

PARITY FAILURE DETECTOR AND SUBSTITUTE CHARACTER INSERTER (SA120)

CHECKOUT AND TROUBLESHOOTING

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1. GENERAL

1.01 This section provides the checkout and troubleshooting procedures for the SA120 parity failure detector and substitute character inserter and the bypass and indicator assemblies available for use with it.

1.02 There are two versions of the SA120: One for installation on receivers to monitor incoming signals for characters with parity errors and insert substitute characters for them in the output copy, and one for installation on senders using nonparity tapes to monitor outgoing characters for parity and insert correct parity when necessary. There are many varieties of the first version, but only two (SA120 AS and SA120 FA) of the second.

1.03 The checkout procedure is divided into three parts: Checkout for parity failure detectors mounted on standard speed equipment (33 and 35 type sets), checkout for those mounted on DATASPEED Type 2 receivers, and checkout for those mounted on DATASPEED Type 2 senders. Since the SA120 is either a receive-only device (except for optional break generation) or a send-only device, access to either a sending station or receiving station – either remote or local – is necessary for checkout and troubleshooting.

1.04 Because of the complexity of the SA120 circuits, troubleshooting is confined to repairing wired connections and replacing faulty circuit cards. It is not considered practical to repair cards in the field. Damaged cards should either be sent to a shop equipped to test and replace integrated circuit packages or discarded.

2. CHECKOUT PROCEDURE

2.01 The following operational tests should be made, when required, after installation is complete. They should also be performed after correction of any SA120 trouble.

2.02 Refer to Part 3 for analysis of any trouble which appears during checkout.

ALL STANDARD SPEED EQUIPMENT (33 AND 35 TYPE SETS)

A. Reception of Normal Copy

2.03 This test requires transmitting a test message from an external sender to the terminal having the SA120, either locally (over a signal line) or remotely (over transmission lines). If a remote sender is used, transmission errors may occur which are not detectable by the SA120, or which have only the parity bit changed and so are detected by the SA120 as errors but appear correctly in the printed copy. The presence of an error in the copy which was not detected by the SA120 or the appearance of an error indication not accompanied by an error in the copy, then, does not necessarily mean that a malfunction occurred.

Should this happen, testing must be extended to determine whether other errors will be detected or other false indications occur. If a local sender is used, no transmission errors can occur.

2.04 When a remote sender is used for either a 33 or 35 type set, the data connection to the terminal should be established in the usual manner as though the SA120 were not there. If there is more than one remote sender to choose from, pick the sender most likely to have the lowest overall error rate. This will probably be a new sender, or one recently readjusted, located in the same city as the SA120 receiver or otherwise physically as close to it as possible. If records have been kept of the error rates from various senders, select the best one regardless of its age or location. If the error indication includes a line break (SA120 AJ through SA120 AQ, SA120 BC, SA120 BD, SA120 CC, SA120 CD, and SA120 EB), a telephone connection must be established to the sender for the operator there to report on the indications received.

2.05 When a local sender is used for either a 33 or 35 type set, the data connection to the terminal should be established in the usual manner as though the SA120 were not there. If there is more than one local sender to choose from, pick the one most likely to have the lowest overall error rate. This will probably be a new sender, or one recently readjusted, unless error rate records have been kept and show otherwise.

2.06 Transmit correct parity copy to the SA120 for 15 minutes. If the copy is printed correctly (no substitute characters or incorrect characters) and no line breaks are generated or errors counted, or if an occasional

line break is generated or error counted and a corresponding substitute character is observed in the copy (remote sender only), the SA120 can be assumed to operate properly with error-free copy. If the copy is garbled, refer to Part 3. If the copy is printed correctly, but errors are indicated continuously from a remote sender or if any errors are indicated from a local sender, refer to Part 3. If the copy from a remote sender is printed correctly but an occasional substitute character is inserted, line break is generated, or error counted or if an occasional error appears in the copy which is not indicated, extend the test for several more minutes. This will determine whether normal false indications or non-detectable errors occurred or whether the SA120 is defective. If further failures occur regularly, refer to Part 3.

Note: For odd parity transmission, correct parity copy for this test should include RUB OUT or DELETE characters (all eight levels marking) which have even parity. These should not be detected as errors. If they are, refer to Part 3.

B. Parity Error Detection

2.07 A tape containing parity errors can be prepared using either a nonparity or a parity keyboard. If an ASR set with a nonparity keyboard is available it is easier to use it. (To determine if the keyboard on an ASR set is nonparity, turn on the set and depress the A key several times. If three holes are punched in the tape, the keyboard is nonparity.) Make a test tape using the format of Figure 1. If an ASR set with a nonparity keyboard is not available, use any ASR set and make a test tape as shown in Figure 2.

(RETURN) CEFIJLQRTWX AEXERTBEXERT ATWXB TWXDTWX QUESTMOPRAID ABDGHKMNPSUV

Note: Space once between each group of 12 letters. First group has no parity errors, second group has two (A and B) with five good characters following, third group has three (A, B, and D) with three good characters following, fourth has alternate correct and incorrect parity (six errors – U, S, M, P, A, and D), and last group has 12 consecutive errors.

Figure 1 - Low Speed Parity Error Test Tape Using Nonparity Keyboard
(8th Bit Marking)

(RETURN) A?U*A?U*A?U* A?U*A?U*A?U* A?U*A?U*A?U* A?U*A?U*A?U* A?U*A?U*A?U*

Make Incorrect Parity Characters as Explained Below

Note: Space once between each group of 12 letters. Keyboard the characters with incorrect parity as follows:

- A – Keyboard A then depress LOC B SP once and keyboard @
- U – Keyboard U then depress LOC B SP once and keyboard @
- ? – Keyboard ? then depress LOC B SP once and depress spacebar
- * – Keyboard " then depress LOC B SP once and keyboard LINE FEED

Figure 2 - Low Speed Parity Error Test Tape Using Parity Keyboard

2.08 Send the parity error tape to the SA120 receiver from a local sender, if possible. The response depends on the SA120 version being checked, as follows:

(a) The response of an SA120 AB, SA120 AF, SA120 BA, SA120 BB, SA120 CA, or SA120 CB for either tape should be as follows for each group of 12 letters: Group 1 – no response; group 2 – two substitute characters (first and seventh); group 3 – three substitute characters (first, fifth, and ninth); group 4 – six substitute characters (every other one beginning with second character); and group 5 – all 12 substitute characters.

(b) The response of an SA120 AK, SA120 AP, SA120 BC, SA120 BD, SA120 CC, or SA120 CD for either tape should be the same as in (a) except that line breaks should also be generated for each group of 12 letters as follows: Group 1 – no line breaks; group 2 – two line breaks; group 3 – two line breaks; group 4 – two or three line breaks; and group 5 – three line breaks.

(c) The response of an SA120 BE, SA120 BF, SA120 CE, or SA120 CF should be the same as in (a) except that the counter should also indicate errors for each group of 12 letters as follows: Group 1 – no indication; group 2 – counter registers 2; group 3 – counter registers 3 more (total is 5); group 4 – counter registers 6 more (total is 11); and group 5 – counter registers 12 more (total is 23). Lamp flashes for each error or lights on first error and blinks off and on for all following errors until reset by depressing lamp housing, depending on strapping.

2.09 If any deviation from the correct response occurs for a local sender, refer to Part 3. If a deviation occurs for a remote sender, repeat the test one or two times to see if it was caused by line noise. If the same deviation is repeated, refer to Part 3.

“DATASPEED” TYPE 2 RECEIVERS

A. Reception of Normal Data

2.10 This test requires transmitting a test message to the terminal having the SA120, either locally (at a send-receive station in the TEST position or over a telephone extension) or remotely (over transmission lines). If a remote sender is used, transmission errors may occur which are not detectable by the SA120, or which have only the parity bit changed and so are detected by the SA120 as errors but appear correctly in the punched tape. The presence of an error in the tape which was not detected by the SA120 or the appearance of an error indication not accompanied by an error in the tape, then, does not necessarily mean that a malfunction occurred. Should this happen, testing must be extended to determine whether other errors will be detected or other false indications occur. If a local sender is used, no transmission errors can occur.

2.11 When a remote sender is used, the data connection to the terminal should be established in the usual manner as though the SA120 were not there. If there is more than one remote sender to choose from, pick the sender most likely to have the lowest overall error rate. This will probably be a new sender, or one recently readjusted, located in the same city as the SA120 receiver or otherwise physically as close to it as possible. If records have been kept of the error rates from various senders, select the best one regardless of its age or location.


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UUUUUUUUUU*****AAAAAAAAA 10 DELETESUUUUUUUUUU*****AAAAAAAAA
UUUUUUUUUU*****AAAAAAAAA 10 DELETESUUUUUUUUUU*****AAAAAAAAA
    Make Incorrect Parity Character as Explained Below
UUUUUUUUUU*****AAAAAAAAA 10 DELETESUUUUUUUUUU*****AAAAAAAAA
    Make Incorrect Parity Characters as Explained Below
UUUUUUUUUU*****AAAAAAAAA 10 DELETESUUUUUUUUUU*****AAAAAAAAA
    Make Incorrect Parity Characters as Explained Below
UUUUUUUUUU*****AAAAAAAAA 10 DELETESUUUUUUUUUU*****AAAAAAAAA
    Make Entire Line Above Incorrect Parity Characters as Explained Below
    
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Note: "10 DELETES" refers to nonprinting DELETE (RUB OUT) character, which should be punched where indicated. Separate each line with 50 DELETES so that it can be clearly recognized in the output tape. Keyboard the characters with incorrect parity as follows:

- U – Keyboard U then depress LOC B SP once and keyboard @
 - * – Keyboard " then depress LOC B SP once and keyboard LINE FEED
 - A – Keyboard A then depress LOC B SP once and keyboard @
- DELETE – Keyboard A then depress LOC B SP once and keyboard ?

Figure 4 - High Speed Even Parity Error Test Tape Using Parity Keyboard

2.15 Send the parity error tape to the SA120 receiver from a local sender, if possible. The response depends on the SA120 version being checked, as follows:

- (a) The response of an SA120 AD or SA120 EA for either tape should be as follows for each line (group of 70 characters): Line 1 – no response; line 2 – one substitute character (first); line 3 – two substitute characters (first and fifty-second); line 4 – 35 substitute characters (every other one beginning with first character); and line 5 – all 70 substitute characters.
- (b) The response of an SA120 AM or SA120 EB for either tape should be the same as in (a) except that breaks on reverse channel should also be generated for each line (group of 70 characters) as follows: Line 1 – no break; line 2 – one break on reverse channel; line 3 – two breaks on reverse channel (one break acceptable but indicates that SA120 inhibit is longer than 500 milliseconds); line 4 – two breaks on reverse channel; and line 5 – two breaks on reverse channel.

Note: More or less breaks will appear if the lines are not separated by about 50 DELETE characters.

- (c) The response of an SA120 EC for either tape should be the same as in (a) except that the counter should also indicate errors for each line (group of 70 characters) as follows: Line 1 – no indication; line 2 – counter registers 1; line 3 – counter registers 2 more (total is 3); line 4 – counter registers 11 to 17 more (total is 14 to 20); and line 5 – counter registers about 11 to 17 more (total is about 25 to 37). The SA120 is considered acceptable if the counter has a total of at least 23 at the conclusion of this test and substitute characters are inserted for all 108 errors. Lamp flashes for each error or lights on first error and blinks off and on for all following errors until reset by depressing lamp housing, depending on strapping.
- (d) The response of an SA120 ED for either tape should be the same as in (a) except that the indicator lamp should also light for each line (group of 70 characters) as follows: Line 1 – no indication; line 2 – lamp lights and remains on; and lines 3 through 5 – no change. Lamp remains on after test is complete until lamp housing is depressed.
- (e) The response of an SA120 EE for either tape should be the same as in (a) except that the counter should also indicate errors for each line (group

of 70 characters) as follows: Line 1 – no indication; line 2 – counter registers 1; line 3 – counter registers 2 more (total is 3); line 4 – counter registers 35 more (total is 38); line 5 – counter registers 70 more (total is 108). A few counts may be dropped in the last line; the SA120 is considered acceptable if the final total is at least 101 and substitute characters are inserted for all 108 errors. Lamp lights on first error and remains on after test is complete until lamp housing is depressed (blinks may be seen while the counter is counting).

- 2.16 If any deviation from the correct response occurs, refer to Part 3.

“DATASPEED” TYPE 2 SENDERS

2.17 Normally all receivers are equipped to monitor parity, either directly (with the SA120 or equivalent) or indirectly (with an off-line processor) in applications requiring parity insertion at a sender. If access to a receiver so equipped is convenient, send a nonparity tape (usually available) to it through the SA120 AS or SA120 FA (PARITY CHECK switch in ON). The tape should be copied correctly with the proper parity present for each character. If access to a receiver equipped to check parity is inconvenient, send a nonparity tape to any receiver and verify that all characters are punched correctly and have the proper number of holes (even or odd).

Note: Line noise may cause an occasional character to have incorrect parity. About 85 to 90 percent of the time, such an incorrect parity character will be a different character than the one originally transmitted due to the noise (in other words, the parity bit will not be the only bit in error). If very many incorrect parity characters are received during this test, or if in doubt as to the source of any which do appear, repeat the test once. If repeated errors occur which do not seem to be caused by noise, refer to Part 3.

- 2.18 For the SA120 FA, turn the PARITY CHECK switch to OFF and transmit a nonparity tape as above. The tape should be copied exactly as sent, with no parity insertion.

3. TROUBLESHOOTING PROCEDURE

GENERAL

3.01 Tools required for troubleshooting are listed in Section 570-005-800. A volt-ohm-milliammeter is also required.

3.02 Special terms used in troubleshooting are defined as follows:

- (a) Open circuit – no current flowing

- (b) Closed circuit – current able to flow
- (c) Running open – open circuit condition at printer or punch; shafts turn continuously and mechanisms operate, but clutches do not latch, or punch punches continuous NULL characters
- (d) Running closed – closed circuit condition at printer or punch; clutches latched and shafts do not turn
- (e) Garble – incorrect characters printed or punched.

STANDARD SPEED AND HIGH SPEED RECEIVERS

3.03 Receiving troubles at the set can be caused by malfunction of one or more of several elements. The sender might garble or distort its signal; its data set might do likewise; the transmission line might open or become noisy; the terminal data set might open or garble signals; the SA120 might fail in a number of ways; or the terminal itself might malfunction. The first step in troubleshooting is to isolate the trouble to one or more of these sources.

3.04 To determine if the source of trouble is in the terminal or ahead of it (SA120, data set, etc), place the terminal in the local mode, if possible, and check its operation. Abnormal operation indicates that the trouble is in the terminal.

3.05 Troubles isolated to the terminal are not covered in this section.

3.06 If a local mode is unavailable or if terminal operation is normal in the local mode, turn the PARITY CHECK switch on the bypass switch or indicator assembly (if present) to OFF. (If the SA120 has no bypass switch or indicator assembly, place a wire strap in the terminal between the data input and the data output of the SA120 and disconnect the SA120 from the terminal. Be sure to remove the strap before reconnecting the SA120 to the terminal when this check is completed.) Request a message transmission from a terminal whose transmission the receiver could not copy correctly. Abnormal operation indicates that the trouble is in the sender or its data set, the transmission line, or the receiver or its data set, provided that the SA120 was installed correctly. Verify all SA120 connections if in doubt.

3.07 Troubles isolated to sending terminals, data sets, or the transmission line are not covered in this section.

3.08 If terminal operation is normal with the SA120 PARITY CHECK switch OFF (or equivalent), but is abnormal with the PARITY CHECK switch ON, the trouble is in the SA120.

3.09 Troubles isolated to the SA120 are corrected by replacement of a fuse or card. Do not remove or insert cards with the power on. Unplug the SA120 first.

CAUTION: THE INTEGRATED CIRCUITS USED ON THE SA120 CIRCUIT CARDS ARE FRAGILE. DO NOT DROP OR JAR ANY CARD OR ALLOW ONE TO COME IN CONTACT WITH SOLDER OR LOOSE METAL PARTICLES.

3.10 Because of the complexity of the SA120 circuits, it is not practical to make some repairs to cards at the terminal location. Defective cards which cannot be repaired quickly should be returned to a central facility for repair.

3.11 SA120 troubles are listed on Chart 1 in the order they would be detected when the SA120 is checked. Reference is made to the following schematic and actual wiring diagrams:

<u>NUMBER</u>	<u>TYPE</u>	<u>CONTENTS</u>
8200WD	S	SA120 Parity Failure Detector and Substitute Character Inserter
8201WD	A	SA120 (EIA Interface)
8202WD	A	SA120 (Current/No Current Interface)
322001	C	TP322001 (MC001) Receiving Logic Card
322002	C	TP322002 (MC002) Sending Logic Card
322204-206	C	TP322204-206 (MC204-MC206) Bit Timer Cards
320019	C	TP320019 Partial Power Supply Card
322400	C	TP322400 Rubout Detect/Break Generator/Counter Driver Card
323513	C	TP323513 Interface Amplifiers Card
8716WD	S	TP327631-34 Bypass Switch and Indicator Assemblies
8566WD	A	TP327631-34 Bypass Switch and Indicator Assemblies
8717WD	S	TP327637-40 Bypass Switch and Indicator Assemblies

<u>NUMBER</u>	<u>TYPE</u>	<u>CONTENTS</u>
8567WD	A	TP327637-40 Bypass Switch and Indicator Assemblies
322423	C	TP322423 Counter Driver Card

S = Schematic, A = Actual, C = Card Drawing

Note: These diagrams are contained in WDP 0204.

3.12 Refer to Section 578-200-201 for information on installation of the SA120 and the optional bypass switch and indicator assemblies coded as part of it, and Section 578-200-801 for parts. Refer to sections and wiring diagrams furnished with the terminal for information on the terminal.

“DATASPEED” TYPE 2 SENDERS

3.13 Sending troubles can be detected only by a remote receiver – not locally. Consequently, apparent sending troubles can be caused by malfunction of one or more of several elements. The terminal might garble or distort its signal; the SA120 might fail in a number of ways; the terminal data set might open or garble signals; the transmission line might open or become noisy; the receiver data set might open or garble signals; or the receiver itself might malfunction. The first step in troubleshooting is to isolate the trouble to one or more of these sources.

3.14 To determine if the source of trouble is in the terminal or after it (SA120, data set, etc), place the terminal in the TEST mode, if possible, and check its operation with the local receiver. Abnormal operation indicates that the trouble is in one of the two terminals.

3.15 Troubles isolated to a terminal are not covered in this section.

3.16 If the TEST mode is unavailable or if terminal operation is normal in the TEST mode, turn the PARITY CHECK switch (if present) to OFF. (If the SA120 has no PARITY CHECK switch, disconnect it from terminal and data set and place a wire strap between the data output of the terminal and the data input of the data set. Be sure to remove the strap before reconnecting the SA120 to the terminal and data set when this check is completed.) Send a message to a remote receiver and check on reception. Abnormal operation indicates that the trouble is in the sender or its data set, the transmission line, or the receiver or its data set, provided that the SA120 was installed correctly. Verify all SA120 connections if in doubt.

3.17 Troubles isolated to terminals, data sets, or the transmission line are not covered in this section.

SECTION 578-200-301

3.18 If terminal operation is normal with the SA120 PARITY CHECK switch OFF (or equivalent), but is abnormal with the PARITY CHECK switch ON, the trouble is in the SA120.

3.19 Troubles isolated to the SA120 are corrected by replacement of a fuse or card. Do not remove or insert cards with the power on. Unplug the SA120 first.

CAUTION: THE INTEGRATED CIRCUITS USED ON THE SA120 CIRCUIT CARDS ARE FRAGILE. DO NOT DROP OR JAR ANY CARD OR ALLOW ONE TO COME IN CONTACT WITH SOLDER OR LOOSE METAL PARTICLES.

3.20 Because of the complexity of the SA120 circuits, it is not practical to make some repairs to cards at the terminal location. Defective cards which cannot be repaired quickly should be returned to a central facility for repair.

3.21 SA120 troubles are listed on Chart 2. Reference is made to the following schematic and actual wiring diagrams:

NUMBER	TYPE	CONTENTS
322001	C	TP322001 (MC001) Receiving Logic Card
322002	C	TP322002 (MC002) Sending Logic Card
322204-206	C	TP322204-206 (MC204-MC206) Bit Timer Cards
320019	C	TP320019 Partial Power Supply Card
322422	C	TP322422 Parity Insert Card
8717WD	S	TP327637-40 Bypass Switch and Indicator Assemblies
8567WD	A	TP327637-40 Bypass Switch and Indicator Assemblies

S = Schematic, A = Actual, C = Card Drawing

Note: These drawings are contained in WDP 0204.

NUMBER	TYPE	CONTENTS
8200WD	S	SA120 Parity Failure Detector and Substitute Character Inserter
8201WD	A	SA120 (EIA Interface)

3.22 Refer to Section 578-200-201 for information on installation of the SA120 and the optional bypass switch assembly coded as part of it, and Section 578-200-801 for parts. Refer to sections and wiring diagrams furnished with the terminal for information on the terminal.

Note: All voltages are nominal.

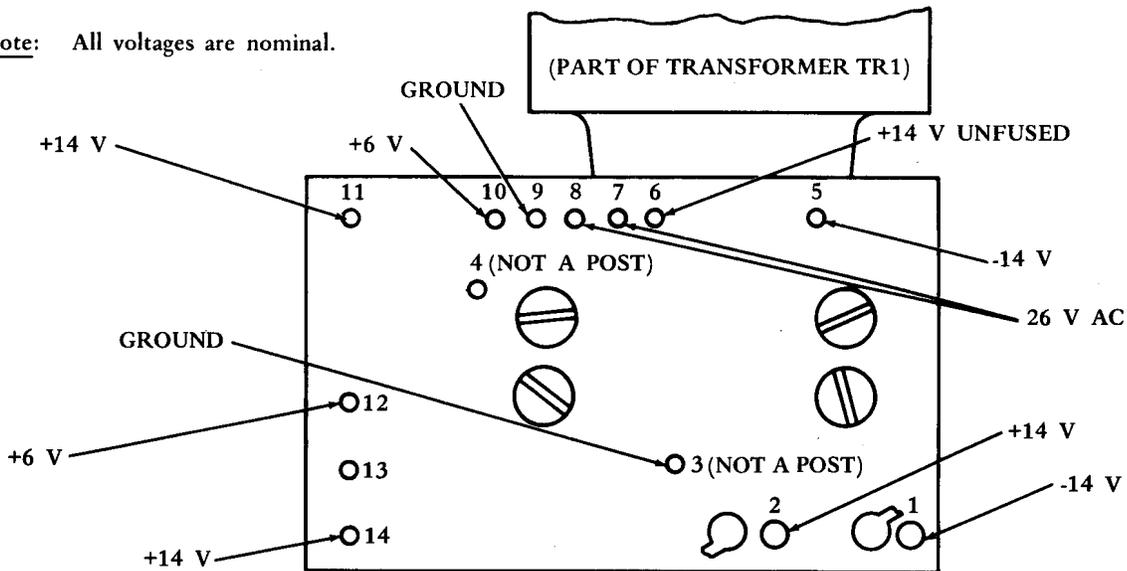


Figure 5 - Location of Power Supply Voltages (Top of Card TP320019 - Z101)

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
1.	Nothing is received by terminal from SA120 (terminal runs closed).	<p>a. Check connections between terminal and SA120 to be certain that all wires were installed at the correct locations (8716WD or 8717WD) and that no connections are loose. Correct any faults found.</p> <p>b. If terminal connections are good, wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Make certain cards are properly lined up. Turn PARITY CHECK switch (if present) to ON, request a message transmission from another station, and recheck operation.</p> <p>c. If card connections are tight but trouble remains, request a long message transmission from another station. Measure the voltage between slip connection terminals 1 and 3 on terminal board TB4 or card TP323513, whichever is present at the end of the SA120, while the message is being received. If this voltage is a steady 0 volt, check the contacts and wiring on the PARITY CHECK switch (8566WD or 8567WD), if present. Repair any faults found.</p> <p>d. If the voltage measured in step c fluctuates near 0 volt (positive or negative, but not a steady -3 to -25 volts), measure the voltage between slip connection terminals 4 and 3 on card TP323513, if present, while a message is being received. (If card TP323513 is not present, go to step h.) If this voltage is a steady -8 to -14 volts, the input interface amplifier on card TP323513 (8200WD) is defective. Repair it or replace card TP323513.</p> <p>e. If the voltage measured in step d fluctuates near -6 volts, measure the voltage between slip connection terminals 5 and 3 on card TP323513 while a message is being received. If this voltage is a steady -6 to -10 volts, card MC001 (TP322001), MC002 (TP322002), or one of their associated piggyback bit timer cards (MC204-MC206, TP322204-206) is probably defective. Proceed as follows:</p> <ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only the entire card MC001 assembly in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, replace piggyback card only on original card MC001, restore original card MC001, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC001 and set original card MC001 aside for repair.

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
1. (contd)		<p>3. If trouble comes back after only card MC001 assembly is replaced, restore original card MC001 assembly, replace entire card MC002 assembly, and recheck. If trouble disappears, replace piggyback card only on original card MC002, restore original card MC002, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC002 and set original card MC002 aside for repair.</p> <p>4. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.</p> <p>f. If the voltage measured in step e fluctuates near -2 volts, measure the voltage between slip connection terminals 2 and 3 on card TP323513 while a message is being received. If this voltage is a steady 0 volt, the output interface amplifier on card TP323513 (8200WD) is defective. Repair it or replace card TP323513.</p> <p>g. If the voltage measured in step f fluctuates near -7 volts, check the contacts and wiring on the PARITY CHECK switch (8566WD or 8567WD), if present, and connections to the terminal. Repair any faults found.</p> <p>h. If the voltage measured in step c fluctuates near 0 volt (positive or negative, but not a steady -3 to -25 volts), measure the voltage between slip connection terminals 2 and 3 on terminal board TB4 while a message is being received. If this voltage is a steady -6 to -10 volts, card MC001 (TP322001), MC002 (TP322002), or one of their associated piggyback bit timer cards (MC204-MC206, TP322204-206) is probably defective. Proceed as follows:</p> <ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only the entire card MC001 assembly in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, replace piggyback card only on original card MC001, restore original card MC001, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC001 and set original card MC001 aside for repair. 3. If trouble comes back after only card MC001 assembly is replaced, restore original card MC001 assembly, replace entire card MC002 assembly, and recheck. If trouble disappears, replace piggyback card only on original card MC002, restore original card MC002, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC002 and set original card MC002 aside for repair.

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
1. (contd)		<p>4. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.</p> <p>i. If the voltage measured in step h fluctuates near -7 volts, check the contacts and wiring on the PARITY CHECK switch (8566WD or 8567WD), if present, and connections to the terminal. Repair any faults found.</p>
2.	Terminal runs open when SA120 PARITY CHECK switch (if present) is ON or SA120 is connected without switch.	<p>a. Check connections between terminal and SA120 to be certain that all wires were installed at the correct locations (8716WD or 8717WD) and that no connections are loose. Correct any faults found.</p> <p>b. If terminal connections are good, wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Make certain cards are properly lined up. Turn PARITY CHECK switch (if present) to ON, request a message transmission from another station, and recheck operation.</p> <p>c. If card connections are tight but trouble remains, check fuses F1 and F2 on SA120 chassis. Replace fuse F1 if blown. If fuse F2 is blown, either transistor Q1 (on card TP320019 in the power supply) is shorted or zener diode ZD1 (on same card) is open, unless a card was removed from the SA120 while the ac power cord was plugged in. Repair or replace card TP320019 if necessary, then replace fuse F2. Make sure SA120 is securely plugged in after replacing fuses, and retest.</p> <p>d. If fuses are good, measure the ac voltage between posts 7 and 8 on card TP320019 on the power supply (Figure 5). If this voltage is less than 16.5 volts, transformer TR1 (TP320017) is defective or the fuseholder for fuse F1 (TP116783) is open. Replace defective part or card (check continuity of fuse F1 with meter before replacing fuseholder).</p> <p>e. If the voltage measured in step d is 16.5 volts ac or more, measure the voltage between rivet 2 and post 9 on card TP320019. If this voltage is less than +8.9 volts, diode bridge CR1 or capacitor C1 on card TP320019 is open or shorted, respectively, or the fuseholder for fuse F2 (TP116783) is open. Replace defective part or card (check continuity of fuse F2 with meter before replacing fuseholder).</p> <p>f. If the voltage measured in step e is between +8.9 and +16.0 volts, measure the voltage between posts 10 and 9 on card TP320019. If this voltage is less than +5.0 volts or more than +7.0 volts, zener diode ZD1, transistor Q1, or resistor R2 on card TP320019 is open or shorted. Replace defective part or card. Check zener diode ZD2 and SCR Q2 if Q1 is shorted or ZD1 is open; if either is defective, the integrated circuits on cards MC001 and MC002 may be damaged.</p>

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
2. (contd)		<p data-bbox="607 436 1425 579">g. If the voltage measured in step f is between +5.0 and +7.0 volts, measure the voltage between rivet 1 and post 9 on card TP320019. If this voltage is less than -11.0 volts or more than -16.8 volts, diode bridge CR1 or capacitor C2 on card TP320019 is open or shorted. Replace defective part or card.</p> <p data-bbox="607 617 1425 827">h. If the voltage measured in step g is between -11.0 and -16.8 volts, request a long message transmission from another station. Measure the voltage between slip connection terminals 1 and 3 on terminal board TB4 or card TP323513, whichever is present at the end of the SA120, while the message is being received. If this voltage is a steady positive voltage (about +6 volts or less), check the contacts and wiring on the PARITY CHECK switch (8566WD or 8567WD), if present. Repair any faults found.</p> <p data-bbox="607 865 1425 1062">i. If the voltage measured in step h fluctuates near 0 volt (positive or negative, but not a steady +3 to +25 volts), measure the voltage between slip connection terminals 4 and 3 on card TP323513, if present, while a message is being received. (If card TP323513 is not present, go to step m.) If this voltage is a steady +8.9 to +16.0 volts, the input interface amplifier on card TP323513 (8200WD) is defective. Repair it or replace card TP323513.</p> <p data-bbox="607 1100 1425 1272">j. If the voltage measured in step i fluctuates near -6 volts, measure the voltage between slip connection terminals 5 and 3 on card TP323513 while a message is being received. If this voltage is a steady +5 to +7 volts, card MC001 (TP322001), MC002 (TP322002), or one of their associated piggyback bit timer cards (MC204-MC206, TP322204-206) is probably defective. Proceed as follows:</p> <ol data-bbox="659 1310 1425 1877" style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only the entire card MC001 assembly in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, replace piggyback card only on original card MC001, restore original card MC001, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC001 and set original card MC001 aside for repair. 3. If trouble comes back after only card MC001 assembly is replaced, restore original card MC001 assembly, replace entire card MC002 assembly, and recheck. If trouble disappears, replace piggyback card only on original card MC002, restore original card MC002, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC002 and set original card MC002 aside for repair.

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
2. (contd)		<p>4. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.</p> <p>k. If the voltage measured in step j fluctuates near -2 volts, measure the voltage between slip connection terminals 2 and 3 on card TP323513 while a message is being received. If this voltage is a steady -11.0 to -16.8 volts, the output interface amplifier on card TP323513 (8200WD) is defective. Repair it or replace card TP323513.</p> <p>l. If the voltage measured in step k fluctuates near -7 volts, check the contacts and wiring on the PARITY CHECK switch (8566WD or 8567WD), if present, and connections to the terminal. Repair any faults found.</p> <p>m. If the voltage measured in step h fluctuates near 0 volt (positive or negative, but not a steady +3 to +25 volts), measure the voltage between slip connection terminals 2 and 3 on terminal board TB4 while a message is being received. If this voltage is a steady +5 to +7 volts, card MC001 (TP322001), MC002 (TP322002), or one of their associated piggyback bit timer cards (MC204-MC206, TP322204-206) is probably defective. Proceed as follows:</p> <ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only the entire card MC001 assembly in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, replace piggyback card only on original card MC001, restore original card MC001, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC001 and set original card MC001 aside for repair. 3. If trouble comes back after only card MC001 assembly is replaced, restore original card MC001 assembly, replace entire card MC002 assembly, and recheck. If trouble disappears, replace piggyback card only on original card MC002, restore original card MC002, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC002 and set original card MC002 aside for repair. 4. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards. <p>n. If the voltage measured in step m fluctuates near -7 volts, check the contacts and wiring on the PARITY CHECK switch (8566WD or 8567WD), if present, and connections to the terminal. Repair any faults found.</p>

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
3.	Terminal receives garbled copy when SA120 PARITY CHECK switch (if present) is ON or SA120 is connected without switch.	<p>a. Check SA120 data input and output terminals for loose connections or connections made to wrong terminals (8716WD or 8717WD). Correct any faults found.</p> <p>b. If data connections are good, replace piggyback card MC204, MC205, or MC206 (TP322204, TP322205, or TP322206) on card MC001. Request a message transmission from another station. If trouble disappears, repair or discard original card, but if not, restore original card, replace piggyback card on card MC002, and retest. If trouble disappears, repair or discard original piggyback card on card MC002. If not, restore original card.</p> <p>c. If trouble remains after both piggyback cards have been checked, replace card MC001 (TP322001). Request a message transmission from another station. If trouble disappears, repair or discard original card MC001, but if trouble remains, replace card MC002 (TP322002) and repair or discard original card MC002.</p> <p>d. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.</p>
4.	Parity errors are not indicated (some or all).	<p>a. If no parity errors are indicated, check strapping of terminals W, X, Y, and Z on card MC001 (8200WD). Carefully resolder straps correctly if open or incorrect.</p> <p>b. If strapping of terminals W, X, Y, and Z is correct, wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Turn PARITY CHECK switch (if present) to ON, request a message transmission containing parity errors from another station, and recheck operation.</p> <p>c. If card connections are tight but trouble remains, or if some parity errors are indicated, either card MC001 or card MC002 is probably defective. (The piggyback cards on these cards are almost certainly good.) Proceed as follows:</p> <ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only card MC001 (TP322001) in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, repair or discard original card MC001. 3. If trouble comes back after only card MC001 is replaced, restore original card MC001, replace card MC002 (TP322002), and repair or discard original card MC002.

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
4. (contd)		4. If trouble remains after both cards have been replaced individually, replace both MC001 and MC002 and repair or discard original cards.
5.	Substitute character inserted but no break generated, lamp lighted, or count indicated (SA120 AK, SA120 AP, SA120 AM, SA120 BC-BF, SA120 CC-CF, and SA120 EB-EE only).	<p>a. Wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Make certain cards are properly lined up. Request a message transmission containing parity errors from another station and recheck operation.</p> <p>b. If card connections are tight but trouble remains, check SA120 and terminal connections to bypass switch or indicator assembly (if present) for loose connections or connections made to wrong terminals (8716WD or 8717WD). (If bypass switch or indicator assembly is not present, go to step c.) Correct any faults found.</p> <p>c. If bypass switch or indicator assembly connections are good, check terminals 69, 70, and 71 on card MC400 to determine if they are strapped for -14 or +14 volts as required (Section 578-200-201). If connections are wrong, strap as required.</p> <p>d. If strapping of terminals 69, 70, and 71 is correct, check wiring of bypass switch, lamp, and counter, if present (8566WD or 8567WD). Correct any faults found.</p> <p>e. If trouble remains, replace card MC400 (TP322400).</p>
6.	Break generated or lamp lighted and count indicated, but substitute character not inserted (SA120 AK, SA120 AP, SA120 AM, SA120 BC-BF, SA120 CC-CF, and SA120 EB-EE only).	<p>a. Check straps H and J on card MC400 to be sure they are both properly closed (zero resistance). Carefully resolder them if necessary (do not keep soldering iron on strap any longer than necessary to obtain a good joint, or the heat may loosen the ends of the strap).</p> <p>b. If straps H and J are closed, wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Make certain cards are properly lined up. Request a message transmission containing parity errors from another station and recheck operation.</p> <p>c. If card connections are tight but trouble remains, either card MC002 or card MC400 is probably defective. (The piggyback card on card MC002 is good.) Proceed as follows:</p> <ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace card connector TB2 (TP319995) on SA120 baseplate.

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
6. (contd)		<ol style="list-style-type: none"> 2. If trouble disappears when all cards are replaced, replace only card MC002 (TP322002) in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, repair or discard original card MC002. 3. If trouble comes back after only card MC002 is replaced, restore original card MC002, replace card MC400 (TP322400), and repair or discard original card MC400. 4. If trouble remains after both cards have been replaced individually, replace both MC002 and MC400 and repair or discard original cards.
7.	Errors indicated continuously.	<ol style="list-style-type: none"> a. Check strapping of terminals W, X, Y, and Z on card MC001 (8200WD) to determine if they are strapped for the type of parity being received (W and X, Y and Z strapped for even parity check – substitute character on odd parity, W and Y, X and Z strapped for odd parity check – substitute character on even parity). Change strapping if incorrect. b. If strapping of terminals W, X, Y, and Z is correct, either card MC001 or card MC002 is defective if card MC400 is not present. (The piggyback cards on these cards are good.) Proceed as follows: <ol style="list-style-type: none"> 1. Replace card MC001 (TP322001) only in original "sandwich." Request a message transmission from another station and recheck operation. If trouble disappears, repair or discard original card MC001. 2. If trouble remains after only card MC001 is replaced, restore original card MC001 and replace card MC002 (TP322002). If trouble disappears, repair or discard original card MC002. 3. If card MC400 is present and trouble remains after card MC002 is replaced, restore original card MC002 and replace card MC400 (TP322400). If trouble disappears, repair or discard original card MC400. 4. If card MC400 is not present and trouble remains after card MC002 is replaced, replace both MC001 and MC002 and repair or discard original cards. If card MC400 is present and trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
8.	False error indications (not continuous).	Either card MC001 or card MC002 is defective if card MC400 is not present. (The piggyback cards on these cards are good.) Proceed as follows:

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
8. (contd)		<ol style="list-style-type: none"> 1. Replace card MC001 (TP322001) only in original "sandwich." Request a message transmission from another station and recheck operation. If trouble disappears, repair or discard original card MC001. 2. If trouble remains after only card MC001 is replaced, restore original card MC001 and replace card MC002 (TP322002). If trouble disappears, repair or discard original card MC002. 3. If card MC400 is present and trouble remains after card MC002 is replaced, restore original card MC002 and replace card MC400 (TP322400). If trouble disappears, repair or discard original card MC400. 4. If card MC400 is not present and trouble remains after card MC002 is replaced, replace both MC001 and MC002 and repair or discard original cards. If card MC400 is present and trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
9.	Indicator lamp does not light, but counter advances for each error.	<ol style="list-style-type: none"> a. Check lamp bulb. Replace bulb if burned out. b. If bulb is good, check SA120 connections for lamp and counter (8716WD or 8717WD). Look for loose connections or connections made to wrong terminals. Correct any faults found. c. If lamp and counter connections are good, check wiring of bypass switch and indicator assembly for lamp and counter (8566WD or 8567WD). Correct any faults found. d. For the SA120 EE only, check to be sure that strap C on card MC400 is open and strap D is closed (except 2400 baud operation). Change strapping if incorrect. e. If straps C and D are correct, relay K1 on card MC400 is defective. Replace it or replace card MC400 (TP322400).
10.	Indicator lamp lights, but counter does not advance (SA120 BE, SA120 BF, SA120 CE, SA120 CF, or SA120 EC only).	<ol style="list-style-type: none"> a. Check terminals 69, 70, and 71 on card MC400 to determine if they are strapped for -14 volts as required (Section 578-200-201). If connections are reversed, strap as required. Also replace diode CR1 (8716WD, 8566WD, 8717WD, 8567WD) on the counter, which was destroyed by the improper voltage. b. If strapping of terminals 69, 70, and 71 is correct, check SA120 connections for lamp and counter (8716WD or 8717WD). Look for loose connections or connections made to wrong terminals. Correct any faults found.

CHART 1

TROUBLESHOOTING FOR SA120 MOUNTED ON LOW OR HIGH SPEED RECEIVER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
10. (contd)		<p>c. If lamp and counter connections are good, check wiring of bypass switch and indicator assembly for lamp and counter (8566WD or 8567WD). Correct any faults found.</p> <p>d. If wiring is good, replace TP327641 counter.</p>
11.	Indicator lamp lights, but counter does not advance (SA120 EE only).	<p>a. Check terminals 69, 70, and 71 on card MC400 to determine if they are strapped for +14 volts as required (Section 578-200-201). If connections are wrong, strap as required.</p> <p>b. If strapping of terminals 69, 70, and 71 is correct, check SA120 connections for counter (8717WD). Look for loose connections or connections made to wrong terminals. Also check the single white-black wire from position C7 of plug P902 to the bypass switch and indicator assembly for loose connections (8717WD). Correct any faults found.</p> <p>c. If counter connections are good, check wiring of bypass switch and indicator assembly for counter (8567WD). Correct any faults found.</p> <p>d. If wiring is good, either TP322423 counter driver card or TP327642 counter is defective. Replace counter driver card first to isolate trouble or replace entire TP327637 bypass switch and indicator assembly.</p>
12.	PARITY CHECK switch (if present) inoperative.	Repair or replace TP327621 PARITY CHECK switch.
13.	Substitute character inserted for RUB OUT (DELETE) character with odd parity transmission.	Replace card MC400 (TP322400).

CHART 2

TROUBLESHOOTING FOR SA120 MOUNTED ON "DATASPEED" TYPE 2 SENDER

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
1.	Remote receiver runs closed when PARITY CHECK switch is ON.	<p>a. Check connections between terminal and SA120 to be certain that all wires were installed at the correct locations (8717WD) and that no connections are loose. Correct any faults found.</p> <p>b. If terminal connections are good, wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Make certain cards are properly lined up. Turn PARITY CHECK switch (if present) to ON and send a message to another station to recheck operation.</p> <p>c. If card connections are tight but trouble remains, put a continuous-loop test tape or the beginning of a long reel of tape in the reader of the sender and start the reader. Measure the voltage between slip connection terminals 1 and 3 on terminal board TB4 at the end of the SA120 while the tape is being sent. If this voltage is a steady 0 volt, check the contacts and wiring on the PARITY CHECK switch (8567WD), if present. Repair any faults found.</p> <p>d. If the voltage measured in step c fluctuates near 0 volt (positive or negative, but not a steady -3 to -25 volts), measure the voltage between slip connection terminals 2 and 3 on terminal board TB4 while the tape is being sent. If this voltage is a steady -6 to -10 volts, card MC001 (TP322001), MC002 (TP322002), or one of their associated piggyback bit timer cards (MC206, TP322206) is probably defective. Proceed as follows:</p> <ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only the entire card MC001 assembly in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, replace piggyback card only on original card MC001, restore original card MC001, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC001 and set original card MC001 aside for repair. 3. If trouble comes back after only card MC001 assembly is replaced, restore original card MC001 assembly, replace entire card MC002 assembly, and recheck. If trouble disappears, replace piggyback card only on original card MC002, restore original card MC002, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC002 and set original card MC002 aside for repair.

CHART 2

TROUBLESHOOTING FOR SA120 MOUNTED ON "DATASPEED" TYPE 2 SENDER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
1. (contd)		<p>4. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.</p> <p>e. If the voltage measured in step d fluctuates near -7 volts, check the contacts and wiring on the PARITY CHECK switch (8567WD), if present, and connections to the terminal. Repair any faults found.</p>
2.	Remote receiver runs open when PARITY CHECK switch is ON.	<p>a. Check connections between terminal and SA120 to be certain that all wires were installed at the correct locations (8717WD) and that no connections are loose. Correct any faults found.</p> <p>b. If terminal connections are good, wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Make certain cards are properly lined up. Turn PARITY CHECK switch (if present) to ON and send a message to another station to recheck operation.</p> <p>c. If card connections are tight but trouble remains, check fuses F1 and F2 on SA120 chassis. Replace fuse F1 if blown. If fuse F2 is blown, either transistor Q1 (on card TP320019 in the power supply) is shorted or zener diode ZD1 (on same card) is open, unless a card was removed from the SA120 while the ac power cord was plugged in. Repair or replace card TP320019 if necessary, <u>then</u> replace fuse F2. Make sure SA120 is securely plugged in after replacing fuses, and retest.</p> <p>d. If fuses are good, measure the ac voltage between posts 7 and 8 on card TP320019 on the power supply (Figure 5). If this voltage is less than 16.5 volts, transformer TR1 (TP320017) is defective or the fuseholder for fuse F1 (TP116783) is open. Replace defective part or card (check continuity of fuse F1 with meter before replacing fuseholder).</p> <p>e. If the voltage measured in step d is 16.5 volts ac or more, measure the voltage between rivet 2 and post 9 on card TP320019. If this voltage is less than +8.9 volts, diode bridge CR1 or capacitor C1 on card TP320019 is open or shorted, respectively, or the fuseholder for fuse F2 (TP116783) is open. Replace defective part or card (check continuity of fuse F2 with meter before replacing fuseholder).</p> <p>f. If the voltage measured in step e is between +8.9 and +16.0 volts, measure the voltage between posts 10 and 9 on card TP320019. If this voltage is less than +5.0 volts or more than +7.0 volts, zener diode ZD1, transistor Q1, or resistor R2 on card TP320019 is open or shorted. Replace defective part or card. Check zener diode ZD2 and SCR Q2 if Q1 is shorted or ZD1 is open; if either is defective, the integrated circuits on cards MC001 and MC002 may be damaged.</p>

CHART 2

TROUBLESHOOTING FOR SA120 MOUNTED ON "DATASPEED" TYPE 2 SENDER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
2. (contd)		<p data-bbox="711 443 1528 590">g. If the voltage measured in step f is between +5.0 and +7.0 volts, measure the voltage between rivet 1 and post 9 on card TP320019. If this voltage is less than -11.0 volts or more than -16.8 volts, diode bridge CR1 or capacitor C2 on card TP320019 is open or shorted. Replace defective part or card.</p> <p data-bbox="711 625 1528 831">h. If the voltage measured in step g is between -11.0 and -16.8 volts, put a continuous-loop test tape or the beginning of a long reel of tape in the reader of the sender and start the reader. Measure the voltage between slip connection terminals 1 and 3 on terminal board TB4 at the end of the SA120 while the tape is being sent. If this voltage is a steady positive voltage (about +6 volts or less), check the contacts and wiring on the PARITY CHECK switch (8567WD), if present. Repair any faults found.</p> <p data-bbox="711 867 1528 1041">i. If the voltage measured in step h fluctuates near 0 volt (positive or negative, but not a steady +3 to +25 volts), measure the voltage between slip connection terminals 2 and 3 on terminal board TB4 while the tape is being sent. If this voltage is a steady +5 to +7 volts, card MC001 (TP322001), MC002 (TP322002), or one of their associated piggyback bit timer cards (MC206, TP322206) is probably defective. Proceed as follows:</p> <ol data-bbox="769 1077 1528 1640" style="list-style-type: none"> <li data-bbox="769 1077 1528 1161">1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). <li data-bbox="769 1192 1528 1398">2. If trouble disappears when all cards are replaced, replace only the entire card MC001 assembly in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, replace piggyback card only on original card MC001, restore original card MC001, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC001 and set original card MC001 aside for repair. <li data-bbox="769 1430 1528 1640">3. If trouble comes back after only card MC001 assembly is replaced, restore original card MC001 assembly, replace entire card MC002 assembly, and recheck. If trouble disappears, replace piggyback card only on original card MC002, restore original card MC002, and recheck; if operation is still normal, discard piggyback card replaced or set it aside for repair, but if not, reinsert replacement card MC002 and set original card MC002 aside for repair. <li data-bbox="769 1671 1528 1734">4. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards. <p data-bbox="711 1766 1528 1850">j. If the voltage measured in step i fluctuates near -7 volts, check the contacts and wiring on the PARITY CHECK switch (8567WD), if present, and connections to the terminal. Repair any faults found.</p>

CHART 2

TROUBLESHOOTING FOR SA120 MOUNTED ON "DATASPEED" TYPE 2 SENDER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
3.	Remote receiver receives garbled data when PARITY CHECK switch is ON.	<ul style="list-style-type: none"> a. Check SA120 data input and output terminals for loose connections or connections made to wrong terminals (8717WD). Correct any faults found. b. If data connections are good, check all straps on card MC422 to be certain that five straps are closed and seven straps are open as specified on 322422 for parity insertion in the level required. Correct strapping if wrong. c. If strapping is correct, replace piggyback card MC206 (TP322206) on card MC001. Send a message to another station to recheck operation. If trouble disappears, repair or discard original card, but if not, restore original card, replace piggyback card on card MC002, and retest. If trouble disappears, repair or discard original piggyback card on card MC002. If not, restore original card. d. If trouble remains after both piggyback cards have been checked, replace card MC001 (TP322001). Send a message to another station to recheck operation. If trouble disappears, repair or discard original card MC001, but if trouble remains, replace card MC002 (TP322002) and repair or discard original card MC002. e. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
4.	Parity not inserted – data received identical to data sent (PARITY CHECK switch ON).	<ul style="list-style-type: none"> a. Check connections between terminal and SA120 to be certain that all wires were installed at the correct locations (8717WD) and that no connections are loose. Correct any faults found. b. If terminal connections are good, wiggle the "sandwich" of circuit cards in the SA120 and compress it to be certain that all connections are tight. Make certain cards are properly lined up. Turn PARITY CHECK switch (if present) to ON and send a message to another station to recheck operation. c. If card connections are tight but trouble remains, check all straps on card MC422 to be certain that five straps are closed and seven straps are open as specified on 322422 for parity insertion in the level required. Correct strapping if wrong. d. If strapping is correct, card MC001 (TP322001), MC002 (TP322002), or card MC422 (TP322422) is probably defective. (The piggyback cards on cards MC001 and MC002 are good.) Proceed as follows:

CHART 2

TROUBLESHOOTING FOR SA120 MOUNTED ON "DATASPEED" TYPE 2 SENDER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
4. (contd)		<ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only card MC001 in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, repair or discard original card MC001. 3. If trouble comes back after only card MC001 is replaced, restore original card MC001, replace card MC422, and retest. If trouble disappears, repair or discard original card MC422. 4. If trouble remains after only card MC422 is replaced, restore original card MC422, replace card MC002, and retest. If trouble disappears, repair or discard original card MC002. 5. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
5.	Parity inserted incorrectly (data bits correct).	<ol style="list-style-type: none"> a. Check all straps on card MC422 to be certain that five straps are closed and seven straps are open as specified on 322422 for parity insertion in the level required. Correct strapping if wrong. b. If strapping of MC422 is correct, check strapping of terminals W, X, Y, and Z on card MC001 (8200WD) to determine if they are strapped for the type of parity to be provided (W and X, Y and Z strapped to provide even parity output, W and Y, X and Z strapped to provide odd parity output). Change strapping if incorrect. c. If strapping is correct, card MC001 (TP322001), MC002 (TP322002), or card MC422 (TP322422) is probably defective. (The piggyback cards on cards MC001 and MC002 are good.) Proceed as follows: <ol style="list-style-type: none"> 1. Replace entire "sandwich" of cards and retest. If trouble remains after all cards have been replaced, replace SA120 baseplate card connectors (TP319995). 2. If trouble disappears when all cards are replaced, replace only card MC001 in original "sandwich," restore original "sandwich," and retest. If trouble does not come back, repair or discard original card MC001. 3. If trouble comes back after only card MC001 is replaced, restore original card MC001, replace card MC422, and retest. If trouble disappears, repair or discard original card MC422.

CHART 2

TROUBLESHOOTING FOR SA120 MOUNTED ON "DATASPEED" TYPE 2 SENDER (Continued)

NO.	TROUBLE INDICATION	ANALYSIS AND RECOMMENDED ACTION
5. (contd)		<ol style="list-style-type: none"><li data-bbox="638 443 1398 527">4. If trouble remains after only card MC422 is replaced, restore original card MC422, replace card MC002, and retest. If trouble disappears, repair or discard original card MC002.<li data-bbox="638 558 1354 617">5. If trouble remains after all cards have been replaced individually, replace in pairs to isolate defective cards.
6.	PARITY CHECK switch (if present) inoperative.	Repair or replace TP327621 PARITY CHECK switch.