REMEX

REFER TO ADDENDUM SHEET

TECHNICAL MANUAL

TAPE READER

MODELS: RRK7000BAX
RRT7000BAX

Peripheral Products

Ex-Cell-O Corporation

ADDENDUM SHEET

The following changes in the manual are required:

1. On pages 7-3, 8-2 and 8-3, change R101 to Resistor 0.4 ohm, 3W, ±5%, REMEX Part No. 701015-R40.

2. On page 5-7, steps e and f should read:

   e. Loosen the two 8-32 socket head screws (B) which hold the mechanism assembly to the panel. Adjust the position of the mechanism assembly to obtain the clearance conditions described in steps c and d above.

   f. Tighten the screws (B) and perform the clearance measurement in steps c and d. It may be necessary to loosen screws (B) slightly and move the mechanism assembly a small amount. Repeat the clearance measurement and adjustment as necessary to achieve proper clearance.

TECHNICAL MANUAL

TAPE READER

MODELS: RRK7000BAX
RRT7000BAX

EX-CELL-O CORPORATION
REMEX
1733 Alton St. • P.O. Box 11926 • Santa Ana, CA 92711

RSM-506AL

WARRANTY

Remex warrants to the original buyer that this product is free from defects in workmanship and material under normal use and service. Unless otherwise agreed to in writing, Remex's obligation under this warranty shall be limited to furnishing a replacement for, or at Remex's option, repairing this product or any part or parts thereof which, to Remex's satisfaction, prove defective within one year (unless specifically excepted below*) from the date of shipment by Remex, provided all warranty stipulations of Remex Standard Terms and Conditions are complied with. No product or part may be returned without Remex's prior approval. In no event will any claim for labor in removing or replacing a defective product or part or for consequential damages be allowed.

NOTE:

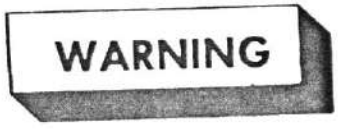
No warranty is made as to this product or part which has not been registered, installed, operated or maintained in accordance with instructions conveyed by Remex or the instructions contained in this technical manual or which has been subject to misuse, abuse, accident or alteration or to improper or negligent use, maintenance, storage, transportation or handling.

This warranty is in lieu of all other warranties, expressed or implied, and Remex neither assumes, nor authorizes any person or firm to assume for it, any other or further obligations or liability in connection with the sale, installation or use of this product.

A Warranty Registration Card is included with each unit which must be completed and mailed within (30) days after receipt of the product.

*Excludes lamps and fuses in all products. Excludes all punch mechanisms for material and labor in excess of 90 days or that have exceeded a use volume of 700 rolls (84 million characters) of Remex recommended tape. Excludes diskette and Cassette Drives or mechanisms for material or labor in excess 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 

and 

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 RRT7000 and RRK7000 series punched tape readers. The basic difference between the two units is that the RRK is provided with drive electronics whereas the RRT is simply a transport without drive electronics. See Figure 1-1. It is the purpose of this model series to provide tape reading at up to 300 characters/second speed. 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.

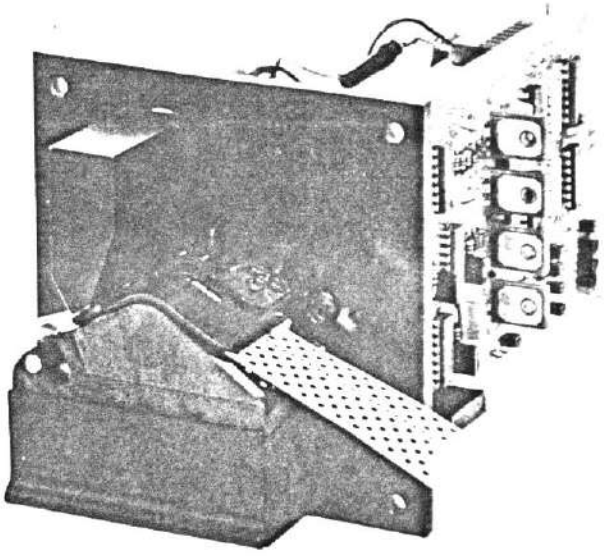
The printed circuit card on the RRK7000 provides the logic control for tape movement in either direction from external signals. The outputs from the card control a step motor which drives the tape via a sprocket wheel. Data outputs are generated from the photocell readhead. As tape passes over the photocells, changes in light intensity are sensed by the photocells, amplified, and brought out to an external connector. On the RRT7000 the readhead and step motor are accessed directly without supplied electronics.

1.2 EQUIPMENT SUPPLIED

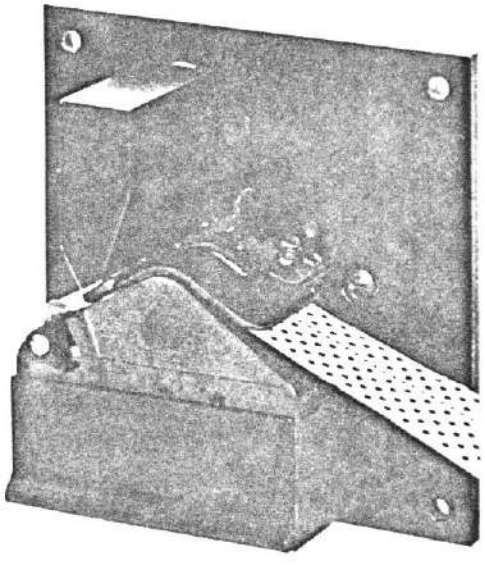
Several items are included with the reader for spare parts, installation, and maintenance. These items are listed in Table 1-1. No other equipment is required for the operation of the unit.

Table 1-1. Items Included with the RRK7000 and RRT7000.

Item	REMEX Part No.	Quantity
Brush, Soft Bristle	716003-101	1
Connector, P1, Viking 2VK1502/1-2, RRK7000 Only	706510-250	1
Key, Polarizing (P1), Viking 091-0024-000, RRK7000 Only	706540-138	1
Manual	-	1
Screw, 8-32 x 3/4 long, Black	709091-512	4
Washer, Flat, Nylon, Black	713600-165	4



Model RRK7000BAX



Model RRT7000BAX

Figure 1-1. REMEX Reader, Models RRK7000BAX and RRT7000BAX.

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.

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 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 tape reader, Models RRK7000BAX and RRT7000BAX are listed in Table 1-2.

Table 1-2. Specifications of the REMEX Reader, Models RRK7000BAX and RRT7000BAX

Characteristic	Specification
Tape Movement	Bidirectional (Left-to-right or right-to-left)
Reading Speed	Asynchronous: Up to 200 cps Synchronous: Up to 300 cps Stops "On Character"
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. Other tape size options listed in Figure 1-2.
Input Power	+5 ± 0.2 Vdc @ 1.3 amp (RRK7000) or 800 ma (RRT7000) *+32 Vdc ± 10% @ 1.5 amp motor voltage (run) *+10 Vdc ± 10% motor voltage (standby)
Temperature	Operating: 0°C to +55°C, free air Non-operating: -55°C to +85°C
Weight	RRK7000: 3.5 lbs. RRT7000: 3 lbs.
Mounting Dimensions	4-1/2" high, 4-1/2" wide, 6.20" (RRK7000) or 3.50" (RRT7000) behind a 1/4" panel. 2.20" in front of panel. See Figures 1-3 and 1-4.
Data Output RRK7000	Data Mode Selectable (See Section 3.3.4): 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.

*It is recommended that a programmed motor voltage power supply be used which switches to a lower power level during periods of inactivity (standby).

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 RRX7000 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.

Always consult the serial number tag for proper voltage and frequency to be used and for model identification. Failure to do so could result in damage to the unit. 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. Because the list of possible options is constantly changing, it is not included in the manual. Generally, this list consists of special customer requirements that do not affect the operation of the unit and include such things as special paint, no logo, mill edge panel, etc.

1.7 PHYSICAL DESCRIPTION

The REMEX tape reader model RRK7000 and RRT7000 are mounted on a 4.5-inch panel with a height of 4.5 inches. Detailed dimensions are shown in Figures 1-3 and 1-4. The front panel contains the tape reading and transport mechanism, the lamp, readhead assembly and sprocket drive assembly. The electronic chassis is mounted at the rear of the unit (RRK7000 only).

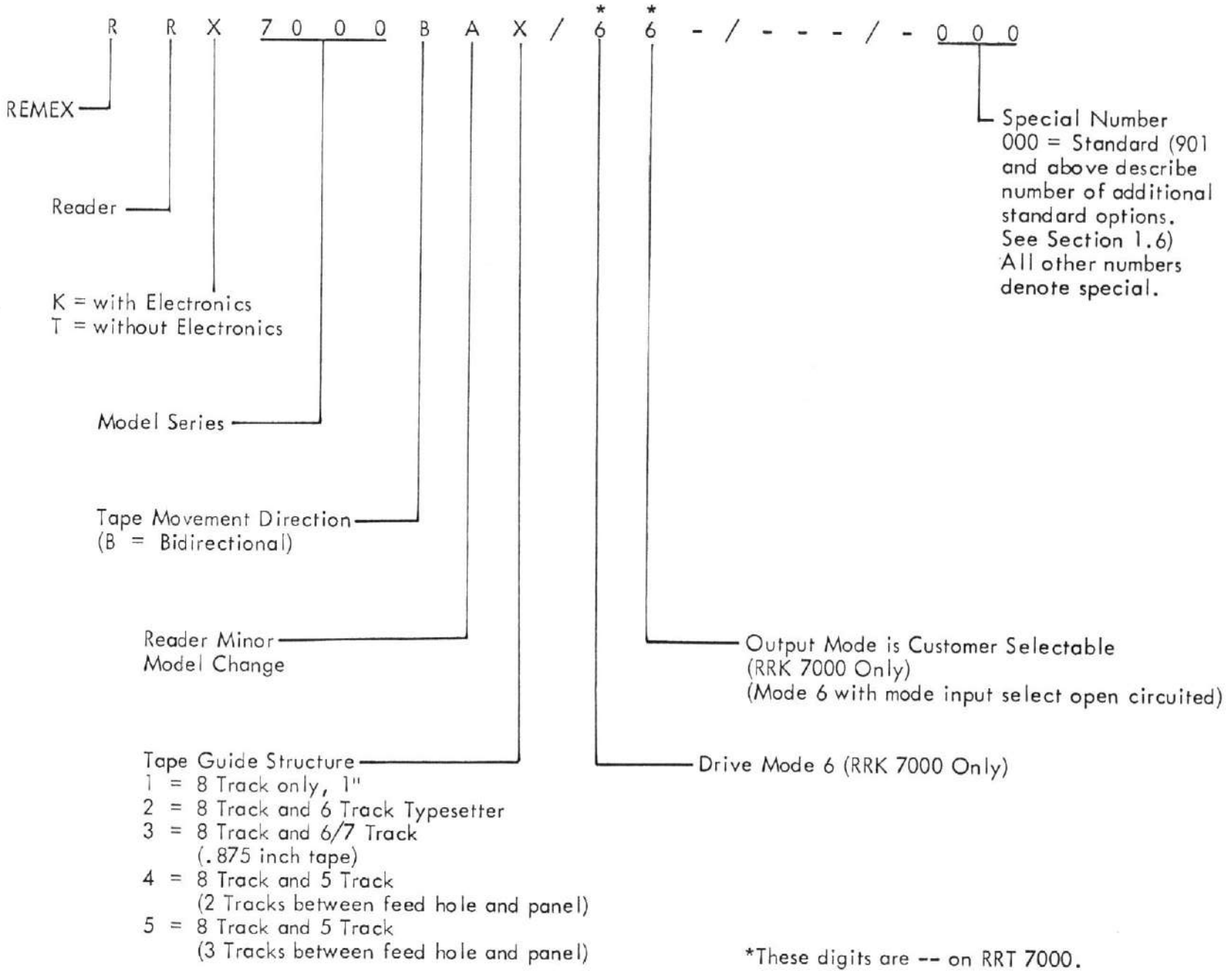


Figure 1-2. Model Number Coding, RRK7000 and RRT7000.

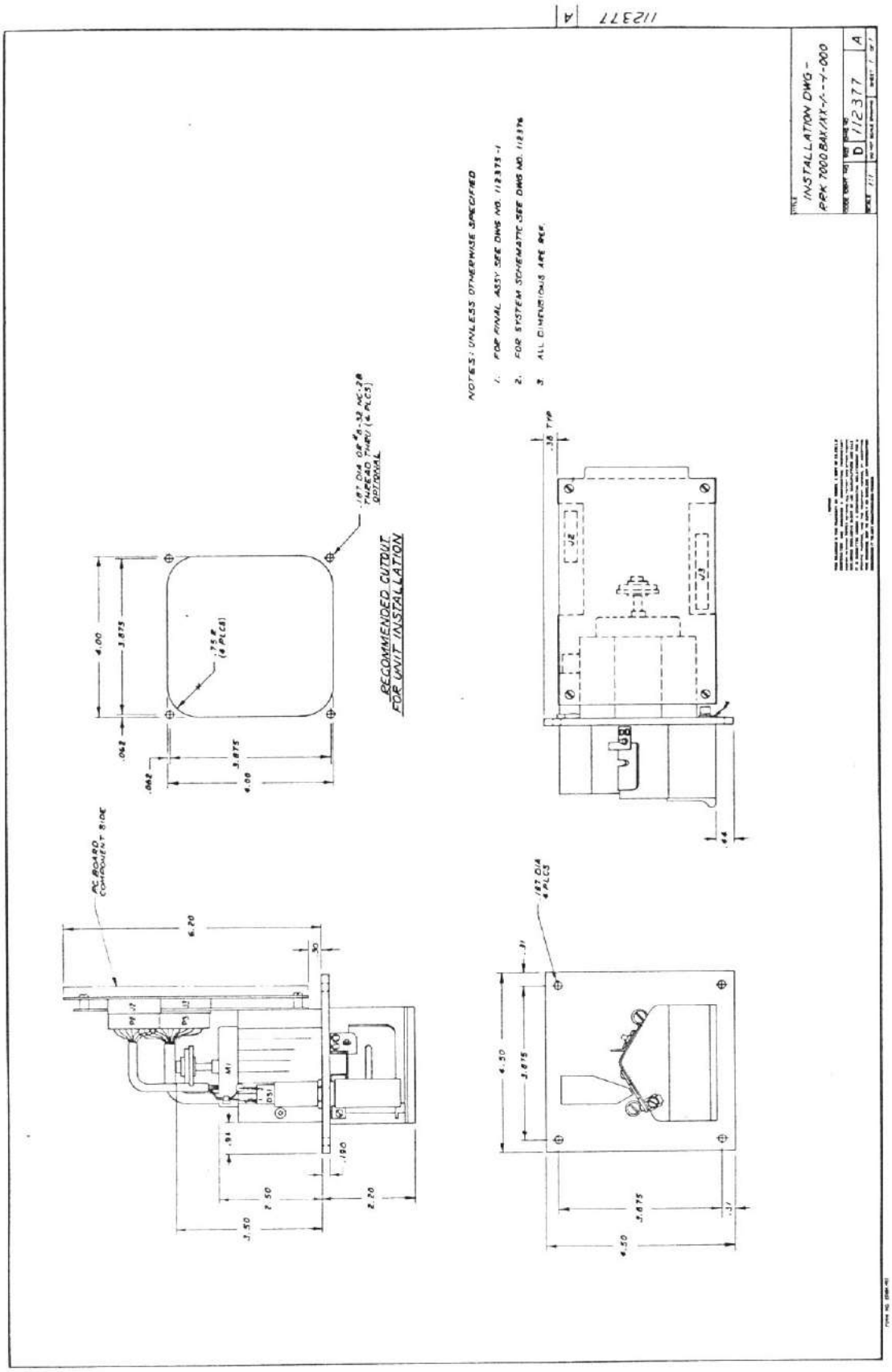


Figure 1-3. Installation Drawing, Model RRK7000BAX.

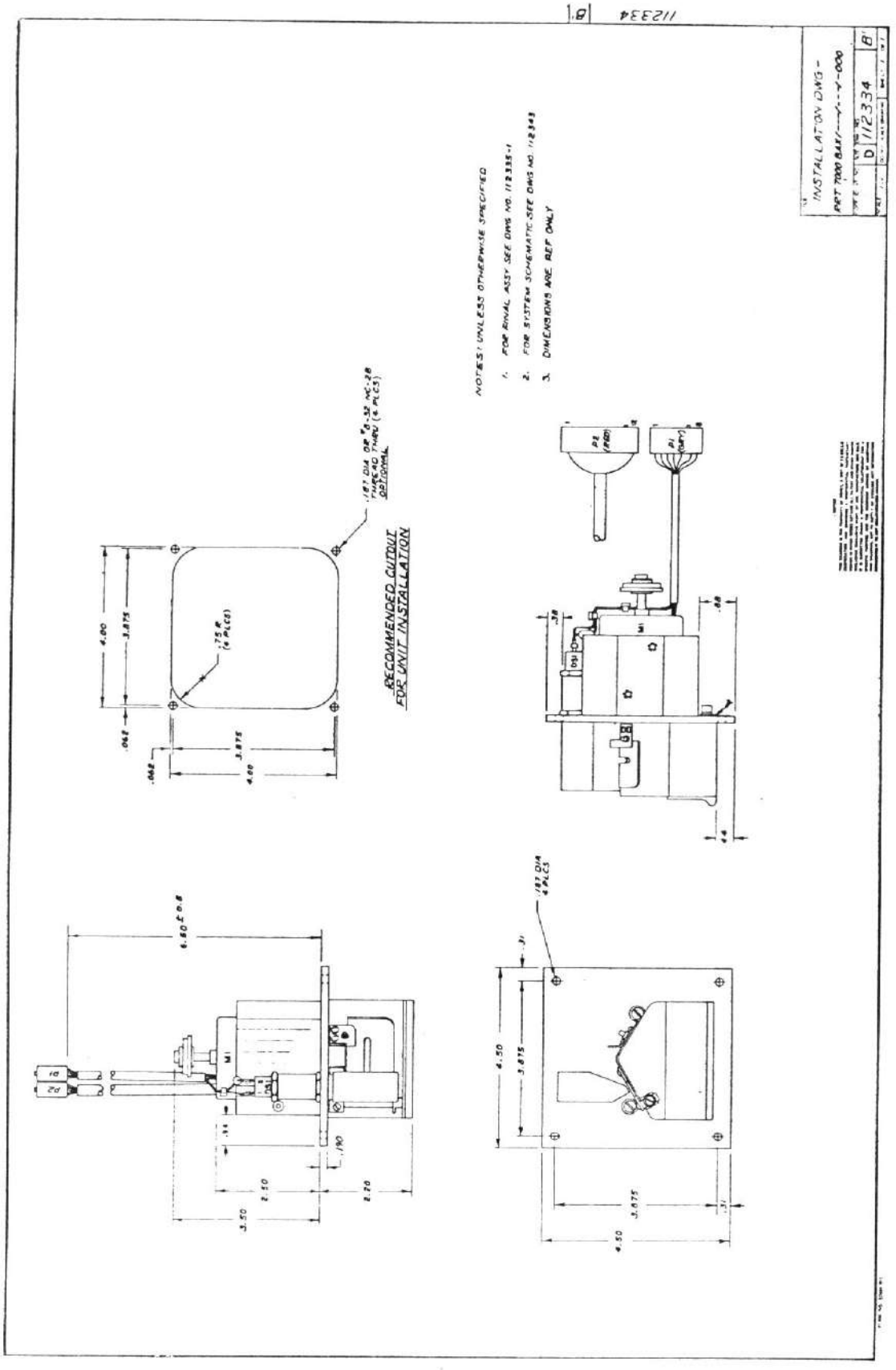
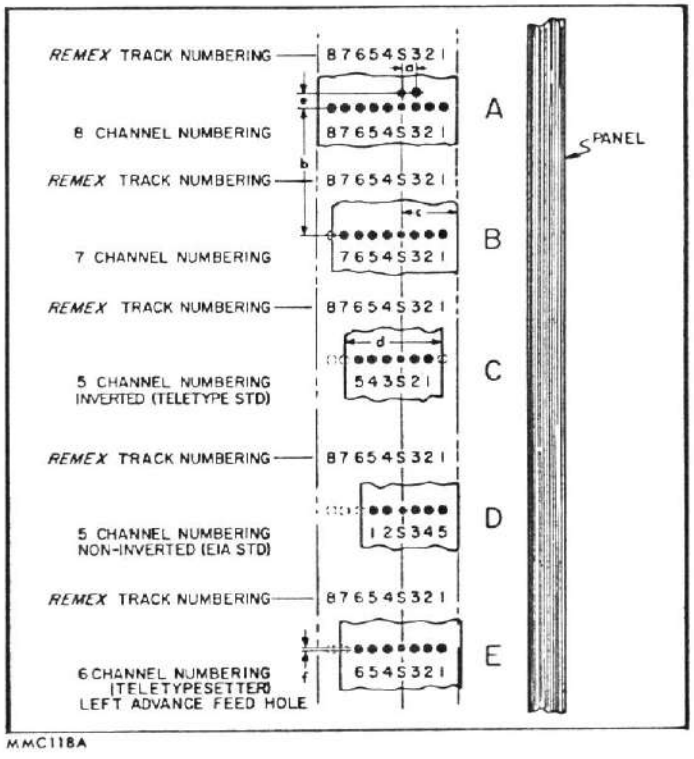


Figure 1-4. Installation Drawing, Model RRT7000BAX.

1.8 TAPE CHANNEL NUMBERING

Figure 1-5 illustrates the tape channel numbering. The reader accepts one inch, eight channel tape and other width tapes, depending upon the tape guide structure used.



Configuration	c ±0.003	d ±0.003	
A	0.392	1.000	a = 0.100 ± 0.002
B	0.394	0.875	b in any span of five inches is ±0.025
C	0.293	0.687	e = 0.100 ±0.001
D	0.394	0.687	Data hole diameter is: $0.072^{+.001}_{-.002}$
E	0.441 Drive Right 0.434 Drive Left	0.875	Sprocket hole diameter is: $0.046^{+0.002}_{-0.001}$

NOTE: The 6 channel teletypesetter has the sprocket hole center line advanced by 0.013 inch with respect to the data track center line (dimension f in illustration E).

Figure 1-5. Tape Channel Numbering.

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. 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, lamp 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 reader mounts as shown in Figures 1-3 and 1-4 with mounting holes provided. To ensure a minimum transmission of acoustical 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.

When operating at 25°C ambient temperature it is recommended that one or more of the following be done to keep the panel at a temperature (45°C) which is not uncomfortable to touch:

a. Mount the reader in a panel (or the equivalent) of 1/4-inch aluminum with a frontal area of 60 square inches (not including the reader frontal area).

b. Provide air flow at 22 cfm over the motor heatsink.

c. Provide a programmed motor voltage power supply which switches to a lower power level during periods of inactivity.

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.

2.4 POWER AND SYSTEM CONNECTIONS

On the RRK7000, the power, control and data track output signals are routed through J1. These signals are described in detail in Table 3-1. All wire sizes shall be 22 AWG except the ground and power input lines which should be 20 AWG.

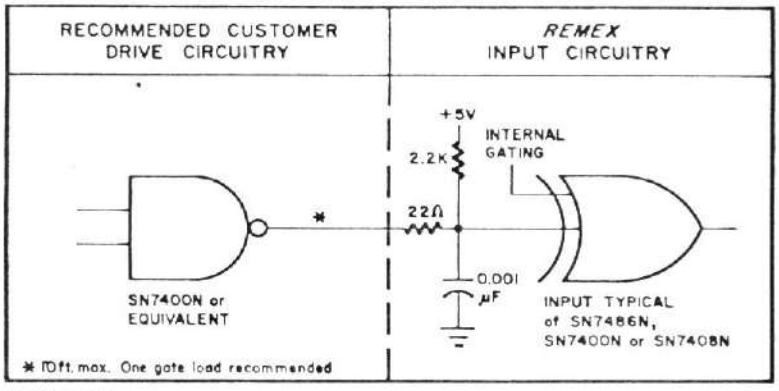
On the RRT7000 the motor and lamp inputs signals are routed through P1 and the outputs directly from the readhead are available at P2.

NOTE

All input and output logic signals are defined for REMEX mode 5 logic, i.e., +5V = active condition. Signals that are mode 6, i.e. 0V = active condition are written with an asterisk, e.g. DL*.

2.5 INTERFACE CIRCUITRY

Figure 2-1 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.



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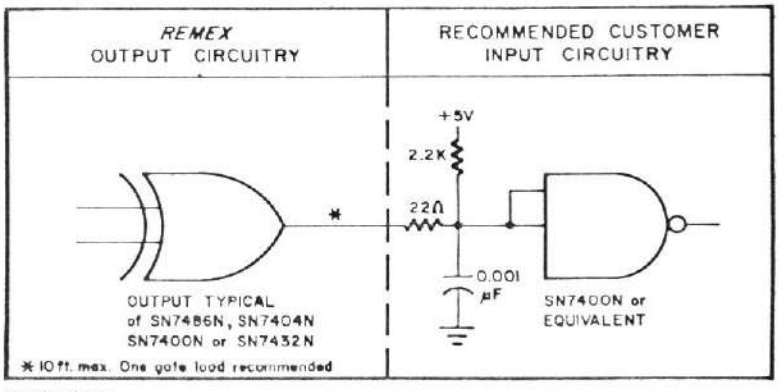


MMC 305A

Figure 2-1. Recommended Interface Circuitry, RRK7000.

SECTION III

OPERATION

3.1 INPUT-OUTPUT SIGNALS

Table 3-1 lists those input and output signals which are routed through connector J1 for the RRK 7000 and Table 3-2 lists the signals for the RRT 7000. The definition and/or usage of these signals are also included in the table. Figure 3-1 shows the timing diagram for these signals on the RRK 7000 and Figure 3-2 shows these signals for the RRT 7000.

3.2 CONTROL FUNCTIONS

All operations of the reader are controlled by external signals. Refer to Tables 3-1 and 3-2.

3.3 OPERATING INSTRUCTIONS

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

3.3.1 LOADING INSTRUCTIONS

a. Connect J1/P1 and J2/P2 (RRK 7000 Only). Apply power from customer sources. See Tables 3-1 and 3-2.

b. Raise the Upper Tape Guide allowing tape to be loaded.

c. Insert the tape into the reader so that the sprocket holes are aligned over the sprocket teeth. Make sure the sprocket holes engage the sprocket teeth and that the tape lies flat in the tape riding surface and that it covers the read station. See Figure 3-3.

d. Lower the Upper Tape Guide to its closed position.

e. The reader may now be operated as described in Section 3.3.2 or 3.3.3.

f. To unload tape, stop tape movement, raise the Upper Tape Guide and remove the tape.

Table 3-1. Interface Signal Descriptions, RRK 7000

Connector Pin	Description	Interface IC Type	Signal Levels	
			Active	Inactive
J1-1 thru J1-8	Data Tracks 1-8 Output. Active signal indicates data track hole and inactive condition indicates no hole condition. Output mode 5 or 6 selectable (see J1-10).	SN7486N	Operates in mode 5 or 6: 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).	Operates in mode 5 or 6: Mode 5: 0<V<+0.4 @16 mA (sink); No hole (or Data Not Ready).
J1-9	Data Ready Output. Active signal indicates data track outputs are in "On Character" condition. Signal active with leading edge of feed hole and remains active until next drive signal is accepted. Output mode 5 or 6 selectable (see J1-10)			
J1-10	Data Mode Select Output. Active signal places Data Outputs and Data Ready output in Mode 6. Inactive signal places these signals in Mode 5.	SN7486N	+2.4<V< +5.0 (or open circuit) Data Track and Data Ready signals in Mode 6.	0<V<+0.4 @17 mA max. Data Track and Data Ready signals in Mode 5.
J1-12, J1-N	Signal Ground (0Vdc), +5V return. Isolated from J1-14 and J1-R.			
J1-13, J1-P	+5 ±0.2 Vdc @1.3 mA logic and lamp supply.			
J1-14, J1-R, J1-J, J1-K, J1-L	Signal Ground (0Vdc), +32V motor supply return (VMR)			
J1-15, J1-S	+32 ± 10% Vdc @1.5 amps motor supply (VMOT)			
J1-F	(Drive Left)* Input. Active signal drives tape to left. Pulse or DC level input drives tape at 300 characters second. Signal must be maintained until the Data Ready signal becomes inactive (typically less than 0.5 µsec) and must be removed within 50 µsec. after the leading edge of the active Data Ready signal to stop on that character. The next pulse or DC level may be applied any time after the Data Ready signal becomes active. See Timing Diagram, page 3.	SN7400N	0<V<+0.4 @5.0 mA, max. Reader drives tape.	+2.4 < V< +5.0 (or open circuit). Tape is not being driven.
J1-H	(Drive Right)* Input. Same as drive left except drives tape to right.			
J1-11, J1-D, J1-E, J1-M	Not Connected.			
J1-A, J1-B J1-C	Reserved.			

Table 3-2. Interface Signal Descriptions, RRT 7000

Connector Pin	Signal and Definition and/or Usage
P1-1 thru P1-4	Step Motor phases 1 thru 4, respectively. The motor is a four phase stepper motor with a mechanical damper attached to the rear of the motor shaft. To drive tape it is required that two motor phases at a time be energized in the following sequence which drives tape to the right: 1 and 2, 2 and 3, 3 and 4 and then 4 and 1. Drive left is the reverse sequence. It is also recommended that a programmed power supply be utilized to reduce power consumption during periods of inactivity to lower the operating temperature.
P1-5	Motor Supply Voltage (+VMOT); +32 Vdc at 1.50 amps for 300 cps; +28V at 1.35 amps for 200 cps operation. +10 Vdc for programmed standby operation. The resistance of each motor winding is 35 ohms/phase.
P1-6	Key Postion.
P1-7	0VDC return (signal ground) for +5V lamp supply (P1-8). This signal is isolated from P2-10.
P1-8	Lamp Supply Voltage: +5 ± 0.2 VDC @800 ma.
P2-1 thru P2-9	Data Track Outputs 1 thru 8 and Sprocket (Pin 9). Each cell output is an analog signal indication of a data hole condition. A negative voltage is generated by a photovoltaic cell when it is activated by a light source. Minimum cell output, hole condition is 70 micro amps into 1K load. Maximum cell output, no hole condition with oil yellow paper tape is 20 micro amps into 1K load.
P2-10	0VDC return (signal ground). This signal is isolated from P1-7.
P2-11	Key Position.
P2-12	Not Used.

Mating connector for P1 is Molex 09-60-1081 and mating connector for P2 is Molex 09-60-1121. Other 8 and 12 pin connectors are available from Molex depending upon the application.

3.3.2 TAPE DRIVE, RRK 7000

In this mode of operation, the reader is controlled in either a continuous or a line-at-a-time step operation.

a. Perform Section 3.3.1, steps a through e.

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

c. Apply the following signal to the drive left (DL*) line, J1-F or drive right (DR*) line, J1-H:

Stop: $+2.4 < V < +5.0$ (2.2K to +5V) or an open circuit

Run: $0 < V < +0.4$ @5 ma.

The drive signal can be either in the form of a pulse or a continuous DC level which must be maintained until the Data Ready signal goes inactive (typically less than 0.5 μsec) and must be removed within 50 μsec after the leading edge of the active Data Ready signal to stop on that character. The next pulse or D.C. level may be applied any time after the Data Ready signal becomes active. See Figure 3-1. In this mode of operation tape is driven in excess of 300 characters/sec.

d. 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, RRT 7000

This reader contains only the stepper motor. All control electronics are provided externally. Figure 3-2 shows the waveforms required to operate the motor. Perform Section 3.3.1, steps a through e for initial tape loading. The cell outputs are in the form of photovoltaic cell transistions and are routed through P2. The lamp voltages and stepper motor signals are routed through P1.

3.3.4 DATA OUTPUT MODE SELECTION, RRK 7000 ONLY

The output mode of both the data tracks and the Data Ready output is selectable for either Mode 5 (+5 volt active) or mode 6 (0 volt active) 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)

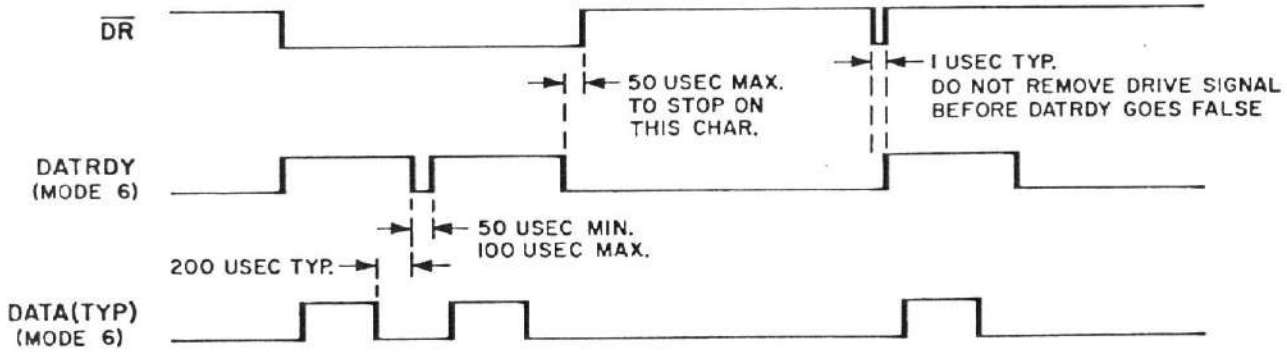
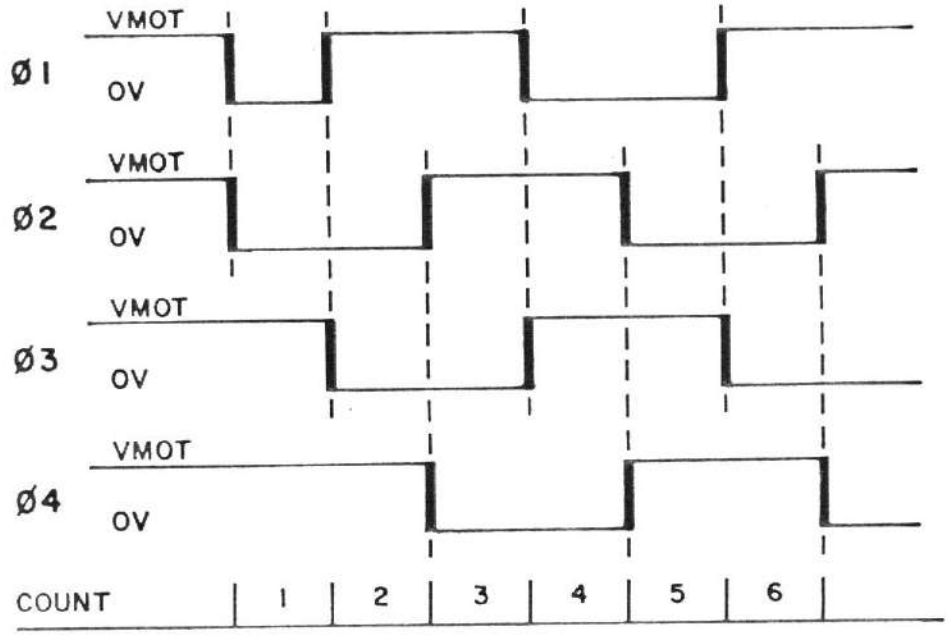


Figure 3-1. Timing Diagram for RRK 7000.



MMC 535

Figure 3-2. Timing Diagram for RRT 7000.

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 stiff bristle brush supplied. Cleaning of the photocell 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 3-3 are among those recommended for use. Mylar tapes should be used in applications requiring continuous use.

Table 3-3. Recommended Tapes

Type	Manufacturer	Part Number
Paper, Unoiled or Oiled (except black carbon filled)	REMEX	715200-002 1000 ft. roll
	Paper Manufacturers, Inc.	Perfection Series
	Bemis	
Special Paper	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 X3.18-1967 (ANSI; formerly United States of American 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 compromised, especially in restricting the tape tolerances capable of being read.

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 RRK 7000

The REMEX punched tape reader performs two basic functions; (1) it drives tape in either direction over the read station and (2) converts the tape information into electrical signals. The following block diagram description applies primarily to the RRK 7000. Since the RRT 7000 consists only of the readhead, lamp and motor, it seems oversimplified to discuss this unit in a formal manner. Information contained in the RRK 7000 description covering these items is also applicable to the RRT 7000.

4.1.1 TAPE DRIVE

Reader Logic Card 112381 contains the circuit logic used to operate the stepper drive motor in response to the drive inputs. Refer to Figure 4-1 for the Block Diagram of the RRK 7000. Applying a 0V active drive signal sets the direction memory to the required state and establishes the direction of rotation for the motor by setting Motor Control Logic. The input drive signal also triggers the Drive Logic Control circuitry which generates the motor clock pulse MCP. MCP is used to advance the motor control logic which steps the motor and, in turn, moves the tape to the left or right one line depending upon the direction selected. The tape then stops on character and waits for the next MCP. The Drive Control Logic also locks out the sprocket signal for 2 ms after the MCP is generated using the Drive Inhibit (DRINH*) signal so that any initial jitter in the sprocket is locked out as the tape starts up and the sprocket goes off character.

When the next sprocket hole is read, the sprocket output is amplified, delayed 180 μs and sent to the Drive Control lgoic. Upon receipt of the sprocket signal, the Drive Control logic does two things: (1) generates a Data Ready signal for use in external equipment and (2) provides a 180 μs delay to allow data to be examined and make the stop-go decision. The Data Ready output is gated with the Mode Select signal to produce either mode 5 or 6. At the end of the 180 μs, if the drive signal has not been removed, the read-drive cycle will be repeated and the tape will advance another line.

4.1.2 TAPE READING

The readhead is located under the fiber optics and contains photovoltaic cells which are used to sense the punched tape perforations. As tape is advanced over the readhead by the sprocket drive, the photovoltaic cells are energized by the light source when the corresponding holes are present in the tape. Outputs from the readhead are then applied to the data track amplifiers, and then to the Mode Select gates which produces either Mode 5 or 6 outputs depending upon the level applied to the Mode Select input.

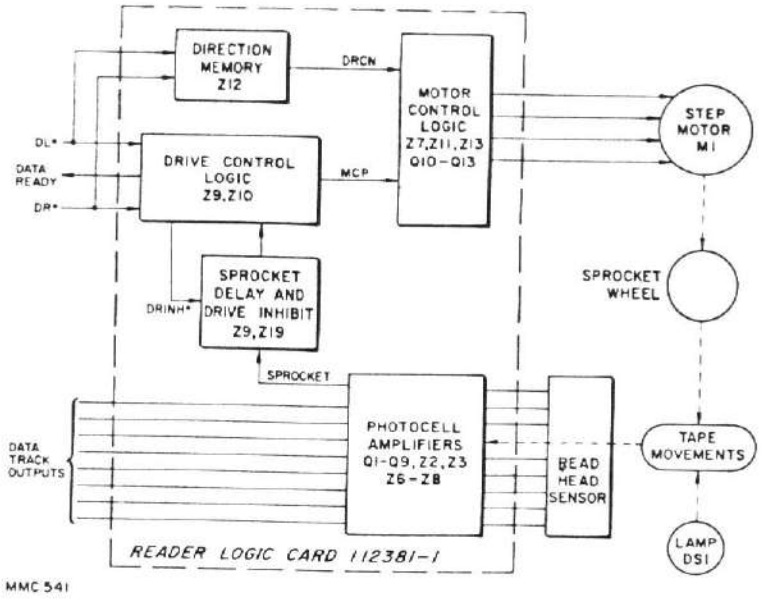


Figure 4-1. Block Diagram Reader Circuitry.

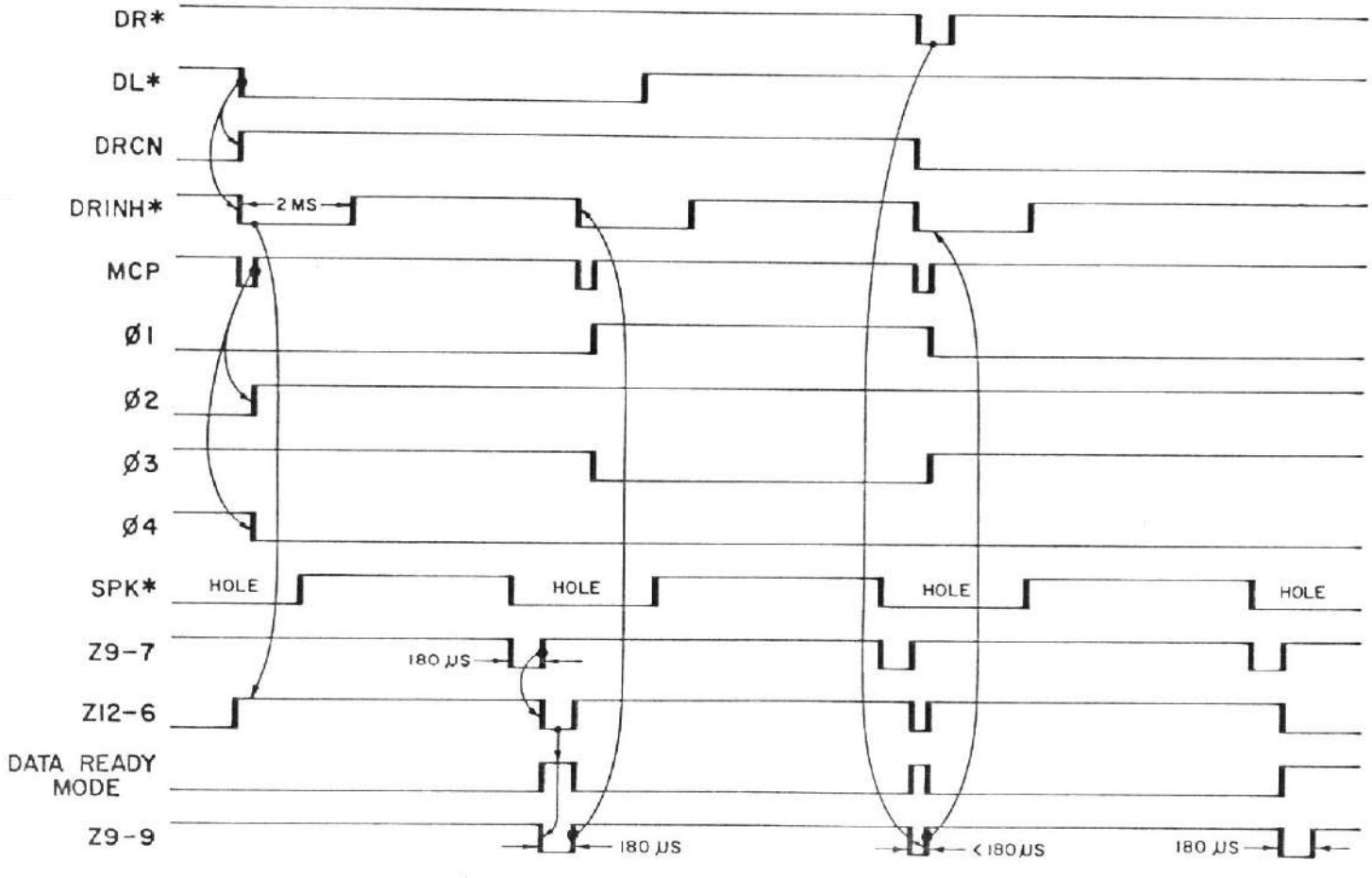


Figure 4-2. Timing Diagram, Reader Circuit Card 112381.

4.2 READER LOGIC CARD DESCRIPTION 112381 (RRK7000 ONLY)

The reader circuitry on PC card 112381 is used to: (1) generate output signals to drive the stepping motor in response to the drive signal inputs and (2) to provide amplification and gating of the readhead data output signals.

4.2.1 DRIVE CIRCUITS

During the following description, refer to Figure 4-2 which shows the waveforms and timing diagrams for the drive circuit. This figure is intended as a guide to show the sequence of events and which signal 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 8-3 during this description.

Applying a 0V, DL* signal at J1-F sets the direction flip-flop Z12 and places DRCN at +5V. This sets up the four phase counter, Z8, Z11 and Z13, to energize two motor phases at a time in the sequence which drives tape to the left, i.e., phases 4 and 3, 3 and 2, 2 and 1, and then 1 and 4 (drive right is the reverse order). The counter is advanced one count with each clock pulse received by MCP as described in the next paragraph.

The 0V, DL* signal places Z14-3 at +5V and Z14-6 at 0V. This negative going edge triggers the 2 ms single-shot at Z10-11. The resulting negative going edge at Z10-9 (DRINH*) triggers the 5 µs single-shot at Z10-5. At the end of the 5 µsec MCP pulse, the positive going edge of Z10-7 is applied to the four phase counter causing the motor to move the tape one line to the left. DRINH* is also used to hold Z12 at pin 1 in the reset condition until Z10 times out (2 ms). As a result, any noise or startup jitter from the sprocket signal is prevented from generating a true Data Ready signal.

When the next line is read, the negative going Sprocket (SPK*) signal triggers the 180 µs Sprocket Delay single-shot at Z9-5. This delay is required when using a feed hole advanced tape to electronically delay the feed hole and make sure all data is present before the sprocket is recognized. With standard in-line feed holes, this serves only to add an extra safety margin. At the end of the 180 µs delay, the positive going edge of Z9-7 sets Z12. The resulting positive going edge at Z12-6 is used two places: (1) to trigger Z9 at pin 11 and (2) to generate the active Data Ready signal at J1-9. The function of Z9 is to provide a 180 µs delay by holding Z14-5 at 0V and thus inhibiting any drive signal. This allows the external equipment to examine the data and make the go/no-go decision. If the decision to stop is made, the DL* signal must be taken high within 50 µs (actually 180 µs but conservatively specified at 50 µs). Otherwise, when Z9 times out, the positive going Z9-9 signal will cause Z10 to trigger and repeat the tape advance cycle. If the drive line is taken high, Z14-3 resets Z9 at pin 13 and the next drive command can occur and begin the next drive sequence immediately.

4.2.2 TAPE READING CIRCUITS

Nine photovoltaic cells in the readhead assembly sense the performations in the tape. Refer to Figure 8-3. An illumination system consisting of a lamp and a fiber optic distributor provide a continuous beam which covers the area of the photocells. The tape is driven over the top of the photocell block and when a hole appears between the photocell and the light source, the photocell becomes energized.

Each cell output is applied to a Schmitt trigger amplifier circuit consisting of Q1-Q9, Z6 and Z7. Track 1 is used in the following discussion since it is typical of tracks 1-8. When track 1 photocell becomes energized, the negative going signal at the cathode of the photocell turns Q1 off. Q1 and Z6-1 are connected to function as a Schmitt trigger. The resulting 0V active signal at Z6-2 is gated with the Mode Select signal at Z2, pins 1 and 2. A 0V Mode Select input provides a mode 5 output at J1-1 (i.e., 0V for no hole and +5V for 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 Sprocket signal is generated in the same way except it is not gated with the Mode Select signal. The Data Ready output is gated in the same manner as the track outputs at Z8, pins 9 and 10.

4.3 LIGHT SOURCE

A +5V filament lamp is used as the light source and is connected to the rear of the front panel by means of a sleeve. See Figure 7-1. A lens in the lamp focuses the light to the fiber optics located on the front of the panel which in turn directs a beam over the photocells. The lamp is operated at apporximately 10% below rated voltage to provide a long life expectancy.

SECTION V

MAINTENANCE

5.1 GENERAL

The REMEX punched tape reader has been designed to keep maintenance as simple and infrequent 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 ckecks 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

	QUANTITY
*Frequency Counter, 10 Hz to 20 MHz, 5V Input	1
Miller-Stephenson MS-200 Magnetic Tape Head Clean (REMEX Part Number 716004-150)	1
*Pulse Generator, 10 Hz to 1 MHz, up to +5V amplitude, 1 μs to 100 ms width	1
*Oscilloscope, DC to 10 MHz, single sweep	1
Tape Gauge, REMEX Part Number 110597	1
*Voltmeter, Digital 0-0.1 ma, 0-100 mv dc, 0-100 Vdc, 100 K impedance or greater	1
*Plastic Shim Stock, .010 Thick. Available from ARTUS Corp., 201 S. Dean St., Englewood, N.J. 07631	

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.

*These items are not available from REMEX.

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 buildup 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 and on the lamp assembly and lens.

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 lamp 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	5.4
						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	
16			42			X	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
			52			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 bristle brush supplied or the cleaning materials 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.

5.2.1.2 Sprocket Cleaning

The sprocket wheel should be checked for cleanliness every two weeks. Depending upon tape conditions, accumulations may buildup 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 buildup of grease, oil and dirt on the tape. When the buildup 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 replaced as required.

5.2.1.4 General Cleaning

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

> Using the bristle 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.

5.3 TROUBLE-SHOOTING

Trouble-shooting is presented in the form of a chart, Table 5-3, which should be consulted whenever tape reader performance is unsatifactory. The chart is divided into three columns; Indication – the way in which the malfunction becomes evident; Probable Cause – the possible reason or reasons for the malfunction; and Remedy – the manner in which the malfunction may be corrected.

Table 5-3. Trouble-Shooting, RRK 7000

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. Fiber Optics, Light Source misaligned	Check alignment of the Fiber Optics Light Source as described in Section 5.4.
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. Photocell defective	Check the output of the Photocell assembly as described in Section 5.4 and replace if defective as described in Section 6.2.
	3. Defective component on Reader Card	Check the components and IC 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 photocell	Check the output of the Photocell assembly as described in Section 5.4 and replace if defective as described in Section 6.2.
	3. Defective component on Reader Card	Check the components and IC models associated with the particular track output.
4. Correct drive signals present; tape does not move.	1. Defective component on Reader Card	Check operation of Reader Card.
	2. Step Motor defective	Check Ø1 thru Ø4 outputs from Reader Card to see if they are present. If so, replace stepper motor as described in Section 6.5.
5. Tape does not stop on character	1. Improper reader alignment	Perform Section 5.4.
	2. Defective component	Check operation of Reader card.
	3. Improper input timing	Check removal time of drive signal.

Table 5-3. Trouble-Shooting, RRK7000 (Continued)

Indication	Probable Cause	Remedy
6. Continuous tape speed less than 270 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 6.5.
	3. Tape guide assembly worn.	Replace tape guide assembly.

REFER TO ADDENDUM SHEET

5.4 READER ALIGNMENT

Proper operation depends upon maintaining accurate adjustments. Although the unit is completely adjusted at the factory, the following adjustments should be checked periodically (refer to Table 5-2) and should be performed when the tape reader performance is unsatisfactory or when any of the following items are replaced: light source, readhead assembly, upper tape guide assembly, mechanism assembly, sprocket, step motor, or circuit card. Letter and number designations in parenthesis refer to item called out in Figure 7-1.

a. Remove all power and control signals by disconnecting P1 and P2 (RRT7000 Only).

b. Check the distance between the rear of the sprocket and the surface of the front panel as shown in Figure 7-1. This distance should be 0.862 inch. If the spacing is not correct, perform the procedure presented in 6.5, steps b, c, f and h.

CAUTION

The procedure outlined in steps e and f should not be performed unless one of the components listed in the introductory paragraph above has been replaced or unless the reader performance is unsatisfactory. Prior to performing these steps, measure the clearance between the readhead housing tape riding surface and the sprocket perimeter high point as shown in Figure 5-1 and as described in step c and d below. Perform the steps e and f only if the distance is not within the tolerance prescribed in steps c and d.

c. To check the sprocket position, place the end of a small steel rule on the tape riding surface so that the rule is resting on the surface and between the teeth of the sprocket as shown in Figure 5-1.

NOTE

As shown in Figure 5-2, the sprocket perimeter is not round but is rather a surface comprised of 24 flat surfaces upon which the sprocket teeth are mounted.

d. Rotate the sprocket in both directions and observe that the perimeter high point clears the steel rule. The high point should just clear the rule by a few thousandths of an inch (no more than .007 inch). If the sprocket is not positioned as described above, perform steps e and f below.

e. Loosen the two 6-32 binder-head screws (D) which hold the stepper motor to the panel. Adjust the position of the heat sink to obtain the clearance conditions described in steps c and d above.

f. Tighten the screws (D) and perform the clearance measurement in steps c and d. It may be necessary to loosen the screws (D)slightly and move the heat sink slightly. Repeat the clearance measurement and adjustment as necessary to achieve proper clearance.

g. Apply power by connecting P1/J1 and P2/J2 (RRT7000 Only).

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

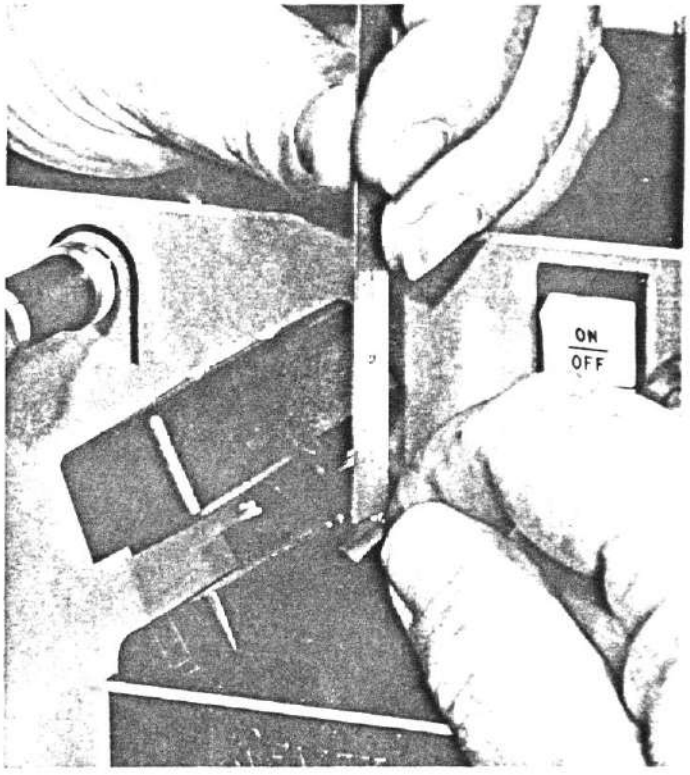
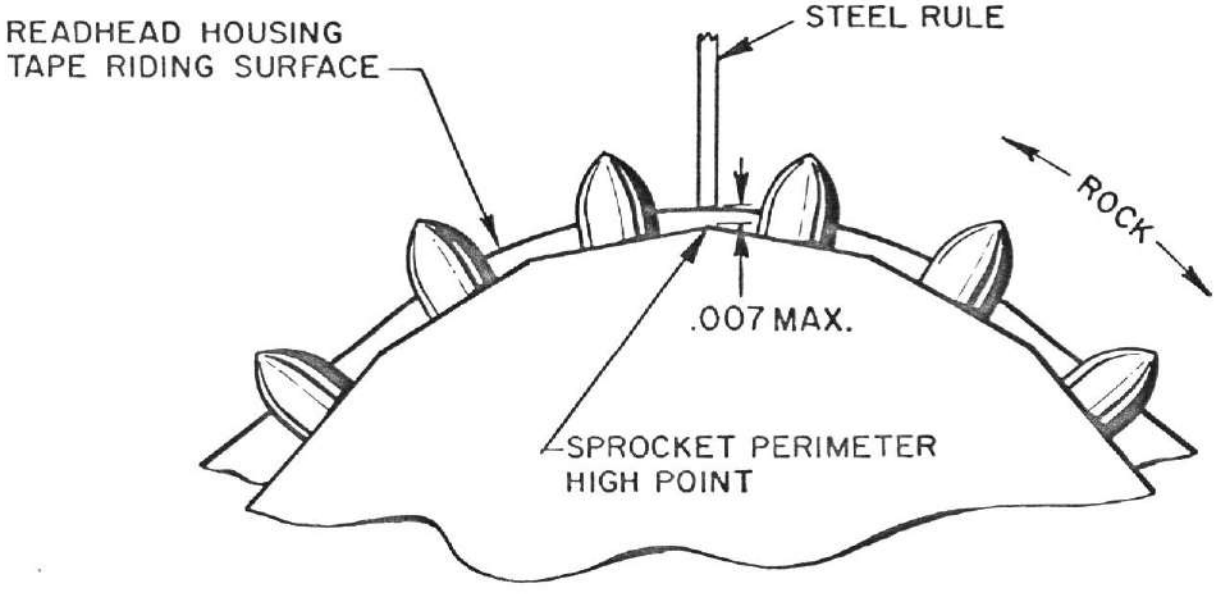


Figure 5-1. Sprocket Height Adjustment Technique.



MMC 353A

Figure 5-2. Sprocket to Readhead Clearance.

i. Insert three layers of .0037 mylar tape (approximately .011) or a piece of .010 plastic (see Table 5-1) between the Upper Tape Guide and Readhead Assembly.

j. Referring to Figure 5-3, use screws H and N to adjust the Upper Tape Guide so that there is maximum contact and parallelism from A to B. Use screws H for lateral movement and screw N for rotational movement. From B to C the Upper Tape Guide will not show this parallelism.

k. Remove the three layers of tape.

l. Insert two layers of tape between A and B only.

m. 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.

n. 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 hence these tapes should not be used for this adjustment unless the tape has been checked on a registration gage and found to be within .0025%.

o. With power on, the motor should be energized. Loosen screw (R) which holds the motor to the heat sink.

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 any adjustment or use a cloth or pair of gloves.

p. Rotate the motor so that the holes in the tape appear concentric with the light columns. Use care not to disturb the sprocket-to-panel adjustment made in step b. Tighten screw (R).

q. Remove the tape and connect P3 (RRK 7000) or P2 (RRT 7000) coming from the Readhead Assembly to a test circuit as shown in Figure 5-4. Connect a microammeter in series with the 1K resistor. Make sure the +5V is being supplied from the external source.

r. Loosen nut (T) which holds the fiber optic light source to the front panel and nut (U) which locks the lamp in the sleeve. Rotate the fiber optics and screw the lamp in or out until the cell outputs are at their maximum. The reading on the ammeter should be 80 microamps min. for the data tracks and 100 microamps min. for the sprocket. The maximum output from any cell should not be greater than 130 microamps so that tapes with the highest permitted transmissivity (See Table 1-2) can be read without error. Tighten nuts (T) and (U).

s. Reconnect P2 or P3 and reload the tape.

t. Connect a pulse counter to TP4 (Data Ready) and TP1 (0V) on the Reader Logic Card on the RRK 7000. On the RRT 7000 the speed in characters per second can be counted by connecting to the sprocket cell output.

u. Insert a loop of tape and apply a drive left signal to J1-F and measure the drive left speed in character/second with the pulse counter. With RRT 7000 the reader is operated from external equipment.

v. Repeat step u with a drive right signal at J1-4. 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%. Repeat steps u and v as required. When rotating the motor, make sure it is tight to the panel so that the distance from the rear of the sprocket to the front panel as described in step c is not disturbed. Tighten set screw (S).

NOTE

The importance of steps u and v is not a specific interest in drive speed, but rather that balancing the 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 feed hole placement errors which are attributable to tape registration errors, but only to the position of the sprocket in relation to feedhole aperture in the readhead. Thus measuring and balancing the speed is only an accurate, electronic method of assuring that this relationship exists. When speeds are properly balanced, feedhole placement error will be minimal and independent of the direction of the tape, thereby increasing tape readability to a maximum.

w. On the RRK 7000, connect a pulse generator to the DR* input. Set the pulse generator for 300 pps. On the RRT 7000, drive the motor using external controls at 300 cps.

x. Connect an oscilloscope to the sprocket cell output at the base of Q9 (RRK7000) or P2-9 (RRT 7000) and observe the jitter at the -0.3 Vdc level (the jitter at the +0.6 Vdc level is not of concern nor the time jitter in the leading or trailing edges of the waveform). Minimize the jitter by loosening the two set screws (R) which hold the collar to the motor shaft and move the collar in or out as required to obtain the least amount of jitter. Cycle the reader between 20 and 300 characters and adjust for minimum jitter. Repeat steps w and x for the DL* input or a drive left sequence.

y. Perform the reverse of step a.

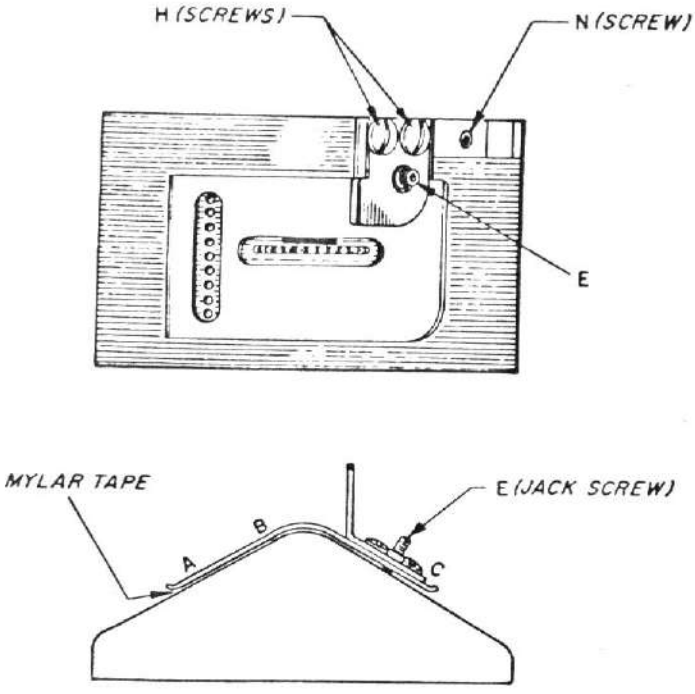


Figure 5-3. Adjustment of the Upper Tape Guide.

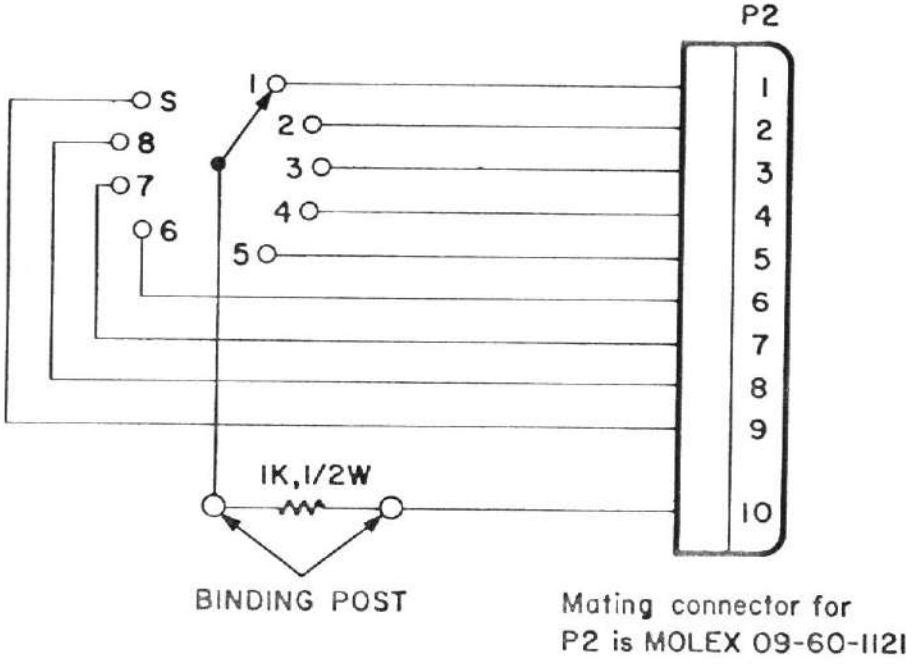


Figure 5-4. Photocell Output Test Circuit.

5.5 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 al 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. Feeh 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 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 protion 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.

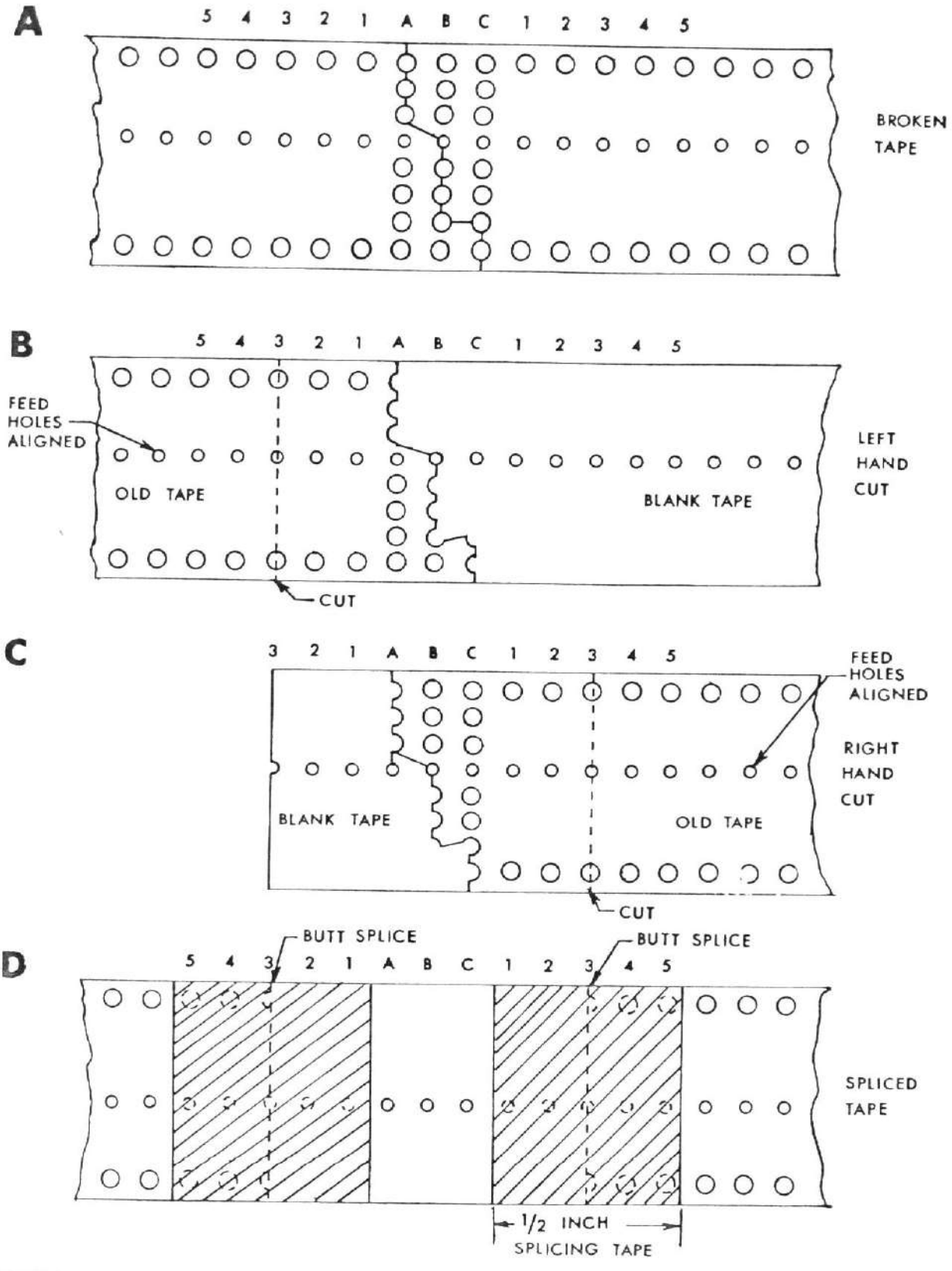


Figure 5-5. Tape Splicing Procedure.

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 or telephone 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.

6.2 READHEAD MECHANISM DISASSEMBLY

This procedure is required when replacing the Upper Tape Guide Assembly, the Readhead Assembly (consisting of the Readhead Housing, Photocell Assembly and Light Columns), or the Mechanism Assembly (consisting of the Mounting Block, Tape Guide Cam, and Tape Guide Actuator). For ease of assembly, it is recommended that the Readhead Assembly (part number 110459-4) and Mechanism Assembly (part number 112346-1) be replaced as a complete assembly. Figure 7-1 should be referred to in Section 7 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 P2 (RRK 7000 Only).

b. Disconnect P3 from the circuit card (RRK 7000 Only).

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

6.3 READER CARD REPLACEMENT (RRK7000 ONLY)

The following procedure is recommended when removing the Reader Card:

a. Remove all power and control signals by disconnecting P1/J1, P2/J2 and P3/J3.

b. Remove the 4-40 binder head screws and nylon washers which hold the Reader Card to the Chassis and P.C. Board spacers.

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

6.4 LAMP REPLACEMENT

The following procedure is recommended when replacing the Lamp:

a. Remove all power and control signals by disconnecting P2 (RRK7000) or P1 (RRT7000).

b. Remove the two quick connect terminals at the rear of the lamp.

c. Unscrew the lamp from the sleeve.

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

e. Perform Section 5.4, steps q, r and s.

6.5 MOTOR AND/OR SPROCKET REPLACEMENT

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

a. Remove the Mechanism Assembly by performing Section 6.2, steps a through d.

b. Loosen the two set screws (Item J, Figure 7-1) which hold the sprocket to the motor shaft. If only the sprocket needs replacing proceed to step e.

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

d. Install the new motor by performing the reverse of step c. The motor should be up flush against the panel. Tighten screw R.

e. Install the sprocket wheel so that: (1) distance from the back of the sprocket to the front panel is 0.862 inch (see Figure 7-1); (2) the 1/8 long set screw tightens on the flat of the motor shaft. Tighten the set screws J.

f. Install the Mechanism Assembly by performing the reverse of step a.

g. Perform Section 5.4.

SECTION VII

PARTS LIST

7.1 GENERAL

Tables 7-1 through 7-4 list the electronic and mechanical parts used on the RRK 7000 and RRT 7000 along with the recommended spare parts (Table 7-1). Standard hardware items are not listed. Indented items are part of the assembly under which they are indented and the quantity of the indented items is per each assembly. An X in a particular model number digit designator denotes any of the combinations given in Figure 1-2 for that designator is applicable.

Reference designations refer to the parts illustrated in Figures 7-1 through 7-3. The reference designations include a figure number and a part designation number which appears on that figure to indicate the location of the part. For example, a "7-1; 12" appearing in the reference designation column indicates that the item listed in the description column is identified as Item 12 in Figure 7-1. All electronic components are identified by letter-number combinations (such as R1 and T1) 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 Street, P.O. Box 11926, Santa Ana, California 92711.

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.

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, RRK 7000 and RRT 7000

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Unless specifically noted, the items listed below apply to both units:			
Lamp, 5 Volt, Welch Allyn 999079-6	715071-141	1	DS1
Printed Circuit Card Assembly, Reader Logic, RRK 7000 Only	112381-1	1	
Readhead Assembly	110459-4	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.

REFER TO ADDENDUM SHEET

Table 7-2. Parts List, RRK7000BAX, RRT7000 Only

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Unless specifically noted, the items listed below apply to both units:			
Top Assembly, RRT7000BAX	112335-1	1	Ref.
Top Assembly, RRK7000BAX	112375-1	1	Ref.
Bracket, (RRK7000 Only)	112398-1	1	7-2;1
Gasket, Welch Allyn 11200182	715018-104	1	7-1;3
Heatsink, Motor	112523-1	1	7-1;4
Key, Polarizing, Molex 15-04-0219	706540-149	2	(P2, P3)
Kit of Parts, See Table 1-1 for Contents	112378-1	1	
Label, Nameplate	716018-113	1	
Lamp, 5 Volt, Welch Allyn 999079-6	715071-141	1	7-1;DS1
Light Source, Fiber Optics	112297-1	1	7-1;15
Motor Assembly, Stepper	112524-1	1	(M1, P1)
Collar	110866-1	1	7-1;23
Collar, Spring	110869-1	1	7-1;18
Connector, Housing, Gray, 8 pin, Molex 09-50-7081	706510-242	1	7-1;P1, P2 ①
Contact, Connector, Female, Molex 08-50-0108	706530-138	7	7-1;(P1)(P2) ①
Damper Assembly	110867-1	1	7-1;24
Faceplate	111386-1	1	7-1;21
Motor	715075-195	1	7-1;M1
Plate, Friction	111385-1	1	7-1;22
Resistor, 0.5Ω, 3W, ± 5%	701015-R50	1	R101
Spring, Lee LC-032D-1 (MW)	714090-136	1	7-1;19
Panel, Front	112521-1	1	7-2;2
Printed Circuit Card Assembly, Reader Logic (RRK7000 Only) See Table 7-3 for component listing.	112381-1	1	7-2;PC1
Readhead Mechanism Assembly	112313-1	1	Ref.
Clamp, Cable, Weckesser A-30	715040-139	1	
Ground Plate Assembly	112423-1	1	7-1;14
Lever, Upper Tape Guide	111797-1	1	7-1;1
Mechanism Assembly	112346-1	1	7-1;9
The following parts are listed for reference only. It is recommended that the entire 112346-1 assembly be replaced as a complete unit.			
Actuator Assembly	110769-1	1	
Cam, Tape Guide	110438-1	1	
Ground Strap Assembly	110762-1	1	
Mounting Block, Readhead	112338-1	1	
Ring Retainer, Truarc 5013-25	715025-148	1	
Spring, Associated Spring Co. E0094-014-0620M	714090-127	1	

① This connector is designated P1 on RRT7000 and P2 on RRK7000.

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, RRK7000BAX, RRT7000 Only (Continued)

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Readhead Mechanism Assembly (Continued			
Readhead Assembly Except for the components listed below, the entire 110459-4 assembly must be replaced as a complete assembly.	110459-4	1	7-1;12
Connector, Housing, Red, 12 pin Molex 09-50-7121	706510-224	1	7-1; P2, P3 ①
Contact, Connector, Female, Molex 08-50-0108	706530-138	10	(P2)(P3)①
Tape Guide Assembly, Upper	112407-1	1	7-1;16
Tape Guide, Fixed	112329-1	1	7-1;17
Sleeve	112319-1	1	7-1;2
Sprocket, LaVezzi A24B18F	716057-102	1	7-1;6
Tape Guide Assembly, RRX7000BA1	112411-1	1	7-1;13
Tape Guide Assembly, RRX7000BA2	112411-2	1	7-1;13
Tape Guide Assembly, RRX7000BA3	112411-3	1	7-1;13
Tape Guide Assembly, RRX7000BA4	112411-4	1	7-1;13
Tape Guide Assembly, RRX7000BA5	112411-5	1	7-1;13

① This connector is designated P2 on RRT7000 and P3 on RRK7000.

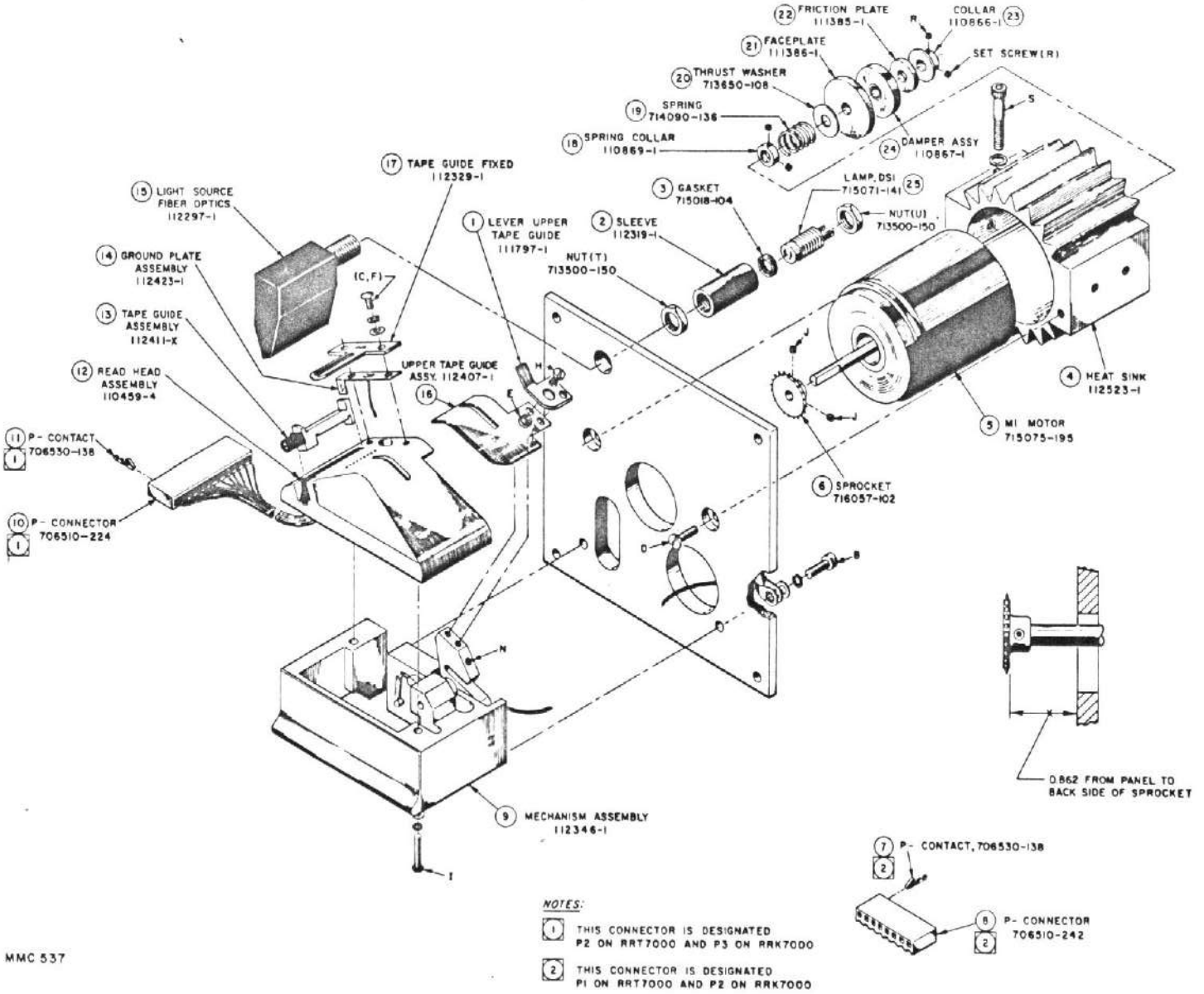


Figure 7-1. Exploded Drawing, Tape Drive and Readhead Mechanism Assemblies.

Table 7-3. Parts List, Reader Logic Card, 112381-1

Description and Manufacturer's Part No.	REMEX Part No.	Quantity	Reference Designation
Capacitor, 220 pf, 200V, Ceramic, Type CK05	702128-221	1	C1
Capacitor, 0.01 µf, 100V, Ceramic, Type CK06	702128-103	2	C2,C3
Capacitor, 1 µf, 100V, Metallized Mylar IMBXP7B105X	702181-105	1	C4
Capacitor, 0.0033 µf, 100V, Metallized Mylar IMBXP7B332X	702181-332	1	C5
Capacitor, 1.0 µf, 50V, Ceramic, Monolithic Sprague 71	702131-105	5	C6-C10
Capacitor, 10 µf, 25V, Polarized, Sprague Model 1960	702395-106	1	C11
Connector, Molex 09-60-1081, 8 pin, gray	706501-088	1	J2
Connector, Molex 09-60-1121, 12 pin, Red	706501-122	1	J3
Diode, 1N4003	704005-137	4	CR1-CR4
Diode, FD6666	704000-110	1	CR5
I.C. Package, R.C. Network Keldron KD-406	701950-001	1	Z1
I.C. Package, SN7486N	704600-109	4	Z2,Z3,Z8, Z11
I.C. Package, R.C.Network Beckman 1899-4104-0	701950-006	2	Z4,Z5
I.C. Package, SN7406N	704600-111	2	Z6,Z7
I.C. Package, Fairchild U7B960259X	704610-127	2	Z9,Z10
I.C. Package, SN7474N	704610-110	2	Z12,Z13
I.C. Package, SN7400N	704600-101	1	Z14
Resistor, 4.7K, 1/4W, ± 5%	701003-472	10	R1-R9,R18
Resistor, 120K, 1/4W, ± 5%	701003-124	1	R10
Resistor, 220Ω, 1/4W, ± 5%	701003-221	1	R11
Resistor, 1.5K, 1/4W, ± 5%	701003-152	1	R12
Resistor, 2.2K, 1/4W, ± 5%	701003-222	1	R13
Resistor, 47K, 1/4W, ± 5%	701003-473	2	R14,R15
Resistor, 6.8K, 1/4W, ± 5%	701003-682	1	R16
Resistor, 1K, 1/4W, ± 5%	701003-102	1	R17
Resistor, 470Ω, 1/4W, ± 5%	701003-471	4	R19-R22
Resistor, 0.5Ω, 3W, ± 5%	701015-R50	1	R23
Resistor, 22Ω, 1/4W, ± 5%	701003-220	1	R24
Terminal, Test Point, Lerco 5025-B-1	715013-121	4	TP1-TP4
Transistor, 2N5088	704203-119	9	Q1-Q9
Transistor, MJE1100	704204-115	4	Q10,Q13

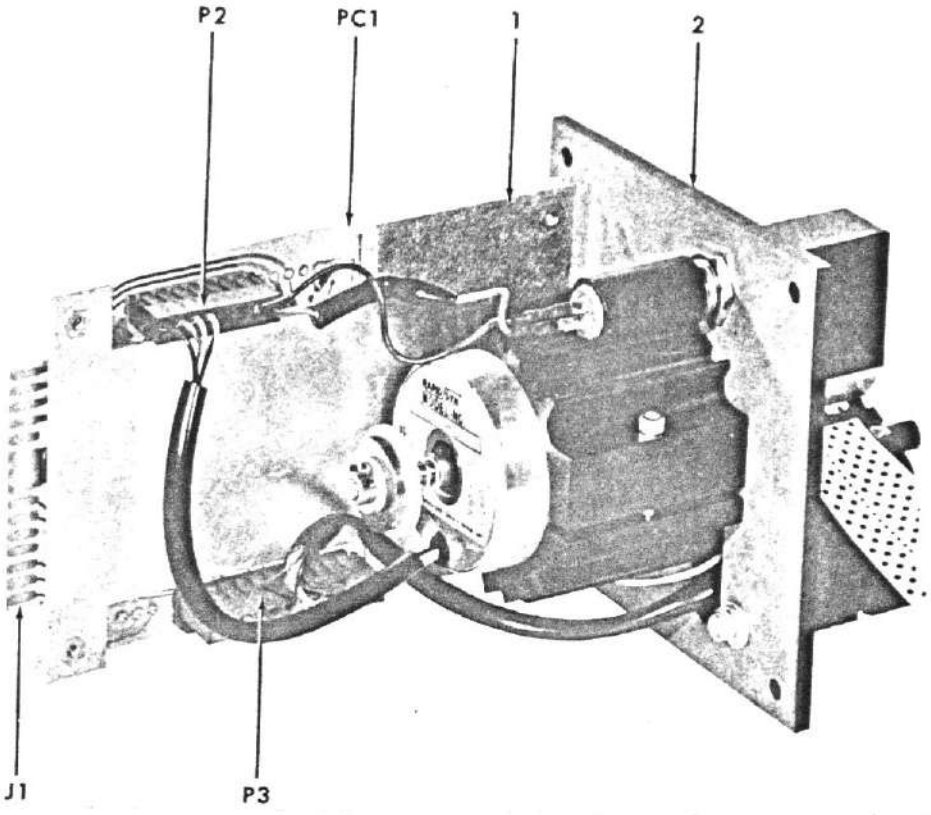


Figure 7-2. Rear View RRK 7000BAX.

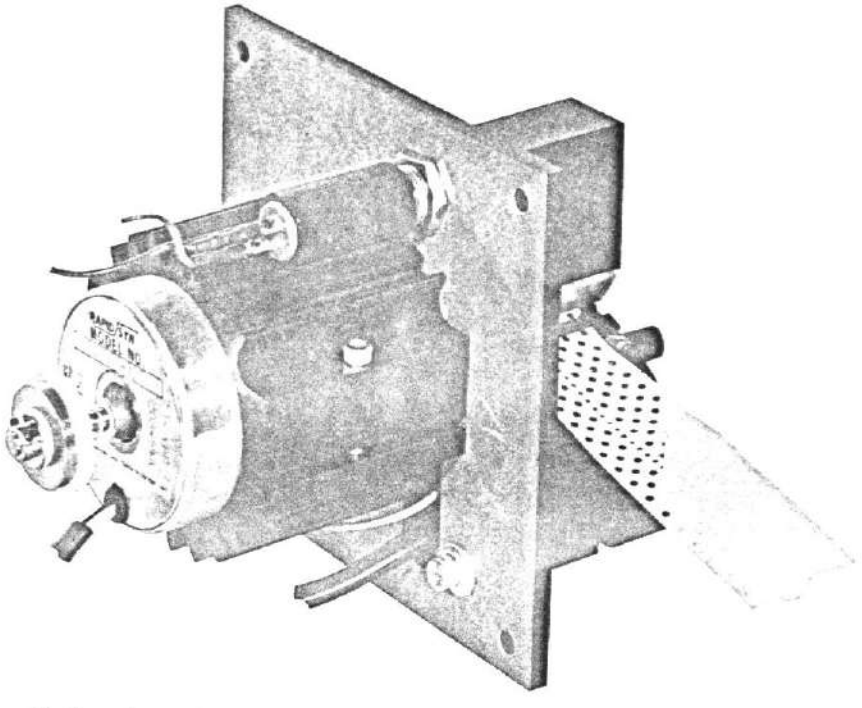


Figure 7-3. Rear View RRT7000BAX. See Figure 7-1 for exploded drawing and callouts of these components.

SECTION VIII

SCHEMATIC DRAWINGS

8.1 GENERAL

Figures 8-1 through 8-3 contain the schematic diagrams for models RRK 7000BAX and RRT 7000BAX.

REFER TO ADDENDUM SHEET

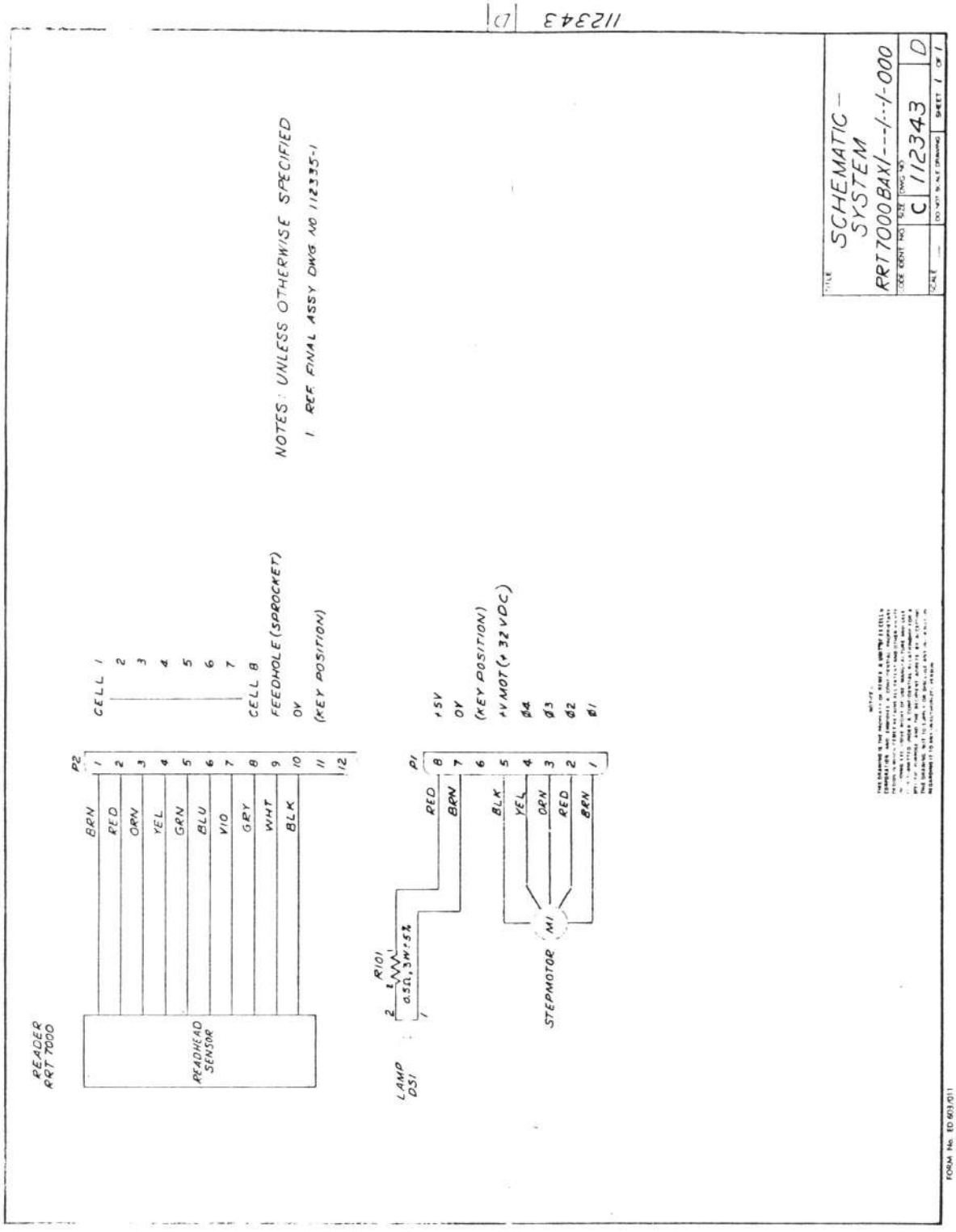


Figure 8-1. Schematic, RRT7000BAX.

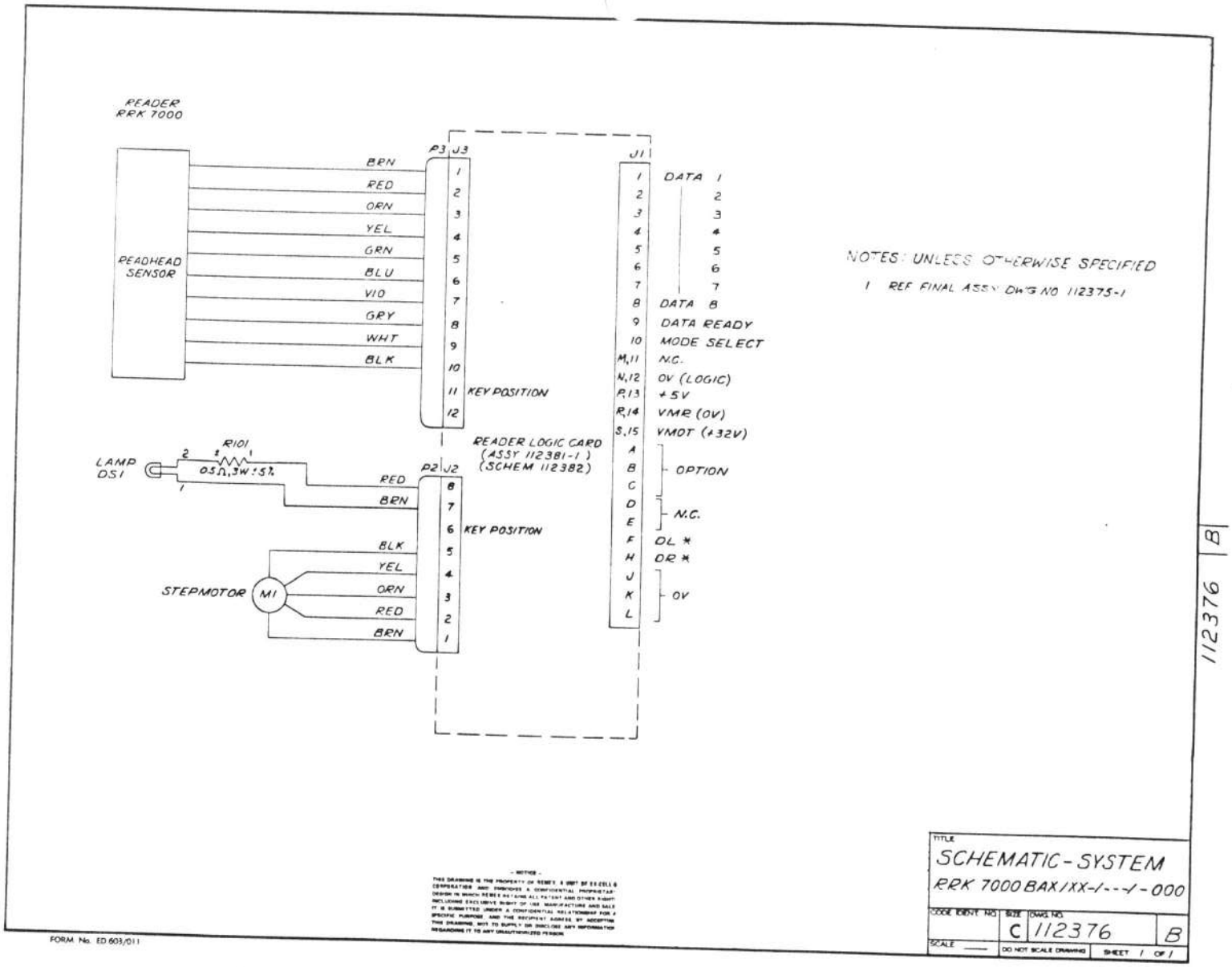


Figure 8-2. Schematic, RRK7000BAX.

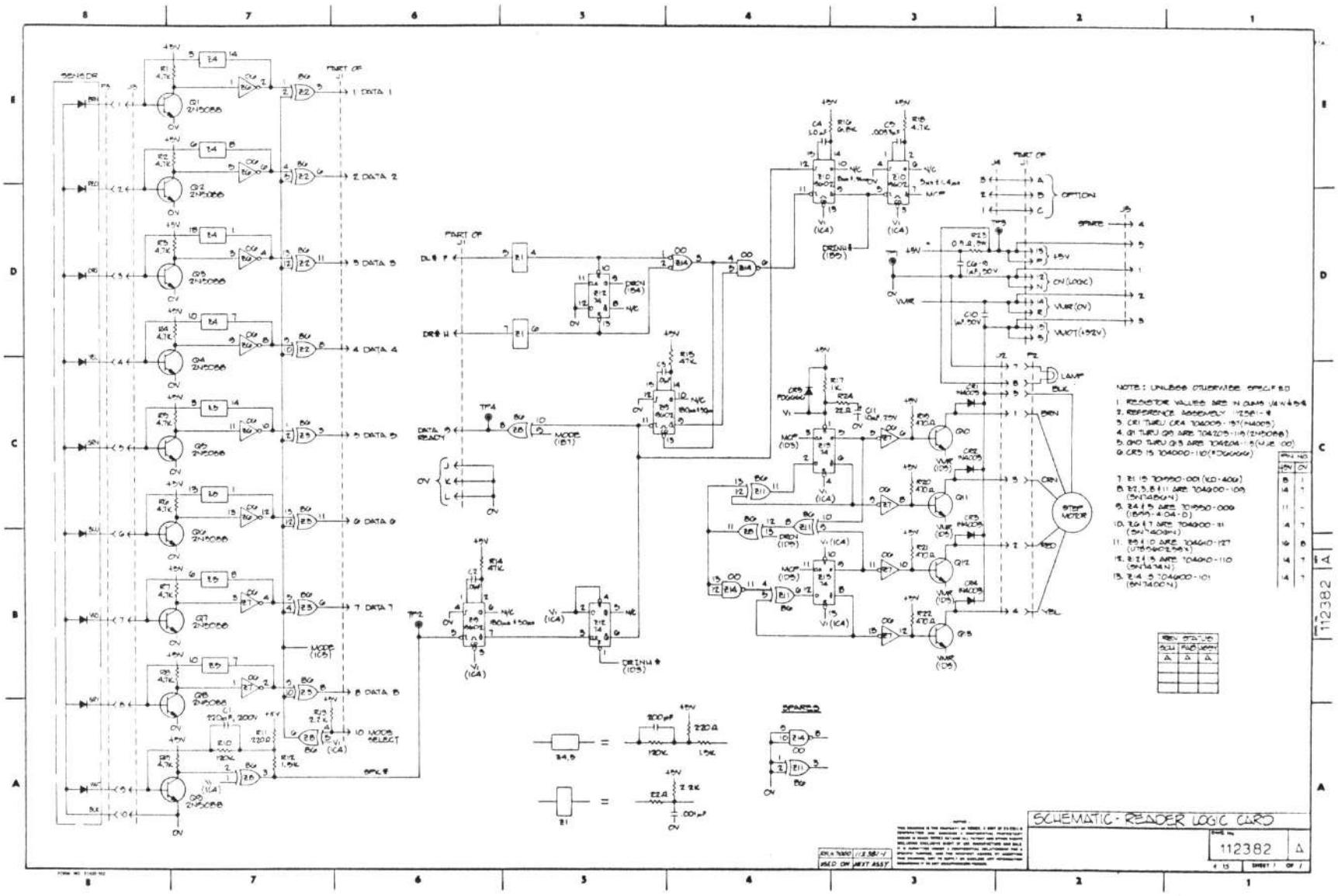


Figure 8-3. Schematic, Printed Circuit Card 112381.