

DINAMAP™
TREND RECORDER
MODELS 950, 950A, AND 950B

OPERATION/SERVICE MANUAL

Critikon, Inc.
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LIST OF EFFECTIVE PAGES

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WARRANTY

CRITIKON, INC. ("CRITIKON") warrants to the purchaser that the DINAMAPTM Trend Recorder Models 950, 950A, and 950B, exclusive of expendable parts and other accessories, shall be free from defects in material and workmanship for a period of one year from the date of purchase. Critikon's sole obligation with respect to any such defect is limited to the repair, or at Critikon's option, replacement of the Recorder.

This warranty is made on the condition that prompt notification of a defect is given to Critikon within the warranty period. Critikon shall have the sole right to determine whether a defect exists. On receipt of shipping instructions by Critikon's Field Service, forward the Recorder to Critikon, transportation prepaid. Repairs shall be made at the designated service center, and the Recorder will be returned to the purchaser prepaid.

This warranty does not apply to Recorders that have been altered, subjected to misuse, negligence, unauthorized repair, or accident, or operated other than in accordance with the instructions.

This warranty represents the exclusive obligation of Critikon and the exclusive remedy of the purchaser regarding defects in a Recorder. This warranty is given in lieu of any expressed or implied warranties, including the warranty of merchantability or fitness for a particular purpose. No person is authorized to modify, in any manner, our obligation described above.

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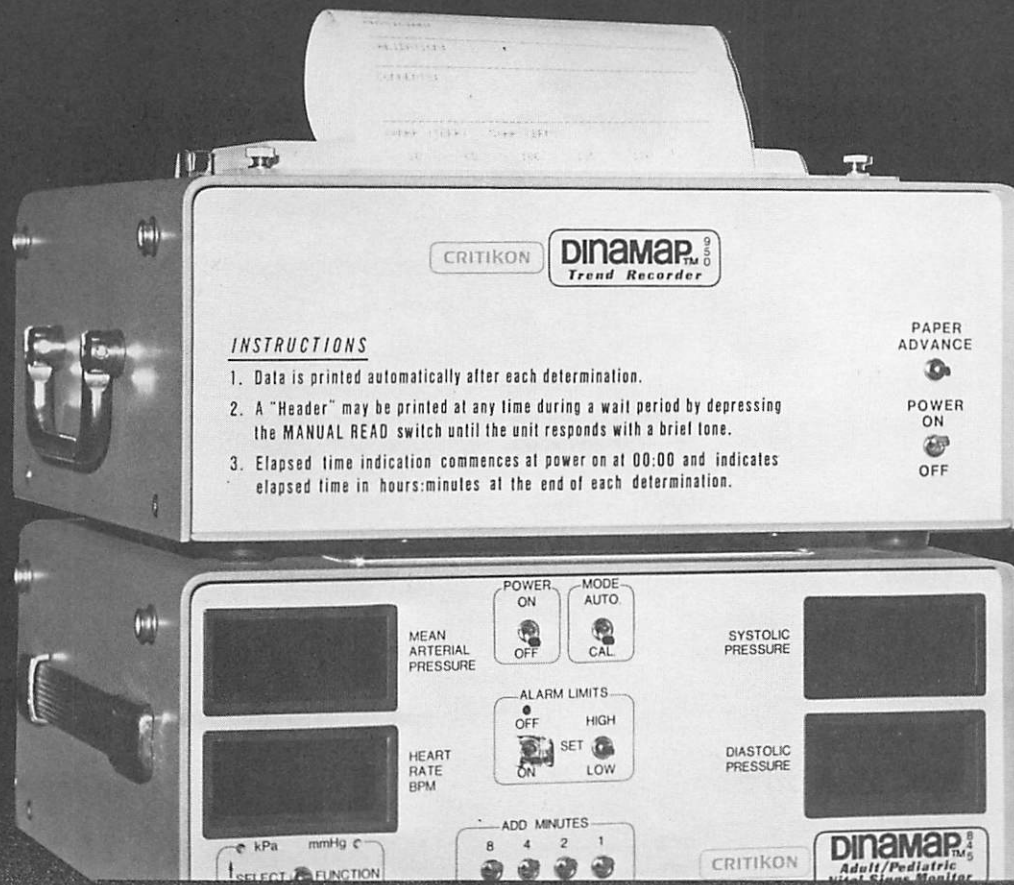


FIGURE 1-1. DINAMAPTM TREND RECORDER MODEL 950

SECTION 1. INTRODUCTION

1.1 General

The DINAMAP™ Trend Recorder, when connected to a DINAMAP™ Monitor, will provide the clinician with a printed, permanent record of the Monitor's determinations.

The Recorder is a thermal printer which, under a Monitor's microcomputer control, generates an alpha-numeric printout of the Monitor's determinations as well as information useful in documenting and analyzing these determinations.

1.2 Purpose of the Manual

This manual provides both operation and service for the Trend Recorder (Models 950, 950A, and 950B). Note that the only difference among the 950, 950A, and 950B is color.

Sections of this manual pertinent to the Recorder's operation, along with the Operation Manual for the Monitor being used should be read thoroughly to ensure proper operation and satisfactory results.

1.3 Manual Changes

If, in the normal use of this manual, errors, omissions, or incorrect data are noted, please complete the Publications Change Request Form included in the back of this manual. Submit the form to:

Technical Communications
Critikon, Inc.
1410 N. Westshore Blvd.
Tampa, Florida 33607

Such inputs will be evaluated and appropriate action will be taken to revise this manual.

Revision of this manual, either in response to user's inputs or to continuing product improvement, will be accomplished through reprinting. Changes between printings will be communicated through Change Information Sheets and replacement pages. If a Change Information Sheet does not accompany this manual, your manual is correct as printed.

SECTION 2. OPERATING FEATURES

The DINAMAP™ Trend Recorder is a thermal printer which consists of a thermal print head, a microcomputer-based controller, and associated drive mechanisms. The Recorder's internal components and their functions are described in detail in Section 6 Electro/Mechanical Description.

The Recorder is not a stand-alone device. To operate, it must be connected to a DINAMAP™ Monitor since it relies on software stored in the Monitor. An interface cable is supplied with each Recorder for this purpose.

Also supplied with each Recorder are two rolls of thermal recorder paper. Each 167-foot roll permits up to 99 hours of continuous recording at the rate of one determination per minute (nominal). The paper has a heat-sensitive coating on one side (the shiny side) which darkens when heated by elements in the thermal print head. Images darkened onto the heat-sensitive paper form the alpha-numeric characters. A sample printout is illustrated in Figure 2-1. This printout reflects determination results obtained by a DINAMAP™ Adult/Pediatric Vital Signs Monitor Model 845 when connected to a DINAMAP™ Trend Recorder Model 950.

NOTE: The print format and the information recorded by the Trend Recorder will vary depending on the type of DINAMAP™ Monitor used. These variations are explained in Figure 2-2.

The following paragraphs explain each section of the sample printout shown in Figure 2-1.

A header is provided so that the clinician can insert information which will help in the identification and filing of a patient's vital signs record.

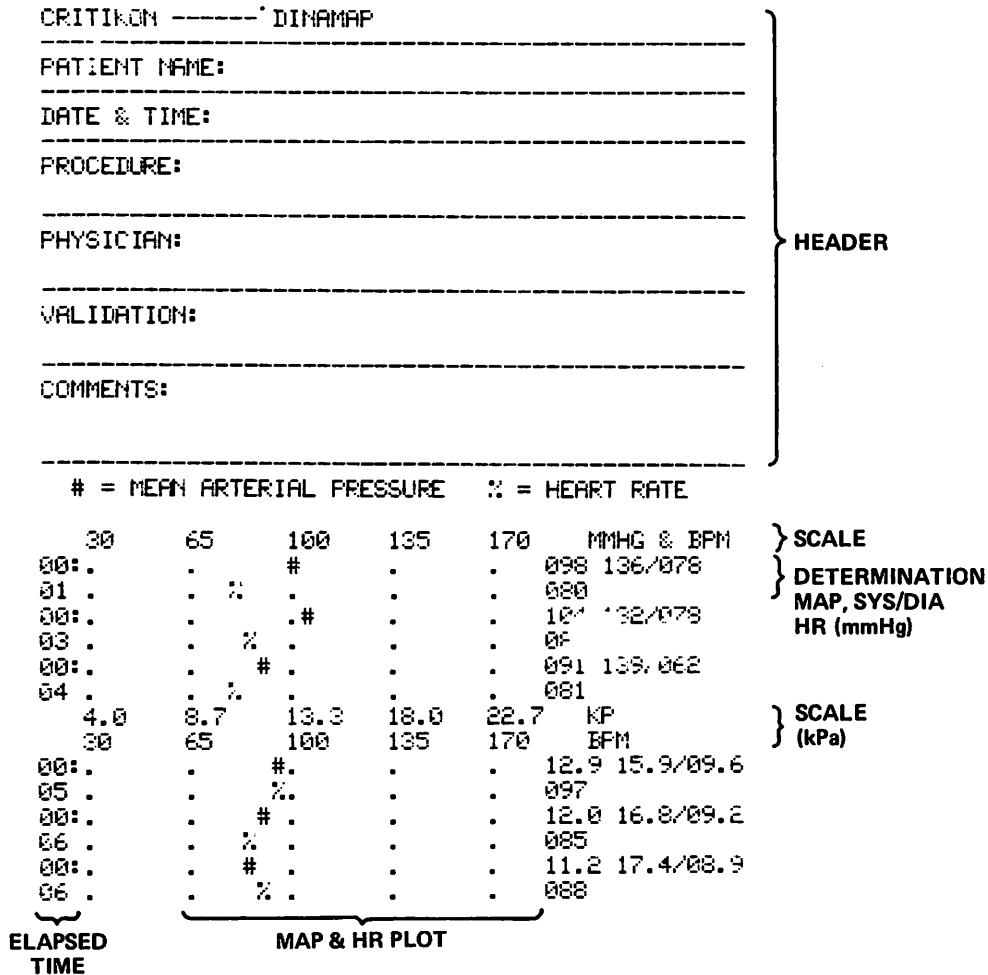


FIGURE 2-1. SAMPLE PRINTOUT (845, 847)

The scale provides the MAP (mean arterial pressure) and HR (heart rate) range (30 mmHg - 170 mmHg/4.0 kPa - 22.7 kPa). Measurements of MAP/HR below 30 mmHg and above 170 mmHg will be plotted on the graph's margins. The scale is printed after a header, when the Monitor is first powered up and every 16 determinations thereafter. A new scale will also be printed if the user changes the displayed measurements from mmHg to kPa (via the Monitor's Manual Read switch).

The elapsed time clock, in the extreme left-hand margin, indicates the period of time, in hours and minutes, that the Monitor has been operating and does not reflect how long the Recorder has been on. The elapsed time clock serves as the left vertical axis of the printout's graph.

MAP/HR plot is located in the center of the printout. This plot provides graphic trends of mean arterial pressure and heart rate. A MAP determination is expressed by a pound sign (#). A percent sign (%) is used to express heart rate.

Each determination is not only graphically presented but digitally printed as well. Three sets of numbers are expressed in this section of the printout. The first (left) entry on the top line is the mean arterial pressure result. The second entry is a fractional expression of the systolic and diastolic results. The third entry, on the bottom line, is the heart rate result.

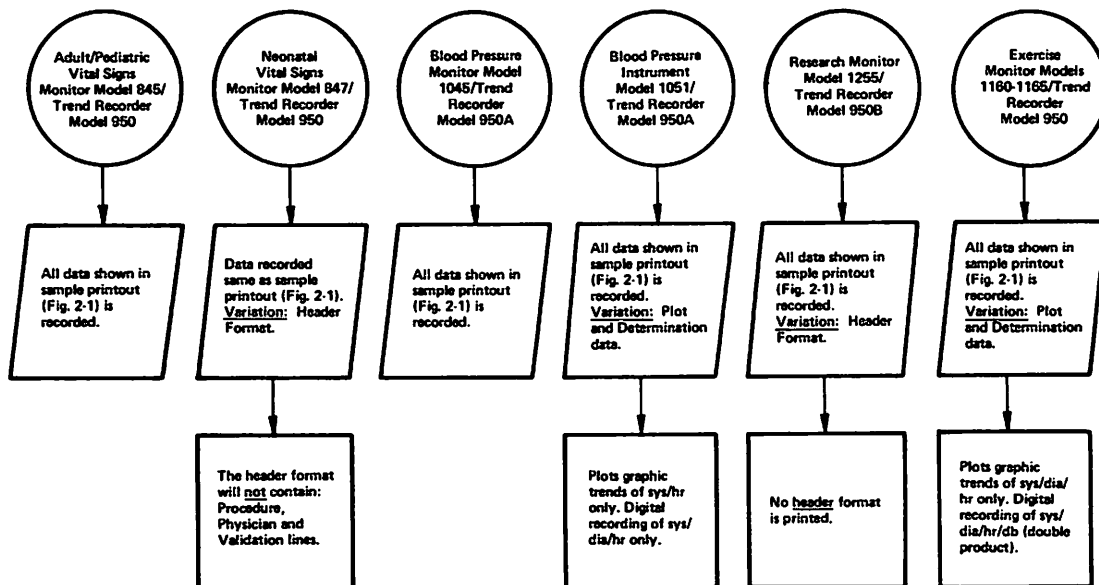


FIGURE 2-2. PRINTOUT VARIATIONS

SECTION 3. PHYSICAL DESCRIPTION

This section contains descriptions of the main components, controls, indicators and connector which make up the DINAMAPTM Trend Recorder (Models 950, 950A, 950B). Covered in Table 1 are the physical characteristics of the Recorder. Detailed technical specifications can be found in Appendix A.

TABLE 1. PHYSICAL CHARACTERISTICS	
DIMENSIONS	
Height	4.75 in/12.0 cm
Width	11.25 in/28.6 cm
Depth	11.25 in/28.6 cm
WEIGHT	14 lb/6.4 kg
COLOR	Dark blue case with light blue front panel (Model 950). Dark brown case with tan front panel (Model 950A). Dark green case with light green front panel (Model 950B).

3.1 Front Panel

The front panel, as shown in Figure 3-1, contains two switches:

1. Paper Advance Switch: When depressed, this switch will provide a continuous paper feed function.

NOTE: The paper feed function can only be activated if the Recorder is properly connected to a suitable AC power source.

2. ON/OFF Switch: When activated, this switch provides AC power to the Recorder.

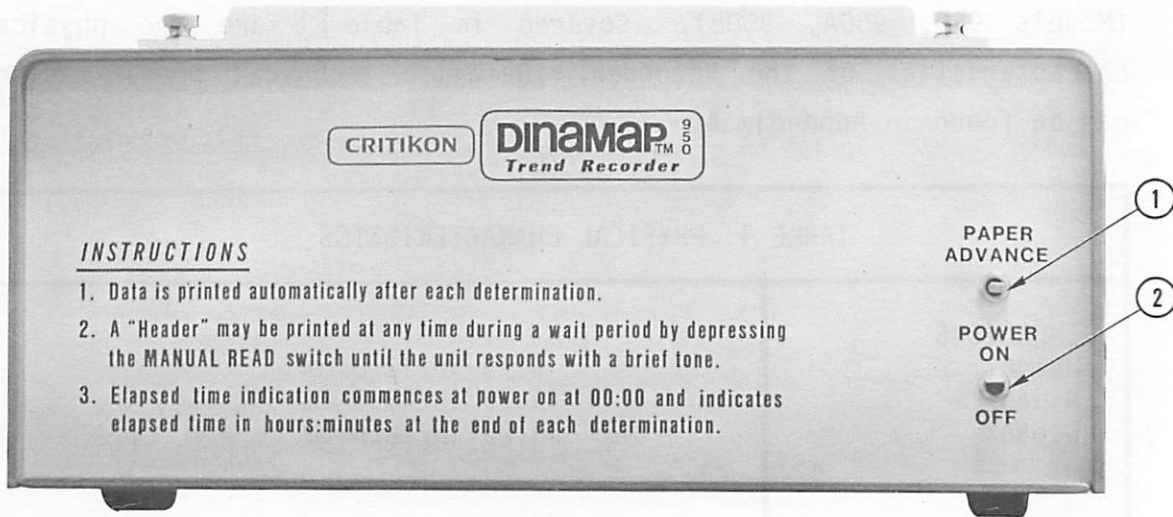


FIGURE 3-1. FRONT PANEL WITH CALLOUTS

3.2 Top of Trend Recorder

Components called out on the top view (Figure 3-2) include:

1. **Print Head:** This component contains an array of 35 heating elements arranged in a 7 X 5 matrix. These elements, when heated, cause the sensitized paper used in the Recorder to darken, thus providing the print functions.
2. **Paper Input Slot:** After the paper is positioned within the paper chamber via the paper roller, it must be inserted in the paper input slot. Once the paper is in this slot, the Paper Advance switch can be depressed to advance the paper forward.
3. **Paper Roller:** The roller holds the paper roll in place within the paper chamber.

4. Paper-Out Sensor: Once the roll of paper is secured in the paper chamber via the roller, the paper must be fed through the paper-out sensor. The Recorder will not print if the paper does not travel through this sensor. This safety feature prevents the print head from being damaged.
5. Plexiglass Paper Cutter: The cutter provides an easy cutting edge for paper detaching.

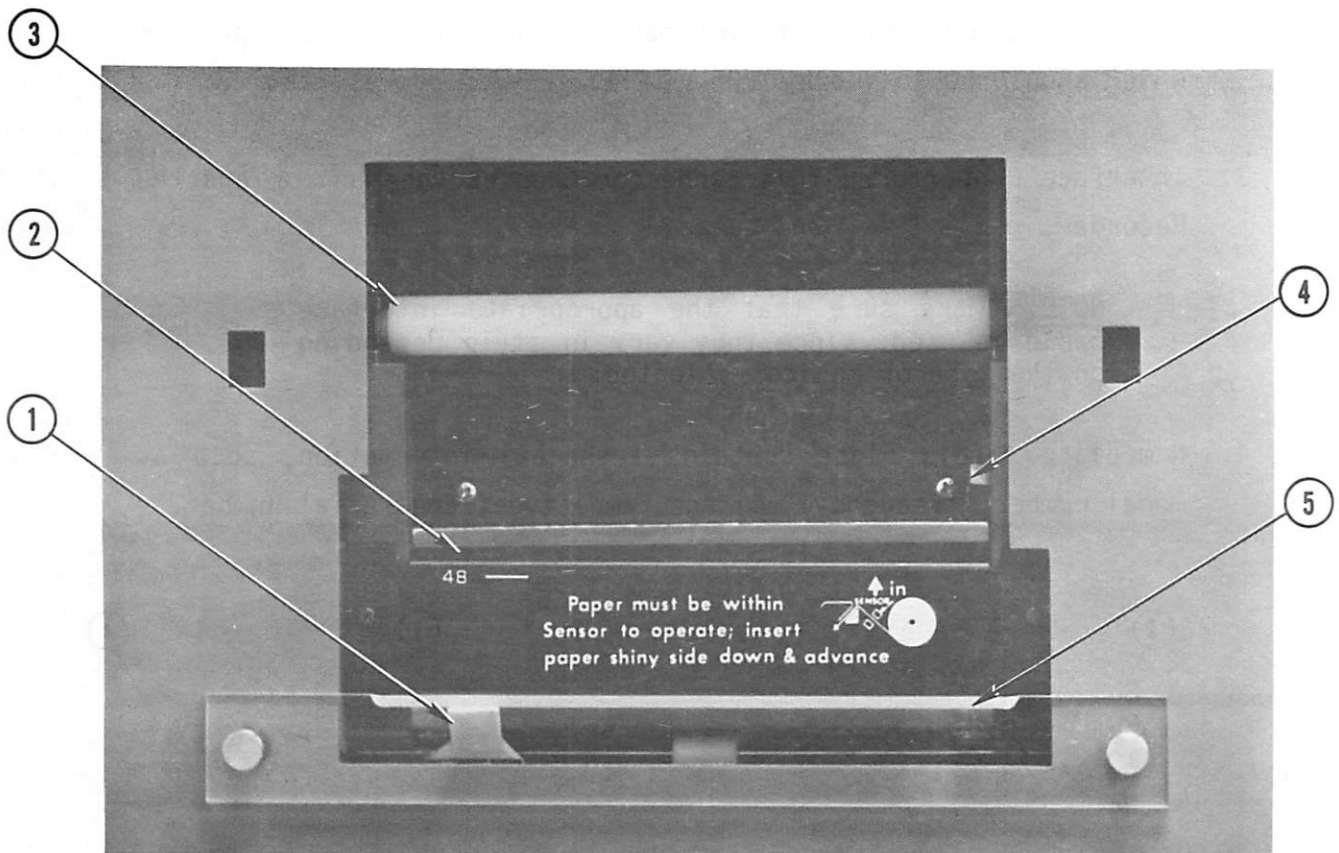


FIGURE 3-2. TOP PANEL WITH CALLOUTS

3.3 Rear Panel

As shown in Figure 3-3, the following components are found on the Recorder's rear panel:

1. AC Power Cord/Plug: On domestic units, the AC power cord is safety yellow. It is equipped with a hospital grade, three-prong, grounded connector.

The connector receptacle must be an approved three-pin socket with proper voltage and frequency.

NOTE: On non-U.S./Canadian units, a qualified technician should connect the appropriate AC connector to the internationally color coded line cord.

2. AC Line Fuse: The Recorder is fused for the protection of the user. REPLACED FUSES MUST BE OF THE TYPE SPECIFIED ON THE REAR PANEL. Repeated fuse failure may indicate a technical problem which should be solved by a qualified service representative.

3. Interface Connector: This connector couples the Monitor and the Recorder.

NOTE: Make sure that the appropriate interface cable is used, since they vary in style depending on the type of Monitor selected.

4. Nameplate. This plate contains technical information, such as model number, frequency, voltage, amplitude, and serial number.

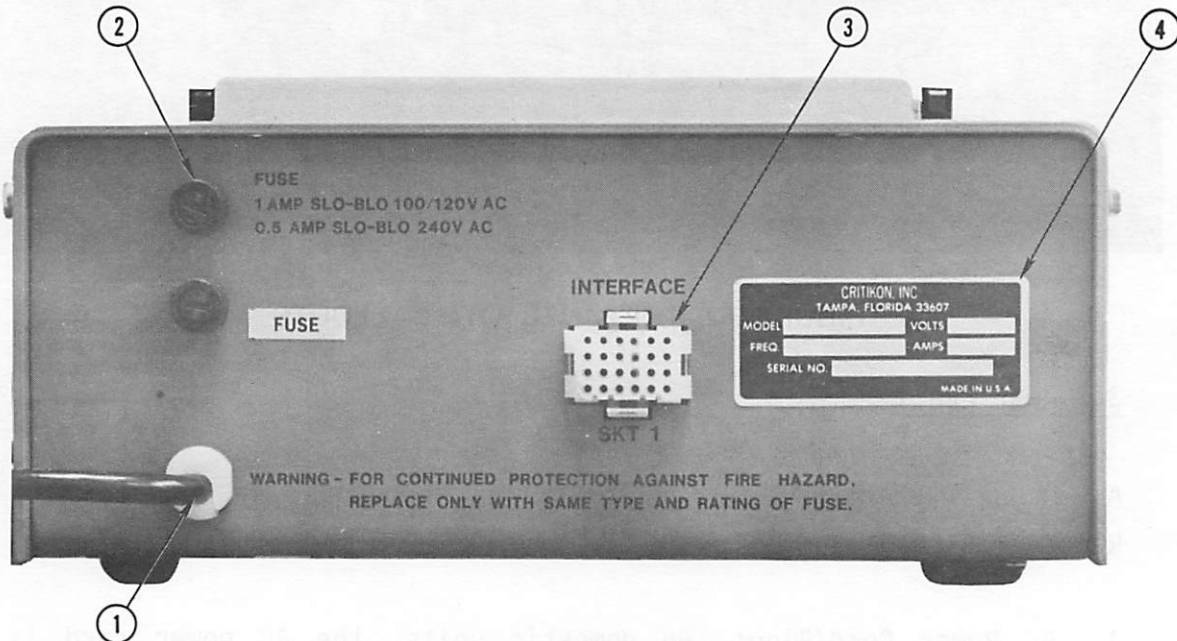


FIGURE 3-3. REAR PANEL WITH CALLOUTS

SECTION 4. INSTALLATION AND OPERATION

The following paragraphs contain the preparation and initial setup instructions, operating precautions, and operating instructions which must be followed to obtain satisfactory results when operating the DINAMAP™ Trend Recorder.

4.1 Operation Preparation

4.1.1 UNPACKING

1. When unpacking your Recorder, check for any damage incurred through shipping.
2. Report any claims to the freight forwarder and Critikon immediately.
3. Save the shipping materials in case you must return the unit to Critikon for repair.
4. If an item is missing (see the contents checklist below) contact your sales representative or call Critikon Customer Service:
1-800-237-7517
1-800-282-7533 (in Florida)
5. If the unit is damaged, call Critikon Field Engineering 1-800-237-5591, in Florida call 1-800-282-9151, or contact the nearest Service Center in your area (see Table 2).
6. Fill out the warranty card found in front of this manual and mail it.

4.1.2 CONTENTS CHECKLIST

- 1 - Interface Cable (for use with 845, 847, 1255 only)
- 2 - Rolls of Thermal Recorder Paper
- 1 - Instruction Card
- 2 - Operation/Service Manual

4.2 Initial Setup

To properly install the Recorder, perform the following steps in the sequence in which they are presented.

1. Place the Recorder on top of, or near, the Monitor.

WARNING

To avoid a safety hazard insure that both the Recorder and Monitor are secure before being transported to the monitoring site.

2. Attach the appropriate interface cable to the interface connector on the rear panel of the Monitor and the Recorder.

NOTE: Interface cables vary in style depending on the type of Monitor used.

3. Insert the power plug into a properly grounded, hospital grade receptacle.

WARNING


Using any type of 3-pin to 2-pin adapter (Cheater) on the AC power plug may result in a dangerous shock hazard.

4. Insert the Recorder paper as illustrated on top of the chassis.

NOTE: The shiny side of the paper must face UP.

5. Place the Recorder's ON/OFF switch ON.
6. Press the Paper Advance switch until approximately one inch of paper extends beyond the print head.
7. Carefully read Section 4.3 before starting the operating cycle.

4.3 Operating Notes and Precautions

- MAKE CERTAIN THAT THE THERMAL RECORDER PAPER PASSES THROUGH THE PAPER-OUT SENSOR.
- MAKE CERTAIN THAT THE SHINY SIDE OF THE THERMAL RECORDER PAPER FACES THE PRINT HEAD, I.E., UP.
- CHECK THE PAPER LEVEL IN THE RECORDER REGULARLY TO AVOID RUNNING OUT DURING A CRITICAL PROCEDURE.
- TURNING THE MONITOR OFF WILL CAUSE THE RECORDER'S ELAPSED TIME CLOCK TO RESET.
- WHEN THE RECORDER RECEIVES INPUT IT DOES NOT RECOGNIZE, A SPECIAL CHARACTER () WILL BE PRINTED.
- PLACE THE RECORDER ON A RIGID SURFACE.
- ALLOW FOR HEAT DISSIPATION BY INSURING THAT THE REAR OF THE CHASSIS IS UNOBSTRUCTED.
- DO NOT USE THE RECORDER IN THE PRESENCE OF FLAMMABLE ANESTHETICS.
- DO NOT PLACE FLUIDS ON THE RECORDER.
- OBSERVE ALL CAUTIONS AND WARNING LABELS ON THE RECORDER AND THE MONITOR.

4.4 Typical Operating Cycle

Once the initial setup instructions (Section 4.2) are followed in the sequence in which they were presented, perform the following:

1. Turn the Monitor ON.

2. When a brief tone is heard (power up alarm), depress and hold the Manual Read switch on the Monitor's front panel until another brief tone is heard. The Recorder will then print a header and scale.
3. Because the Monitor automatically initiates a determination when it is turned ON, the results of that determination will be printed by the Recorder.
4. Subsequent determinations and recordings thereof will occur at intervals governed by the setting of the Monitor's Add Minutes switches.
5. A new scale will be printed automatically after every 16 determinations.
6. To generate a new header between determinations, depress and hold the Manual Read switch on the Monitor's front panel until a brief tone is heard. The Manual Read switch must be depressed while the last MAP determination is being displayed but before the next determination is initiated.

////////////////////// WARNING //////////////////////////////////////
Electrocautery procedures may interfere with
the normal operation of the Recorder. If
electrocautery interferes with the
recording, turn the Recorder OFF.////////////////////////////////////

4.5 Operation

The proper operation of the DINAMAPTM Trend Recorder presumes that it is connected to a DINAMAPTM Monitor.

Operation of the Recorder can be examined in terms of function.

User-activated functions are addressed in Section 4.5.1. Functions performed by the Recorder without manual intervention are addressed in Section 4.5.2.

4.5.1 USER-ACTIVATED FUNCTIONS

With both the Monitor and Recorder ON, the following actions taken by the operator will cause the corresponding functions to occur:

<u>ACTION</u>	<u>FUNCTION</u>
Hold the Monitor's Manual Read switch down until a brief tone sounds.	Recorder will generate a header. (<u>Exception</u> : No header is printed if the Recorder is connected to a DINAMAP™ Research Monitor Model 1255.
Lift the Manual Read switch on the Monitor's front Panel. This action changes the displayed readings from mmHg to kPa or vice versa.	Recorder will print a new scale.
Depress the Trend Recorder's Paper Advance switch.	Paper will continuously feed through the Recorder.

4.5.2 AUTOMATIC FUNCTIONS

With both the Monitor and Recorder ON, the following functions are performed automatically by the Recorder:

<u>FUNCTION</u>	<u>OCCURRENCE</u>	<u>RATIONALE</u>
3-line advance; 3-line retract	Each time an entry is printed.	So that the last line printed is visible to the operator.
Prints a scale.	After the header format is printed, when the Monitor is powered up, and every 16 determinations thereafter.	To provide the graph's horizontal axis and MAP/HR trends in mmHg or kPa.
Records and plots determination results, and the time they occurred.	Each time a determination is made by the Monitor.	To record patient's vital signs.
Either Prints: PROBLEMS or UNIT MALFUNCTION	When the Monitor detects hang-up or failsafe alarm condition. (See DINAMAP™ Monitor Model 845 Operation Manual, "Alarm Functions and Conditions.")	To alert the user.

SECTION 5. GENERAL OPERATING PARAMETERS

The DINAMAP™ Trend Recorder is not a stand-alone device. It must rely on the DINAMAP™ Monitor to: 1) measure the patient's vital signs, 2) format the results, and 3) transmit the appropriate print signals needed to provide a continuous and permanent record of the parameters measured.

Device Limitations

MAXIMUM

Systolic pressure	230 mmHg with Adult/Pediatric Monitors; 200 mmHg with Neonatal Monitors
Diastolic pressure	If systolic cannot be determined, diastolic will not be displayed.
Mean Arterial pressure	230 mmHg with Adult/Pediatric Monitors; 200 mmHg with Neonatal Monitors (see <u>NOTE</u> below)

MINIMUM

The minimum systolic, diastolic and mean arterial pressures measured by the Monitor will vary according to the patient's physiological state. The Monitor may measure mean arterial pressures at levels below 30 mmHg (see NOTE below).

NOTE¹: The scale on the Recorder's printout extends from 30 to 170 (models 845, 847, 1255 only). Measurements of MAP or HR below 30 mmHg and above 170 mmHg will be plotted on the graph's margins.

NOTE²: The scale on the Recorder's printout extends from 40 to 200 mmHg (models 1160, 1165 only). Measurements of systolic, diastolic, or heart rate below 40 mmHg and above 200 mmHg will be plotted on the graph's margins.

WARNING

The following servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any internal adjustments unless you are qualified to do so.

SERVICE POLICY

The warranty for the Recorder is prominently displayed in the front of this manual. Should your Recorder require maintenance while under warranty or after the warranty period has expired, you may refer the Recorder to Critikon. If the Recorder is not referred to Critikon, its repair should be made only by qualified electronics personnel. Unauthorized repairs will void the warranty.

Technical Assistance

Should you experience difficulty with the use or maintenance of your Recorder, contact your Critikon Sales Representative, your nearest Service Center (see Table 2), or call Critikon Field Engineering at 1-800-237-5591, in Florida call 1-800-282-9151.

Repair Service

To obtain repair service, call the Service Center nearest you (see Table 2), or contact Critikon Field Engineering. State your name, hospital name, address, telephone number, unit model number, serial number, and the nature of the problem. Your Field Service Representative will return your call promptly and will advise you of the corrective action required.

If you are advised to return the Recorder to Critikon for repair, do the following:

1. Package the Recorder with adequate protection. If available use the materials in which the Recorder was originally shipped.
2. Include a brief description of the problem, as well as the name, address and phone number of the person that can be contacted for additional information.

3. Include a purchase order number if the Recorder being returned is out of warranty or if you require a loaner.
4. Ship the Recorder, transportation prepaid, to the Service Center nearest you (refer to Table 2).

Ordering of Spare Parts

To order or inquire about the availability of spare parts, call 1-800-237-5591, in Florida call 1-800-282-9151.

Clinical Application Inquiries

Questions related to clinical applications and equipment useage should be directed to Critikon's Clinical and Technical Communication Department at 1-800-237-5593, in Florida call 1-800-282-9151.

Service Contracts and Biomedical Engineering Training Seminars

A wide variety of post warranty service contracts and Biomedical Engineering training seminars are available. Contact your local Critikon Service Center for further information.

TABLE 2. FIELD SERVICE CENTER LOCATIONS

<u>CUSTOMER SITE</u>	<u>REGIONAL SERVICE CENTER</u>	<u>FIELD SERVICE CENTER</u>
Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, E. New York, New Jersey, E. Pennsylvania	Critikon, Inc. 120 Interstate N. Parkway E. Suite 405 Atlanta, GA 30339 (404) 953-3831	Critikon, Inc. Building 1EB Chimney Rock Road Bound Brook, NJ 08805 (201) 524-2574
Maryland, Delaware, W. Virginia, Virginia, N. Carolina	Critikon, Inc. 120 Interstate N. Parkway E. Suite 405 Atlanta, GA 30339 (404) 953-3831	Critikon, Inc. 30 E. Padonia Road Suite 403 Timonium, MD 21093 (301) 561-1558
Alabama, Georgia, S. Carolina, Kentucky, Tennessee	Critikon, Inc. 120 Interstate N. Parkway E. Suite 405 Atlanta, GA 30339 (404) 953-3831	Critikon, Inc. 120 Interstate N. Parkway E. Suite 405 Atlanta GA 30339 (404) 953-3831
Florida	Critikon, Inc. 120 Interstate N. Parkway E. Suite 405 Atlanta, GA 30339 (404) 953-3831	Critikon, Inc. Corporate Service Center 5144A W. Cypress Street Tampa, FL 33607 (813) 876-2519
Louisiana, Mississippi, Arkansas	Critikon, Inc. 120 Interstate N. Parkway E. Suite 405 Atlanta, GA 30339 (404) 953-3831	Critikon, Inc. 2000 Clearview Parkway Suite 103 Metairie, LA 70001 (504) 455-6173
North Dakota, S. Dakota, Minnesota, Wisconsin, Iowa, Indiana, N. Illinois	Critikon, Inc. 616 N. Court Suite 235 Palatine, IL 60067 (312) 934-9195/6	Critikon, Inc. 616 N. Court Suite 235 Palatine, IL 60067 (312) 934-9195/6
Michigan, Ohio, W. New York, W. Pennsylvania	Critikon, Inc. 616 N. Court Suite 235 Palatine, IL 60067 (312) 934-9195/6	Critikon, Inc. Interstate Plaza 16600 Sprague Road Suite 215 Middleburg Heights, OH 44130 (216) 243-1924

TABLE 2. (cont'd)

Kansas, Nebraska, Missouri, S. Illinois	Critikon, Inc. 616 N. Court Suite 235 Palatine, IL 60067 (312) 934-9195/6	Critikon, Inc. 616 N. Court Suite 235 Palatine, IL 60067 (312) 934-9195/6
Texas, Oklahoma	Critikon, Inc. 616 N. Court Suite 235 Palatine, IL 60067 (312) 934-9195/6	Critikon, Inc. 1020 W. Main Lewisville, TX 75067 (214) 434-2940
South California, Arizona, New Mexico, Hawaii	Critikon, Inc. 27402 Camino Capistrano Suite 102 Laguna Niguel, CA 92677 (714) 831-8762	Critikon, Inc. 27402 Camino Capistrano Suite 102 Laguna Niguel, CA 92677 (714) 831-8762
North California, Nevada, Utah, Colorado	Critikon, Inc. 27402 Camino Capistrano Suite 102 Laguna, Niguel, CA 92677 (714) 831-8762	Critikon, Inc. Research Development Corp. 2225 Palou Avenue San Francisco, CA 94124 (415) 826-1010
Washington, Oregon, Idaho, Montana, Wyoming, Alaska	Critikon, Inc. 27402 Camino Capistrano Suite 102 Laguna Niguel, CA 92677 (714) 831-8762	Critikon, Inc. 300-120th Avenue N.E. Suite 236 Benaroya Business Park Bellevue, WA 98005 (206) 454-0152

SECTION 6. ELECTRO/MECHANICAL DESCRIPTION

This section describes the electro/mechanical components and functions which make up the DINAMAP™ Trend Recorder (Models 950, 950A, 950B). The circuit diagrams and their respective parts lists can be found in Appendix B.

6.1 Theory of Operation

As shown in Figure 6-1, 300 BAUD, asynchronous ASCII data is transmitted from the DINAMAP™ Monitor to the DINAMAP™ Trend Recorder. The data signal travels through the filters and buffers located on the Power Supply Board before it reaches U10, the Recorder's microcomputer chip. U10 interprets each ASCII character, and produces the proper output. The output of U10 controls print, line feed, and carriage return functions. A sample character format for the output of U10 is shown in Figure 6-2.

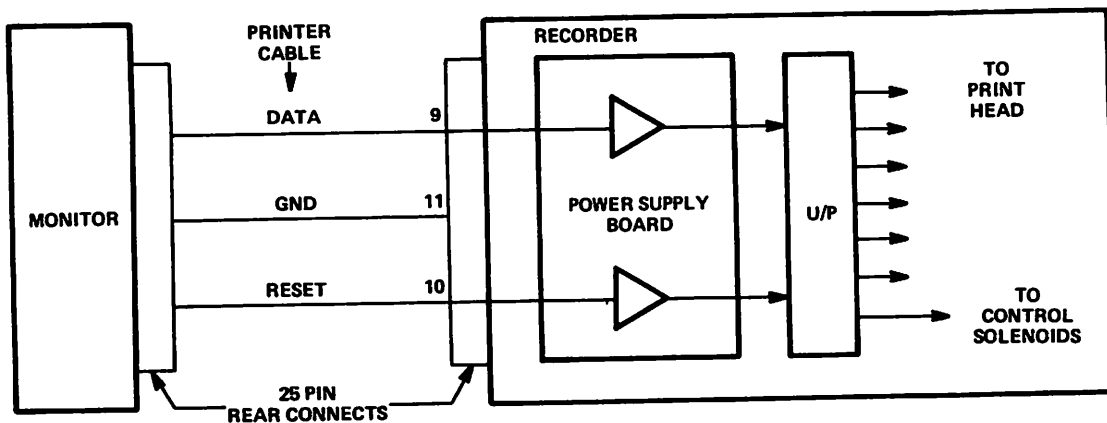


FIGURE 6-1. DATA TRANSFER FROM MONITOR TO RECORDER

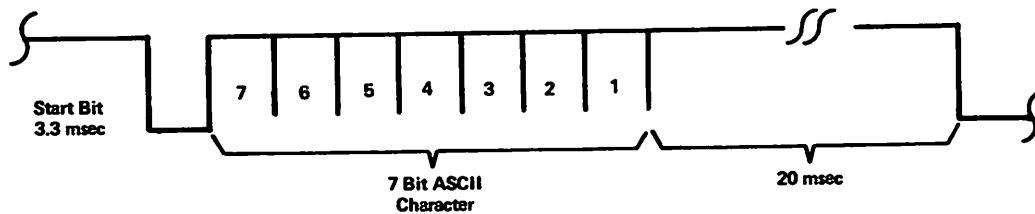


FIGURE 6-2. CHARACTER FORMAT FOR OUTPUT DATA

A typical data stream (from the Monitor to the Recorder) after a determination has been processed is illustrated in Figure 6-3.

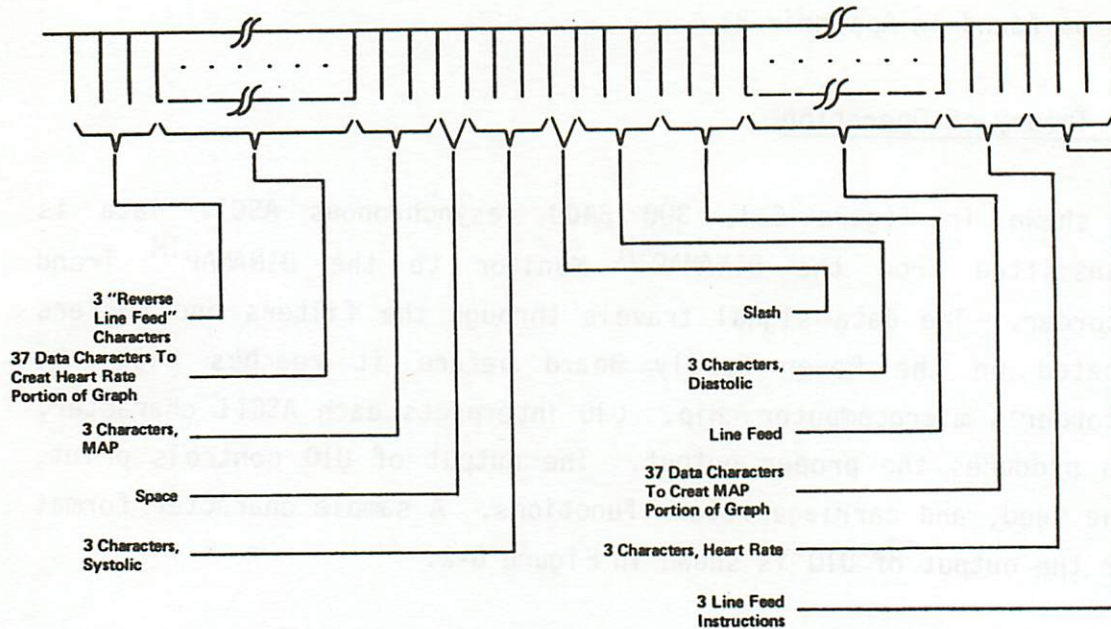


FIGURE 6-3. DATA TRANSFER FROM MONITOR TO RECORDER AFTER DETERMINATION

Data transmission is usually preceded by a print reset pulse. This signal is also buffered by the Power Supply Board before it reaches U10.

The print reset signal is normally high. It will go low for approximately 4 milliseconds when active. When the low pulse signal is received by U10, a carriage return and a line feed are produced.

Figure 6-4 illustrates the electrical components responsible for the operation of the Recorder. A thorough understanding of the diagram is recommended.

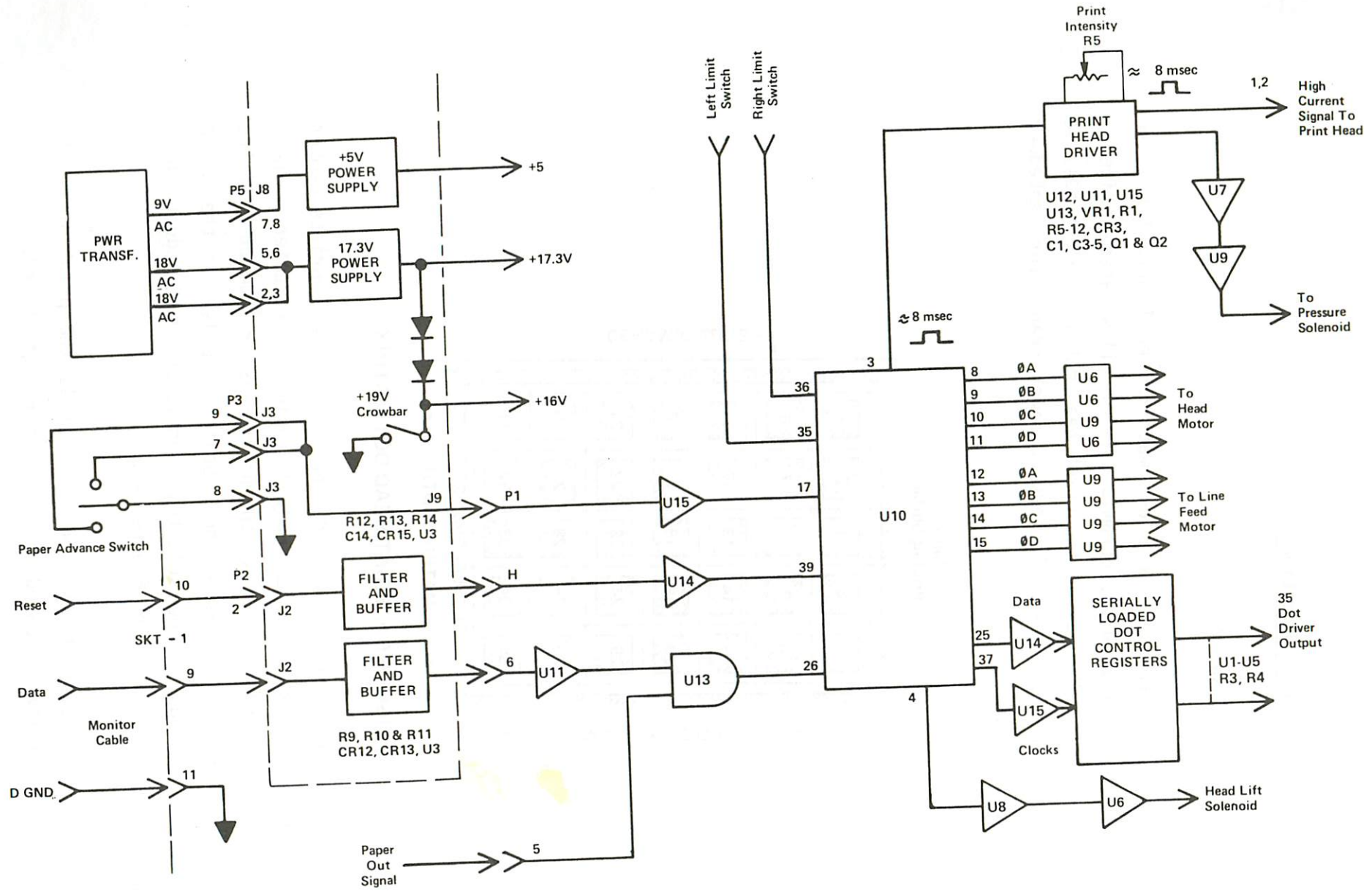


FIGURE 6-4. SIMPLIFIED BLOCK DIAGRAM

6.2 Components and Their Functions

6.2.1 PRINT HEAD MECHANISM

The print head contains a 7 x 5 dot matrix, see Figure 6-5. The matrix is mounted on a white, ceramic carrier illustrated as item 1 on Figure 3-2. The 35 dots on the print head matrix are not passive heating elements. They are collectors of power transistors embedded in print substrata.

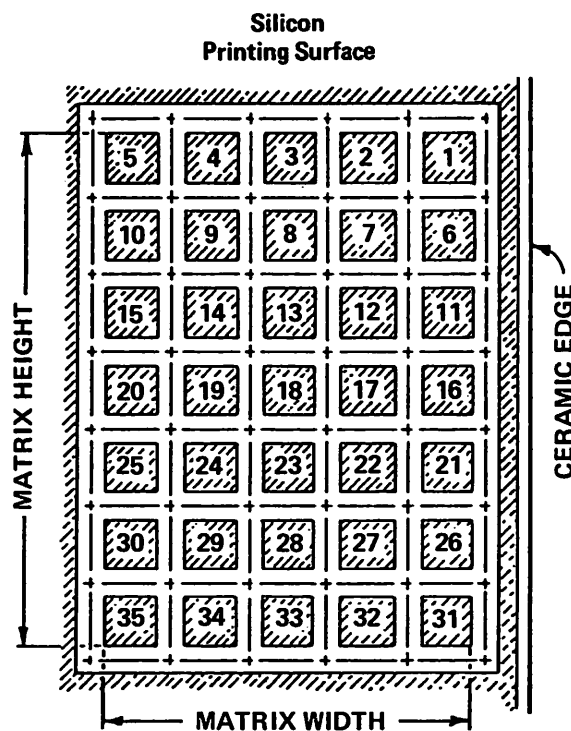


FIGURE 6-5. PRINT HEAD DOT MATRIX

The microcomputer within the Recorder enables the appropriate number of control signals when it is ready to print a character. These control signals supply base drive to the transistors embedded in the print head. The microcomputer then applies a pulse to the drive transistor (Q1) causing the selected transistors to conduct, heat up, and darken the paper, see Figure 6-6.

The duration of the print pulse which controls the print intensity can be adjusted via VR1 located on the Printer Logic Board.

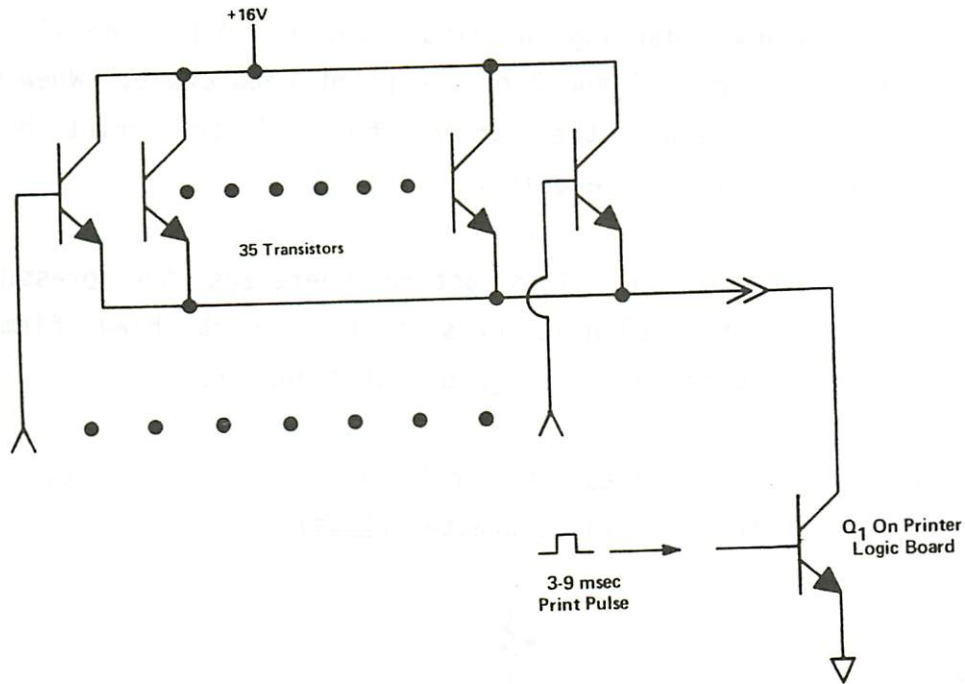


FIGURE 6-6. CONTROL SIGNALS FROM PRINTER LOGIC BOARD TO PRINT HEAD

6.2.1.1 Print Operation

Upon receiving a printable ASCII character from the Monitor, the Recorder's microcomputer performs the following functions:

- A. Formulates the appropriate dot pattern to produce the desired character.
- B. Loads the dot pattern serially into the print register (U1 through U5). The microcomputer then produces the data (pin 25), and the clocks (pin 37), to load these registers. The parallel outputs of these shift registers go directly to the bases of the transistors embedded in the print head.
- C. Issues a print command (pin 3). The print command goes through a one-shot (U12). The heat and intensity of the print head are controlled by adjusting the width of the one-shot output.

The print command (one-shot output) travels to two locations:

1. Through a power darlington circuit (Q2 and Q1). The signal then goes to pins 1 and 2 of the print head cable. When Q1 conducts, it sinks the current for all the print head transistors that are enabled.
2. Through U7 and U9. This action energizes the pressure solenoid. The solenoid presses the print head firmly against the paper ensuring good heat transfer.

If the microcomputer receives an input it cannot recognize, the Recorder will print this special character (▬▬▬).

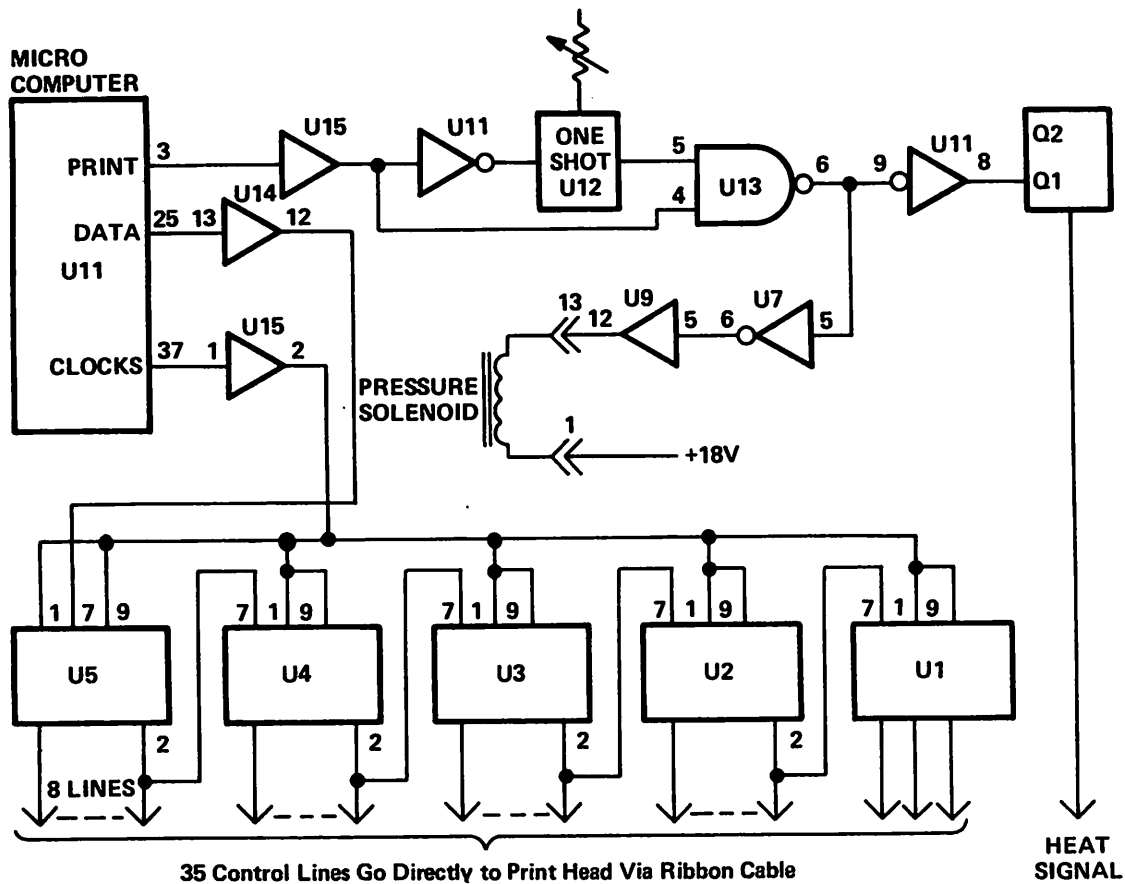


FIGURE 6-7. PRINT FUNCTION DIAGRAM

6.2.2 LINE FEED MECHANISM

The Recorder can produce two types of line feed functions:

1. Forward line feed (LV).
2. Reverse line feed (NVT).

The mechanical components responsible for these functions are shown in Figure 6-8.

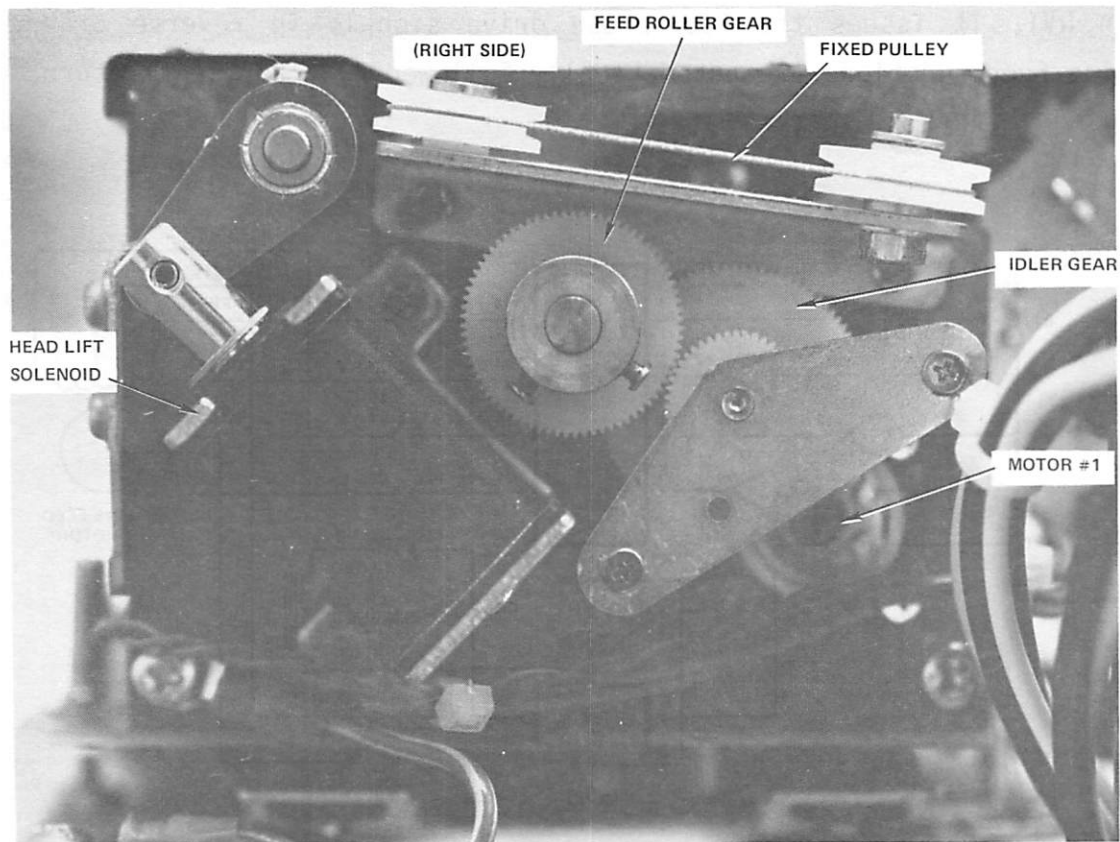


FIGURE 6-8. LINE FEED MECHANICAL COMPONENTS

6.2.2.1 Line Feed Operation

The line feed function is controlled by a four phase stepper motor (Motor #1). Four microcomputer output lines (through drivers) sequence the four drive coils causing motor rotation, see Figure 6-9.

One complete rotation of Motor #1 produces one line feed. The motor's shaft drives an idler gear, which in turn drives the feed roller gear. The feed roller gear is connected to the paper pinch roller which advances the paper forward.

During a line feed, the microcomputer within the Recorder enables the head lift solenoid. The solenoid lifts the print head when it travels left, or whenever the paper moves. This feature reduces abrasion and wear on the print head.

The Reverse Line Feed (NVT) function is software controlled. When the Recorder's microcomputer receives the appropriate characters for an NVT, it issues the four-phase drive signals in reverse order. Line feed functions are automatically followed by a carriage return.

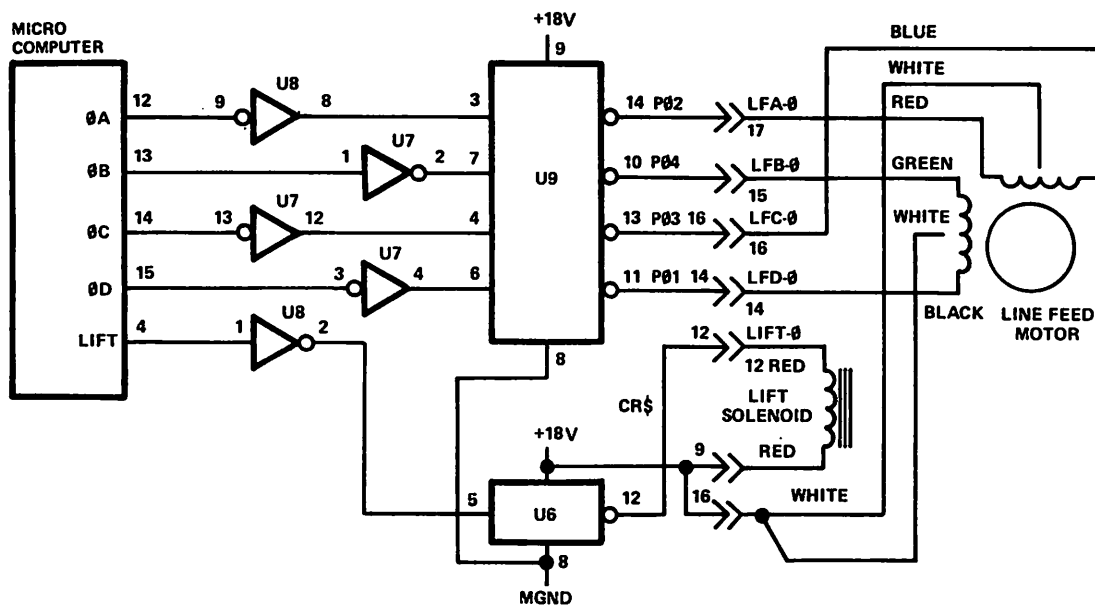


FIGURE 6-9. LINE FEED DIAGRAM

6.2.3 CARRIAGE RETURN MECHANISM

Carriage returns, as well as normal head movements, are controlled by a four-phase stepper motor (Motor #2). The head movement motor is also driven by four lines from the Recorder's microcomputer. Each step of the motor (90°) corresponds to one character width.

The motor's shaft drives the head cable reel. This cable, which is connected to the print head, wraps twice around the reel, then goes through three fixed pulleys and one floating tension pulley.

The components responsible for the carriage return functions are shown in Figure 6-10.

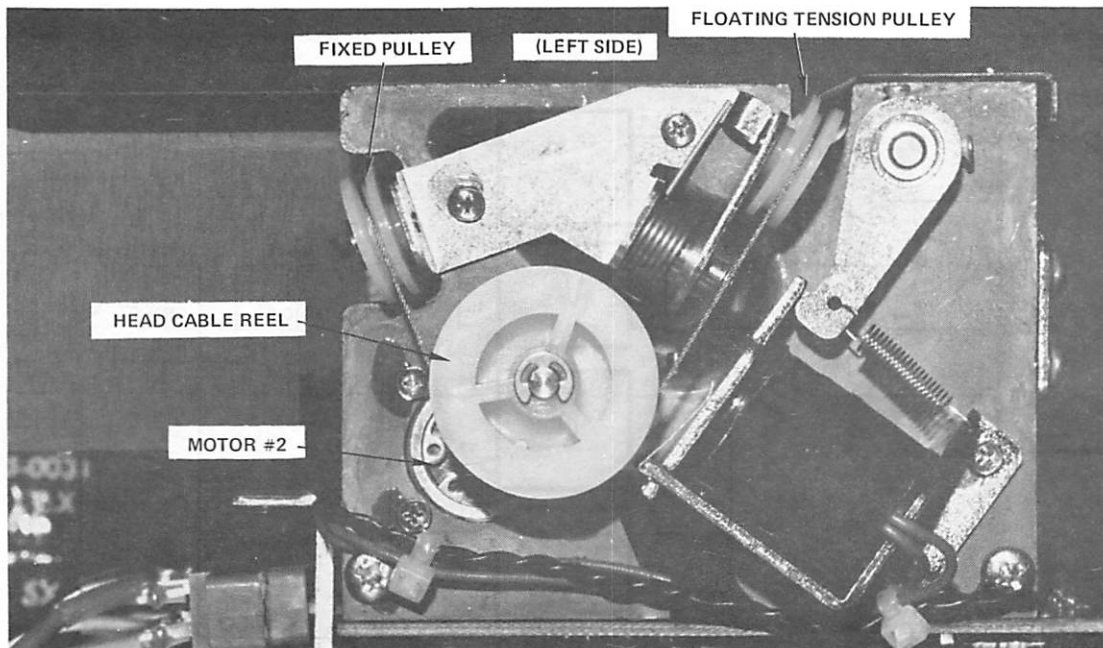


FIGURE 6-10. CARRIAGE RETURN MECHANICAL COMPONENTS

6.2.3.1 Carriage Return Operation

When the Recorder's microcomputer issues drive pulses in a normal sequence, the print head moves toward the right (as in printing). Pulses issued in reverse order drive the print head to the left (carriage return).

During a carriage return, as with a line feed, the head lift solenoid is energized to avoid wear on the print head during travel. When the Recorder's microcomputer receives a carriage return command, it issues a continuous string of reverse order drive pulses, sending the print head towards the left side of the Recorder. It continues to do this until the print head makes contact with the left limit switch. After the microcomputer senses the left limit switch closing, it reverses the drive direction and monitors the limit switch. The print head advances two character widths to the right, after the limit switch reopens. The time consumed in moving two characters to the right is a necessary delay which maintains the integrity of the left margin by allowing the slack to be taken into the drive cable assembly. A sectional schematic of the carriage return function is shown below.

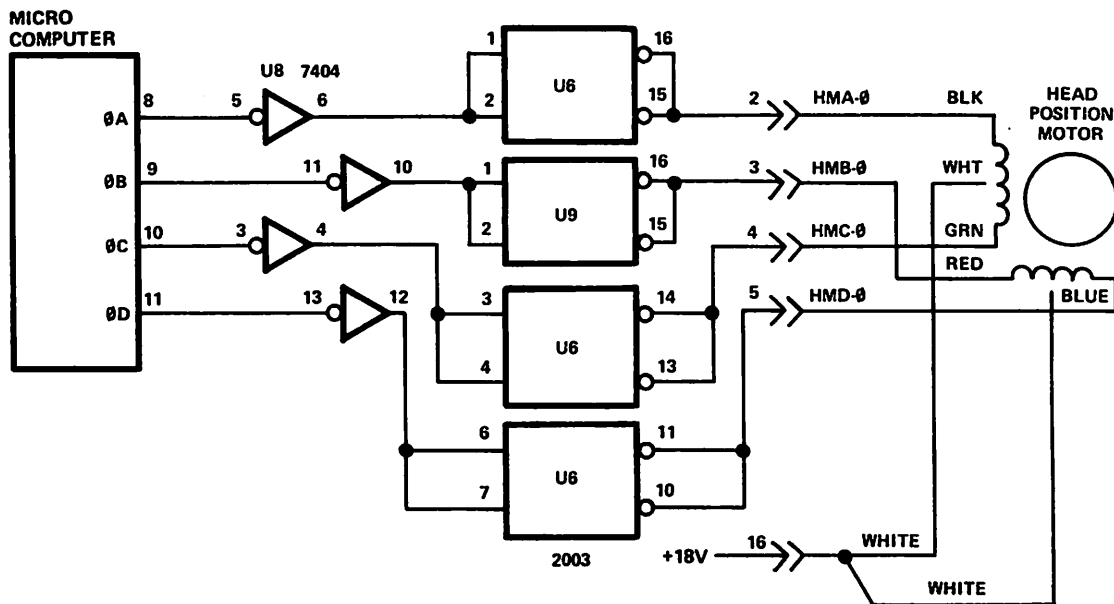


FIGURE 6-11. CARRIAGE RETURN DIAGRAM

SECTION 7. MAINTENANCE

Periodic maintenance is essential for the proper operation of your DINAMAP™ Trend Recorder. Table 3 and Figure 7-1 are provided for this purpose. Hardware checks and adjustments are covered in Section 7.1.

TABLE 3. PREVENTIVE MAINTENANCE SCHEDULE			
<u>ITEM</u>	<u>PROCEDURE</u>	<u>REQUIRED FREQUENCY</u>	<u>NOTES</u>
Print Head	Clean and Lubricate	90 days	Clean with lint-free cloth and 90% alcohol.
Slider Bar	Clean and Lubricate	90 days	Clean with lint-free cloth and 90% alcohol. Apply a light coat of silicon-base lubricant uniformly over the length of the bar.
Cable Pulleys	Lubricate	90 days	Inject one drop of silicon-base lubricant in center spindle of each of the 4 cable pulleys.
Print Head Drive Gear	Lubricate	90 days	Inject one drop of silicon-base lubricant in center spindle of drive gear (left side).

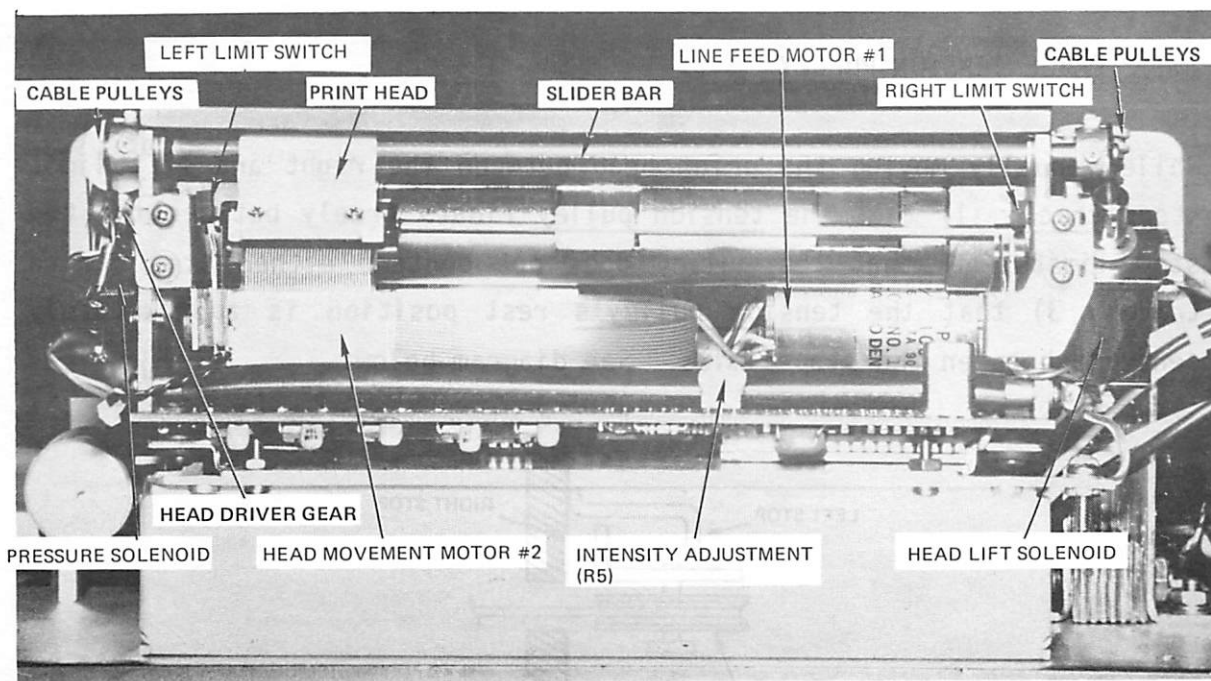


FIGURE 7-1. PREVENTIVE MAINTENANCE ITEMS

7.1 Hardware Checks and Adjustments

7.1.1 SOLENOIDS

To check the head lift solenoid (right side), verify that the print head is lifted well off the paper when the solenoid is energized. The solenoid should have a pull distance of 1.25 to 1.5 millimeters (50 to 60 mills).

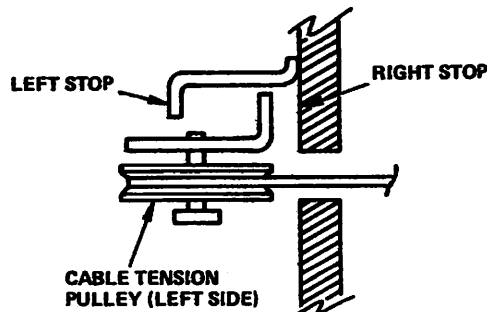
To adjust the head lift solenoid, loosen the solenoid lever screws. Set the solenoid armature pull distance to 50-60 mills with the print head against the platen. Tighten the lever screws.

To check the head pressure solenoid (left side), verify that the print head presses firmly against the print platen when the solenoid is energized. The solenoid should have a pull distance of .64 to .9 millimeters (25 to 30 mills).

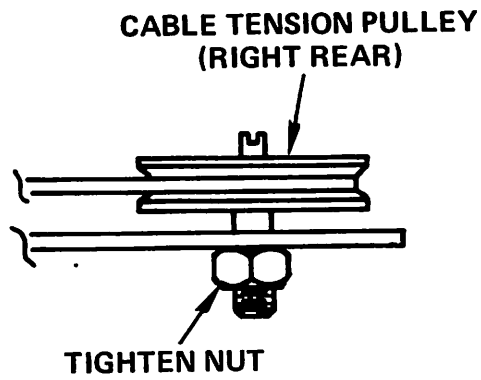
To adjust the head pressure solenoid, loosen the solenoid pull-lever screws. Set the armature pull-spacing to 25-35 mills. Tighten the lever screws.

7.1.2 CABLE TENSION PULLEY

While manually moving the print head between the right and left limit stops check: 1) that the tension pulley floats freely between the two stop limits, 2) that the pulley does not contact either stop during travel, 3) that the tension pulley's rest position is approximately centered between the stop limits. See diagram below:



If the tension pulley contacts either limit stop during travel, adjust it by loosening the nut on the bottom of the upper, rear, right cable pulley (in slotted hole) until the tension pulley is approximately centered in its travel; then, tighten the nut with a wrench. See diagram below:



APPENDIX A

Page

Technical Specifications..... A1-A2

TECHNIQUE: Provides an alpha-numeric printout of DINAMAP™ Monitor determinations, elapsed time in hours and minutes, and medical header outline under the control of the DINAMAP™ Monitor microcomputer. Additionally, the Trend Recorder will, under DINAMAP™ Monitor microcomputer control, provide trend line information determined by the type of DINAMAP™ Monitor used.

ON/OFF SWITCH: Provides AC power to the Trend Recorder.

PRINT HEAD: High speed thermal.

PAPER FEED SWITCH: Provides continuous paper feed function while depressed.

ACCESSORY CONNECTOR: Provides interface between the DINAMAP™ Monitor and the DINAMAP™ Trend Recorder.

CLEANING: Wipe or damp sponge with normal hospital bactericides.

OPERATING TEMPERATURE: 59 to 104 degrees F, 15 to 40 degrees C.

OPERATING ALTITUDE: Sea level to 7500 feet.

HUMIDITY: Normal room, ambient.

POWER REQUIREMENTS: 1 amp, 50 or 60 hz at 100 or 120 VAC; 1/2 amp, 50 or 60 hz at 240 VAC.

INPUT VOLTAGE: 100 VAC, 120 VAC, 240 VAC, \pm 10%, 50 or 60 hz.

POWER CABLE: Three-prong, three-wire, hospital grade connector and 8 foot cord.

FUSE: 1 amp, 3AG SB at 100 or 120 VAC; 1/2 amp, 3AG SB at 240 VAC.

MOUNTINGS: Self-supporting on rubber feet or may be placed on top of Monitor.

COLOR: 950: Dark blue case with light blue panel.
950A: Dark brown case with tan panel.
950B: Dark green case with light green panel.

SIZE: 4.75 inches high--11.25 inches wide--11.25 inches deep (12.0cm high--28.6cm wide--28.6cm deep).

WEIGHT: 14 pounds (6.4 kg).

Standard Equipment

<u>Description</u>	<u>Part Number</u>
Operation/Service Manual.....	776-162
Instruction Card.....	776-174
Interface Cable (for use w/Models 845, 847, 1255 only)....	316-007
Trend Recorder Paper (2 rolls).....	770-101

APPENDIX B

	<u>Page</u>
Illustrated Parts Breakdown.....	B1
Parts List.....	B2-B5
Printer Assembly Wiring & Power Supply Schematic.....	B6
Printer Power Supply Assembly.....	B7
Parts List.....	B8-B11
Thermal Printer Schematic.....	B12
Thermal Printer Assembly.....	B13
Parts List.....	B14

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
1		(703-125)	Chassis Cover, 950 Printer (Blue)	1	
		950-6200-0000 (703-112)	Chassis Cover, 950A Printer (Brown)	REF	
		(703-120)	Chassis cover, 950B Printer (Green)	REF	
2		950-6010-0004 (703-111)	Desk Cover, 950 Printer (Blue)	1	
		950-6220-0000 (703-113)	Desk Cover, 950A Printer (Brown)	REF	
		(703-121)	Desk Cover, 950B Printer (Green)	REF	
3		950-6020-0001 (704-193)	Paper Cutter, Plexiglass™	1	
4		200-0001-4001 (732-103)	Handle Strap w/Hardware	1	
5		175-0001-0000 (727-112)	Release, Squeeze	2	
6		950-6030-0003 (702-108)	Chassis, 950 Printer (Blue)	1	
		950-6210-0002 (702-109)	Chassis, 950A Printer (Brown)	REF	
		(702-124)	Chassis, 950B Printer (Green)	REF	
7		(701-146)	Front Panel, 950 English (Blue)	1	
		950-6150-0002 (701-124)	Front Panel, 950 German	REF	
		950-6160-0002 (701-125)	Front Panel, 950 French	REF	
		950-6170-0001 (701-126)	Front Panel, 950 English (Brown)	REF	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
		(701-136)	Front Panel, 950 English (Green)	REF	
8		507-0001-0001 (722-101)	Thumb Screw, 6-32x3/8	2	
9		295-6000-0002 (729-135)	Label, Danger Explosion Hazard	1	
10		481-0001-0404 (727-104)	Pop Rivet, Alum	4	
11		316-0001-0000 (770-101)	Paper, Thermal Printing Black	2 rl.	
12		(704-192)	Paper Guide, L.H.	1	
13		950-4020-0002 (704-191)	Paper Guide, R.H.	1	
14		(704-196)	Spring Booster	2	
15			Assembly, PWB (See Assy. Dwg. AS-690-106 and Schematic SC-690-106)	1	
16			Spindle (Telpar No. 102001-0005)	1	
17		302-0003-2540 (716-101)	Nut, 1/4" x 40mm Decorative	2	
18		637-1410-0051 (734-114)	Terminal, Gnd. Lug Locking	1	
19	S2	624-0016-1221 (664-116)	Switch, SPDT U15P4HCQ	1	
20	S1	624-0017-2221 (664-117)	Switch, DPDT 9221P4HZ4	1	
21		295-0005-0351 (729-105)	Label, Elec. Leakage Condition	1	
22		295-6540-0000 (729-172)	Label, Critikon S/N	1	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
23		(316-007)	Printer Cable Assy. 845A/950	1	
24		034-0018-0318 (683-121)	Cable, AC,SJT,18-3 Yellow UL 120V/60Hz	1 8.8 ft.	
		034-0019-0318 (683-122)	Cable, AC,SJT,18-3 Black UL 240V/50Hz	REF 8.8 ft.	
25		611-0002-0000 (752-120)	Strain Relief, Line Cord	1	
26		120-0032-2018 (607-109)	Connector, 3-pin Hosp. Grade Plug (For 120V/60Hz only, no plug supplied for 240V/50Hz)	1	
27		208-0005-2000 (752-108)	Fuseholder Cap, American	2	
		208-0006-2000 (752-109)	Fuseholder Cap, Foreign	REF	
28		208-0004-1000 (617-104)	Fuseholder, Buss	2	
	F1/2	190-0002-3010 (628-102)	Fuse, 1.0 Amp Slo-Blo 120V/60Hz	2	
	F1/2	190-0007-0005 (628-107)	Fuse, 0.5 Amp Slo-Blo 240V/50Hz	2	
29	T1	950-4010-0002 (320-029)	Transformer Prep, 950 Printer	1	ALL
30		302-0002-0832 (715-109)	Nut, Reg. 8-32 SS	6	
31		706-0001-0008 (724-103)	Washer, Lock Split Ring #8	4	
32		704-0001-0008 (723-104)	Washer, Flat Std. #8	4	
33		500-0208-0832 (719-121)	Screw, Mach. Pan Hd. 8-32x1/2	7	
34		500-0208-1032 (719-122)	Screw, Mach. Pan Hd. 10-32x1/2	4	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
35		706-0001-0010 (724-104)	Washer, Lock Split Ring #10	4	
36		500-0207-0632 (719-114)	Screw, Mach. Pan Hd. 6-32x7/16	5	
37		706-0001-0006 (724-102)	Washer, Lock Split Ring #6	5	
38		(732-122)	Foot, Rubber	4	
39		(719-171)	Screw, #8 1/4" Slotted Pan Head	4	
40		500-0406-0832 (719-151)	Screw, Mach. Flt. Hd. 8-32x3/8	4	
41		174-0001-0832 (727-101)	Fastener, Dot	4	
42		(315-034)	Power Supply Assy.	1	
43		950-6070-0000 (704-194)	Standoff 4.14"	1	
44		634-0001-0616 (704-104)	Tape, 1" DC Foam 1/16 Thick	1	
45		302-0002-0440 (715-107)	Nut, Reg. 4-40	3	
46		500-0206-0440 (719-110)	Screw, Mach. Pan Hd. 4-40x3/8	1	
47		120-0241-1127 (607-128)	Connector, 24-pin Male, Amp	1	
48		950-6090-0002 (704-195)	Bracket, Printer Support	2	
49		295-0019-0352 (729-119)	Tag, 120VAC Cord	1	
		295-0021-0352 (729-121)	Tag, 240VAC Cord	REF	
		295-0020-0352 (729-120)	Tag, 100VAC Cord	REF	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
		950-1000-0*** (315-034)	Power Supply Assembly	1	120V/60Hz ENG.
1	PPS,PWB	950-5000-00** (640-128)	PWB, 950 Power Supply	1	
2	J2	120-0031-3211 (607-108)	Connector, 3 Pin Female Header Amp	1	
3	J3,4,5	120-0091-3211 (607-197)	Connector, 9 Pin Header Female Amp	3	
4			NOT USED		
5		598-0066-4061 (735-143)	Standoff	3	
6		204-6010-0001 (735-117)	Heatsink	1	
7		500-0207-0632 (719-114)	Screw, Mach Pan Hd 6-32 x 7/16	1	
8			NOT USED		
9		222-0002-0000 (752-112)	Insulator, Washer	2	
10		706-0002-0006 (724-107)	Washer, Lock Int. Tooth #6 SS	2	
11		636-2022-0211 (734-102)	Terminal, Turret	8	
12		677-0731-0184 (756-105)	Tyrap, Large	5	
13		580-0612-2514 (735-133)	Spacer, Nylon 6-32 x 1/8	1	
14		506-0806-0632 (721-105)	Screw, Nylon 6/32 x 3/8	1	
15		704-0001-0106 (723-107)	Washer, Flt Sm. Patt. #6 SS	2	
16	P9	120-0560-3212 (607-139)	Connector, 56 Pin Edge	1	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
17	Ref Item 16	567-0001-2013 (742-110)	Heatshrink, 1/8" Clear Fit	.666 ft.	
18			NOT USED		
19	U3	224-4049-1611 (619-111)	I.C., 16 Pin MC140498CP	1	
20	U1	225-0205-0822 (621-105)	I.C., 8 Pin LM205	1	
21	U2	225-7805-0351 (621-137)	I.C., 7805	1	
22	U4	225-0358-0811 (621-113)	I.C., 8 Pin LM358AN	1	
23	Q4	660-0971-0000 (676-102)	Transistor, JFET MPF971	1	
24	Q3	663-6346-2283 (675-102)	Transistor, 2N6346	1	
25	Q1	665-3055-6194 (673-103)	Transistor, MJE3055	1	
26	Q2	661-4403-4132 (674-103)	Transistor, 2N4403	1	
27	CR3	149-5248-2152 (612-110)	Diode, Zener 1N5248B	1	
28	CR12-15, 17	145-4148-7511 (610-104)	Diode, Power IN4148	5	
29	CR1,2, 5-11,16	146-0531-1323 (611-103)	Diode, Power GE531	10	
30			NOT USED		
31	C11,17	065-4707-9160 (604-113)	Capacitor, Elect. 4700 UF 16VDC	2	
32	C1,2,3	065-2207-9400 (604-113)	Capacitor, Elect. 2200 UF 40VDC	3	
33	C8,14	065-4706-9250 (614-115)	Capacitor, Elect. 470 UF 25VDC	2	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
34	C7,15	065-4706-9250 (604-109)	Capacitor, Elect. 22 UF 25VDC	2	
35	C4,9,12 13,16	054-1003-2101 (603-113)	Capacitor, Film .1 UF 100V 5%	5	
36	C6	054-2201-2101 (603-118)	Capacitor, Film .0022 UF 100V 5%	1	
37	C5	052-2000-5301 (602-113)	Capacitor, Mica 200 PF 300V 5%	1	
38			NOT USED		
39			NOT USED		
40	R5	400-1006-0758 (630-113)	Trimpot, 1 K	1	
41		567-0002-2013 (742-110)	Heatshrink, 1/8" Clear Fit	1 ft.	
42	R2,3	439-0168-3030 (655-102)	Resistor, WW .16 OHM 3 W	2	
43	R4	424-1332-1128 (652-115)	Resistor, MF 13.3 K 1/8 W 1%	1	
44	R6	424-1401-1128 (652-116)	Resistor, MF 1.4 K 1/8 W 1%	1	
45	R1	403-6809-5258 (650-177)	Resistor, CF 68 OHM 1/4 W 5%	1	
46			NOT USED		
47		714-0059-1222 (680-153)	Wire, 22 GA GSA Black	1 ft.	
48	R9-14,16 17	403-1002-5258 (650-103)	Resistor, CF 10 K 1/4 W 5%	8	
49	R15,18	403-1004-5258 (650-105)	Resistor, CF 1 MEG 1/4 W 5%	2	
50	R8	403-6800-5258 (650-173)	Resistor, CF 680 OHM 1/4 W 5%	1	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
51	R7	403-1201-5258 (650-111)	Resistor, CF 1.2 K 1/4 W 5%	1	
52		714-0066-1222 (680-161)	Wire, 22 AWG CSA Grey	1 ft.	
53		714-0064-1222 (680-159)	Wire, 22 AWG CSA Brown	7.5 ft.	
54		714-0063-1222 (680-158)	Wire, 22 AWG CSA Blue	2.5 ft.	
55		714-0060-1222 (680-155)	Wire, 22 AWG CSA Red	5.0 ft.	
56		714-0059-1222 (680-153)	Wire, 22 AWG CSA Black	7.5 ft.	
57		714-0062-1222 (680-157)	Wire, 22 AWG CSA Yellow	2.5 ft.	
58		714-0065-1222 (680-160)	Wire, 22 AWG CSA Orange	2.5 ft.	

ITEM NO.	REF. DES.	PART NO.	DESCRIPTION	UNITS PER ASSY.	REF. CONFIG.
			<p style="text-align: center;"><u>NOTE</u></p> <p>The parts list for the 1B-11TS Thermal Printer Assembly was not available at the time of printing. It will be supplied as soon as it is available.</p>		

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