81C1 AND 81D1 SWITCHING SYSTEMS
SIMPLIFIED STATION CONTROL UNIT
(CA-16754-SD)
TROUBLE SHOOTING GUIDES

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1. GENERAL

1.01 This practice presents methods which may be used to isolate trouble at 81C1 and 81D1 stations equipped with a Simplified Station Control Unit per drawing CA-16754. It includes tables that provide step by step procedures which may be used to localize troubles in the equipment. The trouble conditions covered by the tables can be applied to stations arranged for Split, or Non-Split operation, and are based on a study of typical customer reports from 81C1 and 81D1 stations.

1.02 The principal difference between the Split and Non-Split operation is as follows:

(a) Split operation uses a 28ASR to perform both send and receive functions. In this application, the transmitter is disassociated from the typing unit and is connected to the send line. The typing unit of the 28ASR is connected to the receive line. Split operation, due to its wiring, is limited in that hard copy is not obtainable in either the preparation of tape or tape transmission.

(b) Non-Split operation uses a 28ASR for sending and a 28RO for the receiving functions. The sending control unit is mounted in the 28ASR cabinet and the receiving control unit is mounted in the 28RO cabinet. The application of Non-Split operation permits hard copy to be obtained on the 28ASR either when perforating or transmitting.

1.03 Information contained in this section is not intended to replace or reduce the formal training required for station maintenance forces to maintain 81C1 and 81D1 station equipment.

2. TROUBLE CLEARING PROCEDURES

2.01 The trouble report should first be associated with one of the tables listed in the index of this Section. Some reports may use different words to describe the trouble or may not include all conditions covered in the step by step procedures. However, comparison of the reported trouble with the trouble conditions listed in the index will generally indicate which steps should be used to isolate the trouble. Since any one of the isolation steps and trouble clearance procedures may clear the trouble, it may not be necessary to complete all steps listed for each trouble condition. The station equipment should be retested after some type of action has been completed on an isolation step that indicates a trouble condition exists. In some instances, application of the procedures may be helpful in locating a ***trouble not specifically covered by the table.*** In this case, the trouble should be associated with the steps closest to the condition reported.

2.02 It is assumed that the station maintenance man will have obtained the proper release of the station equipment and that the station has been removed from the circuit in accordance with standard procedures prior to working on any teletypewriter equipment.

2.03 Teletypewriter machine defects are not included in this section. These may be cleared by application of usual procedures.

2.04 The trouble report should be analyzed and, if required, sending and receiving distortion tolerance tests should be made before working on the station control circuit. The typing unit may be tested by using a TP154650 clip to hold the print code bar in its print (spacing) position. The clip mounts on the code bar detent bracket. The transmitter signal generator may be tested by placing a tape in the transmitter and manually operating the MS key in the Send station control unit.

2.05 It is assumed that the serving test center has sectionalized the trouble using standard procedures before dispatching a man to the station.

2.06 To prevent damage to relay contacts, the following precautions should be observed when clearing trouble on the station equipment.

(a) When making continuity tests, all power to the station equipment should be disconnected. All continuity tests in this section can be made in this manner unless otherwise specified.

(b) When it is required to make tests with power connected to the station equipment, make sure the test leads of the volt-ohmmeter are used with extreme care to prevent possible shorting of circuits or damage to meter.

2.07 When contacts of wire spring relays are used to make continuity tests, it is of utmost importance that extreme care be exercised to prevent accidental crossing of wire spring contacts. A 651-type tool should be used for these tests to minimize the possibility of contact cross over.

3. RELAY AND DRAWING INFORMATION

3.01 Information on relay contact numbering and some of the basic symbols used on FS drawings is contained in this part. This information is intended to aid the maintenance man in understanding some of the basic circuit drawings he will be using. For more detailed information on Detached Contact Type Schematic Drawings (SDs), refer to Section 005-109-101.

3.02 Contact information for relays is always contained in one of the Apparatus Figure drawings (C sheets). Wire spring relays are listed in tabular form with each column containing information for a particular relay. The numbers at the extreme left and right sides of the form refer to the contact position number, that is, number 12 at the top of the relay and number 1

at the bottom. Contacts not listed are not used in the circuit. If the contact is physically removed from the wire springs, the contact position should be counted when verifying a particular contact position. A typical arrangement of wire spring relay contacts is shown in Fig. 1 below.

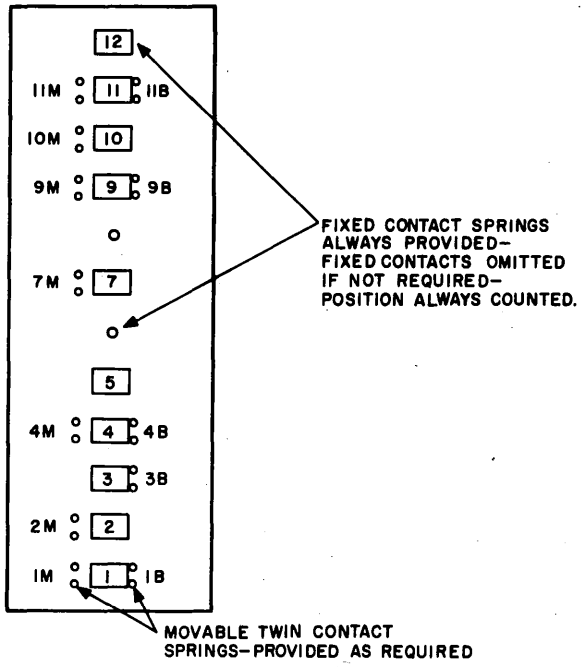

Fig. 1 – Spring Relay Contact Numbering

3.03 Listed below are some of the symbols used on FS drawings and the meaning of the particular symbol.

SYMBOL	MEANING
TS 7	Contact 7M (Make) of the TS relay. Circuit is open when relay is unoperated and closed when relay is operated. The number 7 designates the fixed or stationary spring. (See Fig. 1.)
TS 3	Contact 3B (Break) of the TS relay. Circuit is closed when relay is unoperated and open when relay is operated. The number 3 designates the fixed or stationary spring. (See Fig. 1.)
TS 4	Transfer contacts – The contact number and symbols are used in the same manner as explained above. The contact sequence, such as make-break, is covered in the Apparatus Figure. (See Fig. 1.)
C2 7	Connector terminals – Male and female contacts of mating connectors. C2 is the functional designation and the number 7 designates the contact terminal.

4. TOOLS AND TEST EQUIPMENT

4.01 The following tools and test equipment are desirable for maintenance work:

1 – Teletypewriter Maintenance Tools

1 – KS-14510-L1 Volt-Ohm-Milliammeter or Equivalent

1 – 164-Type Transmission Measuring Set or Equivalent

2 – 627A Armature Blocking Tool

1 – 360 Tool

1 – 639A Tool

1 – 651C Tool

1 – 651D Tool

2 – 2 ft. lead E/W alligator clips on each end

5. TESTING PROCEDURES

5.01 The procedures outlined in 5.04 and 5.05 are a suggested method to be used to test the various components of the 81D1 Simplified Station Control Unit. The procedures assume that all equipment has been assembled and interconnected in accordance with drawing CA-16754.

5.02 Testing of the 81C1 stations can be accomplished by using the procedures outlined in 5.04 or 5.05 and substituting a complete start pattern for each TSC and using a single LTRS

where the LTRS LTRS is specified. To test the emergency stop feature, it may be necessary to substitute the assigned emergency stop character for X.

5.03 Testing a 28ASR station arranged for split operation can be accomplished by using the procedure outlined in 5.05 and omitting Steps 1, 7, and 8.

5.04 The following procedure should be used for operation tests at a Receiving Only station.

STEP	FUNCTION TESTED	ACTION	VERIFICATION
1	EOM	Line closed, typing unit in any condition, LTRS LTRS FIGS H LTRS received from testboard.	RO should be in the select nonprint condition.
2	BP relay operation	Typing unit in any condition, LTRS LTRS received from the testboard.	BP relay releases, if operated.
		BLANK pause SPACE CDC for this station RY RY LTRS LTRS.	RO should not connect or print.
3	Station lockout	Typing unit in the select nonprint condition, CR LF LTRS CDC for this station RYRY FIGS H LTRS received from the testboard.	RO should not connect or print.
4	Blinding and unblinding during the TSC. Typing unit Figures Letters shift coding.	Typing unit in the select nonprint condition, CDC for this station. CR LF FIGS 12345 BLANK pause SPACE ASID LTRS LTRS 67890 NOW IS THE TI BLANK pause SPACE ASID LTRS LTRS ME received from the testboard.	RO should connect and print 1234567890 NOW IS THE TIME.

5.05 The following procedure should be used for operation tests at stations arranged for Non-Split operation equipped with a 28ASR and a 28RO.

STEP	FUNCTION TESTED	ACTION	VERIFICATION
1	Tape preparation	Operate the K-KT-T switch to the KT position. Prepare test message using the keyboard.	ASR will receive hard copy while preparing tape.
2	EOM	Line closed, typing unit in any condition, LTRS LTRS FIGS H LTRS received from testboard.	RO should be in the select nonprint condition.

STEP	FUNCTION TESTED	ACTION	VERIFICATION
3	BP relay operation	Typing unit in any condition, LTRS LTRS received from the testboard.	BP relay releases, if operated.
		BLANK pause SPACE CDC for this station RYRY LTRS LTRS received from the testboard.	RO should not connect or print.
4	RO station lockout	Typing unit in the select nonprint condition, CR LF LTRS CDC for this station, RYRY FIGS H LTRS received from the testboard.	RO should not connect or print.
5	Blinding and unblinding during TSC. Typing unit Figures Letters shift coding.	Typing unit in the select nonprint condition, CDC for this station, CR LF FIGS 12345 BLANK pause SPACE ASID LTRS LTRS 67890 NOW IS THE TI BLANK pause SPACE ASID LTRS LTRS ME received from the testboard.	RO should connect and print 1234567890 NOW IS THE TIME.
6	Transmitter start	Typing unit on the RO in any condition, BLANK pause SPACE, TSC for this station, LTRS LTRS received from the testboard.	With tape in the transmitter, tape should run until sixth pin is released. No hard copy on ASR. With no tape in the transmitter, an H answer back should be received at the testboard.
7	Tape preparation	Operate the K-KT-T switch to the T position and prepare a test message.	No hard copy should appear on ASR.
8	Transmitter start	Typing unit on the RO in any condition, BLANK pause SPACE TSC for this station, LTRS LTRS received from the testboard.	Same as Step 6 except that hard copy of transmission should appear on the ASR.
9	Emergency stop	Typing unit on the RO in any condition, ASR transmitting tape, BLANK pause X received from testboard.	EMER STOP lamp should light and buzzer sound.
10	Transmitter start and alarm circuit	With tape in the transmitter, buzzer silenced and alarm lamp lighted, BLANK pause SPACE, TSC for this station, LTRS LTRS received from the testboard.	An H answer back should be received by the testboard.

STEP	FUNCTION TESTED	ACTION	VERIFICATION
11	Alarm Release	Alarm lamp lighted on ASR and the AR key depressed.	Alarm lamp should be extinguished.
12	Tight Tape circuit *Note:* At stations where modification to the Tight Tape circuit have been made, this test may not apply.	While tape is being transmitted from the ASR, manually operate and release the tight tape arm.	The transmitter should stop and start with the operation and release of the tight tape arm.
13	OPEN LINE alarm	Open line condition on the Receive loop from the testboard for two seconds.	OPEN LINE alarm lamp should light and buzzer sounds.
14	Alarm Release	Receive loop closed and idle, operate the BCO key and then the AR key.	Buzzer is silenced with BCO key and alarm condition released with the AR key.

TABLE A – 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) RECEIVING FAILURES

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
The Receive station does not connect on the CDC code.	1	Request the testboard to send CR-LF LTRS FIGS H LTRS LTRS to the Receive station. Verify that the select code bar is shifted to the select (marking) position.	Verify that the function levers in slots 10 and 30 on the stunt box operate and latch when FIGS is received and that the function levers in slots 11 and 31 operate when the FIGS H sequence is received. If the function lever of either character fails to operate properly, check the stunt box end plates and the top guide plate for wear. If the top guide plate is worn, install TP195109 wear plates.	CA-16754-ED-2 Note 201 and Table B
			Make several checks of the reset bail adjustment. Rotate the main shaft after each check. If the adjustment varies, check the reset roller for wear on the bearing surface.	BSP Section P34.612
	2	Verify that the BP relay is released. (LTRS and any other character or function should release the BP relay if previously operated.)	At 81C1 stations, verify that the function lever in slot 33 operates any time the LTRS character is received.	CA-16754-ED-2 Note 204
			At 81D1 stations, verify that the function lever in slot 32 operates and latches on the LTRS character and that the function lever in slot 33 operates momentarily on any character or function preceded by a LTRS.	CA-16754-ED-2 Table B
			Failure of either function lever to operate properly, indicates trouble in the stunt box mechanism. Check the stunt box end plates and top guide plate for wear. If the top guide plate is worn, install TP195109 wear plates.	
			Make several checks of the reset bail adjustment. Rotate the main shaft after each check. If the adjustment varies, check the reset roller for wear on the bearing surface.	BSP Section P34.612
			Check the contacts over slots 18 and 33 for a possible short. Check the contact arms for a groove worn at the end of the contact arm by the function lever. Replace parts as required.	CA-16754-SD-B1-FS1
			Remove the R fuse from the receive control unit and the AUX connector from the typing unit. Check the BP relay operate and lock paths for a possible foreign ground. If a foreign ground is not present, a reading of more than 20,000 ohms should be read.	CA-16754-SD-B1-FS1 CA-16754-SD-W1
	3	Manually operate the CDC relay applicable to the trouble condition. If the CDC(2) relay is being used for connecting the Receive station, proceed to Step 4. If the CDC(1) relay remains operated, proceed to Step 5. If the CDC(1) relay will not lock operated, see TROUBLE CLEARANCE column.	Disconnect all power and verify continuity between the number 2 FIXED contact of the CDC(1) relay and the number 8 MAKE contact of the CDC(2) relay.	CA-16754-SD-B1-FS1 CA-16754-SD-W1
			Verify continuity between the number 2 MAKE contact of the CDC(1) relay and terminal 2L of the CDC(1) relay winding. Approximately 640 ohms should be indicated.	
			Proceed to Step 4 if the trouble is not cleared.	

TABLE A – 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) RECEIVING FAILURES (Cont)

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
The Receive station does not connect on the CDC code. (Cont)	4	Operate the CDC(2) relay manually to verify that the lock path to the stunt box contacts FIGS H is functioning properly. The CDC(2) relay should remain operated. If the CDC(2) relay remains operated and is being used to control an auxiliary station, proceed to Step 6.	If the CDC(2) relay does not remain operated, disconnect all power and verify continuity between the number 8 MAKE contact of the CDC(2) relay and the frame of the TTY cabinet. If a short is not indicated, verify that the NEGATIVE side of the rectifier is grounded to the frame of the TTY cabinet.	CA-16754-SD-B1-FS1 CA-16754-SD-G1 CA-16754-SD-W1
			Check the FIGS H contacts for cleanliness and proper operation. Check stunt box wiring.	CA-16754-S1-G1
			Check leads associated with terminal 7 of the R cord and connectors for an open.	CA-16754-SD-B1-FS1
	5	When the trouble condition is associated with the operation of the CDC(1) relay, verify that the Print Magnet is energized when the CDC(1) relay is operated and that the typing unit will print test signals received from the testboard. If the typing unit functions properly, trouble in the stunt box or CDC(1) relay operate path is indicated. Proceed to Step 7.	If the Print Magnet does not operate, disconnect all power and verify continuity of the Print Magnet circuit. Continuity can be checked from the number 5 FIXED contact of the CDC(1) relay and the frame of the TTY cabinet. Approximately 740 ohms should be indicated.	CA-16754-SD-B1-FS1 CA-16754-SD-G1 CA-16754-SD-W1 Specification 5823S
			Check the R1 resistor for an open and proper resistance.	
			Verify battery supply to the R1 resistor.	
	6	The function of the CDC(2) relay is to blind or unblind the line relay contacts of an Auxiliary station. When the CDC(2) relay is operated, the Auxiliary station should respond to line signals.	Check the number 10 BREAK contact of the CDC(2) relay and the number 5 MAKE contact of the BP relay for a possible short or a contact cross over. Check terminals 17 and 18 of the R cord and connectors for a possible short.	CA-16754-SD-B1-FS1 CA-16754-SD-W1
			Failure of the Auxiliary station to follow line signals can also be due to a normal station trouble. Use standard trouble procedure to check the Auxiliary station equipment.	
	7	Request the testboard to send FIGS H LTRS and the first character of the CDC. Verify that the associated function lever is operated and latched. Request the testboard to send the second character of the CDC. The function lever associated with the second character of the CDC should operate momentarily.	If the function lever of either character fails to operate properly, trouble in the stunt box mechanism is indicated. Check the stunt box end plates and top guide plate for wear. If the top guide plate is worn, install TP195109 wear plates.	
			Verify that the lock out shift slide and the reset bail are in proper adjustment. Make several checks of the reset bail adjustment. Rotate the main shaft of the typing unit after each check. If the adjustment varies or is difficult to make, check the reset roller for wear on the bearing surfaces.	BSP Section P34.612
			Check the function bars for proper coding and excessive wear on tines. Improper selection of function bars due to wearing of tines can be caused by maladjustment of the lockout shift slide or print magnet assembly causing a bow in the associated code bar. Recheck adjustments as required.	Specification 5823-S BSP Section P34.612

TABLE A — 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) RECEIVING FAILURES (Cont)

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
The Receive station does not connect on the CDC code. (Cont)	8	If both function levers associated with the CDC are operating properly, trouble in the CDC relay operate path is indicated. (See TROUBLE CLEARANCE column.)	Depending on the CDC relay that is being used for connecting the Receive station, verify that the number 8 or 10 BREAK contact of the BP relay is closed and shorted when the BP relay is released. Check the BP relay for a contact spring cross over.	CA-16754-SD-B1-FS1 CA-16754-SD-G1 CA-16754-SD-W1
			Check the CDC contact on the stunt box for proper operation. Check the wiring of typing unit terminals and the R cord and connectors for a possible open.	
The Receive station fails to disconnect on FIGS H LTRS. or The Receive station is receiving nonvalid messages.	9	The trouble condition indicates a failure of either the CDC relay or the Print Magnet to release. With the CDC relay operated, request the testboard to send FIGS H LTRS. If the CDC relay releases and the typing unit will print test signals, trouble in the Print Magnet assembly or the blind path to the Auxiliary station, whichever is applicable, is indicated. If the CDC relay fails to release, see TROUBLE CLEARANCE column.	Manually operate the BP relay and request the testboard to send FIGS H to the Receive station. If the CDC relay releases, trouble in the CDC relay operate path is indicated. If the CDC relay does not release, trouble in the lock path is indicated. Make point to point continuity checks of the circuit indicating trouble. Check stunt box contacts for cleanliness and proper operation and the contact arm for wear. ***Note:*** Failure of the customer to put LTRS between the CDC may give a false indication of the trouble condition. If the trouble cannot be located, have the testboard check monitor copy to verify that proper format is being used.	CA-16754-SD-B1-FS1 CA-16754-SD-G1 CA-16754-SD-W1
The Receive station turns on in the middle of a message. or The Receive station cuts off in the middle of a message.	10	Request the testboard to send FIGS H LTRS CR LF LTRS to the Receive machine. Verify that the select code bar is shifted to the nonselect (spacing) position.	Request the testboard to send FIGS H LTRS CR. Verify that the function lever in stunt box slot 13 is operated and latched. If the function lever in slot 13 is operating properly, request the testboard to send CR LF and verify that the function lever in slot 14 is operated and latched. If the function lever of either character fails to operate properly, check the stunt box end plates and top guide plate for wear. Install new end plate and TP195109 wear plates when required.	CA-16754-ED-2 BSP Section P34.460
			Make several checks of the reset bail adjustment. Rotate the main shaft after each check. If the adjustment varies or is difficut to make, check the reset roller for wear on the bearing surface.	BSP Section P34.612
	11	Request the testboard to send FIGS H LTRS CR LF LTRS and the CDC of the station in trouble. Verify that the station does not connect. If the trouble condition is intermittent, see TROUBLE CLEARANCE column.	Verify that the function bars are properly coded. Check the tines for wear. Improper adjustment of the lockout shift slide or Print Magnet can cause a bow in the associated code bar which could result in breakage or wear of tines. Check the lockout shift slide and Print Magnet adjustments as required.	CA-16754-ED-2 Table B, Note 201 BSP Sections P34.460, P34.612 Specification 5823S
	12	Request the testboard to send FIGS H LTRS CR LF LTRS H LTRS. Verify that the function lever in stunt box slot 14 is operated and latched. If the function lever in slot 14 is latched, request the testboard to send FIGS H LTRS CR LF LTRS FIGS 1234 H. Verify that the function lever in slot 14 is still operated and latched.	Failure of either test indicates broken or incorrect parts being used in the stunt box slots 10 and 30. The function bars in these slots should be coded for FIGS with no restrictions. Verify that a TP152121 function lever and a TP154613 latch are installed in slots 10 and 30.	BSP Section P34.460

TABLE A – 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) RECEIVING FAILURES (Cont)

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
The Receive station garbles and shifts from Figures to Letters condition when the station is connected and TSC codes are received.	13	Manually operate the CDC relay and request the testboard to send FIGS H LTRS. Verify that the shift code bar or oscillating rail is in the Figures condition.	Verify coding of function bar in slot 3 of the stunt box for proper coding. The function bar should be coded for LTRS and should be restricted to respond only in the print condition. Look for worn or broken part on the stunt box.	CA-16754-ED-2 Note 201 BSP Section P34.460
	14	Request the testboard to send FIGS H LTRS LTRS, station CDC LTRS, CR LF LTRS. The station should be in the print, nonselect condition. Request the testboard to send a single BLANK. Verify that the BP relay is operated.	Verify that the function lever in stunt box slot 18 is operated and latched after a single BLANK is received. If the function lever operates but does not latch, check the stunt box top guide plate and end plates for wear. Install TP195109 wear plates and replace end plates as required.	CA-16754-ED-2 Table B
			Make several checks of the reset bail adjustment. Rotate the main shaft of the typing unit after each check. If the adjustment varies or is difficult to make, check the reset roller bearing surface for wear.	BSP Section P34.612
			If the function lever operates properly and the BP relay does not operate, check the stunt box contacts over slot 18 for cleanliness and a possible worn contact arm. Make point to point check of BP operate path as required.	CA-16754-SD-B1-FS1
	15	Place the Receive station in a normal idle condition. Manually operate the BP relay and verify that the BP relay remains operated.	Check the stunt box contacts over slot 33 for cleanliness and a possible worn contact arm. Make point to point checks of BP relay lock path as required.	CA-16754-SD-B1-FS1 CA-16754-SD-G1 CA-16754-SD-W1
	16	Manually operate the BP relay. At regular stations verify that the Print Magnet is released and the typing unit is in a nonprint condition. At stations using auxiliary equipment, operation of the BP relay places a shunt across the contacts of the line relay of the auxiliary station to accomplish blinding.	For regular stations verify that the BP relay number 4 BREAK contacts are open and for auxiliary stations verify that the number 5 or 9 MAKE contacts are closed. Make point to point checks of station wiring as required.	CA-16754-SD-B1-FS1 CA-16754-SD-W1
			When applicable, check the Print Magnet assembly for proper adjustment.	Specification 5823S
Receive Open Line alarm with loop closed.	17	Verify that the typing unit is running closed and idle when the station is in the trouble condition.	If the typing unit is running open, make the following checks as required. Verify that the rectifier in the electrical service unit is operating, replace the line relay and check the loop for a short, ground or turnover. Check the typing unit and base for a loose cord and connector, verify proper operation of line shunt relay. Check cabinet wiring for a possible short in the line connections.	Use standard station wiring drawing for checking cabinet connections.
	18	Manually release the BP relay if operated and verify that the alarm can be restored by operating the AR key. It may be necessary to release the latched function lever in slot 18 on the Receive stunt box to release the BP relay.	Check the contacts over slot 36 on the Receive stunt box for a possible short or worn contact arm. Replace as required.	CA-16754-SD-B1-FS1 CA-16754-SD-W2
			With the AR key depressed verify that contacts 1 and 2 of the AR key are open. Make point to point checks of the OL relay lock path as required.	
	19	Verify that the function levers in stunt box slots 35 and 36 do not operate when Fox test signals are being received.	If either of the function levers operate on any character other than BLANK, verify the function bars for proper coding and the function levers for broken parts.	BSP Section P34.460

TABLE A — 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) RECEIVING FAILURES (Cont)

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
Receive Open Line alarm with loop closed. (Cont)	20	Verify that the function lever in slot 35 of the stunt box operates on a single BLANK and will release if any character other than a BLANK is received.	Check the associated function lever for worn or broken parts. Check the typing unit adjustments associated with the stripper bail blade.	BSP Section P34.612
OPEN LINE alarm not operating on an open circuit.	21	Manually operate the OL relay and verify that the OL relay remains operated and the alarm lamp lights.	Verify that the rectifier in the Send station is energized. (Power to operate the OL relay is supplied by the T fuse in Send station.)	CA-16754-SD-B1-FS1 CA-16754-SD-W1, W2
			Check the R16 resistor and the OL relay winding for a possible open. Make point to point checks of station wiring to the R16 resistor and the OL relay lock path as required.	
	22	Restore the alarm circuit to normal and verify that the function levers in stunt box slots 35 and 36 are operating properly. The function lever in slot 35 should operate and latch on a single BLANK and the function lever in slot 36 should operate momentarily on the second BLANK when two consecutive BLANKS are received. ***Note:*** The function lever in slot 35 will reoperate on the second BLANK.	Check the stunt box top guide plate and the end plates for wear. Install TP195109 wear plates and replace end plates as required.	
			Make several checks of the reset bail adjustment. Rotate the main shaft of the typing unit after each check. If the adjustment varies or is difficult to make, check the reset roller bearing surface for wear.	BSP Section P34.612
	23	Check the continuity of the OL relay operate path. (See TROUBLE CLEARANCE column.)	Verify that the Send and Receive TTY cabinets are both grounded.	CA-16754-SD-B1-FS1 CA-16754-SD-W1, W2
			Check the stunt box contacts over slot 36 for cleanliness and the contact arm for wear.	
			Make point to point check of leads in the S and R cord and connectors for a loose or broken connection.	

TABLE B — 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) SENDING FAILURES

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
No H answer back on TSC.	1	Isolate trouble to stunt box operation or H answer back circuit by placing a tape in the transmitter and request the testboard to send the TSC. (See TROUBLE CLEARANCE column.)	If the testboard fails to pick up tape on the TSC, proceed to Step 8. If the transmitter operates on the TSC, trouble in the H answer back circuit is indicated. Proceed to next step.	
	2	Verify that the DX relay is released when the Send station is in the idle condition.	Check the distributor Aux A contacts and the number 6 MAKE contacts of the HR relay for a possible short. Make point to point continuity checks of the DX relay operate path as required.	CA-16754-SD-B1-FS2 CA-16754-SD-W2
	3	Isolate the trouble to the distributor clutch magnet circuit or the HR relay operate path by manually operating the HR relay and verifying that the distributor operates and generates the H answer back.	If the distributor clutch magnet operates but fails to release the distributor cam, check the distributor for broken parts and proper adjustment.	BSP Section P34.630
			If the distributor cam operates and the H answer back is NOT generated, check the distributor contacts for a possible short. Verify that the LINE SHUNT relay in the Send station is operated when power is connected.	BSP Section P34.303 Use standard station wiring drawing for checking TTY cabinet connections.
			If the distributor clutch magnet fails to operate, disconnect all power to the Send station and remove the T fuse from the control unit. Verify continuity of the clutch magnet circuit between each terminal of the distributor clutch magnet and the frame of the TTY cabinet. Approximately 400 to 500 ohms should be indicated. Make point to point checks as required. RESTORE FUSE.	CA-16754-SD-B1-FS2 CA-16754-SD-G2, 63 CA-16754-SD-W2 CA-16754-ED-2 BSP Section P34.303

TABLE B – 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) SENDING FAILURES (Cont)

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
No H answer back on TSC. (Cont)	4	Release the BP relay if operated. Request the testboard to send the station TSC with sufficient pause between each character to allow verification of the BP and HR relay operation. If the BP relay fails to operate and remain operated during the TSC, see Table A, Steps 14 and 15 for trouble clearance. If the test indicates only a failure of the HR relay to operate, see TROUBLE CLEARANCE column.	Disconnect all power to the Send station and verify continuity between the number 4 FIXED contact of the TA relay and the L terminal of the HR relay winding. Approximately 700 ohms should be read. If a short or low resistance is indicated, check the 185A network across the HR relay winding for a possible short.	CA-16754-SD-B1-FS2 CA-16754-SD-W2
			Verify that a short is read between the L terminal and number 2 FIXED contact of the HR relay.	
Getting repeated H answer back on TSC.	5	Isolate the trouble to a failure of the distributor or a failure of the DX relay to operate properly by manually operating the HR relay and verifying that the DX relay operates during the first revolution of the distributor cam. If the trouble isolates to the DX relay, proceed to the next step.	Verify that the distributor is in proper adjustment. On 28J or later models of the 28-type distributor, verify that a new style TP172760 armature is installed.	BSP Sections P34.630, P98.999.48
			Check the number 2 BREAK contacts of the DX relay for cleanliness and proper operation.	CA-16754-SD-B1-FS2
	6	If the DX relay fails or is slow operating, make tests described in TROUBLE CLEARANCE column. If tests in Step 5 indicate the DX relay is releasing too soon, proceed to the next step.	Check the distributor Aux A contacts for cleanliness and proper adjustment.	BSP Section P34.630
			Disconnect all power to the Send station and remove the T cord from the U connector. Verify continuity between the number 2 terminal of the U connector and the L terminal of the DX relay winding. Approximately 270 ohms should be read. If a lower resistance is read, check the 185A network across the DX relay winding for a possible short.	CA-16754-SD-B1-FS2 CA-16754-SD-W2
			Check the R15 resistor for a possible open or short. Check wiring of battery supply to the R15 resistor for an open or loose connection.	
			Check associated strapping and wiring in TTY cabinet.	CA-16754-SD-B1-FS2 CA-16754-SD-G2, G3
	7	If the DX relay is releasing too soon, trouble in the lock path is indicated. To test the DX relay lock path, manually operate the DX relay and then the HR relay. With the HR relay held operated, the DX relay should remain in the operated condition.	Verify that a short is read from the number 6 FIXED contact of the HR relay and the frame of the TTY cabinet.	CA-16754-SD-B1-FS2 CA-16754-SD-W2
			Check continuity between the number 6 MAKE contact of the HR relay and the number 12 MAKE contact of the DX relay.	
			Check the contacts of the DX and HR relays for cleanliness and proper operation.	
Cannot pick up tape on TSC. Do not get H answer back.	8	Isolate the trouble by placing a tape in the transmitter and manually operating the TM relay. If the transmitter operates and the TM relay remains operated until released by the tape out switch, trouble in the TM relay operate path is indicated, proceed to Step 10. If the transmitter does not operate, proceed to Step 9. If the TM relay will not lock operated, see TROUBLE CLEARANCE column.	With the tape removed from the TRANSMITTER, the MX relay released, and the Receive station in an idle condition, verify continuity between the number 6 MAKE contact of the TA relay and the frame of the TTY cabinet. If a short is not indicated, verify that the Send and Receive cabinets are grounded.	CA-16754-SD-B1-FS1 CA-16754-SD-W1, W2
			Operate the BP relay and perform the same test as outlined above. If a short is not indicated, check the stunt box contacts over slot 19 on the Receive machine for cleanliness and proper operation. Check stunt box wiring for a loose or open connection.	CA-16754-SD-B1-FS1 CA-16754-SD-G1 CA-16754-SD-W1, W2
			Make point to point continuity checks from the number 6 MAKE contact of the TA relay to terminal 7 on the Receive machine AUX connector.	
			Verify continuity from the number 6 FIXED contact of the TA relay and the number 10 MAKE contact of the TM relay.	
			Make point to point continuity checks from the number 10 FIXED contact of the TM relay through the TM relay and R14 resistor.	

TABLE B – 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) SENDING FAILURES (Cont)

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
Cannot pick up tape on TSC. Do not get H answer back. (Cont)	9	Check the transmitter for broken or worn parts and proper mechanical adjustment. Verify that the tight tape contacts are closed and operating properly. If the trouble is not cleared when checking the mechanical adjustments, trouble in the transmitter clutch magnet circuit is indicated. (See TROUBLE CLEARANCE column.)	Restore transmitter unit and disconnect all power to the Send station. Verify continuity between the number 8 FIXED contact of the TA relay and the frame of the TTY cabinet. Approximately 350 ohms should be read. If an open is indicated, verify strapping in TTY cabinet. Make point to point continuity checks of transmitter clutch magnet circuit as required.	CA-16754-SD-B1-FS2 CA-16754-SD-G1, G2 CA-16754-SD-W2 Use standard station wiring drawings for checking TTY cabinet connections.
			Check the R12 resistor for a possible open. Make point to point continuity checks from the number 8 MAKE contact of the TA relay to the R12 resistor.	
	10	Request the testboard to send the TSC. Verify that the function levers associated with the TSC in the Receive station stunt box are operating properly.	If any of the function levers fail to operate properly, check the stunt box top guide plate and end plates for wear. Replace end plates and install TP195109 wear plates as required.	
			Make several checks of the reset bail adjustment rotating the main shaft of the typing unit after each check. If the adjustment varies or is difficult to make, check the reset roller bearing surface for wear.	BSP Section P34.612
			Check stunt box contacts over slot 34 for cleanliness and the contact arm for wear. Replace arm as required. Verify stunt box wiring to AUX connector.	CA-16754-SD-B1-FS1 CA-16754-SD-G1
	11	If no trouble is indicated in the typing unit, make continuity checks as described in TROUBLE CLEARANCE column.	Disconnect all power to the Send and Receive machines. Verify continuity between the number 4 FIXED contact of the TA relay and the number 6 terminal of the S connector. Make point to point checks from terminal 6 of the S Cord to terminal 10 of the Receive station AUX connector. RESTORE WIRING.	CA-16754-SD-B1-FS1, 2 CA-16754-SD-G1-3 CA-16754-SD-W1, 2
			Verify continuity between the number 4 MAKE contact of the TA relay and the number 2 FIXED contact of the HR relay. Approximately 700 ohms should be read. If a resistance lower than 700 ohms is read, check the 185A network across the TM relay winding for a short. If an open is indicated, make point to point checks of circuit as required.	CA-16754-SD-B1-FS2 CA-16754-SD-W2
			Check the R14 resistor for an open and the battery supply to the R14 resistor for an open or loose connection.	
Receive a H answer back with tape in the transmitter.	12	Verify that the OL or EM relays are not operated.	If either relay is operated and no alarm condition is indicated on the KEY and LAMP panel, verify that the buzzer BCO relay has not been disabled and that the associated alarm lamp is not open.	CA-16754-SD-B1-FS2 CA-16754-SD-C2 CA-16754-SD-G1 CA-16754-SD-W1
	13	Verify that the tape out contacts (6th pin) on the transmitter operate properly when tape is placed in the transmitter.	Check adjustments as covered in the BSP.	BSP Section P34.633
	14	Place a tape in the transmitter and verify that the TA relay operates.	With a tape in the transmitter, verify continuity from the U terminal of the TA relay and the frame of the TTY cabinet. A short should be indicated.	CA-16754-SD-B1-FS1 CA-16754-SD-W2 Use standard station wiring drawings for checking TTY cabinet connections.
			Remove the tape from the transmitter, release the MX relay if operated and verify continuity between the U terminal of the TA relay and the center terminal of the R11 resistor. Approximately 5500 ohms should be indicated. Make point to point checks as required.	

TABLE B – 81C1 AND 81D1 SIMPLIFIED STATION CONTROL UNIT (CA-16754-SD) SENDING FAILURES (Cont)

TROUBLE CONDITION	STEP	ISOLATION PROCEDURE IF TEST INDICATES NO TROUBLE, PROCEED TO NEXT STEP.	TROUBLE CLEARANCE	REFERENCE
The Send station fails to respond to the Emergency Stop Code.	15	Place a tape in the transmitter and manually operate the TM relay to start the transmitter. After the transmitter has started, manually operate the EM relay. Verify that the EM relay remains operated, the EMER STOP lamp lights, the TM relay releases and the transmitter stops.	If the TM relay does not release, check the number 2 BREAK contacts of the EM relay for proper operation and a possible short. If the TM relay releases and the transmitter does not stop, check the number 6 MAKE contacts of the TM relay for proper operation and a possible short.	CA-16754-SD-B1-FS2 CA-16754-SD-W1, W2
			If the EM relay does not lock operated, disconnect all power to the Send machine, block the EM relay operated and verify that a short is read between terminal 1L of the EM relay winding and the frame of the TTY cabinets. Make point to point checks of the EM relay lock path as required.	
			Check the EM relay winding for a possible open or short and the R17 resistor for a possible open. Verify battery connection to the R17 resistor.	
			If the EMER STOP lamp does not light, check the lamp for a possible open. Make point to point continuity checks of the lamp circuit.	
	16	Request the testboard to send the Emergency Stop Code. Verify that the function lever in slot 20 on the Receive machine stunt box operates momentarily on the Emergency Stop Code. (See Note 204 on CA-16754-ED-2.)	If the function lever in slot 20 operates properly, check the associated contacts for cleanliness and proper operation. Check stunt box wiring as required.	CA-16754-ED-2 Table B, Note 204
			Verify that the Receive and Send TTY cabinets are grounded.	CA-16754-SD-W1, W2
			Make point to point continuity checks from terminal 8 of the Receive machine typing unit AUX connector to the number 4 FIXED contact of the MX relay.	CA-16754-SD-B1-FS1, FS2 CA-16754-SD-G1 CA-16754-SD-W1, W2
The Send station runs open when transmitting to the line.	17	Verify that the Transmitter signals are being received at the testboard. If the transmitter signals are not being received at the testboard, use normal procedures to check the loop and TTY equipment. If the signals are being received at the testboard, see TROUBLE CLEARANCE column.	Check the line connections at terminal C1 and C2 on Send machine TTY cabinet for a loop turn over. If a loop turn over is found and a wave shaper is installed, recheck line connections to the wave shaper for proper installation after the trouble has been cleared.	CA-16754-SD-B1-FS2 BSP Section P30.620
			Replace the line relay and if required check the line relay assembly for an open connection and proper current output to line relay bias winding.	Use standard station wiring drawings for checking TTY cabinet circuit.
			Check strapping on TTY cabinet C terminal strip.	CA-16754-SD-G1, G2
			Verify that the Line Shunt relay is operated when power is connected. If the line shunt relay does not operate, verify that all cords and connectors in TTY cabinet are fully connected.	Use standard station wiring drawings for checking Line Shunt relay circuit.
The Send station is receiving a copy of another station's transmission.	18	This trouble condition applies to stations wired for Non-Split operation. Request the testboard to put test signals on the Send loop to verify the trouble condition. (See TROUBLE CLEARANCE column.)	If the station receives the test signals from the testboard or the trouble is intermittent, check the number 4 BREAK contacts of the TM relay for cleanliness and proper operation.	CA-16754-SD-B1-FS2 CA-16754-SD-G2 CA-16754-SD-W2 Use standard station wiring drawing to check TTY cabinet connections.
			Disconnect the T cord from the U connector and verify that a short is read from terminal 7 to terminal 8 of U connector. Check continuity between terminals 7 and 8 of the T connector and terminals C127 and C128 on the TTY cabinet. Check internal wiring of TTY cabinet as required.	