

"DATASPEED®" TAPE SENDER AND RECEIVER
WITH ERROR DETECTION AND CORRECTION
TYPE 4A SENDER AND TYPE 4B RECEIVER

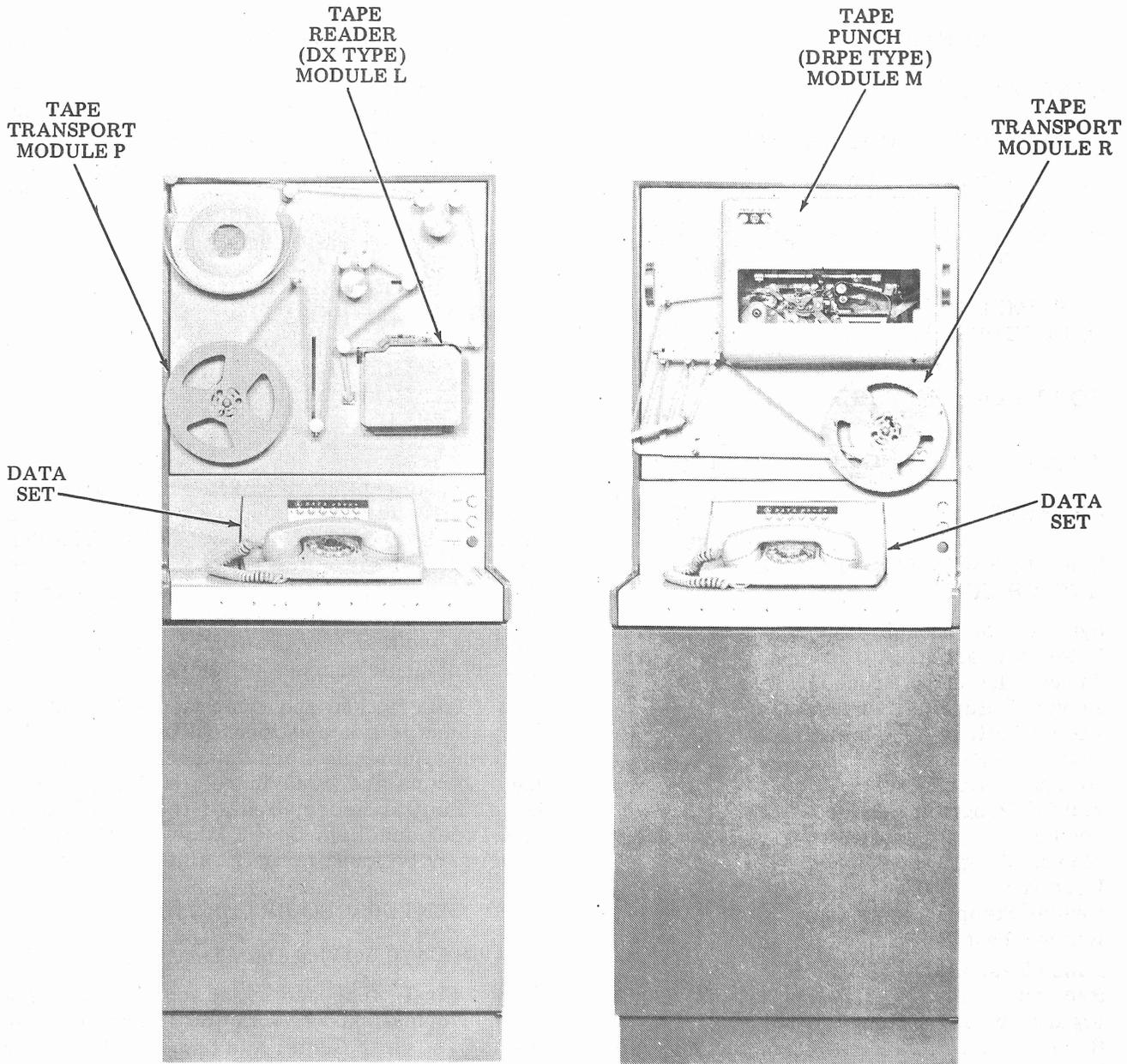
TROUBLESHOOTING

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GENERAL	4	1. GENERAL	
TROUBLESHOOTING TABLES AND CHARTS		1.01 This section provides troubleshooting, a list of equipment, charts, procedures and references for the Type 4 Tape-To-Tape "DATASPEED" system consisting of a 4A Sender and 4B Receiver with associated data sets and line. It is reissued to include engineering changes, to add interface information, and wir- ing field and test tape drawings. Arrows in the margin indicate changes or additions.	
Symptom or Trouble Report		1.02 Description and operation information, installation and checkout procedure, ad- justments, lubrication and disassembly, and wir- ing diagrams are found in related Type 4 sec- tions. Similar information for the Tape Reader (DX Type) and High Speed Tape Punch (DRPE Type) may be found in their related sections.	
Index to Charts	4	TEST CENTER REQUIREMENTS	
Trouble Isolation Procedures.....	7	A. 904-Type Serving Data Test Center	
Power Failure — Sender.....	11/12	1.03 First, test and clear data sets in the normal manner with local, serving 904- Type Data Test Center and test boards. Tests can then be made with the Type 4 terminals in their NON-EDC mode for evaluating and for	
Power Failure — Receiver	13/14		
Alarm — Sender	15/16		
Alarm — Receiver.....	17/18		
Manual Program Advance — Sender	19/20		
Manual Program Advance — Receiver.....	21/22		
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Receiver — Trouble Analysis	33-45 ←		
Sender — Trouble Analysis.....	46-53 ←		

adjusting operation of station arrangements, data sets, serializing circuitry and the reader (DX Type) and the punch (DRPE Type) as covered in installation, maintenance and adjustment practices. These tests are recommended first in order to hold the testing load at the Type 4 Test Center in Chicago, Illinois to a minimum.

B. Special Type 4 Data Test Center

1.04 A Special Test Center is now available at Illinois Bell Telephone Co. in Chicago for testing with all Bell Telephone companies in connection with Type 4 Tape-to-Tape System Service and later with other complex services.



TAPE SENDER 4A

TAPE RECEIVER 4B

Figure 1 - Tape Sender 4A and Tape Receiver 4B

For test procedures and information the Special Test Center can be reached from within Illinois on "INWATS" 800-972-3500 and from outside of Illinois on "INWATS" 800-621-7447. After testing with the normal servicing Test Center as indicated in 1.03, tests should be made with this Special Test Center to verify proper operation of the EDC error control logic and to analyze and clear troubles in this circuitry or in any of the complex control system aspects of the service. Local private line and long lines controlled private line stations should be transferred or patched to an existing loop or extension to permit dialed access to the Special Test Center for testing.

PRELIMINARY CHECKS AND PROCEDURES

1.05 The following paragraphs outline preliminary checks and procedures to be followed in using the charts to troubleshoot the Type 4 Tape-To-Tape system.

1.06 Use a thoroughly pretested data set and line if possible. Recheck these if trouble is not easily cleared. A great deal of time may be lost trying to shoot trouble on the wrong equipment.

1.07 Make arrangements to run tests with an available test center; otherwise, test with a pretested appropriate terminal and a data set. If neither a test center nor a remote terminal are available, or if the trouble cannot be located and cleared by use of local tests, the trouble may be located and cleared through use of the related Type 4 description and operation, installation and checkout and adjustment sections. Use the schematic and actual wiring diagrams shipped with the equipment. If unusual difficulties are encountered, check the equipment for previous emergency field modifications or other unrecorded changes.

1.08 Make certain that all cables and connectors are properly connected and that they appear to be in good condition.

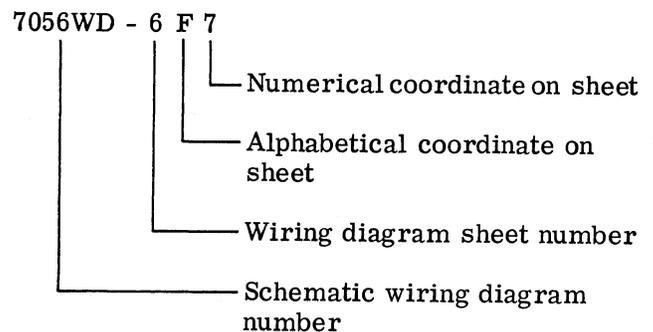
1.09 If the system fails to perform its intended function, the difficulty should be analyzed in a logical manner to recognize the source of the problem before starting to shoot trouble. Make certain whether the difficulty is mechanical or electrical. Take time to pinpoint the exact nature of the difficulty rather than generalize. Be specific. For example, it would be best to determine whether the reader fails to step in the block mode, or whether the Sender is failing to transmit.

1.10 Do not change mechanical or electrical adjustments indiscriminately in an effort to correct a difficulty which is not fully understood. Very often this will only add more trouble.

1.11 As an aid to troubleshooting, the troubleshooting (TSC) and other charts in this section are intended to serve as a guide in the analysis, isolation and correction of difficulties. The associated schematic wiring diagrams and description, installation and checkout, and adjustment sections are required for reference. These charts are intended for field repair and, as such, will assist in determining the probable nature of the difficulty. If a circuit card fails, an immediate solution is to replace the card rather than try to find the defective card component.

1.12 For the location of referenced circuit elements on schematic wiring diagrams refer to Tables C and D. For location on equipment, refer to the schematic and actual wiring diagrams and to the circuit card location charts on the inner side of the Sender and Receiver front doors.

1.13 The circuit element location referenced in the text may be located on schematic wiring diagrams according to the following system:



2. EQUIPMENT REQUIRED

2.01 In addition to the usual tools (screwdrivers, wrenches, etc) troubleshooting should be done with a standard volt-ohm-milliammeter and a precision calibrated oscilloscope.

2.02 Refer to the appropriate parts sections for parts ordering information and detailed illustrations of the equipment.

SECTION 592-811-300

2.03 The following replacement maintenance parts and tools are available:

TP303050 SR Parts Kit - For both Sender and Receiver.

TP303058 Send Parts Kit - For Sender only.

TP303059 Rec Parts Kit - For Receiver only.

TP303060 Send Tool Kit - For Sender only.

TP303061 Rec Tool Kit - For Receiver only.

3. TROUBLESHOOTING

CAUTION: DISCONNECT ALL AC POWER BEFORE ATTEMPTING TO REMOVE ASSEMBLIES OR REMOVE AND REPLACE CIRCUIT CARDS. EXERCISE EXTREME CAUTION IN THE AREA OF ROTATING MECHANICAL UNITS AS A SCREWDRIVER PLACED IN THE WRONG AREA MAY PERMANENTLY DAMAGE A UNIT.

GENERAL

3.01 If the exact nature of the trouble and symptoms are not clear, go through the complete sender and receiver checkout procedures in the installation and checkout procedure sections.

3.02 Refer to the symptom or trouble report index to charts to determine which chart to use in analyzing a problem.

3.03 Refer to Table E for data set strapping options as needed to obtain proper operation.

3.04 In some cases, equipment may be returned to service on an emergency basis by replacing circuit cards without checking as instructed by charts. However, the most difficult types of troubles to locate and clear, such as random, unclassifiable and intermittent garble, are most likely to be caused by marginal operation of a common ground, voltage, timing, oscillator, pulse shaping and filter elements or almost anything in the signal path circuits. At present, many of these unusual troubles can only be located and cleared, and preventive maintenance performed for continuing service through proper use of a volt-ohm-milliammeter and precision calibrated oscilloscope, with careful reference to detailed principles of operation in the description sections and to the schematic wiring diagrams.

3.05 End-to-end tests should always be performed after trouble has been cleared. This completion test is to assure that the customer service is operating properly.

TABLE A

SYMPTOM OR TROUBLE REPORT INDEX TO CHARTS

SYMPTOM OR TROUBLE REPORT	CHART SPECIFYING CORRECTIVE ACTION
<p>A. Sender Terminal</p> <ol style="list-style-type: none"> 1. Power Failure 2. Reader Power Failure 3. Reader Motor Not Running 4. Reader Contact Retractor Not Energizing 5. Tape Puller Motor Not Running 6. Reader Tearing Feed Holes 	<p>TSC 1 & 12</p> <p>TSC 1 & 12</p> <p>TSC 1 & 12</p> <p>TSC 1</p> <p>TSC 1 & 12</p> <p>Reader (DX Type) Troubleshooting Section</p>

TABLE A

SYMPTOM OR TROUBLE REPORT INDEX TO CHARTS (Continued)

SYMPTOM OR TROUBLE REPORT	CHART SPECIFYING CORRECTIVE ACTION
7. No Reader Stepping on Reverse Channel Simulate Command	TSC 7 & 12
8. Erratic Reader Stepping	TSC 7 & 12
9. Alarm After Reader Steps a Few Characters	TSC 3
10. Programmer Locked in BK Mode	TSC 7 & 12
11. No Reader Stepping in Reverse	TSC 7 & 12
12. No Forward Reader Stepping	TSC 7 & 12
13. No Manual Program Advance	TSC 5 & 12
14. Programmer Locked in R1 Mode	TSC 7 & 12
15. Cannot De-Alarm Sender	TSC 3 & 12
16. No Tape-Out/Tape Jam Alarm	TSC 3 & 12
17. No Three Consecutive Re-Runs Alarm	TSC 3
18. No Reader Test Operation	TSC 8
19. Continuous Reader Test Alarms	TSC 8 & 12
20. No Unattended Answering	TSC 12
21. Sender Fails to Remain on Line - Drops Call After Connection Has Been Established	TSC 12
22. Transmitter Does Not Drop Call After Message is Completed	TSC 12
23. Transmitter Does Not Detect Reverse Channel	TSC 12
B. Receiver Terminal	
1. Power Failure	TSC 2 & 11
2. Chad and Tape Puller Motor Not Running	TSC 2 & 11
3. Backup Mechanism Motor Not Running	TSC 2 & 11
4. Photoelectric Verifier Light Source Off	TSC 2 & 11
5. Punch Motors Not Operating	TSC 2 & 11
6. Tape Motion Alarm	TSC 4 & 11
7. Tape Backup Alarm	TSC 4 & 11
8. Cannot De-Alarm Receiver	TSC 4 & 11
9. No Tape Motion Through Punch Block	TSC 11
10. No Feed Pin Motion	TSC 11
11. Punching Garbled or Random Product Tape	Trouble Isolation Procedures

TABLE A

SYMPTOM OR TROUBLE REPORT INDEX TO CHARTS (Continued)

SYMPTOM OR TROUBLE REPORT	CHART SPECIFYING CORRECTIVE ACTION
12. Missing or Added Bits in Product Tape	Trouble Isolation Procedures
13. Improper Fixed Characters Received	Trouble Isolation Procedures
14. Received Short First Block	Trouble Isolation Procedures
15. No Manual Program Advance	TSC 6 & 11
16. Punch Does Not Punch in BK Mode	TSC 11
17. Feed Alarm	TSC 4 & 11
18. Extreme Burring of Feedholes	TSC 11
19. Partial or No Perforation	TSC 11
20. Punch Block Jams	TSC 11
21. Wavering of Patterns on Product Tape	TSC 11
22. No Overpunching of Backed-Up Tape	TSC 11
23. Excessive Burring or Elongating of Feed Holes on Backup of Tape	TSC 11
24. Improper Overpunching of First Few Characters After a Backup	TSC 11
25. Feed Alarm and Incompletion of Errored Block Deletion	TSC 11
26. Excessive Elongated Code Holes on Overpunch	TSC 11
27. Intermittent Violent Rocking of the Punch Assembly	TSC 11
28. No Figs Insert After Errored Block Deletion	TSC 10
29. No Punch Test Operation	TSC 9
30. No Unattended Receiver Answering	TSC 11
31. Receiver Does Not Drop Call After Message is Completed	TSC 11
32. Low Tape Flasher Does Not Function	TSC 11
33. Receiver Does Not Turn on Reverse Channel	TSC 11
34. Transmitter Does Not Detect Reverse Channel	TSC 11

TABLE B
TROUBLE ISOLATION PROCEDURES

SYMPTOM OR TEST REQUIRED	TROUBLE ISOLATION PROCEDURE																												
Sender Alarmed after Repetitive Tape Re-Runs	<p>The most common indication of system malfunction is a repetition of tape reruns followed by alarming of the sender terminal. If this condition persists, the following procedure should be followed to determine the cause of the problem.</p> <p>With both terminals in the EDC mode of operation and with a pattern test tape in the reader (preferably test tape TP303099), attempt to transmit from a Sender to a Receiver, making sure that all level selectors are set to the same level. If the tape reruns and alarming of the Sender continues, alarm the Sender, place the Receiver in the NON-EDC mode, and punch an all spacing leader in the punch.</p> <p>De-alarm the Sender and allow the Receiver to punch at least five to ten feet of product tape. Inspect the Receiver tape and compare it with the Sender message tape.</p>																												
Garbled or Random Punching	<p>1. If the product tape from above procedure does not conform to the message tape and appears as garbled or random punching, the problem can probably be traced to one of the areas below:</p> <p>a. Receiver Distributor Module Check and adjust if necessary the LC-OSCILLATOR (ZD107) for an output of 2100 Hz at 1050 wpm and 2400 Hz at 1200 wpm.</p> <p>b. Receiver Control Module Check and adjust if necessary the Recycle Timer (ZB415) for an output of 45 to 50 ms.</p> <p>Check Clock Generator Circuit for defective cards:</p> <p style="text-align: center;">ZB416 ZB118 ZB208</p>																												
Missing or Added Bits	<p>2. If the Receiver product tape does not conform to the Sender message tape because of missing or extra bits, look for the problem in the reader contact area, (check code contacts). Run a Reader Test on the Transmitter and if the test indicates improper operation, refer to the Reader Test Troubleshooting Chart (included with the troubleshooting section on the high speed reader (DX type).</p>																												
Fixed Character Comparisons	<p>Inspect the product tape and compare the fixed characters. These characters must conform to the following listing:</p> <table style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>1.</td> <td>SR</td> <td>1567</td> <td>Marking</td> </tr> <tr> <td>2.</td> <td>BN1</td> <td>1368</td> <td>Marking</td> </tr> <tr> <td></td> <td>BN2</td> <td>2457</td> <td>Marking</td> </tr> <tr> <td></td> <td>BN3</td> <td>1278</td> <td>Marking</td> </tr> <tr> <td>3.</td> <td>EOB</td> <td>2345678</td> <td>Marking</td> </tr> <tr> <td>4.</td> <td>CK1</td> <td>All</td> <td>Marking</td> </tr> <tr> <td>5.</td> <td>CK2</td> <td>All</td> <td>Marking</td> </tr> </tbody> </table> <p>Note: Characters CK1 and CK2 are all marking only with a repetitive pattern tape such as TP303099.</p>	1.	SR	1567	Marking	2.	BN1	1368	Marking		BN2	2457	Marking		BN3	1278	Marking	3.	EOB	2345678	Marking	4.	CK1	All	Marking	5.	CK2	All	Marking
1.	SR	1567	Marking																										
2.	BN1	1368	Marking																										
	BN2	2457	Marking																										
	BN3	1278	Marking																										
3.	EOB	2345678	Marking																										
4.	CK1	All	Marking																										
5.	CK2	All	Marking																										

TABLE B
TROUBLE ISOLATION PROCEDURES (continued)

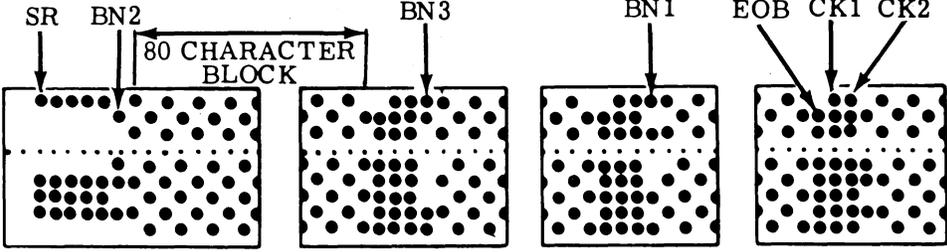
SYMPTOM OR TEST REQUIRED	TROUBLE ISOLATION PROCEDURE
Fixed Character Comparisons - continued	 <p>3. If any of the above characters do not conform, check the following areas in the Transmitter Control Module:</p> <ol style="list-style-type: none"> 1) SR - ZA105, ZA205, and timing of ZA418 (40 ms). 2) BNs - ZA104, ZA105, ZA205 and proper contact closure of block counter on reader. 3) CKs - ZA106, ZA107, ZA206 4) If the Receiver product tape does conform to the Sender message tape, count the number of characters in the first block (the characters between the BN and EOB characters). If the number of characters falls short of 80 (usually 78 or 79), this indicates that the EOB contact on the reader is maladjusted. Refer to the reader (DX type) adjustment section. <p>An alternative and easier way to check for a short first block is to use a test tape composed of alternate letters and all space characters (Test Tape TP148554). If a block of 79 characters is transmitted during the first block, the check characters (CK1 and CK2) will be punched all space instead of letters.</p>
Short First Block	<p>If the product tape conforms to the message tape and all other requirements are met, run a Punch Test on the Receiver. To accomplish this, alarm the Sender, set the receiver control PUNCH TEST switch to TEST. De-alarm the Sender and allow the punch to continue punching. If the alarm on the Receiver is not set, the Receiver photoelectric verifier functions well; rocking the punch gently should not alarm the terminal.</p> <p>If the alarm is set at any time while punching, the photoelectric verifier circuit may need a readjustment.</p> <p><u>Note:</u> To rerun PUNCH TEST after an ALARM, ALARM the Sender Terminal, switch the PUNCH TEST switch to NORM, de-alarm the Receiver, place PUNCH TEST switch to PUNCH TEST and then de-alarm the Sender. PUNCH TEST will only work when all LEVEL SELECTOR switches are positioned for 8-level operation.</p> <p>Refer to the Receiver and punch (DRPE type) adjustment sections for the proper requirements and procedures. Refer to the punch Test Trouble Charts 4, 6 and 9. (All level switches must be in 8-level position for punch test.)</p>
Punch Test	

TABLE B

TROUBLE ISOLATION PROCEDURES (continued)

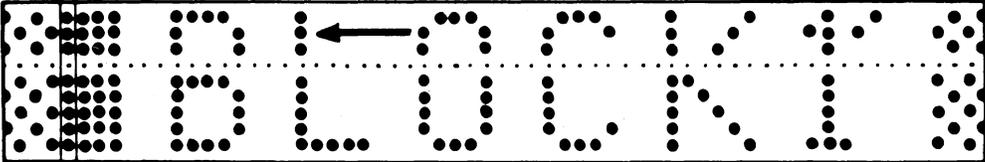
SYMPTOM OR TEST REQUIRED	TROUBLE ISOLATION PROCEDURE									
<p>Reader Verify Contact Test</p>	<p>If the Punch Test indicates good receiver photoelectric verifier adjustments, the next step is to determine if the reader verify contacts are working properly. To check them, test tape TP303069 should be used as this tape will generate eleven different check characters. To use this tape properly, place the sender control assembly in AUX. MOTOR on and insert the tape into the reader as indicated by the arrow in the tape. Insert the tape with the character marked below on the code contacts.</p> 									
<p>Reader Test</p>	<p>Notice that the starting block is one prime (two marks above the numeric one).</p> <p>The Receiver LEVEL SELECTOR switch should be left in the 8-level position and the Sender in the desired level (Sender in EDC and Receiver in NON-EDC modes).</p> <p>The check characters obtained should be as given in the check character chart. The numbers quoted are mark holes (Table F).</p> <p>If the check characters do not conform to those in the chart, run a Reader Test on the Sender.</p> <ol style="list-style-type: none"> 1. If Reader Test indicates improper operation, refer to the reader troubleshooting chart given in the section for the high speed reader (DX type) to determine if the verify contacts are bad. 2. If contacts are good, check the following cards in Transmitter Distributor Module: <table data-bbox="706 1501 1234 1585" style="margin-left: auto; margin-right: auto;"> <tr> <td>ZA215</td> <td>ZA117</td> <td>ZA120</td> </tr> <tr> <td>ZA216</td> <td>ZA118</td> <td>ZA121</td> </tr> <tr> <td>ZA116</td> <td>ZA119</td> <td></td> </tr> </table> <p style="text-align: center;">and the Spiral Register ZA217, ZA218, ZA219</p>	ZA215	ZA117	ZA120	ZA216	ZA118	ZA121	ZA116	ZA119	
ZA215	ZA117	ZA120								
ZA216	ZA118	ZA121								
ZA116	ZA119									
<p>Tape Requirements</p>	<p>If the check characters conform to those in the chart, inspect the type of tape that the reader has to read, ie, typical message tape that the Sender operator transmits. The reader used in the Sender is not particularly sensitive to a type of tape; however, the tape used must conform to the following requirements:</p> <ol style="list-style-type: none"> 1. Tape must be nonmetallic and must conform to recognized Standard USAIX 3.18.1967 or equivalent. 									

TABLE B

TROUBLE ISOLATION PROCEDURES (continued)

SYMPTOM OR TEST REQUIRED	TROUBLE ISOLATION PROCEDURE
Tape Requirements - continued	<p>2. The ten-to-the-inch requirement (specified in the punch (DRPE type) adjustment section) must not vary more than ± 0.025 inch over five inches, ± 0.010 inch over any one inch and ± 0.003 inch between any two adjacent perforations. If the tape is prepared on a perforator which punches erratically with uneven spacing, the reader may not be able to read it correctly.</p> <p>3. There must be no wavering of characters in the product tape. It is important that the characters be placed directly, and in line, over the contacts.</p> <p>If the reader cannot read the tape properly in the area of a splice, make certain that the splice meets the following requirements:</p> <ol style="list-style-type: none"> 1. The splice must be a butt-edge with no overlap. 2. The splice must be a single one with overall thickness not to exceed 0.0075 inch maximum at the splice. 3. The splice should preferably be at top of tape (away from contacts). If necessary, a temporary splice (for less than one hour tests) may be made with a TP317212 tape splicer and the appropriate patches indicated in Figure 7. <p>The tape guides on the reader must be set to the width of the tape to be read, to prevent the tape from entering the reader at an improper angle.</p> <p>If the above outlined steps have been followed and the problem still exists, go back and recheck the tests outlined, specifically the Reader Test and Photoelectric Verifier Adjustments. Exercise diligence in this recheck to guarantee that these areas perform their functions properly.</p> <p>If the problem still persists, the trouble may be located through reference to the description, operating procedure and principles of operation sections and the related timing diagrams. Refer also to the listing of troubles given in Table A.</p>

CHART 1 - POWER FAILURE - SENDER

ZG2 - (7402WD) Station Control

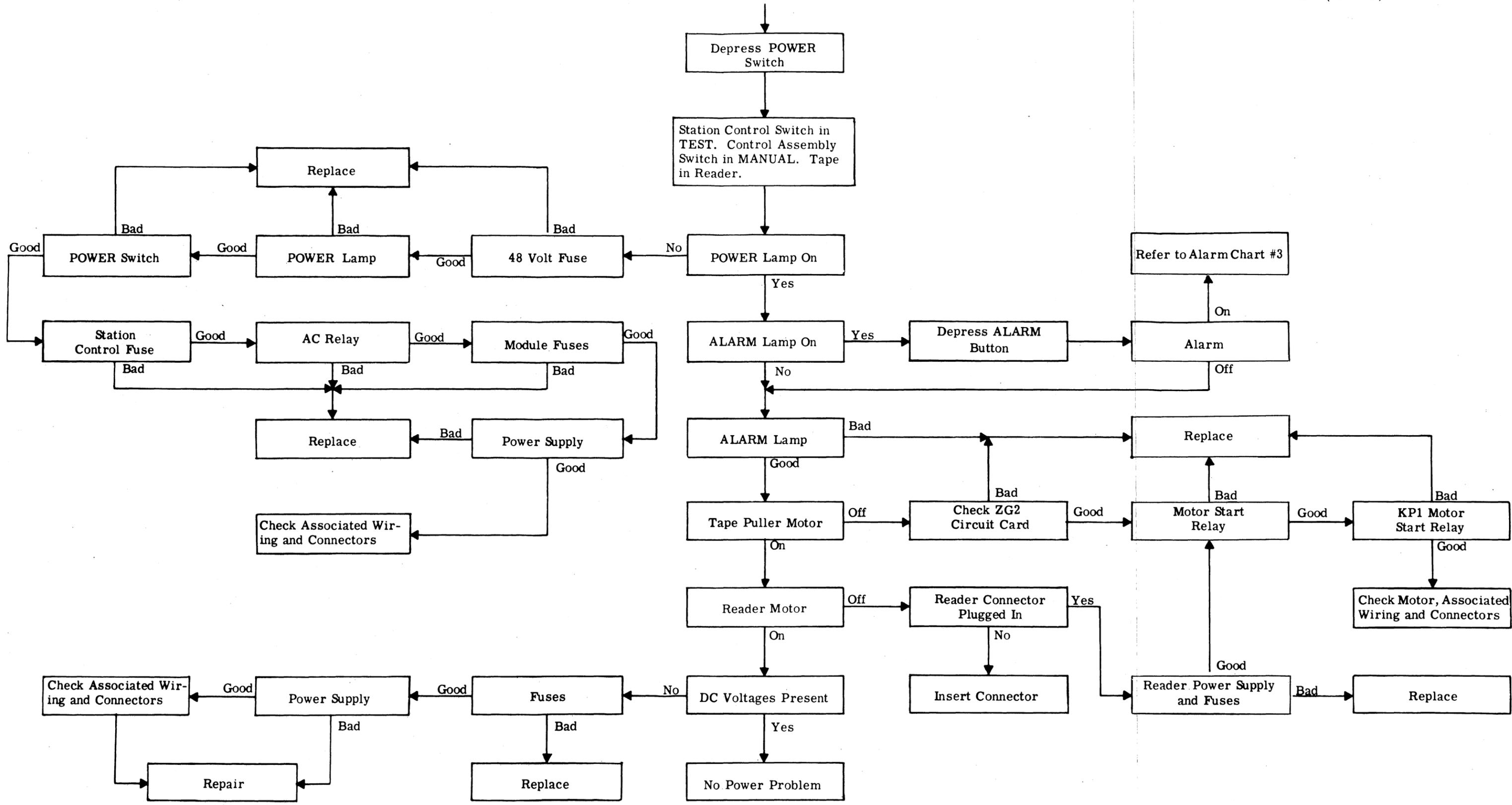


CHART 2 - POWER FAILURE - RECEIVER

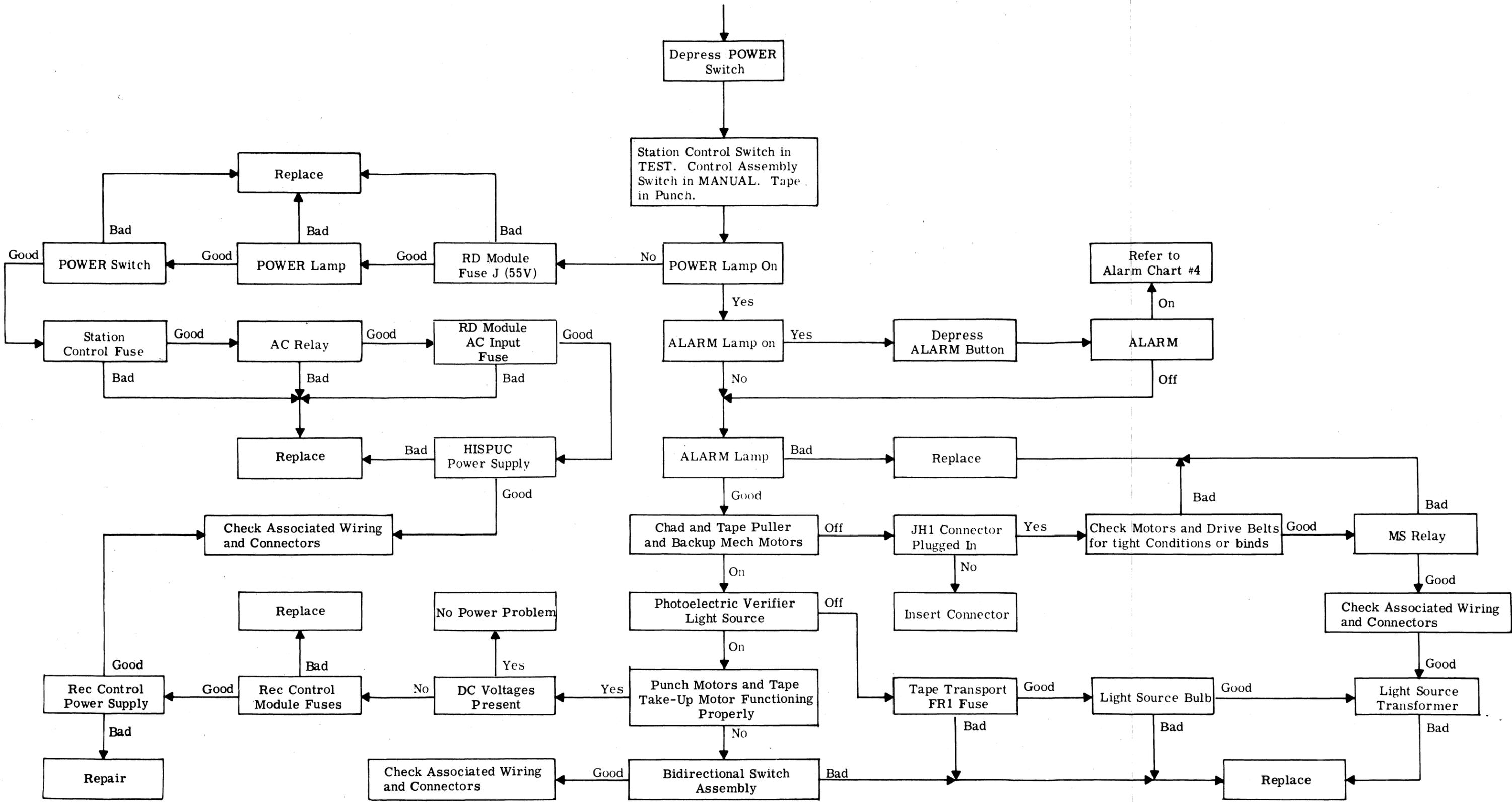


CHART 3 - ALARM - SENDER

ZA108 - (7056WD) Transmitter Control
 ZC212 - (7410WD) Transmitter Distributor
 ZG2 - (7402WD) Station Control

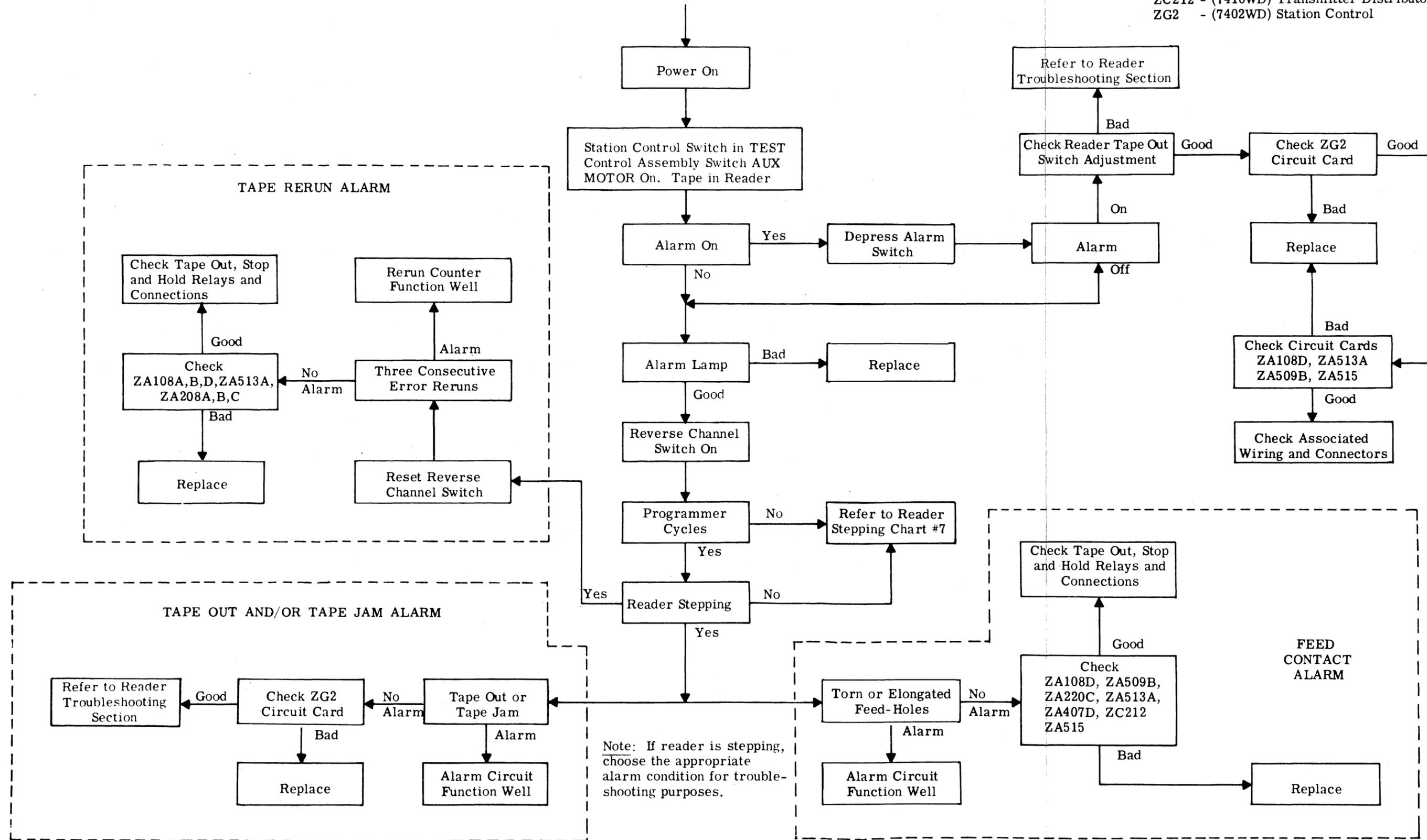


CHART 4 - ALARM - RECEIVER
ZB118 - (7063WD) Receiver Control

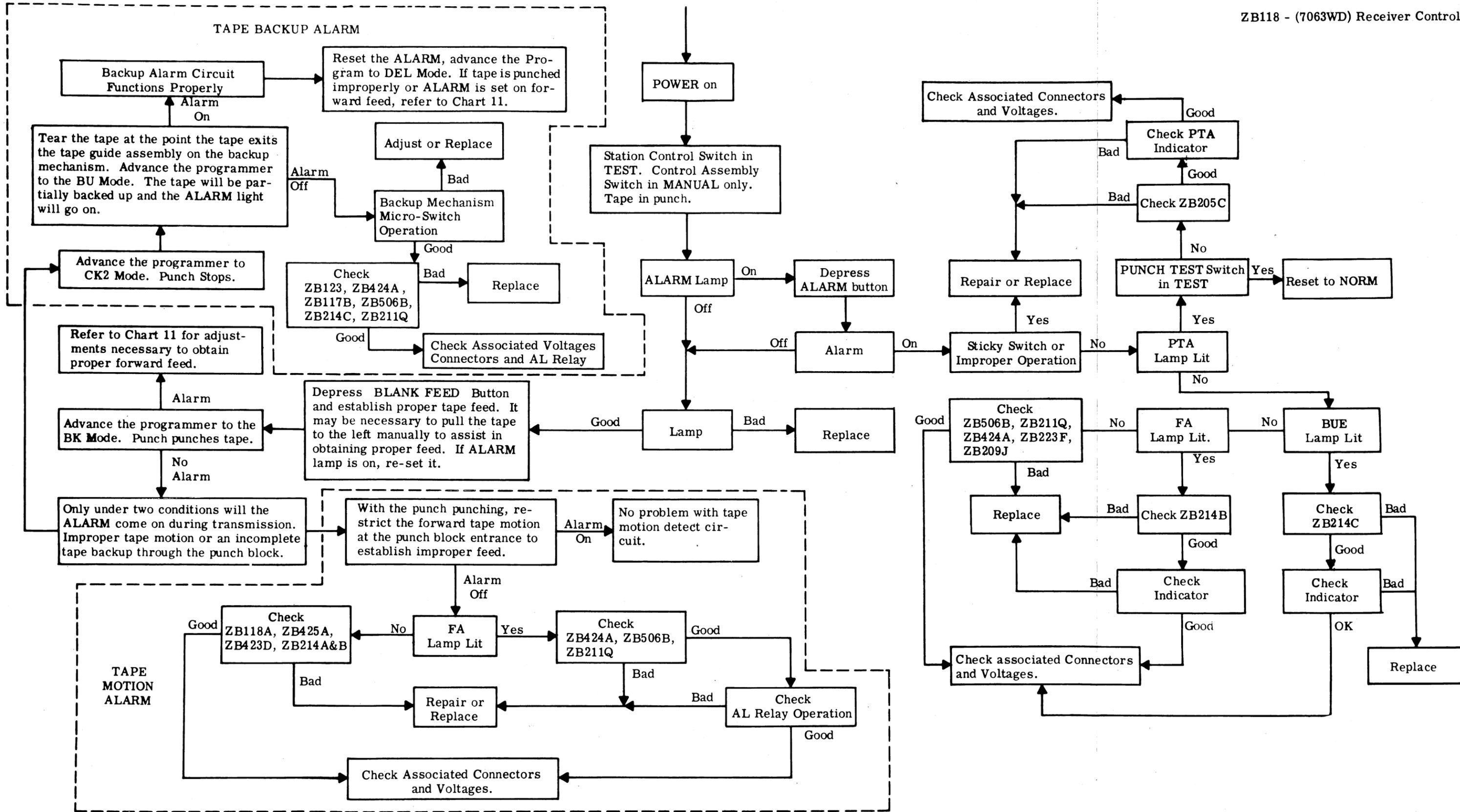


CHART 5 - MANUAL PROGRAM ADVANCE - SENDER

ZA411 - (7056WD) Transmitter Control

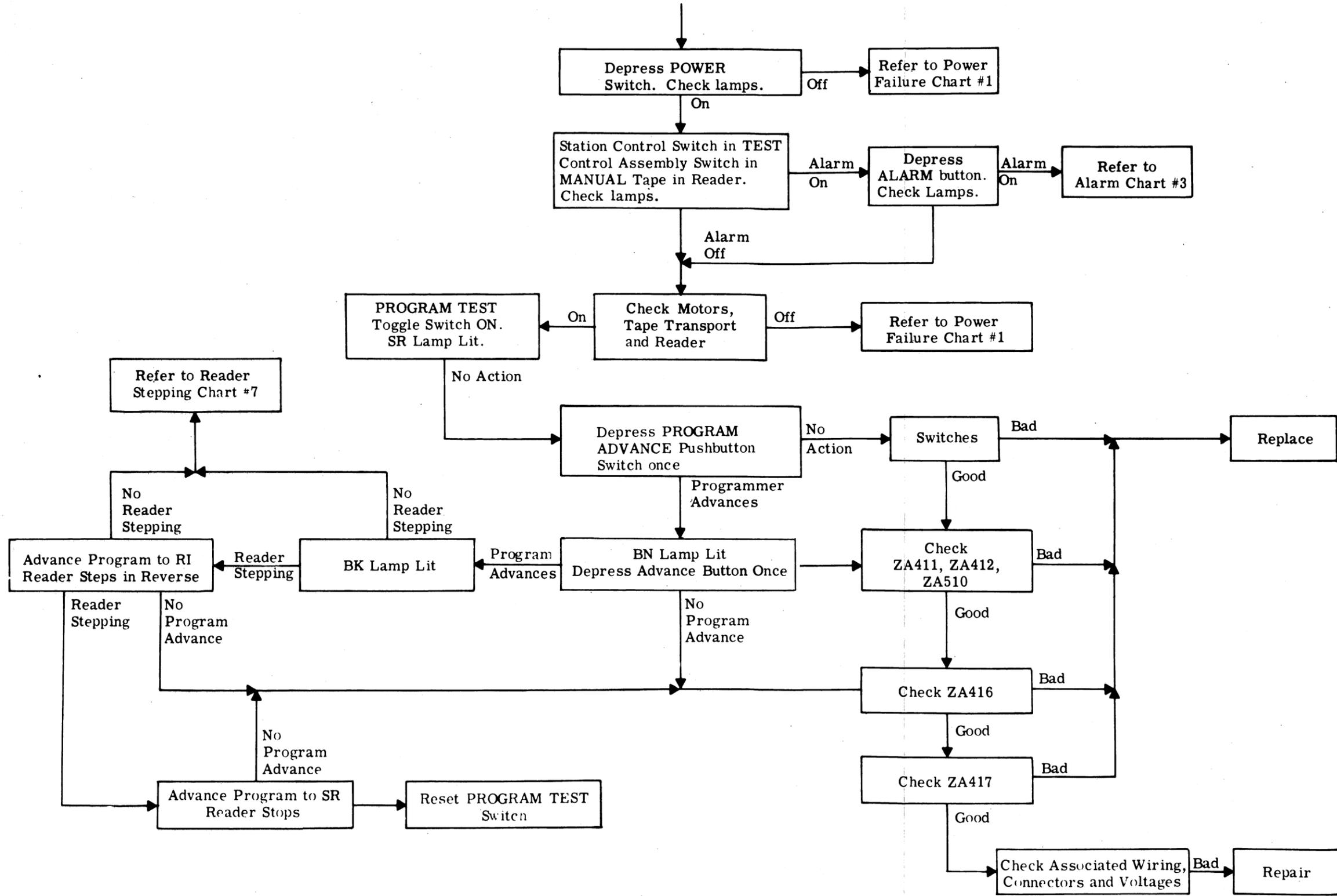
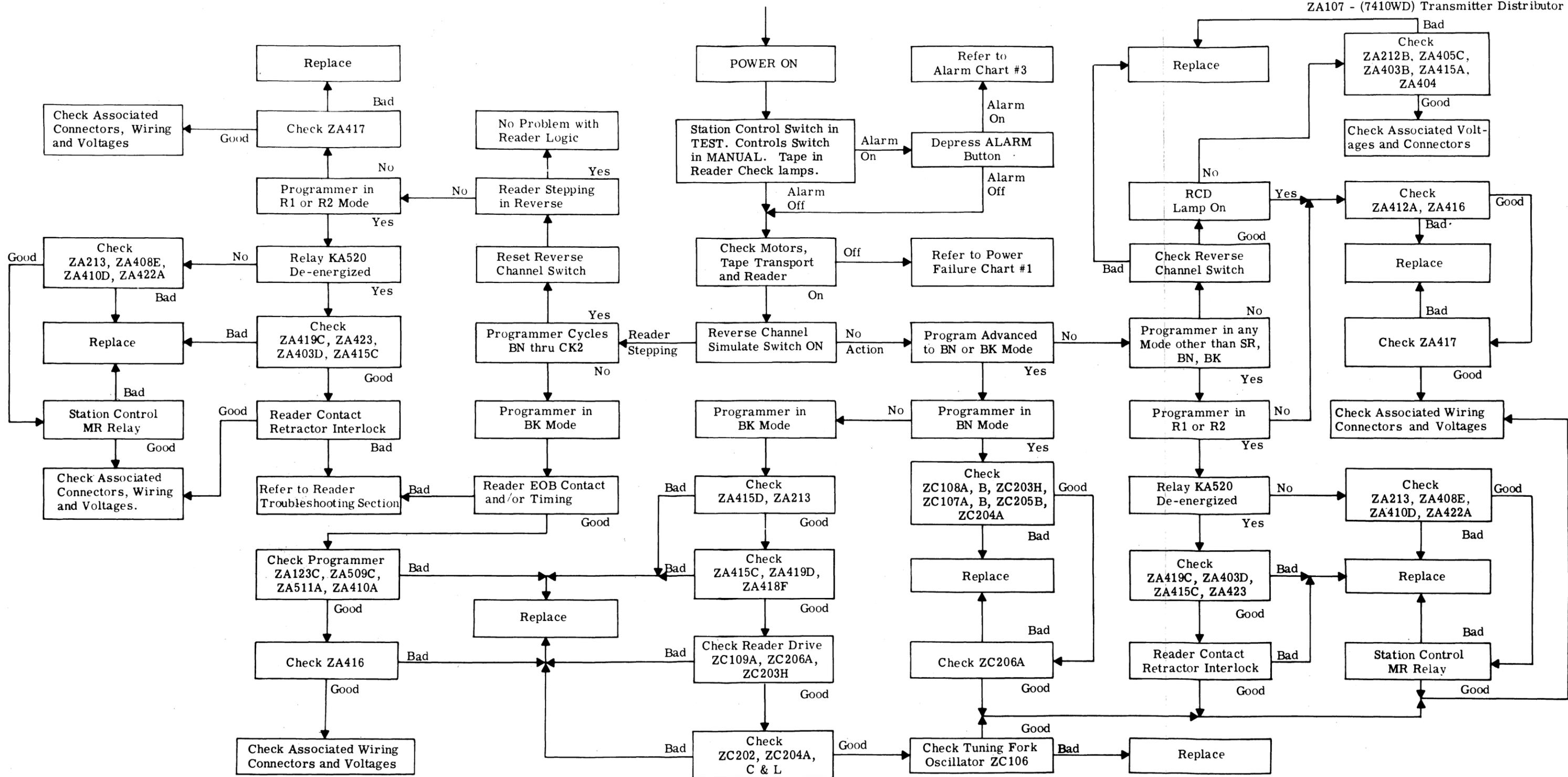


CHART 7 - READER STEPPING - SENDER

ZA415 - (7056WD) Transmitter Control
 ZA107 - (7410WD) Transmitter Distributor



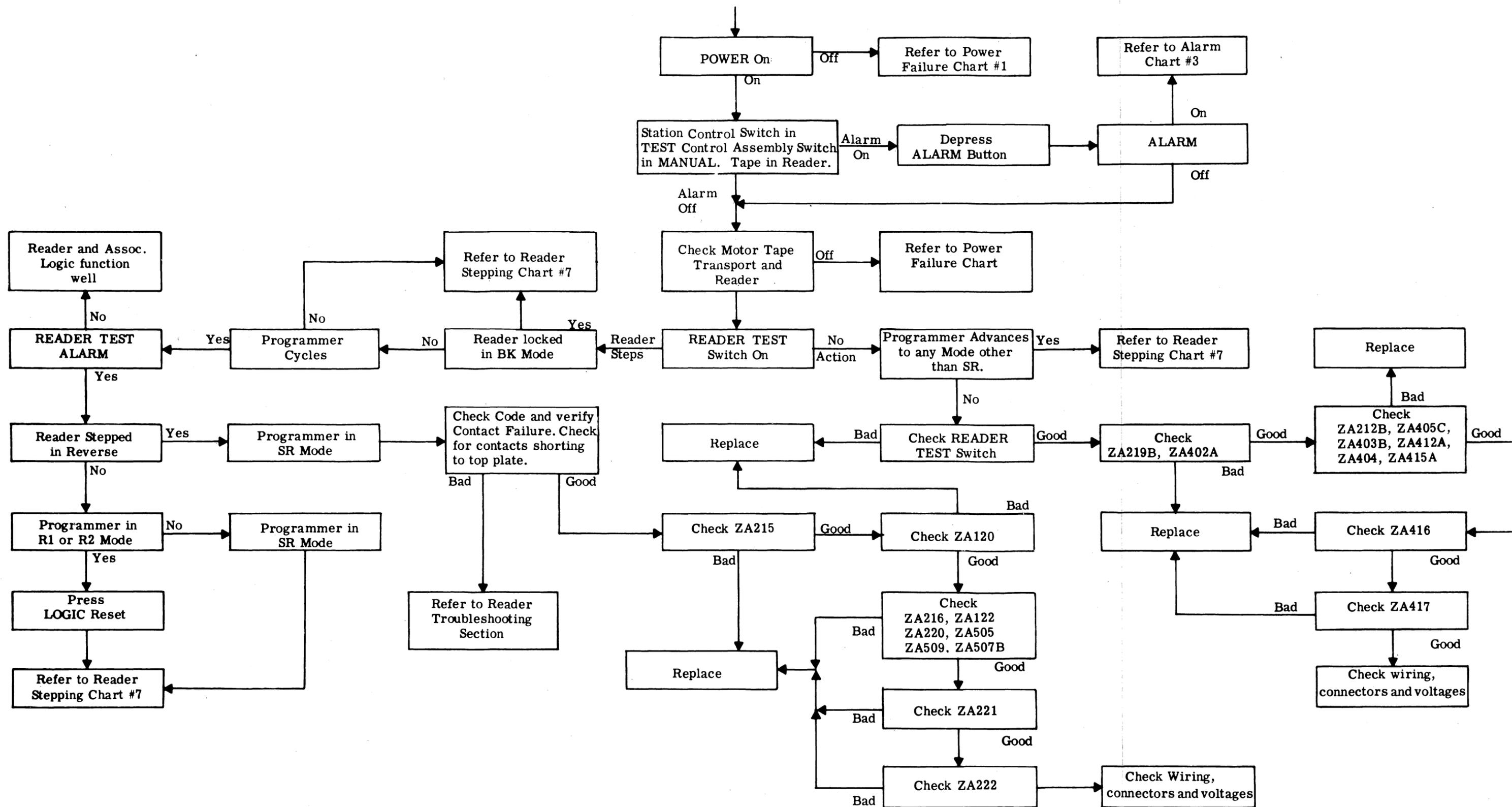


CHART 9 - PUNCH TEST ALARM (PTA) - RECEIVER

ZB512 - (7063WD) Receiver Control

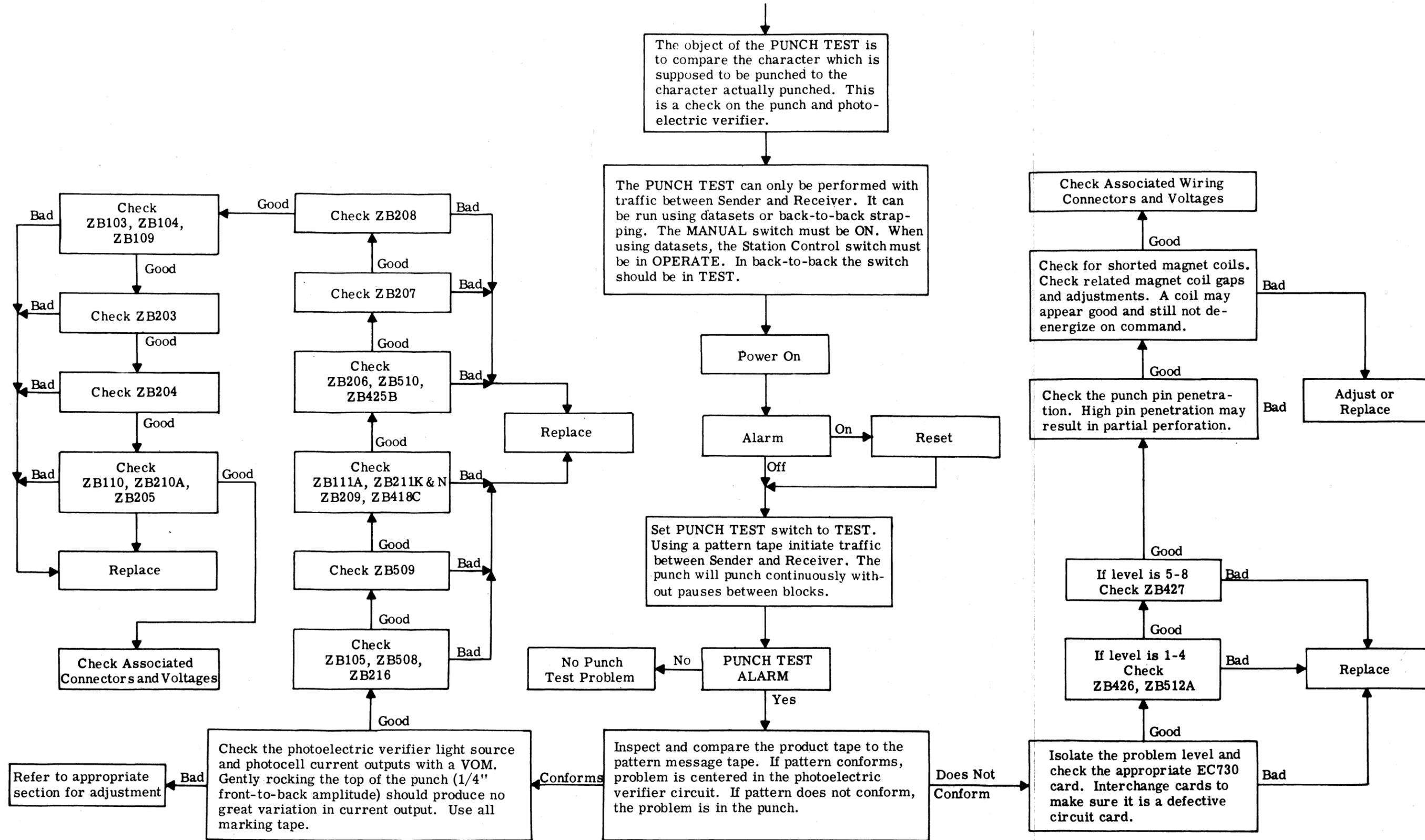
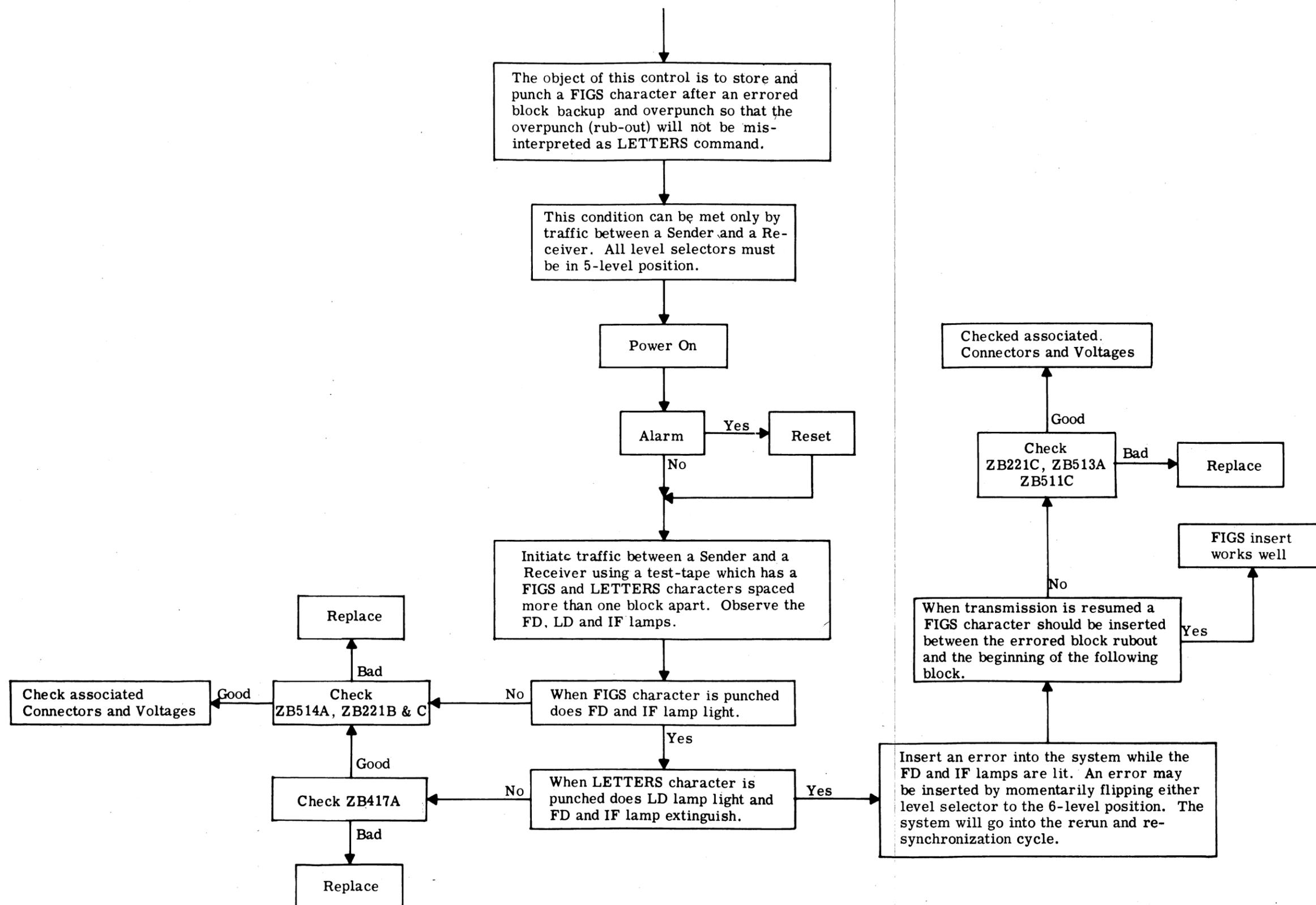


CHART 10 - FIGURES INSERT (5-LEVEL TAPE) - RECEIVER

ZB221 - (7063WD) Receiver Control



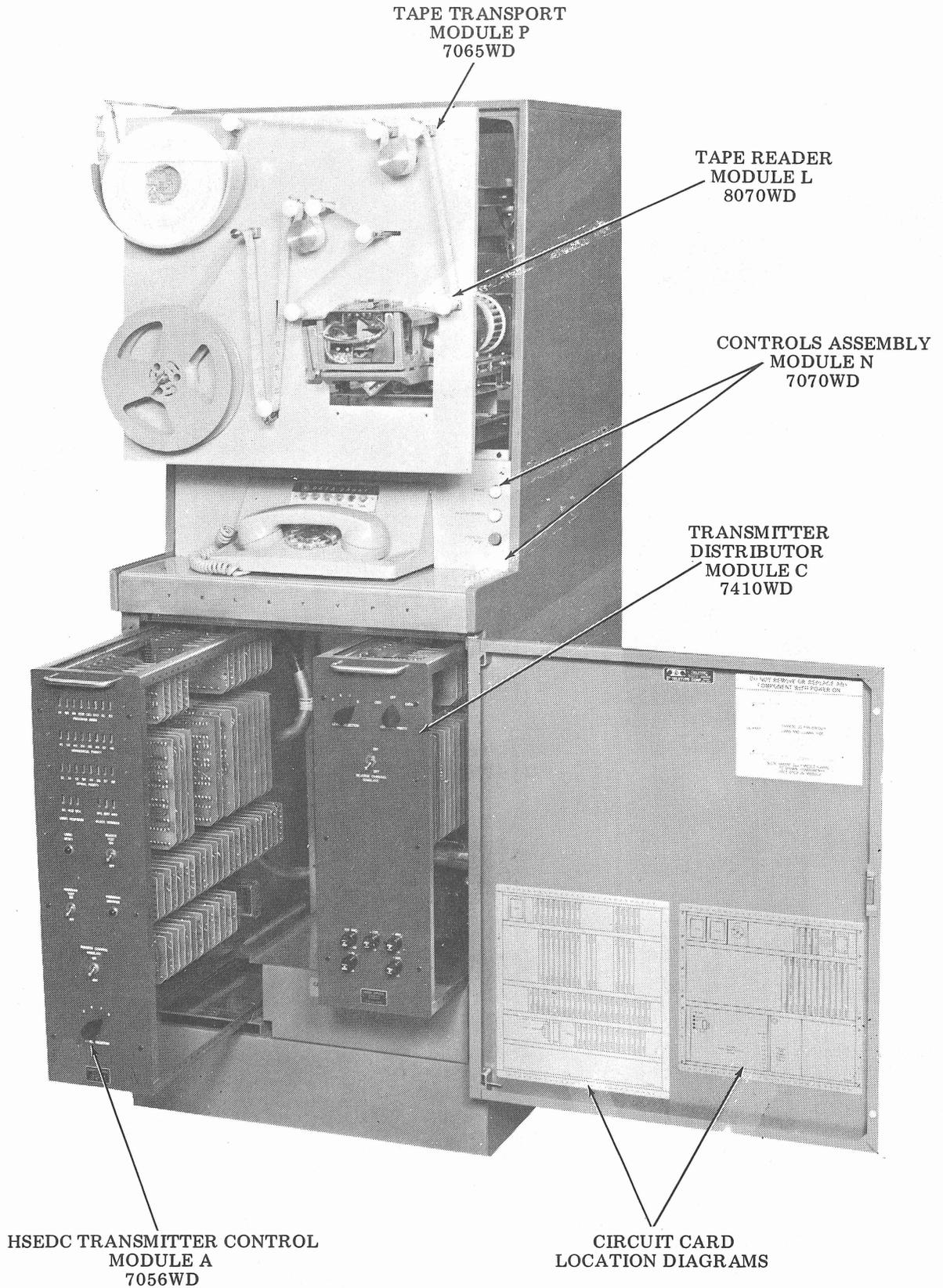


Figure 2 - Tape Sender 4A

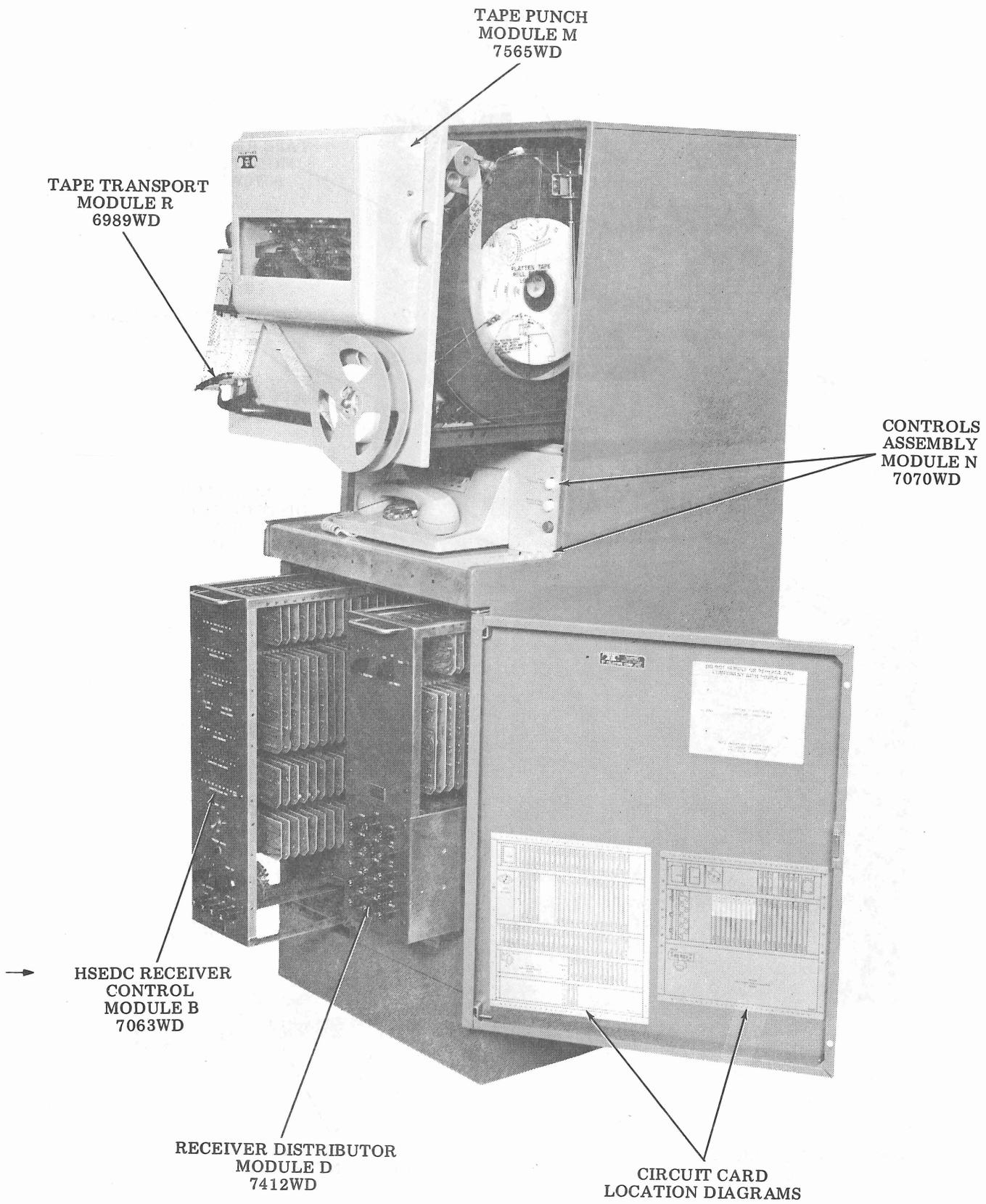


Figure 3 - Tape Receiver 4B

3.06 Chart 11 closely follows the Receiver CHECK OUT PROCEDURE (592-812-200) and gives actions to be performed to correct a trouble.

3.08 Use Table C for locating cards in their WD location.

CAUTION: TAKE SPECIAL CARE WHEN WORKING WITH OR NEAR CURRENT CARRYING (LIVE) CIRCUITS AND ASSOCIATED CAPACITORS. DISCONNECT EQUIPMENT FROM POWER SOURCE WHENEVER POSSIBLE.

3.07 Chart 11 can be used with Tables A and B, Charts 2, 4, 6, 9 and 10.

CHART 11

RECEIVER - TROUBLE ANALYSIS

NO.	TROUBLE	RECOMMENDED ACTION
1	POWER lamp does not light, with POWER switch depressed.	a. Check set connected to ac source. b. Replace, if defective, lamp (TP193179). c. Replace, if defective, J fuse in D module (1/2 amp TP171593). d. Replace, if defective, FH1 fuse in station control assembly (10 amp TP151418). Note: If -12v fuse blows at turn-on, check or add TP337812 Time Delay Modification Kit at XZ115.
2	Station control assembly KHAC relay not energized with POWER switch ON.	a. Remove relay. With VOM, read 1800 ohms across coil pins 2 and 7. If coil shows open, replace relay (TP310108). b. Remove PH3 plug. With VOM across pins 17 and 19, meter should indicate continuity when POWER switch is ON.
3	Fan(s) fail.	a. Check fan(s) connection to ac blower receptacle. b. Replace, if defective, fan cord fuse (1/2 amp TP171593). c. With VOM, read 240 ohms across each fan winding or 120 ohms parallel across both windings. Replace fan(s) (TP193942) indicating open winding.
4	AUX. MOTOR START lamp does not light.	a. Replace, if defective, lamp (TP199549). b. Check for broken wires or nonfunctioning switch contacts.
5	Punch and Tape Handling motors fail.	a. Check that JH1 connector is firmly seated in its receptacle. b. Check for loose or broken wires.

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
6	Motor start KHMS relay not energized with AUX. MOTOR START button depressed.	a. Remove relay coil. With VOM, read 1800 ohms across pins 2 and 10. If coil shows open, replace relay (TP308455). b. With VOM across pin 2 (in relay socket) and frame ground, meter indicates continuity when AUX. MOTOR START button is depressed. If meter indicates open, check circuit for broken wires, loose connector pins, or bad SWN3 contacts.
7	Photoverifier lamp does not light.	a. Replace, if defective, lamp (TP302901). b. Replace, if defective, FR1 fuse (lamp TP143306). c. Check TR1 transformer voltage input and output; if defective, replace transformer (TP300356).
8	MANUAL lamp and/or NON-EDC lamp do not light.	a. Replace, if defective (TP165678). b. Check for broken wires or nonfunctioning switch contacts.
9	EDC module RC indicator fails to conduct.	a. With NON-EDC button depressed, its no. 5 and 6 contacts should close; if necessary, bend contact wire. b. Replace, if defective, ZB503 card with TP177503 card. c. Replace, if defective, RC indicator.
10	NON-EDC lamp does not go OFF.	a. With NON-EDC button released, its no. 1 and 4 contacts should be open; if necessary, bend contact wire. b. Check for grounded or shorted no. 1 contact.
11	EDC module RC indicator does not go OFF.	a. Replace, if defective, ZB213 card with TP303671 card. b. Check for grounded or shorted no. 6 contact. c. Replace, if defective, RC triode.
12	Tape cannot be passed through punch block.	Note: Check freedom of tape motion through punch block and tape guide by pulling the tape at the punch block entrance to the right. Tape should snap to the left when released. a. Remove punch block paper jam, if present. Use TP149836 tool.

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
12 (cont)		b. Check Tape Guide Alignment Adjustment. c. Check Punch Pin Penetration Adjustment. d. Check trouble no. 13.
13	Punch pin coil(s) fail.	a. Check for punch pin penetration, use TP308375 gauge. This will check feed plus all levels. High pin penetration may result in partial perforation. Low pin penetration may result in drag on tape or lack of feed motion timing. b. Replace, if defective, fuse of the failing level. <u>Note 1:</u> If 25 amp fuse is blown at F15, replace with a 30 amp fuse (TP338011). c. Replace, if defective, TP303730 punch driver card of failing level. d. Connect the wires from a functioning coil to coil of the failing level. Turn power on. Replace coil if it is not energized. <u>Note 2:</u> After removing defective coil and before installing new coil, check Armature (Reed) Clearance, and Bumper (Silencing) Adjustments. e. After installation, perform Punch Pin Penetration Adjustment.
14	Tape does not advance.	Depress LETTERS FEED button and pull tape to the left to establish acceptable feed. Observe tape motion. If no tape motion, check -55v fuses (1.5 amp), then see trouble no. 15.
15	No feed pin motion.	a. If no tape motion, isolate the problem level by using the following procedure. Strap pin 28 of EC675 (ZD211) to pin 13 of the level to be tested (EC730). By depressing BLANK FEED button, the feed and the selected level to be tested are punched. At the same time, observe waveform on pin 32 of the same EC730 card, representing the level under test. Refer to Figure 4 for typical waveforms.

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
15 (cont)		<p>b. If no waveform is present, check the following:</p> <ol style="list-style-type: none"> 1. Associated -55v, -12v, -6v, +6v fuses 2. Defective (EC730 or EC675) card 3. Defective magnet coils and/or associated wiring. If coil is replaced, refer to note 2 in trouble no. 13. <p>c. When waveform is present, but does not conform to Figure 4, check the magnet core air gap (0.027 inch) and the bumper clearance (0.006 to 0.010 inch) and for maximum reed to magnet core face of 0.002 inch when reed is energized. Refer to punch (DRPE type) adjustment section.</p>
16	Drive spring overwound.	Replace spring, if defective. Check Ratchet Wheel Drive Spring Adjustment.
17	Improper ratchet and pawl engagement.	Check Ratchet and Feed Pawl Engagement Adjustment.
18	Improperly spaced or burred tape.	<p>a. Place test tape (all space) into the reader and establish transmission between sender and receiver in the NON-EDC mode. Check for 10-to-inch spacing (long and short), burring and elongated feedholes and associated adjustments, particularly forward feed wheel clearance (0.004 to 0.006 inch) and yield spring tension in adjustment section on punch (DRPE type).</p> <p>b. If acceptable, use letters test tape and repeat above procedure. Check the bias spring at entrance to punch block for edge burring or wavering in the alignment of perforations with respect to edge of tape.</p> <p>c. Use message tape and transmit in the EDC mode. Check for proper product tape. Notice that between blocks, the product tape will show slight short and long spacing. This is a normal condition.</p>
19	Forward feed wheel not engaging tape.	Check Forward Feed Wheel and Vertical Feed Wheel Adjustments.

CHART 11

RECEIVER - TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
20	Reverse feed wheel teeth extend above tape guide.	<ul style="list-style-type: none"> a. Check Reverse Feed Wheel Adjustment. b. If teeth still protrude above tape guide, refer to section covering other punch (DRPE type) adjustments.
21	Tape perforation improperly aligned.	Check the forward feed wheel line up by perforating a length of tape and examining it for burrs. Fold the tape with edges and first level holes in line. The eighth level hole should overlap. Gauge by eye. If alignment is off, refer to punch (DRPE type) adjustment section.
22	No overpunching of backed-up tape.	<ul style="list-style-type: none"> a. This is a condition caused by backing the tape through the punch block less than 80 characters (usually 79). When this occurs, the ALARM lamp and BUE lamp are lit to indicate an improper backup. b. Three areas are the primary causes of this condition: <ul style="list-style-type: none"> 1. The drive cam assembly positions the tape guide assembly over the reverse feed wheel after the intermediate shaft begins to rotate, causing the "loss" of a number of characters backed-up. Refer to punch (DRPE type) adjustment section for procedure. 2. The intermediate clutch spring is disengaged too soon causing the intermediate shaft assembly and the reverse feed wheel to incomplete their cycle. This is indicated by the detent roller not seating properly in the detent disc. An incomplete cycle will not back the tape a full 80 characters. Refer to punch (DRPE type) adjustment section for procedure. 3. The improper operation of the backup switch, which indicates a backup cycle, is the third potential area. Refer to punch (DRPE type) adjustment section.
23	Excessive burring or elongating of feed holes on backup of tape.	<ul style="list-style-type: none"> a. This condition is caused by improper reverse feed positioning and/or phasing.

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
23 (cont)		<p>b. If the tape guide above the reverse feed wheel is positioned too high, the teeth of the feed wheel will not enter fully into the feedholes and cause burring and elongating. Refer to punch (DRPE type) adjustment section.</p> <p>c. If the reverse feed wheel is out of phase, the reverse feed wheel teeth are not aligned with the feed holes and drag across the webs between feed holes, potentially tearing and burring feed holes. Refer to punch (DRPE type) adjustment section.</p>
24	<p>Improper overpunching of the first few characters after a backup.</p> <p>Feed alarm and incompleteness of errored block deletion.</p>	<p>a. This occurs when the tape is backed-up 79-1/2 or 80-1/2 characters. The punch will overpunch the product tape across the webs and cause feed error and/or tape jam. After overpunching the first few characters improperly, tape motion will stop and the rest of the errored block will not be overpunched.</p> <p>b. Cause of this problem is an out of phase reverse feed wheel. Refer to punch (DRPE type) adjustment section.</p>
25	<p>Excessive elongated code holes on overpunch.</p>	<p>a. This condition may be caused by an improper delete clock. Check gated oscillator EC546 (ZB416) for pulses spaced as follows:</p> <ol style="list-style-type: none"> 1. 9.52 ms @ 1050 Hz 2. 8.33 ms @ 1200 Hz <p>b. Adjust if necessary.</p> <p>c. If delete clock is proper, refer to trouble nos. 23 and 52 of this chart to make sure forward tape punching is acceptable. Improper punching and tape motion in the forward direction may cause improper overpunching after a tape backup.</p> <p><u>Note:</u> A slight overpunching of the code levels is normal. This is indicated by crescent shaped chad of 0.005 inch width.</p>

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION															
26	Intermittent violent rocking of the punch assembly.	This condition is caused by partial engagement or grabbing of the clutch spring, causing the entire backup mechanism and punch to rock violently forward, intermittently. Primary cause of this condition is a tight clutch spring. Refer to punch (DRPE type) adjustment section.															
27	Tape alarm will not reset.	Check that KHHO, KHST, and KHAL relays are energized.															
28	All indicators remain ON.	Replace, if defective, fuse located at bottom of EDC module A (4 amp TP148466).															
29	All indicators remain OFF.	Replace, if defective, fuse located at bottom of EDC module A (1/2 amp TP117176) and check indicator assembly circuit wiring.															
30	One indicator remains ON.	<p>a. Remove card associated with ON indicator (listed below).</p> <table data-bbox="868 955 1502 1102"> <thead> <tr> <th>Indicator</th> <th>Remove Card</th> <th>Replace With Card</th> </tr> </thead> <tbody> <tr> <td>BUE</td> <td>ZB214C</td> <td>TP303671</td> </tr> <tr> <td>FE</td> <td>ZB214A</td> <td>TP303671</td> </tr> <tr> <td>FA</td> <td>ZB214B</td> <td>TP303671</td> </tr> <tr> <td>PTA</td> <td>ZB205C</td> <td>TP303671</td> </tr> </tbody> </table> <p>b. Replace indicator if it remains on. If indicator goes OFF, replace indicator assembly.</p>	Indicator	Remove Card	Replace With Card	BUE	ZB214C	TP303671	FE	ZB214A	TP303671	FA	ZB214B	TP303671	PTA	ZB205C	TP303671
Indicator	Remove Card	Replace With Card															
BUE	ZB214C	TP303671															
FE	ZB214A	TP303671															
FA	ZB214B	TP303671															
PTA	ZB205C	TP303671															
31	BUE, FE, FA, and PTA alarms OUT.	<p><u>Note:</u> Remove electrical power while replacing cards. Replace circuit cards listed below, one at a time, until KHAL relay becomes de-energized. Reinstall removed good cards.</p> <table data-bbox="885 1375 1404 1522"> <thead> <tr> <th>Remove Card</th> <th>Replace With Card</th> </tr> </thead> <tbody> <tr> <td>ZB506B</td> <td>TP177581</td> </tr> <tr> <td>ZB211</td> <td>TP303606</td> </tr> <tr> <td>ZB223E</td> <td>TP303606</td> </tr> <tr> <td>ZB424</td> <td>TP177504</td> </tr> </tbody> </table> <p>Check for defective circuit wiring.</p>	Remove Card	Replace With Card	ZB506B	TP177581	ZB211	TP303606	ZB223E	TP303606	ZB424	TP177504					
Remove Card	Replace With Card																
ZB506B	TP177581																
ZB211	TP303606																
ZB223E	TP303606																
ZB424	TP177504																
32	KHHO and KHST relays remain energized.	<p>a. Check that all alarm conditions above have been eliminated.</p> <p>b. Check that relay wires are not crossed.</p> <p>c. Remove energized relays cover to insure relay is free of mechanical binds.</p>															

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION																
33	Red alarm indicator remains ON.	a. Check that KHST 1M and/or KHHO 12M relay wires do not touch adjacent center wires. b. Check associated wires and connector for improper ground.																
34	Motor and verifier lamps do not light; station control switch in TEST position.	a. Strap KHDSR 1L terminal to frame ground. If KSDSR relay is not energized, check relay operating wiring path. b. With VOM, read 2450 ohms across pins 1L and 2L. Replace AK-4 coil if defective.																
35	Programmer does not advance to BN mode.	a. Check switch for defect or loose wires. b. Check for defective card by replacing the following circuit cards, one at a time. Depress PROGRAM ADVANCE button after each replacement. Reinstall removed good cards. <table data-bbox="787 1014 1315 1249" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;">Remove Card</th> <th style="text-align: left;">Replace With Card</th> </tr> </thead> <tbody> <tr> <td>ZB507</td> <td>TP172441</td> </tr> <tr> <td>ZB504</td> <td>TP177589</td> </tr> <tr> <td>ZB403</td> <td>TP172353</td> </tr> <tr> <td>ZB405A</td> <td>TP172327</td> </tr> <tr> <td>ZB404</td> <td>TP172353</td> </tr> <tr> <td>ZB212</td> <td>TP303606</td> </tr> <tr> <td>ZB406</td> <td>TP172327</td> </tr> </tbody> </table>	Remove Card	Replace With Card	ZB507	TP172441	ZB504	TP177589	ZB403	TP172353	ZB405A	TP172327	ZB404	TP172353	ZB212	TP303606	ZB406	TP172327
Remove Card	Replace With Card																	
ZB507	TP172441																	
ZB504	TP177589																	
ZB403	TP172353																	
ZB405A	TP172327																	
ZB404	TP172353																	
ZB212	TP303606																	
ZB406	TP172327																	
36	RC indicator remains OFF.	a. Replace, if defective, ZB213 card with TP303671 card. b. Replace, if defective, ZB212 card with TP303606 card. c. Check associated wiring and connections.																
37	IBK indicator remains OFF.	a. Replace, if defective, ZB208 card with TP303671 card. b. Check associated wiring and connections.																
38	Programmer does not advance to BK mode.	Replace, if defective, ZB405 card with TP172327 card.																

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION																																				
39	Punch does not operate; programmer in BK mode.	<p>Check for defective card by replacing the following circuit cards, one at a time in the order shown. Reinstall removed good cards.</p> <table data-bbox="844 483 1364 598"> <tr> <td>Remove Card</td> <td>Replace With Card</td> </tr> <tr> <td>ZB417C</td> <td>TP177501</td> </tr> <tr> <td>ZB118D</td> <td>TP172357</td> </tr> <tr> <td>ZB416</td> <td>TP177546</td> </tr> </table> <p><u>Note:</u> If ZB416 card is replaced, it will be necessary to perform the Clock Generator Electronic Adjustment (Section 592-812-700).</p> <p>Continue checking for defective card.</p> <table data-bbox="795 819 1477 1018"> <tr> <td></td> <td>Replace</td> <td></td> <td>Replace</td> </tr> <tr> <td>Remove Card</td> <td>With Card</td> <td>Remove Card</td> <td>With Card</td> </tr> <tr> <td>ZB422A</td> <td>TP177504</td> <td>ZB112</td> <td>TP172457</td> </tr> <tr> <td>ZB111B</td> <td>TP172357</td> <td>ZB116D</td> <td>TP172356</td> </tr> <tr> <td>ZB402</td> <td>TP177503</td> <td>ZB209</td> <td>TP303603</td> </tr> <tr> <td>ZB211</td> <td>TP303606</td> <td>ZD211</td> <td>TP303675</td> </tr> <tr> <td>ZB115D</td> <td>TP172356</td> <td></td> <td></td> </tr> </table> <p><u>Note:</u> If ZD211 card is replaced, it will be necessary to perform the Control Card Electronic Adjustment (Section 592-812-700).</p>	Remove Card	Replace With Card	ZB417C	TP177501	ZB118D	TP172357	ZB416	TP177546		Replace		Replace	Remove Card	With Card	Remove Card	With Card	ZB422A	TP177504	ZB112	TP172457	ZB111B	TP172357	ZB116D	TP172356	ZB402	TP177503	ZB209	TP303603	ZB211	TP303606	ZD211	TP303675	ZB115D	TP172356		
Remove Card	Replace With Card																																					
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ZB118D	TP172357																																					
ZB416	TP177546																																					
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ZB111B	TP172357	ZB116D	TP172356																																			
ZB402	TP177503	ZB209	TP303603																																			
ZB211	TP303606	ZD211	TP303675																																			
ZB115D	TP172356																																					
40	Character counter fails or Units counter fails Signal delay defective Inverter defective BKL indicator remains off DEL indicator remains off Diode defective Ring drive defective Fails to Count 0, 1, 2, 3 Fails to Count 4, 5, 6, 7 Fails to Count 8, 9 Inverter defective Ring drive defective Fails to Count 00, 10, 20, 30 Fails to Count 40, 50, 60, 70 Fails to Count 80 — Units counter continues to operate	<p>Check for defective card.</p> <table data-bbox="860 1197 1380 1690"> <tr> <td>Remove Card</td> <td>Replace With Card</td> </tr> <tr> <td>ZB216</td> <td>TP303635</td> </tr> <tr> <td>ZB124</td> <td>TP172382</td> </tr> <tr> <td>ZB106</td> <td>TP172357</td> </tr> <tr> <td>ZB115</td> <td>TP172356</td> </tr> <tr> <td>ZB512</td> <td>TP172356</td> </tr> <tr> <td>ZB424</td> <td>TP177504</td> </tr> <tr> <td>ZB408</td> <td>TP172353</td> </tr> <tr> <td>ZB410</td> <td>TP172327</td> </tr> <tr> <td>ZB411</td> <td>TP172320</td> </tr> <tr> <td>ZB412</td> <td>TP172320</td> </tr> <tr> <td>ZB118C</td> <td>TP172357</td> </tr> <tr> <td>ZB409B</td> <td>TP172353</td> </tr> <tr> <td>ZB413</td> <td>TP172327</td> </tr> <tr> <td>ZB414</td> <td>TP172320</td> </tr> <tr> <td>ZB412</td> <td>TP172320</td> </tr> </table> <p><u>Note:</u> If above does not clear trouble, card ZB217 may be bad — replacement of this card requires a check of the Photoreader Light Source and Pad Out Circuit (Section 592-812-700).</p>	Remove Card	Replace With Card	ZB216	TP303635	ZB124	TP172382	ZB106	TP172357	ZB115	TP172356	ZB512	TP172356	ZB424	TP177504	ZB408	TP172353	ZB410	TP172327	ZB411	TP172320	ZB412	TP172320	ZB118C	TP172357	ZB409B	TP172353	ZB413	TP172327	ZB414	TP172320	ZB412	TP172320				
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ZB414	TP172320																																					
ZB412	TP172320																																					

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
41	FE indicator remains off in BK mode.	Replace, if defective, ZB214A card with TP303671 card.
42	Programmer does not advance to EOB mode.	Replace, if defective, ZB405 card with TP172327 card.
43	Programmer does not advance to CK1 mode.	Replace, if defective, ZB405 card with TP172327 card.
44	Programmer does not advance to CK2 mode.	Replace, if defective, ZB406 card with TP172327 card.
45	Programmer does not advance to BU mode.	Replace, if defective, ZB406 card with TP172327 card.
46	Backup assembly BU coil fails (does not energize).	<ol style="list-style-type: none"> a. Check continuity between BU coil and pin A on card ZB506A. b. Replace, if defective, ZB506A card with TP177881 card. c. Replace, if defective, ZB505 card with TP177505 card. d. Replace, if defective, BU coil (TP177M). If coil is replaced, perform Clutch Magnet Armature Adjustment.
47	RC indicator remains ON.	Replace, if defective, ZB213C card with TP303671.
48	IBK indicator remains ON.	Replace, if defective, ZB424 card with TP172424, ZB211C card with TP303606, ZB503C card with TP177503, and ZB208C card with TP303671.
49	Tape backs up more than one cycle.	<ol style="list-style-type: none"> a. Check Clutch Magnet Armature Adjustment. b. Check Drive Shaft Clutch Stop Lever and Latchlever Springs Adjustment. c. Check and remove any oil on backup coil core face. d. Clutch magnet armature should be flush to core; if not, loosen two mounting screws, position armature.

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
50	Tape backs up less than 80 characters.	a. Check Clutch Release Lever Adjustment. b. Check Reverse Feed Wheel Phasing Adjustment.
51	Intermediate and drive clutches chatter during tape backup.	a. Check Clutch Release Lever Adjustment. b. Check and remove any oil on drive springs.
52	No tape backup.	a. Check and eliminate any binds in armature latching. b. Lubricate associated components as needed. c. Check armature-core gap. If greater than 0.055 inch at closest point, set Clutch Magnet Armature Adjustment gap to the minimum (0.008 inch) of requirement. d. Check and remove any burrs from lever latching surfaces.
53	Programmer does not advance to DEL mode.	Replace, if defective, ZB406 card with TP172327 card.
54	Punch does not operate in DEL mode.	Replace, if defective: ZB406 card with TP172327 card. ZB417C card with TP177501 card. ZB118D card with TP173357 card. ZB416 card with TP177546 card.
55	Set does not return to SR mode.	Replace, if defective, ZB404 card with TP172353 card.
56	Product tape does not conform to message tape — garbled, random punching.	a. Receiver distributor module: check, and if necessary adjust, LC Oscillator (ZD107) for output of 2100 Hz at 1050 wpm 2400 Hz at 1200 wpm b. Receiver control module: check, and if necessary adjust recycle timer card (ZB415) output (45-50 ms). c. Clock generator circuit: check ZB118, ZB208, and ZB416 cards.

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
57	Added or deleted bits in product tape.	Check erroring levels associated driver card and circuitry.
58	Fixed character(s) do not conform.	a. Sender Check Test: Transmitter control module SR code error — check ZA105; ZA205, and ZA418 timing (40 ms). BN1, 2, 3 code error — check ZA104, ZA105, ZA205, and block counter (on reader) contact closure. b. CK1, 2 code error — check ZA106, ZA107, and ZA206.
59	Number of characters in first block, between BN and EOB is less than 80.	a. Sender Check Test: Check Reader EOB Contact. b. Check trouble no. 51.
60	Receiver terminal alarm (PTA) set while DRPE is operating.	Check photoverifier circuit (adjustments in 592-812-700).
61	Received TP303069 test tape check characters do not correspond to Check Character Chart.	Sender Check Test: Advise Test Center of improper check characters.
62	No unattended answering.	a. Check for correct strapping options on data set. b. When the called terminal receives a ring indication, the Data Terminal Ready lead (DTR) must remain on (+6v) at all times and the DSR lead must switch from -6v (off) to +6v (on) and the DSR relay must energize. If the relay does not energize, check the Low Tape (LT) and Alarm (AL) relays to make sure that they are de-energized. If they are energized, replace the tape supply roll and de-alarm the terminal. If alarm cannot be reset, refer to Alarm Chart 4. c. If LT and AL relays are de-energized and the call is still not answered and the DSR lead remains low, check ZH1-H circuit card and replace if defective. If card is good, data set may be defective and should be tested. d. If DSR lead goes high and DSR relay does not energize, check circuit card ZH1-G and replace if defective. If DSR does energize and motors do not turn ON, check the MS relay and connections.

CHART 11

RECEIVER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
63	Receiver does not drop call after message is completed (Unattended).	<ul style="list-style-type: none"> a. Check the delay timer (TP308545) and replace it if necessary. b. If delay timer is good, check and replace if necessary circuit card ZH1-C and F (TP303695) and check operation of CD relay.
64	Low tape flasher does not function.	<ul style="list-style-type: none"> a. When a low tape condition occurs, the LT relay must energize and the FL flasher must indicate a low tape condition. b. If LT relay is not energized, check and adjust the low tape mercury switch, and check the LT relay for proper operation. c. If the LT relay is energized, check the FL (TP308546) flasher to determine if it is defective, and replace it, if necessary.
65	Receiver does not turn on reverse channel.	<ul style="list-style-type: none"> a. When an SR character is detected by the receiver, the programmer advances to the BN mode and the reverse channel control turns reverse channel on and the RC lamp lights. If the lamp remains off in the BN mode check ZB213C (TP303671) and replace it if necessary. b. If RC is turned on check the reverse channel blind ZB222J (TP303603) and replace it if necessary. The data set Reverse Channel lead JK2-B1 will remain off if the ALARM lamp is lit. If it is, reset it. Check ZH1-J and K (TP303695) and replace if necessary. c. If reverse channel remains off, the data set may be defective and should be tested.

3.09 Chart 12 closely follows the CHECK-OUT PROCEDURE (592-811-200) and gives actions to be performed to correct a trouble.

3.10 An oscilloscope is not required in any of these recommended actions. To use an oscilloscope, the station or unit will have to undergo further analysis, and may use related

timing diagrams or descriptions, operating procedures and operation sections for oscilloscope analysis.

3.11 Chart 12 can be used with Tables A and B, Charts 1, 3, 5, 7 and 8.

3.12 Use Table C for locating cards in their WD location.

CHART 12

SENDER — TROUBLE ANALYSIS

NO.	TROUBLE	RECOMMENDED ACTION
1	POWER indicator lamp fails to light.	<ul style="list-style-type: none"> a. Check ac source. b. Check 48 volt fuse 1-1/2 amp. c. Check lamp. d. Check switch. e. Check station control fuse 6-1/4 amp. f. Check that KGAC relay should be operated if ac cord is plugged into outlet (7402WD). g. Check module fuses. h. Check power supply. i. Check associated wiring and connections (7070WD).
2	Fan(s) fail.	<ul style="list-style-type: none"> a. Check that ac power cord is plugged into wiring field outlet. b. Check fuse on fan power cord. c. Check for ac with VOM at wiring field power outlet. d. Check wiring.
3	AUX MOTOR START indicator fails to light.	<ul style="list-style-type: none"> a. Check lamp. b. Check switch. c. Check associated wiring (7070WD).
4	Reader motor OFF.	<ul style="list-style-type: none"> a. Check reader connector. b. Check DX power supply and fuses 6/10 amp (8070WD). c. Check motor start relay (KGMS) is energized by ground from AUX MOTOR START switch (7402WD). d. Check motor, associated wiring and connections (8070WD, 7406WD, 7402WD).

CHART 12

SENDER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
5	Tape puller motor OFF (TEST/OPERATE switch in TEST).	a. Check motor start relay KP1 (7065WD). b. Check motor, reset switch, associated wiring and connections (7065WD).
6	MANUAL indicator fails to light.	a. Check lamp. b. Check switch and wiring (7070WD).
7	Motors do not turn OFF.	Check KGMS relay is de-energized, if not, check for ground to coil of relay (7402WD).
8	Non EDC indicator fails to operate.	Check lamp, switch and wiring respectively.
9	MANUAL button does not reset NON/EDC button.	Check MANUAL button switch for proper resetting of NON/EDC key.
10	Failure of AUX MOTOR START and NON/EDC button to operate simultaneously.	Check switch for proper operation.
11	MANUAL button fails to reset NON/EDC and AUX MOTOR START switch.	Check control switch.
12	Stop alarm/reset lamp fails to go out, when tape is placed in reader.	a. Check Reader Tape Out Switch Adjustment. b. Check tape-out relay (KGTO) for proper seating of wires, and that relay is not hung up in energized position. Remove ZA513A card from EDC module if KGTO relay remains energized, replace ZG2 card in control module (G). If relay still remains energized, check for GND on IL of coil (7402WD and 7056WD). If removal of ZA513A card extinguishes alarm, replace card if alarm is still on replace ZA509, ZA108 and ZA515 respectively.
13	Motors do not turn ON.	a. Check that KGDSR relay in control module is energized from ground at make contacts of OPERATE-TEST switch (7402WD). b. Check KGMS relay should be energized (7402WD). c. Check KGHO relay — de-energized. Replace ZG2-E card. d. Check KGST relay — de-energized.

CHART 12

SENDER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
14	Motors do not turn OFF.	a. Check KGHO and KGST relays (7402WD). Ground should be applied to KGST relay when Stop Alarm/Reset button is depressed and when released KGHO relay will pick-up. b. Check wiring.
15	SR light out, programmer in SR mode.	a. Apply ground to pin H on ZA416A card. If lamp lights, replace ZA416 card. If lamp remains off, replace lamp. b. Check PROGRAM ADVANCE pushbutton. c. Replace ZA213 card. d. Check circuitry.
16	Program does not advance to BN.	a. Check ZA417, ZA412, ZA424 and ZA510 cards. b. Check program advance pushbutton and TEST switch. c. Apply ground to pin H of ZA417. Lamp should light, if not replace lamp.
17	BN indicator remains ON.	Replace ZA213 card.
18	Programmer does not advance to BK mode.	a. Check ZA416 and/or ZA213 card. b. Apply ground to pin D of ZA416 lamp. c. Check circuitry.
19	Reader blows F3 fuse continuously upon entering BK mode.	a. Check for ground on stepper coils. b. Replace reader power supply.
20	Reader does not run (READER TEST switch ON and RCD lamp off).	a. Check READER TEST switch. b. Replace cards, one at a time ZA212B, ZA403B, ZA405C, ZA404, ZA415A, ZA402A and ZA219B. Retest after each.
21	Reader steps, receives reader test alarm (RTA lamp lights), reverses and stops in SR mode.	a. Check Contact Sensing Wires to Top Plate, Tape Sensing Wires and Feed Wheel Alignment and Contact Sensing Wire Tip Height Adjustments. b. Replace cards, one at a time. Test as follows: move READER TEST switch from ON to OFF to ON, to cycle reader after replacing a card. Follow this order ZA215, ZA120, ZA216, ZA220, ZA509A, ZA122, ZA505, ZA507A, ZA221 and ZA222.

CHART 12

SENDER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
22	Reader fails to step or erratic stepping.	<ul style="list-style-type: none"> a. Replace fuse F3 (1.5 amp) and/or F4 (0.6 amp). Check if escapement shaft has torque applied from motor. b. Check drive spring is on and motor belt is on. c. Check Magnetic Clutch Torque Adjustment. d. If escapement shaft has torque, check for binds in pallet and escapement shafts. e. Check Escapement Wheel Adjustment. f. Clean magnet armature and pole faces. g. Check pallet and escapement wheel for wear, replace if worn. h. Replace oscillator card ZC106.
23	Mode does not advance to EOB mode.	<ul style="list-style-type: none"> a. Replace ZA416 card. b. Check EOB lamp by applying ground to ZA416, pin K lamp should light. c. Replace triode and check circuitry.
24	Mode does not advance to CK1 mode.	<ul style="list-style-type: none"> a. Replace ZA417 card. b. Check CK1 lamp by applying ground to ZA416, pin M lamp should light.
25	Mode does not advance to CK2 mode.	<ul style="list-style-type: none"> a. Replace ZA417 card. b. Check CK2 lamp by applying ground to ZA417, pin D lamp should light.
26	Mode does not advance to R1 mode.	<ul style="list-style-type: none"> a. Replace ZA417 card. b. Check R1 lamp by applying ground to ZA417, pin K lamp should light, if not, replace.
27	Reader does not run in reverse.	<ul style="list-style-type: none"> a. When programmer enters R1 mode, ground is applied to relay KGMR through ZA422, ZA408, ZA410, and ZA213, if KGMR is not energized when we step into R1 mode, replace above cards one at a time until KGMR relay energizes (7056WD). b. If KGMR is energized, check ZA419, ZA403, ZA423, and ZA415 (7056WD).

CHART 12

SENDER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
28	Retractor solenoid hums.	Check Retractor Solenoid Adjustment.
29	Retractor fails to operate.	<ul style="list-style-type: none"> a. Check Retractor Solenoid Adjustment. b. Check retractor interlock switch. c. Check associated wiring and connector.
30	Block numbers fail to cycle (in reverse).	<ul style="list-style-type: none"> a. Replace ZA104 card. b. Check Block Counter Contact Bracket, Block Counter Contact Connection and Block Counter Contacts, Bracket, and Cam Adjustments. c. If block counter has been removed and then reinstalled, check Block Counter Driven Gear and Pinion Alignment Adjustment.
31	Mode fails to advance to R2.	<ul style="list-style-type: none"> a. Replace ZA417 card. b. Check R2 lamp by applying ground to ZA417, pin M lamp should light, if not, replace lamp.
32	Reader fails to stop when programmer goes to SR.	Verify that the ground is removed from KGMR relay. When KGMR de-energizes, KA520 (SR) relay energizes through KGMR normally closed contacts 8 and 11 (7056WD and 7402WD). Replace ZA422, ZA408, ZA410 and ZA213 cards.
33	Station does not logic reset (return to SR mode).	<ul style="list-style-type: none"> a. Check LOGIC RESET pushbutton for operation and wiring (7056WD). b. Replace ZA212 card.
34	REVERSE CHANNEL DETECT (RCD) lamp fails to light. Reader runs (with READER TEST switch ON).	If reader runs and programmer cycles, check RCD lamp and wiring to lamp.
35	RCD lamp fails to light. Reader does not run.	<ul style="list-style-type: none"> a. Replace ZA212, ZA403, ZA405, ZA404 and ZA415 cards. b. Check Reverse Switch and wiring.
36	No unattended transmitter answering.	<ul style="list-style-type: none"> a. When the called terminal receives a ring indication, the Data Terminal Ready (DTR) lead must remain on (+6v) and the Data Set Ready (DSR) lead must switch from -6v (off) to +6v (on), and the DSR relay must energize. If the relay does not energize, check the Tape Out (TO) relay. If TO is energized, the DTR lead will switch low and prevent the DSR from turning high and answering the call. Remedy the tape out condition if it exists.

CHART 12

SENDER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
36 (cont)		<p>b. If tape out condition is remedied and the call is still not answered, and the DSR lead remains low with each ring, check ZG1-H circuit card. If card is bad replace it; if it is good, the data set may be defective and must be tested.</p> <p>c. If DSR lead does go high and DSR relay does not energize, check circuit card ZG1-G and replace if defective. If DSR does energize and motors do not turn on, check ZG1-K and replace if necessary. Check also the MS relay and connections.</p>
37	Transmitter fails to remain on line — drops call after connection has been established.	<p>a. The call will be dropped if the remote receiver does not have power applied to it when the DATA button is depressed. This prevents the Carrier Detect lead from being on and completing the requirement to keep the call held on.</p> <p>b. If power is on, and the call is dropped continuously, check carrier detect lead on the remote receiver JK2-A8 to determine if it goes high when DATA button is depressed. If it does not go high, check and replace the data set if necessary.</p>
38	Transmitter does not drop the call after message is completed (Unattended).	<p>a. Check the delay timer and replace it if necessary.</p> <p>b. If reverse channel (RC) is off, check and replace if necessary ZG1-C and F circuit card, which controls the RC relay. If card is good, check operation of RC relay.</p>
39	Transmitter does not detect reverse channel.	<p>a. With the receiver reverse channel on, the reverse channel reverse lead, JJ2-B2, on the transmitter must be +6v. If the lead is clamped at -6v, the data set is defective and should be replaced.</p> <p>b. If the RC lead is +6v, check JG4-15 for -6v. If lead is clamped at 0v, check and replace it if necessary.</p> <p>c. If JG4-15 is set at -6v, check and replace if necessary ZA106C in transmitter control module. If card is good, refer to Reader Stepping, Chart 7 for isolating problem.</p> <p>Note: The REVERSE CHANNEL SIMULATE switch on the transmitter distributor module must be off, to allow the RC relay to energize when DSR is on and reverse channel is lost.</p>

CHART 12

SENDER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
39 (cont)		d. When Receiver turns RC on, check the RC lead JJ2-B2 on the transmitter for a +6v reading. If lead is clamped at -6v, test the data set. If RC lead is at +6v, check ZG1-C and F circuit and RC relay for proper operation. Replace circuit card if necessary. e. If RC relay is energized check ZA106 circuit card in transmitter control module. If card is good refer to Reader Stepping, Chart 7, isolating area causing reverse channel detect malfunction.
40	Feed holes burring.	a. Check for proper tape routing. b. Check Tape Lid and Feed Wheel to Reading Head Adjustments.
41	Feed holes burring, during tape reverse travel only.	Check Backup Solenoid, Control Arm Spring and V-Belt Clutch Adjustments.
42	Tape tearing during backup operation.	Check strap at pin 45 of PL1 to pin E10 of PC125, (7410WD).
43	Error on tangled tape/tape-out signal.	a. Check Tangled Tape/Tape-Out Contacts Adjustment. b. Check for dirty contact surfaces.
44	Error on EDC block counter output.	a. Check for binds in block counter mechanism. b. Check Block Counter Contacts, Bracket, and Cam Adjustment.
45	Reader does not step out of reverse after 160 characters.	a. Check End-Of-Block Sensing Wires Adjustment. b. Replace following cards one at a time in order shown, ZA123C, ZA511A, ZA509C, ZA106A and ZA503.
46	Added or deleted bits in product tape.	a. Check Tape Sensing Wires and Feed Wheel Alignment Adjustment. b. For 1, 2, or 3 bit error, replace card ZC207, for 4, 5, or 6 bit error, replace card ZC208, for 7 or 8 bit error, replace card ZC209. c. Check data set using standard tests.
47	Fixed character(s) do not conform.	a. If SR code error — replace, if defective, cards ZA105, ZA205, and/or ZA418 (requires 40 ms adjustment).

CHART 12

SENDER — TROUBLE ANALYSIS (Continued)

NO.	TROUBLE	RECOMMENDED ACTION
47 (cont)		b. If BN1, 2, 3 code error — (1) replace, if defective, cards ZA104, ZA105, and/or ZA205 (2) Check block counter contact closure. c. If CK1, 2 code error — replace, if defective, cards ZA106, ZA107, and/or ZA206.

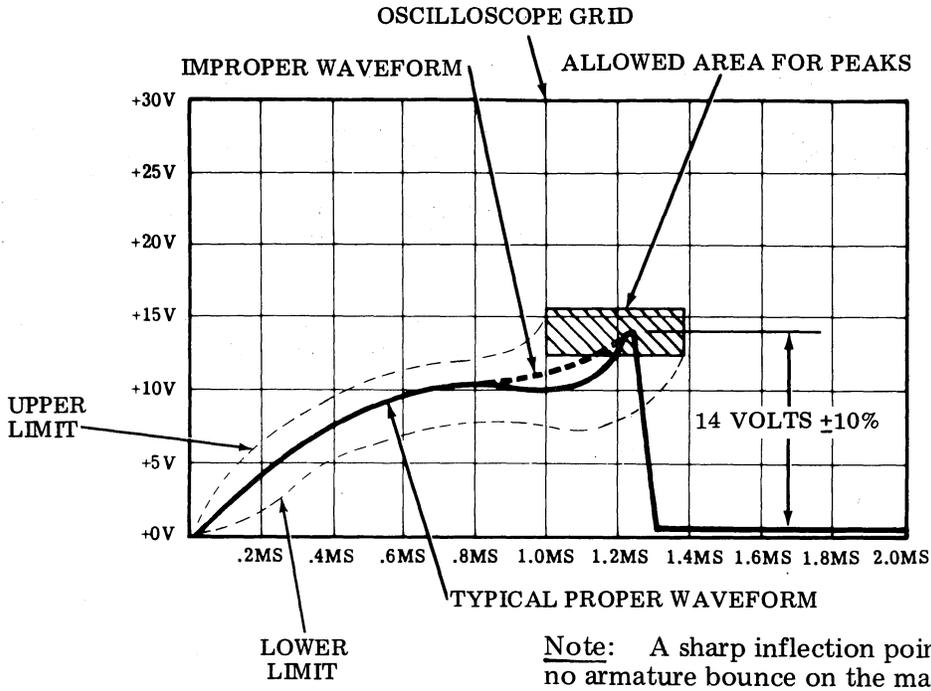


Figure 4 - Typical Waveforms

TABLE C

TROUBLESHOOTING CIRCUIT INDEX — SENDER

1. EDC MODULE "A" (7056WD)				
<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>		<u>WD Location</u>
ZA104	A	EC357	INV (4)	2B3
	B			2B3
	C			2B3
	D			5C3
ZA105	A	EC356	INH (4)	2A3
	B			2C4
	C			2B4
	D			2B4
ZA106	A	EC357	INV (4)	2E3
	B			2F3
	C			4B3
	D			2C3
ZA107	A	EC528	EF (6)	2C3
	B			2E3
	C			2F3
	D			SPARE
	E			SPARE
	F			SPARE
ZA108	A	EC356	INH (4)	7E6
	B			7E5
	C			7A5
	D			7C6

TABLE C

TROUBLESHOOTING CIRCUIT INDEX — SENDER (continued)

1. EDC MODULE "A" (7056WD) (continued)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>	<u>WD Location</u>
ZA115		EC428 FILTER	6D1
ZA116	A	EC512 INV (2)	3F8
	B		3E2
ZA117	A	EC332 EF (2)	3F8
	B		3E3
ZA118		EC589 OS (200us)	3D2
ZA119	A	EC383 PA	3C2
	B		7B3
ZA120		EC516 PP	3D3
ZA121		EC352 FAN-OUT	3A3
ZA122		EC380 OR	3D8
ZA123	A	EC547 INT (5)	SPARE
	B		SPARE
	C		6E2
	D		SPARE
	E		4F5
ZA205		EC641 DIODE Diode Matrix	2B6
ZA206	A-H	EC600 INH (16)	2D6
ZA207	A-H	EC600 INH (16)	2F6
ZA208	A-C	EC671 FF (3)	7E5
ZA212	A	EC671 FF (3)	4B8
	B		5A3
	C		6B3
ZA213	A-R	EC606 EF (16)	5C8
ZA215	A-J	EC682 CSS (8), RESET DRIVER (1)	3F5
ZA216	A-H	EC600 INH (16)	3E5
ZA217	A-C	EC671 FF (3)	3B4
ZA218	A-C	EC671 FF (3)	3B5
ZA219	A	EC671 FF (3)	3B7
	B		4C5
	C		3B7
ZA220	A	EC671 FF (3)	3D6
	B		3D8
	C		7B4
ZA221	A-C	EC671 FF (3)	3D5
ZA222	A-C	EC671 FF (3)	3D4
ZA402	A	EC356 INH (4)	4C5
	B		6B7
	C		4E6
	D		4E8
ZA403	A	EC357 INV (4)	4B6
	B		5A3
	C		4F7
	D		6F5
ZA404		EC138 IPS	4A6
ZA405	A	EC502 OR	6C4
	B	AND	5D3
	C	AND	4A7
ZA406	A	EC383 PA	6D3
	B		5A4

TABLE C

TROUBLESHOOTING CIRCUIT INDEX — SENDER (continued)

Position	Circuit	Type Card	WD Location	
ZA407	A	EC503 AND (4)	SPARE	
	B		4D8	
	C		4F3	
	D		7B4	
ZA408	A	EC527 EF (6)	4C8	
	B		4F3	
	C		SPARE	
	D		4E8	
	E		6D5	
	F		4E6	
ZA409	A	EC356 INH (4)	SPARE	
	B		4F6	
	C		SPARE	
ZA410	D	EC504 OR	5D2	
	A		5E2	
	B		6C7	
	C		6C7	
ZA411	D	EC589 OS (200us)	6D5	
	A		5F3	
	ZA412		EC353 RING RESET	5F4
	B		RING DRIVE	5F3
ZA413	A	EC353 RING RESET	5F8	
	B		RING DRIVE	SPARE
ZA414		EC589 OS (200us)	6B3	
ZA415	A	EC504 OR (4)	4B6	
	B		6E7	
	C		6E6	
	D		5E6	
ZA416		EC327 TRUNCATED-N DIST	5F5	
ZA417		EC327 TRUNCATED-N DIST	5F5	
ZA418	A	EC527 EF (6)	6B2	
	B		5E3	
	C		6C8	
	D		6C7	
	E		6D7	
	F		6D6	
ZA419	A	EC503 AND (4)	6D7	
	B		6B7	
	C		6E5	
	D		6D6	
ZA420		EC546 GATED OSC (4-45ms)	6C8	
ZA421		EC380 OR	6A8	
ZA422	A	EC581 PA	6E5	
	B		5C3	
ZA423		EC546 GATED OSC (4-45ms)	6F5	
ZA424	CR6	EC181	4B7	
	R2, CR2		4F4	
	R4, CR4		4F7	
	R6		5F3	
	R7		5F3	

TABLE C

TROUBLESHOOTING CIRCUIT INDEX — SENDER (continued)

1. EDC MODULE "A" (7056WD) (continued)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>	<u>WD Location</u>
ZA424 (continued)	R1, CR1 R5, CR5 R3, CR3		6E4 SPARE SPARE
ZA503		EC597 OS (1ms)	6E3
ZA504	A B	EC332 EF (2)	4E8 4E6
ZA505		EC589 OS (200us)	4C3
ZA507	A B	EC383 PA (2)	4C4 SPARE
ZA508		EC354 IPS	6C4
ZA509	A B C D & E F	EC527 EF (6)	6B7 7B6 6D2 SPARE 4B4
ZA510		EC441 IPS	5F2
ZA511	A B C	EC501 AND	6C2 5F7 6C3
ZA512		EC104 IPS	6A7
ZA513	A B	EC581 PA	7B7 SPARE
ZA515		EC119 FF	7B6

2. TRANS DIST MODULE "C" (7410WD)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>	<u>WD Location</u>
ZC107	A B C D	EC503 AND	2C5 2C5 2E5 2F5
ZC108	A B C D	EC121 PA	2D3 2D3 2E7 2F7
ZC109	A B C D	EC121 PA	2B8 SPARE SPARE SPARE
ZC110		EC428 FILTER	5F7
ZC202	A & J B & K C & L D & M E & N F & P G	EC606 EF (16)	3B7 2E7 2F7 2F8 4C1 3B5 SPARE

TABLE C

TROUBLESHOOTING CIRCUIT INDEX — SENDER (continued)

2. TRANS DIST MODULE "C" (7410WD) (continued)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>	<u>WD Location</u>
ZC202	H		SPARE
(continued)	Q		SPARE
	R		SPARE
ZC203	A	EC683 INH or INV (10)	2E2
	B		2D3
	C		2B5
	D		2E5
	E		1F5
	F		2D6
	G		2C1
	H		2C7
	J		2A3
	K		2B4
ZC204	A	EC684 AND	2C7
	B	OR	3A8
	C	OR	2B5
	D	OR	SPARE
	E	OR	2C3
	F	AND	3C8
	G	OR	3B7
	H	OR	3B5
ZC205	A	EC671 FF	2F6
	B		2C6
	C		2C4
ZC206	A	EC671 FF	3D8
	B		2D1
	C		2C7
ZC207	A	EC671 FF	3D7
	B		3D7
	C		3D7
ZC208	A	EC671 FF	3D5
	B		3D5
	C		3D5
ZC209	A	EC671 FF	3D3
	B		3D3
	C		3D3
ZC210		EC682 Contact Signal Shaper (CSS)	4D2
ZC211		EC680 Parity Logic	5A2
ZC212		EC618 Resistor Board	4A3

Reader Contacts

Tape-Out - Tangled Tape	1D5
Block Counter #1	1E5
Block Counter #2	1E5
Block Counter #3	1E5
End of Block - Forward	1E5
End of Block - Reverse	1E5

TABLE C

TROUBLESHOOTING CIRCUIT INDEX — SENDER (continued)

2. TRANS DIST MODULE "C" (7410WD) (continued)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>	<u>WD Location</u>
Code Level 1			4F8
	2		4F6
	3		4F6
	4		4F5
	5		4F4
	6		4F1
	7		4F3
	8		4F2
Feed Level			
Verify Level 1			1B4
	2		1B4
	3		1C4
	4		1C4
	5		1C4
	6		1C4
	7		1D4
	8		1D4
Retractor Interlock			1F4

3. RELAYS

	<u>Module and Schematic</u>	<u>WD Location</u>
KA520		A-7056WD - 6F6
DSR Data Set Ready		G-7402WD - 2F5
RC Reverse Channel		2F5
MS Motor Start		3C3
ST Stop		3F3
HD Hold		3F2
MR Motor Reverse		3E7
TO Tape Out		3D7
AC AC Power		1B3

4. GENERAL

Tape Puller Motor (Schematic 7065WD)	(Actual WD) -	P-7066WD	1B3
DX4 Motor		P-7065WD	1C7
KP1 Motor Start Relay		P-7065WD	1D5

TABLE D

TROUBLESHOOTING CIRCUIT INDEX — RECEIVER

1. EDC MODULE "B" (7063WD)				
<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>		<u>WD Location</u>
ZB103	A-D	EC356	INH (4)	9F3-5
ZB104	A-D	EC356	ONH (4)	9F5-7
ZB105		EC516	PP	8B2
ZB106	A	EC357	INV (4)	2C7
	B			2C7
	C			2A4
	D			3B4
ZB107		EC589	OS (200us)	10C3
ZB108	A	EC383	PA (2)	10D3
	B			3C8
ZB109		EC516	PP	10B4
ZB110		EC352	FAN-OUT	10B5
ZB111	A	EC357	INV (4)	8F2
	B			2A6
	C			2A7
	D			5B3
ZB112		EC457	OS (2ms)	5B3
ZB113	A	EC383	PA (2)	2A5
	B			2D4
ZB114	A	EC356	INH (4)	2A5
	B			2E6
	C			6F6
	D			1A3
ZB115	A	EC356	INH (4)	4A3
	B			3C2
	C			3C2
	D			5B3
ZB116	A	EC356	INH (4)	5B4
	B			3F6
	C			3F6
	D			5B3
ZB117	A	EC383	PA (2)	3A7
	B			3F6
ZB118	A	EC357	INV (4)	5B5
	B			4F3
	C			3D4
	D			2C6
ZB119	A	EC357	INV (4)	3F6
	B			5D7
	C			3D3
	D			3D8
ZB120		EC382	SIG DELAY (50us)	2A4
ZB121		EC382	SIG DELAY (50us)	2C4
ZB122		EC597	OS (1ms)	3A6
ZB123		EC138	IPS	3F7
ZB124		EC382	SIG DELAY (50us)	3A5
ZB203	A-C	EC671	FF (3)	10E4
ZB204	A-C	EC671	FF (3)	10E6
ZB205	A	EC671	FF (3)	10E8
	B			10E8
	C			5E4

TABLE D

TROUBLESHOOTING CIRCUIT INDEX — RECEIVER (continued)

1. EDC MODULE "B" (7063WD) (continued)				
<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>		<u>WD Location</u>
ZB206	A-C	EC671	FF (3)	9D4
ZB207	A-C	EC671	FF (3)	9D6
ZB208	A	EC671	FF (3)	9D7
	B			9D7
	C			2D5
ZB209	A-H	EC603	INH or INV (10)	8F3-8
	J			5D6
	K			5D6
ZB210	A	EC640	OR (5) 8 Input	10B8
	B		8 Input	9B2
	C		8 Input	9C8
	D		2 Input	2C4
	E		2 Input	1B5
ZB211	A	EC606	EF (16)	2D4
	B			2E4
	C			2E6
	D			6F7
	E			6F4
	F			2B8
	G			3B3
	H			5D7
	J			SPARE
	K			8F3
	L			2D4
	M			2F3
	N			2B3
	P			6F3
	Q			5E4
	R			SPARE
ZB212	A-R	EC606	EF (16)	1C6
ZB213	A	EC671	FF	2F6
	B			4F3
	C			2E1
ZB214	A	EC671	FF (3)	5B6
	B			5C6
	C			3F5
ZB215	A-D	EC601	(6 Input 3 Output) Spec Purpose Gate	4B4-8
ZB216	A-H	EC635	PHOTO-AMP (9)	8B3-8
	I		FEED	3A3
ZB217	A-H	EC679		8D3-8
	J		FEED	3A2
ZB221	A	EC671	FF (3)	6C8
	B			6C4
	C			6C6
ZB222	A-H	EC603	INH or INV (10)	7B-F5
	J			2F1
	K			2F3
ZB223	A	EC606	EF (16)	7F2
	B			7F3
	C			7F3

TABLE D

TROUBLESHOOTING CIRCUIT INDEX — RECEIVER (continued)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>	<u>WD Location</u>
	D		3E7
	E		5C3
	F		5D5
	G		SPARE
	J-R		7B- F6
ZB224		EC641 DIODE MATRIX	7B- F8
ZB403	A	EC353 RING RESET	1E3
	B	RING DRIVE	1F3
ZB404	A	EC353 RING RESET	1F5
	B	RING DRIVE	4A4
ZB405		EC327 TRUNCATED-N DIST	1E4
ZB406		EC327 TRUNCATED-N DIST	1E5
ZB407	B,C,D	EC327 TRUNCATED-N DIST A-SPARE	4A5
ZB408	A	EC353 RING RESET	3C4
	B	RING DRIVE	3B4
ZB409	A	EC353 RING RESET	3E4
	B	RING DRIVE	3D4
ZB410		EC327 TRUNCATED-N DIST	3C5
ZB411		EC320 TRUNCATED-N DIST	3C6
ZB412	A,C,D	EC320 TRUNCATED-N DIST B-SPARE	3E7
ZB314		EC327 TRUNCATED-N DIST	3E5
ZB415		EC546 GATED OSC (4-45ms)	2C5
ZB416		EC546 GATED OSC (4-45ms)	2B6
ZB417	A	EC501 AND	6C4
	B	OR	5E6
	C	OR	2E6
ZB418	A	EC502 OR	6F5
	B	AND	2D4
	C	AND	2B4
ZB419	A	EC502 OR	2F4
	B	AND	2E4
	C	AND	2E7
ZB420	A	EC503 AND (4)	6F6
	B		3E7
	C		2A8
	D		3D8
ZB421	A	EC502 OR	6F8
	B	AND	1F2
	C	AND	SPARE
ZB422	A	EC504 OR (4)	2A6
	B		10B3
	C		6F8
	D		1D5
ZB423	A	EC504 OR (4)	2D7
	B		4F7
	C		3D3
	D		5B4
ZB424	A	EC504 OR (4)	5D4
	B		2E8
	C		7F3
	D		3B3

TABLE D

TROUBLESHOOTING CIRCUIT INDEX — RECEIVER (continued)

1. EDC MODULE "B" (7063WD) (continued)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>		<u>WD Location</u>
ZB425	A	EC383	PA (2)	5D8
	B			2C3
ZB426	A-D	EC504	OR (4)	7C3
ZB427	A-D	EC504	OR (4)	7E3
ZB428	A	TB186	TP149186	6B4
	B			7D8
	C			5F7
	D			1B3
ZB503	A	EC503	AND (4)	8D7
	B			8D8
	C			1E2
	D			5C7
ZB504		EC589	OS (200us)	2E6
ZB505		EC584	OS (70ms)	5E7
ZB506	A	EC581	PA	1C3
	B			3E1
ZB507		EC441	IPS	3F1
ZB508	A-D	EC504	OR (4)	5E5
ZB509	A-D	EC504	OR (4)	1B2
ZB510		EC457	OS (2ms)	8A4
ZB511	A	EC503	AND (4)	8A7
	B			2C5
	C			6F4
	D			SPARE
ZB512	A	EC356	INH (4)	6B7
	B			3B2
	C			7D3
	D			6F5
ZB513	A	EC348	Pulse Inhibit (2)	3C3
	B			2F4
ZB514	A	EC426	AND (2)	6C6
ZB613	A			SPARE
	B			6B3
ZB614		EC428	FILTER	6C3
ZB614		EC441	IPS	6F1
				5F8

2. MODULE "D" RECEIVING DISTRIBUTOR AND PUNCH DRIVER (7412WD)

<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>		<u>WD Location</u>
ZD104	A	EC101	IPS (500us)	2F3
	B		INV	2F4
ZD105		EC119	FF	2B6
ZD106		EC364	PA	2B6
ZD107		EC406	OSC	2B5
ZD109		EC516	PP	5B6
ZD110		EC428	FILTER	6E6
ZD111		EC382	SIG DELAY (50us)	2A7

TABLE D

TROUBLESHOOTING CIRCUIT INDEX — RECEIVER (continued)

2. MODULE "D" RECEIVING DISTRIBUTOR AND PUNCH DRIVER (7412WD) (continued)						
<u>Position</u>	<u>Circuit</u>	<u>Type Card</u>		<u>WD Location</u>		
ZD202	A & L	EC693	PA	2C8		
	B & M		PA	2C8		
	C		POR	2D5		
	D		INV	2B3		
	E		INV	2B8		
	F & G		INV-EF	2F7		
	K		EF	2E3		
	H & J		INV-EF	2E7		
	ZD203		A	EC684	AND	2D4
			B		OR	2B5
C		OR	2F6			
D		OR	2E6			
E		OR	2E3			
F		AND	2C6			
G		OR	2F3			
H		OR	SPARE			
ZD204	A	EC671	FF	2C4		
	B			2F5		
	C			3C3		
ZD205	A	EC671	FF (3)	3C3		
	B			3C4		
	C			3C4		
ZD206	A	EC671	FF (3)	3C5		
	B			3C6		
	C			3C6		
ZD207	A	EC671	FF (3)	3C7		
	B			3C8		
	C			3C8		
ZD208	A-R	EC606	EF (15)	3E3-8		
ZD209		EC680	Vert Parity Only	4B3		
ZD210	A-D	EC681	Vert Parity Only	4C5		
	F		PA	4F5		
	G		FAN-OUT	4E7		
ZD211	A-C	EC675	CONTROL	5A5		
ZD212		EC730	DRIVER Level 1	5D8		
ZD213		EC730	DRIVER 2	5D7		
ZD214		EC730	DRIVER 3	5D6		
ZD215		EC730	DRIVER 4	5D6		
ZD216		EC730	DRIVER 5	5D5		
ZD217		EC730	DRIVER 6	5D4		
ZD218		EC730	DRIVER 7	5D3		
ZD219		EC730	DRIVER 8	5D3		
ZD220		EC730	DRIVER FEED	5D2		
	Magnet Coil Circuit 1-8, FEED			5F6		
	Light Sensor 1-9			6B1		
	Clutch Magnet			6E1		
	Tape Lid Switch			6F1		
	Power Supply PSD428			6C6		
	Level Selector Switch (SWD1)					
	Front CKT A			6B1		
	Front CKT C			4D5		
	Baud Switch (SWD103)			2B7		

TABLE D

TROUBLESHOOTING CIRCUIT INDEX — RECEIVER (continued)

3. MODULE "H" RECEIVER STATION CONTROL (7406WD)

<u>Position</u>	<u>Circuit</u>		<u>Type Card</u>	<u>WD Location</u>
ZH1	A	EC695	P/N	2E5
	B		P/N	2F5
	C		P/N	2B4
	D		OR	2B5
	E		OR	SPARE
	F		RD	2C5
	G		RD	2D4
	H		P/N P/P	2F5
	J		OR	2A5
	K		N/P OR	2A5

RELAYS

DSR	Data Set Ready			2E6
CD	Carrier Detect			2C6
FL	Flasher			3C3
MS	Motor Start			3D3
ST	Stop			3E3
HO	Hold			3E2
AL	Alarm			3E7
LT	Low Tape			3C7
DT	Delay Time			3D7
AC	AC Power			1E5

4. GENERAL

	<u>Module and Schematic</u>	<u>WD Location</u>
HISPUC Power Supply	6405WD	
Multivoltage Power Supply	7058WD	
Back-Up Motor (Schematic 6989WD)	(Actual WD) R-6990WD	1D6
Tape Winder Motor		1C3
Low Tape Mercury Switch		1A5
Light Source - Fuse		1E8
Light Source - Transformer		1D8
Light Source - Lamp		1C6
Chad and Tape Puller Motor		1D3

DRPE ASSEMBLY

Magnet Coils (Schematic 7565WD)	(Actual WD) M-7558WD	1B6
Feed Motor		1E3
Puller Motor		1E4
Tape Lid Switch		1E7
Bi-Directional Switch Assembly		1D6

TABLE E
DATA SET 202C — STRAPPING OPTIONS

The strapping options listed below are needed to provide proper operation of the data set interfaced with the Type 4 terminals.		
Feature or Option	Wiring Option	Strap Terminals on TB2
Automatic Answering Feature (Permanent-Voltage Interface)	Q	59-60
Bit Rate (Greater than 900 bits/sec.)	ZB	15-16
Amplitude Equalizer (IN)	F	18-19
Delay Equalizer (IN)	B	61-62, 64-65
Interface (EIA)	N	1-2, 4-5, 6-7, 8-9
Squelch (IN)	R	46-47
Demodulator Clamp (ON)	V	20-21
2-Wire Operation	Z	27-28, 31-32, 33-34, 35-36, 38-39, 41-42, 53-54, 56-57
900 Ohm Termination	W	43-44
Data Transmit Levels (-6 dbm)	H	22-23
Reverse Channel (IN)	T	1-2, 6-7 (On Terminal Board TB3)
Reverse Channel Transmit Level (-6 dbm)	ZG	White Lead to 2 (On Terminal Board TB4)

TABLE F
CHECK CHARACTERS (Test Tape TP303069)

Levels	8	7	6	5
Block 1 Prime				
CK1	278	278	278	1278
CK2	278	167	125	1245
Block 2 Prime				
CK1	13456	134568	1345678	1345678
CK2	24678	1578	12678	145
Block 3 Prime				
CK1	123578	123578	123578	123578
CK2	3456	5678	1457	124578
Block 1				
CK1	358	358	3578	13578
CK2	345	137	4567	367
Block 2				
CK1	23456	234568	2345678	12345678
CK2	678	124578	14678	15
Block 3				
CK1	3578	3578	3578	13578
CK2	46	3678	1347	12478

TABLE G

DATA SET INTERFACE LEAD DESCRIPTION AND DESIGNATION

Pin No.	Lead and Function	Designation
1	Protective Ground — common to signal and ac power service ground.	AA
2	Transmitted Data — customer data presented to data set.	BA
3	Received Data — data output presented to business machine.	BB
4	Request to Send — when business machine places this lead in ON condition, data set is placed in transmit condition. When placed in OFF condition, data set is placed in receive condition.	CA
5	Clear to Send — signals business machine that data may be transmitted.	CB
6	Data Set Ready — signals business machine when data set is in the data mode.	CC
7	Signal Ground — common to frame ground and ac power service ground.	AB
8	Data Carrier Detector — signals business machine data carrier is being received.	CF
9	+ Voltage — (+18 volts) power supply (telephone company use only)	+ P
10	- Voltage — (-18 volts) power supply (telephone company use only)	- P
11*	Supervisory Transmitted Data — provides means of transmitting low-speed coordinating signals to data transmitting end of connection.	SA
12*	Supervisory Received Data — provides means of receiving low-speed coordinating signals and circuit assurance signal.	SB
19†	Remote Release — when opened by business machine terminates call. Must be connected to CD lead for data set to go to data mode.	RR
20	Data Terminal Ready — business machine applies an ON condition for auto answer and allows data set to go to data mode. An OFF condition disconnects data set from line.	CD
21†	Ready — is closed to CD lead by business machine when automatic answering of incoming calls is desired.	RY
22	Ring Indicator 1 — signals business machine that an incoming call is being received.	CE
23†	Ring Indicator 2 — signals business machine that an incoming call is being received.	RI2

* Sets equipped with and wired for reverse channel (option T).

† For data set 202A/B type interface option only (option M).

TP302748 WIRING
FIELD ASSEMBLY
(ASSEMBLY K)
ACTUAL 7072WD

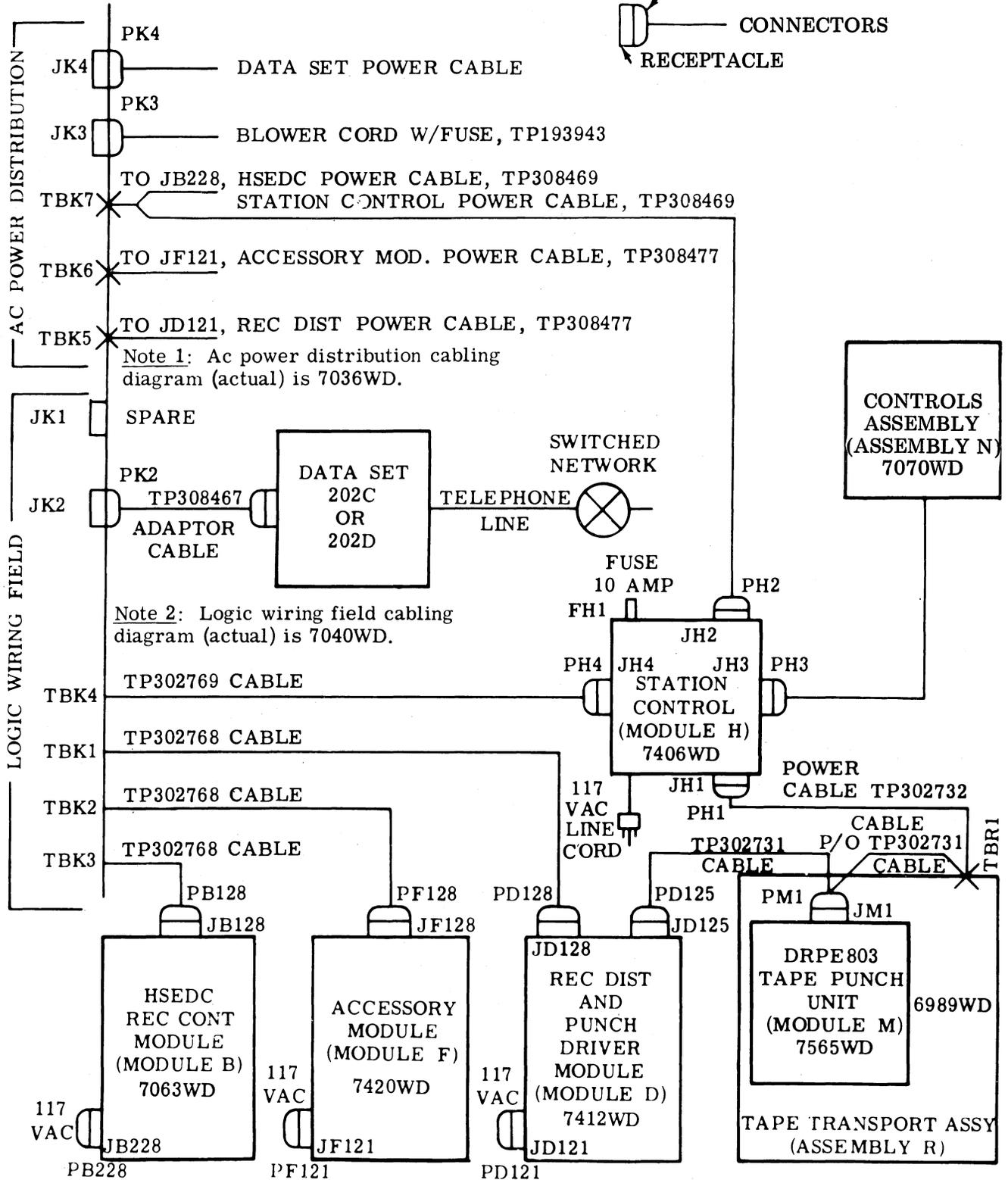
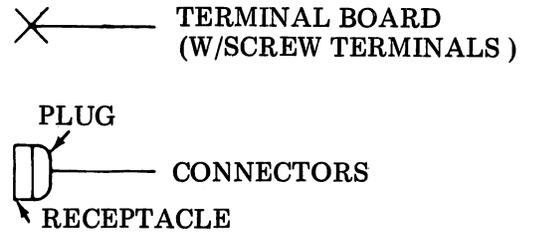


Figure 6 - Receiver Cabling and Schematic Wiring Diagram Reference Numbers

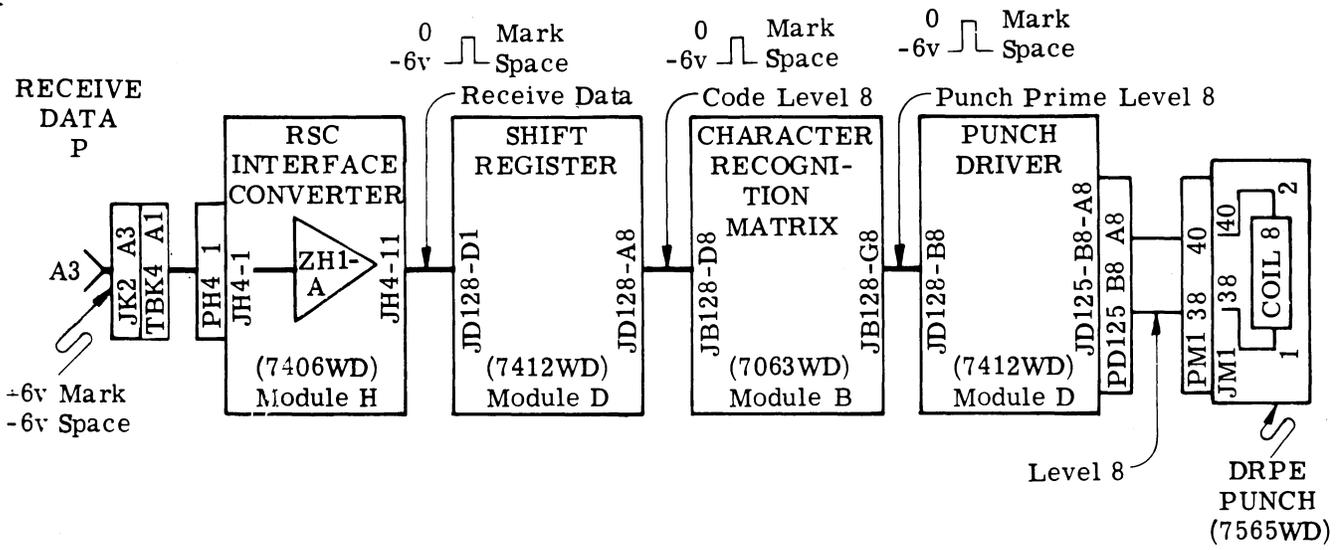


Figure 7 - Receiver Pulse Path Signal

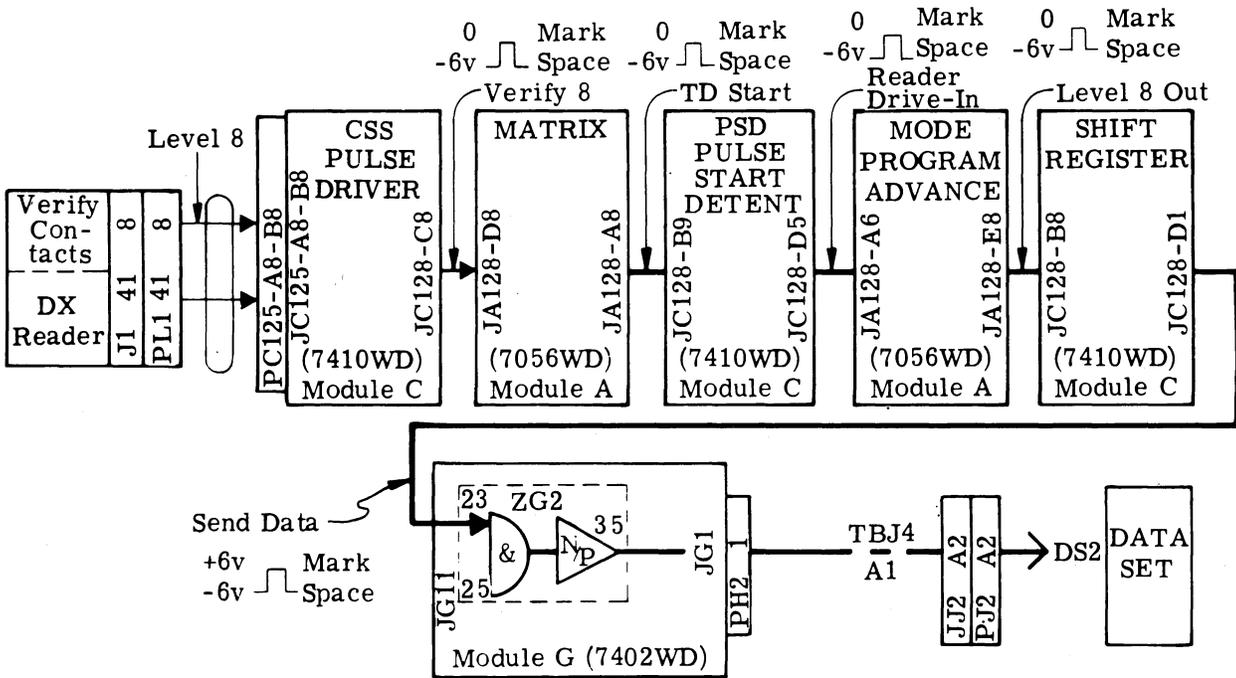


Figure 8 - Sender Pulse Path Signal

4. INTERFACE ELECTRICAL CHARACTERISTICS

4.01 Data Sets 202C and 202D conform to the electrical characteristics contained in RS-232-A and will work with business machines that also conform to that specification. These characteristics are briefly outlined in the following paragraphs.

4.02 The maximum open-circuit voltage to either Protective Ground on any interchange circuit does not exceed 25 volts, and the maximum short-circuit current flow between any two conductors (including grounds) does not exceed one-half ampere.

4.03 All circuitry used to generate signal voltages on interchange circuits are designed so that no damage will be caused by either an open circuit condition or a short-circuit to either Protective Ground or Signal Ground. All circuitry used to receive signals from interchange circuits is designed for continuous operation with any input signal within the maximum voltage limits.

4.04 For Transmitted Data and Received Data, the signal is considered in the marking condition when the voltage on the circuit is more negative than minus three volts with respect to Signal Ground, and the signal is considered in the spacing condition when the voltage is more positive than plus three volts with respect to Signal Ground. During transmission of data, the marking condition is used to denote the binary state ONE (eg, hole punched in paper tape), and the spacing condition is used to denote the binary state ZERO. Note that marking is the normal condition on a data circuit when no signals are present.

4.05 Summary of Data Circuit Interface Terms

Binary State	ONE	ZERO
Signal Condition	Marking	Spacing
Voltage	Negative	Positive
Paper Tape	Hole	No Hole

For all control circuits the control function is considered ON when the voltage on the circuit

is more positive than plus three volts with respect to Signal Ground, and is considered OFF when the voltage on the circuit is more negative than minus three volts with respect to Signal Ground.

4.06 Summary of Control Circuit Interface Terms

Control Function	OFF	ON
Voltage	Negative	Positive

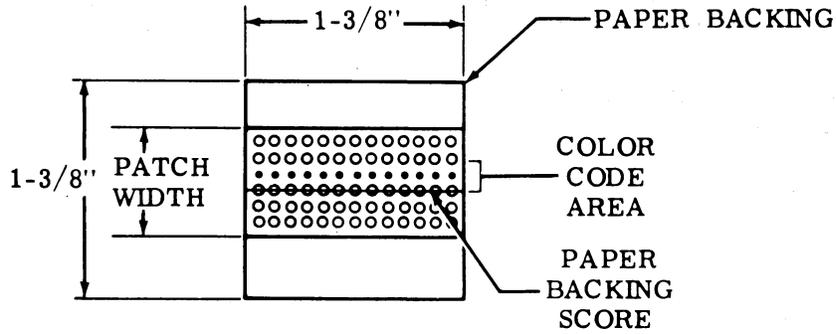
4.07 The operation of the circuitry that receives signals from an interchange circuit is dependent only on the signal voltage, and is, therefore, insensitive to the rise time, fall time, presence of signal overshoot, etc. The design of this circuitry minimizes the effects of any circuit time constants which would delay the circuit response, thus introducing time distortion in the signals.

4.08 The terminating impedance of the receiving end of interchange circuits has a dc resistance of not less than 3000 ohms, and the voltage in open-circuited condition does not exceed two volts.

4.09 The source impedance of the sending end of interchange circuits is not specified.

4.10 For data circuits (Transmitted Data and Received Data), neither the rise time nor the fall time, through the six-volt range in which the signal condition is not defined, exceeds three percent of the nominal duration of a signal element. The circuitry used to generate a signal voltage on an interchange circuit meets this specification with any receiving termination which complies with 4.08.

4.11 In some applications, it may be necessary for fail-safe operation to detect either the power-off condition in the data set or the disconnection of the interconnecting cable. Request to Send, and Data Set Ready may be used for this purpose. The power-off source impedance of the sending end of these circuits is not less than 300 ohms, measured at an applied voltage not greater than plus or minus two volts referenced to Signal Ground.



TYPICAL PATCH

CODE LEVELS	FEED HOLES	PATCH WIDTH	COLOR CODE	CATALOG DESIGNA.	TELETYPE PART NO.
ALL					TP317324
5	IN LINE	11/16	BLUE	5 CHANNEL	TP317325
6	ADVANCED	7/8	RED	6 CHANNEL	TP317326
7	IN LINE	7/8	LAVENDER	7 CHANNEL	TP317327
8	IN LINE	1"	GREEN	8 CHANNEL	TP317328

Note 1: Fully punched pressure sensitive splicing patch for oiled fully perforated paper and mylar tapes.

Note 2: Two-piece removable paper backing.

Note 3: To be used with TP317212 tape splicer.

Figure 9 - Tape Splicing Patches

5. ATTACHMENT INDEX

TITLE	DIAGRAM INDEX
Wiring Field Assembly	302748
Wiring Field Assembly	302788
Test Tape	303069

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.

WIRING FIELD ASSEMBLY

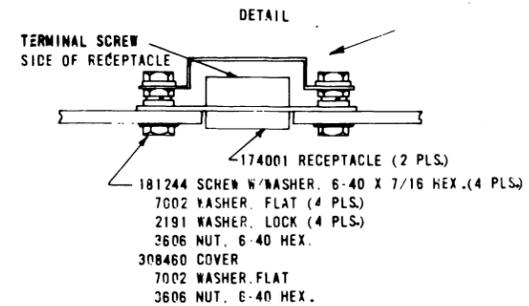
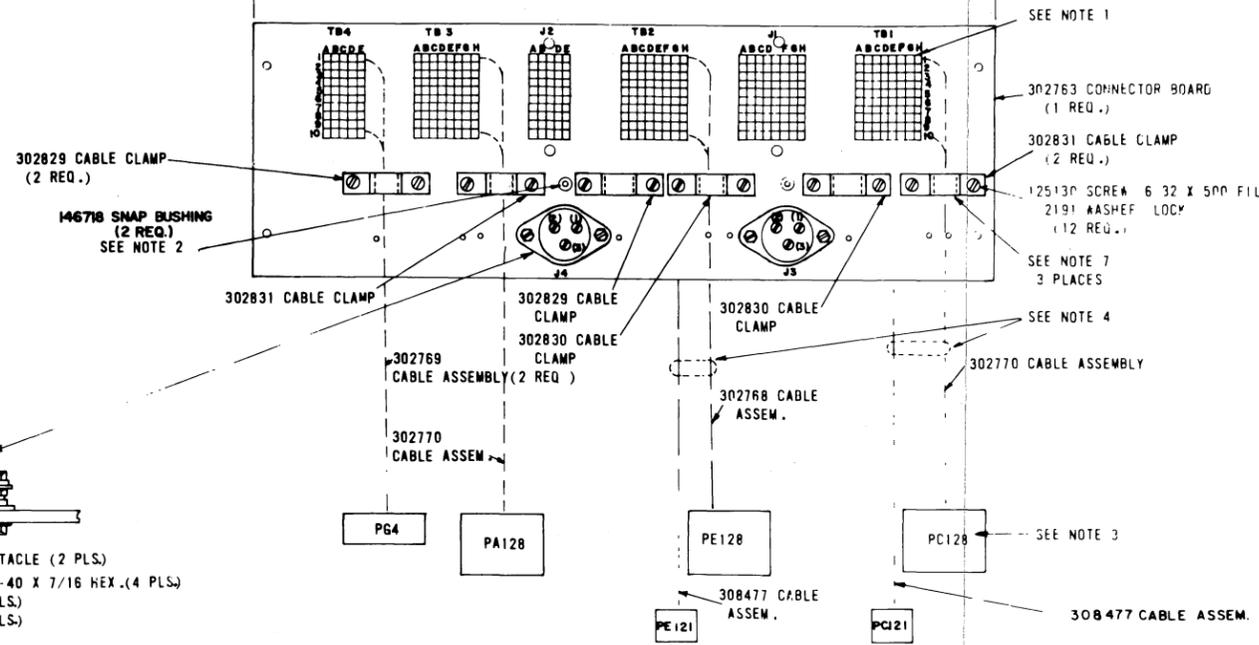
302788

NO B/M

RUNNING LIST			
FROM	TO	COLOR	DEC FEET
308477 CABLE ASSEM. PC121			
CABLE	TB5-2	BK	
CABLE	TB5-4	W	
CABLE	FR. GRD.	G	
31770 RM 18 GA. WIRE			
TB5-2	J3-(1)	BK*	1.00
J3(1)	TB6-(1)	BK*	1.00
TB6-2	J4-(1)	BK*	1.00
J4(1)	TB7-1	BK*	1.00
31771RM 18 GA. WIRE			
TB5-4	J3-(2)	W*	1.00
J3-(2)	TB6-3	W*	1.00
TB6-4	J4-(2)	W*	1.00
J4-(2)	TB7-3	W*	1.00
308477 CABLE ASSEMBLY PE121			
CABLE	TB6-2	BK	
CABLE	TB6-4	W	
CABLE	FR. GRD.	G	

SEE NOTE 8

150966 INSULATOR (6 REQ.)
 151335 STUD (6 REQ.)
 151415 BLOCK TERMINAL (3 REQ.)
 111017 SCREW, 6-40 X 5/16 FIL. (12 REQ.)
 151416 NUT #6-40 HEX. (12 REQ.)
 151827 JUMPER STRAP (6 REQ.)
 151657 SCREW 6-40 X 1/4 FIL. (6 REQ.)
 2191 WASHER LOCK (6 REQ.)
 151630 SCREW 6-40 X 1/4 HEX. (3 REQ.)
 107116 WASHER STAR (3 REQ.)



TB4
302769 CABLE ASSEMBLY

	A	B	C	D	E
1	BL-W	BL-R	BL-BK	BL-Y	BL-P
2	W-BL	R-BL	BK-BL	Y-BL	P-BL
3	O-W	O-R	O-BK	O-Y	O-P
4	W-G	R-O	BK-O	Y-O	P-O
5	G-W	G-R	G-BK	G-Y	G-P
6	W-G	R-G	BK-G	Y-G	P-G
7	BR-W	BR-R	BR-BK	BR-Y	BR-P
8	W-BR	R-BR	BK-BR	Y-BR	P-BR
9	S-W	S-R	S-BK	S-Y	S-P
10	W-S	R-S	BK-S	Y-S	P-S

TB2
302770 CABLE ASSEMBLY

	A	B	C	D	E	F	G	H
1	W	BK	R	BR	BK	Y	BR	W-Y
2	BK	W	BR	R-G	W-BK	W-BR	W-O	G-BL
3	BR	W	R	R-BL	W-BK	W-BR	W-O	G-P
4	R	W	O	R-P	W-BK	W-R	W-O	P
5	O	W	Y	R-S	W-BK	W-R	W-O	S
6	Y	W	G	BK-O	W-BR	W-R	W-O	P
7	G	W	BL	BK-Y	W-BR	W-R	W-O	S
8	BL	W	P	W-BR	W-R	W-O	W-BL	BL
9	P	W	S	W-BR	W-R	W-O	W-P	P
10	S	R	BK	W-BR	W-R	W-O	W-S	S

SEE NOTE 5

SEE NOTE 6

TB2
302768 CABLE ASSEMBLY

	A	B	C	D	E	F	G	H
1	BL-W	BL-R	BL-BK	BL-Y	BL-P	BL-W	BL-R	BL-BK
2	W-BL	R-BL	BK-BL	Y-BL	P-BL	W-BL	R-BL	BK-BL
3	O-W	O-R	O-BK	O-Y	O-P	O-W	O-R	O-BK
4	W-O	R-O	BK-O	Y-O	P-O	W-O	R-O	BK-O
5	G-W	G-R	G-BK	G-Y	G-P	G-W	G-R	G-BK
6	W-G	R-G	BK-G	Y-G	P-G	W-G	R-G	BK-G
7	BR-W	BR-R	BR-BK	BR-Y	BR-P	BR-W	BR-R	BR-BK
8	W-BR	R-BR	BK-BR	Y-BR	P-BR	W-BR	R-BR	BK-BR
9	S-W	S-R	S-BK	S-Y	S-P	S-W	S-R	S-BK
10	W-S	R-S	BK-S	Y-S	P-S	W-S	R-S	BK-S

SEE NOTE 5

- NOTES
- 1 INSERT TERMINAL 17478E SUPPLIED WITH CABLE ASSEMBLY. (290 PLS.)
 - 2 USE SNAP BUSHING HOLES FOR 18 GA. SURFACE WIRING. (2 PLS.)
 - 3 RUBBER STAMP ALL CHARACTERS .125 HIGH ON CONNECTOR SHELLS USING WHITE INK. (TYPICAL 6 PLS.)
 - 4 TIE WITH 7880RM TWINE EVERY 10 INCHES.
 - 5 ASTERISK DENOTES 18 GA. WIRE.
 - 6 DOT DENOTES CONDUCTORS IN BUNDLE BOUND WITH ORANGE WRAP.
 - 7 WRAP WITH SUITABLE TAPE TO PROVIDE ADEQUATE CLAMPING WHEN NECESSARY. (4 PLS.)
 - 8 ASSEMBLE 72597RM TERMINALS (16 PLS.). TWO PER WIRE ON 18 AWG. WIRE, BOTH ENDS.

SCALE	DATE	STOCK SPECIFICATION
G.J.M. 2-96-134 184A	2-20-65	SIZE
G.J.M. LSK		TEMPER

APPROVALS	
DESIGNED	CHECKED
DRAWN	APPROVED
302788	
TELETYPE CORPORATION	
302788	

ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

TEST TAPE

303069

CHAR NO	CODE LEVEL							
	1	2	3	4	5	6	7	8
1	1	2	3	4	5	6	7	8
2	1	2	3	4	5	6	7	8
3	1	2	3	4	5	6	7	8
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9	1	2	3	4	5	6	7	8
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11	1							
12	1							
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28	1							
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33		2	3	4	5	6	7	8
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35	1							
36	1							
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45			2					
46	1							
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69	1	3	5	7				
70	2	4	6	8				

CHAR NO	CODE LEVEL							
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129	2							
130	1							
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140	1	3	5	7				

CHAR NO.	CODE LEVEL							
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209	2							
210	1		4					

CHAR NO.	CODE LEVEL							
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237	1	3	5	7				