Figure 5 or 6 (DC/EIA interface) or Figure 9 (FSK interface) for circuitry involved.
8	Typing unit does not run open (cycle continuously without printing or spacing) when BREAK button is depressed.	DC/EIA Interface Check voltage at J13, pin 9. If voltage is zero with BREAK button depressed, break contact may be defective. If voltage is +24 v, circuit card 303847 may be defective. See Figure 5 (DC interface) or Figure 6 (EIA interface) for related circuitry. FSK Interface Check voltage at J15, pin 15. If voltage is +24 v with BREAK button depressed, break contact may be defective. If voltage is zero, circuit card 322491 may be defective. See Figure 16 for related circuitry.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
	KEYBOARD	
9	Keyboard fails to trip when key is depressed.	(a) Check to make sure H-plate and spring are correctly positioned on keyboard trip arm. (b) Make sure universal codebar and tie link are free to move, and that tie link moves non-repeat lever and latchlever to right, allowing universal lever to move up. (c) Check following adjustments in Section 574-421-700TC: Universal Link Distributor Trip Linkage Trip Lever Engagement Trip Arm
10	Keyboard double trips or runs continuously.	(a) Check latchlever and nonrepeat lever for free operation. (b) Check Latchlever Spring and Nonrepeat Lever Spring adjustments in Section 574-421-700TC. (c) Check Trip Lever Engagement and Trip Arm adjustments in Section 574-421-700TC, and Shoe Lever Gap and Trip Lever Engagement adjustments in Section 574-422-700TC.
11	Key binds.	Check for broken keytop guideplate, displaced keylever on return spring under guideplate, or bind in codebars or T-levers.
12	Repeat keys fail to generate repeat characters when fully depressed.	(a) Make sure there is no obstruction in keylever slot. (b) Check for bind in keytop. (c) Check for bind in universal tie link and/or non-repeat lever. (d) Make sure repeat keylever engages nonrepeat lever.
13	Incorrect characters produced by keyboard. (Answer-back or reader produces correct characters.	(a) Make sure contact wires are correctly positioned on T-levers. (b) Check action of contact wires. Make sure bottom ends of contact wires are secure, and that contacts open and close according to code bits of character.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
13 (contd)		(c) Check contact points for any foreign material. Clean as necessary. (d) Check Contact Wires adjustment in Section 574-421-700TC. (e) Remove keytop guideplate and make sure all codebars and tie links are correctly engaged with T-levers. (f) If contact wire operation is satisfactory, circuit card 322450 may be defective. See Figure 8 for electrical check points.
14	No upper case characters in shift mode. (Answer-back or reader produces correct characters.)	(a) Check movement of shift codebar and associated contact wire. (b) Check Left Shift Contact Wire and Shift Codebar Spring adjustments in Section 574-421-700TC. (c) If contact wire operation is satisfactory, circuit card 322450 may be defective. See Figure 8 for electrical check points.
15	Control characters not produced from keyboard. (Answer-back or reader produces correct characters.)	(a) Check movement of control codebar and associated contact wire. (b) Check CTRL Contact Wire adjustment in Section 574-421-700TC. (c) If contact wire operation is satisfactory, circuit card 322450 may be defective. See Figure 8 for electrical check points.
16	SHIFT keys fail to lock when SHIFT LOCK key is depressed, or fail to unlock when SHIFT LOCK key is depressed a second time.	Remove keytop guideplate and observe mechanical linkage between shift and shift lock keylevers.
	TYPING UNIT	
17	Incorrect characters produced by keyboard, reader, and answer-back.	Adjust range finder setting. If no setting can be found which produces error-free operation, operate unit manually from keyboard and observe selection of push levers in selector. If character is incorrect at selector, refer to trouble No. 18. If character is correct at selector, but incorrect character is printed, refer to trouble No. 19.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
18	Incorrect characters printed — selector push lever combinations do not correspond to character codes.	(a) Check for loose selector magnet wires and/or connectors. (b) Check for missing springs in selector. (c) Check for dirt or oil on selector armature. (d) Check the following adjustments in Section 574-422-700TC: Shoe Lever Gap and Trip Lever Engagement Armature Spring Armature Bracket Position (Preliminary) Belt Tension (Final) Gear Backlash *NOTE: Refine Armature Bracket Position (Preliminary) adjustment by equalizing clearance between armature extension and No. 1 and No. 8 selector levers.*
19	Incorrect characters printed — selector produces correct code combination.	Operate unit manually and observe selection of codebars. (a) If codebar combinations are incorrect for character selected, check Codebar Reset Lever Position and Selector Blocking Lever Positioning adjustments in Section 574-422-700TC. (b) If codebar combinations are correct for character selected, check all adjustments related to carriage area in Section 574-422-700TC.
20	Function failures.	(a) Check for bent function levers. (b) Check following adjustments in Section 574-422-700TC: Function Lever Retainer Left Rocker Drive Right Rocker Drive Print Suppression Latch — Horizontal Clearance Print Suppression Latch — Vertical Clearance Function Shaft and Casting Position Function Clutch Trip Lever Engagement

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
21	Function repeat.	Check following adjustments in Section 574-422-700TC: Stripper Bail Clearance Function Clutch Trip Lever Engagement
22	Failure to print at one end of carriage travel.	Check following adjustments in Section 574-422-700TC: Rear Rail Position Carriage Drive Bail Endplay
23	Ribbon fails to feed or feeds erratically.	(a) Make sure ribbon spool is seated correctly over feeding pin. (b) Check Ribbon Power Lever Drive adjustment in Section 574-422-700TC.
24	Ribbon does not shift for two-color printing.	(a) Make sure ribbon is installed correctly. (b) Check Color Selection Latch Overtravel adjustment in Section 574-422-700TC.
25	Friction Feed Units All characters too light or too dark.	Check Platen — Horizontal Position adjustment in Section 574-422-700TC.
26	One side of character darker than the other. (All characters.)	Check Typewheel "Home" Position adjustment in Section 574-422-700TC.
27	One side of character darker than the other. (Characters in clockwise field of typewheel only, or in counterclockwise field only.) *NOTE: See Figure 2 for typewheel layout.*	(a) Check Stop Plate adjustment in Section 574-422-700TC. (b) Refine Typewheel "Home" Position adjustment if necessary. *NOTE: Check horizontal spacing of characters involved. If necessary, refine adjustments to provide best shading and spacing.*
28	All characters darker at top or bottom.	Check Vertical Type Alignment adjustment in Section 574-422-700TC
29	Horizontal spacing of characters varies. (All characters, or characters in either clockwise or counterclockwise field of typewheel — see Figure 2.)	(a) Check Stop Plate adjustment in Section 574-422-700TC. (b) Refine Typewheel "Home" Position adjustment if necessary. *NOTE: Check for uniform horizontal shading of characters involved. If necessary, refine adjustments to provide best shading and spacing.*

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
30	Incorrect spacing at left side of copy only.	Check following adjustments in Section 574-422-700TC: Spacing Belt Tension Left Margin Position Left Margin Printing
31	Repeated characters are unequally spaced at left side of copy.	(a) Check for bind in carriage rollers or dashpot plunger, or for out-of-parallel dashpot. (b) Check Reset Lever Positioning adjustment in Section 574-422-700TC.
32	Random characters are unequally spaced at left side of copy.	Check following adjustments in Section 574-422-700TC: Print Hammer Bail Spring Print Hammer Trip Lever Spring Power Bail Roller Clearance
33	Unit fails to line feed, or feeds erratically.	Friction Feed Units (a) Observe operation of line feed drive link. If drive link does not operate, check operation of line feed function lever and line feed blocking lever. (See trouble No. 4 for function failures.) Check Line Feed Drive Arm Clearance and Line Feed Upstop Bracket Position adjustments in Section 574-422-700TC. (b) If drive link moves through its full travel, or repeats, check Line Feed Stripper Plate Clearance adjustment in Section 574-422-700TC. (c) If drive link travels fully but does not drive platen fully, or drives too far, check following adjustments in Section 574-422-700TC: Line Feed Selection Detent Position Line Feed Drive Link Position Line Feed Pawl Downstop Position Sprocket Feed Units (a) If platen does not advance, check selection of line feed pawl in slot 13. (b) Check Line Feed Selection and Line Feed Pawl Stripping adjustments in Section 574-422-700TC.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
33 (contd)		(c) If extra line feed occurs, check Line Feed Selection and Line Feed Pawl Stripping adjustments in Section 574-422-700TC. (d) If line feed is irregular, check Detent Position adjustment in Section 574-422-700TC.
34	Wide Platen Units Paper does not advance when PAPER ADVANCE button is depressed.	(a) Make sure cable to form feed mechanism is secure. (b) Check Paper Advance adjustment in Section 574-426-700TC.
35	Sprocket Feed Units Form feed does not operate or operates erratically.	(a) If form does not advance, check selection of form feed pawl in slot 14. If pawl selects but form does not advance, check for bind in reset follower lever. *NOTE: Roller should rest on form-out cam disc after a line feed.* Check following adjustments in Section 574-422-700TC: Form-Out Lever Overtravel Form-Out Lever Reset Clearance Cam Lobe Position Form-Out Lever Spring (b) If form feed repeats, check following adjustments in Section 574-422-700TC: Form-Out Lever Reset Clearance Cam Lobe Position Trip Lever Engagement — Final (c) If printed line is off, check Printing Line Position — Final adjustment in Section 574-422-700TC. (d) If zero pointer is off, check Cam Zero Position adjustment in Section 574-422-700TC.
36	Printer fails to carriage return when RETURN key is depressed.	(a) Check selection of function lever in slot 2. (b) Make sure return spring is attached to carriage. (c) Check Carriage Return Lever — Latch Clearance adjustment in Section 574-422-700TC.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
37	No carriage return when LOCAL RETURN button is depressed.	Check Local Return adjustment in Section 574-426-700TC.
38	Spacing failure or erratic spacing.	(a) Move carriage from left to right and make sure carriage rollers rotate freely. (b) If spacing fails and spacing feed pawl is not blocked, check following adjustments in Section 574-422-700TC: Carriage Return Lever — Unlatch Clearance Feed Pawl Stop Position Feed Pawl Travel Carriage Return Lever Spring Space Suppression Lever Clearance — Printing Space Suppression Lever Clearance — Spacing
39	Incorrect or erratic positioning at left margin.	(a) Check for dashpot misalignment, binding of carriage rollers, or binding of plunger against dashpot surfaces. (b) Check Carriage Bounce and Carriage Return Lever — Unlatch Clearance adjustments in Section 574-422-700TC.
40	Incorrect or erratic operation at right margin.	Check Line Length Selection adjustment in Section 574-422-700TC.
41	Signal bell fails to ring.	(a) If bell fails to ring when bell code is keyed, check selection of function pawl in slot 7. Also check Bell Clapper Gap adjustment in Section 574-422-700TC. (b) If bell fails to ring when carriage approaches right margin, check selection of function pawl in slot F. Also check Margin Bell Bellcrank Clearance adjustment in Section 574-422-700TC.
42	Spacing and printing suppression failures.	(a) If unit neither prints nor spaces, and print hammer bail and spacing feed pawl are blocked, check Print Suppression Latch — Vertical Clearance adjustment in Section 574-422-700TC. (b) If unit fails to space on characters only, check Space Suppression Lever Clearance — Printing adjustment in Section 574-422-700TC.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
42 (contd)		(c) If unit fails to space on space only, check Space Suppression Latch Clearance — Spacing adjustment in Section 574-422-700TC. (d) If unit fails to print only, check Print Suppression Latchlever Release adjustment in Section 574-422-700TC. (e) If unit fails to suppress on nonprint, nonspace functions, check selection of correct function lever or blank function lever in slot 6. (See trouble No. 4 for function lever failures.) (f) If only print suppression fails, check Print Suppression Latchlever Release adjustment in Section 574-422-700TC. (g) If only space suppression fails, check Space Suppression Lever Clearance — Printing and Space Suppression Lever Clearance — Spacing in Section 574-422-700TC.
43	ALARM does not light when low paper (friction feed) or no paper (sprocket feed) condition occurs.	(a) Make sure paper is installed correctly. (b) Operate paper alarm lever manually and observe contacts. (c) Check circuitry related to paper alarm contacts in wiring diagrams 1194SD (DC/EIA interface) or 1196SD (FSK interface). If contacts and circuit connections are in good order, circuit card 303847 (DC/EIA) or 322491 (FSK) may be defective.
	ANSWER-BACK	
44	Answer-back does not operate when HERE IS button is depressed.	(a) Manually depress answer-back armature. If answer-back does not cycle, check the following adjustments in Section 574-422-700TC: Trip Lever Clearance Trip Bail Position Trip Lever Overtravel and Armature Gap HERE IS Bellcrank Position (b) Refer to Figure 10 for electrical check points. (c) Connect a jumper between J20, pins 1 and 2 (DC/EIA interface) or between J4, pin 4 and ground (FSK interface). If answer-back cycles, HERE IS switch contacts may be defective.

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
44 (contd)		DC/EIA Interface (d) With jumper between J20, pins 1 and 2, check voltage at J4, pin 6. If +24 v is present, form-out contact may be open. If not present, answer-back magnet coil may be defective. FSK Interface (e) With jumper from J4, pin 4 to ground, check voltage at J8, pin 8. If +24 v is present, answer-back magnet coil may be defective. If not present, form-out contact may be open.
45	Answer-back drum moves during first distributor cycle but fails to continue cycle, or cycles erratically.	Check following adjustments in Section 574-422-700TC: Drum Position Feed Lever Position Feed Pawl Position
46	Answer-back cycles but characters are not generated.	Check Character Suppression Contact Wire Gap adjustment in Section 574-422-700TC.
47	Incorrect characters produced by answer-back. Keyboard produces correct characters.	(a) Check positioning of answer-back contact wires and springs. (b) Check Code Contact Wire Gap adjustment in Section 574-422-700TC.
48	Answer-back repeats.	Check Trip Lever Clearance adjustment in Section 574-422-700TC.
	TAPE PUNCH	
49	Tape punch does not operate when lever is placed in ON position.	(a) Check mechanical drive linkage between typing unit and punch. Operate typing unit manually with punch lever in ON position and observe action of drive linkage. (b) Check Tape Punch Drive adjustment in Section 574-425-700TC.
50	Punched characters do not correspond to characters selected by keyboard and printed by typing unit.	(a) Check for missing pawl springs. (b) Check following adjustments in Section 574-425-700TC: Pawl Upstop Assembly — Final Stripper Bail Upstop Punch Penetration

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
51	Tape does not feed, or feeds erratically.	(a) Make sure tape roll is installed correctly, and tape feeds from top of roll. (b) Check for jammed tape or chad accumulation in punch block. (c) Check Punch Penetration and Feed Wheel Ratchet and Pawl adjustments in Section 574-425-700TC.
52	Tape does not backspace when lever is moved to B.SP. position.	Check Backspace Stop adjustment in Section 574-425-700TC.
53	Punch does not turn on when CONTRL DC2 is depressed on keyboard.	Check Automatic On adjustment in Section 574-425-700TC.
54	Perforations are spaced incorrectly.	Check Feed Wheel Ratchet and Pawl and 10 Characters Per Inch adjustments in Section 574-425-700TC.
55	Punch does not turn off when CONTRL DC4 is depressed on keyboard.	Check Automatic On adjustment in Section 574-425-700TC.
56	Punch Equipped for Low Tape Alarm ALARM lamp does not light when low tape condition exists.	(a) Check routing of tape between tape roll and punch. (b) If ALARM lamp responds to tape out/tight tape condition in reader, or low paper condition in typing unit, check low tape contacts of punch, and adjust as necessary. (c) Refer to wiring diagrams 1194SD (DC/EIA) or 1196SD (FSK) for electrical circuitry.
	TAPE READER	
57	Tape reader does not operate when lever is in START position.	(a) Manually depress armature of reader trip magnet. If reader operates, check start contact wire with lever in START position. Adjust per Section 574-424-700TC. (b) Make sure stop/tight tape/tape out contact wire is closed. If necessary, adjust per Section 574-424-700TC. *NOTE: For automatic readers, make sure EOT, DC3, and ENQ contacts are closed. (See Figure 12 (DC/EIA) or Figure 11 (FSK).*

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
57 (contd)		(c) Check for approximately 150 v dc between J1, pin 3 (+) and J1, pin 6 (-) with lever in START position. If not present, check for 115 v ac between J1, pins 14 and 15. If dc voltage is not present, but ac voltage is correct, replace fuse F3. If dc is still not present, reader circuit card 183079 may be defective. (d) If dc voltage is correct between J1, pins 3 and 6, check for approximately 150 v dc between J2, pin 13 (+) and J2, pin 1 (-). If voltage is present, reader feed magnet coil may be defective. If not, check continuity of circuit per Figure 12 (DC/EIA) or Figure 11 (FSK).
58	Reader operates when lever is held in START position, but stops when lever is released.	(a) Check operation of TDC relay on reader feed card 183079. (b) If TDC-2 contacts fail to close when lever is placed in START position, check for 24 v dc between J1, pin 8 (+) and J1, pin 13 (-). If present, TDC relay may be defective. If not present, check circuit connections per Figure 12 (DC/EIA) or Figure 11 (FSK).
	Reader Strapped For Automatic Operation	
59	Reader does not start when DC1 is keyboarded. Operation normal when reader operating lever is placed in START position.	(a) Check for closure of DC1 function contacts on typing unit when CONTRL/DC1 is depressed. (b) If contact operation is normal, check circuit connections per Figure 12 (DC/EIA) or Figure 11 (FSK).
60	Reader does not single-step when lever is moved to STEP position. Operation normal when lever is moved to START position.	(a) Make sure contact closes when lever is moved to STEP position. Adjust as necessary. (b) Check circuit connections per Figure 12 (DC/EIA) or Figure 11 (FSK).
61	Printed copy on typing unit does not correspond to code characters on tape when typing unit is operated from reader. Typing unit gives correct print out from keyboard.	(a) Check for damaged or bent sensing contacts, or for contacts out of sensing pin slots. (b) Check following adjustments in Section 574-424-700TC: Detent Lever Feed Pawl Sensing Pin

TABLE 4

TROUBLESHOOTING — OFF-LINE OPERATION (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
62	Tape jams or tears when fed through reading head.	(a) Check tape lid and guide pins for burrs or roughness. (b) Check for binding of sensing pins.
63	Tape cannot be moved freely through head in both directions when control lever is in FREE position.	Make sure control lever extension engages blocking pawl and feed pawl when control lever is in FREE position.
64	Reader does not stop when control lever is moved to STOP position.	Make sure stop contact opens when lever is moved to STOP position. Adjust as necessary.
65	Reader does not stop when tape runs out or when tight tape condition occurs.	(a) Make sure tape out/tight tape contact opens for either condition. See Figure 12 (DC/EIA) or Figure 11 (FSK) for circuitry. (b) Check Control (or Tape-Out) Contact Wires adjustment in Section 574-424-700TC.
66	Reader Strapped for Automatic Operation Reader does not stop when DC3, ENQ, or EOT is read on tape.	Check for opening of function contacts on typing unit when CONTRL/DC3, ENQ, or EOT is depressed. See Figure 12 (DC/EIA) or Figure 11 (FSK) for circuitry.

TABLE 5

TROUBLESHOOTING — ON-LINE OPERATION WITH DC OR EIA INTERFACE

NOTES:
Circuit common is terminal 8 or 9 of card 303846.
Signal currents in signal lines of DC interface are 60 or 20 ma from an external voltage source of 25 to 120 v dc.
Voltage levels for EIA interface are +5 to +25 v for "on" or "space" and -5 to -25 v for "off" or "mark."

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
1	Motor does not run when LINE or LINE FDX button is depressed. Motor does turn on when LOCAL button is depressed.	DC Interface (a) Check for positive voltage at J11, pin 6. If not present, check local, off, and paper alarm switch contacts per Figure 5. (b) If voltage is correct at J11, pin 6, check voltage at J15, pin 6. If voltage is not zero, circuit card 303847 may be defective. EIA Interface (a) Check for positive voltage at J11, pin 15. If not present, check EOT, local, off, and paper alarm contacts per Figure 6. (b) Check for positive voltage at J11, pin 6. If not present, trouble is external (no DSR signal from external device). (c) If voltage is correct at J11, pin 6, check voltage at J15, pin 6. If voltage is not zero, circuit card 303847 may be defective.
2	Local typing unit runs continuously (open) in line mode on either half-duplex or full-duplex operation.	DC Interface Check for small voltage between J11, pins 5 (+) and 9 (-). If not present, trouble is external. *CAUTION: IF CIRCUIT IS OPEN, VOLTAGES UP TO +125 V MAY BE PRESENT.* If voltage is normal, circuit card 303847 may be defective. EIA Interface Check voltage at J11, pin 3. If positive voltage (space) is present, trouble is external (ie, no marking carrier from external device). If negative voltage is present, circuit card 303847 may be defective.

TABLE 5

TROUBLESHOOTING — ON-LINE OPERATION WITH DC OR EIA INTERFACE (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
3	DC Interface Wired for Half-Duplex Local and remote terminals run continuously (open) in line mode.	Place jumper between J11, pins 5 and 10. If remote receiver still runs open, trouble is external. If not, remove jumper and check voltage between J11, pins 11 (+) and 10 (-), and between J11, pins 5 (+) and 9 (-). Each voltage should be about 2 v. *CAUTION: IF CIRCUIT IS OPEN, VOLTAGES UP TO 125 V MAY BE PRESENT.* If voltages are correct, circuit card 303847 may be defective.
4	Remote terminal runs continuously (open) in line mode.	DC Interface (a) If terminal is wired for half-duplex, trouble is external. (b) If wired for full-duplex, connect jumper between J11, pins 10 and 11. If remote terminal still runs open, trouble is external. If not, circuit card 303847 may be defective. EIA Interface (a) Check voltage at J11, pin 11. If negative (marking) and if J11, pin 4 is positive (RTS on), trouble is external. (b) If voltage at J11, pin 11 is not -24 v, circuit card 303847 may be defective.
5	Remote terminal does not receive message from local terminal in line mode.	(a) Check voltage at J13, pin 2. If +20 v, check to make sure normally closed contacts of LINE or LINE FDX are open. If not, switch may be defective. (b) Voltage at J13, pin 2 should be zero with no message being sent. If not, circuit card 303847 may be defective.
6	Local terminal does not receive message from remote terminal in line mode.	DC Interface (a) Place jumper between J11, pins 5 and 9. If local typing unit runs open, trouble is external. (b) Check voltage at J13, pin 6. If voltage is zero, local contact may be closed in line mode. Check and repair as necessary. If positive voltage is present, circuit card 303847 may be defective.

TABLE 5

TROUBLESHOOTING — ON-LINE OPERATION WITH DC OR EIA INTERFACE (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
6 (contd)		EIA Interface (a) Check voltage at J11, pin 3. If pulsating voltage (+ and -) is not present when signal is being transmitted from remote terminal, trouble is external. (b) Check voltage at J13, pin 6. If voltage is zero, local contact may be closed in line mode. Check and repair as necessary. If positive voltage is present, circuit card 303847 may be defective.
7	Full-Duplex Option Enabled Local typing unit operates when local terminal transmits in LINE FDX.	Check for +24 v at J15, pin 11. If not present, check contacts on LINE FDX switch. If present, circuit card 303847 may be defective.
8	Copy errors in line mode. No errors noted in local mode.	Check range scale setting on typing unit. Adjust as necessary to provide error-free copy.
9	Answer-back does not operate when ENQ is received from remote terminal.	(a) Place terminal in local mode. (b) Depress CONTRL/ENQ and manually trip codebar clutch. If ENQ function pawls operate (extreme right of function box), check Right Rocker Drive adjustment in Section 574-422-700TC. (c) If function pawls do not operate, depress OFF button, trip codebar clutch, and manually cycle main shaft clockwise as viewed from left. Check for binds in function lever or pawls.

TABLE 6

TROUBLESHOOTING — ON-LINE WITH FSK INTERFACE

NOTES:
Circuit common is J14, pin 15.
Voltage low is zero to +1 v.
Voltage high is +2 to +6 v.

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
1	Motor does not run when ANS or ORIG button is depressed. No dial tone on auto-answer DAA.	(a) Measure voltage at J15, pin 9 and depress ANS button. Voltage should be +6 v when button is depressed, and zero when released. (b) Measure voltage at J15, pin 7 and depress ORIG button. Voltage should be zero when button is depressed, and +6 v when released. (c) Measure voltage at J15, pins 3 and 5 within 25 seconds after depressing ANS or ORIG button. Voltage at pin 3 should be +6 v, and voltage at pin 5 should be zero. (d) If above voltages are correct, circuit card 322491 may be defective. If any are incorrect, check ANS, ORIG, EOT, CLEAR, LOCAL, or PAPER ALARM contacts. See Figure 9 for related circuitry.
2	Auto-Answer DAA Motor does not run when ANS or ORIG button is depressed. Dial tone is present in DAA.	Circuit card 322491 may be defective.
3	Motor turns on when ORIG button is depressed, but ORIG lamp does not light after hanging up handset (auto-answer DAA) or lifting exclusion key (manual DAA). Motor turns off after 25 seconds.	(a) F2m carrier (2225 Hz tone) from remote terminal may be too weak to operate circuit. If so, trouble is external. Check loudness of tone in handset. (b) If f2m tone seems adequate, originate call and check voltage at J2, pin 8 after going on line (within 25 seconds after remote terminal goes into answer mode). If voltage is zero, circuit card 322490 may be defective. If voltage is +6 v, circuit card 322491 may be defective.
4	When answering a call, motor turns on but ANS lamp does not light. Motor turns off after 25 seconds. In terminal equipped for auto answer-back in called mode, answer-back is not sent.	(a) F1m carrier (1270 Hz tone) may not be received from remote terminal. Check voltage at J2, pin 8. If voltage is zero during 25 second interval, trouble is due to lack of incoming f2m carrier. If voltage is high, circuit card 322491 may be defective.

TABLE 6

TROUBLESHOOTING — ON-LINE WITH FSK INTERFACE (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
4 (contd)		(b) F2m carrier (2225 Hz tone) may not have been sent to remote terminal. Check with remote operator. If f2m carrier is not produced, check for zero voltage at J2, pins 4 and 13. If voltage is zero yet tone is not produced, readjust R32. If still not produced, circuit card 322490 may be defective. If voltage at J2, pins 4 and 13 is not zero, circuit card 322491 may be defective.
5	When placing a call, ORIG lamp lights but no answer-back is received from remote terminal equipped for auto answer-back. ORIG lamp goes out and motor stops after 25 seconds. If auto-answer DAA, terminal disconnects.	F1m carrier may not have been sent, or f1m level may be too low. While ORIG lamp is on, check for f1m carrier. If present, trouble is external. If not present, check voltages at J2, pins 7 and 13. If either voltage is zero, circuit card 322491 may be defective. If both voltages are high, circuit card 322490 may be defective.
6	ORIG or ANS lamp lights and remains on, but typing unit runs open or does not print message from remote terminal.	(a) Check voltage at J2, pin 14 for constant high (spacing) or constant low (marking) when remote terminal is transmitting. (b) If voltage at J2, pin 14 varies with incoming message, circuit card 322491 may be defective. (c) If voltage at J2, pin 14 does not vary with incoming message, check operation in both originate and answer mode. If operation fails in both modes, go into echoplex mode. (d) If remote sender (in full-duplex) receives looped back message, circuit card 322491 of local terminal may be defective. (e) If remote sender does not receive looped back message, monitor data line with test handset to determine if data signals are present (see Figure 16).
7	ORIG or ANS lamp lights and remains on, but remote terminal runs open or does not print message sent by local terminal.	(a) Check voltage at J2, pin 1 for constant high (space) or constant low (mark) when local terminal is transmitting. (b) If voltage at J2, pin 1 remains constant, circuit card 322491 may be defective. Refer to Figure 16 for related circuits. (c) If voltage at J2, pin 1 varies with message, monitor data line with test handset to determine if data signals are being sent. Refer to Figure 16 for circuitry. (d) If data signals are not present, circuit card 322490 may be defective.

TABLE 6

TROUBLESHOOTING — ON-LINE WITH FSK INTERFACE (Continued)

NO.	SYMPTOM	ANALYSIS AND CORRECTIVE MEASURES
8	Local terminal sends and receives correctly, but fails to echo in originate or answer mode when echoplex function is implemented.	Circuit card 322491 may be defective.
9	Terminal fails to disconnect when no carrier is present for approximately 25 seconds.	Check voltage at J2, pin 8. If high, circuit card 322490 may be defective. If low, circuit card 322491 may be defective.
10	ANS lamp does not flash in response to incoming ring signal when auto-answer terminal is called in local mode.	Check for low pulsing at J16, pin 11 when ringing. If pulsing occurs at J16, pin 11, but voltage remains high at J15, pin 8, circuit card 322491 may be defective.
11	Motor does not turn off on receipt of EOT or loss of carrier.	Circuit card 322491 may be defective. Refer to Figures 9 and 14 for control and reset circuitry.
12	Motor turns off but terminal fails to disconnect on receipt of EOT or loss of carrier. Terminal does not disconnect when CLEAR or LOCAL button is depressed.	Check voltage at J15, pin 3. If low, circuit card 322491 may be defective. If high, trouble is probably in DAA. If trouble occurs on only one of the listed conditions, refer to Figures 9 and 14 and check contact and reset circuitry.
13	Local typing unit prints out locally generated message in full-duplex.	Check voltage at J15, pin 12. If low, circuit card 322491 may be defective.
14	In echoplex mode, local terminal fails to inhibit sending (option screw no. 1 tight).	Check voltage at J15, pin 11. If high, circuit card 322491 may be defective. If low, check echo contacts. See Figure 18 for related circuitry.
15	Local terminal goes into answer mode when called, but does not produce answer-back (option screw no. 4 tight).	Circuit card 322491 may be defective. Refer to Figure 14 for related circuitry.
16	Answer-back does not operate when ENQ is received from remote terminal.	Place terminal in local mode and depress CONTRL ENQ on keyboard. Manually trip codebar clutch. If ENQ function pawls operate (extreme right of function box), check Right Rocker Drive adjustment of Section 574-422-700TC. If not, depress CLEAR button, trip codebar clutch, and manually cycle main shaft clockwise as viewed from left. Check for binds in function lever or pawl.

BITS 7				0				1			
BITS 6				0		1		0		1	
BITS 5				0	1	0	1	0	1	0	1
4	3	2	1								
0	0	0	0	NUL	DLE	SP	0	@	P	\	p
			1	SOH	DC1	!	1	A	Q	a	q
		1	0	STX	DC2	"	2	B	R	b	r
			1	ETX	DC3	#	3	C	S	c	s
	1	0	0	EOT	DC4	$	4	D	T	d	t
			1	ENQ	NAK	%	5	E	U	e	u
		1	0	ACK	SYN	&	6	F	V	f	v
			1	BEL	ETB	'	7	G	W	g	w
1	0	0	0	BS	CAN	(	8	H	X	h	x
			1	HT	EM	)	9	I	Y	i	y
		1	0	LF	SUB	*	:	J	Z	j	z
			1	VT	ESC	+	;	K	[	k	{
	1	0	0	FF	FS	,	<	L	\	l	¦
			1	CR	GS	-	=	M	]	m	}
		1	0	SO	RS	.	>	N	^	n	~
			1	SI	US	/	?	O	—	o	DEL

Characters and controls are generated by use of a key alone ( ), with a SHIFT key ( ), or with a CONTRL key ( ).

Figure 1 - American National Standard Code for Information Interchange (ASCII)

' BELL	&	% WRU	$ EOT	#	"	!	AD SPACE	(BACK SPACE	)	* LINE FEED	+ VERT TAB	, FORM FEED	- CAR RET	.	/
7	6	5	4	3	2	1	0	8	9	:	;	<	=	>	?
G	F	E	D	C	B	A	@	H	I	J	K	L	M	N	O
W	V	U	T	S	R	Q	P	X	Y	Z	[	\	]	^	_
g	f	e	d	c	b	a	`	h	i	j	k	l	m	n	o
w	v	u	t	s	r	q	p	x	y	z	{	¦	}	~	DELETE

CLOCKWISE FIELD | COUNTERCLOCKWISE FIELD

Figure 2 - Type Wheel Layout for 38 Typing Unit

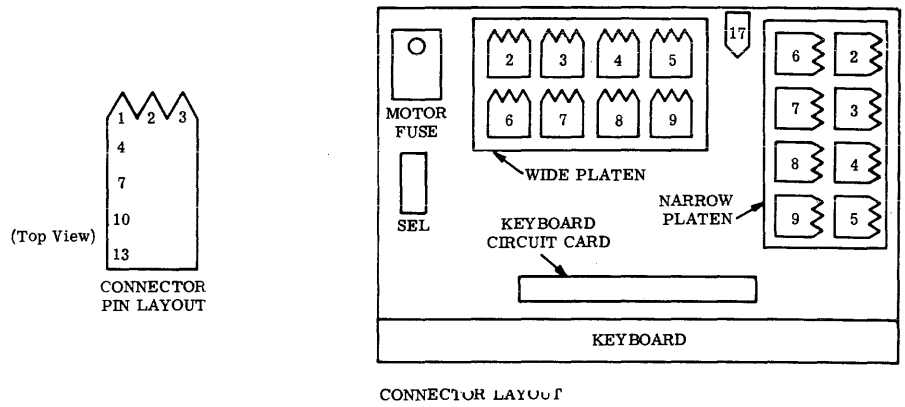


Figure 3 - Connector Layout on Base of Typing Unit

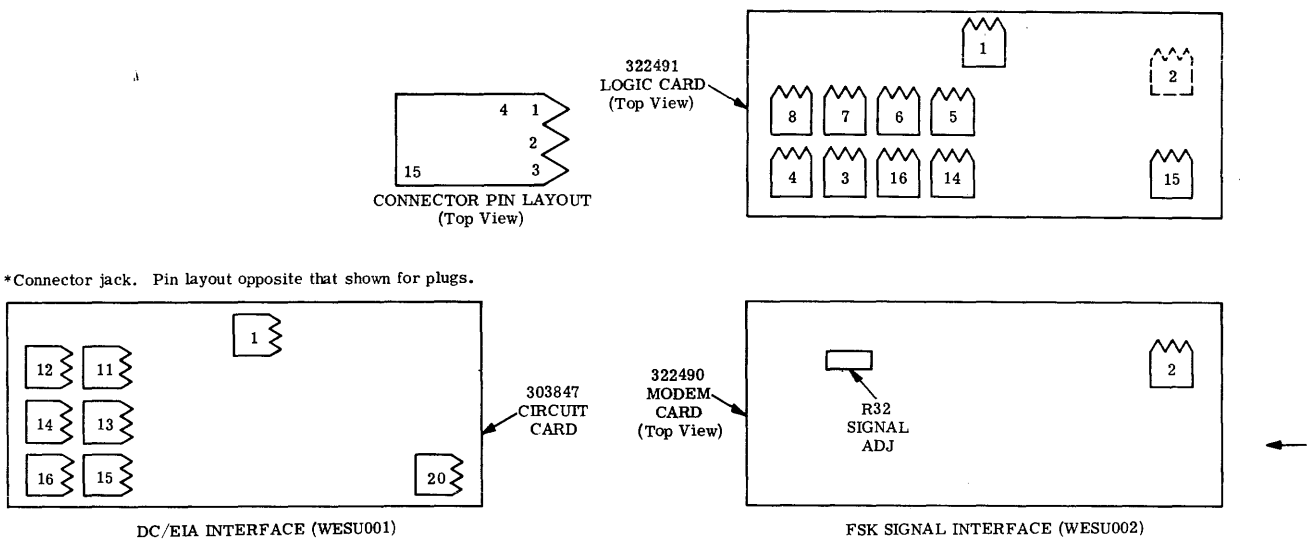


Figure 4 - Connector Layout on ESU

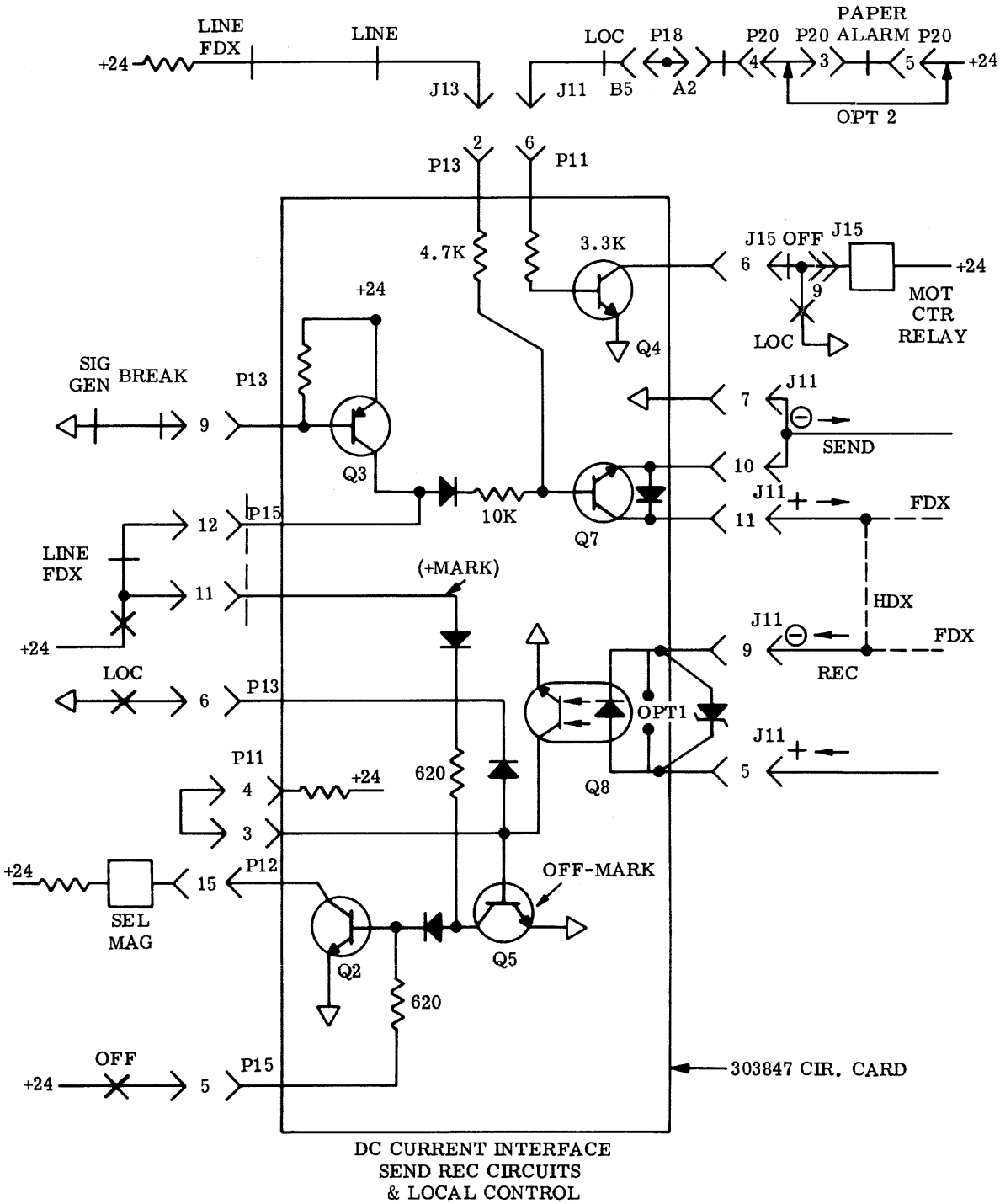
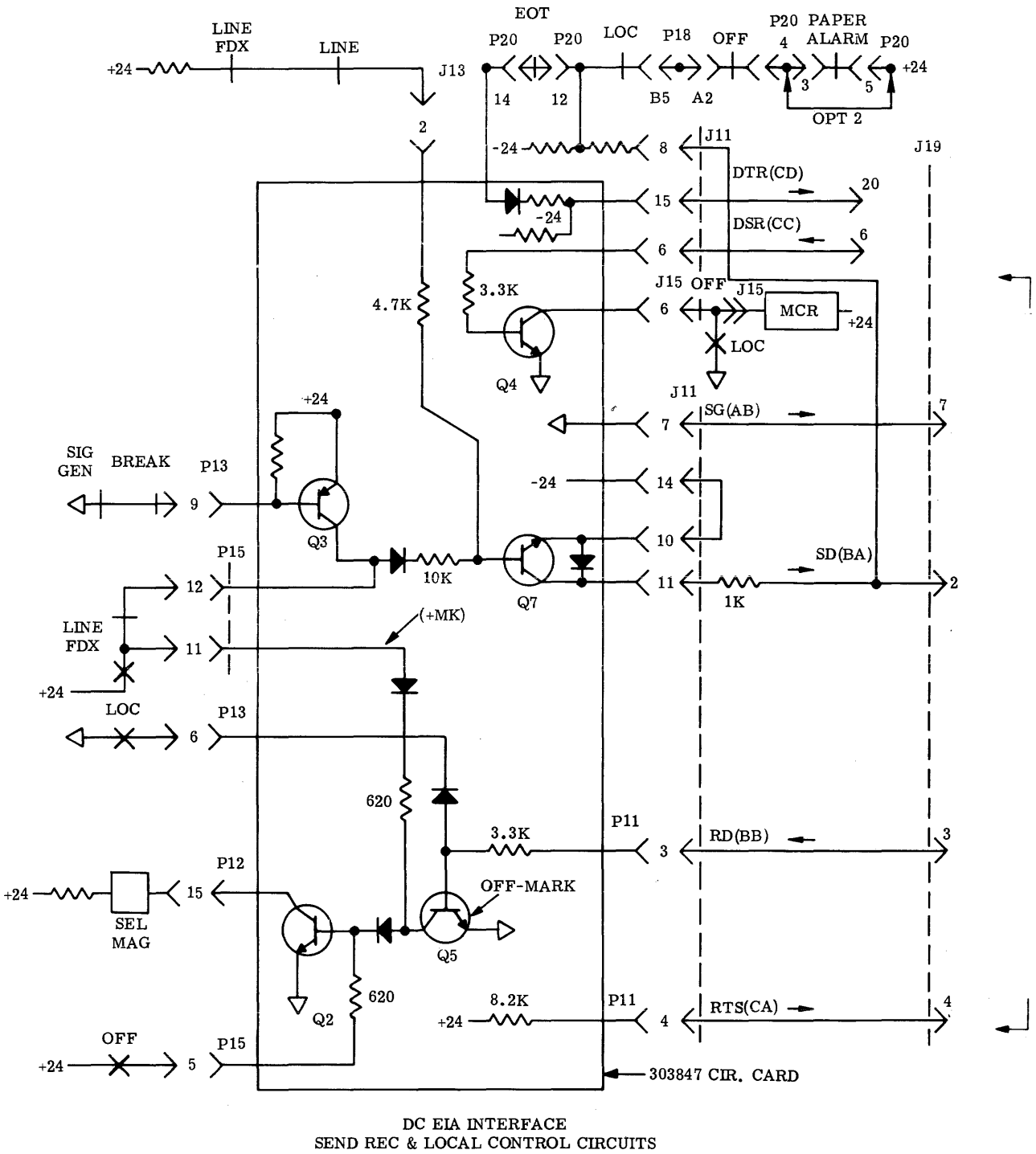


Figure 5 - DC Interface Send/Receive and Local Control Circuits



DC EIA INTERFACE
SEND REC & LOCAL CONTROL CIRCUITS

Figure 6 - EIA Interface Send/Receive and Local Control Circuits

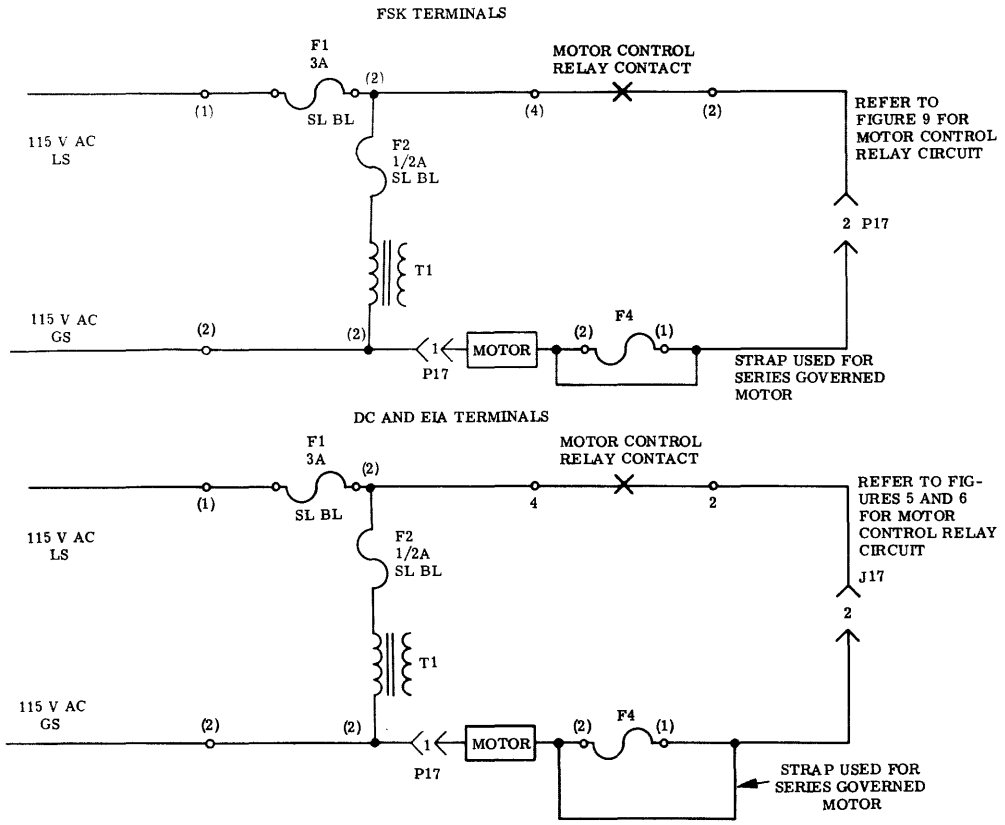


Figure 7 - Motor Circuits

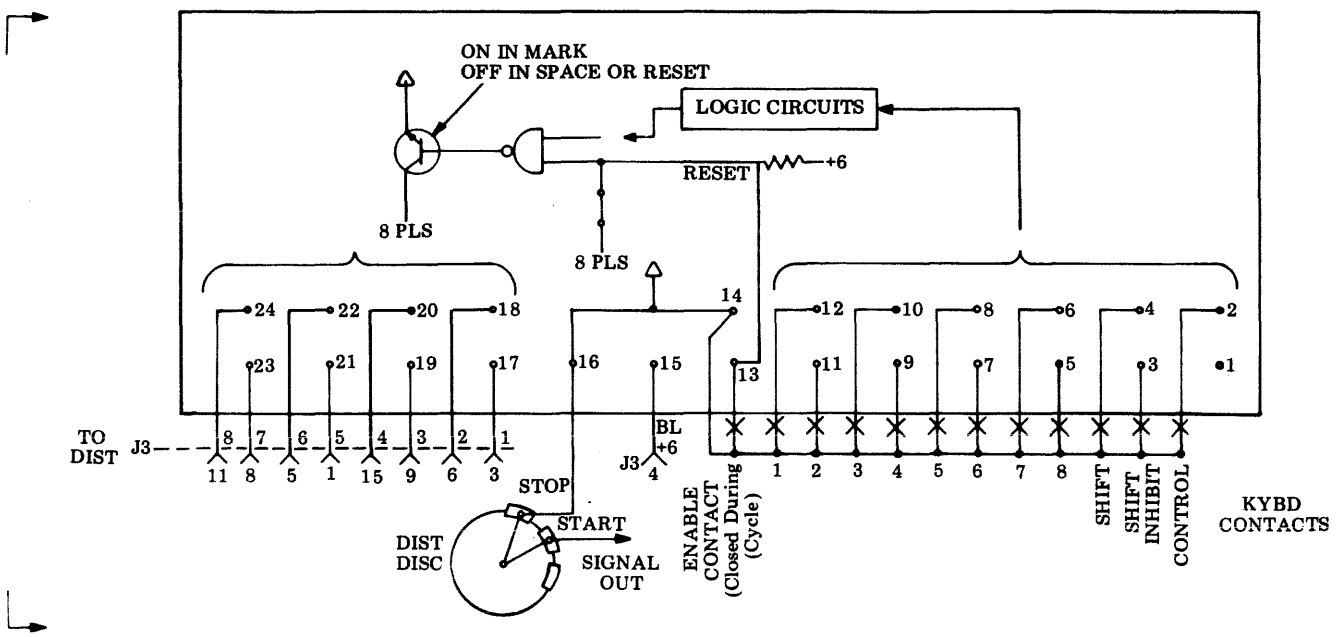


Figure 8 - Keyboard Logic Card

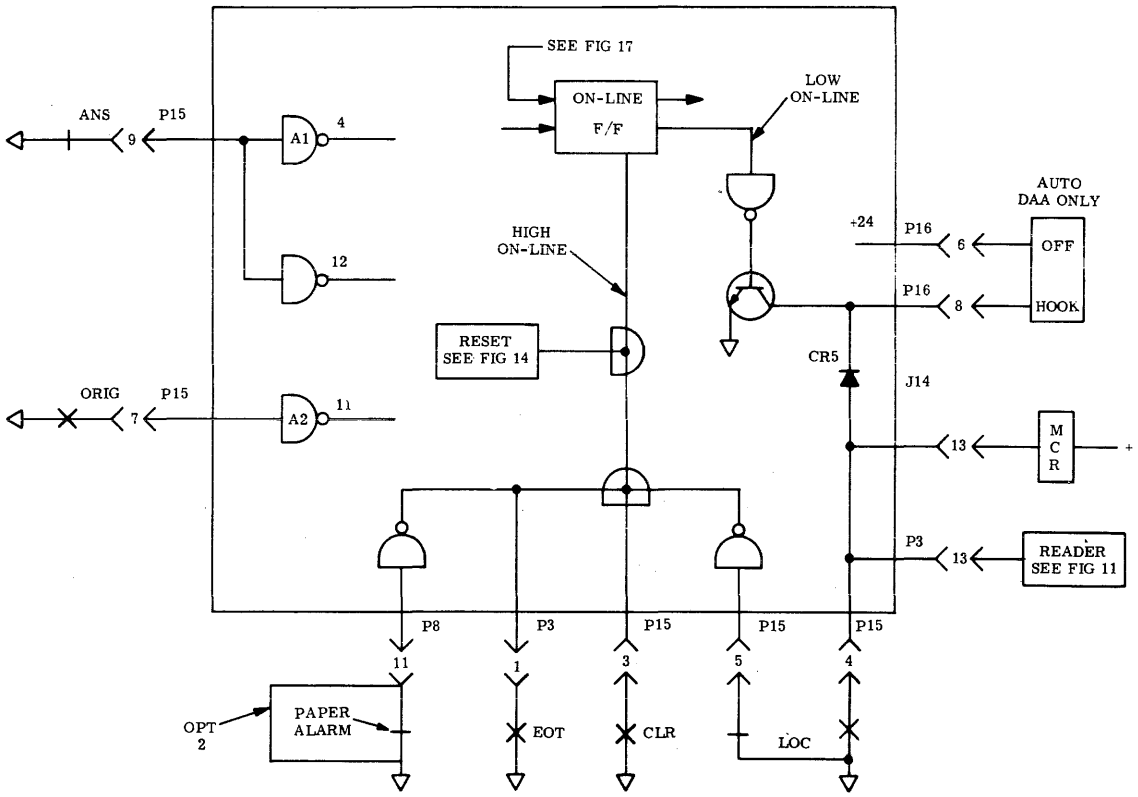


Figure 9 - FSK Motor — Off-Hook Circuits

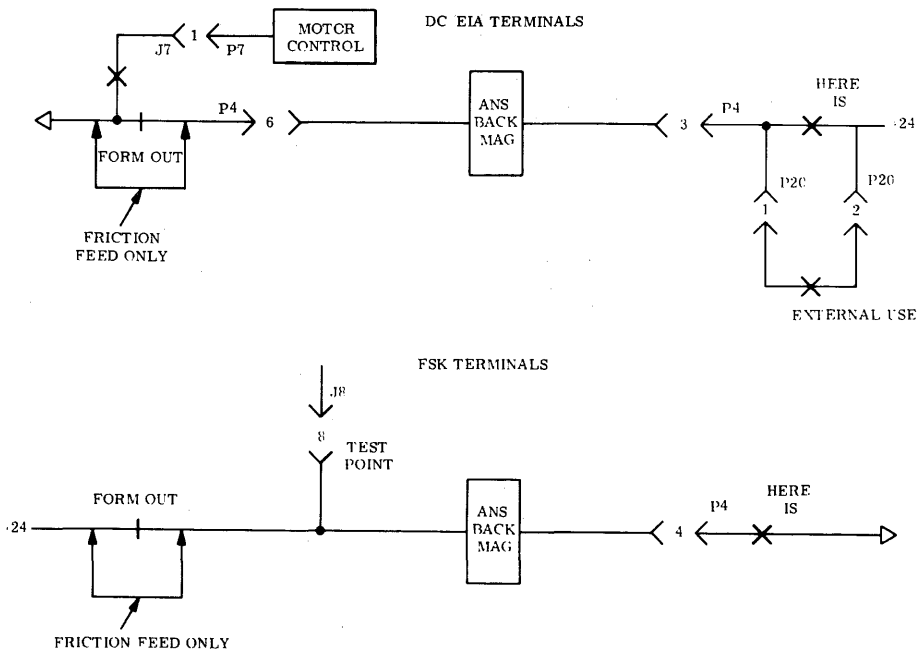


Figure 10 - Local Answer-Back Control

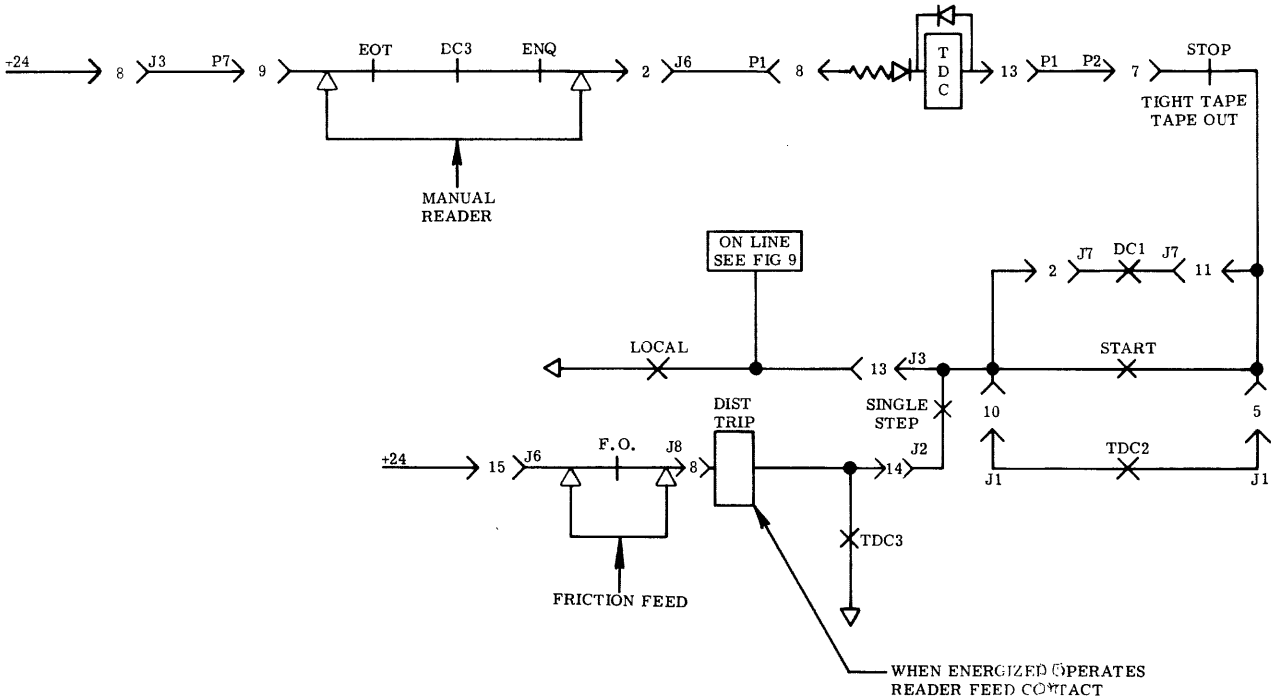


Figure 11 - FSK Reader Trip Circuitry

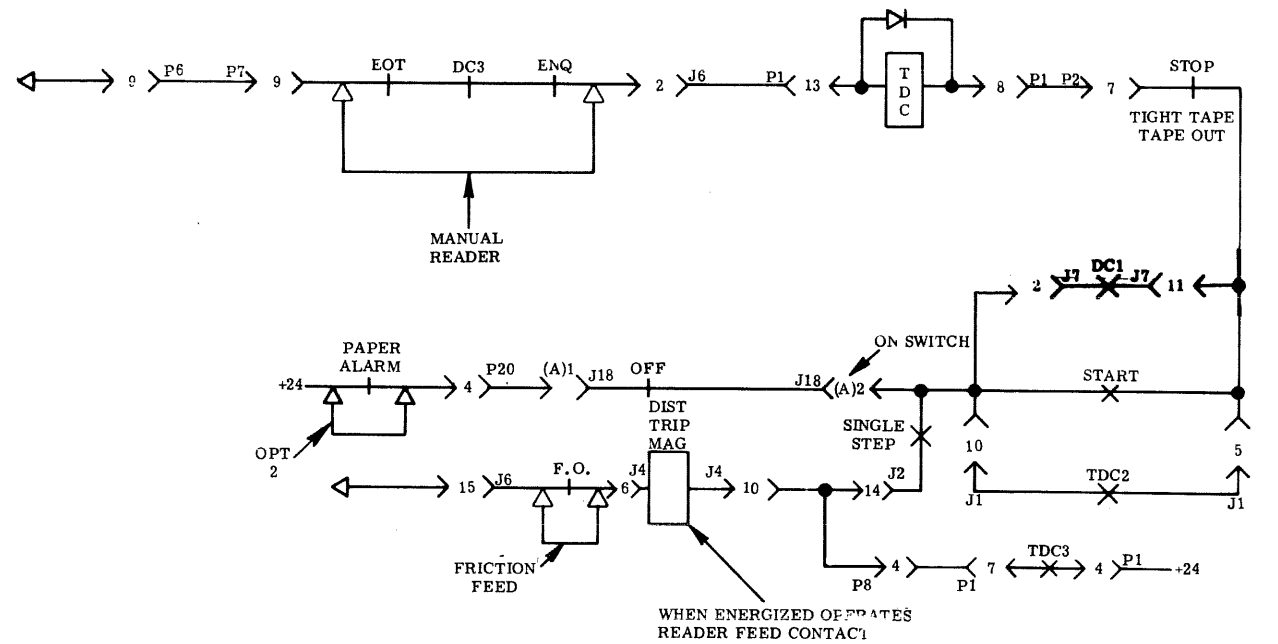


Figure 12 - DC/EIA Reader Trip Circuitry

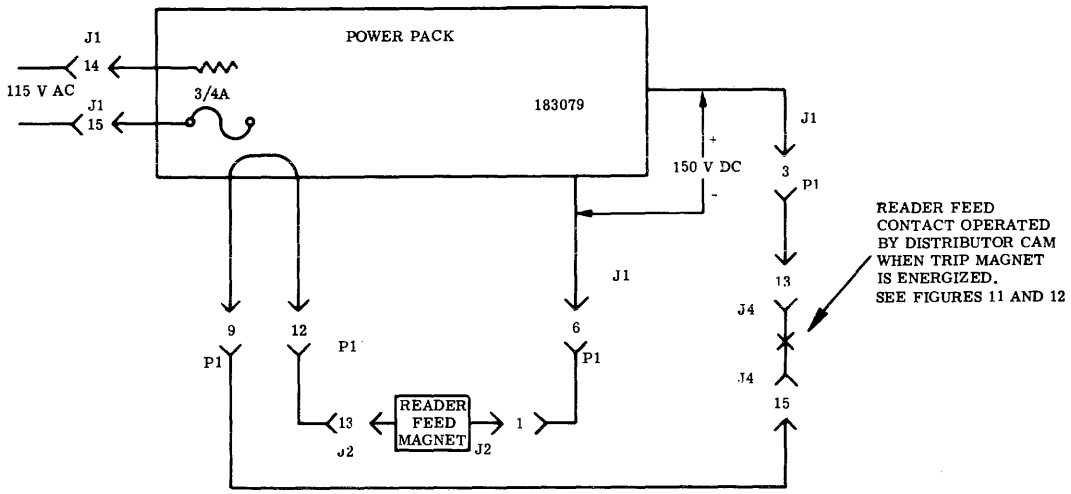


Figure 13 - Reader Feed Circuit

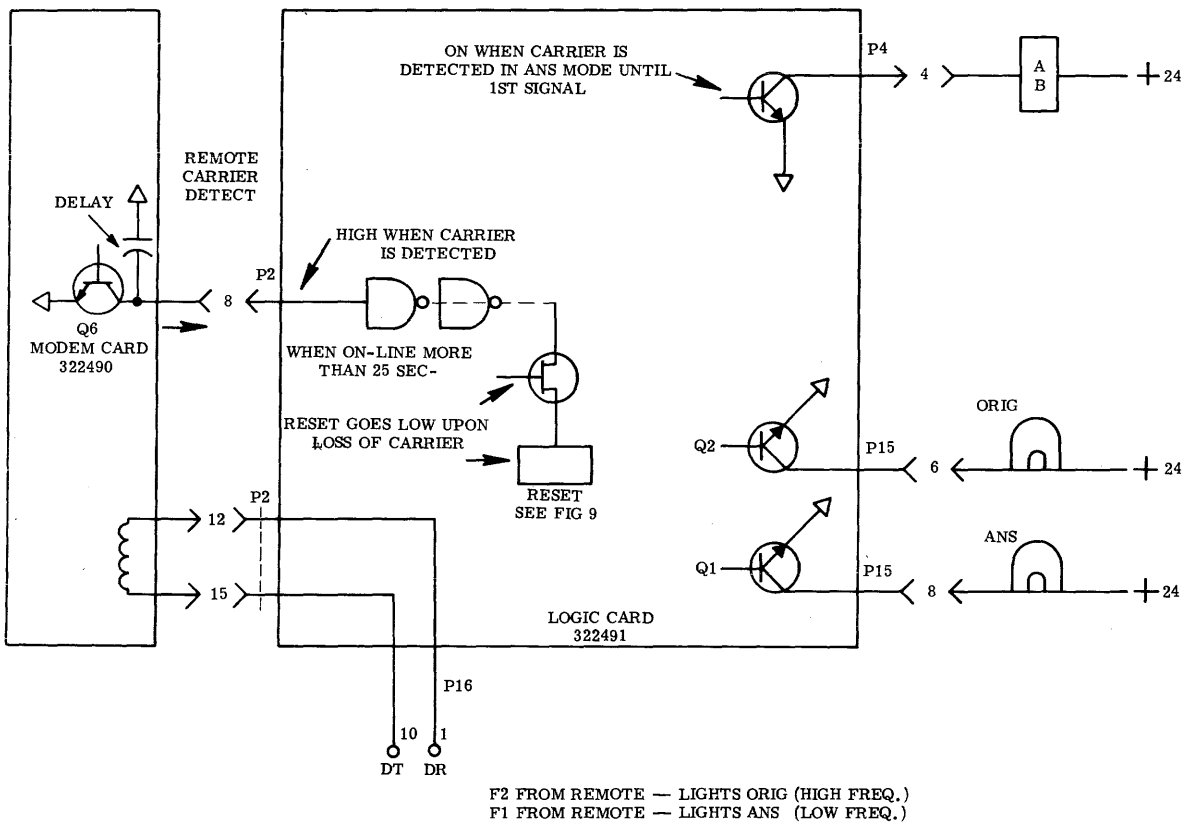


Figure 14 - FSK Carrier Detect Circuit

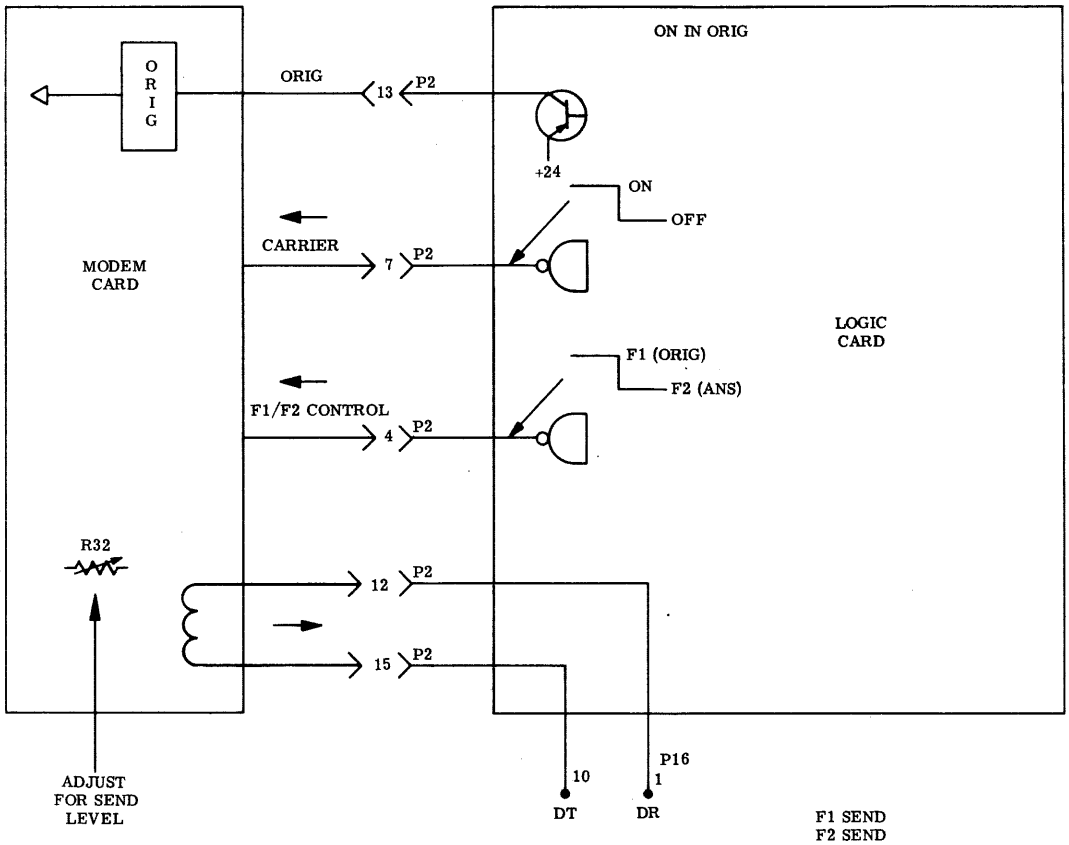


Figure 15 - FSK Carrier Send Circuit

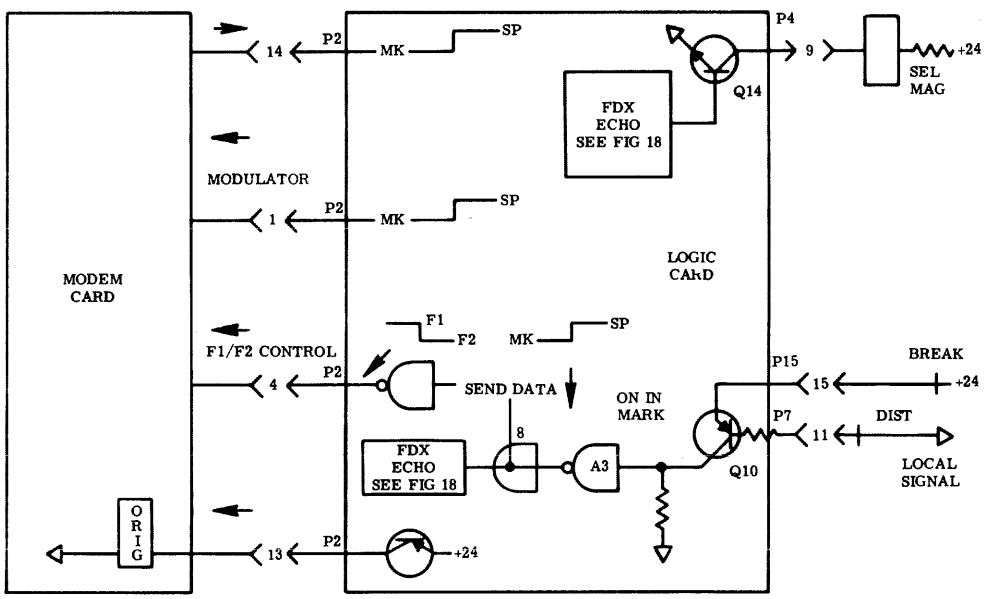


Figure 16 - FSK Carrier Modulate/Demodulate Circuit

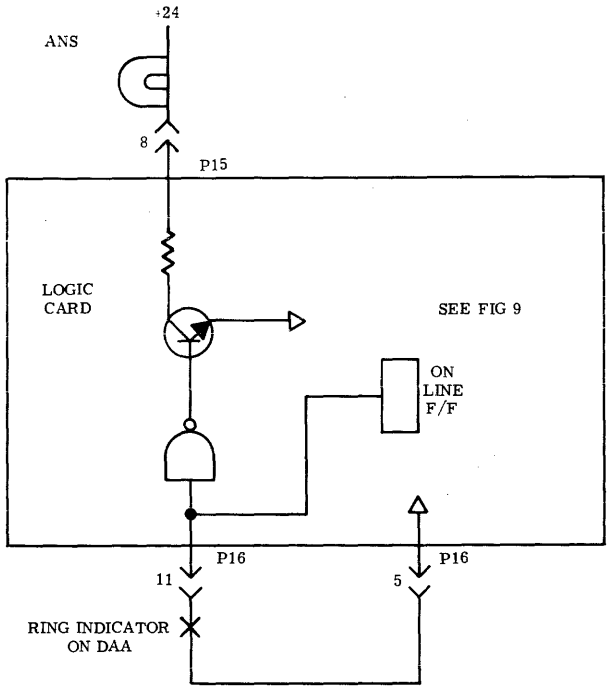


Figure 17 - Ring Indicator Circuit

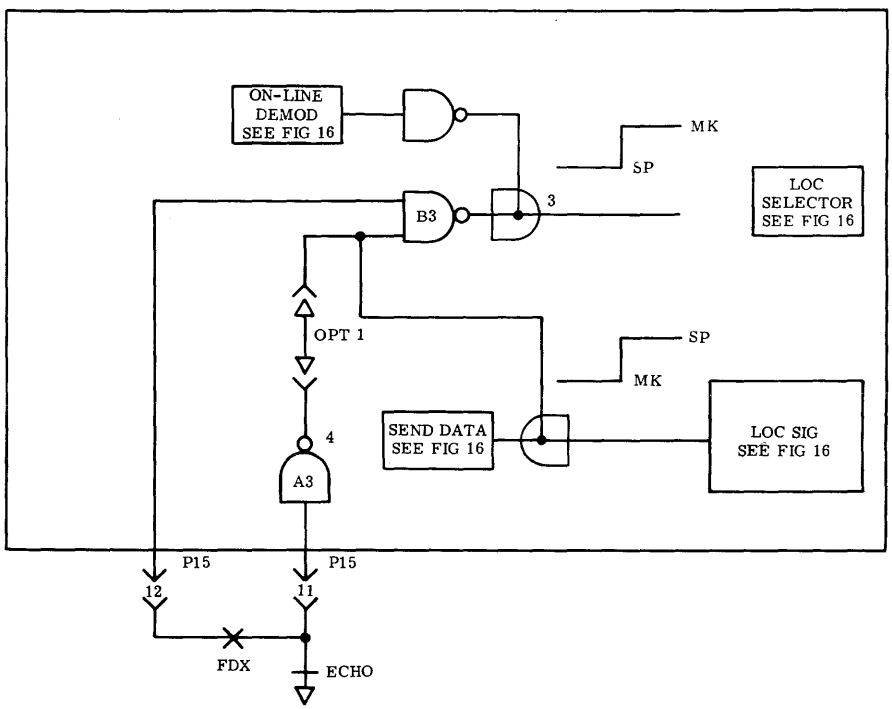


Figure 18 - FDX/Echo Control Circuit