

NAVSHIPS 93454

(Non-Registered)

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TECHNICAL MANUAL

for

REPERFORATOR

DISTRIBUTOR-TRANSMITTER

TT-268/UG

SYLVANIA ELECTRONIC SYSTEMS
A DIVISION OF
SYLVANIA ELECTRIC PRODUCTS INC.
BUFFALO 7, NEW YORK

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

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LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original	4-0 to 4-12	Original
ii to ix	Original	5-1 to 5-17	Original
1-0 to 1-4	Original	6-0 to 6-20	Original
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3-1 to 3-5	Original	i-1 to i-7	Original

TEMPORARY CORRECTION T-1 to TECHNICAL MANUAL FOR REPERFORATOR DISTRIBUTOR-
TRANSMITTER TT-268/UG NAVSHIPS 93454

This temporary correction revises the manual to reflect the equipment changes made by Field Change 1-TT-268/UG. The purpose of this field change is to increase the value of the spike-suppression resistor R-9016 from 1k ohm to 2k ohm. This field change applies to all TT-268/UG equipments.

When this change is included in the manual, the manual shall cover the equipment as though Field Change 1-TT-268/UG had been accomplished on the equipment. This correction does not supersede any other corrections or changes.

Maintenance Support Activities shall make this correction in the technical manual immediately but shall keep the superseded data intact for support of equipment that have not been modified.

Holders of equipment accompanied by technical manuals shall not make this correction in the manual until accomplishment of the field change.

Make the following pen-and-ink corrections. Insert this temporary correction in the technical manual immediately after the front cover and preceding the title page.

1. Figure 4-3, page 4-3, 4-4: Change rating of resistor (R-9016) from "1k ohm" to "2k ohm."
2. Page 4-5, paragraph 4-2b(3) line two, after "R-9016" add "2k ohm."
3. Figure 5-4, page 5-13, 5-14: Change rating of resistor (R-9016) from "1k ohm" to "2k ohm".
4. Figure 6-10, page 6-19, 6-20: Change rating of resistor (R-9016) from "1k ohm" to "2k ohm."
5. Page 7-7. In Description column, delete "Same as R-9001" and enter, "Resistor, comp, 1 watt, 2k ohm."

Record this action on Record of Correction Made page.

This Technical Manual correction material was originally published as part of Field Change 1-TT-268/UG which appeared in EIB 556, dated 13 March 1961.



DEPARTMENT OF THE NAVY

BUREAU OF SHIPS
WASHINGTON 25, D. C.IN REPLY REFER TO
Code 240N-100

From: Chief, Bureau of Ships
To: All Activities concerned with the Installation, Operation,
and Maintenance of the Subject Equipment
.
Subj: Technical Manual for Reperforator Distributor-Transmitter
TT-268/UG, NAVSHIPS 93454

1. This is the Technical Manual for the subject equipment and is in effect upon receipt.
2. When superseded by a later edition, this publication shall be destroyed.
3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.
4. Errors found in this publication (other than obvious typographical errors), which have not been corrected by means of Temporary Corrections or Permanent Changes should be reported. Such report should include the complete title of the publication and the publication number (short title); identify the page and line or figure and location of the error; and be forwarded to the Electronics Publications Section of the Bureau of Ships.
5. All Navy requests for NAVSHIPS electronics publications listed in the current issue of NAVSANDA Publication 2002 "Requisitioning Guide and Index of Forms and Publications", Cognizance Symbol I, or in a subsequent issue of the Electronics Information Bulletin should be directed to the appropriate Forms and Publications Supply Point.

R. K. JAMES
Chief of Bureau

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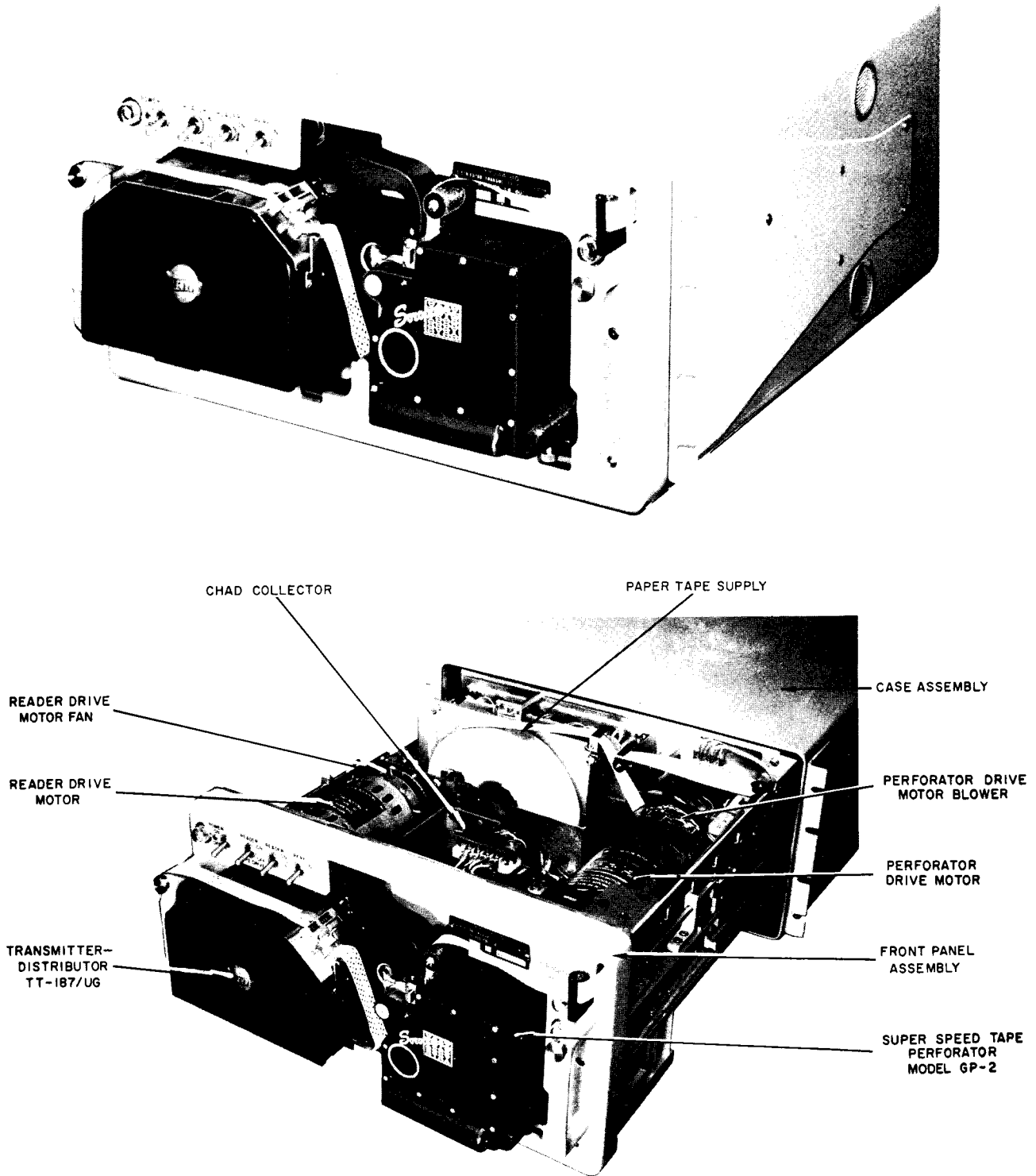


Figure 1-1. Reperforator Distributor-Transmitter TT-268/UG Relationship of Units

SECTION 1
GENERAL INFORMATION

1-1. EQUIPMENT ILLUSTRATIONS.

Figure 1-1 shows the relationships between the units which constitute Reperforator Distributor-Transmitter TT-268/UG (perforator-reader). Super-Speed Tape Perforator Model GP-2 (perforator) is mounted on the right side, inside the electrical equipment case (drawer), and Transmitter-Distributor TT-187/UG (reader) is mounted on the left side. The tape supply assembly in the rear of the electrical equipment case (drawer) consists of a tape holder assembly and of the tape guiding mechanism. The motor which drives the perforator is also used to drive a fan which supplies cooling air to the perforator. The chad from the perforated tape is forced by the perforator through a chute into the chad collector. A capacitor is mounted under the perforator motor, and an electric running time indicator (timer) is mounted near the perforator motor. Operating controls are mounted on the front panel. The drawer is designed to be mounted inside a standard equipment rack. Components of the perforator and the reader are shock-mounted on a frame which is provided with guide rollers. The reader operates within a standard teletypewriter 60 milliamperere series loop.

1-2. FUNCTIONAL DESCRIPTION.

The perforator-reader is used to receive high speed teletype information and to punch this information into paper tape at a very high speed. This taped information is converted at a lower speed into an electrical signal which is then applied to a standard teletype printer. The perforator-reader serves two basic purposes: It makes a permanent record of the incoming information, and it feeds this information to other components at a rate and in a form in which it can be further processed.

1-3. FACTORY OR FIELD CHANGES.

No changes have been made to the equipment.

1-4. QUICK REFERENCE DATA.

Principal functional characteristics of the perforator-reader are given in table 1-1.

TABLE 1-1. QUICK REFERENCE DATA

CHARACTERISTICS	PERFORATOR	READER
Input Power to Driving Motor	94.5 to 137.5 vac 1 phase 60 cps 2.5 amp	115 vac 1 phase 60 cps 2.0 amp
Punch Signal Characteristics	<u>Input</u>	<u>Output</u>
Kind of Signal	5-hole teletype code 5 codes in parallel	7.5 unit code
Pulse Amplitude	85 to 110 milliamperes, 400 volts maximum peak	

TABLE 1-1. QUICK REFERENCE DATA (continued)

CHARACTERISTICS	PERFORATOR	READER
Pulse Width	2.25 milliseconds*	60, 75 or 100 words per minute
Speed	2400 words per minute	
Circuit Impedance	150 to 300 millihenries, 250 ohms each code coil	
Feed Signal Characteristics		
Feed Signal	120 to 160 milliamperes, 400 volts maximum peak, dc or pulse 4.16 milliseconds wide	
Feed Coil	500 to 1000 millihenries, 240 ohms	
Feed Reset Signal	40 to 110 milliamperes, 400 volts maximum peak, dc or pulse 4.16 milliseconds wide	
Feed Reset Coil	50 to 100 millihenries, 130 ohms	
Synchronization Signal	Positive and negative pulses of min 2 volts peak, 1/4 millisecond wide, 1.9 millisecond spacing positive to negative, 2.25 millisecond spacing negative to positive, 400 ohms source impedance	
Driving Motor		
Type	Hysteresis synchronous	Induction
Horsepower	1/6	1/20
Speed	3600 rpm	3600 rpm
Lubrication	Lifetime	Grease
Lubrication		
Type	Splash bath	Oil and grease
Shortest Lubricating Interval	Weekly	Six months
Accuracy		
Tape Transport	± 0.005 inches in six inches of punched tape	Nominal 100%
Signal Handling	Nominal 100%	
* Approximate value		

1-5. EQUIPMENT LISTS.

a. EQUIPMENT SUPPLIED. - Equipment supplied is listed in table 1-2.

TABLE 1-2. EQUIPMENT SUPPLIED

QTY PER EQUIP.	NOMENCLATURE		OVERALL DIMENSIONS			*VOLUME	*WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Reperforator Distributor-Transmitter	TT-268/UG	8.62	18.94	24.15	2.29	60
2	Technical Manual for Reperforator Distributor-Transmitter	NAVSHIPS 93454					

*Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

b. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED. - Table 1-3 lists equipment used to test the performance of the perforator-reader, or to troubleshoot the electrical circuitry.

TABLE 1-3. PERFORATOR-READER EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QTY PER EQUIP.	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
1	Vacuum tube voltmeter	RCA WV-98A Senior VoltOhmyst	Resistance and voltage measurements	D-c input impedance of 11 megohms. Uses a 1.5-volt battery for resistance measurements.
1	Oscilloscope	Tektronix Model 535 or 545	Indicate shape of reader output pulse and perforator input and output pulses	
1	Technical Manual for Transmitter-Distributor TT-187/UG	NAVSHIPS 92733	Operating and maintenance instructions	Information on Transmitter-Distributor TT-187/UG
1	6-inch precision scale		Measure distance between punched tape holes	Scale graduated to 1/100ths of an inch

c. SHIPPING DATA. - Table 1-4 contains shipping data applicable to the perforator-reader.

TABLE 1-4. PERFORATOR-READER SHIPPING DATA

BOX NO.	NOMENCLATURE		OVERALL DIMENSIONS*			VOLUME*	WEIGHT*
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
21	Reperforator Distributor-Transmitter (Perforator and lubricant are shipped in separate container)	TT-268/UG	23.0	31.75	38.38	16.2	185
22	Perforator	GP-2	15.75	14.75	Drum	1.6	29

*Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

- d. EQUIPMENT SIMILARITIES. - Not applicable.
- e. ELECTRON TUBE COMPLEMENT. - Not applicable.

SECTION 2
INSTALLATION

2-1. UNPACKING AND HANDLING.

When unpacking Reperforator Distributor-Transmitter TT-268/UG (perforator-reader), avoid thrusting tools inside the shipping container. The perforator-reader is precision equipment, and must be handled with care. Open the shipping container in a space where dirt and dust will not come in contact with the equipment. The perforator-reader mechanisms are built to extremely close mechanical tolerances. It is important to keep these mechanisms free of dirt or dust which would cause excessive wear of parts.

CAUTION

Keep the perforator-reader in a fairly horizontal attitude with the top uppermost. The perforator is splash-bath lubricated. If the perforator is turned upside-down, the lubricant may seep out of the mechanism.

2-2. POWER REQUIREMENTS AND DISTRIBUTION.

Primary power requirements of the perforator-reader are 105 v, 115 v, or 125 vac ± 10 percent of the selected voltage at 5.5 amperes. Distribution of the primary power within the perforator-reader is shown in figure 5-2.

2-3. INSTALLATION LAYOUT.

The perforator-reader is designed for standard relay rack installation.

2-4. INSTALLATION REQUIREMENTS.

a. COMPONENT INSTALLATION. - Perform steps 1 through 13 to install perforator-reader.

Step 1. Open door on rear of relay rack.

Step 2. Firmly grasp perforator-reader by handles and gently position to correct location through front of relay rack while providing adequate support at rear of component.

Step 3. Insert eight screws through washers and then through angle support on side of perforator-reader. Tighten screws until angle support is flush with L-beam on inside of relay rack.

Step 4. Connect perforator-reader to associated components.

Step 5. Close door of relay rack.

Step 6. Release two handle locks and pull front panel and chassis assembly forward until drawer is open.

Step 7. Mount chad chute on the perforator with the two socket head screws and the one hex nut which protrudes above the top of the perforator.

CAUTION

Keep perforator in fairly horizontal attitude with top uppermost at all times. If the perforator is turned upside down, the lubricant may seep out of the mechanism.

Step 8. Slide the perforator partially into the motor mount in the electrical equipment case.

Step 9. Place the 51 tooth timing belt around the motor pulley and the small punch drive pulley.

Step 10. Push the perforator fully into the mount, thereby connecting the perforator mating connectors.

Step 11. Tighten the two captive screws on the under side of the motor mount.

Step 12. Ascertain that perforator-reader is properly secured and wired in its electrical equipment case.

Step 13. Close drawer.

b. OUTLINE DRAWING. - Figure 2-1 shows the outline dimensions and mounting details of the perforator-reader. The unit is shipped in two packages, one contains the equipment case, reader and punch chad chute; the other contains the GP-2 Super Speed Tape Perforator.

c. INTERCONNECTING DIAGRAMS. - Interconnecting wiring diagrams depend upon components used in conjunction with perforator-reader and therefore are not given.

2-5. INSPECTION AND ADJUSTMENT.

Inspect the drawer for loose mounting screws, bolts and nuts. Move all shock-mounted components to make sure they are free to move. Check that the two belts which drive the perforator are properly installed, and that the perforator and reader motors are free to turn. Examine the wiring inside the drawer for loose terminals and broken wires. Detailed adjustment procedures are given in paragraph 6-2 c (3).

CAUTION

Make sure equipment is properly lubricated before applying power to the driving motors. Follow procedures given in paragraph 3-6 d.

2-6. PREPARATION FOR RESHIPMENT.

a. REMOVAL PROCEDURES. - Perform steps 1 through 14 to remove the perforator-reader.

Step 1. Open door on rear of relay rack.

Step 2. Remove power plug from power source.

Step 3. Remove cable access plate from rear of electrical equipment case of perforator-reader.

Step 4. Disconnect all external wires and coaxial cable.

Step 5. Provide adequate support at rear of component. Remove screws and washers securing component to relay rack.

Step 6. Grasp component securely by handles and gently pull component from relay rack.

CAUTION

While lifting perforator-reader, keep it in a fairly horizontal attitude.

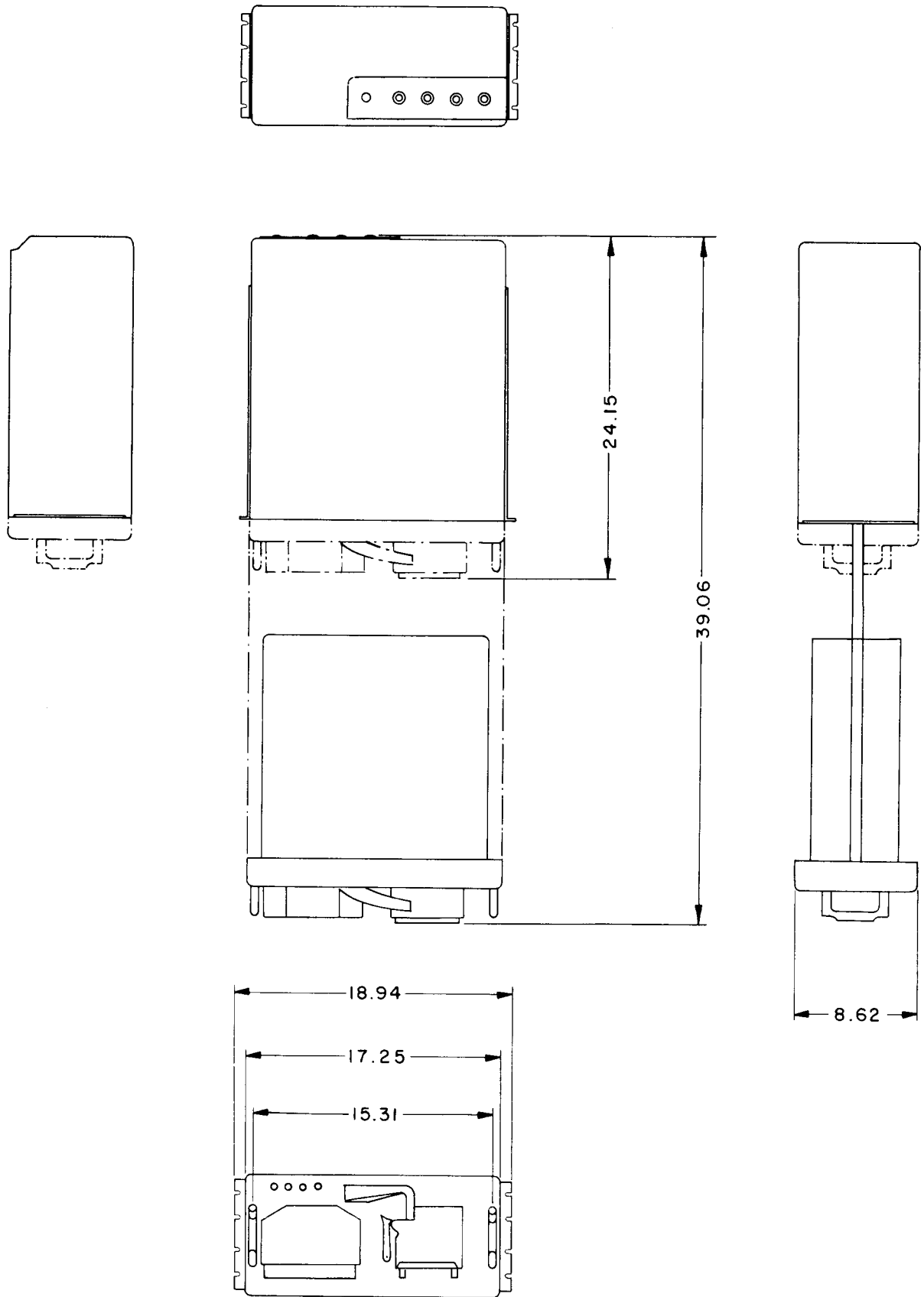


Figure 2-1. Perforator-Reader Outline Drawing

Step 7. Close door of relay rack and install cable access plate to perforator-reader.

Step 8. Loosen the two captive screws under the motor mount.

Step 9. Slide the perforator slightly away from the rear of the motor mount thus disconnecting the mating connectors.

Step 10. Remove the 51 tooth drive belt from motor pulley and perforator drive pulley.

Step 11. Slide the perforator completely out of motor mount.

Step 12. Remove the socket head screws and hex nut holding the chad chute to the perforator.

Step 13. Remove chad chute from the perforator.

Step 14. Replace socket head screws and captive nut on the perforator.

b. PACKAGING PROCEDURE. - The perforator-reader must be packaged and packed in accordance with specific requirements depending upon assigned destination (domestic, immediate use, storage or overseas shipment) and box containing technical manual(s) identified.

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

a. GENERAL. - Reperforator Distributor-Transmitter TT-268/UG (perforator-reader) consists of the Super-Speed Tape Perforator Model GP-2 (perforator), the Transmitter-Distributor TT-187/UG (reader) and the components mounted in the electrical equipment case (drawer). Information in the form of electrical signals is applied to the perforator, which then punches holes at high speed in paper tape. The holes represent a five-unit Baudot code. The punched tape may be stored, or may be fed through the reader. The reader converts the punched code into electrical signals, and transmits these signals to other circuits in the external system. Some of the other components of the perforator-reader are the tape supply assembly which stores a reel of tape, the running-time indicator, two driving motors, an air blower, a chad collector, the perforator input circuit, the front panel with control switches, and connectors and terminal boards.

b. PERFORATOR. - The perforator generates a timing signal, it punches the tape, and it advances the tape between punching operations. The timing signal consists of positive-going and negative-going pulses, each having a minimum amplitude of about two volts and a width of about 0.25 milliseconds. These pulses are generated in a magnetic pickup by a rotating disc mounted on the feed drive shaft. The timing signal pulses are fed to circuits outside the perforator-reader, and are used to initiate a data read-out signal and a tape-advance signal. The negative-going pulse from the perforator initiates the data read-out signal, and the information stored in the external circuits energizes the appropriate punch and punch reset magnets in the perforator. The energized punch magnets pull interposers between the punch pins and the punch bail. The energized punch reset magnets pull the interposers away from the punch pins. As the punch bail moves up, the interposers actuated by the punch magnets are pushed against the punch pins, and the pins are pushed through the tape. The punch pins are then mechanically pulled out of the tape by the punch bail. Chad from the punched tape is pushed into the chad collector. As the punching cycle is completed, the positive-going timing pulse from the perforator initiates a tape-advance signal and the code release signal in the external circuit. The tape advance signal is applied to the feed magnet in the perforator tape feed assembly. The feed magnet causes the feed pawl to engage the internal teeth of the tape feed sprocket. The tape feed sprocket advances the tape one space, at which time the tape feed pawl is withdrawn from inside the sprocket by the action of the feed armature reset cam. Most of the heat generated in the perforator mechanism is absorbed by the lubricating oil which is circulated by a pump on the feed drive shaft. The oil is cooled by air forced through the cooling fins at the bottom of the perforator. The air is circulated by a blower mounted on the rear of the perforator drive motor. In the event the tape supply is exhausted, or a tape jam occurs at the tape supply, the perforator will stop feeding tape.

c. READER. - The reader operates within a standard teletypewriter 60 milliamperere series loop. For additional information, refer to NAVSHIPS 92733.

3-2. PREPARATION FOR USE.

Before use of the perforator or the reader, tape must be threaded through the units, and the level of the lubricating oil in the perforator must be checked. Procedures are given in paragraph number 3-3, b.

3-3. OPERATING PROCEDURES.

a. DESCRIPTION OF CONTROLS. - Operating controls are located on the front panel (figure 3-1). Control designations and functions are as follows:

(1) POWER SWITCH. - The 117-volt a-c power is applied to the perforator-reader through two fuses and a double-pole, single-throw toggle switch marked POWER. When this switch is in the ON position, the neon indicator lamp next to the switch on the front panel will light.

(2) **READER TAPE DRIVE SWITCH.** - A circuit in the perforator-reader is closed or opened by the **READER TAPE DRIVE** toggle switch. This circuit controls the tape drive clutch in the tape reader.

(3) **READER SWITCH.** - The double-pole, single-throw toggle switch marked **READER** is used to apply power to the reader drive motor.

(4) **PERF SWITCH.** - Power to the time meter and the drive motor of the perforator is applied through the double-pole, single-throw toggle switch marked **PERF**.

(5) **OVERLOAD INDICATOR.** - An overload condition on the perforator signal input circuits is indicated by a neon indicator lamp. This indicator is located on the right side of the front panel.

(6) **TAPE OUT INDICATOR.** - If all the tape in the tape supply assembly has been used, the **TAPE OUT** neon indicator on the right of the front panel will light. This indicator will also light if the tape breaks between the perforator and the tape supply assembly.

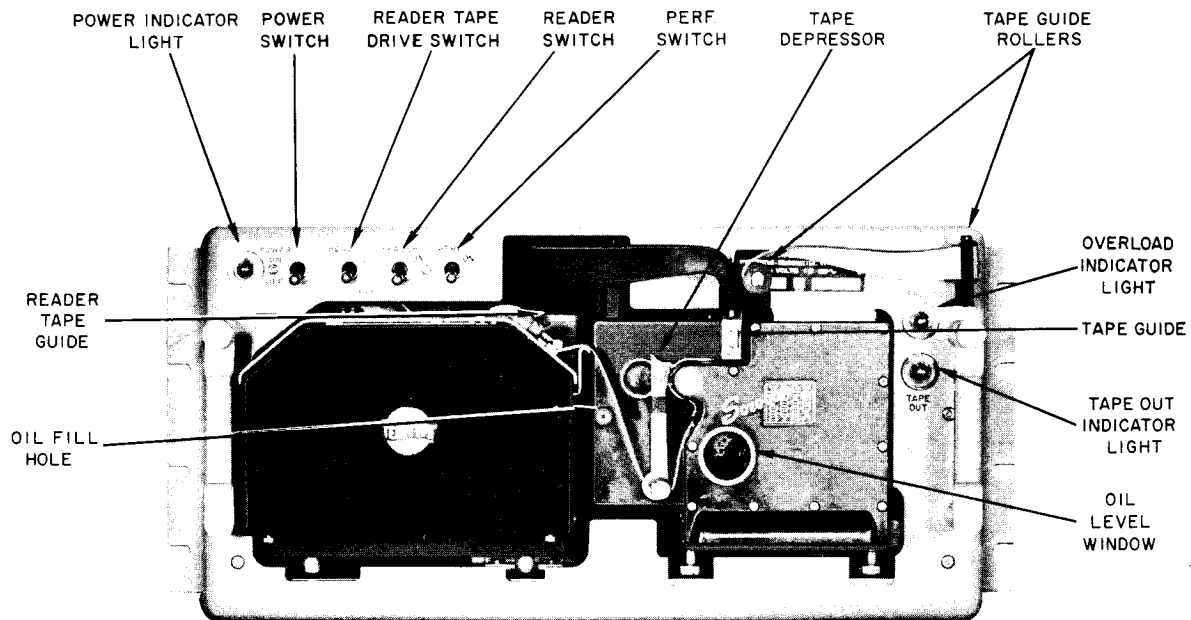


Figure 3-1. Perforator-Reader, Location of Controls and Indicators on Front Panel

b. SEQUENCE OF OPERATION.

(1) **BEFORE USE.** - Check that the oil level in the perforator is up to the line on the oil level sight; if it is not, add oil (refer to paragraph 3-6, d). Release locks on drawer handles and pull perforator-reader out of the drawer to the stop limits. Remove the chad collector (figure 1-1) and empty all chad; replace chad collector. Place a supply of tape in the tape supply assembly. Thread the tape as shown in figure 3-2. Grasp front panel handles and push perforator-reader back into drawer. Pull the small tab on the perforator tape guide slightly away from the chad chute so that the paper tape can enter the tape guide. The perforator feed hole punch pin may have stopped in a position which would prevent the tape from entering the space between the die plate and the punch pin guide block. In this event, place **POWER** switch to **OFF**. Rotate the motor pulley manually until the center of the routed-out portion of the timing disc is toward the perforator motor, 90 degrees from vertical. Thread the paper tape under the die plate, and push the tape guide tab toward the chad chute. Pull the tape depressor away from the sprocket, and pull the paper tape over the sprocket. To make sprocket holes in new paper tape, push the tape against the sprocket pins until the pins are forced through the tape. Lower tape depressor over the paper tape. Run approximately 12 inches of tape through the perforator, punching only

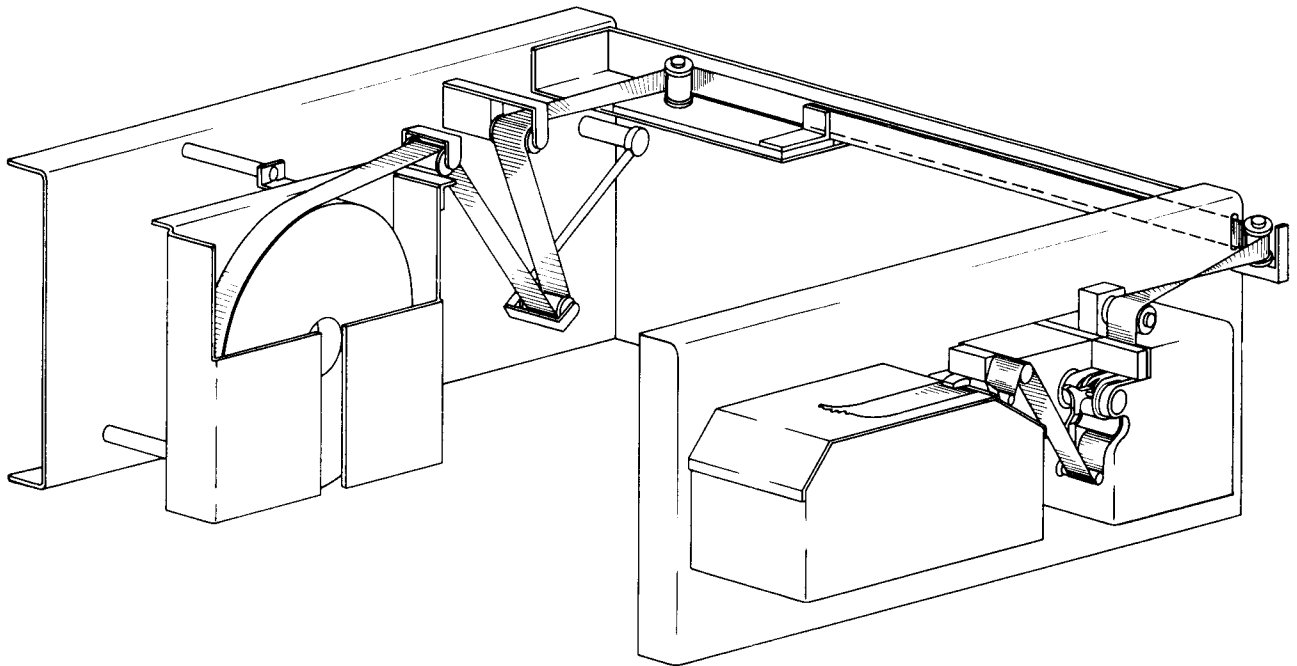


Figure 3-2. Perforator-Reader, Tape Loading

feed holes. Check that the feed holes are punched properly and are the proper distance from the tape edge. If they wander on the tape, check tape guide tab to be assured it is positioned properly.

(2) DURING USE. - Place PERF switch (figure 3-1) to ON, if the perforator is to be used. If the reader is to be used with the perforator, place READER switch and READER TAPE DRIVE switch to ON positions. (If the reader is to be used without the perforator, place PERF switch to OFF position.) Place POWER switch to ON; panel power indicator lamp should light, and the perforator and reader motors should start (if both are used), and should run continuously. Punching of paper tape, and reading from the tape, are automatic. Both of these operations are started and stopped by incoming signals.

(3) SECURE. - Place all four toggle switches on the front panel to OFF position. Remove chad from chad collector.

c. TUNING ADJUSTMENTS. - Not applicable.

d. PRECAUTIONS. - Make sure the perforator and the reader are properly lubricated. When the perforator and reader are both in use, allow slack in the tape between the two units.

3-4. SUMMARY OF OPERATING PROCEDURES.

a. Thread tape through perforator or reader, or both.

b. Empty chad collector.

c. Place four toggle switches on front panel to ON.

d. To secure, place four toggle switches to OFF.

3-5. EMERGENCY OPERATION.

a. TIGHT TAPE. - A restraining force on the tape at the tape supply will cause a tight-tape switch to be actuated. This switch stops the perforator from feeding tape. Thus if the perforator does stop feeding tape, the tape supply should be checked for obstruction or other restrictions which could interfere with tape feed. If a tight or jammed tape condition exists it can usually be corrected by operating personnel.

NOTE

It is possible that the pressure which actuated the tight-tape switch also produced enough reverse torque on the tape-feed sprocket to bring about mechanical misalignment of the tape feeding mechanism in the perforator. If the reason for tape feed failure was due to tight or jammed tape and the situation has been corrected, but the perforator still does not feed tape, it may be necessary to manually move the tape-feed sprocket two or three hole spaces.

b. JAMMED PUNCH GUIDE BLOCK. - Figure 3-3 illustrates a tape scraper which should be used in event the punch guide block becomes jammed with a piece of paper tape. The tape scraper is mounted on the chad collector.

CAUTION

Do not use the tape scraper while the perforator is running as this will damage the punching mechanism.



Figure 3-3. Tape Scraper

c. If the perforator-reader fails in any other way to operate properly, the only other emergency operating procedure that can be accomplished is to substitute the malfunctioning perforator-reader with a perforator-reader known to be operating properly.

3-6. OPERATOR'S MAINTENANCE.

a. OPERATING CHECKS AND ADJUSTMENTS.

(1) PERFORATOR. - The operator can check the performance of some parts of the perforator. However, because of the extremely close tolerances to which the perforator has been machined and assembled, the operator should not make any adjustments and should not replace any parts in the perforator itself. Two belts are used to drive the perforator; if these should break, a timing adjustment should be made by maintenance (not operating) personnel when new belts are installed. The accuracy of the feed may be checked by operating personnel by using a precision scale and measuring the distance between 60 consecutive sprocket (not data) holes; this distance should be 6 ± 0.005 inches.

(2) READER. - For information about reader, refer to NAVSHIPS 92733.

(3) DRAWER. - Components in the electrical equipment case (drawer) require no routine checks and no adjustments other than those given in paragraph 3-3 and in paragraph 6-2 c.

b. ROUTINE CHECK CHARTS. - The routine preventive maintenance procedures which are to be performed by the operator are given in paragraph 6-1 b (1).

c. EMERGENCY MAINTENANCE. - Emergency maintenance is performed by the operator only in the event defective equipment must be repaired when maintenance personnel is not available. The emergency maintenance which can be performed consists of replacement of line fuses. The two fuses in the 117-volt power line are located inside the drawer between the reader and perforator motors. To replace the fuses, place POWER switch (figure 3-1) to OFF. Release locks on drawer handles and pull perforator-reader out of the drawer to the stop limits. Take out blown fuses and insert new ones. Place POWER switch to ON. Place PERF switch to ON. Check fuses; if they blow, there is a short circuit in the timer or perforator motor circuit, or the motor is overloaded. If possible, correct the short circuit or remove the overload; if not, equipment must be repaired by maintenance personnel. If fuses do not blow, place READER switch to ON. Check fuses; if they blow, there is a short circuit in the reader motor circuit, or the reader motor is overloaded. If possible, correct the short circuit or the overload; if not, equipment must be repaired by maintenance personnel. If fuses do not blow, place READER TAPE DRIVE switch to ON. Check fuses; if they blow, there is a short circuit in the tape reader tape drive clutch circuit. If possible, correct the short circuit; if not, repairs must be made by maintenance personnel.

d. LUBRICATION.

(1) PERFORATOR. - The perforator drive motor has sealed bearings which need no periodic lubrication. The perforator mechanism is splash-bath lubricated. Correct oil level in the perforator is indicated by lines on the transparent cover of the oil level indicator. When the oil level drops below the lower line while the perforator motor is not running, add oil through the oil fill hole (figure 3-1). Remove the screw from the oil fill hole, fill an eye dropper or small oil can with Lubriplate #1 oil or equivalent, and force oil through oil fill hole until oil reaches correct level. Close oil fill hole with the oil fill hole screw.

(2) DRAWER. - Components of the drawer which need occasional lubrication are those which are part of the slide mechanism. Use a good grade of lubricating grease, and apply sparingly.

(3) READER. - For information on reader refer to NAVSHIPS 92733.

SECTION 4

PRINCIPLES OF OPERATION

4-1. OVERALL FUNCTIONAL DESCRIPTION.

Reperforator Distributor-Transmitter TT-268/UG (perforator-reader) consists of a Super-Speed Tape Perforator Model GP-2 (perforator), a Transmitter-Distributor TT-187/UG (reader), and other components mounted in the electrical equipment case (drawer). Information in the form of electrical signals is applied to the perforator (see figure 4-1), which then punches holes at high speed in paper tape. The holes represent a five-unit Baudot code. The punched tape may be stored, or may be fed through the reader. The reader converts the code in the paper tape into electrical signals, and transmits these signals to other circuits in an external system. Some of the other components of the perforator-reader are the tape supply assembly which stores a reel of tape, the running-time indicator, two driving motors, an air blower, a chad collector, the front panel with control switches, connectors, terminal boards, resistors, and silicon diodes. The perforator generates a timing signal, it punches the tape, and it advances the tape between punching operations. The timing signal consists of positive-going and negative-going pulses, each having an amplitude of minimum two volts and a width of approximately 0.25 milliseconds. These pulses are generated in a magnetic pickup by a rotating disc mounted on the feed drive shaft. The timing signal pulses are fed to a punch control where they control the punch, punch reset, feed, and feed reset outputs. The negative-going pulses indicate when the perforator is ready to punch, and any information stored in the punch control will energize the appropriate punch magnets. At the same time the associated punch reset magnet will be de-energized. The energized punch magnets pull interposers between the punch pins and the punch bail. As the punch bail moves up, the interposers actuated by the energized punch magnets are pushed against the punch pins and the pins are pushed through the tape. The punch pins are then mechanically pulled out of the tape by the punch bail. At the end of the punch cycle, the punch

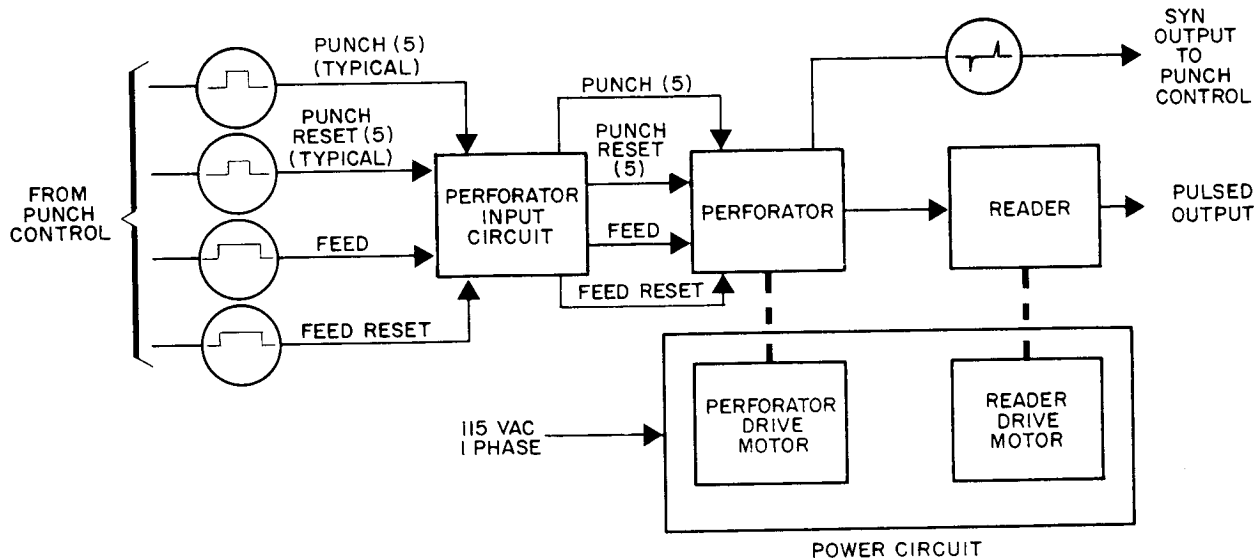


Figure 4-1. Perforator-Reader, Block Diagram

magnets previously energized will now be de-energized, and the associated punch reset magnets will be energized. The energized punch reset magnets will pull the interposers away from the punch pins. Chad from the punched tape is pushed through the chad chute into the chad collector. The positive-going timing pulse from the perforator indicates that the perforator is ready to accept the feed signal output of the punch control. The feed signal is applied to the feed magnet in the perforator feed assembly. The feed magnet causes the feed pawl to engage the internal teeth of the tape feed sprocket. The tape feed sprocket advances the tape one space, at which time the tape feed pawl is withdrawn from inside the sprocket by the action of the feed armature reset cam. Resistors and diodes in the perforator input circuits are supplied so as to minimize the loading on the output circuit of the punch control. Most of the heat generated in the perforator is absorbed by the lubricating oil that is circulated by a pump on the feed drive shaft. The oil is cooled by air forced through the cooling fins at the bottom of the perforator. The air is circulated by a blower mounted on the rear of the perforator drive motor.

For information regarding the operation of the reader, refer to NAVSHIPS 92733.

4-2. FUNCTIONAL SECTIONS.

The perforator-reader consists of four functional sections as follows: power circuit, perforator input circuit, perforator, and reader.

a. POWER CIRCUIT. - Alternating current at 115 volts is applied to the perforator drive motor, the running-time indicator, and the reader drive motor through the power circuit (figure 4-2). Filter circuit FL9001 prevents feedback into the power line of interference created by the drive motors. Two fuses, F9001 and F9002, are in series in each of the two power lines. POWER switch S9001 completes the circuit between the fuses and the other power switches in the perforator-reader. An indicator lamp, DS9001, located next to the POWER switch, lights up when switch S9001 is in the ON position. Switch S9004, PERF, is used to apply power to the perforator drive motor B9002 and to the running time indicator B9001.

The running time indicator shows the accumulated time, in hours and tenths of hours, during which the perforator motor has been running. This time is not equal to the perforating time since tape is advanced through the perforator only in response to an external tape feed command (refer to paragraph 4-2 c). Capacitor C9001 in the perforator drive motor circuit is used to correct the motor circuit power factor. While tape is correctly threaded through the perforator, the tape keeps the normally-closed switch S9006 in the open position. If the tape supply is used up, this switch will close, and the TAPE OUT indicator DS9003 will light. Power to the reader drive motor B9003 is applied through READER switch S9003. The reader motor will operate but tape will not feed through the reader until READER TAPE DRIVE switch S9002 is placed in the ON position. The reader tape clutch circuit will be opened by either of two switches (in series with the reader tape clutch solenoid) if no tape is threaded through the reader or if the tape is too tight.

b. PERFORATOR INPUT CIRCUIT. - A complete schematic diagram of the input circuit is shown in figure 4-3. The input circuit serves to suppress sudden loading of the output circuits in the punch control, to dissipate surges through the perforator magnet coils, and to indicate an overload condition caused by a shorted or grounded magnet coil.

(1) Each of the punch and punch reset magnet input circuits in figure 4-3 is similar (except for resistor and silicon diode designations) for all five code channels. Resistor R9023 in channel 1 and comparable resistors in other channels prevent overloading of the output circuit of the punch control. The input to the perforator punch magnets is a minimum 85 milliamperere current pulse of 2.2 ± 0.11 milliseconds duration. Oscillations generated in the magnet coil and the distributed capacitance are suppressed by silicon diode CR9001 and resistor R9001 of channel 1 and comparable resistors and diodes in the other channels. The input to the punch reset magnets is an identical square waveform. Suppression of oscillations is through silicon diode CR9002 and resistor R9002 in channel 1 and comparable resistors and diodes in the other channels.

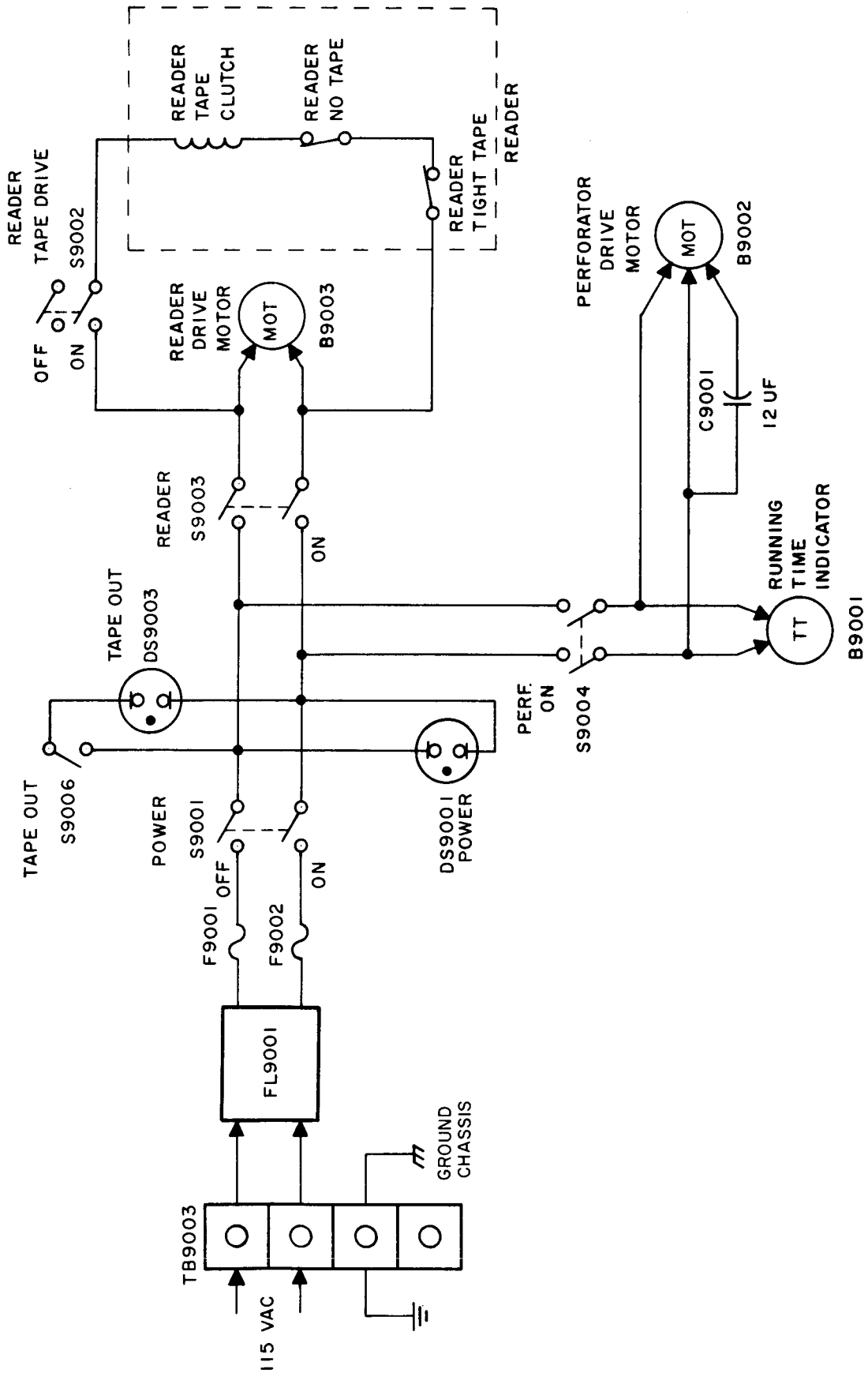


Figure 4-2. Power Circuit, Simplified Schematic Diagram

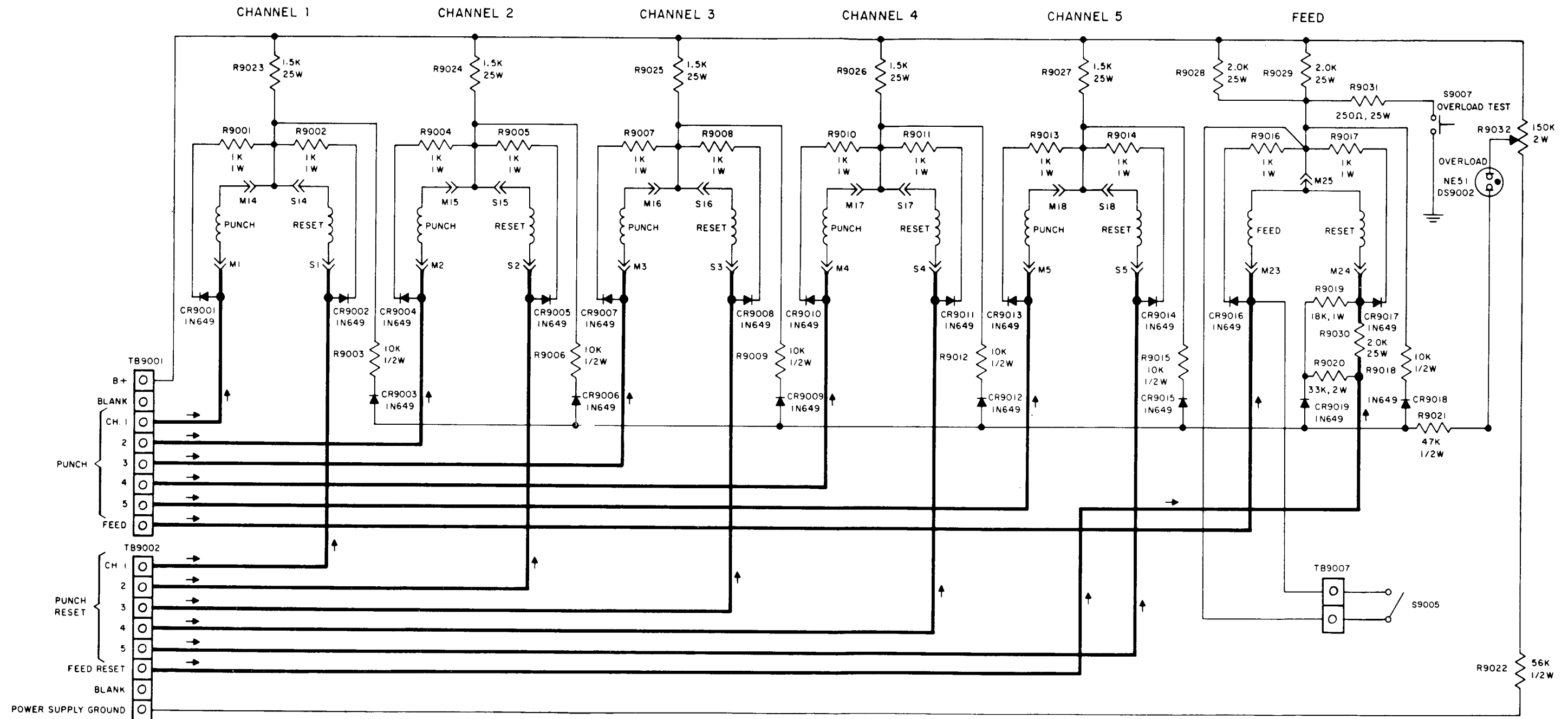


Figure 4-3. Perforator Input Circuit, Simplified Schematic Diagram

(2) A short circuit across the magnet coils, or the grounding of the coil, would overload the punch control output circuit. This overload would be indicated by the OVERLOAD indicator lamp (see figure 4-3) on the perforator front panel. The indicator lamp will light if the voltage at the junction of resistors R9003 and R9023 in channel 1 and comparable resistors in the other channels rises above a predetermined value. The voltage drop across the indicator lamp can be adjusted by variable resistor R9032. Silicon diode CR9003 in channel 1 and comparable diodes in other channels isolate the magnet coil circuits from the overload circuit.

(3) The suppressor circuit for the perforator feed magnet consists of silicon diode CR9016 and resistor R9016*. The input signal is a minimum 120-milliampere current pulse of 4.16 ± 0.208 milliseconds duration. The feed reset input signal is a minimum 40 milliampere current pulse of 4.16 ± 0.208 millisecond duration. Because of this lower current, the feed reset input circuit contains resistors R9019, R9020, and R9030 connected so as to produce the proper voltage drop across the overload indicator lamp in case of a short circuit or ground in the feed reset coil.

(4) The paper tape is threaded so that it rides against the actuator of the normally open switch S9005. In case the tape exerts tension against this actuator, or the tape supply is exhausted, the switch S9005 will close and short out the feed magnet. This will cause the perforator to stop feeding.

(5) Variable resistor R9032 must be set so that the voltage across OVERLOAD indicator lamp DS9002 will be sufficient to light the lamp when an overload condition exists. An overload condition is simulated by closing the overload test switch S9007. The variable resistor R9032 is then adjusted so that DS9002 does not glow when the perforator-reader is operating properly.

c. PERFORATOR. - The perforator (see figure 4-4) consists of three major functional assemblies. These are the tape feed assembly, the tape punching mechanism, and the timing unit.

(1) TAPE FEED ASSEMBLY. - The tape feed assembly (figure 4-5) advances the paper tape at the proper time. The tape is advanced after one row of code holes has been punched, at the end of the message, or at the operator's discretion. The tape is pulled forward by the pins of the sprocket end of the sprocket and ratchet. The sprocket pins engage the tape through the feed holes which are punched continuously in the paper tape by the tape punch assembly. Refer to paragraph 4-2 c (2). When the perforator is operating, the perforator drive motor is running continuously. Power from the drive motor to the feed cam shaft (figure 4-5) is transmitted through the drive motor gear, two drive belts, and the feed drive gear. The drive belts are made of rubber-impregnated canvas. Internal teeth in the drive belts engage the teeth of the gears. Proper timing relationship between the tape feed cycle and the tape punch cycle is maintained by the drive belt internal teeth.

The feed cam shaft, feed cam, and feed armature reset cam are machined from a single piece of steel. The feed cam is a constant-diameter triangular cam ground to a tolerance of ± 0.0002 inches. During the rotation of the feed cam, the cam touches both sides of the U-shaped feed cam follower. The rotation of the feed cam creates a stationary interval at each end of reciprocating clockwise and counterclockwise rocking motions by the feed cam follower about the longitudinal axis of the sprocket shaft. A slot is cut in a boss of the feed cam follower. The rocking motion of the feed cam follower is transmitted to the feed pawl which slides up and down in the boss and also pivots about the free end of the feed armature.

The feed armature pivots about the fixed feed armature shaft. When the feed signal is received from the external circuit, the feed magnet is energized and the feed armature moves toward the feed magnet. The feed pawl is raised by the feed armature so that the end of the feed pawl is inserted between two internal teeth of the sprocket and ratchet during the position of rotation of the feed cam at which the cam-follower is stationary before beginning its counterclockwise rocking motion, as shown in figure 4-5. Further rotation of the feed cam now rocks the feed cam-follower counterclockwise thus pivoting the pawl and turning the sprocket and ratchet. The pins in the sprocket end of the sprocket and ratchet engage the feed holes punched

in the paper tape and pull the tape forward a distance of 0.100 inch. As the feed cam continues to rotate, the second stationary period of the feed cam-follower is reached. During this stationary period, the feed pawl is positively disengaged from the teeth in the sprocket by the action of the feed armature reset cam against the feed armature.

Also at the end of the counterclockwise stroke of the feed cam-follower, the sprocket and ratchet assembly is positively detented by the detent assembly. A torsion spring in the detent assembly forces the detent roller into scalloped external teeth on the ratchet end of the sprocket and ratchet. The feed armature reset cam serves as a positive means for disengaging the pawl from the teeth of the sprocket at the end of the feed cycle while also precluding the possibility of engaging the pawl in the teeth of the sprocket by misapplication of current to the feed magnet while the feed cam-follower is in motion. The feed reset magnet is used to hold the feed armature away from the feed armature reset cam (at the same time holding the pawl away from the teeth in the sprocket) when the perforator is not feeding tape. This effectively reduces undue wear on the feed armature and reset cam.

(2) TAPE PUNCHING MECHANISM. - The tape punching mechanism perforates, in one row across the width of the tape, one feed hole and up to five information holes. The punched holes are on 0.100 inch centers across, as well as along the length of the tape. The diameter of the feed holes is 0.0465 inches, and that of the information holes is 0.070 inches. One row of holes consists of three information holes, the feed hole, and two other information holes. The information holes represent letters and numbers in the Baudot code. The operation of the punching mechanism is illustrated in figures 4-6 and 4-7.

Power from the perforator drive motor to the punch cam is applied through the drive motor gear, a toothed punch drive belt, a punch drive gear, and the punch cam shaft. The constant-diameter cam is precision ground on the punch cam shaft and is in constant contact with both sides of the U-shaped punch cam follower. During operation of the perforator, the punch cam rotates continuously, whether or not information is punched into the paper tape.

The punch cam follower is attached to the cam follower support by the two punch cam follower anchor links. The rotation of the punch cam causes the punch cam follower to move from one side of the anchor link pivot points to the other. In this motion the ends of the anchor links describe arcs about the fixed pivot points, and thus cause the punch cam follower to move up and down. A punch drive link is pivoted at the top of the punch cam follower and the bottom of a punch bail, and transmits vertical motion from the follower to the bail. The punch bail moves about the punch bail pivot point.

If a punch signal is received from the external equipment, the punch magnet pulls the interposer armature toward the punch pins about the interposer armature pivot point. At this time the punch bail is stationary at the bottom of its stroke. The selected interposer armature pushes the interposer between the punch bail and the punch pins (see figure 4-7). The upward motion of the punch bail is transmitted through the selected interposers to the punch pins. The punch pins are then vertically moved up in the punch pin guide block, through the paper tape, and part way into the die plate mounted under the chad chute. The total punch pin travel is approximately 0.032 inches. The small disk of paper (the chad) punched out of the paper tape is pushed by the punch pin into the chad chute which guides the chad into the chad collector mounted inside the drawer.

The punch pins are then pulled out of the paper tape and into the punch pin guide block by the downward motion of the punch cam follower and the punch bail. A punch pin stop prevents the punch pin from interfering with the motion of the interposer.

The punch pin which punches the feed hole is fixed to the punch bail and is driven into the die block every punch bail cycle. An interposer, punch magnet, and punch reset magnet are therefore not used with the feed hole punch pin. During the time when no information is received by the perforator, the feed punch pin may pass many times through a previously perforated feed hole.

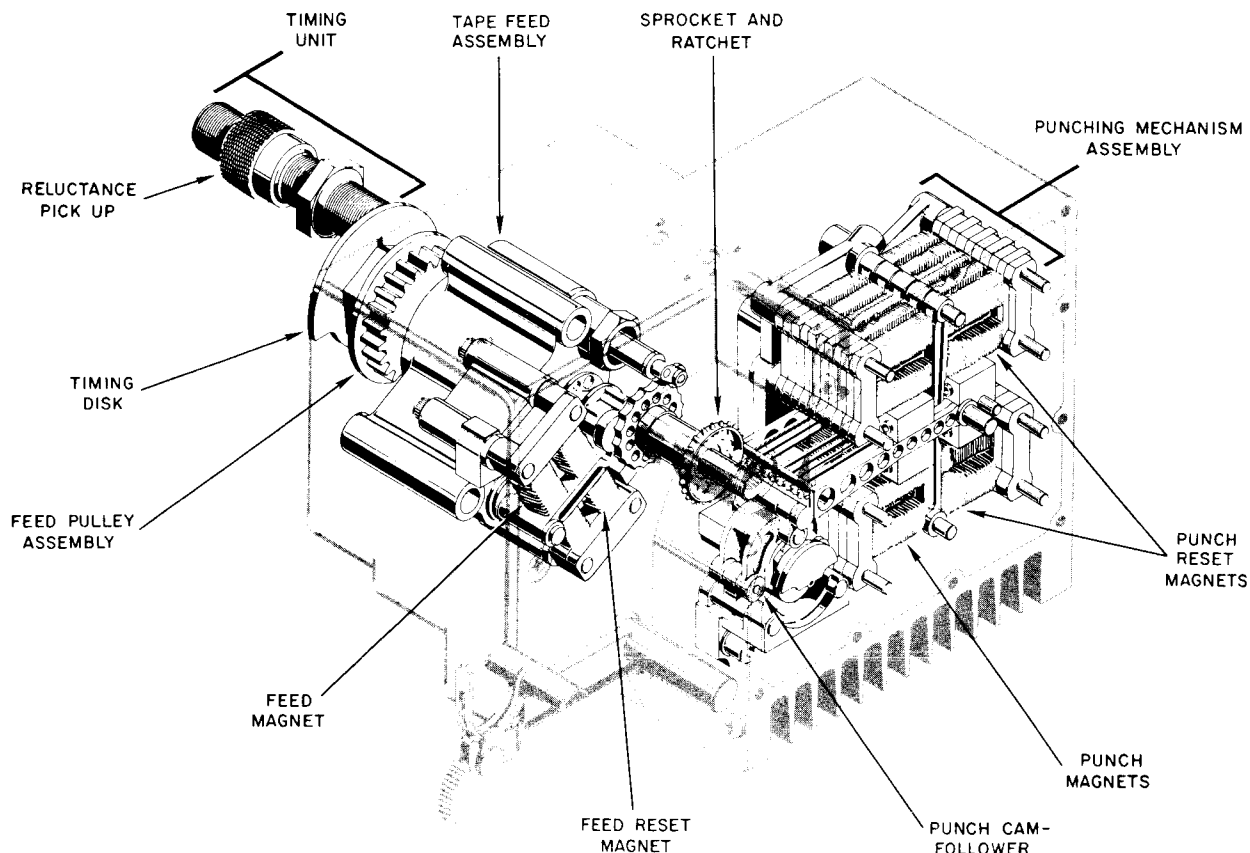


Figure 4-4. Perforator, Partial Phantom View

If a punch reset signal is received by the perforator, the punch magnets are de-energized, and the punch reset magnets pull the interposer armature away from the punch pins. This motion of the interposer armature will pull the interposer from between the punch bail and the punch pin. At this time the punch bail is stationary at the bottom of the stroke. The upward motion of the punch bail will not move the punch pin, and therefore the tape will not be perforated. For each complete rotation of the punch cam, the punch bail will move up twice and down twice.

The punch mechanism of the perforator includes five code interposers, five punch magnets, and five punch reset magnets. Only one punch bail is used. The punch or the punch reset signals for any one code must be applied to all five magnets at the same time. The maximum potential of these signals must be not more than 400 volts peak-to-peak. Each punch and punch reset magnet coil needs between 85 and 110 milliamperes of current to energize the magnet. The resistance of each coil is 250 ohms.

(3) TIMING UNIT. - Timing pulses for the external circuit are generated in the perforator by a pulse generator. The pulse generator consists of a rotating timing disk and a stationary reluctance pickup. The 1-1/2 inch diameter iron and copper laminated timing disk is turned by a belt driven by the perforator motor drive gear. A 195-degree sector of the iron laminate of the timing disk (figure 4-8) is routed out so that the magnetic reluctance of this part of the disk approaches that of air. The reluctance pickup consists of a permanent magnet and a coil, and is mounted in the perforator motor mount so that the air gap between the pickup and the timing disk is between 0.030 and 0.045 inch. As the disk is rotated before the reluctance pickup, the magnetic flux through the pickup coil changes suddenly, and a pulse is induced in the coil. The pulse has a width of about 1/4 millisecond and an amplitude of about two volts minimum. When the timing disk changes from iron to air, the induced pulse is positive. When, 165 degrees later, the disk changes from iron to air, the pulse is negative. A coaxial cable is used to conduct the pulse to the external circuit. The positive pulse is used to initiate and/or stop a tape feed cycle and release the code cycle. The negative pulse is used to initiate the punch code cycle (see figure 4-9).

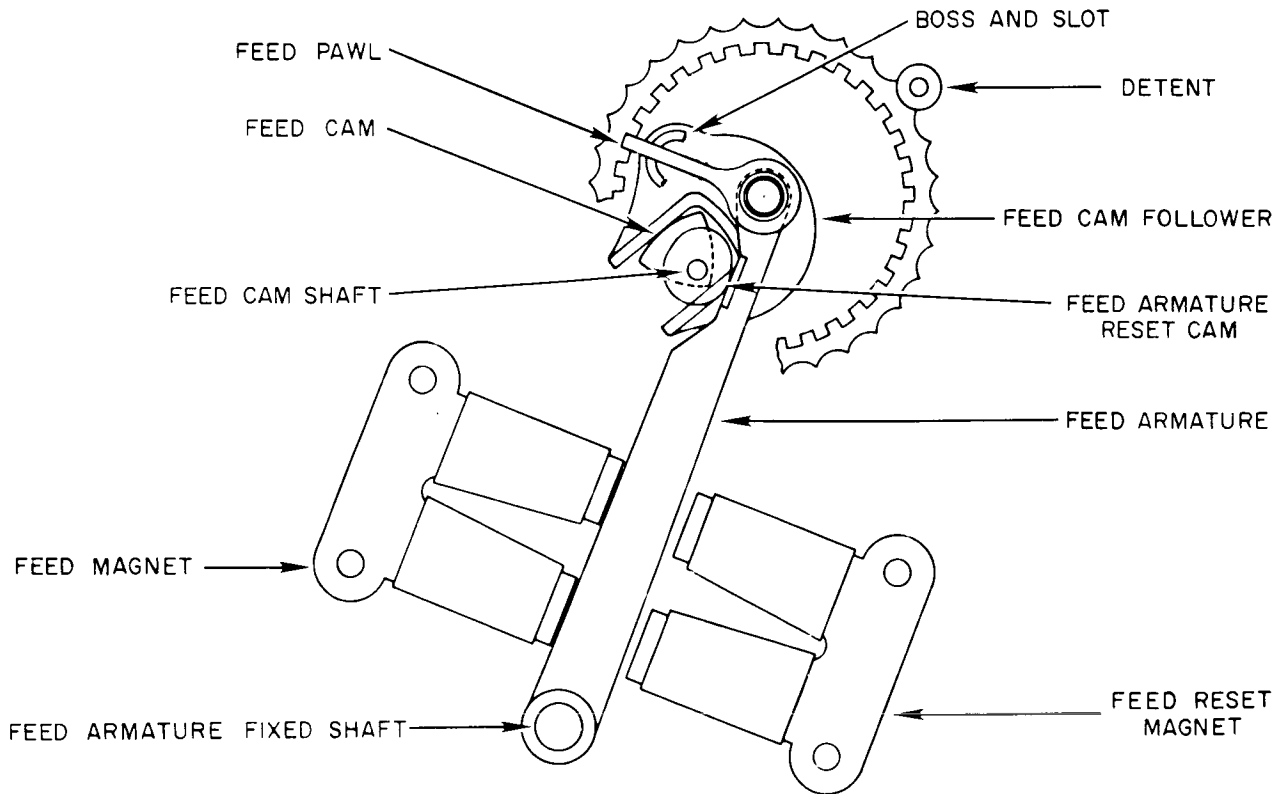
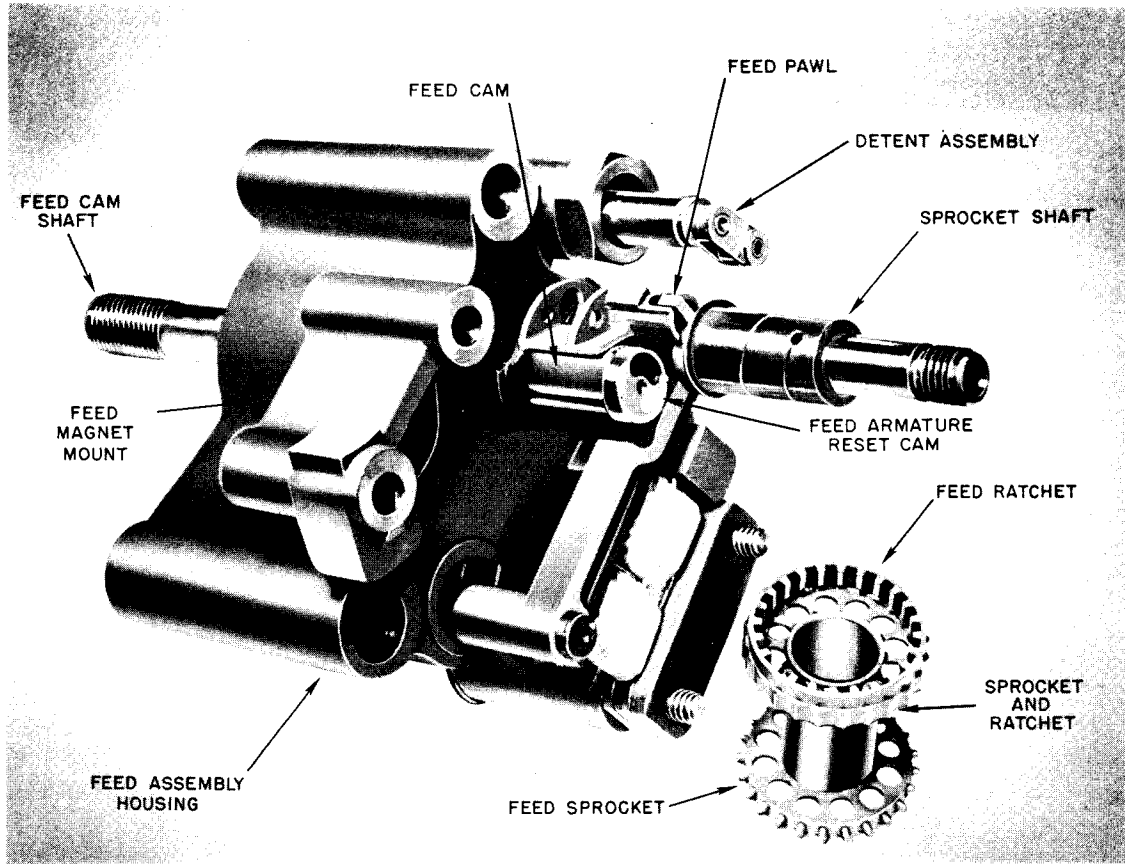


Figure 4-5. Perforator Tape Feed Assembly

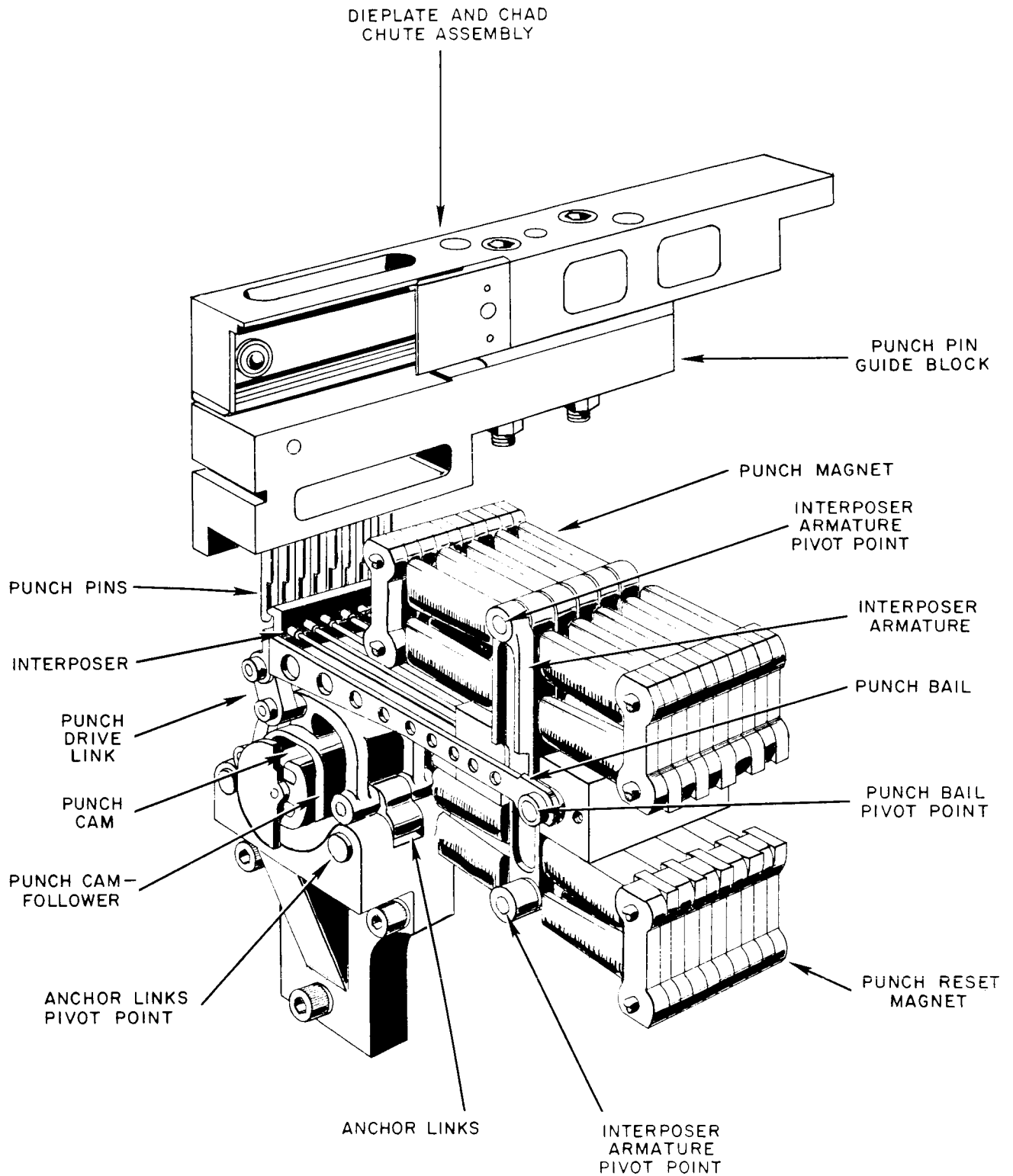


Figure 4-6. Perforator Simplified Schematic of Punching Mechanism

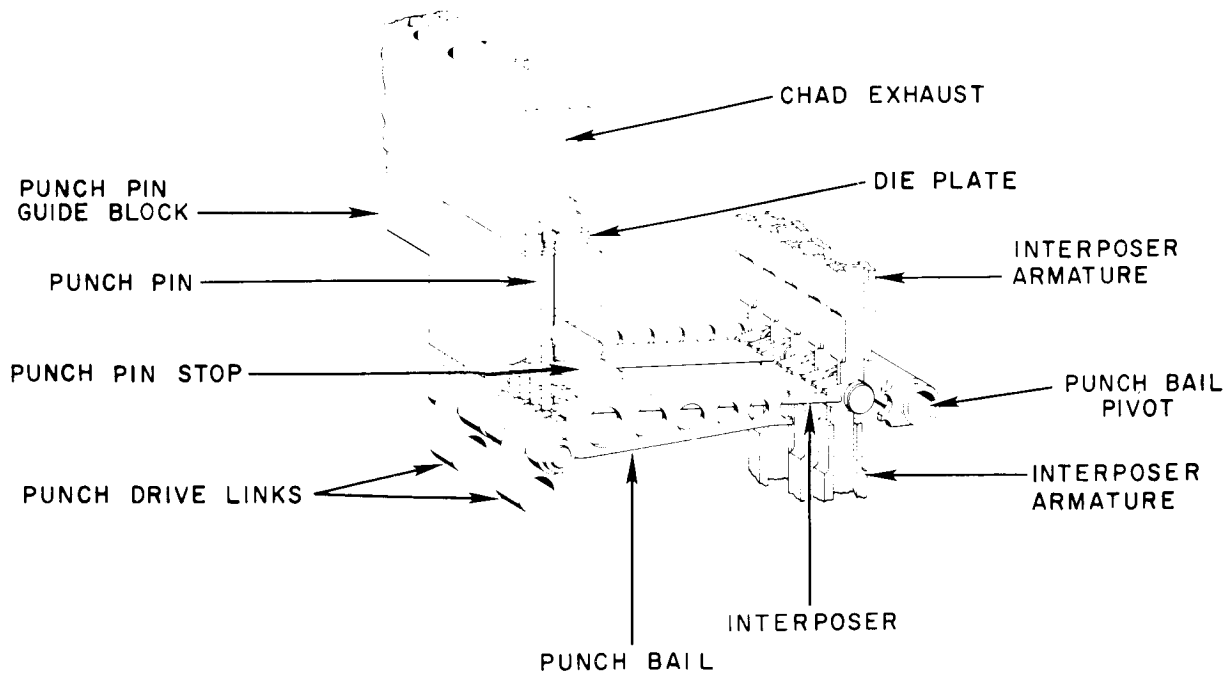


Figure 4-7. Perforator Punch Bail and Related Parts

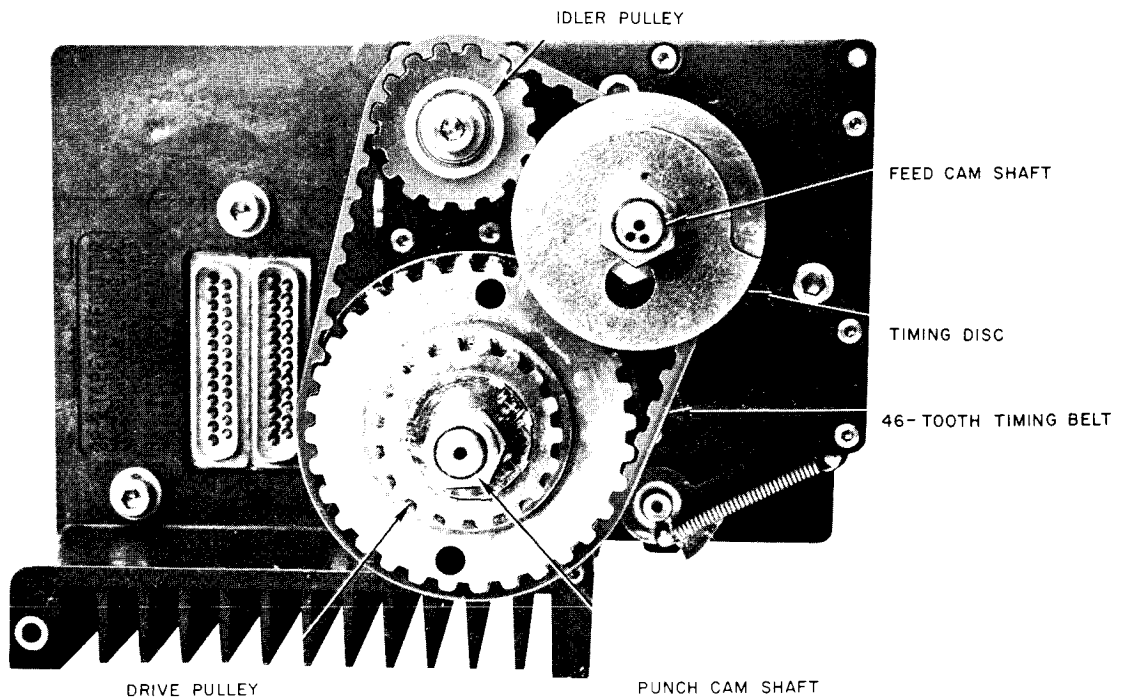


Figure 4-8. Perforator, Rear View

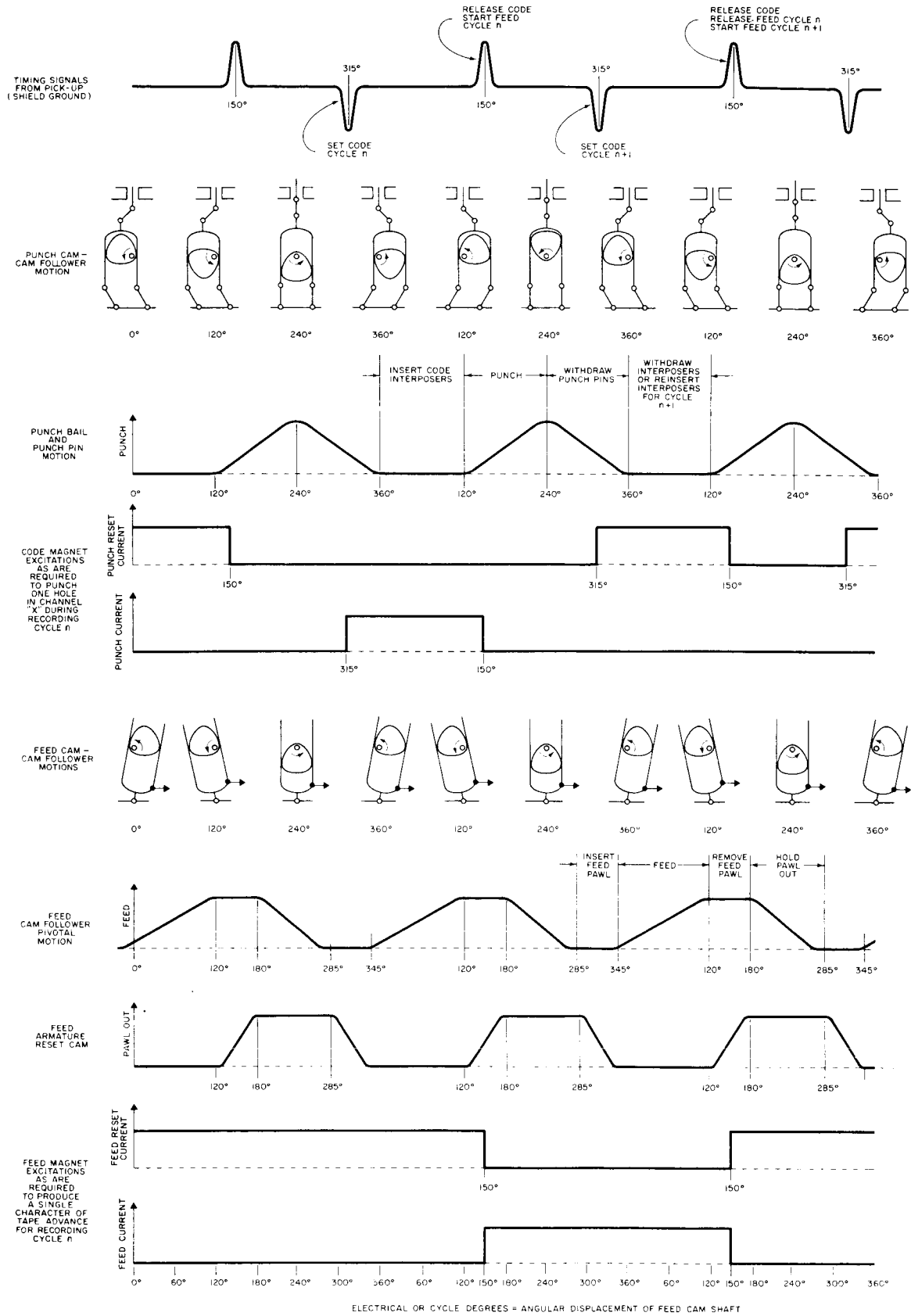


Figure 4-9. Perforator Timing and Waveforms

Timing of the feed and punching operations in the perforator are arbitrarily referenced to the time 150 degrees (1.341 milliseconds) when the punch mark signal is received (figure 4-9). As stated in the description of the tape punching operation, the punch bail completes two punching cycles for each revolution of the punch cam shaft. The tape feed cam follower completes only one feed cycle for each feed cam shaft rotation. Gearing is therefore used to make the feed cam shaft turn to twice the rate of the punch cam shaft.

One complete cycle(s) of tape perforation and tape feed is illustrated in figure 4-9. The perforator operates at a speed of 240 codes per second, and therefore one cycle will take 4.16 milliseconds. During this time the feed cam shaft will turn 360 degrees, while the punch cam shaft will only turn 180 degrees. The feed pawl will be inserted or withdrawn from the internal teeth on the sprocket only while the tape is stationary. Figure 4-9 also shows that the interposers are engaged or disengaged while the punch bail is stationary at the bottom of the stroke.

d. READER. - The reader operates within a standard teletypewriter 60 milliamperere series loop. For additional information regarding reader, refer to NAVSHIPS 92733.

SECTION 5
TROUBLESHOOTING

5-1. GENERAL.

a. Reperforator Distributor-Transmitter TT-268/UG (perforator-reader) consists of the electrical equipment case (drawer), the Super-Speed Tape Perforator Model GP-2 (perforator), and the Transmitter-Distributor TT-187/UG (reader). The electrical equipment case (drawer) serves to enclose the perforator, the reader, and the other components of the perforator-reader. The drawer may be mounted in a standard electronic equipment rack. Two slides, one on each side of the drawer, are provided so that the main frame assembly can be pulled out of the drawer for servicing components. A capacitor, a timer, the two driving motors, terminal boards, and the front panel are secured to the main frame assembly. The perforator and the reader are shock mounted, and extend partly through the front panel. Four switches mounted on the front panel control input power to the driving motors. Signal inputs to the perforator, and outputs from the reader and the perforator synchronizer are connected through terminal boards mounted on a plate located at the rear of the drawer. The capacitor is used as a phase splitter to start the perforator drive motor. The timer is a standard unit which indicates the perforator motor running time in hours and tenths of hours. Chad, produced by the punching operation of the perforator, is pushed through a chad chute into the chad collector. Tape is stored in the tape supply assembly, and is guided through the perforator and the reader as shown in figure 3-2. The operation of the mechanical components of the perforator generates a large amount of heat. Air is pulled in the side of the drawer by a vane-axial blower mounted on the perforator drive motor shaft, forced through a duct, through the cooling fins on the punch, then exhausted at the front of the punch. Resistors and silicon diodes which form the perforator input circuit are mounted on a terminal board located behind the tape supply assembly.



b. The electrical circuits of the perforator-reader consist of the magnet coils, switches, a capacitor, two electric motors, a pulse generator, resistors, silicon diodes and a synchronous running-time indicator. All of these electrical components (except the capacitor and the diodes) can be tested for continuity with an ohmmeter.

c. The mechanical components of the drawer consist mainly of the case, mounting brackets, shock mounts, tracks, and hardware. A careful visual inspection of these parts will easily identify those which are defective.

d. The mechanical components of the perforator are not complex, but some are manufactured with extremely close (0.0001 inch) tolerances. Further, some parts are machined after assembly to ensure perfect fit. For this reason, parts in the perforator cannot be repaired, and a defective perforator must be replaced as an assembly.

e. Most of the mechanical parts of the reader can be replaced individually. With very few exceptions, repair of individual parts is not possible. For all troubleshooting information pertaining to the reader, refer to NAVSHIPS 92733.

f. Troubleshooting procedures given in this section are intended to identify the replaceable parts or assemblies which are defective.

g. A system of test points is utilized to facilitate troubleshooting: Major test points are used in checking the overall function of the equipment and localizing trouble to a functional section and are identified by an Arabic numeral enclosed in a star, e.g. ; secondary test points are used in isolating causes of abnormal performances within a specific functional section and are identified by a capital letter enclosed in a circle, e.g. .

5-2. TEST EQUIPMENT AND SPECIAL TOOLS.

a. TEST EQUIPMENT. - The test equipment needed to test the operation of the perforator-reader is listed in table 5-1.

TABLE 5-1. TEST EQUIPMENT

NAME	AN TYPE DESIGNATION OR MANUFACTURERS DESIGNATION	ALTERNATE	USE
Senior Volt-Ohmyst (vtvm)	RCA Type WV-98A	Equivalent	To measure resistances and voltages
Oscilloscope	Tektronix Model 535 or 545	Equivalent	To show waveform of timing pulse
Six-inch scale			To measure distance between holes punched in tape

5-3. OVERALL TROUBLESHOOTING.

a. PRELIMINARY CHECK. - Perform a visual inspection of the perforator-reader. Refer to table 5-2. Refer to NAVSHIPS 92733 for information on the reader.

b. CONTROL SETTINGS. - Before performing overall troubleshooting checks, place all controls to off position.

TABLE 5-2. PERFORATOR-READER VISUAL INSPECTION

COMPONENT PART	INSPECT FOR
Indicator Lamps	Security of mounting, broken bulb, broken lens.
Switches	Security of mounting; placed in off position.
Fuses	Properly installed and not blown.
Cables	Interconnecting cabling for proper routing, security of cable clamps, chafed outer covering.
Wiring	Broken connections, charred insulation (evidence of overheating), poor solder connections.
Front Panel and Chassis Assembly	Evidence of physical damage and obliterated markings.
Tape Supply	Full, tape properly threaded (figure 3-2).
Perforator	Lubricant visible through oil sight and at proper level (paragraph 3-6 d).

c. PERFORATOR-READER TROUBLESHOOTING CHART. - Perforator-reader troubleshooting consists of the checks required to localize the defective functional section. Refer to table 5-3.

TABLE 5-3. PERFORATOR-READER TROUBLESHOOTING CHART

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	Place POWER switch to ON.	Power indicator lamp glows; TAPE OUT indicator lamp glows.	<p>Check indicator lamps if they do not glow. If indication is abnormal, power circuit is malfunctioning. Refer to paragraph 5-4.</p> <p>If indication is normal, proceed with step 2.</p>
2	Load paper tape into tape supply assembly, and thread tape through perforator-reader (paragraph 3-3 b (1)). Leave a long (about three feet) loop of tape between perforator and reader.	TAPE OUT indicator lamp will not glow.	<p>Check tape out switch and tape threading if light continues to glow. If indication is abnormal, power circuit is malfunctioning. Refer to paragraph 5-4.</p> <p>If indication is normal, proceed with step 3.</p>
3	Place PERF switch to ON.	<p>Punch drive motor starts.</p> <p>Air is pulled in the side of the drawer by a vane axial blower mounted on the perforator drive shaft, forced through a duct, through the cooling fins on the punch and finally exhausted at the front of the punch.</p> <p>Running time indicator starts. (Dial reading changes each six minutes of running time.)</p>	<p>Check switch and motor if motor does not start. If indication is abnormal, power circuit is malfunctioning. Refer to paragraph 5-4.</p> <p>If cooling air is not discharged at the front of the punch, immediately place POWER switch to OFF. Check for obstructions between perforator cooling fins; if fins are clear, check mounting of air blower on punch drive motor shaft.</p> <p>Check running time indicator. If indication is abnormal, power circuit is malfunctioning. Refer to paragraph 5-4.</p> <p>If indication is normal, proceed with step 4.</p>

TABLE 5-3. PERFORATOR-READER TROUBLESHOOTING CHART (continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4	Place READER switch to ON.	Reader motor starts.	<p>Check reader motor and switch. If indication is abnormal, power circuit is malfunctioning. Refer to paragraph 5-4.</p> <p>If indication is normal, proceed with step 5.</p>
5	Place READER TAPE DRIVE switch to ON. Punch about 12 inches of sprocket holes only on the tape.	Blank (feed holes only punched) tape feeds through perforator and through reader.	<p>If tape does not feed through the perforator, check the threading of the tape for a tight tape condition. (Paragraph 3-3 <u>b</u> (1).)</p> <p>If paper tape does not feed through perforator and the reason is not a tight tape condition, the input circuit or the perforator is malfunctioning. Refer to paragraphs 5-5 and 5-6.</p> <p>If paper tape feeds through perforator but does not feed through reader, refer to the maintenance section of NAVSHIPS 92733.</p> <p>If indication is normal, proceed with step 6.</p>
6	Place READER TAPE DRIVE switch to OFF. Feed continuously a signal on channel 1. Punch about 12 inches of tape.	Tape feeds through perforator, and holes are punched in channel 1.	<p>If holes are not punched in channel 1 of the paper tape, the perforator or the input circuit is malfunctioning. Refer to paragraphs 5-5 and 5-6.</p> <p>If indication is normal, feed signal to channel 2. Repeat procedure with signals to channels 3, 4, and 5. If indication is normal for all channels place all power switches in off position and return the perforator-reader to its pretroubleshooting configuration.</p>

5-4. POWER CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING.

a. PRELIMINARY CHECK. - Preliminary check of the power circuit functional section is the same as preliminary check for the overall unit. Refer to paragraph 5-3 a.

b. TEST EQUIPMENT AND SPECIAL TOOLS.

(1) TEST EQUIPMENT. - The test equipment required to troubleshoot the power circuits consists of a Senior VoltOhmyst, RCA Type WV-98A (vtvm).

(2) SPECIAL TOOLS. - None required.

c. CONTROL SETTINGS. - Before performing power circuit troubleshooting, check that the POWER switch is in the OFF position.

d. POWER CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING CHART. - Power circuit troubleshooting consists of the necessary checks to isolate the particular part at fault. Refer to table 5-4.

e. ILLUSTRATIONS.

(1) PHOTOGRAPH. - Figure 5-1 physically locates the test points used in the power circuit functional section troubleshooting chart (table 5-4).

(2) SCHEMATIC DIAGRAM. - Figure 5-2 is a schematic diagram of the primary power circuit.

(3) VOLTAGE AND RESISTANCE DIAGRAM. - All voltages line-to-line are 94.5 to 137.5 vac. Resistances across circuit elements are shown in table 5-4.

5-5. PERFORATOR INPUT CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING.

a. PRELIMINARY CHECK. - Preliminary check of the perforator input circuit functional section is the same as preliminary check for the overall unit. Refer to paragraph 5-3 a.

b. TEST EQUIPMENT AND SPECIAL TOOLS.

(1) TEST EQUIPMENT. - The test equipment required to troubleshoot the perforator input circuit consists of a Senior VoltOhmyst, RCA Type WV-98A (vtvm).

(2) SPECIAL TOOLS. - None required.

c. CONTROL SETTINGS. - Before performing perforator input circuit troubleshooting, check that the POWER switch is in OFF position.







d. PERFORATOR INPUT CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING CHART. - Perforator input circuit troubleshooting consists of the checks necessary to isolate the particular part at fault. Refer to table 5-5. The components of the perforator input circuit, except the magnet coils, are mounted outside the perforator, and are individually replaceable.

e. ILLUSTRATIONS.

(1) PHOTOGRAPH. - Figure 5-3 physically locates the test points used in the perforator input circuit functional section troubleshooting chart (table 5-5).

(2) SCHEMATIC DIAGRAM. - Figure 5-4 is a schematic diagram of the perforator input circuit.

TABLE 5-4. POWER CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	 Figures 5-1, 5-2 and 6-10	Measure a-c voltage by connecting vtm test leads across terminals of fuses F9001 and F9002.	Vtm should read 94.5 to 137.5 vac.	If voltage indication is normal, proceed with step 2. If voltage indication is either too high or too low, check primary power circuit outside the perforator-reader. If voltage indication is zero, check fuses; replace with new fuses if defective.
2	 Figures 5-1, 5-2 and 6-10	Measure parallel resistance of running time indicator and perforator drive motor by connecting vtm across open terminals of PERF switch.	Vtm should indicate 4.8 ohms $\pm 10\%$.	If resistance indication is normal, proceed with step 3. If resistance indication is abnormal, verify associated wiring (see figure 5-2).
3	 Figures 5-1, 5-2 and 6-10	Place POWER switch to ON. Place PERF switch to ON. Measure voltage by connecting vtm across terminals of POWER switch S9001.	Vtm should indicate 94.5 to 137.5 vac. Perforator drive motor should run. Running time indicator should run.	If indication is normal, proceed with step 4. If indications are abnormal, check associated wiring (see figure 5-2).
4	 Figures 5-1, 5-2 and 6-10	Place PERF switch to OFF. Place READER switch to ON. Measure a-c voltage by connecting vtm test leads across terminals of switch S9003.	Vtm should indicate 94.5 to 137.5 vac.	If indication is normal, proceed with step 5. If indication is abnormal, check associated wiring (see figure 5-2).
5	 Figures 5-1, 5-2 and 6-10  Figures 5-1, 5-2 and 6-10	Place READER TAPE DRIVE switch to ON. Measure a-c voltage by connecting vtm test leads between switch S9002 terminal and S9003-A terminal with grey-red wire connected to it.	Vtm should indicate 94.5 to 137.5 vac.	If indication is normal, place all perforator switches to off. If indication is abnormal, check associated wiring (see figure 5-2).

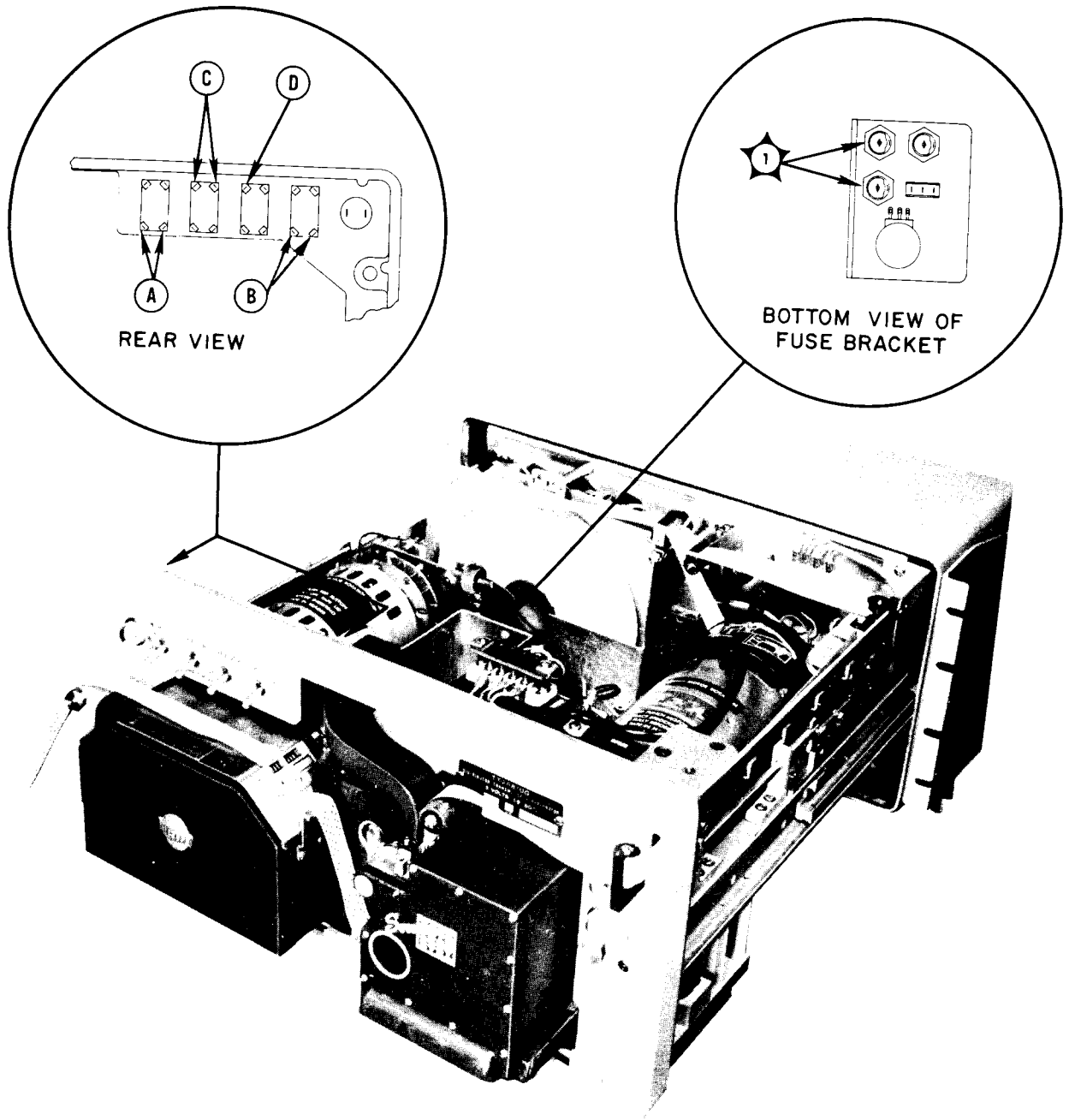


Figure 5-1. Power Circuit, Test Point Location

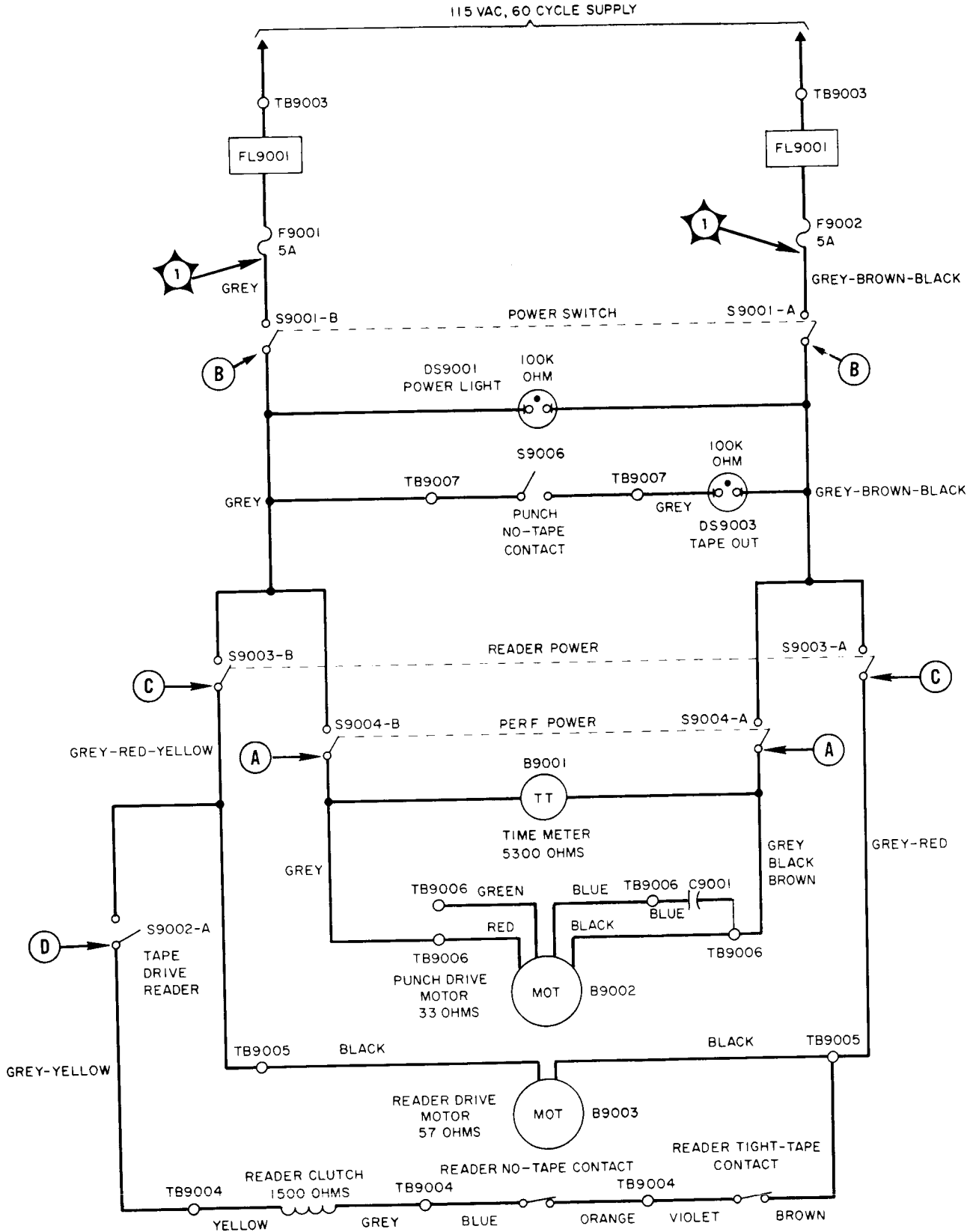
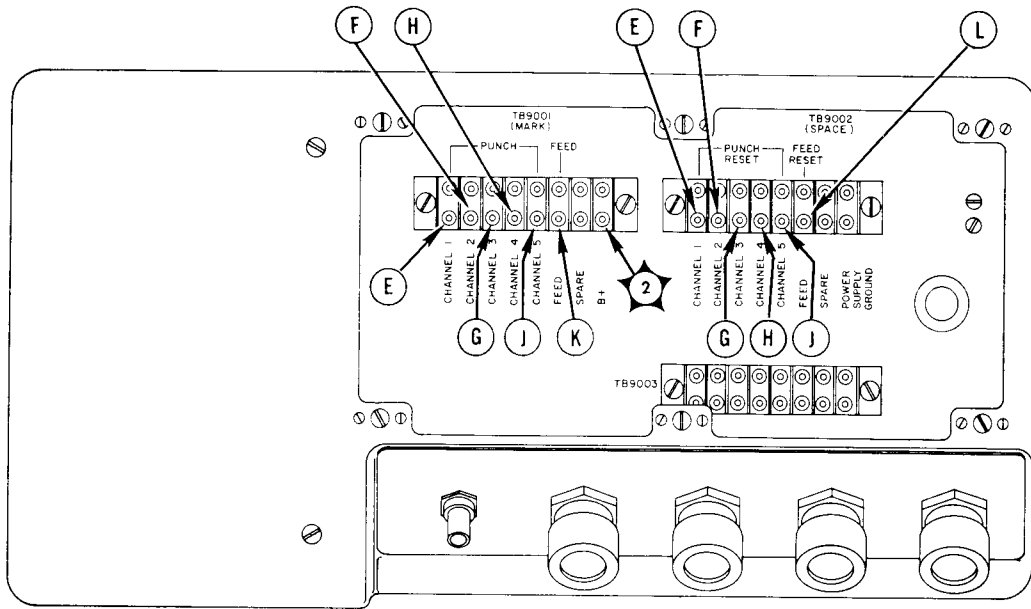


Figure 5-2. Perforator-Reader Primary Power Distribution, Schematic Diagram

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PERFORATOR-READER, REAR VIEW

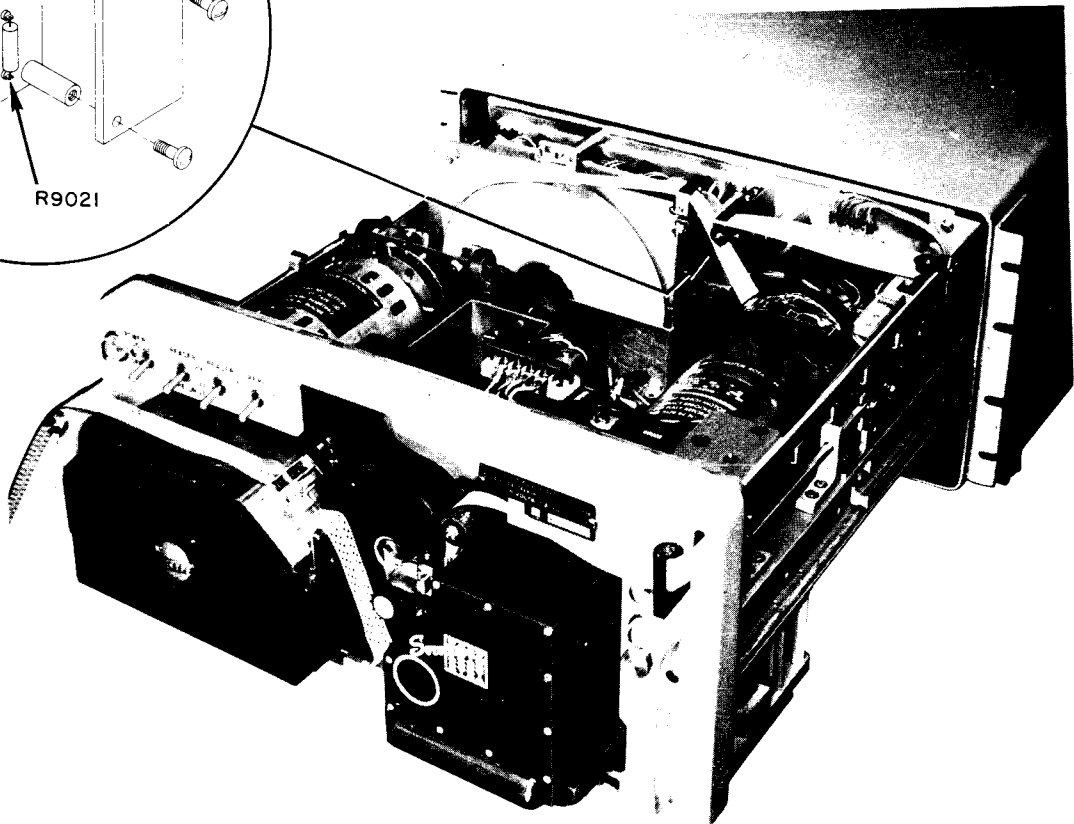
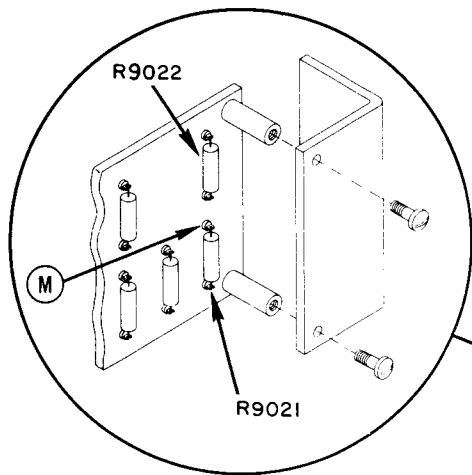


Figure 5-3. Input Circuit, Test Point Location

TABLE 5-5. PERFORATOR INPUT CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING










STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	 Figures 5-3, 5-4 and 6-10	Place POWER switch to OFF. Measure B+ voltage by connecting vtm test leads between power supply ground and the B+ terminal on TB9001. (To make this measurement, the perforator-reader must be connected to punch control, and the POWER switch on the perforator-reader control panel must be in ON position.)	Vtm should read 320 to 380 vdc.	If indication is normal, proceed with step 2. If indication is abnormal, check external B+ supply.
2	 Figures 5-3, 5-4 and 6-10  Figures 5-3, 5-4 and 6-10	Deenergize punch control. Measure resistance of punch and punch reset channel 1 input circuit by connecting vtm test leads between corresponding CHANNEL 1 terminals on TB9001 and TB9002 and B+ terminal of TB9001. In steps 2 through 11, it will be necessary to disconnect leads to external circuit.	Vtm should read 1800 ohms \pm 10%.	If indication is normal, proceed with step 3. If indication is abnormal, measure resistance of each circuit element in channel 1 input circuit (see figure 5-4).
3	 Figures 5-3, 5-4 and 6-10  Figures 5-3, 5-4 and 6-10	Measure resistance of punch and punch reset channel 2 input circuit by connecting vtm test leads between corresponding channel 2 terminals on TB9001 and TB9002 and B+ terminal of TB9001.	Vtm should read 1800 ohms \pm 10%.	If indication is normal, proceed with step 4. If indication is abnormal, measure resistance of each circuit element in channel 2 input circuit (see figure 5-4).
4	 Figures 5-3, 5-4 and 6-10  Figures 5-3, 5-4 and 6-10	Measure resistance of punch and punch reset channel 3 input circuit by connecting vtm test leads between corresponding CHANNEL 3 terminals on TB9001 and TB9002 and B+ terminal of TB9001.	Vtm should read 1800 ohms \pm 10%.	If indication is normal, proceed with step 5. If indication is abnormal, measure resistance of each circuit element in channel 3 input circuit (see figure 5-4).

TABLE 5-5. PERFORATOR INPUT CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING
(continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	<p>(H)</p> <p>Figures 5-3, 5-4 and 6-10</p> <p>2</p> <p>Figures 5-3, 5-4 and 6-10</p>	<p>Measure resistance of punch and punch reset channel 4 input circuit by connecting vtm test leads between corresponding CHANNEL 4 terminals on TB9001 and TB9002 and B\neq terminal of TB9001.</p>	<p>Vtm should read 1800 ohms \pm10%.</p>	<p>If indication is normal, proceed with step 6.</p> <p>If indication is abnormal, measure resistance of each circuit element in channel 4 input circuit (see figure 5-4).</p>
6	<p>(J)</p> <p>Figures 5-3, 5-4 and 6-10</p> <p>2</p> <p>Figures 5-3, 5-4 and 6-10</p>	<p>Measure resistance of punch and punch reset channel 5 input circuit by connecting vtm test leads between corresponding CHANNEL 5 terminals on TB9001 and TB9002 and B\neq terminal of TB9001.</p>	<p>Vtm should read 1800 ohms \pm10%.</p>	<p>If indication is normal, proceed with step 7.</p> <p>If indication is abnormal, measure resistance of each circuit element in channel 5 input circuit (see figure 5-4).</p>
7	<p>(K)</p> <p>Figures 5-3, 5-4 and 6-10</p> <p>2</p> <p>Figures 5-3, 5-4 and 6-10</p>	<p>Measure resistance of the feed input circuit by connecting vtm test leads between FEED and B+ terminal of TB9001. Steps 7 and 8 should be performed with tape loaded in drawer as shown in figure 3-2.</p>	<p>Vtm should read 1270 ohms \pm10%.</p>	<p>If indication is normal, proceed with step 8.</p> <p>If indication is abnormal, measure resistance of each circuit element in the feed input circuit (see figure 5-4).</p>
8	<p>(L)</p> <p>Figures 5-3, 5-4 and 6-10</p> <p>2</p> <p>Figures 5-3, 5-4 and 6-10</p>	<p>Measure resistance of feed reset input circuit by connecting vtm test leads between FEED RESET terminal on TB9002 and B\neq terminal on TB9002.</p>	<p>Vtm should read 3071 ohms \pm10%.</p>	<p>If indication is normal, proceed with step 9.</p> <p>If indication is abnormal, measure resistance of each circuit element in the feed input circuit (see figure 5-4).</p>
9	<p>2</p> <p>Figures 5-3, 5-4 and 6-10</p>	<p>Measure resistance of series resistors R9032 and R9022 by connecting vtm test leads between B\neq terminal on TB9001 and power supply ground on TB9002.</p>	<p>Vtm should read 206K ohms \pm10%.</p>	<p>If indication is normal, proceed with step 10.</p> <p>If indication is abnormal, check resistors R9032 and R9022 individually, and check wiring.</p>

TABLE 5-5. PERFORATOR INPUT CIRCUIT FUNCTIONAL SECTION TROUBLESHOOTING
(continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
10	 Figures 5-3, 5-4 and 6-10	Measure resistance of overload test circuit (in parallel with series resistors R9032 and R9022) by connecting vtm test leads between ground on TB9002 and B \neq terminal of TB9001; close switch S9007 while taking the reading.	Vtm should read 1250 ohms \pm 10%.	If indication is normal, proceed with step 11. If indication is abnormal, check wiring, resistors R9028, R9029 and R9031 and switch S9007, (see figure 5-4).
11	 Figures 5-3, 5-4 and 6-10	Open switch S9007. Measure resistance between B \neq terminal of TB9001 and junction of resistor R9021 and indicator lamp DS9002. (Connect negative lead from vtm on B \neq terminal of TB9001 and positive lead from vtm on junction of DS9002 and R9021.)	Vtm should read 48,000 ohms \pm 10%.	If indication is normal, restore perforator-reader to operating condition. If indication is abnormal, check wiring and circuit elements in series-parallel shown in figure 5-4.

(3) VOLTAGE AND RESISTANCE DIAGRAMS. - Values given in table 5-4.

5-6. PERFORATOR FUNCTIONAL SECTION TROUBLESHOOTING.

a. PRELIMINARY CHECK. - Preliminary check of the perforator functional section is the same as preliminary check for the overall unit. Refer to paragraph 5-3 a.

b. TEST EQUIPMENT AND SPECIAL TOOLS.

(1) TEST EQUIPMENT. - The test equipment required to troubleshoot the perforator consists of a Senior VoltOhmyst, RCA Type WV-98A (vtm) and an oscilloscope.

(2) SPECIAL TOOLS. - None required.

c. CONTROL SETTINGS. - Before performing perforator troubleshooting, check that the POWER switch is in OFF position.

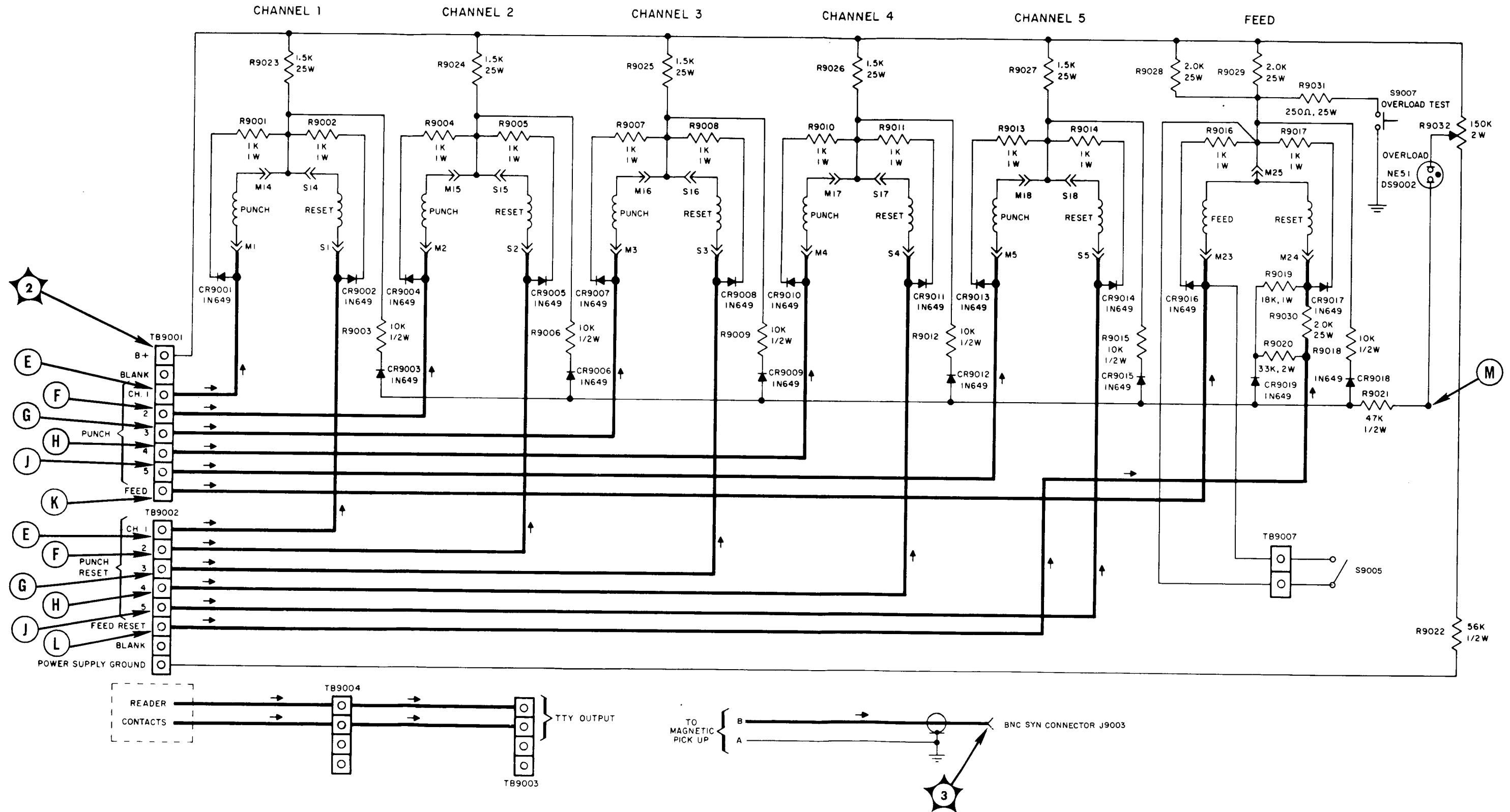


Figure 5-4. Perforator-Reader Input Circuit, Schematic Diagram

See T-1 if Fe 1 made

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d. PERFORATOR FUNCTIONAL SECTION TROUBLESHOOTING CHART. - Perforator troubleshooting consists of the checks necessary to isolate the particular part at fault. The mechanical parts inside the perforator are not complex, but some are manufactured with extremely close (0.0001 inch) tolerances. Further, some mating parts are machined during assembly to ensure perfect fit. For this reason, parts within the perforator cannot be repaired, and a malfunctioning perforator must be replaced as an assembly. The procedures in the troubleshooting chart therefore will not identify individual defective parts inside the perforator.

e. ILLUSTRATIONS.

(1) PHOTOGRAPH. - Figure 5-5 physically locates the test points used in the perforator functional section troubleshooting chart (table 5-6).

(2) SCHEMATIC DIAGRAM. - Part of figure 5-4 is a schematic diagram of the perforator showing the magnet coils and the timing circuit.

(3) VOLTAGE AND RESISTANCE DIAGRAMS. - Not applicable.

5-7. READER FUNCTIONAL SECTION TROUBLESHOOTING.

Procedures for troubleshooting the reader functional section are given in NAVSHIPS 92733.

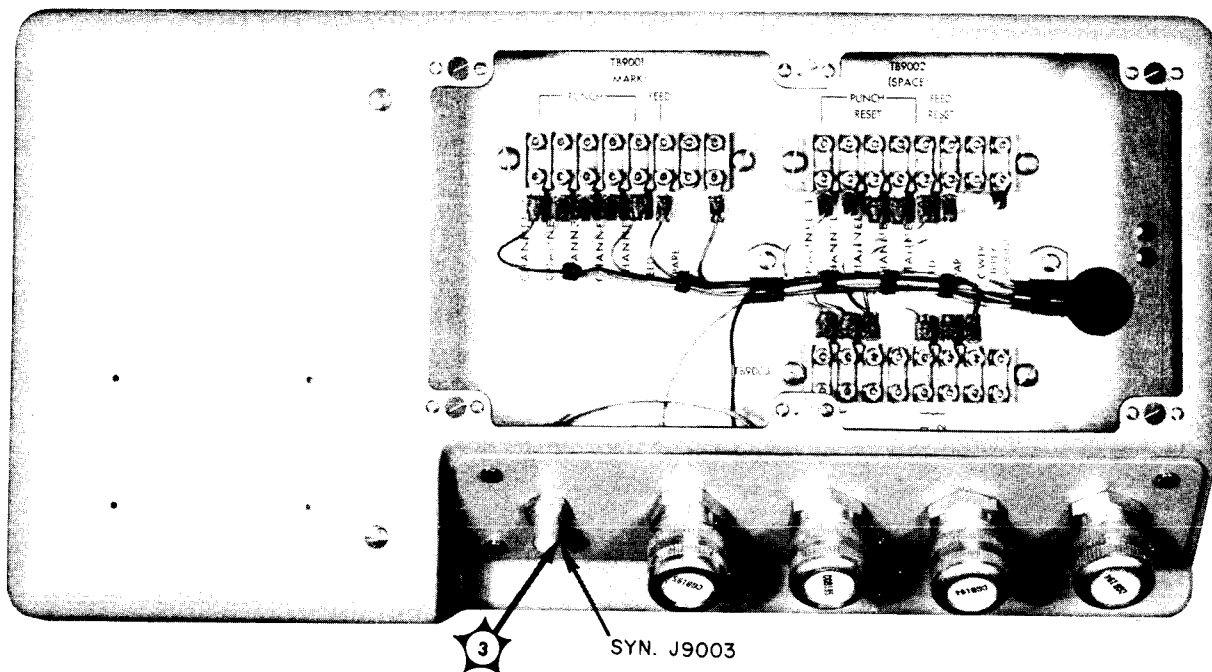

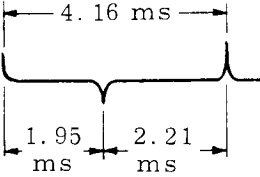



Figure 5-5. Perforator Functional Section, Test Point Location

TABLE 5-6. PERFORATOR FUNCTIONAL SECTION TROUBLESHOOTING

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	 Figures 5-4, 5-5 and 6-10	Disconnect SYN coaxial connector J9003 from external circuit. Connect vertical input of oscilloscope to J9003. Use positive internal synchronization at oscilloscope. Place POWER switch on perforator-reader front panel to ON. Place PERF switch to ON.	 <p>Amplitude = 4V peak to peak (min)</p> <p>Base width of pulses = 0.25 ms</p>	If indication is normal, restore perforator-reader to operating condition. If indication is abnormal, proceed as follows: a. If no waveform is indicated, proceed with step 2. b. If waveform is present but does not have proper amplitude or shape, refer to the adjustment procedure given in paragraph 6-2 c (3) (b).
2	 Figures 5-4, 5-5 and 6-10	Measure resistance of timing signal generator by connecting test leads of vtm between ground and center conductor of J9003.	Vtm should read 140 ohms \pm 10%	If indication is normal, restore perforator-reader to operating condition. If indication is abnormal, check wiring and magnetic pickup of timing signal generator.

5-8. TYPICAL TROUBLES.

The typical troubles of the perforator-reader are listed in table 5-7.

TABLE 5-7. TYPICAL TROUBLES

TROUBLE	NATURE OF TROUBLE	SYMPTOMS
One or more channels will not punch.	Faulty magnet(s)	Tape will not be punched for one or more channels.
Perforator drive motor will not start.	Faulty starting capacitor or drive motor.	Perforator fails to operate.
Spacing of punched holes not proper.	Perforator drive motor or drive assembly faulty.	Punched holes in tape not properly spaced after adequate warm-up time.
TAPE OUT light operating improperly.	Defective microswitch S9006.	TAPE OUT light stays lit after proper threading of tape.

SECTION 6

SERVICE AND REPAIR

6-1. PREVENTIVE MAINTENANCE.

a. INTRODUCTION. - The tests and maintenance contained herein provide the technician with a systematic and efficient method of checking the Reperforator Distributor-Transmitter TT-268/UG (perforator-reader), and of performing routine preventive maintenance. The perforator-reader consists of the Super-Speed Tape Perforator Model GP-2 (perforator), the Transmitter-Distributor TT-187/UG (reader), and the components mounted in the electrical equipment case (drawer). Preventive maintenance contains tests that, when performed as directed, will increase operating efficiency of the perforator-reader. The records that should be kept as a result of performing the preventive maintenance provide an equipment history of performance which, when properly analyzed by a technician, will clearly indicate when or what preventive measures must be taken. However, to be of any value, the steps must be performed conscientiously, accurately, and completely. Preventive maintenance contains weekly and monthly steps which are both routine and technical. To lighten the load of the maintenance personnel, the routine steps are performed by the operator. The time required is not a fixed standard, but an average established by many technicians of varied experience. It is expected that the steps will show nominal variances from time to time. This does not necessarily mean that the equipment is operating improperly. If, however, a particular step shows a reading which varies progressively in the same direction every time a check is made, it is an indication of improper operation, and corrective measures must be taken.

NOTE

Instructions for the service and repair of the Transmitter-Distributor TT-187/UG are given in NAVSHIPS 92733. The reader operates within a standard 60 milli-ampere series loop.

(1) RECORD OF FIELD CHANGES. - Field changes (if any) are listed in table 6-1.

(2) TEST EQUIPMENT. - Test equipment required to perform maintenance schedule is the accurate six-inch ruler and a punch control.

(3) SPECIAL PROCEDURES. - Before performing the preventive maintenance accomplished by the operator, it is necessary for the operator to apply an R-Y signal input to the perforator-reader.

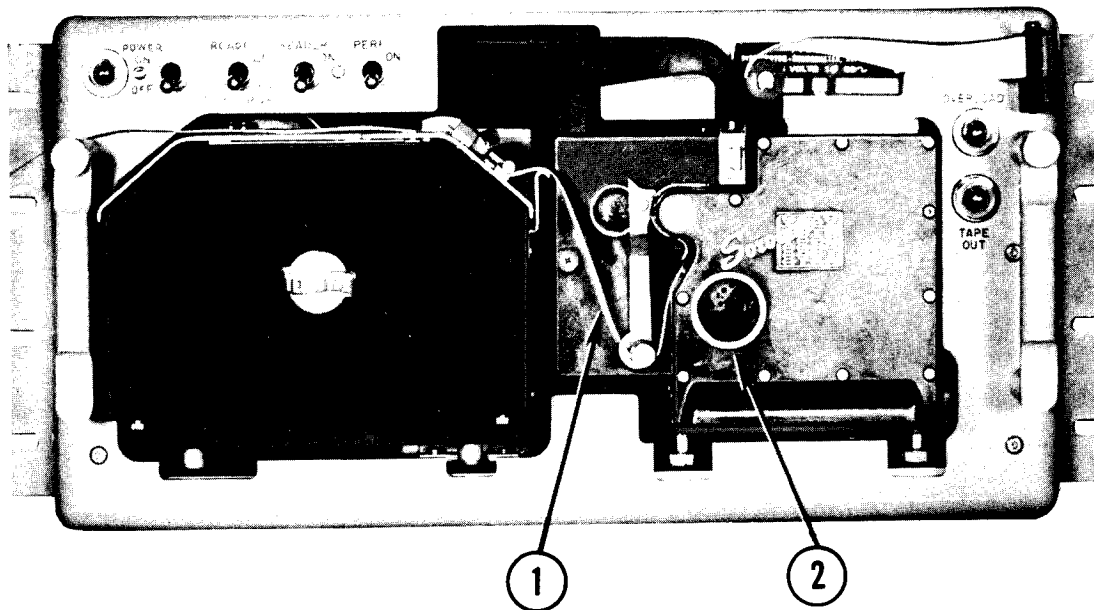
b. MAINTENANCE SCHEDULE. - The maintenance schedule consists of a weekly and a monthly check.

(1) The weekly check is performed by the operator with the aid of the ruler, and consists of the steps listed on figure 6-1.

(2) Monthly checks are performed by operator with the aid of the ruler. Figure 6-2 lists the necessary steps.

6-2. PERFORMANCE STANDARDS.

a. INTRODUCTION. Performance standards represent the performance measured at key test points on the perforator-reader. The perforator-reader consists of the Super Speed Tape Perforator Model GP-2 (perforator), the Transmitter-Distributor TT-187/UG (reader), and the components mounted in the electrical equipment case (drawer). Only an engineer qualified on the equipment is authorized to change any of the standards established for this equipment. Standards are to be established upon completion of installation or yard overhaul, or when a major field change has been completed. Prior to accomplishment of the initial standards of this equip-

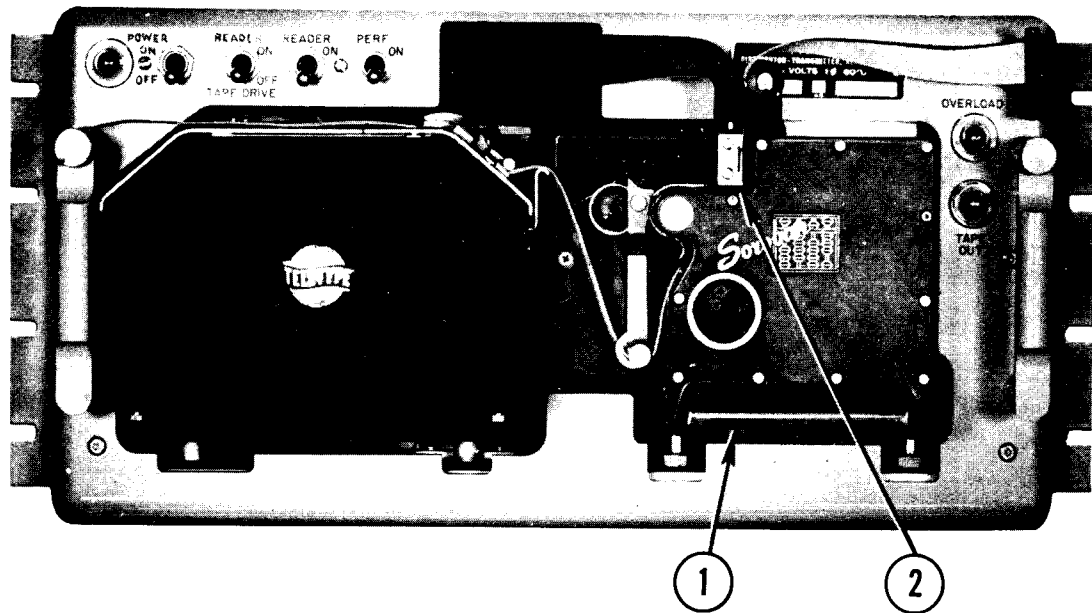


TIME REQUIRED TO PERFORM ALL STEPS - 15 MINUTES
 R-Y CODE INPUT TO PERFORATOR
 POWER SWITCH: ON
 PERF SWITCH: ON

WEEKLY
 STEPS ① AND ②

STEP		PRELIMINARY ACTION	READ INDICATION ON	PERFORMANCE STANDARD
NO.	ACTION REQUIRED			
①	Measure distance between two holes punched six inches apart on the tape. Check punching operation.	Punch R-Y code on at least six inches of tape.	Ruler	Distance of holes should be 6 ± 0.005 inches. Correct R-Y code punched into tape.
②	Check oil level in perforator.	PERF switch to OFF.	Perforator oil sight	Oil to oil level line.

Figure 6-1. Weekly Preventive Maintenance



TIME REQUIRED TO PERFORM ALL STEPS - 30 MINUTES

MONTHLY

STEPS ① AND ②

STEP		PRELIMINARY ACTION	READ INDICATION ON	PERFORMANCE STANDARD
NO.	ACTION REQUIRED			
①	Observe operation of blower.	POWER switch to ON. PERF switch to ON. Hold hand close to bottom of perforator and in front of the cooling fins.		If blower is operating properly, a steady stream of air will be exhausted at the front of the perforator.
②	Clean perforator-reader.	POWER switch to OFF. Clean chad from perforator die plate. Clean entire perforator-reader with a vacuum cleaner. Wipe off excess oil from perforator surfaces.		

Figure 6-2. Monthly Preventive Maintenance

ment, all adjustments should be made to determine that associated circuits are operating to the maximum of their design capabilities. The tolerances shown in phantom in the PERFORMANCE STANDARD column are not absolute limits. They are intended to serve merely as a guide for the engineer in establishing the standards. It is possible upon occasion for some of the standards to exceed the limits shown without such performance being an indication that the particular circuit under test is bad.

b. RECORD OF FIELD CHANGES. - Field changes (if any) are listed in table 6-2.

c. ADJUSTMENT. - Before making adjustments on the perforator-reader it is necessary to pull the front panel and chassis assembly from the drawer. Depress the two pushbuttons on the handles of the front panel, and pull and slide the front panel and chassis assembly from the drawer. Do not disconnect any electrical connections at this time.

(1) TEST EQUIPMENT. - Test equipment required to perform adjustments consists of an oscilloscope, Tektronix Model 535 or 545; and a punch control.

(2) TEST SETUP. - Ascertain that the perforator-reader is connected to punch control.

(3) INSTRUCTIONS. - Perform either or both adjustments given in following subparagraphs (a) and (b) as necessary. See figure 6-3 for location of adjustment controls.

(a) OVERLOAD ADJUSTMENT.

Step 1. Start perforator-reader by following procedures given in paragraph 3-3b.

Step 2. Place resistor R9032 in full CW position. OVERLOAD neon indicator should glow.

Step 3. Slowly rotate R9032 in CCW direction until neon lamp de-ionizes. Note position of variable resistor shaft.

Step 4. Continue rotating variable resistor in CCW direction until CCW stop is reached. Note position of potentiometer shaft.

Step 5. Set variable resistor shaft at mid position between positions obtained in steps 3 and 4.

Step 6. Check operation of system by operating OVERLOAD TEST switch (S9007). Neon lamp should glow brightly. When switch is released, lamp should de-ionize.

CAUTION

Do not operate switch for any continuous period exceeding 30 seconds.

(b) TIMING VOLTAGE ADJUSTMENT.

Step 1. Insert a T coaxial adaptor between SYN connector J9003 and the external coaxial cable.

Step 2. Connect the vertical input of the oscilloscope between the center conductor and outer conductor of the T coaxial adaptor.

Step 3. Apply continuous punch signal to channel 1 of perforator-reader.

Step 4. Start perforator-reader by following procedures given in paragraph 3-3b.

Step 5. Adjust oscilloscope controls so as to provide for synchronization with 60-cps power line.

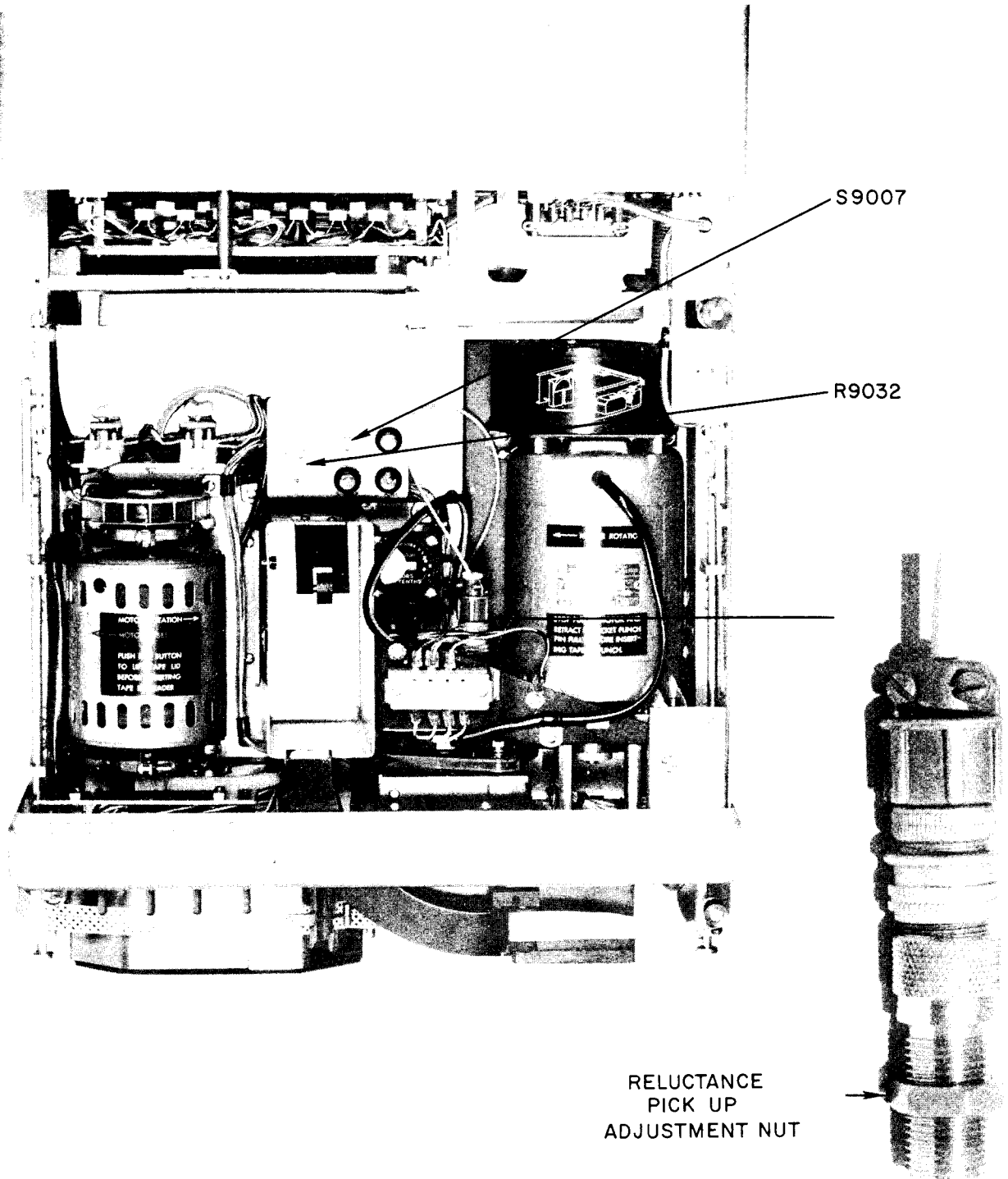


Figure 6-3. Perforator-Reader Adjustment Controls

Step 6. Adjust oscilloscope intensity, focus, attenuation, and sweep speed control so as to obtain a good trace.

Step 7. Observe amplitude of waveform on oscilloscope: amplitude of pulse should be 4 volts minimum, peak to peak.

Step 8. If amplitude of output pulse is not at least 4 volts peak to peak, stop perforator-reader by placing POWER switch to OFF.

Step 9. Release two handle locks and pull front panel and chassis assembly forward.

Step 10. Release magnetic pickup mounting nut (see figure 6-3) and insert an 0.030-inch thickness gage between timing disc and magnetic pickup.

Step 11. Adjust position of pickup so that thickness gage just slides between pickup and disc, and then tighten pickup mounting nut.

CAUTION

Do not change the position of the magnetic pickup in any direction except directly toward or away from the timing disc, otherwise the synchronizing signal will be mistimed with relation to the mechanical action of the punch. The magnetic pickup should be positioned radially as shown in figure 6-4.

Step 12. Connect a 10 to 1 attenuator probe from channel 1 terminal (brown wire) of terminal board TB9001 to vertical input terminal of oscilloscope. This will feed both synchronizing and punch signals into vertical deflection plates of oscilloscope so that a comparison can be made for timing.

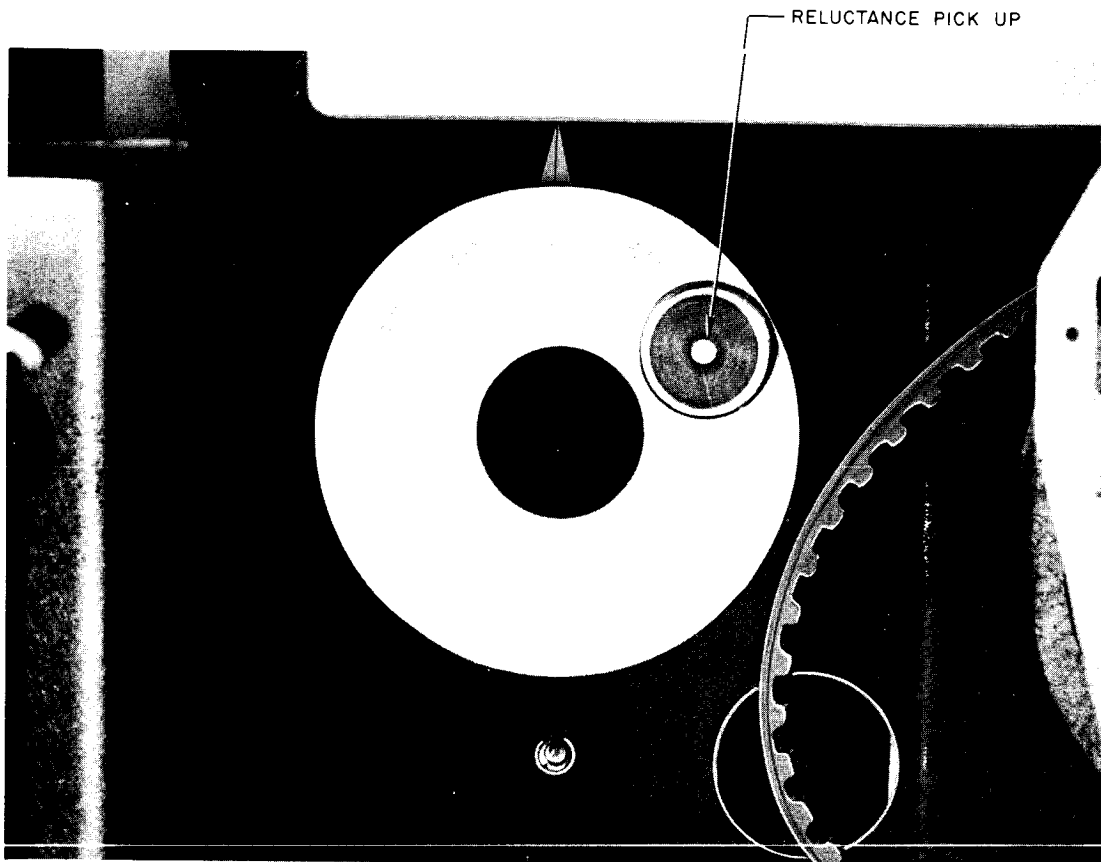


Figure 6-4. Perforator Magnetic Pick-up Setting

Step 13. Observe waveform of synchronizing signal; it should consist of a negative and a positive pulse. The distance between positive pulses should be 4.16 milliseconds. The distance between a positive pulse and next negative pulse should be 1.95 milliseconds. Duration of pulses should be 0.25 milliseconds.

Step 14. Observe channel 1 punch signal; it should be a square wave with leading edge coincident with negative synchronizing pulse, lasting 2.155 milliseconds.

Step 15. If an improper indication is obtained, check punch control.

d. TEST EQUIPMENT. - The test equipment required to accomplish performance standards consists of a precision six-inch ruler and of an oscilloscope, Tektronix Model 535 or 545.

e. SPECIAL PROCEDURES. - None required.

f. BLOCK DIAGRAM. - A block diagram of the functional sections is illustrated in figure 4-1.

g. FUNCTIONAL SECTIONS.

(1) POWER CIRCUIT. - Performance standards of the power circuit are given in figure 6-5. Test equipment is not required.

(2) PERFORATOR INPUT CIRCUIT. - Performance standards of the perforator input circuit are given in figure 6-6. Test equipment required is that given in paragraph 6-2d.

(3) READER. - Performance standards for the reader are given in NAVSHIPS 92733.

(4) PERFORATOR. - Performance standards of the perforator are given in figure 6-6.

6-3. REPAIR.

a. FAILURE REPORT. - Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE form DD787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Bureau of Ships. However, the importance of providing complete information cannot be emphasized too much. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember - there are two sides to the failure report -

"YOUR SIDE"

"BUREAU SIDE"

"Every FAILURE REPORT is a boost for you:

1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

"The Bureau of Ships uses the information to:

1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

Always keep a supply of failure report forms on board. You can get them from the nearest "Forms and Publications Supply Point".

b. TUNING AND ADJUSTMENT. - Procedures for the adjustments required on the perforator-reader are given in paragraph 6-2c.

c. REMOVAL, ADJUSTMENT, REPAIR, AND RE-ASSEMBLY OF PARTS AND SUB-ASSEMBLIES.

(1) ELECTRICAL EQUIPMENT CASE.

(a) REMOVAL. - Parts in the electrical equipment case (drawer) can be removed by disconnecting wiring at the terminal boards, and removing mounting hardware. Location of parts is shown in figures 1-1, 3-1, and 6-7. To remove either the perforator drive motor or the reader drive motor, remove first the perforator or the reader respectively.

(b) ADJUSTMENT. - All applicable adjustment instructions are given in paragraph 6-2c.

(c) REPAIR. - Repair of individual parts in the drawer is not practical. Defective parts must be replaced with new ones.

(d) STANDARDS. - Information for the selection of replacement parts is given in the parts list, Section 7. Each replaceable component is described, and required characteristics are given. Physical dimensions are not critical provided the replacement part will fit in the space available in the drawer without interference with other parts.

(e) REASSEMBLY. - Reassembly procedures are generally the reverse of disassembly. When connecting wires, check the circuits with the schematic and the wiring diagram.

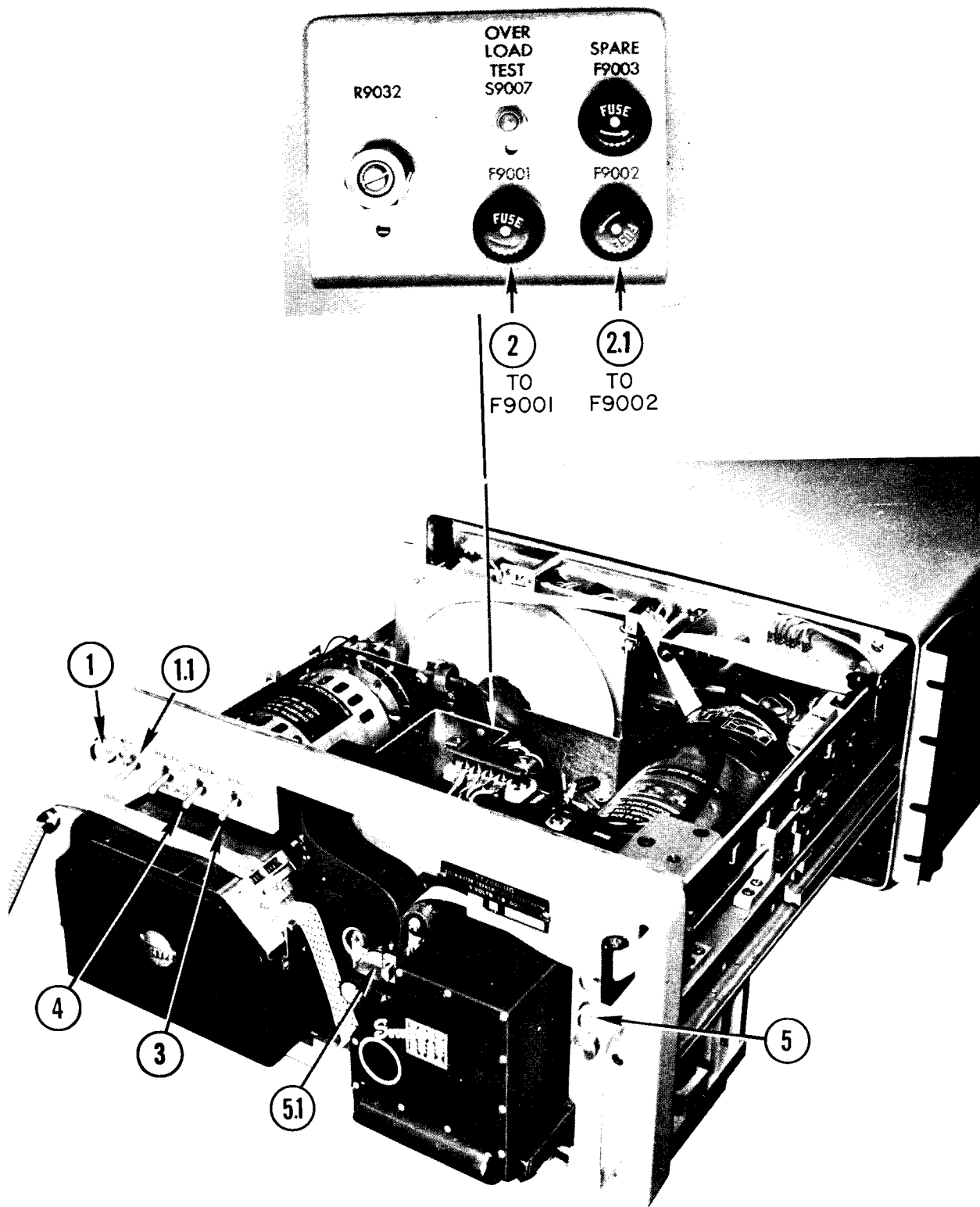


Figure 6-5. (Sheet 1) Perforator Reader Power Circuit Performance Standards

TIME REQUIRED TO PERFORM ALL STEPS - 15 MINUTES

STEPS (1) THROUGH (5.1)

STEP		PRELIMINARY ACTION	READ INDICATION ON	PERFORMANCE STANDARD
NO.	ACTION REQUIRED			
(1)	Observe operation of POWER indicator light.	POWER switch: ON	POWER indicator lamp	POWER indicator lamp on front panel glows.
(1.1)		POWER switch: OFF	POWER indicator lamp	POWER indicator lamp extinguishes.
(2)	Verify protective action of fuses F9001 and F9002	Remove fuse F9001 from fuseholder. Place POWER switch: ON	POWER indicator lamp	POWER indicator lamp remains out.
(2.1)		Place POWER switch: OFF. Replace fuse F9001 in fuseholder and remove fuse F9002 from fuseholder. Place POWER switch: ON.	POWER indicator lamp	POWER indicator lamp remains out.
(3)	Check operation of perforator drive motor.	Place POWER switch: OFF. Replace fuse F9002 in fuseholder. Place POWER switch: ON. Place PERF switch: ON.	Perforator drive motor	Perforator drive motor starts; air is exhausted at front of the perforator.
(4)	Check operation of reader drive motor.	Place READER switch to ON.	Reader drive motor	Reader drive motor operates.
(5)	Observe operation of TAPE OUT indicator lamp.	Place READER switch to OFF. Place PERF switch to OFF. Remove paper tape from all tape guide rollers. Place PERF switch to ON.	TAPE OUT indicator lamp	TAPE OUT indicator lamp glows.
(5.1)		Place PERF switch to OFF. Thread paper tape through perforator (refer to paragraph 3-3b). Place PERF switch to ON.	TAPE OUT indicator lamp	TAPE OUT indicator lamp remains out.

Figure 6-5. (Sheet 2) Perforator Reader Power Circuit Performance Standards

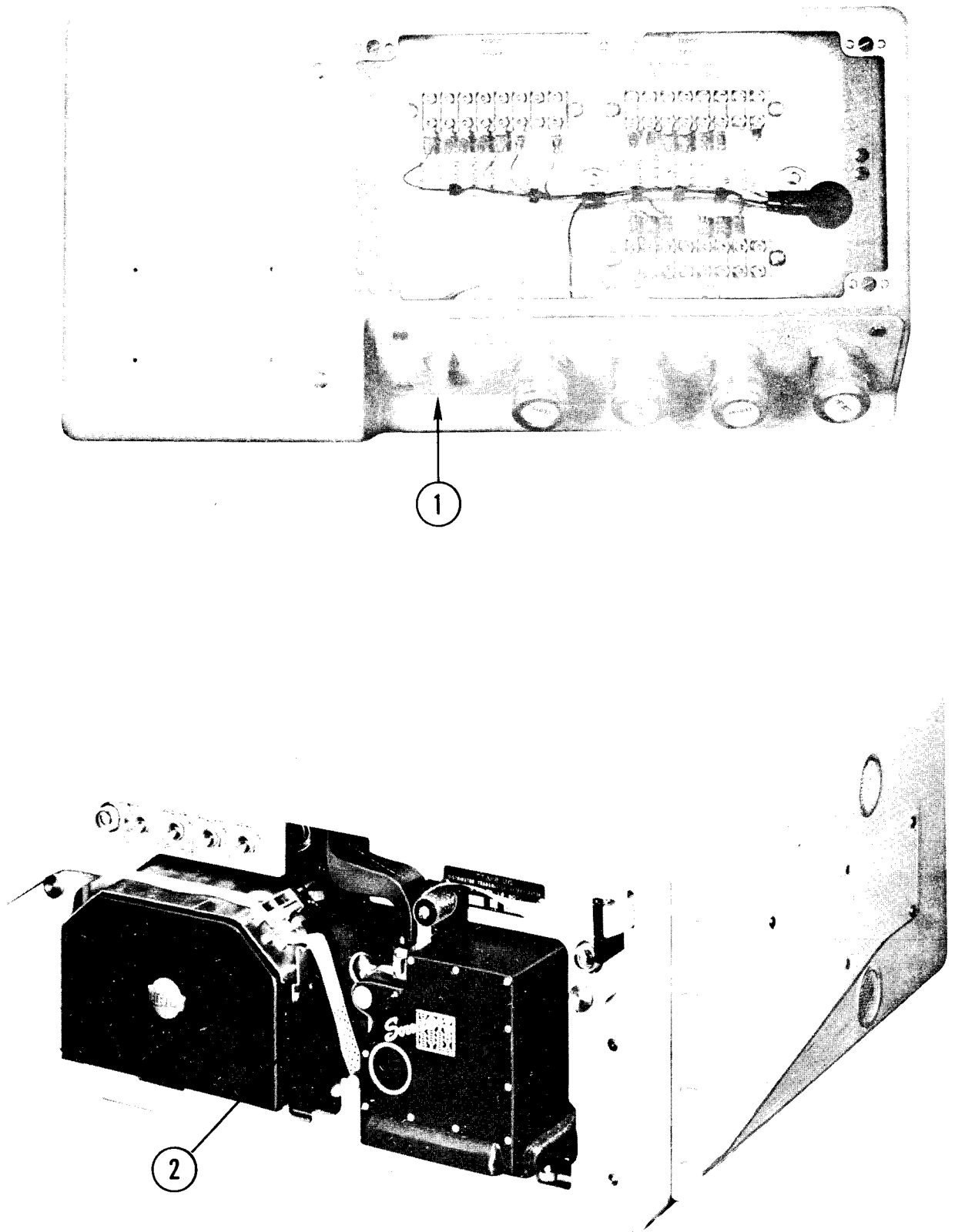


Figure 6-6. (Sheet 1) Perforator Performance Standards

TIME REQUIRED TO PERFORM ALL STEPS - 45 MINUTES

STEPS 1 AND 1.1

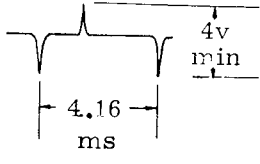
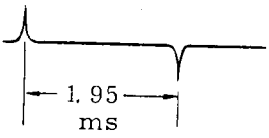
STEP		PRELIMINARY ACTION	READ INDICATION ON	PERFORMANCE STANDARD
NO.	ACTION REQUIRED			
1	Observe timing generator synchronizing signal waveform.	Insert T coaxial adaptor between SYN connector J9003 and external coaxial cable. Connect vertical input of oscilloscope between center conductor and outer conductor of T coaxial adaptor. Apply continuous punch signal to channel 1 of perforator-reader. Start perforator-reader by following procedures given in paragraph 3-3b. Adjust oscilloscope controls so as to provide for synchronization with 60-cps power line. Adjust oscilloscope intensity, focus, attenuation, and sweep speed control so as to obtain a good trace. Observe amplitude of waveform on oscilloscope, amplitude of pulse should be 4 volts minimum, peak to peak.	Oscilloscope, Tektronix 535 or 545	 <p style="text-align: center;">4.16 ms</p> <p style="text-align: right;">4v min</p>
1.1	Observe timing generator synchronizing signal waveform.	Connect a 10 to 1 attenuator probe from channel 1 terminal (brown wire) of terminal board TB9001 to vertical input terminal of oscilloscope. This will feed both synchronizing and punch signals into vertical deflection plates of oscilloscope so that a comparison can be made for timing. Observe waveform of synchronizing signal; it should consist of a negative and a positive pulse. The distance between a positive pulse and next negative pulse should be 1.95 milliseconds. Duration of pulses should be 0.25 milliseconds. Observe channel 1 punch signal;	Oscilloscope, Tektronix 535 or 545	 <p style="text-align: center;">1.95 ms</p>

Figure 6-6. (Sheet 2) Perforator Performance Standards

STEPS 1.1 AND 2

STEP		PRELIMINARY ACTION	READ INDICATION ON	PERFORMANCE STANDARD
NO.	ACTION REQUIRED			
1.1 cont.		it should be a square wave with leading edge coincident with negative synchronizing pulse, lasting 2.155 milli-seconds.		.
2	Measure distance between two feed holes punched six inches apart on the tape	Punch R-Y code on at least six inches of tape.	Six-inch precision ruler.	R-Y character punched out on tape. Distance between centers of holes should be 6 ± 0.005 inches.

Figure 6-6. (Sheet 3) Perforator Performance Standards

(2) SUPER-SPEED PERFORATOR.

(a) REMOVAL. - To remove the perforator, loosen two captive screws from under the perforator mounting bracket, separate the drive motor belt from the punch drive chart, pull the perforator part way from the mounting bracket. The chad chute will come with the perforator. Remove the perforator from the mounting bracket.

(b) DISASSEMBLY. - Separate the chad chute and guide roller assembly from the perforator by removing the two attaching socket head screws and one hex nut. Remove the timing belt from the feed and punch shaft gears. Disengage the tape depressor spring, remove the mounting screw, and separate the tape depressor from the perforator. Further disassembly is not recommended.

(c) ADJUSTMENT. - Adjustment of the disassembled parts is not possible. After reassembly, adjust as indicated in paragraph 6-2 c.

(d) REPAIR. - Dented or bent parts can be straightened if the location of the damage on the part so warrants, and if the original shape can be restored to the original tolerances.

(e) STANDARDS. - Complete information for the selection of substitute replacement parts cannot be given except by means of the manufacturing drawings. Except for hardware, the parts of the perforator have no commercial equivalents and can be obtained only from the manufacturer.

(f) REASSEMBLY. - Reassembly procedures are generally the reverse of disassembly. When installing the timing belt, align the feed shaft pulley and punch shaft pulley as shown in figure 6-8.

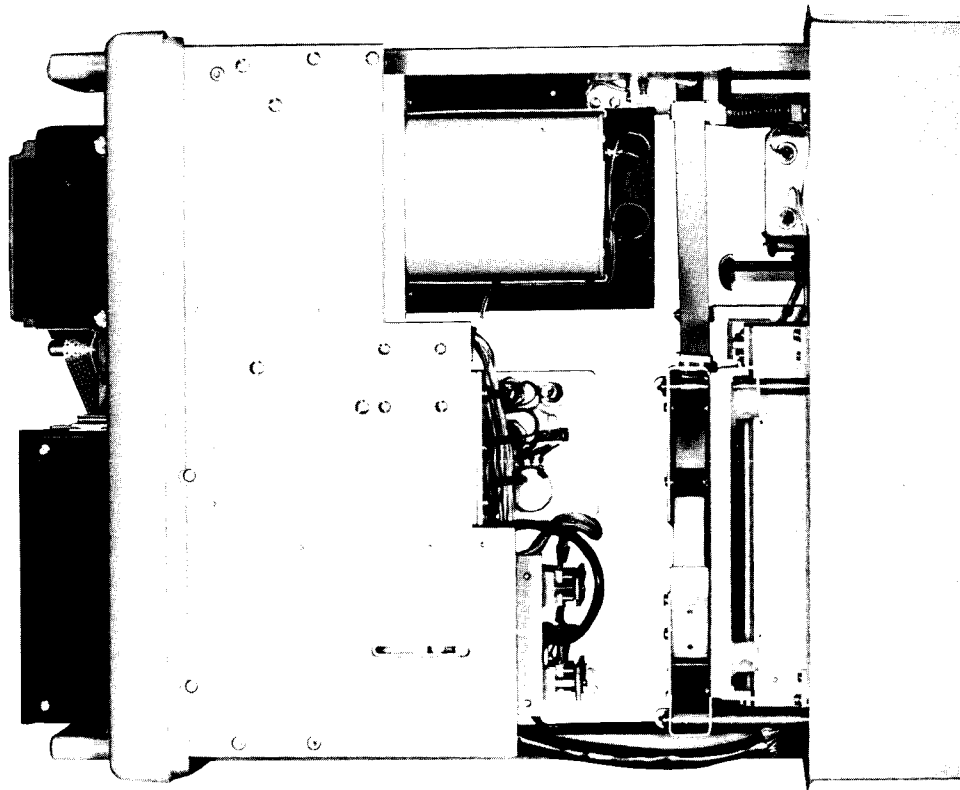


Figure 6-7. Perforator-Reader Electrical Equipment Case, Bottom View

NOTE

On punches with serial numbers 169 and above (serial number indicated on top of die plate assembly), alignment of the punch shaft pulley and feed shaft pulley requires aligning the two pulleys so that the slots cut in the disc and pulley create a straight line as shown in figure 6-8.

On punches with serial numbers 168 and below, alignment of the punch shaft pulley and feed shaft pulley requires that the two pulleys be aligned so that the dot on the punch shaft and the dot on the feed shaft pulley are immediately adjacent each other, as is shown in the exploded portion of figure 6-8.

(3) TRANSMITTER - DISTRIBUTOR TT-187/UG. - Repair and adjustment procedures for the reader are given in NAVSHIPS 92733.

d. WIRING DIAGRAM. - Figure 6-9 is the wiring diagram for the perforator-reader.

e. OVERALL SCHEMATIC DIAGRAM. - Figure 6-10 is the overall schematic diagram for the perforator-reader. For explanation of test points illustrated on this figure, refer to paragraph 5-1, g.

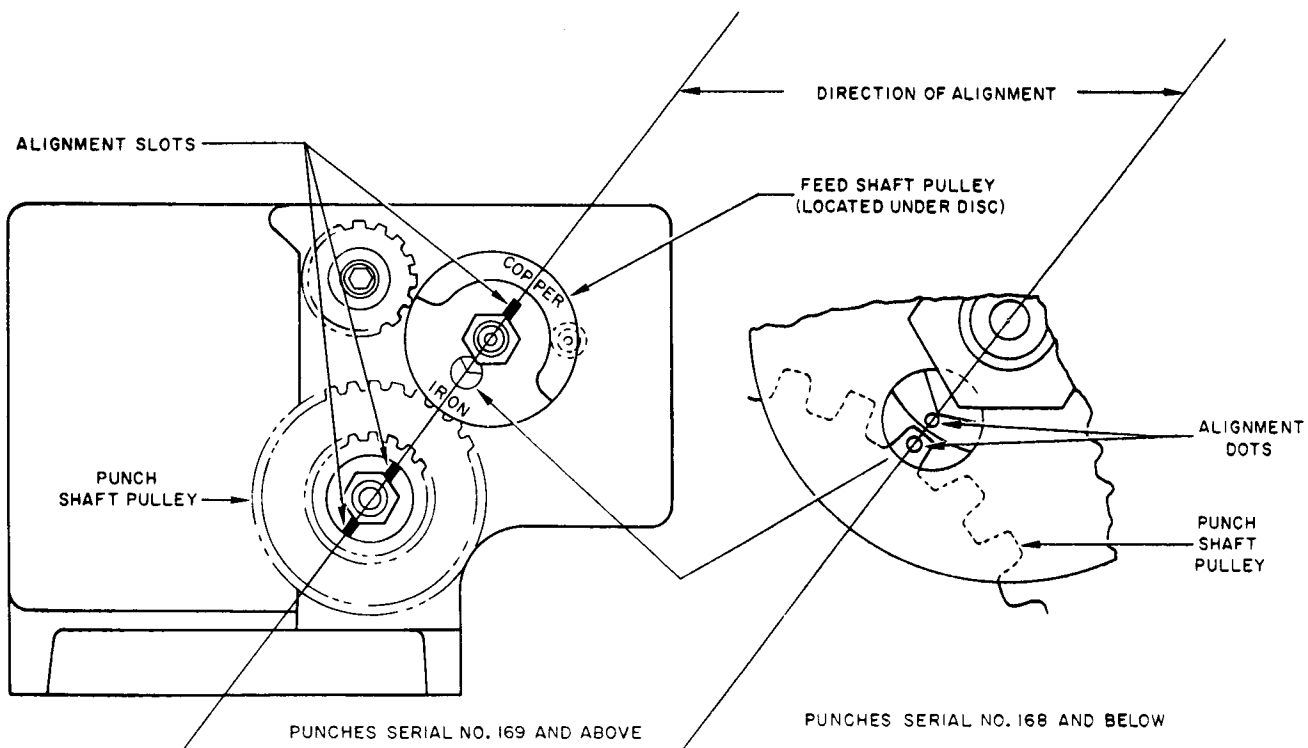
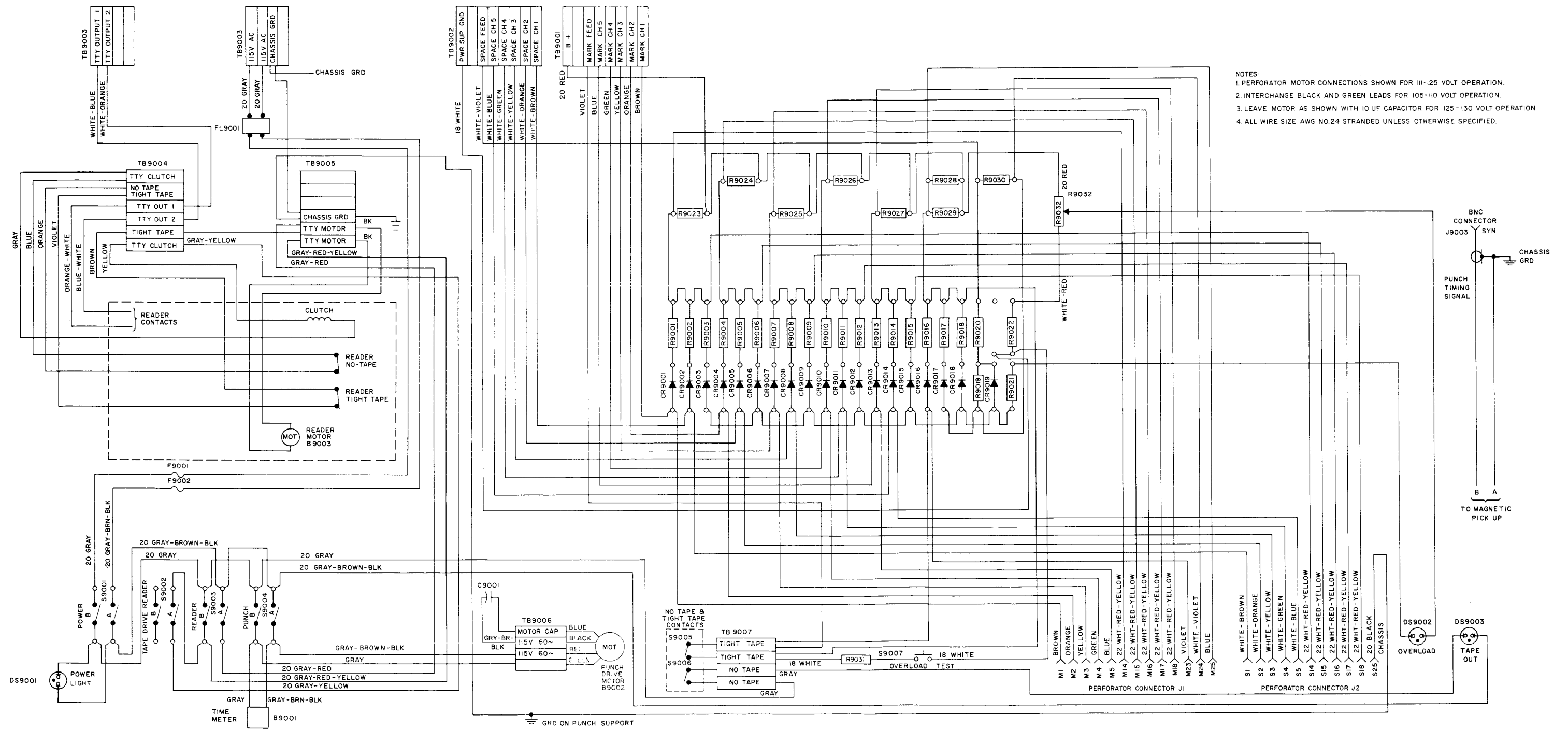


Figure 6-8. Alignment of Perforator Timing Gears



- NOTES:
1. PERFORATOR MOTOR CONNECTIONS SHOWN FOR 111-125 VOLT OPERATION.
 2. INTERCHANGE BLACK AND GREEN LEADS FOR 105-110 VOLT OPERATION.
 3. LEAVE MOTOR AS SHOWN WITH 10 UF CAPACITOR FOR 125-130 VOLT OPERATION.
 4. ALL WIRE SIZE AWG NO.24 STRANDED UNLESS OTHERWISE SPECIFIED.

Figure 6-9. Perforator-Reader, Wiring Diagram

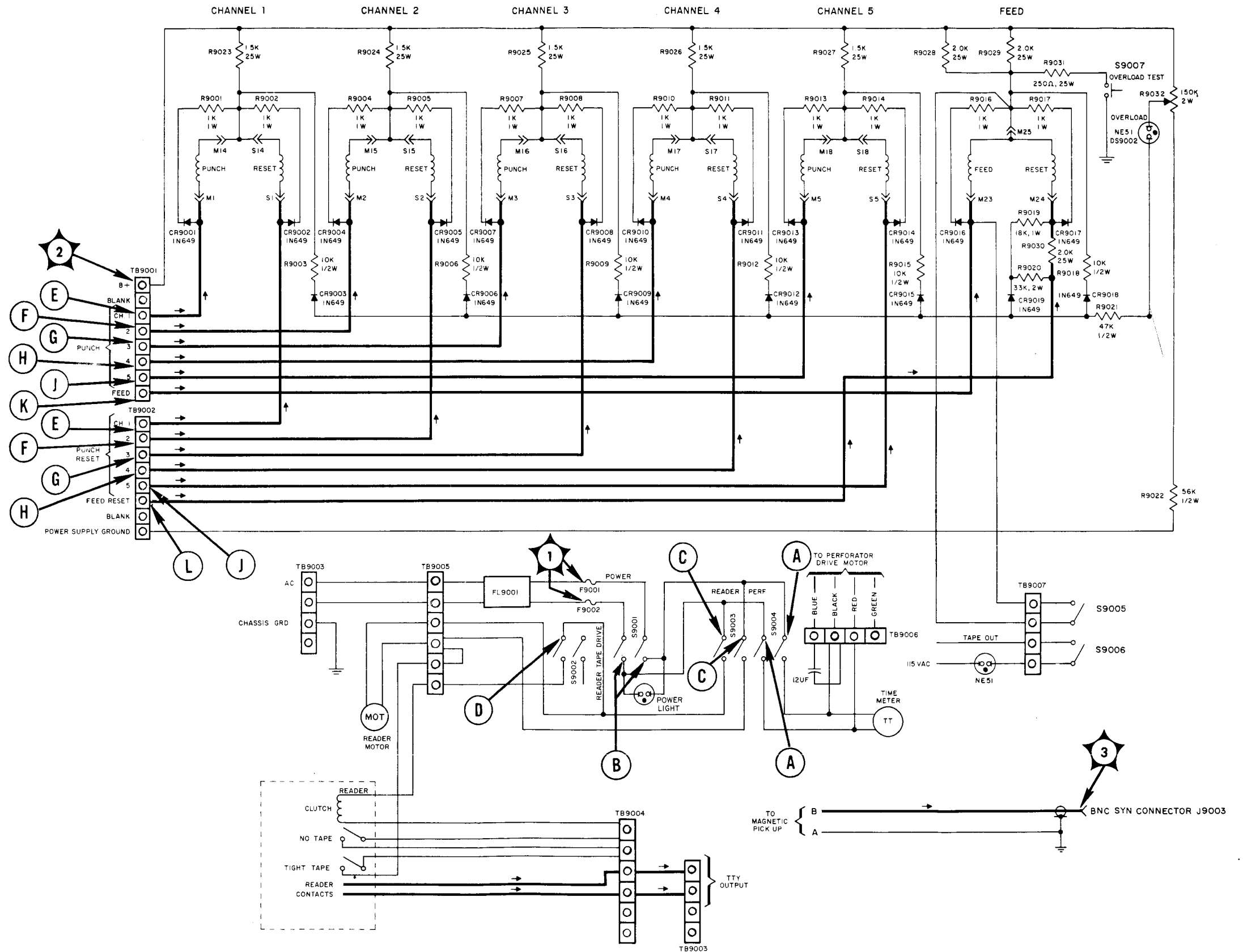


Figure 6-10. Perforator-Reader, Overall Schematic Diagram

ORIGINAL

See T-1 if Form 6-19, 6-20

SECTION 7

PARTS LIST

7-1. INTRODUCTION.

Reference designations have been assigned to identify all maintenance parts of the Reperforator Distributor-Transmitter TT-268/UG (perforator-reader). They are used for marking the equipment (adjacent to the part they identify) and are used on drawings, diagrams, and the parts list. The letter (s) of the reference designation indicate the kind of part (generic group), such as a resistor, capacitor, silicon diode, etc. The number differentiates between parts of the same generic group. Parts of the perforator-reader are numbered from 9001 to 9113. Stock numbers of the parts used in the perforator-reader can be obtained by referring to Stock Number Identification Table (SNIT) published by the Electronics Supply Office.

NOTE

For parts list of the Transmitter-Distributor TT-187/UG (reader), refer to NAVSHIPS 92733.

7-2. MAINTENANCE PARTS LIST.

Table 7-1 lists all maintenance parts of the perforator-reader. The first column lists the reference designations of the various parts in alphabetical and numerical order. The second column refers to explanatory notes (if any) at the end of the table. The third column lists the name and describes the various parts. The fourth column lists how the parts are used and gives their functional location in the equipment. It also includes the figure number of the wiring diagram upon which the part is identified. Complete information is given for all key parts (parts differing from any parts previously listed in this table). The name and description of identical parts are omitted. However, reference is made to the key part or sub-key part for data. The following abbreviation is used in the table in lieu of symbols: P/M for %.

7-3. LIST OF MANUFACTURERS.

Table 7-2 lists manufacturers of parts used in the equipment. The first column includes the manufacturer's code used in table 7-1 to identify manufacturers.

TABLE 7-1. REPERFORATOR DISTRIBUTOR-TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
9001-9113		DISTRIBUTOR-TRANSMITTER, REPERFORATOR: Physical characteristics: Operating power requirements 105/115/125V, 60 cps 1 phase; dimensions: 8-5/8 in. by 17-1/4 in. by 25-6/16 in. ; unit consists of an automatic teletypewriter perforator (made by Soroban Engineering Inc) and a teletypewriter reader (made by Teletype Corp) mounted on a common panel and housed in a common electrical cabinet, unit can be operated rack or table mounted; Govt spec. data: BUSHIPS contract specification SHIPS P-3058; Soroban Engineering Inc. Box 1717, Melbourne, Florida; Perforator-Reader as per SHIPS P-3058	
B9001		METER, TIME TOTALIZING: 27780 Series 7010; 07264 part/dwg A-50045	Running time meter Fig. 6-9
B9002		MOTOR, ALTERNATING CURRENT: 73693 part/dwg GLHJRTD-1549-D72 modified; 07264 part/dwg A-11224	Punch motor Fig. 6-9
CR9001		SEMICONDUCTOR DEVICE, DIODE: 01295 part/dwg 1N649	Transient limiting circuit, punch coil channel 1 Fig. 6-9
CR9002		Same as CR9001	Transient limiting circuit, reset coil channel 1 Fig. 6-9
CR9003		Same as CR9001	Steering diode, overload circuit channel 1 Fig. 6-9
CR9004		Same as CR9001	Transient limiting circuit, punch coil channel 2 Fig. 6-9
CR9005		Same as CR9001	Transient limiting circuit, reset coil channel 2 Fig. 6-9
CR9006		Same as CR9001	Steering diode, overload circuit channel 2 Fig. 6-9
CR9007		Same as CR9001	Transient limiting circuit, punch coil channel 3 Fig. 6-9
CR9008		Same as CR9001	Transient limiting circuit, reset coil channel 3 Fig. 6-9
CR9009		Same as CR9001	Steering diode, overload circuit channel 3 Fig. 6-9
CR9010		Same as CR9001	Transient limiting circuit, punch coil channel 4 Fig. 6-9
CR9011		Same as CR9001	Transient limiting circuit, reset coil channel 4 Fig. 6-9
CR9012		Same as CR9001	Steering diode, overload circuit channel 4 Fig. 6-9

TABLE 7-1. REPERFORATOR DISTRIBUTOR-TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST (cont)

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
CR9013		Same as CR9001	Transient limiting circuit, punch coil channel 5 Fig. 6-9
CR9014		Same as CR9001	Transient limiting circuit, reset coil channel 5 Fig. 6-9
CR9015		Same as CR9001	Steering diode, overload circuit channel 5 Fig. 6-9
CR9016		Same as CR9001	Transient limiting circuit, feed coil feed circuit Fig. 6-9
CR9017		Same as CR9001	Transient limiting circuit, reset coil feed circuit Fig. 6-9
CR9018		Same as CR9001	Steering diode, overload circuit feed circuit Fig. 6-9
C9001		CAPACITOR, FIXED, PAPER DIELECTRIC: 400 Vdc, 12 uf plus 1.42 Pct; 12 uf to 12.17 uf capacity range; Metal; Uninsulated, hermetically sealed; D- 1.25 in. deep, H- 3.75 in. high, W- 4.75 in. wide; MIL; MIL-C-25; 56289 part/dwg P48637	Punch drive motor starting capacitor Fig. 6-9
DS9001		LIGHT, INDICATOR: Supplied w/lens, 5/8 in. dia; Plastic; colorless; Smooth face, smooth back; 72619 part/dwg 95408-937	Power indicator light Fig. 6-9
DS9002		Same as DS9001	Overload indicator light Fig. 6-9
DS9003		Same as DS9001	Tape out indicator light Fig. 6-9
FL9001		FILTER, RADIO INTERFERENCE: AC; 115V; 5 amp; 81831 part/dwg FA-3119	Input power filter Fig. 6-9
F9001		FUSE, CARTRIDGE: 5 amp; 250 V max; normal instantaneous; MIL; MIL-F-15160 type MS90078-14	Input power line fuse Fig. 6-9
F9002		Same as F9001	Same as F9001
F9003		Same as F9001	Spare fuse
J9001		CONNECTOR, RECEPTACLE, ELECTRICAL: Low loss plastic dielectric; 71468 part/dwg DBF-25S-C7	Interconnecting wiring disconnect point Fig. 6-9
J9002		Same as J9001	Same as J9001
J9003A		CONNECTOR, RECEPTACLE, ELECTRICAL: Low loss plastic dielectric; MIL; MIL-C-3608 type UG-492A/U	Same as J9001
J9003B		Same as J9003A	Same as J9001
MP9001		CONNECTOR: Straight, male thd with tapered rubber bushing, watertight; 15235 part/dwg CGB195	Rear cover plate
MP9002		Same as MP9001	

TABLE 7-1. REPERFORATOR DISTRIBUTOR-TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST (cont)

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
MP9003		CONNECTOR: Straight, male thd with tapered rubber bushing, watertight; 15235 part/dwg CGB194	Rear cover plate
MP9004		Same as MP9003	
MP9005		SPRING, HELICAL, COMPRESSION: Cres, 300 series, passivated; 07264 part/dwg A-8340	Handle pushbutton return spring
MP9006		Same as MP9005	
MP9007		MOUNT, RESILIENT: 76005 part/dwg HTO-7	Punch and motor shock mount
MP9008		SCREW, EXTERNALLY RELIEVED BODY: Cres; 94222 part/dwg 58-26-309-23	Punch mounting screw
MP9009		Same as MP9008	
MP9010		PACKING, PREFORMED: Vinyl-plastic; 94222 part/dwg 58-42-0-63	Punch mounting screw retainer
MP9011		Same as MP9010	
MP9012		MOUNT, RESILIENT: 76005 part/dwg HTO-5	Reader and motor shock mount
MP9013		Same as MP9012	
MP9014		Same as MP9012	
MP9015		SLACK ARM ASSEMBLY: Slack arm subassy with angle bracket screwed in one end holding a roller shaft that accommodates a roller assy; 07264 part/dwg B-8362-P5	Tape slack take up located on right side of back panel
MP9016		BUSHING, SLEEVE: Nylon (FM 10001); 07264 part/dwg A-8419A-P2	Sleeve for slack arm return spring
MP9017		SPRING, HELICAL COMPRESSION: Music wire; 07264 part/dwg A-8420-P2	Slack arm tension
MP9018		TUBE ASSEMBLY: Tube, cres, pass., 2.140 in. lg, 0.59 dia, partially threaded with two teflon, flanged bushings pressed in each end; 07264 part/dwg B1701, G10	Bearing and housing for slack arm pivoting
MP9019		SPRING STOP ASSEMBLY: Circular, cres, member with eight bent flanges soldered to a nut, plain, hexagon; 07264 part/dwg A-11236	Retains spring for slack arm tension
MP9020		SHAFT, SLACK ARM: Cres, pass., 3 in. lg, one end milled to four flat surfaces, other end milled to two flat surfaces; 07264 part/dwg B-8398	Slack arm pivot shaft
MP9021		BUMPER: G-R-M 40 durometer, neoprene; 75543 part/dwg 727-R	Stops slack arm travel
MP9022		Same as MP9021	
MP9023		NUT CLIP: Cres, 0.50 in. lg, 0.437 in. wide, U shaped, with No. 6-32 tapped hole in one surface, No. 26 drilled hole in other surface; 07264 part/dwg; A-11248-P1	For captivating insulator barrier strip screws
MP9024		NUT CLIP: Cres, 0.50 in. lg, 0.437 in. wide, U shaped, with No. 4-40 tapped hole in one surface, No. 30 drilled hole in other surface; 07264 part/dwg A-11248-P2	For captivating insulator barrier strip screws
MP9025		LOCKSPRING, TURNLOCK FASTENER: Music wire, Cad. Pl., S shaped, height 0.150; 72794 part/dwg S3-150	Access cover retainer (case)

TABLE 7-1. REPERFORATOR DISTRIBUTOR-TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST (cont)

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
MP9026		Same as MP9025	
MP9027		Same as MP9025	
MP9028		Same as MP9025	
MP9029		Same as MP9025	
MP9030		Same as MP9025	
MP9031		RING, RETAINING: Carbon spring steel; 79136 part/dwg 5555-12	Retains tape roller guide (supply box)
MP9032		ROLLER AND SHAFT ASSEMBLY: Sleeve and roller assembly with tapped shaft inserted in sleeve with bearings; bearings mounted with grip rings and shims; 07264 part/dwg B-11231, G2	Keeps tape roll from binding (supply box)
MP9033		Same as MP9032	
MP9034		CABLE ARM: 2024-T4 AL AL; 0.375 in. thk, 0.750 in. wide, 12.375 in. lg; Two 0.250 in. dia holes drilled 0.187 in. from the ends; Two No. 6-32 holes tapped in the sides; 07264 part/dwg A-11120	Part of cable retracting mechanism
MP9035		Same as MP9034	Same as MP9034
MP9036		PIVOT BLOCK, CABLE ARM: 2024-T4 AL AL, 1 in. lg, 0.750 in. wide, 0.558 in. thk, one 0.250 in. dia hole drilled thru length, two No. 6-32 tapped holes in the side; 07264 part/dwg A-11121	Same as MP9034
MP9037		Same as MP9036	Same as MP9034
MP9038		PIVOT PIN: 303 cres, 0.250 in. dia, 1.837 in. lg, with straight knurl on length of shaft; 07264 part/dwg A-11161, T1	Same as MP9034
MP9039		Same as MP9038	Same as MP9034
MP9040		PIVOT PIN: 303 cres, 0.250 in. dia, 1.593 in. lg, with straight knurl on length of shaft; 07264 part/dwg A-11161, T2	Same as MP9034
MP9041		RING, RETAINING: Carbon spring steel; 79136 part/dwg 5103-25	
MP9042		Same as MP9041	
MP9043		Same as MP9041	
MP9044		Same as MP9031	Retains roller, retains cam
MP9045		Same as MP9031	
MP9046		ADAPTER, SWITCH ACTUATOR: Roller leaf actuator, cres frame and leaf; oil impregnated bronze roller: 91929 part/dwg JS-5	Actuates switch (tape sensor)
MP9047		Same as M9046	Same as MP9046
MP9048		SPRING, HELICAL, TORSION: 12 gage, 0.304 mean dia, two and one third turns coiled left hand; 07264 part/dwg A-10085-P1	Keeps tension on tape sensor roller
MP9049		PIN: 0.125 in. dia., 0.875 in. lg; 83584 part/dwg G	Retains spring in tape sensing mechanism

TABLE 7-1. REPERFORATOR DISTRIBUTOR-TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST (cont)

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
MP9050		Same as MP9049	
MP9051		GROMMET, RUBBER: G-R-M 40 durometer neoprene; 75543 part/dwg 903	Prevents wire chaffing
MP9052		SLIDE ASSEMBLY: Left hand; Ball bearing type; 07264 part/dwg C-11216-P2	LH Drawer slide assembly
MP9053		SLIDE ASSEMBLY: Right hand; Ball bearing type; 07264 part/dwg C-11215-P2	RH Drawer slide assembly
MP9054		Same as MP9007	Punch and motor shock mount
MP9055		MOUNT, RESILIENT: 76005 part/dwg HTO-3	Punch and motor shock mount
MP9056		ROLLER: Nylatron GS; 0.375 in. lg, 0.750 in. O.D., 0.200 ID; 07264 part/dwg C-0031, T33	Retains chad box in position when drawer is closed
MP9057		PIN, SPRING: Cres, pass.; MS171596	Shaft for chad box roller
MP9058		GROMMET, RUBBER: G-R-M 40 durometer neoprene; 75543 part/dwg 917	Same as MP9051
MP9059		Same as MP9031	Retains chad chute roller
MP9060		HIGH SPEED PUNCH: 07264 part/dwg GP-2	Tape punch
MT9001		TRANSDUCER, MOTIONAL PICKUP: 81692 part/dwg 3010-AN	Syn signal pickup
P9003		CONNECTOR, PLUG, ELECTRICAL: 2 Contacts; 2 Connector mating ends; MIL; MIL-C-3608 type UG-88 B/U	Interconnecting wiring disconnect Fig. 6-9
R9001		RESISTOR, FIXED, COMPOSITION: 1000 ohms P/M 10 Pct; 1 W; Rated at 70 deg C ambient temp; F; MIL; MIL-R-11 type RC32GF102K; 01121 part/dwg GB1021	Transient limiting, channel 1 Fig. 6-9
R9002		Same as R9001	Same as R9001
R9003		RESISTOR, FIXED, COMPOSITION: 10000 ohms P/M 5 Pct; 1/2W; Rated at 70 deg C ambient temp; F; MIL; MIL-R-11 type RC20GF103K; 01121 part/dwg EB 1031	Series dropping, over- load circuit channel 1 Fig. 6-9
R9004		Same as R9001	Transient limiting, channel 2 Fig. 6-9
R9005		Same as R9001	Same as R9004
R9006		Same as R9003	Series dropping, over- load circuit channel 2 Fig. 6-9
R9007		Same as R9001	Transient limiting, channel 3 Fig. 6-9
R9008		Same as R9001	Same as R9007
R9009		Same as R9003	Series dropping, over- load circuit channel 3 Fig. 6-9

TABLE 7-1. REPERFORATOR DISTRIBUTOR- TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST (cont)

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R9010		Same as R9001	Transient limiting, channel 4 Fig. 6-9
R9011		Same as R9001	Same as R9010
R9012		Same as R9003	Series dropping, overload circuit channel 4 Fig. 6-9
R9013		Same as R9001	Transient limiting, channel 5 Fig. 6-9
R9014		Same as R9001	Same as R9013
R9015		Same as R9003	Series dropping, overload circuit channel 5 Fig. 6-9
R9016		Same as R9001 - see T-1 if Fe made	Transient limiting, feed circuit Fig. 6-9
R9017		Same as R9001	Same as R9016
R9018		Same as R9003	Series dropping, overload circuit of feed circuit Fig. 6-9
R9019		RESISTOR, FIXED, COMPOSITION: 18000 ohms P/M 5 Pct; 1 W; Rated at 70 deg C ambient temp; F; MIL; MIL-R-11 type RC32GF183J; 01121 part/dwg GB1835	Transient limiting, feed reset circuit Fig. 6-9
R9020		RESISTOR, FIXED, COMPOSITION: 33000 ohms P/M 5 Pct; 2 W; Rated at 70 deg C ambient temp; F; MIL; MIL-R-11 type RC42GF333J; 01121 part/dwg HB3335	Same as R9019
R9021		RESISTOR, FIXED, COMPOSITION: 47000 ohms P/M 10 Pct; 1/2 W; Rated at 70 deg C ambient temp; F; MIL; MIL-R-11 type RC20GF473K; 01121 part/dwg EB4731	Series dropping, over- load circuit Fig. 6-9
R9022		RESISTOR, FIXED, COMPOSITION: 56000 ohms P/M 10 Pct; 1/2 W; Rated at 70 deg C ambient temp; F; MIL; MIL-R-11 type RC20GF563K; 01121 part/dwg EB5631	Same as R9021
R9023		RESISTOR, FIXED, WIRE WOUND: Inductive winding; 1500 ohms P/M 3 Pct; 25 W; 350 deg C max continuous operating temp; 40 deg C ambient temp; 91637 type PH-25	Current limiting, channel 1 Fig. 6-9
R9024		Same as R9023	Current limiting, channel 2 Fig. 6-9
R9025		Same as R9023	Current limiting, channel 3 Fig. 6-9
R9026		Same as R9023	Current limiting, channel 4 Fig. 6-9
R9027		Same as R9023	Current limiting, channel 5 Fig. 6-9
R9030		RESISTOR, FIXED, WIRE WOUND: Inductive winding; 2000 ohms P/M 3 Pct; 25 W; 350 deg C max continuous operating temp; 40 deg C ambient temp; 91637 type PH-25	Current limiting, feed reset Fig. 6-9
R9031		RESISTOR, FIXED, WIRE WOUND: Inductive winding; 250 ohms P/M 3 Pct; 25 W; 350 deg C max continuous operating temp; 40 deg C ambient temp; 91637 type PH-25	Current limiting, overload test cir- cuitry Fig. 6-9

TABLE 7-1. REPERFORATOR DISTRIBUTOR-TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST (cont)

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R9032		RESISTOR, VARIABLE: Composition element; 1 section; 150000 ohms 2W; 12697 part/dwg 53C2-150K-S	Voltage adjustment overload light Fig.6-9
S9001		SWITCH, TOGGLE: Double pole, single throw; MIL; MIL-S-21195; 75382 part/dwg ST-52K	Main power switch Fig. 6-9
S9002		Same as S9001	Reader tape drive switch Fig. 6-9
S9003		Same as S9001	Reader motor switch Fig. 6-9
S9004		Same as S9001	Punch motor switch Fig. 6-9
S9007		SWITCH, PUSH: Type SS sealed pushbutton switch with J-1 actuator; 80207 part/dwg S-6743	Overload test switch Fig. 6-9
TB9001		TERMINAL BOARD: Terminals included; 8; solder stud type; MIL; MIL-T-16784 type 8TB8	Interconnecting wiring tie point Fig. 6-9
TB9002		Same as TB9001	Same as TB9001
TB9003		Same as TB9001	Same as TB9001
TB9004		TERMINAL BOARD: Terminals included; 6; solder stud type; MIL; MIL-T-16784 type 8TB6	Same as TB9001
TB9005		Same as TB9004	Same as TB9001
TB9006		TERMINAL BOARD: Terminals included; 6; solder stud type; MIL; MIL-T-16784 type 8TB6 modified; 07264 part/dwg A-8487	Same as TB9001
TB9007		Same as TB9006	Same as TB9001
XF9001		FUSEHOLDER: Extractor post type; 75915 part/dwg 342012	Fuseholder for F9001
XF9002		Same as XF9001	Fuseholder for F9002
XF9003		Same as XF9001	Fuseholder for F9003
M9101		BELT, TIMING: 46 tooth, 0.250 in. wide, pitch circumference 10.7640, neoprene teeth, tension member No. 4 cord fortisan, neoprene backing; 97487 part/dwg 30038-T4N10	Timing belt
M9102		BELT, POSITIVE DRIVE: 51 tooth, 0.250 in. wide, pitch circumference 11.9340, neoprene teeth nylon facing, tension member No. 4 cord fortisan, neoprene backing; 97487 part/dwg 9465-T4N10	Drives punch
M9103		ROLLER BRACKET, TAPE HOLDER: 16 gage, 1010-1020 cres, 0.375 in. thk, 0.785 in. wide, 1.187 in. lg; 0.125 in. dia holes drilled in each side, two No. 17 holes drilled in flange; 07264 part/dwg A-9221-P2A	Holds tape roller (supply box)
M9104		ROLLER SHAFT: 303 cres, centerless ground, 1.062 in. lg, 0.1249 OD; 07264 part/dwg A-11243A-T4	
M9105		ROLLER ASSEMBLY: Nylatron GS, flanged roller, 0.770 in. lg, 0.562 in. OD; with two flanged, radial retainer, double shield, alloy high carbon chrome steel, bearings pressed in each end; 07264 part/dwg A-11238	Upper tape roller guide, supply box

TABLE 7-1. REPERFORATOR DISTRIBUTOR-TRANSMITTER TT-268/UG
MAINTENANCE PARTS LIST (cont)

PERFORATOR-READER

REF DES	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
M9106		CHANNEL SUB-ASSEMBLY: Channel, 14.713 in. lg, 0.1240 in. wide, with a bracket with four flanges soldered to the channel: 07264 part/dwg C-11255	Guides tape
M9107		ROLLER ASSEMBLY: Nylatron GS roller, 0.770 in. lg, 0.375 in. dia of flanges, 0.312 and 0.625 dias of roller; with flanged radial retainer, alloy high carbon chrome steel, bearings pressed in each end; 07264 part/dwg A-11258	Tape roller guide (channel)
M9108		Same as M9105	Guides tape on component panel
M9109		Same as M9105	Upper tape guide roller (supply box)
M9111		TAPE ROLLER ASSEMBLY: Teflon sleeve 1.125 in. lg, 0.250 in. dia with a molded 5-10 durometer neoprene roller 1.062 in. lg, 0.750 OD, around the sieve; 07264 part/dwg A-11242	Tape roller (chad chute)
M9113		TAPE SCRAPER: cres 303, 0.005 in. thk, 3 in. lg, 0.500 in. wide, with 75° angle at one end: 07264 part/dwg A-11227	Cleaning tool for punch

TABLE 7-2. LIST OF MANUFACTURERS

MANUFACTURERS CODE	NAME	ADDRESS
01121	Allen-Bradley Co	136 W. Greenfield Ave, Milwaukee 4, Wis.
01295	Texas Instruments, Inc Semiconductor Components Div	3609 Buffalo Speedway, Houston 6, Tex.
07264	Soroban Engineering, Inc	P O Box 1717, Melbourne, Fla.
12697	Clarostat Mfg Co, Inc	Dover, N. H.
15235	Crouse-Hinds Co	Syracuse, N. Y.
27780	Haydon Mfg Co, Inc	Torrington, Conn.
56289	Sprague Electric Co	235 Marshall St, North Adams, Mass.
71468	Cannon Electric Co	3208 Humbolt St, Los Angeles, Calif.
72619	Dialight Corp	60 Stewart Ave, Brooklyn 37, N. Y.
72794	Dzus Fastener Co, Inc	P O Box 185, Babylon, N. Y.
73693	Electric Indicator Co	Camp Ave, Stamford, Conn.
75382	Kulka Electric Mfg Co	633-643 S. Fulton Ave, Mt. Vernon, N. Y.
75543	Lavelle Rubber Co	424 North Wood St, Chicago 22, Ill.
75915	Littlefuse, Inc	1865 Main St, Des Plaines, Ill.
76005	Lord Mfg Co	1635 W. 12th St, Erie, Pa.
79136	Waldes-Kohinoor, Inc	47-16 Austel Pl., Long Island City, N. Y.
80207	Unimax Switch Div The M.L. Maxson Corp	1 Ves Road, Wallingford, Conn.
81692	Electro Products Lab	4501 North Ravenswood Ave, Chicago 40, Ill.
81831	Filtron Co, Inc	131-15 Fowler Ave, Flushing 55, N. Y.
83584	Driv Loc Pin Co	Sycamore, Ill.
91637	Dale Products, Inc	1356 28th Ave, Columbus, Neb.
91929	Minneapolis Honeywell Regulator Co, Micro Switch Div	Freeport, Ill.
94222	Southco Division of South Chester Corp	3rd St, Lester, Pa.
97487	United States Rubber Co, Mechanical Goods Div	Chicago, Ill.

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