Data General

Field Engineer's
Maintenance Series

ENHANCED DASHER™ LP2 and TP2 PRINTERS

015-000124-01

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ENHANCED LP2/TP2 PRINTER FIELD MAINTENANCE MANUAL

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PREFACE

INTRODUCTION

This manual provides installation, operation and maintenance information for the Enhanced DASHER LP2/TP2 family of printers. The manual comprises six chapters including:

* Chapter 1- Product Description. This chapter provides a brief physical and functional overview of the printer family, identifies all replaceable subassemblies and lists all applicable manuals.

* Chapter 2-Operation. This chapter identifies and describes all operating controls and indicators and provides operating procedures for the printer.

* Chapter 3- Functional Description. This chapter provides theory of operation for the printer down to the field replaceable unit (FRU) level.

* Chapter 4- Troubleshooting. This chapter contains procedures for isolating equipment malfunctions down to the field replaceable unit level.

* Chapter 5- Maintenance. This chapter provides preventive and corrective maintenance procedures for the printer family.

* Chapter 6- Installation. The installation chapter contains unpacking data, cabling information, and initial checkout procedures for new installations.

TABLE OF CONTENTS

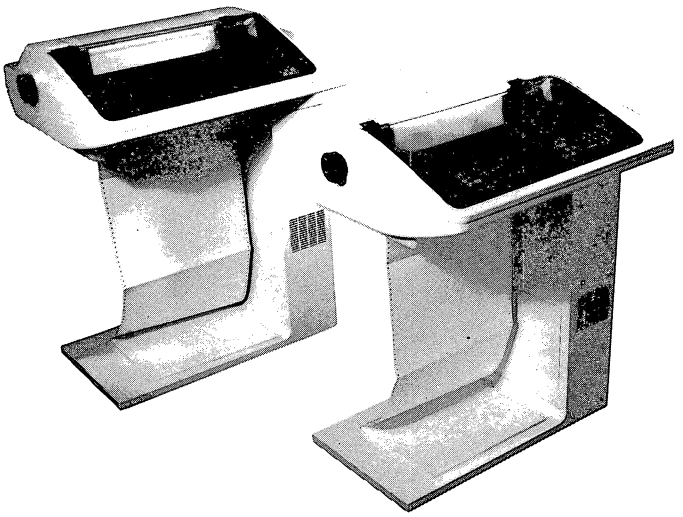


Figure 1.1 DASHER LP2/TP2 Printer Family
(Models 6190-6194, 9610-9613)

CHAPTER 1 - GENERAL DESCRIPTION

1.1 INTRODUCTION

This chapter provides a general description of the enhanced TP2/LP2 family of dot matrix impact printers manufactured by Data General Corporation. This section includes a brief physical and functional description of the printer, identifies the major assemblies and subassemblies and lists and describes all field replaceable units (FRU's).

1.2 PRODUCT OVERVIEW

The TP2/LP2 family of printers are microprocessor-controlled bi-directional, dot matrix printers capable of printing at burst speeds up to 180 characters per second. The printers are available with either serial or parallel interfaces for direct installation on DGC computer systems or indirect connection via a Bell 103 or 212A compatible modem.

All printer models are equipped with seven international character sets but only two sets may be used at any given time (selected via DIP switches on the Control Logic PCB). The primary character set is factory configured according to the model suffix and the secondary set is the U.S. character set.

The printers are housed in free-standing pedestal cabinet assemblies and are available in receive only configurations or keyboard send receive (KSR) configurations with full upper/lower case ASCII keyboards.

1.3 STANDARD FEATURES

All members of the printer family include the following features:

* Choice of two character sets from total of seven ROM-resident international character fonts (switch selectable)

* Standard/Alternate character set- permits printing from either of two active character sets under software control

* Horizontal and vertical tabbing
* Plotting
* Underscoring
* Elongated printing
* 6 or 8 lines/inch spacing
* Automatic form feed
* Down line loaded character sets
* Compressed printing (permits printing 132/ 220 characters per line on 8 1/2 / 14 inch wide paper

1.3.1 International Character Fonts

The TP2/LP2 printers contain seven ROM-resident international character sets but only two of the sets may be used at any given time. The two selected sets are designated the standard and alternate sets by means of DIP switches located on the Control Logic PCB. The user may then print from either the standard or the alternate character set under software control.

The standard character set for each printer is factory-configured according to the customer's model number beta suffix. The alternate character set is configured as the American character set.

However maintenance personnel may reconfigure the standard and secondary character sets using dual-in-line-package (DIP) switches located on the control board (see details in the Installation chapter).

The available character sets include:

* American
* British
* French
* German
* Swedish
* Danish
* Spanish

1.3.2 Horizontal and Vertical Tabbing

The horizontal tabbing feature permits the user to set or clear tabs anywhere in the 132 character line (220 character line in compressed print mode). All tabs may be set with a single escape sequence (on 7-bit interfaces, tabbing is limited to 127 using ESC E sequence).

The vertical tabbing feature permits the user to to quickly move to any selected line on a form. All vertical tabs for a given form may be set with a single escape sequence.

1.3.3 Plotting

The plotting feature provides the user with complete control over seven of the 9 individual print wires . For printing of continuous graphs, interline spacing may be eliminated.

1.3.4 Underscoring

The underscoring feature permits underlining characters, strings or complete lines and is printed at the same time that the associated character is being printed.

1.3.5 Elongated Printing

This feature permits the user to print characters at twice the width of normal characters. Normal print character spacing is 10 characters per inch and 5 characters per inch in elongated mode.

1.3.6 6 or 8 Lines Per Inch Spacing

This feature permits the user to select the spacing between lines on a form. This selection is controlled by a switch from the secondary control panel (see Chapter 2).

1.3.7 Automatic Form Feed

This feature permits advancing the paper to the top of the next form in one operation.

1.3.8 Automatic Perforation Skip

The automatic perforation skipover feature allows the user to skip the perforation between forms.

1.3.9 Downline Loaded Character Sets

This feature allows the user to load a character set from the host system into the printer (user may design a character set with up to 118 printable characters).

1.3.10 Compressed Printing

The compressed printing feature permits the user to print 132 characters per line on 8 1/2 inch paper or 220 characters per line on 14-inch paper.

1.4 OPTIONAL FEATURES

Some of the optional features of the TP2/LP2 printer family include the following:

* Choice of serial or parallel interface
* NOVA/ECLIPSE programmed I/O controller
* NOVA/ECLIPSE data channel controller
* Ribbon cartridges
* Paper holder

1.4.1 Serial/Parallel Interface

The TP2 printer is equipped with a serial interface that permits the printer to be connected to a host system via asynchronous communications equipment. The serial interface transfers serial data streams at switch-selectable rates ranging from 110 to 4800 baud. The serial interface also has a number of switch selectable data formats as described in greater detail in Chapter 6.

The LP2 printer is equipped with a parallel interface that permits connection of the printer to a host system equipped with a parallel ASCII line printer interface. The parallel interface transfers 7 or 8 bits of information in parallel. In addition, the interface permits sending back information to the host indicating when the printer is powered up and ONLINE as well as when the printer's buffer can accept more characters.

1.4.2 Programmed I/O Controller

The NOVA/ECLIPSE programmed I/O controller permits connecting a printer to a DGC system currently not equipped with a line printer interface. This controller communicates with the CPU in a NOVA or ECLIPSE system via programmed I/O instructions.

1.4.3 Data Channel Controller

The NOVA or ECLIPSE data channel controller is needed to connect an LP2 printer a DGC host system that was not previously equipped with a line printer interface. This controller permits host to printer data transfers via the computer's data channel facility.

1.4.4 Ribbon Cartridges

The user may procure replacement fabric-type, continuous feed ribbon cartridges (in boxes of 12, 60, or 600) that fit all LP2/TP2 printers.

1.4.5 Paper Holder

As an optional feature, any of the TP2/LP2 printers may be equipped with a paper holder that collects and stacks fan-fold style forms.

1.5 DESCRIPTION OF PRINTER MODELS

The printers are available in nine basic models as summarized in table 1.1 below. As indicated in the table, the printer family includes seven LP2 models equipped with parallel interfaces and two TP2 models (6193 and 6194) equipped with serial interfaces. Of the two TP2 printers, model 6193 is a receive only (RO) type printer and Model 6194 is a keyboard send receive unit (KSR).

The model designation on a TP2/LP2 printer is located on the lower rear portion of the printer pedestal next to the power cord connector.

Table 1.1 LP2/TP2 Printer Model Configurations

DASHER MODEL CONFIGURATIONS

MODEL	TYPE	DESCRIPTION
6190	LP	Receive only line printer with parallel interface
6191	LP	Receive only line printer subsystem, parallel interface, Nova/Eclipse programmed I/O controller, paper holder.
6192	LP	Receive only line printer subsystem parallel interface, Nova/Eclipse data channel controller, paper holder
6193	TP	Receive only terminal printer with serial interface
6194	TP	Keyboard send/receive terminal printer with serial interface
9610	LP	Receive only line printer subsystem with parallel interface for CS/10 C1 systems
9611	LP	Receive only line printer subsystem with parallel interface for use with CS/10 C3 systems
9612	LP	6190 Receive only printer with parallel interface configured for CS/30 systems
9613	LP	6190 receive only line printer with parallel interface configured for CS/40+ systems
1285A	—	Box of 12 ribbon cartridges for all models
1285B	—	Box of 60 ribbon cartridges for all models
1285C	—	Box of 600 ribbon cartridges for all models
1127A	—	Paper holder for all models

1.6 TECHNICAL SPECIFICATIONS

The technical specifications for the TP2/LP2 printers are summarized in table 1.2.

Table 1.2 TP2/LP2 Technical Specifications

Print Rate	180 characters per second (logic seeking, bidirectional)
Print Method	Serial 9-wire, impact through ribbon
Character Style	7 × 9 dot matrix
Character Size	Height: 2.67mm (0.105") Width: 1.93mm (0.076") (normal width characters)
Character Fonts	American, British, French, German, Spanish and Swedish
Paper Forms	Pin-feed, fan-fold, 1 to 6 parts.
	Width: 10.2cm to 38.1 cm (4" to 15") Hole spacing: 1.27cm (0.5") centers (nom.) Maximum form thickness: 0.625mm (0.025") Form weight: 5.45kg (12 lbs.) paper 3.63kg (8 lbs.) carbon Form crimps: tab type only
Ribbon:	Fabric ribbon, cartridge type, continuous loop.
Parallel Interface (LP2 Printers)	Compatible with 8-bit line printer interfaces which include STROBE, DEMAND, and READY signals.
Serial Interface (TP2 Printers)	Plug compatible with either 20mA current loop or EIA RS-232C voltage interface. Available with MODEM interface.
Power Requirements	120, 220/240 volts ac (nom.), 47 to 63 Hz.
Power Dissipation	Idle: 140 Watts (typical) Running: 300 Watts (typical)
Power Cable:	1.8m (6 ft.)
External I/O Cables (max. length)	Parallel interface: 7.4 meters (25 feet) Serial interface: 20mA — 457 meters (1,500 feet) EIA — 7.6 meters (50 feet)
Dimensions	Height: 85.7cm (33.75") Depth: 53.3cm (21") Width: 67.3cm (26.5")
Weight:	27kg (60 lbs.)
Printhead Drive	Lead screw driven by permanent magnet stepping motor.
Print Wire	Pulse Width: 400 microseconds
Solenoid Drive	Actuating voltage: 48 VDC (primary) 12 VDC (secondary) Solenoid Current: 4 Amps (max.)
Ribbon Drive	Cable drive; bidirectional input, unidirectional output clutch box
Paper Feed Drive	Pin-feed tractors driven by permanent magnet stepping motor and timing belt, eight 7.5 deg steps per line at 6 lines per inch spacing.
Temperature Ranges	Operating: 10 degC to 40 degC (50 degF to 104 degF) Storage: – 40 degC to 60 degC (– 40 degF to 140 degF)
Humidity Ranges	Operating: 10% to 90% (non-condensing) Storage: 5% to 95% (non-condensing)
Maximum Altitude	15,250 meters (50,000 ft.)

1.7 FIELD REPLACEABLE UNITS

Table 1.3 lists all field replaceable units (FRU's) for the TP2/LP2 printer family.

Table 1.3 TP2/LP2 FRU Listing

PART NO	DESCRIPTION
002-004115	ADJUSMENT LEVER, PLATEN
002-004146	KNOB
002-006148	DISK, NORMAL PRINT
002-006166	COUPLING ADAPTER
002-006551	DRIVE PULLEY PAPER FEED
002-007016	PAPER FEED SHAFT
002-007448	FRONT GUIDE RAIL
002-007927	COUPLING CLAMP
002-007928	CLAMP, COUPLING SHAFT
002-010232	SPACER
002-010233	CLAMP
002-010237	PLATEN (REPLACES 002-004110)
002-010245	COVER, FAULT INDICATOR
002-010253	LABEL, FAULT INDICATOR COVER
002-010255	BEARING FLANGE (REPLACES 002-004132)
002-010256	DETENT FLANGE (REPLACES 002-004133)
002-010264	FEEDTHRU CONNECTOR W/PINS (EIA/20 MA)
005-001246	CABLE, EXTERNAL
005-001356	CABLE, EXTERNAL
005-003564	CONTROLLER, PIO
005-006227	PLATEN ASSEMBLY
005-006406	CABLE
005-006407	CONTROL PANEL PCB
005-007428	CABLE,EXTERNAL
005-007636	CABLE, EXTERNAL
005-007637	CABLE, EXTERNAL
005-007888	CABLE, EXTERNAL
005-007889	CABLE, EXTERNAL
005-008096	CONTROLLER, DCH
005-008181	CABLE, EXTERNAL
005-008452	CABLE, EXTERNAL
005-008833	CABLE, EXTERNAL
005-009060	CABLE, EXTERNAL
005-009505	DRIVER PCB (REV 11+)
005-009508	PAPER FEED MOTOR ASSEMBLY
005-009509	RIBBON DRIVE ASSEMBLY
005-009511	CARRIAGE MOTOR ASSEMBLY
005-009516	CABLE HARNESS ASSEMBLY
005-009523	TRANSFORMER ASSEMBLY
005-009575	CABLE, PRT HEAD/DRIVER
005-009579	CABLE, POWER SUPPLY TO DRIVER PCB

Table 1.3 Enhanced TP2/LP2 FRU Listing (Continued)

PART NO	DESCRIPTION
005-009580	CABLE, LOGIC TO DRIVER PCB
005-009581	CABLE, LOGIC TO SECONDARY CONTROL PANEL
005-009588	CABLE, HOME TRANSDUCER ASSEMBLY
005-009595	DG PRINTHEAD (Replaces 118-573)
005-009596	CABLE, LOGIC TO PARALLEL I/O
005-009597	CABLE, LOGIC TO MODEM
005-009692	CABLE, EXTERNAL
005-010603	CABLE, EXTERNAL
005-010707	CABLE, EXTERNAL
005-012099	CABLE, EXTERNAL
005-012100	CABLE, EXTERNAL
005-012924	RIBBON, CARTRIDGE ASSEMBLY
005-012938	CABLE, LOGIC TO BELL
005-012939	TRANSDUCER ASSEMBLY
005-012940	CABLE, LOGIC TO KEYBOARD
005-012942	CABLE, LOGIC TO 20/EIA
005-012943	CABLE, LOGIC TO FAULT
005-012944	CABLE, LOGIC TO PRIMARY CONTROL PANEL
005-012945	CABLE, LOGIC TO SECONDARY CONTROL PANEL
005-012946	CABLE, LOGIC TO POWER SUPPLY
005-012975	SECONDARY CONTROL PANEL (Common to TP2/LP2)
005-013887	POWER SUPPLY PCB (REV 9+)
005-014692	CABLE, EXTERNAL
005-014693	CABLE, EXTERNAL
005-014757	CABLE, EXTERNAL
005-016358	FAULT INDICATOR PCB (Common to TP2/LP2)
005-016362	CONTROL LOGIC PCB (Common to TP2/LP2)
005-016721	CABLE, EXTERNAL
100-001692	IC SYC6551 (UART) (Serial TP2 Only)
103-000288	CAPACITOR LINE FILTER
106-000066	SCREW, 4/40 X 5/8
106-000540	SCREW, CP 6/32 X 3/4
106-000581	SCREW FOR PF PULLEY
106-000603	SCREW FOR ADJ KNOB
106-001813	SCREW, 6/32 X 3/8
109-000238	POWER CORD - 120 VOLT
109-000240	POWER CORD - 240 VOLT
110-000132	SWITCH
110-000226	SWITCH DPDT
110-000255	SWITCH
110-000261	SWITCH

Table 1.3 Enhanced TP2/LP2 FRU Listing (Continued)

PART NO.	DESCRIPTION
110-000329	THUMBWHEEL SWITCH
110-000330	PUSHBUTTON SWITCH
110-000351	ROTARY SWITCH
110-000363	TOGGLE SWITCH
113-000168	CIRCUIT BREAKER (120 VOLT)
113-000186	CIRCUIT BREAKER (220/240 VOLT)
115-000151	FAN
118-000676	KEYBOARD (U.S. Keycaps)
118-000696	STEEL CABLE, RIBBON DRIVE
118-000699	TRACTORS, PAPER FEED
118-001399	LEADSCREW AND ANTIBACKLASH NUT
123-000427	MINI PM SPEAKER
123-000842	BEARING, LEADSCREW
123-000843	WAVY WASHER
123-000851	SPRING FOR ADJ KNOB
123-000946	DRIVE BELT
123-000992	SHIM
123-001255	PIN, DOWEL LOCK
123-001264	RETAINING RING
123-001267	"O" RING
123-001321	BEARING LINEAR

1.8 OPERATIONAL OVERVIEW

The LP2/TP2 printers communicate with host systems via 7-bit ASCII codes from the standard 128 character ASCII set. The ASCII character set includes 96 upper and lower case alphanumeric and punctuation characters and 32 control codes. If a printer receives an alphanumeric code, it prints the corresponding character. If it receives a valid control code, it performs the specific function defined by the code. If, however, the printer receives one of the control codes it does not use, it ignores that code.

An LP2/TP2 printer can store up to 2528 characters in its buffer. Characters enter the buffer from either a parallel interface (DASHER LP2 printers) or a serial interface (DASHER TP2 printers). Both types of interfaces are able to signal the computer or communication system when the buffer is full.

The parallel interface printers generate a special hardware signal which tells the computer system when there is room in the buffer for a character. This scheme prevents buffer overflow and subsequent loss of data.

The serial interface models contain hardware and firmware that prevent buffer overflow. These printers can notify the host to stop sending data via a hardware signal (for local connections), or by transmitting special control characters (full duplex).

While receiving codes, the printer scans those codes already in the buffer to determine the fastest way to print each line. If the buffer becomes filled, the printer uses one of the methods discussed above to stop the system from transmitting codes. When the buffer is half empty, the printer can accept additional codes.

Printers respond to three types of information:

* Printing Character Codes - result in a character being printed.
* Control Codes - initiate a special function.
* Escape Sequences - sequences of codes (beginning with an escape) which control certain functions.

These three classes of information codes are described in greater detail in the following paragraphs.

1.9 PRINTING CHARACTER CODES

The printing characters include all the upper and lower case alphanumeric characters as well as graphic, punctuation, and space characters. Up to 132 characters may be printed on each line. If more than 132 characters are received without a line terminator, the line is truncated or a fault may occur, depending on the mode of operation. Newlines (012), Vertical Tabs (013), Form Feeds (014), and Carriage Returns (015) are all considered line terminators.

1.10 CONTROL CODES

A TP2/LP2 printer recognizes some control codes it receives as commands to perform specific operations. The control codes and their effects are listed in Table 1.4.

Table 1.4 TP2/LP2 Control Codes

NAME	MNEMONIC	CONTROL CODE (OCTAL)	EFFECT OF CODES RECEIVED
Bell	BEL	007	Sounds audible tone.
Back space	BS	010	Print head moves back one character position.
Horizontal Tab	HT	011	Print head moves to next horizontal tab stop. If no tab is set, the command is ignored.
Newline (Line Feed)	NL	012	Terminates the present line, advances the paper one line, and either: a) determines the fastest way to print the next line (if it is complete), or b) performs a carriage return and prints any character from left to right.
Vertical Tab	VT	013	Paper advances to next tab stop. If no tab is set, a carriage return command is substituted and no paper motion occurs.

Table 1.4 TP2/LP2 Control Codes (Continued)

NAME	MNEMONIC	CONTROL CODE (OCTAL)	EFFECT OF CODES RECEIVED
Form Feed	FF	014	Paper advances to top of next form.
Carriage Return	CR	015	Carriage returns to the left-hand margin.
Shift Out	SO	016	Selects alternate character set.
Shift In	SI	017	Selects standard character set.
Escape	ESC	033	Denotes the beginning of a command sequence.

1.11 ESCAPE SEQUENCES

Several printer functions may be initiated by sequences of codes called escape sequences. The functions controlled by the escape codes include:

* Horizontal and vertical tabbing
* Elongated printing
* Underscoring
* Plotting
* Resetting the printer
* Compressed printing
* Down line loading a character set

An Escape code (033) defines the beginning of a command sequence while subsequent codes define the function to be performed. If no valid code follows the Escape code, the Escape code is ignored and subsequent codes produce the standard effect.

If the ESCAPE DISABLE switch on the secondary control panel is in the DISABLE position, all Escape codes are ignored and subsequent codes are printed.

The escape codes and the valid function codes are described in table 1.5.

Table 1.5 TP2/LP2 Escape Codes Description

ESCAPE SEQ.	OCTAL CODES	FUNCTION
ESC 1	033 061	Sets a horizontal tab at the current print-head position.
ESC 2	033 062	Clears a horizontal tab from the current print-head position.
ESC E #..CTRL @	033 105 #..000	Sets horizontal tabs at the column positions specified by the octal number(s) #. All previous tabs are cleared.
ESC E CTRL @	033 105 000	Clears all horizontal tabs.
ESC 5	033 065	Sets a vertical tab at the current line position.
ESC 6	033 066	Clears a vertical tab from the current line position.
ESC F #..CTRL @	033 106 #..000	Sets vertical tabs at the line positions specified by the octal number(s) #. All previous tabs are cleared.
ESC 1 CTRL @	033 106 000	Clears all vertical tabs.
ESC <	033 074	Selects elongated printing for subsequent characters.
ESC =	033 075	Clears elongated printing for subsequent characters.

Table 1.5 TP2/LP2 Escape Codes Description (Continued)

ESCAPE SEQ.	OCTAL CODES	FUNCTION
ESC >	033 076	Selects the compressed print mode.
ESC ?	033 077	Selects the normal print mode.
ESC a	033 141	Starts underscoring subsequent characters.
ESC b	033 142	Stops underscoring subsequent characters.
ESC c CTRL@ CTRL@	033 143 000 000	Performs a master reset.
ESC d	033 144	Selects plot mode.
ESC e	033 145	Deselects plot mode.
ESC Y...	033 131	Beginning of character set load sequence (see DGC 014000094).
ESC N Starting Character Set Address*	033 116 004 000	Selects down line loaded character set
ESC O	033 117	Deselects a down line loaded character set.

* 8 data bit controllers only

1.12 CODE TRANSMISSION

Only TP2 printers are capable of transmitting data to a computer. If the software busy feature is enabled (using switches), TP2 printers transmit control codes which act as software busy and not busy signals. These codes are listed in table 1.6.

Table 1.6 TP2 Control Codes Description

CODE NAME	MNEMONIC	CONTROL CODE	EFFECT
Device Control	DC1	021 (CONT Q)	Indicates that the character buffer has room for more character.
Device Control	DC3	023 (CONT S)	Indicates that the character buffer is full.

In addition to the software busy feature, the keyboard on keyboard send receive (KSR) terminals can generate all the ASCII codes from 0 to 177 (octal). See Appendix A for the keys and key combinations that generate these codes.

1.13 PRINTER PHYSICAL DESCRIPTION

All TP2/LP2 printer models contain the following major assemblies:

* Carriage assembly - moves the printhead horizontally in front of the paper .

* Paper feed assembly - moves the paper vertically through the carriage assembly.

* Power supply - provides the necessary supply voltages for the logic,printhead, and motors.

* Main control board - contains a microprocessor and its related control circuitry. The microprocessor controls and monitors the printer's operation.

* Driver board - contains the motion sensing and driver circuits for the motors and printhead.

* Primary control panel - contains three frequently used control switches and indicator lights.

* Secondary control Panel - contains a number of less frequently used control switches.

In addition to the above assemblies, the keyboard send/receive TP2 printers are equipped with a keyboard assembly consisting of a typewriter style keyboard, a numeric pad, and a modified primary control panel.

The major assemblies of the LP2/TP2 printers are shown in figure 1.2.

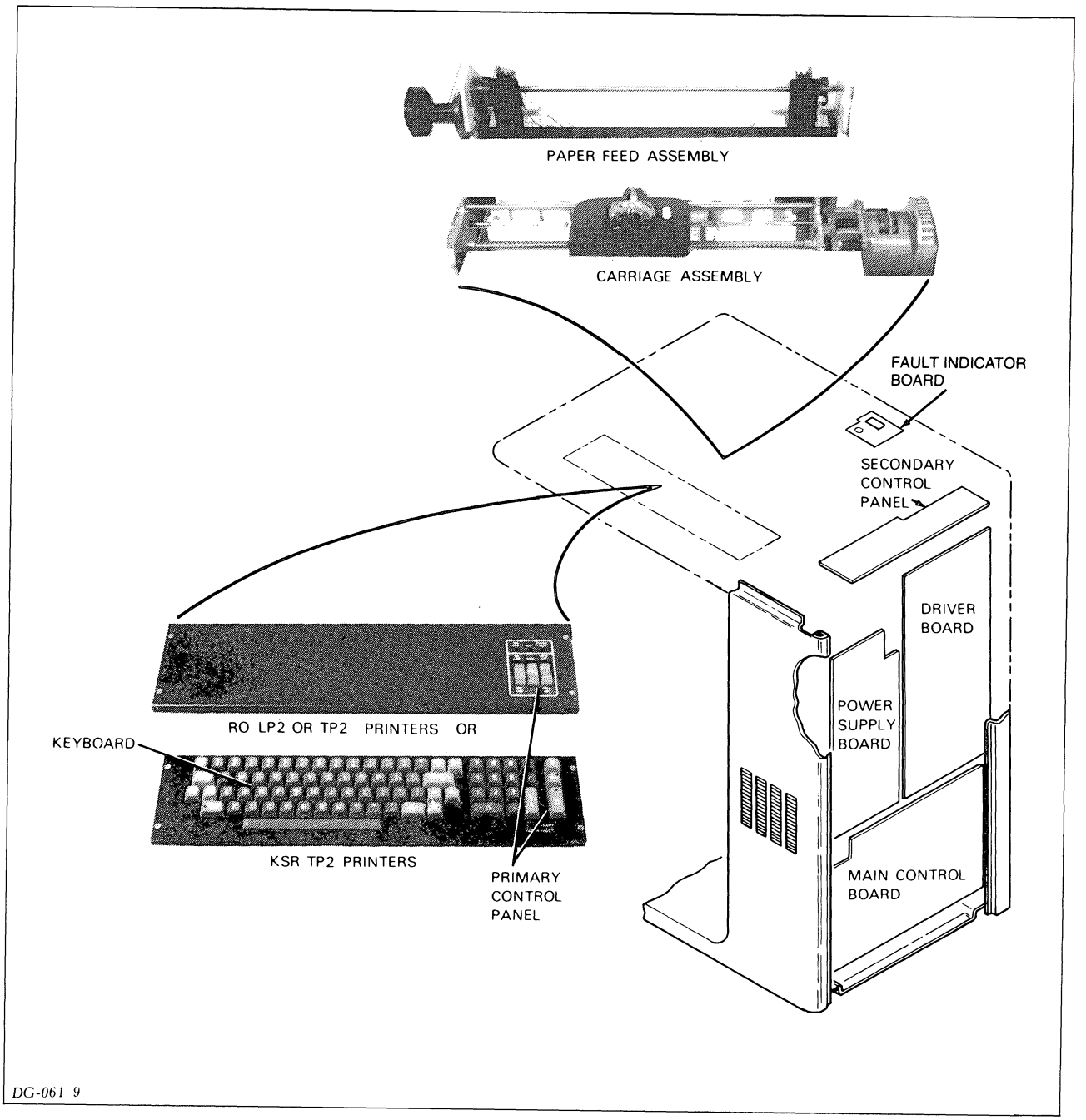


Figure 1.2 TP2/LP2 Major Assemblies

The carriage assembly and the paper feed assembly each consist of a number of subassemblies as described in the following paragraphs.

1.13.1 Carriage Subassemblies

The carriage subassemblies include the following:

* Carriage - supports the printhead and allows it to move horizontally (left or right) across the paper.

* Carriage stepping motor - driven by logic on the driver board, turns the leadscrew which moves the printhead.

* Home transducer - tells the microprocessor when the carriage is positioned at the left-hand margin.

* Lead screw - translates the carriage stepping motor's circular motion into the carriage's linear (horizontal) motion.

* Printhead - contains nine wires, in a vertical column, which fire as printhead moves across the page. These wires force the inked ribbon against the paper.

* Platen - supports for printhead wires when they strike the ribbon and paper.

* Motion transducer - tells microprocessor when the carriage is moving.

* Ribbon cartridge - contains an inked continuous ribbon.

* Ribbon drive gearbox - advances the ribbon using motion of the carriage.

* Ribbon drive cable - turns a drive capstan on the ribbon drive gearbox when the carriage moves.

The carriage subassemblies are shown in figure 1.3.

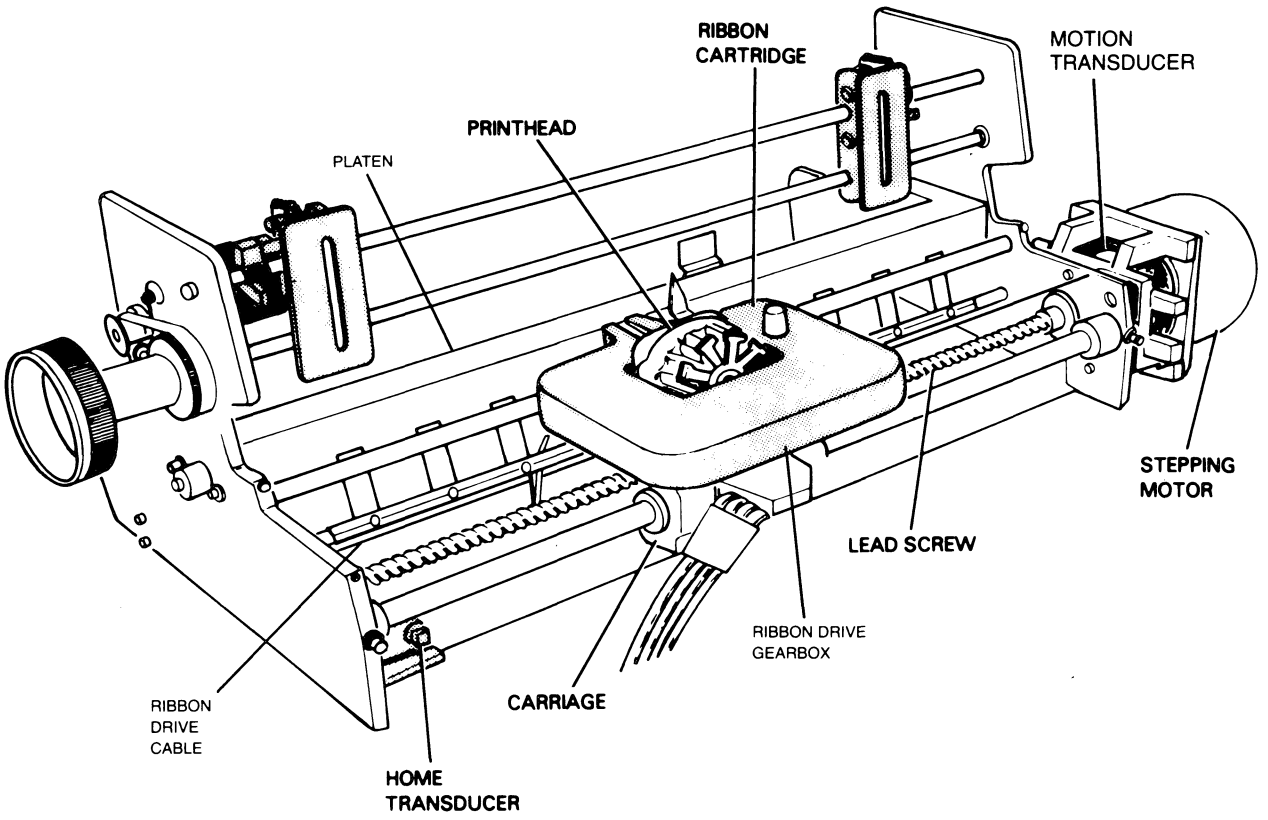


Figure 1.3 Printer Carriage Subassemblies

1.13.2 Paper Feed Subassemblies

The paper feed subassemblies include the following:

* Out of forms switch - tells microprocessor when printer runs out of paper.
* Paper feed stepping motor - provides motion to the assembly that moves paper through the printer. The motor is driven by logic on the driver board.
* Paper feed tractors - Control movement of paper through printer; driven indirectly by the stepping motor.
* Paper tension bar - keeps the paper flat against the platen.

The paper feed subassemblies are shown in figure 1.4.

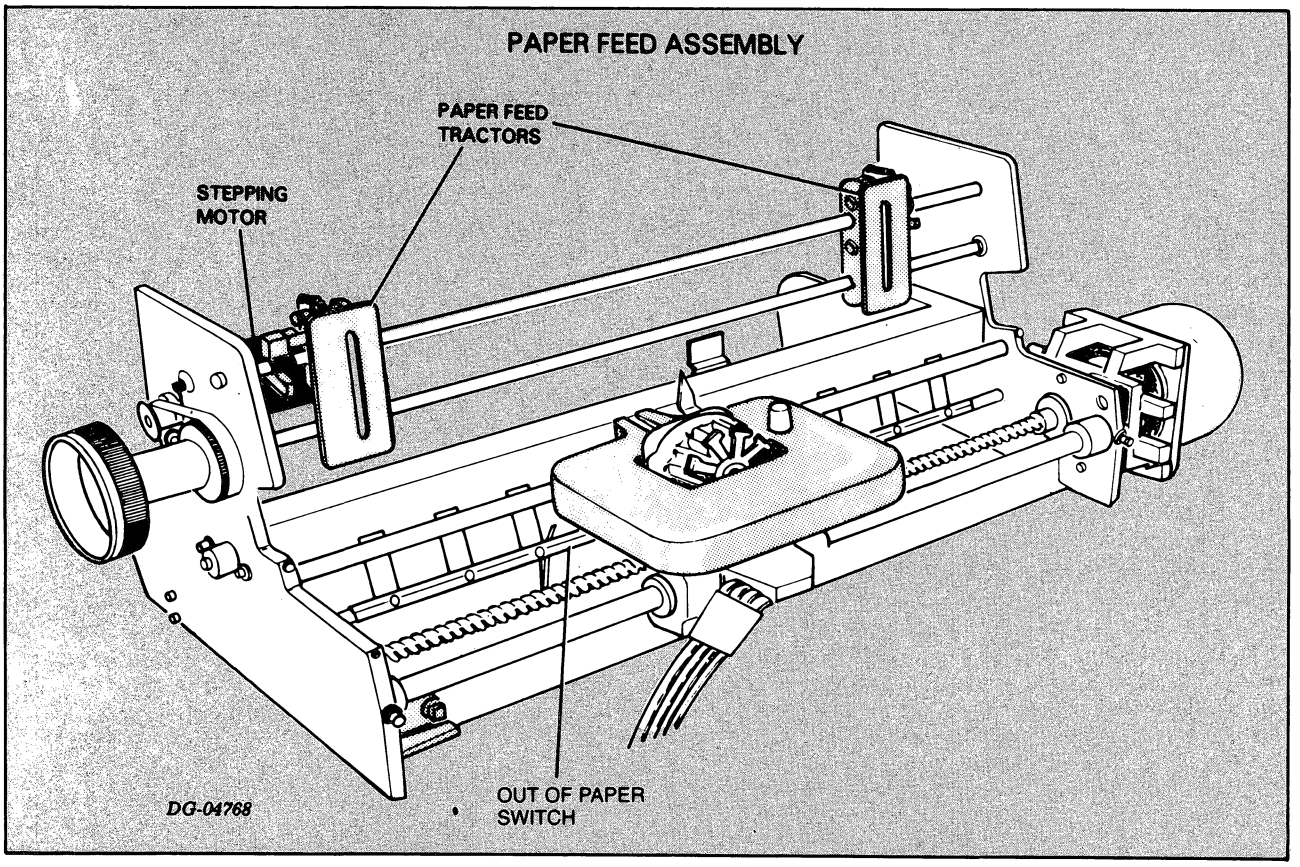


Figure 1.4 Printer Paper Feed Subassemblies

1.14 CHARACTER SETS

The LP2/TP2 printers are equipped with seven sets of 96-symbol character sets that are ROM resident. However only two of the sets can be used at any given time (standard and alternate character set selection occurs initially at the factory in response to the customer's order but may be field modified using DIP switches on the main logic board).

The seven character sets correspond to standard ASCII code specifications in the following seven countries: France, Germany, Spain, Sweden, the United Kingdom, the United States and Denmark.

Each character is defined by a 7-bit ASCII code. Control codes 000-037 (octal) are not printed. The codes from 040-177 octal define the 96-symbol character set.

The LP2/TP2 character sets are shown in figure 1.5.

AMERICAN USAGE

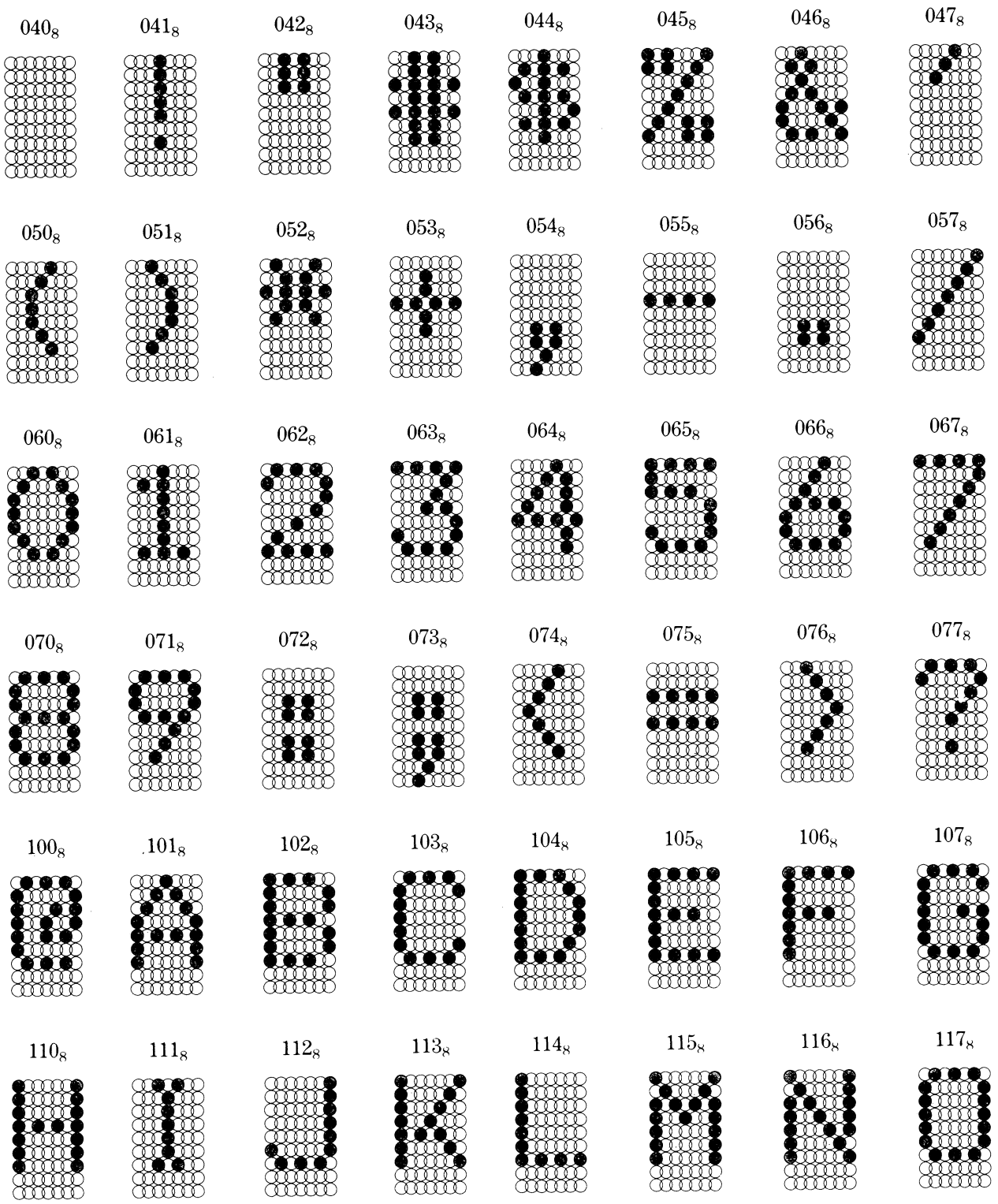


Figure 1.5 TP2/LP2 Character Sets (Sheet 1 of 4)

AMERICAN USAGE

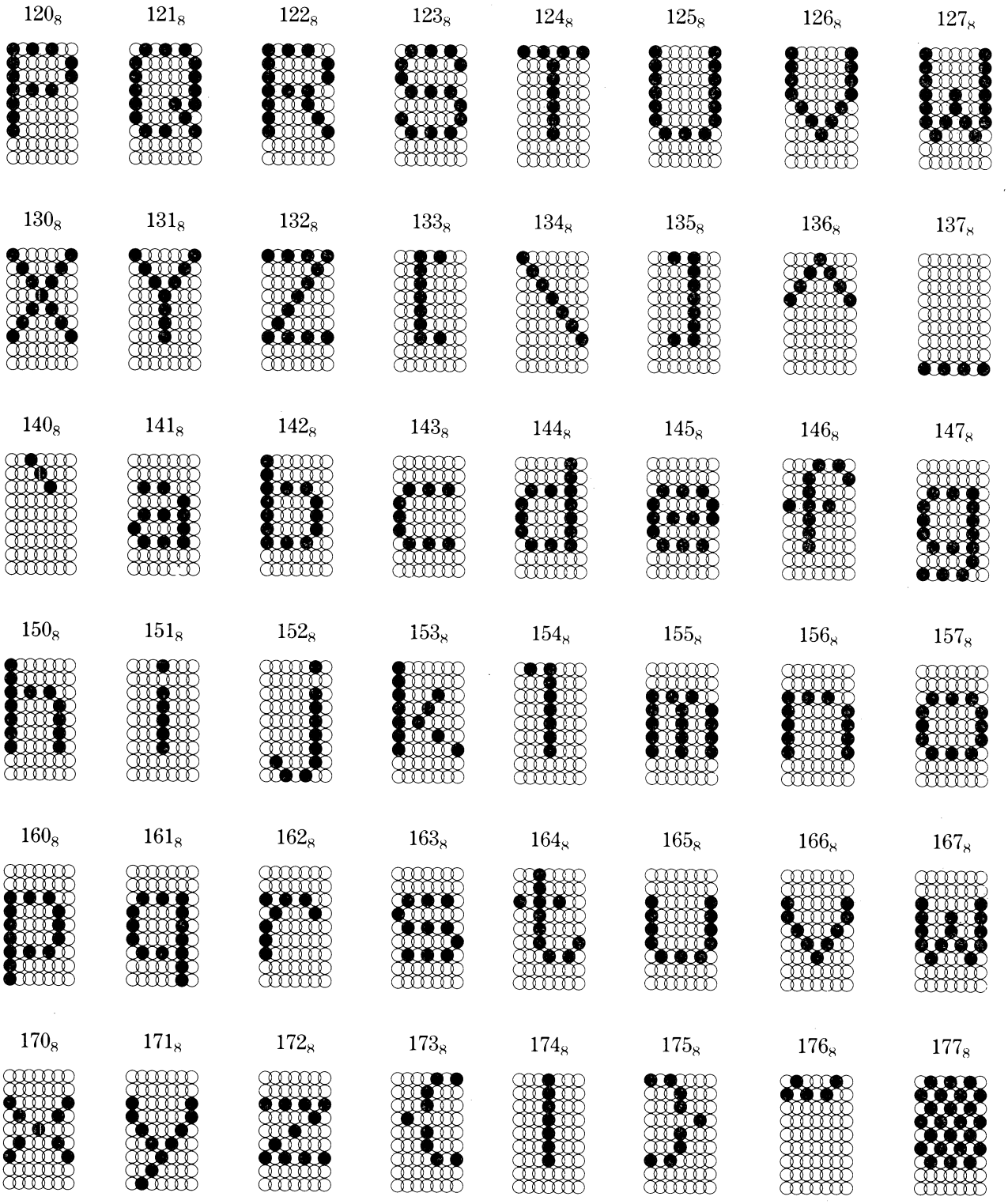
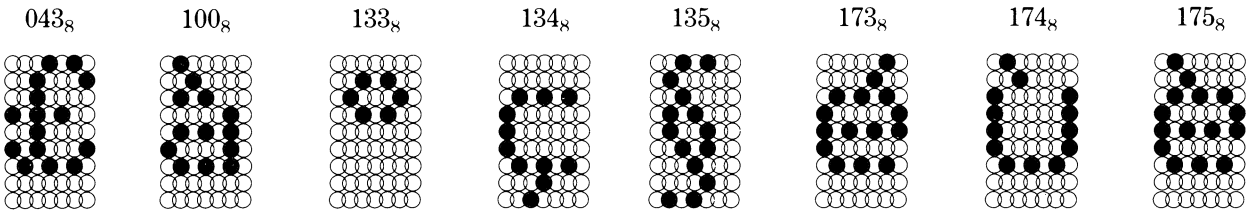
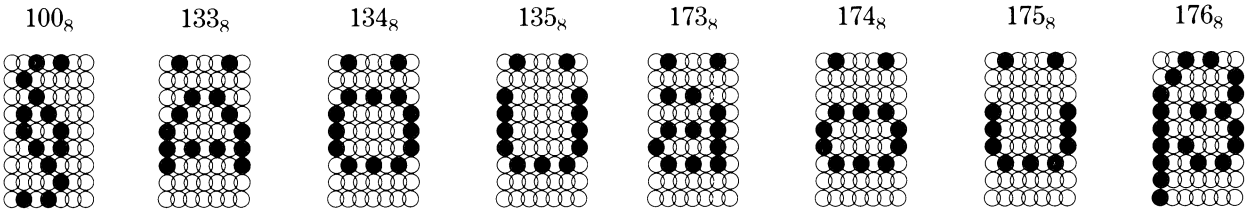


Figure 1.5 TP2/LP2 Character Sets (Sheet 2 of 4)

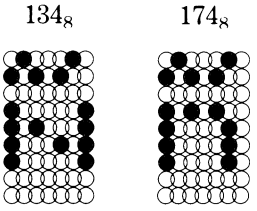
FRENCH USAGE



GERMAN USAGE



SPANISH USAGE



BRITISH USAGE

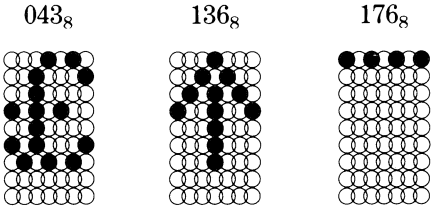
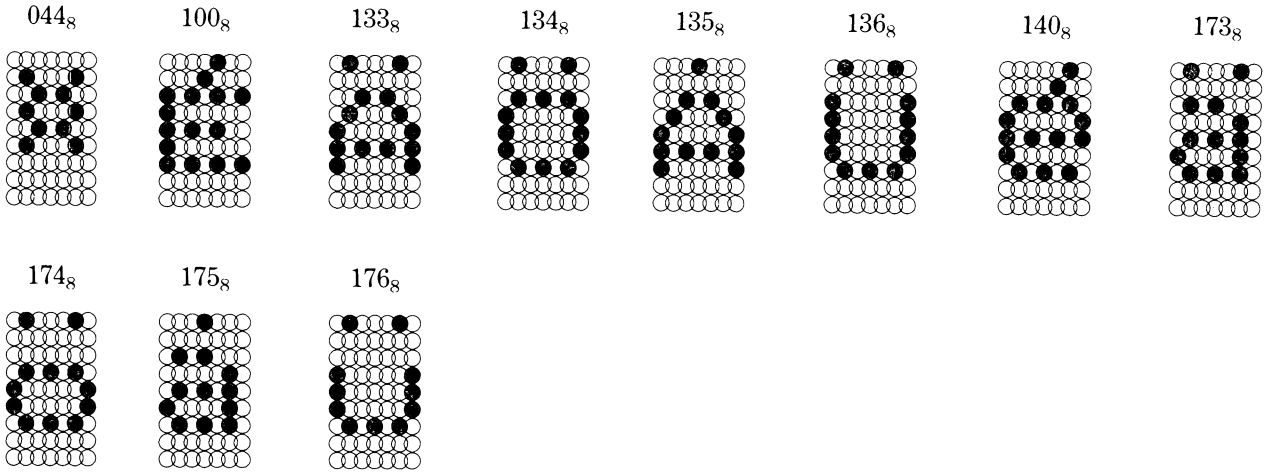


Figure 1.5 TP2/LP2 Character Sets (Sheet 3 of 4)

SWEDISH/FINNISH USAGE



DANISH/NORWEGIAN USAGE

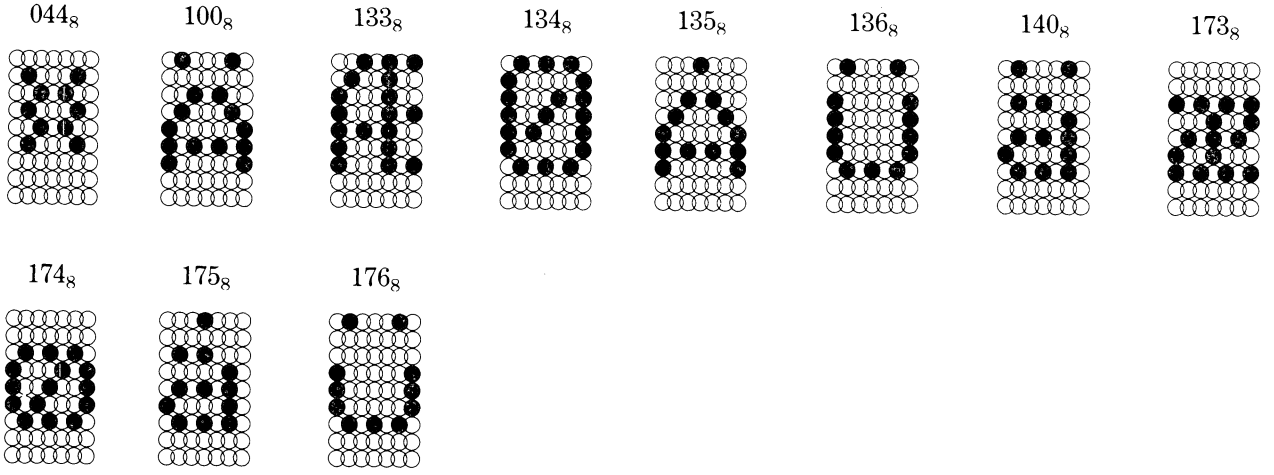


Figure 1.5 TP2/LP2 Character Sets (Sheet 4 of 4)

CHAPTER 2 - OPERATION

2.1 GENERAL

This chapter describes the various printer operating controls and indicators and provides powerup and shutdown procedures and paper/ribbon loading procedures.

2.2 CONTROLS/INDICATORS

All TP2/LP2 printer operating controls and indicators (with exception of the main power switch) are located on three control panels including:

* Primary control panel (keyboard assembly on KSR models)
* Secondary control panel
* Fault indicator panel

These control panels are shown in figure 2.1 and described in greater depth in the following paragraphs.

2.2.1 Power Switch

The two-position POWER switch is located on the inner side of the printer pedestal as shown in figure 2.1. When the switch is set to the up or ON position, power is applied to the unit. Setting the switch to the down position shuts off power to the printer.

2.2.2 Primary Control Panel

The printer family may be equipped with either of two types of primary control panels depending on whether it's a receive only printer (RO) or a keyboard send receive (KSR) configuration with keyboard.

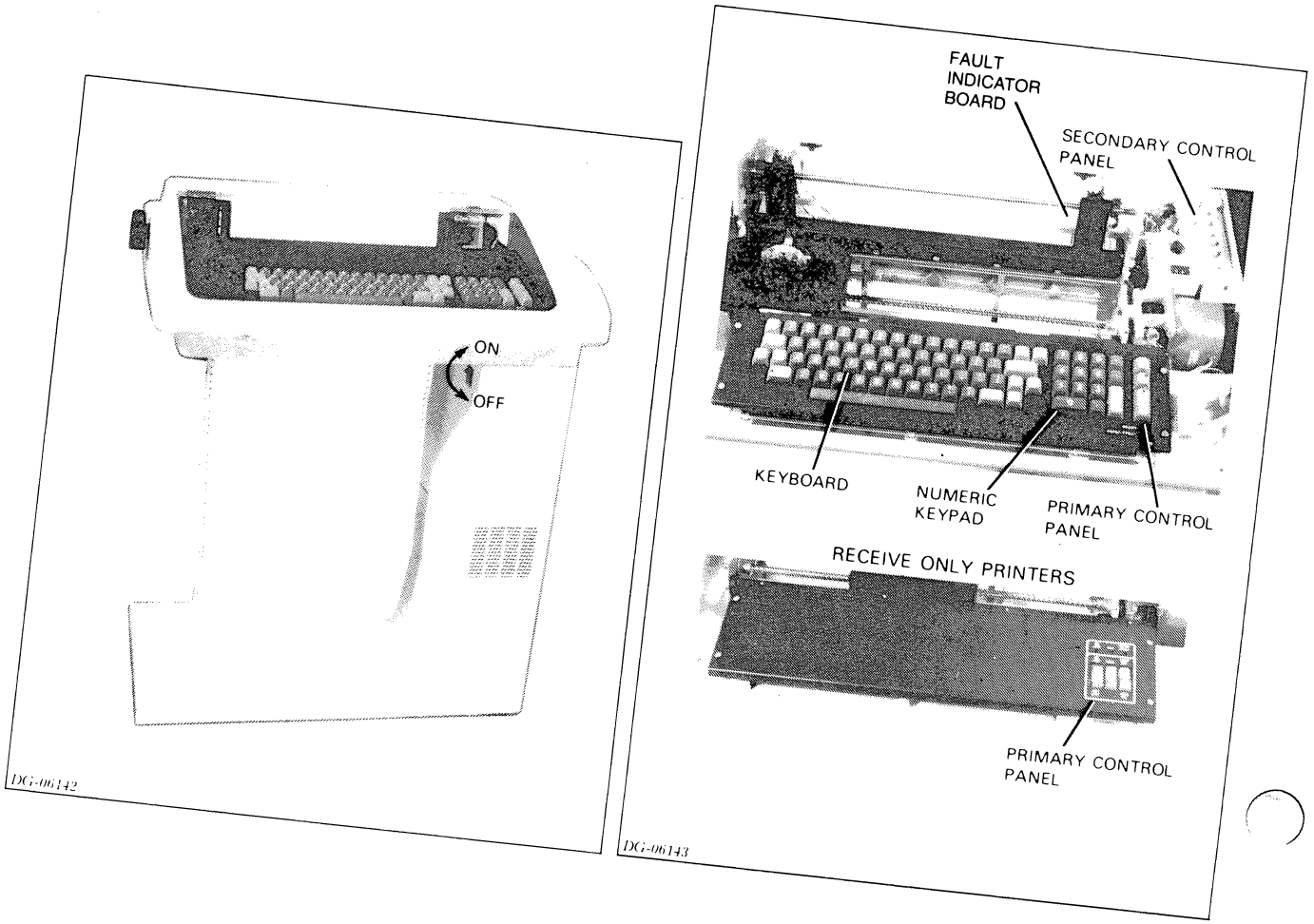


Figure 2.1 Printer Control/Indicator Locations

2.2.2.1 RO Primary Control Panel

The RO primary control panel (figure 2.2) contains the following controls and indicators:

* ONLINE/OFFLINE switch- Two position switch used to alternately switch printer to ONLINE/OFFLINE mode each time the switch is pressed. When unit is ONLINE, data from it's buffer is printed. When the unit is OFFLINE, it signals BUSY to the host and stops printing. However any data sent from the host to the printer will be stored in the printer's buffer until the buffer is filled.

* ONLINE indicator- Lights when printer is ONLINE.

* FEED Switch- Three position switch is used to initiate a line feed or form feed. Pressing the switch to position 1 initiates a line feed. Position 2 is the resting position of the switch; pressing the switch to position 3 moves the paper to the top of the next form (form feed).

* VIEW ON/OFF switch - Enables or disables the view feature. When the view feature is enabled (VIEW ON) and a printing pause occurs, the printhead automatically moves a few spaces away to permit viewing the last character printed. This feature is operational only in the ONLINE mode.

* RDY (ready) indicator- This indicator lights when the printer is ready to receive data from the host. If RDY is not lit, the printer is either OFFLINE, not powered up, or a fault condition exists (see fault indicator description).

* FAULT Indicator- Lights to indicate a fault condition (see fault indicator board description).

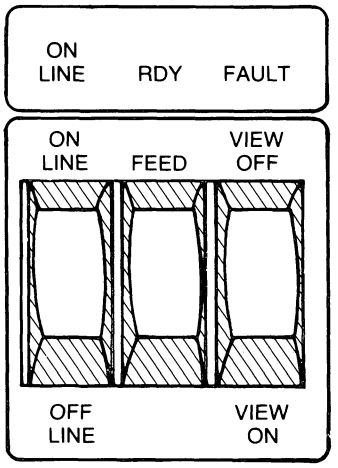


Figure 2.2 RO Primary Control Panel

2.2.2.2 KSR Primary Control Panel

The KSR primary control panel is shown in figure 2.3. These controls and indicators are located along the right edge of the keyboard assembly.

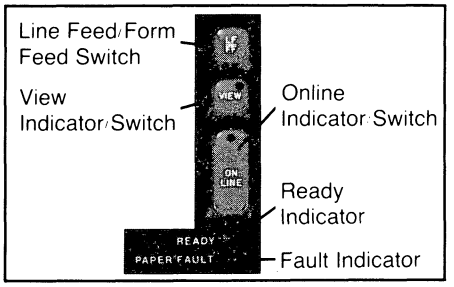


Figure 2.3 KSR Primary Control Panel

The controls and indicators on the KSR control panel include:

* LF/FF (line feed/form feed) switch- Momentarily pressing the switch results in a line feed; holding the switch down for more than one second results in a form feed.

* VIEW indicator/switch- Indicator portion of switch lights when the printer is in the view mode (in view mode, printhead automatically moves aside to permit viewing the last print character anytime the printer is idle). The view mode is alternately enabled or disabled each time the switch is pressed (operational in ONLINE mode only).

* ONLINE indicator/switch-Alternate action switch that controls ONLINE/OFFLINE operation. The indicator portion of the switch lights in the ONLINE mode. When the printer is switched OFFLINE, the printer signals BUSY to the host and stops printing. However if data is being sent by the computer while the printer is OFFLINE, the data will be stored in a buffer until the buffer is full.

* READY indicator- For normal ONLINE operation, the READY indicator remains lit. However if the unit is OFFLINE, or otherwise not ready for normal operation, the READY indicator extinguishes.

* FAULT indicator- This indicator is normally extinguished. When the FAULT indicator lights, the printer is either out of paper, the ribbon cartridge is jammed or some othe fault exists.

The KSR keyboard includes a layout of keys similar to a conventional office typewritter. In the OFFLINE mode of operation, the printer behaves very much like a typewriter. However in the ONLINE mode of operation, the printer's response to a keyboard entry depends on the host system software.

In addition to the standard typewriter keys, the keyboard also includes eleven function keys. The functions of these keys are described in table 2.1.

Table 2.1 KSR Function Keys (Primary Control Panel)

NOTE: The ONLINE function of a key may vary from system to system. Note and record differences for future use.

KEY	FUNCTION	DESCRIPTION
ALPHA LOCK	Upper Case Alpha Lock Key	This key functions as the Shift Lock key does on a Typewriter. Pressing it together with any alpha (letter) key generates the upper case character for that alpha key. This upper case function continues until you press the ALPHA loc key a second time. The Indicator light on the SHIFT key glows while this function is taking place.
BRK	Break Key	Holding this key down prevents the transmission of any character codes.
BS	Back Space Key	OFF LINE, pressing this key moves the carriage back one space.
CTRL	Control Key	OFF LINE, holding this key down while depressing another key has no effect o the terminal, with the following exception: DEL, BS, NEW LINE, CR.
DEL	Delete Key	OFF LINE, pressing this key results in printing the rubout code.

Table 2.1 KSR Function Keys (Continued)

KEY	FUNCTION	DESCRIPTION
ESC	Escape Key	OFF LINE, pressing this key has no effect on the printer.
NEWLINE	New Line Key	OFF LINE, pressing this key terminates the present line and advances the paper one line.
CR	Carriage Return Key	OFF LINE, pressing this key moves printhead carriage to the left-hand margin but does not advance the paper.
RPT	Repeat Key	Pressing this key by itself has no effect on the printer. Pressing the RPT key together with another key results in repeating action of the second key until the key is released.
SHIFT (two per keyboard)	Upper Case Key	This key functions the same as the shift key on a conventional typewriter. With the shift key pressed, simultaneously with another key, the printer generates the shifted mode function for that key. The leftmost SHIFT key is also equipped with an indicator that lights when keyboard is locked in shift mode via ALPHA LOCK key.
TAB	Tabulation Key	OFF LINE, this key has no effect.

A numeric keypad is also included on the KSR keyboard layout. This keypad functions similar to that of a conventional calculating machine keyboard.

2.2.3 Secondary Control Panel

The secondary control panel shown in figure 2.4 is used on both the RO and KSR printer configurations. Basically, the secondary control panel is used to set up printer features that are seldom changed. With exception of the master reset (MST RST) switch, all controls on the secondary control panel are monitored by the printer's microprocessor only when the printer is OFFLINE.

The controls and indicators on the secondary control panel are shown in figure 2.4 and described in table 2.2.

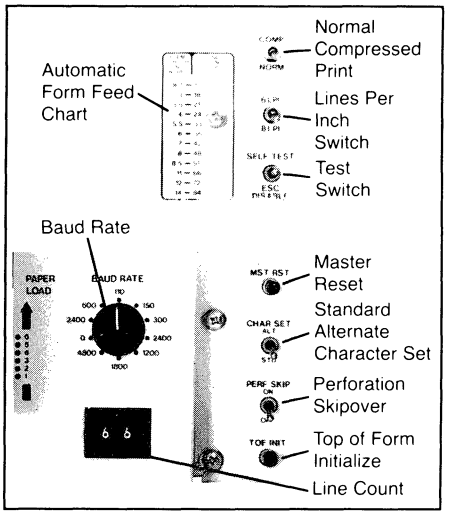


Figure 2.4 Secondary Control Panel (All Models)

Table 2.2 Secondary Control Panel Controls and Indicators

CONTROLS	FUNCTION
NORM/COMP Switch	In NORM position, printer produces 132 characters per line on 14-inch wide paper. In COMP position, printer produces 220 characters per line on 14 inch wide paper or 132 characters per line on 8 inch paper.
LPI (lines per inch) 6/8 Switch	In the 6 position, the printer produces 6 lines per inch (LPI) vertical spacing. In the 8 position, the printer produces 8 LPI vertical spacing. If the switch setting is changed, only the lines received from the computer after the change will have the new line spacing.
SELF TEST/ESC DISABLE Switch	This 3-position switch is normally set to the middle position to enable decoding of escape codes. In the ESC DISABLE position, the printer ignores escape codes and prints out subsequent codes. In the SELF TEST position, the printer enables the 8 inch line length self test. The printing test begins when the ONLINE switch, on the primary control panel, is pressed. If the SELF TEST is repeated, the printer alternates between the 8 inch and 13.2 inch line lengths. If the switch is then put in ESC DISABLE position, self test will overprint the line 33 times before issuing a line feed.
MST RST Switch (Master Reset)	When pressed, this switch resets the printer (same function that is performed during initial power turnon). The printer mode of operation is reset to the mode set up on the secondary control panel switches.

Table 2.2 Secondary Control Panel Controls and Indicators (Continued)

CONTROLS	FUNCTION
CHAR SET STD/ALT Switch	In the STD position (down position), the printer uses the character set defined as standard via switches internal to the printer. In the ALT position (up position), the printer uses the alternate character set defined by switches internal to printer.
PERF SKIP (perforation skipover) Switch	This switch is monitored while the printer is OFFLINE, during initial power turnon, and when the MST RST switch is pressed. In the ON Position (up position), printer skips to the top of the next form if any line feeding action (line feed, vertical tab, etc.) would ordinarily space the paper into the bottom one inch of the form. In the OFF position (down position), no perforation skip is performed.

Table 2.2 Secondary Control Panel Controls and Indicators (Continued)

CONTROLS	FUNCTION
TOF INIT Switch	This switch is monitored when the printer is OFF LINE. When the switch is depressed, the current line on the form becomes line 1 and the form length is computed from the 6/8 LPI and the Line Count thumb-wheel switches. A top of form initialize operation also takes place when the printer is initially powered up or when a Master Reset is generated (MST RST is pressed).
LINE COUNT switches	These switches are used to set the number of lines defined to be one page length. A value of 0 is converted to 1 line per page. If the switch is not present, the default lengths are 66 lines per form with the 6/8 LPI switch set to 6 and 88 lines per form with the 6/8 LPI switch set at 8 lines per inch spacing. NOTE: The line count equals form length in inches multiplied by 8. If LPI is in the 6 position, use the form feed chart on the panel to convert from length to line count.
BAUD RATE Rotary Switch	This switch is monitored during initial power turnon and when MST RST is pressed. The baud rate switch selects 1 of 8 communication rates for serial interface printers. NOTE: This switch is not used on parallel printers.

2.2.4 FAULT INDICATOR BOARD

The TP2/LP2 is equipped with a fault indicator board that displays an error code when a fault is detected. After detection of a fault, the printer is disabled until the fault is corrected and the RESET switch on the fault indicator board is pressed.

The controls and indicators on the fault display board are shown in figure 2.5 and described in table 2.3.

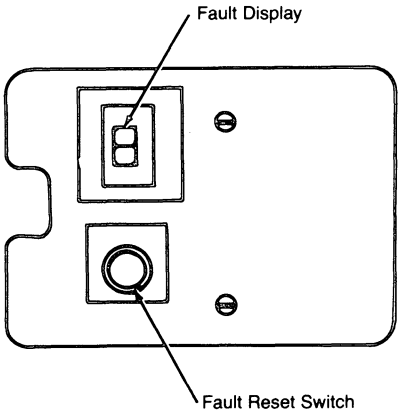


Figure 2.5 Fault Indicator Board Controls/Indicators

Table 2.3 Description of Fault Indicator Board Controls/Indicators

CONTROLS/INDICATORS	FUNCTION
FAULT RESET Switch	When depressed, the fault logic is reset. NOTE: If pressing this switch fails to restore normal operation, refer to the troubleshooting section of this manual.
ERROR CODE Display	The display will indicate either a number from 1 to 9 or a lower case c. The fault codes include: 1. Hardware error - ROM self test failure. 2. Hardware error - RAM self test failure. 3. Hardware error - Serial Interface failure. 4. Parity error - the parity error fault indication is switch selectable on the Control Logic PC board. 5. Carriage Motor Stall- The fault can be caused by a ribbon cartridge jam, buildup of foreign matter on the leadscrew/guide shafts, or similar problems. The printer attempts 1 retry if a stall is detected. If the carriage fails to recover, a fault will occur. 6. Future Expansion. 7. Out of Forms - The fault indicates the printer is out of paper or that the paper is no longer feeding into the printer for some reason. 8. System Ok - This indication is temporarily displayed after the completion of self test. 9. Buffer Overflow - The fault indicates that the correct busy signal is not configured on the Control Logic PC board, or that the host system did not respond to the selected busy signal. c. Power Failure Recovery - this fault indication informs the operator that a power failure has occurred and prevents going directly from a power failure to an ON LINE condition.

2.2.5 NORMAL OPERATING PROCEDURE

For normal printer operation, perform the following procedural steps:

1. Set the POWER switch to the ON or up position.
2. Ensure paper is correctly installed.
3. Switch ON LINE/OFF LINE switch (primary control panel) to ON LINE position.

2.2.6 PAPER LOADING PROCEDURE

The DASHER printer uses standard pin-feed, fan-fold paper forms. These forms have from one to six parts and may be from 4 to 15 inches wide. The space between the printhead and the platen can be adjusted for forms of different thicknesses to ensure good print contrast. Different form widths can be used by resetting the right and left paper tractors.

Load the paper into the DASHER as follows:

1. On the primary control panel, switch the terminal OFF LINE.
2. Swing the top cover up until it latches.
3. Adjust the paper tractors, if needed, by Loosening the levers that lock them in place and then moving the tractors to the desired position. Next retighten the levers to lock the tractors in place.
4. Place a box of pin-feed paper under the printer.
5. Move the platen adjustment lever to the widest position to allow room to slide the paper into place.

6. Swing the tractor gates open and feed the paper through the opening in the bottom of the terminal, under the vertical tension springs and onto the tractor pins.

NOTE: It may be necessary to reposition the right tractor to line the tractor pins up with the paper feed holes. Make sure that corresponding holes on either side of the paper are aligned so the top of the paper is horizontal. Misalignment may cause the paper to jam or tear in the tractors.

NOTE: There should be a slight horizontal tension on the paper; however, too great a tension may cause the paper to tear. To increase the horizontal tension, move the right tractor slightly to the right; to decrease the tension, move the right tractor slightly to the left.

7. Close the tractor doors.

8. Move the platen space lever to the appropriate position for the form thickness used (numbering of positions next to platen space lever corresponds to approximately the number of forms used, however form thickness varies from supplier to supplier. For best results, adjust the platen lever until you get the desired print contrast.

9. Adjust paper to desired vertical position using FEED switch on RO models or the LF/FF switch on the KSR models. Make fine adjustments manually by pulling out and rotating the paper feed vernier knob.

10. Check line count switch on secondary control panel to make sure they are set to correct line count for the length of form you are using, then press TOF INIT (initialize top of form).

11. Feed the paper through large slot on the top cover as you close it.

12. Switch the terminal ON LINE.

2.2.7 RIBBON CARTRIDGE REPLACEMENT PROCEDURE

The LP2/TP2 DASHER printer uses a continuous feed cartridge type ribbon. The ends are connected together so that both the upper and lower halves are used. A new cartridge should be installed when printing becomes light.

Change the cartridge as follows:

1. Switch the printer OFF-LINE.
2. Swing the top cover up until it latches open.
3. Note the position of the platen lever and move it away from printhead by moving the platen space lever (located next to the Secondary Control Panel) to the widest position (PAPER LOADING position).
4. Grasp the sides of cartridge with both hands and gently pull upwards to remove the ribbon cartridge from carriage assembly.
5. Turn knob on the new cartridge clockwise until the ribbon is taut.

CAUTION: The knob on the ribbon cartridge should never be turned counter-clockwise as it may jam the ribbon.

6. Place cartridge (knob side up) on cartridge assembly. Slowly turn knob clockwise as you gently push the cartridge in place (this engages the ribbon drive spindle located at the top of carriage assembly).
7. Replace the platen lever to the correct detent position for desired print contrast.
8. Close the top cover.
9. Switch the printer ON-LINE.

CHAPTER 3 - THEORY OF OPERATION

3.1 INTRODUCTION

This chapter describes the printer operation down to the field replaceable unit (FRU) level. The first part of the chapter provides a functional overview of printer operation and the remainder of the chapter describes the FRU interaction in greater detail.

3.2 FUNCTIONAL OVERVIEW

Functionally, the TP2 or LP2 printer consists of eight major units including :

* Microprocessor control logic
* Printhead and carriage section
* Paper feed section
* Control panels
* Keyboard and numeric pad (KSR models only)
* Parallel interface or serial interface.
* Power supply

A simplified functional diagram of the printer is shown in figure 3.1. A functional description of the printer is provided in the following paragraphs.

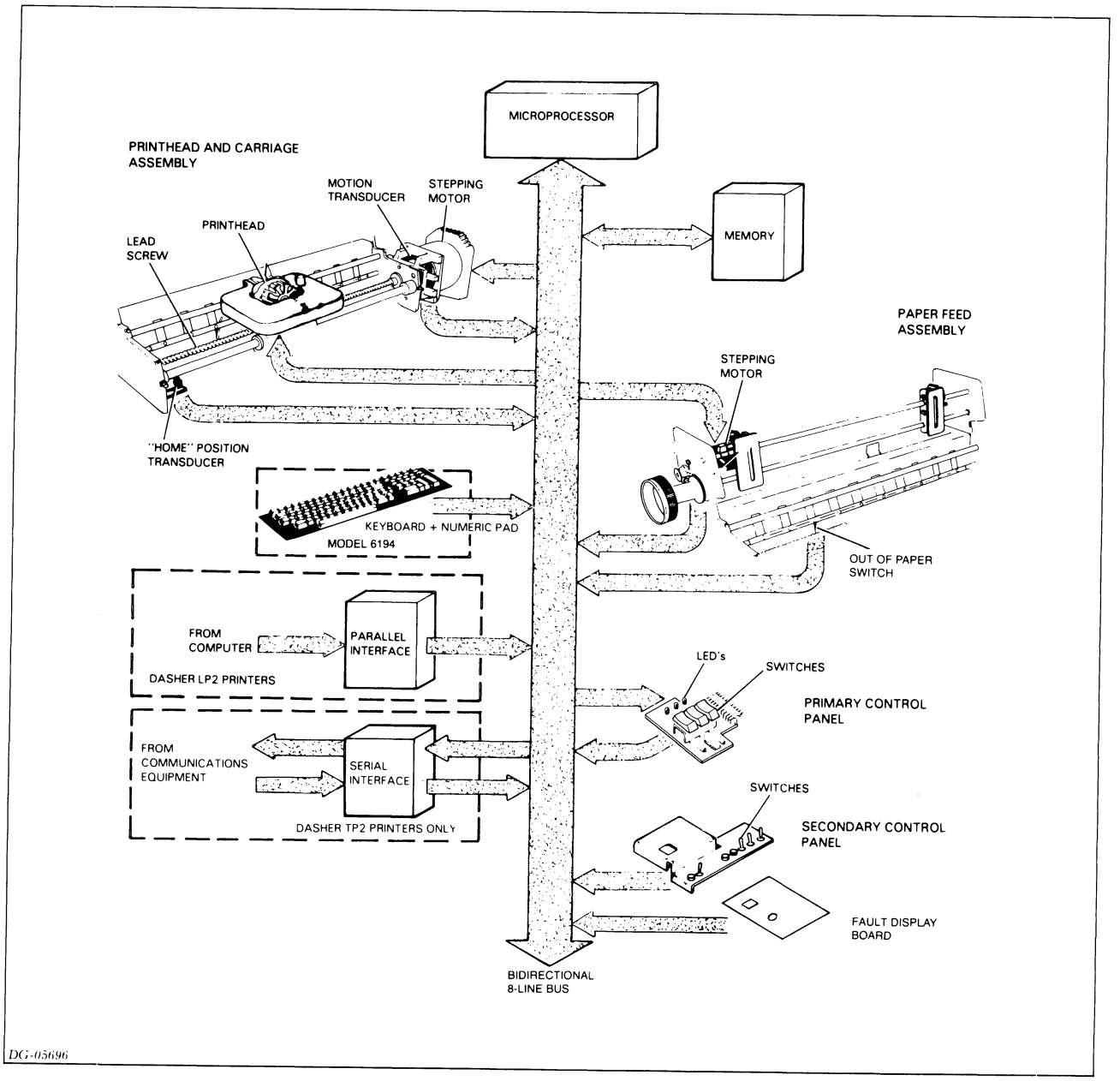


Figure 3.1 TP2/LP2 Functional Block Diagram

3.2.1 Microprocessor Control Logic

All printer operations for all models of the DASHER TP2/LP2 printers are controlled by an 8-bit microprocessor and associated firmware (programs resident in read-only-memory) located on the control logic PCB.

The microprocessor communicates with all remaining functional sections via a bi-directional 8-bit data bus as shown in figure 3.1.

Functionally, the control section consists of the following major circuits:

* Microprocessor
* Read only memory (ROM)
* Random access memory (RAM)
* Timing and control logic

The primary control intelligence for the printer consists of a series of program routines (firmware) that reside in ROM memory and are continuously executed by the microprocessor. In this manner, the microprocessor monitors keyboard entries and transducer/switch inputs from the mechanical components and control panels and coordinates communications with the host system.

The RAM memory is used for temporary storage of incoming data characters from the host system and for temporary storage of variables generated by the firmware in ROM memory.

The timing and control logic circuits provide such functions as generating clock pulses for use by the microprocessor and other internal circuits, decoding commands to generate control signals for routing of data, and other similar functions.

3.2.2 Printhead and Carriage Section

The printhead and carriage section consists of the mechanical assemblies and electronic circuits that are associated with positioning the printhead and printing characters on the paper. The major parts of the printhead and carriage positioning section include:

* Printhead/drivers/ribbon cartridge
* Stepping motor/motor control circuits
* Leadscrew
* Motion transducer
* Home transducer

These assemblies are shown in figure 3.2 and described in the following paragraphs.

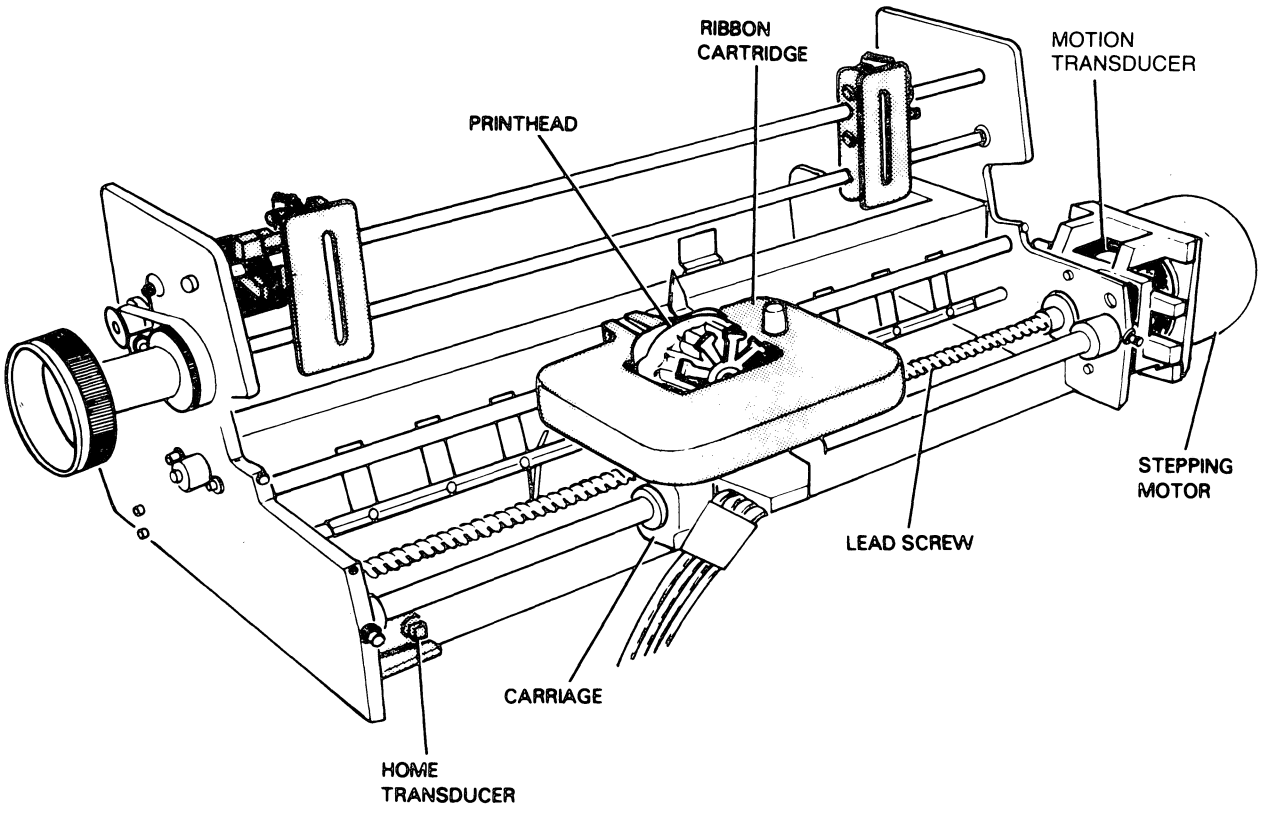


Figure 3.2 Printhead/Carriage

3.2.2.1 Printhead/Drivers/Ribbon Cartridge

Print characters from the RAM memory section are routed through drivers and fed to the printhead/ribbon cartridge to produce printed characters.

The printhead forms a character in seven segments as it moves across the paper. Each segment is formed by firing a subset of the 9 printhead wires. These wires force the ribbon against the paper forming a 7 by 9 dot matrix character. The microprocessor fires these print wires by obtaining a 9-bit codes from the character ROM and transmitting that code to the printhead. Figure 3.3 shows how a character is formed during a left to right print sequence.

Since printing is bidirectional, a character may also be formed by starting with its right column. In this case, the microprocessor issues the firing codes in reverse order.

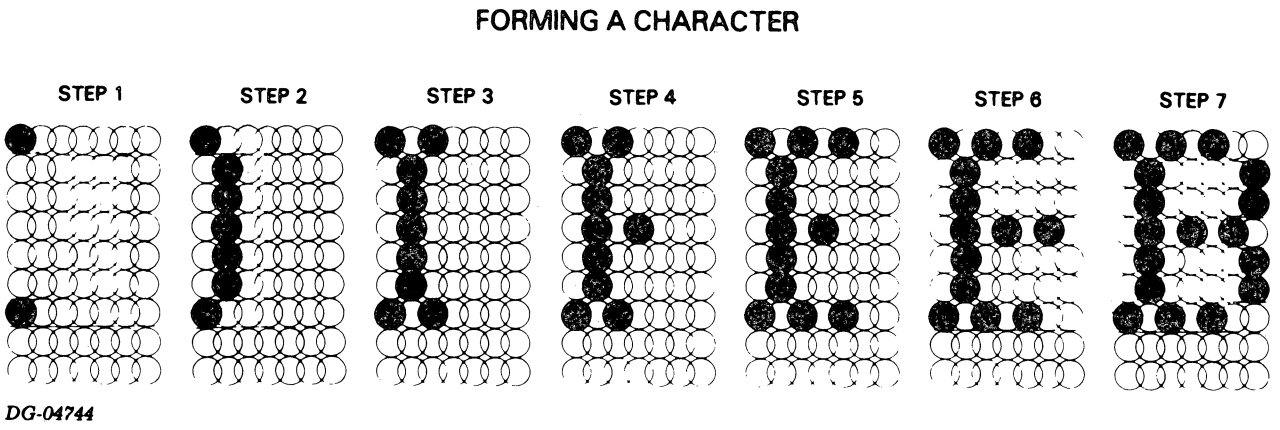


Figure 3.3 Print Character Generation, Simplified Diagram

3.2.2.2 Carriage Assembly

The microprocessor controls the horizontal motion of the printhead by issuing commands to the drive circuitry of the carriage mechanism. This mechanism consists of a stepping motor and lead screw assembly (to which the printhead carriage is attached). When the microprocessor steps this motor (tells it to rotate a fixed amount), the lead screw turns, moving the printhead a fixed distance. Since the stepping motor may be stepped clock- wise or counter-clockwise, the printhead may be moved either right or left.

3.2.2.3 Transducers

A transducer informs the microprocessor when the printhead has reached the left-hand margin (home position). This transducer is used to initialize the printhead's horizontal alignment. Another transducer rotating with the shaft is used to indicate when the carriage is moving and the motor is not stalled.

3.2.3 Paper Feed Assembly

The paperfeed assembly controls the vertical movement of paper past the printhead. Like the carriage mechanism, the paper feed assembly uses a stepping motor. This motor turns the tractors which move the paper by the printhead. The microprocessor directly controls how much paper is fed through the printer by stepping this motor a selected number of times. In fact, the difference between selecting 6 lines/inch or 8 lines/inch spacing is reflected in the number of steps the microprocessor issues to the stepping motor for a line feed.

A switch informs the microprocessor when paper runs out. If this occurs, the microprocessor generates a paper fault.

3.2.4 Control Panel Section

The printers are equipped with three control panels including:

* Primary control panel
* Secondary control panel
* Fault display panel

The primary control panel contains a number of lights and switches used to display status information and control commonly used functions. The KSR version of the printer also contains a keyboard and a numeric keypad. The RO version contains only the control panel (see Chapter 2).

The keyboard and numeric pad allow the user to communicate with the host system. The microprocessor monitors the keyboard and keypad as it monitors the other subsystems. When the operator presses a key, the microprocessor retrieves the character's 7-bit ASCII code. If the printer is offline, the microprocessor immediately processes the character. If the printer is online, the microprocessor transmits the 7-bit code to the communications line via the serial interface.

The secondary control panel contains switches which configure the printer and select its various options.

3.2.5 Parallel Interface

A parallel interface transfers data received from a computer to the microprocessor. Eight data lines transfer data from the computer to the interface 8 bits at a time. A DEMAND line informs the computer when the interface is able to accept data. A second status line, READY, informs the computer when the printer is powered up and online with no fault conditions.

The microprocessor continually checks the interface to see if any data is present. If it finds that a byte has arrived, the microprocessor retrieves this byte from the interface and stores it in memory for processing. The parallel interface can accept data at a rate of up to 5,000 characters/second until the allocated storage area in memory is filled. At this point, the micro- processor processes most of the stored characters before it accepts any additional characters.

3.2.6 Serial Interface

The serial interface transfers data in either direction between the printer and a communications system. This interface is available on both RO and KSR DASHER TP2 printer. Switches select a number of different serial formats. In addition, one of eight different information transfer rates (110, 150, 300, 600, 1200, 1800, 2400, and 4800 baud) are switch selectable.

The serial interface assembles data in an 8-bit buffer as it is received, notifying the microprocessor when the complete byte is present. The microprocessor then retrieves the byte and stores it in memory for processing.

When the microprocessor wishes to transmit a character, it first checks the serial interface to see if it is busy transmitting a character. When the interface is idle, the microprocessor transfers the byte (character) to the interface.

3.2.7 Power Supply

The printer's power supply provides six different dc supply voltages from either 120 volt or 220/240 volt ac power sources (47-63 Hz). The design uses pulse-width modulation to regulate the output voltages. In addition, overvoltage and overcurrent detection protect the supply against fluctuations in line voltage.

3.3 FRU INTERACTION

Some of the basic functions performed by the printer include:

* Moving the carriage (printhead)
* Firing the printhead
* Feeding the paper through the printer
* Transferring data to and from the printer
* Detecting faults

The remainder of this chapter describes the relationships between the circuit boards, mechnical assemblies, and interconnecting cables which perform these operations. The discussion of each operation includes two figures. The first figure shows the location of related hardware, while the second illustrates the flow of control information through that hardware.

We do not attempt to explain the operation of the microprocessor and its related control circuitry because of their complexity. This circuitry resides on the main control board.

3.3.1 Carriage Position Control

The microprocessor moves the carriage and printhead assembly by controlling the motion of the carriage motor. Control signals, originating from the microprocessor on the main control board, pass through the carriage motor drivers on the driver board and "step" (i.e., move) the carriage motor, thereby turning the leadscrew and moving the carriage.

A diagram showing the physical placement of components associated with the carriage control section is shown in figure 3.4. Figure 3.5 contains a simplified functional block diagram of the carriage control section . During the following discussion of the carriage control logic, reference should be made to these two figures.

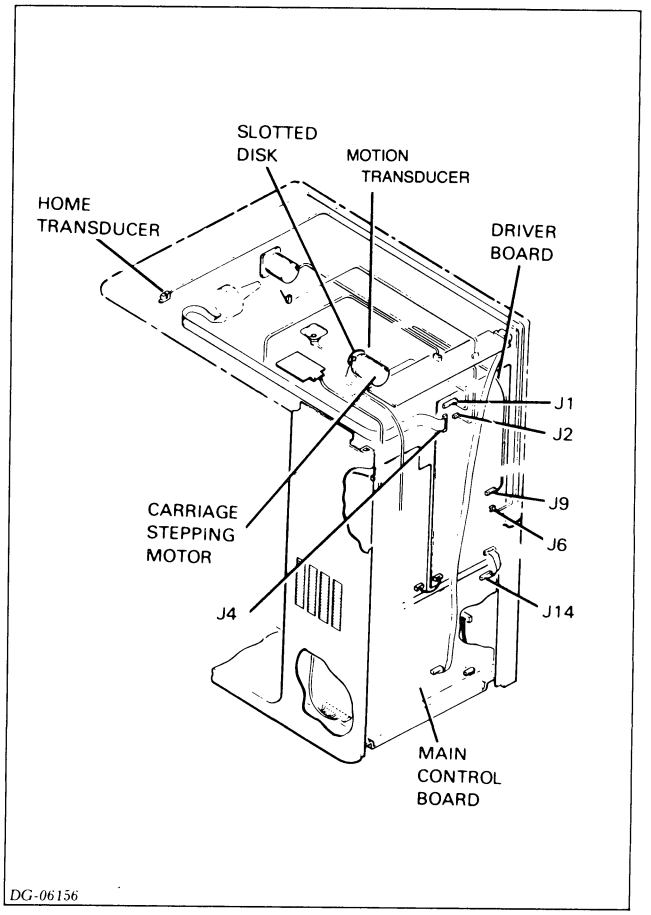


Figure 3.4 Carriage Control Section, Physical Layout Diagram

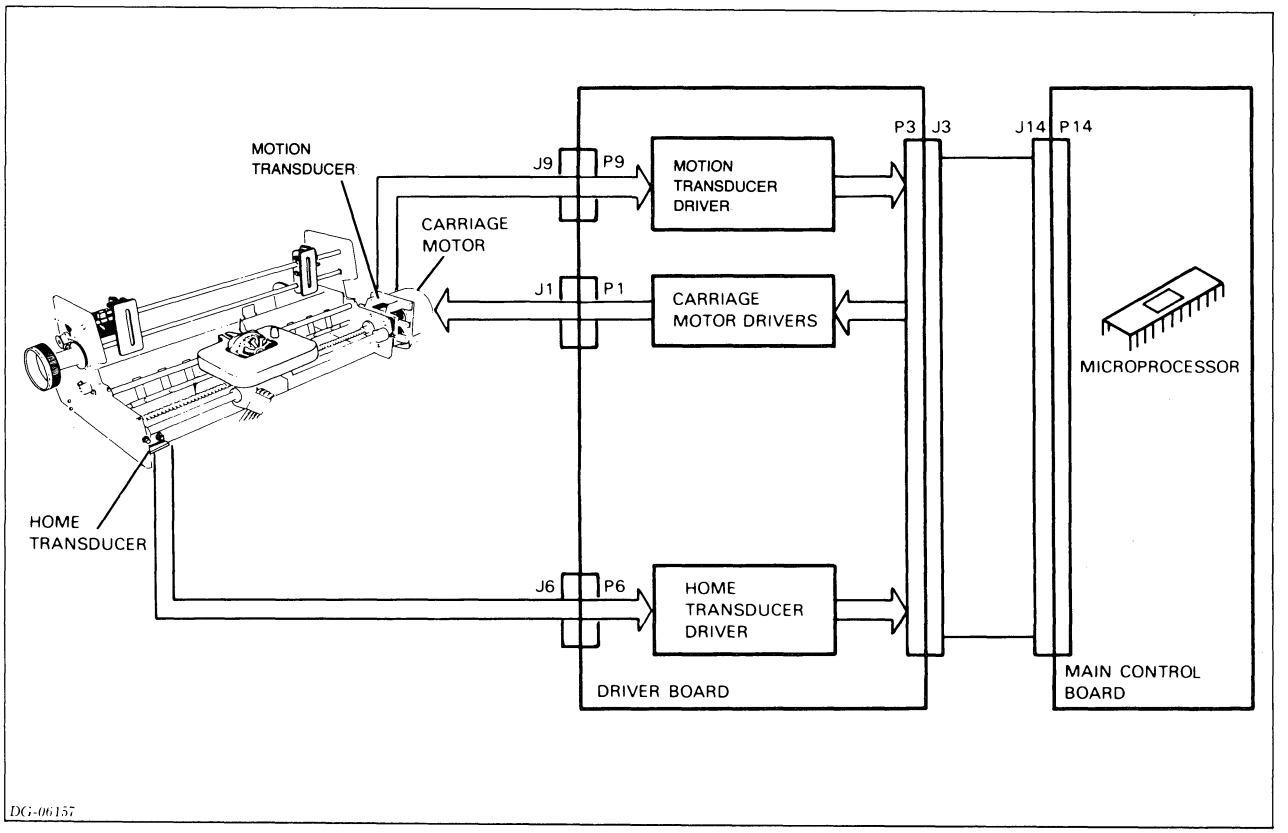


Figure 3.5 Carriage Control Section, Simplified Functional Diagram

3.3.1.1 Detecting Carriage Motion

Located on the motor's drive shaft is a disc with slots arranged around its periphery. The motion transducer "sees" these slits pass by when the motor turns. Signals informing the micro- processor of this motion are detected by the transducer drivers on the driver board and passed back to the control logic on the main control board. The control logic uses this information to check that the carriage moves.

A home transducer detects the presence of the carriage at the left-hand margin. It allows the control logic to determine exactly where the left margin is.

If any part of this loop is broken or not functioning correctly, the microprocessor will signal a problem by turning on the FAULT light on the primary control panel and signalling a carriage stall fault on the Fault Indicator (after attempting one retry).

3.3.2 Print Control

The microprocessor determines when it should fire the printhead wires according to the position of the carriage. The Home Transducer allows the microprocessor to locate the exact position of the carriage, while the timing circuitry help the micro- processor keep track of its subsequent motion.

The physical layout of the print control section is shown in figure 3.6 and the associated functional block diagram is provided in figure 3.7. For the following discussion, reference should be made to these two figures.

3.3.2.1 Determining When to Fire the Printhead

Print position timing is generated by circuitry on the main logic PCB. The microprocessor counts the print position pulses generated by this circuitry thereby keeping track of its position. When a stall is detected by a lack of motion on the Motion Transducer Disk, the microprocessor moves the carriage past the Home Transducer and regains its position at the Home Flag transition.

3.3.2.2 Firing the Printhead

The microprocessor fires the printhead via control logic on the main control board. This logic passes a 9-bit code to the driver circuitry on the driver board which in turn energizes the appropriate coils in the printhead. When a printhead coil is energized, it sets up a magnetic field forcing a print wire out of the printhead. The print wire forces the ribbon against the paper, forming one part of the dot matrix character.

If for some reason a coil in the printhead is energized for too long a period, or a printhead winding shorts out, an overcurrent sensing circuit shuts down the power supply. In this case, a HEAD FAULT light on the power supply board indicates the cause of the shutdown.

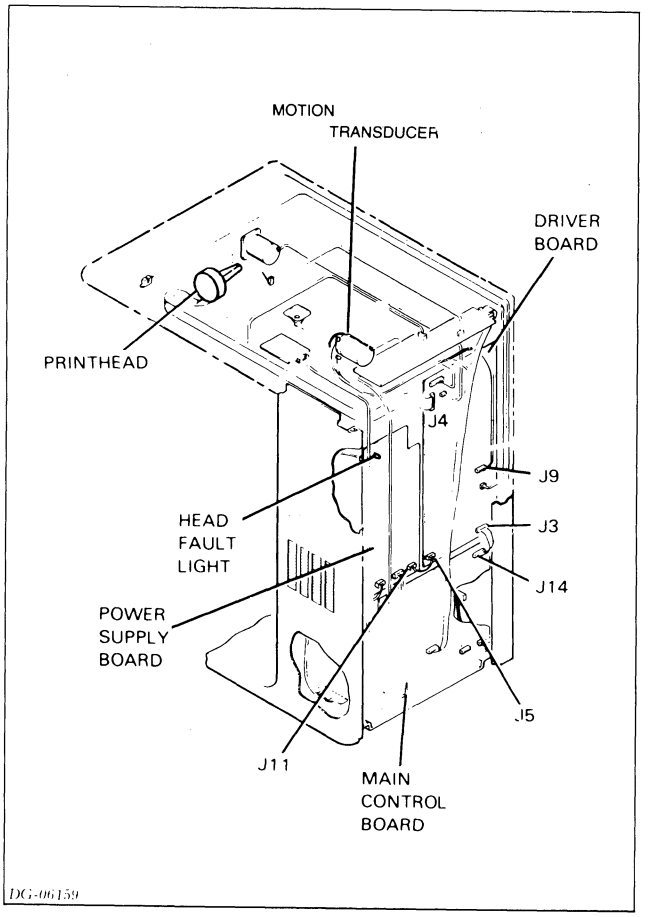


Figure 3.6 Print Control Section, Physical Layout

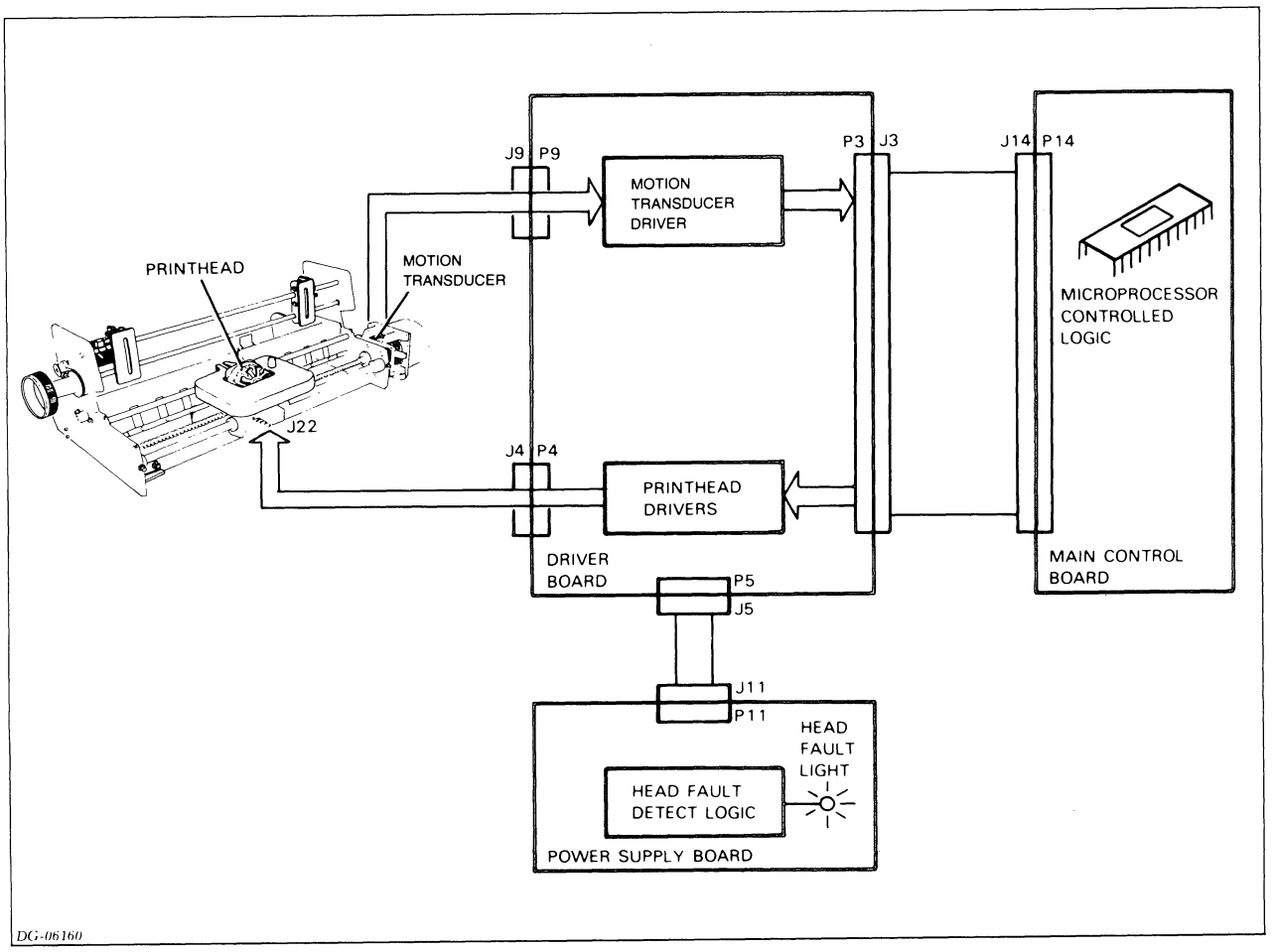


Figure 3.7 Print Control Section, Functional Block Diagram

3.3.3 Paper Feed Control

The microprocesser moves paper through the printer, passing it vertically by the printhead. Paper may be advanced in only one direction. Control signals, originating from the microprocessor on the main control board, pass through the paper feed drivers on the driver board and turn the paper feed motor. The motor advances the paper via the remainder of the paper feed mechanism.

The physical layout of the paper feed control section is shown in figure 3.8 and the associated functional block diagram is provided in figure 3.9.

3.3.3.1 Sensing The Presence Of Paper

Another feedback mechanism is the Paper Fault switch, which determines the presence of absence of paper. The state of this two position micro-switch is fed back to the microprocessor via the secondary control panel. When the Paper Fault switch detects an absence of paper, the microprocessor completes printing the present line, places the printer offline, turns on the FAULT light, and flags an Out of Forms Fault (7) on the Fault indicator board.

3.3.4 Data Reception and Transmission

The microprocessor controls the interface which allows a printer to receive and transmit data. A printer's parallel or serial interface resides on the main control board. Both interfaces notify the microprocessor when they receive data. The microprocessor then retreives the data and processes it.

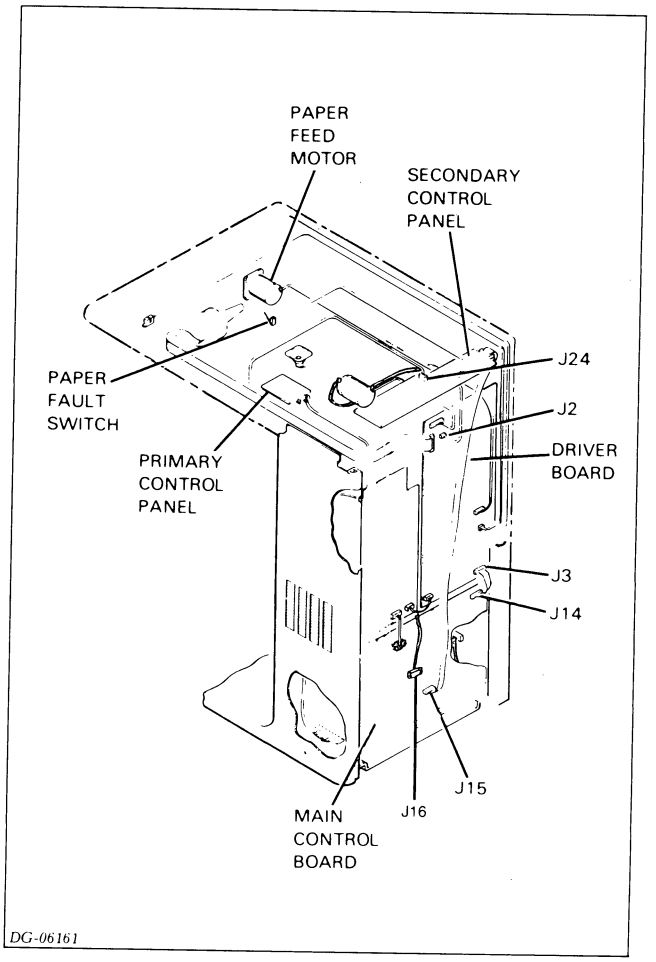


Figure 3.8 Paper Feed Control, Physical Layout

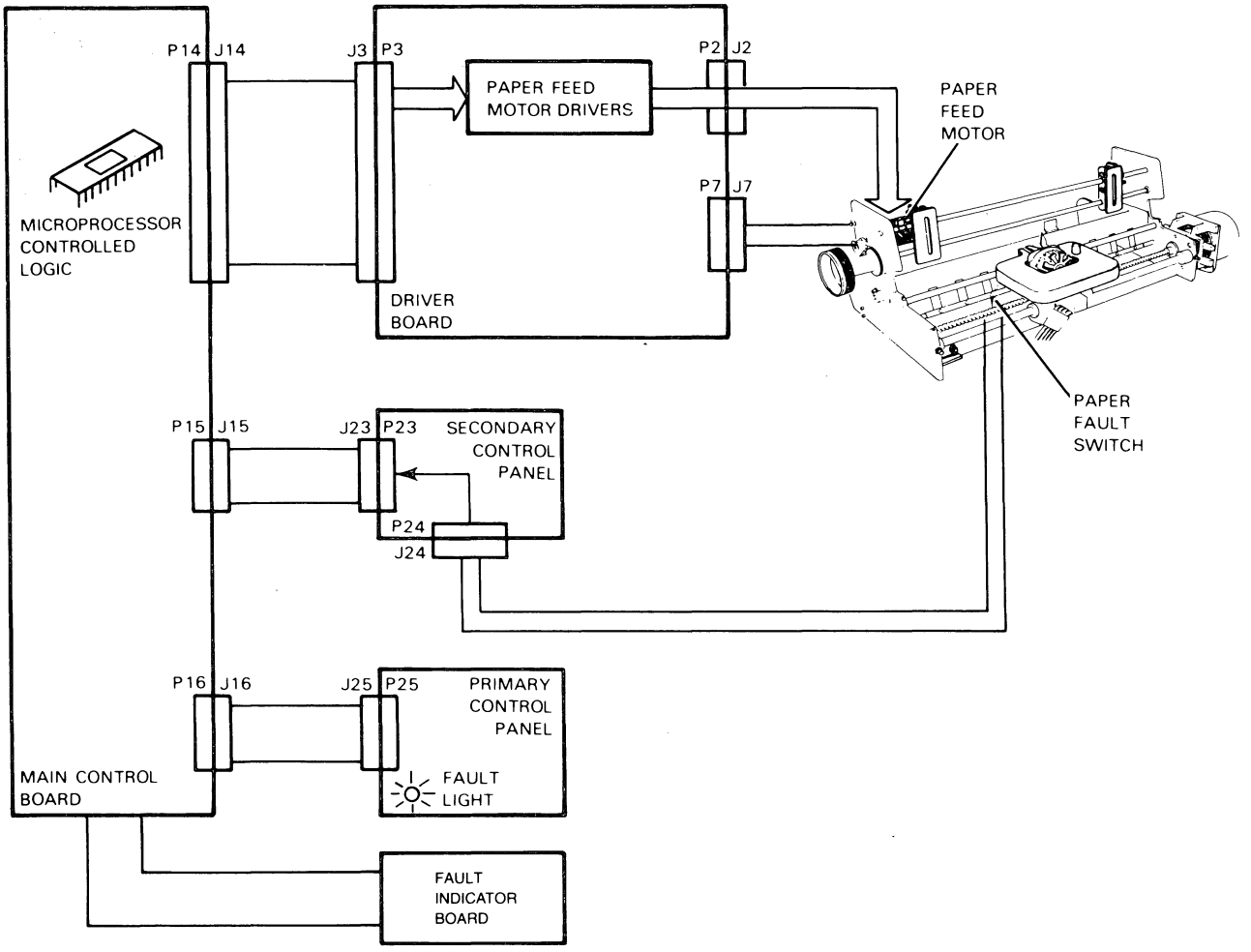


Figure 3.9 Paper Feed Control, Functional Block Diagram

3.3.5 Power Supply Distribution

The power supply board distributes d.c. voltages to the main control board, the driver board, and the fault indicator board. The power supply board receives either 110 or 220 volt power from the line filter located in the bottom of the cabinet.

Two power cords are available for DASHER LP2 and TP2 printers: one for 120 volt operation and one for 220/240 volt operation. The wiring of the connector on the printer end of each cord (J27) selects the appropriate input wires to the power supply board. This way, the power cord automatically selects the appropriate input circuit on the power supply board for the given supply voltage.

A physical layout diagram for the power supply section is shown in figure 3.10 and the associated functional block diagram is provided in figure 3.11.

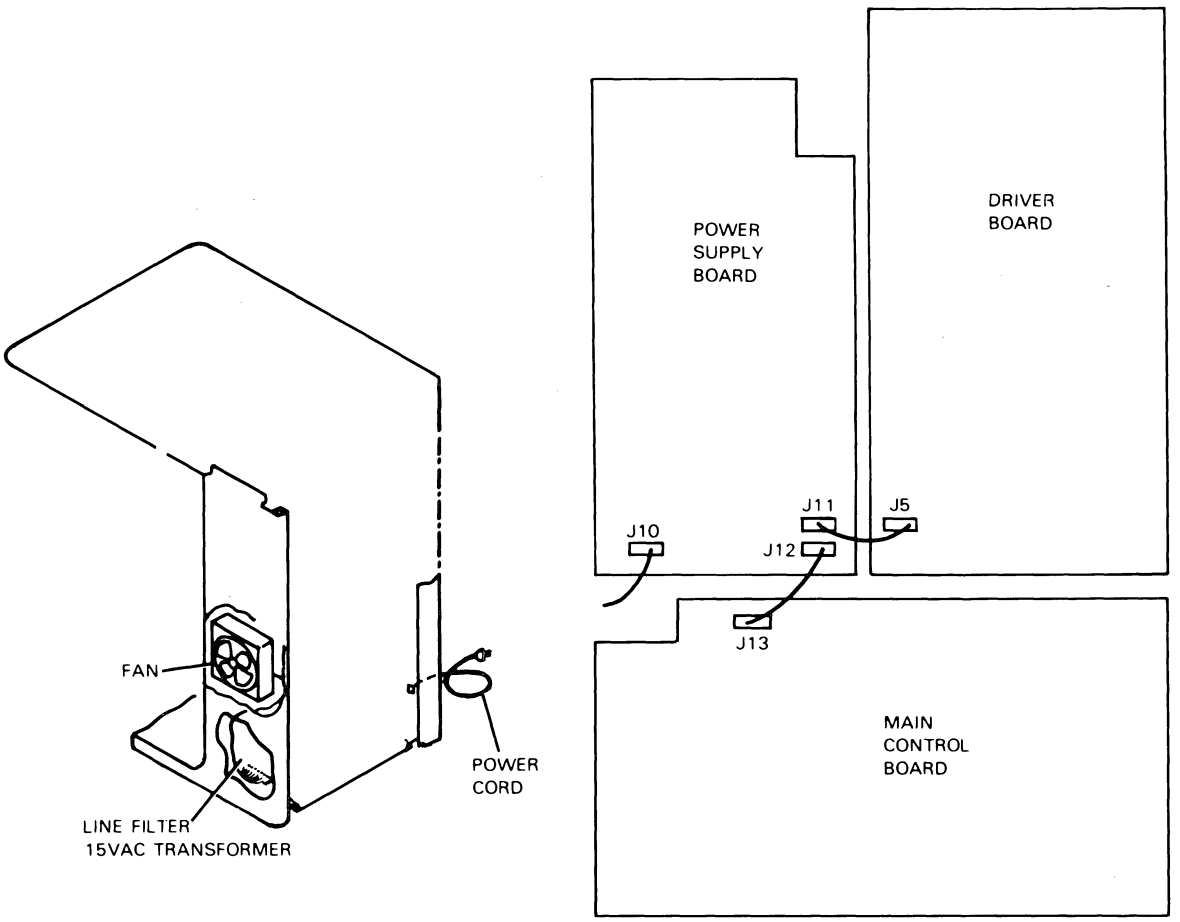


Figure 3.10 Power Supply Section, Physical Layout

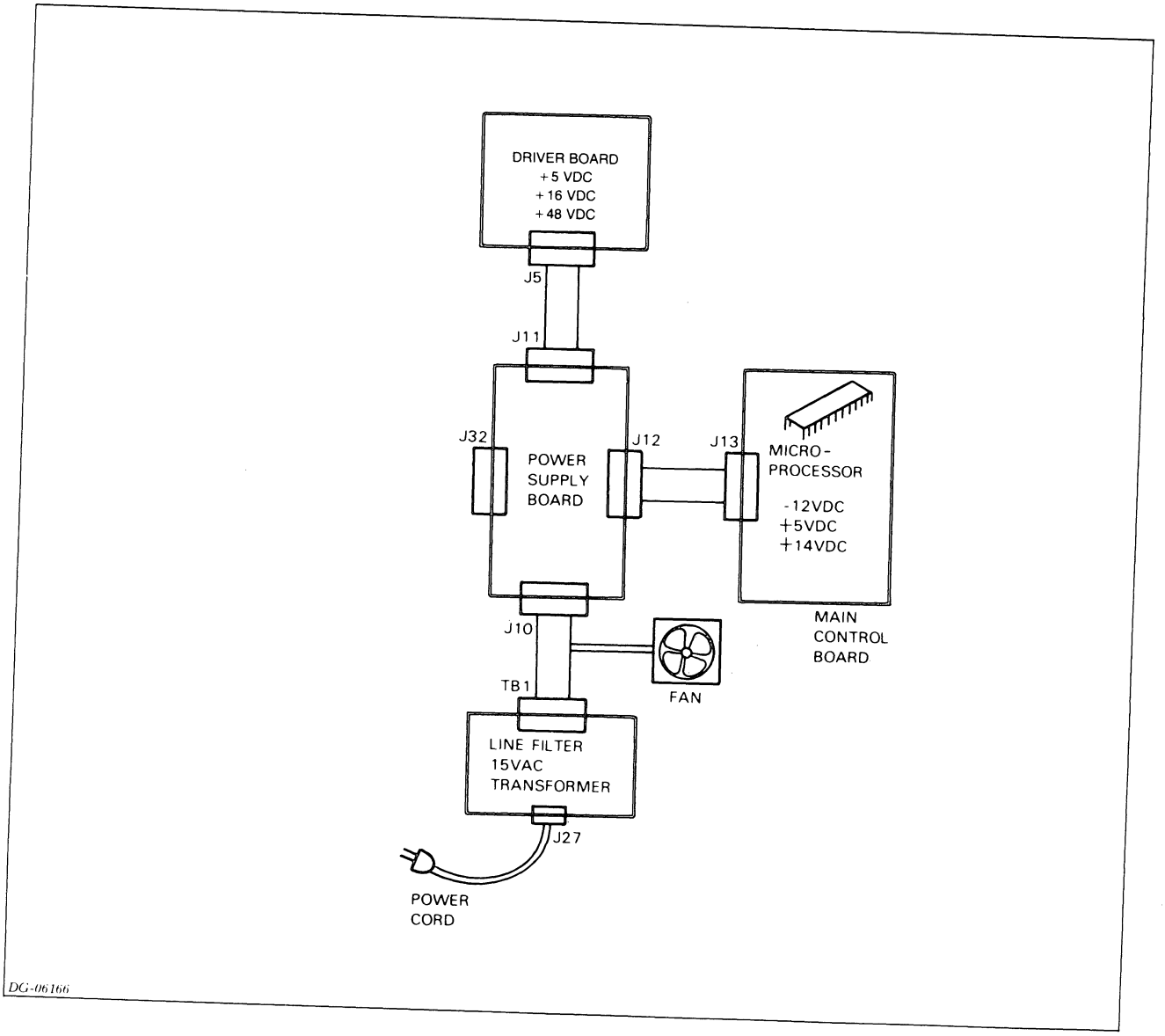


Figure 3.11 Power Supply Section, Functional Block Diagram

3.3.6 Detecting Faults

The DASHER LP2 and TP2 printers are protected by a system of fault interlocks which serve to disable operation of the printer if certain functions (such as out of paper, carriage drag, etc.) or components (such as ROM or RAM) fail. Included in this system of fault interlocks are a circuit breaker and a reporting system of indicator lights. These indictor lights are used to facilitate troubleshooting. The indicator lights on the LP2 and TP2 include the following:

* FAULT light - located on the primary control panel.
* HEAD FAULT light - located on the power supply PCB.
* Seven-segment LED - located on the Fault Indicator PCB.

3.3.6.1 Power Line Circuit Breaker

A circuit breaker protects a printer from overcurrent situations. A portion of the circuit breaker pops out in event of a short. Reset the circuit breaker (with the power switch OFF) by pressing in the cylinder. If a circuit breaker will not reset, wait 5 minutes and try again. DO NOT FORCE the circuit breaker or damage may result to the printer.

3.3.6.2 Fault Indicator Light

The FAULT indicator light on the primary control panel lights when a problem exists that requires operator intervention. The nature of the problem can be determined by evaluating the fault code on the Fault Indicator Board (FIB). Once a problem is diagnosed and correct, the light should go out once the FAULT RESET button, on the FIB, is pressed.

3.3.6.3 HEAD FAULT Light

When this light is off, the printhead is operating normally. When this light is lit, the power supply is shut down because excessive current was detected in one or more of the printhead windings. To reset the circuit, turn the main POWER switch OFF for 1 minute, then turn the switch ON. Head faults usually occur due to a problem in the printheads driving circuitry, a short in the printhead, or a short in the ribbon cable connecting the printhead to the driver PCB.

3.3.6.4 Fault Indicator Display

The seven-segment LED on the fault indicator board displays a numerical fault code anytime an operational or equipment fault is encountered. Each time the display is updated, a bell is sounded to alert the operator. Refer to the Troubleshooting chapter for a description of the codes and the corrective action required to clear each type of fault.

CHAPTER 4 - FAULT DIAGNOSIS

4.1 INTRODUCTION

This chapter provides guidelines for diagnosing equipment failures down to the field replaceable unit (FRU) level (refer to Chapter 1 for a complete listing of TP2/LP2 FRU's).

Information required to remove and replace a faulty FRU is provided in the Removal, Replacement chapter.

The maintenance philosophy for the TP2/LP2 printer involves the use of troubleshooting charts and built-in diagnostics combined with the fault display capability of the printer to isolate malfunctions down to the FRU level. In some cases, the terminal tester may also be required. The remainder of this chapter provides detailed information for tracking down faulty FRUs and information on the use of the terminal tester and available diagnostics.

In general, the fault isolation approach for the TP2/LP2 printer is as follows:

* Set the main POWER switch to the OFF position and back to the ON position which causes the printer to execute the power up diagnostic.

* Examine the indicator on the fault indicator board to determine if a fault was detected

* Next try the self-test diagnostic in the OFFLINE mode.

* If the problem cannot be resolved OFFLINE, hook up the Terminal Tester and troubleshoot the printer in the ONLINE mode (while disconnected from the host system).

4.2 FAULT INDICATOR CODES

Much of the fault isolation procedures are dependent on error codes that may be displayed on the fault indicator board. The codes, their meanings and the recommended corrective action for each of the codes is provided in table 4.1.

Table 4.1 Fault Indicator Board Error Codes

FAULT CODE	DESCRIPTION	REMEDY
0	CONTINUOUS DISPLAY INDICATES HARDWARE FAILURE	REPLACE MAIN LOGIC PCB
1	ROM CHECKSUM FAULT	REPLACE MAIN LOGIC PCB
2	RAM TEST FAULT	REPLACE MAIN LOGIC PCB
3	SERIAL INTERFACE FAULT (TP PRINTERS ONLY)	REPLACE MAIN LOGIC PCB
4	PARITY ERROR (ONLY WHEN PARITY FAULT IS ENABLED)	CHECK PARITY SELCTION ON CONFIGURATION SWITCHES. CHECK JUMPERING ON CONTROLLER. THIS FAULT CAN BE DISABLE WITH SWITCH 2.4
5	CARRIAGE MOTOR STALL	CHECK VOLTAGES OF DRIVE TRANSISTORS DURING SELF TEST. CHECK HORIZONTAL MOTION TRANSDUCER. CHECK MECHANISM FOR RIBBON BINDING. CHECK FOR EXCESSIVE LEAD SCREW TORQUE.
6	(FUTURE EXPANSION)	
7	OUT OF FORMS	CHECK CONNECTION BETWEEN OUT OF FORMS SWITCH AND SECONDARY CONTROL PANEL CHECK THAT THE OUT OF FORMS SWITCH OPENS AND CLOSES AS PAPER IS INSERTED IN PRINTER
8	SYSTEM OK (TEMPORARILY ON)	
9	BUFFER OVERFLOW FAULT	CHECK BUSY CONFIGURATION SWITCH CHECK THAT CONTROLLER IS RESPONDING TO THE PRINTER BUSY SIGNAL.

4.3 TROUBLESHOOTING FLOWCHARTS

The troubleshooting flowcharts include the following:

* General troubleshooting procedure (references the remaining charts)
* Power up/fault troubleshooting
* Carriage Control troubleshooting
* Power supply troubleshooting
* Head troubleshooting

4.4 GENERAL TROUBLESHOOTING PROCEDURE

The general troubleshooting procedure is described in flowchart form in figure 4.1. You should follow this procedure when you arrive at the scene of a new printer installation or when called in to repair a printer. The general procedure then refer you to a specific troubleshooting procedure depending on the indications provided by the printer.

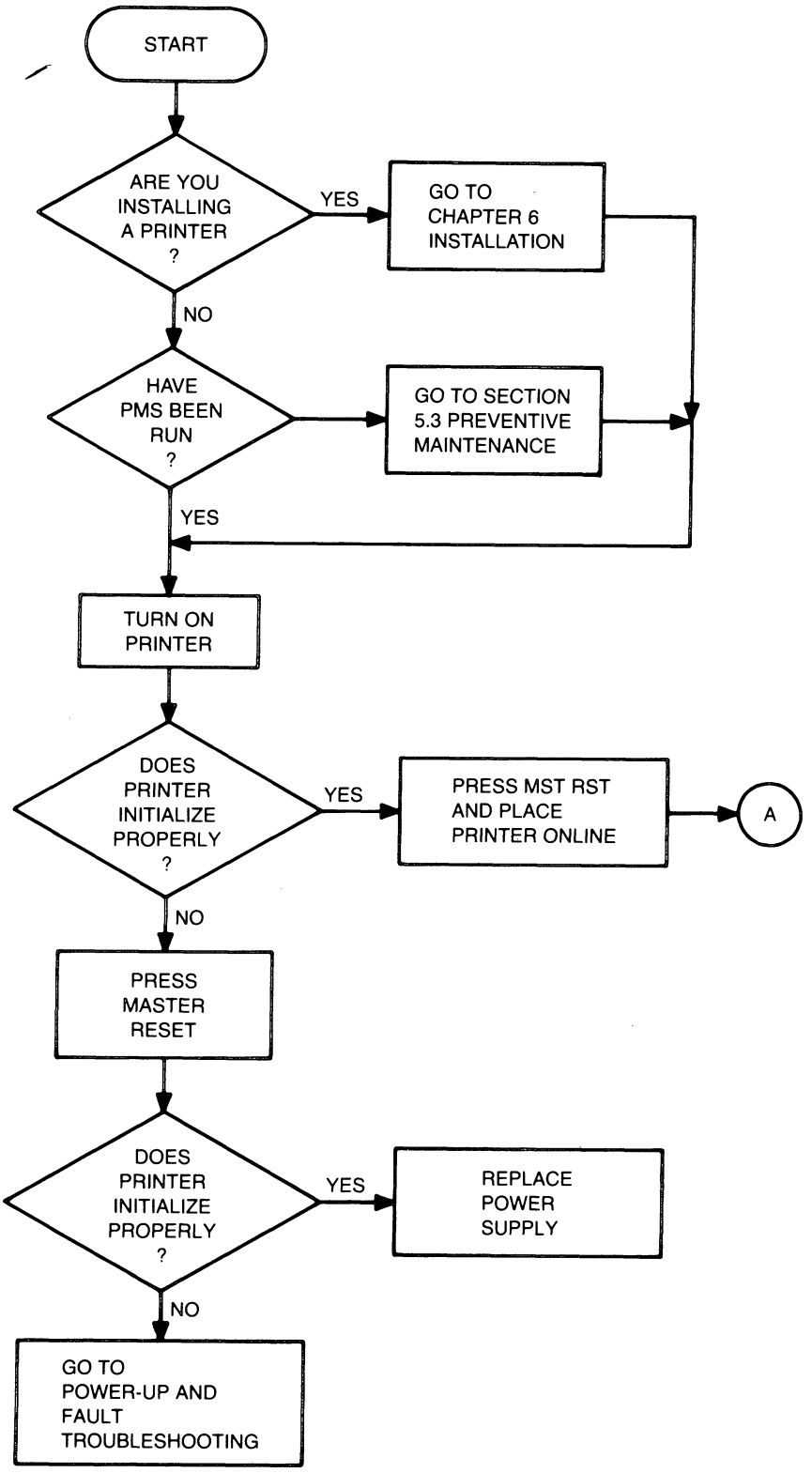


Figure 4.1 General Printer Troubleshooting Flowchart (Sheet 1 of 2)

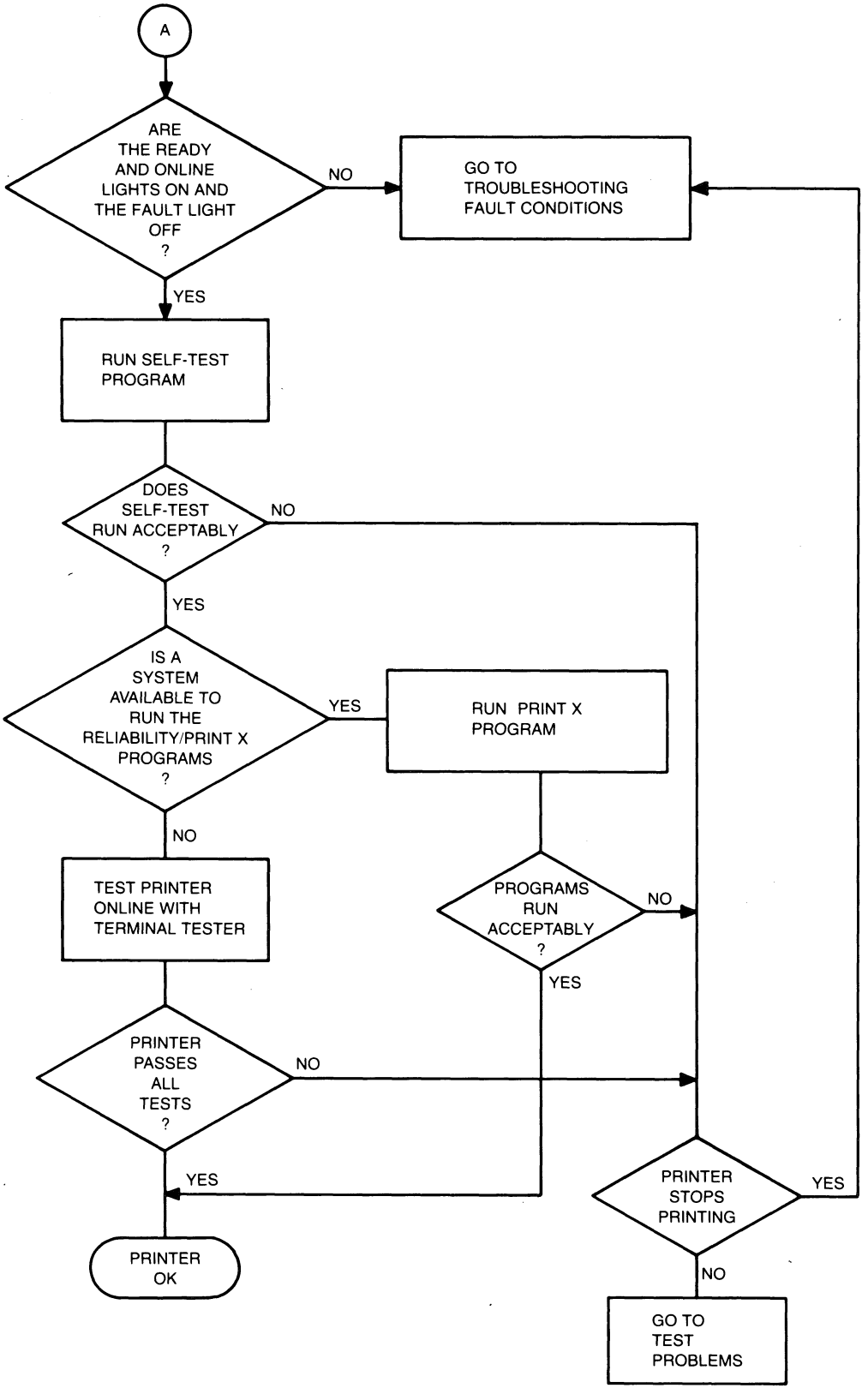


Figure 4.1 General Printer Troubleshooting Flowchart (Sheet 2 of 2)

4.5 POWER UP AND FAULT TROUBLESHOOTING PROCEDURE

The power up and fault troubleshooting procedure should be followed when a printer fails to initialize properly when MASTER RESET is pressed.

NOTE: Proper initilization consists of the print head moving to the left-hand margin, the printer sounding a tone, accepting the print characteristics set up on the secondary control panel and clearing the character buffer.

The power up and fault troubleshooting procedure is described in the flowcharts in figure 4.2.

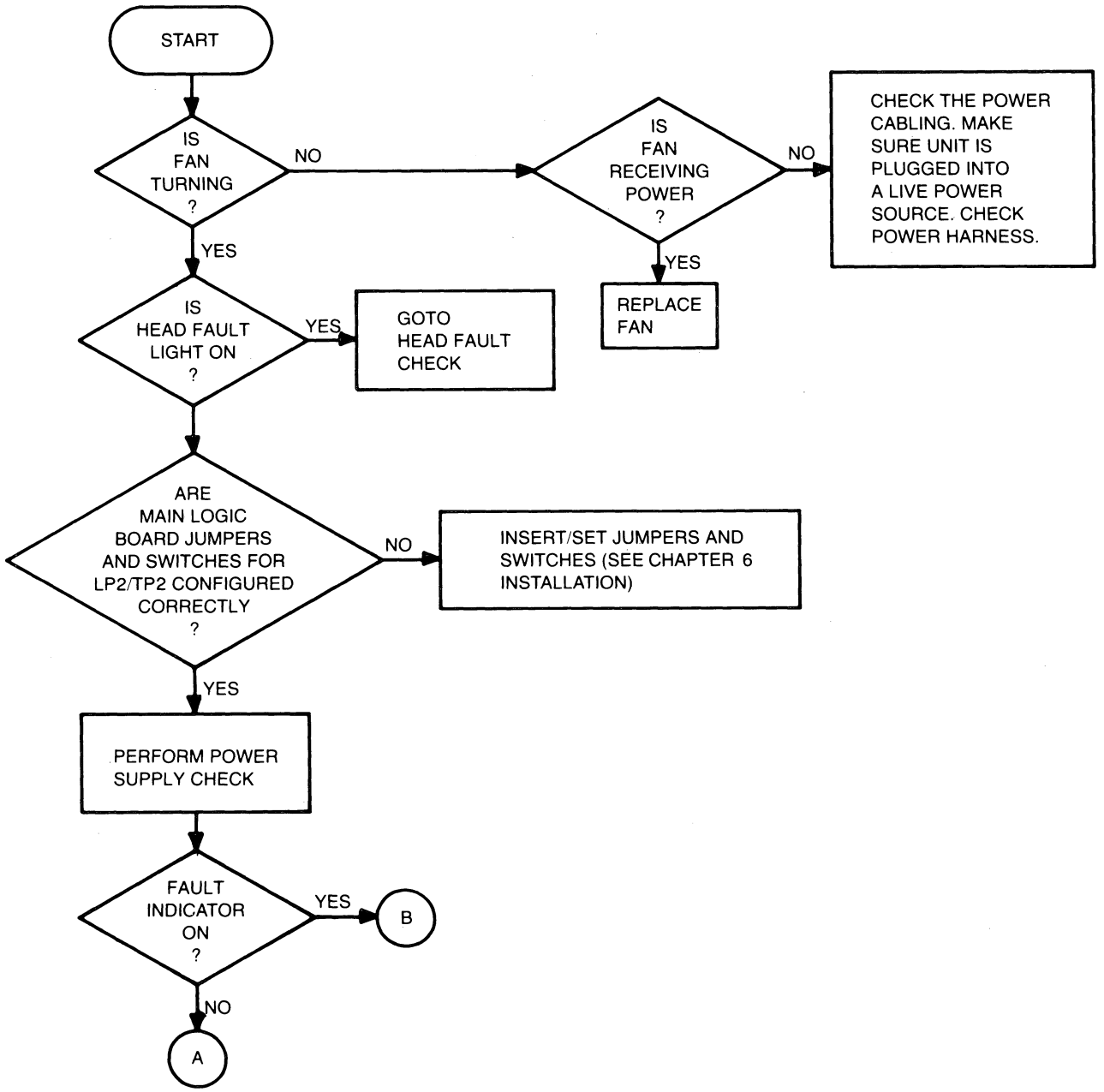


Figure 4.2 Power Up and Fault Troubleshooting Flowchart (Sheet 1 of 5)

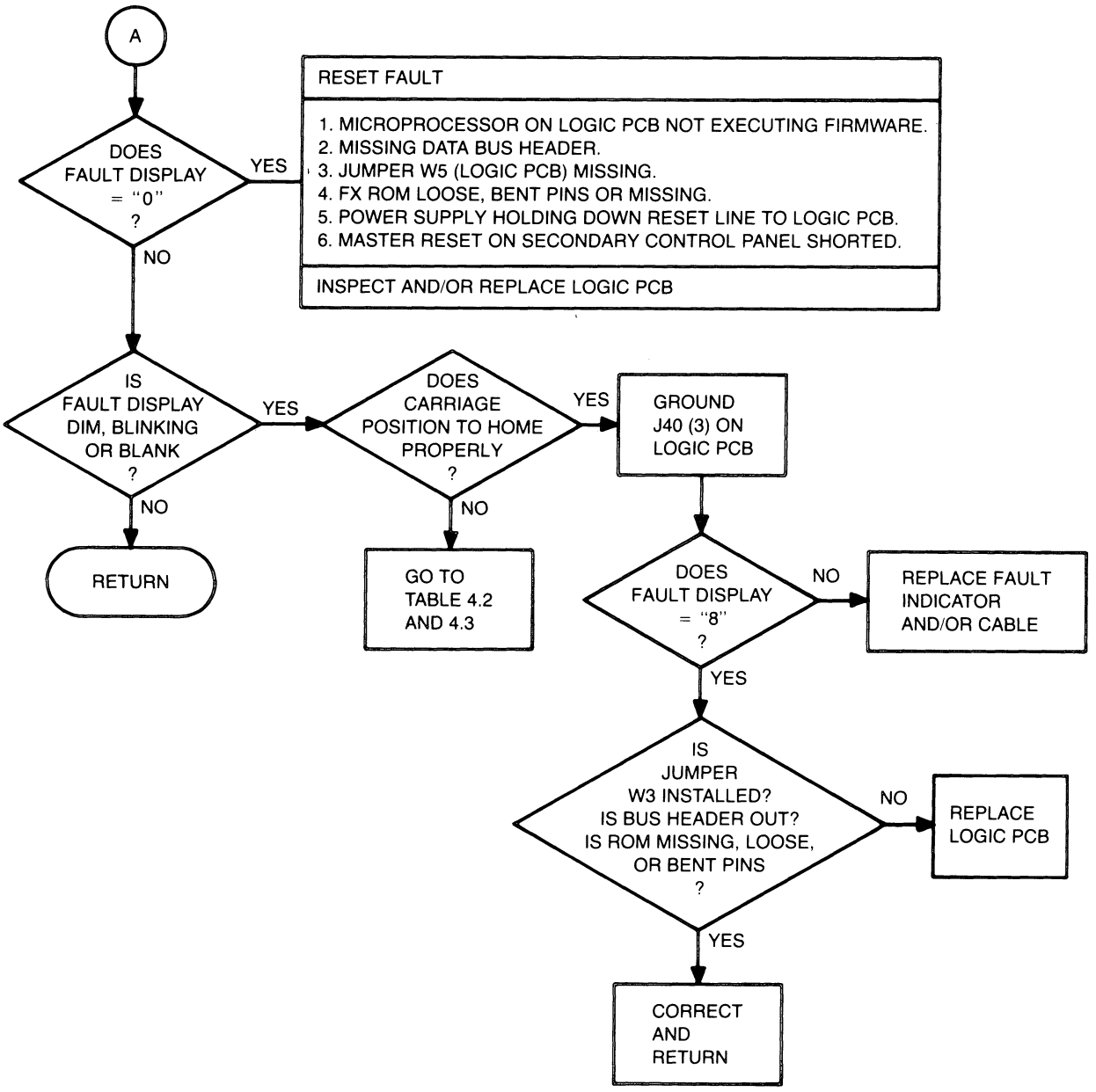


Figure 4.2 Power Up and Fault Troubleshooting Flowchart (Sheet 2 of 5)

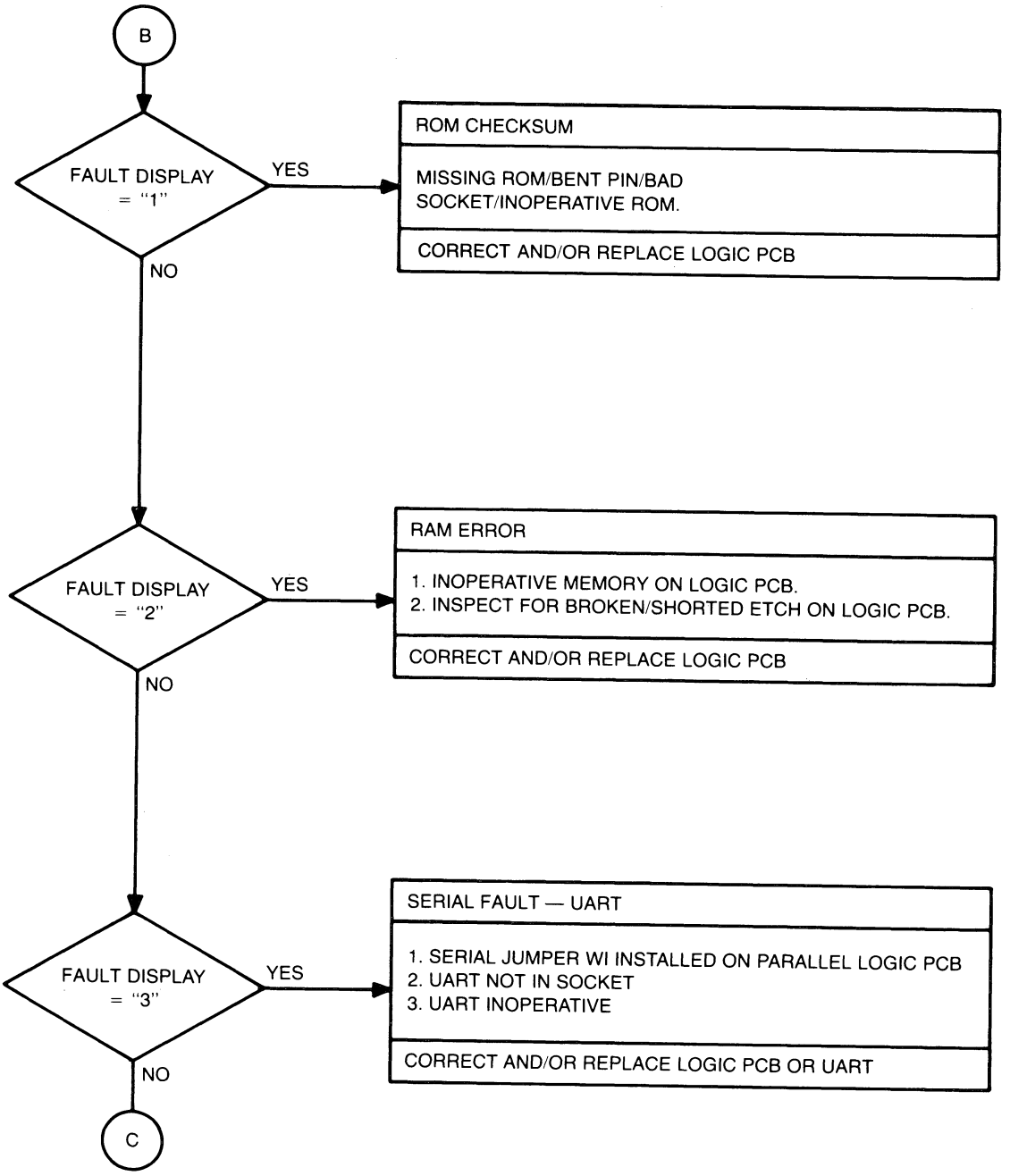


Figure 4.2 Power Up and Fault Troubleshooting Flowchart (Sheet 3 of 5)

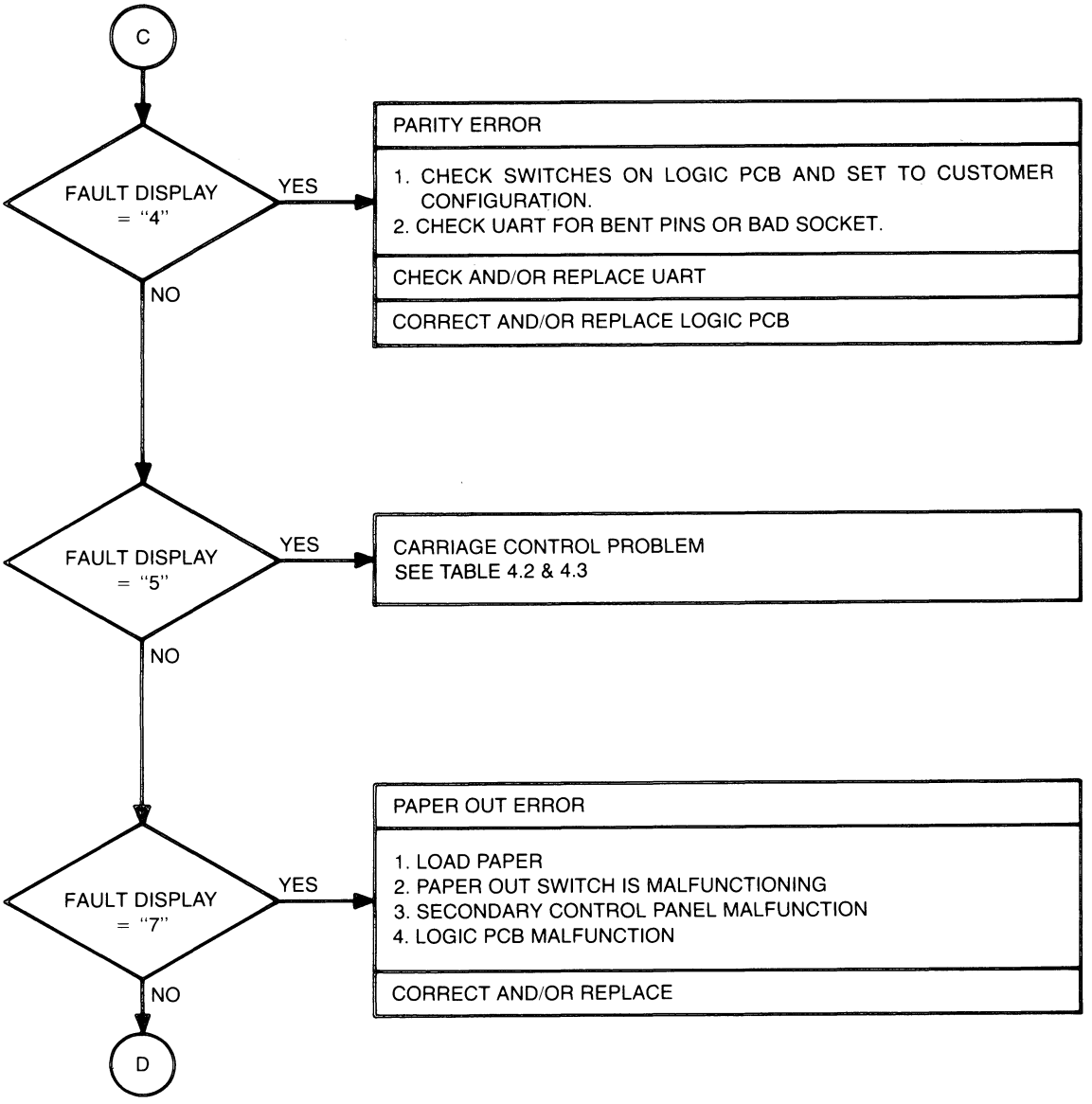


Figure 4.2 Power Up and Fault Troubleshooting Flowchart (Sheet 4 of 5)

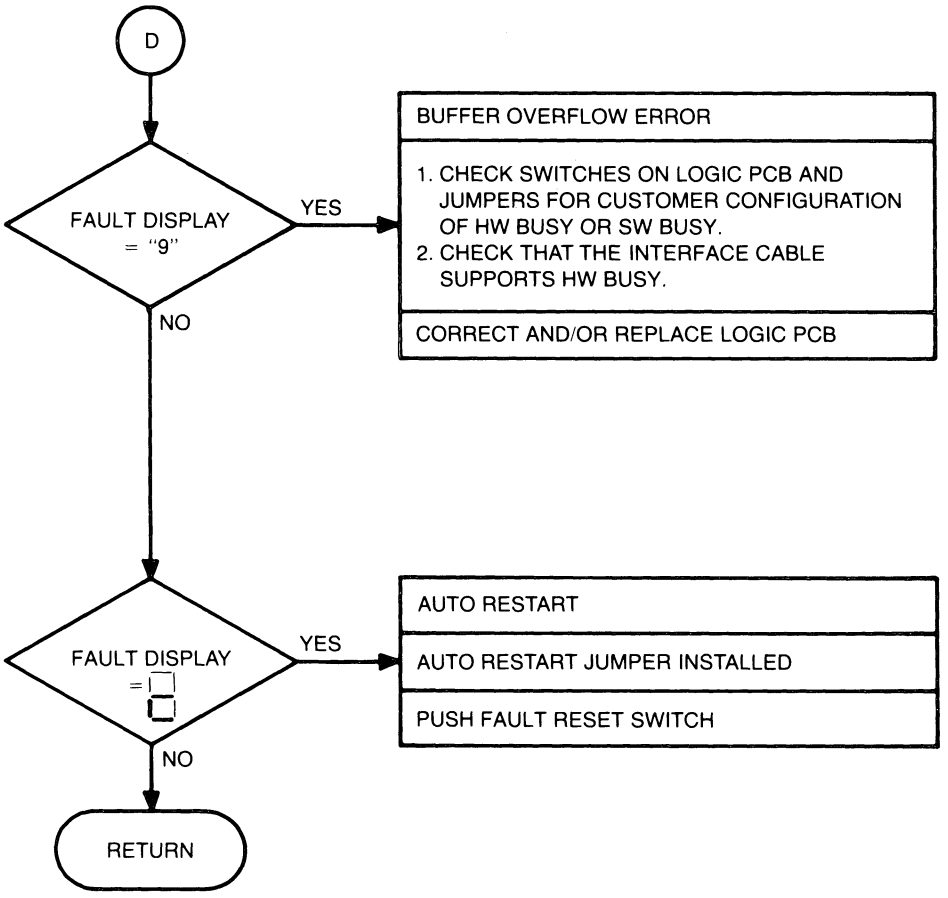


Figure 4.2 Power Up and Fault Troubleshooting Flowchart (Sheet 5 of 5)

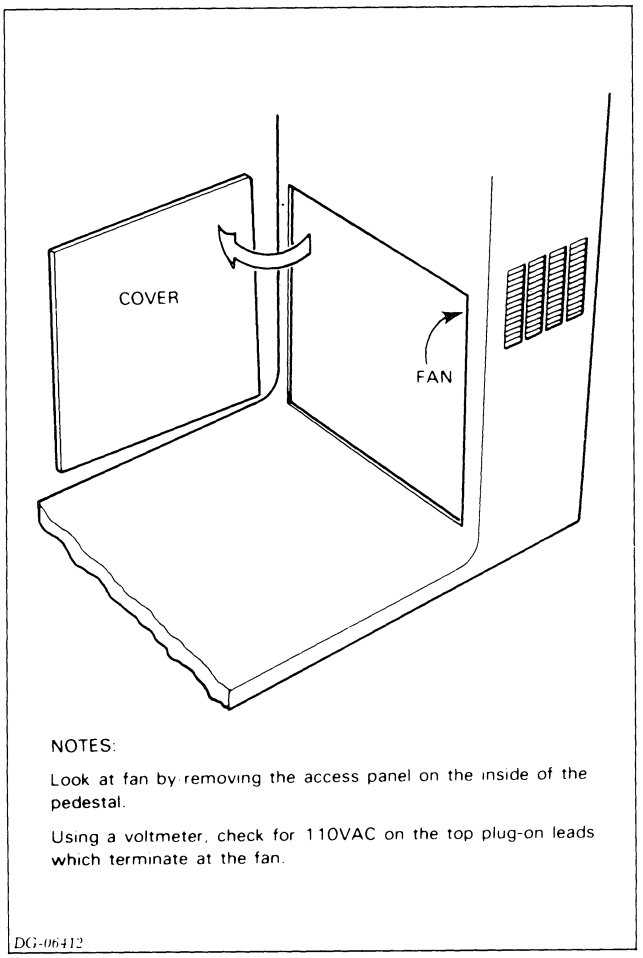


Figure 4.3 Fan Troubleshooting Diagram

4.6 CARRIAGE CONTROL TROUBLESHOOTING PROCEDURE

The carriage control troubleshooting procedure should be performed if a fault code of 5 is displayed on the fault indicator board. The carriage control troubleshooting procedures are shown in the flowcharts in figure 4.4 . Additional carriage fault isolation information is provided in tables 4.2 and 4.3.

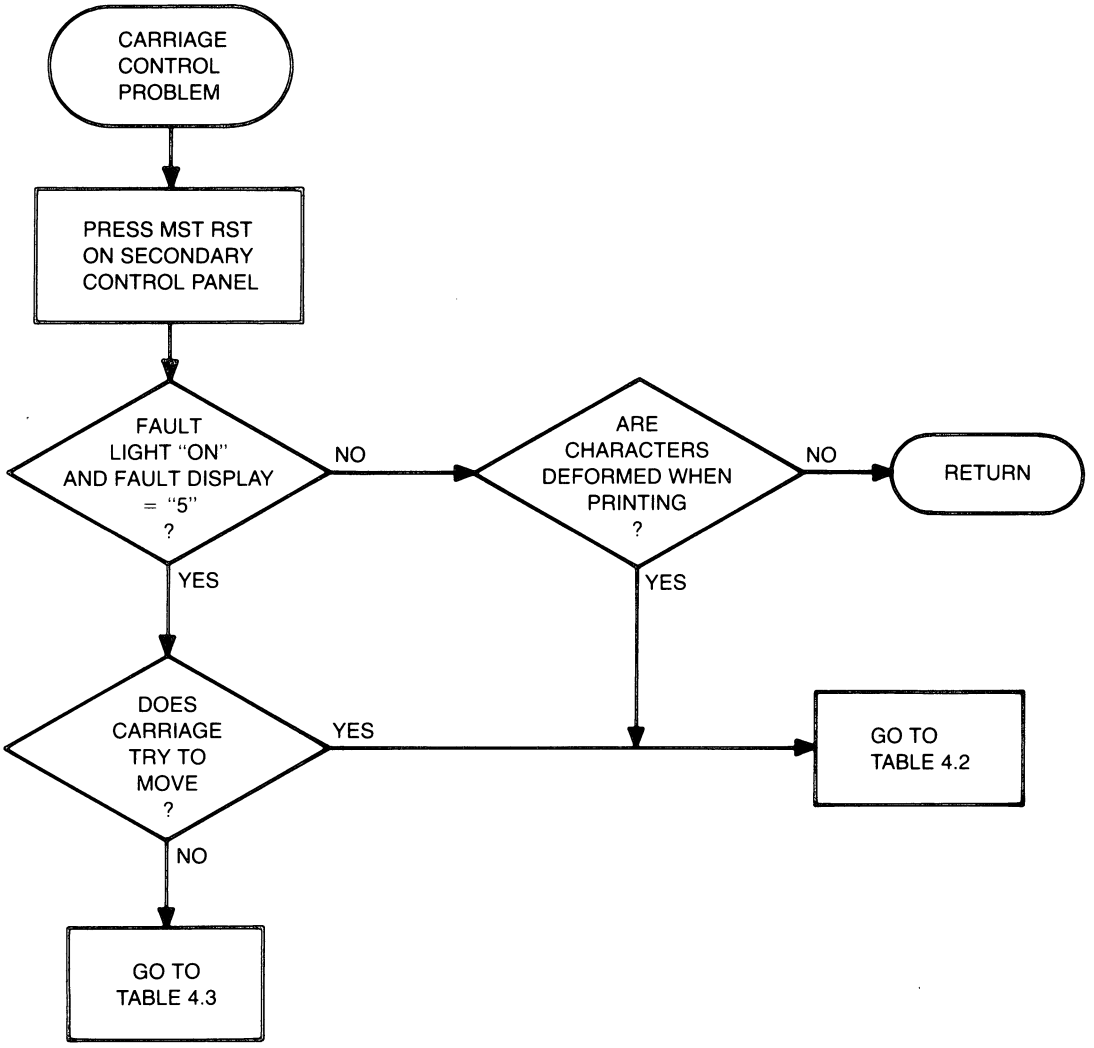


Figure 4.4 Carriage Control Troubleshooting Flowchart

Table 4.2 Carriage Motion Fault Isolation Procedures

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
CARRIAGE MOVES IN JERKING MOTIONS	a. CARRIAGE MOTION TRANSDUCER AND/OR DISK IS DIRTY	a. CLEAN MOTION TRANSDUCER AND CODE DISK
	b. CARRIAGE MOTION TRANSDUCER IS OUT OF ADJUSTMENT	b. PERFORM THE MOTION TRANSDUCER TIMING ADJUSTMENT
	c. CARRIAGE IS BINDING	c. CHECK TO SEE IF THE FOLLOWING PARTS ARE JAMMING: - RIBBON CARTRIDGE - RIBBON DRIVE GEARBOX - CARRIAGE RAIL BEARINGS
	d. CABLE CONNECTING THE MOTION TRANSDUCER TO THE DRIVER BOARD IS DISCONNECTED OR CONNECTED BUT BAD	d. CHECK AND/OR REPLACE CABLE WHICH GOES TO J9
	e. TRANSDUCER CONTROL LOGIC ON DRIVER BOARD IS BAD	e. REPLACE DRIVER BOARD
	f. TRANSDUCER CONTROL LOGIC ON MAIN CONTROL BOARD IS BAD	f. REPLACE MAIN CONTROL BOARD
	g. TRANSDUCER IS BAD	g. REPLACE THE TRANSDUCER
CARRIAGE MOVES TO RIGHT MARGIN AT A LOW SPEED. CARRIAGE MOVES TO LEFT MARGIN AND GENERATES A FAULT.	a. HOME TRANSDUCER IS DIRTY	a. CLEAN THE HOME TRANSDUCER
	b. HOME TRANSDUCER CABLE IS UNPLUGGED OR BAD	b. CHECK AND/OR REPLACE CABLE ATTACHED TO J6 ON THE DRIVER BOARD
	c. HOME DETECT LOGIC ON DRIVER BOARD IS BAD	c. REPLACE THE DRIVER BOARD
	d. HOME DETECT LOGIC ON MAIN CONTROL BOARD IS BOARD	d. REPLACE THE MAIN CONTROL BOARD

Table 4.3 Carriage Motor Troubleshooting Procedure

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
CARRIAGE MOTOR DOES NOT MOVE	a. CABLE CONNECTING THE CARRIAGE MOTOR TO THE DRIVER BOARD IS UNPLUGGED OR BAD	a. CHECK AND/OR REPLACE CABLE CONNECTED TO J1 ON DRIVER BOARD
	b. DRIVER BOARD MOTOR CIRCUITRY IS BAD	b. REPLACE DRIVER BOARD
	c. CONTROL BOARD CIRCUITRY IS BAD	c. REPLACE MAIN CONTROL BOARD
	d. POWER SUPPLY NOT PROVIDING MOTOR DRIVING VOLTAGES (16 VDC AND/OR 48 VDC)	d. CHECK POWER SUPPLY FOR 16 VDC AND 48 VDC; REPLACE IF NECESSARY.
	e. CARRIAGE MOTOR IS BAD	e. REPLACE CARRIAGE MOTOR

4.7 POWER SUPPLY CHECK

The power supply check procedure is shown in the flowcharts in figure 4.5. Additional power supply troubleshooting data is provided in tables 4.4 through 4.6.

Table 4.4 Connector J10 Power Supply Input Voltages

PIN	VOLTAGE	MIN	MAX	
1	120 VAC (NEUTRAL)	---	---	
2	15 VAC	---	---	
3	120 VAC (NEUTRAL)	---	---	120 VOLT OPERATION (USE LINE CORD DGC #109-000238)
4	15 VAC	12.8	16.5	
5	120 VAC (LINE)	102	132	
6	GROUND	---	---	
1	220/240 VAC (LINE)	196	253	
2	15 VAC	---	---	
3	NEUTRAL	102	132	220 OR 240 VOLT OPERATION (USE LINE CORD DGC #109-000240)
4	15 VAC	12.8	16.5	
5	220/240 VAC (LINE)	196	253	
6	GROUND	---	---	

Table 4.5 Connector J11 to Driver Board Voltages

PIN	VOLTAGE	MIN	MAX
1	NO CONNECTION		
2	+5 VDC	+ 5.1	+ 5.2
3	+48 VDC	+43.0	+53.0
4	GROUND	----	----
5	+16 VDC	----	----

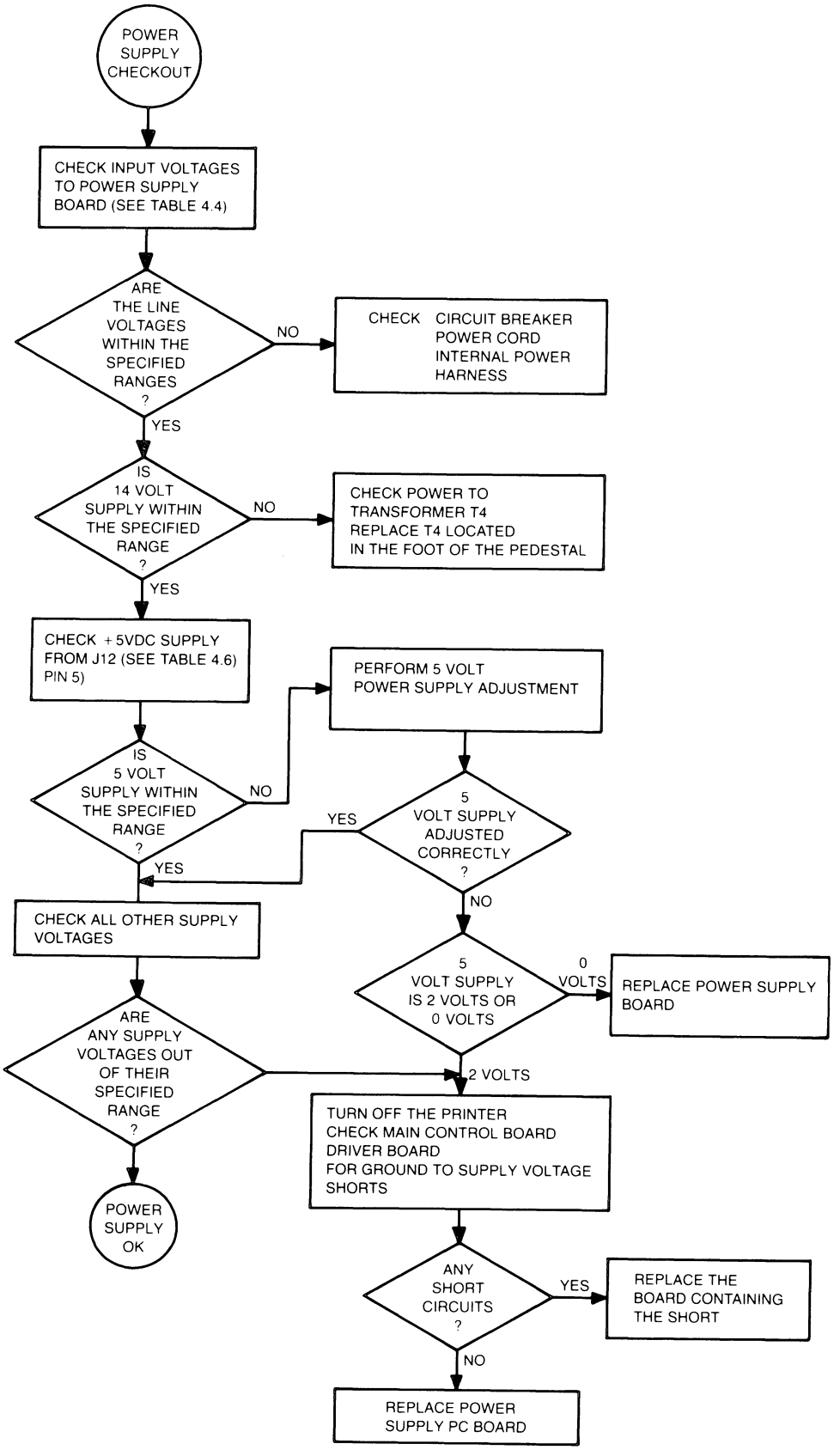


Figure 4.5 Power Supply Checkout Flowchart

Table 4.6 Connector J12 To Main Control Board

PIN	VOLTAGE	MIN	MAX
1	-12 VDC	-12.4	-11.8
2	-5 VCD	- 5.2	- 4.8
3	POWER OK	+ 4.8	----
4	GROUND	----	----
5	+5.0 VDC	+ 5.1	+ 5.2
6	+14 VDC	+13.0	+15.0

4.8 HEAD FAULT TROUBLESHOOTING FLOWCHARTS

The head fault checks described in figure 4.6 should be performed when the printer's head fault indicator lights.

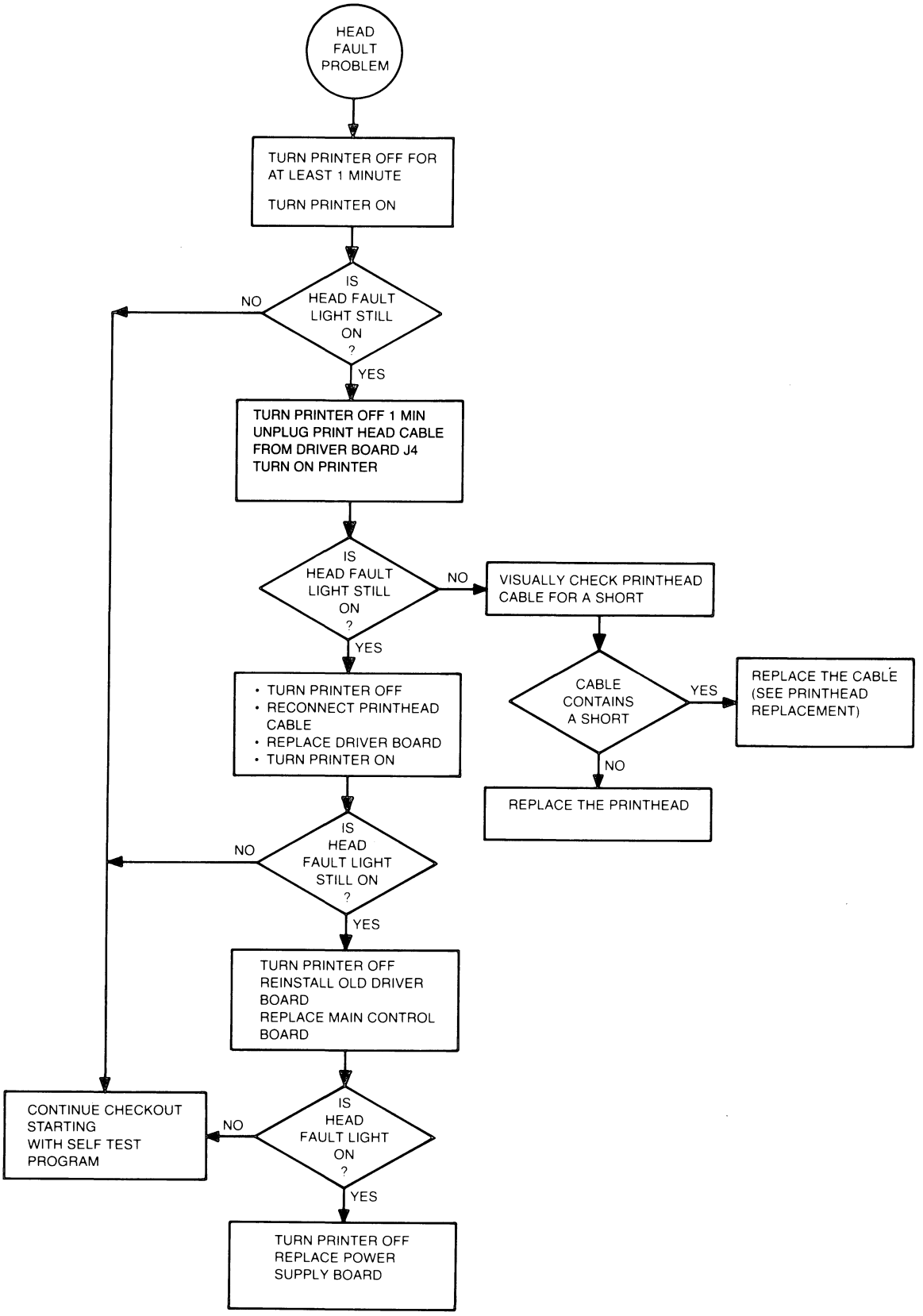


Figure 4.6 Head Fault Troubleshooting Flowcharts

4.9 SELF TEST FEATURE

The Self test feature of the LP2 and TP2 printers permits the testing of the printing capabilities while the printer is offline. Placing the printer in self test mode causes the printer to print a continuously rotating character pattern in either normal or compressed format. Correct printer operation can be verified by visually inspecting the printout. Since the characters are generated internally, self test does not require an external device to generate the codes. However, this also means that the self test feature does not test a printer's communications interface or the cabling to the controller.

4.9.1 Self Test Operating Procedure

The self test feature is exercised as follows:

1. Place the printer offline.
2. On the secondary control panel, set the 6/8 LPI, NORM/COMP, a STD/ALT CHAR SET switches to test the desired characteristics.
3. Press MST RST.
4. Toggle the SELF TEST/ESC DISABLE switch towards SELF TEST as follows:

   Once for 9 inch wide paper.

   Twice for 15 inch wide paper.

NOTE: If the switch is then placed in the ESC DISABLE position, the self test will over print every other line 33 times before issuing a line feed.

5. Switch the printer online.

Self test will start as soon as the printer is online. To get out of self test mode, press the MST RST (master reset) switch on the secondary control panel.

NOTE: Perform a self-test for each mode of operation selectable from the secondary control panel (eg. normal, compressed, expanded, etc.).

After entering self test mode, the printer should start printing all of a character set's printable characters. Printable characters begin with the space character (40 octal) and end with the tilde character (176 octal). Printing should be bidirectional and the sequence should repeat indefinitely until the MST RST (master reset) button is pressed.

In particular, look for:

* Even margins from line to line
* Proper column alignment
* Consistent horizontal spacing
* Consistent vertical spacing

4.9.1.1 Corrective Action If Self Test Fails

If a failure causes the printer to completely stop printing, go to the beginning of this chapter and follow the troubleshooting flowcharts to determine the cause. However if the printer prints refer to the Test Problem section at the back of this chapter for corrective action that should be taken for various problems.

4.9.2 DIAGNOSTIC TROUBLESHOOTING

Diagnostic troubleshooting is normally performed during initial system installation. Most problems thereafter are solved offline with the printer disconnected from the host system.

The print X diagnostic used for online troubleshooting may be procurred using the following part numbers:

Program No. 095-001651
Listing No. 096-001651

The Print X program provides I/O exercises and troubleshooting facilities for printers on a single controller subsystem. The subsystem must have the following equipment in order to run the diagnostic program :

* NOVA or ECLIPSE line computer with at least 16K of read/write memory.
* Console teletype or equivalent
* Controller:

  LP2 - line printer controller
  TP2 - asynchronous controller

4.9.2.1 Print X Test Descriptions

Print X is a diagnostic program that is used for testing of printers. The program sequentially transfers the output of a test buffer to one or more devices on a controller. The contents of the buffer locations are controlled by the operator test selection. Operator inputs which control the method of output are: single step characters, RTC interrupt triggering, and maximum transfer rate.

In the following paragraphs, we have listed and described some of the Print X tests that apply to the Enhanced LP2/TP2 family of printers. Additional test information is available in the Print X listing (p/n 096-001651).

Selection 1: Keyboard and Troubleshooting Test

Test 15 - SIMPLE ECHO TEST - echoes to the printer any key struck on the control terminal. The only exit from this test is ^C.

Test 16 - SIMPLE OCTAL ECHO - this test echoes to the printer any octal input from control terminal. Any non-octal input will be interpreted as a control character.

Test 21 - KEYBOARD TEST - this test inputs a character via a key struck on the printer, and outputs to that printer an echo of the character (if > 37 ASCII) and the ASCII code of the key in octal and binary. Two consecutive ^Z inputs result in a return to the test scheduler.

Test 23 - BUFFER ECHO TEST - this test repeatedly sends a series of characters to the printer until the test is halted by the operator.

Selection 3: Enhanced LP2 and TP2 Tests

Test 01 - PRINT ALTERNATING E IN ALL MODES - this test alternates lines of normal and elongated print.

Test 02 - ROTATING CHARACTER SET IN ALL MODES - this test prints a rotating character set in normal, compressed, compressed elongated, and elongated. The output is centered on the page with leading and trailing spaces to verify correct margin justification.

Test 03 - ESCAPE TEST 1 - sets a tab at location 32 -then outputs horizontal tab and message.

Test 04 - PRINT DOWN LINE LOAD CHARACTERS

Test 05 - TEST VERTICAL TABS

Test 06 - TEST ESCAPE 2 - sets a tab, clears the tab, then outputs message which should be left justified on the page.

Test 07 - TEST ESCAPES 5 AND 6 -sets vertical tabs, clears vertical tabs ; then outputs messages which should be on consecutive lines.

Test 10 - TEST UNDERSCORE - checks proper operation of the start underscore escape sequences in all four modes. The test will print four messages, the last word in each will be underscored.

Test 11 - PLOT MODE - the test output is a series of plotted messages, an alternately formed (and misspelled) block and a normal block. There should be no intercharacter or interline spacing.

Test 12 - TEST TABS - this test prints a line of equally spaced x's by setting and resetting horizontal tab stops.

Test 13 - TEST PRINT DIRECTION ANALYZATION - this test checks the printhead direction analyzation firmware. The test prints alternating lines of <<<< and >>>>. For higher baud rates the direction of print should be in the direction of the arrows.

Test 14 - ALTERNATING CHARACTER SET TEST - this test selects the alternate character set and prints the full set. The standard set is then printed for comparison.

Test 15 - BELL TEST - prints bell ,then rings 100 times.

Test 16 - CHARACTER POSITIONER TEST - output consists of M's on a diagonal. Each M preceded by an increasing number of spaces. Then a solid triangle of M's is printed.

Test 17 - NON-PRINTING TEST (delete) - continuously outputs string of delete codes.

Test 20 - NON-PRINTING TEST (null) - continuously outputs a string of nulls.

Test 21 - BACK SPACE TEST - a full width line is printed two characters at a time at opposite sides of the paper using the back space.

Test 22 - THROW AWAY CHARACTER TEST-DASHER LP2 AND TP2 function of throw away characters greater than 132/220 in normal and/ compressed mode respectively is checked. The last character printed on the last column should be Z.

Test 23 - APL MODE TEST - APL mode select/de-select sequence is checked.

Test 24 - SOFTWARE MASTER RESET TEST - software master reset is checked and executed.

Test 25 - DOWN LOAD FIRING CODE OVERRIDE TEST - checks ability of firmware to not fire a print wire in two adjacent columns.

Test 26 - PLOT ESC TEST - plots the word ESCAPE using 033 (ESC) code.

4.9.3 TERMINAL TESTER

This section informs the reader how to test a printer's various print modes and escape sequences with a DASHER Terminal Tester. It is assumed that the reader is familiar with the basic set-up and operation of a Terminal Tester. If not, see How to Use and Service the DASHER Terminal Tester (DGC No. 015-000087).

The Terminal Tester can test a DASHER LP2 or TP2 printer in the following ways:

1. It can transmit single printing codes or a rotating pattern of codes with a selected number of characters per line.

2. It can transmit control codes and escape sequences to check the printer's special functions.

3. It can store up to 40 characters received from a TP2 printer's keyboard or it can echo received characters back to the printer.

4.9.3.1 When to Use the Tester

The DASHER Terminal Tester may be used to test the online operation of an LP2 or TP2 printer if a CPU and controller are not available to run the Print X diagnostic program or if running the diagnostic program would tie up a system. Moreover, since the Tester supplies known data, it will help the user to decide when a problem is due to the printer or originating from the external cabling, the controller, the communications network, and/or the software. Since the Tester does not test the external cable or controller, it is a good idea to run the diagnostic programs as a final test.

4.9.3.2 Test Procedures

Ten tests are outlined on the following pages. They test the four print modes and the escape sequences. Each test consists of one or more procedures to be performed with the aid of the tester. In each case, the purpose of the test is explained as well as what codes need to be transmitted to perform the test.

4.9.3.3 Test Selection

Always perform Test #1. It is not necessary to perform Tests 2 through 10 unless the user wishes to check specific escape sequences.

4.9.3.4 If a Test Fails

If a test fails , try issuing the codes to the printer a second time. If the test does not produce any response and the printer stops printing or the FAULT light comes on, go to the troubleshooting flowcharts at the beginning of this chapter. For other types of failures, refer to the Test Problem section at the back of this chapter.

4.9.3.5 General Test Information

All numeric values are given in octal.

The user may set up the line length via the select line length switches. The tester automatically inserts a newline code at the end of each line.The user should reset the tester, set the character select switches to newline (012), set the single character continuous switch to single and press the start switch three times at the beginning of each test. The first two codes the tester sends after reset are always carriage return (015) and line feed (012).The third code transmitted is defined by the character select switches.

If the tester is not reset at the start of testing, the user cannot be certain of the tester's initial state.

TEST #1 - ROTATING CHARACTER PATTERN TEST (ALL 4 PRINT MODES)

Part 1

Aim: To print all characters from 40-176 in normal mode.

Transmit: Continuous character pattern with a line length of 8 (switches 64 and 16 up).

Reset the tester.

Part 2

Aim: To print all characters from 40-176 in compressed mode.

Transmit: 012 (3 times), 033, 076, and continuous character with a line length of 80.

Reset the tester.

Part 3

Aim: To print all characters from 40-176 in compressed elongat mode.

Transmit: 012 (3 times), 033, 074, and continuous character with a length of 40 (switches 32 and 8 up).

Reset the tester.

Part 4

Aim: To print all characters from 40-176 in normal elongated mode.

Transmit: 012 (3 times), 033, 077, and a continuous character pattern with a line length of 40.

Reset the tester and the printer. Set the Select Line Length switches on the tester so that the 64 and 16 switches are up.

TEST #2 - BELL (AUDIBLE TONE) TEST

Aim: To sound the audible tone.

Transmit: 012 (3 times) and 007.

TEST #3 - BACKSPACE TEST

Aim: To return the printhead to the left margin, move it five spaces to the right, and move it back five spaces to the left margin.
Transmit: 012 (3 times), 040 (5 times), 010 (5 times).

TEST #4 - FORM FEED TEST

Set the Line Count switches on the printer's secondary control panel to 10. Press MST RST on the printer.

Transmit: 014 (4 times).

Aim: To feed 10 lines of paper each time an 014 is transmitted.

Set the Line Count switches on the printer to 20. Press MST RST on the printer.

Transmit: 014 (4 times)

Aim: To feed 20 lines of paper (twice as much as before) each time an 014 is transmitted.

Reset the tester.

TEST #5 - HORIZONTAL TAB TEST

Aim: To print four A's 10 spaces from the left margin followed by four A's at the left margin.

Transmit: 012 (3 times), 040 (10 times), 033, 061, 012, 011, 101 (4 times); 012, 040 (10 times), 033, 062, 012, 011, 101 (4 times).

Aim: To print four A's at the 40th column; four B's at the 80th column and four C's at the 120th column followed by line of four A's, four B's, and four C's at the left-hand margin.

Transmit: 033, 105, 040, 100, 140, 000, 012, 011, 101 (4 times), 011, 102 (4 times), 011, 103 (4 times), 012, 033, 105, 000, 011, 101 (4 times), 011, 102 (4 times), 011, and 103 (4 times).

TEST #6 - VERTICAL TAB TEST

Advance paper to the top of the next form and reset the printer.

Aim: To print four X's at the top of the form, four Y's at the top of the next form followed by four Y's 10 lines down.

Transmit: 012 (11 times), 033, 065, 014, 012, 033, 065, 014, 130 (4 times), 013, 033, 066, 131 (4 times), 014, 130 (4 times) 013, 131 (4 times).

Reset the tester.

Aim: To print four A's on the 1st line, four B's on the 20th line and four C's on the 40th line, followed by four A's, B's and C's overprinted on the first line of the next form.

Transmit: 012 (3 times), 033, 106, 020, 040, 000, 101 (4 times), 013, 102 (4 times), 013, 103 (4 times), 014, 033, 106, 000, 101 (4 times), 013, 102 (4 times), 013 and 103 (4 times).

Reset the tester.

TEST #7 - UNDERSCORE TEST

Aim: To print "DDDDGGGGCCCC" with all four G's underscored.

Transmit: 104 (4 times), 033, 141, 107 (4 times), 033, 142 and 103 (4 times).

TEST #8 - RESET TEST

Aim: To initialize the printer (printhead should move to the left-hand margin and the present line should become the top of form).

Transmit: 012 (3 times), 033, 143, 000.

Reset the tester.

TEST #9 - PLOTTING TEST

Aim: To plot a square at the left margin.

Transmit: 012 (3 times), 033, 144, 177, 100 (12 times), 177, 033, 145, 012, 033, 144, 177, 001 (12 times), 177, 033, 145, and 012.

Reset the tester.

TEST #10 - DOWN-LINE LOADED CHARACTER SET TEST

Aim: To down-line-load a character set consisting of one character the character B. If FAULT light goes on, a checksum error may have been detected (you may have entered a wrong code).

Transmit: The following loads the character B: 012 (3 times), 033 131, 000, 020, 012, 000 (3 times), 001, 004, 000, 370, 001, 004, 000, 040, 001, 004, 000, 040, 000, 330, 341.

Aim: To select the character set and print a B (B is printed in place of the space character normally printed when a printer receives 040).

Transmit: The following selects the down-line-loaded character set 033, 116, 004, 000. Place the tester in continuous single character mode and transmit 040.

4.9.4 Test Problems

This section helps the user to determine the failing field replaceable unit by suggesting probable causes and corrective action for various symptoms observed while the printer is printing. If the printer does not respond at all or its indicator lights show a fault condition go to the troubleshooting procedures at the front of this chapter. Otherwise, look through the column marked "symptoms" in table 4.7 and find the symptom which most closely reflects the observed problem. For quick reference, a summary of the various symptoms appears below in the same order that the symptoms appear in the table:

* Margins do not line up, sloppy character spacing.
* Dark smudgy print
* Light printing (or no printing, but printhead fires)
* No printing (printhead wires not firing)
* Print wires are misfiring
* Prints
* Prints incorrect characters
* Improper paper feed spacing
* Carriage moves in jerking motions or carriage overruns margins
* Control codes or escape sequences do not work correctly

After you have identified the symptom, check the items indicated under "probable causes". Check the various causes in the order given. If a part needs to be replaced or an adjustment needs to performed, go to Chapter 5 Removal/Replacement section or Adjustment section and locate the procedure.

Table 4.7 Troubleshooting Table for Test Problems

SYMPTOMS	PROBABLE CAUSES	CORRECTIVE ACTION
MARGINS DO NOT LINE UP FROM LINE TO LINE, SLOPPY CHARACTER POSITIONING, OR UNEVEN CHARACTER SPACING	a. LINE TO LINE ALIGNMENT NEEDS ADJUSTMENT.	a. MOVE SWITCH 1.7 (ALIGNMENT ADJUST) TO OPPOSITE POSITION. (REALIGNS THE PRINT COLUMNS FROM LINE TO LINE BY COMPENSATING FOR MECHANICAL WEAR OF THE ANTIBACKLASH NUT.)
	b. LEADSCREW AND NUT ARE WORN	b. REPLACE LEADSCREW AND ANTIBACKLASH NUT.
	c. THE COUPLINGS BETWEEN THE LEADSCREW AND THE CARRIAGE MOTOR ARE LOOSE.	c. TIGHTEN CLAMP SCREWS AND/OR REPLACE THE PLASTIC COUPLING ADAPTER.
	d. THE CARRIAGE MECHANISM IS BINDING OR DRAGGING.	d. CLEAN AND ADJUST CARRIAGE BEARING. ADJUST RIBBON CARTRIDGE DRIVE CABLE.
	e. RIBBON CARTRIDGE IS BINDING OR JAMMING.	e. REPLACE THE RIBBON CARTRIDGE.
DARK SMUDGY PRINT	PRINTHEAD IS TOO CLOSE TO PLATEN.	ADJUST THE PLATEN SPACE LEVER. IF THIS DOES NOT SOLVE THE PROBLEM, ALIGN THE PLATEN. REPLACE THE PLATEN IF IT IS BENT OR TOO WORN TO BE ADJUSTED PROPERLY.

Table 4.7 Troubleshooting Table for Test Problems (Continued)

SYMPTOMS	PROBABLE CAUSES	CORRECTIVE ACTION
LIGHT OR NO PRINTING (PRINTHEAD IS FIRING)	a. THE RIBBON IS WORN.	a. REPLACE THE RIBBON CARTRIDGE.
	b. PRINTHEAD IS TOO FAR FROM THE PLATEN.	b. ADJUST THE PLATEN SPACE LEVER. IF THIS DOES NOT WORK REALIGN THE PLATEN
	c. RIBBON MECHANISM IS NOT ADVANCING RIBBON PROPERLY.	c. ADJUST THE RIBBON CARTRIDGE DRIVE CABLE
	d. RIBBON CARTRIDGE IS BINDING	d. REPLACE THE RIBBON CARTRIDGE.
	e. PRINT TIME OUT OF SPEC	e. CHECK PRINT TIME
NO PRINTING (PRINT WIRES ARE NOT FIRING)	a. CABLE FROM PRINT-HEAD TO DRIVER BOARD IS LOOSE OR DISCONNECTED.	a. RECONNECT RIBBON CABLE.
	b. FAULTY PRINTHEAD	b. REPLACE PRINTHEAD.
	c. FAULTY DRIVER BOARD	c. REPLACE DRIVER BOARD
	d. FAULTY MAIN CONTROL BOARD	d. REPLACE MAIN CONTROL BOARD.
	e. FAULTY POWER SUPPLY (48 VOLT SUPPLY)	e. REPLACE POWER SUPPLY BOARD.
FAULTY PRINTING	a. PRINTHEAD JEWEL IS DIRTY, CAUSING THE PRINT WIRES TO JAM.	a. CLEAN PRINTHEAD JEWEL.
	b. FAULTY PRINTHEAD WIRING	b. REPLACE PRINTHEAD.
	c. FAULTY DRIVER BOARD	c. REPLACE DRIVER BOARD.
	d. FAULTY MAIN CONTROL BOARD	d. REPLACE MAIN CONTROL BOARD.

Table 4.7 Troubleshooting Table for Test Problems (Continued)

SYMPTOMS	PROBABLE CAUSES	CORRECTIVE ACTION
PRINTS 	A PARITY ERROR WAS DETECTED UPON RECEIVING THE CHARACTER (TP2 PRINTERS). FIB DISPLAYS 4.	MAKE SURE THE PARITY SELECTED BY SWITCHES ON THE LOGIC BOARD AGREES WITH THE CONTROLLER. CHECK THE EXTERNAL CABLE FOR SECURE CONNECTIONS. REPLACE THE MAIN CONTROL BOARD (SERIAL INTERFACE).
PRINTS INCORRECT CHARACTERS	a. PRINTER IS PRINTING A DOWN-LINE LOADED CHARACTER SET. b. FAULTY CHARACTER GENERATOR	a. PRESS MST RST (MASTER RESET) SWITCH TO CLEAR. b. REPLACE MAIN CONTROL BOARD.
IMPROPER PAPER FEED SPACING	a. INCORRECT PLATEN TO PRINTHEAD SPACING. PAPER IS BEING PINCHED BETWEEN PRINTHEAD AND PLATEN. b. PAPER TENSION BAR IS TOO TIGHT c. BAD CONNECTION IN CABLE FROM PAPER FEED MOTOR TO J2 d. FAULTY DRIVER BOARD e. FAULTY MAIN CONTROL BOARD	a. CHANGE SPACING VIA THE PLATEN ADJUSTMENT LEVER. IF NECESSARY, ALIGN THE PLATEN b. ADJUST THE PAPER TENSION BAR c. FIX CABLE AND/OR CONNECTOR. d. REPLACE DRIVER BOARD e. REPLACE MAIN CONTROL BOARD

Table 4.7 Troubleshooting Table for Test Problems (cont'd)

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
CARRIAGE MOVES IN JERKING MOTIONS	CARRIAGE MOTION TRANSDUCER IS DIRTY	CLEAN MOTION TRANSDUCER AND CODE DISK.
CARRIAGE MOVES IN JERKY MOTIONS AND CARRIAGE STALLS. FIB DISPLAYS 5.	a. CARRIAGE IS BINDING	a. CHECK TO ENSURE THAT PARTS ARE NOT JAMMING - RIBBON CARTRIDGE - RIBBON DRIVE GEARBOX - CARRIAGE RAIL BEARING
	b. HORIZONTAL MOTION TRANSDUCER NEEDS ADJUSTMENT	b. PERFORM THE MOTION TRANSDUCER ADJUSTMENT.
	c. CABLE CONNECTING THE CARRIAGE MOTION TRANSDUCER TO THE DRIVER BOARD IS DISCONNECTED OR BAD.	c. CHECK CABLE TO J9 ON DRIVER BOARD
	d. TRANSDUCER DETECT LOGIC ON DRIVER BOARD IS BAD.	d. REPLACE DRIVER BOARD.
	e. TRANSDUCER CONTROL LOGIC ON MAIN CONTROL BOARD IS BAD.	e. REPLACE MAIN CONTROL BOARD.
	f. TRANSDUCER BAD	f. REPLACE
CONTROL CODES OR ESCAPE SEQUENCES DO NOT WORK CORRECTLY	a. PRINTER RUNNING FROM A DATA CHANNEL LINE PRINTER CONTROLLER OR THE COMMERCIAL SYSTEM'S CONTROLLER (THESE CONTROLLERS PASS ONLY 7-BIT ASCII CODES TO PRINTER AND INTERCEPT SOME CTRL CODES (LP2 PRINTERS)	a. USE A DIFFERENT LINE PRINTER CONTROLLER.
	b. MAIN CONTROL BOARD IS FAULTY (FIRMWARE ROMS ARE BAD).	b. REPLACE THE MAIN CONTROL BOARD.
	c. ESC DISABLE SWITCH ON OR BAD	c. CHECK ESC DISABLE SWITCH POSITION.

CHAPTER 5 - MAINTENANCE

5.1 INTRODUCTION

This chapter contains preventive and corrective maintenance procedures for the TP2/LP2 printers. The corrective maintenance procedures are referenced from the Troubleshooting chapter and include adjustment instructions as well as removal/replacement instructions for the field replaceable units (FRUs).

5.2 REQUIRED TOOLS AND TEST EQUIPMENT

The following tools and test equipment are required for performing preventive and corrective maintenance procedures for the TP2/LP2 printers:

* FE LEVEL 1 tool kit (DGC p/n 005-12583)
* Grease (DGC p/n 120-00753)
* Isopropyl alcohol 91%
* Vacuum cleaner (DGC p/n 128-000734)
* Soft bristle brush (DGC p/n 128-000186)
* Lint free tissue (DGC p/n 119-000062)
* Belt tension hanger (DGC p/n 128-000787)
* Terminal tester (DGC p/n 005-010682)
* Print X diagnostic program (DGC p/n 096-001651)
* Digital Voltmeter (DGC p/n 005-001413)
* P-Mat testset (DGC p/n 005-015328)
* Torque watch (office level) (DGC p/n 128-01550)

5.3 PREVENTIVE MAINTENANCE

A TP2/LP2 printer should be cleaned on a monthly basis and a major cleaning, adjustment and checkout should be performed on a three month basis.The monthly cleaning should be performed by the operator as described in the TP2/LP2 Operator's Manual (DGC part no. 014-678). The three month procedure should be performed by the customer's service engineer or by a Data General field service engineer if the printer is on a service contract.

5.3.1 Initial Preparation

Complete the following procedures to ready the unit for cleaning and adjustment:

1. Switch the printer OFFLINE (switch located on primary control panel).
2. Turn off power to the unit.
3. Unplug the printer power cord from the wall outlet.
4. Swing the top cover up until it latches.
5. Remove the pedestal's right and left side panels.

5.3.2 General Cleaning

Vacuum the top and bottom areas of the printer's paper handling and printing mechanisms using a non-conductive crevice nozzle.

CAUTION: Extreme care should be taken to prevent physical damage to the electronic and mechanical assemblies while vacuuming the printer.

5.3.3 Cleaning Printhead Jewel

The following procedure should be used to clean the printhead face jewel unit:

1. Remove the ribbon cartridge.
2. Remove the printhead (see removal/replacement instructions in Chapter 5).

CAUTION: Handle the printhead with care to prevent damage to the unit.

3. Clean the printhead jewel face with a soft bristle brush.
4. Wipe the printhead face jewel carefully using lint-free tissues and alcohol.

NOTE: Printhead wires extend beyond the jewel; therefore after cleaning, ensure that tissue remnants and/or caked ink are totally removed from the jewel and wires.

5. Reinstall the printhead and ribbon cartridge.

5.3.4 Cleaning Transducers and Timing Discs

The following procedure should be followed in cleaning the transducers and timing discs:

CAUTION: Do not bend the code discs or disturb any of the transducer settings while performing the following cleaning procedure.

1. Carefully clean the carriage motion transducer and and disc using a soft bristle brush. Gain access to all of the disc's timing slits by manually rotating the leadscrew.
2. Clean the home transducer with a soft bristle brush.

NOTE: After cleaning the code discs, ensure that all slits are clear.

5.3.5 Cleaning Leadscrew and Guide Rails

1. Clean the leadscrew with soft lint-free tissues.

CAUTION: Do not leave any foreign material in the leadscrew's groves as this will cause problems.

2. Move the carriage assembly to the left carriage stop.
3. Clean the leadscrew again as described in step 1.
4. Clean the rear guide rail with soft lint-free tissues.

5.3.6 Linear Bearings and Front Guide Rails Check

The following procedure should be used to check the condition of the carriage guide rails and bearings:

1. Clean the front guide rail with a lint-free cloth.

NOTE: Do not use alcohol to clean the front guide rail.

2. Move the carriage assembly between the right and left carriage stops (three times in each direction).
3. Check the front guide rail for slight evidence of of grease from the linear bearings. If no grease is evident, repack the bearings with grease.
4. Rub a thin coat of grease on the front carriage guide rail.

5.3.7 Ribbon Drive Cable Tension Check

Check the ribbon drive cable tension as described later in this chapter. Readjust if necessary.

5.3.8 Preparation for Normal Use

To restore the printer to normal operation, perform the following procedure:

1. Reinstall the ribbon cartridge.
2. Reinstall the two pedestal access panels.
3. Reinstall the paper and close the top cover.
4. Plug the power cord back into the ac outlet.
5. Set the main POWER switch to ON.
6. Verify correct printer operation using PRINT X diagnostic or terminal tester (see Chapter 4 for additional information regarding printer checkout).

5.4 CORRECTIVE MAINTENANCE

Corrective maintenance consists of performing an alignment or adjustment to correct a problem or replacing a defective FRU with a known good unit.

When performing the procedures in this chapter, observe the following precautions:

* Exercise caution when making power supply checks on live circuits. Dangerous ac voltages are exposed when the side panels are opened up for maintenance.

* Remove, replace and adjust only those items described in the procedures.

* Cables and wiring should be disconnected by pulling on the attached connectors and terminals; never pull directly on the wires or cables .

* When a FRU is replaced, make sure you perform all the necessary adjustments (use the chart on the following page as a quick reference). Also perform a complete test of the unit as described in Chapter 4.

5.5 REMOVAL/REPLACEMENT PROCEDURES

5.5.1 Circuit Board Replacement

CAUTION: Be sure power cord is unplugged from the wall or from the rear of the unit before removing any of the cable connectors or boards.

1. Label all of the cable connectors with their respective J numbers.

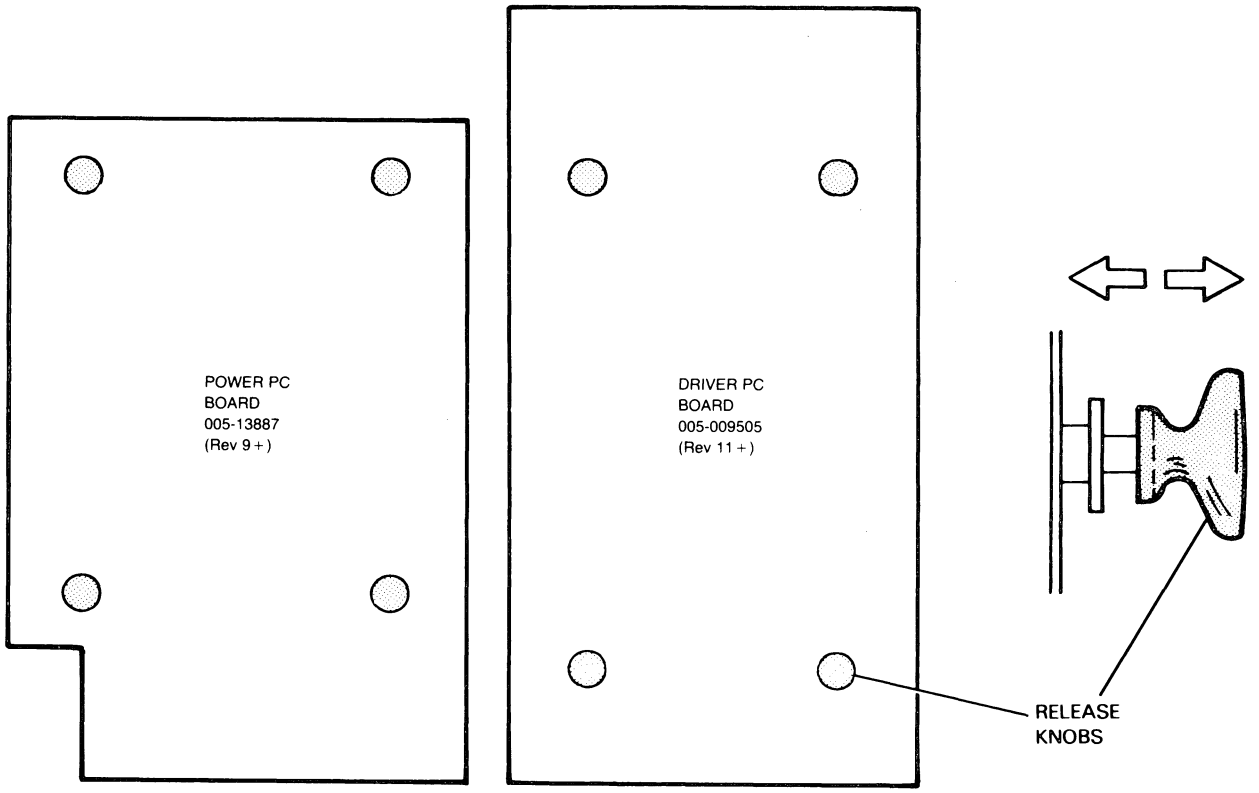
2. Unplug all the cable connectors from the board.

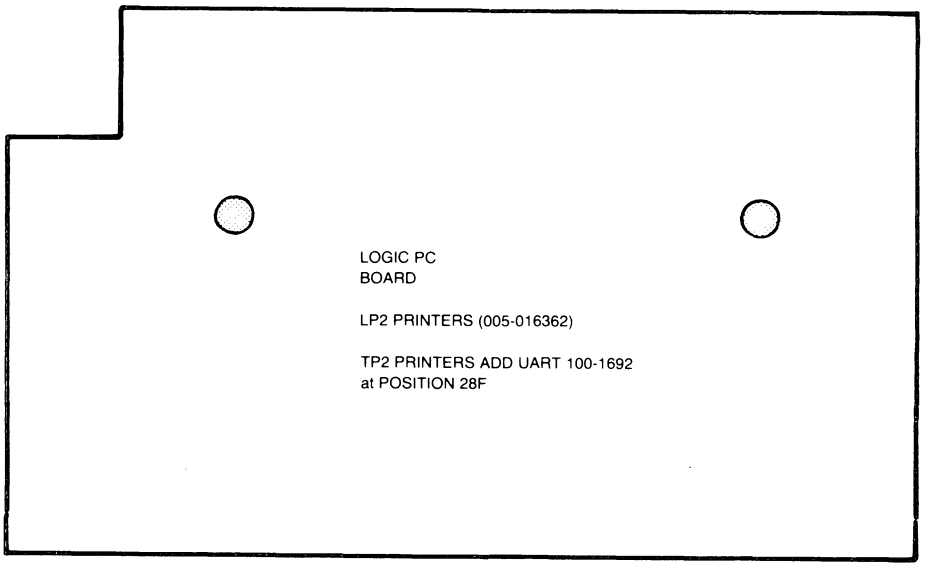
   NOTE: The Power Supply PC board has a cover which must be removed from the board.

3. Pull the release knobs (they will click when open). Remove the board.

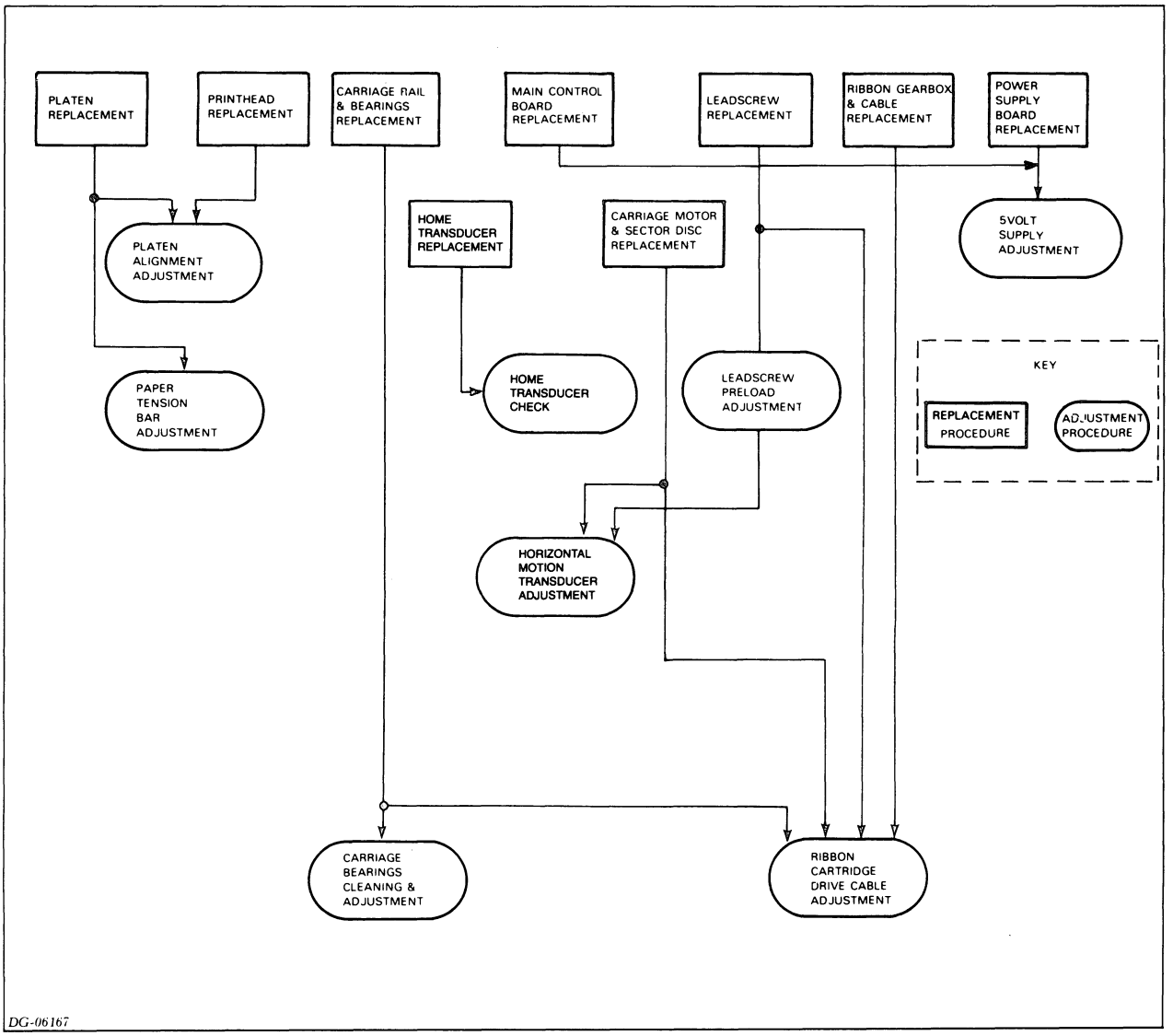
4. Position the new board in place and push on the retainer knobs (they will snap closed).

5. Reconnect all of the cables to the board.





Replacement/Adjustment Guidelines



5.5.2 Control Panel Replacement

The control panels and the fault indicator board assembly in the TP2/LP2 printers may be removed using the following procedure. Figures 5.1 through 5.3 show the removal/installation details for the primary control panel, secondary control panel and fault indicator board respectively.

The control panel removal/replacement procedure is as follows:

1. Remove the cover plate.
2. Unplug the molex connector from the board.
3. Remove the board.
4. Attach the new board.
5. Refasten the molex connector.
6. Attach the cover plate.

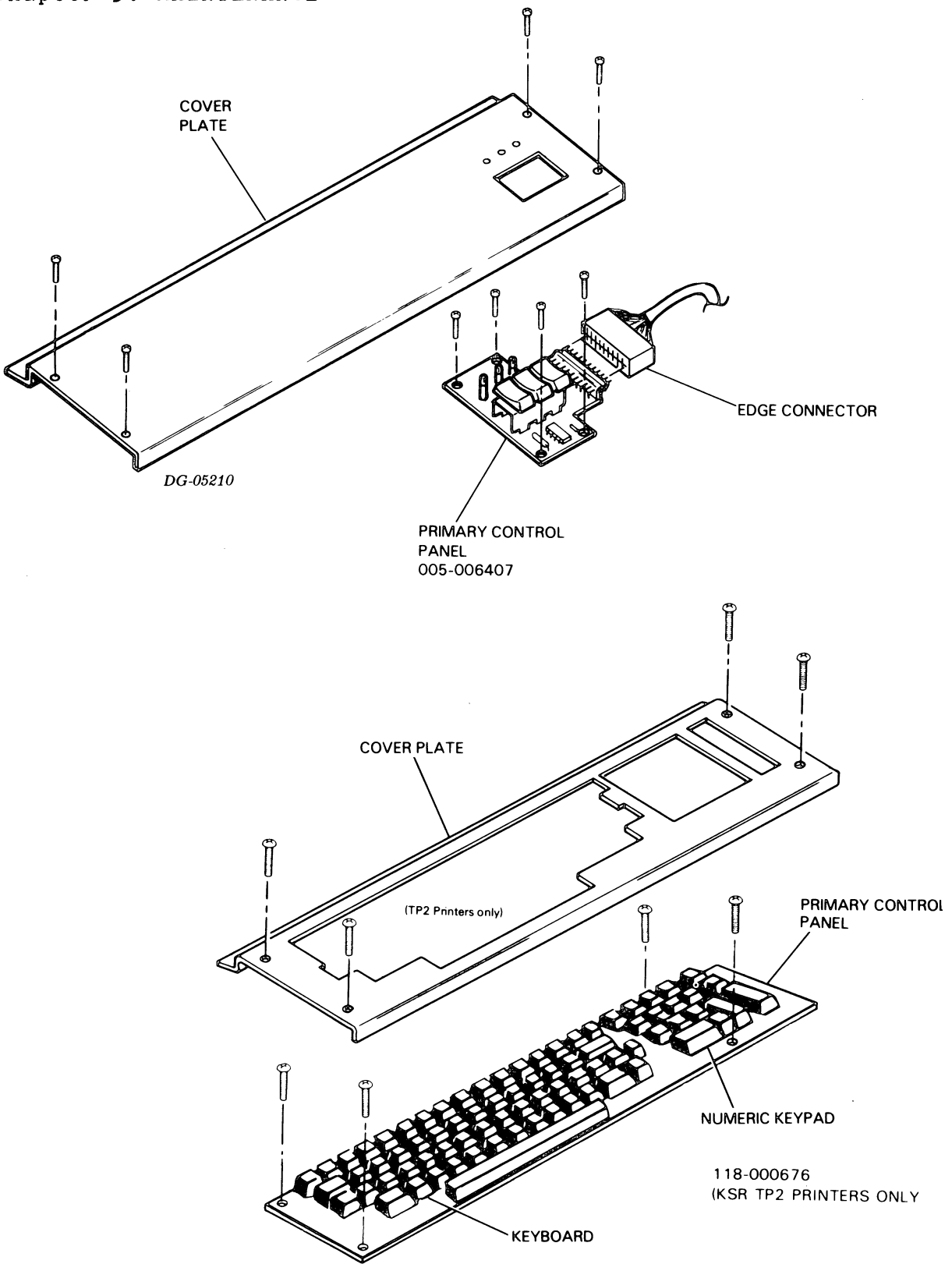


Figure 5.1 Primary Control Panel Removal/Replacement

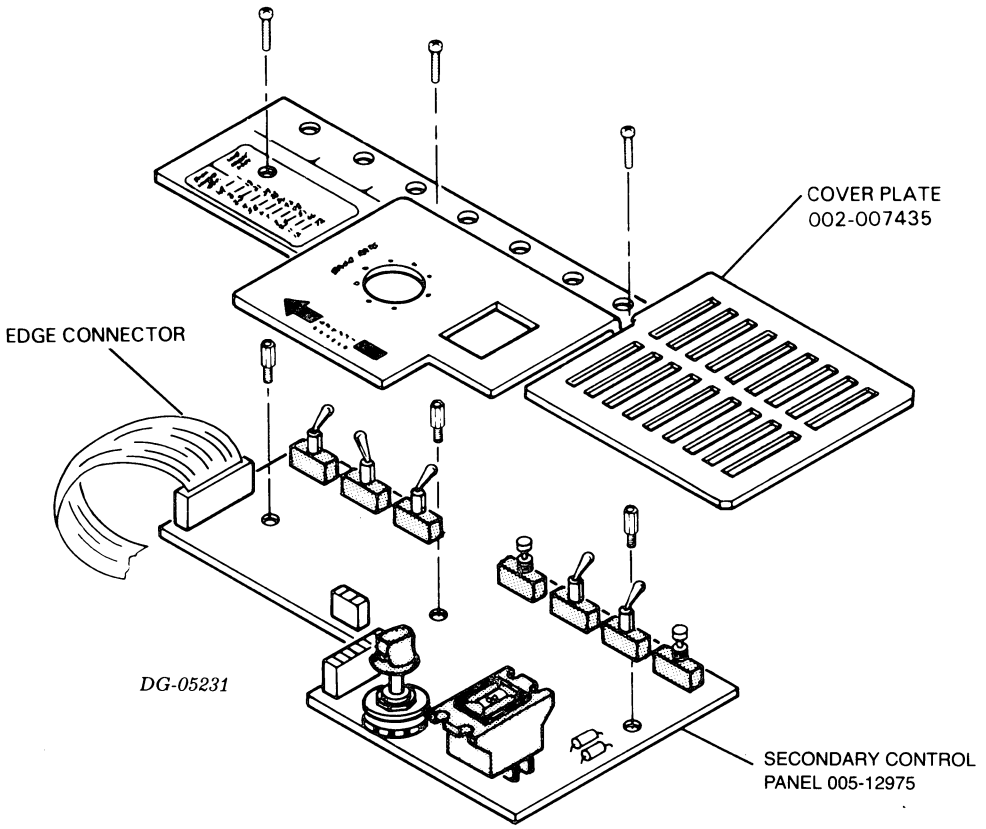


Figure 5.2 Secondary Control Panel Removal/Replacement

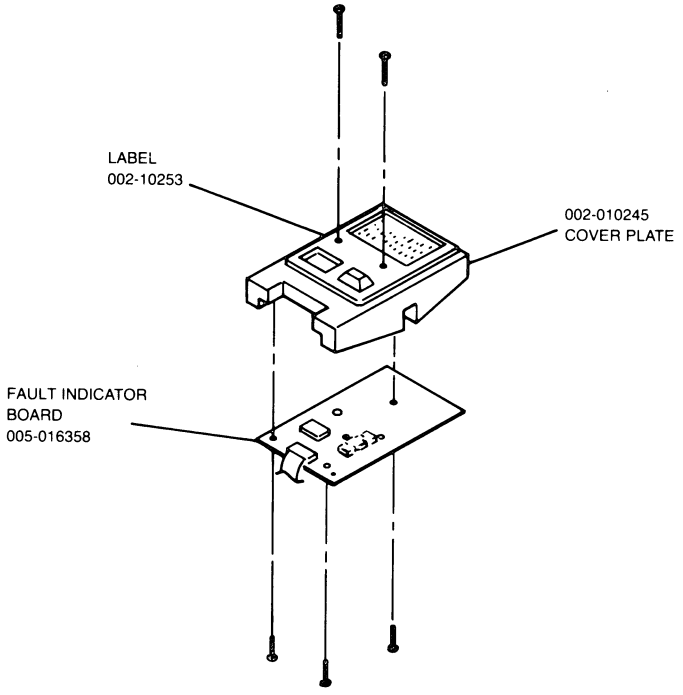


Figure 5.3 Fault Indicator Board Removal/Replacement

5.5.3 Printhead Replacement

The printhead may be removed and replaced using the following procedure:

1. Set the main POWER switch to OFF position.
2. Swing the top cover up until it latches.
3. Move the platen away from the printhead by setting the platen lever (located next to the secondary control panel) to the paper load (rearmost position) setting.
4. Remove the ribbon cartridge by grasping both sides of the cartridge and gently pulling upwards.
5. Remove the two screws and cable clamp as shown in figure 5.4.

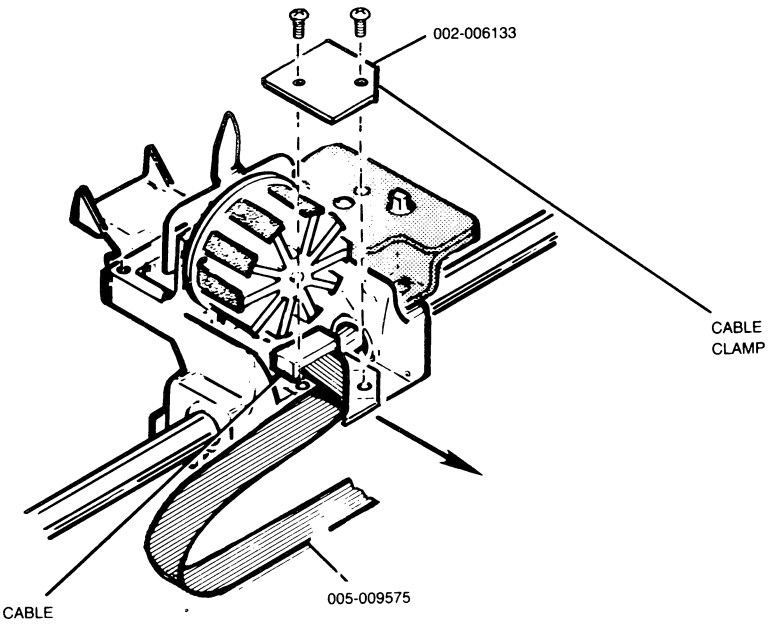


Figure 5.4 Printhead Cable Clamp Removal

5. Unplug the cable from the printhead.

6. Remove the two screws attaching the printhead and column indicator to the carriage (see Figure 5.5).

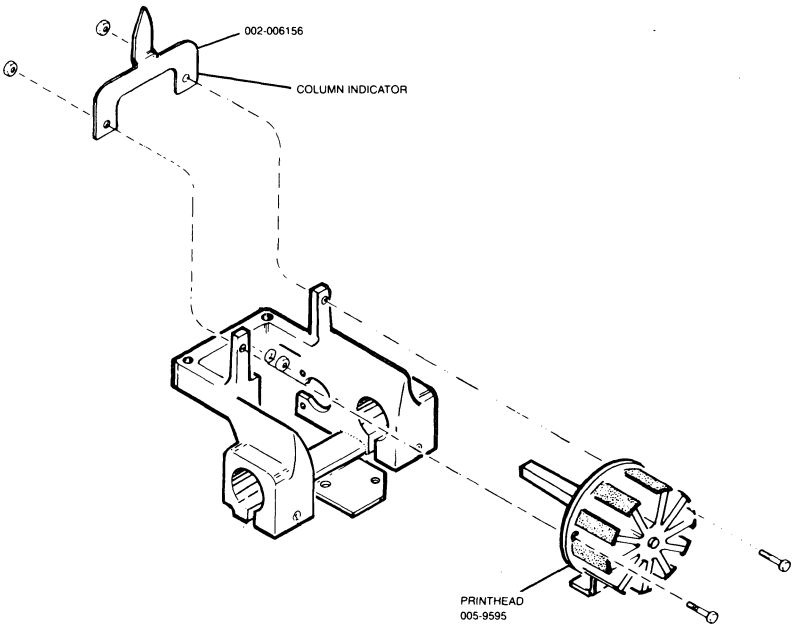


Figure 5.5 Printhead Removal

7. Using the two screws, secure the new printhead and column indicator to the carriage.

NOTES:
1. When fastening the printhead, check that the column indicator is displaced to the right of center.
2. When plugging in the cable, always keep the brown wire to the left and the black wire to the right.

8. Plug in cable.

CAUTION: Do not pinch cable.

9. Using the two screws, secure the cable with the cable clamp

10. Replace the ribbon cartridge.

11. Adjust the spacing between the printhead and the platen .

5.5.4 Ribbon Gearbox and Drive Cable Replacement

The ribbon gearbox and cable may be replaced as follows:

1. Remove the two screws securing the ribbon gearbox to the carriage.

2. Unwind the cable from the capstan of the ribbon gearbox (Figure 5.6).

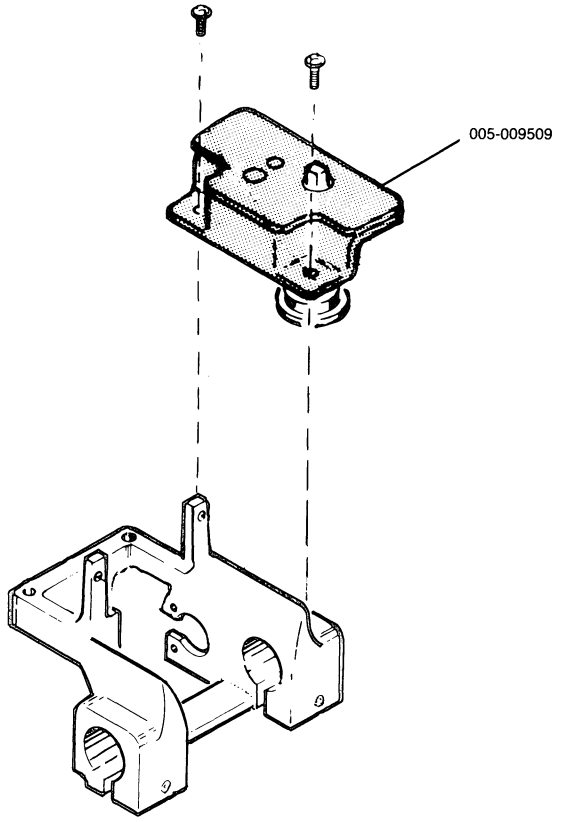


Figure 5.6 Ribbon Gearbox Removal/Replacement

NOTE: If the ribbon gearbox is being replaced, but not the cable, go to step 7.

3. Remove screw attaching cable keeper to the right end (see Figure 5.7).

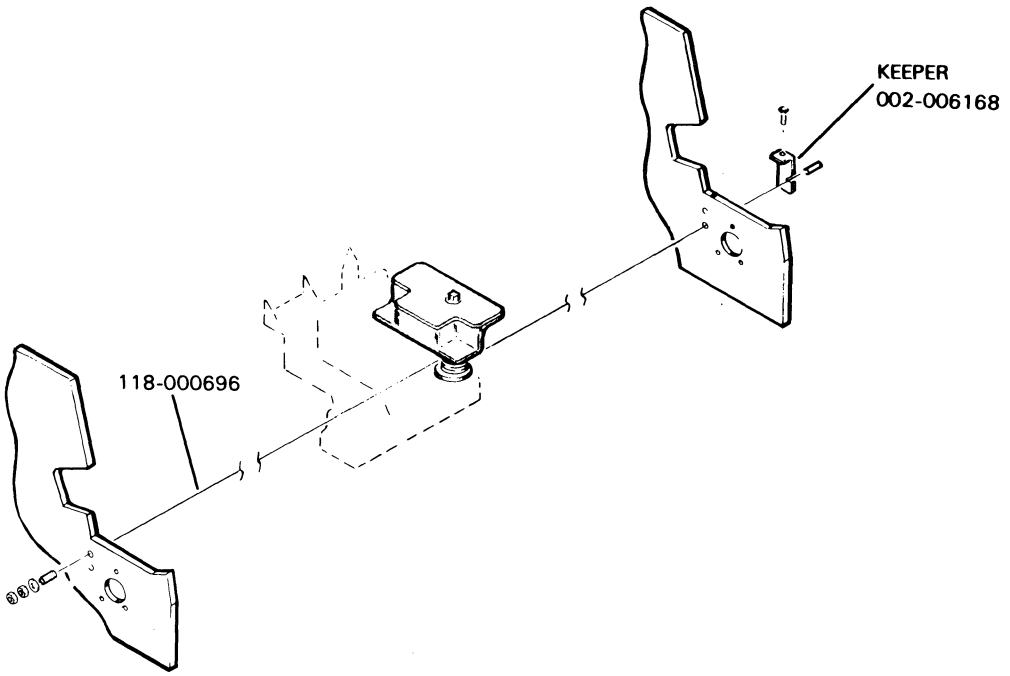


Figure 5.7 Cable Removal

4. Pull the cable to the left out of the frame.

5. Pass the unthreaded end of new cable to right through two end plates.

NOTE: The cable goes through the upper of the two holes in the left end plate and the lower hole in the right end plate.

6. Tighten cable keeper so that cable cannot slip through the end plate.

7. Wind the cable three turns around the gearbox capstan (see Figure 5.8).

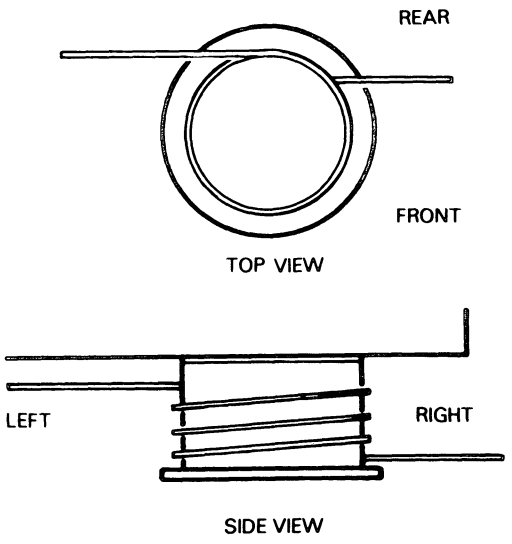


Figure 5.8 Cable winding

8. Secure ribbon gearbox to carriage using the two screws.

9. Move cable back and forth a few times to ensure that cable is not crossthreaded.

10. Adjust the ribbon cartridge drive cable as described in the adjustment section later in this chapter.

5.5.5 Antibacklash Nut and Leadscrew Replacement

NOTE: The antibacklash nut and leadscrew are packaged as a matched set (DGC part no. 118-001399) and should be replaced as a matched set to ensure proper operation.

The removal/replacement procedure is as follows:

1. Remove the ribbon gearbox .
2. Remove the secondary control panel cover.
3. Remove carriage motor assembly from the right end plate by removing three screws securing the motor mount bracket (see Figure 5.9). There is no lock washer on the top screw.

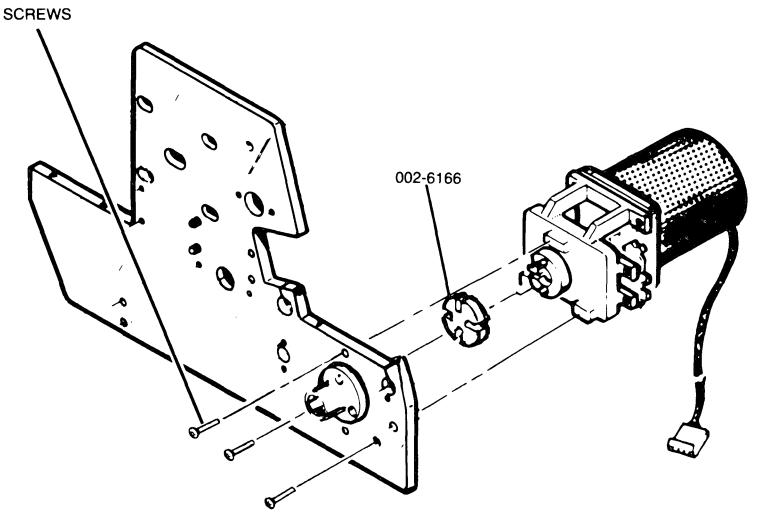


Figure 5.9 Carriage Motor Removal

4. Slide the carriage all the way to the left.

5. Loosen the coupling clamp set screw using a 3/32 inch Allen wrench, and slide coupling off the leadscrew (see Figure 5.10).

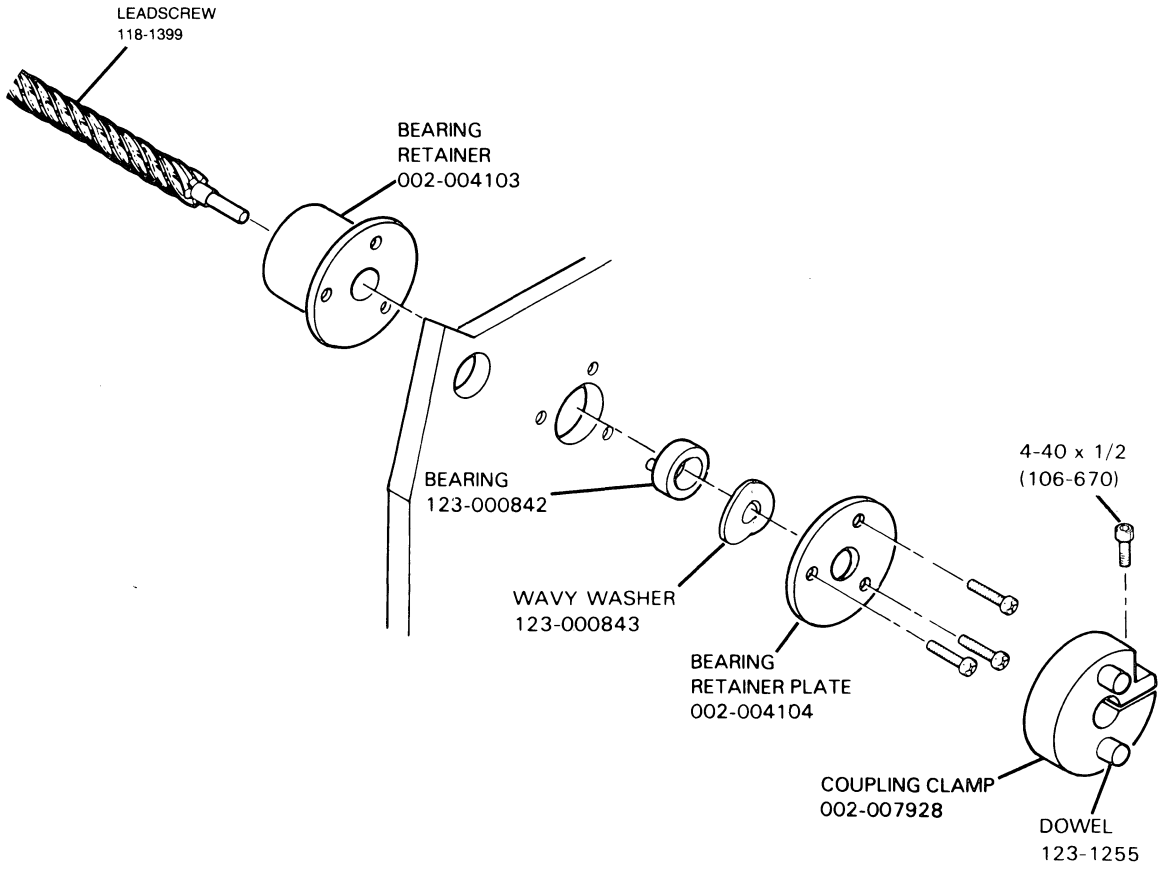


Figure 5.10 Leadscrew Removal/Replacement

6. Remove the three screws securing the bearing retainer plate

   NOTE: Do not lose the wavy washer.

7. Remove the three screws securing the antibacklash nut (see Figure 5.11).

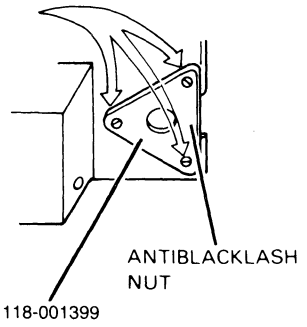


Figure 5.11 Anti-backlash Nut Removal

8. Without allowing antibacklash nut to come off leadscrew, partially withdraw leadscrew through the right end plate until it clears carriage. Then pull the leadscrew and nut assembly to the left and out of the plate.

9. Measure stand-alone leadscrew torque as follows:

   A. Attach the torque watch to the leadscrew.

   B. Grasp anti-backlash nut and hold the leadscrew in a horizontal position.

   C. Rotate leadscrew through the anti-backlash nut and observe torque reading. The torque reading should be between 4 and 6 inch oz. on new leadscrews (black) and 3 to 5 oz. on used leadscrews.

10. Insert right end of new lead screw through the right hand bearing retainers and into right end plate until left end will pass through the hole in the carriage. Attach the anti-backlash nut to carriage, using three #8 screws and flat washers.

NOTE: A number of shims (p/n 123-992) may be required for proper leadscrew preload.

NOTE: Tighten the screws alternately in approximately 1/8 turn increments.

11. Secure bearing retainer, wavy washer, and bearing retainer plate using the three screws.

12. Check the leadscrew torque as follows:

   A. Install torque watch on right end of the leadscrew.

   B. Turn lead screw with the torque watch. The reading needed to move carriage should not exceed 7.5 inch oz.

13. Perform the Leadscrew Preload Adjustment.

14. Attach carriage motor assembly to right end plate using three screws. Make sure plastic coupling adapter is in place.
15. Install the ribbon gearbox.

16. Install the secondary control panel cover.

17. Adjust the horizontal motion transducer.

5.5.6 Carriage Motor and Sector Disc Replacement

1. Remove the secondary control panel cover.

CAUTION: The sector disc is extremely fragile. Carefully support the motor when removing the last screw, and be sure not to bend the sector disc when removing the motor from its mount.

2. Remove three screws securing carriage motor assembly to the motor mounting bracket.

3. Remove the coupling clamp from the motor shaft.

4. Remove two screws and washers securing horizontal transducer assembly to motor mounting bracket (see Figure 5.12).

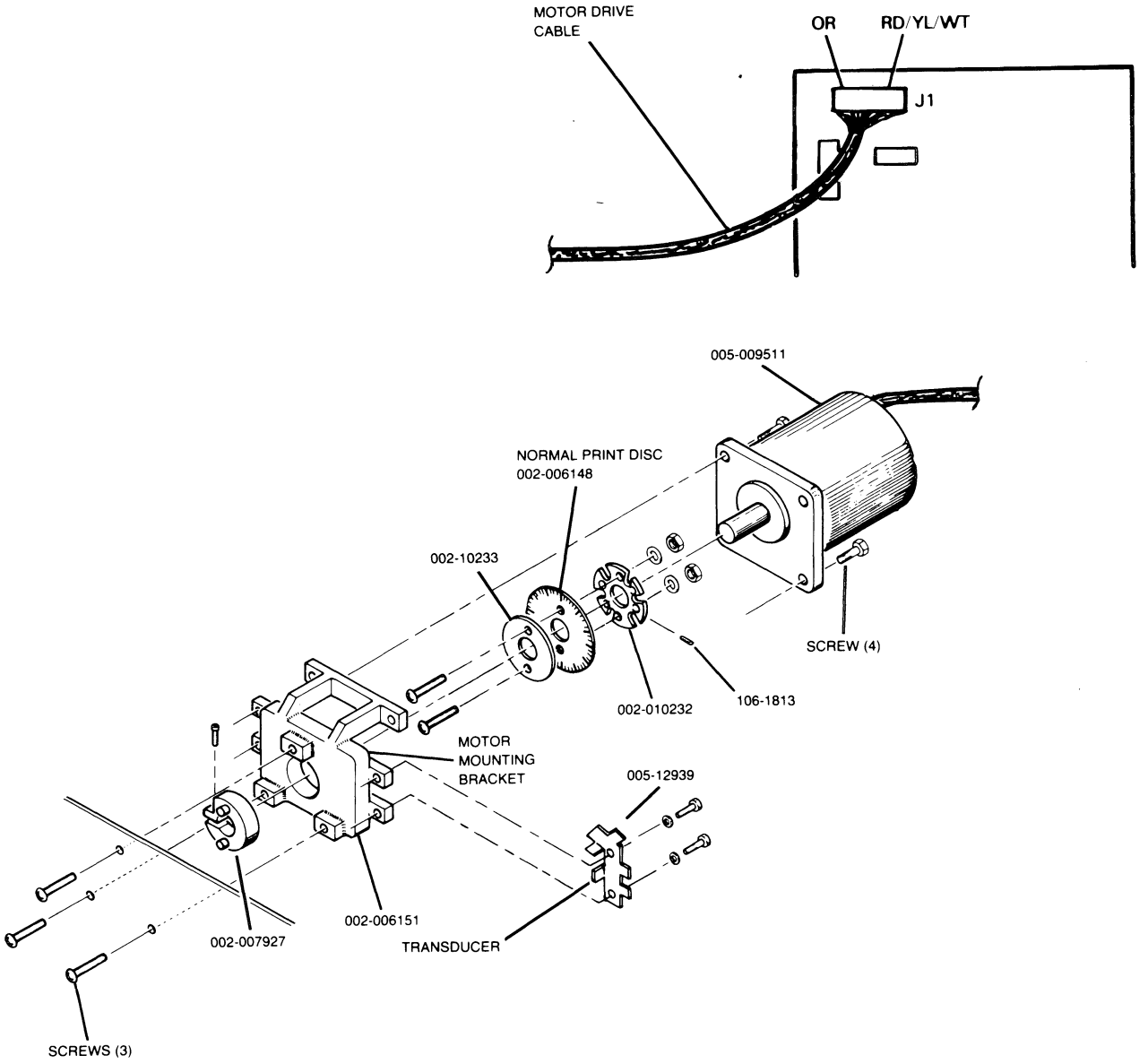


Figure 5.12 Carriage Motor and Sector Disk Removal/Replacement

5. Unplug motor drive cable from connector J1 on the Driver PC board and cut any ties securing the cable.

6. Remove four screws securing motor to motor mount bracket.

7. Using a 3/32 inch Allen wrench, loosen coupling clamp and sector disc and slide it off the motor shaft.

8. Reposition the sector disc and coupling loosely on motor shaft. With coupling flush on the end of shaft, tighten coupling clamp screw from 6.3 to 7.5 in. lbs..However do not tighten the sector disc clamp yet.

9. Fasten motor to motor mounting bracket using the four screws.

10. Secure horizontal transducer to motor mounting bracket by using the two screws and washers.

11. Make sure sector disc is between horns of the transducer (see Figure 5.13).

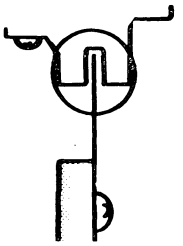


Figure 5.13 Sector Disk/Transducer Alignment

12. Connect motor drive cable to J1 on Driver PC board.

13. Perform Horizontal Transducer Adjustment.

5.5.7 Carriage Rail and Bearings Replacement

1. Unplug the printhead cable from the printhead.
2. Remove the ribbon cartridge gearbox from the carriage.
3. Remove the secondary control panel cover

NOTE: Some printers could have a small piece of .005 shim stock at each end of the front rail guide. Recover these shiims when removing the rails.

4. Remove four bolts securing the main print assembly to the shock mounts in the bottom of the print cavity.
5. Loosen two clamp screws securing the front guide rail to end plates (see Figure 5.14).

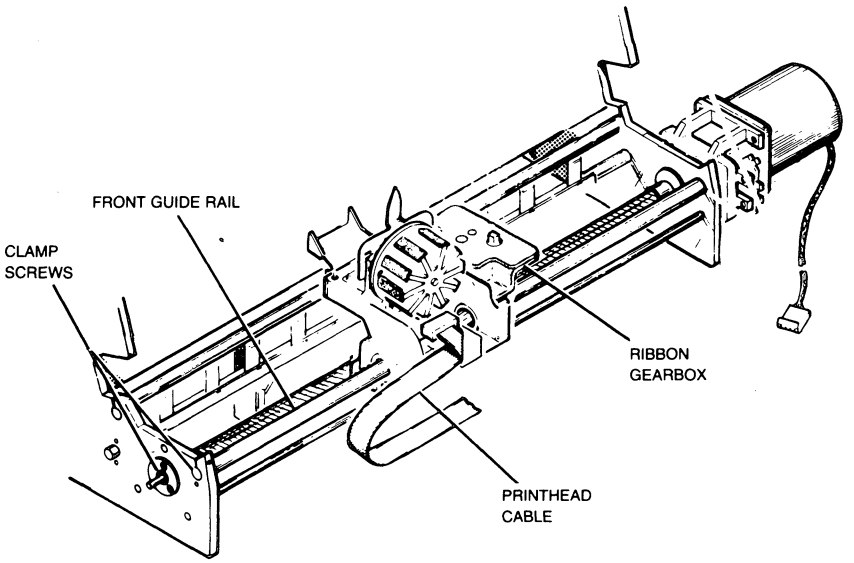


Figure 5.14 Carriage Removal/Replacement

6. Lift print assembly far enough out of print cavity so that front guide rail will slide to the left and out of carriage bearings.

7. While holding carriage, slide the front guide rail to left until it is clear of the carriage.

8. Remove two front bearings by loosening the lock screws and unsnapping the retainer rings (see Figure 5.15).

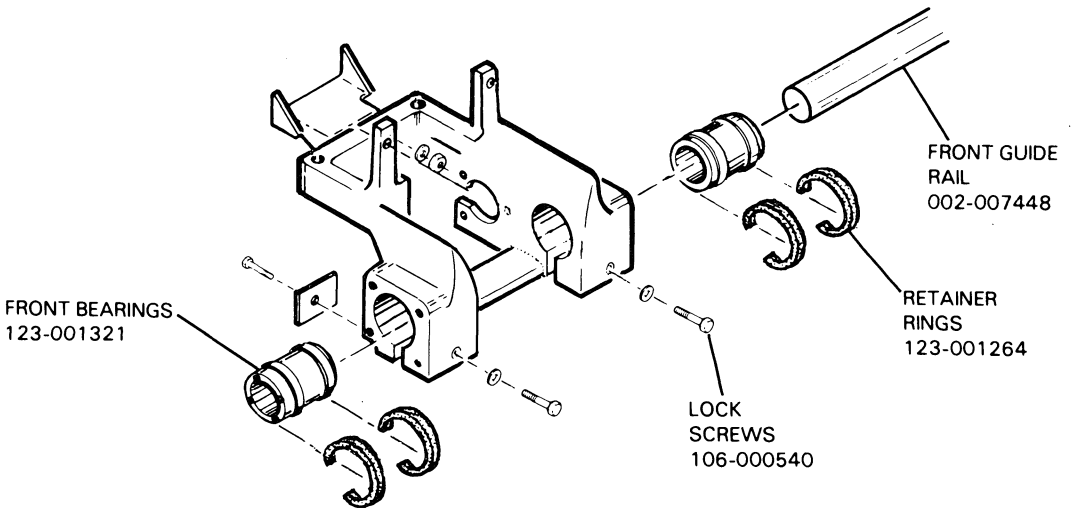


Figure 5.15 Front Bearing Removal

9. Force grease into new front bearings and secure new front bearings in carrage by snapping their retainer rings in place.

10. Clean the front guide rail and grease bearings.

11. Place carriage in position on rear guide rail and slide the front guide rail in from the left through the bearing.

12. Adjust the carriage bearings.

13. Replace secondary control panel cover.

14. Replace the ribbon gearbox.

15. Replace the printhead cable.

5.5.8 Platen Removal/ Replacement

1. Remove the paper feed motor.

2. Remove the secondary control panel cover.

3. Remove two guide bars located above platen slides, inside each end plate (see Figure 5.16).

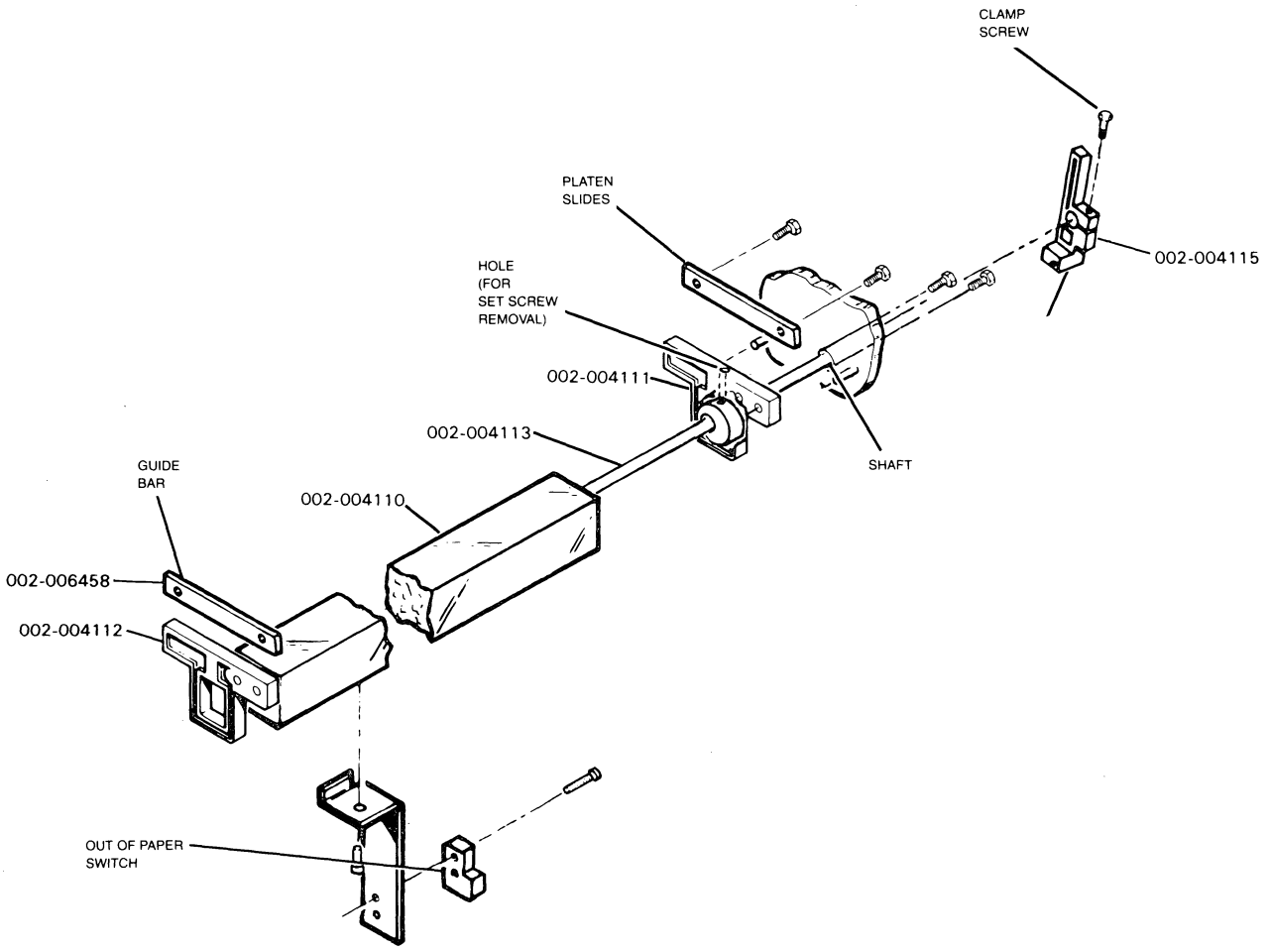


Figure 5.16 Platen Removal/Replacement

4. Rotate platen adjust lever until the set screws are visible through holes in the platen slides. Loosen each screw so that the cams can slide on the shaft.

5. Remove clamp screw of the platen adjust lever and slide the lever off the shaft.

6. Withdraw the shaft from the right-hand end plate.

7. Lift the platen up and back, out of the frame.

8. Move the transducer mounting bar to the new platen.

9. Move the platen slides to the new platen.

10. Let the platen back down into the frame, until the platen slides rest on the dowels (see Figure 5.17).

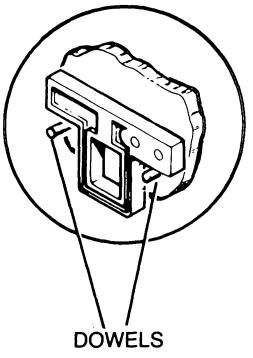


Figure 5.17 Locating Dowels

11. Place adjusting cams into the platen slides with their set screws up (see Figure 5.18).

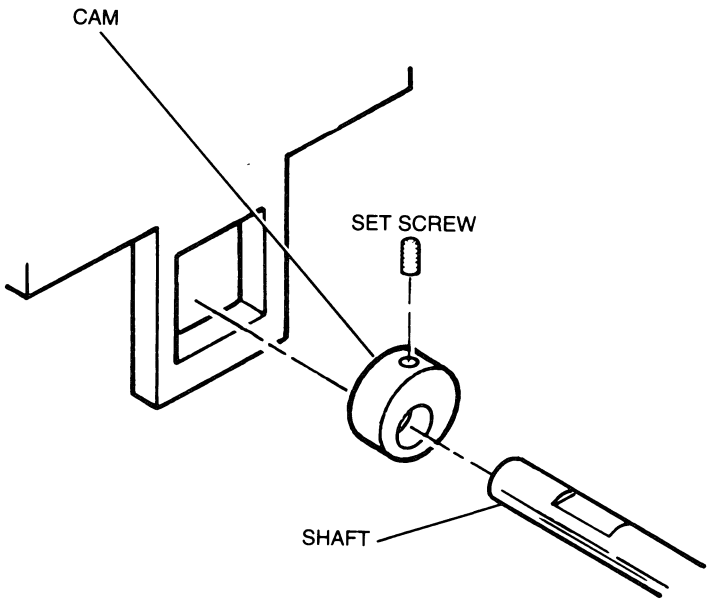


Figure 5.18 Adjusting Cam

12. Slide the shaft in to the left (flat surface up) and hold the cams in position while the shaft passes through.

13. Align flat of the shaft with the set screw of each cam and tighten the screws.

14. Attach the guide bars on top of the platen slides.

15. Reclamp the platen adjust lever on the shaft.

16. Install the paper feed motor.

17. Align the Platen.

5.5.9 Paper Feed Motor and Belt Replacement

1. Loosen four motor mounting bolts and slide motor forward (see Figure 5.19).

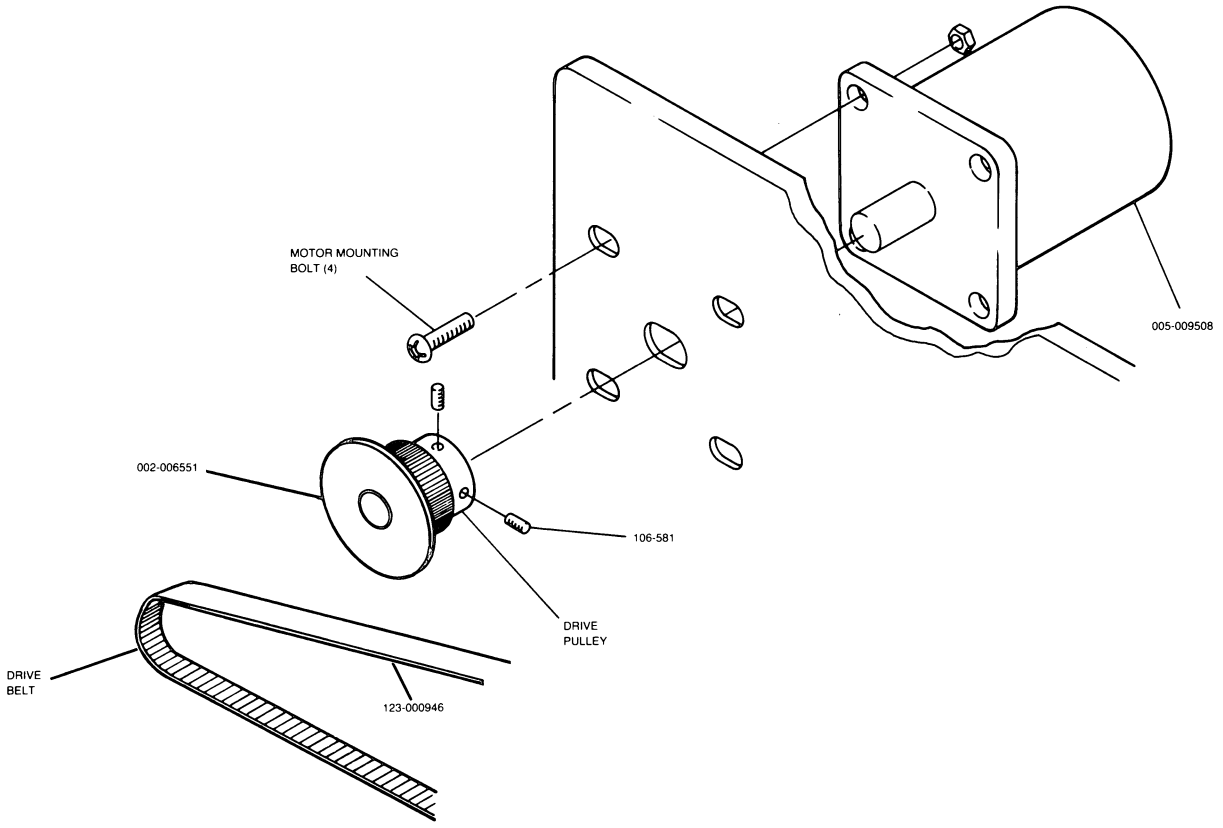


Figure 5.19 Paper Feed Motor Replacement

2. Remove the drive belt.

3. Remove four bolts securing motor. Pull motor out from the end plate and lay it down in the in the printer frame.

4. Unplug the control cable from J2 on the Driver PC board (see Figure 5.20).

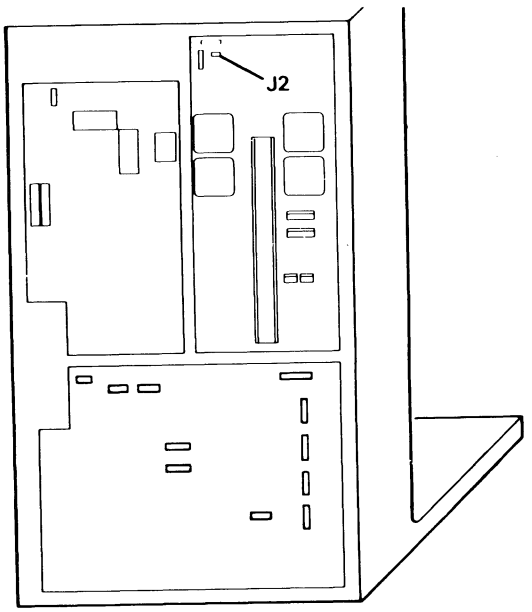


Figure 5.20 J2 Location

5. Loosely install the new motor using the four bolts.

6. Install drive pulley on the motor shaft so there is 1/64 in. clearance with the end plate (see Figure 5.21).

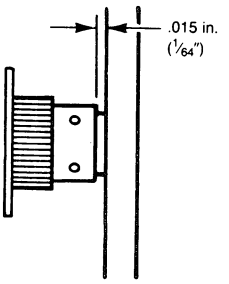


Figure 5.21 Drive Pulley Clearance

7. Replace drive belt on its pulleys. Slide motor back until belt deflects only 1/8 in. when pressed down with a force of 1 pound (see Figure 5.22).

NOTE: If the belt tension is right, it will take 1 or 2 more inch-ounces of torque to turn the paper feed shaft than it takes when the belt is removed.

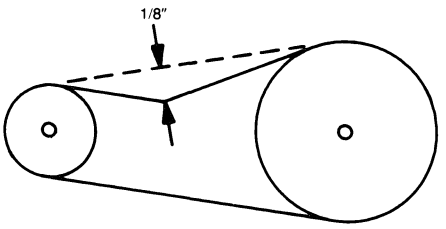


Figure 5.22 Drive Belt Deflection

8. Tighten the four mounting bolts on the motor.

5.5.10 Paper Feed Drive Mechanism Replacement

The following procedure should be used to remove and replace the paper feed drive mechanism:

1. Remove the drive belt (see Figure 5.23).
2. With a 1/16 in. hex key, remove retaining screw and spring.
3. Pull the vernier knob off the shaft.
4. Remove the key from the shaft.
5. Unsnap the "E" ring and pull the clutch pulley off the shaft
6. Remove the right hand bearing retainer plate.
7. Slide the drive shaft to the right out of the frame (see Figure 5.24 on following page).
8. Remove support shaft by removing the two screws (one on each end).
9. Remove tractors by unlocking their clamp and sliding them of the suport shaft.
10. Slide the tractors back on the support shaft.

NOTE: There is a right tractor and a left tractor(not interchangable). Place them on the support shaft with the locking clamps toward the outside.

11. Fasten the support shaft with the two screws.
12. Slide drive shaft in from the right, through the tractors.
13. Replace the right bearing plate.
14. Secure the clutch pulley in place with the "E" ring.
15. Place the key into its keyway.
16. Secure vernier knob to shaft using the retaining screw, washer and spring.
17. Replace the drive belt.

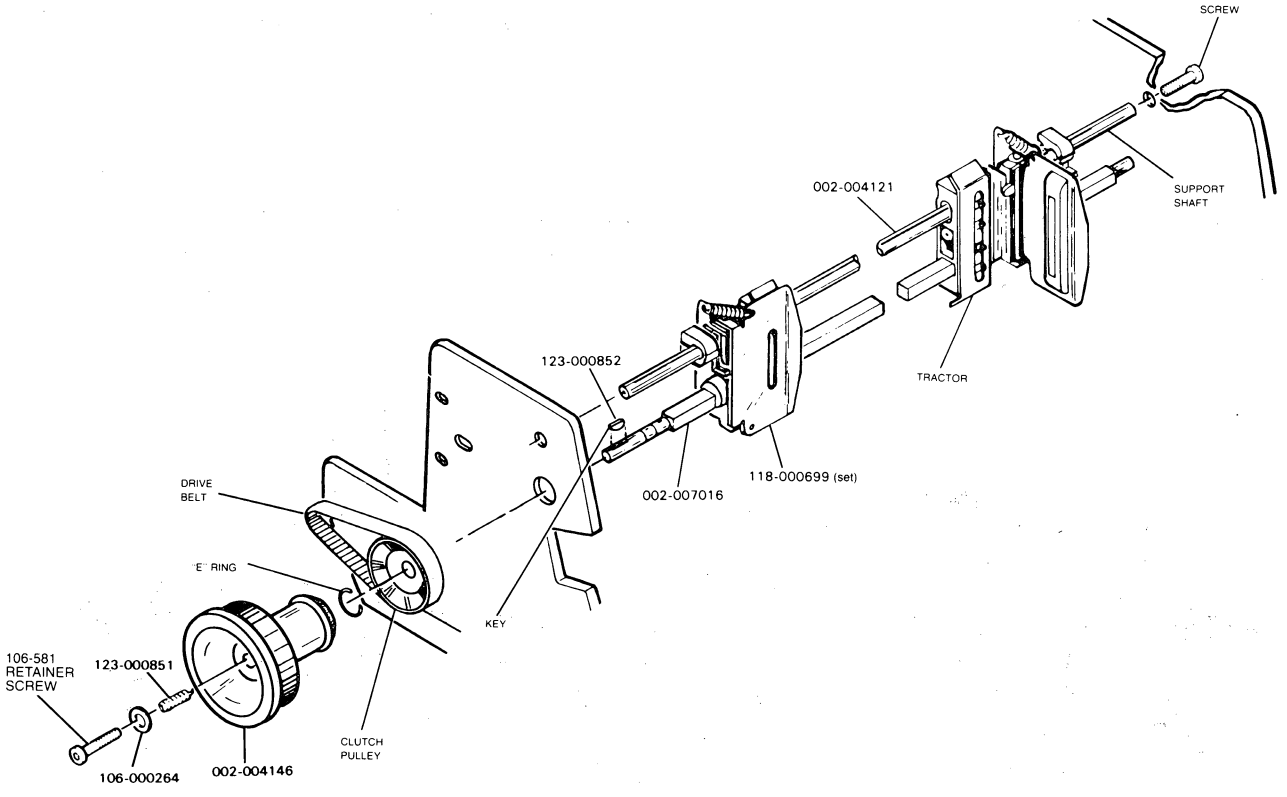


Figure 5.23 Paper Feed Mechanism Removal/Replacement

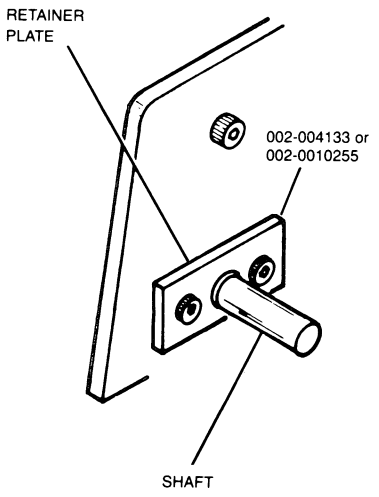


Figure 5.24 Paper Feed Drive Shaft Removal/Replacement

5.5.11 Transducer Replacement

This paragraph describes the procedure and provides other information required to remove and replace the various transducers in the printer. Figure 5.25 shows the various transducer locations.

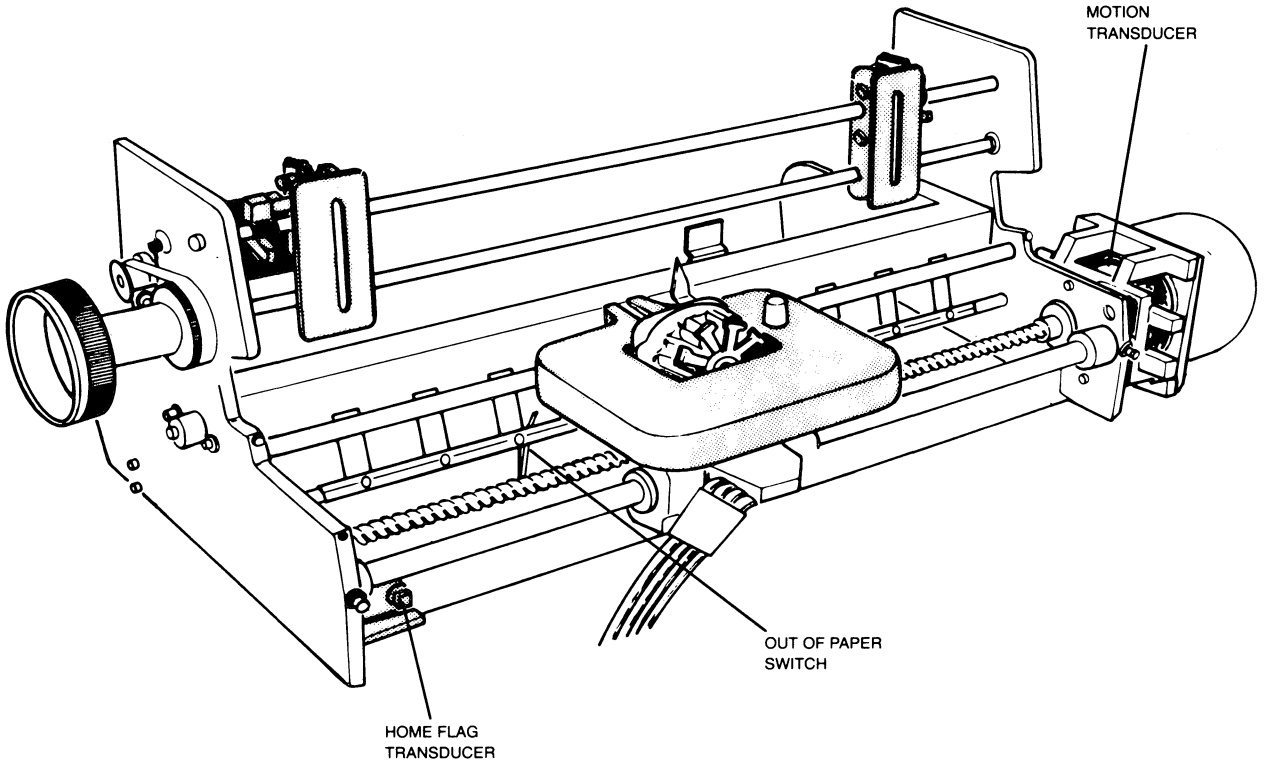


Figure 5.25 Transducer Locations

The transducer replacement procedure is as follows:

NOTE: Refer to Table 5.1 for specific information concerning the transducers to be replaced.

1. Unplug the cable connector and cut any ties securing the cable.
2. Remove the securing screw(s) fastening the transducer.
3. Install new transducer using hardware removed in step 2.
4. Connect cable disconnected in step 1 and tie down away from any moving parts.
5. Perform the appropriate adjustment.

Table 5.1 Transducer Replacement Data

TRANSDUCER	CABLE CONNECTOR	# OF SCREWS	SEE FIGURE	ADJUSTMENT
HOME FLAG	J6 ON DRIVER PCB (See figure 5.26)	1	5.27	HOME TRANSDUCER CHECK
HORIZONTAL	J9 ON DRIVER PCB (See Figure 5.28)	2	5.29	HORIZONTAL MOTION TRANSDUCER ADJUSTMENT (REFER TO SECTION

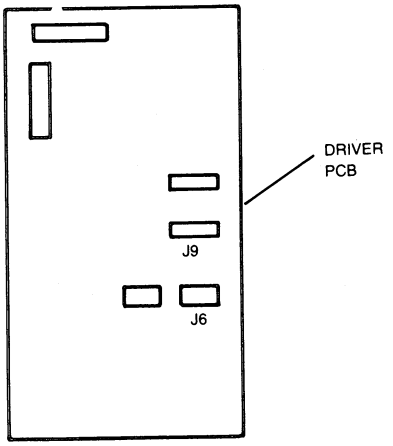


Figure 5.26 J6 Location

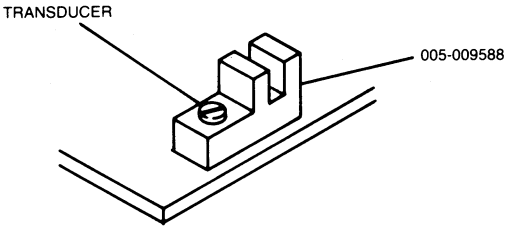


Figure 5.27 Home Transducer Replacement

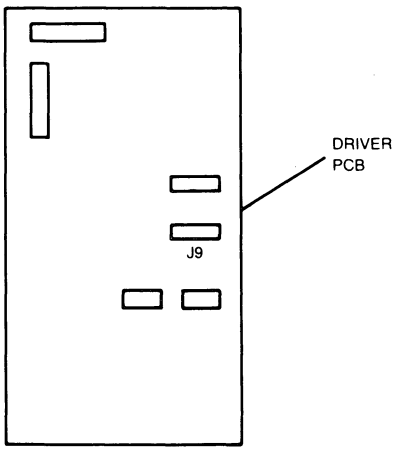


Figure 5.28 J9 Location

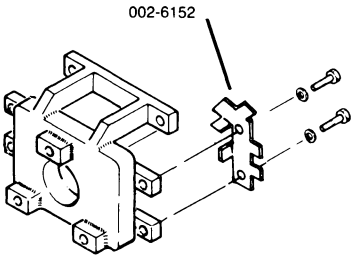


Figure 5.29 Horizontal Motion Transducer Replacement

5.5.12 Out of Paper Switch Removal and Adjustment

The following procedure should be used to remove, replace and adjust the out of paper switch (applies to all models):

1. Unplug the cable connector from J24 on the secondary control panel cut any ties securing the cable (see Figure 5.30).

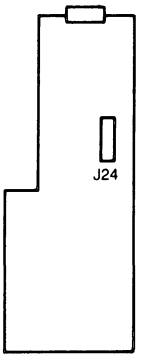


Figure 5.30 J24 Location

2. Remove the two screws securing the switch to its mount and remove the switch (see Figure 5.31).

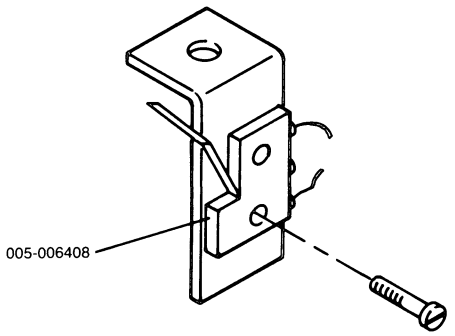


Figure 5.31 Out of Forms Switch Replacement

3. Secure the new switch to mount using the screws removed in step 2.

4. Reconnect the cable to J24 on the secondary control panel and tie it down away from any moving parts.

5. Load paper.

6. Power up the printer.

7. Check the fault light (it should be off). The fault display will be 7 if a fault still exists.

8. Remove paper from printer.

9. Check the fault light (it should be on). FIB displays 7.

10. Bend the arm of the switch slightly until proper operation is obtained.

5.6 PRINTER ALIGNMENT PROCEDURES

5.6.1 Power Supply 5 Volt Adjustment

NOTE: This adjustment should be performed before any other adjustment.

1. Attach the positive lead of the voltmeter to TP1 (or pin 5 of J13).
   Attach the negative lead of the voltmeter to GND (or pin 4 of J13).

NOTE: See figure 5.32 for J13 pin configuration.

PIN	SIGNAL
1	-12V
2	-5V
3	POWER OK
4	GND
5	+5V
6	+14V

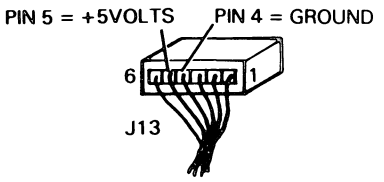


Figure 5.32 J4 Pin Configuration

2. Turn printer on.

3. With printer idle, adjust 10-turn potentiometer on power supply PC board until the voltmeter reads 5.1 volts +0.1 volt (see Figure 5.33).

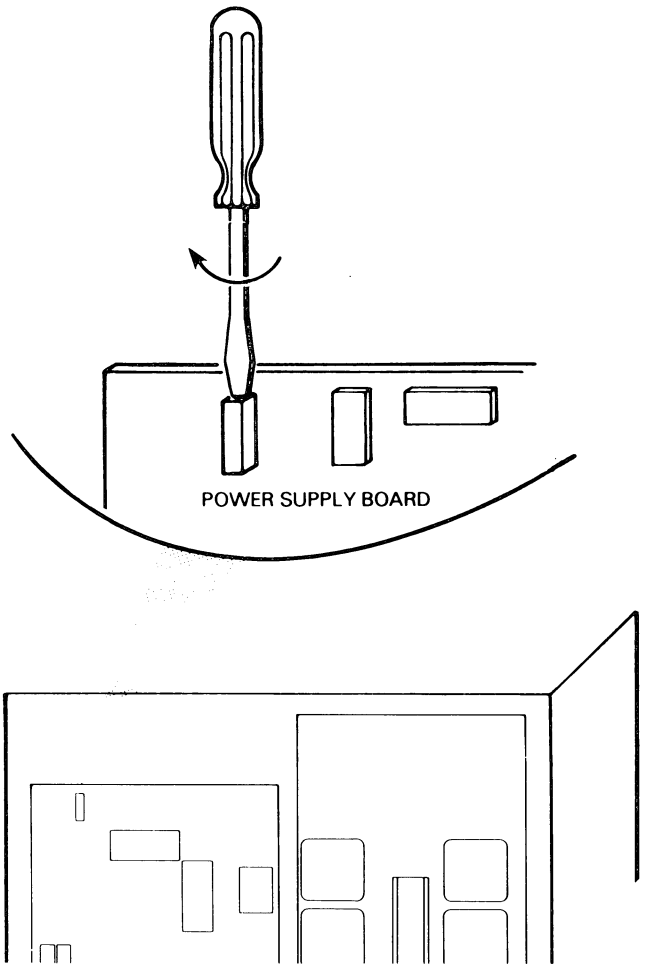


Figure 5.33 Power Supply 5V Adjustment

5.6.2 Horizontal Motion Transducer Adjustment

Two procedures (scope-based and P-MAT-based) are available for aligning the horizontal transducer, depending on the available equipment.

5.6.2.1 Scope-Based Horizontal Transducer Adjust Procedure

1. Turn the printer off.
2. Remove the side cover to expose the Main Control, Power Supply, and Driver PC boards.
3. Connect the oscilloscope probe (Channel A) to J9 pin 8 (the blue wire) on the Driver PC board (see Figure 5.34).

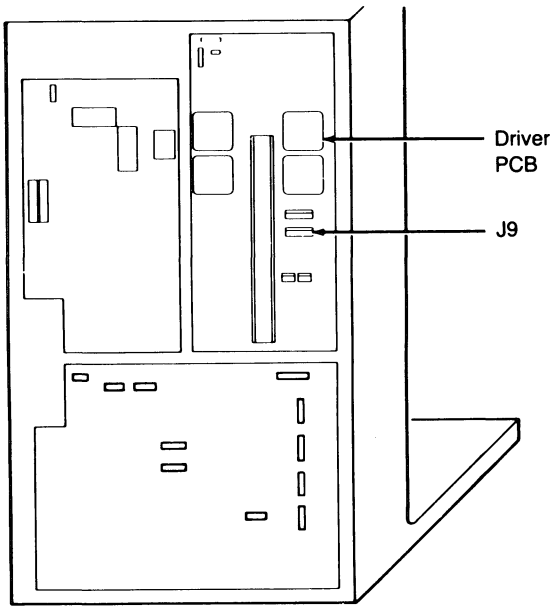


Figure 5.34 J9 Location

4. Set the sweep rate of Channel A to 0.5 msec/div.

5. Set the voltage scale of Channel A to 2 volts/cm.

6. Set the COMP/NORM switch on secondary control panel to the NORM position.

7. Turn the printer on.

8. Switch the printer OFFLINE.

9. Toggle the SELF TEST switch, on the secondary control panel toward SELF TEST according to the following:

   8 inch wide forms - once,
   13.5 inch wide forms - twice.

10. Switch the printer ONLINE.

11. Self test printing should begin and the trace on the oscilloscope should look like Figure 5.35 when the printer is moving at full speed. Waveform will expand as the printer decelerates at the end of each line.

NOTE: The waveform should be a sine wave exceeding 4.0 V (but not square) in the positive direction and dropping below 0.5 V in the negative direction.

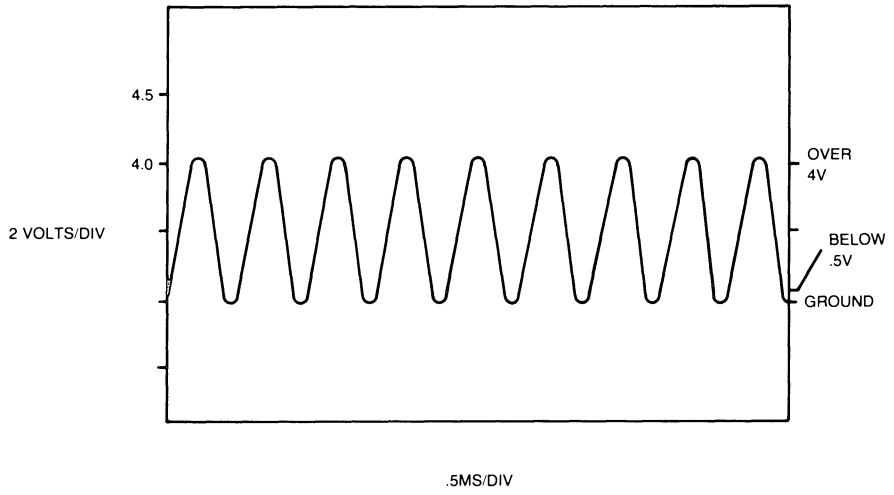


Figure 5.35 Horizontal Motion Transducer Oscilloscope Reading

12. If the printer indicates a carriage stall fault, the transducer waveform may be less than 4 V in amplitude. If this is so, adjust the transducer as follows:

    (a) Loosen the two screws attaching the transducer to the motor mounting bracket (see Figure 5.38).

    (b) Rock the transducer mounting bracket so that the transducer moves towards or away from the slotted disk (see Figure 5.36).

    (c) Press the FAULT RESET switch, on the Fault Indicator PC board.

    (d) Repeat steps 8 thru 11 above.

13. After adjusting the transducer, tighten the screws that attach the transducer mounting bracket to the motor bracket.

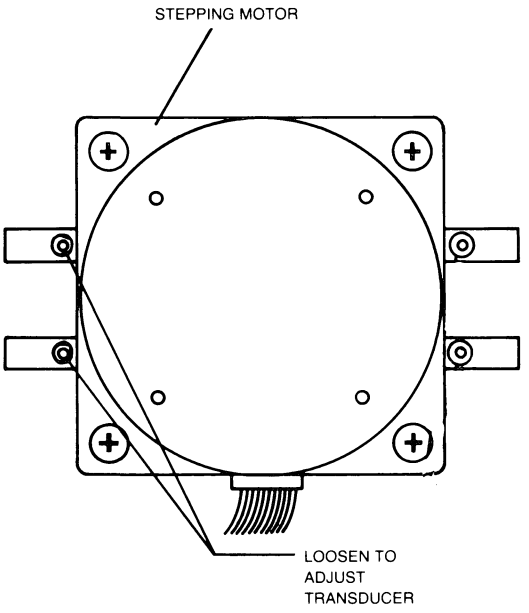


Figure 5.36 Horizontal Motion Transducer Adjustment

5.6.2.2 P-MAT Procedure for Horizontal Motion Transducer Alignment

The P-MAT procedure requires the following test equipment:

* D.V.M. (Fluke)
* P-MAT

The initial setup procedure is as follows:

1. Turn the printer power off.
2. Disconnect carriage drive motor from the drive board.
3. Set D.V.M. to measure D.C. voltage greater than 5.0 volts.
4. Connect D.V.M. positive lead to Pin 8 of J9 on the Driver board. Connect Ground lead to TP-25 on Control board.
5. Power up the printer.
6. Rotate the leadscrew until the maximum voltage is indicated on the D.V.M.
7. Loosen the stall detect transducer and adjust until the voltage on the D.V.M. indicates 4.0 volts +/- .2 volts. Then tighten the transducer.
8. Rotate the leadscrew and ensure minimum voltage reading on the D.V.M. is less than .5 volts.
9. Reconnect carriage drive motor to the driver board.

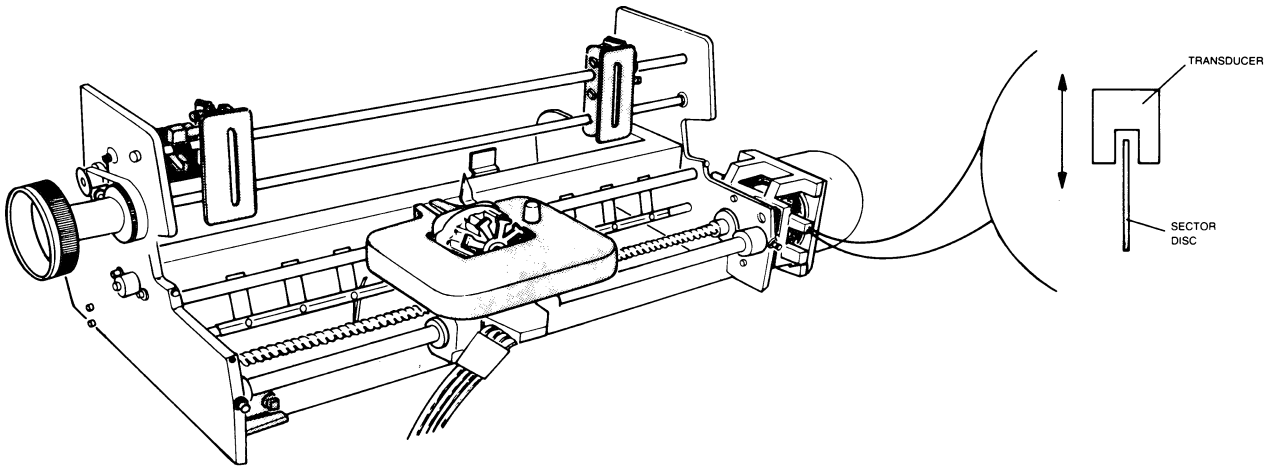


Figure 5.37 Horizontal Motion Transducer Adjustment

To adjust the horizontal motion transducer using the P-MAT, proceed as follows:

1. Configure the P-MAT as follows:

   CHAN A gate to Rising Gate
   CHAN B gate to Trailing Edge
   GATE switch to 'INT'
   UNIT switch to 'STOP' (toggle to 'START' in center of carriage travel)
   TI/PLS switch in 'PLS' position
   TRIG LEVEL to 0
   INPUT switch to 'TTL'
   Function switch to 'TI/PLS' position
   Sample rate to .01 sec

2. Connect CHAN A input to pin 12 of 42-N (input of stall detect one shot). Connect ground to TP-25.

3. Place the printer in SELF-TEST mode of operation and toggle 'UNIT'. Switch to START as the carriage moves across the center of the page.

4. The pulse width should be 200 to 300 microseconds.

5. Change gate on CHAN A to trailing edge and observe pulse width of 200 to 300 microseconds.

NOTE: The sum of readings taken in steps (4) and (5) should be 550 usec. The correct readings confirm that all horizontal drive logic on the control board and the driver board is working.

5.6.2.3 Home Transducer Check

Use the following procedure to verify proper alignment of the home transducer:

1. Take the printer offline.
2. Set the DVM to the 20V range.
3. Connect the negative probe of the DVM to ground (J6-pin 4 which has the green wire).
4. Connect the positive lead of the DVM to J6-pin 1 (blue wire).
5. Move the printcarriage to within a few inches of the lefthand margin.
6. The DVM should indicate 4 volts or greater.
7. Move print carriage to the left margin. The voltage reading should drop to 0.5 volts or less.

NOTE: If the above readings are not obtained, replace home transducer (p/n 005-009588).

5.6.2.4 Print Wire Firing Time Check

The print wire firing time check requires the use of the P-MAT test set. The procedure is as follows:

1. Configure P-MAT for measuring pulse width (see P-MAT user's guide). CHAN A GATE switch to RISING EDGE.
2. Connect CHAN A input to TP6 on the control board and connect ground to TP25 on the control board.
3. Press master reset on the printer's secondary control panel.
4. Press SELF TEST switch one time.
5. Place printer ONLINE, then OFFLINE.
6. The P-MAT should display 400 microseconds +/- 20 microseconds (5% tolerance). If out of tolerance, adjust R63.

NOTE: CCW rotation on R63 will increase firing time.

5.6.2.5 Print Time Check

The print time check also requires the use of the P-MAT test set. The procedure for checking the print time is as follows:

1. Configure P-MAT to measure pulse width (see P-MAT user's guide). CHAN A GATE switch to RISING EDGE.
2. Connect CHAN A input to TP7 on control board.
3. Connect GROUND to TP25 on control board.
4. Power up the printer. The P-MAT should display 100 usec +/-5%(5 usec).

NOTE: This is a fixed resistor and is not adjustable.

5.6.2.6 Formfeed Check

Use the P-MAT tester to make the formfeed check. If you use the tester as an event counter, it can tell you how many pulses it takes from the vertical motion one shot to complete a linefeed or formfeed.

NOTE: When the LPI switch is set to 6, a single linefeed requires 8 pulses from the VERT.MTR one shot (no adjustment is possible).
Total pulses required for a form feed will equal the number of lines per form multiplied by 8.

The line formfeed check procedure is as follows:

1. Configure the P-MAT as an "events/pulse" counter (see P-MAT user's guide).
2. Connect CHAN A input to pin 6 of 42-N (output of "VERT MTR" one shot) and connect ground to TP25 on control board.
3. Press the linefeed switch once; observe 8 pulses on the P-MAT.
4. Reset the P-MAT.
5. Select 66 lines per page on the secondary control panel and press TOF INIT switch.
6. Execute a form feed. P-MAT should display 528 pulses.

NOTE: Number of pulses = number of lines x 8
528 = 66 x 8

7. Configure the P-MAT to measure pulse width (see P-MAT user's guide).
8. Execute a single line feed. The P-MAT should read approximately 2.6 msec per pulse.

5.6.2.7 Carriage Bearings Cleaning and Adjustment

The following procedure should be followed when cleaning and adjusting the printer's carriage bearings:

1. Remove the carriage from the printer .
2. Apply grease (120-000753) to the four bearings in each of the two bearings (see Figure 5.38).

NOTE: Force grease into bearings.

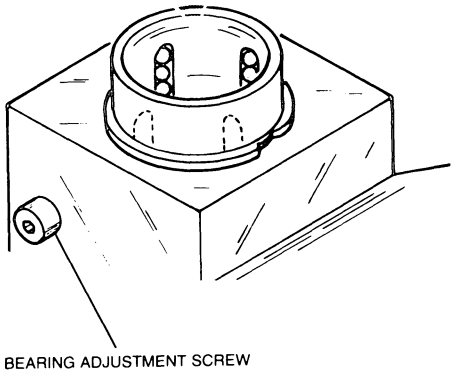


Figure 5.38 Bearing Adjustment Screw Location

3. Clean the front carriage rail using isopropyl alcohol on a lint free cloth.

4. Coat a film of grease (120-000753) on the front rail (this prevents rust).

5. Install the carriage and carriage rail in printer.

NOTE: When installing the front carriage rail, be sure that one rubber stop is on the left end and two rubber stops are on the right.

6. Loosen the bearing adjustment screws on the carriage (see Figure 5.38).

7. Slide carriage from side to side while tightening left bearing adjustment screw until an identifiable "drag" is present (see Figure 5.39).

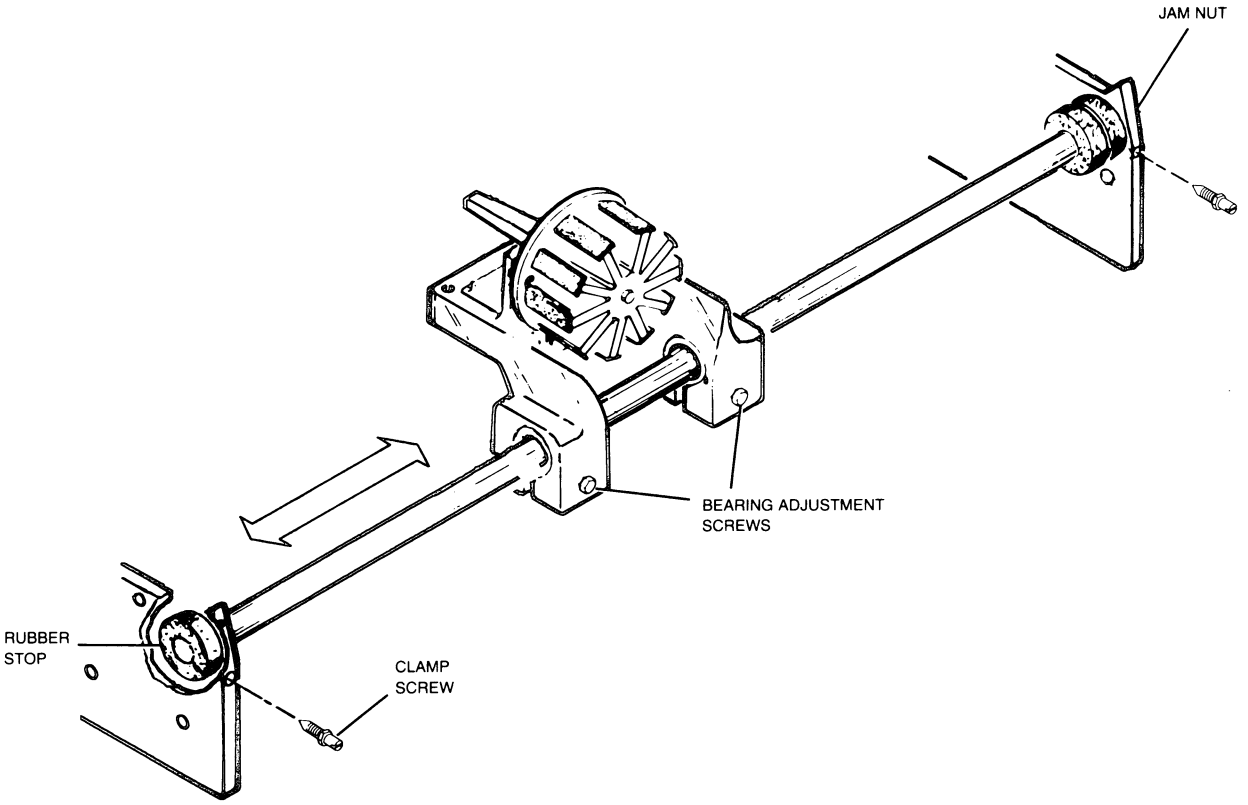


Figure 5.39 Carriage Bearing Adjustment

8. Slightly back the adjustment screw out slightly until drag is minimum detectable.

9. Repeat steps 7 and 8 above for the right bearing adjustment screw.

10. Slide carriage back and forth to assure no binging occurs.

11. Tighten the two front carriage rail clamp screws.

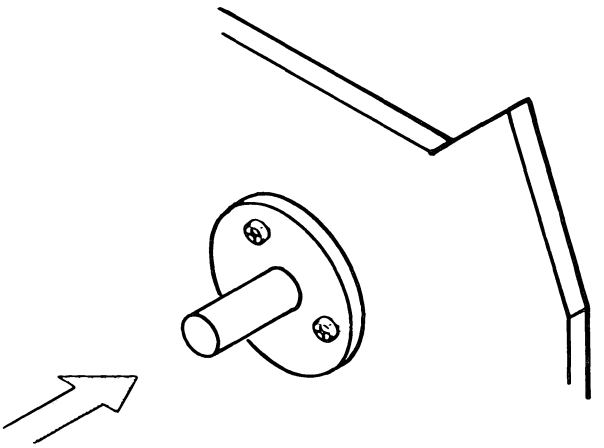
12. When screws are tight, maintain torque with screwdriver and tighten the jam nuts.

13. Replace the carriage motor assembly.

14. Replace the secondary control panel cover.

5.6.2.8 Leadscrew Preload Adjustment

1. Using finger pressure, press in on left end of leadscrew with about 5 lbs. of pressure and note whether or not leadscrew moves (see figure 5.40).



NOTE: The pre-load is measured at the left end of the leadscrew with a force applied axially on the leadscrew in the direction towards the carriage motor.

Specification: Displacement should be between .002 and .010

Figure 5.40 Leadscrew Displacement

5.6.2.9 Leadscrew adjustment

1. Remove the left bearing retainer plate by removing three screws (see Figure 5.41).

2. Remove bearing.

3. Add or remove one or more shims (p/n 123-992) according to the following:

   excessive motion - add shims,
   no motion - remove one shim.

4. Insert bearing.

5. Secure the left bearing retainer with the three screws.

6. Perform 1 above.

NOTES:
1. This adjustment is meant to be performed between steps 6 and 11 of the Antibacklash and Leadscrew Replacement.

2. When fastening the bearing retainer plates, be sure they are flush with the end plate, and that the washers are not wedged between the retainer plate and the end plate.

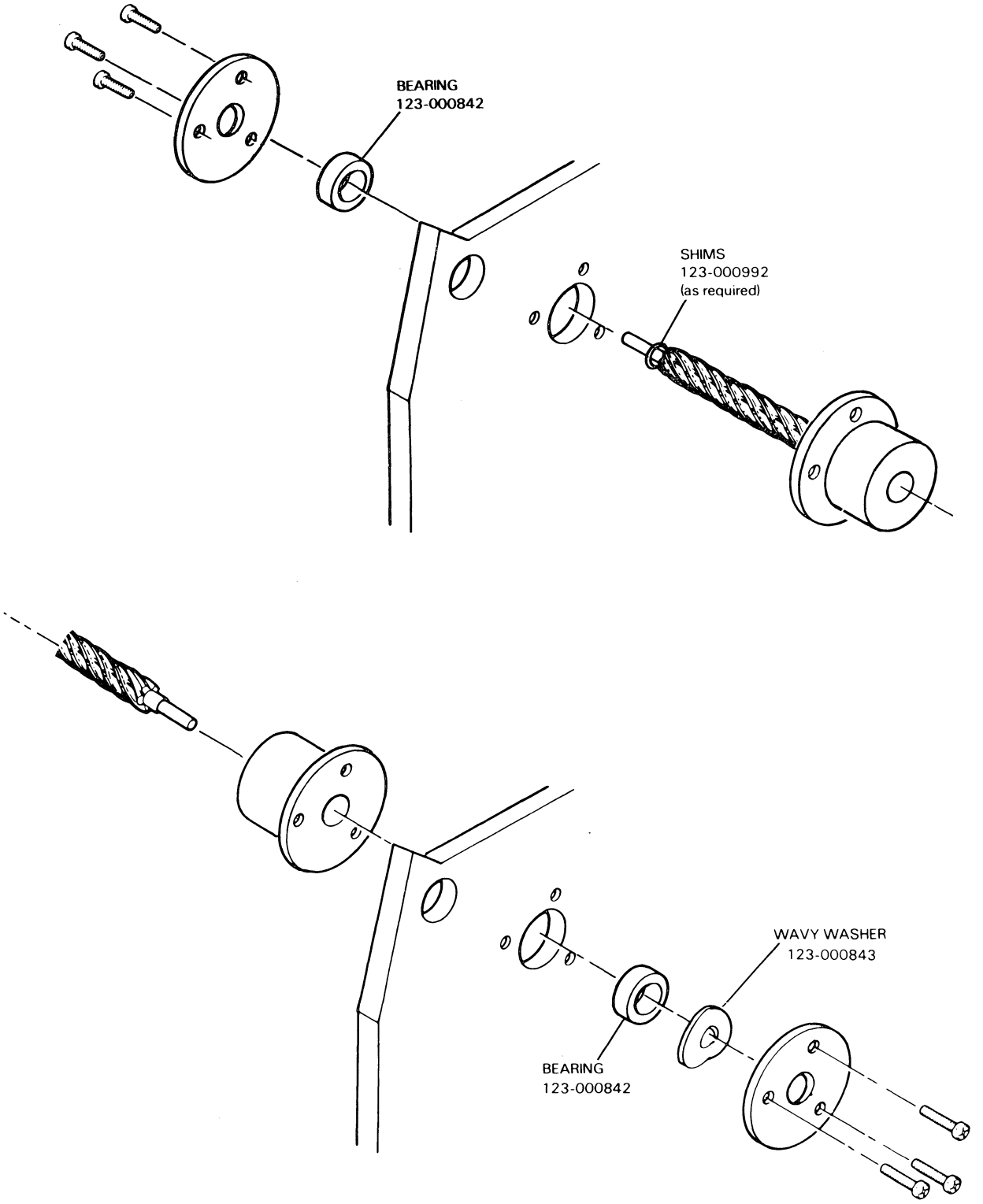


Figure 5.41 Leadscrew Adjustment

5.6.2.10 Horizontal Motion Check

The following procedure should be used to verify/correct the horizontal motion of the carriage:

1. Check the carriage float with the leadscrew nut, horizontal stepping motor and the ribbon drive disconnected.

2. Move the carriage from margin to margin using a tensiometer (part no. 128-000787). A normal reading is 6 to 8 (approximately 180 gram force).

3. If the reading changes at either end of the carriage rail, the front bearing must be shimmed using the following procedure:

   a. Loosen the screws that retain the front bearing bar.

   b. Insert a small piece of .005 inch shim stock (p/n 002-008288) in both end plates so that the front bearing bar is moved away from the platen.

NOTE: Do not allow any of the shim stock to protrude outside the end plate.

   c. Tighten the bearing bar retaining screws snugly, but do not overtighten.

   d. Check the platen gap and readjust if necessary.

5.6.2.11 Platen Alignment Adjustment

1. Remove the secondary control panel.
2. Loosen the platen adjust lever clamp (figure 5.42).

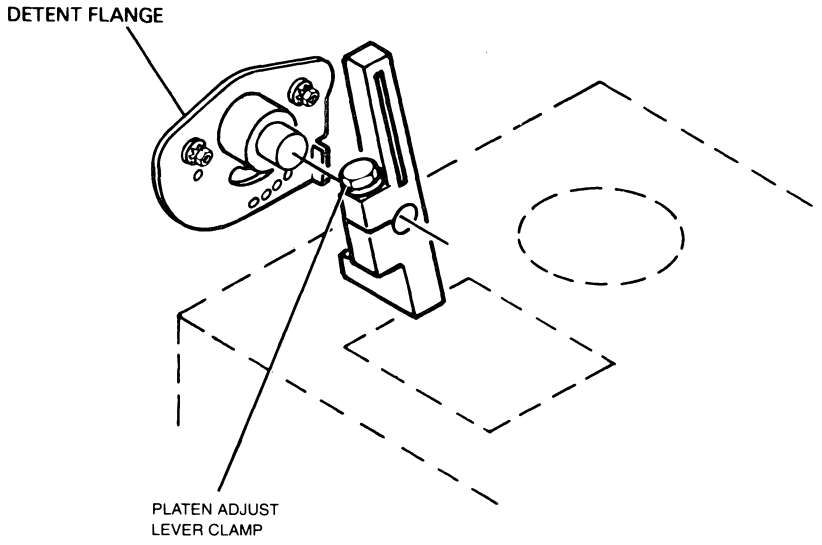
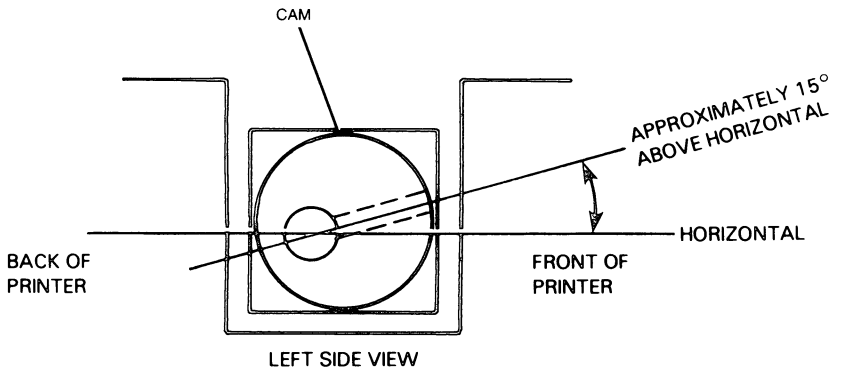


Figure 5.42 Platen Adjust Clamp Location

3. Slide the lever out to the end of the shaft and retighten the clamp.
4. Rotate the lever until the cams are in the position shown in figure 5.43.



NOTE: The setscrew and largest part of the cam face the front of the printer and are pointed just above the horizontal.

Figure 5.43 Cam Positioning Diagram

5. While holding the platen still, loosen the clamp of the platen adjust lever (see figure 5.44).

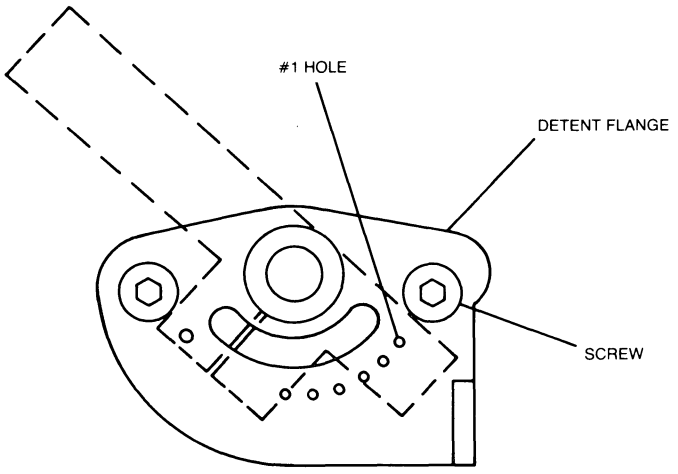


Figure 5.44 Positioning the Platen Adjust Lever

6. Position the lever so that the detent pin is in the no. 1 hole.

7. Tighten the screw clamp.

8. Move the carriage all the way to the left.

9. Loosen the four screws securing the two detent flanges (2 screws on each side).

CAUTION: Do not damage the printhead while measuring the platen spacing.

10. Set gap between printhead and platen to 0.020 +/- .002 inches. Measure the gap using a 0.20 feeler gauge. Adjust the platen by sliding the detent flanges forward or backward (see figure 5.45).

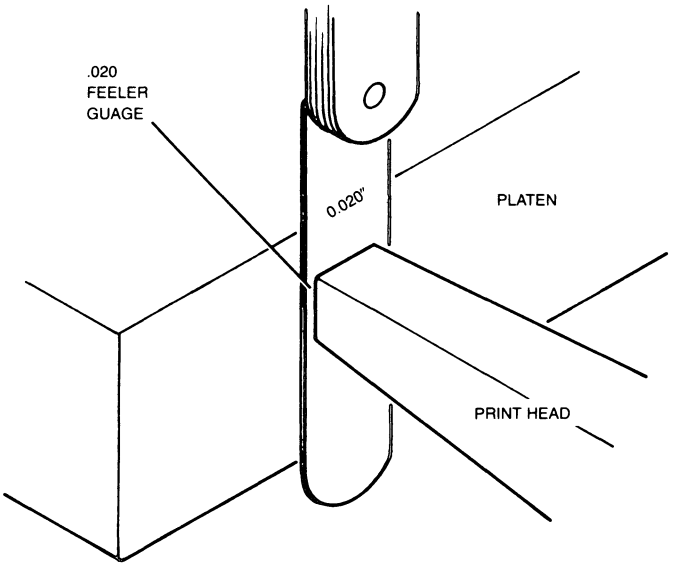


Figure 5.45 Gap Setting

11. Move the carriage all the way to the right.

12. Repeat step 10.

13. Move the carriage back to the left and check the gap spacing.

14. When the gap spacing is uniform (0.020 inches) at both ends, tighten the four screws securing the detent flanges.

5.6.2.12 Ribbon Cartridge Drive Cable Adjustment

The following procedure requires the use of two tools:

* 6 inch metal rule (p/n 128-000197)

* 5M Polyflex tensiometer (p/n 128-000787)

The ribbon cartridge drive cable adjustment procedure is as follows:

1. Move the carriage all the way to the right.

2. Place the 6-inch metal rule underneath the cable approximately 8 or 9 inches from the end plate. Orient the rule as shown in figure 5.46.

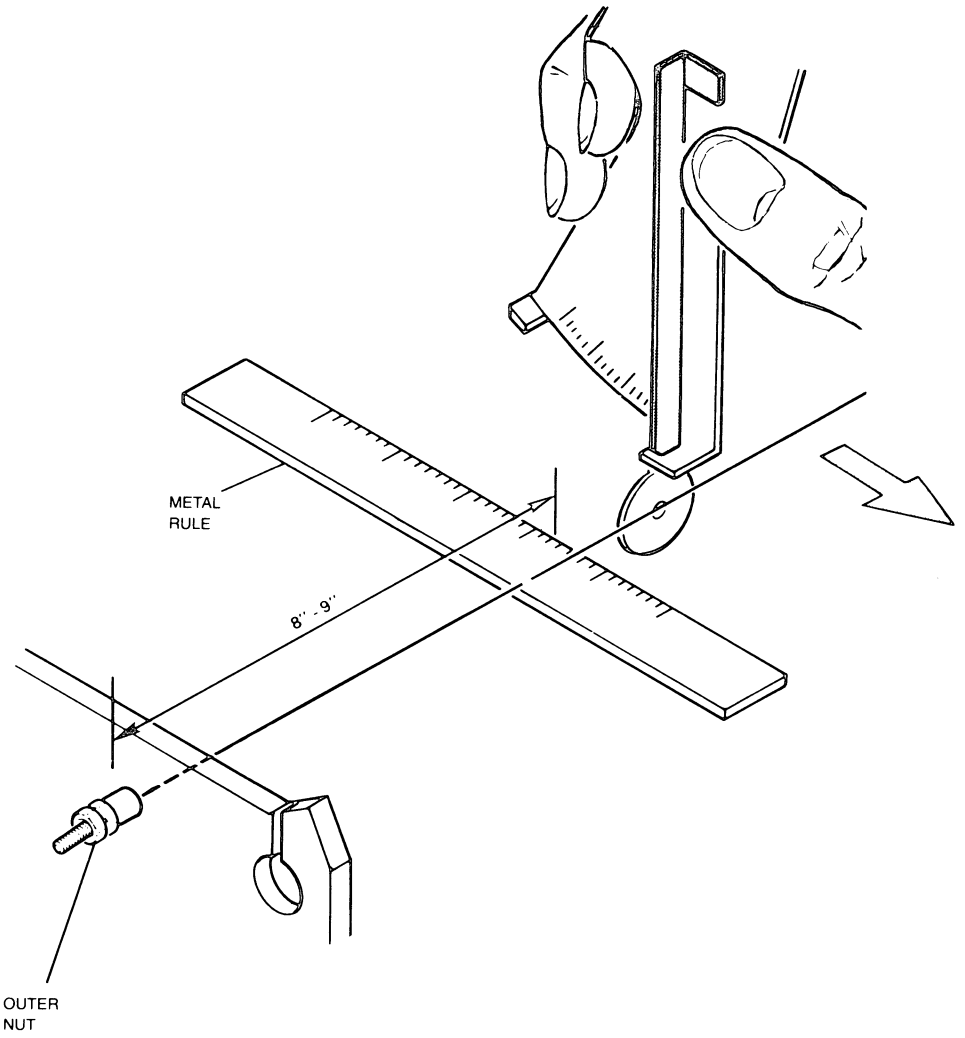


Figure 5.46 Ribbon Drive Cable Adjustment Setup

3. Hold the tensiomenter as shown in figure 5.47.

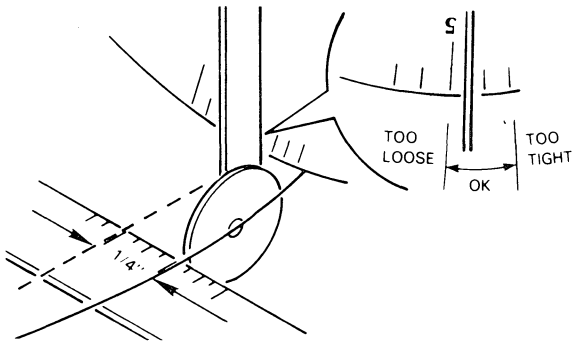


Figure 5.47 Ribbon Cartridge Drive Cable Adjustment

4. Hold the rule so that the cable is lined up with a division marking (1/4 or 1/8 inch). Note which marking you used.

5. With the tensiometer held vertically, and the scale facing left, pull forward on the cable with the disk of the tensiomenter (figure 5.47).

6. Deflect the cable 1/4 inch from its original position and check the reading on the tensiometer. The arm should cross the scale with a reading between 3 and 5.

7. Tighten or loosen the cable if necessary and repeat steps 6 and 7 above.

8. When the tension is correct, lock the adjustment by tightening the outer nut without changing the setting.

5.6.2.13 Rear Bearing Check

The following procedure should be used to check for correct adjustment of the rear bearing:

1. Perform the platen gap adjustment previously described.

2. With platen space lever (level located just to left of secondary control panel) set to position 1, measure the gap between the platen and the rear bearing The clearance should be between 0.030 and 0.005 inch.

NOTE: Readjust platen gap if necessary.

3. Check adjustment of rear bearing as follows. Pull up vertically on the rear bearing using light finger pressure. A noticable movement of the bearing should occur without movement of the rear rail. If no movement occurs, replace the rear bearing.

NOTE: Do not overtighten the screw securing the rear bearing as this will result in moving the bearing out of parallel with the bearing rail. The correct torgue on the screw will allow the rear bearing to be rotated slightly by hand.

CHAPTER 6 - INSTALLATION

6.1 INTRODUCTION

This chapter contains installation instructions for the LP2/TP2 family of printers. Once the printer is installed, the service engineer should checkout the unit using the procedures outlined in the flowcharts in figure 4.1.

6.2 SITE SELECTION

The TP2 series of printers are equipped with an asynchronous serial interface and may be installed in areas far removed from the host system. However,the LP2 printers are equipped with parallel interfaces and must be located within 25 feet of the computer (limited by the length of the I/O cable).

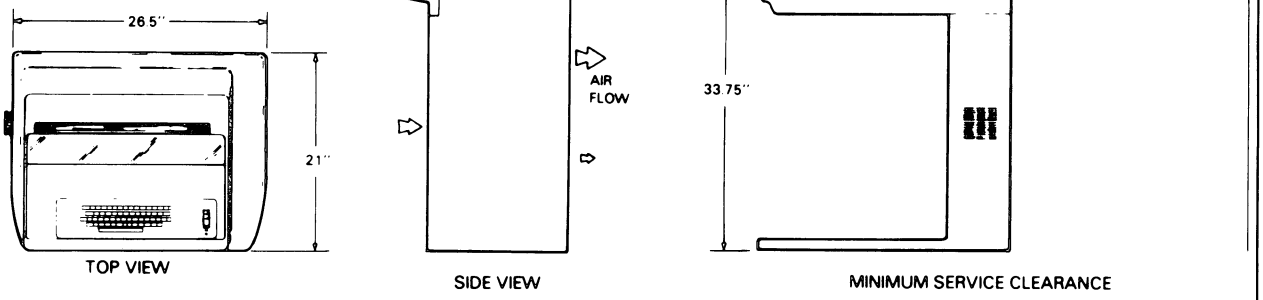
Other things to consider when choosing a site for the printer are listed in table 6.1.

Table 6.1 TP2/LP2 Printer Site Specifications

SPECIFICATIONS

Item	Component	Number in Sub-system	Weight lbs / kg	Operating Humidity (Relative) min / max	Maximum Operating Temperature Component °F / °C	Maximum Operating Temperature Media °F / °C	Power Dissipation (Watts)	BTUs/hr (3.41 x Watts)	Primary Power Volts	Hz	Phase	Cond	Amps	Power Cable Length ft / m	Power Cable Connector	Power Drop Mating Power Receptacle	Wall Mating Power Receptacle
		N/A	80 / 36.3	10% / 90%	104* / 40*	N/A	250	853	120	47-63	1	3	2.0	6 / 1.82	5-15P	5-15R	5-15R
		N/A	80 / 36.3	10% / 90%	104 / 40	N/A	250	853	220 / 240	47-63	1	3	1.2 / 1.1	6 / 1.82	5-15P	5-15R	5-15R

* MINIMUM OPERATING TEMPERATURE 50°F/10°C



NOTE
REAR OF UNIT MUST BE AT LEAST 6"
FROM WALL OR OTHER OBSTRUCTION TO
PROVIDE COOLING AIR FLOW

DG-02866

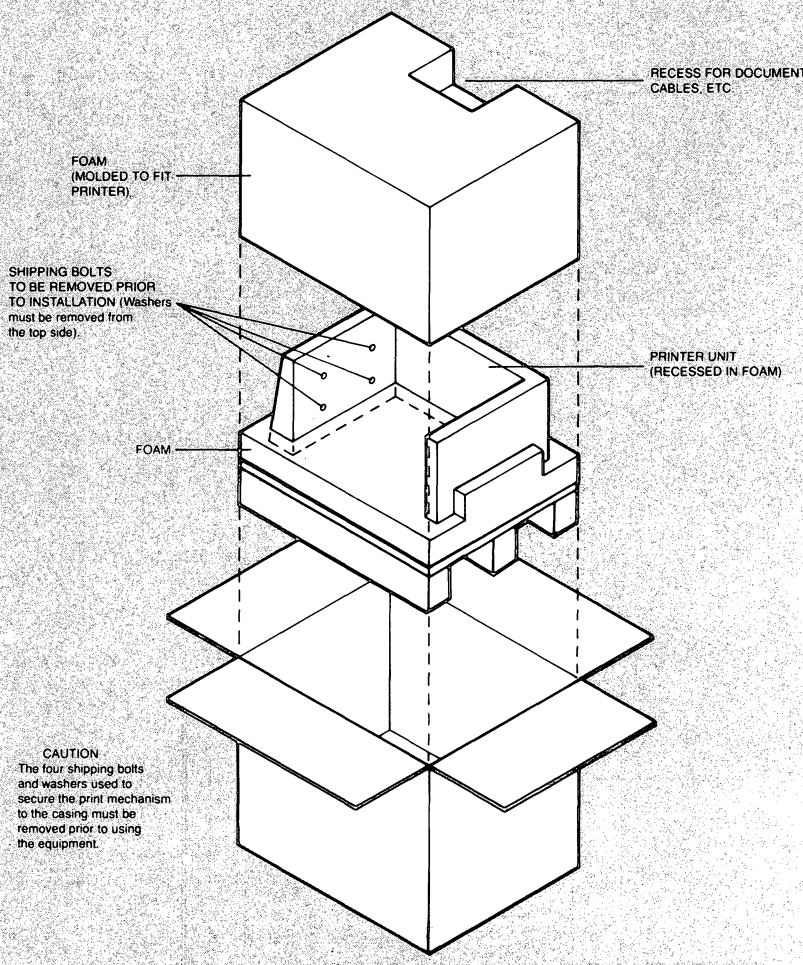
6.3 UNPACKING

After selecting a site for the printer , move the crated printer unit to the desired location using a forklift or other suitable means.

Then perform the following unpacking procedure (also reference figure 6.1):

1. Cut the straps and open the top of the shipping container.
2. Remove the documentation and cables from inset in top foam piece.
3. Remove top foam piece.
4. Remove box.
5. At this point, stand printer upright before removing rest of foam.
6. Remove the four shipping bolts that hold the print mechanism to the casing. Also remove the four washers from underneath the printer platen.

PACKAGING



SHIPPING AND PACKAGE DATA

Outside Dimensions			Weight (Gross)	Volume	Density
Length	Width	Depth			
in. / cm	in. / cm	in. / cm	lbs. / kg	cu ft. / cu m	lbs/cu ft. / kg/cu m
40.5 / 102.9	31.50 / 80.0	30.75 / 78.1	123 / 55	22.7 / .6	5.4 / 87.8

SHIPPING SPECIFICATIONS			STORAGE SPECIFICATIONS		
Temperature Range °F / °C	Relative Humidity (Non-condensing)	Maximum Altitude	Temperature Range °F / °C	Relative Humidity (Non-condensing)	Maximum Period
-40 +160 / -49 +71	0%/80%	50,000 ft. 15,200 m	40 +160 / -40 +71	0%/80%	90 days

DG-03224

Figure 6.1 Printer Unpacking Diagram

6.4 LP2 CONFIGURATION

The LP2 printers are configured for the user's system via six jumper wires and a dual inline package (DIP) switch all located on the Main Control PCB (p/n 005-016362).

The configuration switches/jumper wires are shown and described in figure 6.2.

Guidelines for configuring an LP2 printer are provided in tables 6.2 and 6.3.

Table 6.2 LP2 Jumper Wire Configuration Guidelines

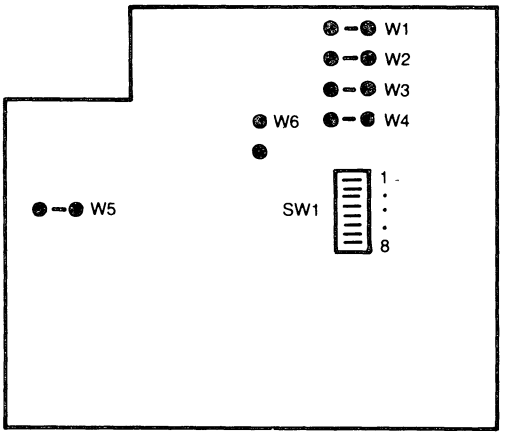
LP2 JUMPER WIRE CONFIGURATION		
JUMPER	**IN/OUT**	**DESCRIPTION**
W1	IN	Parallel I/F
W2	IN	Power Failure Recovery Enabled
W3	OUT	SA Disabled
W4	OUT	APL Disabled
W5	IN	Clock Enabled
W6	IN	8-bit Interface

Table 6.3 LP2 DIP Switch Configuration Guidelines

LP2 SWITCH BIT SETTINGS			
SWITCH	BIT	SETTINGS	DESCRIPTION
SW1	1	ON	American
	2	ON	character
	3	ON	set select
	4	ON	American
	5	ON	character
	6	ON	set select
	7	ON/OFF	Alignment Adjust *
	8	ON/OFF	HDW Busy Disable/Enable

*Preset at factory to OFF position

LP2 CONFIGURATION SUMMARY



LP2 Control PCB (p/n 005-0 16362)

LP2 SWITCH BIT SETTINGS			
SWITCH	BIT	SETTING	DESCRIPTION
SW1	1	See	Standard
	2	Table	character
	3	Below	set select
	4	See	Alternate
	5	Table	character
	6	Below	set select
	7	ON/OFF	Alignment Adjust *
	8	N/A	—

*Preset at factory to OFF position

LP2 JUMPER WIRE ASSIGNMENTS		
JUMPER	IN/OUT	DESCRIPTION
W1	IN	Parallel I/F
	OUT	Serial Interface *
W2	IN	Power Failure Recovery Enabled
	OUT	Power Failure Recovery Disabled
W3	IN	SA Enabled (maintenance only)
	OUT	SA Disabled
W4	IN	APL Enabled
	OUT	APL Disabled
W5	IN	Clock Enabled
	OUT	Clock Disabled (Maintenance only)
W6	IN	8-bit Interface
	OUT	7-bit Interface

*Not a valid configuration for LP2 printers

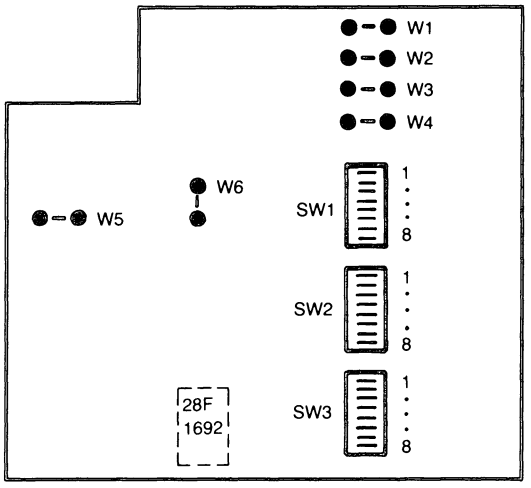
CHARACTER SET SELECT (SW1, BITS 1-6)						
STANDARD SET			ALTERNATE SET			SELECTED CHARACTER SET
SW1 BITS			SW1 BITS			
1	2	3	4	5	6	
ON	ON	ON	ON	ON	ON	American
ON	ON	OFF	ON	ON	OFF	British
ON	OFF	ON	ON	OFF	ON	German
ON	OFF	OFF	ON	OFF	OFF	Spanish
OFF	ON	ON	OFF	ON	ON	French
OFF	ON	OFF	OFF	ON	OFF	Danish
OFF	OFF	ON	OFF	OFF	ON	Swedish
OFF	OFF	OFF	OFF	OFF	OFF	Optional**

**American set if no optional character set has been installed.

Figure 6.2 LP2 Configuration Summary Data

6.5 TP2 CONFIGURATION

Configuration of the TP2 consists of selecting either EIA or current loop operation, selecting a baud rate from 110 to 4800, selecting the parity type and selecting the primary and secondary character sets. All of these features are set up using six jumper wires and three DIP switches all located on the TP2 control PCB as indicated in figure 6.3.



TP2 Control PCB (p/n 005-016362)

Note: IC 100-1692 installed on TP2 P/N 005-16710 through 005-16713.

Figure 6.3 TP2 Configuration Switches and Jumper Wires

6.5.1 TP2 Configuration Options

The various TP2 configuration options are summarized in table 6.4.

Table 6.4 TP2 Configuration Options

TP2 JUMPER WIRE ASSIGNMENTS		
JUMPER	**IN/OUT**	**DESCRIPTION**
W1	IN	Parallel I/F*
	OUT	Serial Interface
W2	IN	Power Failure Recovery Enabled
	OUT	Power Failure Recovery Disabled
W3	IN	SA Enabled (maintenance only)
	OUT	SA Disabled
W4	IN	APL Enabled
	OUT	APL Disabled
W5	IN	Clock Enabled
	OUT	Clock Disabled (Maintenance only)
W6	N/A	—

*Not a valid configuration for TP2 printers.

SWITCH	NO.	SETTING	DESCRIPTION
SW1	1-3	See Table	Standard Character Set Select
	4-6	See Table	Alternate Character Set Select
	7	On/Off	Alignment Adjust
	8	On	HW Busy Disabled
		Off	HW Busy Enabled
SW2	1	On	Parity Disabled
		Off	Parity Enabled
	2	On	Odd/Mark Parity
		Off	Even/Space Parity
	3	On	Odd/Even Parity
		Off	Mark/Space Parity
	4	On	Parity Fault Disabled
		Off	Parity Fault Enabled
	5	On	8 Data Bits
		Off	7 Data Bits
	6	On	1 Stop Bit
		Off	2 Stop Bits
	7	On	HW Busy Low
		Off	HW Busy High
	8	On	SW Busy Disabled
		Off	SW Busy Enabled
SW3	1	On	Current Loop Mode
		Off	EIA Mode
	2	On	EIA Mode
		Off	Current Loop Mode
	3	On	Busy to RTS Connect
		Off	Busy to RTS Disconnect
	4	On	RTS Disabled High
		Off	RTS Enabled
	5	On	DTR Disabled High
		Off	DTR Enabled
	6	On	Current Loop Mode
		Off	EIA Mode
	7	On	EIA Mode
		Off	Current Loop Mode
	8		Not Used

CHARACTER SET SELECT (SW1, BITS 1-6)						
STANDARD SET			**ALTERNATE SET**			**SELECTED CHARACTER SET**
SW1 BITS			**SW1 BITS**			
1	**2**	**3**	**4**	**5**	**6**	
ON	ON	ON	ON	ON	ON	American
ON	ON	OFF	ON	ON	OFF	British
ON	OFF	ON	ON	OFF	ON	German
ON	OFF	OFF	ON	OFF	OFF	Spanish
OFF	ON	ON	OFF	ON	ON	French
OFF	ON	OFF	OFF	ON	OFF	Danish
OFF	OFF	ON	OFF	OFF	ON	Swedish
OFF	OFF	OFF	OFF	OFF	OFF	Optional**

**American set if no optional character set has been installed.

6.5.2 TP2 Configuration Guidelines

Guidelines for configuring a TP2 printer are provided in table 6.5.

Table 6.5 TP2 Configuration Guidelines

TP2 JUMPER WIRE INSTALLATION

JUMPER	IN/OUT	DESCRIPTION
W1	OUT	Serial Interface
W2	IN	Power Failure Recovery Enabled
W3	OUT	SA Disabled
W4	OUT	APL Disabled
W5	IN	Clock Enabled
W6	N/A	—

SWITCH	BIT	SETTING	DESCRIPTION
SW1	1	See	Standard
	2	Table	character
	3	Below	set select
	4	See	Alternate
	5	Table	character
	6	Below	set select
	7	OFF	Alignment Adjust
	8	OFF	HDW Busy Enabled
SW2	4	ON	Parity Fault Disabled
SW3	5	OFF	DTR Enabled

INTERFACE OPTIONS			
HARDWARE BUSY CONFIGURATION			
SW1	8	OFF	HW Busy Enabled
SW2	7	ON	HW Busy Low
SW2	8	ON	SW Busy Disabled
SW3	3	ON	Busy to RTS
SW3	4	OFF	RTS Enabled
SOFTWARE BUSY CONFIGURATION			
SW1	8	ON	HW Busy Disabled
SW2	7	ON	HW Busy Low
SW2	8	OFF	SW Busy Enabled
SW3	3	OFF	Busy to RTS
SW3	4	ON	RTS Enabled
EIA CONFIGURATION			
SW3	1	OFF	EIA Modem
SW3	2	ON	EIA Modem
SW3	6	OFF	EIA Modem
SW3	7	ON	EIA Modem
20 MIL CURRENT LOOP			
SW3	1	ON	Curr. Loop Mod.
SW3	2	OFF	Curr. Loop Mod.
SW3	6	ON	Curr. Loop Mod.
SW3	7	OFF	Curr. Loop Mod.

CHARACTER SET SELECT (SW1, BITS 1-6)

STANDARD SET SW1 BITS			ALTERNATE SET SW1 BITS			SELECTED CHARACTER SET
1	2	3	4	5	6	
ON	ON	ON	ON	ON	ON	American
ON	ON	OFF	ON	ON	OFF	British
ON	OFF	ON	ON	OFF	ON	German
ON	OFF	OFF	ON	OFF	OFF	Spanish
OFF	ON	ON	OFF	ON	ON	French
OFF	ON	OFF	OFF	ON	OFF	Danish
OFF	OFF	ON	OFF	OFF	ON	Swedish
OFF	OFF	OFF	OFF	OFF	OFF	Optional **

**American set if no optional character set has been installed.

PARITY OPTIONS			
SW2 BIT POSITIONS 1	2	3	SELECTED PARITY
ON	OFF	OFF	No Parity
OFF	ON	OFF	Mark Parity
OFF	OFF	OFF	Space Parity
OFF	OFF	ON	Even Parity
OFF	ON	ON	Odd Parity

STOP BIT CONFIGURATIONS	
SW2 BIT 6	NO. STOP BITS
ON	One Stop Bit
OFF	Two Stop Bits

CHARACTER LENGTH	
SW 2 BIT 5	LENGTH
OFF	7 Data Bits[1]
ON	8 Data Bits[2]

NOTES: 1. Normal Configuration: 7 Data Bits, selectable parity and selectable stop bits.
2. DLL Configuration: 8 Data Bits, no parity and 1 stop bit.

6.6 EXTERNAL PRINTER CABLES

The external printer cables required for installation include the interface cable between the printer and the host system or modem and the power cable.

6.6.1 Power Cables

The TP2/LP2 printers are supplied with one of the following power cables:

* 120 Volt, 13A cable- p/n 109-000238
* 240 Volt,15A cable- p/n 109-000240

6.6.1.1 LP2 Interface Cabling

The LP2 interface cable attaches to the printer at the rear base of the pedestal just above the power connection as shown in figure 6.4. The type interface cable used depends on the host system hardware as summarized in table 6.5. The interface signals are described in table 6.6.

EXTERNAL CABLING

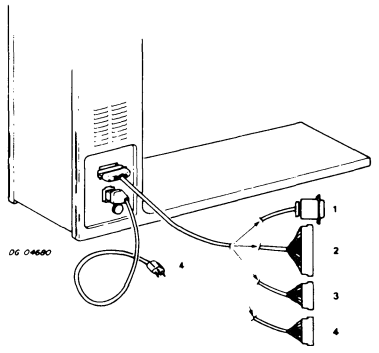
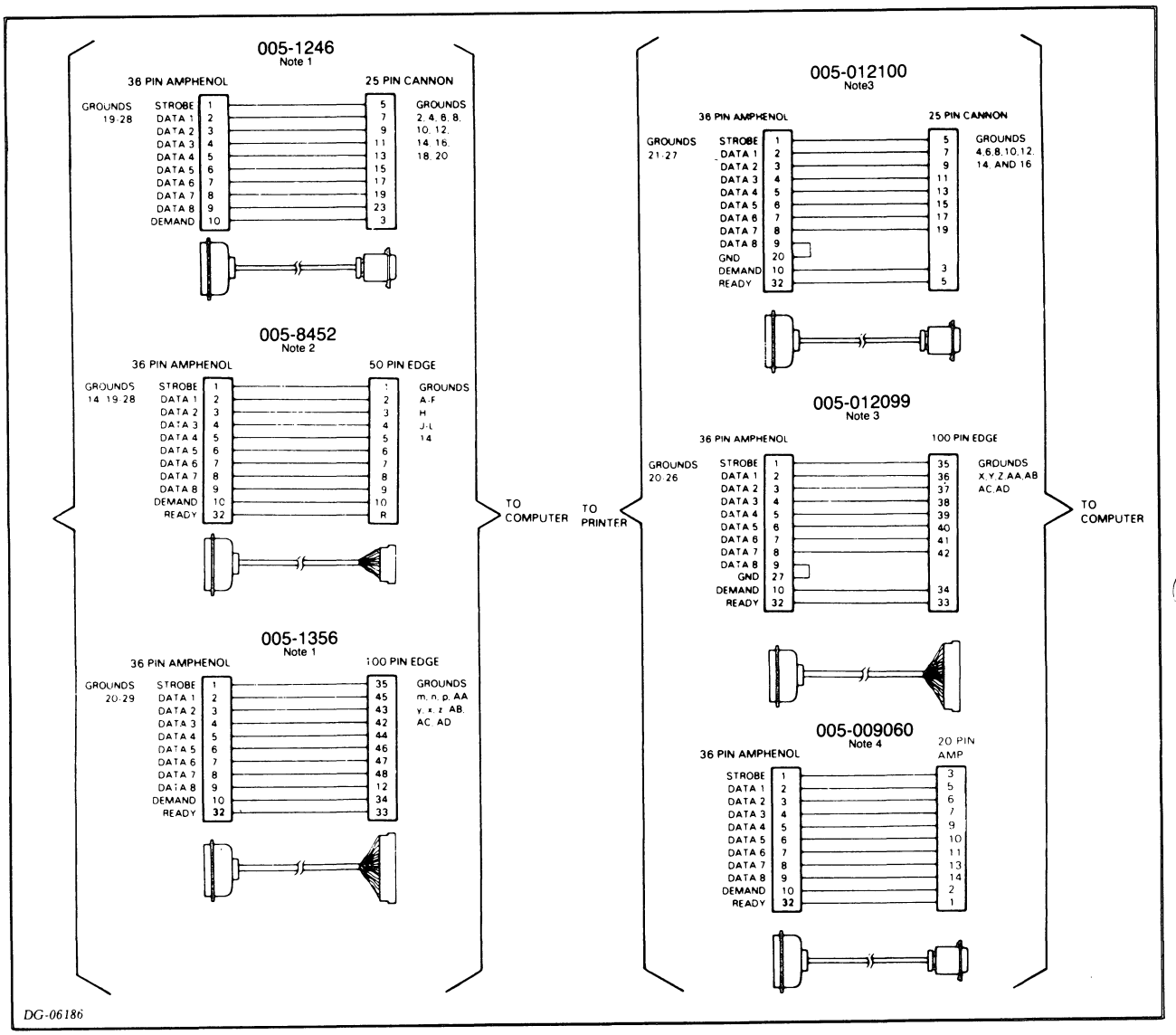


Figure 6.4 LP2 External Interface Cabling

PARALLEL INTERFACE CABLES



If you are making your own cable, it should not exceed 25 feet (7.4 meters) in length.

Note 1 For use with DGC programed I/O controllers.
Note 2 For use with DGC microcomputer controllers.
Note 3 For use with DGC data channel controllers.
Note 4 For use with DGS CS Systems.

Figure 6.4 LP2 External Interface Cabling (Continued)

Table 6.5 LP2 Interface Cable Requirements

CONN. TYPE*	HOST SYSTEM	CABLE NUMBER	WIRE LIST NUMBER	CONTROLLER
1	NOVA 800/830	005-001246	008-000310	005-003564
1	NOVA 840/1200	005-012100	008-003203	005-008096
2	NOVA 2/3/820/ 1210/1220	005-001356	008-000304	005-003564
2	ECLIPSE M/600	005-012099	008-003202	005-008096
3	microNOVA	005-008452	008-000995	005-008448
4	CS systems	005-009060	008-002086	-
5	CS/10 C1/C3	005-014770	018-000906	-

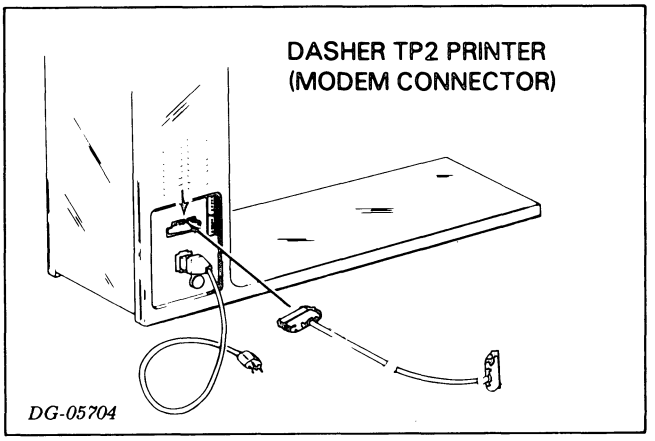
* Connector type designation keyed to figure 6.4

Table 6.6 TP2 Interface Signal Requirements

SIGNAL	DESCRIPTION
Data lines	High= logic 1 (2.4 to 5.0 volts) Low = logic 0 (0.0 to 0.4 volts)
$\overline{\text{Strobe}}$	Duration = 0.5 to 10.0 microseconds Data lines sampled on falling edge
Demand	High= Requesting data Low = busy
Ready	High= online & no fault conditions Low = offline and/or fault conditions

6.6.1.2 TP2 External Interface Cables

The TP2 printer interface cabling is described in figures 6.5 and 6.6 and table 6.7.



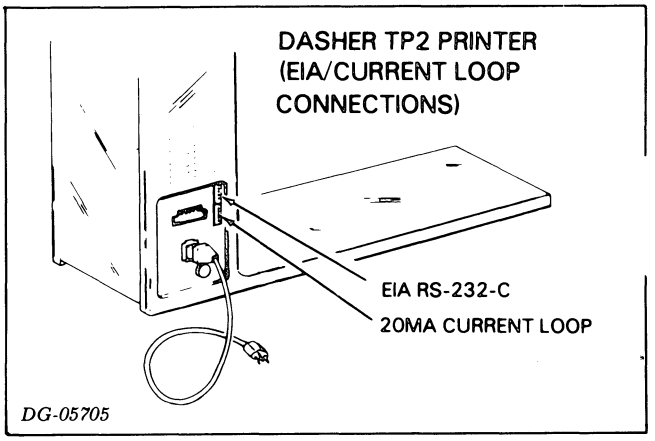


Figure 6.5 TP2 Interface Cable Connectors

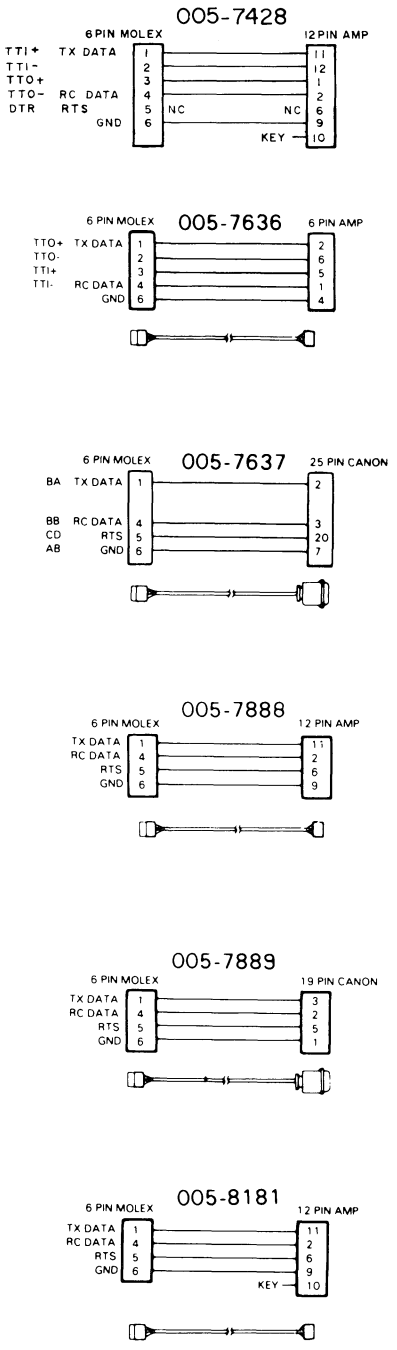


Figure 6.6 TP2 Serial Interface Cables (Sheet 1 of 2)

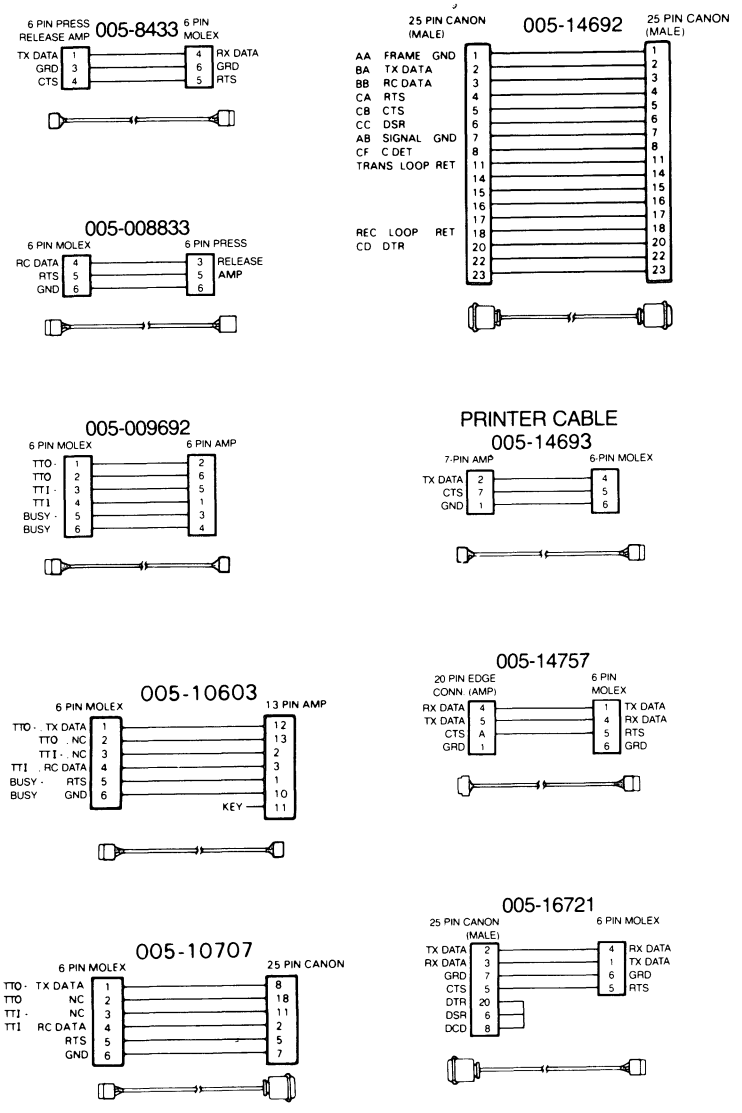


Figure 6.6 TP2 Serial Interface Cables (Sheet 2 of 2)

Table 6.7 TP2 Printer External Interface Cable Data

DASHER TP2 PRINTER EXTERNAL CABLING LIST

CABLE CONNECTS		REMARKS	CABLE NUMBER	WIRELIST
TP2 CONNECTOR	COMPUTER/ CONTROLLER			
C.L.	ALL	SECONDARY DEVICE, MICRONOVA, MUX, ULM	005-007428	008-000977
EIA CL	ALM-16	BAUD RATES UP TO 4800 BAUD CAN BE RUN IF DC1 AND DC3 ARE USED.	005-007636	008-000971
EIA	MODEM	USED WITH SIMPLE MANUAL ANSWER MODEMS	005-007637	008-000973
EIA	NOVA 2. 3. 4. 820. 1210. 1220. ECLIPSE S100. S200. S230. C300. C330. S130. C150. AP130. S140. MICRONOVA	WHEN TP2 PRINTER IS A SECONDARY DEVICE (OR ANY DEVICE ON MICRO NOVA).	005-007888	008-002003
EIA	NOVA 800. 830. 840. 1200	—	005-007889	008-002002
EIA	ALM-8 CS SYSTEMS	TP2 IS A SECONDARY DEVICE ON CS SYSTEMS	005-008181	008-002033
EIA	ALL	D1. 2 R O PRINTER	005-008433	008-002071
EIA	ALL	CS20. D3. R O PRINTER	005-008833	008-002552
C.L.	CS SYSTEMS	ALLOWS USE OF CURRENT LOOP BUSY SIGNAL. CABLE LENGTH DEPENDS ON 005 CABLE #	005-009692 005-009806 thru 005-009810	008-002125
EIA	NOVA 2. 3. 4. 820. 1210. 1220. ECLIPSE S100. S200. S230. C300. C330. S130. S140. C150. AP130	WHEN TP2 PRINTER IS THE PRIMARY CONSOLE	005-010603	008-002507
EIA C.L.	MV8000. M600. S250. C350. NOVA 4. S140. CS10. C3.	—	005-010707	008-002542
EIA	MODEM	USED WITH AUTO-ANSWER. AUTO-DISCONNECT MODEMS	005-014692	018-000819
EIA	ALL	D100. 200 R O PRINTER	005-014693	018-000820
EIA	CS10. C1	R O PRINTER	005-014757	018-000886
EIA	MPT 80 83 87	R O PRINTER	005-016721	018-000994

6.6.2 OPERATIONAL CHECK-OUT

The operational checkout consists of two parts: (1) an offline checkout after you unpack and tailor your printer, and (2) an online checkout after you connect it to your system. Before conducting these checkouts, please read the Operator's Manual (014-000678).

6.6.2.1 Offline Check-Out

After you unpack and tailor your printer, check it out using the following procedures:

1. Plug the 12-pin end of the power cord into unit's power socket just above the circuit breakers on the back of the pedestal column.
2. Check the ac outlet for proper voltage using digital voltmeter (Refer to voltage reading on model plate).
3. Plug the 3-pin end into the ac line supply outlet.
4. Load paper and ribbon cartridge as described in the Operator's Manual.
5. Advance the paper to the top of the next form.
6. You are now ready to conduct the Offline Checkout in table 6.8.

Table 6.8 Offline Checkout Procedure

PROCEDURE	EXPECTED RESULT
Turn the power ON, switch the unit OFF LINE, and switch VIEW off.	The fan spins and the printhead returns to column one.
* Type a line of text without a NEWLINE.	The text is printed as you type.
* Press the CARRIAGE RETURN key.	The printhead moves to the left-hand margin of the same line.
* Press the NEWLINE key.	The paper advances one line.
* Type more text followed by a NEWLINE.	The text is printed as you type and the printhead moves to the left-hand margin of the next line.
Press the FEED switch to the single line feed position several times (on KSR models press the LF/FF key several times).	The paper advances one line each time you press the switch.
Hold the FEED switch in the continuous line feed position (on KSR models hold down the LF/FF key for at least one second).	The paper is advanced to the top of the next form.

* Applies to testing KSR terminals only.

6.6.2.2 Online Checkout

Before you can conduct the online checkout, you need to connect your printer to a computer or communications system as follows:

1. Plug the printer end of the I/O adapter cable or custom cable into the appropriate connector on the back side of the pedestal column as shown below.

2. Connect the other end to the system.

If you have an RO model printer, load a program into your system that transmits ASCII characters to the printer. If you have a KSR terminal, load a program into your system that transmits codes received from your keyboard back to the printer. Now you are ready to conduct the online checkout.

Table 6.9 ONLINE Checkout Procedure

PROCEDURE	EXPECTED RESULT
Switch the power ON and switch your printer ON LINE.	The fan spins and the printhead returns to the left-hand margin. The ON LINE and RDY indicators light.
With the printer online, repeat the steps of the offline check-out.	The results are identical to the steps in the offline check-out.
Check the form feed as follows:	
Switch the printer OFF LINE. Activate the automatic perforation skip-over feature, set the line count thumbwheels to the number of lines corresponding to length of the form you are using, adjust the paper so that the printhead is about 1/2 inch below the top of the form, and press and release the TOF INIT pushbutton Switch the printer ON LINE.	No visible result after the ONLINE indicator extinguishes.
Type several lines of text and press the CTRL and the L keys simultaneously. (For an RO terminal, transmit an appropriate number of ASCII printing characters followed by a Form Feed character.)	The text is printed as you type and the paper advances to 1/2 inch below the top of the next form.

Table 6.9 Online Checkout Procedure (Continued)

PROCEDURE	EXPECTED RESULT
Type in (or transmit) the same number of lines as set by the line count thumbwheels.	The text is printed until you reach the sixth line from the bottom. The paper advances to 1/2 inch below the tope of the next form, and the rest of the text is printed.
Type in (or transmit): - a few NEWLINES (012) - ESC - 5 (033 065) (sets vertical tab) - a CTRL - L(014), (a form feed) - CTRL - K(013) (a vertical tab)	Paper advances a few lines, proceeds to the top of the next form, and advances to the line in which the vertical tab is set.
Type in (or transmit) a word or two followed by: - ESC - 1 (033 061) (sets horizontal tab) - NEW LINE (015) - CTRL - 1 (011)	The text is printed as you type (or transmit), a horizontal tab is set at the end of the text, the printhead returns to the beginning of the next line and tabs out to the position where the tab was set.
Type in or transmit: - Some text - ESC < (033 074) - More text _ ESC = (033 075) - More text	- The text is printed. - Nothing happens. - The text is printed in elongated width characters. - Nothing happens. - The text is printed in normal width characters.
Type in (or transmit): - Some text - ESC < (033 141) - Some more text _ ESC b (033 142) - More text	- The text is printed. - Nothing happens. - The text printed is underscored. - Nothing happens. - The text is printed without an underscore.

Table 6.9 Online Checkout Procedures (Continued)

PROCEDURE	EXPECTED RESULT
Type in (or transmit): ESC c CTRL@ (033 143 000)	The printer reinitializes itself according to the settings of the Secondary Control Panel (see Operator's Manual). The printhead returns to the left-hand margin.
Type in (or transmit): - NEWLINE (012) - ESC > (033 076) - some text - NEWLINE (012) - ESC ? (033 077) - More text	-Printhead returns to left-hand margin. - Carriage seeks home. - Text is printed in compressed width characters. - Printhead returns to left-hand margin. - Carriage seeks home. - Text is printed in normal width characters.

This completes the checkout of your printer. If you did not get the expected result, check the input power, the cabling connections, the jumpers on the main PC board, and the coding of the program transmitting or echoing characters to your printer. If your printer still does not function properly, refer to the troubleshooting data in Chapter 4.

APPENDIX A
ASCII - 128 CHARACTER CODES

NAME OR MNEMONIC	ACTION TAKEN BY PRINTER	ASCII CODE (OCTAL)	DECIMAL EQUIVALENT	KEYS ** PRESSED TO GENERATE CODE
NUL	None	000	000	CTRL 0
SOH	None	001	001	CTRL A
STX	None	002	002	CTRL B
ETX	Reserved	003	003	CTRL C
EOT	Reserved	004	004	CTRL D
ENQ	None	005	005	CTRL E
ACK	Reserved	006	006	CTRL F
BEL	Sounds audible tone	007	007	CTRL G
BS	Back Space (online only)	010	008	CTRL H●BS●SHIFT BS●CTRL BS
HT	Horizontal Tab	011	009	CTRL I●TAB●SHIFT TAB●CTRL TAB
NL	Newline (Line Feed)	012	010	CTRL J●LF●SHIFT LF●CTRL LF
VT	Vertical Tab *	013	011	CTRL K
FF	Form Feed *	014	012	CTRL L
CR	Carriage Return	015	013	CTRL M●CR●SHIFT CR●CTRL CR●(NP)
SO	Selects Alternate Character Set	016	014	CTRL N
SI	Selects Standard Character Set	017	015	CTRL O
DLE	None	020	016	CTRL P
DC1	None	021	017	CTRL Q
DC2	None	022	018	CTRL R
DC3	None	023	019	CTRL S
DC4	None	024	020	CTRL T
NAK	None	025	021	CTRL U
SYN	None	026	022	CTRL V
ETB	None	027	023	CTRL W
CAN	None	030	024	CTRL X
EM	None	031	025	CTRL Y
SUB	None	032	026	CTRL Z
ESC	Begins Command Seq.	033	027	CTRL [●ESC●SHIFT ESC●CTRL ESC
FS	None	034	028	CTRL ↓
GS	None	035	029	CTRL →
RS	None	036	030	CTRL ,
US	None	037	031	CTRL _
SP	Space	040	032	SPACE BAR

**CTRL denotes control key.
NP denotes keys appearing on numeric pad as well as keyboard.

NAME OR MNEMONIC	ACTION TAKEN BY PRINTER	ASCII CODE (OCTAL)	DECIMAL EQUIVALENT	KEY(S) PRESSED TO GENERATE
Exclamation	Prints !	041	033	SHIFT! OR CTRL SHIFT!
Quotation Mark	Prints "	042	034	SHIFT" OR CTRL SHIFT"
Number Sign	Prints #	043	035	SHIFT# OR CTRL SHIFT#
Dollar Sign	Prints $	044	036	SHIFT$ OR CTRL SHIFT$
Percent Sign	Prints %	045	037	SHIFT% OR CTRL SHIFT%
Ampersand	Prints &	046	038	SHIFT& OR CTRL SHIFT&
Apostrophe	Prints '	047	039	SHIFT' OR CTRL SHIFT/
Open Parenthesis	Prints (	050	040	SHIFT(OR CTRL SHIFT(
Close Parenthesis	Prints)	051	041	SHIFT) OR CTRL SHIFT)
Asterisk	Prints *	052	042	SHIFT* OR CTRL SHIFT*
Plus Sign	Prints +	053	043	SHIFT+ OR CTRL SHIFT+
Comma	Prints ,	054	044	, OR CTRL,
Hyphen (Minus Sign)	Prints -	055	045	- OR CTRL-
Period (Decimal Point)	Prints .	056	046	. OR CTRL.(NP)
Slash	Prints /	057	047	/ OR CTRL/
Zero	Prints 0	060	048	0 OR CTRL 0(NP)
One	Prints 1	061	049	1 OR CTRL 1(NP)
Two	Prints 2	062	050	2 OR CTRL 2(NP)
Three	Prints 3	063	051	3 OR CTRL 3(NP)
Four	Prints 4	064	052	4 OR CTRL 4(NP)
Five	Prints 5	065	053	5 OR CTRL 5(NP)
Six	Prints 6	066	054	6 OR CTRL 6(NP)
Seven	Prints 7	067	055	7 OR CTRL 7(NP)
Eight	Prints 8	070	056	8 OR CTRL 8(NP)
Nine	Prints 9	071	057	9 OR CTRL 9(NP)
Colon	Prints :	072	058	SHIFT : OR CTRL SHIFT:
Semicolon	Prints ;	073	059	; OR CTRL;
Less Than	Prints <	074	060	SHIFT < OR CTRL SHIFT<
Equal Sign	Prints =	075	061	= OR CTRL=
Greater Than	Prints >	076	062	SHIFT > OR SHIFT>
Question Mark	Prints ?	077	063	SHIFT? OR CTRL SHIFT?
Commercial At	Prints @	100	064	SHIFT@ OR CTRL SHIFT@
A	Prints A	101	065	SHIFT A
B	Prints B	102	066	SHIFT B
C	Prints C	103	067	SHIFT C
D	Prints D	104	068	SHIFT D
E	Prints E	105	069	SHIFT E
F	Prints F	106	070	SHIFT F
G	Prints G	107	071	SHIFT G
H	Prints H	110	072	SHIFT H
I	Prints I	111	073	SHIFT I
J	Prints J	112	074	SHIFT J
K	Prints K	113	075	SHIFT K
L	Prints L	114	076	SHIFT L
M	Prints M	115	077	SHIFT M
N	Prints N	116	078	SHIFT N
O	Prints O	117	079	SHIFT O
P	Prints P	120	080	

NAME OR MNEMONIC	ACTION TAKEN BY PRINTER	ASCII CODE (OCTAL)	DECIMAL EQUIVALENT	KEY(S) PRESSED TO GENERATE
Q	Prints Q	121	081	SHIFT Q
R	Prints R	122	082	SHIFT R
S	Prints S	123	083	SHIFT S
T	Prints T	124	084	SHIFT T
U	Prints U	125	085	SHIFT U
V	Prints V	126	086	SHIFT V
W	Prints W	127	087	SHIFT W
X	Prints X	130	088	SHIFT X
Y	Prints Y	131	089	SHIFT Y
Z	Prints Z	132	090	SHIFT Z
Opening Bracket	Prints [	133	091	[
Back Slash	Prints \	134	092	\
Close Bracket	Prints]	135	093	]
Circumflex	Prints ^	136	094	^
Underline	Prints _	137	095	SHIFT _
Accent Grave	Prints `	140	096	`
a	Prints a	141	097	A
b	Prints b	142	098	B
c	Prints c	143	099	C
d	Prints d	144	100	D
e	Prints e	145	101	E
f	Prints f	146	102	F
g	Prints g	147	103	G
h	Prints h	150	104	H
i	Prints i	151	105	I
j	Prints j	152	106	J
k	Prints k	153	107	K
l	Prints l	154	108	L
m	Prints m	155	109	M
n	Prints n	156	110	N
o	Prints o	157	111	O
p	Prints p	160	112	P
q	Prints q	161	113	Q
r	Prints r	162	114	R
s	Prints s	163	115	S
t	Prints t	164	116	T
u	Prints u	165	117	U
v	Prints v	166	118	V
w	Prints w	167	119	W
x	Prints x	170	120	X
y	Prints y	171	121	Y
z	Prints z	172	122	Z
Open Baroque Parenthesis	Prints {	173	123	{
Vertical Mark Parenthesis	Prints |	174	124	SHIFT |
Close Baroque Parenthesis	Prints }	175	125	SHIFT }
TILDE	Prints ~	176	126	SHIFT ~
DELETE	None	177	127	DEL●SHIFT DEL●CTRL DEL●CTRL SHIFT DEL

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Appendix B
SUMMARY OF CONTROL CODES AND ESCAPE SEQUENCES

DASHER LP2 AND TP2 PRINTER CONTROL CODES

NAME	MNEMONIC	CONTROL CODE (OCTAL)	EFFECT
			(Codes received)
Bell	BEL	0 0 7	Sounds audible tone immediately after code is received.
Back Space	BS	0 1 0	Print head moves back one character position.
Horizontal Tab	HT	0 1 1	Print head moves to next horizontal tab stop. If no tab is set, the command is ignored.
Newline (Line Feed)	NL	0 1 2	Terminates the present line, advances the paper one line, and either: a) determines the fastest way to print the next line (if it is complete), or b) performs a carriage return and prints any characters from left to right.
Vertical Tab	VT	0 1 3	Paper advances to next tab stop. If no tab is set, a carriage return is performed.
Form Feed	FF	0 1 4	Paper advances to the top of the next form.
Carriage Return	CR	0 1 5	Carriage returns to the left-hand margin.
Shift Out	SO	0 1 6	Selects alternate character set.
Shift In	SI	0 1 7	Selects standard character set.
Escape	ESC	0 3 3	Denotes the beginning of a command sequence.
			(Codes transmitted)*
Device Code 1	DC1	0 2 1	** Indicates that the character buffer has room for more characters.
Device Code 3	DC3	0 2 3	** Indicates that the character buffer is full.

*On DASHER TP2 printers only.
**When Software Busy in enabled (See Installation Chapter).

SUMMARY OF CONTROL CODES AND ESCAPE SEQUENCES

Escape Sequence	Octal Codes	Function
ESC =	033 075	Clears a elongated printing for subsequent characters.
ESC >	033 076	Selects the compressed printing mode.
ESC ?	033 077	Selects the normal print mode.
ESC a	033 141	Starts underscoring subsequent characters.
ESC b	033 142	Stops underscoring subsequent characters.
ESC c NULL	033 143 000	Performs a master reset.
ESC d	033 144	Selects plot mode.
ESC e	033 145	Deselects plot mode.
ESC Y ...	033 131	Beginning of character set load sequence (see DGC No. 014-000094).
ESC N Starting Character Set Address	033 116 --- ---	Selects down line loaded character set (see DGC No. 014-000094).
ESC O	033 117	Deselects a down line loaded character set.

Escape Sequences

Escape Sequence	Octal Codes	Function
ESC 1	033 061	Sets a horizontal tab at the current printhead position.
ESC 2	033 062	Clears a horizontal tab from the current printhead position.
ESC E #.. CTRL-0	033 105 #.. 000	Sets horizontal tabs at the column positions specified by the octal number(s) #. All previous tabs are cleared.
ESC E CTRL-0	033 105 000	Clears all horizontal tabs.
ESC 5	033 065	Sets a vertical tab at the current line position.
ESC 6	033 066	Clears a vertical tab from the current position.
ESC F #.. CTRL-0	033 106 #.. 000	Sets vertical tabs at the line positions specified by the octal number(s) #. All previous tabs are cleared.
ESC F CTRL-0	033 106 000	Clears all vertical tabs.
ESC <	033 074	Selects elongated printing for subsequent characters.

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Appendix C

INTERNAL CABLING AND INTERCONNECTION DIAGRAM

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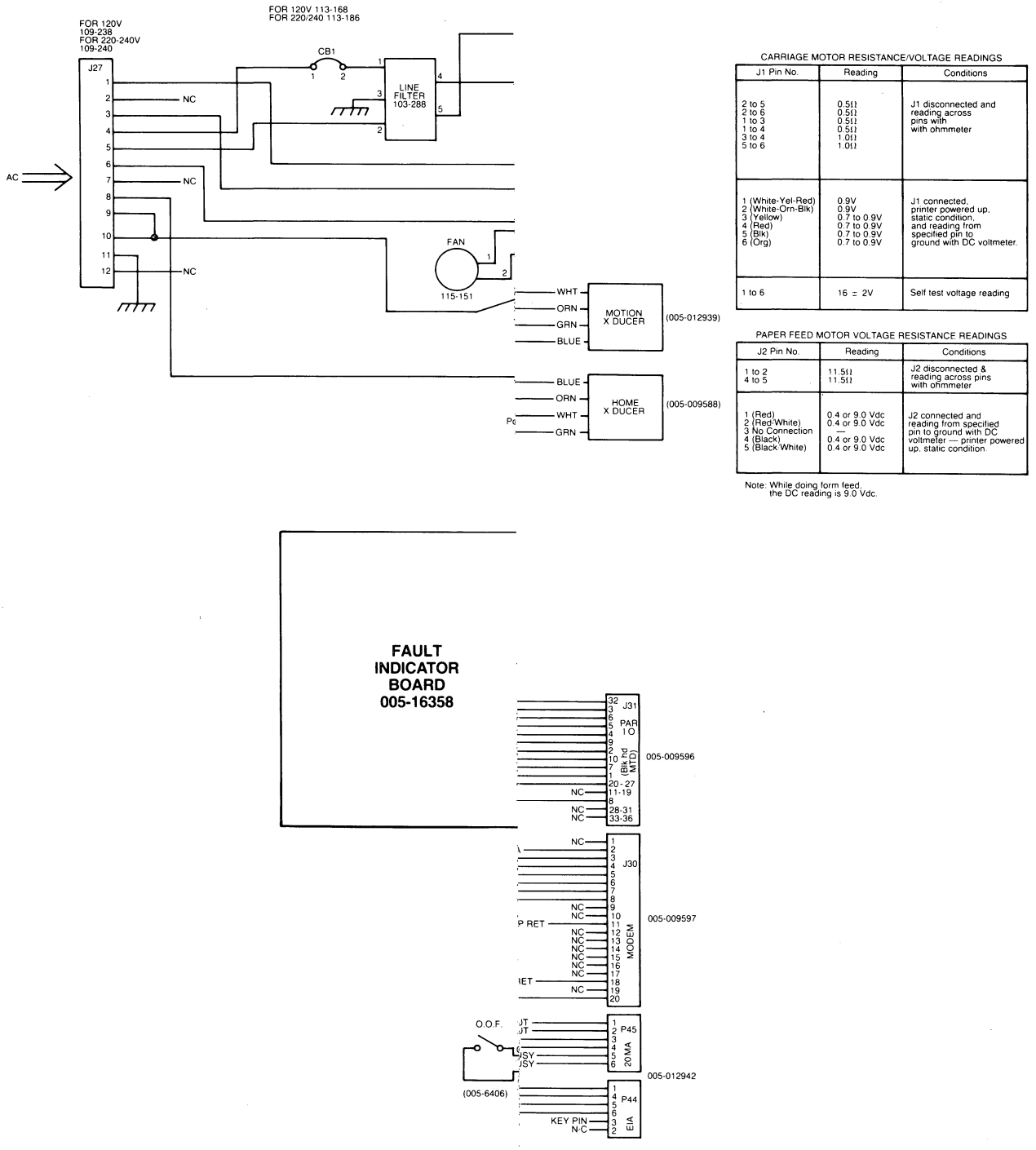

CARRIAGE MOTOR RESISTANCE/VOLTAGE READINGS

J1 Pin No.	Reading	Conditions
2 to 5 2 to 6 1 to 3 1 to 4 3 to 4 5 to 6	0.5Ω 0.5Ω 0.5Ω 0.5Ω 1.0Ω 1.0Ω	J1 disconnected and reading across pins with ohmmeter
1 (White-Yel-Red) 2 (White-Orn-Blk) 3 (Yellow) 4 (Red) 5 (Blk) 6 (Org)	0.9V 0.9V 0.7 to 0.9V 0.7 to 0.9V 0.7 to 0.9V 0.7 to 0.9V	J1 connected, printer powered up, static condition, and reading from specified pin to ground with DC voltmeter.
1 to 6	16 ± 2V	Self test voltage reading

PAPER FEED MOTOR VOLTAGE RESISTANCE READINGS

J2 Pin No.	Reading	Conditions
1 to 2 4 to 5	11.5Ω 11.5Ω	J2 disconnected & reading across pins with ohmmeter
1 (Red) 2 (Red/White) 3 No Connection 4 (Black) 5 (Black/White)	0.4 or 9.0 Vdc 0.4 or 9.0 Vdc — 0.4 or 9.0 Vdc 0.4 or 9.0 Vdc	J2 connected and reading from specified pin to ground with DC voltmeter — printer powered up, static condition

Note: While doing form feed, the DC reading is 9.0 Vdc.

Figure C.1 *LP2/TP2 Interconnection Diagram.*

DataGeneral

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☐	☐	Is this manual easy to read?	○ You (can,cannot) find things easily. ○ Language (is,is not) appropriate. ○ Technical terms (are,are not) defined as needed. ○ Other:
		In what ways do you find this manual useful?	○ Learning to use the equipment ○ As a reference ○ As an introduction to the product ○ To instruct a class. ○ Other:
☐	☐	Do the illustrations help you?	○ Visuals (are,are not) well designed. ○ Labels and captions (are,are not) clear. ○ Other:
☐	☐	Does the manual tell you all you need to know? What additional information would you like?	
☐	☐	Is the information accurate? (If not please specify with page number and paragraph.)	

Name: _____ Title: _____

Company: _____ Division: _____

Address: _____ City: _____

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DG-05809

DataGeneral

Data General Corporation, Westboro, Massachusetts 01581

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users group

Installation Membership Form

Name _____ Position _____ Date _____

Company, Organization or School _____

Address _____ City _____ State _____ Zip _____

Telephone: Area Code _____ No. _____ Ext. _____

1. Account Category

- ☐ OEM
- ☐ End User
- ☐ System House
- ☐ Government

2. Hardware

	Qty. Installed	Qty. On Order
M/600		
C/350, C/330, C/300		
S/250, S/230, S/200		
S/130		
AP/130		
CS Series		
N3/D		
Other NOVA		
microNOVA		
Other (Specify) _____		
_____		

3. Software

- ☐ AOS
- ☐ DOS
- ☐ SOS
- ☐ RDOS
- ☐ RTOS
- ☐ Other

Specify _____

4. Languages

- ☐ Algol
- ☐ DG/L
- ☐ Cobol
- ☐ ECLIPSE Cobol
- ☐ Business BASIC
- ☐ BASIC
- ☐ Assembler
- ☐ Interactive
- ☐ Fortran
- ☐ RPG II
- ☐ PL/1
- ☐ Other

Specify _____

5. Mode of Operation

- ☐ Batch (Central)
- ☐ Batch (Via RJE)
- ☐ On-Line Interactive

6. Communications

- ☐ RSTCP
- ☐ HASP
- ☐ RJE80
- ☐ SAM
- ☐ CAM
- ☐ 4025
- ☐ Other

Specify _____

7. Application Description

○ _____

8. Purchase

From whom was your machine(s) purchased?

- ☐ **Data General Corp.**
- ☐ Other

Specify _____

9. Users Group

Are you interested in joining a special interest or regional Data General Users Group?

○ _____

DG-05810

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