REMEX

TECHNICAL MANUAL

TAPE READER

MODELS: RRS7155BA1/660/D-A
RRS7155BA1/660/G-A

Peripheral Products

Ex-Cell-O Corporation

WARRANTY

The following section is part of the Standard Terms and Conditions and covers only the Warranty. The reader should refer to the complete Standard Terms and Conditions for the entire sales agreement.

The Seller warrants to the original Buyer only, that the Product, except as to software and firmware, is free from defects in workmanship and material under normal use and service. The Seller's obligation under this warranty shall be limited to furnishing a replacement for, or at the Seller's option repairing any Product or any part or parts thereof, which prove defective within 90 days* from the date of shipment by the Seller, provided such Product or such part or parts are returned to the Seller transportation prepaid.

The Seller warrants, for a period of thirty (30) days from the date of shipment by the Seller to the original Buyer only, that the software and firmware Products are free from defects in workmanship and material. Seller's obligation under this warranty shall be limited to correcting any of said defects or replacing the software or firmware. Said warranty shall be void and of no effect whatsoever in the event that changes or additions have been made to the software or firmware (or in the event that the software or firmware product has been adapted by the Buyer) to serve a function not within the system specifications of the Seller.

All replacement Products or parts thereof furnished under this warranty will be invoiced in the usual manner and adjustments will be made after the Product or part thereof claimed to be defective has been returned to, and inspected at, the Seller's plant. Replacements shall be furnished under this warranty F.O.B. Buyer's plant, and the Seller shall not be responsible for installation costs. (For all international transactions, replacement shall be furnished F.O.B. Seller's plant and Buyer is responsible for all customs and brokerage fees.) The Buyer shall be liable for all freight inspection and handling costs if such Product or such part or parts do not prove to be defective. In no event will any claim for labor in removing or replacing a defective Product or part for incidental or consequential damages be allowed. No warranty is made as to any Product or part which has not been installed, operated, or maintained in accordance with Seller's instructions or the instructions contained in its operations or maintenance manuals, when furnished by the Seller, or which has been subject to misuse, abuse, accident, or alteration or to improper or negligent use, maintenance, storage, transportation or handling.

This warranty is in lieu of all other warranties expresses or implied, including any warranty of merchantability or fitness for a particular purpose, and the Seller neither assumes, nor authorizes any person or firm to assume for it, any other or further obligation or liability in connection with the sales, installation or use of any product.

UNDER NO CIRCUMSTANCES SHALL SELLER OR ANY AFFILIATE OF SELLER HAVE ANY LIABILITY WHATSOEVER FOR LOSS OF USE OR FOR ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

*All paper tape products are covered under this warranty for a period of one year, excepting punch mechanisms, lamps and fuses which are warranted for a period of 90 days. Flexible disk drives are warranted for a period of 180 days.

FOR YOUR SAFETY

Before undertaking any maintenance procedure, whether it be a specific trouble-shooting or maintenance procedure described herein or an exploratory procedure aimed at determining whether there has been a malfunction, read the applicable section of this manual and note carefully the **WARNING** and **CAUTION** contained therein.

The equipment described in this manual contains voltages hazardous to human life and safety and may contain mechanical components capable of inflicting personal injury. The cautionary and warning notes are included in this manual to alert operator and maintenance personnel to the electrical and mechanical hazards and thus prevent personal injury and damage to equipment.

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SECTION I

GENERAL DESCRIPTION

1.1 EQUIPMENT DESCRIPTION

This manual has been prepared to assist the user in interfacing, installing, operating and maintaining the REMEX Models RRS7155BA1/660/D-A and RRS7155BA1/660/G-A series Punched Tape Reader/Spooler Combinations. See Figures 1-1 and 1-2. It is the purpose of this model series to provide tape reading at up to 200 characters/second speed along with spooling. The primary difference between the two units is the size of tape reel each can hold. Model RRS7155BA1/660/D-A accepts up to 7-1/2" diameter tape reels and model RRS7155BA1/660/G-A accepts up to 6" diameter tape reels. Unless specifically noted, the material covered in this manual applies to both units. Although the applications for punched tape readers are many and varied, they are generally used as input devices for digital computers, communication systems, numerical controls, and system checkout equipment.

The printed circuit card provides the logic control for tape movement in either direction from external signals. The output from the card controls a step motor which drives the tape via a sprocket wheel. Data outputs are generated from the photosensor array in the readhead. As tape passes over the readhead, changes in light intensity are sensed by the phototransistors, amplified, and brought out to an external connector. The card contains the spooler control circuitry and also provides the required power.

The function of the spooler is to payout tape to the reader and take up the tape that has been read. During read mode, the fully proportional spooler senses the position of the tape arms and provides compensating reel movements that allow the arms to operate near the center of their travel areas. These movements maintain a constant tape tension across the readhead.

1.2 EQUIPMENT SUPPLIED

Several items are included with the reader/spoolers for spare parts, installation, and maintenance. These items are listed in Table 1-1. No other equipment is required for the operation of the unit.

1.3 MAINTENANCE EQUIPMENT REQUIRED BUT NOT SUPPLIED

The maintenance procedures in Section 5 require equipment that is not supplied. This equipment is listed in Table 5-1.

Table 1-1. Items Included with the RRS7155BA1.

Item	REMEX Part No.	Quantity
Brush, Readhead Cleaning	107466-000	1
Fuse, 1A, Slow Blow (100, 115, 127 VAC Operation)	705710-118	1
Fuse, 1/2A, Slow Blow (220, 230 or 240 VAC Operation)	705716-002	1
Fuse Carrier, Black (F101), 230 VAC only	705750-122	1
Fuse Carrier, Gray (F101), 115VAC only	705750-121	1
Power Cord, Belden 17250	708000-110	1
Reel, 7.5 Dia. (RRS7155BA1/660/D-A only)	107878-002	2
Reel, 6.0 Dia. (RRS7155BA1/660/G-A only)	107878-001	2

1.4 EQUIPMENT WARRANTY

A statement covering the warranty of this equipment is given on page iii (second page in book). It should be read and understood. All preventive maintenance procedures must be performed as outlined in Section 5.2 during the warranty period in order that the warranty should remain in effect. Any questions arising concerning the warranty should be directed to the REMEX Service Department.

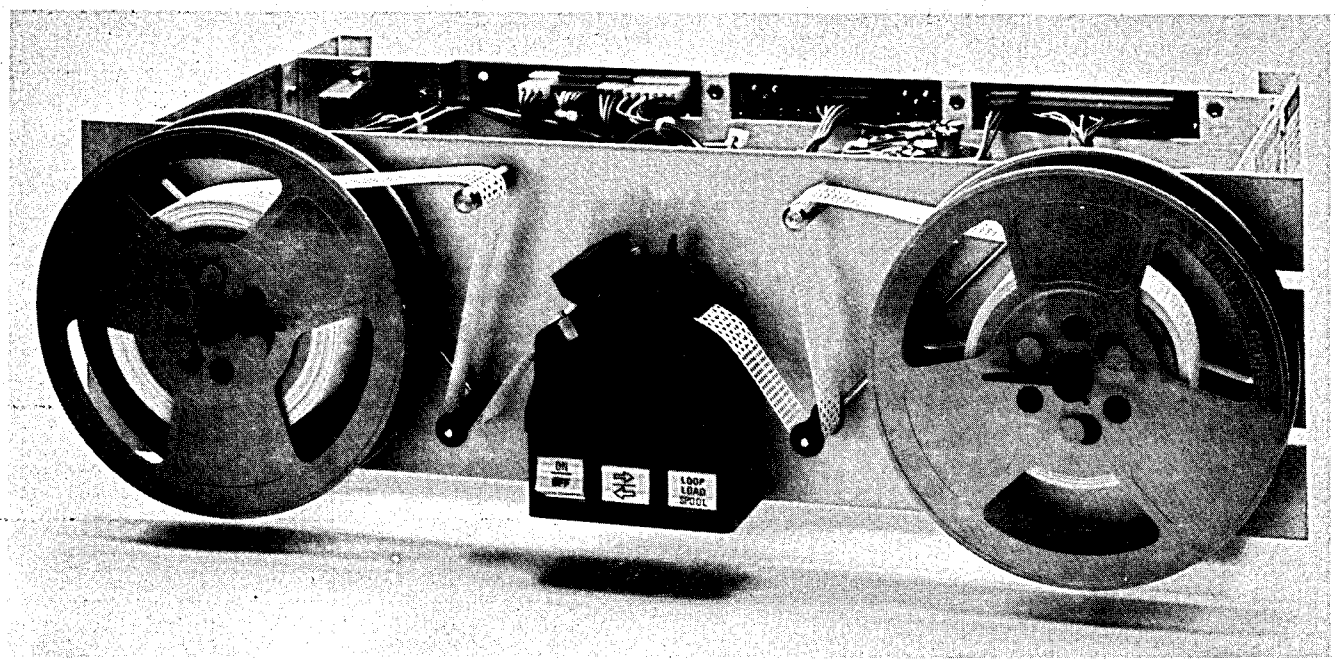
1.5 SPECIFICATIONS

The specifications for the REMEX Reader/Spooler Combination are listed in Table 1-2.

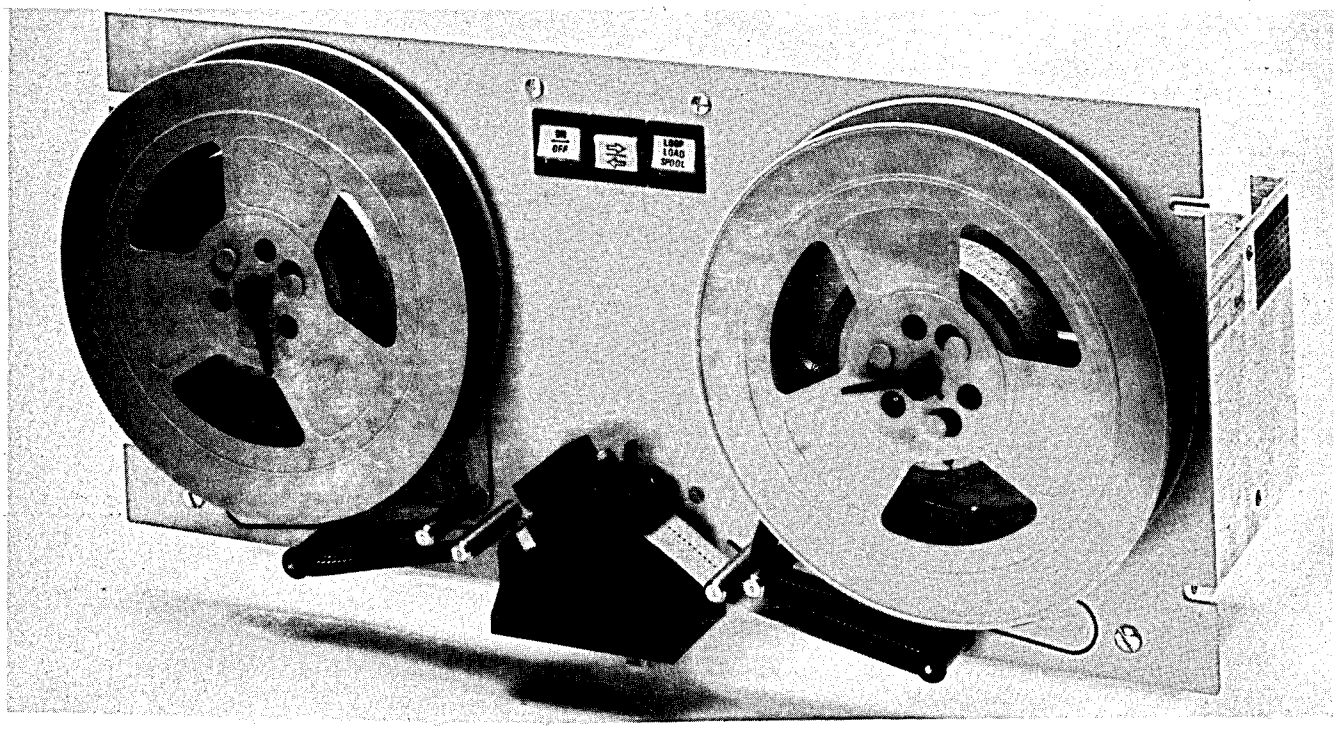
1.6 MODEL NUMBER DESIGNATION

The REMEX model designation is used to code the basic functions and configurations of a particular product line. The model number codes for the RRS7155 series are shown in Figure 1-2. An X in a particular digit designator (as used in many parts of this manual, especially in the parts list) denotes any of the combinations for that digit given in Figure 1-2 applies in the instance cited. The serial tag is located on one of the rear surfaces. In all correspondence, always refer to the complete model number, including the mode and the special number and the unit's serial number.

The last three digits of the model number denote either a standard unit (000 or 901 and higher) or a special (all other numbers). Units with 000 indicate standard units with no additional options other than those coded in the model number structure. Units with 901 and higher are used to indicate the number of standard options (used only on standard units) which are not coded in the model number. These are listed on the serial tag below the model number in the form of a series of three digit numbers depending upon the number of options used. For example, a unit with 902 would list two three digit numbers. Table 1-3 lists the options used with the RRS7155BA1.



Model RRS7155BA1/660/G-A



Model RRS7155BA1/660/D-A

Figure 1-1. REMEX Reader/Spooler, Models RRS7155BA1/660/G-A and RRS7155BA1/660/D-A.

Table 1-2. Specifications of the REMEX Reader, Model RRS7155BA1.

Characteristic	Specification
Tape Movement	Bidirectional (left-to-right or right-to-left).
Reading Speed	Asynchronous: 0-200 characters/second. Synchronous Mode: 200 characters/second. See Sections 3.3.2 and 3.3.3.
Tapes	Reads standard 8-track (1-inch) tapes with light transmissivity of 57% or less and thickness between 0.0027 and 0.0045 inch (oil buff paper tape). Tapes must be punched as described in Section 3.6.
Input Power	115 or 230 VAC, (switch on the rear panel allows selection of either voltage), 47 to 63 Hz, single phase at 1 Amp (115VAC) or 1/2 Amp (230 VAC).
Temperature	Operating: 0°C to 65°C, Free Air Non-operating: -55°C to 85°C
Weight	RRS7155BA1/660D-A, 17.3 lbs; RRS7155BA1/660/G-A, 15.2 lbs.
Mounting Dimensions	RRS7155BA1/660/D-A: 8.75" high x 19" wide, 7 15/16" behind a 1/8" panel, 2.5" in front of panel RRS7155BA1/660/G-A: 5.25" high, 19" wide, 7 15/16" behind a 1/8" panel. See Figures 1-3 and 1-4.
Modes of Operations	Two modes of operation are available: Low Speed and Wind Mode. See Sections 3.3.2 and 3.3.3.
Data Output	Data Mode Selectable (See Section 3.3.6): Mode 5: Hole: $+2.4 < V < +5.0$ @ 0.2 mA (source) No hole: $0 < V < +0.4$ @ 16 mA (sink) Mode 6: Hole: $0 < V < +0.4$ @ 16 mA (sink) No hole: $+2.4 < V < +5.0$ @ 0.2 mA (source)
Timing	Timing Diagram given in Figure 3-1.

Table 1-3. Options Used with RRS7155BA1.

Option No.	Description	Change Required
002	Step Motor Power Down	Replace P.C. Card 114321-001 with 114321-002.

1.7 PHYSICAL DESCRIPTION

The REMEX Tape Reader/Spoolers are mounted on a 19-inch panel with a height of 5.25 inches for the RRS7155BA1/660/G-A and 8.75 inches for the RRS7155BA1/660/D-A. Detailed dimensions are shown in Figures 1-3 and 1-4. The front panel contains the tape reading and transport mechanism. The electronic chassis is mounted at the rear of the unit.

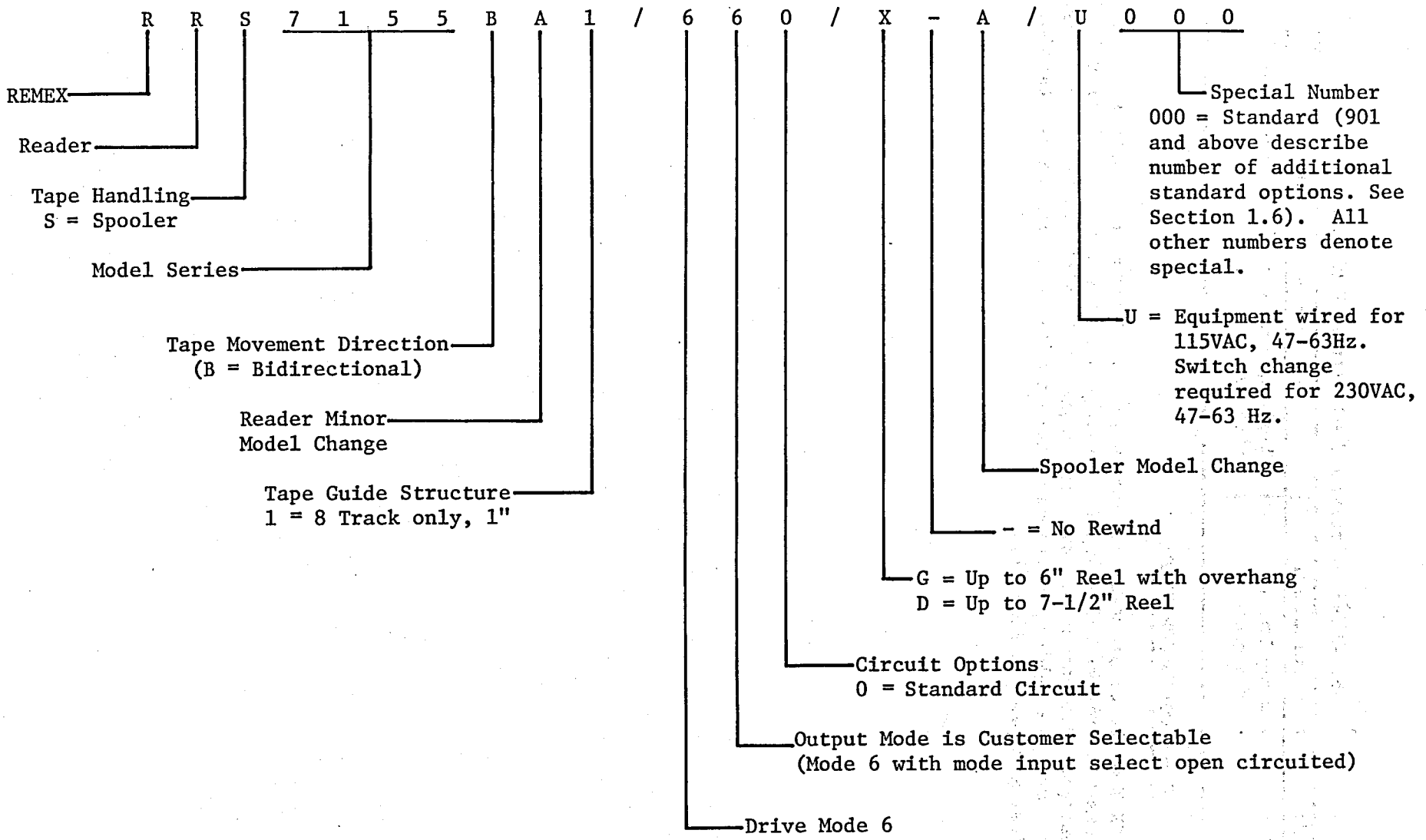


Figure 1-2. Model Number Coding For RRS7155.

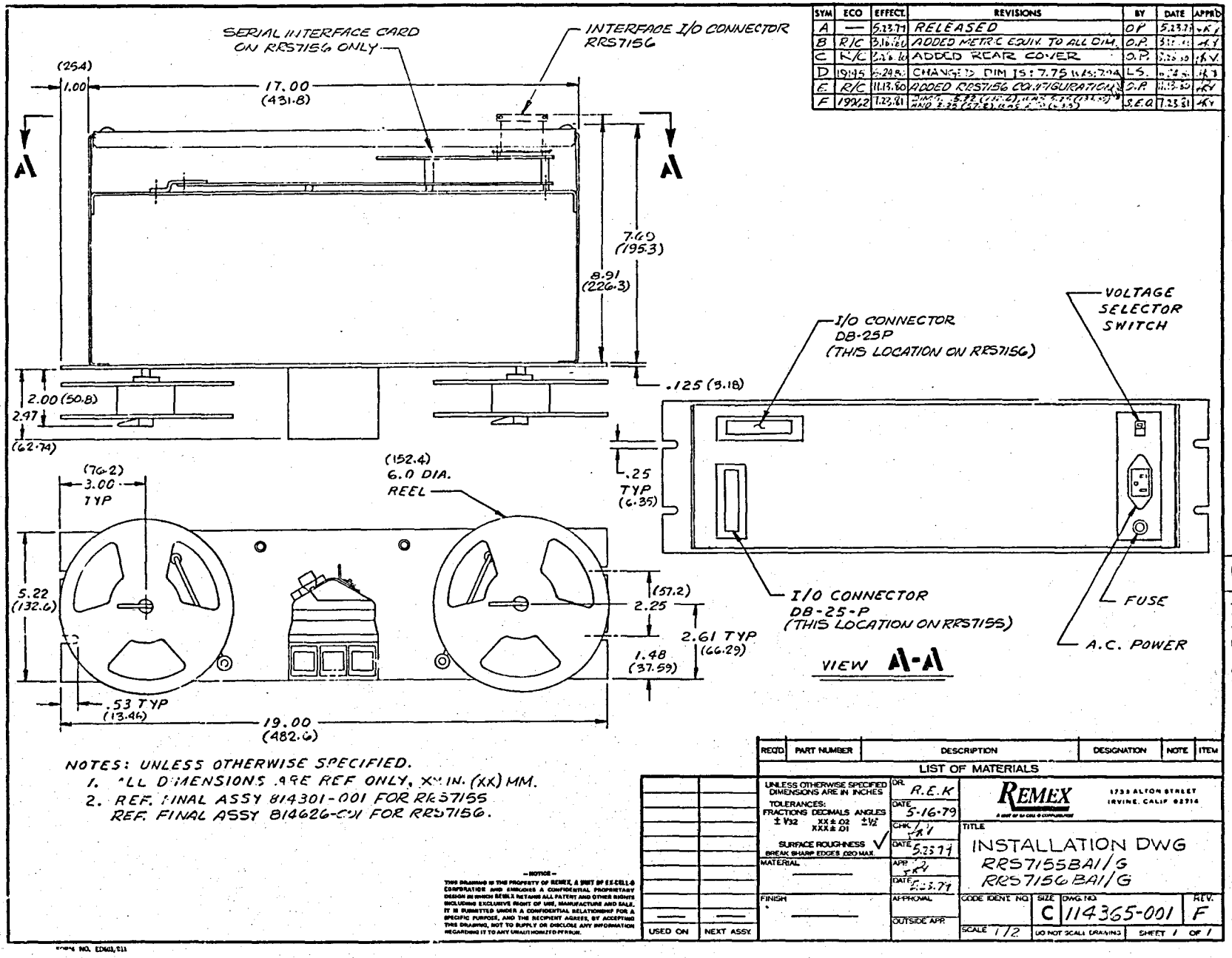


Figure 1-3. Installation Drawing, Model RRS7155BA1/660/G-A.

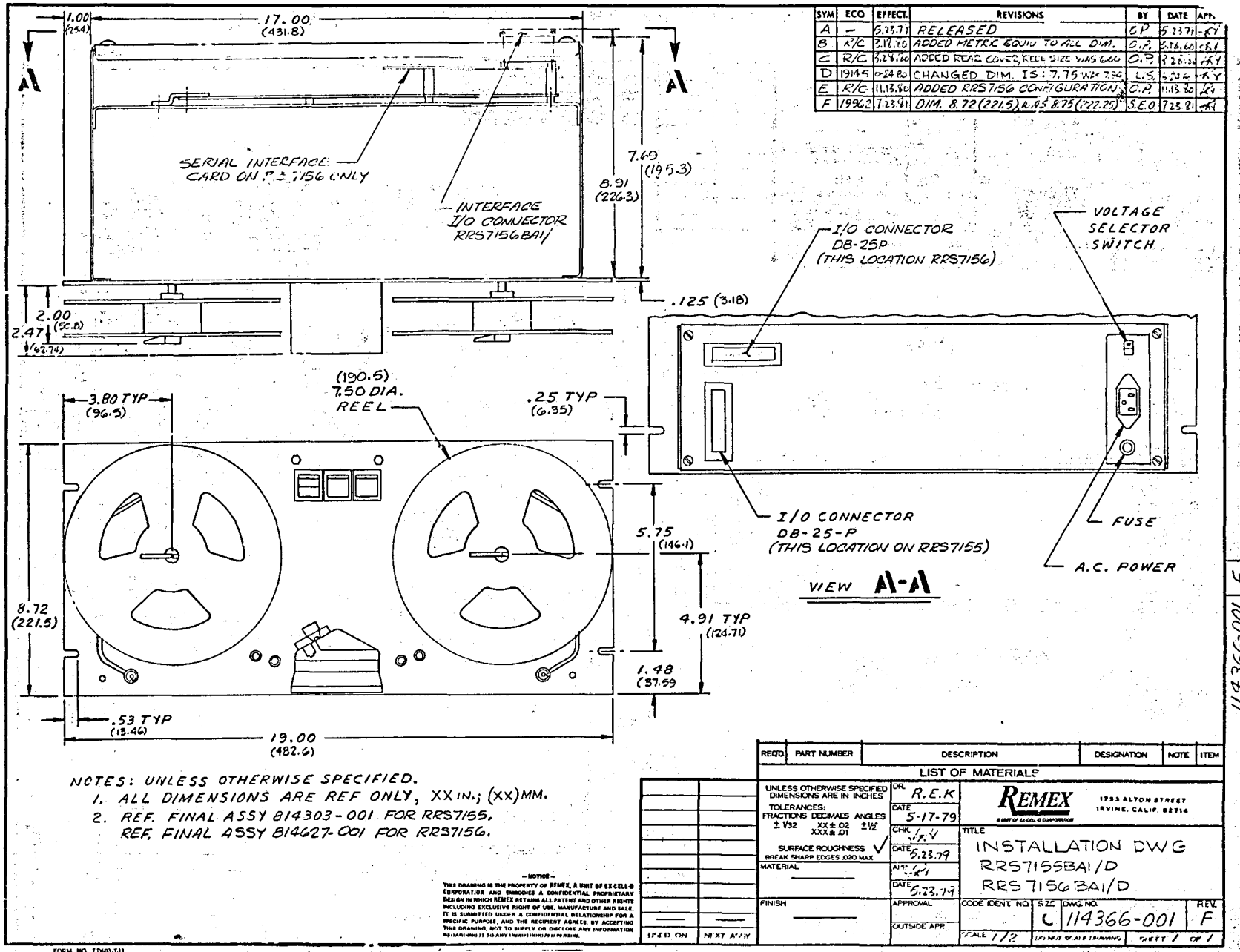
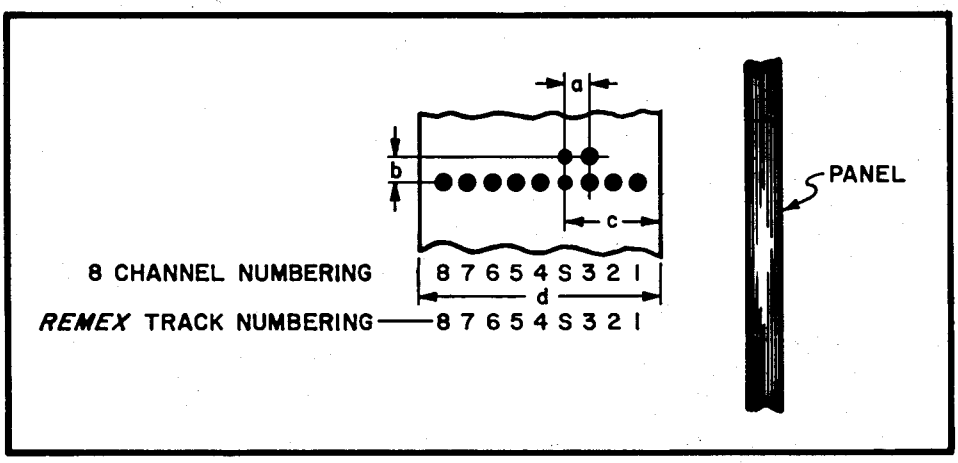


Figure 1-4. Installation Drawing, Model RRS7155BB1/660/D-A.

1.8 TAPE CHANNEL NUMBERING

Figure 1-5 illustrates the tape channel numbering. The reader accepts one inch, eight channel tape only.



MMC 285

a = 0.100 ± 0.002

b = 0.100 ± 0.003

c = 0.392 ± 0.004

d = 1.000 ± 0.003

Tolerance: In span of 1-inch is ± 0.010
In span of 5-inches is ± 0.025

Data Hole Diameter = 0.072 ± .002

Sprocket Hole Diameter = $0.046 \begin{smallmatrix} +.002 \\ -.001 \end{smallmatrix}$

Figure 1-5. Tape Channel Numbering and Dimensions.

SECTION II

INSTALLATION AND INTERFACE

2.1 UNPACKING

To provide the most protection during transit, specially designed and reinforced packing cartons are used to ship the REMEX punched tape reader/spooler. Those items listed in Table 1-1 are also packed with the unit. When removing the unit from the carton, the reader-spooler should be lifted with both hands under it. Never lift or attempt to carry the unit by any of the covers, drive assembly, arms or other delicate parts. Carefully inspect the unit for any apparent damage as soon as it is removed from the carton. Check the equipment supplied list in Table 1-1 against the kit of parts supplied with the reader. In the event the equipment has been damaged as a result of shipping, the carrier and REMEX must be notified as soon as possible.

2.2 MOUNTING

The unit mounts in a standard 19-inch rack with mounting holes provided. To ensure a minimum transmission of accoustical noise and vibration to other equipment, the reader should be securely mounted. When mounting the unit in a closed cabinet, adequate air circulation should be supplied so that the unit does not exceed the ambient temperature specification listed in Table 1-2.

2.3 INITIAL ADJUSTMENTS

Each reader has been accurately adjusted and aligned before leaving the factory. No adjustment or calibration should be required prior to installation or use. However, the proper fuse from the kit of parts requires installation and the voltage switch at the rear of the unit requires switching to the desired voltage input. Refer to Section 2.4.

2.4 POWER AND SYSTEM CONNECTIONS

Input AC power (refer to Table 1-2) is applied through the A.C. connector at the rear.

CAUTION

All units come wired for 115 or 230 VAC, 47-63 Hz operation. The proper input voltage must be selected as described in Section 2.4.1. In addition, before operating the system, the proper fuse value (as indicated in Table 1-1) must be inserted from the kit of parts. Discard the other fuse (unless, of course, a different voltage operation is anticipated).

All control signals and data track output signals are routed through J1. Figure 2-1 lists the detail routing of these signals and their description is given in Table 3-1. All wire sizes are 22 AWG unless otherwise noted in Figure 2-1. The proper mating connector for J1 has been supplied with the unit.

NOTE: All input and output signals are defined for positive logic, mode 5, i.e., logic 0 = 0V and logic 1 = +5V. Therefore, signals that are mode 6, 0V true for logic 1 (action condition) are written with a bar over the designation, e.g., $\overline{\text{Drive Right Input}}$.

J1

1		Data Track 1 Output
2		Data Track 2 Output
3		Data Track 3 Output
4		Data Track 4 Output
5		Data Track 5 Output
6		Data Track 6 Output
7		Data Track 7 Output
8		Data Track 8 Output
9		Data Ready Output
10		Data Mode Select Input
11,12,13,24	20 AWG	Signal Ground 0V
14		$\overline{\text{System Ready}}$ ($\overline{\text{SYSRDY}}$) Output
15		$\overline{\text{External Inhibit}}$ ($\overline{\text{EXT INH}}$) Input
16		$\overline{\text{Drive Right}}$ ($\overline{\text{DR}}$) Input
17		$\overline{\text{Drive Left}}$ ($\overline{\text{DL}}$) Input
18		$\overline{\text{Wind Enable}}$
19		+12Vdc @ 100mA ② ①
20		$\overline{\text{WR}}$ ①
21		$\overline{\text{WL}}$ ①
22		-12 Vdc @ 100mA
23		+5 Vdc @ 0.5mA
25		Chassis Ground

Figure 2-1. Reader Connections to External Equipment. See Table 3-1 for Signal Descriptions.

① These functions appear on units with circuit card 114321-00X with revision F or higher. On these earlier revisions, +12Vdc was at pin 21.

② +12Vdc appeared on J1-21 on units with circuit card assembly 114321-00X revision or lower.

SECTION II

INSTALLATION AND INTERFACE

2.1 UNPACKING

To provide the most protection during transit, specially designed and reinforced packing cartons are used to ship the REMEX punched tape reader/spooler. Those items listed in Table 1-1 are also packed with the unit. When removing the unit from the carton, the reader-spooler should be lifted with both hands under it. Never lift or attempt to carry the unit by any of the covers, drive assembly, arms or other delicate parts. Carefully inspect the unit for any apparent damage as soon as it is removed from the carton. Check the equipment supplied list in Table 1-1 against the kit of parts supplied with the reader. In the event the equipment has been damaged as a result of shipping, the carrier and REMEX must be notified as soon as possible.

2.2 MOUNTING

The unit mounts in a standard 19-inch rack with mounting holes provided. To ensure a minimum transmission of accoustical noise and vibration to other equipment, the reader should be securely mounted. When mounting the unit in a closed cabinet, adequate air circulation should be supplied so that the unit does not exceed the ambient temperature specification listed in Table 1-2.

2.3 INITIAL ADJUSTMENTS

Each reader has been accurately adjusted and aligned before leaving the factory. No adjustment or calibration should be required prior to installation or use. However, the proper fuse from the kit of parts requires installation and the voltage switch at the rear of the unit requires switching to the desired voltage input. Refer to Section 2.4.

2.4 POWER AND SYSTEM CONNECTIONS

Input AC power (refer to Table 1-2) is applied through the A.C. connector at the rear.

CAUTION

All units come wired for 115 or 230 VAC, 47-63 Hz operation. The proper input voltage must be selected as described in Section 2.4.1. In addition, before operating the system, the proper fuse value (as indicated in Table 1-1) must be inserted from the kit of parts. Discard the other fuse (unless, of course, a different voltage operation is anticipated).

2.4.1 TRANSFORMER WIRING CHANGE FOR VOLTAGES OTHER THAN 115 VAC

All units come from the factory with a transformer which allows any of two input voltages to be used: 115 VAC or 230 VAC, 47-63 Hz. Unless otherwise directed by the customer, all units leave the factory wired for 115 VAC. If it becomes necessary to operate on the other voltage, a simple switch change is required.

WARNING

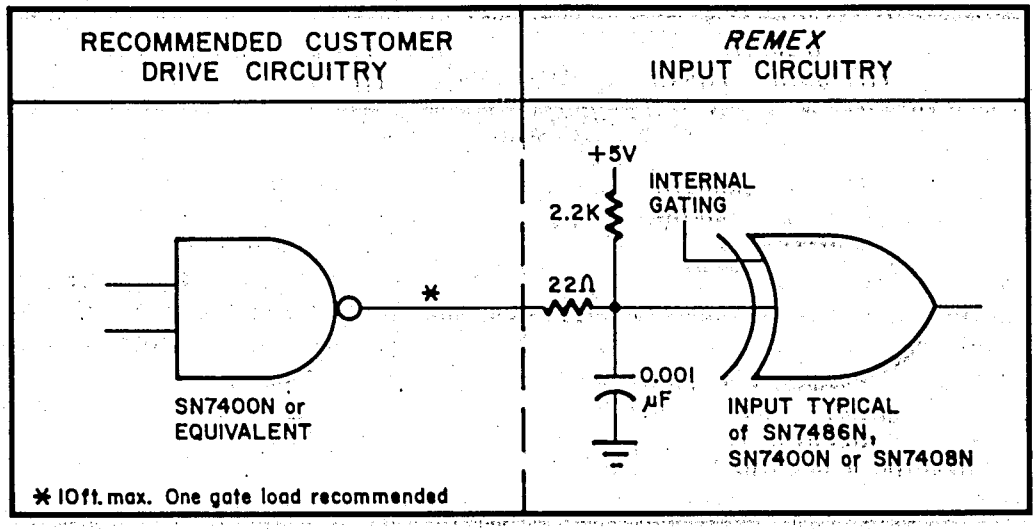
Make sure the power plug is disconnected before making the change.

Change switch S104 from 115 to 230. Switch S104 is located on back panel. See Figure 7-7. In addition, a 1/2 amp fuse and black carrier from the kit of parts must be substituted for the 1 amp fuse and gray carrier at F101 when using 220 or 240 VAC.

2.5 INTERFACE CIRCUITRY

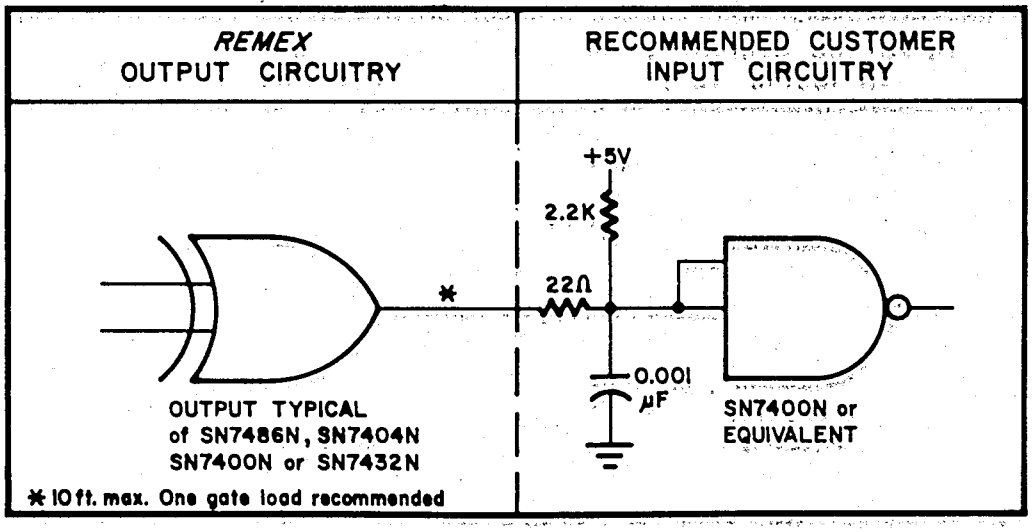
Figure 2-2 illustrates suggested drive and output circuitry with which to interface with the REMEX circuitry. Note the termination network for the output signals. This should be incorporated into the user's equipment for maximum noise elimination. Table 3-1 lists which circuit is used with each input or output.

NOTE: All input and output logic signals are defined for positive logic (mode 5), i.e., logic 0 = 0V and logic 1 = 5V. Therefore, signals that are 0V true (mode 6) for logic 1 (action condition) are written with a bar over the designation, e.g., $\overline{\text{Drive Right}}$ Input.



MMC 304A

Circuit A



MMC 305A

Circuit B

Figure 2-2. Recommended Interface Circuitry.

SECTION III

OPERATION

3.1 INPUT-OUTPUT SIGNALS

Table 3-1 lists those input and output signals which are routed through connector J1. The definition and/or usage of these signals are also included in the table. Figure 3-1 shows the timing diagram for these signals.

3.2 CONTROL FUNCTIONS

Table 3-2 lists the operating controls located on the front panel. A description of the controls and their functions is also included. It is recommended that the reader review the functions of these controls before operating the unit.

3.3 OPERATING INSTRUCTIONS

The following procedure should be used when loading and reading a tape.

3.3.1 LOADING INSTRUCTIONS

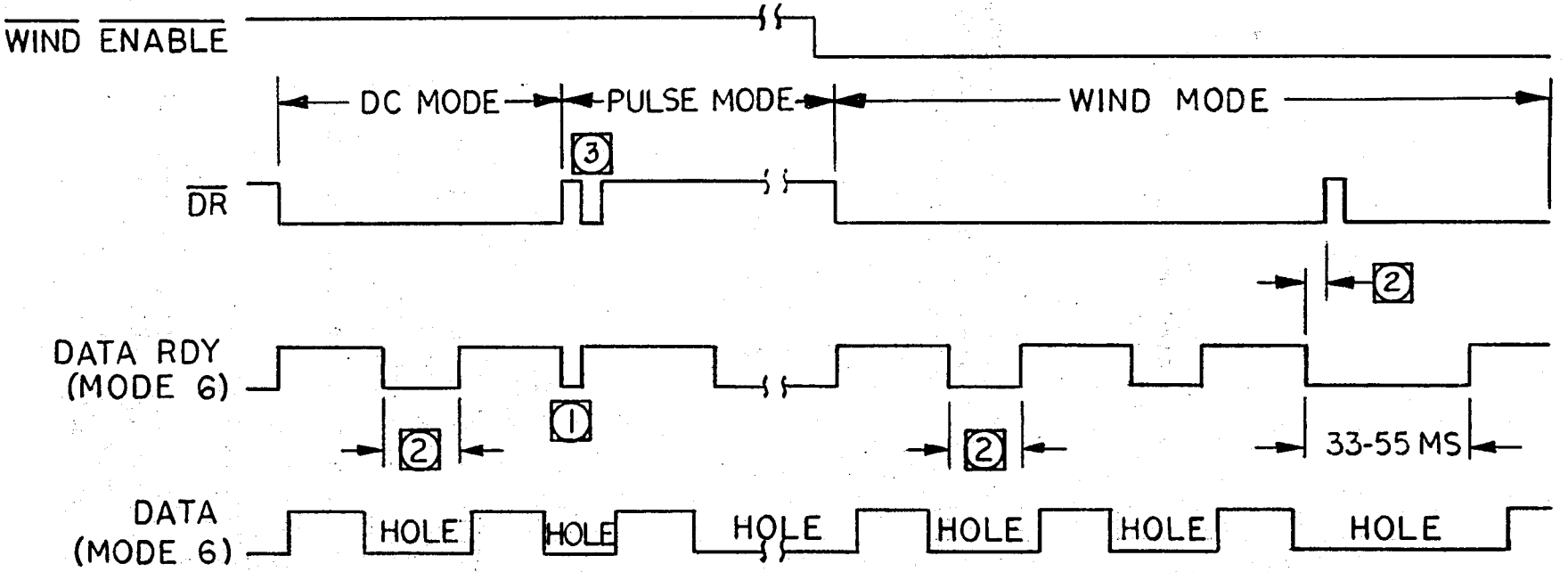
CAUTION

All units come wired for 115 or 230 VAC, 47-63 Hz operation. The proper input voltage must be selected as described in Section 2.4.1. In addition, before operating the system, the proper fuse value and carrier (as indicated in Table 1-1) must be inserted from the kit of parts. Discard the other fuse and carrier (unless, of course, a different voltage operation is anticipated.

a. Connect J1/P1 and plug the line cord into the AC connector.

WARNING

Steps b and c should be performed in the order stated. If step c were performed first (ON-OFF in the ON position with LOOP-LOAD-SPOOL in SPOOL), the spooler would be enabled and any movement of the tape arms could cause rapid rotation of the hub assembly resulting in possible personal injury.



NOTES:

1. IN BOTH DC MODE AND PULSE MODE, THE DATA RDY SIGNAL GOES FALSE WHEN A NEW $\overline{DR}$ IS COMMANDED.
2. IN BOTH MODES, THE MAX DELAY AFTER DATA RDY TO STOP ON CHARACTER IS 500 μSEC.
3. DRIVE SIGNAL MUST REMAIN TRUE UNTIL DATA RDY GOES FALSE.

Figure 3-1. Timing Diagram for RRS7155.

b. Place the LOOP/LOAD/SPOOL switch in the LOAD position.

c. Place the ON-OFF switch into the ON position. This will apply power to the unit.

d. Raise the Upper Tape Guide allowing tape to be loaded. Install the reel of tape onto the hub and thread the tape through the spooler and readhead as shown in Figure 3-2 for the RRS7155BA1/660/G-A and Figure 3-3 for the RRS7155BA1/660/D-A. If a loop of tape is used, let it hang free of the tape arms.

e. Lower the Upper Tape Guide to its closed position and place the LOOP/LOAD/SPOOL switch in LOOP if a tape loop is used or in SPOOL if a spool of tape has been installed.

f. Make sure the System Ready output signal at J1-14 is in the true condition, i.e., 0<V< +0.4.

g. Apply 0<V< +0.4 to J1-10 to select mode 5 data output and data ready signals or + 2.4<V< +5.0 (or open circuited) to select mode 6. See Section 3.3.6.

h. The reader may now be operated in either of the modes listed in Section 3.3.2 or 3.3.3. See Section 3.3.4 for external inhibit operation.

i. To unload tape, stop tape movement, place the LOOP/LOAD/SPOOL switch in LOAD, raise the Upper Tape Guide and remove the tape.

j. To remove power, place the ON-OFF switch in the OFF position.

3.3.2 TAPE DRIVE, READ MODE

In this mode of operation, the reader is controlled in either a continuous or a line-at-a-time step operation but is not completely synchronized with the reader outputs.

a. Perform Section 3.3.1, steps a through g.

b. Make sure the Data Ready signal at J1-9 is in the true condition depending upon the mode. See Table 3-1.

c. Place the $\overline{\text{Wind Enable}}$ input at J1-18 in its false condition (+ 2.4<V< + 5.0 or open circuited).

d. Apply the following signal to the $\overline{\text{drive left}}$ ($\overline{\text{DL}}$) line, J1-17 or the $\overline{\text{drive right}}$ ($\overline{\text{DR}}$) line, J1-16:

Stop: + 2.4 <V< + 5.0 (2.2K to +5V) or an open circuit
Run: 0 <V< + 0.4 @ 5 mA.

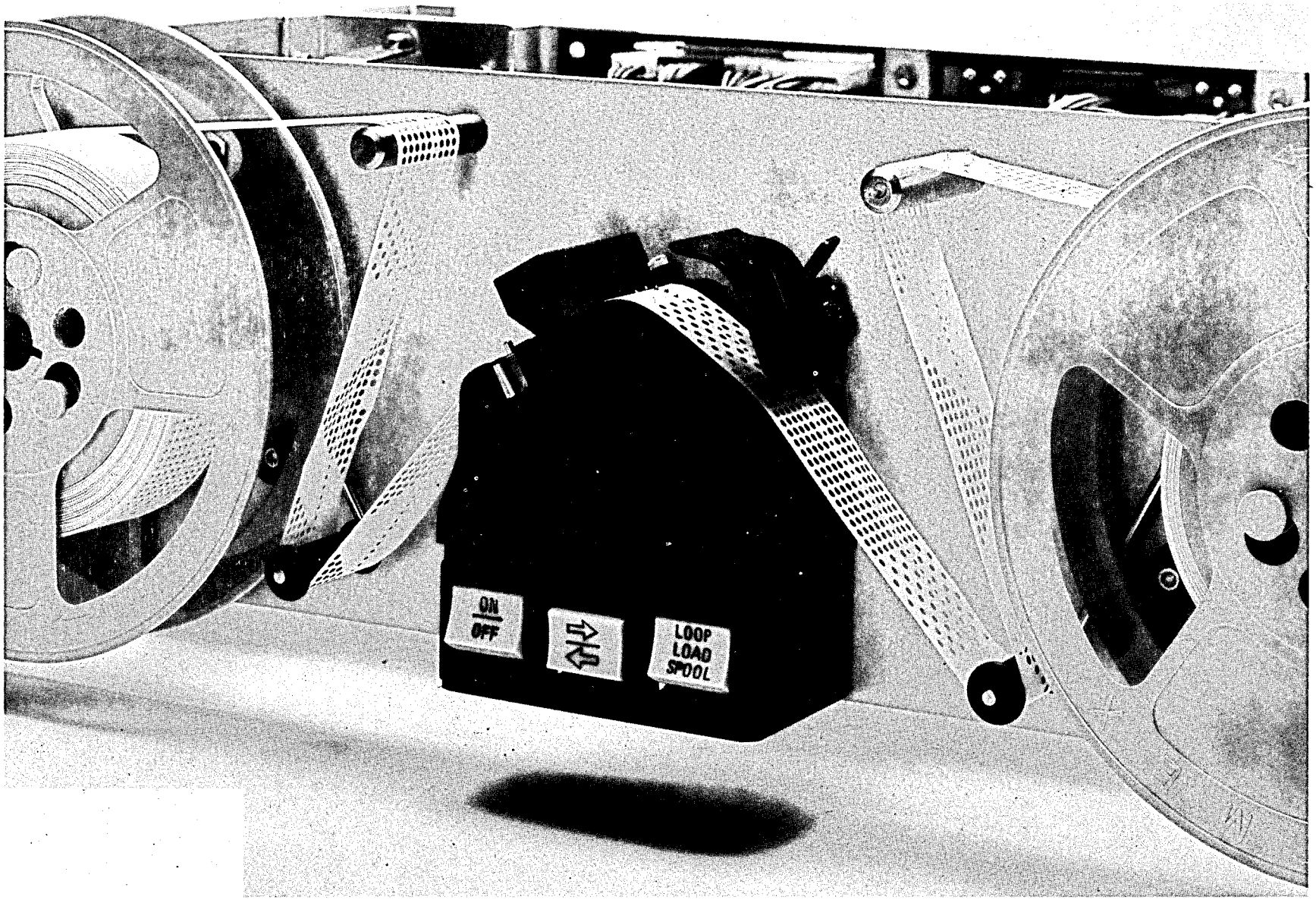


Figure 3-2. Tape Loading, RRS7155BA1/660/G-A.

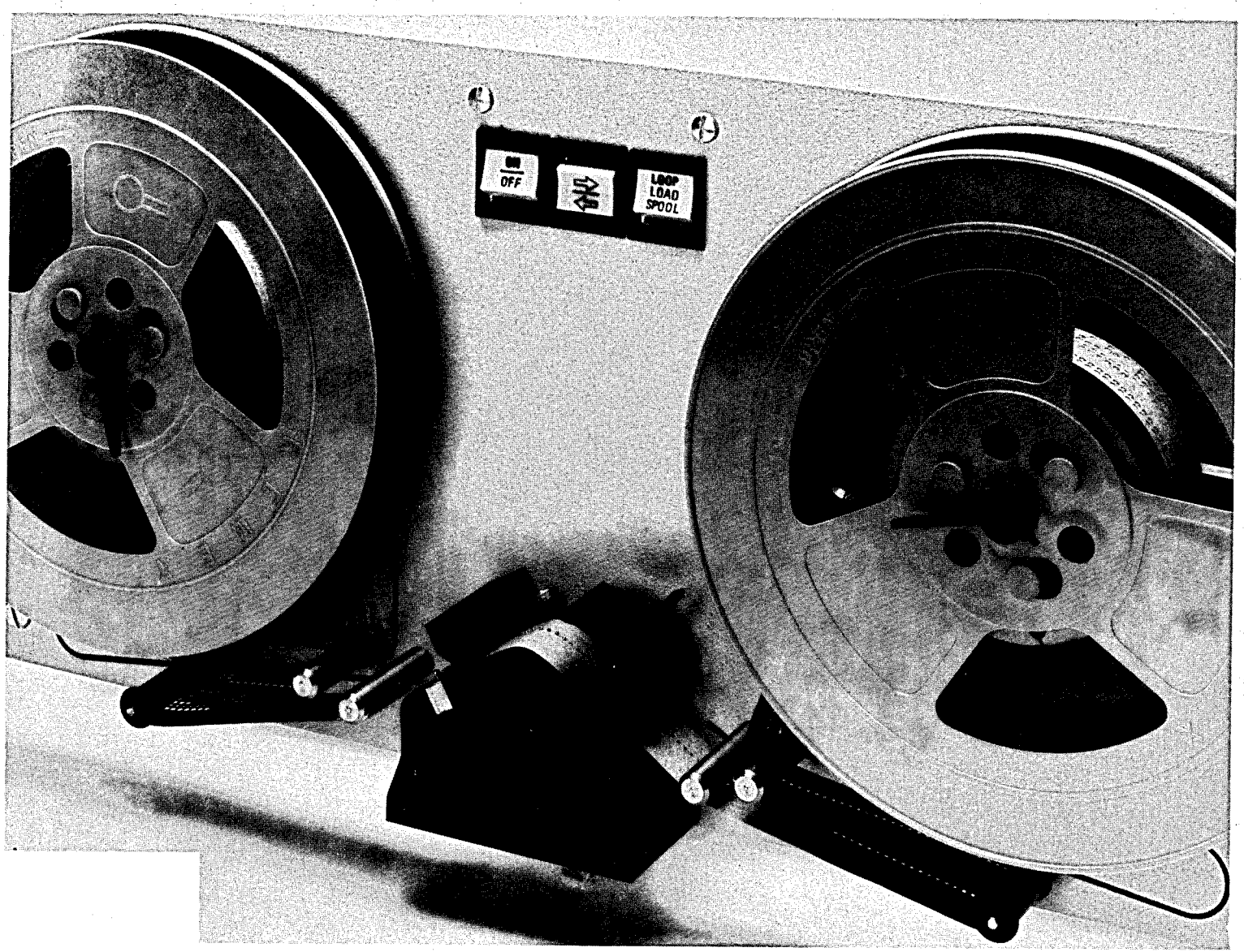


Figure 3-3. Tape Loading, RRS7155BA1/660/D-A.

The drive signal can be either in the form of a pulse (asynchronous) or a continuous DC level (synchronous) which must be removed within 500 µsec after the leading edge of the true Data Ready signal to stop on character. A pulse must be maintained true until the Data Ready signal goes false (typically less than 0.5 µsec) and changed back to the false state in no more than 5 ms. The next pulse or D.C. level may be applied any time after the Data Ready signal comes true. See Figure 3-1. In this mode of operation tape is driven at approximately 200 characters/sec.

e. If the drive direction is reversed and the spooler is enabled, all drive signals will be locked out for 320 ms max. from the time the previous drive signal is terminated to give the servo time to stabilize.

f. Only one run signal must be present at one time. If both run signals are applied simultaneously, the reader will drive in the last previously commanded direction.

3.3.3 TAPE DRIVE, WIND MODE

In this mode of operation the reader is controlled in a continuous operation, and must be completely synchronized with the Data Ready signal or else the drive signal can be locked out.

a. Perform Section 3.3.1, step a through g.

b. Make sure the Data Ready signal at J1-9 is in the true condition depending upon the mode. See Table 3-1.

c. Place the $\overline{\text{Wind Enable}}$ input at J1-18 in its true condition ($0 < V < +0.4$).

d. Apply the following drive signal to the $\overline{\text{Drive Left}}$ ($\overline{\text{DL}}$) line, J1-17 or the Drive Right ($\overline{\text{DR}}$) line, J1-16. Units with circuit card 114321-00X, revision F or higher can apply the same signal to $\overline{\text{Wind Right}}$ ($\overline{\text{WR}}$), J1-20 or to $\overline{\text{Wind Left}}$ ($\overline{\text{WL}}$), J1-21.

Stop: $+2.4 < V + 5.0$ (2.2K to + 5V) or an open circuit
Run: $0 < V < +0.4$ @ 5 mA

DC level input signal drives tape at approximately 400 characters/sec. Signal must be maintained until at least the next Data Ready signal goes true, but must be removed within 500 µsec after the leading edge of the true Data Ready signal to stop on that character. After the stop signal is applied, subsequent drive signals will be locked out for 30 to 55 msec before the reader can be driven again. If the drive direction is reversed, the new drive signal will be locked out for 320ms from the time the previous drive is terminated to allow the spooler to stabilize.

e. Only one run signal must be present at one time. If both run signals are applied simultaneously, the reader will drive in the last previously commanded direction.

3.3.4 EXTERNAL INHIBIT

In this mode of operation, the reader and spooler are inhibited and the System Ready output (J1-14) and the Data Ready output (J1-9) are set to the false state. To place the reader in the inhibit mode apply the following signal to pin 15 of J1:

Reader Not Inhibited: +2.4<V< +5.0 (2.2K to +5V) or an open circuit
Reader Inhibited: 0<V< +0.4 @ 5 mA.

3.3.5 MANUAL DRIVE MODE OPERATION

Tape can be driven manually at approximately 400 characters/sec either to the left or right as follows:

a. Perform Section 3.3.1, steps a through g.

b. Depress ← switch for drive left or the → switch for drive right as required. This option can be used to wind tape onto either reel.

3.3.6 DATA OUTPUT MODE SELECTION

The output mode of both the data tracks and the Data Ready output is selectable for either Mode 5 (+5V true) or Mode 6 (0V true) by applying one of the following signals to J1-10:

Mode 5: 0<V< +0.4 @ 17 mA max.
Mode 6: +2.4<V< +5.0 (or open circuit).

Table 3-1. Interface Signal Descriptions

Connector/ Pin	Description	Interface Circuit (see Figure 2-2)& I.C. Type	Signal Levels	
			True Condition	False Condition
J1-1 thru J1-8	Data Track Outputs. True signal indicates data track hole and false condition indicates no hole condition. Output mode 5 or 6, selectable (see J1-10).	B SN7486N	Mode 5:+2.4<V<+5 @0.2 ma (source) Hole (or Data Ready) Mode 6:0<V<+0.4 @16 ma (sink) Hole (or Data Ready)	Mode 5:0<V<+0.4@16 ma (sink) No Hole (or Data Not Ready) Mode 6: +2.4<V<+5 @0.2 ma (source) No Hole (or Data Not Ready)
J1-9	Data Ready Output. True signal indicates data track outputs are in "on character" condition. Signal true with leading edge of feed hole and remains true until next drive signal is forced false by a load condition, external inhibit signal or out-of-tape signal. Output mode 5 or 6, selectable (see J1-10).	B SN7486N		
J1-10	Data Mode Select Input. True signal places data outputs and data ready output in mode 6. False signal places data outputs and data ready output in mode 5.	A	+2.4<V<+5.0 (or open circuit) Data Track & Data Ready signals in mode 6.	0<V<+0.4 @ 17 ma max. Data Track & Data Ready signals in mode 5.
J1-11 thru J1-13,J1-24	Signal Ground (OV) to External Equipment. OV ground reference for all inputs and outputs (isolated from chassis ground).			
J1-14	System Ready (SYSRDY) Output. True signal indicates the load switch is in its run position and none of the false condition signals are present (system ready). False signal indicates at least one of the following conditions is present: (1) LOOP/ LOAD/SPOOL switch in LOAD, (2) the External inhibit signal present, (3) if a drive signal is accepted and a new feed hole is not sensed within 550 ms., this output indicates either no tape or torn tape and serves as the out-of-tape signal.	B SN7400N	0<V<+0.4 @ 16 ma (sink) System Ready	+2.4<V<+5/0 @ 0.2 ma (source) System Not Ready

Table 3-1. Interface Signal Description, Cont'd

Connector/ Pin	Description	Interface Circuit (See Figure 2-2)& I.C. Type	Signal Levels	
			True Condition	False Condition
J1-15	$\overline{\text{External}}$ $\overline{\text{Inhibit}}$ ($\overline{\text{EXT}}$ $\overline{\text{INH}}$) Input. True signal inhibits reader operation and causes System Ready and Data Ready signals to go false. False signal allows reader to operate in normal manner.	A SN7408N	0<V<+0.4 @ 16 ma (sink) Reader Inhibited. Data Ready and System Ready signals False.	+2.4<V<+5.0(or open circuit) Reader not externally inhibited.
J1-16	$\overline{\text{Drive}}$ $\overline{\text{Right}}$ Input. True signal drives tape to right. See sections 3.3.2 thru 3.3.3.	A SN7400N	0<V<+0.4 @ 5.0 ma max. Reader drives tape to right.	+2.4<V<+5.0(or open circuit) Reader does not drive tape to right.
J1-17	$\overline{\text{Drive}}$ $\overline{\text{Left}}$ Input. Same as drive right except drives to the left.			
J1-18	$\overline{\text{Wind}}$ $\overline{\text{Enable}}$ Input. False condition and true drive signal drives tape continuously at 200 characters/sec. True condition and a true drive signal drives tape at 400 characters/sec.	A SN7400N	0<V<+0.4 @ 5 ma max. Tape drives at 400 characters/ sec.	+2.4<V<+5.0(or open circuit) Tape drives at 200 characters/ sec.
J1-19 (2)(1)	+12Vdc @ 100 ma output available to external equipment.			
J1-20 (1)	$\overline{\text{Wind Right}}$ External input. True signal winds tape to right.	A SN7400N	0<V<+0.4 @ 5.0 ma max. Wind Active.	+2.4<V<+5.0 (or open circuit). Wind inactive.
J1-21 (1)	$\overline{\text{Wind Left}}$ External input. True signal winds tape to left.			
J1-22	-12Vdc @ 100 ma output available to external equipment.			
J1-23	+5V @ 0.5 ma output available to external equipment.			
J1-25	Chassis ground; isolated from signal ground.			

(1) These inputs are present on units with circuit card assembly 114321-00X, revision F or higher.

(2) +12Vdc appeared on J1-21 on units with circuit card assembly 114321-00X, revision E or lower.

Table 3-2. Front Panel Controls.

SWITCH	POSITION	FUNCTION
ON-OFF	OFF	Removes AC Power from reader-spooler.
	ON	Applies AC Power to reader-spooler.
LOOP/LOAD/SPOOL	LOOP	Disables the spooler allowing a tape loop to be read.
	LOAD	Inhibits reader and spooler and places $\overline{\text{System Ready}}$ output in false state.
	SPOOL	Enables operation of the spooler and reader.
DRIVE CONTROL	←	Drives the tape to the left at approximately 400 characters/sec.
	→	Drives tape loop to right at approximately 400 characters/sec.

Table 3-3. Modes of Operation.

MODES OF OPERATION	DESCRIPTION
INHIBIT	System is in Inhibit mode (drive circuits inhibited) when (1) LOOP/LOAD/SPOOL switch is in LOAD, (2) $\overline{\text{External Inhibit}}$ input is true, or (3) End of Tape Sensor is true.
DRIVE	D.C. level or pulse input drives tape at 200 characters/sec., under the conditions described in Section 3.3.2 and Figure 3-1.
SPOOL	Placing the LOOP/LOAD/SPOOL switch in the SPOOL position enables spooler to payout and take up tape.
WIND	When $\overline{\text{Wind Enable}}$ input is true and OV is applied to $\overline{\text{DR}}$, $\overline{\text{DL}}$, $\overline{\text{WR}}$, $\overline{\text{WL}}$ inputs, tape is driven at approximately 400 characters/sec.

3.4 OPERATIONAL MAINTENANCE

After every 6 to 8 hours of use, the operator should check the tape transport area for cleanliness. This is extremely important since any dirt or foreign material covering the readhead can cause readout errors. For general cleaning, use the brush supplied. Cleaning of the readhead assembly area is described in Section 5.2.1.1. Make sure the tape remains clean at all times since any residue picked up by the tape can be deposited on the readhead. It has been found in certain cases that residue picked up by the tape comes from soiled hands. It is important that care be exercised when handling tape, especially in machining areas or other areas where grease, oil and sprays are present.

3.5 TAPE RECOMMENDATIONS AND AVAILABILITY

The tapes listed in Table 3-4 are among those recommended for use. Mylar tapes should be used in applications requiring continuous use.

Table 3-4. Recommended Tapes.

Type	Manufacturer	Part Number
Paper, Unoiled or Oiled (except black carbon filled)	REMEX	715200-002 1000 foot roll
	Paper Manufacturers, Inc.	Perfection Series
	Bemis	Paper Tape Series
Special Paper	Numeridex	0500
	Nova Tech	Syntosil Machine Tool Tape
Special Mylar	Arvey	RVCZ 60
	Chase Foster	PMP01151
	Numeridex	2000

NOTE: Black carbon tapes may be used but with reduced tape life.

3.6 TAPE PREPARATION REQUIREMENTS

Proper tape reader operation requires that the maximum accumulated longitudinal error between feed hole centers in the punched tape be ±0.025 inch within any span of 5 inches, as specified in the American National Standards Institute Standard X3. 18-1974 (ANSI; formerly United States of America Standards Institute). In the event a user has, because of punching problems, a number of tapes which do not conform to this specification by an amount consistently out of tolerance, the reader may be set up as in Section 5.4 using one of these tapes rather than the type specified. However, unless absolutely necessary, the user should be encouraged not to do this since the reader performance may be compromized, especially in restricting the tape tolerances capable of being read. For ease of threading the recommended tape leader length is four feet.

A tape gauge is available from REMEX (part number 110597) so that the ±0.025 tolerance specification can be checked. To use the gauge, place the feed hole of one end of a 5-inch span (50 characters) at the single cross hair and swing the other end of the 5-inch span in the arc until one of the cross hairs is centered in the feed hole. Read the measurement adjacent to that cross hair (plus tolerances to the right and minus tolerances to the left). A second 5-inch gauge is printed at the bottom to check both longitudinal and perpendicular transverse center line spacing.

SECTION IV

THEORY OF OPERATION

4.1 BLOCK DIAGRAM DESCRIPTION

The REMEX Punched Tape Reader/Spooler Combination performs three basic functions: (1) it drives tape in either direction over the read station, (2) converts the tape information into electrical signals and (3) spools tape on and off the tape reels. These three functions are described in block diagram form in Sections 4.1.1, 4.1.2 and 4.1.3 and illustrated in block diagram form in Figures 4-1 and 4-2. Figure 8-1 gives the overall system schematic for both units.

4.1.1 TAPE DRIVE

Reader card 114321-001 contains the circuit logic for both models of the RRS7155. These units can be operated either at 200 characters/sec with the ($\overline{WIND}$) input false or at 400 characters/sec with $\overline{WIND}$ true (at 0V). Operation at 200 characters/sec will be described first followed by the 400 character/sec description. Refer to Figure 4-1 for the Reader Block Diagram.

Applying a 0V, true signal to the $\overline{\text{drive left}}$ ($\overline{DL}$) or $\overline{\text{drive right}}$ ($\overline{DR}$) input line sets the direction memory in the input logic to the desired state and establishes the direction of rotation for the motor by setting the three phase counter. The input logic also produces the true $\overline{\text{Drive Gate}}$ ($\overline{DRVG}$) signal which triggers the Ready Circuit. It is the function of the Ready Circuit to make sure the reader is ready to accept a drive command and, when the drive command is accepted, to generate the motor clock pulse (MCP). The MCP pulse is used to advance the three phase counter one count which steps the motor and, in turn, the tape to left or right one line depending upon the direction selected. The tape then stops on character and waits for the next MCP pulse. The Ready Circuit also locks out the sprocket signal for 2 ms after the MCP is generated so that any initial jitter in the sprocket is locked out as the tape starts up and the sprocket goes off character. At the end of the 2 ms time period, the Ready Circuit generates a 770 µs damping pulse which is applied to all three phases of the motor at once to minimize motor oscillations as the tape comes on character.

When the next sprocket hole is read, the sprocket output is amplified, delayed 150 µs and sent to the Ready Circuit. Upon receipt of the sprocket signal, the Ready Circuit generates the following three signals: (1) a Data Ready signal for use in external equipment, (2) a strobe signal which latches up the data from the read head and (3) a 550 µs delay to allow data to be examined and make the stop-go decision. At the end of the delay, if the drive signal has not been removed, the read-drive cycle will be repeated and the tape will advance another line.

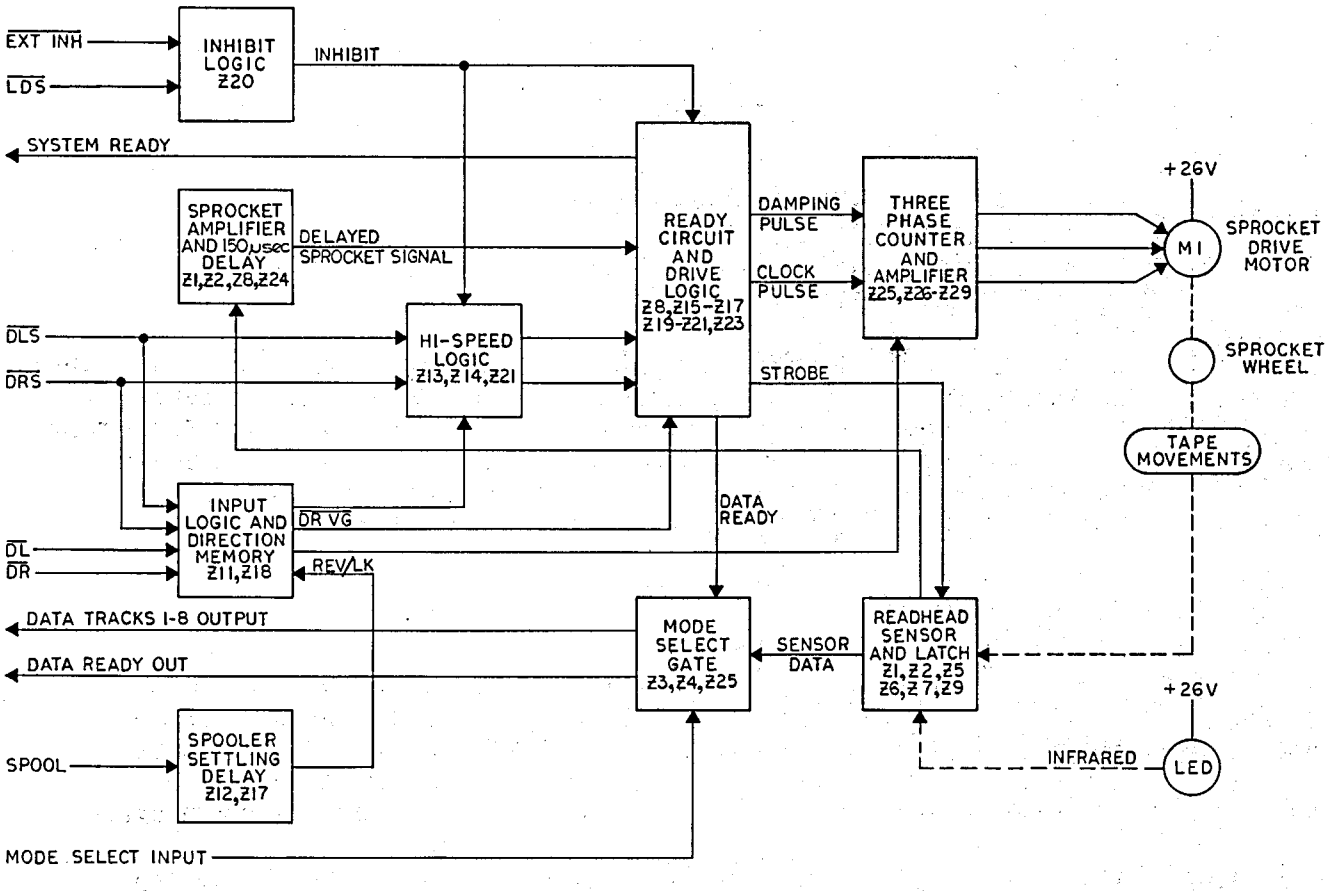


Figure 4-1. Block Diagram Reader Circuitry.

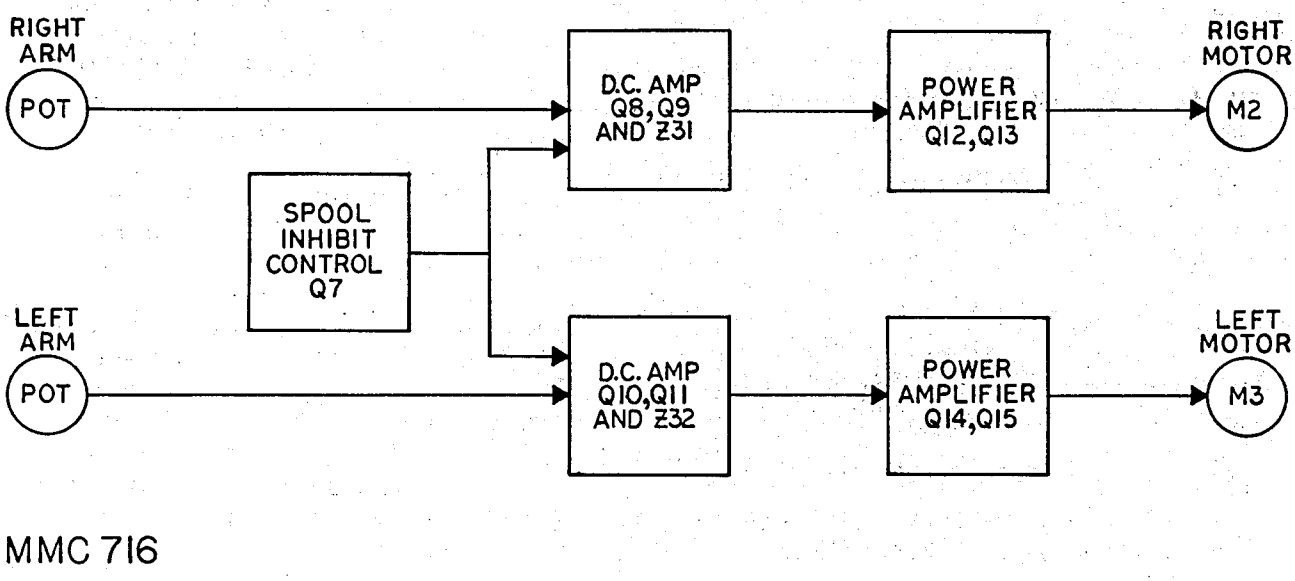


Figure 4-2. Block Diagram Spooler Circuitry.

In WIND operation (400 characters/sec speed), the WIND ENABLE line is pulled down to 0V which sets the high speed flip-flop FF1. The drive sequence is similar to that described for low speed operation with the following exceptions: (1) the damping pulse is inhibited and (2) after the initial MCP pulse starts the motor advancing, a second clock pulse is generated as soon as the tape goes off character. This sets the three phase counter one count ahead of the line to which the tape is advancing. When that line is reached, the motor will not stop, unless the drive signal is removed, but will continue rotating one line more. Again when the tape goes off character, the counter is again pulsed. In this manner the counter is always one count ahead of the line being read on the tape. If, during the 550μs data sampling period, the reader drive signal is removed, the counter backs up one count and causes the motor to stop on character. Another single shot is also set which allows a setting time of 45 ms.

The reader can be inhibited by any one of several methods: (1) placing the LOOP/LOAD/SPOOL switch into LOAD causes the true 0V LDS signal to be generated, (2) a true, 0V, External Inhibit signal applied to J1-15. Items 1 and 2 are gated to form the Inhibit (INH) signal which inhibits both the High Speed Logic and the Ready Circuit and places the System Ready (SYSRDY) in the false state. The System Ready also goes false if, after receipt of a drive signal, no new sprocket is sensed within 550 ms ± 150 ms, indicating that the reader is out of tape.

4.1.2 TAPE READING

The readhead is located under the LED source and contains phototransistor cells which are used to sense the punched tape perforations. As tape is advanced over the readhead by the sprocket drive, the phototransistor cells are energized by the LED source when the corresponding holes are present in the tape. Outputs from the readhead are then applied to the data track amplifiers and latch circuits. A 0V, strobe signal locks up the two latch circuits, Z6 and Z7, thereby storing that line of data. The latch circuit outputs are applied to the Mode Select gates which produces either mode 5 or 6 outputs depending upon the level applied to the Mode Select input. At the same time, the Data Ready-output signal goes true and it too is gated with the Mode Select signal.

4.1.3 SPOOLER BLOCK DIAGRAM

The tape spooler portion of the reader/spooler combination supplies and takes-up tape from the reader during operation. See Figure 4-2 for the Spooler Block Diagram. The operation is discussed below in block diagram form.

Servo mode operation is achieved by the use of an output signal from an arm potentiometer which is proportional to the position of the tape arm. This signal is applied to a summing amplifier which controls a power amplifier that drives the servo motor. When the arm is in the center of its travel the servo motor is not turned on. However, arm movement, caused by the movement of the tape, turns on the motor in the direction which winds or unwinds the tape to bring the arm back to its center position.

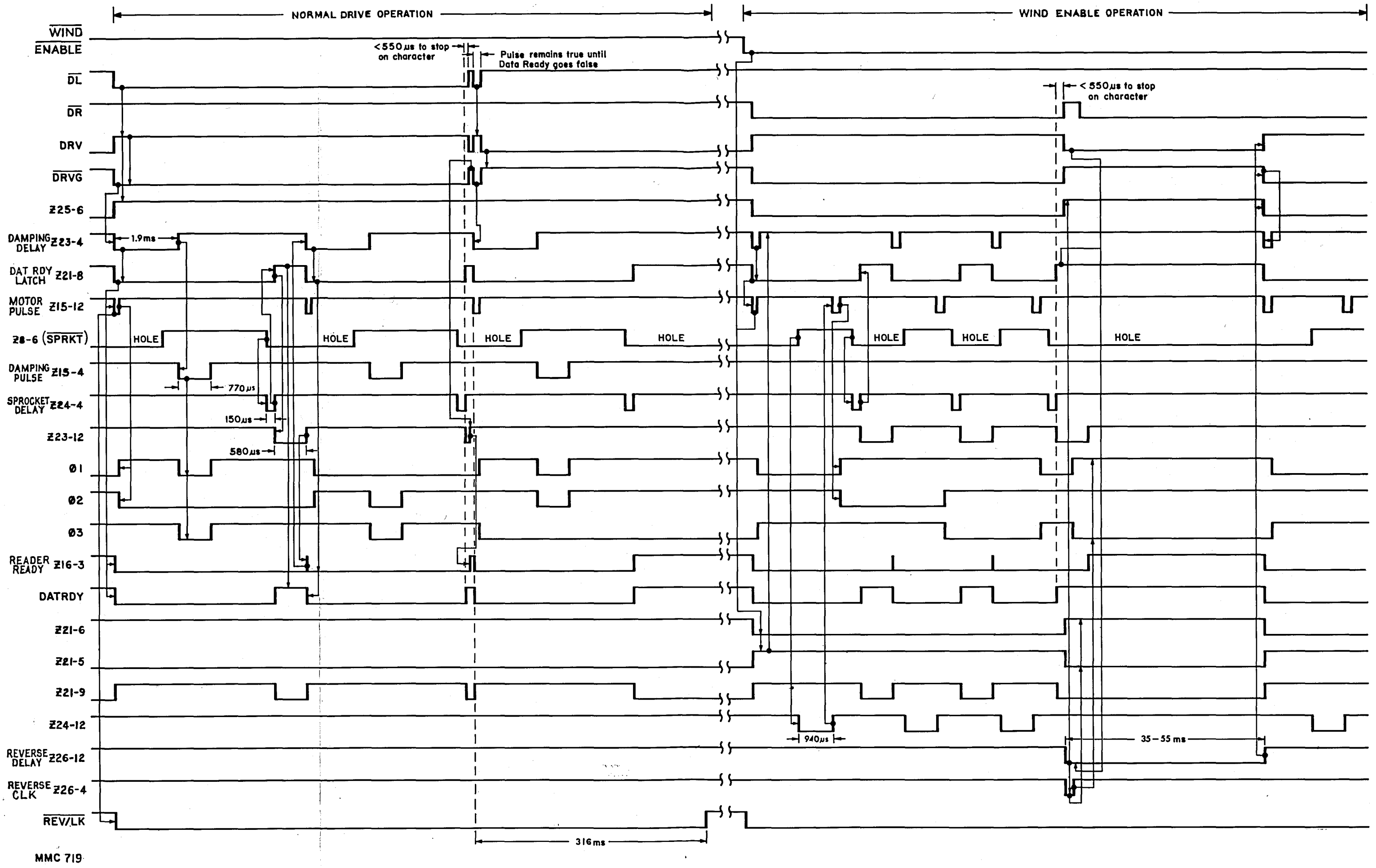


Figure 4-3. Timing Diagram, Reader Circuit Card.

4.2 CIRCUIT CARD DESCRIPTIONS

The following paragraphs describe the operation of the circuits which comprise the Reader Card Assembly 114321. Figure 8-2 gives the schematics (5 pages) for the card. Circuit areas described in the text are referenced to the schematic by sheet number and zone coordinates on that sheet. For example, the location of the stepper motor, M1, would be referenced as 3C1, i.e., zone C1 of sheet 3. Logic devices are designated by the use of a Z followed by a number. An additional number may be added when referring to a pin on a particular gate. For example, the External Inhibit input is applied directly to Z20-2 (4C7), i.e., pin 2 of Z20 shown on zone C7 of sheet 4.

4.2.1 READER CIRCUITRY

The reader circuitry on P.C. Card 114321 is used: (1) to generate output signals used to drive the stepping motor in response to the drive input signals and (2) to provide amplification and gating of the readhead data output signals.

4.2.1.1 Drive Circuits

During the following description, refer to Figure 4-3 which shows the waveforms and timing diagrams for the drive, step and wind enable operations. This figure is intended as a guide to show the sequence of events and which signals initiate other signals. It must be cautioned that due to the wide range of pulse widths, no attempt has been made to draw the time axis to exact scale. Refer also to the schematic, Figure 8-2, sheets 3 and 4, during this description.

Normal drive operation begins with the LOOP/LOAD/SPOOL switch in either LOOP or SPOOL depending upon the tape being read. In the SPOOL position, the spooler is enabled as described in Section 4.2.2. In either LOOP or SPOOL, the inhibiting effectsof the LOAD position are removed. See Section 4.2.1.3.

Application of a true 0V $\overline{DL}$ signal at J1-17 sets the direction flip-flop (F/F), composed of Z11 and Z18, to the drive left state. This places the CW RIGHT line at Z18-11 (3D6) at 0V and causes Z25-6 to rise to +5V (Z25-4 is at +5V since the REVERSE DELAY circuitry is not enabled at this time). A +5V signal at Z25-6 sets up the three phase counter (composed of Z25, Z28 and Z29) so as to energize the motor phases in the sequence which drives tape to the left, i.e., phase 3, phase 2 and then phase 1 (drive right is the reverse order). The counter is advanced one count with each motor clock pulse received as described in the next paragraph.

The 0V, $\overline{DL}$ signal also generates the +5V DRV signal which, in turn, generates the 0V true Drive Gate (DRVG) signal at Z22-3 (3D5). DRVG is used to set single-shot (S/S) Z23 at pin 1 (4B4) and removes the reset from Z23, pin 11. The output of Z23 at pin 4 then goes to 0V which sets F/F Z21 at pin 10. Z21-8 subsequently goes low causing Z20-6 (4D3) to go low and trigger Z15 at pin 9. The output of Z15 at pin 12 is the Motor Clock Pulse signal which is used to set-up the three phase counter at Z29-1 (3B5). The counter is then advanced one count. The Motor Clock Pulse also triggers S/S Z17 at pin 1 (4D6) causing the REV/LK line to go to 0V. This prevents the drive circuits from reversing

direction for 316 ms to allow the reader to stabilize. Z17 is a retriggerable S/S which means the present direction is locked up for 316 ms after the last Motor Clock Pulse.

A new motor phase is now energized which moves the tape one line to the left. Z21-8 also causes Data Ready (DAT RDY) to go false (0V) at Z20-11 (4B3). Z21-9 stays set until Z23-4 times out (approximately 2 ms). As a result, any noise or start up jitter from the sprocket signal is prevented from generating a true DAT RDY signal.

At the end of the 2 ms period when Z23-4 goes high, Z21-10 is released and by this time, the tape is up to speed and the only signal available to reset Z21 is the positive going edge of the Delayed Sprocket Pulse from Z24-4.

The positive going edge of the signal at Z21-9 is also used to trigger S/S Z17 at pin 10 (4B2). This is a retriggerable S/S timed for approximately 550 ms and is used as an End of Tape Sensor. Its output at pin 12 is gated with the Z21-9 output at Z12, pins 4 and 5. If Z17 is not retriggered within the 550 ms and if no sprocket signal is sensed (Z21-9 remains high) then Z12-6 drops to 0V. This places the $\overline{\text{SYS RDY}}$ signal at Z8-8 in the +5V false state, indicating that the system is not ready. Z12-6 also causes Z12-8 (4A6) to be +5V which inhibits the spooler (see Section 4.2.1.3). Readers which use the 002 option (See Table 1-3) use the 114321-002 Assembly. This assembly is identical to the -001 except it uses the End of Tape (E.O.T.) signal to power down the motor (3D3). When E.O.T. is high, Q2 turns on which turns on Q3 and places +26V across the Stepper Motor (M1). If E.O.T. goes to 0V, Q2 and Q3 turn off and R34 is switched in series with M1 thereby reducing the voltage on the stepper motor.

When Z23-4 times out, the positive going edge is used to trigger S/S Z15 at pin 2. The negative going output of Z15 at pin 4 is called the $\overline{\text{Damping Pulse}}$ and is applied to a negative OR combination at Z27, pins 5, 12 and 9 (3C3). The $\overline{\text{Damping Pulse}}$ causes the remaining two motor windings which are not energized during a given phase sequence to become energized by turning on the other two drive transistors of the following: Q4-Q6. This momentary energizing of all three motor phases dampens the inherent oscillations present in all stepping motors as the tape moves on character. The setting of R24 which controls the length of the Damping Pulse is described in Section 5.

When the next line of tape is read, the positive going sprocket signal is inverted at Z8-6 (4E4) and the resulting negative going edge triggers the 150 µs Sprocket Delay at Z24-1. This delay ensures that all data is available before the sprocket is recognized, and used to latch the data. At the end of the 150 s delay, the positive going edge of Z24-4 resets Z21 at pin 11. The resulting positive going signal at Z21-8 is gated with the +5V false Inhibit ($\overline{\text{INH}}$) at Z20, pins 12 and 13 (4B3) to give the +5V true DAT RDY signal. DAT RDY is used two places: (1) it is inverted at Z8, pins 10 and 12 to give the STROBE 1 and 2 signals which are used in the tape reading section (See Section 4.2.1.4) and (2) to trigger S/S Z23 at pin 10. Z23-12 provides a 580µs delay by holding Z16-3 and, in turn, Z23-2 at 0V and prevents another cycle. This allows the external equipment to examine the data and make the go/no-go decision. If the decision to stop is made, the $\overline{\text{DL}}$ input line must be taken high within 580µs. Otherwise, when Z23-12 times out, Z23-2 will again be triggered and repeat the tape advance cycle. If the drive line is taken false and then returned to the true state during the 580µs period, Z23 will be reset at pin 11 due to the $\overline{\text{DRVG}}$ signal at Z19-1 going high and the next drive sequence will begin immediately.

4.2.1.2 Wind Mode Operation

During normal tape reading operations, the WIND ENABLE input at J1-18 is taken high (or open circuited). A true, OV, signal applied to the WIND ENABLE line at J1-18 and a true drive input at J1-16 or J1-17 or a wind input at J1-20 or J1-21 will cause the reader to drive tape at approximately 400 characters/sec. Applying OV to Z13-4 (4E7) causes Z13-6 to go to +5V and, in turn, Z14-8 goes to +5V provided the drive signal is present (DRV is at +5V at Z14-9). Note that Z14-8 will go to +5V when OV from the direction switch (DLS or DRS) is applied to Z14, pin 4 or 5. With +5V at Z14-8 (and Z13-9), Z13-8 is ready to go low when the first Motor Clock Pulse is generated and applied to Z13-13. When the drive signal is applied, the same sequence is generated as described in 4.2.1.1. When the first Motor Clock Pulse is generated in that sequence Z13-11 goes high causing Z13-8 to go low which sets F/F Z21 at pin 4.

The outputs of Z21 at pins 5 and 6 are used to modify the low speed drive sequence (see section 4.2.1.1) by performing the following functions: (1) Z21-5 inhibits the 770 µs damping pulse at Z15-1; (2) Z21-5 enables Z19-11 at pin 13 so that as soon as Z21-9 is set in the drive sequence, Z19-11 goes low and clears Z23 at pin 3 which removes the 2ms damping delay; (3) Output Z21-5 along with the output at Z21-8 are combined at Z16, pins 12 and 13 (4D5) are used to enable Z26 at pin 10. The significance of Z26 will be described later; (4) Z21-6 holds Z20-5 low so that Z15-10 will be triggered by the output pulses from Z24-12 (discussed in the next paragraph); and (5) Z21-6 enables Z24 at pin 10 so that it is triggered by the positive going edge of the inverted SPKT signal.

When the tape moves off character, the positive going SPKT is inverted at Z8-6 and triggers the 770µs S/S Z24 at pin 10 (4D5). At the end of the 770 µs pulse, the positive going Z24-12 signal triggers Z15 at pin 10, causing a second Motor Clock Pulse to be generated. The Motor Clock Pulse is applied to the counter and advances it one count ahead of the phase to which the motor is being advanced. Thus, when the next character is reached, if the reader has not been told to stop, the motor will continue advancing to the next character without stopping. Each time the tape goes off character, the counter will again be pulsed causing it to always be one count ahead. It should be noted that after the initial Motor Clock Pulse is generated by Z21-8 going low, this signal does not generate any more Motor Clock Pulses since Z20-5 is held low. This coupled with the absence of the motor damping pulse (Z15-4) allows the reader to drive tape at approximately 400 characters/sec.

If during the period that Z21-9 is reset and the drive signal is removed, (i.e., the drive signal is removed within the 580µs decision time) the DRV signal will drop to OV and trigger S/S Z26 at pin 9. The resulting negative going output at Z26-12 performs the following functions: (1) provides a 45ms REVERSE DELAY signal which is gated with the DRV signal at Z22, pins 1 and 2 (3D5) and inhibits the DRVG line and prevents another drive signal of the same direction to be applied within 45 ms (a drive signal of the opposite direction is locked out for 316ms by the REV/LK line as previously described); (2) will reverse the direction of the motor counter at Z25-6 (3C6) by placing Z25-4 at OV; (3) triggers S/S Z26 at pin 1 (3B6). With motor counter direction line reversed, the negative going REVERSE CLOCK pulse from Z26-4 causes the three phase counter to back up one count which puts it in phase with the existing motor position, causing it to stop. The REVERSE CLOCK pulse is also applied to Z20-9 (4D6) and is used to reset F/F Z21 at pin 1 which takes it out of wind mode

operation. When Z26-12 times out, the REV/DELAY line returns to +5V. When Z17-4 times out, the REV/LK line returns to +5V and the reader is ready to accept the next drive signal.

4.2.1.3 Inhibit Mode

Normal operation begins with the loading of the tape. Placing the LOOP/LOAD/SPOOL (4A8,4B8) switch into LOAD causes 0V to be applied to Z20-1 (4C7) and in turn, places Z20-3 (the INH line) at 0V. An EXT INH signal applied to Z20-2 produces the same results. The INH is used to perform the following functions: (1) it is applied to Z20-10 and the resulting pin 8 goes to 0V which resets and inhibits Z21-1 at pin 1 if the reader was in wind mode operation; (2) it clears and inhibits Z21 at pin 13, thereby preventing recognition of any sprocket signal; (3) it is applied to Z20-12 which causes the DAT RDY line to be inhibited at 0V. This will also place Z16-3 at 0V and prevent the DRVG signal from triggering Z23 at pin 1; (4) with DAT RDY false, Strobe 1 and Strobe 2 are false which inhibits data from being latched; (5) it is applied to Z16-5 causing a false SYSRDY to be generated. In the LOAD position, Z12-11 is also at 0V causing the SPL INH line to be +5V true. This line inhibits the spooler servo circuit (See Section 4.2.2). After the tape has been loaded, placing the LOOP/LOAD/SPOOL switch into either LOOP or SPOOL removes the above inhibiting effects and makes the reader operational. LOOP position will also inhibit the spooler.

4.2.1.4 Tape Reading Circuits

Hole recognition is by means of a phototransistor sensing array. Nine LED's housed above the tape path provide the illumination. The tape is driven over the top of the Photosensor Array Assembly housed in the Readhead Assembly and when a hole appears between the LED and phototransistor, the phototransistor becomes energized. See Figure 8-2, Sheet 2. Each output is applied to a Schmitt trigger circuit (Z1,Z5) and then thru a Level Converter circuit (Z2, Z9). Following the Level converter stage it is applied to a latch circuit, Z6 and Z7. Track 1 is used in the following discussion since it is typical of tracks 1-8 (the sprocket signal is developed differently as described in a subsequent paragraph). When track 1 is energized, Z1-3 drops to 0V causing Z1-4, Z2-3 to be at +12V level and Z2-2 to be at +5V. Z2-2 is connected to the D_1 input of Z6. When the 0V Strobe 1 signal is generated, Z6 locks its output (Z6-16) corresponding to the input at Z6-2.

Track 1 output at Z6-16 is gated with the Mode Select signal at Z3, pins 1 and 2. A 0V Mode Select input provides a Mode 5 output at J1-1 (i.e., 0V for no hole and +5 for the hole). Conversely, when the Mode Select signal is +5V, J1-1 will produce a Mode 6 output (i.e., +5V for no hole and 0V for hole). The DATRDY output is gated in the same manner as the track output at Z25, pins 1 and 2.

The sprocket track is similiar but its Level converted signal at Z2-4 is not latched as is the data tracks. It is inverted at Z8-6 (4E4) and used as an internal logic signal as described in Section 4.2.1.1. The SPKT is not gated with the Mode Select signal nor is it brought out as an external signal.

4.2.2 SPOOLER CIRCUITRY

The spooler circuitry is designed to control the payout and take-up of the spooler motors during tape reading. Since there are two identical spooler motors and two identical control circuits only one side will be discussed. The following discussion pertains to the left side (refer to Figure 8-2, sheet 5) during the following description.

While tape is loaded on the unit, the LOOP/LOAD/SPOOL switch is set to the LOAD position (4A8). This causes the SPL INH to be at +5V which is applied to the base of Q7 (5C7) which turns on Q7. 0V is then applied to Z32-3 causing Q10 and Q11 to be shut off which, in turn, shut off the drive transistors Q14 and Q15. 0V is also applied across the left arm potentiometer.

When the tape is loaded, the LOOP/LOAD/SPOOL switch is placed in the SPOOL position, thereby removing the SPLINH signal. The tape arm potentiometer is now the controlling component for the motor control circuit. Assume for the purposes of this discussion that the left tape arm is in the slack position. This will make the center arm of the potentiometer more positive and this positive voltage is applied to Z32-2 causing the operational amplifier output at Z32-6 to go in the negative direction. The negative going output of the operational amplifier tends to turn Q11 on while Q10 tends to turn off. When Q11 goes into conduction, its collector goes in the positive direction and this causes Q15 to turn on with the collector of Q15 moving in the positive direction. At the same time Q10 is conducting less and its collector moves in the positive direction causing Q14 to begin turning off. The result is that the junction of the collectors for Q14 and Q15 goes negative. Current flows in the left motor which causes it to rotate in the direction required to take the slack out of the tape and move the arm to its center position. This reverses the off-center bias condition just described and the junction of Q14 and Q15 moves toward zero. Since the purpose of the circuit and motors is to maintain a slight tension on the tape, a small negative voltage remains on M3, sufficient to maintain the proper tension.

When the tape reader sprocket moves the tape in a direction that tightens the tape, the process described is reversed, and the Q14 and Q15 collectors are driven in a positive direction. M3 thus rotates in the direction required to pay out tape and move the arm back to the center of the potentiometer.

4.2.3 POWER SUPPLY

The power supply provides the regulated DC voltages required to operate the logic, LED's and spooler circuits. Figure 8-1 shows the front end of the supply. AC power is applied at J101 and switched through the POWER ON-OFF switch, S101. It is then passed through S104 which switches the power to the proper transformer windings, depending upon whether it is 115 VAC or 230 VAC. The transformer, T101 is a step-down transformer designed to convert the AC line voltage to approximately 40 VAC. The voltage from the transformer secondary is rectified by BR101 and filtered by C101 and C102. The resultant +26 and -28 Vdc voltages are applied to the reader card at J8, pins 3 and 2 (5B4). The +26 and -28 Vdc voltages are unregulated and are used to provide power to the spooler circuits and the LED array assembly. The +26 Vdc is also applied to the input of the 12V regulator Z33. The 5V regulator, Z34 is

supplied from the 12V Regulator Z33. Regulator Z35 is used to convert the -28V to -12V. There are no adjustments in the power supply.

4.3 MECHANICAL THEORY OF OPERATION

Tape handling, at all speeds, requires that the proper tape tension be maintained. This is especially true where rapid, hi-torque starting, reversal of direction, and stopping is necessary. In addition, at times it is necessary to maintain different tape tensions at various points of travel throughout the tape transport mechanism due to the different and simultaneous requirements of the various tape mechanisms.

For example, in order for the tape to be moved over the readhead in a start-stop "geneva" mechanism fashion, the tape must have a certain tension applied in order to flow smoothly. At the same time, in order to insure proper packing on the take up reel, the tape must have a constant tension applied which is significantly different than the tension of the readhead. This is necessary to prevent uneven winding or loose pack on the take up reel.

The REMEX RRS7155 utilizes a unique combination of tape handling devices designed especially to maintain the required tape tension at each point of travel throughout the tape handling process. Assume that a full reel of tape is loaded on the right hand reel and an empty reel is placed on the left spindle. As the tape is moved from right to left during servo mode, it passes by a number of points which require different tension. As the tape is wound on the left hand reel, it starts winding on a small diameter since the reel is nearly empty. This means that the take up motor, if it were a fixed power or constant torque motor, would have a greater wind torque advantage when the reel was empty than when the reel was nearly full. To over come this effect of varying tape diameter, a variable torque motion is used which is controlled by the position of the tape tension sensing arm. This arm indicates to the motor when and how much tape to take up by means of a potentiometer attached to the arm which controls a dc servo. When the reader stepper motor drives tape toward the left reel, the tape sensor arm senses the slack in the tape causing the take-up motor to rotate counterclockwise. This takes the slack out of the tape and moves the sensor arm back to its mid-range.

Thus it can be seen that the tension applied to the tape by the sensor arm is the tension at which the tape passes the readhead. The tape sensor arms are adjusted so that with the stepper motor stopped, the torque motor applies just the amount of tension to the tape required to hold the tape sensor arms in their approximate mid-position. Since the take-up and supply motors always return their arm to the mid-position, it is evident that the tension applied to the tape across the readhead is a function of the tape arm return spring tension.

SECTION V

MAINTENANCE

5.1 GENERAL

The REMEX punched tape Reader/Spooler has been designed to keep maintenance as simple as possible. Table 5-1 lists the maintenance equipment required for the various procedures. To prolong the life of the equipment and minimize down-time, certain checks and preventive procedures are set up in Section 5.2 and Table 5-2 with suggested schedules. Section 5.3 outlines possible malfunctions along with probable causes and remedies. The remaining sections describe the required adjustment procedures. Replacement procedures are given in Section 6.

Table 5-1. Maintenance Equipment Required.

ITEM	QUANTITY
* Frequency Counter, 10Hz to 1kHz, 5V Input	1
Miller-Stephenson MS-200 Magnetic Tape Head Cleaner (REMEX Part Number 716004-150)	1
* Pulse Generator, 10Hz to 1kHz, up to 5V amplitude, 1μs to 100ms width	1
* Oscilloscope, dc to 10MHz, single sweep	1
Tape Gauge, REMEX Part Number, 110597	1
Infrared Filter of 10% transmissivity, REMEX P/N 716051-187	1
* Voltmeter, Digital 0-0.1mA, 0-100mVdc, 0-100Vdc, 100K impedance or greater	1
* Plastic Shim Stock, .010 Thick. Available from Artus Corp., 210 S. Dean St., Englewood, N.J. 07631.	

* These items are not available from REMEX.

5.2 PREVENTIVE MAINTENANCE

Preventive maintenance, which includes cleaning and lubrication, should be performed periodically in order to maintain peak performance. In addition, in order that the warranty remain in effect, the unit must be maintained in accordance with the instructions outlined below (see Section 1.4 and page iii). A preventive maintenance schedule and log are presented in Table 5-2 which indicates the item, frequency of action and references the maintenance paragraph in this section. For customer convenience the table is arranged so that a log can be kept of when each maintenance procedure was performed. Also refer to Section 3.4, Operational Maintenance.

NOTE

The frequency of cleaning as listed in Table 5-2 has been adopted for clean environmental conditions and usage. These items, however, may vary greatly from one installation to another. For example, a reader used in a machine shop to program numerical controls may require maintenance procedures considerably more frequently.

5.2.1 CLEANING

CAUTION

In all cleaning procedures, avoid using cleaning methods and materials other than those recommended in this manual. Do not use ethyl alcohol or denatured alcohol as the denaturing agents vary and may damage the reader. Certain cleaning compounds will damage parts of the reader, especially in the readout assembly area. REMEX primarily recommends the use of Miller-Stephenson MS-200 Magnetic Tape Head Cleaner (REMEX Part Number 716004-150) for most areas requiring cleaning. However, due to the degreasing nature of the cleaner, it should not be used in areas where the spray may come in contact with bearings or other oiled parts. This cleaner may be obtained from REMEX or directly from Miller-Stephenson Chemical Company at one of the following locations:

1001 East First Street
Los Angeles, California 90012

1350 W. Fullerton Avenue
Chicago, Illinois 60614

Route 7
Danbury, Connecticut 06810

To use the cleaner, hold the spray can 4 to 6 inches away from the area to be cleaned and allow spray to flush the dirt off. If a heavy build-up is present, loosen with the spray mist and scrub with a cotton swab. A 6-inch pin-point, spray nozzle extension is available for hard-to-reach areas or for delicate applications. Avoid spraying on lubricated surfaces or parts.

If the Miller-Stephenson cleaner is not available, a small amount of isopropyl alcohol applied to a clean, lint-free cloth or cotton swab may also be used. However, it should be used carefully and sparingly since damage to the photocell and the finish on the plastic cover may result. Use only clear, unadulterated isopropyl alcohol.

It is important that, whether the MS-200 cleaner or the isopropyl alcohol is used, only the amount required to clean the surfaces be applied. Never saturate or drench the areas to be cleaned. Never apply these materials to the LED assembly.

Table 5-2. Preventive Maintenance Schedule and Log.

Frequency* of Action Weeks	Date	Initial	Frequency* of Action Weeks	Date	Initial	5.2.1.1	5.2.1.2	5.2.1.3	5.2.1.4	5.2.3	5.4, 5.5
						Cleaning				Check Adjust.	
2			28			X	X	X	X		
4			30			X	X	X	X		
6			32			X	X	X	X		
8			34			X	X	X	X		
10			36			X	X	X	X		
12			38			X	X	X	X		
14			40			X	X	X	X	X	X
16			42			X	X	X	X		
18			44			X	X	X	X		
20			46			X	X	X	X		
22			48			X	X	X	X		
24			50			X	X	X	X		
26						X	X	X	X	X	X
			52			X	X	X	X	X	X

*See Note on page 5-2.

5.2.1.1 Readhead Assembly Cleaning

The top surface of the readhead assembly should be cleaned every two weeks (for most installations having clean environments; dirtier environments which contain dust, oil and sprays, such as machining areas, may require cleaning as much as every eight hours). Cleaning is extremely important because any dirt or foreign material in this area can create errors in readout. Use the brush supplied or the cleaning material and methods described in Section 5.2.1 and clean the surfaces of the readhead assembly and the upper tape guide assembly. Care should be exercised so that no residue remains from the recommended cleaning materials when the cleaning operation is completed. Figure 5-0 shows the correct method of inserting the cleaning brush between the LED Array Housing Assembly and the Read Head Assembly.

5.2.1.2 Sprocket Cleaning

The sprocket wheel should be checked for cleanliness every two weeks. Depending upon tape conditions, accumulations may build up on the sprocket and be transferred to the sprocket holes in the tape which may cause readout errors. Use the recommended cleaning materials described in the caution in Section 5.2.1. Care should be taken so that the alignment of the sprocket wheel is not disturbed. If the sprocket wheel requires adjustment, refer to Section 5.4.

5.2.1.3 Tape Inspection

Repeated handling and usage of the tape leads to a build up of grease, oil and dirt on the tape. When the build up becomes excessive, this material will become lodged in the tape transport areas and could cause tape reading errors. To prevent this, the tape should be thoroughly inspected every two weeks and repunched as required.

5.2.1.4 General Cleaning

The entire reader should be cleaned every year. Use the following procedure:

> Using the brush supplied with the unit and/or compressed air, remove all dust and dirt, paying particular attention to all moving parts. Use the recommended materials described in the caution in Section 5.2 to remove any grease or other accumulations. When cleaning, use care not to damage components on the circuit board.

5.2.2 LUBRICATION

All points of rotation have permanently lubricated bearings and should not require lubrication for the life of the part.

5.2.3 POWER SUPPLY VOLTAGES

Check all voltages on the reader card listed in Table 5-3 with a voltmeter once every three months. A change in voltage may be indicative of a gradual component failure. Before taking any measurements, allow a short period of time for warm up after turning on power. See Figure 7-7 for location of test points.

Table 5-3. Power Supply Voltage Locations and Specifications.

Voltage and Tolerance	From	To
+ 5.0Vdc ± 0.2V	TP2	TP3
+12 Vdc ± 10%	TP17	TP3
-12 Vdc ± 10%	TP11	TP3
+26 Vdc ± 10%	TP16	TP3
-28 Vdc ± 10%	TP18	TP3

5.3 TROUBLE SHOOTING

Trouble shooting is presented in the form of a chart, Table 5-4, which should be consulted whenever tape reader performance is unsatisfactory. The chart is divided into three columns; Indication - the way in which the malfunctions becomes evident; Probable Cause - the possible reason or reasons for the malfunction; and Remedy - the manner in which the malfunction may be corrected.

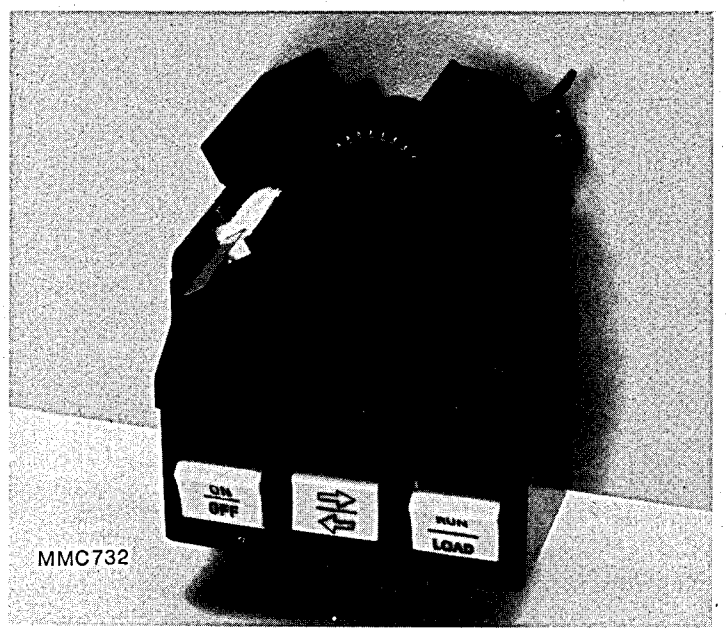


Figure 5-0. Proper Method of Inserting Cleaning Brush.

Table 5-4. Trouble Shooting.

Indication	Probable Cause	Remedy
1. No track outputs on any track.	1. Readhead dirty.	Clean Readhead Assembly as described in Section 5.2.1.1.
2. Outputs present on all but one track or one track intermittent.	1. Readhead dirty.	Clean Readhead Assembly as described in Section 5.2.1.1.
	2. Phototransistor defective.	Check the output of the Phototransistor assembly as described in Section 5.4 and replace if defective as described in Section 6.2.1.
	3. Defective component on Reader Card.	Check the components and I.C. modules associated with the particular track output.
3. Track output present with no hole punched in tape.	1. Tape transmissivity.	Tape must have a transmissivity of 57% or less as specified in Table 1-2.
	2. Defective phototransistor.	Check the output of the Phototransistor assembly as described in Section 5.4 and replace if defective as described in Section 6.2.1.
	3. Defective component on Reader Card.	Check the components and I.C. modules associated with the particular track output.
4. LOOP/LOAD/SPOOL switch in SPOOL or LOOP, correct drive signals present; tape does not move.	1. LOOP/LOAD/SPOOL switch defective.	Check switch S102 and replace if defective.
	2. Defective component on Reader Card.	Check operation of Reader Card.
	3. Step Motor Defective.	Check Ø1 thru Ø3 outputs from Reader Card to see if they are present. If so, replace stepper motor as described in Section 6.2.4
5. Tape does not stop on character.	1. Improper Reader Alignment.	Perform Secton 5.4.
	2. Defective component on Reader Card.	Check operation of Reader Card.

Table 5-4. Trouble Shooting (Continued).

Indication	Probable Cause	Remedy
6. Continuous tape speed less than 200 characters/second.	1. Tape out of registration.	Check tape registration to make sure tape conforms to specifications as described in Section 3.6.
	2. Sprocket out of rotational alignment.	Check alignment of reader as described in Section 5.4.
	3. Defective component on reader card.	Check reader for proper operation of drive circuits and single shot timings.
7. Irregular movement of tape.	1. Drive system improperly adjusted	Perform Reader alignment as described in Section 5.4.
	2. Sprocket wheel bent or worn.	Replace sprocket wheel as described in Section 6.2.4.
	3. Tape guide assembly worn.	Replace tape guide assembly.
8. +5V supply voltage too low or too high.	1. Defective regulator.	Check operation Z101 and replace if required.
	2. T101 malfunction.	Check for presence of 40 VRMS across the secondary terminals of T101. Replace T101 if not present.
	3. BR101 faulty.	Check operation of bridge rectifier BR101 and replace if faulty.
9. Spooler spills tape when first turned on.	1. Improper threading	Thread tape as shown in Figure 1-1.
10. Tape sensor arms hit bumper during operation or arms act erratically.	1. Improper adjustment of tape arm pot.	Check tape arm potentiometer zero adjustment as described in Section 5.6.
	2. Reader card malfunction.	Check operation of servo circuitry on reader card.

Table 5-4. Trouble Shooting (Continued).

Indication	Probable Cause	Remedy
11. Spooler does not go into wind mode when proper signals are applied.	1. Reader card malfunction.	Check operation of Reader card.
12. One spooler motor does not operate.	1. Reader card malfunction.	Check outputs from servo circuitry on Reader card and replace card if required.
	2. Servo motor faulty.	Check servo motor and replace if required as described in Section 6.3.3.
13. LOOP/LOAD/SPOOL switch in SPOOL, reader drives tape, and neither spooler motor runs.	1. Switch S102 faulty.	Check S102 for proper operation and replace as described in Section 6.2.6.
	2. +12 or -12 Vdc on Power Supply card faulty.	Check to see if proper power supply voltages are present on Reader card and replace if required.
	3. Servo circuitry on Reader card faulty.	Check reader card for proper operation and replace if required.
	4. T101 faulty.	Check for presence of 40 VRMS across the secondary terminals of T101 and replace if not present.
	5. BR101 faulty.	Check operation of bridge rectifier BR101 and replace if faulty.

5.4 READER ALIGNMENT

Proper adjustment depends upon making and maintaining accurate adjustments. Although all adjustments are made at the factory, the following adjustments should be checked periodically (refer to Table 5-2) and should be performed only when the tape reader performance is unsatisfactory or when any of the following items is replaced: LED array, read head assembly, upper tape guide assembly, mechanism assembly, sprocket, step motor or circuit card. Letter designations in parenthesis refer to items called out in Figure 7-1.

Improper adjustment of this procedure will result in one or both of the following problems: (1) reading errors, especially in computer applications and (2) restriction of the tape tolerances capable of being read, i.e., either long or short tolerance tapes, not the ±0.025 inch in either direction as specified in Section 3.6.

CAUTION

This is a factory set adjustment and should not require readjustment unless one of the aforementioned components has been replaced or the reader performance is unsatisfactory.

a. Remove all power and control signals by disconnecting P1 and the power cord plug.

CAUTION

The procedure outlined in steps b through i should not be performed unless the read head assembly, mechanism assembly, sprocket or step motor has been replaced or the reader performance is unsatisfactory. Prior to adjustment, steps b, d, e and f should be checked and corrective steps c and/or g, h, i and j performed only if necessary.

b. Raise the Upper Tape Guide. Check the clearance between the read head housing tape riding surface and the sprocket perimeter high point by placing the end of a small steel rule on the surface and rock the sprocket in both directions. See Figures 5-1 and 5-2. Observe that the perimeter high point clears the steel rule by a few thousandths of an inch. The sprocket teeth must have maximum tape penetration with no interference when driving tape. If the sprocket is not positioned as described, perform step c.

c. If the conditions of step b do not exist, loosen two screws (D) which hold the motor heat sink to the panel. Adjust the height of the motor so that the conditions in step b exist. Tighten screws (D). On some units it may also be necessary to loosen the two 8-32 socket head screws (B) at the rear of the panel which hold the Mechanism Assembly to achieve the required setting. This should only be attempted if the adjustment cannot be made with the motor only. Tighten screws (B) if required. Check the conditions in step b again and perform step c as required.

WARNING

If the motor has been running for a period of time, it or the head sink may be too hot to touch comfortably. Allow sufficient time for the motor and heat sink to cool before any adjustment or use a cloth or pair of gloves.

d. Insert a loop of tape known to have been punched to within ±0.0025 inch in a 5-inch span (0.05% error).

NOTE

Since repeatability of the feedhole placement in either direction is essential, a tape whose accumulated error in a 5-inch span is considerably better than 0.025 inches (as specified in Section 3.6) must be used in this procedure. REMEX specifies a tape known to be punched to within ±0.0025 inch in a 5-inch span (±0.05% tolerance). Note that most REMEX punches are specified at ±0.025 and therefore these tapes should not be used for this adjustment unless the tape has been checked on a registration gauge and found to be within ±0.0025 inch.

e. Loosen the two 4-40 socket head screws which hold the LED Array Housing Assembly to the Mechanism Assembly and remove the LED Array Housing Assembly.

f. With the rear edge of the tape parallel to the front panel, align the holes over the light columns in the readout assembly so that they are concentric. See Figure 5-3. The tape must remain parallel to the front panel so that no skew is present. With the tape in this position, the sprocket teeth should be centered in the sprocket holes in the tape. Skewing is indicated by tracks 1 and 8 not being concentric.

g. If the conditions of step f do not exist, loosen the set screw (J) which holds the sprocket to the motor shaft and move the sprocket in or out on the shaft until the teeth are centered in the feed holes and the tape holes remain concentric with the light tunnels. Tighten screw (J). Recheck the adjustment and readjust as required.

h. Connect the power plug and place the POWER switch into the ON position. The motor should be energized.

i. Loosen the single screw which holds the motor to the heat sink.

j. Rotate the motor so that the holes in the tape are concentric with the light columns in the read head and the sprocket teeth are centered in the feed hole. Tighten the screw. Recheck the adjustment and readjust as required.

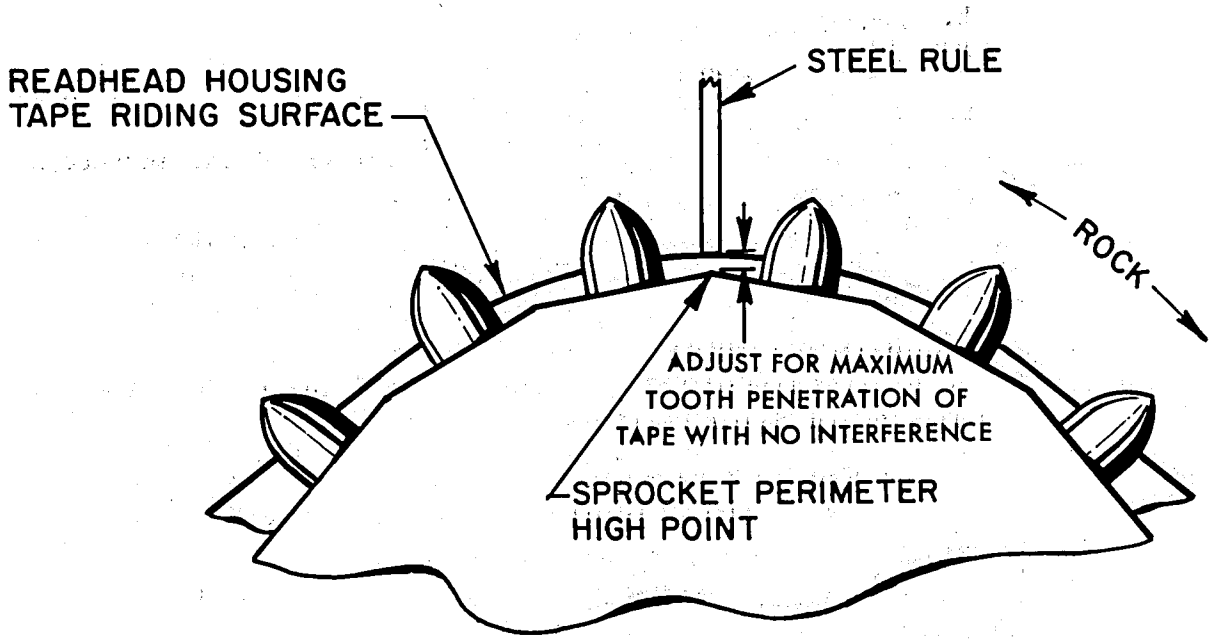


Figure 5-1. Sprocket Height Adjustment Technique.

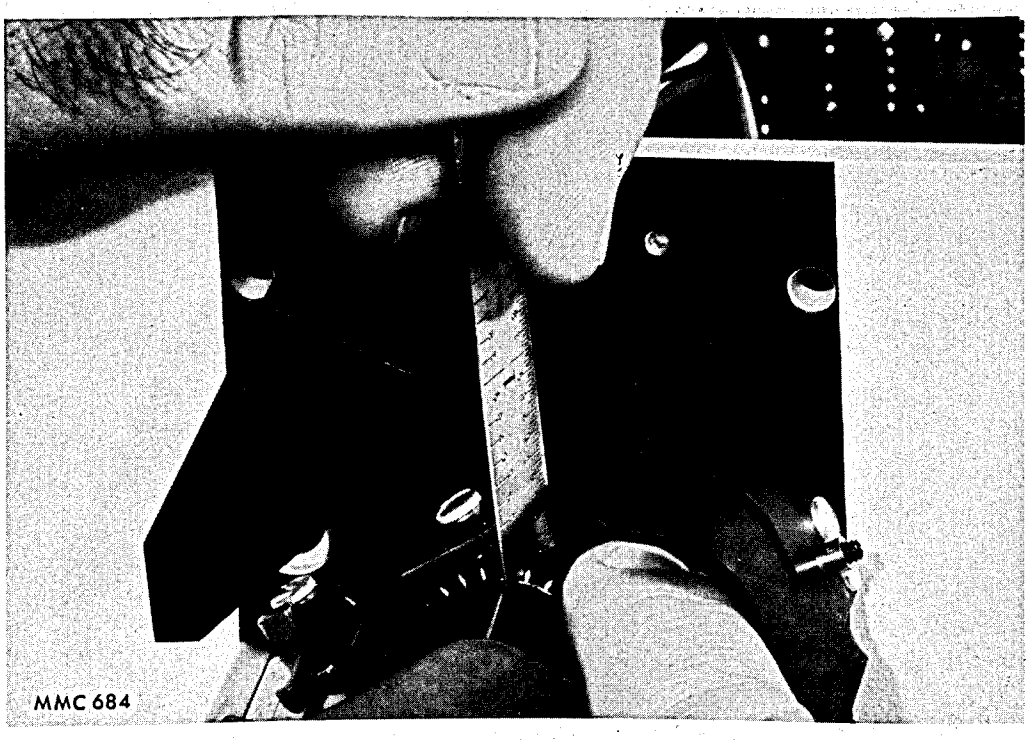


Figure 5-2. Sprocket to Readhead Clearance.

k. Remove the 0.05% tape.

l. Place the POWER switch in the OFF position.

m. Make sure jack screw (E) is not protruding below the surface of the Upper Tape Guide.

n. Insert three layers of 0.0037 mylar tape (approximately 0.011 inch) stapled together at one end or a piece of 0.010 plastic shim stock (see Table 5-1) between the Upper Tape Guide and the readhead assembly.

o. Referring to Figure 5-4 use screws (H) and (N) to adjust the Upper Tape Guide so that there is maximum contact, firm pressure on the tape, and parallelism from A to B. Use screw (H) for lateral movement and screw (N) for rotational movement. From points B to C, the Upper Tape Guide will not show this parallelism.

p. Remove the three layers of tape or the 0.010 plastic shim stock.

q. Insert two layers of tape between points A and B only or a strip of 0.0075 shim stock.

r. Screw down jack screw (E) which will raise the Upper Tape Guide slightly. Adjust screw (E) until there is free movement of two layers of tape or shim stock between points A and B. This should provide a gap of between 0.009 and 0.011 inch.

s. Remove the two layers of tape or shim stock.

t. Replace the LED Array Housing Assembly and reconnect P1 and the Power Cord.

u. Install an infrared filter of 10% transmissivity (REMEX P/N 716051-187) between the LED Array Housing Assembly and the Readhead Assembly.

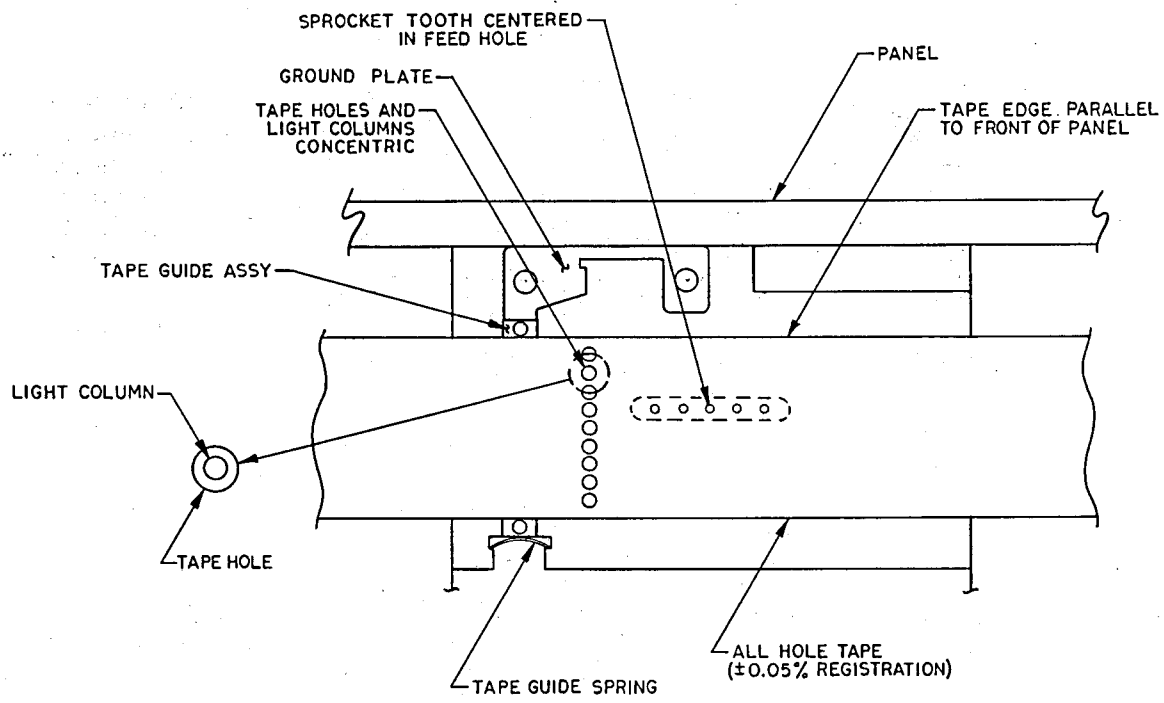
v. Using a digital voltmeter, measure the voltage on the pins listed below for P2. Adjust each corresponding potentiometer for 10.5 Vdc ± 0.25V.

Track	P2-Pin	Potentiometer
1	2	R1
2	3	R3
3	4	R5
FH	5	R7
4	6	R9
5	7	R11
6	8	R13
7	9	R15
8	10	R17

w. Remove the voltmeter and the infrared filter.

x. Place the POWER switch in the ON position and insert the 0.05% tape described in step d.

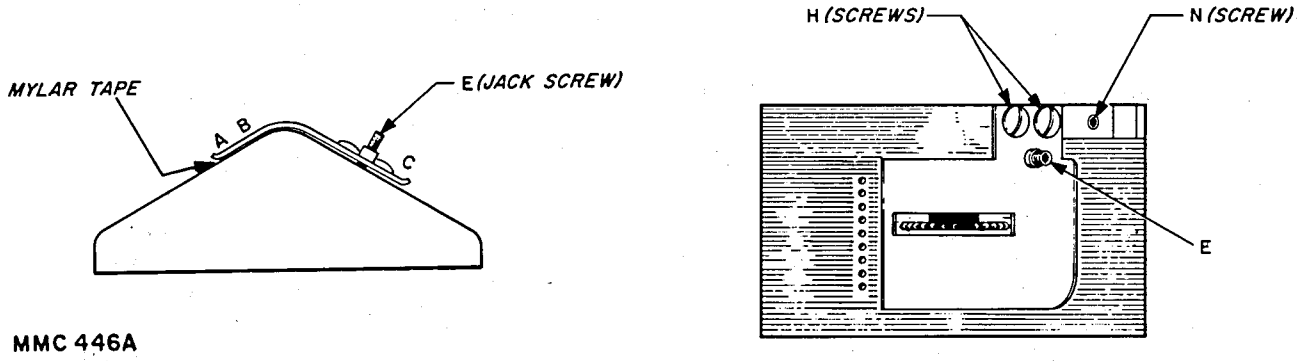
y. Connect a pulse counter to TP6 (Data Ready) and TP3 (0V) on the Reader Card.



NOTE: L.E.D. LIGHT SOURCE REMOVED FOR CLARITY

MMC 718

Figure 5-3. Alignment of the Sprocket with the Light Columns.



MMC 446A

Figure 5-4. Adjustment of the Upper Tape Guide.

z. Measure the drive left speed using a DL* signal tied to 0V at J1-17. Repeat using a DR* signal tied to 0V at J1-16. If the lowest speed is more than 5% slower than the highest speed, loosen screw (S) which holds the motor to the heat sink. Rotate the motor slightly so that the difference in drive left and drive right speeds is less than 5%. Tighten screw (S). Repeat step z as required. When rotating the motor, make sure it is kept tight to the panel so that the adjustment in step g is not disturbed. If steps g and j have been performed correctly only a slight adjustment of the motor should be necessary to obtain the 5% difference in speeds.

NOTE

The importance of steps y and z is not a specific interest in matching speeds, but rather that balancing speeds insures proper placement of the feedhole (via the sprocket) in relation to its aperture in the readhead. The 0.05% tape used virtually assures that there are no feedhole placement errors which are attributable to tape registration errors, but only to the position of the sprocket in relation to the feedhole aperture in the readhead. Thus measuring and balancing the slew speed is only an accurate, electronic method of assuring that this relationship exists. When the speeds in the two directions are properly balanced, feedhole placement error will be minimal and independent of the direction of the tape, thereby increasing tape readability to a maximum.

aa. Connect the oscilloscope probe to TP9 and the ground lead to TP3. Drive tape at low speed (See Section 3.3.2) and observe the damping pulse at TP9. This pulse should be 770µs ±150µs. Adjust R24 to obtain the correct pulse width.

bb. Connect the oscilloscope probe to TP8 and the ground lead to TP3 and observe the pulse width which should be 2.9 ms ± .4ms. Adjust R29 to obtain the correct pulse width.

cc. Connect the oscilloscope probe to TP1 and observe the jitter. The maximum height of the interpulse noise must be less than 25% of pulse height. If this is not the case readjust R24 and R29 to obtain the conditions. Repeat steps aa and bb as required. Do not exceed the tolerance limits placed on pulses observed at TP9 and TP8.

5.5 SERVO ALIGNMENT

Alignment of the servo system is performed in the following manner:

a. Place the ON-OFF switch in the OFF position.

b. Remove all tape and reels from the reader/spooler.

c. Place the LOOP/LOAD/SPOOL switch in SPOOL and the ON-OFF switch in ON and close the upper tape guide.

d. Rotate the left and right tape sensing arms to the center of their travel arc. Secure the arms in this position with a rubber band loop around the tape rollers.

e. If the left motor rotates when the arm is positioned in the center of its travel arc, perform steps f and g.

f. Loosen the set screw which holds the coupling to the potentiometer shaft. See (A) Figure 7-4.

g. Rotate the shaft (B) of the potentiometer until the left motor stops rotating. Tighten set screw (A).

h. Repeat steps e, f and g for the right arm.

5.6 TAPE SPLICING

If tape breakage occurs, this break may result in damage to one, two or possibly three characters. When splicing tape for this reader, great care should be used to ensure that the proper sprocket hole spacing be preserved. A lap splice should not be used; use only a butt type splice. To repair the tape without loss of characters, the process shown in Figure 5-5 is recommended and is accomplished as follows:

a. Bring the tape ends together as shown in Figure 5-5A.

b. Make a sketch of character(s) at the break (A-B-C) and five additional characters to the left (5-4-3-2-1) and five to the right (1-2-3-4-5) of the broken character(s) (A-B-C).

c. Place the left end of the broken tape over a section of blank tape containing only feed holes so that at least eight or ten feed holes in each tape are aligned with one another as shown in Figure 5-5B. Cut the tapes at the third undamaged character (A-B-C). Use care to insure that feed holes are aligned and make cut through the center of the holes in the third undamaged character. Characters 5, 4 and half of 3 should remain on the broken tape.

d. Place the right end of the broken tape over the section of blank tape so that at least eight or ten feed holes are aligned with one another. Feed holes for one-half of 3, 2 and 1 on the blank tape cut in step c should be visible to the left of the broken tape end as shown in Figure 5-5C. Cut the tapes at the third undamaged character to the right of the damaged character. Be sure that the feed holes are aligned and make the cut through the center of the holes in the third undamaged character.

NOTE

One-half of character 3 and characters 4 and 5 should remain in the broken tape.

e. Place tape ends and new section on a flat surface with feed holes forward as shown in Figure 5-5D (tape is bottom side up). Using silver Scotch tape, No. 852, splice the new section and the old tape ends as shown. That portion of tape that secures the old tape ends must cover the first two and a half characters (one-half of 3,4 and 5) on the old tape ends. The edges of the tape should be between characters as shown. Use of 1/2-inch wide splicing tape is recommended as shown in Figure 5-5D.

f. Repunch the characters recorded in step d.

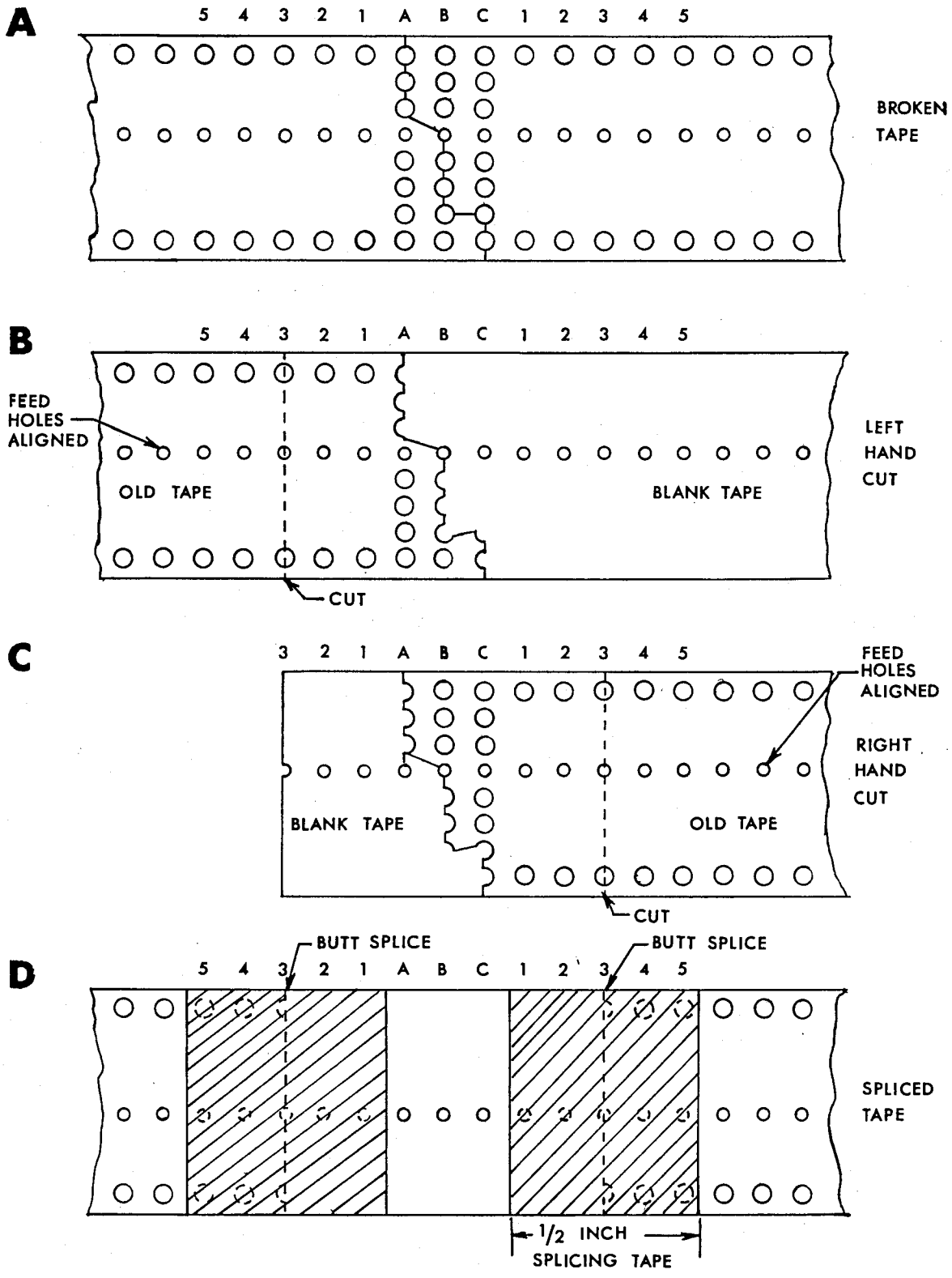


Figure 5-5. Tape Splicing Procedure.

SECTION VI

PARTS REPLACEMENT

6.1 GENERAL

REMEX maintains service facilities at its manufacturing location and at service centers in major population areas for repair or replacement of components for their products. It is recommended that one of these centers be contacted for assistance in case of equipment malfunction. For the locations of service facilities in any area, contact REMEX at the address listed on the title page of the manual. Please direct inquiries to the attention of the Service Department.

When any parts of the reader require replacement or disassembly, the procedures below should be followed closely. The warnings and cautions are included to protect personnel and equipment. Notes are included to assist persons unfamiliar with the equipment. Before attempting any procedure, all instructions for that disassembly should be read and understood.

Quantities of replaceable items suggested as spares are listed in Table 7-1. All system components are identified in Section VII of this manual, along with illustrations showing part locations. This information may be used to locate parts below unit level if replacement is required.

WARNING

Potentially dangerous line voltage is applied to components within this equipment. If adjustments must be performed with power applied, these points must be located and avoided. High voltage can be accidentally contacted at TB1, at the OFF-ON switch/wiring connections, and on the circuit card (rear of the Unit).

6.2 READER PARTS REPLACEMENT

6.2.1 READHEAD MECHANISM DISASSEMBLY

This procedure is required when replacing the Upper Tape Guide Assembly, the Readhead Assembly (consisting of the Readhead Housing, Phototransistor Assembly and Light Columns), or the Mechanism Assembly. For ease of assembly, it is recommended that the Readhead Assembly (part number 114352-001) and Mechanism Assembly (part number 112346-001) be replaced as a complete assembly. Figure 7-1

should be folded out from Section 7 to follow during this procedure. The following procedure is recommended when replacing any of the above mentioned items:

a. Remove all power and control signals by disconnecting P1 and the power cord.

b. Disconnect P2 from the circuit card.

c. Remove two 4-40 socket head screws (C and F, Figure 7-1) which hold the LED Array Assembly to the Readhead assembly.

d. Loosen the two 8-32 socket head screws (Item B, Figure 7-1) which hold the Mechanism Assembly to the Front Panel at the rear of the front panel. The entire Readhead Mechanism Assembly consisting of the Tape Guide Assembly, the Readhead Assembly, and the Mechanism Assembly is now free to be removed from the panel.

e. Remove the two 4-40 binder head screws (Item H, Figure 7-1) which hold the Tape Guide Assembly to the Mechanism Assembly. If no further disassembly is required, install the new Upper Tape Guide Assembly and perform the reverse of steps e through c. Perform Section 5.4.

f. From the underside of the Mechanism Assembly remove the two 4-40 round head screws (Item I, Figure 7-1) which hold the Readhead Assembly to the Mechanism Assembly. The Readhead Assembly and the Mechanism Assembly are now separated and can be replaced as individual assemblies. It is not recommended that Mechanism Assembly be disassembled beyond this level.

g. Reassembly is the reverse of steps f, e, d and c.

h. Perform Section 5.4.

6.2.2 READER CARD REPLACEMENT

The following procedure is recommended when removing the Reader Card:

a. Remove all power and control signals by disconnecting P1 and the power cord.

b. Disconnect P2/J2, P3/J3, P4/J4, P5/J5, P6/J6, P7/J7 and P8/J8.

c. Remove the nine 4-40 round head screws which hold the reader card to the chassis and P.C. Board spacers.

d. Reassembly is the reverse of steps c and b.

e. Perform Sections 5.4 and 5.5.

6.2.3 MOTOR AND/OR SPROCKET REPLACEMENT

The following procedure is recommended when replacing the motor and/or sprocket:

a. Remove all power and control signals by disconnecting P1 and the power cord.

WARNING

If the motor has been running for a period of time, it or the heat sink may be too hot to touch comfortably. Allow sufficient time for the motor and heat sink to cool before adjusting or use a cloth or pair of gloves.

b. Loosen the screw (Item S, Figure 7-1) which holds the motor to the heat sink and back the motor out.

c. Loosen the set screw (Item J, Figure 7-1) which holds the sprocket to the motor shaft.

d. Install the new sprocket on the new motor and perform the reverse of steps c and b. The sprocket wheel is installed so that:

(1) the distance from the rear of the sprocket to the front panel is 0.862 inch (see Figure 7-1) and
(2) the 1/8 long set screw tightens on the flat of the motor shaft. This is a preliminary step. The final setting of the sprocket is performed in Section 5.4.

e. Perform Section 5.4.

6.2.4 TRANSFORMER REPLACEMENT

The following procedure is recommended when replacing the transformer:

a. Remove all power and control signals by disconnecting P1 and the power cord.

b. Remove the seven wires from T101 at the locations indicated in Table 6-1.

c. Loosen the two pop rivets which hold the transformer to the chassis and remove the transformer.

d. Install the new transformer by performing the reverse of steps c, b and then a. Refer to Table 6-1 for transformer wire connections.

Table 6-1. Transformer Wire Connections

From	To	Wire Color
T101-1	S104-1	Black
T101-2	S104-5	Red
T101-4	S104-2	Yellow
T101-5	S104-4	Green
T101-6	BR101-1	White
T101-8	C101	Brown
T101-10	BR101-2	Violet

6.3 SPOOLER PARTS REPLACEMENT, RRS7300

6.3.1 POTENTIOMETER REPLACEMENT

The following procedure is recommended when replacing a potentiometer. Refer to Figure 5-5 for callout designations.

a. Remove all power and control signals by disconnecting P1 and the power cord.

b. Unsolder the wires at terminals 1, 2 and 3 on the potentiometer. Note wire colors and terminal orientation so new pot can be installed in the same manner.

c. Loosen set screw (Item A - Figure 5-5) which holds the coupling to the potentiometer shaft.

d. Loosen nut (Item B, Figure 5-5) which holds the potentiometer to the bracket. Back the potentiometer out from the bracket.

e. Install an ohmmeter across terminals 1 and 2 on the new potentiometer and rotate the shaft until the meter reads 5K.

f. Install the new potentiometer into the coupling and bracket by performing the reverse of steps d and c. Care should be used so that the potentiometer shaft is not rotated and that the orientation of the terminals are as noted in step b.

g. Perform Section 5.5.

6.3.2 FRONT PANEL AND CHASSIS SEPARATION

The following procedure is recommended when separating the front panel from the chassis:

a. Remove all power and control signals by disconnecting P1 and the power cord.

b. Disconnect the following connectors on the Reader card: J2/P2, J3/P3, J4/P4, J5/P5, J6/P6, and J7/P7.

c. Disconnect P102/J102.

d. Remove the four 10-32 binder head screws which hold the front panel to the side brackets. The front panel and chassis can now be separated.

e. Reassembly is the reverse of steps d, c, b and then a.

6.3.3 SERVO MOTOR REPLACEMENT

The following procedure is recommended when replacing either servo motor assembly. When replacing the motor, it is recommended that the entire 114339-001 motor assembly (including connector and hub assembly) be replaced.

a. Separate the front panel and chassis. Refer to Section 6.3.2.

b. Remove the two 8-32 binder head screws which hold each motor to the front panel. Note the orientation of the motor so that the new motor will be installed the same way.

c. Install the new motor by performing the reverse of steps b and then a.

6.3.4 TAPE ARM REPLACEMENT

The following procedure is recommended when replacing either tape arm:

a. Remove all power and control signals by disconnecting P1 and the power cord.

b. Remove the tape arm link assembly from the tape arm by loosening the socket head screw C, Figure 5-5.

c. Remove the tape arm from the panel.

d. Replacement procedure is the reverse of procedure outlined in steps a through d.

SECTION VII

PARTS LIST

7.1 GENERAL

Listed in Table 7-2 are the electronic and mechanical parts used in the RRS7155BA1/660/G-A. Table 7-3 lists the same parts for the RRS7155BA1/660/D-A. Standard hardware items are not listed. Indented items are part of the assembly under which they are indented and the quantity of these items are per each assembly. Table 7-1 lists the recommended spare parts and the quantity column denotes the number recommended. Table 7-4 contains the components used on the printed circuit card. Figures 7-1 through 7-7 illustrate the parts listed in Tables 7-2 and 7-3. Those items identified by a broken arrow indicate the approximate location of parts not visible in the photograph.

Reference designations refer to the parts illustrated in Figures 7-1 through 7-7. All electronic components are identified by letter-number combinations in the Reference Designation column and mechanical parts are identified by number. Reference designations contained in parenthesis are associated or function with the parenthetical item. These items are generally individual items and not part of an assembly but for reference are related back to the associated item. All items are available from Spares Order Desk, REMEX 1733 Alton St., P.O. Box C-19533, Irvine, California 92713.

7.2 KIT OF PARTS

The kit of parts contains items used for installation and maintenance and is shipped with the unit. Refer to Table 1-1.

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-1. Recommended Spare Parts

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Bridge, Rectifier, Motorola MDA 2501	704005-143	1	BR101
Printed Circuit Card, Reader	114321-001	1	PC1
Switch, AC Selector, DPDT, Switchcraft 46256LFR	715057-111	1	S104
Readhead Assembly	114352-001	1	
LED Array Housing Assembly	114362-001	1	
Switch, ON-NONE-ON, C&K L21Z3X36	715063-111	1	S101
Switch, ON-OFF-ON, C&K 5211Z3BX36	715063-115	1	S102
Switch, (ON)-OFF-(ON), C&K 5205Z3BX36	715063-114	1	S103

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-2. Parts List, RRS7155BE1/660/G-A

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Top Assembly, RRS7155BE1/660/G-A	814301-001	1	Ref.
. Chassis Assembly Power Supply	114348-001	1	Ref.
. . Bridge, Rectifier, Motorola MDA 2501	704005-143	1	7-2, BR101
. . Capacitor, 6.3µf, 40V Cornell Dubilier FAH632-40-A3	702313-108	2	7-2;C101,C102
. . Capacitor, 0.01µf, 1.4 kV Ceramic Disk, Erie 3848Z5U103M	702136-103	2	7-2;C103,C104
. . Chassis, Power Supply	114317-001	1	7-2;1
. . Clamp, Capacitor, Richo SCH-1	715045-153	2	(C101,C102)
. . Connector, AC, 3-pin, Switchcraft EAC-301	706500-296	1	7-7,J101
. . Connector, 4-pin, Molex 03-06-1042	706510-339	1	7-2;J102
. . Connector, 4-pin, Molex 03-06-2042	706500-349	1	J103
. . Connector, 5-pin, Red, Molex 09-50-7051	706510-309	1	7-2;P7
. . Connector, 3-pin, White, Molex 09-50-7031	706510-258	1	7-2;P8
. . Contact, Connector, Molex 02-06-1103	706530-156	4	(J102)
. . Contact, Connector, Male, Molex 02-06-2103	706530-157	2	(J103)
. . Contact, Connector, Molex 08-50-0106	706530-137	8	(P7,P8)
. . Fuseholder, Schurter 031-1673	705750-120	1	7-7;F101
. . Lug, Capacitor, Amp 31887	715005-110	10	(C101,C102,E101)
. . Plate, Side	114314-001	2	7-2;3
. . Printed Circuit Card, Reader See Table 7-4 for Card Components	114321-001	1	7-7;PC1
. . Resistor, 15 ohm, 25W	701171-5R0	3	7-2;R103-R105
. . Switch, AC Selector, DPDT Switchcraft 46256LFR	715057-111	1	7-7;S104
. . Terminal, Faston .188, Amp 2-350800-2	715005-143	11	(T101)
. . Terminal, Faston .250, Amp 2-350804-2	715005-145	4	(BR101)
. . Transformer, REMEX Specification	703010-171	1	7-2;T101
. Cover, Rear	114374-001	1	
. Decal, Caution	111933-001	1	
. Decal, Warning	111246-001	1	
. Decal, Serial No.	716018-113	1	
. Front Panel Assembly	114346-001	1	Ref. 7-3,7-4
. . Arm, Tape	109087-002	2	7-3;1
. . Bracket	114316-001	2	7-4;1
. . Bumper, Rubbercraft No. 9114	715021-115	2	7-3;2
. . Bushing, Tape Arm	114368-001	2	7-4;2
. . Collar	113117-001	2	7-4;3
. . Grip Ring, Truarc 5555-12	715025-115	6	7-3;3
. . Heat Sink, Step Motor	110448-002	1	7-1;5
. . Motor Assembly, Spooler	114339-001	2	Ref.
. . . Hub Assembly	110560-001	1	7-3;4
. . . Motor, Spooler, REMEX Specification	715075-211	1	7-4;4

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-2. Parts List, RRS7155BE1/660/G-A (Continued)

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
. Front Panel Assembly (Continued)			
. . Motor Assembly, Stepper	110862-001	1	7-1(M1)
. . . Connector, Housing, Yellow, 6-Pin Molex 09-50-7151	706510-266	1	7-1;P5
. . . Contact, Connector, Female, Burndy 4823	706530-138	6	(P5)
. . . Motor, REMEX Specification	715075-158	1	7-1;M1
. . Panel Front	114315-001	2	7-3;5
. . Potentiometer Assembly	114357-001	1	(P3,P6)
. . . Connector, 3-Pin, Blue, Molex 09-50-7151	706510-255	1	P3,P6
. . . Contact, Connector, Molex 08-50-0106	706530-137	3	(P3,P6)
. . . Potentiometer, 10k, Allen Bradley WA2G044S1030A	701506-103	1	7-4;5
. . Readhead Mechanism Assembly.	114350-001	1	Ref. 7-1
. . . Clamp, Cable, Weckesser A-30	715040-139	1	
. . . Ground Plate Assembly	114367-001	1	7-1;13
. . . LED Array Housing Assembly	114362-001	1	7-1;14
. . . Lever, Upper Tape Guide	111797-001	1	7-1;1
. . . Mechanism Assembly	112346-001	1	7-1;8
. . . Readhead Assembly	114352-001	1	7-1;11
. . . Spring, Tape Guide	114372-001	1	7-1;15
. . . Tape Guide Assembly	114370-001	1	7-1;12
. . . Tape Guide Upper	112407-001	1	7-1;16
. . Roller, Tape	104802-001	2	7-3;6
. . Shaft	112675-001	2	7-3;7
. . Spacer, Hex 4-40x3/8, H.H.Smith 8402	715030-143	2	7-4,6
. . Spring, Associated Spring Co. E0240-026-2000M,	714090-132	2	7-4;7
. . Sprocket, REMEX Specification	716057-102	1	7-1;7
. . Switch Housing Assembly	114363-001	1	7-3;8
. . . Bezel, Black, C&K 87888-2	715063-201	3	(S101-S103)
. . . Cap, ON/OFF, C&K 7922-1	715063-329	1	(S101)
. . . Cap, LOOP/LOAD/SPOOL, C&K 7922-1	715063-331	1	(S102)
. . . Cap, ←—/—→, C&K 7922-1	715063-321	1	(S103)
. . . Connector, Housing, 6-Pin, Green Molex 09-50-7061	706510-222	1	7-4; P4
. . . Connector, Housing, 4-Pin, Molex 03-06-2042	706500-349	1	P102
. . . Contact, Connector, Molex 08-50-0106	706530-137	6	(P4)
. . . Contact, Connector, Molex 02-06-2103	706530-157	4	(P102)
. . . Housing, Panel Switches	113466-001	1	7-3;9
. . . Lug, Terminal, Amp 61454-1	715005-137	12	(S101-S103)
. . . Switch, ON-NONE-ON C&K L21Z3X36	715063-111	1	7-3;S101
. . . Switch, ON-OFF-ON, C&K 5211Z3BX36	715063-115	1	7-3;S102
. . . Switch, (ON)-OFF-(ON), C&K 5205Z3BX36	715063-114	1	7-3;S103

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-2. Parts List, RRS7155BE1/660/G-A (Continued)

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
. Kit of Parts See Table 1-1 for contents.	114298-001	1	
OPTIONS:			
Reel, 1/2" Hub, 4-5/8" diameter, Gray	109119-001	2	
Reel, 1/2" Hub, 5-1/4" diameter, Gray	109119-002	2	
Reel, 1/2" Hub, 4-5/8" diameter, White	109119-003	2	
Reel, 1/2" Hub, 5-1/4" diameter, White	109119-004	2	
Reel, 1/2" Hub, 6" diameter, Gray	107878-001	2	
Reel, 1/2" Hub. 6" diameter, White	107878-003	2	
Rear Cover Kit (RMR0042)	114476-001	1	
Manual (RMR0043)	112670-112	1	
Enclosure Kit for Harsh Environment (RMR0046)	814710-001	1	

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-3. Parts List, RRS7155BE1/660/D-A

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Top Assembly, RRS7155BA1/660/D-A	814303-001	1	Ref.
. Chassis Assembly, Power Supply	114348-001	1	Ref.
. . Bridge, Rectifier, Motorola MDA2501	704005-143	1	7-2;BR101
. . Capactior, 6.3µf, 40V Cornell Dubilier FAH632-40-A3	702313-108	2	7-2;C101,C102
. . Capacitor, 0.01µf, 1.4kV Ceramic Disk, Erie 3848Z5U103M	702136-103	2	7-2;C103,C104
. . Chassis, Power Supply	114317-001	1	7-2;1
. . Clamp, Capacitor, Richo SCH-1	715045-153	2	(C101,C102)
. . Connector, A.C., 3-pin, Switchcraft EAC-301	706500-296	1	7-7;J101
. . Connector, 4-pin, Molex 03-06-1042	706510-339	1	7-2;J102
. . Connector, 4-pin, Molex 03-06-2042	706500-349	1	J103
. . Connector, 5-pin, Red, Molex 09-50-7051	706510-309	1	7-2;P7
. . Connector, 3-pin, White, Molex 09-50-7031	706510-258	1	7-2;P8
. . Contact, Connector, Molex 02-06-1103	706530-156	4	(J102)
. . Contact, Connector, Male, Molex 02-06-2103	706530-157	2	(J103)
. . Contact, Connector, Molex 08-50-0106	706530-137	8	(P7, P8)
. . Fuseholder, Schurter 031-1673	705750-120	1	7-7;F101
. . Lug, Capacitor, Amp 31887	715005-110	10	(C101,C102,E101)
. . Plate, Side	114314-001	2	7-2;3
. . Printed Circuit Card Reader	114321-001	1	7-7;PC1
. . . See Table 7-4 for Card Components			
. . Resistor, 15 ohm, 25W	701171-5R0	3	7-2;R103-R105
. . Switch, AC Selector, DPDT, Switchcraft 46256LFR	715057-111	1	7-7,S104
. . Terminal, Faston .188, Amp 2-350800-2	715005-143	11	(T101)
. . Terminal, Faston, .250, Amp 2-350804-2	715005-145	4	(BR101)
. . Transformer, REMEX Specification	703010-171	1	7-2;T101
. Cover, Rear	114374-001	1	
. Decal, Caution	111933-001	1	
. Decal, Warning	111246-001	1	
. Decal, Serial No.	716018-113	1	
. Front Panel Assembly	114347-001	1	Ref. 7-5,7-6
. . Arm Tape, Left	114312-001	1	7-5;1
. . Arm Tape, Right	114312-002	1	7-5;2
. . Bezel, Black, C&K 87888-2	715063-201	3	(S101-S103)
. . Bracket	114316-001	2	7-6;1
. . Bumper, Rubbercraft No. 9114	715021-115	2	7-5;3
. . Bushing,Tape Arm	114368-001	2	7-6;2
. . Cap, ON/OFF, C&K 7922-1	715063-329	1	(S101)
. . Cap, LOOP/LOAD/SPOOL, C&K 7922-1	715063-331	1	(S102)
. . Cap ←— /—→, C&K 7922-1	715063-321	1	(S103)

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-3. Parts List, RRS7155BE1/660/D-A (Continued)

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
. Front Panel Assembly (Continued)			
. . Collar	113117-001	2	7-6;3
. . Connector, Housing, 6-Pin, Green Molex 09-50-7061	706510-222	1	7-6;P4
. . Connector, Housing, 4-Pin, Molex 03-06-2042	706500-349	1	7-6;P102
. . Contact, Connector, Molex 08-50-0106	706530-137	6	(P4)
. . Contact, Connector, Molex 02-06-2103	706530-157		P102
. . Grip Ring, Truarc 5555-12	715025-115	6	7-5;4
. . Heat Sink, Step Motor	110448-002	1	7-1;5
. . Motor Assembly, Spooler	114339-001	2	7-6(4)
. . . Hub Assembly	110560-001	1	7-5;5
. . . Motor, Spooler, REMEX Specification	715075-211	1	7-6;4
. . Motor Assembly, Stepper	110862-001	1	7-1;M1
. . . Connector, Housing, Yellow, 6-Pin Molex 09-50-7151	706510-266	1	7-1;P5
. . . Contact, Connector, Female Burndy 4823	706530-138	6	(P5)
. . . Motor, REMEX Specification	715075-158	1	7-1;6
. . Panel, Front	114319-001	1	7-5;6
. . Potentiometer Assembly	114357-001	1	7-6 (5)
. . . Connector, 3-Pin, Blue, Molex 09-50-7151	706510-255	1	7-6;P3,P6
. . . Contact, Connector, Molex 08-50-0105	706530-137	3	(P3,P6)
. . . Potentiometer, 10k, Allen Bradley WA2G044S1030A	701506-103	1	7-6,5
. . Readhead Mechanism Assembly	114350-001	1	Ref. 7-1
. . . Clamp, Cable, Wechesser A-30	715040-139	1	
. . . Ground Plate Assembly	114367-001	1	7-1;13
. . . LED Array Housing Assembly	114362-001	1	7-1;14
. . . Lever, Upper Tape Guide	111797-001	1	7-1;1
. . . Mechanism Assembly	112346-001	1	7-1;8
. . . Readhead Assembly	114352-001	1	7-1;11
. . . Spring, Tape Guide	114372-001	1	7-1;15
. . . Tape Guide Assembly	114370-001	1	7-1;12
. . . Tape Guide Upper	112407-001	1	7-1;16
. . Roller, Tape	103802-001	2	7-5;7
. . Shaft	112675-001	4	7-5;8
. . Spacer, Hex 4-40 x 3/8, H.H. Smith 8402	715030-143	2	7-6;6
. . Spring, Associated Spring Co. E0240-026-2000M	714090-132	2	7-6;7
. . Sprocket, REMEX Specification	716057-102	1	7-1;7
. . Switch, ON-NONE-ON, C&K L21Z3X36	715063-111	1	7-6;S101
. . Switch, ON-OFF-ON, C&K 5211Z3BX36	715063-115	1	7-6;S102
. . Switch, (ON)-OFF(-ON), C&K 5205Z	715063-114	1	7-6;S103

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-3. Parts List, RRS7155BE1/660/D-A (Continued)

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
. Kit of Parts See Table 1-1 for Contents	114299-001	1	
OPTIONS:			
Reel, 6-inch dia., 1/2 in. Hub, Gray	107878-001	2	
Reel, 7-1/2 inch dia., 1/2 in. Hub, Gray	107878-002	2	
Reel, 6-Inch dia., 1/2 in. Hub, White	107878-003	2	
Reel, 7-1/2 inch dia., 1/2 inch, Hub, White	107878-004	2	

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-4. Parts List, Printed Circuit Card Assembly 114321-001

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
The following parts list was written for the J assembly and the G_1 schematic revision. Subsequent changes are contained on a P.C. Card Change Record form contained in the addendum.			
Bracket, Heatsink	114318-001	1	(Q12-Q15)
Capacitor, 0.01µf, 100V, Ceramic Disk,	702121-103	35	C1-4,6,8,10,12, 18,19,22,25-28, 30,32,33,35,41-47,51-56,58,60, 62
Capacitor, 100pf, 200V, Ceramic, Type CK05	702128-101	2	C5,C61
Capacitor, 0.056µf, 100V, Metallized Mylar, Electrocube 217A1B563K	702181-563	1	C7
Capacitor, 0.1µf, 100V, Metallized Mylar, IMB XP7B104X	702181-104	4	C9,C11,C36
Capacitor, 1µf, 50V, Ceramic, Monolythic, Sprague Type 7C	702131-105	6	C13-C16,C23,C24
Capacitor, 0.001µf, 200V, Ceramic, Type CK05	702128-102	7	C17,C34,C38,C39, C49,C65,C66
Capacitor, 0.15µf, 100V, Metallized Mylar Electrocube 217A1B154K	702181-154	1	C20
Capacitor, 0.01µf, 100V, Metallized Mylar IMB XP7B103X	702181-103	1	C21
Capacitor, 33µf, 10V, Tantalex Sprague 196D336X9010KA1	702393-336	2	C29,C31
Capacitor, 0.0022µf, 200V, Ceramic Type CK06	702128-222	2	C37,C64
Capacitor, 330pf, 200V, Ceramic, Type CK05	702128-331	2	C40,C67
Capacitor, 100µf, 25V, Polarized, Sprague TE Series	702370-107	1	C48
Capacitor, 0.1µf, 100V, Ceramic Disk Sprague Type TG	702121-104	1	C50
Capacitor, 10µf, 25V, Polarized, Solid Tantalum Sprague 196D106X9025KA1	702395-106	1	C57
Capacitor, 3.3µf, 15V, Polarized, Solid Tantalum Sprague 196D336X9015HA1	702394-335	1	C59
Choke, Coil, RF Suppressor, Ferroxcube VK200-10/3B	702500-239	4	L1-L4
Connector, Cannon DB-25PV	706500-107	1	J1
Connector, 15-Pin, Green, Molex 09-60-1151	706501-155	1	J2
Connector, 3-Pin, Blue, Molex 09-60-1031	706501-036	2	J3,J6
Connector, 6-Pin, Green, Molex 09-60-1061	706501-065	1	J4
Connector, 6-Pin, Yellow, Molex 09-60-1061	706501-064	1	J5
Connector, 5-Pin, Red, Molex 09-60-1051	706501-062	1	J7
Connector, 3-Pin, White, Molex 09-60-1031	706501-039	1	J8
Connector, 4-Pin, Molex 03-06-1042	706510-339	1	P103

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-4. Parts List, Printed Circuit Card Assembly 114321-001 (Continued).

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Contact, Female, Molex 02-06-1103	706530-156	2	(P103)
Connector, Jumper Assembly	115002-001	1	J103
Diode, IN4003	704005-137	4	CR1,C 3-CR5
Diode, IN276	704000-100	1	CR2
Heat Sink, IERE PB1-2CB	715033-135	1	(Z34)
I.C. Package, 74C14	704800-106	2	Z1,Z5
I.C. Package, 4050	704800-115	2	Z2,Z9
I.C. Package, 7486	704600-109	3	Z3,Z4,Z25
I.C. Package, 74LS75	704620-075	2	Z6,Z7
I.C. Package, 7404	704600-110	1	Z8
I.C. Package, Resistor, Capacitor Network REMEX Specification	701950-007	1	Z10
I.C. Package, 74LS132	704620-132	1	Z11
I.C. Package, 74LS00	704620-000	5	Z12,Z13,Z18,Z19, Z22
I.C. Package, 74LS08	704620-008	4	Z14,Z16,Z20,Z29
I.C. Package, 74LS221	704620-221	4	Z15,Z23,Z24,Z26
I.C. Package, 74LS123	704620-123	1	Z17
I.C. Package, 74LS74	704620-074	2	Z21,Z28
I.C. Package, 74LS03	704620-003	1	Z27
I.C. Package, LM307	704520-110	2	Z31,Z32
I.C. Package, VR7812	704520-119	1	Z33
I.C. Package, VR7805	704520-120	1	Z34
I.C. Package, VR7912	704520-126	1	Z35
Insulator	715019-120	5	(Q12-Q15, Z33)
Resistor, 2.7K, 1/4W, ± 5%	701003-272	9	R2,4,6,8,10,12, 14,16,18
Resistor, 196 ohm, 1/4W, ± 1%	701211-60	1	R20
Resistor, 12.1K, 1/4W, ± 1%	701211-212	1	R21
Resistor, 3.16K, 1/4W, ± 1%	701213-161	1	R22
Resistor, 6.81K, 1/4W, ± 1%	701216-811	1	R23
Resistor, 8.2K, 1/4W, ± 5%	701003-822	3	R25,R28,R71
Resistor, 10K, 1/4W, ± 5%	701003-103	2	R26,R85
Resistor, 22 ohm, 1/4W, ± 5%	701003-220	2	R40,R41
Resistor, 22K, 1/4W, ± 5%	701003-223	2	R30,R43 (1)
Resistor, 1K, 1/4W, ± 5%	701003-102	13, (14)	R31, (R32), R35 R44,R47,R54,R58, R59,R64,R68,R77, R78,R83
Resistor, 4.7K, 1/4W, ± 5%	701003-472	4, (5)	(R33), R53,R55 R73,R74
Resistor, 35 ohm, 10W	701017-350	(1)	(R34)
Resistor, 47 ohm, 1/4W, ± 5%	701003-470	3	R36,R39,R50
Resistor, 2.2K, 1/4W, ± 5%	701003-222	5	R37,R38,R51, R67,R72
Resistor, 9.1K, 1/4W, ± 5%	701003-912	1	R42

(1) Components circled are added to make -002 assembly

NOTE: WHEN ORDERING SPARE PARTS, CONTACT REMEX SPARES ORDER DESK AND REFERENCE COMPLETE MODEL AND SERIAL NUMBER OF UNIT. ALWAYS REFER TO ADDENDUM AT THE REAR OF THE MANUAL (IF APPLICABLE) FOR POSSIBLE PART NUMBER CHANGES.

Table 7-4. Parts List, Printed Circuit Card Assembly 114321 (Continued)

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Resistor, 330 ohm, 1/4W, ±5%	701003-331	7	R45,R46,R52,R60, R63,R79,R82
Resistor, 47K, 1/4W, ±5%	701003-473	1	R48
Resistor, 27K, 1/4W, ±5%	701003-273	1	R49
Resistor, 270K, 1/4W, ±5%	701003-274	1	R56,R75
Resistor, 2M, 1/4W, ±5%	701003-205	2	R57,R76
Resistor, 820 ohm, 1/2W, ±5%	701004-821	4	R61,R62,R80,R81
Resistor, 100 ohm, 1/4W, ±5%	701003-101	2	R65,R84
Resistor, 10 ohm, 1/4W, ±5%	701003-100	1	R66
Resistor, 20K, 1/4W, ±5%	701003-203	1	R70
Resistor, Variable, 25K, 1/2W, Bourns 3355X-1-253	701653-253	11	R1,3,5,7,9,11, 13,15,17,24,29
Screw Lock Assembly, Set of 2, Female, Cannon D-10418-2	706540-123	1	(J1)
Standoff, Cambion 350-7409-10-19	715030-170	19	TP1-TP11,TP16-TP19, TP +12V, -12V
Transistor, MPSU05	704204-130	1	Q1
Transistor, MJE1100	704204-115	5	Q4,Q5,Q6,Q13, Q15
Transistor, MPSA06	704203-118	3,(4)	Q7,Q8,Q10, (Q2)(1)
Transistor, MPSA56	704202-109	2	Q9,Q11,Q2
Transistor, MJE1090	704212-108	2,(3)	Q12,Q14,(Q3)

(1) Components circled are added to make -002 assembly.

P.C. CARD CHANGE RECORD

CARD ASSY NO. 114321-001
SCHEMATIC NO. 114322-001

SCH REV	ASSY REV	FAB REV	DESCRIPTION OF CHANGE
D	D	B	Changed R42 from 9.1K to 7.32K, 1/4W, ± 1%, P/N 701217-321. This assures minimum rewind speed of 360 cps.
E	E_2	C	On pages 7-10 and 8-11/8-12, Zone C-7, R27 replaced with wire.
F	F	D	On sheet 3, added Wind Left and Wind Right functions (zones D8, D7), which allow external signals to parallel the operation of the Drive Left and Drive Right switches. Added Resistor/Capacitor network, Z36, REMEX P/N 701950-007.
F	G	D	Changes do not affect schematic or parts lists.

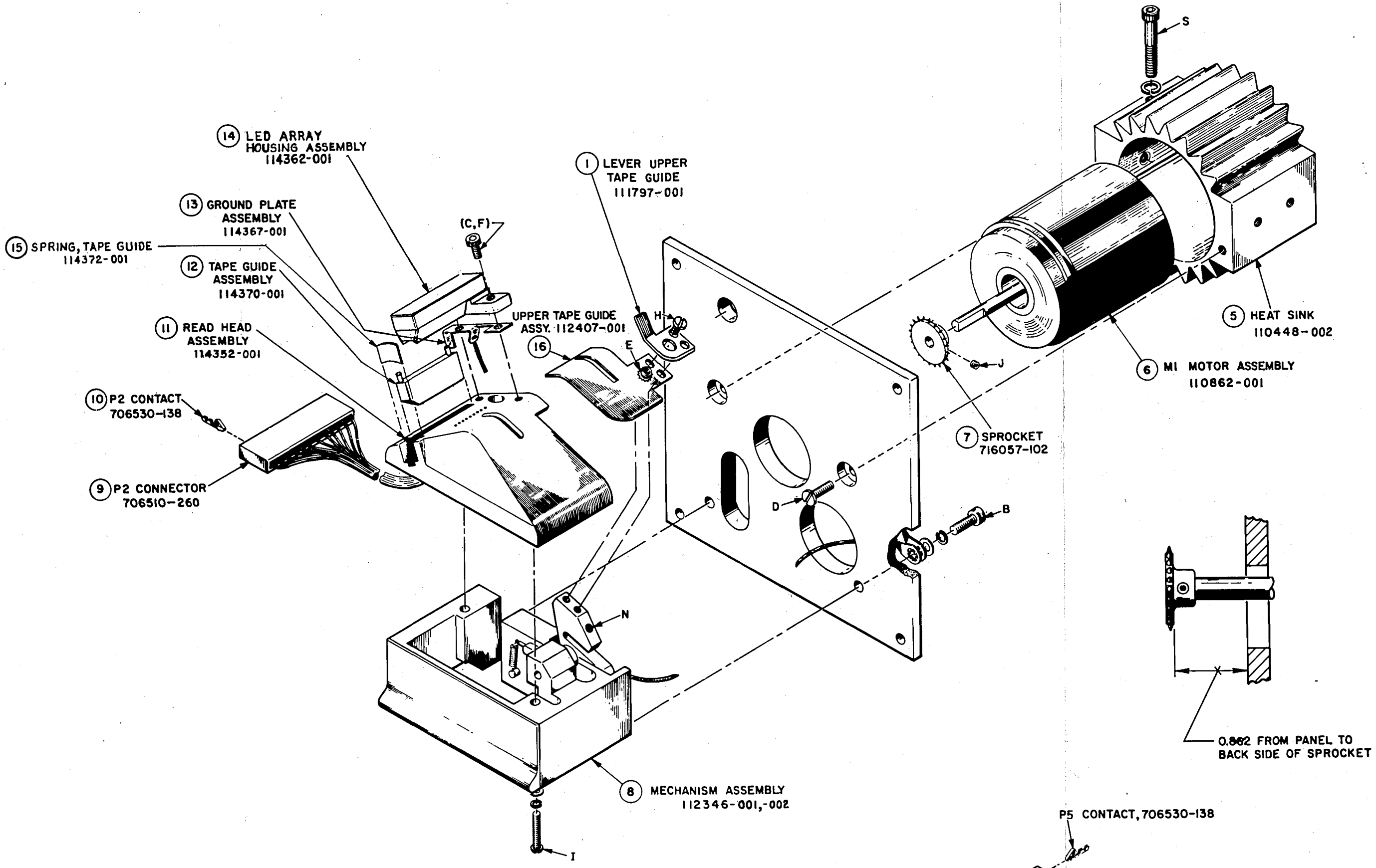


Figure 7-1. Readhead Mechanism & Step Motor Assembly Exploded View.

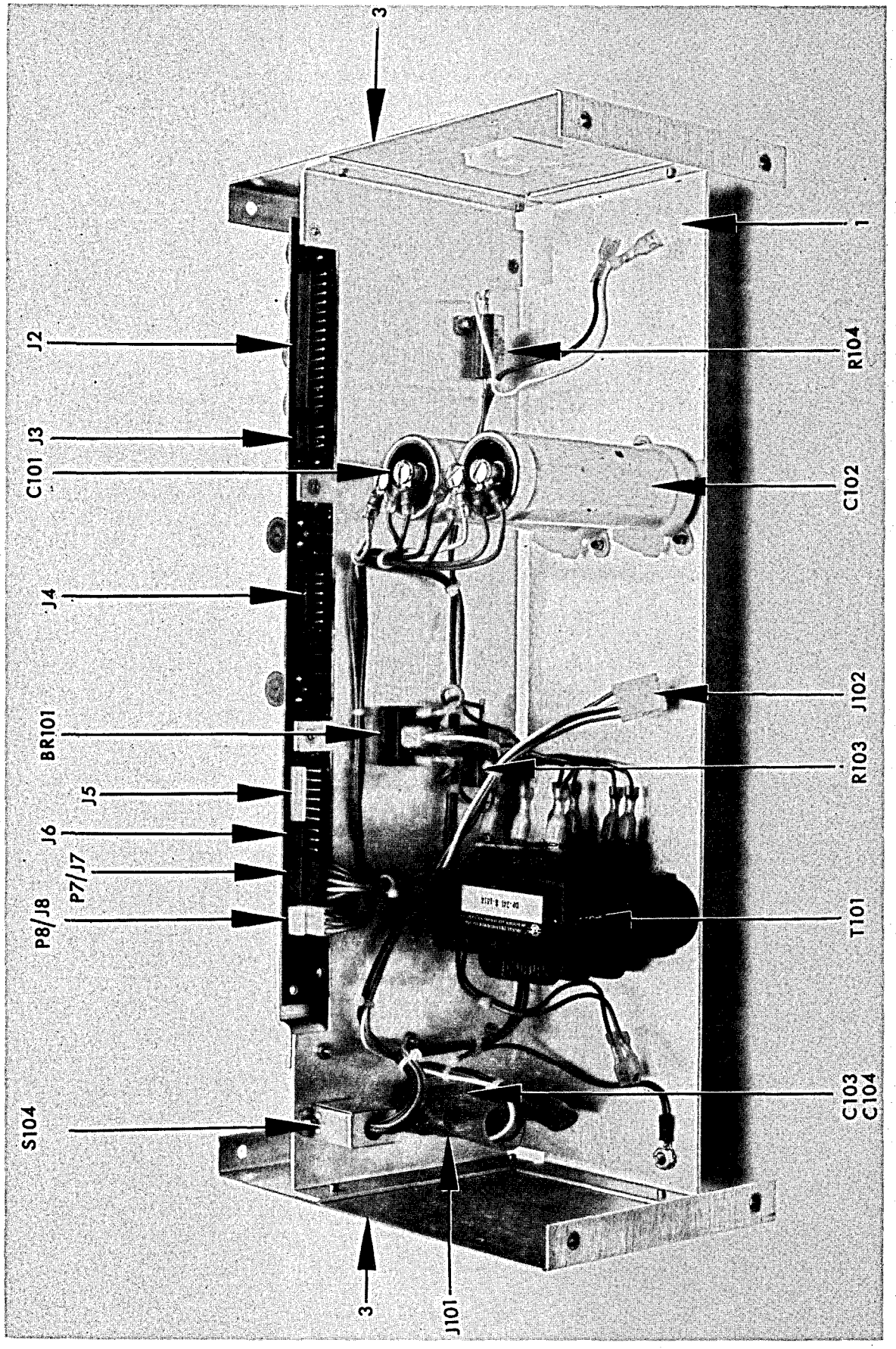


Figure 7-2. Chassis Assembly 114348-001.

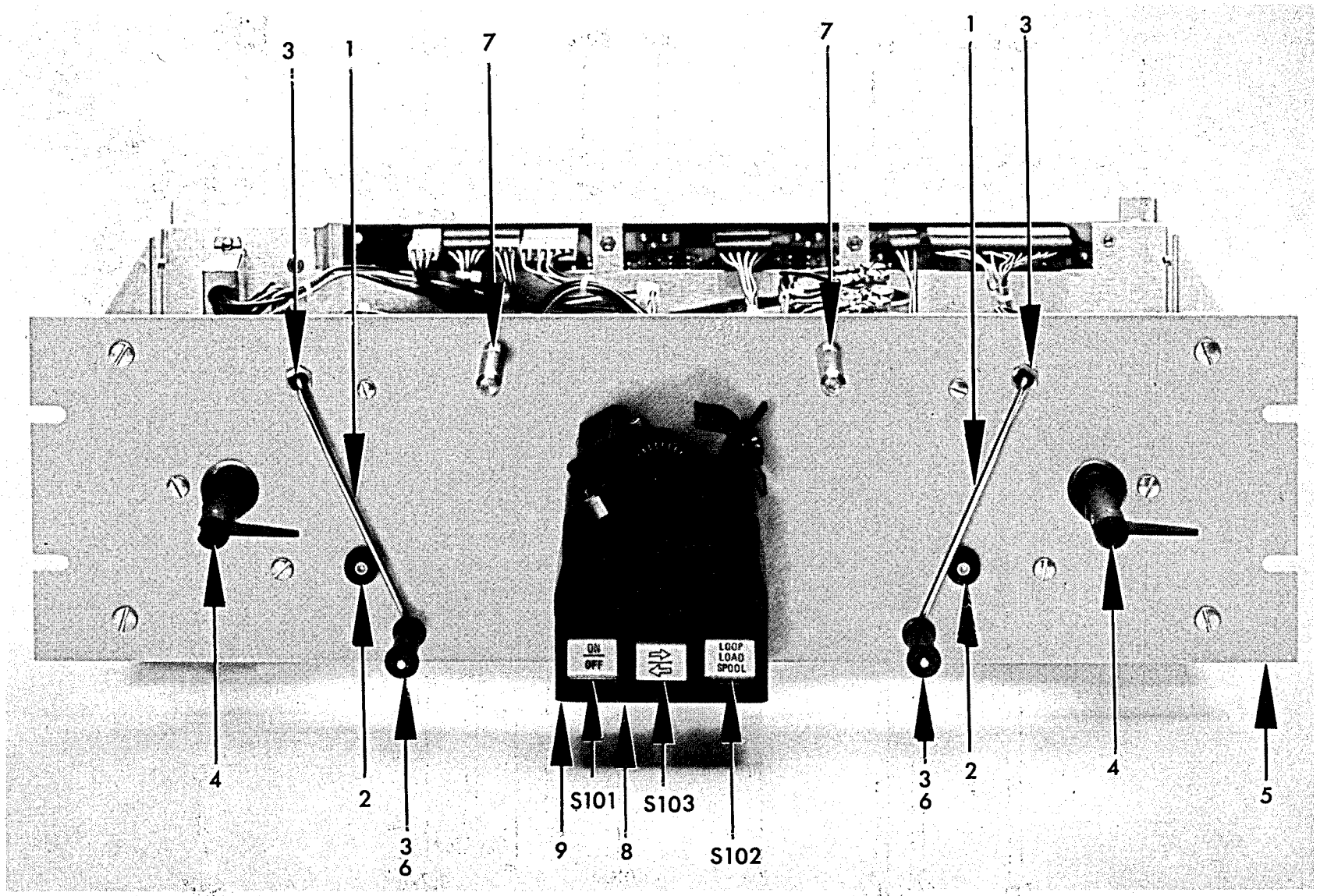


Figure 7-3. Front Panel, RRS7155BA1/660/G-A, Front View.

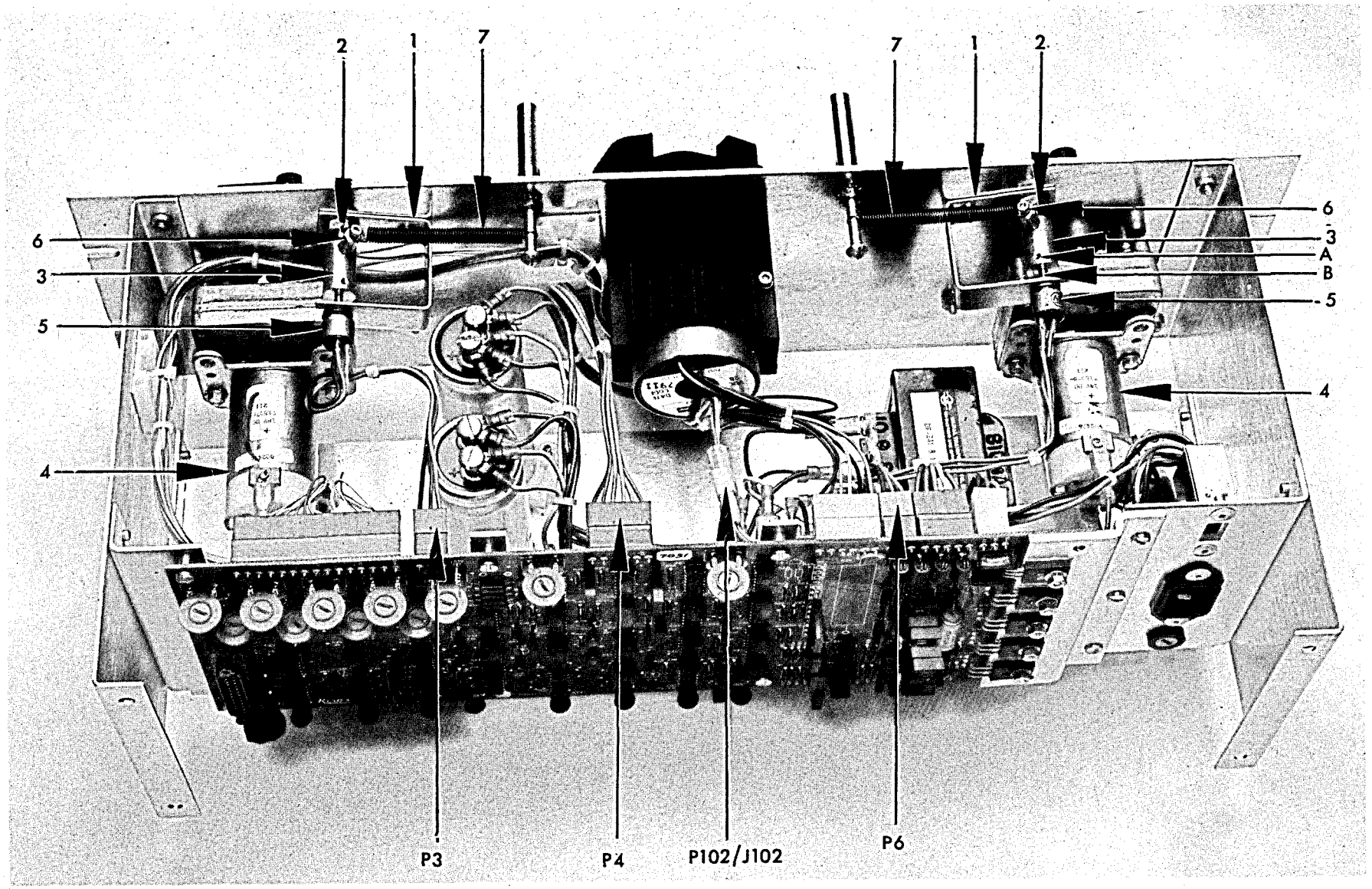


Figure 7-4. Front Panel, RRS7155BA1/660/G-A, Rear View.

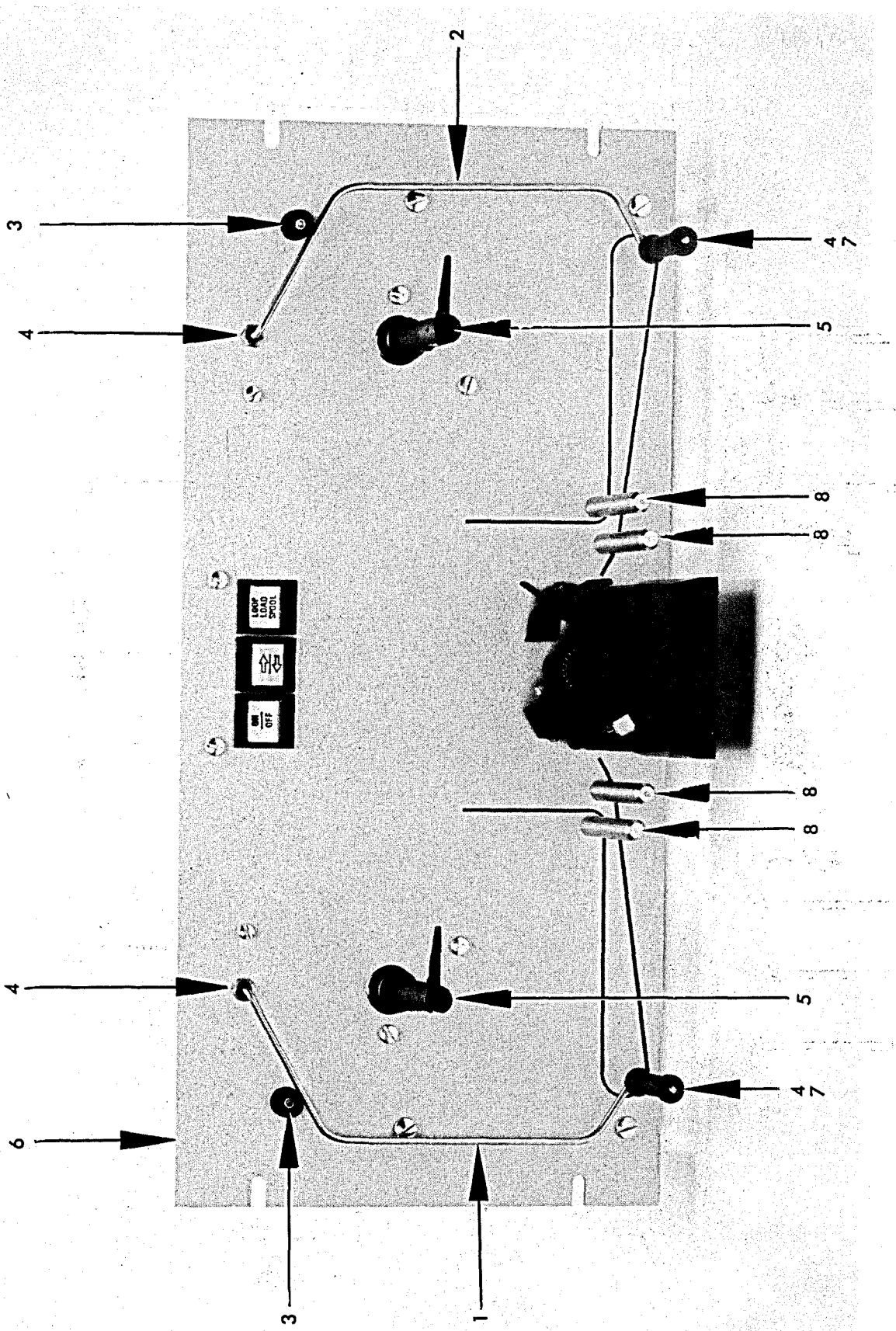


Figure 7-5. Front Panel, RRS7155BA1/660/D-A, Front View.

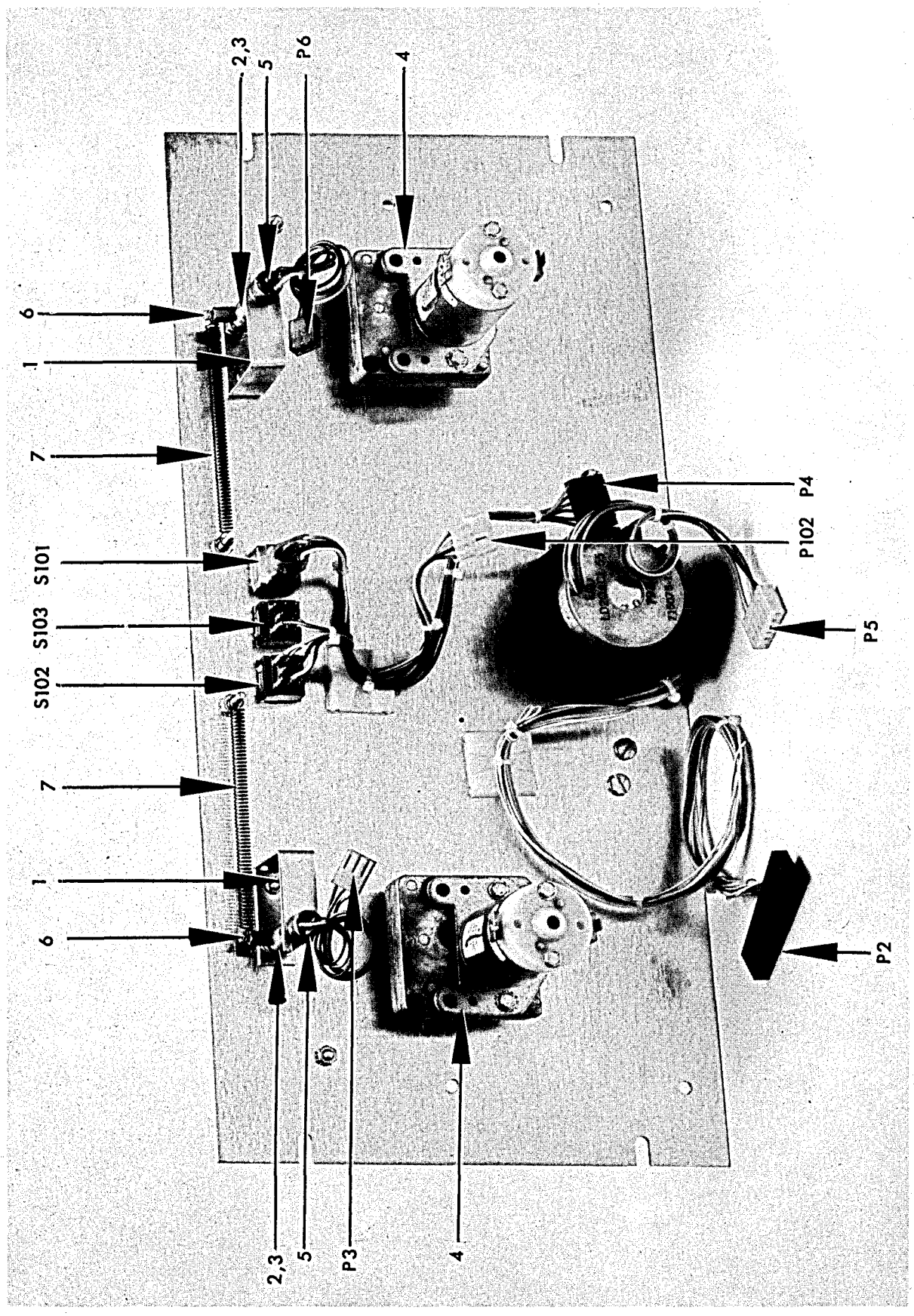


Figure 7-6. Front Panel, RRS7155BA1/660/D-A, Rear View.

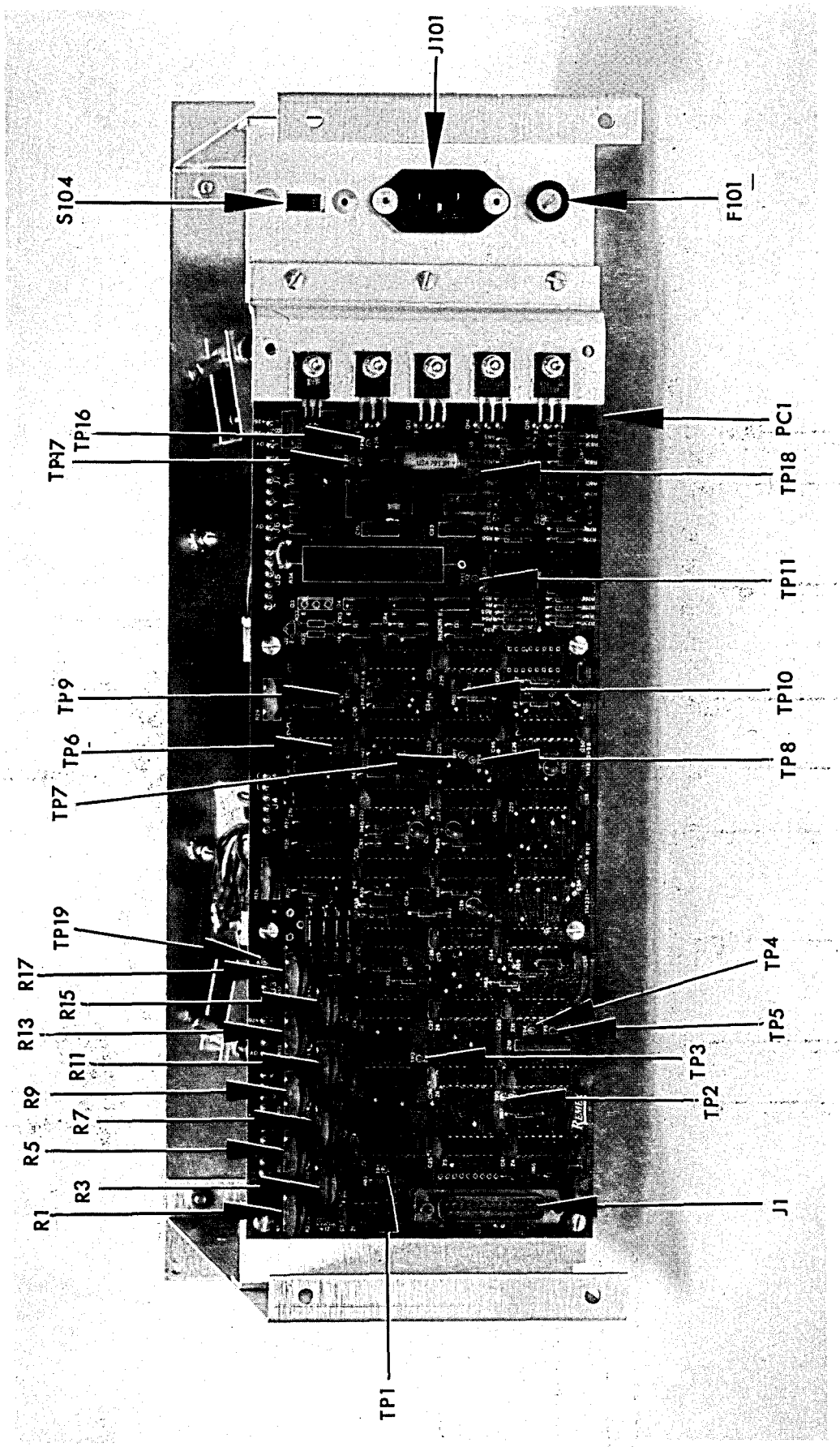


Figure 7-7. Rear View of Chassis Assembly Showing P.C. Card 114321-001.

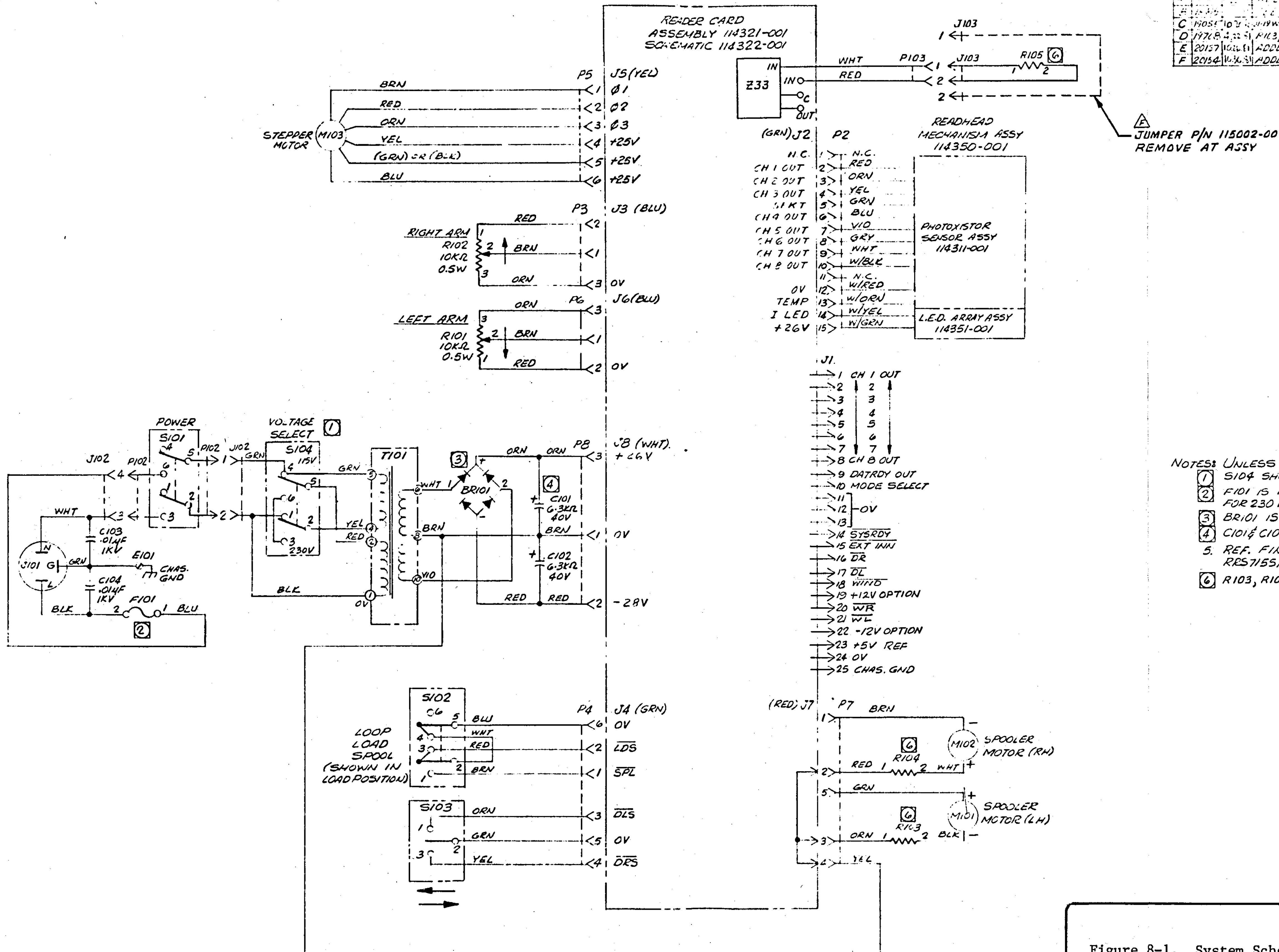
SECTION VIII

SCHEMATIC DRAWINGS

8.1 GENERAL

Figure 8-1 contains the system schematic for the RS7155BA1/660/G-A and RRS7155BA1/660/D-A, Figure 8-2 gives the schematic for the Reader Card 114321-001.

SYM	ECO	EFFECT	REVISIONS	BY	DATE	APPR
A	[illegible]	[illegible]	RELEASED	[illegible]	[illegible]	[illegible]
B	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C	19058	[illegible]	J1-19 WAS NC, J1-20 WAS NC, J1-21 WAS +12VOLT.	D.M.	[illegible]	[illegible]
D	19768	[illegible]	R103, R104 VALUE IS 15Ω 25W, WAS 2Ω 25W	S.E.Q.	[illegible]	[illegible]
E	20157	[illegible]	ADDED Z33 CIRCUIT & NOTE 6	S.E.Q.	[illegible]	[illegible]
F	20154	[illegible]	ADDED DASH LINES FOR JUMPER	S.E.Q.	[illegible]	[illegible]



NOTES: UNLESS OTHERWISE SPECIFIED.

1. S104 SHOWN IN 115VAC SELECT MODE.
2. F101 IS 1.0AMP SLO-BLO FOR 115V OPERATION. FOR 230 V OPERATION—USE 0.5A.
3. BR101 IS 704005-143.
4. C101 & C102 ARE 702313-108.
5. REF. FINAL ASSY DWG. NO. 8/4301-001 FOR RRS7155/G & 8/4303-001 FOR RRS7155/D.
6. R103, R104 & R105 ARE 15Ω, 25W.

Figure 8-1. System Schematic, RRS7155BA1/660/G-A and RRS7155BA1/660/D-A.

112670-112D

114302-001 REV F

DESIGNATION	LAST USED	NOT USED
CAPACITOR	C67	
DIODE	CR5	
INTEGRAT. CIRC.	Z36	Z30
RESISTOR	R85	R27
TRANSISTOR	Q15	
CHOKE	L4	
TEST POINT	TP19	TP12-15

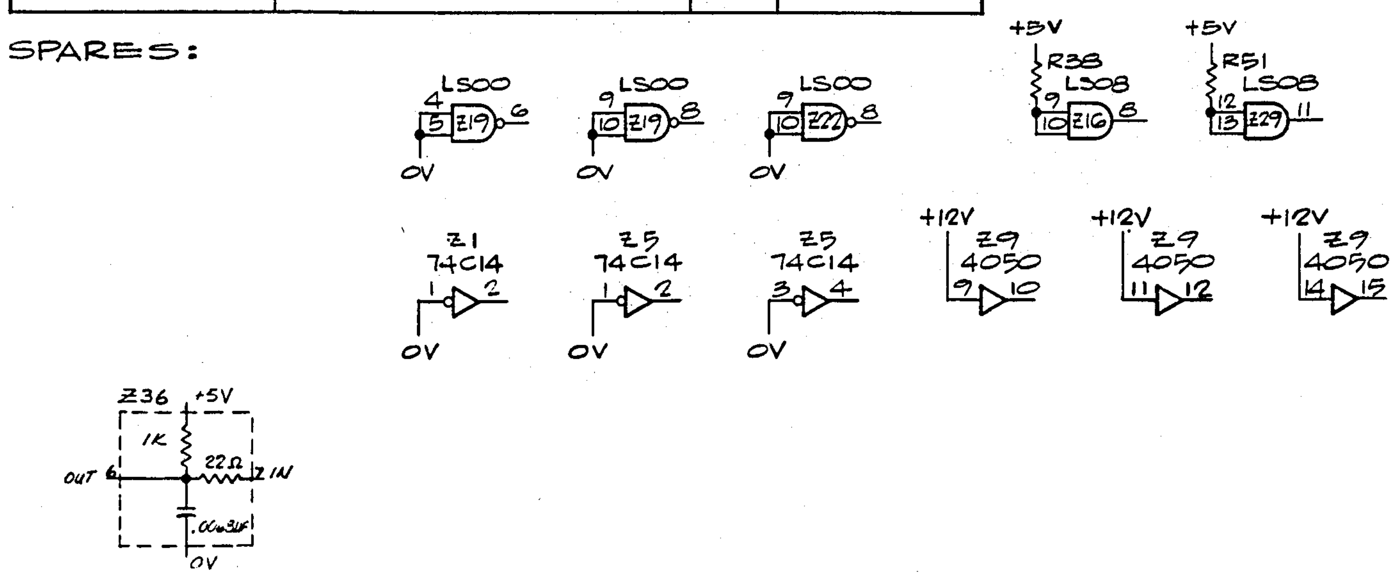
REVISION STATUS CONT...			REVISION STATUS		
FAB	SCH	ASSY	FAB	SCH	ASSY
D	G'	J	A	A	A
E	H	K	B	B	B
			B	C	C
			B	D	D
			C	D'	E
			C	D'	E1
			C	E	E2
			D	F	F
			D	F'	G
			D	G	G
			D	G'	H

SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR'D
A	[illegible]	[illegible]	RELEASED	J	[illegible]	[illegible]
B	[illegible]	6.22.79	[illegible]	N.M.	6.22.79	[illegible]
C	12714	11.19.79	SEE ECO	PEK	11.19.79	[illegible]
D	15925	1.23.80	R42 157.3ΩK±1% WAS 9.1K±5%	D.G.M.	1.23.80	[illegible]
D'	R/C	[illegible]	UPDATED REV. STATUS BLOCK	S.E.O.	[illegible]	[illegible]
D''	R/C	—	UPDATED REV. STATUS [illegible]	D.G.M.	—	—
E	19295	8.29.80	[illegible]	DGM.	8.29.80	[illegible]
F	19055	10.18.80	INCORPORATE [illegible] EXTERNAL CIRCUIT	D.G.M.	10.18.80	[illegible]
F1	R/C	4.3.81	UPDATED REV STATUS BLOCK	O.P.	4.3.81	[illegible]
G	19824	6.19.81	ON SHT 5 S4 WAS S1	O.P.	6.19.81	[illegible]
G'	R/C	10.5.81	SHEET 5: R104 WAS R101, R103 WAS R102	S.E.O.	10.5.81	[illegible]
H	20224	1.8.82	SH 5, ZONE C3: ADDED R103, ETC.	D.G.M.	1.8.82	[illegible]

SIGNAL INDEX

SIGNAL	DEFINITION	SOURCE	LOCATION
DAMPING PULSE	DAMPING PULSE	4B2	3D4
DAT RDY	DATA READY	4A2	2B4
DLS	DRIVE LEFT SWITCH	3E5	4E8
DRS	DRIVE RIGHT SWITCH	3E5	4E8
DRV	DRIVE	3D5	4E8
DRVG	DRIVE GATE	3D5	4B6
E.O.T.	END OF TAPE	4B2	3D4
MOTOR CLOCK PULSE	MOTOR CLOCK PULSE	4D2	3B7
REVERSE CLOCK	REVERSE CLOCK	3A5	4D8
REVERSE DELAY	REVERSE DELAY	4D2	3C7
REV/LK	REVERSE LOCKOUT	4C2	3C7
SPKT	SPROCKET	2B5	4E5
SPL. INH	SPOOL INHIBIT	4A6	5C8
STROBE 1	DATA STROBE 1	4B2	2D5
STROBE 2	DATA STROBE 2	4A2	2B5

SPARES:



NOTE: UNLESS OTHERWISE SPECIFIED-

1. THE THREE CHARACTER ADDRESS IS AS FOLLOWS: SHEET NUMBER-HORIZONTAL ZONE-VERTICAL ZONE.
2. Z10,36 ARE 701950-007.
3. L1,2,3,4 ARE 702500-107.
4. CR2 IS (IN276) 704000-100.
5. CR1, 3,4,5 (IN4003) 704005-137.
6. Q9, 11 ARE (MPSA56) 704202-109.
7. Q2, 7, 8, 10 ARE (MPSA06) 704203-118.
8. Q4, 5, 6, 13, 15 ARE (MJE 1100) 704204-115.
9. Q1 IS (MPSU05) 704204-130.
10. Q3, 12, 14 ARE (MJE 1090) 704212-108.
11. Z31, 32 ARE (LM307) 704520-110.
12. Z33 IS (7812) 704520-119.
13. Z34 IS (7805) 704520-120.
14. Z35 IS (7912) 704520-126.
15. Z12, 13, 18, 19, 22 ARE (74LS00) 704620-000
16. Z27 IS (74LS03) 704620-003.
17. Z8 IS (7404) 704600-110
18. Z14, 16, 20, 29 ARE (74LS08) 704620-008.
19. Z21, 28 ARE (74LS74) 704620-074.
20. Z6, 7 ARE (74LS75) 704620-075.
21. Z3, 4, 25 ARE (7486) 704600-109
22. Z17 IS (74LS123) 704620-123.
23. Z11 IS (74LS132) 704620-132.
24. Z15, 23, 24, 26 IS (74LS221) 704620-[illegible]
25. Z1, 5 ARE (74C14) 704800-106.
26. Z2, 9 ARE (4050) 704800-115.
27. CAPACITOR VALUES ARE IN MICROFARADS ± 10%, 100V:
28. RESISTOR VALUES ARE IN OHMS ±5%, 1/4W.

NOTE	+12V	+5V	0V
2		8	1
15		[illegible]	7
16		[illegible]	7
17		[illegible]	7
18		[illegible]	7
19		[illegible]	7
20		5	12
21		[illegible]	7
22		16	8
23		14	7
24		16	8
25	14	–	7
26		1	8

RR-7155	114469-001
RRS7155	114321-*
USED ON	NEXT ASSY

Figure 8-2. Schematic, Reader Card Assembly 114321-001, Sheet 1 of 5.

112670-112E

DWG No. 114322-001 REV. H

FORM NO. ED633/012

SYM	ECO	EFFECT	REVISIONS	BY	DATE	APD
			SEE SHEET 1			

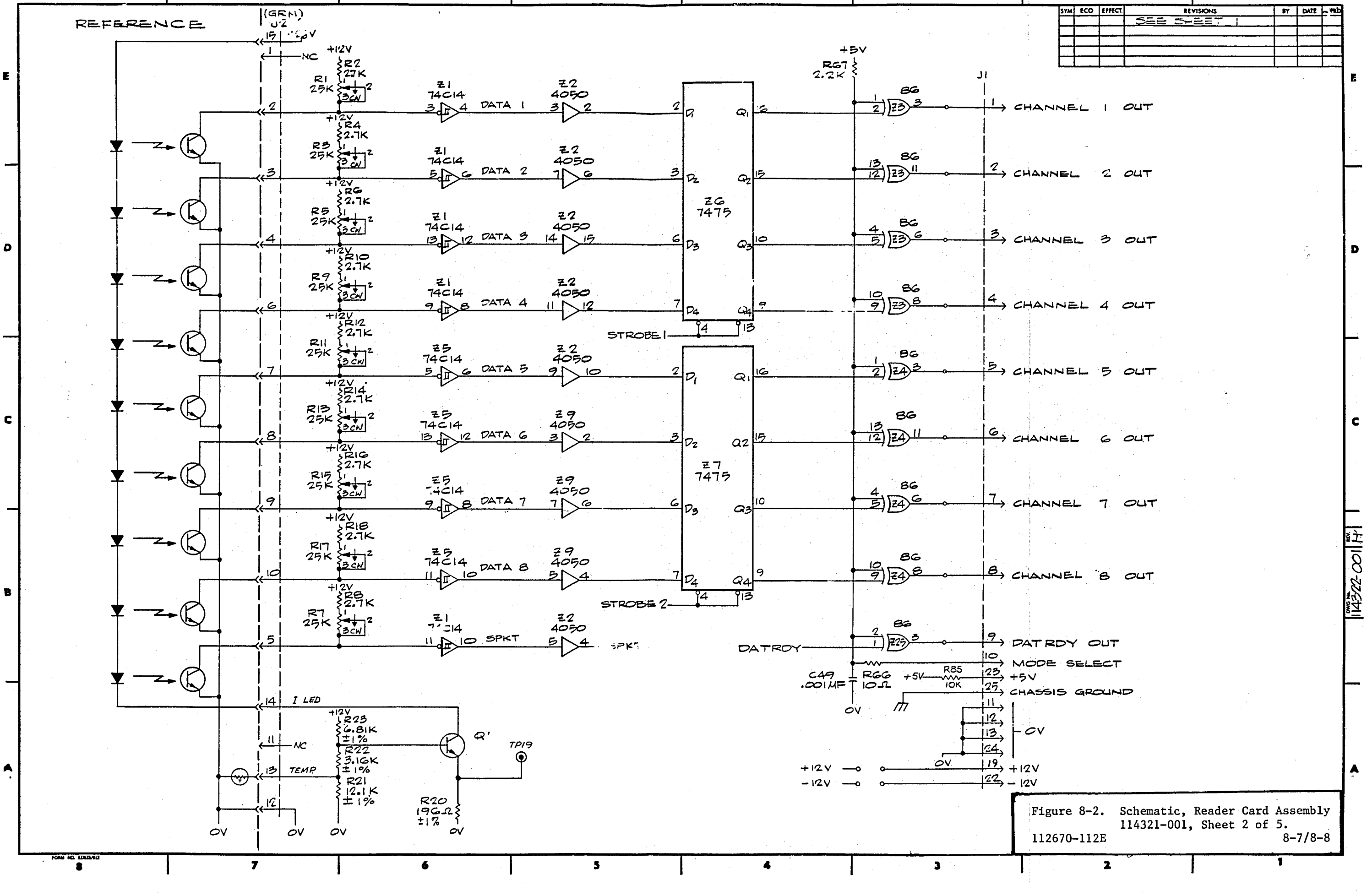


Figure 8-2. Schematic, Reader Card Assembly 114321-001, Sheet 2 of 5.

112670-112E 8-7/8-8

DWG No. 114321-001 REV. H

SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPRD
			SEE SHEET 1			

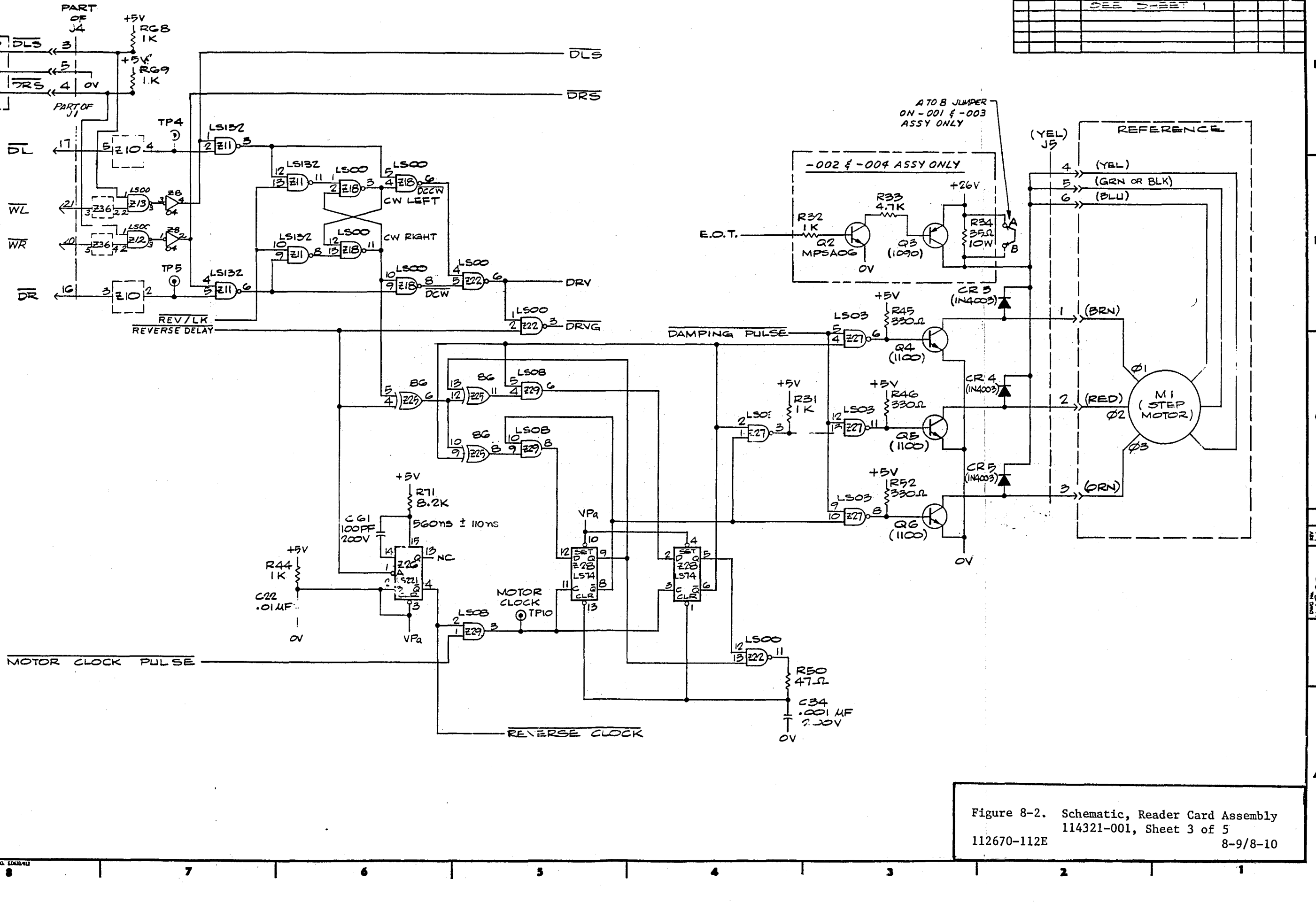


Figure 8-2. Schematic, Reader Card Assembly 114321-001, Sheet 3 of 5

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SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR'D
			SEE SHEET 1			

MOTOR CLOCK PULSE

DRV

DIS RES

+5V R47 1K

LS00 Z13

LS08 Z14

LS00 Z14

LS00 Z13

+5V R49 27K

C31 33 MF 10V

±150ms

316ms

LS123 Z17

LS74 Z21

0V

VPa

TP1

SPKT

Z8 04 Z6

+5V R70 20K

45ms ±10ms

C59 3.3UF 15V

LS221 Z26

NC

+5V R42 7.32K ±1%

770µSEC ±90µSEC

C20 .15MF

LS221 Z24

+5V R43 22K

C21 .01 MF

150µS ±50µS

TP7 DELAYED SPROCKET PULSE

+5V R25 8.2K

C5 100PF 200V

±10ms

560ms

LS221 Z15

MOTOR CLOCK PULSE

REVERSE CLOCK

LS08 Z16

LS08 Z20

LS08 Z20

REVERSE DELAY

LS08 Z14

LS08 Z14

REV / LK

PART OF J1

EXT INH

+5V R35 1K

LS08 Z20

INH

+5V CR1 (IN4003) CR2 (IN276)

R41 22Ω

C19 .01µF

0V

R40 22Ω

C57 10µF 25V

0V

WIND ENABLE

Z10

INH

INH

+5V R30 22K

R29 25K 1/2W ±20%

CW

2.9mS ±.4mS

+5V R28 8.2K

580µS ±80µS

C9 .1µF

LS221 Z23

C11 .1µF

LS221 Z23

LS08 Z16

R39 47Ω

C18 .01µF

0V

C54 .01µF

0V

LS00 Z19

CP Z21 LS74

+5V R26 10K R24 25K 1/2W ±20%

3CW

770µS ±90µS

C7 .056µF

LS221 Z15

TP8 CP

VPa

TP9

LS00 Z19

+5V R48 47K

±150ms

550ms

C29 33µF 10V

LS123 Z17

0V

VPa

R36 47Ω

C17 ±.001µF 200V

0V

LS00 Z12

LS08 Z16

Z8 04 Z6

PART OF J1

SYS RDY

E.O.T.

DAMPING PULSE

DRVG

LS08 Z20

TP6

DAT RDY

Z8 04 Z10

STROBE 1

Z8 04 Z12

STROBE 2

DAT RDY

PART OF J4

REFERENCE -0014-002 ASSYS ONLY

LD3

LOOP LOAD SPOOL (SHOWN IN LOAD POSITION)

SPL

+5V R37 2.2K

LS00 Z12

LS00 Z12

SPL INH

Figure 8-2. Schematic, Reader Card Assembly 114321-001, Sheet 4 of 5.

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SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPRD
			SEE SHEET 1			

REFERENCE RIGHT ARM (BLU) J3
CW
-001 & -002 ASSY ONLY
R54 1K
C36 .1μF
C37 .0022μF 200V
C38 .001μF 200V
R61 820Ω 1/2 W
R60 330Ω
R56 270K
R57 2MEG
R58 1K
R59 1K
R53 4.7K
R55 4.7K
Z31
Q8
Q9
Q12
Q13
R65 100Ω
R64 1K
C40 33PF 200V
C39 .001μF 200V
R62 820Ω 1/2 W
R63 330Ω
+12V
-12V
+26V
-28V
0V

REFERENCE LEFT ARM (BLU) J6
CW
C63 .1μF
C64 .0022μF 200V
C65 .001μF 200V
R80 820Ω 1/2 W
R79 330Ω
R75 270K
R76 2MEG
R77 1K
R78 1K
Z32
Q10
Q11
Q14
Q15
R84 100Ω
R83 1K
C67 330 PF 200 V
C48 100μF 25V
R73 4.7K
R74 4.7K
R72 2.2K
Q7
SPLINH
C66 .001μF 200V
R81 820Ω 1/2 W
R82 330Ω

(RED) J7
REFERENCE
L3 50MHZ
L1 50MHZ
L2 50MHZ
L4 50MHZ
M
RIGHT MOTOR
LEFT MOTOR
R104
R103
$0V_M$

REFERENCE
P103
N/C
R105
(WHT) J8
TP16
TP17
TP2
TP3
TP18
TP11
+26V
+12V
+5V
-12V
-28V
0V
IN
OUT
C
Z33 7812
Z34 7805
Z35 7912
C13 1 μF 50V
C14 1 μF 50V
.01μF 25V C1, 3
C16 1 μF 50V
C15 1 μF 50V
.01 μF 25V
C50 .1 μF 100V
C24 1 μF 50V
C23 1 μF 50V
C2, 4, 6, 8, 10, 12, 25, 26, 27, 28, 30, 32, 33, 35, 41, 42 AND 43, 44, 45, 46, 47, 51, 52, 53, 55, 56, 58, 60 AND 62.

REFERENCE
T101
BR101
C101
C102
115V
$0V_M$
POWER SWITCH
S101
S104
A
B
IND

Figure 8-2. Schematic, Reader Card Assembly 114321-001, Sheet 5 of 5.

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114322-001 REV. H

ADDENDUM

REMEX is constantly evaluating and improving its existing equipment so that you, the user, will always have equipment which is the "state-of-the-art".

Changes, when they occur, are incorporated into the next printing of the manual. In order to make current manuals as up-to-date as possible, all changes to date are contained in this section in the form of addendum sheets. Addendum sheets are also used to list changes to the manuals for special, non-standard units.

We are endeavoring to make our technical manuals as useful and practical as possible. Any comments or suggestions concerning its contents should be addressed to:

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ADDENDUM SHEET

THE FOLLOWING CHANGES IN THE MANUAL ARE REQUIRED:

1. On Page 8-3/8-4 the Part Number for the L.E.D. Array Assembly should be 114362-001.

2. On Page 6-4, Section 6.3.1 change all references of Figure 5-5 to Figure 7-4.

3. On Page 6-5/6-6, step b in Section 6.3.4 should read:

   b. Remove the tape link assembly from the tape arm by loosening the socket head screw, item 6, Figure 7-4.

4. On Pages 7-4 and 7-7 as part of the Readhead Assembly, 114352-001, add Photosensor Assembly, P/N 114311-001.

Ex-Cell-O Corporation

REMEX DIVISION