

“DATASPEED*” TAPE-TO-TAPE SYSTEM

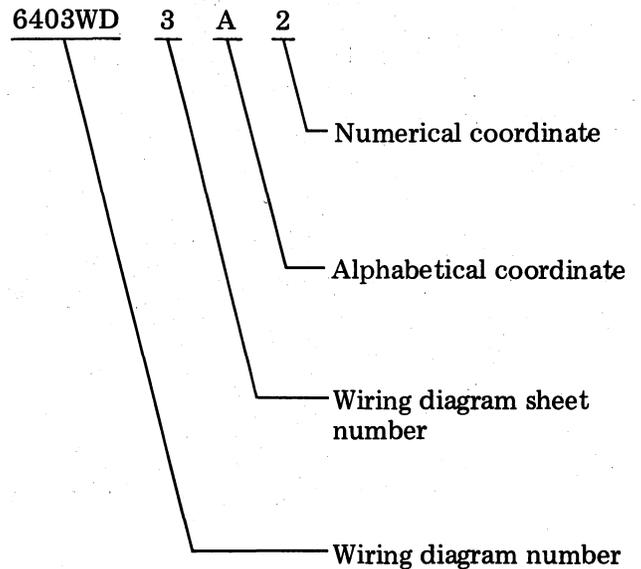
TAPE RECEIVER 5B

TROUBLESHOOTING

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the troubleshooting table. The following TCNs have been included in this issue: 1316, 1629, and 1636. Because of the extensive changes, marginal arrows normally used to indicate change have been omitted. This section was formerly 592-808-300.

1.02 General description and operation information, installation procedures, and adjustment and lubrication information are found in Sections 582-102-120, 582-102-220, and 582-102-720 respectively. The circuit descriptions in this section are referenced to schematic diagrams shipped with the set. The circuit elements on these diagrams relate to the text and may be located as follows:



1. GENERAL

1.01 This section provides troubleshooting procedures for DATASPEED Tape Receiver 5B. It is reissued to expand the text, and

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2. EQUIPMENT REQUIRED

2.01 Aside from standard hand tools, most troubleshooting is done with a volt-ohm-milliammeter. Punch driver card adjustments (Section 582-102-720) require an oscilloscope. These cards however, will seldom (if ever) need readjustment.

3. TROUBLESHOOTING

CAUTION: DISCONNECT ALL POWER BEFORE REMOVING ANY ASSEMBLIES OR COVERS FROM THE PUNCH OR ANY OTHER APPARATUS UNIT.

GENERAL

3.01 Check for and attempt to clear possible cause of trouble. To avoid recurrence, it may be necessary to replace modules, punch unit, power supply or motors as required to restore normal operation as soon as possible. After service is restored, the defective component can be repaired, adjusted, and tested in a more suitable environment.

3.02 If the type and cause of a trouble are known, refer to Tables B, C, and D. The following paragraphs are to isolate the unknown problem area. For extra feature apparatus unit service arrangements and wiring option tables, see Section 582-102-220.

Note: On all station visits, use a tape gauge to check for accurate hole spacing and alignment. Also check operation of the low tape and flashing power lamp. Inspect the chad chute for excessive chad near the punch block.

TAPE PUNCH

3.03 This section deals primarily with Tape Receiver 5B electronic components. For information on the tape punch, refer to Section 582-101-105 and for adjustment information refer to Section 582-101-705.

CABINET

3.04 Cabinet repair, lubrication and adjustment information is found in Section 582-102-720.

TAPE RECEIVER 5B CIRCUITS

A. General

3.05 Circuits associated with the receiver and its module are divided into six groups:

- Control circuits
- Timing pulse circuit
- Alarm circuits
- Punch driver circuits
- Power supply circuits
- Cabinet circuits

(a) Unusual troubles that are not found in Table C or in these circuit descriptions may be cleared by reference to Section 582-102-120, where circuit details are discussed. An interconnecting block diagram (Figure 1), a control circuit diagram (Figure 2), and an interface diagram (Figure 3) are included in this section for the convenience of the serviceman. Also included are trouble sources, and general information that may otherwise be difficult to obtain.

(b) The test center test of the receiver consists of sending test patterns from the data set test set while the data set is in the data mode. These patterns should be punched as alternating all-mark and all-space characters for at least 30 seconds.

(c) Data reception or use of test center signals is the most satisfactory test of overall receiver operation. The BLANKS F.O. (feed-out) and ALL F.O. (feed-out) provide testing for the punch and driver circuits. With no received carrier, the control circuits can be checked by placing the data set in the data mode, waiting a few seconds, and manually operating and releasing the CN relay. The RC relay should operate when the CN relay operates and remain operated even after the CN relay is released. This should cause the signal lamp to light, and the auxiliary signal circuit to close.

B. Data Set Interface

3.06 A brief description of each interface pin connected to data set 402D is given in Table A. This includes pin numbers, lead designations, and function of lead designations.

C. Control Circuits (Figure 2)

3.07 The control circuits associated with data set 402D interface-contact control arrangements must function as follows when used as part of a receive-only terminal or an unattended send-receive terminal.

Interlock Circuit

3.08 Interlock, IK lead to data set pin 13.

(a) The data set grounds this lead immediately after it transmits a 2025 Hz tone signal and goes to data mode (indicated by lighted data lamp). Unless the carrier is being received from a 402C type data set (to operate carrier-on relay CN), the IK lead will

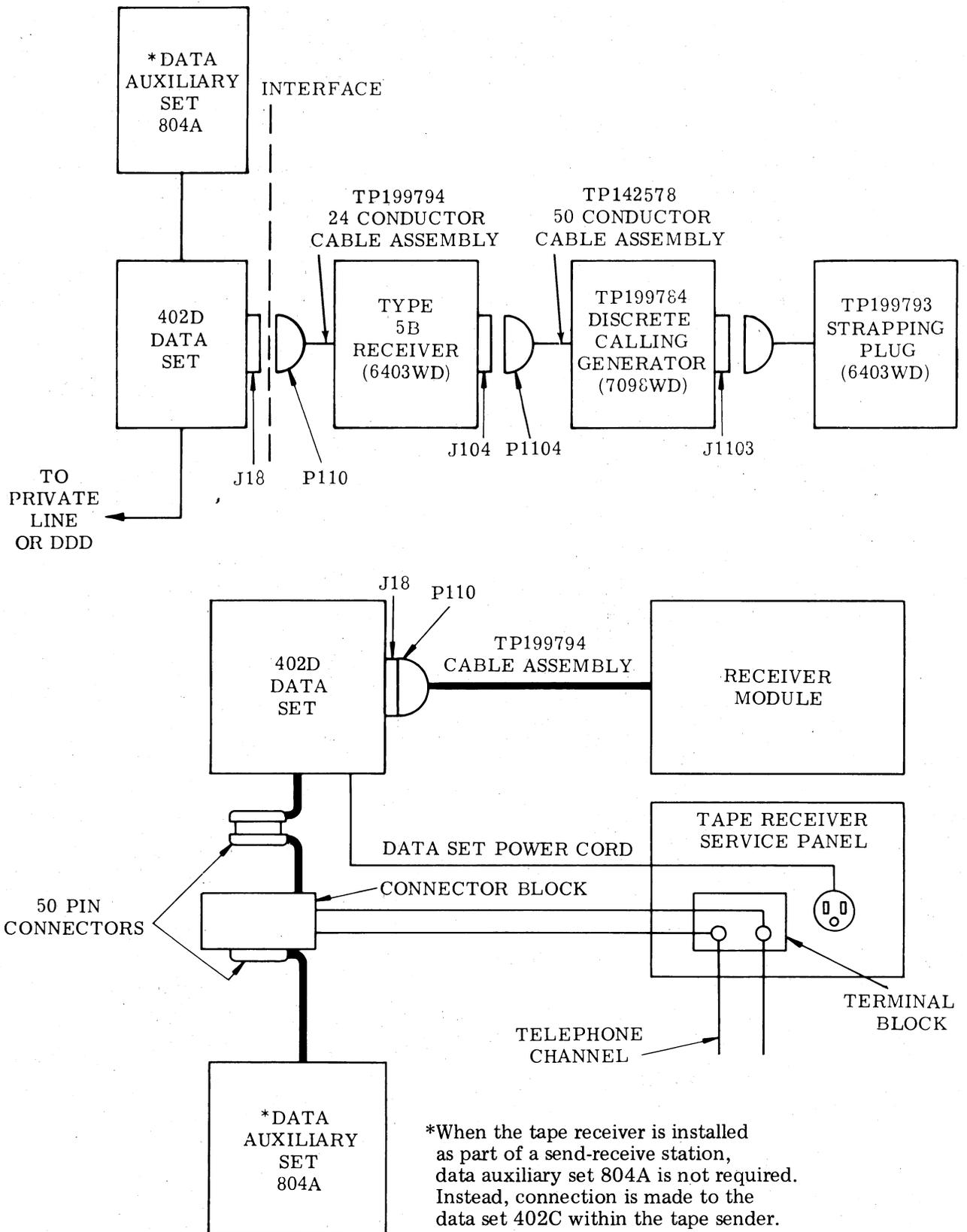


Figure 1 - Interconnecting Diagram for Receive-Only Terminal with Discrete Calling Feature

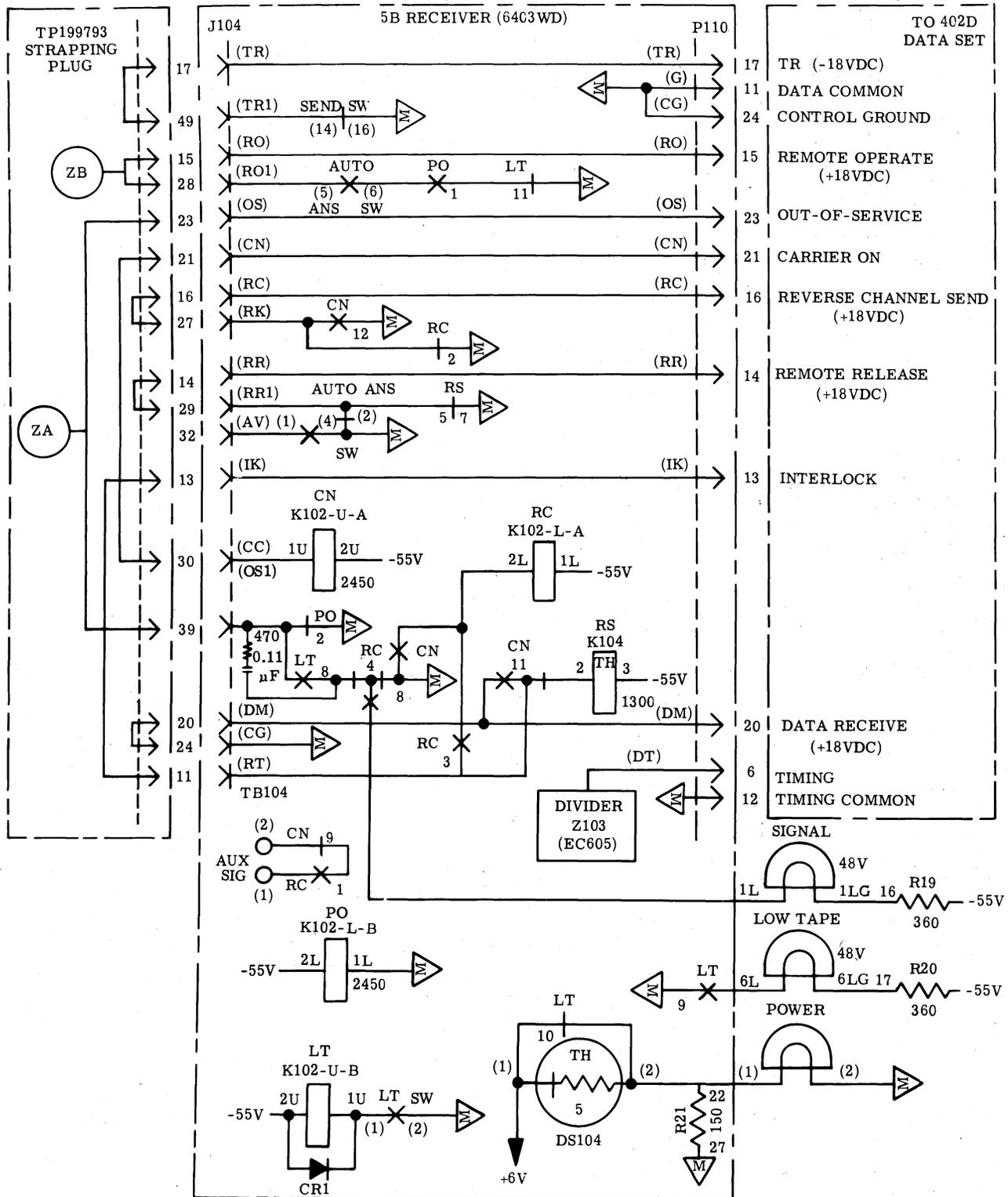


Figure 2 - Tape Receiver 5B, Receive-Only Terminal Control Circuits

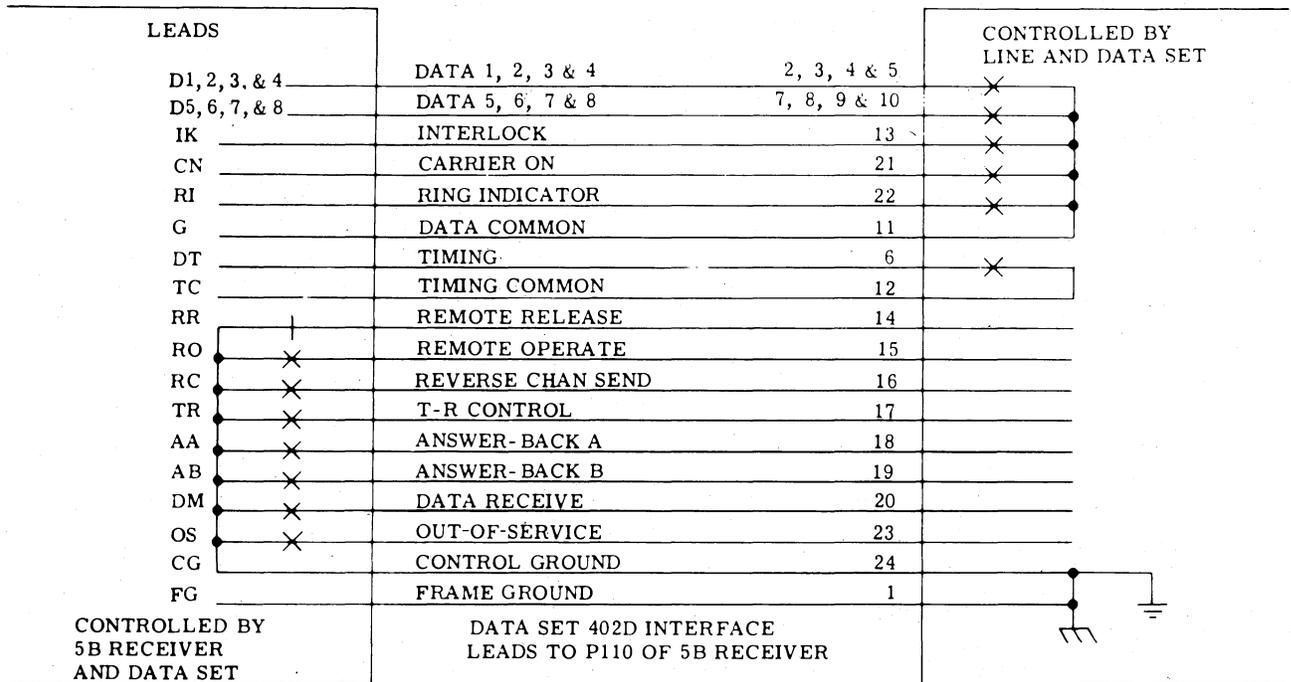


Figure 3 - Typical Interface — Contact Control Arrangements at Data Set

operate thermal relay RS and drop the call in 30 seconds (if AUTO ANS is on) by removing ground from pin 14 of data set 402D. During the 30-second delay of relay RS, the IK lead holds reverse channel relay RC operated if it had been previously operated by relay CN.

(b) If the IK lead to ground is open, the receiver will not automatically terminate the call in 30 seconds when received carrier stops. Nor will it hold the reverse channel send signal on the line for 30 seconds after the received carrier stops. When data set 402D is not in the data mode, the 387 Hz reverse channel transmitter is disabled.

(c) In an unattended send-receive terminal, the IK circuit becomes part of the control circuits in the unattended send-receive apparatus unit and the recognizer apparatus unit. Its use is explained in Sections 582-102-122 and 582-102-116 respectively.

Data Receive Mode Circuit

3.09 Data Mode, DM lead to data set pin 20.

(a) This lead must be permanently grounded by the receiver to receive data through strapping plug TP199793. It also serves as a permanent ground for the data set Control Ground, CG lead pin 24.

(b) If the DM ground lead to pin 20 of the data set is open, the receiver will not receive data.

(c) If an extra feature apparatus unit is used, the lead to pin 20 must be opened for the receiver to transmit identification signals (over answer-back AA lead) or answer-back signals.

Transmit-Receive Circuit

3.10 TR Control, TR lead to data set pin 17.

(a) This lead must be grounded by the receiver to keep the 402D data set and receiver on line. It is opened only by the

TABLE A

INTERFACE OF 402D RECEIVING DATA SET

Pin No.	Lead	Function
1	Frame Ground	Common to signal and ac power service ground.
2	Data 1	Indicates whether corresponding channel is mark (closed) or space (open).
3	Data 2	
4	Data 3	
5	Data 4	
6	Timing	Closes to timing common for 5 ms for each character.
7	Data 5	Indicates whether corresponding channel is mark (closed) or space (open).
8	Data 6	
9	Data 7	
10	Data 8	
11	Data Common	Common lead for closing data leads.
12	Timing Common	Common lead for closing timing lead.
13	Interlock	Signals 5B Receiver when data set is in data mode.
14	Remote Release	Opened from control ground 5B Receiver when AUTO ANS key is operated to terminate call.
15	Remote Operate	Closed to control ground by 5B Receiver for unattended answer feature.
16	Reverse Channel Send	Closed to control ground by 5B Receiver to cause reverse channel to transmit (option).
17	TR Control	Controls transmit or receive condition at transmit-receive terminals using unattended send-receive apparatus unit feature.
18	Answer-Back A	Operated to transmit corresponding answer-back for discrete calling and/or unattended send-receive feature service.
19	Answer-Back B	
20	Data Receive	Grounded by 5B Receiver to receive data, opened to transmit answer-back.
21	Carrier On	Closes to data common to indicate a signal is being received from a remote 402-type transmitter.
22	Ring Indicator	Indicates presence of ringing current to 5B Receiver on incoming call.
23	Out-of-Service	Enables line to be made busy when equipment is out of service.
24	Control Ground	Common with frame ground.
25		Not used.

receiver SEND switch or by an unattended send-receive apparatus unit to place data set 402C and sender on line at a send-receive terminal. With the SEND switch unoperated, it is permanently grounded through strapping plug TP199793 to receiver module ground.

(b) If the TR lead is not grounded, the receiving data set will not be on-line to receive data.

(c) Under certain conditions, the TR lead may be grounded outside the receiver at a receive-only terminal. At this type of station, manual control and telephone service are supplied by auxiliary data set 804A and data set 402D.

(d) At a send-receive terminal, manual control and telephone service is supplied by data set 402C associated with the sender.

Remote Release Circuit

3.11 Remote Release, RR lead to data set pin 14.

(a) This lead must be grounded through strapping plug TP199793 to receiver module ground to keep the on line data set in the data receive mode. It is grounded through the AUTO ANS switch when this switch is unoperated and/or it is grounded through the 30-second delay thermal relay RS when this relay is unoperated.

(b) When the RR ground to the data set is opened, the data set terminates the call. When the remote sender stops transmission of carrier, the receiver CN lead opens a ground path to and releases the CN relay which then energizes the RS relay. The RS relay operates 30 seconds later to open the RR ground lead. If the RR ground lead is opened too soon, the message will be interrupted.

(c) In an unattended send-receive terminal this RR lead becomes part of the automatic disconnect circuits in the unattended send-receive apparatus unit and in the recognizer apparatus unit. Sections 582-102-122 and 582-102-116 respectively cover these two extra feature apparatus units, and explain the use of the RR lead.

Remote Operate Circuit

3.12 Remote Operate, RO lead to data set pin 15.

(a) This lead must be grounded in the receiver for unattended answering service by the receiving data set. The RO lead is grounded through the ZB wiring option of strapping plug TP199793, the operated AUTO ANS switch, contact 1 of operated power-on relay PO, and contact 11 of unoperated low-tape relay LT to module ground in the receiver. Automatic answering is thereby prevented if low tape and/or power off conditions exist, even though AUTO ANS is operated.

(b) Data set 402D will not answer incoming calls automatically unless its RO lead to pin 15 is grounded.

(c) In an unattended send-receive terminal the receiver RR lead is connected to the sender RR lead and has an alternate path to ground in the recognizer if the sender has tape and is arranged for unattended answering (AUTO ANS operated). The unattended send-receive apparatus unit (Section 582-102-122) and the recognizer apparatus unit (Section 582-102-116) explain use of RO leads for this type of service.

Reverse Channel Send Circuit

3.13 Reverse Channel Send, RC lead to data set pin 16.

(a) This lead must be grounded by the receiver for data set 402D to transmit a 387 Hz reverse channel signal over the line. It is grounded through strapping plug TP199793, contact 2 of unoperated relay RC, or contact 12 of operated relay CN to module ground in the receiver. When relay CN operates, it also operates relay RC, leaving RC ground lead dependent on contact 12 of relay CN.

(b) The data set will not transmit reverse channel signal while this RC lead ground path is open. A remote sender that is wired for reverse channel operation will immediately stop transmission and light a signal lamp when the reverse channel signal stops.

(c) In a send-receive terminal the reverse channel send circuit functions in the same manner and is independent, except for wiring, of any circuits in the extra feature apparatus units or sender.

Carrier on Circuit

3.14 Carrier On, CN lead to data set pin 21.

(a) This lead must be grounded by the data set to keep the set on the line when the AUTO ANS is operated, and to transmit reverse channel (circuit assurance and break feature) signal and to setup the aux sig and signal lamp circuits for end of message indication. The CN lead is grounded by the data set 30 ms after it receives an all-space signal from a remote sending terminal. The data set then continues to hold ground on the CN lead until received mark and space carrier signal ceases on either channel 7, or channel 4, or channel 2, indicating end of remote send terminal transmission. This CN ground is applied through the TP199793 strapping plug, carrier on (CN) relay coil to -55 v in the receiver and operates the CN relay. Operated CN relay contacts in the circuit function as follows:

(1) Contact 11 opens the data set interlock ground path to 30-second RS relay, preventing the RS relay from operating and opening the receiver ground path through TP199793 strapping plug to data set remote release, thereby terminating (hanging up) the call while the remote sender is transmitting carrier.

(2) Contact 12 applies receiver ground through TP199793 strapping plug to data set reverse channel send pin 16 to transmit reverse channel if a 402D data set is used and wired for this feature.

(3) Contact 8 applies ground to coil of, and operates, reverse-channel (RC) relay which then holds itself operated through its own contact 3 and TP199793 strapping plug to data set interlock ground pin 13. When the CN relay is released, this operated RC relay lights the SIGNAL lamp through its contact 4, closes the aux sig circuit through its contact 1 and opens the alternate ground to data set reverse channel send pin 16 through its contact 2 and the TP199793 strapping plug.

(4) Contact 9 of operated CN relay opens the aux sig circuit.

(b) The data set will not stay on the line more than 30 seconds if the CN lead ground path is open with the AUTO ANS key operated. If the CN lead is opened when the RC relay is operated, reverse channel signal transmission will immediately cease, the aux sig circuit will close and the signal lamp will light and remain lighted until the ground path from data set interlock pin 13 is opened.

(c) In a send-receive terminal that is equipped for unattended operation, the CN ground is also applied to the pulse generator-relay drive circuit in the unattended send-receive apparatus unit. This stops cycling of the terminal from send to receive condition and holds the receiving data set on the line in the receive mode. This type of operation is explained in the Section 582-102-122 covering the TP199788 unattended send-receive unit feature.

Out-of-Service Circuit

3.15 Out-of-Service, OS lead to data set pin 23.

(a) The ZA wiring option must be present in the TP199793 strapping plug and this lead must be grounded during an out-of-service condition due to low tape or power failure, to cause the 402D data set to appear busy to the remote calling terminal. The ZA wiring should normally be removed except for service such as incoming-only lines of rotary hunting groups where the out-of-service option is required. One path to ground for this lead is supplied by contact 2 of unoperated power-on (PO) relay. Another path to ground is supplied by contact 8 of operated low-tape (LT) relay through contact 4 of unoperated reverse-channel (RC) relay and contact 8 of unoperated carrier-on (CN) relay.

(b) The line will not appear busy to remote calling station if the OS lead to the receiving data set is not grounded.

(c) In an unattended send-receive terminal this OS lead also becomes part of the out-of-service and answer-back A circuits as illustrated by the control and schematic diagrams in the section covering the TP199788 unattended send-receive apparatus unit.

D. Manual Controls

3.16 For proper operation, the manual controls must be positioned according to the section covering operation of the terminal equipment. This includes any extra feature units used. The manual controls may also be operated as an aid in checking their related circuits and to isolate possible troubles in the receiver. Refer to Figure 2 and Tables B and C in this section, and to wiring diagrams 6403WD and 6404WD shipped with the receiver.

E. Timing Pulse Circuit (Figure 4)

3.17 The amplifier-inverter circuit contains bias resistors and clamping diodes to convert the eight-wire contact closure signals from data set 402D to voltage level signals. These signals are 0 volt (mark) when the contacts are closed or -6 volts (space) when they are open. The timing signal from the data set is also converted to a voltage level and then inverted for use as a sample signal to the punch driver. This signal is gated at the data set with a carrier-on condition. The inverter includes a feedback capacitor to prevent data set contact bounce from causing double punching. The timing signal from the data set is normally 5 milliseconds so that the punch command is given about 5 milliseconds after a new character appears on the data leads.

F. Alarm Circuits

3.18 The signal lamp lights when carrier-off occurs at the end of data reception. An auxiliary signal circuit is closed when this lamp lights. The power switch light assembly flashes whenever a low tape condition exists. When this condition is detected, adjustable low tape contacts operate relay LT. Operation of relay LT lights the low tape signal lamp and removes a short circuit across flasher DS104, which causes the power on lamp to flash repeatedly.

G. Punch Driver Circuits (Figure 5)

3.19 In the reset condition, each magnet driver and its associated magnet is energized. When a character sample is received at P110, pin 6, it is inverted by Z103W (EC605) and then applied to integrator pulse shaper Z113B to remove any line noise. The output of the integrator pulse shaper (Figure 6) samples all magnet drivers (Figure 7 or Figure 8). Each magnet driver that is primed to mark (0 volt on pin 15) opens the current path to its associated magnet. This causes its corresponding reed to release and punch tape.

Note: The feed level magnet driver is permanently primed and therefore energizes for each character sample received. This causes the tape to feed once per character.

The gated oscillator Z113A, pin 13, (Figure 5), receives a 0-volt signal from feed magnet driver Z112, pin 24 whenever it is de-energized. This 0-volt signal causes the gated oscillator to time out after 1.9 milliseconds and produce a positive pulse, at pin 5, to be applied to pin 30 of all magnet drivers. Those magnet drivers that were set will now reset and close the current path to their respective magnets.

H. Power Supply Circuit

3.20 Power supply TP148850 consists of full-wave silicon diode rectifiers and provides a continuous -55v, -5v, -12v, -6v, and +6v from a 105 to 130v ac, 58.5 - 61.5 Hz source. These voltages are all labeled, and their wiring color coded to show source, route, and destination. The following information is provided to aid troubleshooting procedures:

- (a) Circuit symbol numbers are stamped on the chassis or mounting bracket adjacent to the designated apparatus.
- (b) Wiring diagrams 6405WD and 6406WD show the schematic and actual wiring of the rectifier.
- (c) Fuses (similar to 3 AG) are commercially available, or may be ordered from Section 582-102-820.
- (d) Signal ground (common) is isolated from frame ground.
- (e) Maximum permissible ripple is 5 percent for the -5v supply and 2 percent for all other supplies.
- (f) The power supply is capable of continuous operation under full load (250 watts), and at ambient temperature ranges of 0 to 55°C.
- (g) There should be no variation of the -6v, -55v, or -5v outputs by more than 2 percent. Variation of the load on any supply voltage from no load to full load should not affect the -12v or +6 v outputs by more than 5 percent.
- (h) The power requirement of the punch control and drive module is 250 watts in both the idle condition and with all eight levels punching.

SECTION 582-102-320

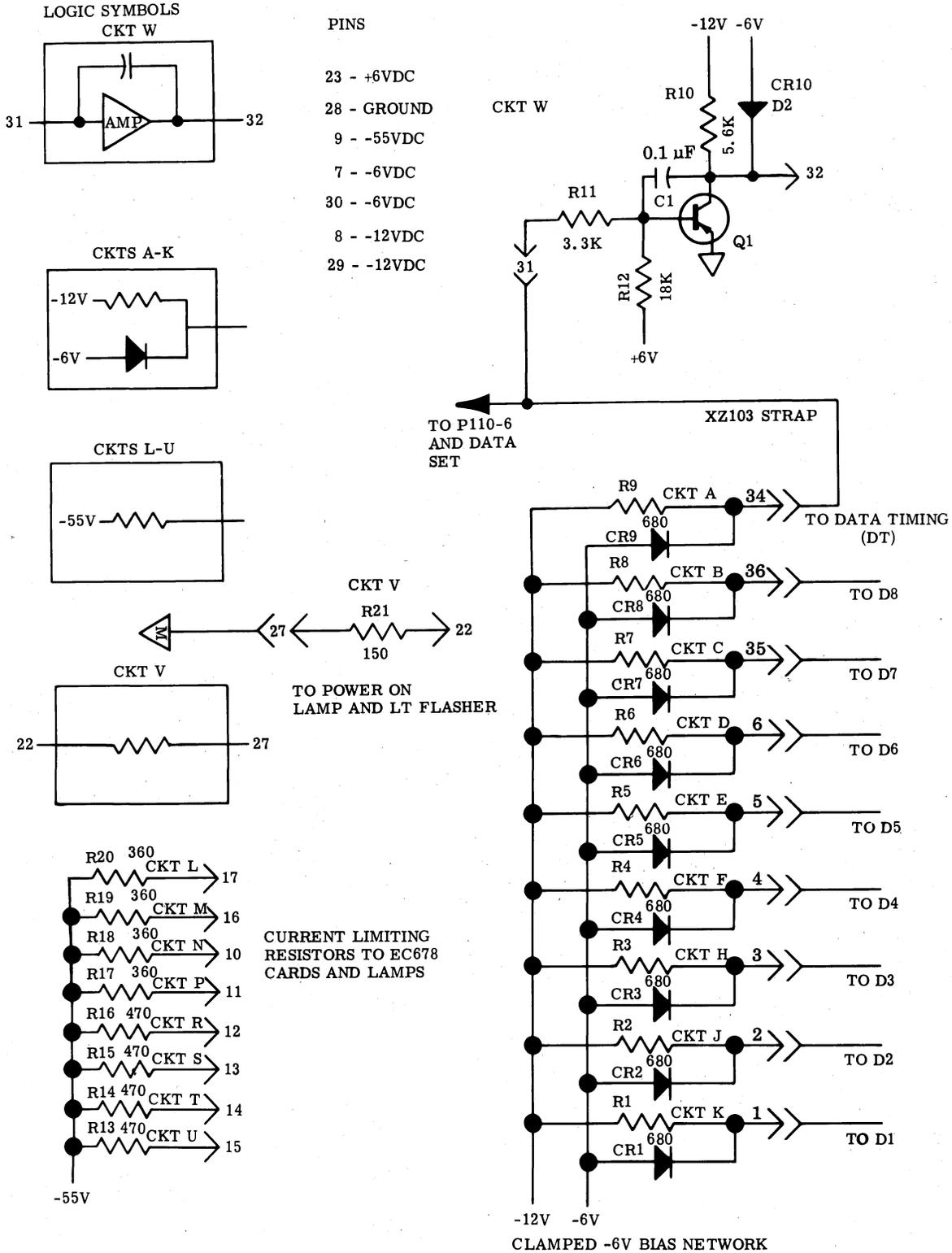
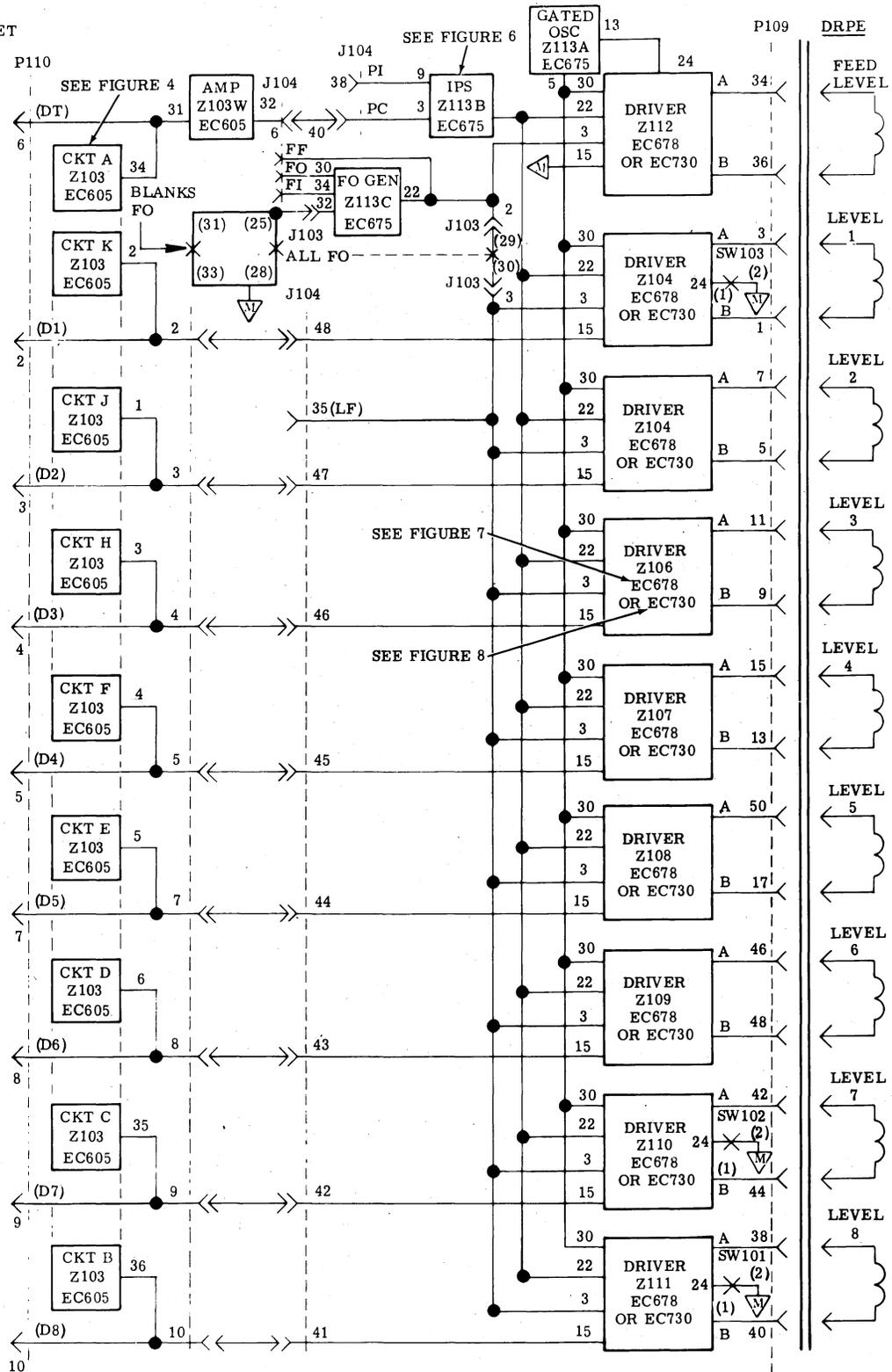


Figure 4 - Timing Pulse Amplifier-Inverter, Bias Network, and Current Limiting Resistors Circuit Card (EC605)

DATA SET



Note 1: IPS, FO GEN, and Gated OSC are located on card EC675 (Z113); circuits A through K are located on card EC605 (Z103).

Note 2: Levels 1, 7, and 8 have a Punch Level Selection switch that grounds pin 24 of punch driver.

Note 3: In 5-level operation, levels 1-5 appear in level positions 2-6.

Figure 5 - Punch Driver Circuits

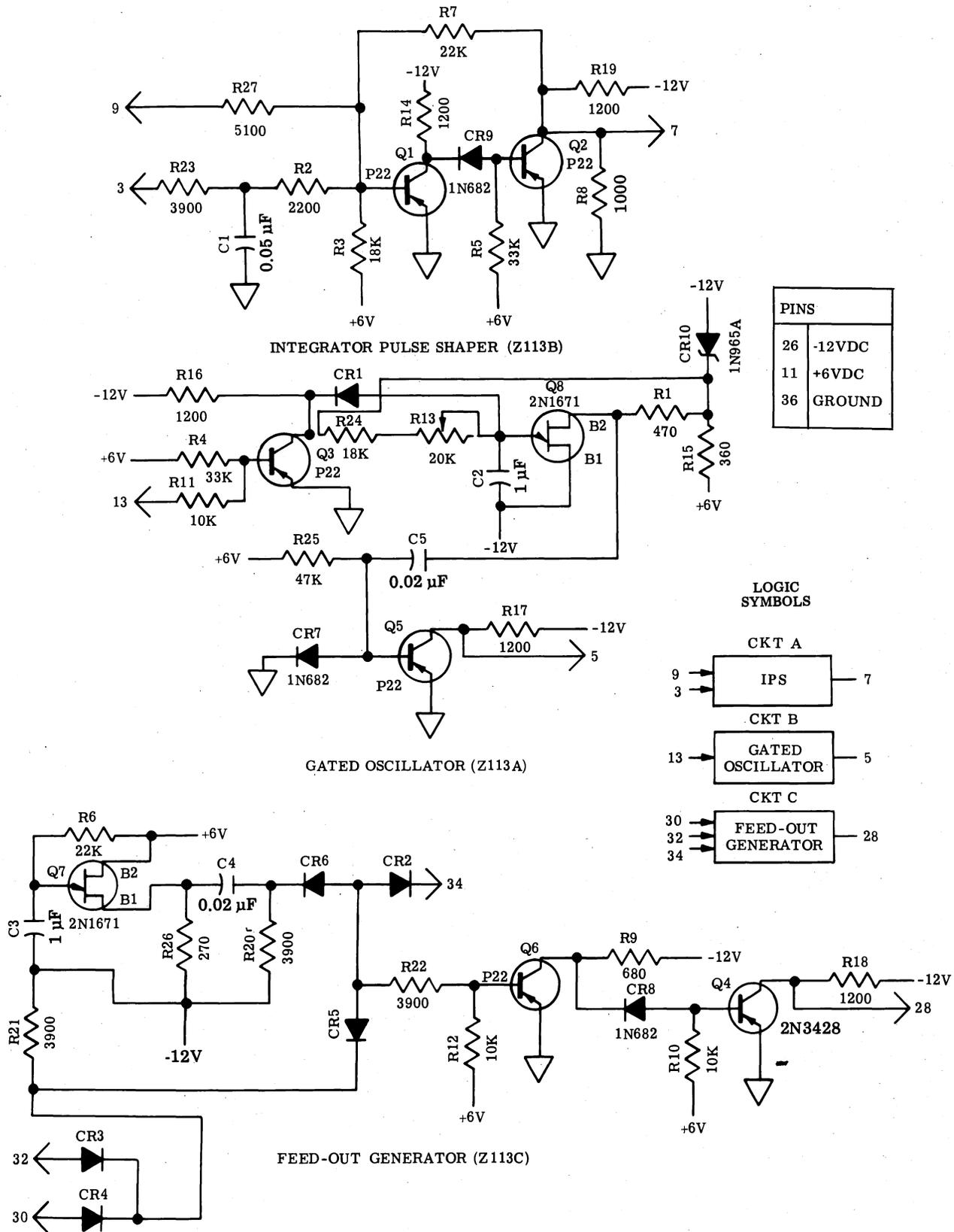
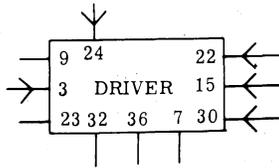


Figure 6 - Integrator Pulse Shaper, Gated Oscillator, and Feed-Out Generator Circuit Card (EC675)

LOGIC SYMBOL



PINS	
1	GROUND
5	-5VDC
26	-12VDC
11	+6VDC

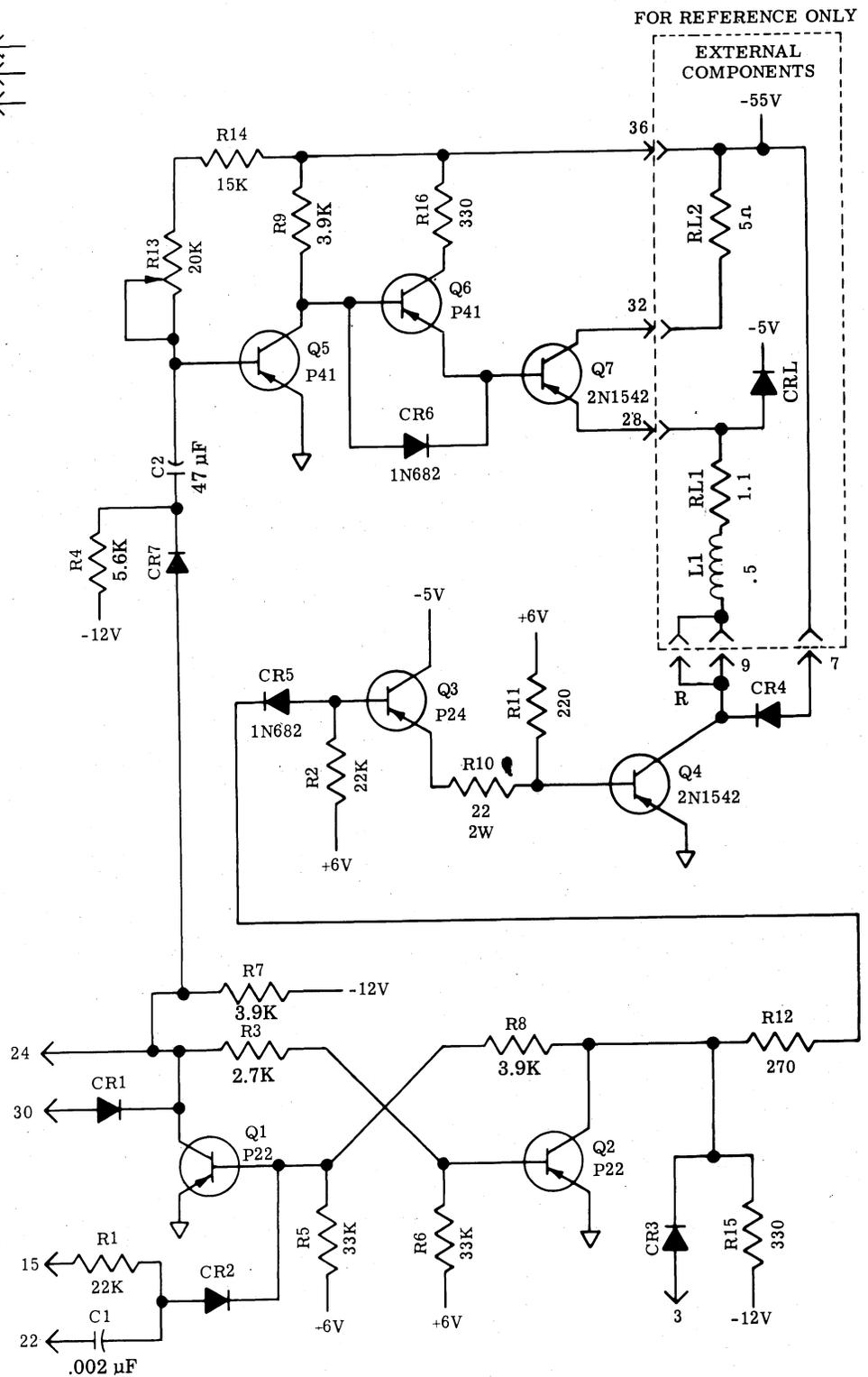


Figure 7 - Magnet Driver Circuit Card (EC678)

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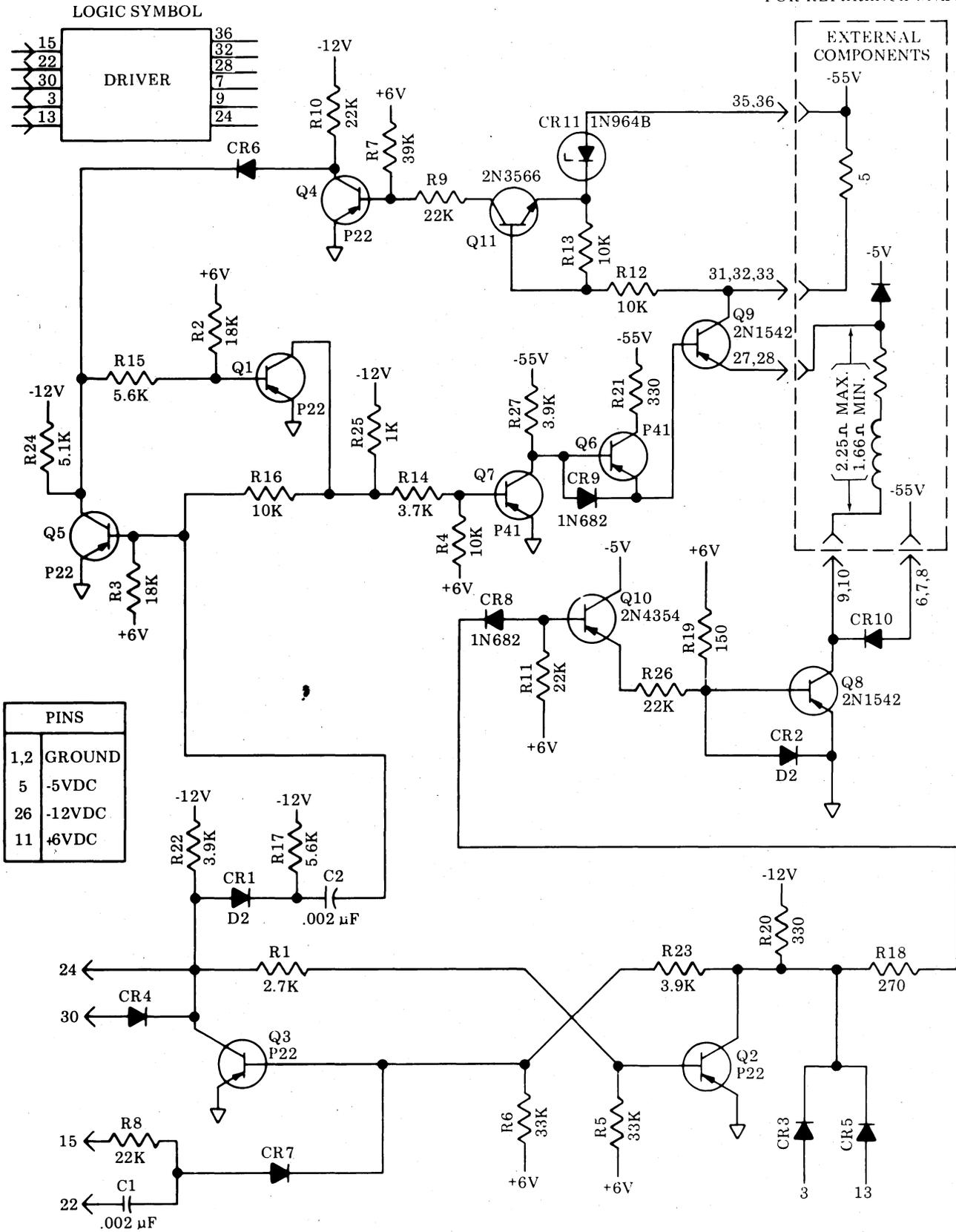


Figure 8 - Magnet Driver Circuit Card (EC730)

I. Cabinet Circuits

3.21 Aside from interconnections, cabinet circuits include a line filter (on electrical service panel), a power switch, and a tape winder (see Figure 9). The control panel switches and indicators are associated with the receiver module. The basic power requirements are, 4.5 amperes at 120 volts ac (103-127) while running and approximately 8 amperes when starting. The frequency requirement is 60 Hz (± 5 Hz). The maximum power required is approximately 950 watts.

TROUBLE CHECKOUT

3.22 The test center must meet these requirements:

- (a) To transmit an all-space signal for at least 300 milliseconds to a receiver.
- (b) To detect reverse channel signal from a receiver.
- (c) To transmit an alternating all-mark, all-space test pattern for at least 30 seconds, after the original all-space signal. See Figure 10 for proper test tape.

3.23 The test center will follow a standard procedure after it is notified of a terminal in trouble. It will call the terminal and have the operator put the 402D Data Set in the test mode and test for troubles at the data set. The test center then calls back to inform the operator of the test results and if testing is now to be done on the receiver terminal.

3.24 Testing of the receiver terminal begins with the operator depressing the DATA key and hanging up the handset. After a short period of punching, the receiver will stop. The handset is to be picked up and the TALK key pushed. The operator responds with the results of the examination of the punch tape.

3.25 If the receive terminal is having trouble while in an unattended condition, the test center will request that the AUTO ANS button be depressed and the call is to be terminated. The test center calls back and determines if a 2025 Hz tone is received for a period of 2 to 7 seconds. If so, when the tone ends an all-space signal of 300 milliseconds will be sent followed by 30 seconds of alternating all-mark, all-space test signals. The test center will then call back and inform the operator of the test results.

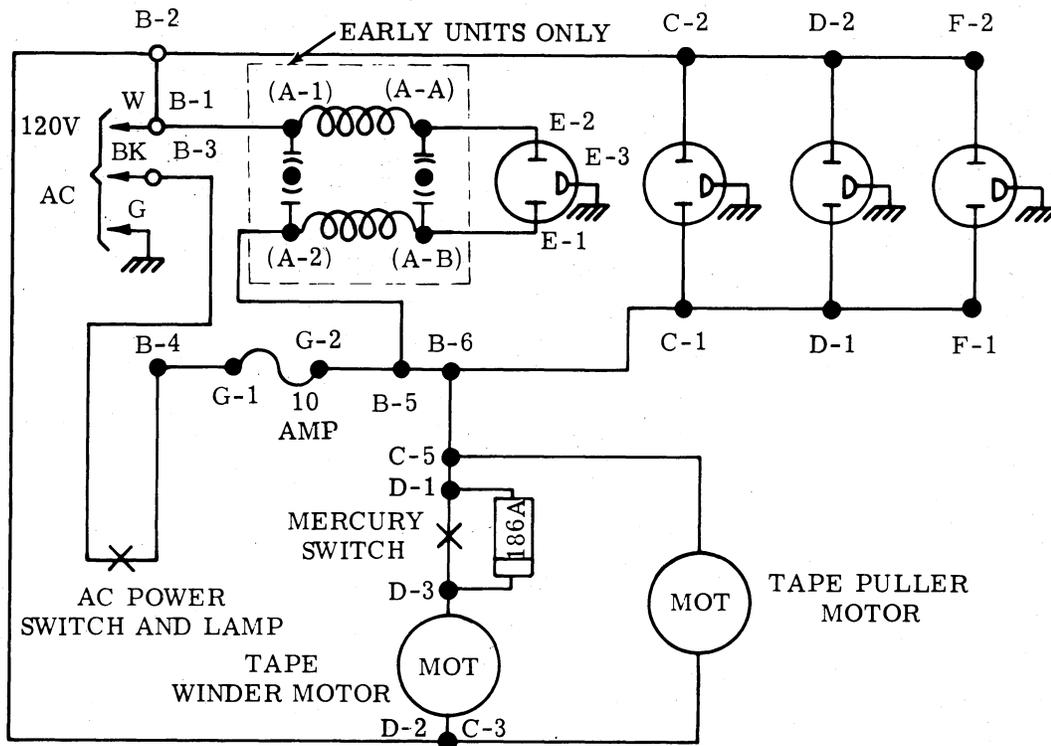


Figure 9 - AC Wiring for Receiver 5B

TROUBLESHOOTING PROCEDURES

3.26 The following paragraphs outline preliminary checks and procedures to be followed in using Tables B and C for troubleshooting Receiver 5B.

3.27 Use a thoroughly pretested data set and line if possible. Recheck if trouble is not easily cleared.

3.28 Make arrangements to run tests with a test center; otherwise, test with a pretested 5A or 5C sender. Use the schematic and actual wiring diagrams shipped with the equipment, if available. If unusual difficulties are still encountered, check the equipment against all associated wiring diagrams and parts sections for previous emergency field modifications or other unrecorded changes.

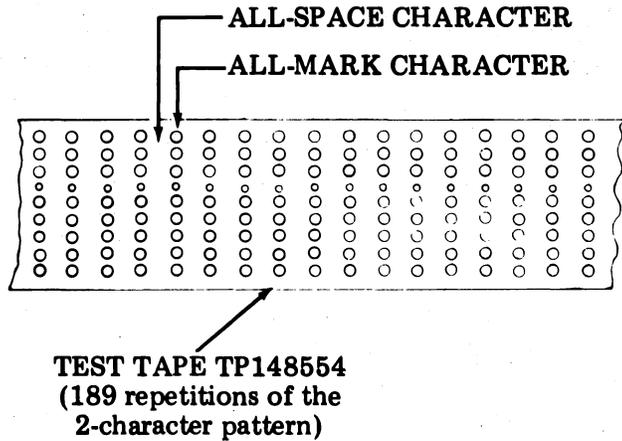


Figure 10 - Test Tape Pattern for Receiver 5B

3.29 See that all cables and connectors are properly connected and in good condition.

Note: Check internal connections, especially extra feature units.

3.30 Table C contains corrective procedures for troubles listed in Table B. A specific procedure or adjustment (for cabinets see Section 582-102-720 and for punch see Section 582-100-705) is given for direct repair; electrical system callouts refer to Wiring Diagrams (see 1.02 for explanation).

3.31 If a trouble is not covered in this table, or cannot be corrected within a reasonable amount of time, consider the following:

- (a) Use locally specified procedures (assistance, call supervisor, etc).
- (b) Repair component using associated circuit descriptions or wiring diagrams.
- (c) Replace (defective) components, only after checking that wiring and connections are not at fault. All components should be tested prior to replacement, if testing is available.

Note: Replace cards or fuses only as directed in Table C.

CAUTION: BEFORE REMOVING OR REPLACING CARDS, COVERS OR ANY OTHER COMPONENTS, REMOVE ELECTRICAL POWER. USE PRETESTED CARDS FOR ALL SUBSTITUTION CHECKS.

TABLE B

INDEX FOR SYMPTOM OR TROUBLE REPORT

SYMPTOM OR TROUBLE REPORT

1. No power indication. POWER indicator pushbutton fails to light when pressed	18
2. Cooling fan does not run when power is applied	18
3. Tape supply puller motor does not run	19
4. Tape supply puller capstan drive does not feed tape	19
5. Punch feed or tape puller motor does not run	19
6. Tape cannot be passed through punch block	20
7. All punch pins not raised (coils de-energized) or improper tape penetration — no ALL F.O. or BLANKS F.O.	20
8. One or more punch pins (but not all) not raised (no ALL F.O. or BLANKS F.O.) or improper tape penetration	20
9. Tape does not advance (but can be pulled freely through punch block when tape guide is pulled down — all pins up, no tape jam)	21
10. Tape perforations improperly spaced using TP302990 gauge	21
11. Tape perforations improperly aligned	21
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13. Tape take-up winder motor runs continuously regardless of tape sensing arm position	21
14. Tape does not feed when BLANKS F.O. or ALL F.O. button is depressed	21
15. Tape feed motor or tape puller motor runs continuously (tape jams at punch)	21
16. POWER indicator button does not flash when tape supply is low	22
17. Receiver terminates call 5 seconds after depressing DATA key	22
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19. After depressing DATA key, data set fails to go into data mode	22
20. Received data garbled	22
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23. Signal lamp does not light when the remote sender is in talk mode (receiver in data mode)	23
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25. Receiver does not automatically terminate call after a message is completed (receive-only station)	23
26. Identifier disc does not turn after depressing the TRANS START button (DATA key at data set already depressed)	23
27. Remote sender does not transmit, but AR and MC relays operate and disc turns	24
28. Identifier disc overruns the home position (does not stop after one rotation)	24
29. Receiver does not answer automatically when in unattended send/receive mode (send-receive station)	24
30. Receiver answers automatically but the TR relay (K1406) does not toggle (alternately operate and release) send-receive station only	24
31. Receiver does not drop call within 35 seconds after toggling of TR relay — send-receive station only	25
32. Receiver does not lock-in receive mode when an all-space signal is received — send-receive station only	25
33. Receiver does not lock-in send mode when answer-back A signal is received — send-receive station only	25
34. After the receiver answers automatically, answer-back signal remains on continuously — send-receive station only	25
35. Answer-back signals not operating properly	25
36. SR (K1402-U) relay in unattended send-receive unit does not operate	25
37. RD (K1404-U) relay in unattended send-receive unit does not operate	25
38. TA (K1405-U) relay in unattended send-receive unit does not operate	26
39. UT (K1401-U) relay in unattended send-receive unit does not operate	26
40. Card TP303675 checkout and adjustment	26
41. Card TP303678 checkout and adjustment	27

TABLE C
TROUBLESHOOTING RECEIVER 5B

No.	Trouble	Corrective Procedure
1	No power indication. POWER indicator pushbutton fails to light or is very dim when pushed.	<p>If power lamp is off, plug in, tighten or replace TP182510 power cord at service panel (6403WD3E2 — 3.20).</p> <p>Examine indicator lamp 6 v TP198019 (6403WD2E5) or 10 amp fuse TP151418 (6403WD3F2) on electrical service panel.</p> <p>Replace blown 5 amp fuse TP129920 at driver module (F1) (6405WDB3) or 0.5 amp fuse TP117176 (-6 v dc) (F3) or 1.6 amp fuse TP171642 (-12 v dc) (F4) (6405WD area D7).</p> <p><u>Note:</u> If -12 v fuse still blows at turn-on, check or add TP337812 time delay modification kit at XZ115 (card TB822 — TP337822) in TP199540 receiver module.</p> <p>Examine power supply TP148850. If ac input present, all fuses good, but -6 v dc and -12 v dc output missing or erratic, replace power supply (6405WD).</p> <p>Defective ac or dc wiring or connections. With a VOM, trace back from point of failure to where proper voltage is obtained. Replace wiring or clean, tighten or resolder connections as required to re-establish circuit (6405WD).</p> <p><u>Note:</u> Motors and outlets have ac voltages present. All lamps and relays are dc operated.</p> <p>If power indicator is dim and -55 v fuses are blown, install a TP337812 modification kit to TP199540 driver module, and replace TP171644 (F5 to F14) 1.5 amp fuses (TCN1636).</p>
2	Cooling fan does not run when power is applied.	<p>Check 0.25 amp fuse TP118510 in fan power cord TP193943 (6403WD3E8).</p> <p>Plug in, tighten, or replace defective ac power cord TP193943, J1701, on electrical service panel (6403WD).</p> <p>If fan blades touch protective screen, position protective screen to clear fan blades.</p> <p>With VOM, read 240 ohms across each fan winding or 120 ohms parallel across both windings. Replace fan TP193942 if indicating open winding (6412WD).</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
3	Tape supply puller motor does not run.	<p>Examine fan blades in chad blower to see if they are jammed by chad. If so, remove chad and clear chad passages.</p> <p>Check Fan Housing Mounting Bracket adjustment.</p> <p>Examine fan blades. If touching chad blower housing, reposition fan blades.</p> <p>Check Fan Sleeve adjustment.</p> <p>Replace motor TP149755 (see trouble 5 Note).</p>
4	Tape supply puller capstan drive does not feed tape.	<p>If TP149750 V-belt is damaged, replace.</p> <p>Check V-Belt Tension or Capstan Clearance adjustments.</p>
5	Punch feed or tape puller motor does not run.	<p>Examine cable connections.</p> <p>Inspect for loose or broken wires.</p> <p>Check Tape Puller Cam, and Tape Puller Contact Pile-Up adjustments.</p> <p>Replace triac TP306838 for failing motor on punch (7565WDB3).</p> <p>Replace tape puller control switch (TP177896) (6403WD3C6 or 7565WD1B2).</p> <p>Replace tape-out control switch (TP151329) (6403WD3C6 or 7565WD1E3).</p> <p>Replace TP145976 punch feed motor or TP149755 tape puller motor.</p> <p><u>Note:</u> If the TP149755 motor is replaced, the early design TP149754 bracket has a 1/2 inch hole that will not accept the TP333514 fan sleeve. A TP149754 bracket with a 3/4 inch hole must be used.</p> <p>For heavy duty applications the use of a TP320297 modification kit (to add heavy duty chad disposal and tape puller) is recommended.</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
6	Tape cannot be passed through punch block.	<p>Depress ALL F.O. button. If any or all reeds or punch pins do not lower and raise properly, go to troubles 7 or 8.</p> <p>If reed and punch pin operation is normal, use TP149836 tool to remove any tape that may be jammed in punch block.</p> <p>Check Punch Block, Tape Guide Punch Block, Downstop, Tape Guide Alignment, Punch Pin Penetration, or Punch Pin Backstop adjustments.</p>
7	All punch pins not raised (coils de-energized) or improper tape penetration — no ALL F.O. or BLANKS F.O.	<p>If power lamp is off, refer to trouble 1.</p> <p>If power lamp is on, check -5 v 25 amp or 30 amp fuse. If -5 v fuse blows repeatedly, replace with a 30 amp fuse (TP338011 — TCN1629) and change panel designation to 30A (decalcomania TP338012).</p> <p>If -5 v fuse is good, check -12 v fuse. If -12 v fuse is blown, also check all nine -55 v fuses in power supply. Replace blown fuses.</p> <p>Check that plug P109 (6403WD1B8) at punch unit is tightly connected. Replace plug if defective (TP199795).</p> <p>Replace cards TP303605 (EC605) and TP303675 (EC675), see trouble 40 and retest (6403WD).</p> <p>Replace ALL F.O. switch (TP149726) key assembly (6403WD1B4).</p>
8	One or more punch pins (but not all) not raised (no ALL F.O. or BLANKS F.O.) or improper tape penetration.	<p>Check Armature (Reed) Clearance and Bumper (Silencing) adjustments at failing level.</p> <p>Turn power off. Connect both wires from a functioning coil to coil of a failing level and vice versa. Turn power on. If trouble remains in same level, replace coil. Restore wiring to normal.</p> <p><u>Note:</u> After removing defective coil and before installing new coil, check Armature (Reed) Clearance, and Bumper (Silencing) adjustments. After installation, perform Punch Pin Penetration adjustment.</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
8 (cont)		If trouble switches to level with which wires are changed, restore wiring to normal and check -55 v fuse for (initially) failing level. If fuse is good, replace TP303678 (EC678) see trouble 40 or TP303730 (EC730) punch driver card of failing level with TP303730 card.
9	Tape does not advance (but can be pulled freely through punch block when tape guide is pulled down — all pins up, no tape jam).	<p>Check +6 v fuse.</p> <p>Unwind drive spring (following directions) and recheck. If trouble remains, check Ratchet and Pawl Escapement adjustment, replace drive spring if defective.</p> <p>Check Spring Winder Switch, Feed Mechanism Vertical Position, Spring Winder Motor Gear Mesh, and Idler Arm Gear Mesh adjustments.</p> <p>Replace feed drive motor (TP177869).</p>
10	Tape perforations improperly spaced using TP302990 gauge.	Check Tape Bias Spring (Standard Punch Block), Ten To The Inch Preliminary, and Final, Spring Winder Motor Gear Mesh, Idler Arm Gear Mesh, Ratchet and Pawl Escapement adjustments. Inspection for worn parts in this area is required.
11	Tape perforations improperly aligned.	Check Feed Wheel Line-Up adjustment.
12	Tape perforations ragged (fibers show in holes).	Replace punch block assembly.
13	Tape take-up winder motor runs continuously regardless of tape sensing arm position.	<p>Check Winder Switch Contact and Winder Switch Positioning adjustments.</p> <p>Replace mercury switch TP149974 (6403WD3E7).</p> <p>Replace arc suppression network TP309899 (6403WD3E7).</p>
14	Tape does not feed when BLANKS F.O. or ALL F.O. button is depressed.	<p>If tape does not advance from line signals either, refer to troubles 6, 7, 8, or 9.</p> <p>Replace key assembly TP149726 (6412WD1C7).</p>
15	Tape feed motor or tape puller motor runs continuously (tape jams at punch).	<p>Check Tape Puller Contact Pile-Up, Tape Puller Cam, Tape-Out Switch Preliminary, and Final adjustments.</p> <p>Replace tape puller control switch TP177896 (7565WD1B2).</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
15 (cont)		<p>Replace tape-out control switch TP151329 (7565WD1E3).</p> <p>Replace triac TP306838 for failing motor on punch (7565WD1B3).</p>
16	POWER indicator button does not flash when tape supply is low.	<p>Check Low Tape Switch adjustment.</p> <p>Replace flasher TP193173 (DS104) (6403WD2E4).</p>
17	Receiver terminates call 5 seconds after depressing DATA key.	<p>Check that strap between pins 14 and 29 in strapping plug TP199793 is connected (6403WD2D1).</p> <p>Replace RS relay TP308548 (K104) (6403WD2C3).</p>
18	Receiver terminates call 30 seconds after depressing DATA key.	<p>Check that strap between pins 21 and 30 in strapping plug TP199793 is connected (6403WD2E1).</p> <p>Examine relay CN (K102U-A). Determine if transmitter is sending an all space signal.</p> <p>Test or replace 402D Data Set.</p>
19	After depressing DATA key, data set fails to go into data mode.	<p>Check that strap between pins 20 and 24 in strapping plug TP199793 is connected (6403WD2C1).</p> <p>If pin 20 of P110 is open when power is off, ground it (6403WD2C1).</p>
20	Received data garbled.	Test or replace 402D Data Set or 804A Data Auxiliary Set.
21	Reverse channel send signal not reaching data set.	<p>Check that strap between pins 16 and 27 in strapping plug TP199793 is connected (6403WD2F1).</p> <p>If relay CN (K102U-A) is not operating (6403WD2E2), clean relay or replace TP199540 module assembly.</p> <p>If ground path to coil of RC relay (K102L-A) TP171501 is open, inspect contact 2. Clean, tighten or solder connection (6403WD2C1).</p> <p>Check that strap between pins 13 and 11 (ZE wiring option) in strapping plug TP199793 is connected (6403WD2C2).</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
22	Receiver does not answer call automatically (receive-only station).	<p>Refer to trouble 1 if power is not on.</p> <p>Check AUTO ANS key on receiver (6403WD2D3).</p> <p>Check that strap between pins 15 and 28 (ZB wiring option) in strapping plug TP199793 is connected (6403WD2D1).</p> <p>Check ground path to data set on RO or RR lead for continuity. If open, trace back from known failure to point where continuity is established. Replace wiring, tighten or solder connections to re-establish circuit.</p>
23	Signal lamp does not light when remote sender is in talk mode (receiver in data mode).	<p>Examine TP199549 indicator lamp (48 v). Replace if burned out (6403WD2B3).</p> <p>Check wiring RC relay. Clean RC relay contacts.</p> <p>Replace TP199540 module assembly (6403WD).</p>
24	Signal lamp lights during message; transmission is interrupted.	<p>Verify that remote sender is still in data mode.</p> <p>Check data set carrier-on (CN) lead (P110, pin 21) (6403WD2E1) or excessive line noise.</p>
25	Receiver does not automatically terminate call after a message is completed (receive-only station).	<p>Replace RS relay TP308548 (K104).</p> <p>Check wiring from RS relay socket contact 5 (6403WD2D2).</p>
26	Identifier disc does not turn after depressing TRANS START button (DATA key at data set already depressed).	<p>Check that P1104 is tightly plugged into J104. Replace plug if defective.</p> <p>With power off and TRANS START button depressed, restore ground at terminal C of Z1101A if missing (7098WD1B2).</p> <p>Replace defective diode CR2 on circuit card assembly TP177520.</p> <p>Check for ground at points C or S, and A on circuit card assembly TP177520. If ground is not present, replace transistor Q1 and/or diode CR6 or replace defective card TP177520.</p> <p>With power off and plug P1101 removed from J1001, check for a complete circuit between terminals 2 and 6 of the signal generator. If circuit is open, replace signal generator (7098WD1E5).</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
26 (cont)		If signal generator motor is not running, check MC relay K1101-L. If good, replace TP199570 signal generator.
27	Remote sender does not transmit, but AR and MC relays operate and disc turns.	<p>Call local Test Center and check discrete calling feature using customer code, if possible. If operation is normal, trouble is at remote sender.</p> <p>Examine disc for any breaks. Remove any dirt or fingerprints from disc. Replace disc TP199580 if defective.</p> <p>Replace transistor Q2 or replace card TP177520.</p> <p>Replace TP199570 signal generator.</p> <p>Test or replace 402D Data Set.</p> <p>Test or replace 804A Data Auxiliary Set.</p>
28	Identifier disc overruns home position (does not stop after one rotation).	Repair defective clutch or replace entire TP199570 signal generator (7098WD1E5).
29	Receiver does not answer automatically when in unattended send-receive mode (send-receive station).	<p>If receiver has low tape and sender has no tape with ZC wiring option removed, this condition is normal. If unattended answer is required for all tape conditions, retain wiring options ZC and ZD, and remove wiring option R.</p> <p>Depress AUTO ANS key on both sender and receiver cabinets.</p> <p>Check that plug P1403 is tightly connected to J104 (no discrete calling generator) or J1103 (with discrete calling generator) (7104WD).</p> <p>Check that strap between pins 23 and 39 of J1402 in strapping plug TP199793 is connected (7104WD).</p>
30	Receiver answers automatically but TR relay (K1406) does not toggle (alternately operate and release) — send-receive station only.	<p>Install new tape supply in receiver or insert tape at reader, if necessary.</p> <p>Verify ground at pin D and open at pin B of TP177579 card.</p> <p>Replace card TP177579.</p> <p>Replace TP199788 unattended send-receive apparatus unit (7104WD).</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
31	Receiver does not drop call within 35 seconds after toggling of TR relay — send-receive station only.	Repair AR relay (K1205) at remote sender (7100WD1A6). <u>Note:</u> TP308548 relay replaces TP199785 relay; be sure to short-out 390 ohm resistor at pin 3 (TCN597).
32	Receiver does not lock-in receive mode when an all-space signal is received — send-receive station only.	With power off, check circuit continuity between pin 21 of P110 and pin 21 of P1403. Replace card TP177579.
33	Receiver does not lock-in send mode when answer-back A signal is received — send-receive station only.	With power off, check circuit continuity between J752, pin 18 (in sender) and J1401, pin 9 (in send-receive unit). Replace card TP177579.
34	After receiver answers automatically, answer-back signal remains on continuously — send-receive station only.	If relay TO does not time-out 10 seconds after relay RD is energized, repair or replace relay TO (K1407), TP308547 (7104WD1C3). <u>Note:</u> When TP308547 relay replaces TP148585 relay, be sure to short out 390 ohm resistor at pin 3. Check operation between relays TO and TO1, and P1403, pin 20. If not correct, check for loss of continuity. If TO1 relay operation is defective, replace TP199788 unattended send-receive apparatus unit (7104WD).
35	Answer-back signals not operating properly.	Check for proper wiring options. For example, R option is removed when ZC and ZD options are used. If ZC is removed, R is removed. If ZC and ZD are removed, then R option must be retained.
36	SR (K1402-U) relay in unattended send-receive unit does not operate.	Check pin 32 at P1403 (7104WD) and AV lead to coil of SR relay for continuity. Replace TP199788 unattended send-receive apparatus unit.
37	RD (K1404-U) relay in unattended send-receive unit does not operate.	SR relay not energized (trouble 34). If IK relay is not energized, check for IK ground from data set. Replace TP199788 unattended send-receive apparatus unit.

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

No.	Trouble	Corrective Procedure
38	TA (K1405-U) relay in unattended send-receive unit does not operate.	<p>Check TA relay in recognizer unit in sender. If it does not operate either, refer to Section 582-102-315.</p> <p>If TA relay in sender operates, check continuity between J1204, pin 2, and J1401, pin 2. If continuity is present, replace TP199788 unattended send-receive apparatus unit.</p>
39	UT (K1401-U) relay in unattended send-receive unit does not operate.	<p>Check UA relay (K1203) in recognizer unit in remote sender. If it does not operate either, refer to Section 582-102-315.</p> <p>If UA relay in sender operates, check continuity between J1204, pin 5, and J1401, pin 5. If continuity is present, replace TP199788 unattended send-receive apparatus unit (7104WD).</p>
40	Card TP303675 checkout and adjustment.	<p>With power on and ALL FEED button depressed all punch magnets do not release and punch tape, if the TP303675 card is misadjusted.</p> <p>Field adjustment, without an oscilloscope, for card Z113A (EC675). With power off, turn (R13) potentiometer screw counterclockwise to the stop position. To adjust, turn screw 12 complete (360°) turns clockwise and retest as in above.</p> <p><u>Note:</u> The above adjustment will enable the punch magnet, if the punch is adjusted properly. Adjustment using an oscilloscope is recommended before the unit is returned to full service.</p> <p>Adjustment with use of an oscilloscope, with power off, set scope to DC Couple, 5 volts/div, 200 msec/div, and trigger to internal negative. Place probe on pin 13 of Z113A card, place</p>

TABLE C
TROUBLESHOOTING RECEIVER 5B (Continued)

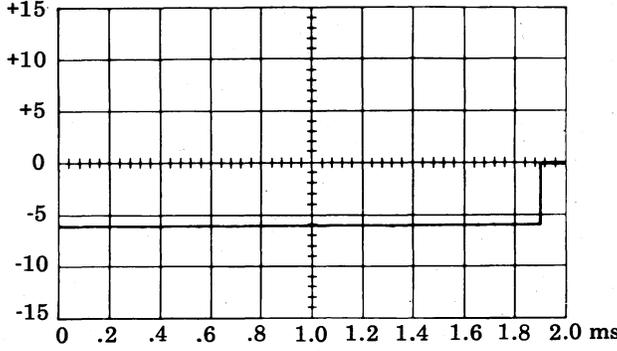
No.	Trouble	Corrective Procedure
40 (cont)		<p>ground lead on pin 1. Turn power on, depress ALL FEED button and adjust potentiometer, R13, until negative side of waveform is at 1.9 ms $\pm .05$ as in scope display.</p> <p>VOLTS</p> 
41	Card TP303678 checkout and adjustment.	<p>Test with power on and LETTERS F.O. button depressed punching at all levels, if any TP303678 card is misadjusted.</p> <p><u>Note:</u> Whenever TP303730 cards are available, replace the TP303678 (adjustable) card with the TP303730 (nonadjustable) card (if available). Testing the TP303730 card is the same manner as for card TP303678.</p> <p>Field adjustment, without an oscilloscope, for card Z112 (EC678) Feed Magnet Driver. With power off, turn (R13) potentiometer screw counterclockwise to the stop position. To adjust, turn screw 11 complete (360°) turns clockwise and retest.</p> <p><u>Note:</u> The above adjustment will enable the feed magnet, if the punch is adjusted properly. Adjustment using an oscilloscope is recommended, before unit is returned to full service.</p> <p>Field adjustment of cards Z104 through Z111, Code Level Magnet Drivers, is the same as for Z112, except the potentiometer screw is only returned 9-1/2 turns clockwise.</p>

TABLE C、
TROUBLESHOOTING RECEIVER 5B (Continued)

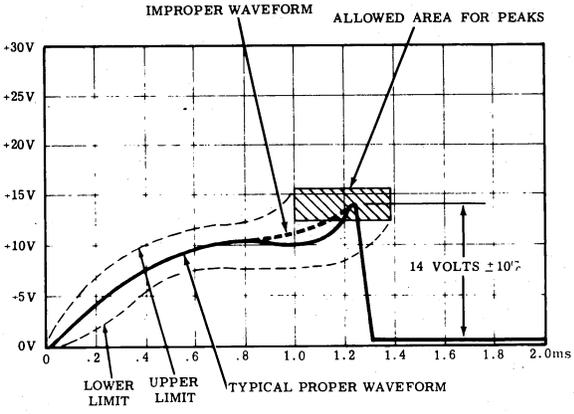
No.	Trouble	Corrective Procedure
41 (cont)		<p>Adjustment with use of an oscilloscope is as follows. With power off, set scope to AC Couple, 5 volts/div, 200 m sec/div and trigger to external positive. Place probe on pin 32 of EC678 failing level card, place triggers lead on pin 13 of EC675 (Z113) and place ground lead on pin 1 of EC675. Turn power on, depress LETTERS F.O. button and adjust potentiometer (R14) for a voltage peak of 14 volts $\pm 10\%$ at full operating speed of unit. This peak shall fall between 1.0 and 1.4 milliseconds from start of pulse as in scope display.</p>  <p>Note: A sharp inflection point usually indicates no armature bounce on the magnet coils.</p>

TABLE D

RECEIVER 5B SYMBOLS, ABBREVIATIONS, AND REFERENCES

CIRCUIT ELEMENT	WIRING DIAGRAM
1. Circuit Card EC605 (TP303605)	6403WD (Sh's 1 & 2), TP303605
Z103A bias (pin 34)	6403WD, 1B3
Z103B bias (pin 36)	6403WD, 1F2
Z103C bias (pin 35)	6403WD, 1E2
Z103D bias (pin 6)	6403WD, 1E2
Z103E bias (pin 5)	6403WD, 1D2
Z103F bias (pin 4)	6403WD, 1D2
Z103H bias (pin 3)	6403WD, 1D2
Z103J bias (pin 1)	6403WD, 1D2
Z103K bias (pin 2)	6403WD, 1C2
Z103L — 55 v current limit (pin 17)	6403WD, 2E6
Z103M — 55 v current limit (pin 16)	6403WD, 2B4
Z103N — 55 v current limit (pin 10)	6403WD, 2C3
Z103P — 55 v current limit (pin 11)	6403WD, 2B7
Z103R — 55 v current limit (pin 12)	6403WD, 2D5
Z103S — 55 v current limit (pin 13)	6403WD, 2B4
Z103T — 55 v current limit (pin 14)	6403WD, 2E3
Z103U — 55 v current limit (pin 15)	6403WD, 2C5
Z103V Flasher — loading (pin 22)	6403WD, 2E5
Z103W Ampl. Invert (pin 32)	6403WD, 1B4
2. Circuit Card EC672 (TP303672)	
Z112 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1B6 & TP303672
3. Circuit Card EC675 (TP303675)	6403WD, TP303675
Z113A Gated oscillator (pin 13)	6403WD, 1B5
Z113B Integrator pulse shaper (pins 9, 3)	6403WD, 1B5
Z113C Feed-out generator (pins 30, 34, 32)	6403WD, 1B4
4. Circuit Card EC678 (TP303678)	
Z104 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1C7
Z105 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1D7
Z106 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1D7
Z107 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1E7
Z108 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1E7
Z109 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1F7
Z110 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1F7
Z111 Magnet driver (pins 30, 22, 3, 15)	6403WD, 1F7
5. Relays	
Carrier On (CN) K102 — U — A	6403WD, 2E2
Low tape (LT) K102 — U — B	6403WD, 2D5
Power On (PO) K102 — L — B	6403WD, 2C5
Reverse channel (RC) K102 — L — A	6403WD, 2B3
Restore — 30 sec (RS) K104	6403WD, 2C3

TABLE D

RECEIVER 5B SYMBOLS, ABBREVIATIONS, AND REFERENCES (Continued)

CIRCUIT ELEMENT	WIRING DIAGRAM
6. Miscellaneous Elements and Assemblies	
Power supply	6405WD
Receiver module (punch logic)	6403 (Sh. 1)
Receiver power distribution	6403WD (Sh. 3)
Receiver (relay logic)	6403WD (Sh. 2)
Receiver cabinet	6403WD (Sh's 2 & 3)
Electrical service panel	6403WD (Sh. 3)
High speed tape punch (DRPE Type)	7131WD
Blanks feed-out — all feed-out (punch logic)	6403WD, 1C4
Aux. signal circuit TB104	6403WD, 2C5
Signal lamp (48 v)	6403WD, 2B3
Low tape lamp (48 v)	6403WD, 2E7
Power lamp (6 v)	6403WD, 2E5
Low tape (mercury gravity switch)	6403WD, 2D6
Trans. start (NL KEY)	6403WD, 2C8
Auto. ans. (NL KEY)	6403WD, 2D2
Level selector switches	6403WD, 1C8 & 1F8