Infoprint 4247-L03 Serial Line Matrix Printers

Maintenance Manual

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Note!

Before using this information and the product it supports, read the information in “Notices” on page 220.

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Safety Information

This section contains information that you need to be familiar with before servicing this printer.

Safety Notices

There are two levels of safety notices that appear in this Maintenance Information.

- **Danger** calls attention to a situation that is potentially lethal or extremely hazardous to people.
- **Caution** calls attention to a situation that is potentially hazardous to people.

The following notices are the Dangers and Cautions used in the Maintenance Information. Attention notices, Important notices, and Notes may be located throughout the Maintenance Information, but are not listed here. Non-English translations of Safety and Caution notices are located in *Infoprint 4247 L03 Line Matrix Printer: Safety Information*, S550-0702.

DANGER

This product is equipped with a 3-wire power cord and plug for the user's safety. Use this power cord in conjunction with a properly grounded electrical outlet to avoid electrical shock.

DANGER

Your country may require an approved power cord and plug, ensure that you have the correct power cord and plug. Use this cord and plug only with an approved correctly-installed power receptacle.x

DANGER

Do not connect or disconnect any communication port, teleport, attachment connector, or power cord during an electrical storm.

CAUTION:
The printhead may get hot during operation. Be careful when removing or replacing the ribbon.

General Safety

Follow these rules to ensure general safety:

- Upon arrival at the job site, notice the location of functioning telephones in your area that may be used in an emergency.
- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any object:
  1. Ensure you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weight more than 18 kg (39.7 lb) or objects that you think are too heavy for you*.
- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Store removed covers and other parts in an isolated location, away from all personnel, while you are servicing the machine.
- Keep your tool case away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the ends.
- Do not wear jewelry, chains, metal-frame eyeglasses, or clothes with metal fasteners.

  Remember: Metal objects are excellent conductors.
- Wear safety glasses when you are involved with:
  - Hammering
  - Drilling

  - Soldering
  - Cutting wire
  - Attaching springs
  - Using liquid cleaners or solvents, or sprays
  - Working in any other conditions that might be hazardous to your eyes
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.

Electrical Safety

For a detailed description of electrical safety, refer to *Electrical Safety for IBM Customer Engineers*, S229–8124.

Observe the following rules when working on electrical equipment:

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you then can operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before:
  - Performing a mechanical inspection
  - Working near power supplies
  - Removing or installing main units
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine and to lock the wall box in the Off (O) position.
- If you need to work on a machine that has *exposed* electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.

    Remember: If conditions require a second person, that person must be present when you power off (O) the printer.

  - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

    Remember: There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.
  - When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
  - Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

    Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.
- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been powered off (O).
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- To ensure correct grounding, do not service the following parts *with the power on* when they are removed from their normal operating places in a machine:
  - Power supply
  - Fans
  - Motors
- If an electrical accident occurs:
  - Use caution; do not become a victim yourself.
  - Power off (O) the printer.
  - Send another person to get medical aid.

Pre-Service Inspection

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgement should be used to identify potential safety hazards because of attachment of non-IBM® features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

The guide consists of a series of steps presented in a checklist.

Checklist:

1.
   a. Check exterior covers for damage (loose, broken, or sharp edges).
   b. Check top main cover Interlock operation. See T&D17 - INTERLOCK SWITCH TEST.
2. Ensure that all safety labels are in place.
3. Inspect the customer's power source/receptacle. See *Electrical Safety for IBM Customer Engineers, S229–8124.*
4. Ensure that any Safety EC's have been installed properly.
5. Power off (O) the printer. Disconnect the power cord. Check the power cord for:
   a. A third-wire ground connector in good condition. Use a meter to measure the third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground. The power connector ground wire is fastened with a screw and star washer near the power supply. Repair as needed.
   b. A second star washer must be between frame ground and the wire lug.
   c. The power cord should be the appropriate type, shipped for the 4247 printer.
   d. Insulation must not be frayed nor worn.
6. Remove the covers. See "Cover Parts Removal" on page 48.

7. Check that the power supply cover has not been removed nor tampered with.
8. Check for any obvious non-IBM alterations. Use good judgement about the safety of any non-IBM alterations.
9. Check inside the unit for any obvious unsafe conditions, such as metal-filing contamination, water or other liquids, or signs of fire or smoke damage.
10. Check for worn, frayed, or pinched cord or cables.

Preface

This Maintenance Manual focuses on the maintenance activities on the IBM Infoprint 4247-L03 model printers.

To limit duplication of information, all defects originated by incorrect paper insertion, wrong menu setting, or mistaken controls commands are not covered by this document. That information is available in the *User's Guide* delivered in the printer package and included on the Maintenance CD.

When the malfunction eludes all the solutions proposed in the *User's Guide* or deducible from it, a severe failure within the printer hardware, firmware, or mechanisms should be suspected. Follow the troubleshooting sequence advised in this manual together with removing and replacing defective parts.

The information in this document is subject to change without notice.

All efforts have been made to ensure the accuracy of the contents of this manual.

However, IBM cannot assume responsibility for any errors that may appear in this document or their consequences.

Chapter 1. General Overview

This Manual describes the features and the maintenance procedures for the IBM Infoprint 4247-L03 printer and relevant options.

Scope of the Product

This serial impact printer is an efficient solution in an industry/department oriented environment. If desk top publishing capabilities are not required, but there is a definite interest for copies, continuous paper, different preprinted forms, with a primary mission of printing alphanumeric characters, business graphics, and bar codes while offering excellent print quality, the 4247-L03 is a good solution.

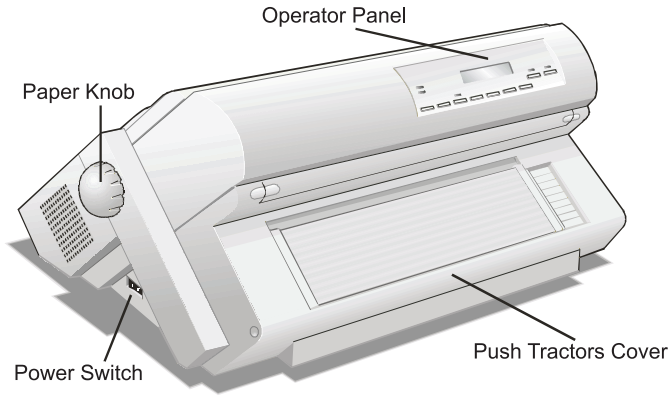
This printer is intended to support the high range requirements for EDP and mainly administrative applications requiring high throughput, high level print quality and graphic capabilities, in order to print spread sheets, diagrams, business or technical graphics and machine readable texts.

Printer Base Model

The Infoprint 4247-L03 comes standard with 1 tractor.

Physical Overview

Front View



Rear View

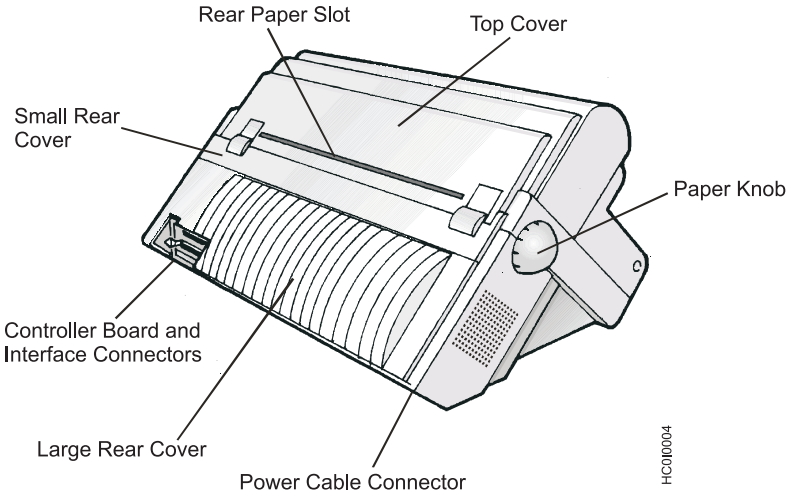


Figure 1. Infoprint 4247 Printer: Front and Rear Views

Printer Structure

The printer is composed of the following main parts which are described in the following pages.

- **MECHANICAL ASSEMBLY**
- **PRINT HEAD**
- **COVERS**
- **ELECTRONIC HARDWARE**
- **INKED RIBBON**

MECHANICAL ASSEMBLY

This block is composed of all parts which are moving in order to print. Paper movement, carriage movement, ribbon movement, A.G.A. (Automatic Gap Adjustment).

Paper Movement

The movement of the paper platen and pinch rollers for paper translation is obtained by means of both a specific step-motor, providing 180 paper steps per inch and a couple of mini-pitch belts. Also, this stepper motor moves the base tractor as well as the optional one.

Carriage Movement

The print head carriage is made of metal for better heat dissipation; it is moved by a stepper motor, which provides incremental movement of 120 steps per inch. The carriage movement is based on an 'open loop' approach.

A dedicated carriage home sensor located at the left side of the base mechanism provides a fixed carriage position reference point.

Firmware routines periodically check the carriage position with respect to the logical print positions. In case of erroneous carriage positioning, a specific error message is displayed on the control panel display.

The bidirectional logic seeking feature implemented by firmware code optimizes the carriage movements to get the better printer performances in terms of print throughput.

Ribbon Movement

A stepper motor located at the left side of the base mechanism generates a ribbon movement independent of the carriage speed, direction and travel, in order to present in front of the print head a continuously renewing well inked ribbon area.

The ribbon motor group is also equipped with a photoelectric sensor to determine if the ribbon motor movement stops for any reason (ribbon blocked or ribbon motor not running). If this condition happens, the printer stops print, and a specific message is given on the control panel display.

A.G.A. (A.F.T.A) Movement

Note: The term, “A.G.A. (Automatic Gap Adjustment)” is equivalent to A.F.T.A. (Automatic Forms Thickness Adjustment) in meaning. A.G.A. operation of the 4247-L03 is performed exactly in the same way as A.F.T.A. is performed on other models.

Another step-motor is used for the A.G.A. (Automatic Gap Adjustment) of the print head, in order to have the best performance with varying thicknesses of paper.

The printer is able to increase/decrease the strength of the needle stroke via MENU (which can be selected by the User) to allow a high impact force for multipart forms (up to 7 copies).

Tractor Unit Assembly

Base Tractor

Fixed front tractor: medium size (4 pins).

On this tractor group, there are two electrical connections. The first one to the basic frame of the printer and the second connection to the additional front tractor group.

Such electrical connections provide the signals to the alternance motor which engage and disengage the tractor to the motion gears.

Optional Tractors

Additional 4 pins front tractor

On this tractor group, an electrical connection with the fixed tractor group allows selecting and deselecting the movement. With the addition of this tractor group, the printer is able to handle two different fanfold papers from the front path.

PRINT HEAD

The core of the printer is a 24-needle print head, which has the following characteristics, according to the printer model.

The adopted technology is electromagnetic non-ballistic with needle positioning in two semi-diamond rows of 12 needles each.

The print head provides a max. frequency of 2.4 KHz with a needle diameter of 0.25 mm.

The print head provides a moving ruby capability to position the two semi-diamond rows either staggered, for best print quality, or parallel, for maximum print speed (the basic print-head frequency is virtually doubled) A print head protection feature is implemented to recognize the temperature of the head. If the maximum limit of temperature is reached, the printing speed is reduced to avoid a degradation of print quality and/or damage of the print head.

COVERS

The cabinet covers are composed of various parts, in order to allow easy access to all the printer internal parts.

ELECTRONIC HARDWARE

The electronic hardware includes the following boards:

Engine Board:

It is located at the bottom of the printer, on the right side (looking the printer from the front side). It receives input commands by the controller board and drives all the electromechanical devices of the printer; motors, sensors and print head.

Controller Board:

It is located into the sliding box that plugs it on the Engine Board. It is easily removable / installable from the rear side of the printer.

The Controller Board provides the input commands for the Engine Board, the management of the parallel interface, 9 pins Serial Interface RS232, USB 2.0, and Ethernet 10/100 interface connections.

There are four controller board options;

Table 1. Controller Board Options

Controller Board	PN	Interfaces	Emulations
SBCS parallel, serial, USB	41U2227	Parallel, Serial, USB	IBM Proprinter XL24/XL24 AGM, IBM 2391 Personal Printer, ANSI X3.64, Epson ESC/P LQ Series
SBCS parallel, Ethernet 10/100	41U2231	Parallel, Ethernet 10/100	IBM Proprinter XL24/XL24 AGM, IBM 2391 Personal Printer, ANSI X3.64, Epson ESC/P LQ Series
DBCS parallel, serial, USB	41U2236	Parallel, Serial, USB	IBM Proprinter XL24/XL24 AGM, IBM 2391 Personal Printer, ANSI X3.64, Epson ESC/P LQ Series, Epson LQ 1600K with GB1830 Character Set
DBCS parallel, Ethernet 10/100	41U2237	Parallel, Ethernet 10/100	IBM Proprinter XL24/XL24 AGM, IBM 2391 Personal Printer, ANSI X3.64, Epson ESC/P LQ Series, Epson LQ 1600K with GB1830 Character Set

On the controller are also present the flash memory with firmware and characters generator. This structure is intended to make easy update the controller with a new firmware version through a downloading operation.

Note: Controller Board FRUs include preinsalled controller firmware.

Power Supply Board:

It is located at the bottom of the printer, on the left side (looking the printer from the front side). It provides specific voltages for the logic area, the print head needles and the drive motors.

It uses an autoswitching power supply boards: 120 -240 V ac.

Operator Panel Board:

It is placed on the printer front side. It contains 9 push buttons and 5 LEDs (3 LEDs for the printer status and 2 LEDs for paper path selection). Furthermore, this board drives a 16-Digit LCD alphanumeric display, in order to easily interact with parameters setting for the menu operation.

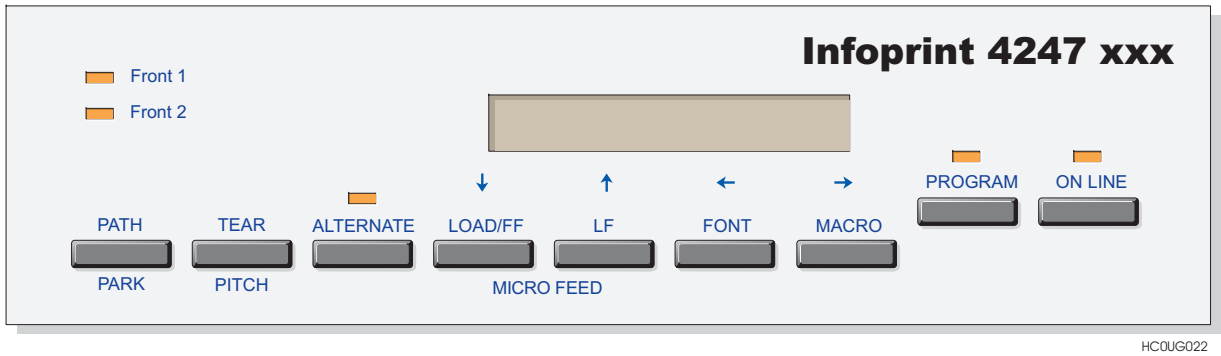


Figure 2. Operator Panel

INKED RIBBON CARTRIDGE

The cartridge is fixed on both sides on four points. Its position is oblique to the print line to automatically show the complete height of the ribbon in front of print head while printing on the full print line.

The inked ribbon inside these cartridges is a continuous Mobius loop.

Infoprint 4247-L03 Printers Technical Specifications

Table 2. CHARACTERS

Printable columns	136 @ 10 CPI	
Pitches (CPI)	5, 6, 7.5, 8.5, 10, 12, 15, 17.1, 20, 24 and Proportional	
Matrix (H x V)		
Draft	12x12	for 10, 15 (normal), 20 CPI
	10x12	for 12, 24 (normal) CPI
	8x8	for 15 (micro) CPI
	14x12	for 17.1 CPI
	10x8	for 24 (micro) CPI
Best Draft	12x24	for 10, 15 (normal), 20 CPI
	10x24	for 12, 24 (normal) CPI
	8x16	for 15 (micro) CPI
	14x24	for 17.1 CPI
	10x16	for 24 (micro) CPI
NLQ	36x12	for 10 CPI
	30x12	for 12 CPI
	24x8	for 15 (micro) CPI
	21x12	for 17.1 CPI
	18x12	for 20 CPI
	15x8	for 24 (micro) CPI

Table 2. CHARACTERS (continued)

LQ	36x24 for 10 CPI 30x24 for 12 CPI 24x16 for 15 (micro) CPI 21x24 for 17.1 CPI 18x24 for 20 CPI 15x16 for 24 (micro) CPI
Character Sets	PC standard set CS1 & CS2: IBM Code Pages: CP437, CP437Greek, CP850, CP851, CP852, CP853, CP855, CP857, CP858, CP860, CP862, CP863, CP864, CP865, CP866, CP867, CP876, CP877, CP1098, CP1250, CP1251, CP1252, CP1253, CP1254, CP1255, CP1256, CP1257 ISO Char Sets: 8859/1, 8859/2, 8859/3, 8859/4, 8859/5, 8859/6, 8859/7, 8859/8, 8859/9, 8859/15 Epson National Variations: USA, France, Germany, England, Denmark 1, Sweden, Italy, Spain 1, Japan, Norway, Denmark 2, Spain 2, Latin America 1 Other national variations: 96Greek, Gost, Tass, Mazowia, Ukranian, CP437Slavic, KOI8-U
Resident Fonts	Draft, Courier, Gothic, Prestige, Script, Presentor, OCR-A, OCR-B

Table 3. PERFORMANCE

Print Speed (CPS @ 10CPI)	**Note:** Speeds shown are for Single Byte Character Sets. See the *User's Guide* for Double Byte Character Set speeds.
Draft	600

Table 3. PERFORMANCE (continued)

Best Draft	400
NLQ	262
LQ	133
Throughput (ECMA 132) PPH	
Draft	580
Best Draft	480
NLQ	340
LQ	220
Paper line feed (msec)	35
Paper slew (IPS)	15

Table 4. GRAPHICS

Dot Graphics (DPI)	60, 80, 90, 120, 180, 240, 360 Horizontal 60, 72, 180, 360 Vertical
Bar Codes	Types: UPC-A, UPC-E, EAN-8, EAN-13, UPC/EAN ADD-ON 2, UPC/EAN ADD-ON 5, Code 2 of 5 Bidirectional / Interleaved / Industrial / Matrix , Code 39, Code 128 (A, B, C), Code 11, Code 93, MSI, Codabar, POSTNET

Table 5. PRINT HEAD

Print Head Technology	Electromagnetic non ballistic.
Print head Geometry	Two semi-diamond, moving ruby
Print head Needles	24
Needle Diameter (mm)	0.25
Needle Frequency (Hz)	2400 Text - 2400 Graphic

Table 5. PRINT HEAD (continued)

Life	700 million draft chars.

Table 6. RIBBON TYPE

Black	Standard 15 Mchars. fabric ribbon, 1" high.

Table 7. PAPER HANDLING

Vertical Spacings	
Basic (LPI)	6, 8, 12 LPI 3, 4, 6, 8, 12 Lines per 30mm
Incremental (inches)	n/60", n/72", n/216", n/180", n/360"
Paper step (inches)	1/180"
Paper Type	
Copies	1+ 7 on front Tractor
Thickness	0.635 mm. max.
A.G.A. (A.F.T.A.)	Yes, Fix and Automatic with gap measurement
Paper Path	
First Front Tractor (Standard)	Available on all models Fixed front with 4 pin push tractor. Paper dimension: 3" to 17" W. Auto paper parking/loading and Zero tear-off
Second Front (Optional)	Removable Front with 4 pin push tractor. Paper dimension: 3" to 17" W. Auto paper parking/loading. Zero tear-off

Table 8. USER INTERFACE

USER INTERFACE	
Operator panel	9 buttons, 6 indicators; 16x1 LCD display; buzzer
Printer setup	With the Operator Panel and by means of software commands (emulation depending) Number of stored customer configuration macros (custom sets): 4

Table 9. INTERFACES & EMULATIONS

Parallel I/F (Standard)	CENTRONICS 36 pins, 100 Kbytes/sec max. Input buffer up to 128Kbytes max.
Serial I/F (Optional)	RS232 9 pins. 300 to 38400 bauds Input buffer up to 128Kbytes max, DTR & Xon/Xoff flow control.
NIC I/F (Optional)	Ethernet 10 /100 Base-T connector type RJ-45.
USB I/F (Optional)	USB 2.0 full speed. Max. band width 12Mbit/sec. Input buffer up to 128 Kbytes max.
Hot Port	Automatic I/F switching
Standard Emulations	IBM Proprinter: XL24 /XL24 AGM, 2391 Personal Printer Epson ESC/P LQ series, and CPG Native Commands Set
Optional I/Fs	The user installable I/O module approach allows the design of H/W and S/W Interface cards to serve specific requests such as Coax, Twinax and others.
Optional Emulations	Specific emulations, fonts, and character set can be implemented on demand with respect the maximum memory capability.
Drivers	For Windows 95/98, ME, WNT 4.0, W2000, and XP

Table 10. STANDARDS & GENERAL

Noise suppression (ISO 7779)	54 dBA (Quiet mode) 56.5 dBA (without Quiet mode)
Noise power (ISO 9296)	7.1 BELS (Quiet mode) 7.2 BELS (without Quiet mode)
Power supply	Universal from 100 to 230 VAC -10+15 % 50/60 Hz +/- 2Hz. Max continuous power output 154 W Power consumption: 22 W standby 116 W average printing
Reliability	
MTBF	10000 hours @ 25 % duty cycle
MTTR	30 minutes
Workload	44000 pages /month 500PPH at 4 hours/day — 22 days/month
Printer Life	5 years or 10000 h @ 25 % (first event is valid)
Physical (WxDxH) - weight	670 x 450 x 320 mm; 21 Kg.

MEDIA FORMS SPECIFICATIONS

The printers handle a multiple of standard continuous fanfold and multi-part forms, provided that metal staples are not used, although paper staples are permitted. The continuous fanfold forms commonly used in Europe and the U.S. have marginal sprocket holes (Carrol type) as specified below:

– hole diameter : 5/32" (3.97 ± 0.1 mm)
– hole-to-hole spacing : 0.5" (12.7 ± 0.1 mm)
– 20 hole spacing : 10" ± 0.24" (254 ± 0.6 mm).

The following tables describe paper types, weights and sizes required for the printers and automatic sheet feeder.

FANFOLD FRONT 1 **FANFOLD FRONT 2**		**WEIGHT**	**THICKNESS**	**WIDTH**	**LENGTH**
SINGLE PART		55-80 g/m2 (15—24 lbs)	0.635mm (0.025") max	3" — 17"	24" max
MULTI-PART (with carbon) 1+5 copies max.	First and other copies Carbon	45-75 g/m2 (16—24 lbs) 14-35 g/m2 (4—8 lbs)			
MULTI-PART (chemical) 1+7 copies max	First and other copies	45-75 g/m2 (16—24 lbs)			

ENVIRONMENTAL CHARACTERISTIC

The printers will work properly if the operating and storage environment does not exceed these temperature and humidity ranges:

– Temperature range +10° C to +38° C

– Humidity range 10% RH to 90% RH (non condensing)

Additional restrictions are introduced by the paper: the ECMA Standard are:

– Temperature range +16° C to +24° C
– Humidity range 40% RH to 60% RH (non condensing)

Outside of these restrictions, some print quality degradation can be expected.

MAINTAINING PARAMETERS

MTTR

The MTTR (Mean Time To Repair) is the estimated time to repair the printer at Optimum Replaceable Unit (ORU) level; it is estimated in 30 minutes. It includes the following operations:

- Identifying the faulty ORU
- Changing the ORU
- Cleaning paper paths
- Testing locally.

LIFE

– UNIT	5 years
– RIBBON	15 Mcharacters Draft (standard black type)
– PRINT HEAD	700 M Characters Draft

Chapter 2. Paper Handling

Paper Handling Architecture

All the paper paths described below can be selected via MENU and SW commands.

The printer automatically switches from one path to the other.

Using the operator panel menu, it is possible to select one format for each path or a single format (equal for all paths).

Front Tractors

Figure 3 on page 39 and Figure 4 on page 40 show the general mechanical architecture approach of the printer in the Base Configuration (Single Tractor) and when the second optional tractor is added. A stepper motor, providing 180 paper steps per inch, moves the base tractor as well as the optional one. The dual tractor version allows the following features:

- Two fanfold forms, can be loaded, parked and moved, one at a time, on the same front path and with the same performance.
- The capability to handle two different fanfold forms at the same time on the printer will easily permits you to alternate between different print jobs that require different paper types.
- The capability to handle the same paper type on two tractors doubles the print capacity (when the first fanfold ends, the second one can be automatically loaded, continuing the print job, without operator intervention).

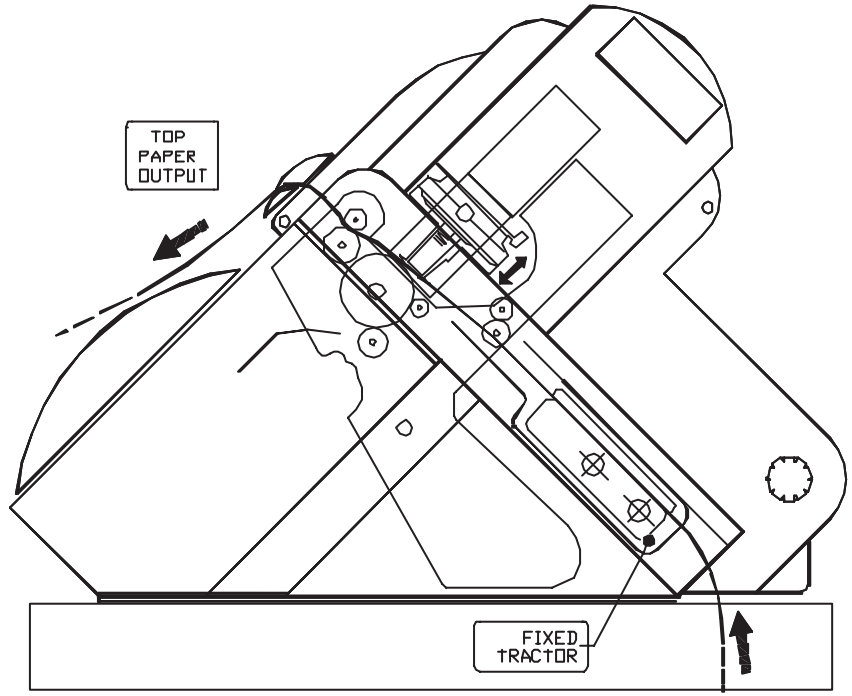


Figure 3. Single Tractor version

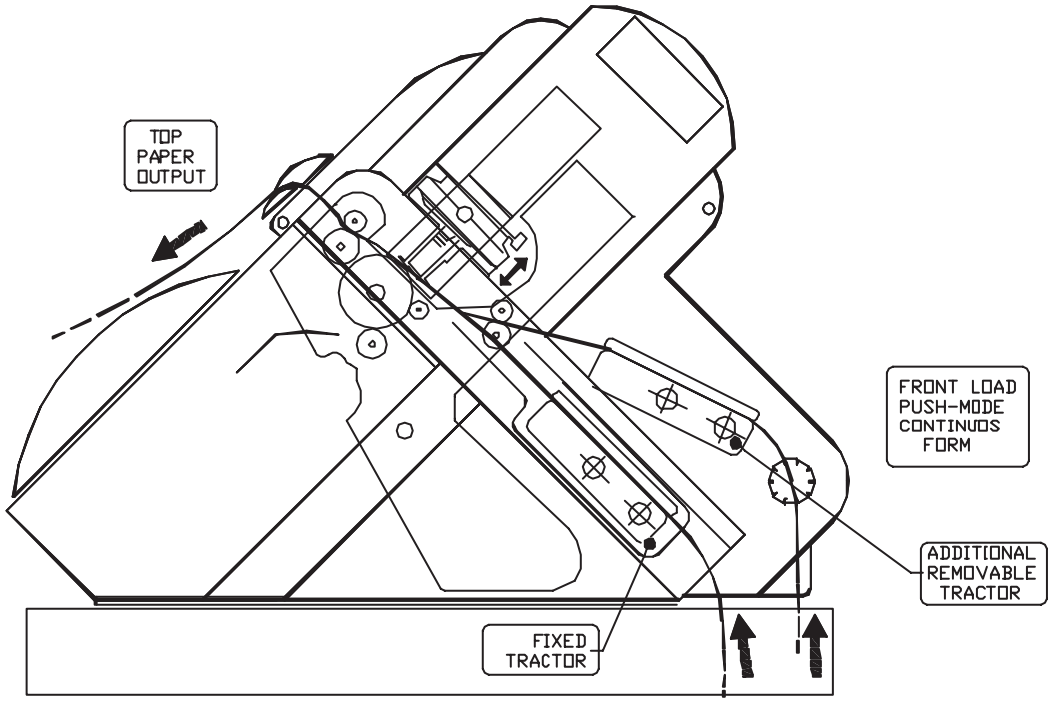


Figure 4. Dual Tractor version

Chapter 3. Removal and Replacement

This section describes the removal and replacement procedures for the basic printer.

Before starting any of these procedures, turn the power OFF, and remove the plug from the wall socket. Before disassembling the printer, remove both the paper and the inked ribbon cartridge from the printer.

REMARKS
Caution and **Danger** in this section highlight specific information. In particular:
• A **CAUTION** provides information intended to prevent any equipment damage. • A **DANGER** provides information intended to prevent any personal injury.

You must observe antistatic precautions when maintaining this printer. The procedures to disassembly this printer must be executed by accessing the printer from its front side.

Recommended Hand Tools and Equipment

The following items should be available to perform corrective maintenance on the printer.

- Assortment of Phillips head and common screwdrivers
- Set of spanners for M3 and M5 nut
- Wrench Allen type
- Pliers
- A Multimeter for resistance and voltage measurements
- Feeler gauge for print head gap adjustment
- Force gauge for carriage and motor belts adjustment
- Slender spring hook
- Set of fastener loop self-lock
- Test & Diagnostic Tools
  - Parallel Loop-Back Connector P.N. 08H7269
  - Serial 232 Loop-Back Connector P.N. 41U2467

F.R.U. ORDER OF ACCESS

Table 11 shows the accessibility of each FRU (Field Replaceable Unit), and the procedure to be performed in order to gain the access to each one.

Table 11. FRU ORDER OF ACCESS

To Remove FRU:	**Requires these procedures in the shown order:**		
1) Front Tractor Group	1	page 43	
2) Operator Panel	2	page 45	
3) PRINT HEAD	3	page 23	(*)
4) Cover Parts Removal	1, 2, 5	page 48	
5) Main Fan	5, 7	page 53	
6) Engine Board	5, 8	page 54	(*)
7) Power Supply Board	5, 7, 9	page 56	
8) Ribbon Motor	1, 2, 5, 10	page 58	
9) AGA (AFTA) Motor	1, 2, 5, 11	page 60	(*)
10) AGA (AFTA) Marker	1, 2, 5, 12	page 60	
11) Carriage Motor and Fan	1, 2, 5, 13	page 62	(*)
12) Bail Assembly	14	page 65	
13) Upper Feeder Assembly	1, 2, 5, 14, 15	page 67	
14) Platen Assembly	1, 2, 5, 14, 15, 16	page 69	(*)
15) Lower Feeder Assembly	1, 2, 5, 12, 17	page 72	(*)
16) Carriage Assembly	1, 2, 3, 5, 18	page 74	(*)
17) Sensor Cable Assembly	1, 2, 5, 19	page 77	(*)
18) Mechanical Assembly	1, 2, 5, 20	page 79	
19) Paper Motor	1, 2, 5, 20, 21	page 81	(*)
20) Ribbon Mask	22	page 83	
21) Lower Mylar	23	page 85	

Note: Procedures marked with an asterisk (*) require an ADJUSTMENT PROCEDURE (see Chapter 4, “Service Checks & Adjustments,” on page 86 for details).

All the spare parts are reported in the specific Illustrated Parts Catalogue.

Front Tractor Group

Attention: Do not remove and install the tractor group with the printer powered on.

Removable (Upper) Tractor

1. Open the front tractor cover and rotate the tractor forward.
2. Unplug the electrical connection cable (item 2) between lower and upper tractor on the right side of the lower tractor.
3. Remove the upper tractor assembly (item 1) after unhooking (item 3) it from the lower tractor.

Fixed (Lower) Tractor

1. Unscrew the two fixing screws (item 4) located on the left and right sides.
2. Remove the lower tractor unplugging the connector (item 5) on the right side. Replace the tractor group following the above instructions in reverse order.

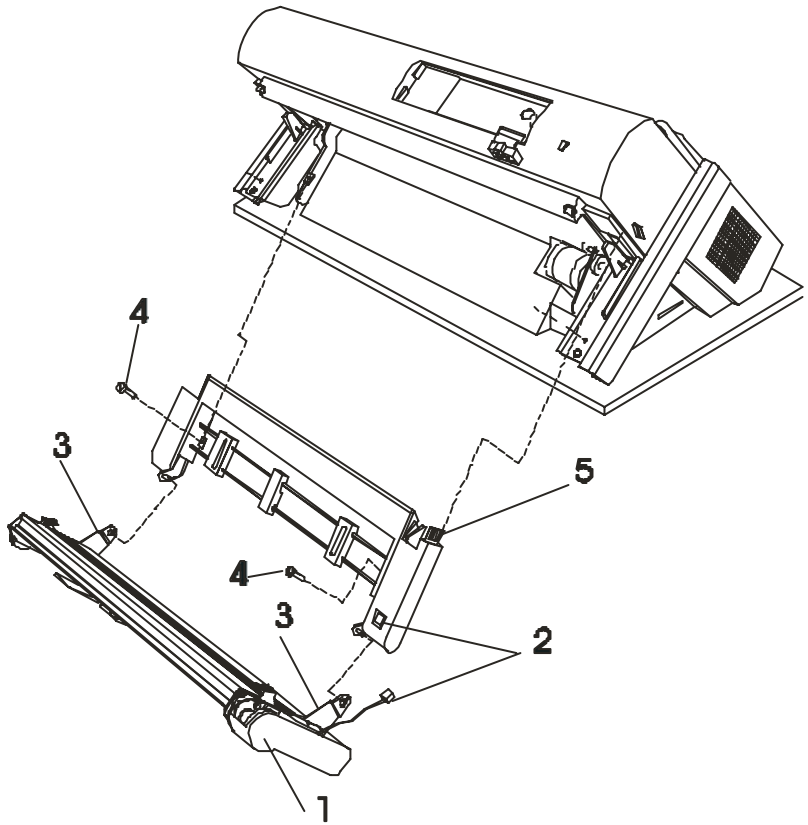


Figure 5. Front Tractor Group

Operator Panel

Attention: Do not attempt to perform this operation without taking all recommended antistatic precautions.

1. Open the top cover (item 1) and remove the ribbon cartridge.
2. Unplug the cable connector (item 2) from the rear of the Operator Panel (item 3).
3. Disengage the Operator Panel from the cover by acting on the hooks located on both sides.

Replace the operator panel following the above instructions in the reverse order.

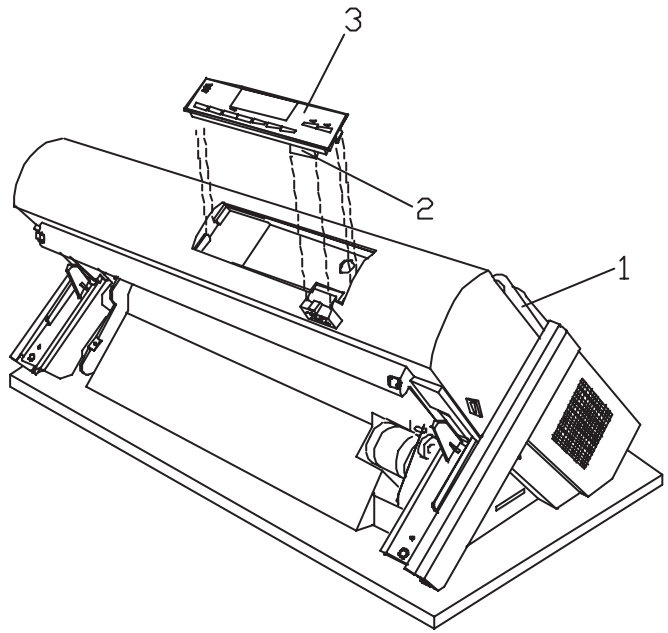


Figure 6. Operator Panel removal

Print Head

CAUTION:
The printhead may get hot during operation. Be careful when removing or replacing the ribbon.

1. Open the top cover.
2. Place the print head in the rightmost carriage position and remove the inked ribbon cartridge and the bail assembly.
3. Unscrew the screw (item 3) on the metal bracket securing the print head cable to the carriage.
4. Unscrew the two screws (item 4) (Allen type) securing the print head.
5. Unplug print head cables (item 5) from the related connectors on the print head assembly by manually pulling on their bends.
6. Remove the print head (item 6).

Replace the Print Head following the above instructions in the reverse order.

Note: Before securing the screws, push the Print Head to its internal stop position. First secure the right screw and then the left one with a force = 25kgcm ± 1Kgcm. Run the AGA calibrate routine to adjust the gap.

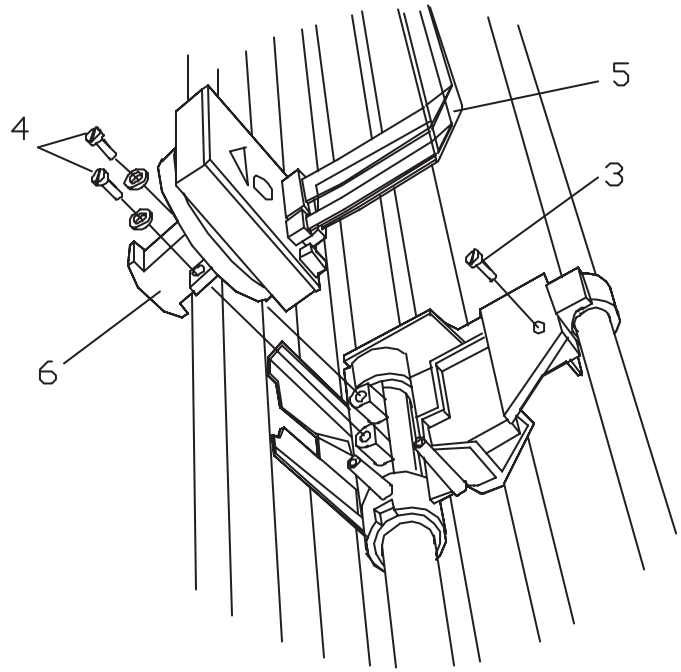


Figure 7. Print Head

Cover Parts Removal

Attention: Before operating make sure to turn the power OFF

1. Open the front tractor cover (item 1) and remove it by unhooking it from the main cover (item 14).
2. Open the top cover (item 2) and remove it by acting on its pins located on both sides.
3. Remove the magnetic interlock (item 3) by pulling it out the top cover.
4. Remove the large, rear cover (item 4) by extracting it from the main rear cover.
5. Remove the small rear cover with the interlock board (item 5), by extracting them from the main rear cover.
6. Remove the right and left gear covers and the paper deflector (item 6).
7. Remove the paper knob (item 7).
8. Unscrew the two screws (item 8) located on the back of the rear cover.
9. Unscrew the two screws (item 9) located on both sides of the main cover.
10. Remove the rear cover (item 10).
11. Remove the upper tractor (item 11).
12. Unscrew the two screws (item 12) located on the front of the main cover.
13. Unplug the connector of the Operator Panel cable (item 13) and extract it from the cable clamp.
14. Remove the main cover (item 14).

Replace the Cover Parts following the above instructions in the reverse order.

Note: Skip step 3 if the replacement of the magnetic interlock is not required.

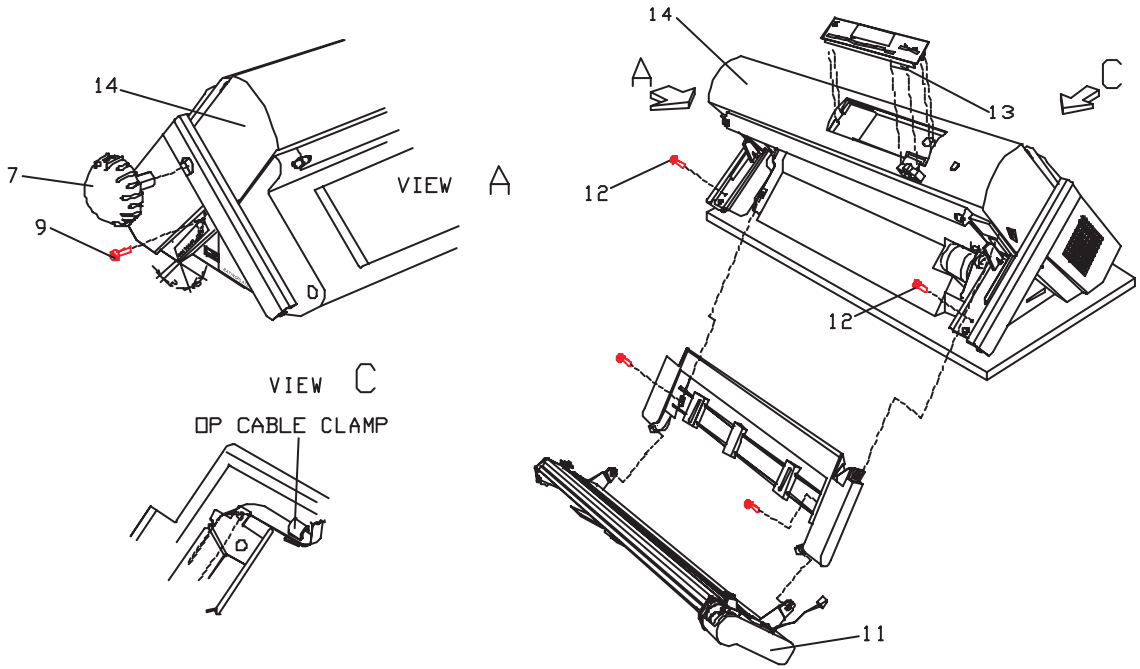


Figure 8. Cover Parts

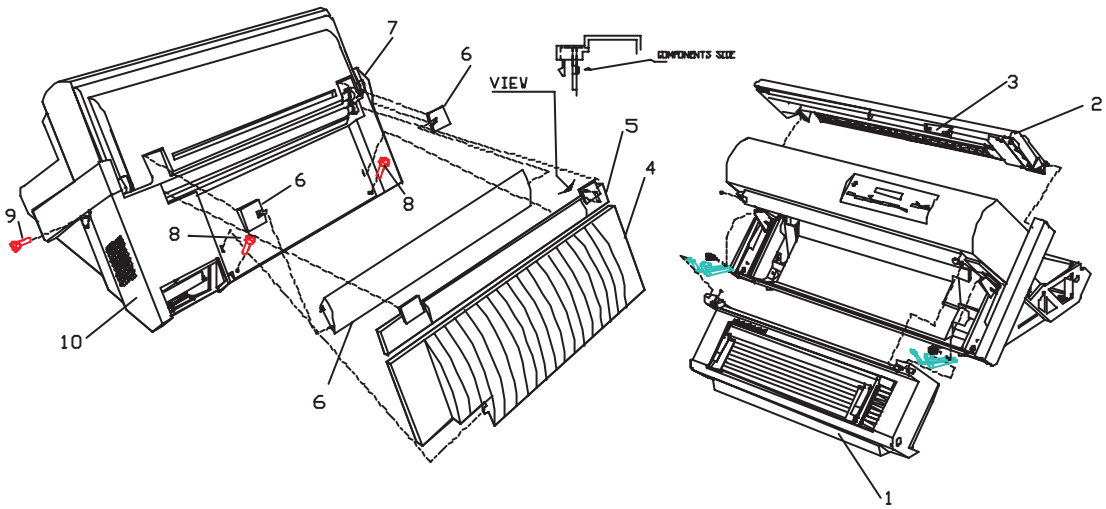


Figure 9. Cover Parts (cont.)

Controller Board

Attention: Do not attempt to perform this operation without having taken all recommended antistatic precautions. Turn the power OFF.

1. Unscrew the two screws (item 45) securing the Controller board to the base assembly.
2. Remove the Controller Board (item 115) by pulling it out from its slot.

Replace the Controller Board following the above instructions in the reverse order.

Download the proper firmware as needed.

Note: Firmware is installed in all Controller Board FRUs. However, you should check the version level of the new controller's firmware to ensure it is at the required level. The Controller firmware version level is displayed on the Operator Panel during power on initialization.

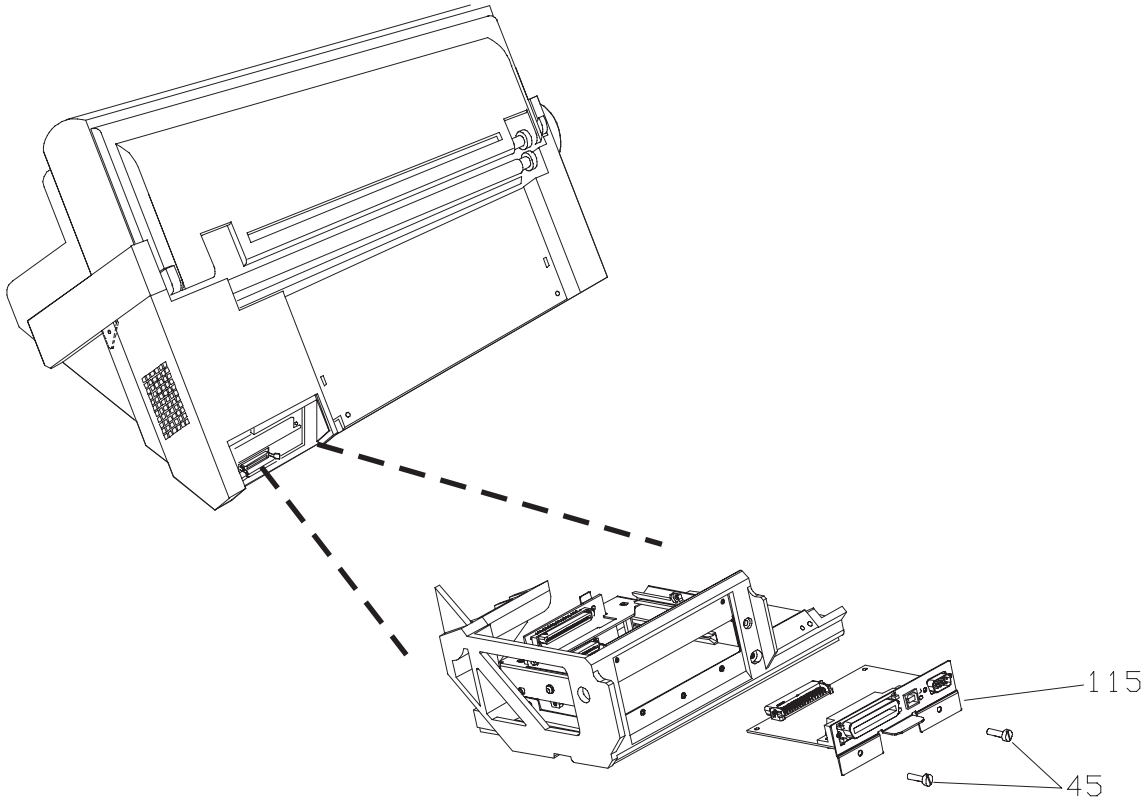


Figure 10. Controller Board

Main Fan

1. Remove the rear cover group.
2. Unscrew the two screws (item 1) securing the main fan plastic support (item 4) to the base assembly.
3. Unplug the fan connector (item 2) from the power supply board.
4. Remove the Main Fan (item 3) by extracting it and catching it by its plastic support.

Replace the Main Fan with the support following the above instructions in the reverse order.

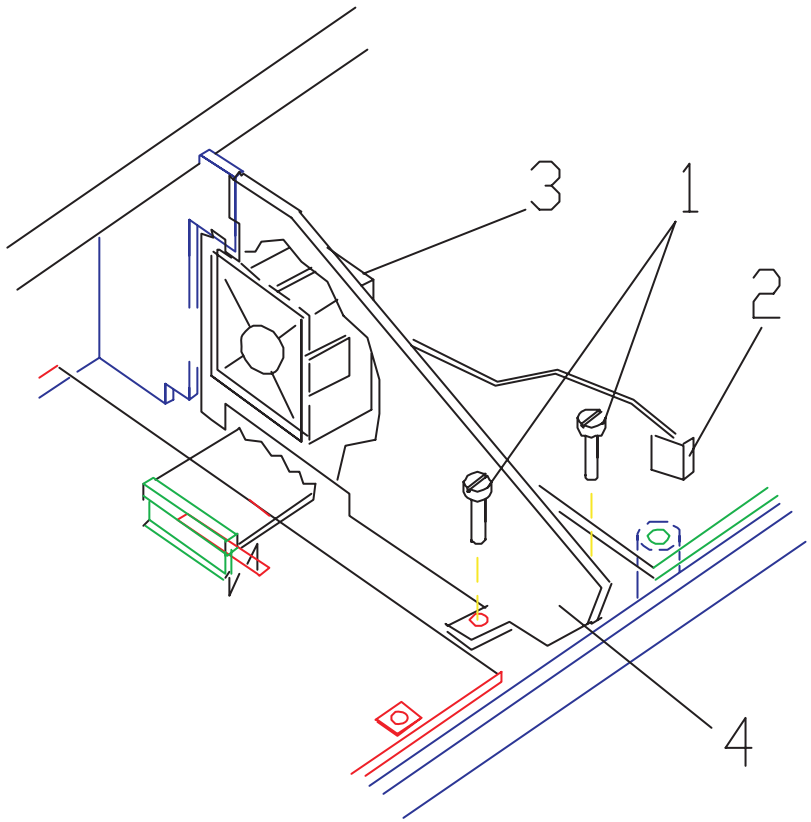


Figure 11. Main Fan

Engine Board

Attention: Do not attempt to perform this operation without having taken all recommended antistatic precautions.

1. Remove the rear cover group.
2. Remove the Controller Board from the sliding box.
3. Unscrew the four screw (item 114 on top, lateral and rear side) and remove the sliding box.
4. Unplug all the connectors from the main board by acting on their bends.
5. Unscrew the screw securing the metal plate (item 111) to the base and extract the metal plate.
6. Unplug and remove the Back Panel Board (item 110) from the Engine board.
7. Unscrew the seven screws securing the Engine board and extract it from the base.

Replace the Engine Board following the above instructions in reverse order, paying attention both to the rear horizontal guides and the relevant bottom shield.

Note: When a new engine board spare part is installed, the printer after initialization automatically display the message "RUN T&D". You have to run firstly the T&D Step By Step in the “T&D03 - NVM COMPLETE TEST” on page 155 in order to correctly inizialize the NVM with the proper Device ID parameters. After that you have to perform complete T&D to readjust the values stored in NVM. (AGA, first printing line, vertical bidirectional, tearing, sensor tuning).

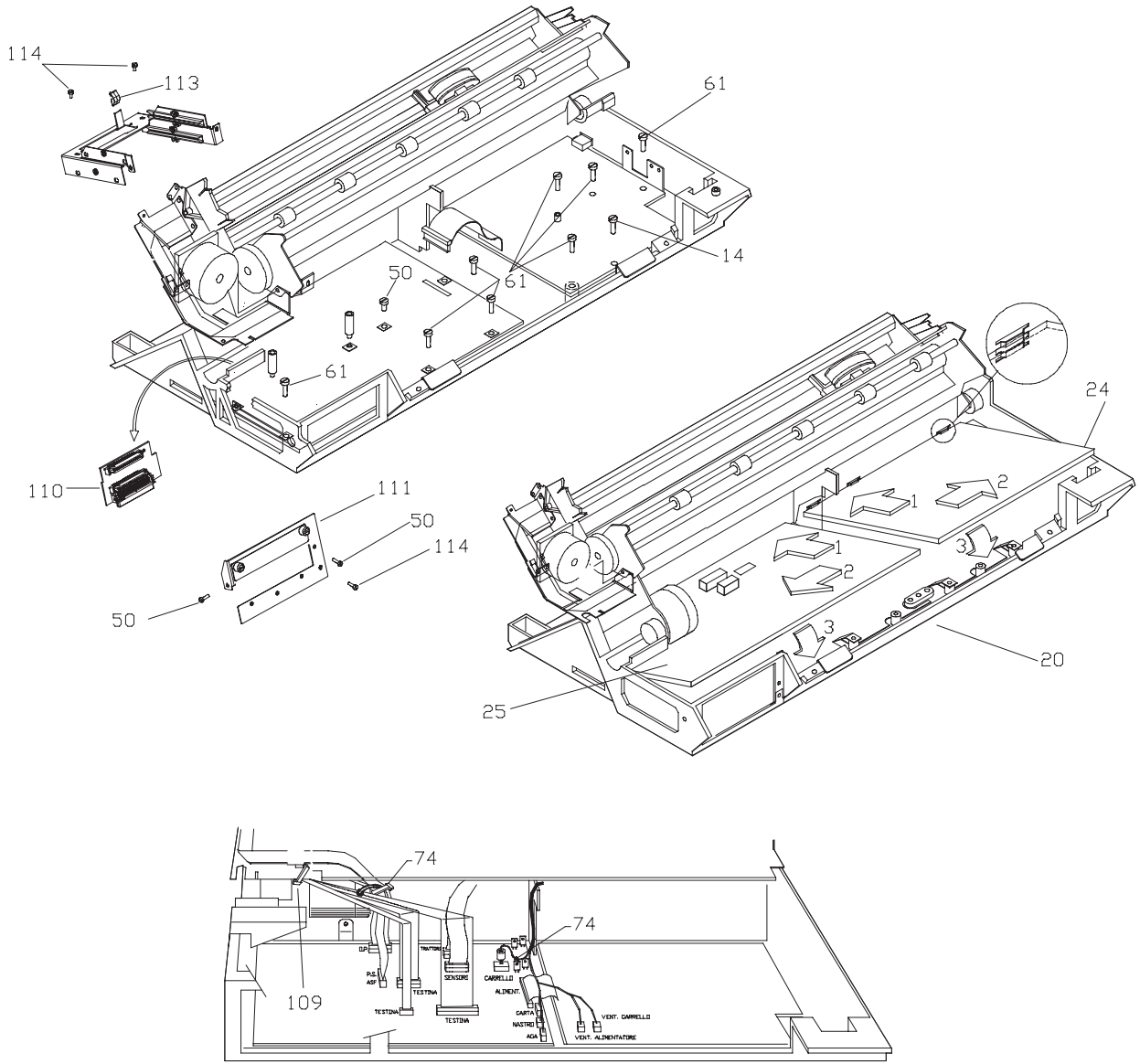


Figure 12. Engine Board

Power Supply Board

Attention: Do not attempt to perform this operation without having taken all recommended antistatic precautions.

1. Remove both the main rear cover and the main fan.
2. Unplug the two fan connectors from the Power Supply Board.
3. Unscrew the two screws (item 51) fixing the fan support and extract it together to the fan assembled.
4. Unscrew the screw securing the inlet bracket (item 37) and remove it.
5. Unscrew the screw (item 62) securing the ground cable to the metal shield.
6. Unscrew the screw (item 45) fixing the ground strip of the mechanical assembly to the lower shield.
7. Unscrew the screws securing the power supply cover (item 49) to the lower shield and remove it.
8. Unscrew the six screws securing the power supply board to the base unit.
9. Unplug the connector from the main board and gently extract the power supply board from the printer.

Replace the Power Supply Board following the above instructions in the reverse order, paying attention to the rear horizontal guides.

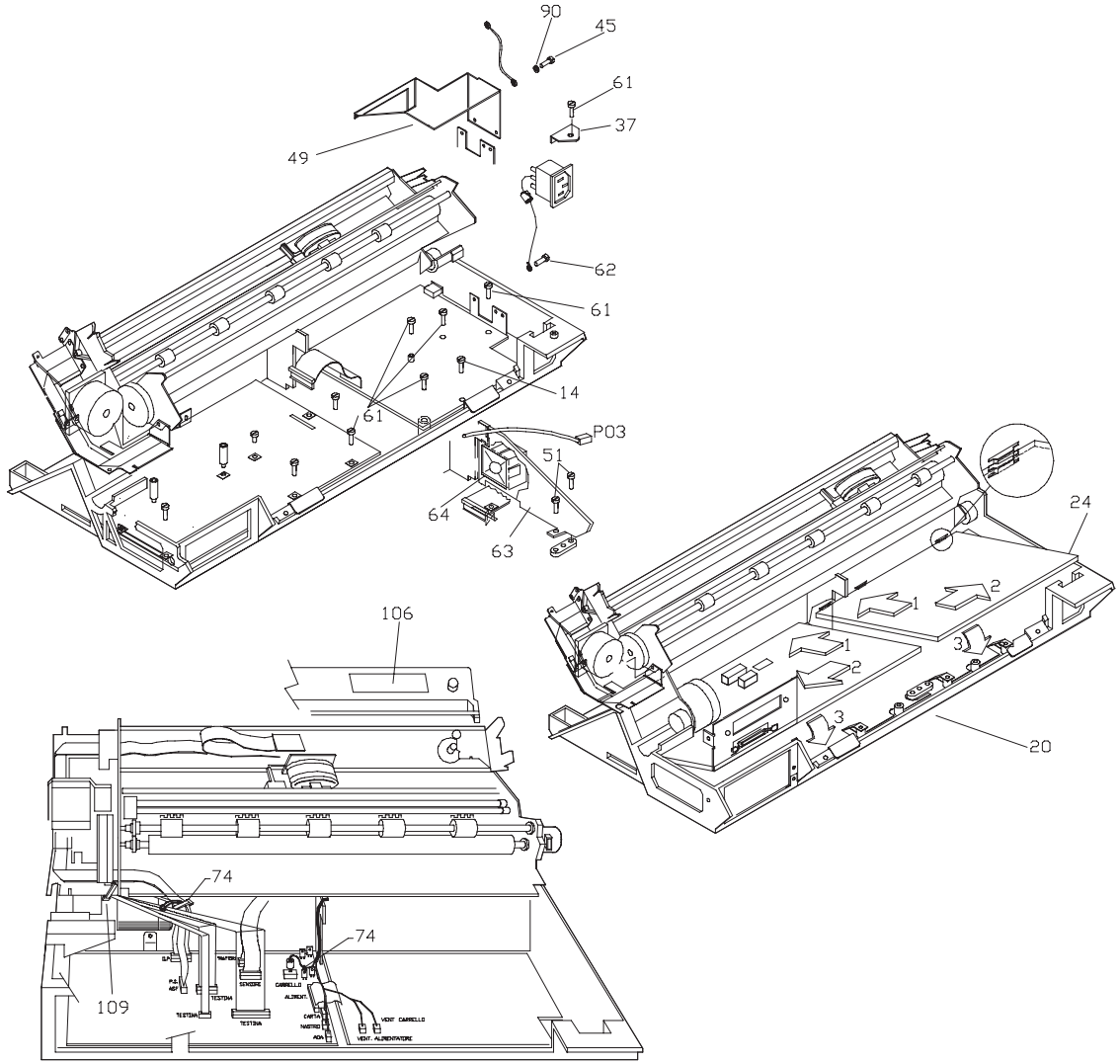


Figure 13. Power Supply Board

Ribbon Motor

1. Remove the Main, Rear, and Front Covers.
2. Remove the “C” ring (item 104) that retains the pivot assembly to the left ribbon cartridge support (item 102).
3. Unscrew the four screws (items 106 and 107) securing the left ribbon cartridge support on the left side of the mechanical assembly (item 3).
4. Extract the ribbon motor (item 105) from the plastic support.
5. Remove the plastic support and the pivot assembly (item 103) from the mechanical assembly.
6. Unplug the ribbon motor connector from the Engine Board and extract the cable from the cable from its cable retainers, located in the rear part of the mechanical assembly.
7. Remove the pivot assembly with the related two washers.

Replace the ribbon motor assembly and the left support parts following the above instructions in the reverse order.

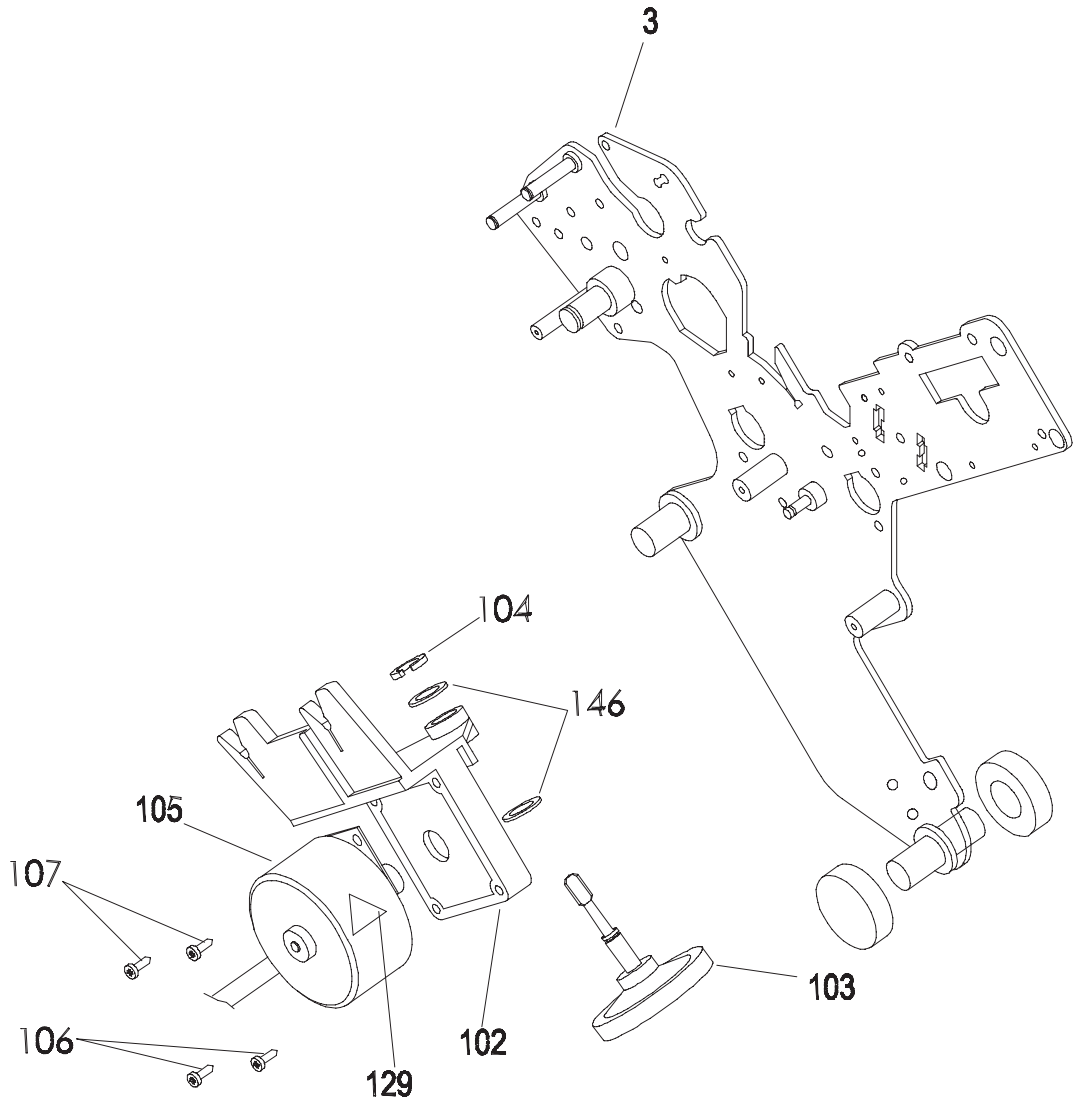


Figure 14. Ribbon Motor and left cartridge support

AGA (AFTA) Motor

1. Remove the Main, Rear, and Front Covers.
2. Unscrew the two screws (item 87) securing the AGA (AFTA) Motor (item 86) to the mechanical assembly.
3. Unplug the AGA (AFTA) Motor connector from the Engine Board and extract the cable from its cable retainers, located on the rear part of the mechanical assembly.
4. Remove the AGA (AFTA) Motor assembly.

Replace the AGA (AFTA) Motor following the above instructions in the reverse order.

NOTICE: Before tightening the motor screws, apply a pushdown force in order to avoid any risk of sticking the gears. Ensure the cable routes around the AGA (AFTA) gear (it must not touch any moving mechanical part). Before tightening the motor screws, verify the correct and free movement of the AGA (AFTA) gears. Run the AGA (AFTA) calibration procedure to verify the correct AGA (AFTA) Marker position.

AGA (AFTA) Marker

1. Remove the Main, Rear, and Front Covers.
2. Unscrew the two screws (items 112 and 184) securing the AGA (AFTA) Marker (item 109) on the left side of the mechanical assembly (item 3).
3. Remove the AGA (AFTA) Marker.

Replace the AGA (AFTA) marker following the above instructions in the reverse order.

NOTICE: Put the AGA (AFTA) Marker in the same position as the previous one. Run the AGA (AFTA) calibration procedure to verify the correct AGA (AFTA) Marker position.

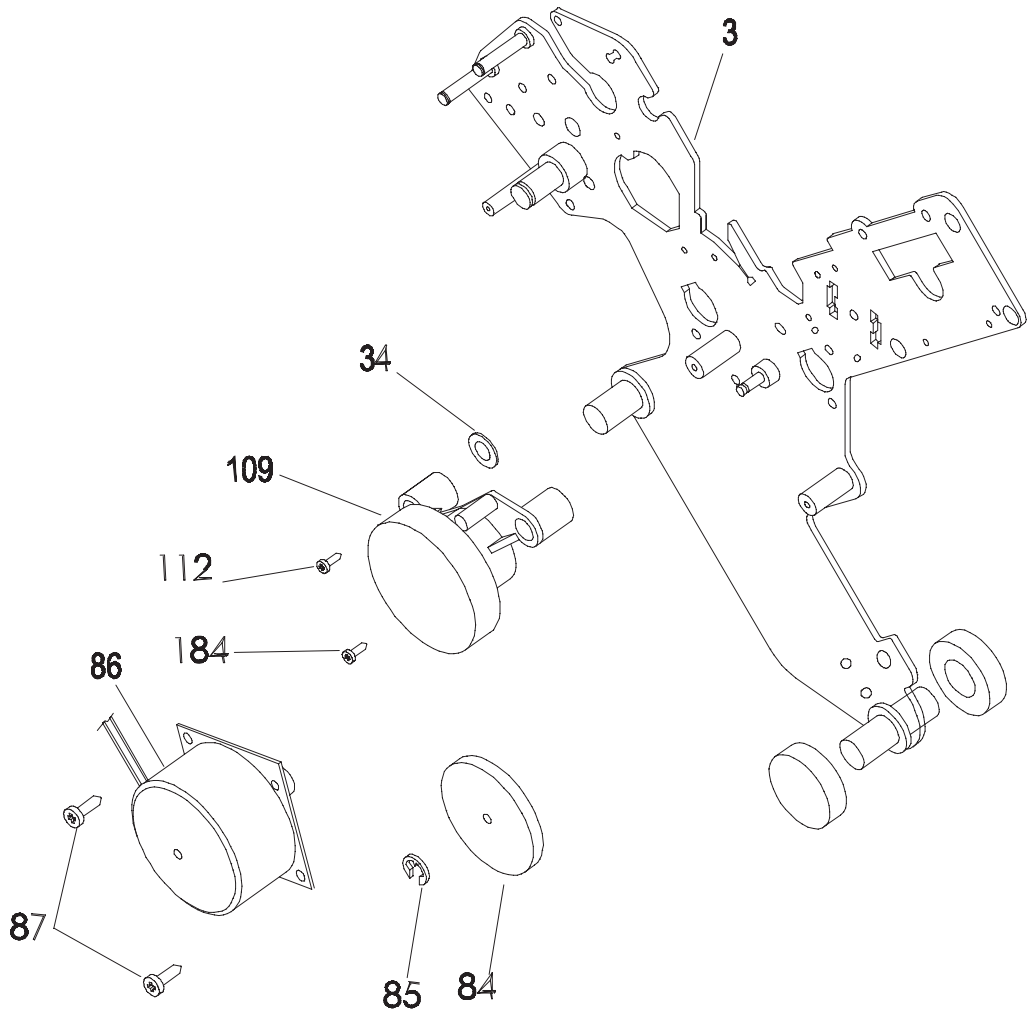


Figure 15. AGA (AFTA) Motor and AGA (AFTA) Marker

Carriage Motor and Fan

1. Remove the Main, Rear, and Front Covers.
2. Unplug the carriage motor fan connector (P03) from the power supply board and extract the cable from its cable retainers, located in the rear part of the mechanical assembly.
3. Keeping the nuts (item 67) by means of a spanner, unscrew the two screws (item 66) securing the carriage motor fan to the mechanical assembly.
4. Remove the carriage motor fan.
5. Cut the self-lock plastic strips retaining the cables to the carriage motor bracket.
6. Unscrew the two screws securing the motor bracket both on the right side of the mechanical assembly and to the ground shield.
7. Remove the M3 nut which secures the motor bracket to the front tractor connector support.
8. Remove the rear motor bracket (item 193) by taking it from the rear.
9. Unplug the carriage motor connector from the main board and remove the cable from its cable retainers, located in the rear part of the mechanical assembly.
10. Unscrew the four studs securing the carriage motor to its support.
11. Slide off the carriage belt from the carriage motor pulley.
12. Remove the carriage motor assembly.

Replace the carriage motor assembly following the above instructions in the reverse order.

NOTICE: The carriage motor replacement requires an appropriate carriage belt adjustment (refer to Chapter 4, “Service Checks & Adjustments,” on page 86 for details).

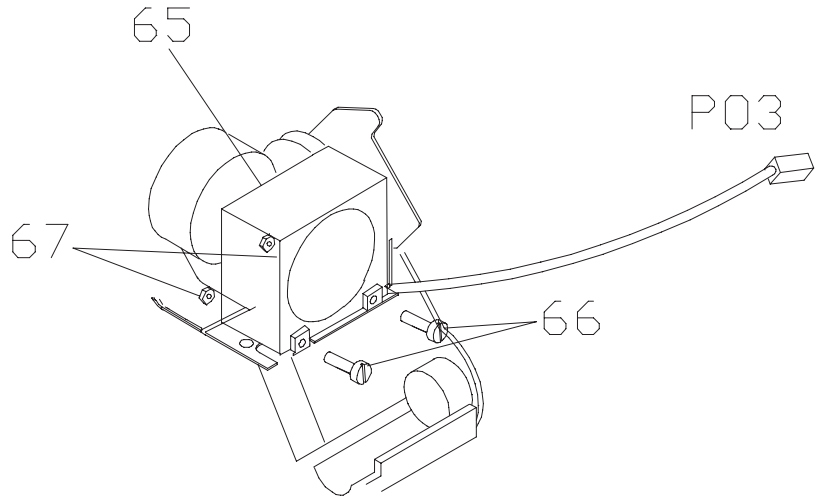


Figure 16. Carriage Motor Fan

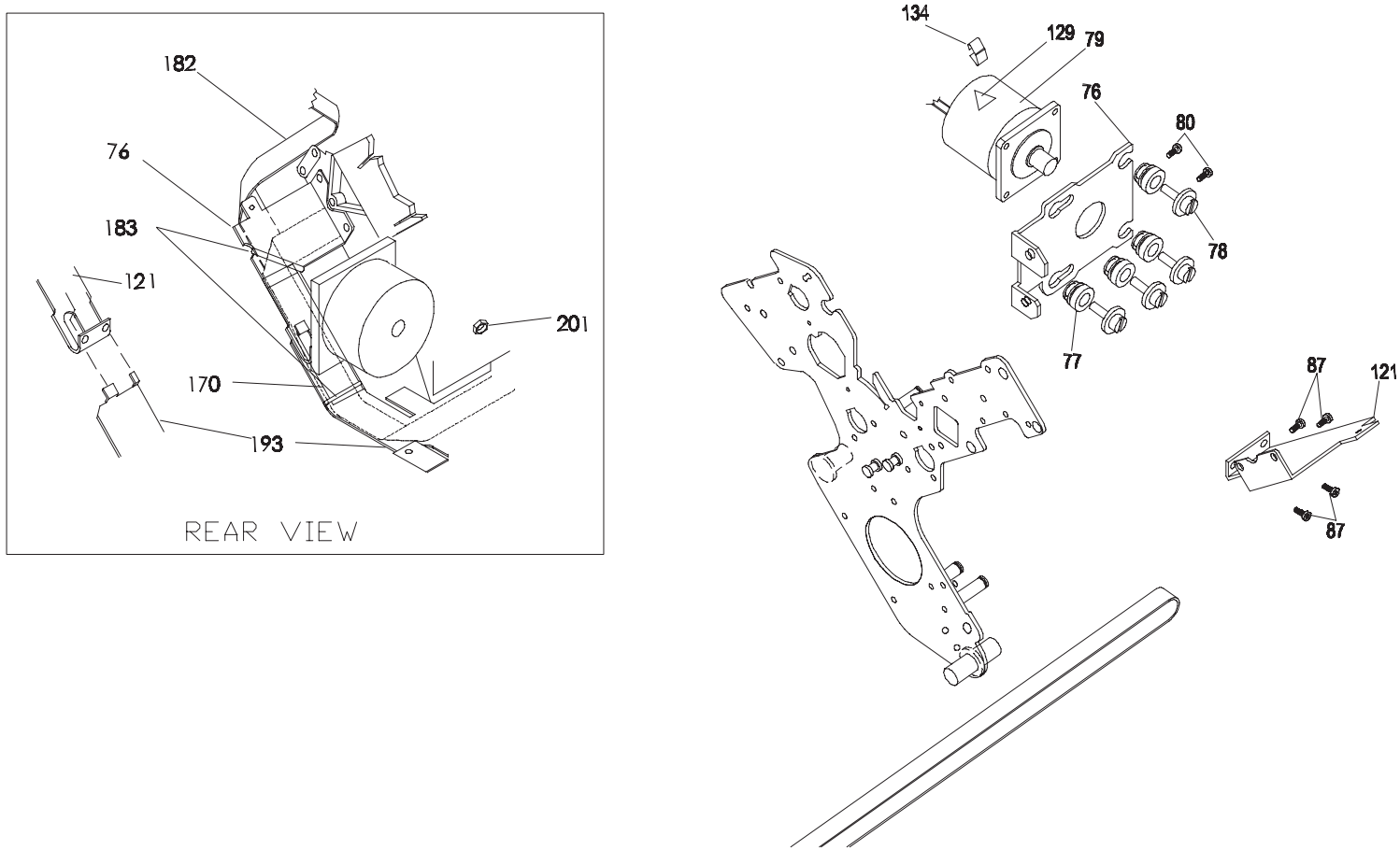


Figure 17. Carriage Motor

Bail Assembly

1. Open the top cover group.
2. Put the carriage unit in the rightmost position.
3. Rotate the bail assembly (item 101) toward its front side, in order to unhook it from both the left and the right mechanical frames.
4. Remove the bail assembly.

Replace the bail assembly following the above instructions in the reverse order.

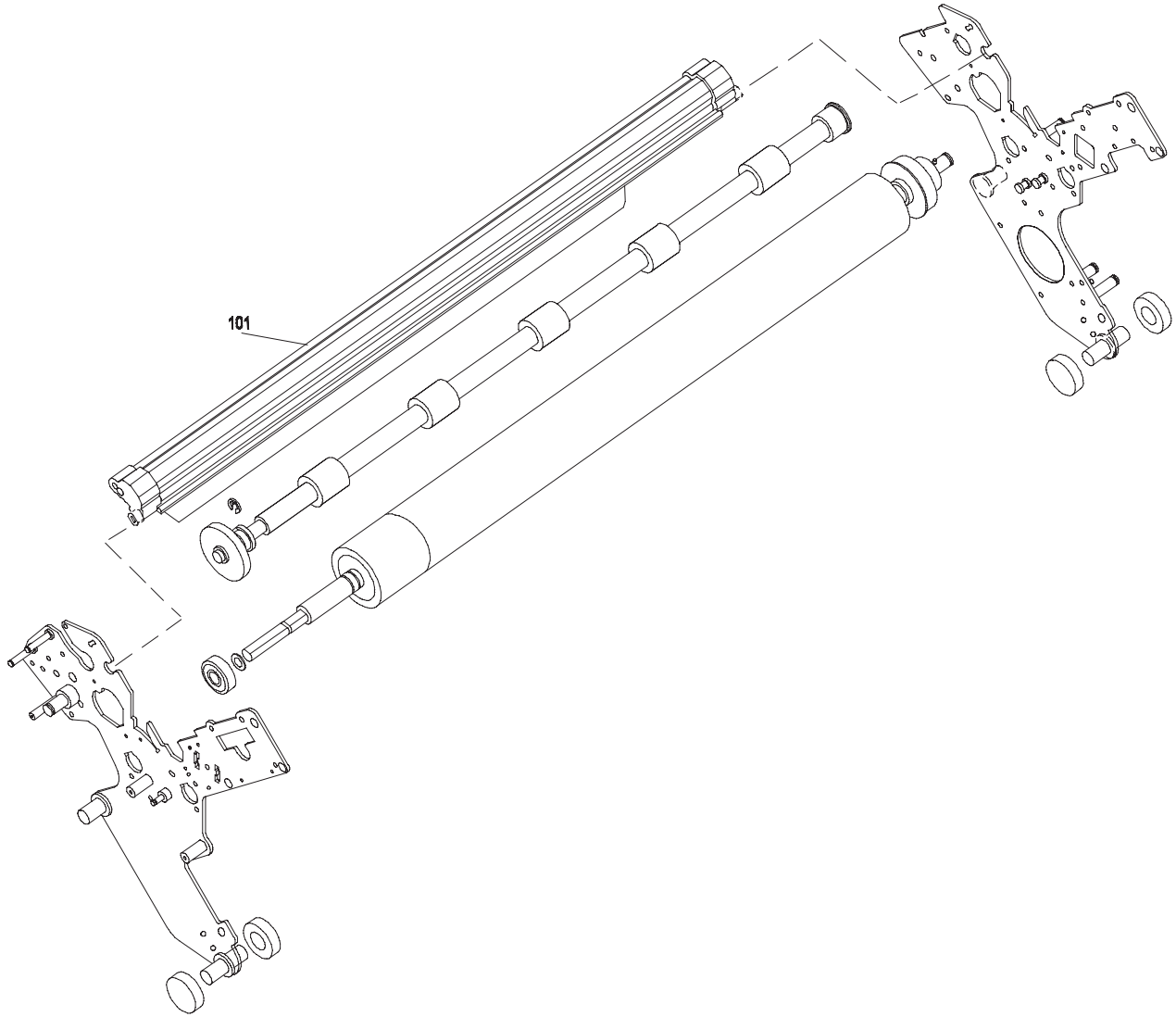


Figure 18. Bail Assembly

Upper Feeder Assembly

1. Remove the Main, Rear, and Front Covers.
2. Remove the inked ribbon cartridge.
3. Remove the bail assembly.
4. Remove the “C” ring (item 9) which retains the upper feeder axis on the left side of the mechanical assembly, and shift the bushing on the feeder assembly axis to the right.
5. Remove the right bushing (item 8).
6. Rotate the platen belt out of the upper feeder assembly gear.
7. Remove the upper feeder assembly (item 90) from the left side of the mechanical assembly, and slightly rotate the feeder assembly located on the left side towards the front side.

Replace the upper feeder assembly following the above instructions in the reverse order.

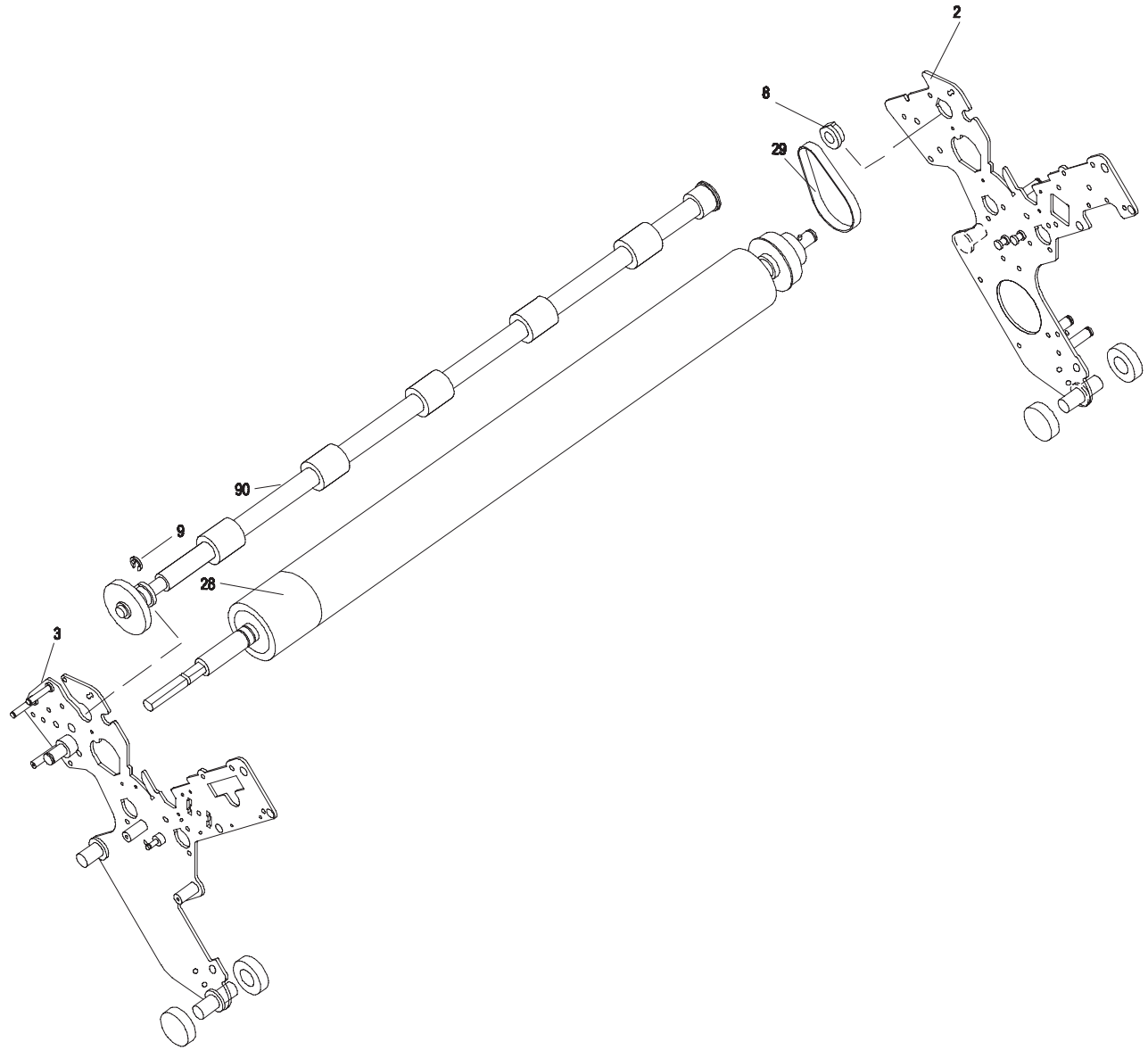


Figure 19. Upper Feeder Assembly

Platen Assembly

1. Remove the Main, Rear, and Front Covers.
2. Remove the upper feeder assembly.
3. Remove the AGA (AFTA) Marker.
4. Remove the “C” ring (item 9) which retains the platen assembly to the pulley gear.
5. Unscrew the two screws securing the bearing bracket (item 30) to the left side of the mechanism and remove it.
6. Remove both the bearing (item 31) and the special washer (item 118) from the platen axis.
7. Put the print head to its maximum distance from the platen assembly.
8. Gently shift the platen assembly (item 28) to the left from its position, and then remove it from the left side of the mechanical assembly.

Replace the platen assembly following the above instructions in the reverse order.

NOTICE: Before tightening the platen retainer screws, push down the retainer as indicated in Figure 21 on page 71, then secure the screws A and B, following this order. The platen assembly replacement requires an appropriate print head gap adjustment procedure (please, refer to Chapter 4, “Service Checks & Adjustments,” on page 86 for details).

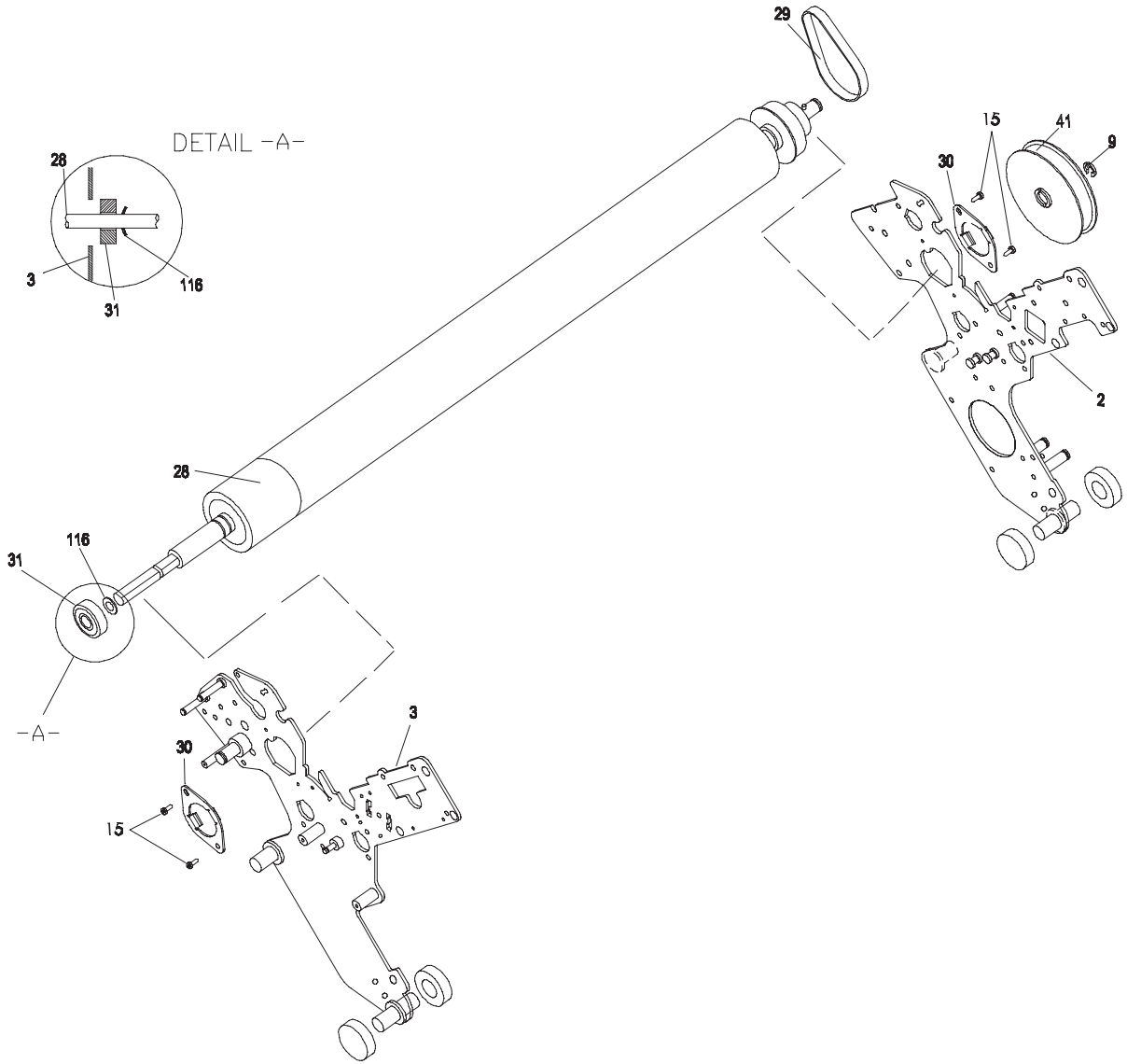


Figure 20. Platen Assembly

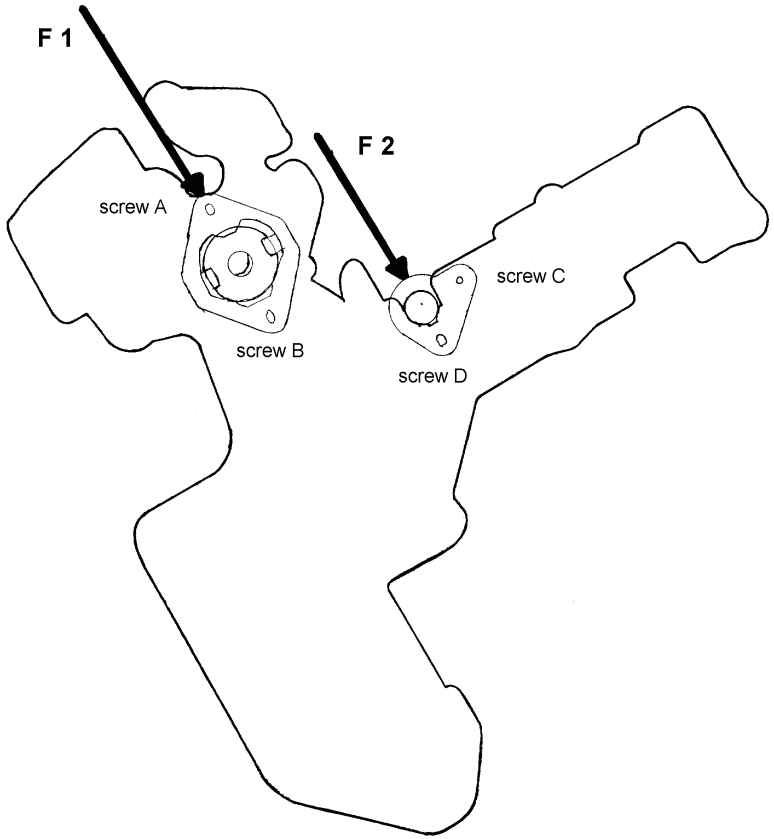


Figure 21. Force for fixing platen and main shaft of carriage assembly

Lower Feeder Assembly

1. Remove the Main, Rear, and Front Covers.
2. Remove the AGA (AFTA) Marker. AGA (AFTA) Motor, and AGA (AFTA) gear.
3. Unscrew the screw securing the AGA (AFTA) sector to the main shaft, then remove it.
4. Remove the carriage motor assembly.
5. Loosen the paper belt tensioning lever screw and remove the paper belt from the lower feeder assembly gear (item 10). Remove the “C” ring (item 18) and remove the lower feeder gear to the axis.
6. Unscrew the four screws securing the metal profile (item 5) to the mechanical assembly and remove the profile from the front side.
7. Remove the “C” ring (item 9) retaining the lower feeder axis on the right side of the mechanical assembly, then slide the feeder assembly out of its location.
8. Remove the lower feeder assembly (item 6) by extracting it from the mechanism.

Replace the lower feeder assembly following the above instructions in the reverse order.

NOTICE: The lower feeder assembly replacement requires an appropriate carriage and paper belt adjustment procedure (refer to Chapter 4, “Service Checks & Adjustments,” on page 86 for detailed information).

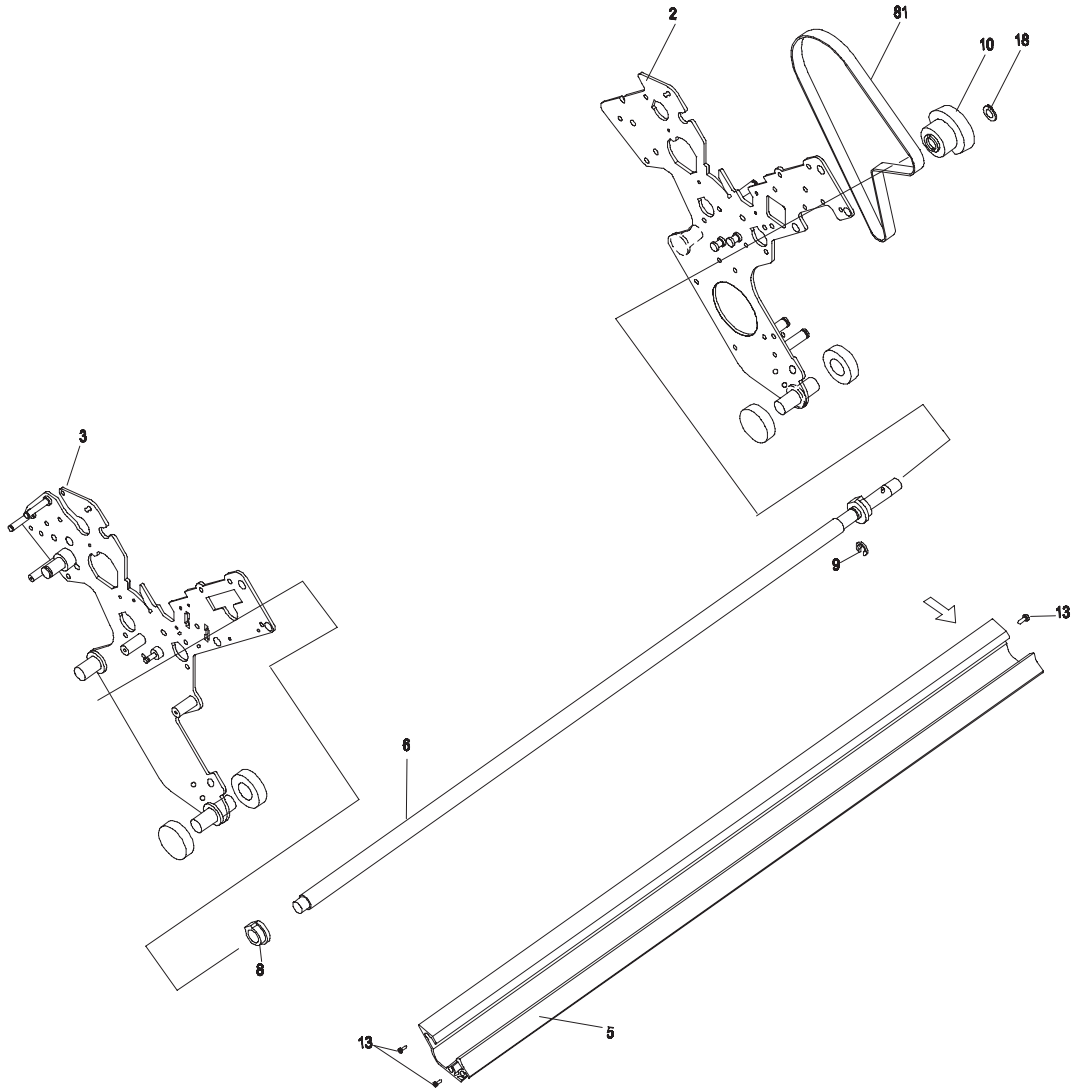


Figure 22. Lower Feeder Assembly

Carriage Assembly

Attention: Before starting this procedure, put the carriage assembly at the maximum distance from the platen assembly, in order to avoid any print head mask damage.

1. Remove the Main, Rear, and Front Covers.
2. Remove the print head.
3. Remove both the AGA (AFTA) Marker and the AGA (AFTA) sector on the left side.
4. Unscrew the screw securing the carriage belt to the carriage assembly.
5. Unscrew the two screws securing the main shaft retainer to the left side of the mechanism.
6. Gently pull the front bar on the right side and move it leftwards at the same time, in order to remove it.

   Be careful not to damage the little springs (item 144 of Figure 23 on page 75 and Figure 24 on page 76) located between the front bar and the frame, on each side.
7. Gently rotate the carriage assembly keeping the front bar upwards and remove it from the rear bar.

Replace the carriage assembly following the above instructions in the reverse order.

Before tightening the front bar retaining screws, push down the retainer as indicated by F2 in Figure 21 on page 71, then secure the screws C and D, following this order.

NOTICE: The carriage assembly replacement requires the appropriate print head gap and carriage belt adjustment procedures (refer to Chapter 4, “Service Checks & Adjustments,” on page 86 for detailed information). Slowly insert the front bar into the carriage holes, being careful with the oil-felt inside it.

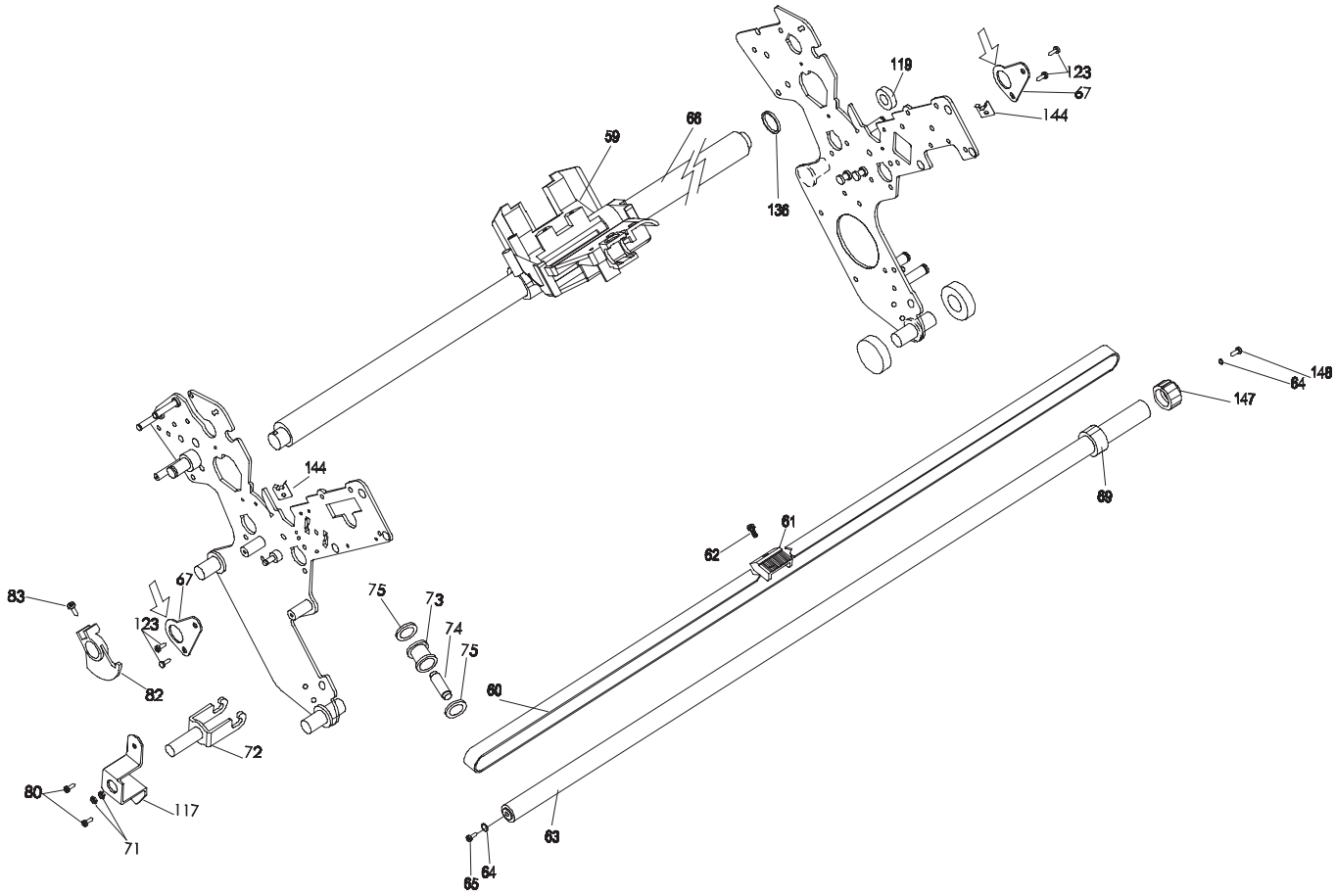


Figure 23. Carriage Assembly

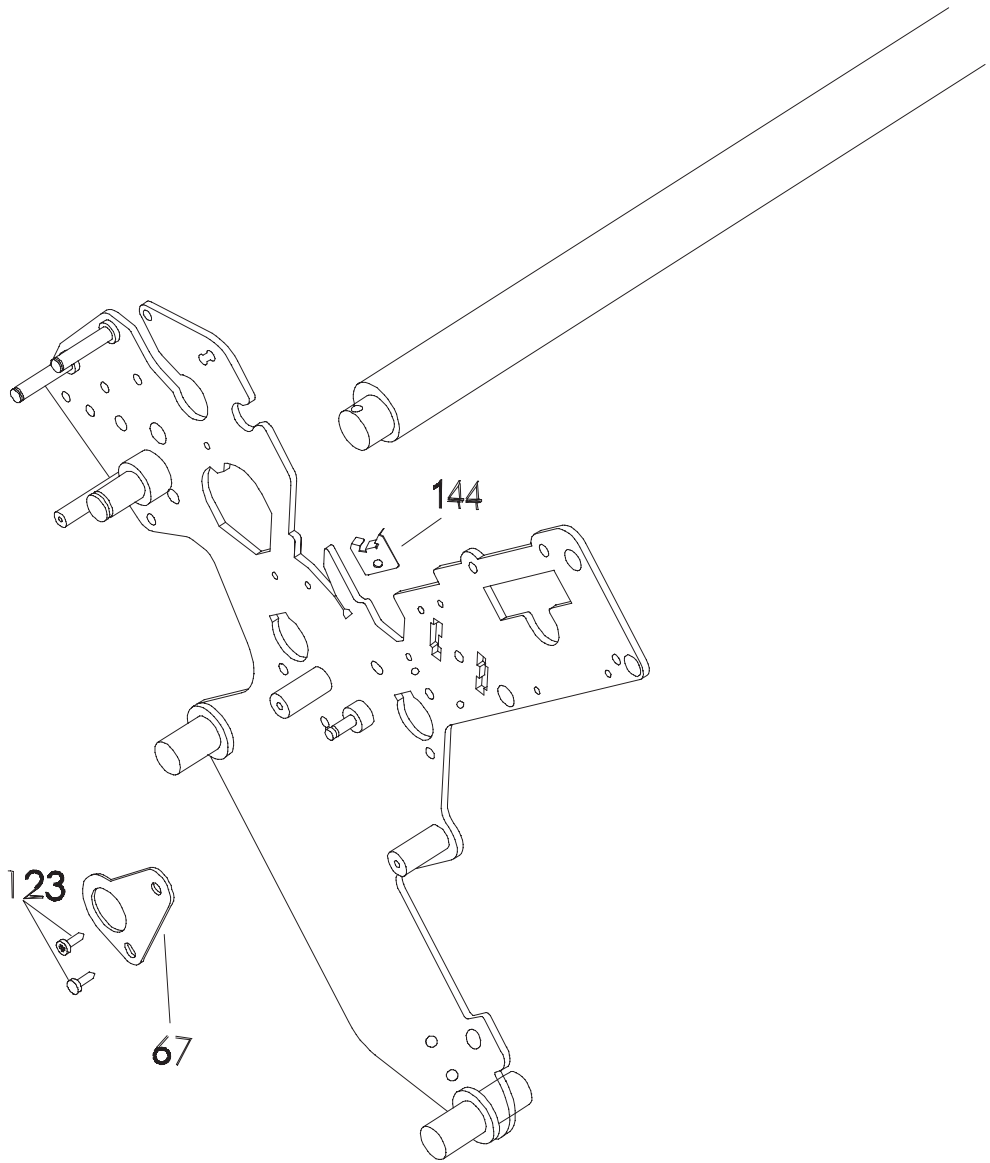


Figure 24. Particular of little spring and main shaft

Sensor Cable Assembly

1. Remove the Main, Rear, and Front Covers.
2. Remove the AGA (AFTA) Marker on the left side part.
3. Remove the ribbon motor and the relevant support.
4. Remove the platen assembly.
5. Unscrew the single sheet or upper tractor path sensor (V04) from its metal support and remove it from the left side of the mechanical assembly.
6. Unscrew the screw securing the front upper sensor (V03) to its support.
7. Unscrew the screws securing both the ribbon fault (V01) and the home position sensors (V02) to the plastic support.
8. Unplug the connector from the main board and remove the cable from its cable retainers, which are located in the rear part of the mechanical assembly.

Replace the sensor assembly following the above instructions in the reverse order.

Note: Sensor Tuning procedure has to be performed. (See T&D description in Chapter 5, “Service Maintenance,” on page 112 for details).

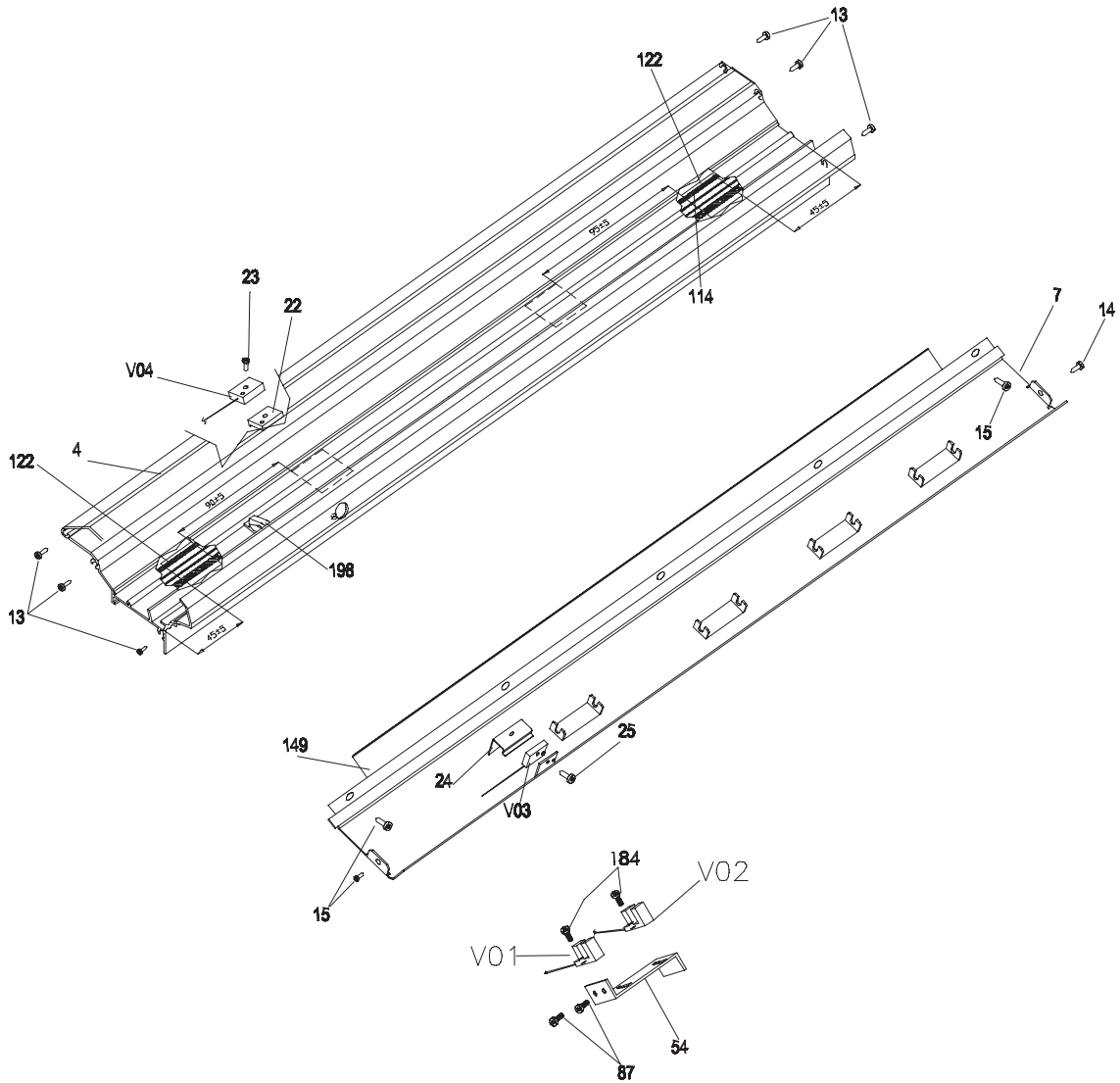


Figure 25. Sensor Cable Assembly

Mechanical Assembly

1. Remove tractor assembly.
2. Remove the Main, Rear, and Front Covers.
3. Unscrew the screws securing the ground strips to the lower shield on both sides of the printer.
4. Unplug all connectors from the main board and the connector of the carriage fan from the power supply.
5. Unscrew the two screws (item 179) retaining the mechanical block (item 175) to the base assembly.
6. Cut the two plastic self-locked strips (item 179) which hold the mechanical blocks to the base assembly and remove the mechanical assembly.
7. Pay attention to the paper position mylar (item 188) on the base assembly.

Replace the mechanical assembly following the above instructions in the reverse order.

Note: Run compete T&D to perform the adjustments. (See Chapter 5, “Service Maintenance,” on page 112).

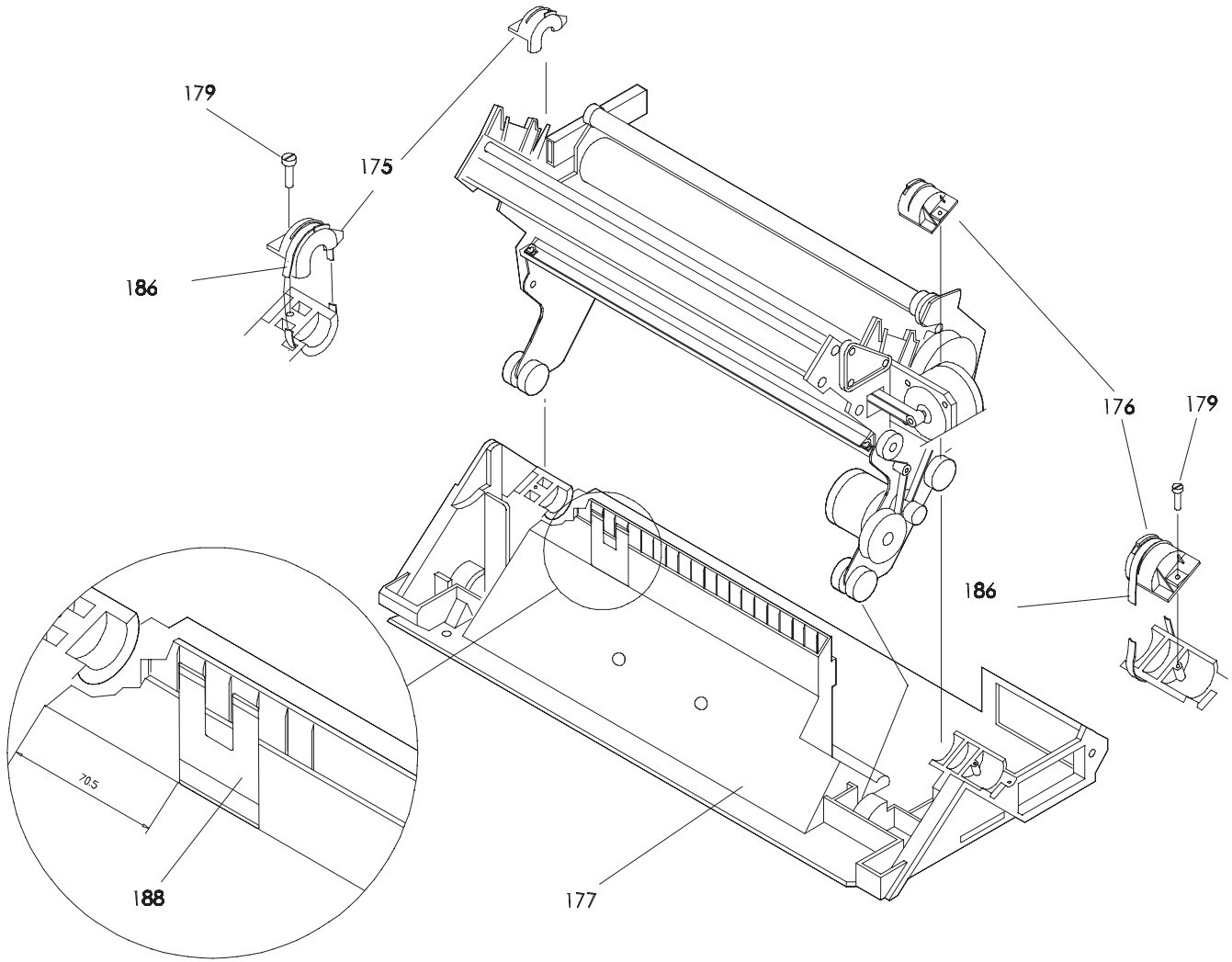


Figure 26. Mechanical Assembly

Paper Motor

1. Remove the Main, Rear, and Front Covers.
2. Remove the mechanical assembly.
3. Loosen the paper belt tensioning lever (item 47) acting on the screws (item 51).
4. Remove the paper belt (item 81) from the paper motor gear.
5. Unscrew the four screws (items 42 and 44) securing the paper motor (item 43) to the right side of the mechanical assembly and remove it.

Replace the paper motor following the above instructions in the reverse order.

NOTICE: The paper motor replacement requires appropriate paper belt adjustment procedure (refer to Chapter 4, “Service Checks & Adjustments,” on page 86 for detailed information).

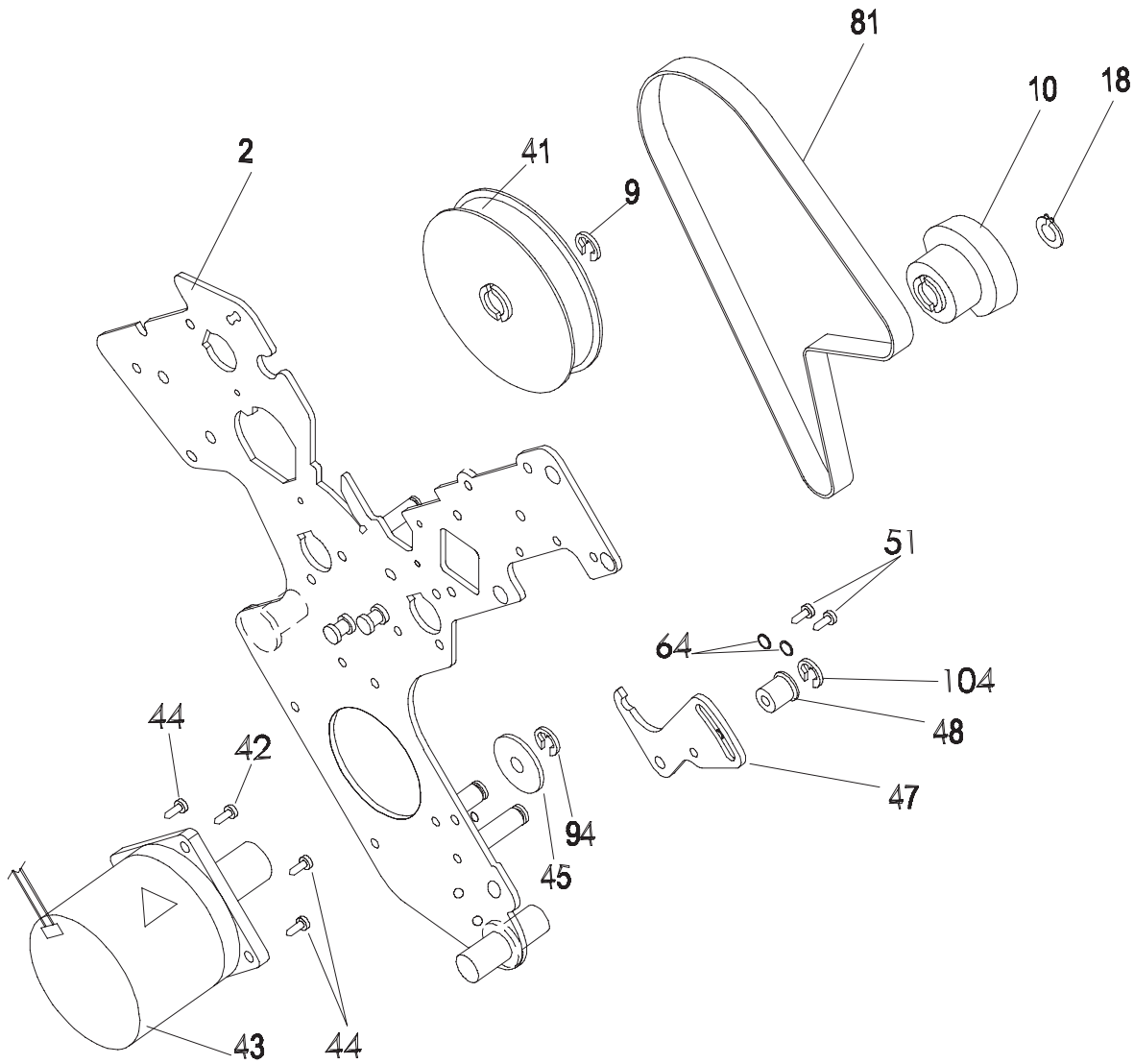


Figure 27. Paper Motor

Ribbon Mask

1. Open the top cover.
2. Remove the inked ribbon.
3. Unscrew the screws A and B.
4. Gently remove the ribbon mask.

Replace the ribbon mask following the above instructions in the reverse order.

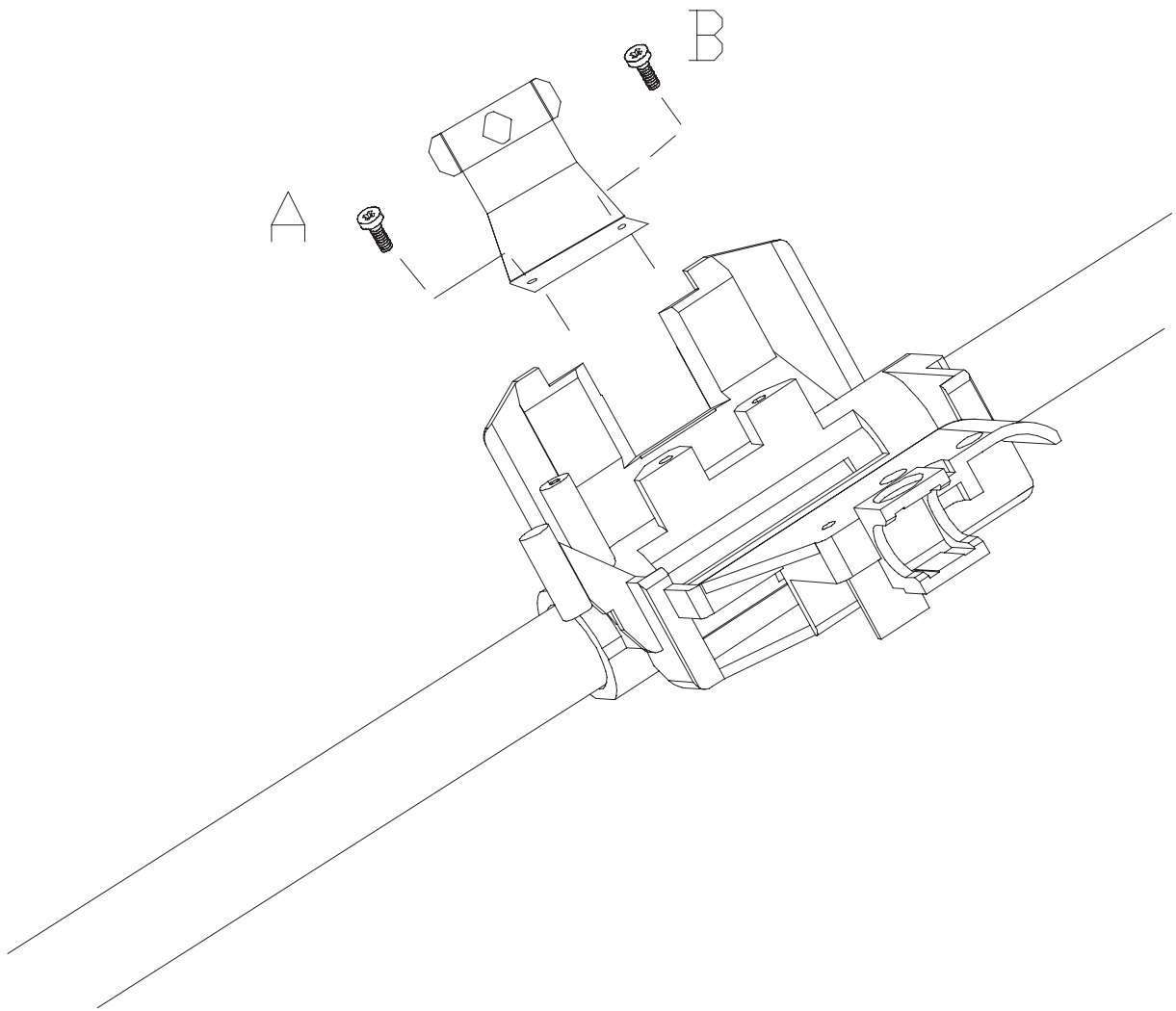


Figure 28. Ribbon Mask removal

Lower Mylar

1. Open the Top Cover.
2. Remove the inked ribbon cartridge.
3. Remove the Bail Assembly.
4. Unscrew the two screws (item 3) fixing the Lower Mylar to the metal support.
5. Remove the Lower Mylar (item 2) sliding it between the mask and the platen. To simplify this operation, move the AGA marker in order to put the printhead at furthest position as opposed to the platen.

Replace the Lower Mylar following the above steps in reverse order being careful to not damage the mask.

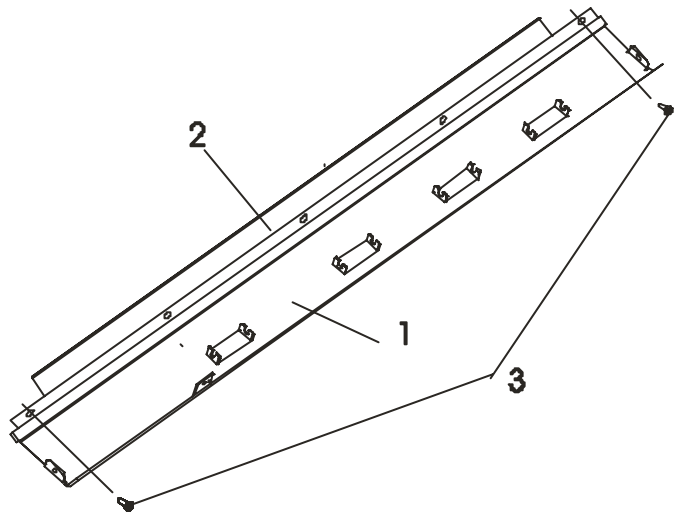


Figure 29. Lower Mylar

Chapter 4. Service Checks & Adjustments

This section describes the adjustment procedures for both printers.

Carriage Belt

This adjustment is required only if either the carriage belt or the parts related to the replacement of it are removed (pulley assembly, carriage motor assembly, and so forth.).

Standard Value: 900gr. ± 50gr. (2.0 lb. ± 0.1 lb.).

Tools: Push-Force type Dynamometer (such as IBM PN 460870, or equivalent)

1. Put the carriage assembly in the rightmost position in the printer. Loosen the M5 nut securing the movable pivot to its support.
2. Put the carriage belt under tension through a counterclockwise rotation of the screw located on the movable pivot.
3. Apply the specified load in the middle of the carriage belt, through a dynamometer, with the indicated force, to obtain the contact between the upper and the lower sides of it.
4. Repeat step 3, if necessary.
5. Keep the screw fixed and, at the same time, tighten the nut.

After this adjustment, it is necessary to run the bidirectional printing adjustment (see Chapter 5, “Service Maintenance,” on page 112 in T&D tests description) to guarantee the best performances of the printer.

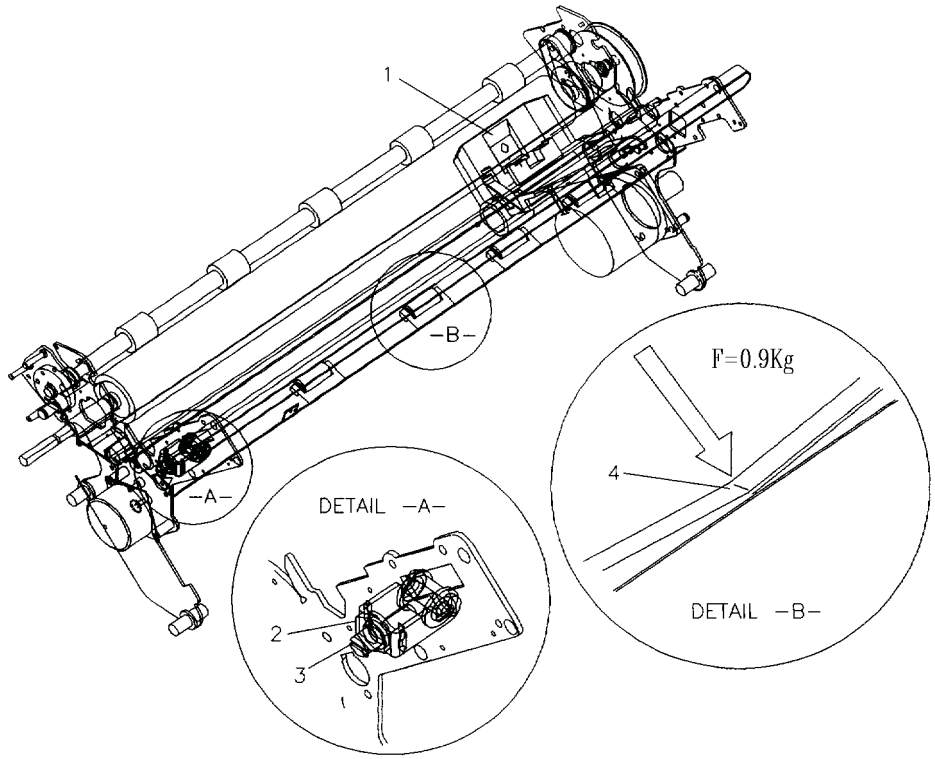


Figure 30. Carriage Assembly Belt Adjustment

Paper Belt

This adjustment is required when the paper motor or the paper belt are removed.

Standard Value: 650gr. ± 50gr. (1.4 lb. ± 0.1 lb.)

Tools: Push-Force type Dynamometer (such as IBM PN 460870, or equivalent)

1. Unscrew the two screws securing the adjustment lever to the right side of the mechanism.
2. Apply the specified load on the hob of the lever with inward orientation, as shown in Figure 31 on page 89, and tighten the 2 screws to stretch the paper belt.
   First tighten the screw marked with A).
   A hole on the base assembly is provided for this purpose.

After this adjustment, it is necessary to run the T&D procedures (see “Test & Diagnostics” on page 137 for details) to verify the correct forward/backward paper advancing with fanfold paper.

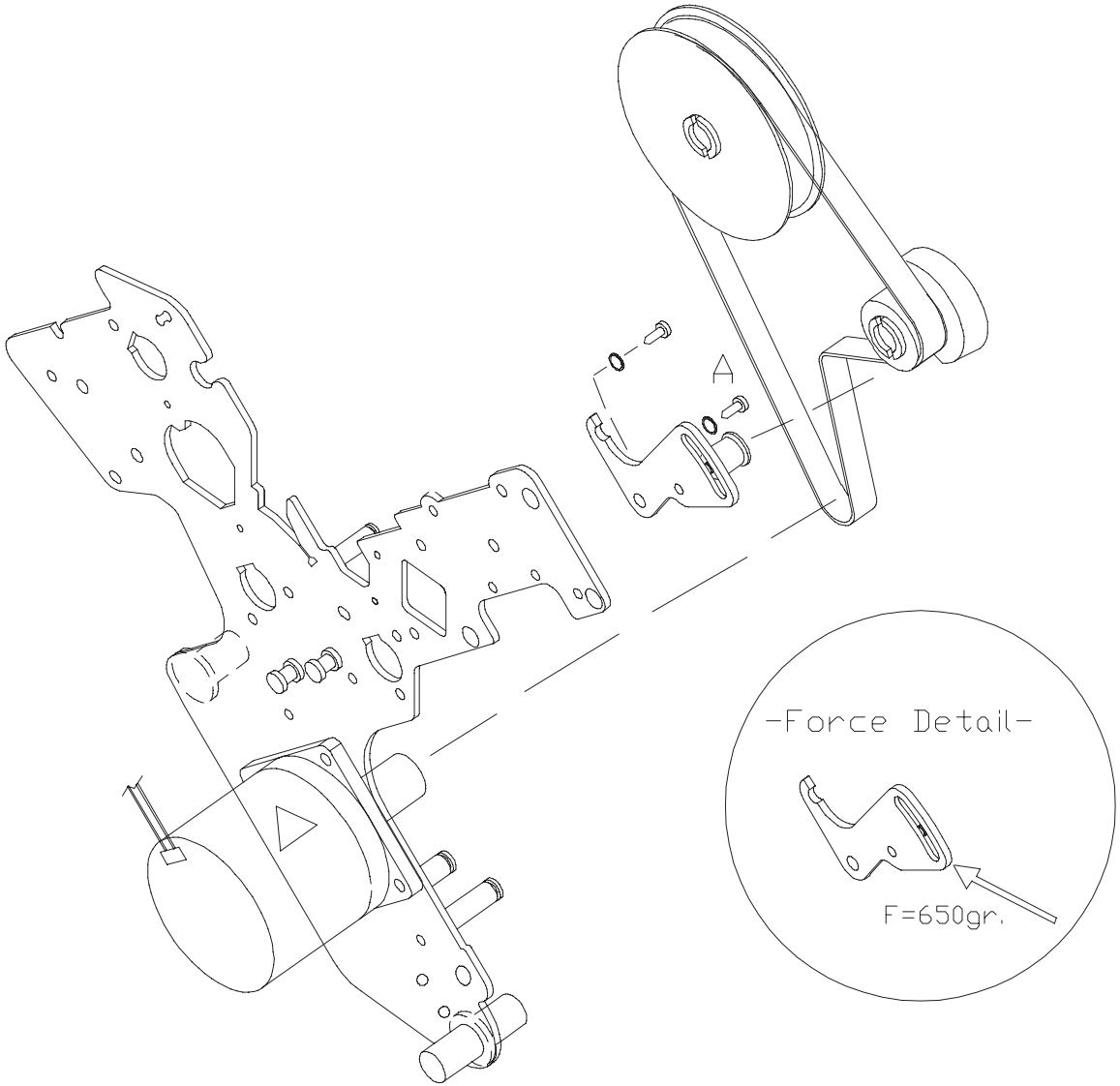


Figure 31. Paper Belt Adjustment

Print Head Gap Adjustment

Two procedures are provided to adjust the print head gap. A procedure using a feeler-gauge and a procedure that does not use a feeler gauge. Either procedure can be followed to adjust the print head gap properly.

Normally print head gap adjustment is only required when one of these parts are replaced:
- Carriage assembly
- Platen assembly
- Smaller carriage bar (Rear Bar).

Or, if one of these print quality problems are present:
- Ink smudges on the paper
- Very light print.

Before making any adjustments, first review the “Print Head Gap Service Checks” on page 100.

Print Head Gap Adjustment (using Feeler-Gauge)

Two little white spots are painted both on the left-side metal platen axis and on the spring support assembly. These spots are the locations for the manufacturing adjustment and indicate the maximum platen eccentricity and the platen/carriage eccentricity points (that is, the minimum print head gap is reached when both the carriage assembly located over the spring support white spot and the platen rotation for the white spot are aligned with the print head).
Their position and meaning are indicated as follows, and they can be used as a reference point in the following procedure when these parts are original and have not been replaced.

1. Support spring assembly.

   A white dot is painted on the support spring assembly. It indicates (joint to the white dots reported in item 2a) the position in the carriage assembly axial movement, in which there is the maximum drum eccentricity.
2. Platen assembly.
   a. Two white dots are painted on the left metal axis of the platen assembly and the related bearing. Matching of these dots (joint to the white dot reported in item 1) indicates the position for the platen assembly

rotation in which there is the maximum drum eccentricity; that is, the minimum distance from the print head needles to the platen is with the combination of items 1) and 2a).

b. A red dot is painted on the left metal axis of the platen. Matching of this dot with the white dot on the bearing indicates the position for the platen assembly rotation in which there is the maximum drum eccentricity, that means the area where the AGA (AFTA) routine is running during T&D.

3. Rear bar.

   Two white dots are painted both on the eccentric bushing and on the right side, located in the right side of the rear bar. They indicate the position of the eccentric bushing, in order to obtain the minimum value for the platen drum and the print head alignment parallelism.

Procedure

For the complete print head gap adjustment procedure, you need to follow all the steps (1 to 12) detailed below. For the simplified procedure, you can follow all the steps except for 7b, 7c, 7d and 7e.

Notes:

- If only the carriage assembly has been replaced with a new one, it is possible to readjust the print head gap with the reduced procedure, using the painted dots of the current parts.
- If the support spring assembly has been replaced with a new one, before installing it you need to paint a white dot in the same location of the replaced one and readjust the print head gap with the reduced procedure, through the help of the painted dots.
- If the platen assembly is replaced with a new one, it is only possible to readjust the print head gap following the complete procedure.
- If the rear bar has been removed, it is possible to readjust the print head gap with the simplified procedure, through the help of the painted dots of the current parts.

Standard Value: 0.25 mm to 0.30 mm (0.01 to 0.012 inch)
Tools: Feeler Gauge.

Follow these steps, in order to ensure the correct print head gap for all the carriage movements:

1. Remove the paper, the ribbon cartridge and the bail assembly.
2. Move the print head to its farthest position from the platen and remove the AGA (AFTA) marker.

3. Move the carriage assembly until the print head nose is in front of the white dot painted on the support spring assembly and, at the same time, rotate the platen assembly until the white dots on its left axis and bearing match.
4. Insert a feeler gauge between the print head needles and the platen drum, ensuring it is in a perpendicular position.

   REMARK: Remove the ribbon mask before measuring with the feeler gauge.
5. Gently move the print head towards the platen using the AGA (AFTA) gear, until a soft friction is noticeable on the feeler gauge.
6. If the printer does not have reference colored points, verify (with the feeler gauge) that the distance between the print head and the platen is included in the range 0.25 - 0.3 mm in any carriage position (item 2 of Figure 32 on page 94).
7. Furthermore, the platen ends must be aligned with the print head by 0.08mm (0.003 inch).

Example:

```
Example: ————————————————— platen
           A       B       C
           ∩       ∩       ∩   print head needles
```

Possible Values:

A	B	C
0.25	0.25	0.25
0.3	0.3	0.3
0.22	0.27	0.3
0.3	0.27	0.22

If the alignment is not correct (>0.08 mm), you need to follow these steps:

If the white dot is painted on the eccentric bushing:

a. Check that the white dot on the rear bar eccentric bushing matches with the one located on the right side.
   If they are not matching, unscrew the screw on the right side (which secures the smaller bar), gently

rotate the eccentric bushing with pliers to align it with the white dot.
While holding the eccentric bushing, firmly tighten the screw on the right side.

b. Tighten the left side rear bar screw.
c. Loosen the right side rear bar screw (item 1).
d. Gently rotate the eccentric bushing with pliers (item 2) and verify the alignment is in its best position.
e. After the adjustment, while holding the eccentric bushing with the pliers, firmly tighten the right side screw.

Mount the AGA (AFTA) Marker by slightly tightening the right side screw indicated in Figure 34 on page 96 (item A). Set the AGA wheel on sector 1 reference. Fix the ribbon mask, if previously removed.

8. Hold the AGA (AFTA) wheel on reference 1 and slowly drop it to its normal position.
If two teeth are touching during the gears engagement, put the (AFTA) Marker gear in the first free tooth and tighten both screws (item A and item B in Figure 34 on page 96).
The (AFTA) Marker should be pointing to reference 1.
Check for its complete and free rotation.
9. Put the AGA (AFTA) Marker in the farthest position from the platen.
Manually insert a 80 gr/m^2/20 lb. single sheet paper between the platen and the print head. It must be free to slide up and down. Slowly move the AGA (AFTA) wheel inward.
A light friction must be noticed on the paper when the AGA (AFTA) reference is on sector 1.
10. Power on the printer and run the “AGA (AFTA) Calibrate (T&D 10)” on page 106 setting.
When the message INSERT A4 FORM appears, load a 80gr/m^2/20 lb. single sheet of paper.
The AGA (AFTA) procedure must be run when the red dot painted on the left axis of the platen matches with the white dot on the bearing.
Use the paper advance knob to reach this point and run the T&D AGA (AFTA) routine until the AGA (AFTA) Marker points to reference 1 on the AGA (AFTA) wheel.
If the platen assembly has not the painted red dot, the procedure must be repeated at least three times on different points along the diameter of the platen; select the point where the AGA (AFTA) Marker has the minimum value and paint the red dot on its left axis for future use.
11. Store the correct AGA (AFTA) value and power off the printer.

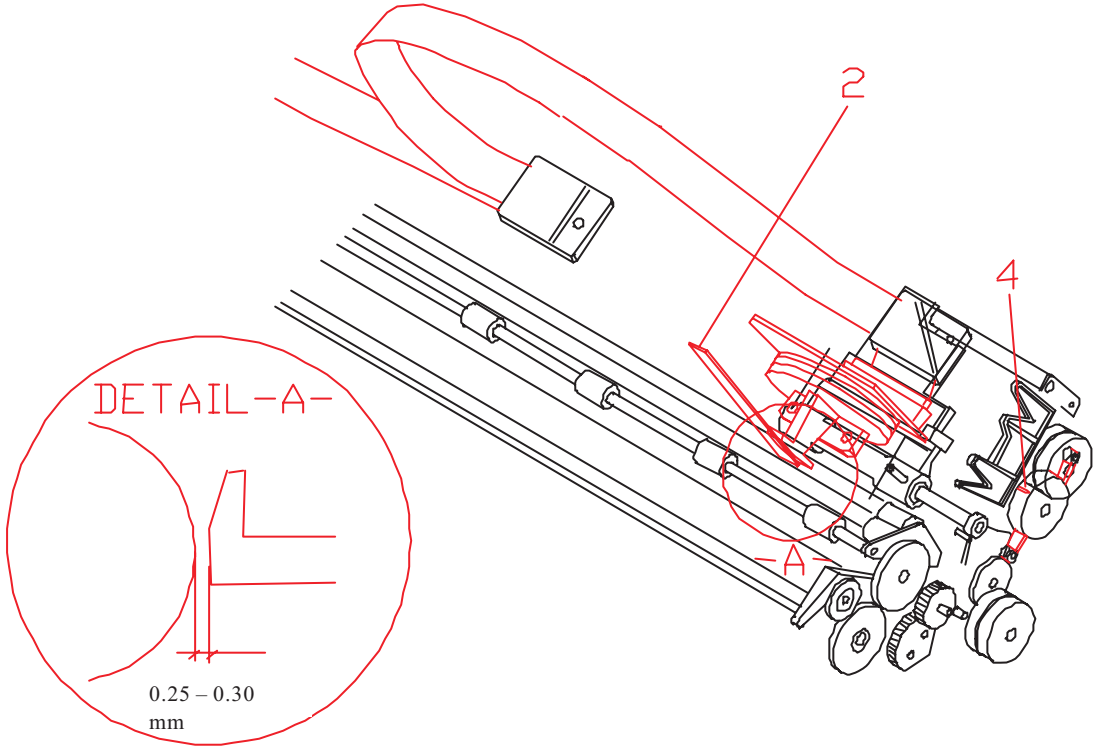


Figure 32. Print Head Gap Adjustment

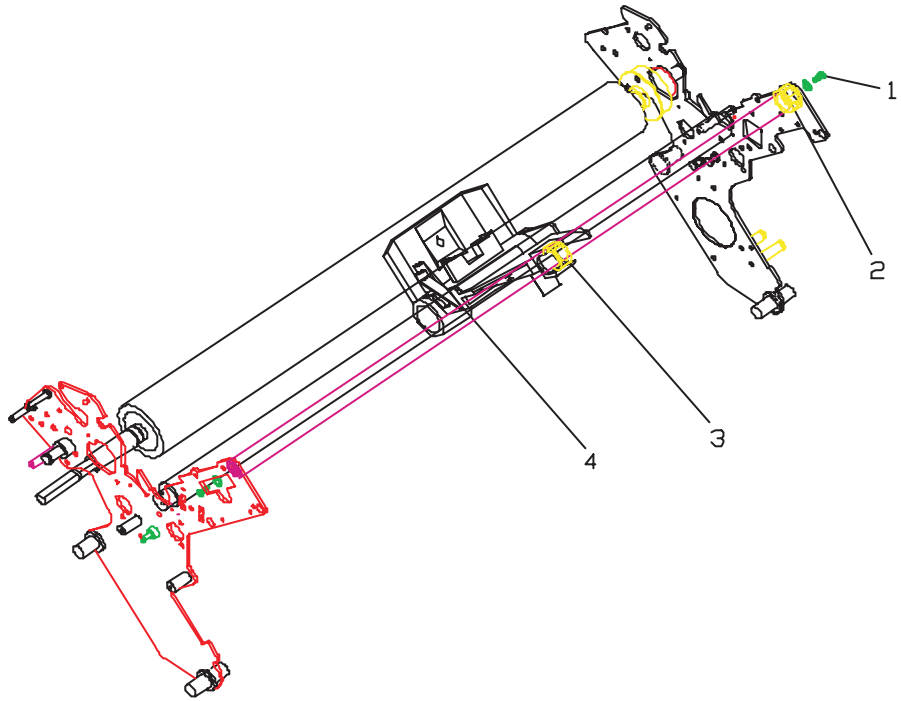


Figure 33. Print Head Gap Adjustment

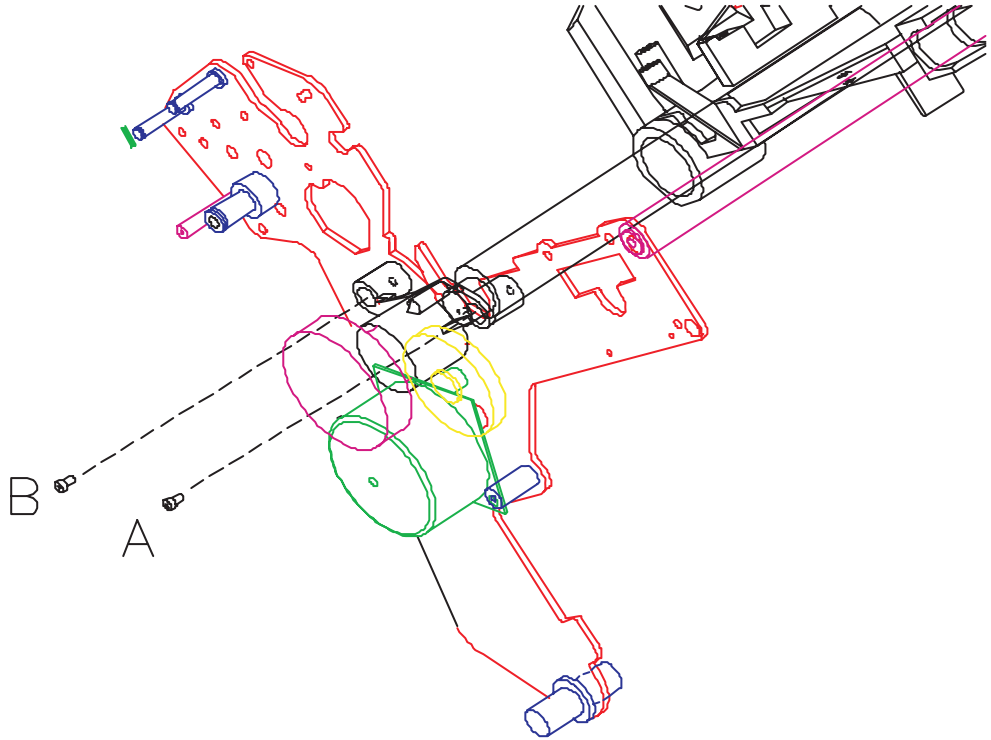


Figure 34. AGA (AFTA) Marker Adjustment

Print Head Gap Adjustment (without using a Feeler-Gauge)

Follow this procedure to set the correct print gap without using a feeler gauge. This procedure applies to printers NOT yet disassembled. If a printer has been disassembled (shafts have been removed, and so forth.) perform the **Print Head Gap Service Checks** before using this procedure.

Preparation

- If needed, with a dry cloth or toothbrush, clean the white surfaces around the print head needles to clear away any excessive ink.
- Verify that the print head is setting squarely against both mount blocks in the carriage by loosening the two (hex) mounting screws, pressing the print head toward the platen and retightening the screws.

Overview of Steps

1. Find the minimum gap (Gap A) that will ensure reliable paper feeding. A smaller gap can pinch the paper and cause jams.
2. Find the maximum gap (Gap B) that will still ensure good print quality (character darkness). A larger gap will result in degraded print quality (darkness).
3. Determine the gap (Wheel position) that produces dark print and will ensure reliable paper feeding.
4. Calibrate AGA (AFTA) using T&D10 and single-part forms to the Wheel position determined above.
5. Reposition the Wheel to indicate '1' as needed.

Step 1. **Find the minimum gap (Gap A) for reliable paper feeding.**

a. Power off and remove the paper bail and ribbon.
b. Advance the platen using the paper advance knob until the WHITE dot on the left end of the platen shaft is aligned with the WHITE mark on the shaft bearing.
c. Rotate the AGA (AFTA) Wheel to the full open gap position. Move the print head carriage to the WHITE mark on the lower mylar assembly, or to the AGA (AFTA) position near the left end of the platen if no mark is present.
d. Slide the 1-part paper up past the carriage. Rotate the AGA (AFTA) Wheel closed, to a very small gap. The paper should be pinched by the carriage and will NOT slide when pulled backwards.

e. As you continue to pull on the paper, begin to rotate the Wheel in small increments to open the gap. Note the Wheel position where you can begin to pull the paper backwards with a friction that remains constant as you continue to open the gap. This gap is where the paper is released from the carriage assembly pinch and begins to slide freely.

f. Close the gap again and repeat this a few times until you agree on the Wheel position number where paper beings to slide with constant friction. The constant friction is from the Lower Mylar assembly.

g. This Wheel position number is the minimum carriage to platen gap required for 1-part Paper Sliding. Determine the minimum gap for reliable paper feeding by adding 0.5 to this Paper Sliding AGA (AFTA) Wheel position number.

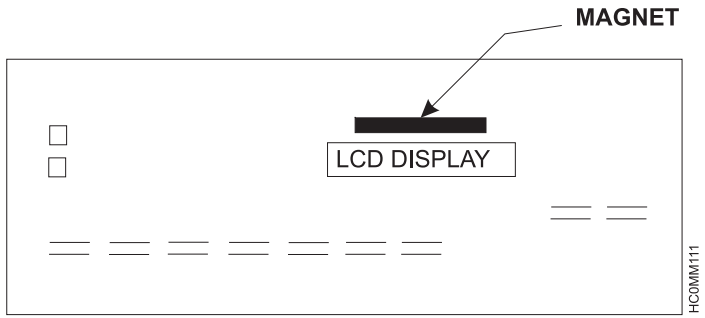
Gap A → Add 0.5 to this Paper Sliding number to get Print Head Gap A.

Step 2. **Find the maximum gap (Gap B) that gives DARK printed characters**

a. Install the bail assembly and a new or nearly new ribbon.

b. Power on holding the Macro and LF keys to enter the T&D menu. Verify that “AGA (AFTA) Calibrate (T&D 10)” on page 106 is set to '0' value and STORE the value. Power off to exit the T&D menu and then back on.

c. Remove the top cover magnet and place this magnet (horizontally) above the top of LCD display as shown below. This overrides the top cover interlock and allows you to observe the Wheel position with power on.



d. Make print samples at FIXED GAP 1.0, 2.0, 3.0, and 4.0 settings. Write the actual Wheel position on each sample.

1) Press the **Program** key and PRINT OUT? NO displays.
2) Press the **Down arrow ↓** then **Right arrow →** keys and MACRO # 1 displays.

3) Press the **Down arrow ↓** key until the AUTOGAP setting displays.
4) Press the **Right arrow →** until FIXED GAP 1.0 displays.
5) Press the **Program** and STORE? QUIT displays.
6) Press the **Right arrow →** until STORE? CURRENT displays.
7) Press the **Program** and ONLINE displays.
8) Press the **Program** and PRINT OUT? NO displays.
9) Press the **Right arrow →**, PRINT OUT? YES displays and the configuration menu prints.

This is your print sample. Write the actual Wheel position number on the print sample. Repeat the steps above to make print samples at settings of FIXED GAP 2.0, 3.0, and 4.0.

e. Find print head gap that begins to give DARK print.

Note: DARK characters are bold and black. Light characters are grayer. Very light characters are even grayer and begin having missing dots.

f. Referring to Table 12, if you see Examples 1, 2, or 3 note the Wheel position number where DARK begins. If you see Example 4, you will need to use AGA (AFTA) Calibrate (T&D 10) to decrease the gap by the value by –4. This will make the samples look like Examples 1, 2, or 3.

Table 12. Fixed Gap Settings

Menu Setting	**Wheel Position #**	**Character PQ and Result**			
		Example 1	**Example 2**	**Example 3**	**Example 4**
FIXED GAP 1.0	A	**DARK**	**DARK**	**DARK**	LIGHT
FIXED GAP 2.0	B	LIGHT	**DARK**	**DARK**	very light
FIXED GAP 3.0	C	very light	LIGHT	**DARK**	
FIXED GAP 4.0	D		very light	LIGHT	
FIXED GAP 5.0	E			very light	
Gap B →		Choose Wheel Position # A	Choose Wheel Position B	Choose Wheel Position C	Choose Wheel T&D12 = –4

Gap B → The Wheel position where DARK characters begin is Print Head B.

Step 3. **Determine the Wheel Position resulting in the correct print head gap.**

Determine the Wheel position that will provide the best print quality while ensuring reliable paper feeding.

Table 13.

Gap A versus Gap B Comparison	Chosen Wheel Position
If Gap B is equal to Gap A or up to 0.5 Wheel number greater	Use Gap A for print head gap
If Gap B is greater than Gap A by more than 0.5 Wheel number	Use Gap A +0.5 for print head gap
If Gap B is LESS than Estimate A, the print needles are worn down	Replace print head & repeat samples

Step 4. **Calibrate AFA (AFTA) using AGA (AFTA) Calibrate (T&D 10).**

Step 5. **Reposition the Wheel to indicate '1' when 1-part paper is loaded.**

- Remove covers.
- Loosen both AGA (AFTA) wheel screws. See A and B in Figure 34 on page 96.
- Hold the AGA (AFTA) wheel at reference position '1' and slowly drop it to its normal position. If the two teeth are touching during the gears engagement, put the marker gear in the first free tooth and tighten both screws.

Print Head Gap Service Checks

AGA (or AFTA) allows the printer to maintain a consistent distance between the print head and the face of the forms. Maintaining this distance (or gap) allows the printer to produce correct print darkness, properly feed forms, and sustain print head drive operation.

Perform this Service Check if parts of the machine have previously been removed or replaced.

Important: The print head should ONLY be replaced when:

- A print needle is broken, causing missing print dots in characters or AGA error.
- LQ or NLQ print quality is deficient due to a damaged/burnt moving ruby coil.
- Print needles have worn down from usage and the print head gap setting produces too small a gap for proper forms feeding and carriage motion.

AGA (AFTA) Power Off Checks

Perform this check if the AGA (AFTA) indicator wheel, motor, gears, carriage shaft, or platen have been removed at any time for service. This section will verify that these hardware pieces are correctly located and moving smoothly without binding.

This check verifies the position of the gap indicator wheel (wheel), and the manual operation of the mechanism for smooth and complete rotation. Use the wheel as an indicator as you adjust the distance between the print needles and the platen. Each numeral change on the wheel represents 0.1 mm (0.004 in.) change of AFTA gap. The numbers '0' through '6' are printed on the wheel, but the numbers can be considered to go beyond the '6' to an implied number of '13'. When all adjustments are correct, the AFTA Indicator Wheel will adjust to point to '1' when single part 20 lb. paper is loaded into the printer.

1. **Verify the smooth rotation of the indicator wheel.**
   - Power off and remove the ribbon.
   - Hand-cycle the wheel to a higher value, until the mechanical stop is against the frame. This is the full-open gap position. The travel of this rotation should equal about 10 to 11 numbers on the wheel. The travel through the entire range must be smooth and free of any binding as you rotate the wheel between the full-open and full-closed positions.
     If you feel any binding check the intermediate gear (gray) and the wheel gear (white) for damaged teeth. Replace parts, as needed.
     Ensure that the motor is not pushed upwards too much against the intermediate gear. Loosen and retighten the motor screws; this allows the motor to fall away from the intermediate gear.
2. **Check the ends of the (large) carriage shaft for correct adjustment.**
   - If the carriage shaft is too tight, you will notice binding at the frame.
   - If the carriage shaft is too loose, you will notice clicking at the frame when you grasp the carriage shaft and attempt to move it up and down.
     How to correct the location: To achieve the correct adjustment, loosen the 2 screws of the carriage shaft retainer to relieve the bind. Bias the carriage shaft retainer toward the lower carriage shaft retainer screw (the 5 o'clock position), and retighten the screws. With Correct location: When you grasp and attempt to move shaft, it turns freely but does not click at the frame.
3. **Verify the correct mounting of the platen.**

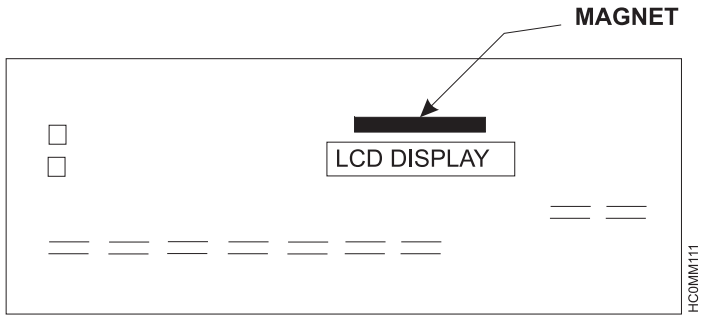
- Remove the paper bail, grasp the left end of the platen shaft and attempt to move up and down. If you hear a clicking where the bearing goes into the frame, loosen and tighten the bearing retainer-plate screws, while biasing the retainer toward the lower screw (the 5 o'clock position). Retighten the 2 screws and verify there is no clicking when you grasp the carriage shaft and attempt to move it up and down.

4. **Verify the initial full open alignment of the wheel by following these steps:**
   a. Rotate the wheel to the full-open gap position. The pointer of the wheel should be in the range of 3 to 4 numbers higher than 6 (at about 9 or 10). This approximate setting will vary from printer to printer.
   b. If it is not in this range, loosen the 2 screws that hold the wheel.
   c. Pull the gear away from the intermediate gear.
   d. Move only the wheel to align the pointer with a number in the range of 9 to 10.
   e. Retighten the screws.
5. **Verify that the print head mounting hardware and proper seating.**
   - Loosen the 2 print head screws, press the print head squarely toward the platen and retighten both screws. This is especially important if the printer has been giving Print Integrity errors or if print head has been hitting the side wall of the printer.
6. **Inspect the print head cable for damage and a poor connection at the print head.**
   - Replace the print head cable, as needed.

AGA (AFTA) Power On Checks

Perform this check only after completing the Power Off Check. This section verifies correct motor and print head needle operation.

1. **Verify AGA (AFTA) operation with single-part forms.**
   - Remove the top cover magnet and place this magnet (horizontally) above the top of LCD display as shown below. This overrides the top cover interlock and allows you to observe the Wheel position with power on.



- Reinstall the paper bail and ribbon. Power on (|) the printer.
- Verify the menu configuration is set to AUTOGAP 0. This invokes the microcode to use the print head needle, motor, and the internal logic to detect the thickness of the forms that are positioned against the platen.
- Load a single sheet of 20 lb. (80 g/m^2) paper. This paper is about 0.1 mm (0.004 in.) thick. Occasionally 20 lb. paper might measure as little as 0.09 mm (0.0038 in.) thick
- As this paper loads, verify that under motor control, the wheel rotates from the full-open position (near the 9 to 10 mark) to the full-close position (near the 0 to 2 mark).
- Park and reload the forms a few times to verify that the wheel position is repeatable.
  a. If the wheel does not rotate, power off (O) the printer and check the motor connections, motor, and the engine board.
  b. If the wheel does not move to the full-open position, then to the full-close position, power off (O) the printer and check for binds in the mechanism.
- When the wheel moves repeatedly to full-open and back to the same position, note the closed position number (near the 0 to 2 mark). For later use identify that number as **A**.

2. **Verify AGA (AFTA) operation with two-part forms.**

   In this section, using a 2 layer form, you must get the wheel position to increase by 1 number above the result **A** using the 1 layer of single part form.
   - Park the single-part forms.
   - Set the operator panel menu item AUTOGAP 0.

- With the single part form, fold the beginning of the forms along a left-to-right perforation to make 2 layers. Mount this 2 layer form onto the tractor pins. This now a combined paper thickness of approximately 0.2 mm (0.008 in.).
- Perform a Load operation on this double-thickness of forms. After performing a Load, the wheel should repeatedly go to a wheel number that is 1 greater (+/– 0.5 on the wheel) than the number **A** that you recorded above. Based on the results you get:
  a. If the number does not increase, perform AGA (AFTA) Calibrate (T&D 10)*, then return to Verify AGA (AFTA) operation using single-part forms.
  b. When the number is seen to increase, remove the wheel and align the pointer to '2'. Go to Final Verification of AGA (AFTA) calibration using single-part forms.
  * Set the AGA (AFTA) Calibrate (T&D 10) adjustment value to 0 (zero) and STORE.

3. **Final Verification of AGA (AFTA) calibration using single-part forms.**

   This section will use the FIXED GAP setting to give final verification that the AGA (AFTA) setup is complete.
   - Set the operator panel menu item FIXED GAP 1.0 and STORE as CURRENT.
   - Load single-part, 20 LB (80 g/m^2.) forms into the printer , using the Load key. Note the wheel position.
   - If the wheel position for FIXED GAP 1.0 is different than the number you noted at **A**, run AGA (AFTA) Calibrate (T&D 10) and set the adjustment value to 0 (zero) and STORE.
   - To verify that the wheel position is now correct, repeat the Load operation using single-part forms, with the settings AUOTGAP 0 and FIXED GAP 1.0. The wheel should go to the same position. Repeat step above if the wheel positions are different by more than +/–0.5.

AGA (AFTA) Print Quality Check

Perform this check only after completing the **Power Off Check** and then the **Power On Check**.

In above procedures the AGA (AFTA) operation has been verified. Now in this procedure, samples will be printed to allow verifying that that print gap is correct. No feeler gages are used.

This procedure creates print samples at various, increased-gap settings to show changes in the character darkness. This change in darkness will verify that the gap setting is correct. If the print darkness does NOT change as specified, you should perform the **Print Head Gap Calibration** procedure.

Ensure that you have a new or nearly new ribbon cartridge loaded in the printer. With printer power on (|), load white, single-part, 20 lb. (80 g/m^2) paper.

Make print samples at FIXED GAP 1.0, 2.0, 3.0 and 4.0 settings

1. Press the **Program** key and PRINT OUT? NO displays.
2. Press the **Down arrow** ↓ then **Right arrow** → keys and MACRO # 1 displays.
3. Press the **Down arrow** ↓ key until the AUTOGAP setting displays.
4. Press the **Right arrow** → until FIXED GAP 1.0 displays.
5. Press the **Program** and STORE? QUIT displays.
6. Press the **Right arrow** → until STORE? CURRENT displays.
7. Press the **Program** and ONLINE displays.
8. Press the **Program** and PRINT OUT? NO displays.
9. Press the **Right arrow** →, PRINT OUT? YES displays and the configuration prints.

This is your print sample. Write the actual Wheel position number on the print sample. Repeat the steps above to make print samples at settings of FIXED GAP 2.0 and 3.0.

Inspect the print samples for the proper print darkness.

Proper gap:

– If the FIXED GAP 1.0 sample is dark, the FIXED GAP 2.0 sample is light (gray), and the FIXED GAP 3.0 sample is very light with missing dots, the gap is set correctly for print quality.
– Go to AGA (AFTA) Gap Check.

Gap is too small:

– If the FIXED GAP 1.0 sample is dark, the FIXED GAP 2.0 sample is also dark, and the FIXED GAP 3.0 sample is light (gray), you should create a FIXED GAP 4.0 sample. The FIXED GAP 4.0 sample should appear light, and exhibit some missing dots.
– Using AGA (AFTA) Calibrate (T&D 10), increase the T&D10 adjustment value +2, and STORE, to increase the wheel position 0.5.
– Rerun the samples to verify satisfactory results. After you are satisfied with the results, go to “AGA (AFTA) Gap Check” on page 106.

Gap is too large:

– If the FIXED GAP 1.0 sample is light, the FIXED GAP 2.0 sample is very light with missing dots, and the FIXED GAP 3.0 sample is unreadable (due to lightness) the gap is too large.
– Using AGA (AFTA) Calibrate (T&D 10), decrease the T&D10 adjustment value –2, and STORE, to decrease the wheel position 0.5.
– Rerun the samples to verify satisfactory results, and go to AGA (AFTA) Gap Check.

AGA (AFTA) Gap Check

1. Set the menu configuration to AUTOGAP 0. This invokes the microcode to use the print head needle, motor, and the internal logic to detect the thickness of the forms that are positioned against the platen.
2. Load 1-part paper into the printer and press the Form Feed key to move a full page above the carriage. Remove the paper bail assembly. Advance the platen using the paper advance knob until the WHITE dot on the left end of the platen shaft is aligned with the WHITE mark on the shaft bearing.
3. Record the AGA (AFTA) Wheel number (it should be indicating near '1').
4. Move the print head carriage the AGA (AFTA) position near the left end of the platen.
5. Tear off the forms at a perforation below the tractors, open the tractor doors, and remove the paper from the tractor pins.
6. Rotate the AGA (AFTA) Wheel closed to a very small gap. The paper should be pinched by the carriage and will NOT slide when pulled backwards.
7. As you continue to pull on the paper, begin to rotate the Wheel in small increments to open the gap. Note the Wheel position where you can begin to pull the paper backwards with a friction that remains constant as you continue to open the gap. This gap is where the paper is released from the carriage assembly pinch and begins to slide freely. This is **'Paper-Sliding Gap'**.
8. Close the gap again and repeat this a few times until you agree on the Wheel position number where paper beings to slide with constant friction. The constant friction is from the Lower Mylar assembly. Repeat this a few times until you agree on the Wheel position number where paper begins to slide with constant friction.
9. If the AGA (AFTA) setup used by the printer (recorded above) is less than the **'Paper-Sliding Gap + 0.5'** then the print head needles may be worn down and the print head should be replaced.

AGA (AFTA) Calibrate (T&D 10)

This test is useful to check the AGA (AFTA) Marker position located on the left side of the mechanism.

NOTICE: T&D 10 prompts you to “INSERT A4 FORMS”. When prompted to insert A4 forms, insert any size single sheet of 20 lb. (80 gram) paper which has the required thickness of 0.004" (0.1 mm). Standard 20 lb (80 gram) laser printer cut-sheet paper can be used.

When the message INSERT A4 FORM appears, manually insert a single sheet of 20 lb. (80 gram) paper into the upper path. Locate the hole in the Base Frame (6–4 on page 200) and black taped area of the Guide Assembly (6–5 on page 200). Insert paper into this area of the upper tractor path. The display shows "DW UP PAPER". Using the LOAD/FF or the LF keys to move down or up the single sheet paper to align the red dot painted on the left end of the platen shaft with the white dot on the left bearing and then press the FONT key to run AGA (AFTA).

The display shows “– + AGA *n*”.

– means a negative change of the AGA (AFTA) value *n*; gap decrement between P.H. and platen. (LOAD/FF key)

+ means a positive change of the AGA (AFTA) value *n*; gap increment between P.H. and platen. (LF key)

AGA *n*
means the execution of the AGA (AFTA) calibration test with associated current value. (FONT key)

Repeat test until the AGA (AFTA) marker is pointing to '1'.
If the platen assembly does not have a painted red dot, the procedure must be repeated at least three times on different points along the diameter of the platen; select the point where the AGA (AFTA) marker has the minimum value and paint the red dot on its left end of the platen shaft for future use.
After the print head gap adjustment, the AGA marker position corresponds with the paper sheet thickness loaded. After a visual check, the correct value must be stored in NVM before to exit from T&D procedure. The range of the variation is from –8 to +8 (every unit changes the gap of 0.03 mm).

First Printing Line (T&D 11)

This adjustment is required only if the paper sensor is removed or, for user application, the position of the first printing line must be changed in its default value.

It is possible to select the upper (FRONT 1) or lower (FRONT 2) paper path.
The display shows: "***– + FRONT1*** *n*" or "**– + FRONT2** *n*" respectively.

Running this test a printout of eight “EEEEEEEE” is done.
The display shows: "YES FR.1 ADJ? NO".
To adjust the FRONT1 tractor path, press the LOAD/FF key.
Next the paper is automatically advanced to show the result to the operator over the top cover.
The display shows the message “+ F.FR n –”.

– means a step decrement of paper motor value; 1st line lower shift. (LOAD/FF key).

+ means a step increment of paper motor value; 1st line higher shift. (LF key).

FRONT1 (*n*)
means execution test on active paper path with associated current value. (FONT key).

n displays the current value. (FONT key)

A printout of eight "EEEEEEEE" is done with the selected value printed below.
The paper is automatically advanced to show the result to the operator over the top cover.

After a visual check the correct value must be stored in NVM before to exit from T&D procedure.

Vertical (bi-directional printing) (T&D 12)

This adjustment is required only if some parts related to the carriage assembly movement are removed.

The paper is automatically advanced to show the result to the operator over the top cover.
The display shows the message “– + VERT *n*”.

– means a negative change of the VERTICAL value. (LOAD/FF key).

+ means a positive change of the VERTICAL value. (LF key).

VERT *n* means the execution of the VERTICAL calibration test with associated current value. (FONT key).

n display the VERTICAL current value. (FONT key).

A printout of 17 patterns composed each by 1 lines of 132 ″|″ characters printed from left to right followed by the same line printed from right to left.
At the beginning of each line is indicated the value (*n*) of the vertical adjustment which is variable from –8 to +8.
At the end of the test, a single pattern with the selected bidirectional offset value is printed.

After a visual check the correct value must be stored in NVM before to exit from T&D procedure.

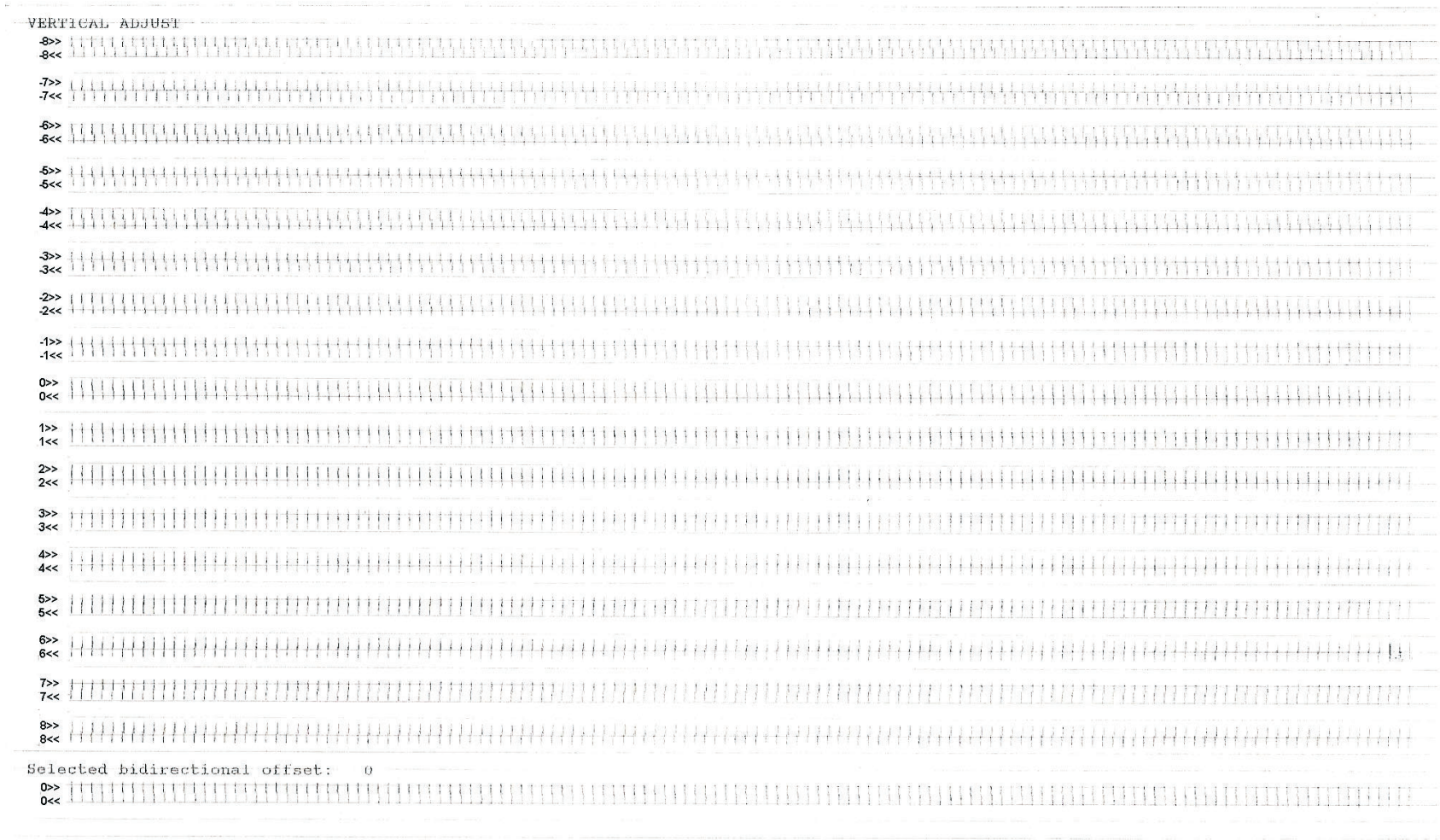


Figure 35. Vertical Adjustment Test

Tear-off Line (T&D 13)

This adjustment is required only if the tear-off setting has changed due to the top cover or one of the paper sensors being removed.

The tear-off position of the paper must be aligned to the cutter line of the top cover.
The display shows the message "– + TEAR *n*"

– means a negative change of the TEAR value. (LOAD/FF key).
+ means a positive change of the TEAR value. (LF key).
TEAR *n* means the execution of the TEAR calibration test with the current selected value. (FONT key).

A printout of 1 line of 60 "X" characters is done at the first printable line.
The paper is automatically advanced to a fixed value (the distance between the print-head and the tear-off bar) to show the result to the operator.

After a visual check the correct value must be stored in NVM before to exit from T&D procedure.

Sensor Tuning (T&D 9, 14, 18)

This adjustment is suggested when the main board is changed or if some problems appear in the paper detection.

The paper sensors are reflecting type and if some parameters of these sensors are changed (due to their life parameters degradation or by a different printer location), this level may not be correct anymore for normal printer operation.

The adjustment is possible by running T&D 9, T&D 14, or T&D 18.

NOTICE: Remove paper from all paths before tuning the sensors.

The sensors are tuned (calibrated) by storing the sensor output voltage level detected with NO PAPER installed in Non-Volatile Memory (NVM) on engine board.

When T&D 18 is performed, the display will show some of the following messages:

"Y PATH STATUS N"
Selecting Y (LOAD/FF) in the PATH STATUS test, the display shows F for “free” path or B for “busy”. Where F is displayed when no paper is present and B is displayed when paper is manually insterted. Where F1 and F2 are the status of both paper paths.
This is a first GO/NO-GO test.
Press FONT key to advance to the next step.

"Y THRESHOLD N"
After that the T&D gives you how is the quality of each sensor, showing its operative margins. Selecting Y (LOAD/FF) in the THRESHOLD test, the display shows two hexadecimal numbers which are the threshold levels stored in NVM for each sensor. Write them on a paper.
Press FONT key to advance to the next step.

"Y SENSOR LEVEL N"
Selecting Y (LOAD/FF) in the next SENSOR LEVEL test with NO PAPER loaded, the display shows two hexadecimal numbers which are the level of the sensors WITHOUT paper. Manually load the paper in each path to simulate the presence of the fanfold, the display shows two hexadecimal numbers which are the level of the sensors WITH paper.

For correct optical sensor behavior the sensor levels have the following tolerances from the threshold level. If these tolerances are not met, unpredictable errors may occur, such as PAPER END or no paper loading action.

The tolerances (hex values) are as follows:

• **THRESHOLD LEVEL**	**=X**	
• **WITHOUT PAPER SENSOR LEVEL**	**=X – 5**	**maximum**
• **WITH PAPER SENSOR LEVEL**	**= X + 1E**	**minimum**

"Y SENSOR TUNE N"
Selecting Y (LOAD/FF) tunes the sensors. Selecting N (LF) skips to the next step.

Chapter 5. Service Maintenance

This section describes how to maintain the printer in order to obtain from it always the best performances.

This chapter offers help to test the printer and to identify defective components using the Test & Diagnostic facilities.

For all other aspects of printer setup and programming, please refer to the *User's Guide*.

GENERAL REMARK: Pay attention to turn the printer off, unplug the power cord and wait for at least 5 minutes before starting due to the high temperature on some mechanical parts if the printer has been on and operating for a long period of time (print head, carriage motor, paper motor).

Initial Inspection

When the printer presents an error, before proceeding to the service maintenance, perform an initial inspection.

Set-Up

Check for the following items to ensure they are correct.

Is the printer placed in a correct position?
Is the environmental temperature in the nominal range?
Is the relative humidity in the nominal range?
Is the unit installed in a bad location? (Close to high temperatures or humidity, near heat sources, dusty areas, areas where gas is generated, exposed to direct sunlight)
Is the printer configuration correct?

Check for this on PROGRAM SETUP PRINTOUT and PROGRAM CONFIGURATION PRINTOUT.
Please refer to the *User's Guide* for more details on all these items.

Paper Specifications

The type of paper is important to high performance.
Check for the correct paper specifications.
See Chapter 1, “General Overview” and the *User's Guide* for more details.

Cleaning

No preventive maintenance, on a schedule basis, is required.
Periodic cleaning will help to keep your printer in top condition.

Clean the printer as follows:

Use a mild detergent or water solution on a soft cloth to clean dirt and grease from the cabinet of the printer.

Do not use an abrasive cloth, alcohol, paint thinner, or similar agents because they may cause discoloration and scratching.

Be especially careful to not damage the electronic and mechanical components.

Check the paper paths to make sure they are clean.
If they are dirty with paper dust or ink, clean them using a soft cloth.

Lubrication

No additional lubrication is required.

Consumables

IBM recommends that you use only original consumables with original packaging to ensure proper use of the printer at the quality level and reliability that is stated in the product characteristics.

Using original consumables assures high printing quality and reliability.

Troubleshooting Guide

The recommended sequences for the printer fault detection are:

- Observe initializing procedure and Operator Panel messages.
- Check power malfunction to the printer.
- Run the SELF-TEST procedure.
- Run the T&D (Test and Diagnostic) procedure.
- Run the HEXADECIMAL dump procedure.

Initializing Phase

When the printer is powered on, before starting normal operations, it performs an initializing phase (BOOTSTRAP).

- The display shows: **STARTING UP**
- The display then shows the printer name with the code version number: **4247-L03 V:00.09**.

After a successful initialization phase, the printer enters the normal operation phase, moves the carriage assembly along the complete course from the rightmost to the leftmost position to check the home position sensor and goes in READY or WAIT state, depending on whether the paper is installed or not.

If the printer does not initialize correctly, see below in this chapter the possible error messages displayed on the LCD.

Printer Errors

Some errors can be displayed by the printer.
These errors can be divided into three main groups:

- Status errors
- Recoverable errors
- Not recoverable errors.

Status Errors

When an status error occurs, the printer shows some messages to the User with the action to fix or bypass the error condition.
See the *User's Guide* for major details.

Recoverable Errors

When a recoverable error occurs, the printer enters the WAIT state and the display shows the first message indicating the error. In some cases, a second message displays giving more specific information about the error condition.
The buzzer sounds intermittently.

All these errors can be reset pressing the ON LINE key or through specific actions.

The display shows **COVER OPEN** with a continuous buzzer sound.
Cause: The top cover is open during the initializing phase.
Action: Close the cover, check for magnet installed on cover.
Cause: The operator panel board may be faulty.
Action: Install a new operator panel.

The display shows: **CLOSE COVER**.
Cause: The top cover has been opened during operation.
Action: Close the cover.

The display shows a first message **RIBBON BLOCKED** followed by **CHECK RIBBON**.

Cause: The inked ribbon in the cartridge is jammed and the sensor detects the fault (the problem appears with some characters printed with poor ink density).

Action: Check if the ribbon is correctly installed.
Remove the ribbon and turn the tension knob to make sure that the ribbon is not jammed.
Press the ON LINE key to reset the error condition.

Cause: Ribbon drive motor, ribbon drive assembly, or engine board failure.

Action: Install one at a time until the problem is corrected.

The display shows: **PRINT INTEGRITY**.

Cause: The carriage assembly is stopped or restricted and the home position sensor detects this fault (the problem appears with the printout shifted on the left or right side).

Action: Check if the carriage assembly movement is free.
Press the ON LINE key to reset the error condition.

Cause: Carriage belt tension incorrect, belt clamp loose, belt idler not turning.

Action: Check and repair as needed.

Cause: Carriage assembly bushings worn out.

Action: Install a new carriage assembly.

Cause: Carriage motor, carriage home sensor, engine board defective.

Action: Install one at a time until problem is corrected.

The display shows the message **A.G.A. NOT OPER.** followed by **ADJUST THE GAP**

Cause: The automatic gap adjustment (AGA) (AFTA) is not enabled.

Action: Manually adjust the gap.
Press the ON LINE key to reset the error condition.

Cause: AGA (AFTA) motor, print head, print head cables defective.

Action: Replace one at a time until the problem is corrected.

The display shows the message **BUFFER OVERFLOW** followed by **CHARACTER LOST**.

Cause: An overflow condition occurred in the buffer (if the serial interface is selected).
The host is sending data to the printer even if it has been required to stop transmission.

Action: Check the connection between the printer and the host.
Press the ON LINE key to reset the error condition.
Turn the printer off if the buffer must be cleared.

The display shows the message **OVERRUN ERROR** followed by **CHARACTER LOST**.
Cause: An error on the serial transmission has occurred. The printer did not recognize a bit.
Action: Check the serial configuration settings of the printer and host.
Press the ON LINE key to reset the error condition.
Turn the printer off if the buffer must be cleared.

The display shows the message **FRAMING ERROR** followed by **WRONG CHARACTER**.
Cause: An error on the serial transmission has occurred. The printer recognized a wrong parity bit.
Action: Check the serial configuration of the printer and host.
Press the ON LINE key to reset the error condition.
Turn the printer off to clear the buffer.

The display shows **PARITY ERROR** followed by **WRONG CHARACTER**.
Cause: An error on the serial transmission has occurred. The printer recognized a wrong parity bit.
Action: Check the serial configuration of the printer and host.
Press the ON LINE key to reset the error condition.
Turn the printer off to clear the buffer.

The display shows the message **DATA SET OFF**.
Cause: The DSR signal is not connected to the printer and is not ready for data transfer (if the serial interface and remote connection are selected).
Action: Check the connection between the printer and the host.
Press the ON LINE key to reset the error condition.

The display shows the message **NVM CHANGE** followed by **REMOVE PAPER**, **PRESS A KEY**, and **NVM CHANGED**.
Cause: The basic FW on the main board has been changed (for FW updating) or the main board has been replaced with a new one. The printer is unable to work.

Action: The T&D adjustment procedure must be performed.

The display shows the message **INTERLOCK ERROR** with a buzzer sound.
Cause: The small rear cover with interlock board has been removed.
Action: Put the cover in its correct position.
Press the ON LINE key to reset the error condition.

Unrecoverable Errors

When an error of this kind occurs, the printer stops and enters into an error state.

All these errors cannot be reset through specific actions and require powering-off and rebooting the printer. Typically, these problems appear if an internal error in the BOOTSTRAP or NORMAL operation phases is detected.

If after powering-on the printer the problem appears again, run the T&D test as described in “Test & Diagnostics” on page 137 to check for a faulty F.R.U.

In the BOOTSTRAP phase, the following messages can be displayed.
If one of these messages appears, the BOOTSTRAP phase is not positively ended and, consequently, the hardware resources of the printer are not initialized.

For all these messages, the fault depends mainly on the Program flash memory, micro-controller or, the data bus problems on the controller board.

Table 14. Unrecoverable Error Display Messages (Bootstrap Phase)

MESSAGE	MEANING	POSSIBLE F.R.U.
STARTING UP (fixed)	Printer not initialized	Controller Board
# SOFTWARE ERROR	Internal unrecoverable error	Controller Board
# ENGINE DRIVER	Engine driver attach/open error	Controller Board
# PM SET-UP ER	Print Manager process setup error	Controller Board
# VOID EXEC LIST	Executable file not found	Controller Board
# MFILE CHECKSUM	Memory File Check-sum error	Controller Board
# UNK MFILE TYPE	Unknown Memory File Type	Controller Board
# TOO MANY FILES	Memory File List Overflow	Controller Board
# NVRAM DRIVER NVM	NVM Driver attach/open error	Controller Board
# MFLIST MEM ERR	Memory Allocation error	Controller Board

In the normal operation phase an unrecoverable message with a combination of the following parameters can be displayed.

DEVICE	(SPV, INT, P_M, ENG)
SERVO	(n1)

CODE (n2)
COMMAND (n3)

Example: ENG FLT 4 3 0 Means an Engine Device Initialization failure error.

Meaning of the SERVO values in Table 15 on page 121 through Table 18 on page 123.
0 = No servo identifier (software problem or Controller / Engine Boards problem).
1 = Line servo (Interface Board or connection of it with the Controller Board or connection with the Host).
2 = Paper servo (All the F.R.U.s involved with paper feeding and its control).
3 = Carriage servo (All the F.R.U.s involved with carriage movement and its control).
4 = Master command identifier.

The possible combinations can be:

SUPERVISOR FAULTS

Table 15. Unrecoverable Supervisor Faults

DEVICE	SERVO	CODE	COMMAND	ERROR DESCRIPTION	POSSIBLE F.R.U.
SPV FLT	0	1	0	Interpreter process answer error	Controller Board, Engine Board, Firmware
SPV FLT	0	1	1	Interpreter answer error in CREATE	Controller Board, Engine Board, Firmware
SPV FLT	0	1	2	Command CREATE Interpreter not executed	Controller Board, Engine Board, Firmware
SPV FLT	0	1	3	Command Kill Timeout	Controller Board, Engine Board, Firmware
SPV FLT	0	1	4	Command Kill error	Controller Board, Engine Board, Firmware
SPV FLT	0	1	5	Command Break Timeout	Controller Board, Engine Board, Firmware
SPV FLT	0	1	6	Command Break error	Controller Board, Engine Board, Firmware
SPV FLT	0	1	7	Interpreter command unknown	Controller Board, Engine Board, Firmware
SPV FLT	0	2	0	Font files not found	Controller Board, Engine Board, Firmware
SPV FLT	0	3	0	NVM device read error	Controller Board, Engine Board, Firmware
SPV FLT	0	4	0	NVM device write error	Controller Board, Engine Board, Firmware
SPV FLT	1	5	0	Serial I/F line driver open error	Controller Board connection with Host
SPV FLT	1	6	0	R.F.U. for USB line driver open error	Controller Board connection with Host
SPV FLT	0	7	0	Memory Allocation error	Controller Board, Engine Board, Firmware
SPV FLT	1	8	0	Parallel I/F line driver open error	Controller Board connection with Host
SPV FLT	1	9	0	LAN I/F line driver open error	Controller Board connection with Host
SPV FLT	1	11	0	Action Type Unknown from Print Manager	Controller Board connection with Host
SPV FLT	1	13	0	LAN Card Error (present but not working)	Controller Board connection with Host
SPV FLT	1	14	0	LAN IPDS Dialogue Error	Controller Board connection with Host

INTERPRETER FAULTS

Table 16. Unrecoverable Interpreter Faults

DEVICE	SERVO	CODE	COMMAND	ERROR DESCRIPTION	POSSIBLE F.R.U.
INT FLT	0	1	0	Barcode Memory Error	Controller Board, Engine Board, Firmware
INT FLT	0	2	0	Graphic Memory Error	Controller Board, Engine Board, Firmware
INT FLT	0	3	0	DLL Memory Error	Controller Board, Engine Board, Firmware
INT FLT	0	4	0	DLL Pitch Error	Controller Board, Engine Board, Firmware
INT FLT	0	5	0	Full Buffer Serial I/F	Controller Board, Engine Board, Firmware
INT FLT	0	6	0	Full Buffer Parallel I/F	Controller Board, Engine Board, Firmware
INT FLT	0	7	0	IBM Character Set not found	Controller Board, Engine Board, Firmware
INT FLT	0	8	0	Epson Character Set not found	Controller Board, Engine Board, Firmware

PRINT MANAGER FAULTS

Table 17. Unrecoverable Print Manager Faults

DEVICE	SERVO	CODE	COMMAND	ERROR DESCRIPTION	POSSIBLE F.R.U.
P_M FLT	0	X	Y	See X and Y meaning below	Controller Board, Engine Board, Firmware

X value	DESCRIPTION
3	Set up error
4	Unknown command code
5	Invalid command argument
6	Unrecoverable runtime error

Y value	DESCRIPTION
1	Allocated memory block not found
2	Unbalance graphics list counter
3	Unbalanced cache counter
4	Unbalanced printing plane counters
5	Drawing law not found
6	No graphics
7	Drawing list overflow
8	Unrecoverable internal error
9	X-list - Y-list mismatch error

LAN FAULTS

Table 18. Unrecoverable LAN Faults

DEVICE	CODE	COMMAND	ERROR DESCRIPTION
LAN FLT	X	Y	See X and Y meaning below

X value	Description
100	RX command timeout
101	RX reply timeout
102	TX command timeout
103	TX reply timeout
104	Wait reply timeout
105	TX reply stream full
106	TX command stream full
107	RX command channel test fail
108	RX reply channel test fail
109	Error INT 01
110	Invalid RX command
111	Error INT 03
112	Error INT 04
114	Test RX command timeout
116	Test RX reply timeout
120	MIB script not found
121	PANEL script not found
123	LAN Boot Error

Y value	Description
144	Busy LAN
145	Read MIB
146	Write MIB
147	Download
148	Read part number
149	Diagnostic
150	Channel test
151	Read MAC Address
152	Write MAC Address
153	Get SW verify
154	Start execution
155	Need reboot
156	Reboot
157	Test Button
158	Reload Factory
159	NIC upgrade request
160	Abort by Host
161	Get Panel script
162	Get MIB script

ENGINE FAULTS

Table 19. Unrecoverable Engine Faults

DEVICE	SERVO	CODE	COMMAND	ERROR DESCRIPTION	POSSIBLE F.R.U.
ENG FLT	2	2 or 3	64	Paper load value out of range	All F.R.U.s involved with paper feeding and its control
ENG FLT	2	2 or 3	65	Paper eject value out of range	All F.R.U.s involved with paper feeding and its control
ENG FLT	2	2 or 3	66	Paper park value out of range	All F.R.U.s involved with paper feeding and its control
ENG FLT	2	2 or 3	67	Paper step value out of range	All F.R.U.s involved with paper feeding and its control
ENG FLT	2	2 or 3	68	Paper LF, FF value out of range	All F.R.U.s involved with paper feeding and its control
ENG FLT	2	2 or 3	69	Paper Stop / stopping microfeed	All F.R.U.s involved with paper feeding and its control
ENG FLT	2	2 or 3	70	Paper tear-off value out of range	All F.R.U.s involved with paper feeding and its control
ENG FLT	2	2 or 3	71	Paper recovery tear-off value out of range	All F.R.U.s involved with paper feeding and its control
ENG FLT	3	2 or 3	16	Print Density value out of range	All F.R.U.s involved with carriage movement and its control
ENG FLT	3	2 or 3	17	Carriage position value out of range	All F.R.U.s involved with carriage movement and its control
ENG FLT	3	2 or 3	18	Print Position value out of Range	All F.R.U.s involved with carriage movement and its control
ENG FLT	4	1	0	Ribbon Block	All F.R.U.s involved with ribbon motion and its control
ENG FLT	4	2 or 3	0	Master Initialization (power on) phase	Controller Board, Engine Board, Firmware and all F.R.U.s involved with carriage motion and control (including the carriage home sensor)
ENG FLT	4	2 or 3	1	Reset Faults	Controller Board, Engine Board, Firmware
ENG FLT	4	2 or 3	2	Reset Command	Controller Board, Engine Board, Firmware
ENG FLT	4	2 or 3	3	Master Command	Controller Board, Engine Board, Firmware
ENG FLT	4	2 or 3	5	PPS	Controller Board, Engine Board, Firmware

Table 19. Unrecoverable Engine Faults (continued)

DEVICE	SERVO	CODE	COMMAND	ERROR DESCRIPTION	POSSIBLE F.R.U.
ENG FLT	4	2 or 3	6	DOE Test	Controller Board, Engine Board, Firmware
ENG FLT	4	2 or 3	7	PRT Time	Controller Board, Engine Board, Firmware
ENG FLT	4	2 or 3	8	Ribbon Test	All F.R.U.s involved with ribbon motion and its control
ENG FLT	4	2 or 3	10	FF jam	All F.R.U.s involved with paper feeding and its control
ENG FLT	4	2 or 3	11	DL jam	All F.R.U.s involved with paper feeding and its control
ENG FLT	4	2 or 3	7	Tractor	All F.R.U.s involved with paper feeding and its control
ENG FLT	4	2 or 3	8	PPS	Controller Board, Engine Board, Firmware
ENG FLT	4	2 or 3	9	Reset Command	Controller Board, Engine Board, Firmware
ENG FLT	4	10	0	Ribbon Block during Master Init phase	All F.R.U.s involved with ribbon motion and its control

For all the messages described above, except for the ENG type with SERVO=4, the fault mainly depends by the Flash memory or by the microcontroller or by the data bus problems (Controller Board F.R.U.).
Messages with format **ENG FLT 3 XX YY** refer to error conditions caused by the carriage. This means that they may include also faults of the home position sensor.

Power Malfunctions

If the printer does not power on, it is essential to check the power supply condition.

Power Supply Troubleshooting Guide

This guide can be useful to find a fault on the power supply F.R.U.

The printer is not powered on.

Cause No AC voltage reaches the printer.

Actions Check power cord insertion.
Press power switch.
Check voltage at wall outlet.
Replace power supply board.

The DC voltages are not present on the main board.

Cause The power supply may be faulty.

Actions Remove the power supply cable from the engine board. Put a load on the + 5 voltage pin of 500 mA minimum (a resistor of 10 Ω and 5 W). This load is needed to run the power supply correctly, otherwise the feedback reaction is not present and the regulation is not activated.
Check for the voltages on the power supply connector and on the board.
All voltages are protected from short-circuit. If the voltages are corrected, check for electromechanical device short circuits (print head, carriage motor, paper motor, AFA (AFTA) motor, ribbon motor, tractor gear alternance motor). See Chapter 6, “Electromechanical Devices” for pin assignments and expected load resistance. Replace the defective electromechanical part.
If the impedance's are correct, replace the engine board.

The AC printer fuse blown.
Cause An overcurrent on the primary circuit has occurred.
Actions Replace the power supply board.

The printer powers off after a short time being powered on.
Cause An overload is present on secondary voltages.
Actions If the voltages are corrected, check for correct electromechanical parts resistances.
Replace the defective electromechanical part.
If the electromechanical device resistances are correct, replace the engine board.

The printer initializes correctly but it does nothing is displayed.
Cause The operator panel board is faulty or has a bad connection to the engine board.
Actions Check for the proper connection to the engine board.
Replace the operator panel board, the operator panel cable, or the engine board.

POWER SUPPLY P3 CONNECTOR TEST POINT DESCRIPTION

CONNECTOR PIN 1	N.C.
CONNECTOR PIN 2	– 5 V
CONNECTOR PIN 3	POWER DOWN SIGNAL
CONNECTOR PIN 4	+ 5 V
CONNECTOR PIN 5	+ 5 V
CONNECTOR PIN 6	GROUND
CONNECTOR PIN 7	GROUND
CONNECTOR PIN 8	GROUND
CONNECTOR PIN 9	GROUND
CONNECTOR PIN 10	GROUND
CONNECTOR PIN 11	+ 38 V
CONNECTOR PIN 12	+ 38 V
CONNECTOR PIN 13	+ 38 V
CONNECTOR PIN 14	VCLAMP 90
CONNECTOR PIN 15	FAN CONTROL (Logic signal)

POWER SUPPLY P1 CONNECTOR TEST POINT DESCRIPTION

CONNECTOR PIN 1	FAN
CONNECTOR PIN 2	FAN
CONNECTOR PIN 3	NO STOP
CONNECTOR PIN 4	STOP COMP.

POWER SUPPLY P2 CONNECTOR TEST POINT DESCRIPTION

CONNECTOR PIN 1	FAN
CONNECTOR PIN 2	FAN
CONNECTOR PIN 3	N.C.

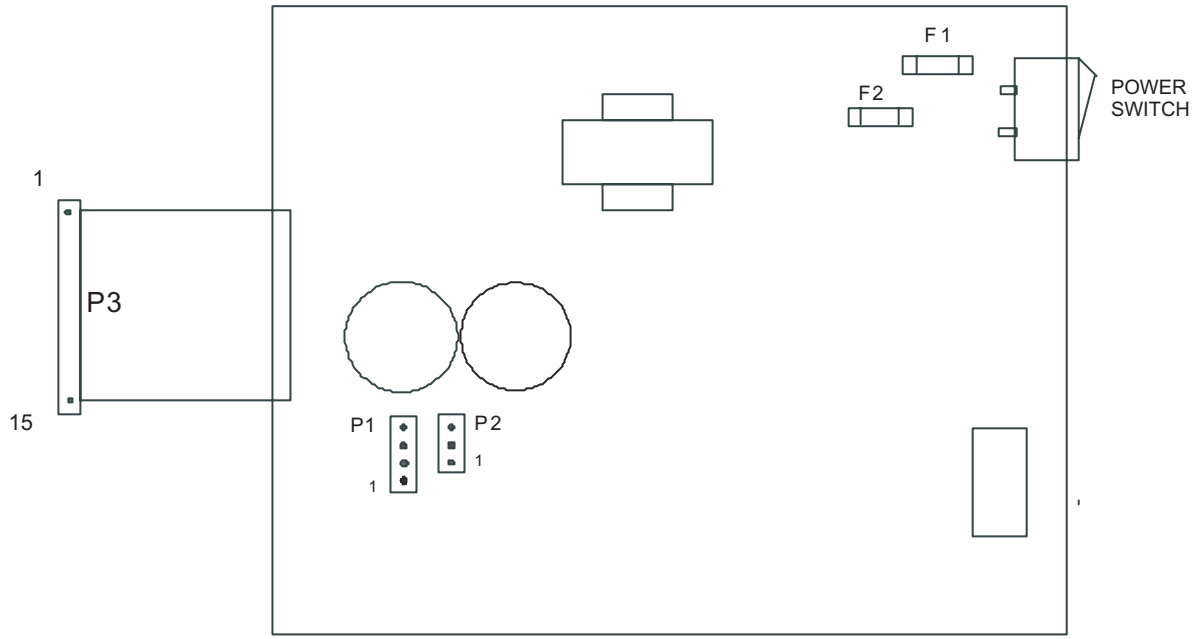


Figure 36. Power supply test points

OFFLINE PRINTER VERIFICATION SELF TEST

The Self-Test is an internal test to check the logic and electromechanical performances of the printer.

To run this test, power on the printer pushing the ON LINE key until the message RELEASE KEYS appears on the display.
If the fanfold paper is present in the path, the test automatically starts, otherwise a message to load paper is displayed.

Notes:
1. The printer can be left in connection with the host line.
2. The printer prints until the ON LINE key is pressed again.

The print sample is formed by:

The printer model with printer code version and IBM P.N. and MAC Address if the LAN interface is installed.
A continuous pattern composed of four complete lines of characters sequentially shifted and with the character pitch changed at every step.

Inspect the print sample for:

Equal density of the character
Equal darkness
Character sharpness
No missing part of character
Underline character and descenders
No smudges or strikes
Equal density of lines
Character correctly formed (graphic)

Refer to the faulty probability table to correct any printing problem.

Table 20. Self-Test Printout

SELF TEST PRINTOUT

PRINTER MODEL: 4247-L03
PRINTER CODE: Version 00.09
IBM P/N: xxxxxxx
MAC ADDRESS: xxxxxxxxxxxx

```
HS Draft    5   CPI
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_ab
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_abc
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_abcd
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_abcde
```

HEX DUMP

This test is necessary when a protocol line error is detected but no error appears by the other internal tests of the printer.

This procedure allows you to see all the characters, that is, also the control characters sent by the host to the printer (example: ESC, DC4, CR, LF, and so forth) in a readable printout.

To run this procedure it is necessary to enter in the PROGRAM SET UP, select the item HEX-DUMP NO. and choose the value YES.

After the selection any character sent to the printer is printed in its hexadecimal value.

The printer can be left in connection with the host line.

This status is reset when the printer is powered off.

The format of the hexadecimal dump printout is shown in Figure 37 on page 132.

Any character sent to the printer is printed in its hexadecimal value on the left side associated with its ASCII character on the right side of the printout.

Example:

Text in normal mode:

ASCII: ESC C H
HEX: 1B 43 48
BASIC: CHR$(27);CHR$(67);CHR$(72)

The same text in hex-dump mode:

```
HEXADECIMAL DUMP MODE

0000  41 53 43 49 49 3A 20 45 53 43 20 43 20 48 0D 0A   ASCII: ESC C H
0001  48 45 58 20 20 3A 20 31 42 20 34 33 20 34 38 0D   HEX: 1B 43 48
0002  0A 42 41 53 49 43 3A 20 43 48 52 24 28 32 37 29   BASIC: CHR$(27)
0003  3B 43 48 52 24 28 36 37 29 3B 43 48 52 24 28 37   ;CHR$(67);CHR$(7
0004  32 29 0D 0A                                       2)
```

Figure 37. Hex-Dump Printout

Fault Probability Guide When No Error Message Displays

Please use this guide whenever a fault is detected but no error message is displayed.

If a fault is caused by an electromechanical part that is not monitored for feedback in real time, no error will be detected by the printer.

Except for the home position and ribbon sensors, (that have a feedback circuit to return the status condition), the other mechanical parts do not have a return feedback and can not be monitored by the printer.

For example, if the paper does not feed, the fault is related to these parts: (paper motor, driver circuit and logic H/W). For this fault, only the paper movement can be verified with a T&D printout.

SYMPTOM:	**Inconsistent character printing (some dark, some light, gaps or spaces, or incomplete)**
CAUSE:	The ribbon may not be correctly mounted.
ACTION:	Re-install the ribbon cartridge.
CAUSE:	The ribbon cartridge may be faulty.
ACTION:	Install a new one.

CAUSE: The ribbon does not work correctly.
ACTION: Check if the carriage unit movement allows a correct ribbon cartridge movement.
Replace the left support group pivot assembly.

CAUSE: The print head cable may be incorrectly installed.
ACTION: Check for the P.H. cables to be correctly mounted.
Replace print head cable.

CAUSE: The gap between print head and platen is not correct.
ACTION: Check for the platen adjustment procedure.

CAUSE: The print head may be faulty.
ACTION: Install a new one.

CAUSE: The AGA (AFTA) function does not work.
ACTION: Check for the AGA (AFTA) motor impedance, connection, and gear movement.
Replace defective components.

CAUSE: The engine board may be faulty.
ACTION: Install a new one. Run T&D procedure to verify.

CAUSE: The power supply board may be faulty.
ACTION: Check the voltages. Install a new one.

SYMPTOM: The character printing is vertically misaligned.
CAUSE: The printer may not be correctly adjusted.
ACTION: Run T&D adjustments to check vertical adjustments.

CAUSE: The carriage belt is not correctly adjusted.
ACTION: Check for correct carriage belt tension. Refer to adjustment procedures.

SYMPTOM: The printer stops printing (prints slowly).

CAUSE: The thermal sensor in the print head is broken.
ACTION: Check for thermal sensor impedance.
Replace print head.

CAUSE: The connection of the print head and engine board is defective.
ACTION: Verify the connection.
Replace print head cable.

CAUSE: The engine board may be faulty.
ACTION: Install a new one.

SYMPTOM: The paper does not feed correctly.
CAUSE: Setup.
ACTION: See “Set-Up” on page 112.

CAUSE: The holes of the fanfold paper are torn.
ACTION: Remove the torn paper and replace it with a new sheet of fanfold paper.
Check the tension of the paper between the left and right tractors.

CAUSE: Paper is not correctly aligned on sprocket wheels.
ACTION: Reload the paper, ensuring that corresponding holes at each side of the paper are correctly aligned on the tractors (see tractor assembly removal).

CAUSE: Paper bail mylar damaged.
ACTION: Install a new one.

CAUSE: The paper motor cable is not correctly mounted.
ACTION: Check for paper motor connection on engine board.

CAUSE: The paper movement has unequal line spacing.
ACTION: Check for correct paper belt tension.
Check the paper belt adjustment.

CAUSE: The paper motor may be faulty.
ACTION: Check for paper motor impedance or connection on main board.
Replace the paper motor.

CAUSE: The engine board may be faulty.
ACTION: Install a new one. Run T&D procedure to verify.

SYMPTOM: The printer initialized, but the display and LEDs are off. Operator panel keys are working.
CAUSE: The connection of the operator panel board and engine board is defective.
ACTION: Verify the connection.
Replace the operator panel cable or the operator panel.

SYMPTOM: The printer initialized, but only the display is off. Operator panel keys are not working.
CAUSE: The connection of the operator panel board and engine board is defective.
ACTION: Verify the connection.
Replace the operator panel cable or the operator panel.

SYMPTOM: The printer initialized, but the carriage assembly moves 1 inch to the right.
CAUSE: The connections of the home position sensor or the carriage motor are defective.
ACTION: Verify the connections of the sensors cable group and carriage motor on engine board.

CAUSE: The home position sensor or the carriage motor assembly are faulty.
ACTION: Check for the sensor action through the carriage assembly and the motor impedance.
Replace the sensors cable group or the carriage motor assembly.

SYMPTOM: The printer not initialized, the buzzer sounds continuously.
CAUSE: The Controller Flash memory or the engine board may be faulty.

ACTION: Reseat the controller board.
Replace the engine board.

SYMPTOM: **The printer initialized but the paper is not loaded.**
CAUSE: The paper optical reflective sensors may be faulty.
ACTION: Check for the sensor cable correctly inserted on the engine board.
Check that the sensor cable is correctly installed without a short circuit.
Check for the correct optical sensor diode impedance (about 1 K).
Run T&D 18 to tune the paper sensors.

SYMPTOM: **The fans do not work**
CAUSE: The power supply board may be faulty.
ACTION: Check if the fan cables are correctly inserted in the power supply board.
Check for the correct voltages on the fan pin. During carriage movement, the voltage must be 21 to 27 volts. In stand by, the voltage must be 14 to 21 volts

Test & Diagnostics

The TEST & DIAGNOSTIC program, abridged in “T&D”, is adopted to check the various functional parts composing the printer, and to diagnose possible operating defects which might occur during this phase.

T&D Structure

The software architecture of these printers is composed of one layer called “PLATFORM”, which has the task to manage the interfaces towards the existing H/W resources, and an “APPLICATION” layer which contains modules for emulations management.

T&D Kit

The parallel loop-back connector	P.N. 08H7269
The 232 serial loop-back connector 9 pins	P.N. 41U2467

Execution of User T&D

The USER T&D is the T&D procedure for the field level maintenance.
It requires the following:

Before running the T&D test:

- Install on the Parallel or Serial Interface, the respective parallel and 232 Serial interface loopback connectors.
- Insert some forms (136 characters, 72 lines) of fanfold modules on the lower tractor, without loading them.
- Find a single sheet form of any size with 20 lb. (80 gram) weight and 0.004 in. (0.1 mm) thickness.

All tests indicated in Table 23 on page 151 are one-shot or automatically sequential executed depending by the first choice after the initialization phases.

At the end, sample forms are printed out for electromechanical verification and mechanical adjustments.

While running each test, the display shows some messages to show to the technician the activity in progress or the action the operator has to do at that moment.

NOTICE: It is important that no paper is loaded from any paper path when the T&D procedure is executed (the sensors must not be covered by the paper).
In fact, the T&D will automatically adjust, without any intervention, all the reflective sensors of the printer (upper fanfold and lower fanfold).

The cover must be closed, otherwise the “COVER OPEN” message is displayed and the printer (after the cover is closed) enters ON LINE status.

Loop-Back Connectors

The T&D can also the check the functionality of various I/Fs existing on the printer.
A proper loopback connector must be used to have the correct feedback.
Two connectors are used for the following interfaces:

Serial Interface loopback.
It is composed of some wires that connect the output signals with the input signals of the interface.

Parallel Interface loopback.
It is composed of some wires that connect the output signals with the input signals of this interface plus an integrated circuit (parallel latch) that provides the correct handling of the bidirectionality of the data input/output lines.

NOTICE: Insert the parallel interface loop-back only when the printer is powered off.

Loop-Back Connector Diagrams

Table 21 shows the diagrams of these loop-backs.

Table 21. 232/C Serial I/F Loop-Back Diagram

232/C SERIAL INTERFACE LOOP-BACK

DTR	(40)	————————	(06) DSR
RTS	(07)	————————	(08) CTS
DCD	(01)	————————	(09) DCD
TXD	(02)	————————	(03) RXD

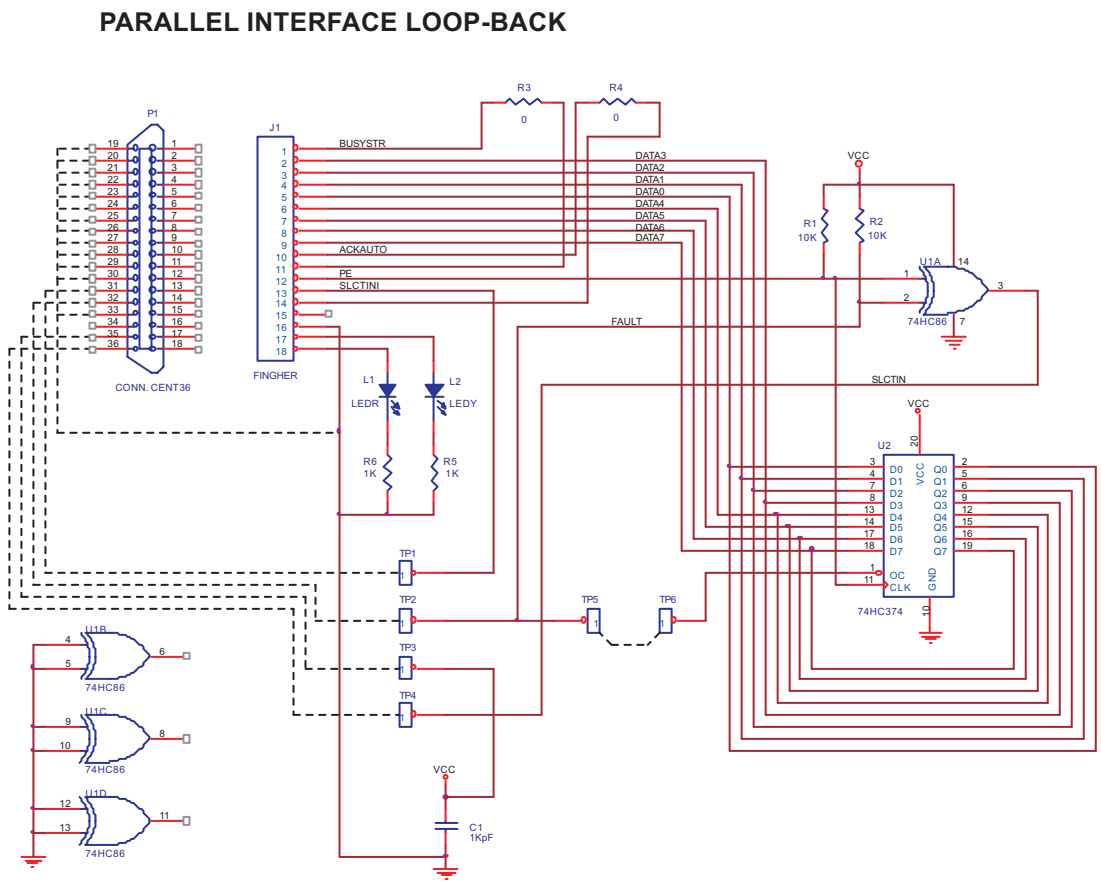


Figure 38. Parallel I/F Loop-Back Diagrams

T&D DESCRIPTION

HOW TO RUN T&D

Power on the printer with the ON LINE + MACRO keys pressed to start the USER T&D procedure. Release both keys when RELEASE KEYS displays
The T&D procedure is interactive and prompts the user to perform actions.

During the hardware initialization, the diagnostic procedure enters in the other tests, and the display shows: <<RELEASE KEYS>>, and then <<STARTING UP>>.

HOW TO HANDLE T&D TESTS

At the end of the initialization two choices are available and showed by the display.

<<SBS CMPL>>

where:

SBS: Executes tests step-by-stop, one at a time.

CMPL: Executes all tests together in a complete chain.

Note: Install (but do not load) exactly 3 sheets of 11 or 12 inch fanfold forms in the bottom front tractor set.

- LOAD/FF key is pressed within 3 seconds, the step-by-step test procedure is started.
- MACRO key is pressed (or no key action), the automatic complete sequence test is started.

In case of step-by-step test procedure, at every running test, the display shows:
"T&D(n) Test Description"
The three choices that can be performed by the operators are:

- LOAD/FF key means the next test is reached (scroll-up the test menu and the displayed one is skipped forward).
- FONT key means the displayed test begins (GO). If the test ends positively, the present test is displayed again.
- LF key means the previous test is reached (scroll-down the test menu and the displayed one is skipped backward).

When a test successfully ends, the display shows:
"REPT SKIP *"**
- LOAD/FF key means the same test is repeated.
- LF key means the skip to main menu.

When a test fails, the display shows:

"REPT SKIP INIT"
Three choices can be performed by the operators:
- LOAD/FF key repeats the same test.
- LF key skips the failed test and goes to the choice test menu.
- FONT key restarts the T&D from the beginning except the BOOT test.

If a test fails, the display shows the error as follows: **"KO(*n*1) ORU(*n*2) [*n*3]"**.

HOW TO HANDLE T&D ERRORS

In the case of a test error, the diagnostic program is stopped and the following message is displayed:

"KO(*n*1) ORU(*n*2) [*n*3]"

In which the *n*1, *n*2 and *n*3 means respectively:

*n*1 the number of failed test (indicated as TEST Number in Table 23 on page 151.)
*n*2 the implied faulty F.R.U. (indicated as F.R.U. in Table 24 on page 152)
*n*3 the diagnostic error code (indicated as ERROR CODE in Table 25 on page 153)

T&D USER FLOW CHART

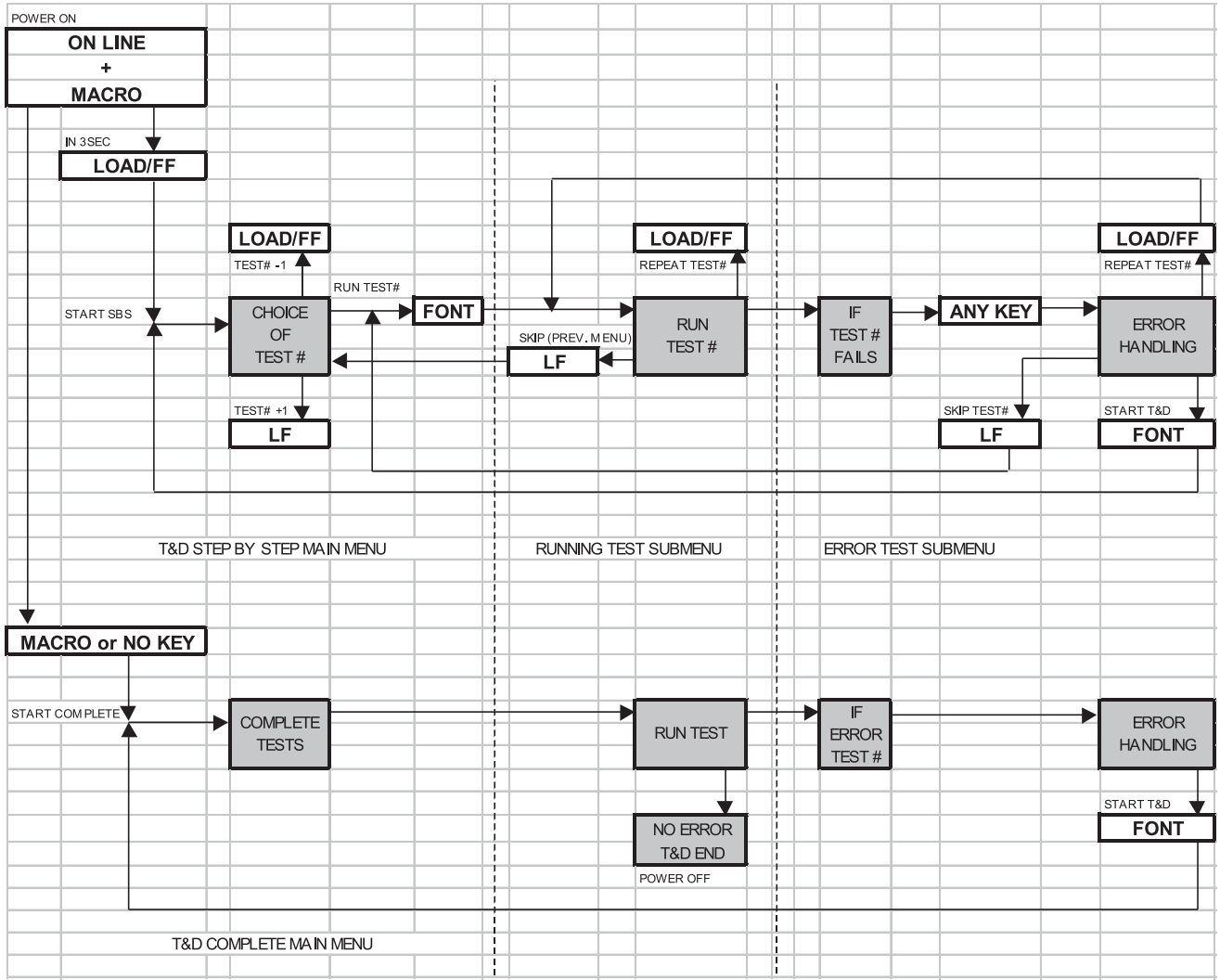


Figure 39. Flowchart of the T&D procedures

T&D STEP BY STEP SCHEMATIC FLOW CHART

Table 22 shows the schematic flowchart of the T&D USER STEP BY STEP mode without errors.
If a running tests fails, look at “HOW TO HANDLE T&D ERRORS” on page 141.

An indication between double quotes (" ") as below, means a display message.

"LCD MESSAGE"

Table 22. T&D Step-by-Step Procedure Flowchart

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
Power on with		ON LINE + MACRO	Launch the T&D	The printer sounds a beep
Initialization phases	"RELEASE KEYS" "STARTING UP" "< T&D USER >"			
Choice of T&D Mode	"SBS CMPL"	LOAD/FF MACRO	Step-by-step (Single shot) test mode Complete test mode	T&D is ready
NVM TEST	"T&D03 NVM Test"			
NVM CHECK	"T&D04 NVM Check"			

Table 22. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
OPERATOR PANEL	"T&D05 PANEL"			
	"PUSH KEY 1 →"	ON LINE	Test Key ON LINE	ON LINE LED blinks
	"PUSH KEY 2"	PROGRAM	Test Key PROGRAM	PROGR LED blinks
	"PUSH KEY 3"	MACRO	Test Key MACRO	FRONT1 LED blinks
	"PUSH KEY 4"	FONT	Test Key FONT	FRONT2 LED blinks
	"PUSH KEY 5"	LF	Test Key LF	ALL LEDS OFF
	"PUSH KEY 6"	LOAD/FF	Test Key LOAD/FF	ON LINE LEDS blink
	"PUSH KEY 7"	ALTERNATE	Test Key ALTERNATE	ALTERNATE LED blinks
	"PUSH KEY 8"	TEAR	Test Key TEAR	FRONT2+PROGRAM LEDS blink
	"PUSH KEY 9"	PATH	Test Key PATH	ALTERNATE LED blinks
	"VERIFY LEDS"	ANY KEYS		ALL LEDS are blinking until a key is pressed
Parallel Interface test	"T&D06 CENTRONIX"			(Parallel Loop Back connector has to be connected during this test)
Serial Interface test	"T&D07 SERIAL"			(Serial Loop Back connector has to be connected during this test)
LAN Interface test	"T&D08 LAN"			
RIBBON test	"T&D09 RIBBON"			
	"← START & RUN"	LOAD/FF	Start the ribbon movement	Visual check for correct ribbon movements
	"STOPPING →"	MACRO	Stop the ribbon movement	Stop test

Table 22. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
AGA (AFTA) test	"T&D10 AGA"			
	"AGA CALIBRATE"			
	"INSERT A4 FORM"			Manually load an 80gr/m^2 (0.1mm) single sheet paper from FONT1 path
	"DW UP PAPER"	LOAD/FF	Move the paper down	See AGA (AFTA) adjustment procedure on page 92
		LF	Move the paper up	
		FONT	Run the T&D10 test again	
	"– + AGA (*n*)"	LOAD/FF	Increases AGA (AFTA) value	
		LF	Decreases AGA (AFTA) value	
		FONT	Executes AGA (AFTA)	Executes AGA (AFTA)
	"YES ←STORE→NO"	LOAD/FF	Store actual AGA (AFTA) value in NVM	Park paper
		MACRO	Enter in change AFA (AFTA) value procedure	
FIRST LINE ADJ test	"T&D11 FRST ROW"			
	"YES FR.1 ADJ? NO"	LOAD/FF	Executes 1st line test on Front 1 path	Load paper from Front 1 path and print pattern
		MACRO	Skips to next test	

Table 22. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
Lower Tractor path	"FRONT1 CALIBRATE"			
	"– + FRONT1 (n)"	LOAD/FF	Increases 1st line value	
		LF	Decreases 1st line value	
		FONT	Executes 1st line value	Park, reload paper from Front1 and right shift print pattern
	"YES ←STORE→NO"	LOAD/FF	Store actual Front1 1st line value in NVM	Park paper
		MACRO	Enter in change Front1 1st value procedure	
	"YES FR.2 ADJ? NO"	LOAD/FF	Executes 1st line test on Front 2 path	Load paper from Front2 path and print pattern
Upper Tractor path	"FRONT2 CALIBRATE"			
	"– + FRONT1 (n)"	LOAD/FF	Increases 1st line value	
		MACRO	Decreases 1st line value	
		LF	Executes 1st line test	Park, reload paper from Front2 and right shift print pattern
	"YES ←STORE→NO"	LOAD/FF	Store actual Front2 1st line value in NVM	Park paper
		MACRO	Enter in change Front2 1st line value procedure	

Table 22. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
VERTICAL (bidir) test	"T&D12 VERTICAL"			
	"YES VERT. ADJ? NO"	LOAD/FF	Executes vertical (bidir) test on Front 1 path	Load paper from Front1 and print complete pattern
		MACRO	Skips to next test	
	"VERTICAL ADJUST"			
	"– + VERT (n)"	LOAD/FF	Increases vertical adjust value	
		LF	Decreases vertical adjust value	
		FONT	Executes vertical adjust test	Print only the selected vertical adjust value (n) pattern
	"YES ←STORE→NO"	LOAD/FF	Stores actual vertical adjust value in NVM	
		MACRO	Enter in change vertical adjust value procedure	
	"TEAR & PUSH KEY"	ANY	Perform the tear action and skip to next test	Raise the fanfold module to tear bar to tear it and then park paper
TEAR ADJ test	"T&D13 TEAR OFF"			
	"TEAR ADJUST"			
	"YES FR.1 ADJ? NO"	LOAD/FF	Executes Front 1 tear offset adjustment test	Load paper from Front 1 and print pattern
		MACRO	Skip to next test	

Table 22. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
Tear-off lower tractor path	"TEAR FRONT 1"			
	"– + TEAR (n)"	LOAD/FF	Increases Tear-off value	Moves the paper up
		LF	Decreases Tear-off value	Moves the paper down
		FONT	Executes Tear-off test	
	"YES ←STORE→NO"	LOAD/FF	Store actual Front 1 Tear-Off value in NVM	Park paper
		MACRO	Enter in change Front 1 Tear-Off value procedure	
	"YES FR.2 ADJ? NO"	LOAD/FF	Executes Front 2 tear offset adjustment test	Load paper from FRONT2 and print
		MACRO	Skip to next test	
Tear-off upper tractor path	"TEAR FRONT 2"			
	"– + TEAR (n)"	LOAD/FF	Increases Tear-Off value	Moves the paper up
		LF	Decreases Tear-Off value	Moves the paper down
		FONT	Executes Tear-Off test	
	"YES ←STORE→NO"	LOAD/FF	Store actual Front 2 Tear-Off value in NVM	Park paper
		MACRO	Enter in change Front 2 Tear-Off value procedure	
PRINT test	"T&D14 USER"			Load paper from FRONT1 after print is ejected
INTERLOCK test	"T&D17 COVER"			
	"OPEN COVER"			Manually Open the top cover
	"CLOSE COVER"			Manually Close the top cover

Table 22. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
SENSORS Test	"T&D18 SENSORS"			
Sensors Tune	"Y SENSOR TUNE N"	LOAD/FF	Executes Sensor Tune	
		MACRO	Skips to next test (sensor status)	
Sensor Status	"Y PATH STATUS N"	LOAD/FF	Executes Path Status test	
		MACRO	Skips to next test (Threshold)	
	"F.1:F F2:F"			Visual check for change from F (free) to B (busy) simulating absence paper condition and presence paper condition for each path
	"F1:B F2:B"			
		ANY KEY	Skips to next test (Threshold)	
Threshold Values	"Y THRESHOLD N"	LOAD/FF	Executes Threshold values check	
		MACRO	Skips to next test (Sensor Level)	
	"F1:X1 F2:Y1"			Visual check of the threshold values stored in the NVM of the Main Board
		ANY KEY	Skips to next test (Sensor Level)	

Table 22. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
Sensors Level	"Y SENSOR LEVEL N"	LOAD/FF	Executes Sensor Level test	
		MACRO	Skips to next test	
	"F1:X0 F2:Y0"			Visual check for indicative values simulating absence paper in any path
	"F1:X2 F2:Y2"			Visual check for indicative values simulating absence paper in any path
		ANY KEY	Skips to next test (Sensor Level)	
	"Y REPEAT TEST N"	LOAD/FF	To repeat the test	
		MACRO	Skip to next test	

T&D ERROR MESSAGES TABLES: KO(n1) ORU(n2) [n3]

There are 14 executed tests.

The table below shows the complete list of tests with description and the F.R.U. (Field Replaceable Unit) under test.

Table 23. T&D Tests List

TEST NUMBER (n1)	TEST DESCRIPTION	F.R.U
T&D00	Reserved Future Use	N/A
T&D01	Reserved Future Use	N/A
T&D03	NVM TEST	ENGINE BOARD
T&D04	NVM CHECK	ENGINE BOARD
T&D05	OPERATOR PANEL TEST	OPERATOR PANEL / ENGINE BOARD / O.P. CABLE
T&D06	PARALLEL INTERFACE (Centronix)	CONTROLLER BOARD
T&D07	SERIAL INTERFACE TEST	CONTROLLER BOARD
T&D08	LAN TEST	LAN BOARD
T&D09	RIBBON TEST	ENGINE BOARD / MOTORS / RIBBON DRIVE ASSEMBLY
T&D10	AGA CALIBRATE TEST	ENGINE BOARD / MOTOR / PRINT HEAD / MECH.
T&D11	1st LINE ADJUSTMENT TEST	MECHANISM / ENGINE BOARD
T&D12	VERTICAL ADJUSTMENT TEST	MECHANISM / CARRIAGE BELT / ENGINE BOARD
T&D13	TEAR-OFF ADJUSTMENT TEST	MECHANISM / ENGINE BOARD
T&D14	PRINT TEST	PRINT HEAD / ENGINE BOARD / MECHANISM
T&D15	Not Used	N/A
T&D16	Not Used	N/A
T&D17	INTERLOCK TEST	MECHANISM / ENGINE BOARD / OPERATOR PANEL
T&D18	PAPER SENSOR TEST	MECHANISM / ENGINE BOARD / SENS. CABLE

The table below shows the list of F.R.U (field replaceable unit) involved in the diagnostic phase.

Table 24. FRU List

ORU (n2)	DESCRIPTION
0	Controller or Engine Board
1	Operator Panel Board
2	Sensors
3	Mechanical Parts
4	Flash on Controller Board
5	Supervisor SW
6	Tractors
7	Print Head
8	Options

These error codes are divided for F.R.U. and are not specified for one test.

Table 25. T&D Error Codes

ORU (n2)	ERROR CODE [n3]	ERROR DESCRIPTION	F.R.U.	IMPACTED AREA
0	1	Strobe-busy	CONTROLLER BOARD	PARALLEL I/F
0	2	Slct-init	CONTROLLER BOARD	PARALLEL I/F
0	3	Ack-autofeed	CONTROLLER BOARD	PARALLEL I/F
0	4	Pe^flt-sctin	CONTROLLER BOARD	PARALLEL I/F
0	5	Data tx-rx	CONTROLLER BOARD	PARALLEL I/F
0	6	Write	ENGINE BOARD	NVM
0	7	Read	ENGINE BOARD	NVM
0	8	Pattern check	ENGINE BOARD	NVM
0	9	Rx-tx	CONTROLLER BOARD	SERIAL I/F
0	10	Dtr-dsr	CONTROLLER BOARD	SERIAL I/F
0	11	Rts-cts	CONTROLLER BOARD	SERIAL I/F
0	12	srts-dcd	CONTROLLER BOARD	SERIAL I/F
0	13	wrong loop-back	CONTROLLER BOARD	SERIAL I/F
0	14	Cts	CONTROLLER BOARD	SERIAL I/F
0	15	AGA values out-of-range	ENGINE BOARD/MECH.	NVM/AGA(AFTA)
0	16	LAN open	CONTROLLER BOARD	LAN I/F
1	1 to 9	Key 1 error to key 9	OPERATOR PANEL BOARD	KEYS
1	10	General	OPERATOR PANEL	KEYS
1	11	Cover open	OPERATOR PANEL	INTERLOCK
1	12	Cover closed	OPERATOR PANEL	INTERLOCK
2	1	Paper sensor (see note)	MECHANICAL	SENSOR
2	2	Ribbon sensor	MECHANICAL/SENSOR/ENGINE BOARD	SENSOR
2	3	Carriage sensor during initialization	MECHANICAL/SENSOR/ENGINE BOARD	SENSOR
2	4	Carriage sensor	MECHANICAL/SENSOR/ENGINE BOARD	SENSOR
3	1	Data Integrity	MECHANICAL/SENSOR/ENGINE BOARD	CARRIAGE MOV.

Table 25. T&D Error Codes (continued)

ORU (n2)	ERROR CODE [n3]	ERROR DESCRIPTION	F.R.U.	IMPACTED AREA
3	2	Paper loading	MECHANICAL/SENSOR/ENGINE BOARD	PAPER MOV.
5	1	Insufficient memory	CONTROLLER BOARD	SW/FLASH/RAM
5	2	Font generator	CONTROLLER BOARD	SW/FLASH/RAM
5	3	Print manager	CONTROLLER BOARD	SW/FLASH/RAM
6	1	Unknown	TRACTOR / ENGINE BOARD / MECH.	TRACTOR
6	2	First tractor (lower)	TRACTOR / ENGINE BOARD / MECH.	TRACTOR
6	3	Second tractor (upper)	TRACTOR / ENGINE BOARD / MECH.	TRACTOR
7	1	AGA (AFTA)	PRINTHEAD / ENGINE BOARD / MECH.	PRINTHEAD
7	2	Thermal sensor	PRINTHEAD / ENGINE BOARD / MECH.	PRINTHEAD
7	3	AGA offset (AFTA offset)	PRINTHEAD / ENGINE BOARD / MECH.	PRINTHEAD
7	4	Head temp. out-of-range	PRINTHEAD / ENGINE BOARD / MECH.	PRINTHEAD

Note: Ensure T&D12 is run with exactly 2 sheets of 11 or 12 inch fanfold forms installed. If the forms are longer, the paper sensor will not detect an "end of form" at the conclusion of this test.

Tests Description

T&D03 - NVM COMPLETE TEST: This test checks the capability of the non-volatile ram memory (NVM) to retain data.
A write pattern 0x55 and 0xAA and a read verify. If the test result is positive, the DEFAULT parameters are loaded.
This test must be run when an “neutral” engine board is installed as spare part.
It correctly initialized the NVM for the specific Device ID.

T&D04 - NVM READ-CHECK SUM TEST: This test checks for correct read access and the checksum, and adjustment data CRC.

T&D05 - OPERATOR PANEL BOARD TEST: This test begins by checking for 9 keys to be opened.
If one key is damaged (short circuit), an error message is displayed and the T&D is halted.
After that, the test checks all the 6 LEDs of the printer.
All these LEDs are lit and then go off, then sequentially from right to left one LED is lit for about 0.5 second with an associated buzzer sound.
Then the test continues with a request to push sequentially the 9 keys from right to left.
The display shows the message "PUSH KEY 1 →" to indicate that the rightmost key should be pressed.
Then, at each step the display shows the message “PUSH KEY (n)”.
If the wrong key is pressed, the buzzer sounds twice to advise the error.
In case the requested key is not activated within a few seconds, an error message is displayed.

T&D06 - PARALLEL INTERFACE TEST: This test checks by means of a loopback plug closing, for the correct operation of control, status and data signals of the bidirectional interface.

T&D07 - SERIAL INTERFACE TEST: This test checks by means of a loopback plug closing, for the correct operation of control, status and data signals of the serial RS232 interface.

T&D08 - RIBBON MOTOR: This test checks the correct movement of the ribbon and the color motors.
If the LOAD/FF key is pressed, the test is executed and the ribbon motor is activated together with a motor color activation and the display shows "STOPPING →".
If the MACRO key is pressed, the test will be stopped.

T&D08 - USB TEST: If this interface is present, this test verifies the identifier code of the USB chip.

T&D09 - RIBBON MOTOR: This test checks the correct movement of the inked ribbon cartridge.

T&D10 - AGA (AFTA) CALIBRATE TEST: This test checks the correct functioning of the AGA (AFTA). If some mechanical parts related to printing are removed (carriage assembly, AGA (AFTA) motor, platen assembly, and so forth) then calibration is required.
See “AGA (AFTA) Calibrate (T&D 10)” on page 106.

T&D11 - FIRST LINE CALIBRATE TEST: This test is to calibrate the first print line on the lower tractor paper path and on the upper one , if it is installed.
It is useful to set the printout for a specific user application.
See “First Printing Line (T&D 11)” on page 107.

T&D12 - VERTICAL (Bidirectional printing) CALIBRATE TEST: This test is to calibrate the bidirectional printing.
If mechanical parts related to the carriage movement are removed (carriage assembly, carriage motor, carriage belt, and so forth) and are out-of-tolerance with respect to the factory setting it is useful to set the printout for best performance. See “Vertical (bi-directional printing) (T&D 12)” on page 108.

T&D13 - TEAR OFF CALIBRATE TEST: This test is to calibrate the tear-off margin.
It is useful to set the printout for a specific user application.
See “Tear-off Line (T&D 13)” on page 110.

T&D14 - FANFOLD PRINTOUT TEST: The printout of this test is a standard module (132 characters, 72 lines) to check the parts involved in printing, such as printhead, needles, carriage and so forth.
See “Analysis of T&D 14 (Fanfold Printout)” on page 157 for specific details.
After this test a tear-off of the printed module is done by the operator.

Important: Install exactly 2 sheets of 11 or 12 inch fanfold forms, If the fanfold forms are longer than this, the following error message will display at the end of the test: `KO 14 ORU 02[01]` meaning the end of the form was not seen.

T&D17 - INTERLOCK SWITCH TEST: This test checks the function of the microswitch installed on the operator panel board.
During the test, the display shows the message “OPEN COVER”. The printer stays in wait until the magnetic switch detects cover open condition. After that the display shows “CLOSE COVER”. The printer will be in wait to detect cover close condition.
If the actions are not executed in time, the diagnostic stops and displays the error.

T&D18 - PAPER SENSOR TEST: This test shows the function of the paper sensors and their margins.
See “Sensor Tuning (T&D 9, 14, 18)” on page 110.

Analysis of T&D 14 (Fanfold Printout)

Please use the standard printout module in the next figure as a reference when checking all printing quality problems and tractor movement.

Following the explanations of various tests performed in this module reported in Figure 40 on page 159.

1. In the first line print is printed in draft mode with two pattern of 6 “E” character near to the left and right margin with a continuous line to check the horizontal printing skew of the paper at the top margin of the module.
2. In the second line print is printed in quality mode an heading of the executed T&D test with the same pattern of the previous point.
3. The Software Version, Identifiers, Device # (1 for 4247-L03), Product # (104 for -L03, 105 for -D03), Lower Tractor type, Upper Tractor type, LAN MAC Address (if LAN I/F installed), T&D Version.
4. A complete pattern which exercises all the 24 needles of the printer.
5. A paper movement test (with forward and backward movements) composed by:
   a. First the printer prints the first and third chopped-lines.
   b. After the point 12. a backward movement is made and the central chopped-line is printed. This line must be between the two previous chopped-lines.
6. A character “H” pattern is printed to check the bidirectional vertical alignment in normal text printout.
7. A bit image pattern is printed to check the bidirectional vertical alignment in graphic printout.

8. Three lines of characters set with different type of printing and with the composed color (first line at 10 CPI draft, second line at 17.14 CPI draft, and the third at 10 CPI quality).
9. A special test of three signs (< , ~ , >) printed in quality, draft and quality on the first line and in draft, quality, draft in the second line to test the half-nose print head electromagnet movement.
10. A special pattern of “H” character to stress the carriage movement.
11. 11. A graphic pattern to check the full-graphic capability.
12. A needle pairs verification.
13. A continuous line printed in the 66th position.
14. See step b. of item 5.
15. A forward paper movement is done to reach the 70th position and a pattern as point 1 is made.

Note: The standard module printout is designed to be printed on 12 inch long (A4) forms. With 11 inch long forms installed, the last line of the printout will be printed near the top of the second 11 inch page.

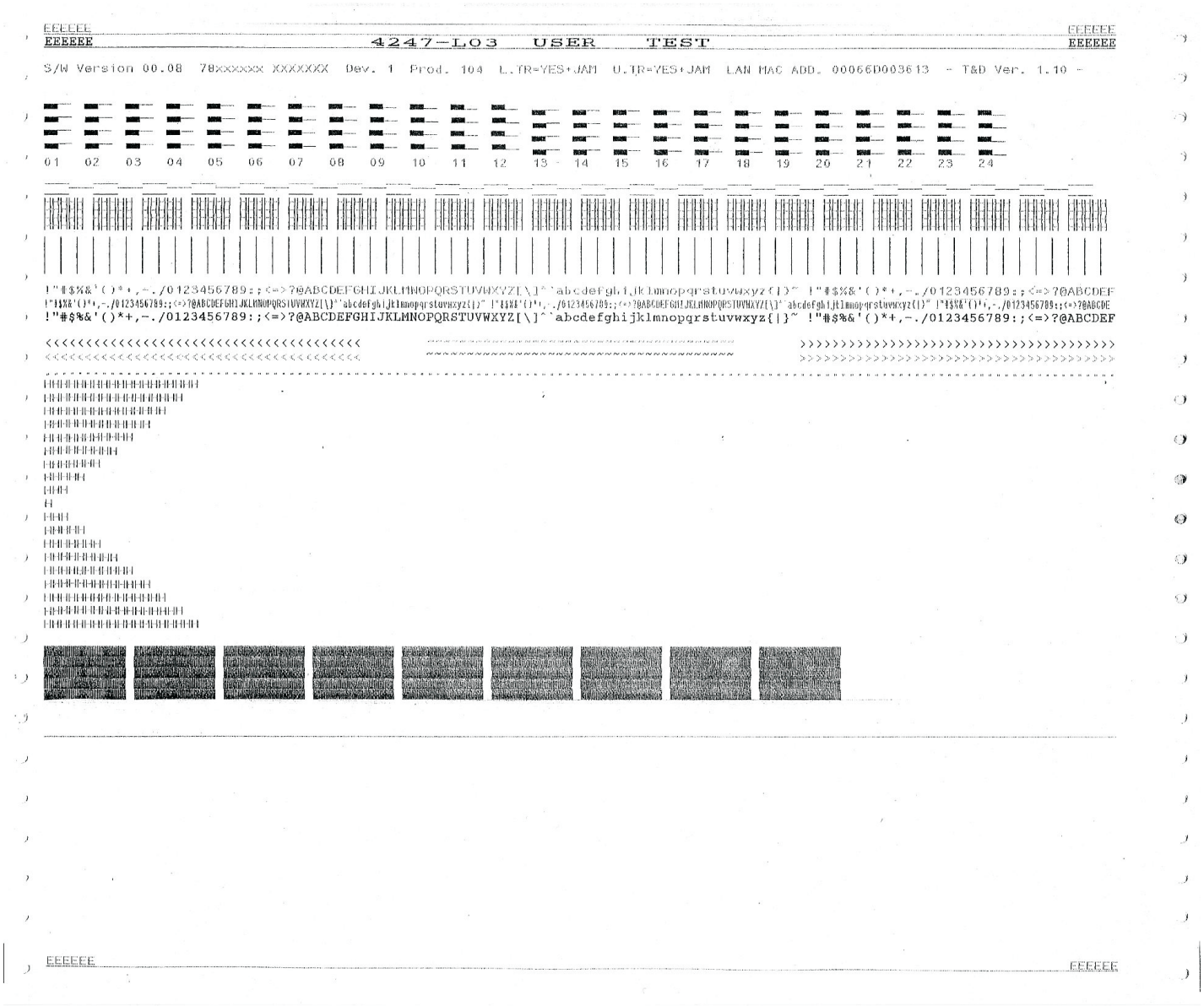


Figure 40. Printout Standard Module

Firmware Downloading

4247 L03 firmware (code) resides in flash memory. Throughout the printer's life cycle firmware changes may be made to address issues discovered in the lab, or by customers in the field. Normally it's not necessary to upgrade your printer, but if needed upgrading your printer's firmware is easy to do. 4247 Base and Interface code can be installed through either the printer's Parallel or Ethernet ports in a one file download operation.

Loading code though the Parallel Port

Follow these instructions to load code through the parallel port using any computer with DOS or DOS Windows. The instructions assume that you are nearby the printer and can access the operator panel.

1. For Windows computers install a 'Generic/Text Only' print driver.
   In Windows click Start → Control Panel → Printer and Faxes → Add printer and choose the following settings.
   - Local printer attached to this computer
   - Port = LPT1
   - Manufacturer = Generic
   - Printer = Generic / Text Only
   - Name your printer →Generic /Text Only
   - Default printer = Yes
   - Printer Sharing → Do not share
   - Test Page → No
2. Printout the printer configuration menus to ensure original settings can be restored at the end of this procedure. Label the printouts “old”.

   Note: Loading new code won’t change any of the printer's network interface settings (IP, subnet mask, gateway addresses), but other user defined configuration settings can be reset to factory default values.
   - Load forms in the front tractor and power on.
   - Press the ON LINE key to take the printer OFF LINE.
   - Press the PROGRAM key and the printer displays **PRINT OUT? NO**.

- Press the → key and **PRINT OUT? YES** displays while the **PROGRAM SETUP PRINTOUT** prints.
- Press the ↓ key until **CONFIG MENU NO** displays
- Press the → key and **CONFIG MENU YES** displays
- Press the ↓ key and **PRINT OUT? NO** displays
- Press the → key and **PRINT OUT? YES** displays while the **CONFIGURATION SETUP** prints

3. Power off the printer.
4. Connect a standard parallel cable between your computer's LPT1 port and the printer.
5. Press and hold the printer LF (line feed) and **MACRO** keys and power on the printer.
6. Release the keys after **RELEASE KEYS** displays and **WAITING CODE** will display with all LEDs flashing.
7. 7) In a DOS window type: copy *drive*:*directory**filename.bin* lpt1: /b <enter>
   For example: copy c:\temp\4247-L03_0009.bin lpt1 /b
8. While the printer code is being received **RECEIVING CODE** displays.
9. While the printer code is being updated **ERASING SECT.XX** followed by **WRITING SECT.XX** displays.
10. After the code download completes and is verified, **CODE OK** displays before the printer automatically reboots and **STARTING UP** displays.

    Note: If **"NUM CHAGNE"** displays, this means that all of the printer configuration settings have been restored to factory defaults.
11. Printout the printer configuration menus again and label them “new”.
12. Compare the old and new configuration printouts and restore the printer's configuration as needed.

Loading code though the Ethernet Port

Follow these instructions to FTP printer code to a network attached printer The instructions assume that you are nearby the printer and can access the operator panel.

1. Printout the printer configuration menus to ensure original settings can be restored at the end of this procedure.

Note: Loading new code won't change any of the printer's network interface settings (IP, subnet mask, gateway addresses), but other user defined configuration settings can be reset to factory default values.

- Load forms in the front tractor.
- Press the **ON LINE** key to take the printer **OFF LINE**.
- Press the **PROGRAM** key and the printer displays **PRINT OUT? NO**.
- Press the → key and **PRINT OUT? YES** displays while the **PROGRAM SETUP PRINTOUT** prints.
- Press the ↓ key until **CONFIG MENU NO** displays.
- Press the → key and **CONFIG MENU YES** displays.
- Press the ↓ key once and **PRINT OUT? NO** displays.
- Press the → key and **PRINT OUT? YES** displays while the **CONFIGURATION SETUP** prints.
- Press the **PROGRAM** key again and **ON LINE M1** displays

2. Make sure the code file is in the same directory that you will launch the FTP service from.
3. In Windows:
   - Click Start → Control Panel → Network and Internet Connections.
   - Click "Network Connections".
   - Double click "Local Area Connections".
   - Highlight "Internet Protocol (TCP/IP)".
   - Click "Properties".
   - Set "Subnet Mask" and "Default Gateway" to the values on the printer Configuration Setup Printout.
   - Set "IP Address" to the printer's address + 1.

     Example: If printer IP is `009.17.162.233` then set the computer IP to `009.17.162.234`.
   - Click OK and close the window.
4. Connect your computer to the printer with an Ethernet cross-over cable.
5. Verify that the printer can be contacted from your computer.
   In a DOS window, type "ping *xxx.xxx.xxx.xxx*" <enter> where "*xxx.xxx.xxx.xxx*" is the printer's IP address.
6. Open the FTP connection to the printer.
   In a DOS window type **ftp xxx.xxx.xxx.xxx** <enter> where xxx.xxx.xxx.xxx is the printer IP address.

7. Type **root** for user login <enter>.
   Type password (default=**root**) for password <enter>.
   Type the commands: **ha** <enter> **bin** <enter> **cd firmware** <enter>.
8. Start the file transfer by typing: **put filename.bin** where filename.img is the name of the code file and press enter.
   For example: put 4247-L03_0009.bin <enter>.
9. While the printer code is being received, the printer will display **REMOTE CONTROL** for approximately 1 minute.
10. When the file is successfully transferred the following host message appears:
    Enter Quit/Bye command to write CODE.
11. Close the FTP connection by typing the command: bye <enter>. After the FTP session is closed the file update will start.
12. After the code update completes, the printer automatically reboots and **STARTING UP** displays.
13. Printout the printer configuration menus again and label them “new”. Compare the new printout to one the old printout, and restore the old menu settings as needed.

    Note: The new code version level also prints out.

ERROR MESSAGES

INVALID CODE: Binary code file is corrupt or incompatible.

Error recovery action: Open the Windows (Generic/Text only) print driver queue, cancel all pending print documents, and try again. If the error repeats the code file may corrupted or incompatible with this printer model. In any case, after this message the printer automatically discharges any code upgrade and escapes from the firmware downloading procedure returning in normal ON LINE status.

FILE NOT FOUND: Code file cannot be found by DOS.

Error recovery action: In the DOS window, change the path to the same directory that the code file is located in.

Chapter 6. Electromechanical Devices

This section describes all the electromechanical parts of the printer with their main electrical and mechanical requirements to allow the field service technicians to check correct operation.

Print Head

The print head installed on these printers is an electromagnetic non-ballistic type with an electromagnet that can shift along a vertical line one column.

Figure 41 on page 165 shows a cross section of the print head and a description of the main parts.

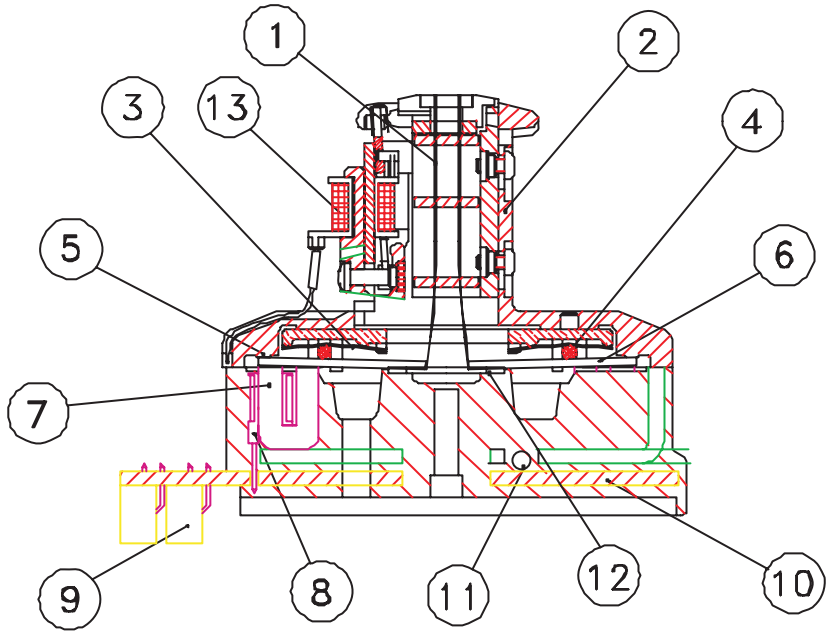


Figure 41. Print Head Internal Components

1	Needle	8	Coil
2	Support	9	Connector
3	Leaf Spring	10	PWB
4	Hinge O-Ring	11	Thermal sensor
5	External stopper	12	Central stopper
6	Clapper	13	Moving-Ruby
7	Core		

OPERATION

With reference to Figure 42, when the actuator is at rest, the Clapper (1) is pushed against the central Stop (2) by the hinge O-Ring (3).
When a dot is to be printed, a current pulse is applied to the Coil (4), the Clapper (1) is attracted by the Core (5) and the needle is pushed against the paper (6).

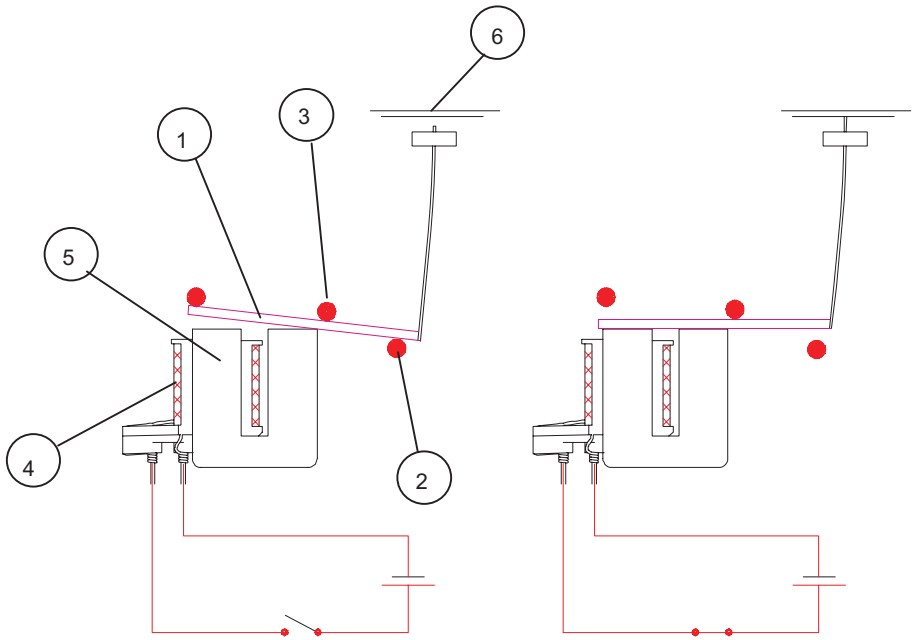


Figure 42. Needle Operation

Print Head Specifications

It has 2 columns of 12 pins each in diamond shape.
The needles have diameter of 0.25 mm (0.00984").

Vertical pitch:

Parallel 0.282 mm (1/90")
Staggered 0.141 mm (1/180")

When the energy is applied to the moving ruby electromagnet it shifts the moving needle guide so that the two needle columns assume a staggered position.

When the moving ruby electromagnet is not energized the needles columns assume a parallel position.

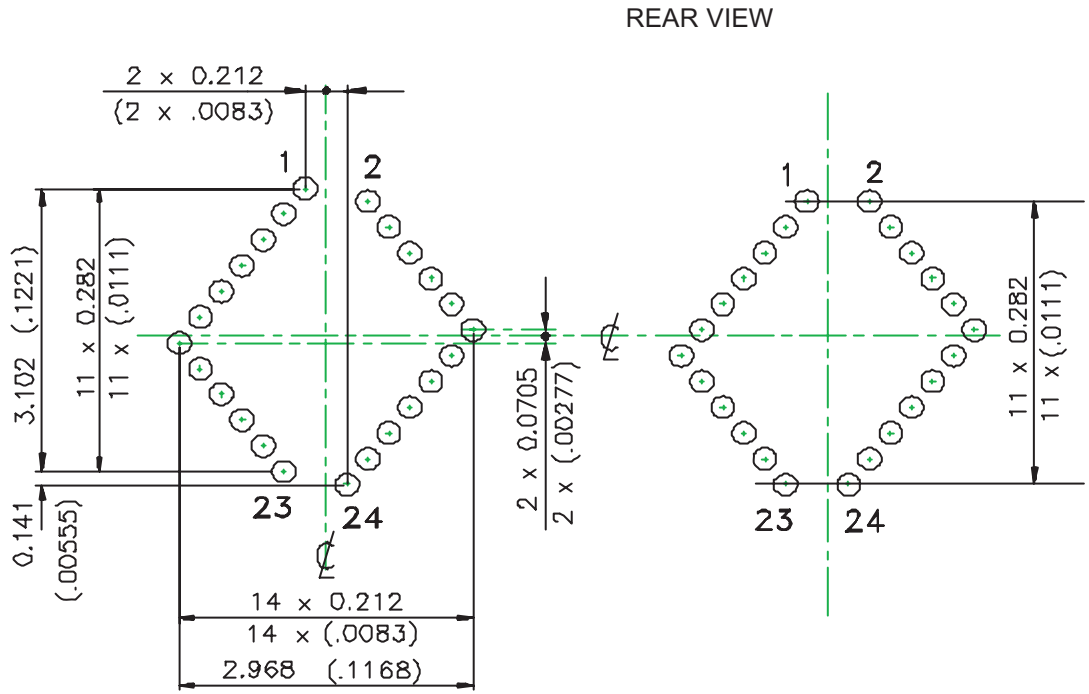


Figure 43. Printhead Needles Position

ELECTRICAL REQUIREMENTS

Needle Coil resistance	4.0 Ω ± 10%	measured at 20°
Thermal sensor	1000 Ω ± 6%	measured at 25°

Mechanical Requirements

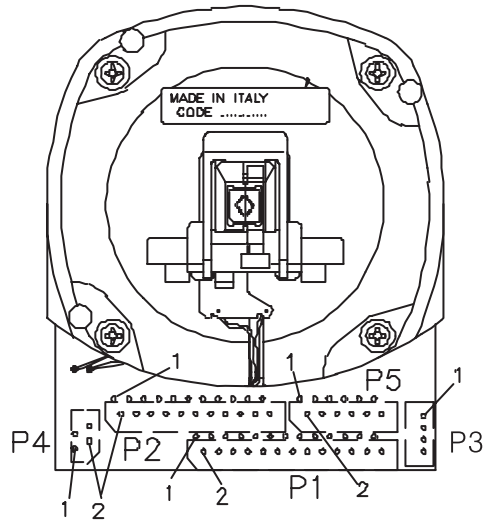


Figure 44. P.H. Electrical interface layout (front view)

Note: Connectors P3 and P4 are not used on this model printer.

Table 26. Connections

From pin Nr.	To	From pin Nr.	To	From pin Nr.	To	From pin Nr.	To
P1 1	Conn. P4 Pin 4	P2 5	needle Nr.06 H	P1 16	needle Nr.17 H	P2 20	needle Nr.22 L
P1 2	Conn. P4 Pin 3	P2 6	needle Nr.06 L	P1 17	needle Nr.15 H	P2 21	needle Nr.21 H
P1 3	Conn. P4 Pin 2	P2 7	needle Nr.08 H	P1 18	needle Nr.15 L	P2 22	needle Nr.21 L
P1 4	Conn. P4 Pin 1	P2 8	needle Nr.08 L	P1 19	needle Nr.13 L	P5 1	needle Nr.24 H
P1 5	GND Th. Sens.	P2 9	needle Nr.10 H	P1 20	needle Nr.13 H	P5 2	needle Nr.24 L
P1 6	Thermal Sensor	P2 10	needle Nr.10 L	P1 21	needle Nr.03 L	P5 3	needle Nr.23 H
P1 7	needle Nr.05 H	P2 11	needle Nr.14 H	P1 22	needle Nr.03 H	P5 4	needle Nr.23 L
P1 8	needle Nr.05 L	P2 12	needle Nr.14 L	P1 23	Conn. P3 Pin 2	P5 5	needle Nr.12 L
P1 9	needle Nr 07 H	P2 13	needle Nr.16 H	P1 24	Conn. P3 Pin 3	P5 6	needle Nr.12 H
P1 10	needle Nr.07 L	P2 14	needle Nr.16 L	P1 25	Conn. P3 Pin 1	P5 7	needle Nr.11 H
P1 11	needle Nr 09 H	P2 15	needle Nr.18 H	P1 26	Conn. P3 Pin 4	P5 8	needle Nr.11 L
P1 12	needle Nr 09 L	P2 16	needle Nr.18 L	P2 1	needle Nr.04 H	P5 9	needle Nr.01 H
P1 13	needle Nr 19 H	P2 17	needle Nr.20 H	P2 2	needle Nr.04 L	P5 10	needle Nr.01 L
P1 14	needle Nr 19 L	P2 18	needle Nr.20 L	P2 3	Moving-Ruby H	P5 11	needle Nr.02 L
P1 15	needle Nr.17 L	P2 19	needle Nr.22 H	P2 4	Moving-Ruby L	P5 12	needle Nr.02 H

Motors

Carriage Motor

The carriage motor is a 1.8° hybrid bipolar stepper motor.

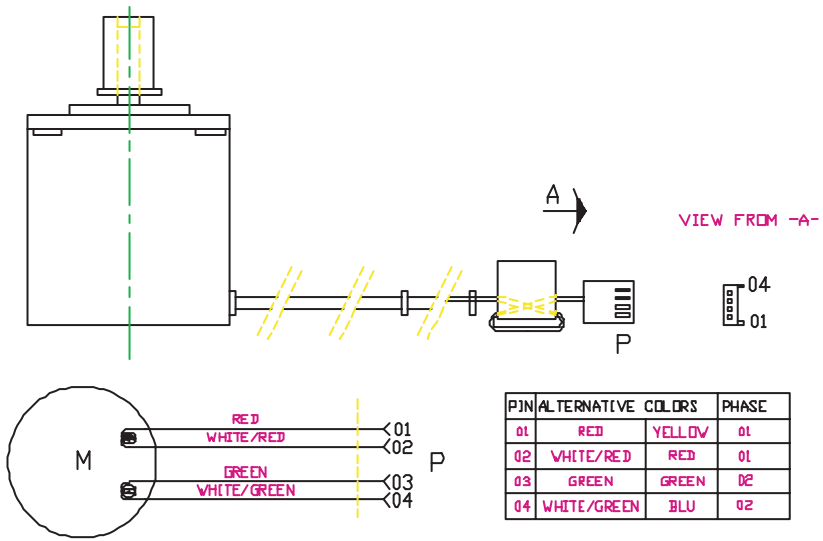
ELECTRICAL REQUIREMENTS

Phase resistance	0.26 Ω ± 15%	Measured at 25° C between pin 1-2 and 3-4
Phase inductance	0.70 mH ± 20%	Measured at 1 Khz 100 mVpp with energized coil.
Rated motor voltage	1.75 V	With rated voltage applied to both phases (parallel).
Rated phase current	5.1 A	With rated current applied to both phases (series).
Back electromotive force	14.5 Vpeak ± 20%	With motor shaft at the constant speed of 1000 RPM

MECHANICAL REQUIREMENTS

Step angle	1.8°

The pin connector assignment is shown in Figure 45 on page 172.



PIN	ALTERNATIVE COLORS		PHASE
01	RED	YELLOW	01
02	WHITE/RED	RED	01
03	GREEN	GREEN	02
04	WHITE/GREEN	BLU	02

Figure 45. Carriage Motor

Paper Motor

The paper motor is a 1.8° hybrid bipolar stepper motor.

The paper motor is a 1.8° hybrid bipolar stepper motor identical for both the printer models. There are two different paper motor groups having different gears on the motor shaft.

ELECTRICAL REQUIREMENTS

Phase resistance	0.84 Ω ± 15%	Measured at 25° C between pin 1-2 and 3-4
Phase inductance	2 mH ± 20%	Measured at 1 Khz 100 mVpp.
Rated motor voltage	2.1 V	With rated voltage applied to both phases (parallel).
Rated phase current	2.5 A	With rated current applied to both phases (series).
Back electromotive force	24 Vpeak ± 20%	With motor shaft at the constant speed of 1000 RPM

MECHANICAL REQUIREMENTS

Step angle	1.8°

The pin connector assignment is shown in Figure 46 on page 174.

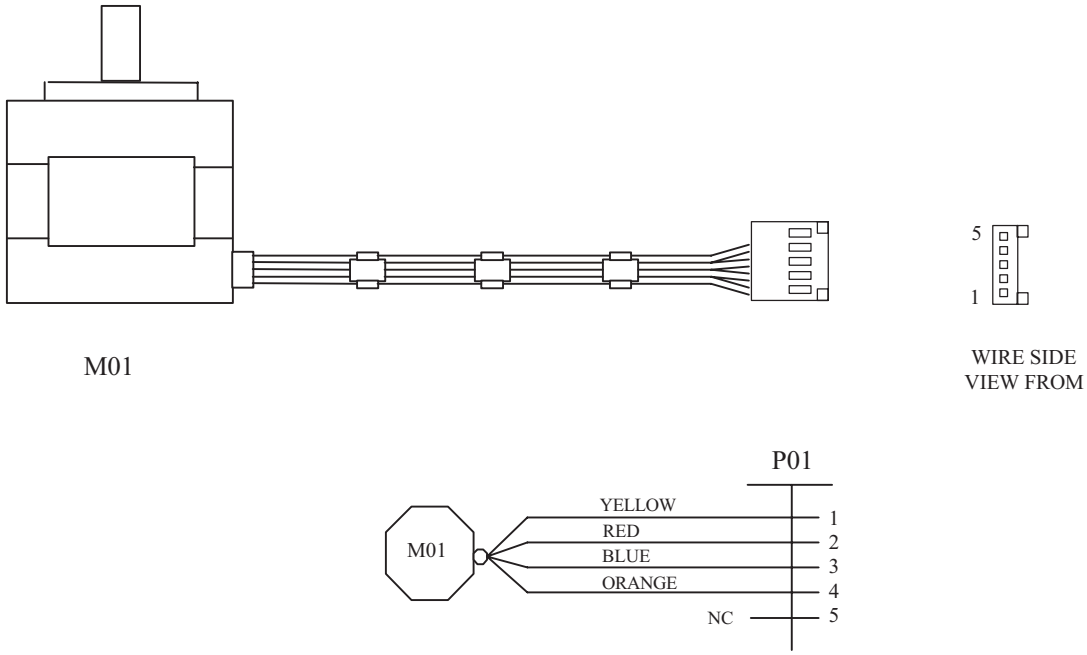


Figure 46. Paper Motor

AGA (AFTA) Motor

The AGA (AFTA) motor is a 3.6° permanent magnet bipolar stepper motor.

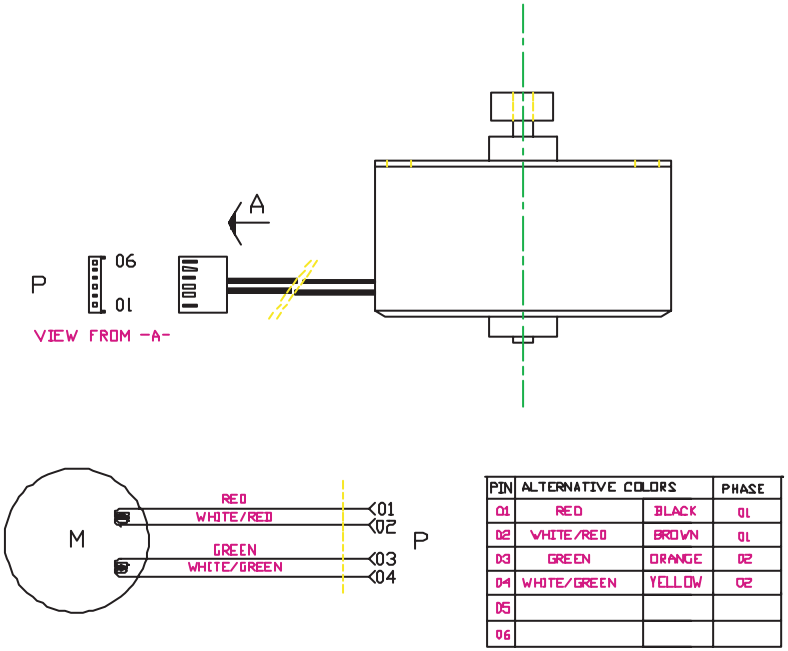
ELECTRICAL REQUIREMENTS

Phase resistance	19 Ω ± 10%	Measured at 25° C between pin 1-2 and 3-4
Phase inductance	18 mH ± 20%	Measured at 1 Khz 100 mVpp.
Rated motor voltage	7.7 V	With rated voltage applied to both phases (parallel).
Rated phase current	0.31 A	With rated current applied to both phases (series).
Back electromotive force	15.5 Vpeak ± 20%	With motor shaft at the constant speed of 1000 RPM

MECHANICAL REQUIREMENTS

Step angle	3.6°

The pin connector assignment is shown in Figure 47 on page 176.



PIN	ALTERNATIVE COLORS		PHASE
01	RED	BLACK	01
02	WHITE/RED	BROWN	01
03	GREEN	ORANGE	02
04	WHITE/GREEN	YELLOW	02
05			
06			

Figure 47. AGA (AFTA) Motor

Ribbon Motor

The ribbon motor is a 7.5° permanent magnet bipolar stepper motor.

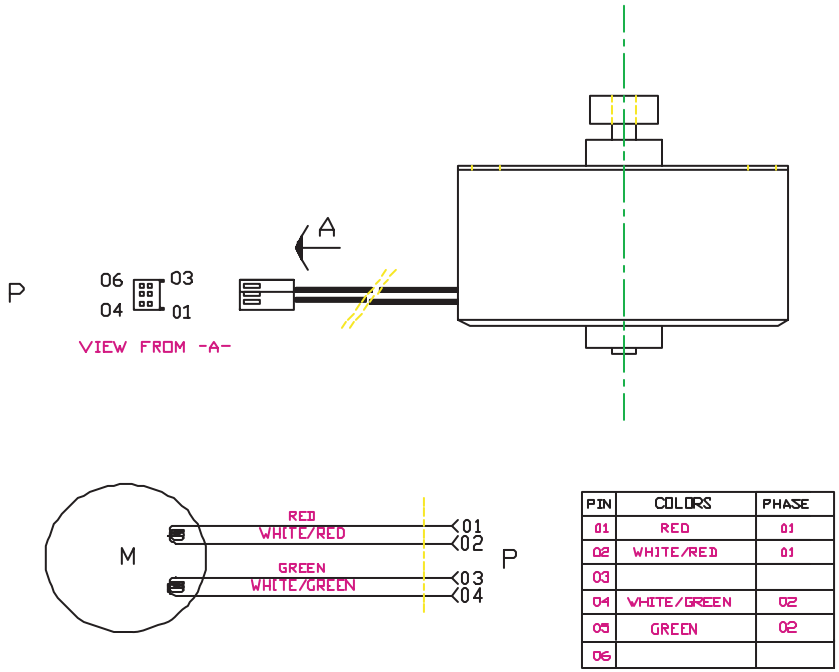
ELECTRICAL REQUIREMENTS

Phase resistance	24 Ω ± 10%	Measured at 25° C between pin 1-2 and 5-6
Phase inductance	33 mH ± 20%	Measured at 1 Khz 100 mV.
Rated motor voltage	7.3 V	With rated voltage applied to both phases (parallel).
Rated phase current	0.35 A	With rated current applied to both phases (series).
Back electromotive force	21 Vpeak ± 20%	With motor shaft at the constant speed of 1000 RPM

MECHANICAL REQUIREMENTS

Step angle	7.5°

The pin connector assignment is shown in Figure 48 on page 178.



PIN	COLORS	PHASE
01	RED	01
02	WHITE/RED	01
03		
04	WHITE/GREEN	02
05	GREEN	02
06		

Figure 48. Ribbon Motor

Tractor Gear Alternance Motor

The alternance motor is a direct current motor.

ELECTRICAL REQUIREMENTS

Terminal resistance	46.15 Ω ± 10%	Calculated as the rated motor voltage divided by stall current.
Terminal inductance	24.5 mH ± 20%	Measured at 1 Khz
Rated motor voltage	24 V	
Rated motor current	0.215 A	It is the current supplied to the motor at rated torque (0.51 Ncm), rated voltage and constant speed of 100 RPM.
Stall current	0.52 A ± 10%	It is the armature current when the rated motor voltage is applied to the motor with locked rotor.
No load current	0.035 A ± 40%	It is the motor armature supply current at no load speed.
Back electromotive force	1.7 V ± 10%	Measured across the terminal, carrying the motor shaft to a constant speed of 1000 rpm.

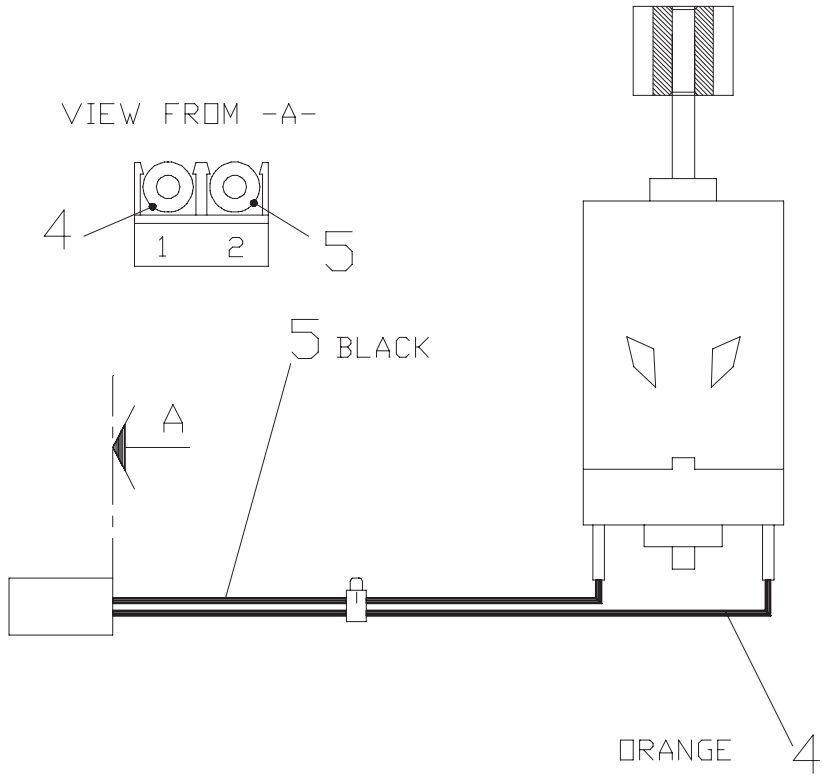


Figure 49. Alternamce Motor

Cables

Sensors Cable

This cable is composed of five optical sensors (two interrupter and three reflective ones).

Figure 50 shows the electrical connections of this cable.

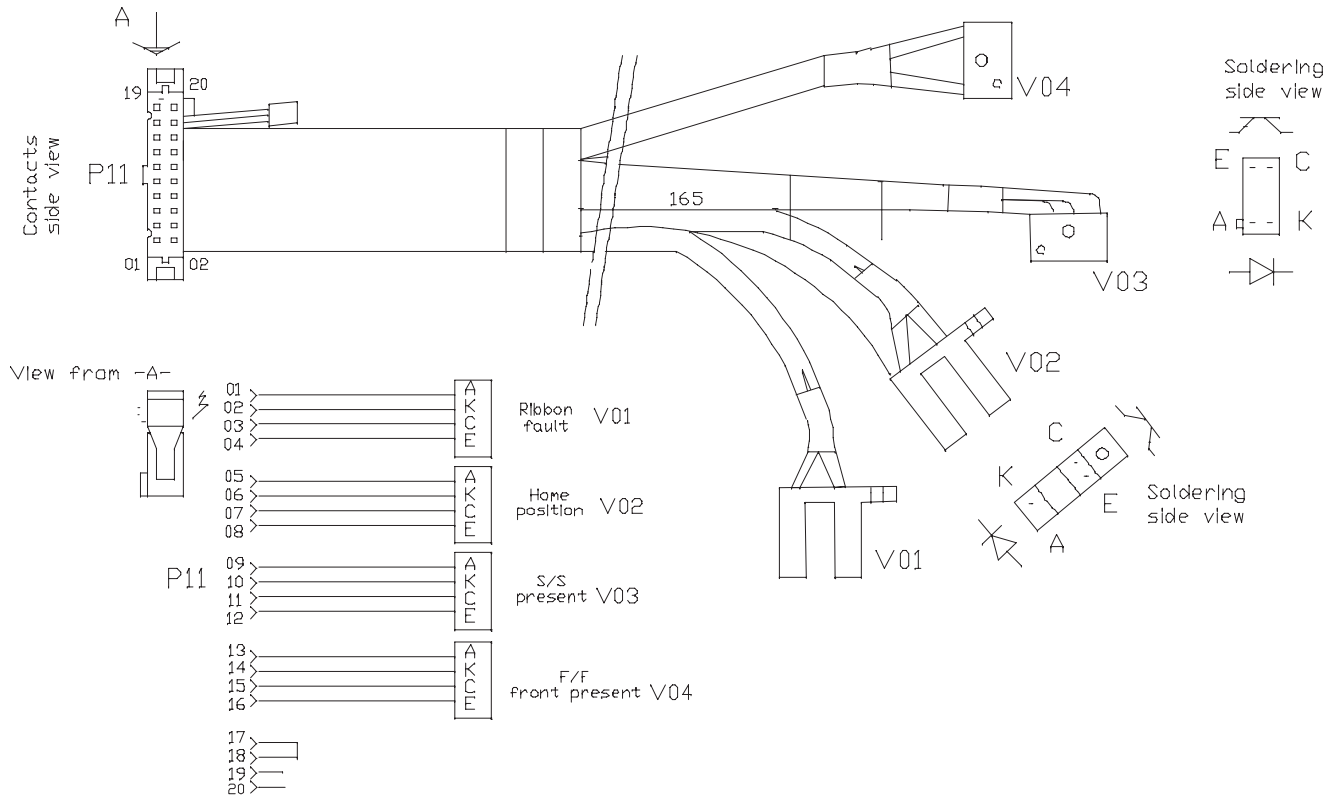


Figure 50. Sensors Cable

Tractor Cable

Figure 51 shows the electrical connections of this cable.

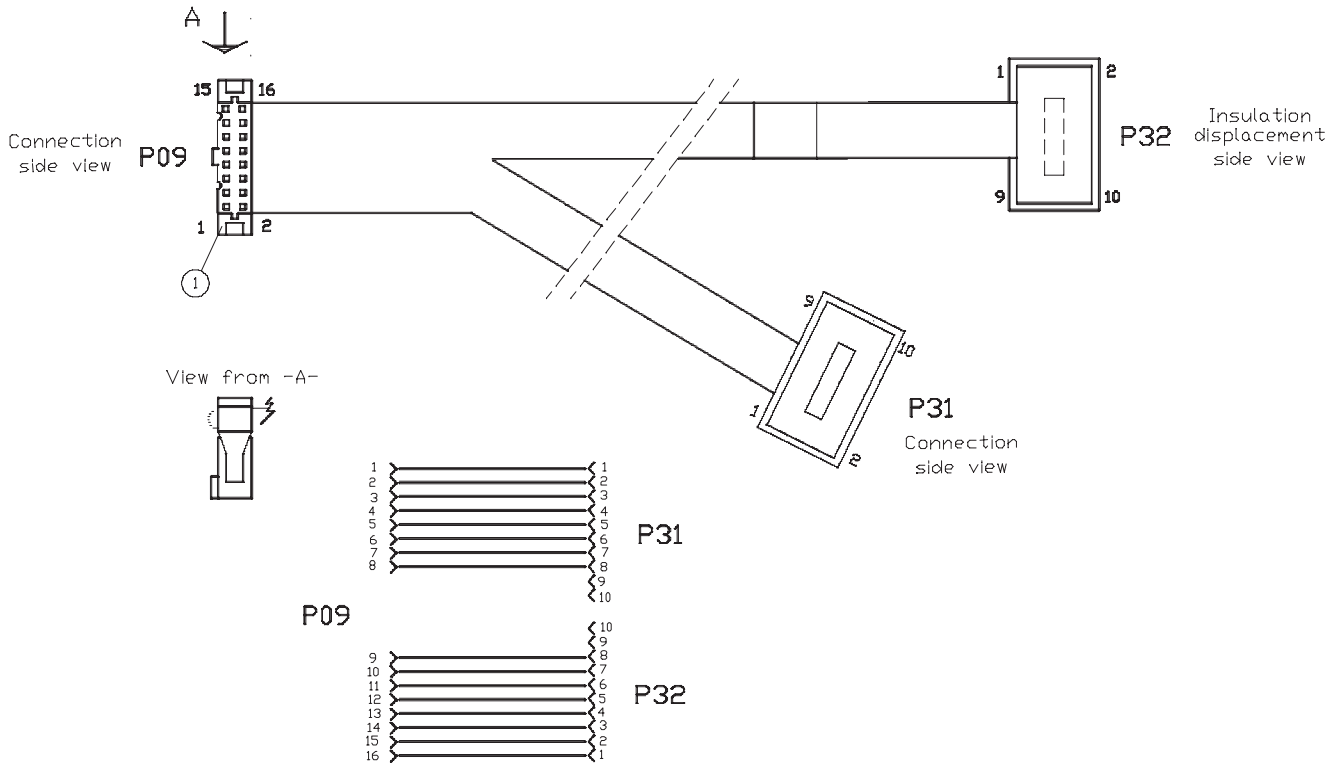


Figure 51. Tractor Cable

Operator Panel Cable

Figure 52 shows the electrical connections of this cable.

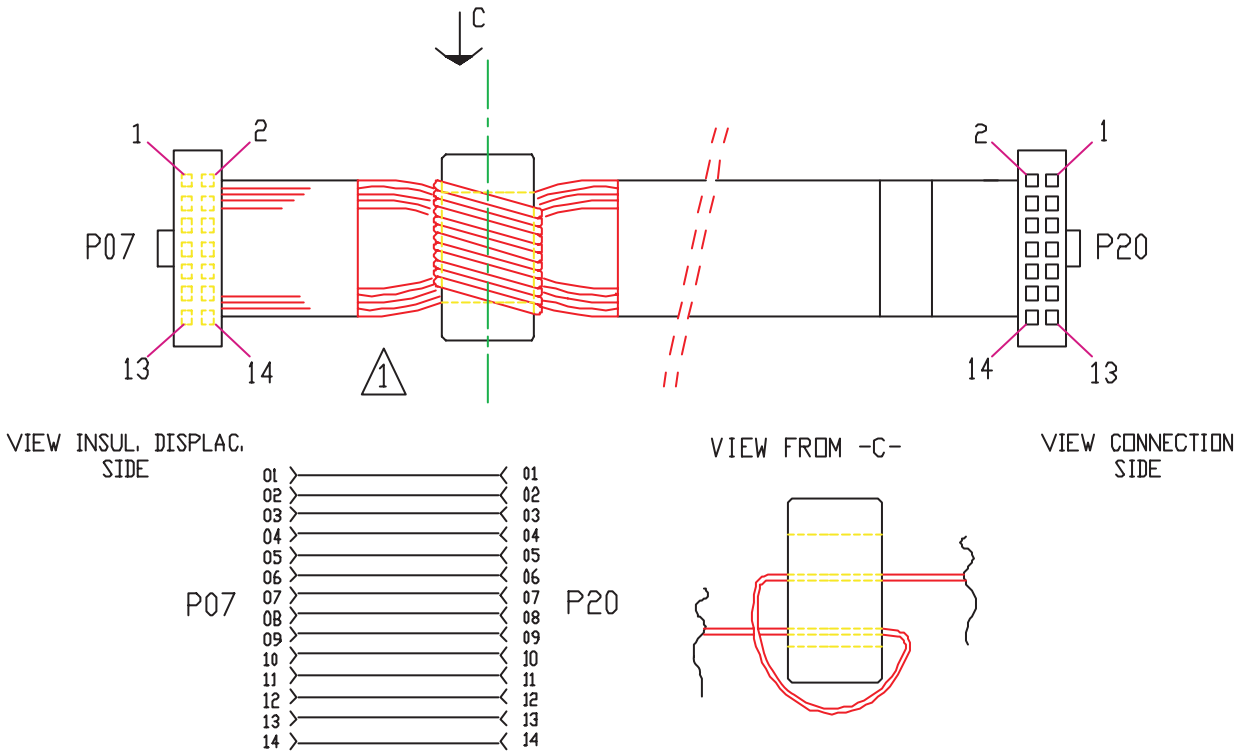


Figure 52. Operator Panel Cable

Appendix. Parts Catalog

This section lists replaceable parts and subassemblies in a form intended to help their identification.

A recommended spare parts list is shown in “Recommended Spare Parts List” on page 185, while the detail of parts referred to their mounting position over the printer, is shown in “Basic Printer Exploded Views” on page 188.

When a part number is written with remark (Misc. item xx), please refer to “Assembly 9: Miscellaneous Kits Spare Part Lists and Line Cords” on page 207 for the composition of these miscellaneous Kits.

When a part number includes more then one item of the table, see the NOTE below on the same page.

Where no part number is written, this part is not procurable.

Recommended Spare Parts List

Table 27. Recommended Spare Parts List for basic printer

SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
Bail Assembly	01P7165	6	101
Kit Left Cart. Supp/Rib.Dr. Assembly	02N7006	8	102 & NOTE
Alternance Cable	08H7248	5 / 8	114
Operator Panel Cable	08H7249	5	182
Carriage Fan Assembly	08H7252	4	65
Fan Assembly	08H7258	4	64
Fan Support	08H7265	4	63
Loopback Conn. Parallel I/F	08H7269	-	Tool
Platen Belt Toothed	08H7287	6	29
Pulley	08H7288	6	41
Upper Feeder Assembly	08H7290	6	90
Idle Gear	08H7301	6	45
Idle	08H7302	6	48
Carriage Belt	08H7304	7	60
Paper Belt Toothed	08H7307	6	81
A.G.A. (AFTA) Sector	08H7308	7	82
Double Gear	08H7309	7	93
Movable Gear	08H7310	7	97
AGA (AFTA) Gear	08H7319	8	84
AGA (AFTA) Motor Assembly	08H7320	8	86
Ribbon Motor Assembly	08H7324	8	105
Cartridge Support Right	08H7325	8	108
Kit Mechanical Parts I	08H7351	9	-
Kit Plastic Parts	08H7353	9	-
Kit Metric-Thread Screw	08H7355	9	-
Magnet Interlock	08H7370	3	26-A
Carriage Assembly	17R7487	7	59 & NOTE 1
Lower Mylar Assembly	24H7729	6	149
O.P. Overlay English	41U2208	1	12

Table 27. Recommended Spare Parts List for basic printer (continued)

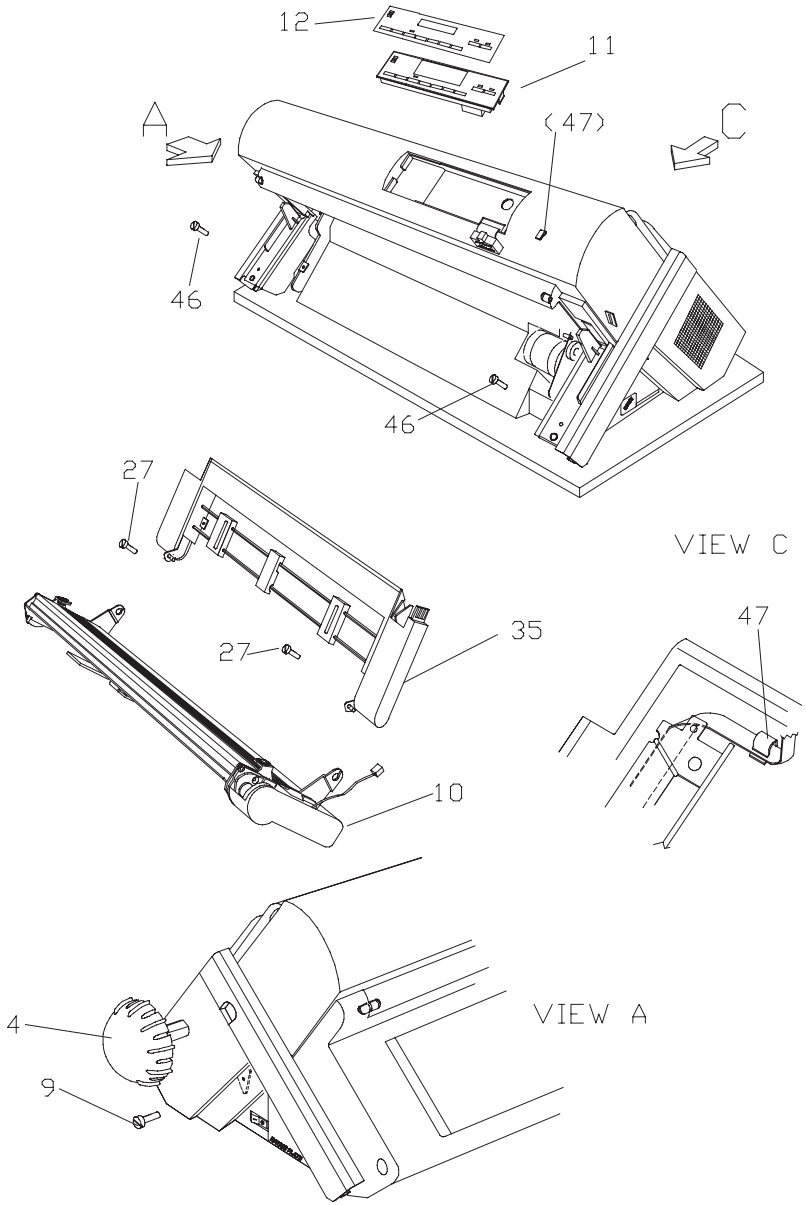
SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
O.P. Overlay German	41U2209	1	12
O.P. Overlay French	41U2220	1	12
O.P. Overlay Spanish	41U2221	1	12
O.P. Overlay Italian	41U2222	1	12
O.P. Overlay Danish	41U2223	1	12
O.P. Overlay Dutch	41U2224	1	12
O.P. Overlay Finnish	41U2225	1	12
O.P. Overlay Norwegian	41U2226	1	12
O.P. Overlay Swedish	41U2230	1	12
O.P. Overlay Portuguese	41U2232	1	12
O.P. Overlay Russian	41U2432	1	12
O.P. Overlay Polish	41U2434	1	12
O.P. Overlay Hungarian	41U2436	1	12
O.P. Overlay Czech	41U2438	1	12
O.P. Overlay Turkish	41U2440	1	12
O.P. Overlay Chinese	41U2234	1	12
Opto Interrupter	41U2271	6	V01 & V02
Kit Mechanical Parts II	41U2290	9	-
Carriage Motor Assembly	41U2318	7	79
Kit Self-Tapping Screw	41U2328	9	-
Kit Washer	41U2329	9	-
Platen Assembly	41U2330	6	28
Lower Feeder Assembly	41U2392	6	6 & NOTE 1
Front Pulley	41U2393	6	10
Small Rear (Tractor) Cover	41U2394	2	8 & NOTE 3
Rear Deflector	41U2395	2	69
Gear Cover Right	41U2396	2	38
Gear Cover Left	41U2397	2	6
Rear Cover Group	41U2398	2	3 & 7 & NOTE 1
Hand Grip	41U2399	1	4
Slide (Support Cover)	41U2460	2	19 & 31

Table 27. Recommended Spare Parts List for basic printer (continued)

SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
Protection Mylar for PH Cable	41U2461	5	196
Main Cover Group	41U2462	2	2
Top Cover Group	41U2463	2	26
Front Cover Group	41U2464	2	5
Sensor Cable Assembly	41U2465	5	19
Print Head Cable 24	41U2466	5	181
LoopBack Conn. Serial I/F 232	41U2467	-	Tool
PWA GX2INT	41U2468	2	75
Paper Motor Assembly	41U2469	6	43
24N. Print Head Assembly	41U2470	5	60
Power Supply Univ.	41U2471	4	24
Lower Tractor Assembly - 4pin	41U2472	1	35
Operator Panel Assembly	41U2473	1	11
Engine Board	41U2474	4	25
Reshipping Kit	41U2425	9	-
Base Assembly	41U2426	3	177
Lower Shield	41U2427	4	178
2nd 4pin Push Tractor	41U2430	1	10
Support Spring Assembly	41U2431	6	7
SBCS Controller P, S, USB	41U2227	4	115
SBCS Controller P, Eth 10/100	41U2231	4	115
DBCS Controller P, S, USB	41U2236	4	115
DBCS Controller P, Eth 10/100	41U2237	4	115
Main Shaft / Front Bar	63H6063	7	66
Rear Bar Kit	63H6274	7	63 & NOTE 2
Printing Position Mylar	63H6375	3	188
Ribbon Mask	75P0518	7	35
AGA (AFTA) Indicator Group	75P0542	8	109
Pulley Bracket Assembly	75P0543	7	72 & NOTE 3
Pulley Assembly	75P0544	7	73 & 74& NOTE 4

Basic Printer Exploded Views

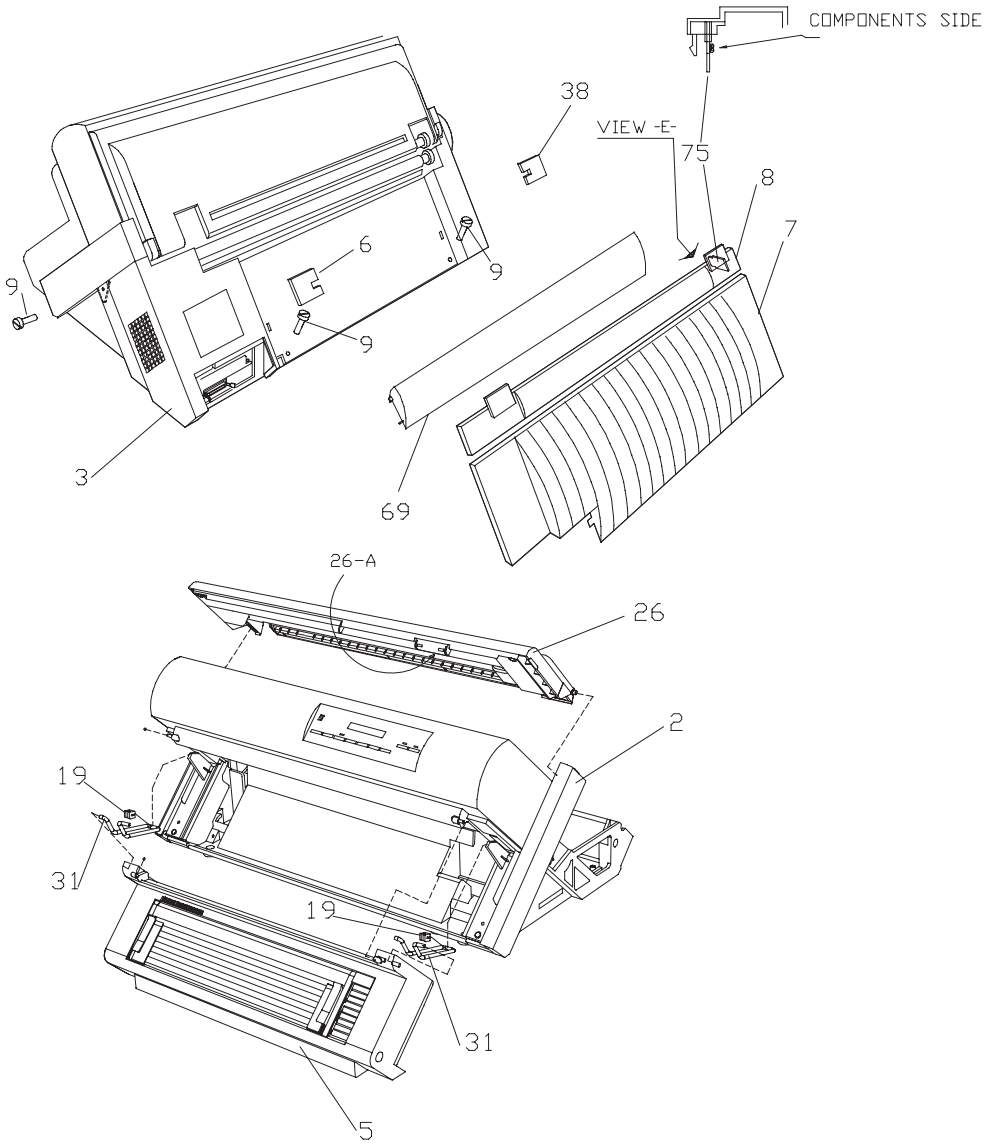
Assembly 1: COVERS ASSEMBLY I



Asm–Index	Part Number	Units	Description
1–4	41U2399	1	Hand Grip
–9	41U2328	1	Screw 3.9 x 16 (misc. Kit item 15)
–10	41U2430	1	Upper Tractor Assembly 4 pin (opt)
–11	41U2473	1	Operator Panel Assembly
–12	41U2208	1	O.P. Overlay English
–12	41U2209	1	O.P. Overlay German
–12	41U2220	1	O.P. Overlay French
–12	41U2221	1	O.P. Overlay Spanish
–12	41U2222	1	O.P. Overlay Italian
–12	41U2223	1	O.P. Overlay Danish
–12	41U2224	1	O.P. Overlay Dutch
–12	41U2225	1	O.P. Overlay Finnish
–12	41U2226	1	O.P. Overlay Norwegian

Asm–Index	Part Number	Units	Description
–12	41U2230	1	O.P. Overlay Swedish
–12	41U2232	1	O.P. Overlay Portuguese
–12	41U2432	1	O.P. Overlay Russian
–12	41U2434	1	O.P. Overlay Polish
–12	41U2436	1	O.P. Overlay Hungarian
–12	41U2438	1	O.P. Overlay Czech
–12	41U2440	1	O.P. Overlay Turkish
–12	41U2234	1	O.P. Overlay Chinese
–27	08H7355	2	Screw M3 x 8 (misc. Kit item 7)
–35	41U2472	1	Lower Tractor Assembly 4 pin
–46	41U2328	2	Screw T.C.I.C. 3.9 x 25 (misc. Kit item 16)
–47	41U2290	1	Clamp for Cable (misc. Kit item 13)

Assembly 2: COVERS ASSEMBLY II

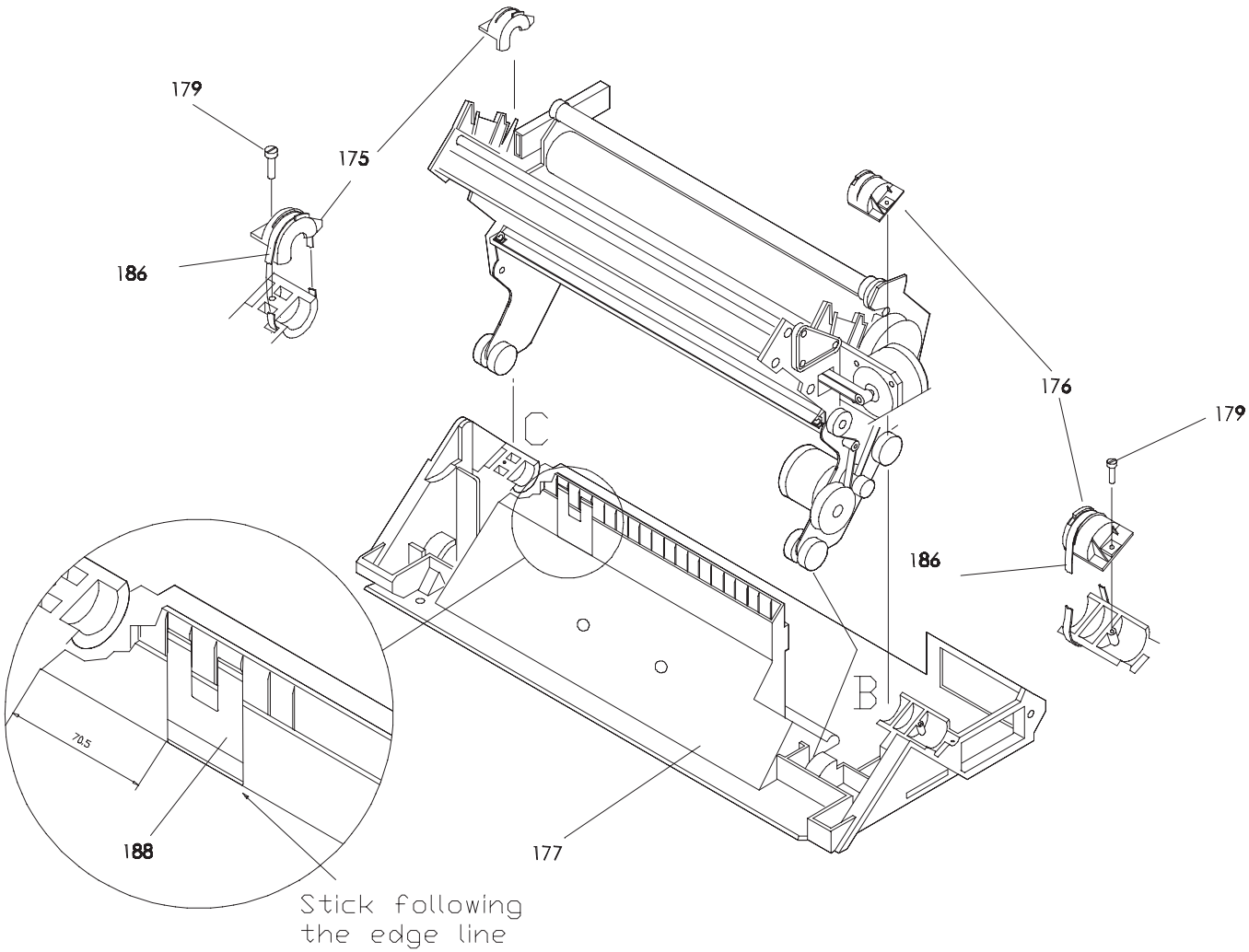


Asm–Index	Part Number	Units	Description
2–2	41U2462	1	Main Cover Group
–3	41U2398	1	Rear Cover Group (Note 1)
–7	41U2398	1	Rear Cover Group (Note 1)
–5	41U2464	1	Front Cover Group
–6	41U2397	1	Gear Cover Left
–8	41U2394	1	Small Rear (Tractor) Cover (Note 3)
–9	41U2328	3	Screw 3.9 x 13 (misc. Kit item 15)
–19	41U2460	1	Slide (Cover Support)
–26	41U2463	1	Top Cover Group
–26-A	08H7370	1	Magnet Interlock
–31	41U2460	2	Slide (Cover Support)
–		1	Printer Data Plate Part of item 3
–38	41U2396	1	Gear Cover Right
–69	41U2395	1	Rear Deflector
–75	41U2468	1	PWA GX2INT Board

Notes:

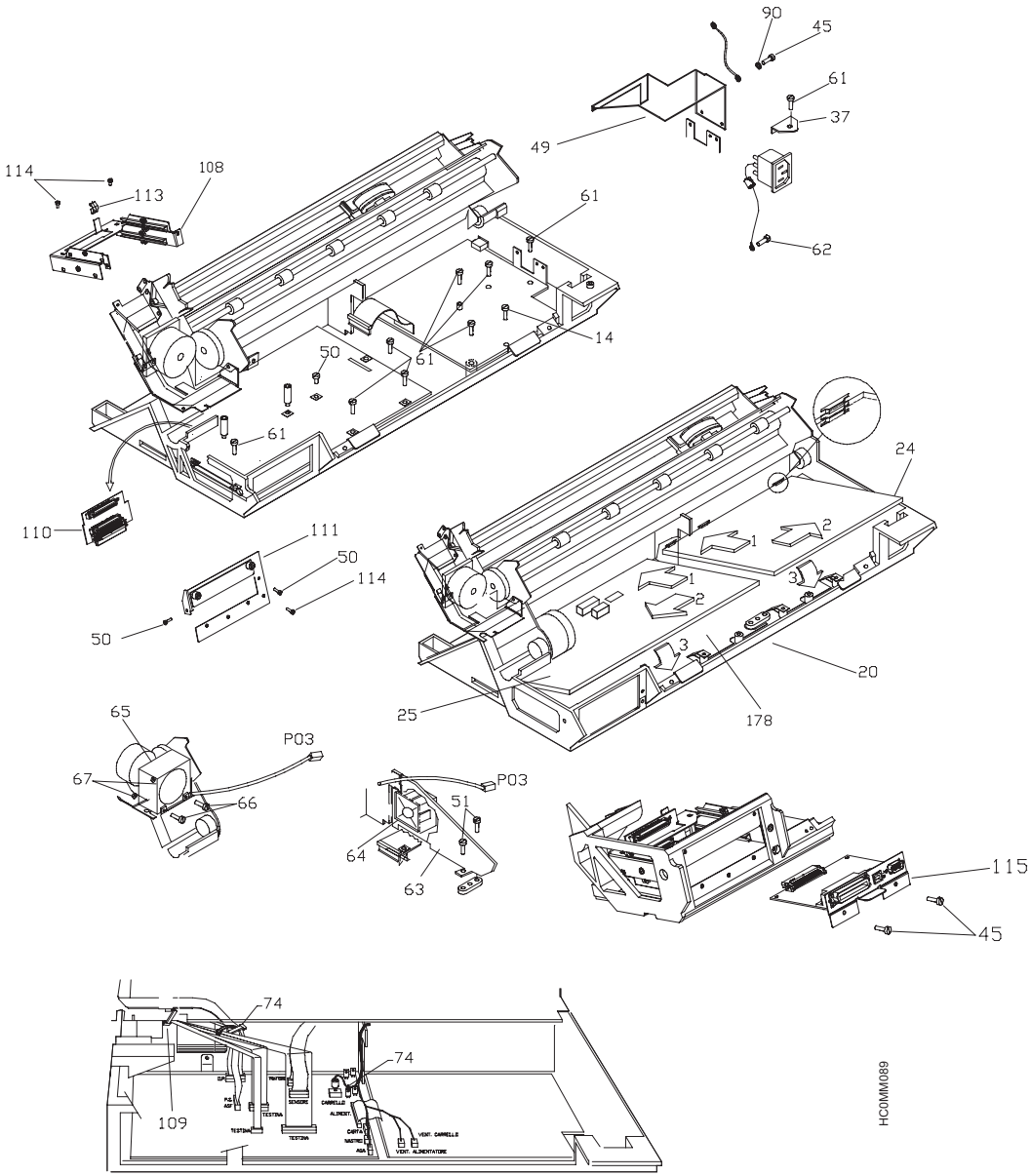
1. Rear Cover Group includes item 3 and item 7 of “Assembly 2: COVERS ASSEMBLY II” on page 191.
2. Slide (Cover Support) includes metal lever (item 31) and plastic slide (item 19).
3. A rear tractor is not supported on this model.

Assembly 3: BASIC ASSEMBLY I



Asm–Index	Part Number	Units	Description
3–175	08H7353	1	Mechanical Block (misc. Kit item 1)
–176	08H7353	1	Mechanical Block (misc. Kit item 2)
–177	41U2426	1	Base Assembly
–179	41U2328	2	Screw 3.9x16 (misc. Kit item 15)
–186	63H6062	2	Fastener Loop Self-Lock
–188	63H6375	1	Paper Position Mylar

Assembly 4: BASIC ASSEMBLY II

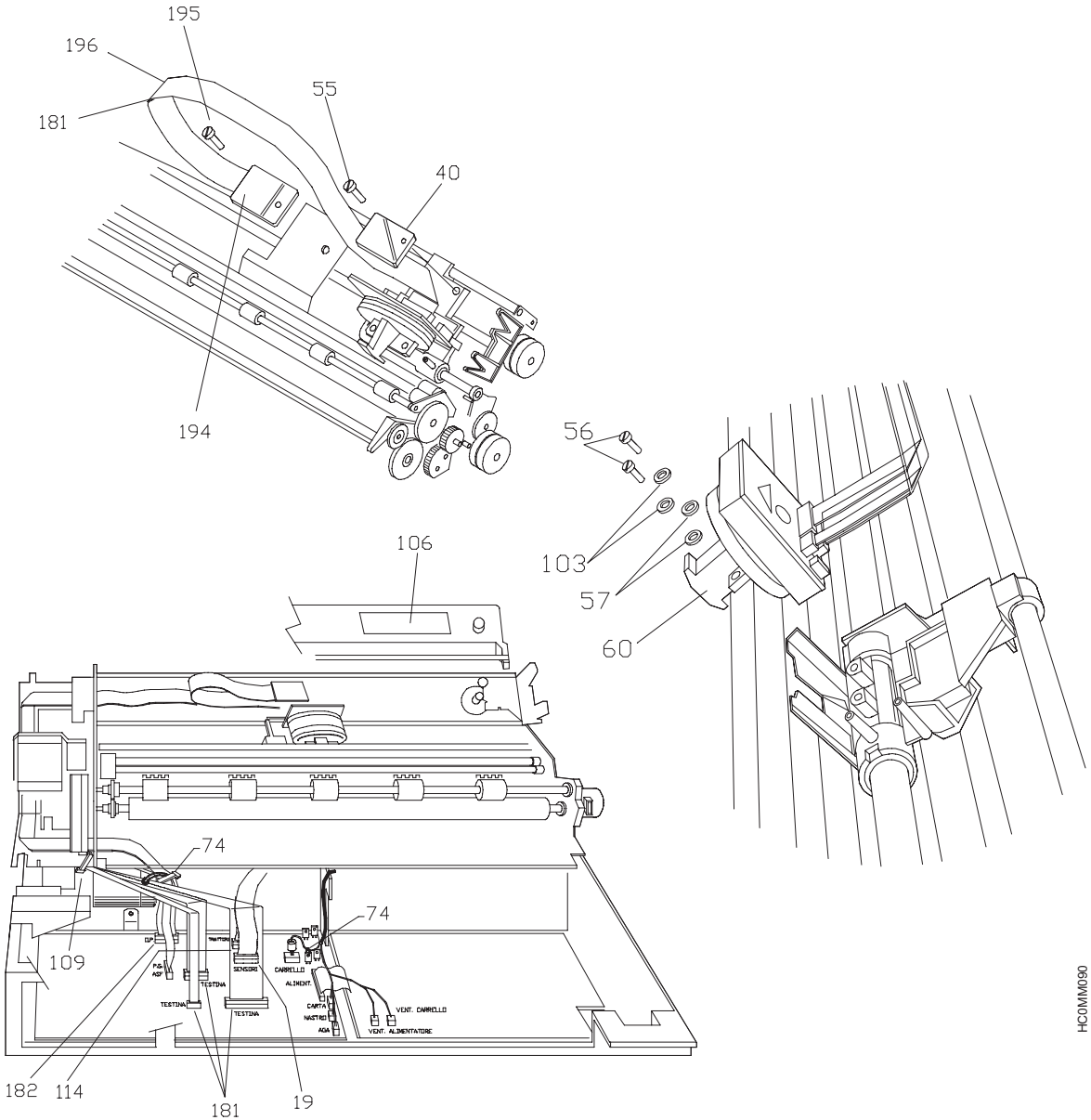


Asm–Index	Part Number	Units	Description
4–14	08H7355	1	Screw M3 x 8 (misc. Kit item 15)
–20	NP	1	Base Assembly
–24	41U2471	1	Power Supply 120-240V
–25	41U2474	1	Engine Board
–37	08H7351		Inlet (misc. Kit item 11)
–45	08H7355	3	Screw M3 x 4 (misc. Kit item 3)
–49	NP	1	P.S. Cover
–50	08H7355	5	Screw M3x8 (misc. Kit item 5)
–51	41U2328	2	Screw 2.9 x 9.5 (misc. Kit item 4)
–61	41U2328	10	Screw 2.9 x 9.5 (misc. Kit item 11)
–62	08H7355	1	Screw M4 x 6 (misc. Kit item 11)
–63	08H7265	1	Fan Support
–64	08H7258	1	Fan Assembly
–65	08H7252	1	Carriage Fan Assembly
–66	08H7355	2	Screw M3 x 30 (misc. Kit item 21)
–67	41U2329	2	Nut M3 (misc. Kit item 17)
–74	08H7264	2	Fastener Loop Self-Lock (50 per pack)
–90	41U2329	3	Washer split D3.2 (misc. Kit item 25)
–108	41U2609	1	Slot Assembly
–109	08H7264	2	Fastener Loop Self-Lock (50 per pack)
–110	41U2610	1	Back Panel Board
–111	NP	1	Mask Plate
–113	NP	1	Finger Soft Grounding
–114	08H7355	2	Screw M3x6 (misc. Kit item 13)
–115	41U2227	1	SBCS Controller Parallel, Serial, USB 2.0 (note 2, 4)
–115	41U2231	1	SBCS Controller Parallel, Ethernet 10/100 (note 2, 4)
–115	41U2236	1	DBCS Controller Parallel, Serial, USB 2.0 (note 3, 4)
–115	41U2237	1	DBCS Controller Parallel, Ethernet 10/100 (note 3, 4)
–178	41U2427	1	Lower Shield

Notes:

1. Item 110 is the Back Panel of the Slot Assembly and is plugged into the Engine Board.
2. SBCS = Single Byte Character Set Controller.
3. DBCS = Double Byte Character Set Controller.
4. Controller firmware included. There is no need to flash download firmware into the new controller under normal conditions.

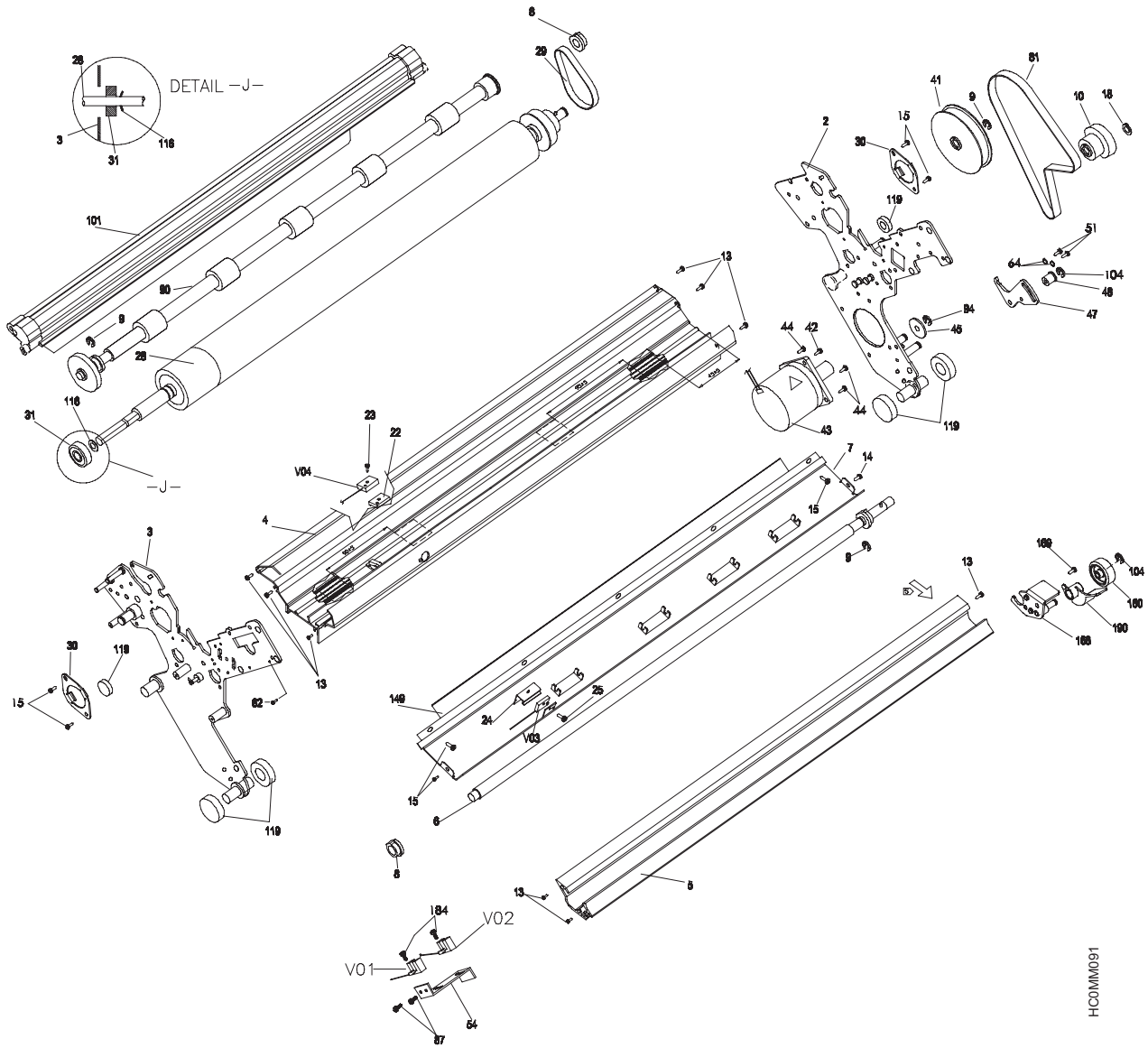
Assembly 5: BASIC ASSEMBLY III



Asm–Index	Part Number	Units	Description
5–19	41U2465	1	Sensors Cable Assembly
–40	08H7253	1	P.H. Bracket
–55	08H7355	1	Screw M4 x 8 (misc. Kit item 19)
–56	08H7355	2	Screw M4 x 14 (misc. Kit item 2)
–57	41U2329	2	Washer (misc. Kit item 8)
–60	41U2470	1	Print Head ER24MR
–74	08H7264	2	Fastener Loop Self Lock (50 per pack)
–103	41U2329	2	Washer Internal Teeth (misc. Kit item 24)

Asm–Index	Part Number	Units	Description
–109	08H7264	1	Fastener Loop Self Lock (50 per pack)
–114	08H7248	1	Alternance Cable
–181	41U2466	1	P.H. Cable 24
–182	08H7249	1	O.P. Cable
–194	63H6349	1	Frame Bracket with M4x6 screw
–195	08H7355	1	Screw M4x6 (Flat Head) (misc. Kit item 23)
–196	41U2461	1	Protect. Mylar for PH Cable

Assembly 6: MECHANICAL ASSEMBLY I



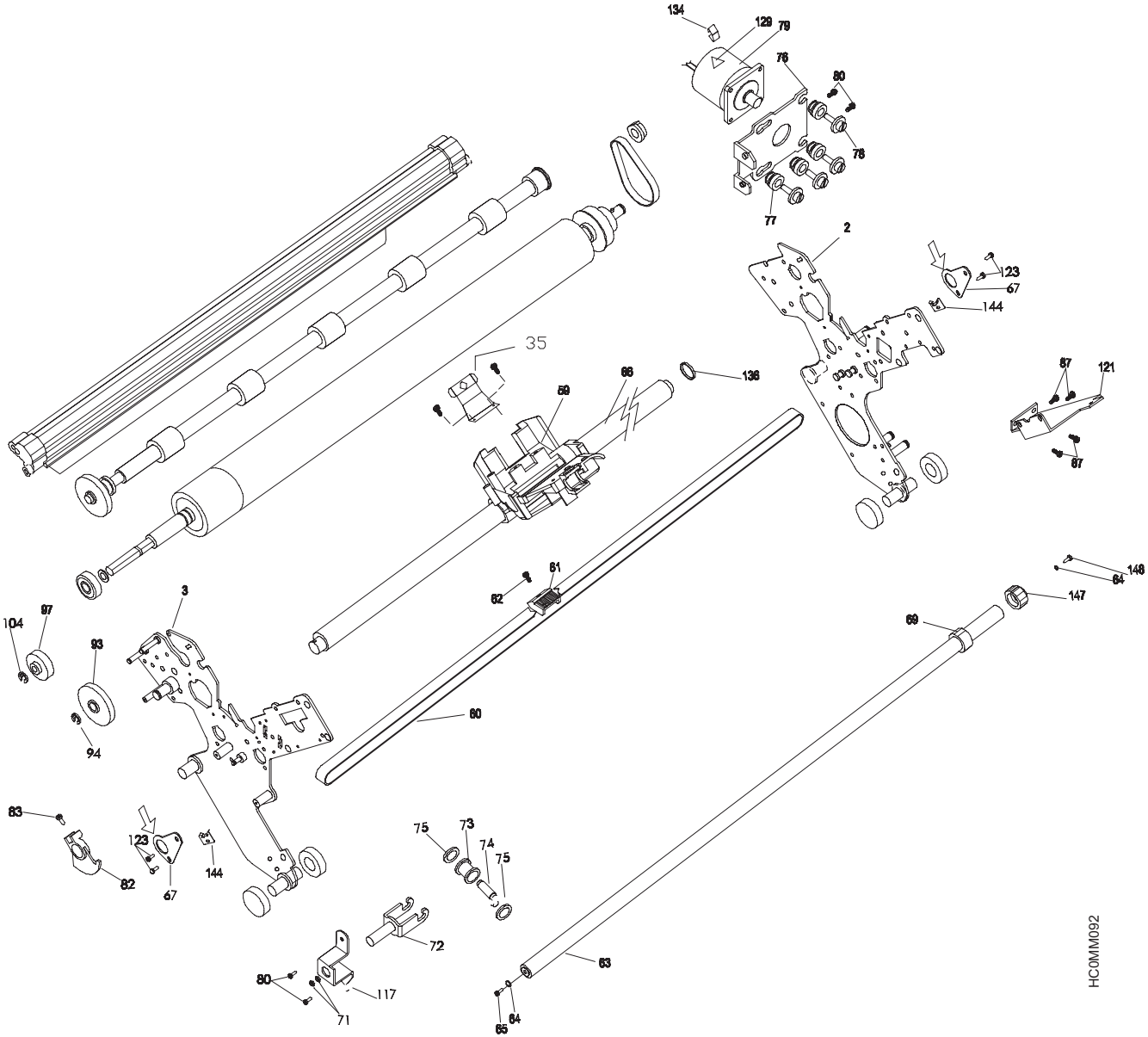
Asm–Index	Part Number	Units	Description
6–2	NP	1	Right Frame
–3	NP	1	Left Frame
–4	NP	1	Base Frame
–5	NP	1	Guide Assembly
–6	41U2392	1	Lower Feeder Assembly (note 1)
–7	41U2431	1	Support Spring
–8	08H7351	2	Bush (misc. Kit item 7)
–9	41U2329	3	Ring Benzing D.7 (misc. Kit item 6)
–10	41U2393	2	Front Pulley
–13	41U2328	9	Screw 3.5 x 13 (misc. Kit item 1)
–14	08H7355	1	Screw M3 x 6 (misc. Kit item 1)
–15	08H7355	6	Screw M3 x 4 (misc. Kit item 3)
–18	41U2329	1	Ring Ret. D.8 (misc. Kit item 7)
–22	08H7353	1	Spacer (misc. Kit item 3)
–23	41U2328	1	Screw 2.2 x 9.5 (misc. Kit item 4)
–24	41U2290	1	Sensor Plate (misc. Kit item 4)
–25	08H7355	1	Screw M2 x 8 (misc. Kit item 4)
–28	41U2330	1	Platen Assembly
–29	08H7287	1	Platen Belt Toothed
–30	41U2290	2	Bearing Retainer (misc. Kit item 5)
–31	08H7351	1	Bearing (misc. Kit item 8)
–41	08H7288	1	Pulley
–42	08H7355	2	Screw M3 x 8 (misc. Kit item 7)
–43	41U2469	1	Paper Motor Assembly
–44	08H7355	2	Screw M3 x 10 (misc. Kit item 8)
–45	08H7301	1	Idle Gear
–47	08H7311	1	Paper Feed Belt Tension Lever
–48	08H7302	1	Idle
–51	08H7355	1	Screw M4 x 6 (misc. Kit item 9)
–54	NP	1	Home Sensors Support
–62	41U2328	1	Screw 2.9x13 (misc. Kit item 7)
–64	41U2329	2	Washer (misc. Kit item 8)
–81	08H7307	1	Paper Belt Toothed
–87	08H7355	2	Screw M3 x 6 (misc. Kit item 13)
–90	08H7290	1	Upper Feeder Assembly
–94	41U2329	1	Ring Benzing D6 (misc. Kit item 5)
–101	01P7165	1	Bail Assembly
–104	41U2329	1	Ring Benzing D4 (misc. Kit item 3)
–116	41U2329	2	Thrust Washer (misc. Kit item 11)
–119	41U2290	6	Vibrodamp (misc. Kit item 1)
–149	24H7729	1	Lower Mylar Assembly
–160	41U2611	1	Dual Tractor Gear (misc. Kit item 1)
–168	41U2611	1	Bracket Pulley Pivot (misc. Kit item 2)

Asm–Index	Part Number	Units	Description
–169	41U2328	1	Screw 3.5 x 19 (misc. Kit item 17)
–184	08H7355	2	Screw M3x6 (misc. Kit item 13)
–190	41U2611	1	Gear Protection (misc. Kit item 3)
–01	41U2271	1	V01 Opto Interrupter (note 2)
–02	41U2271	1	V02 Opto Interrupter (note 2)
–03	41U2465	1	V03 Reflective Sensor
–04	41U2465	1	V04 Reflective Sensor

Notes:

1. Lower Feeder Assembly (item 6) is for cut sheet and is non-functional in this regard. The purpose of the bar is to hold tension between the side frames.
2. Opto Interrupters (V01 and V02) and Reflective Sensors (V03 and V04) are included in the Sensor Cable Assembly.

Assembly 7: MECHANICAL ASSEMBLY II



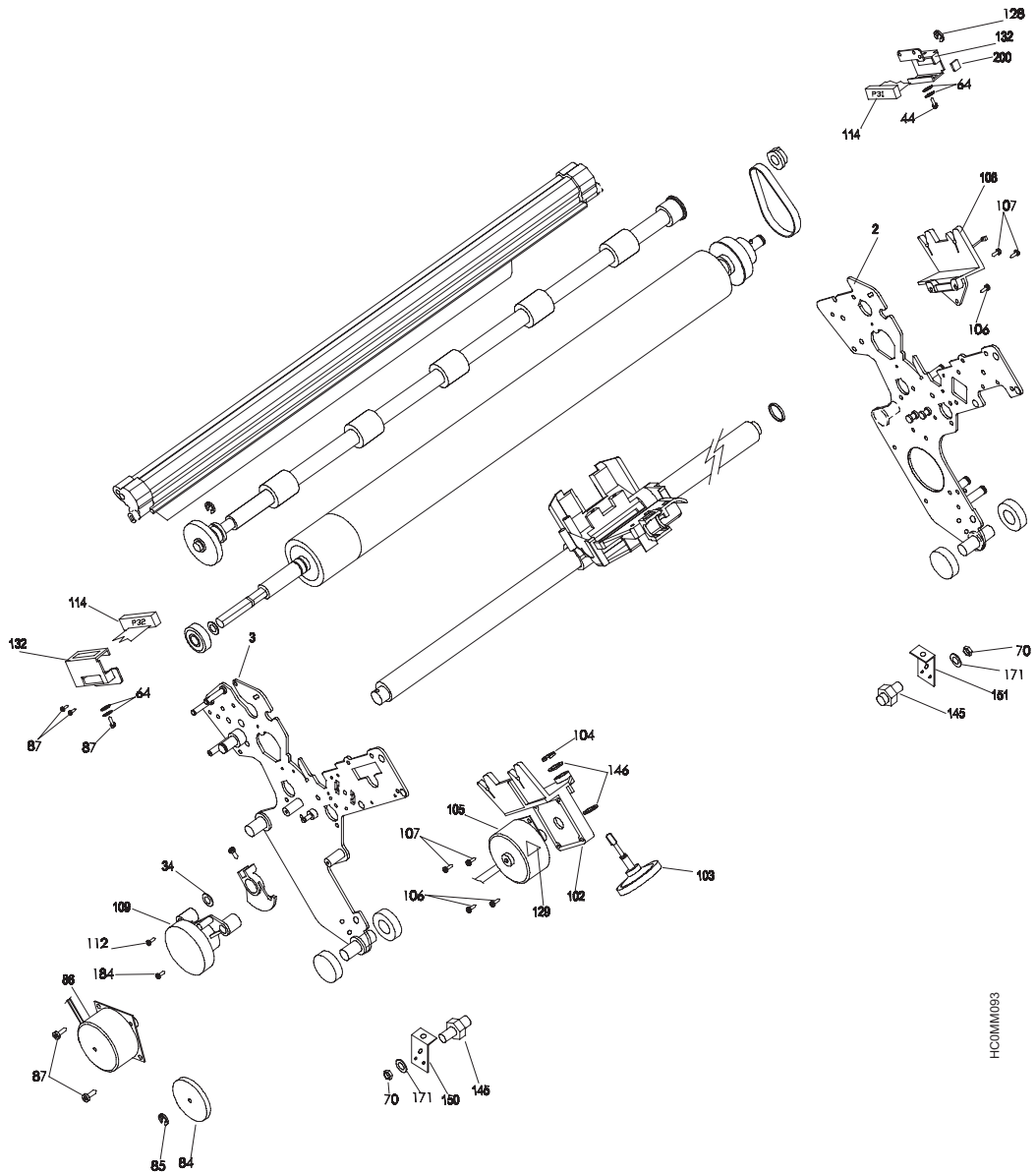
Asm–Index	Part Number	Units	Description
7–2	NP	1	Right Frame
–3	NP	1	Left Frame
–35	75P0518	1	Ribbon Mask
–59	17R7487	1	Carriage Assembly (note 1)
–60	08H7304	1	Carriage Belt Toothed
–61	08H7353	1	Belt Bracket (misc. Kit item 5)
–62	41U2328	1	Screw 2.9 x 13 (misc. Kit item 7)
–63	63H6274	1	Rear Bar (Rear Bar Kit) (note 2)
–64	41U2329	2	Washer (misc. Kit item 8)
–65	08H7355	1	Screw M4 x 8 (misc. Kit item 10)
–66	63H6063	1	Main Shaft
–67	41U2290	2	Shaft Retainer (misc. Kit item 7)
–69	08H7351	1	Carriage Bush (misc. Kit item 13)
–71	75P0543	2	Nut Hexagonal M4 (note 3) (Kit Pulley Bracket Assembly)
–72	75P0543	1	Pulley Bracket Assembly (note 3) (Kit Pulley Bracket Assembly)
–73	75P0544	1	Pulley Assembly (note 4) (Kit Pulley Assembly)
–74	75P0544	1	Pivot (note 4) (Kit Pulley Assembly)
–75	08H7353	2	Spacer (misc. Kit item 8)
–76	NP	1	Carriage Motor Support
–77	41U2290	1	Motor Damp (misc. Kit item 3)
–78	41U2290	1	Stud (misc. Kit item 8)
–79	41U2318	1	Carriage Motor Assembly
–80	08H7355	2	Screw M4 x 6 (misc. Kit item 11)
–82	08H7308	1	AGA (AFTA) Sector
–83	08H7355	1	AGA (AFTA) stud (misc. Kit item 22)
–87	08H7355	4	Screw M3 x 6 (misc. Kit item 13)
–93	08H7309	1	Double Gear
–94	41U2329	1	Ring.D6 (misc. Kit item 5)
–97	08H7310	1	Movable Gear
–104	41U2329	1	Ring Benzing D4 (misc. Kit item 3)
–117	75P0543	1	Support Bracket (note 3) (Kit Pulley Bracket Assembly)
–121	41U2290	1	Clamp 79 (misc. Kit item 14)
–123	08H7355	4	Screw M3 x 4 (misc. Kit item 16)
–134	NP	1	Finger Soft Grounding
–136	08H7353	1	O-Ring (misc. Kit item 11)
–144	08H7351	2	Wear Res. Spring (misc. Kit item 12)

Asm–Index	Part Number	Units	Description
–147	63H6274	1	Eccentric bushing (note 2) (Rear Bar Kit)
–148	63H6274	1	Screw M4 x 12 (note 2) (Rear Bar Kit)

Notes:

1. Carriage Assembly (item 59) includes item 61, 62, 69. Also assembled on the Carriage Assembly, two bushing, two oiled felts, two flanges and the Ribbon Mask (item 35).
2. Rear Bar Kit includes item 63, 147 and 148.
3. Kit Pulley Bracket Assembly includes items 71, 72 and 117.
4. Kit Pulley Assembly includes items 73 and 74.

Assembly 8: MECHANICAL ASSEMBLY III



Asm–Index	Part Number	Units	Description
8–2	NP	1	Right Frame
–3	NP	1	Left Frame
–34	41U2290	1	Spacer (misc. Kit item 15)
–44	08H7355	1	Screw M3 x 10 (misc. Kit item 8)
–64	41U2329	1	Washer (misc. Kit item 8)
–70	41U2329	2	Nut Hexagonal M5 (misc. Kit item 18)
–84	08H7319	1	AGA (AFTA) Gear
–85	41U2329	1	Ring D.2.3 (misc. Kit item 1)
–86	08H7320	1	AGA (AFTA) Motor Assembly
–87	08H7355	5	Screw M3 x 6 (misc. Kit item 13)
–102	02N7006	1	Left Cartridge Support Assembly (Kit Left Cart. Sup./Rib.Dr. Assembly)
–103	02N7006	1	Pivot Assembly (Kit Left Cart. Sup./Rib.Dr. Assembly)
–104	02N7006	1	Ring Benzing D4 (Kit Left Cart. Sup./Rib.Dr. Assembly)
–105	08H7324	1	Ribbon Motor Assembly
–106	08H7355	3	Screw M3 x 14 (misc. Kit item 14)
–107	41U2328	4	Screw 2.9 x 19 (misc. Kit item 8)
–108	08H7325	1	Right Cartridge Support
–109	75P0542	1	AGA (AFTA) Indicator Group
–112	08H7355	2	Screw M3 x 8 (misc. Kit item 15)
–114	08H7248	2	Tractor (Alternance) Cable Assembly
–128	41U2329	1	Washer D 3 (misc. Kit item 15)
–132	08H7360	1	Tractor Cable Connector Plate
–145	41U2329	2	Pivot Mech (misc. Kit item 26)
–146	02N7006	1	Washer 60D (Kit Left Cart. Sup./Rib.Dr. Assembly)
–150	NP	1	Tractor Support Bracket Right
–151	NP	1	Tractor Support Bracket Left
–171	41U2329	2	Washer Lock D5.3 (misc. Kit item 27)
–184	08H7355	1	Screw M3 x 6 (misc. Kit item 17)
–200		1	Foam Strip (Part of 08H7248 item 8-114)

Assembly 9: Miscellaneous Kits Spare Part Lists and Line Cords

Asm–Index	Part Number	Units	Description
9–	08H7351		KIT MECHANICAL I
–1		1	Spring 3
–2		2	Spring
–3		2	Spring
–4		2	Roller Spring
–5		1	Spring
–6		2	Bush
–7		2	Bush 20
–8		1	Bearing
–9		1	Bush Sint
–10		1	Pivot
–11		1	Inlet
–12		2	Wear Resistant Spring
–13		1	Bush-700

Asm–Index	Part Number	Units	Description
9–	41U2290		KIT MECHANICAL II
–1		1	Vibrodamp 76
–2		2	Damper VGA
–3		2	Motor Damp
–4		1	Sensor Plate
–5		1	Bearing Retainer
–6		1	Damper Spacer
–7		1	Shaft Retainer
–8		1	Stud 33/24
–9		1	Spring Guide
–10		1	Cable Retainer 2
–11		1	Spacer ST
–12		2	Clamp for Cable
–13		1	Clamp for Cable
–14		1	Clamp 79
–15		1	Spacer

Asm–Index	Part Number	Units	Description
9–	41U2611		KIT DUAL TRACTOR GEAR
–1		1	Dual Tractor Gear
–2		1	Bracket Pulley Pivot
–3		1	Gear Protection

Asm–Index	Part Number	Units	Description
9–	08H7353		KIT PLASTIC PARTS
–1		1	Mechanical Block
–2		1	Mechanical Block
–3		1	Spacer
–4		1	Support Sensor
–5		1	Belt Bracket
–6		1	Slide
–7		2	Bush
–8		2	Spacer
–9		2	Bushing
–10		3	O Ring D4.48
–11		3	O Ring D5

Asm–Index	Part Number	Units	Description
9–	08H7355		KIT METRIC SCREWS
–1		3	Screw M3 x 6
–2		4	Screw M4 x 14
–3		3	Screw M3 x 4
–4		3	Screw M2 x 8
–5		3	Screw M3 x 8
–6		3	Screw M3 x 4
–7		3	Screw M3 x 8
–8		3	Screw M3 x 10
–9		3	Screw M4 x 6
–10		3	Screw M4 x 8
–11		3	Screw M4 x 6
–12		3	Screw M3 x 6
–13		3	Screw M3 x 6
–14		3	Screw M3 x 14
–15		3	Screw M3 x 8
–16		3	Screw M3 x 4
–17		3	Screw M3 x 6
–18		3	Screw M3 x 10
–19		3	Screw M4 x 8
–20		3	Screw M3 x 4
–21		3	Screw M3 x 30
–22		3	AGA (AFTA) Stud
–23		3	Screw M4 x 6

Asm–Index	Part Number	Units	Description
9–	41U2328		KIT SELF TAPPING SCREWS
–1		5	Screw M3.5 x 13
–2		5	Screw 2.2 x 6.5
–3		5	Screw 2.2 x 13
–4		5	Screw 2.2 x 9.5
–5		5	Screw M3.5 x 16
–6		5	Screw 2.9 x 9
–7		5	Screw 2.9 x 13
–8		5	Screw 2.9 x 19
–9		5	Screw M2.5 x 4
–10		5	Screw M2.9 x 9.5
–11		5	Screw 2.9 x 9.5
–12		5	Screw S.T. 2.9 x 9.5
–13		5	Screw S.T. 2.9 x 6.5
–14		5	Screw 3.5 x 13
–15		5	Screw 3.9 x 13
–16		5	Screw 3.9x25
–17		5	Screw 3.5x19

Asm–Index	Part Number	Units	Description
9–	41U2329		KIT WASHER & CIRCLIPS
–1		5	Ring Benzing D2.3
–2		5	Ring Benzing D3.2
–3		5	Ring Benzing D4
–4		5	Ring Benzing D5
–5		5	Ring Benzing D6
–6		5	Ring Benzing D7
–7		5	Ring Benzing D8
–8		5	Special Washer
–9		5	Ring Ret D4
–10		5	Ring Ret D8
–11		5	Thrust Washer 22
–12		5	Washer 21
–13		5	Washer Flat D4.3
–14		5	Washer Quick Lock D6
–15		5	Washer Quick Lock D8
–16		3	Friction Spacer
–17		5	Nut Hexagonal M3
–18		5	Nut Hexagonal M5
–19		5	Insulating Washer
–20		5	Washer Flat D3.2
–21		5	Washer 60D
–22		5	Thrust Washer
–23		2	Washer 60D
–24		5	Washer Internal Teet.
–25		2	Washer Split D3.2
–26		2	Pivot Mech.
–27		2	Washer Lock D5.3
–28		2	Nut Hexagonal M4

Asm–Index	Part Number	Units	Description
9–	41U2425	1	Reshipping Kit
–1		1	Shipment Block
–2		2	Shipment Block
–3		1	Polystyrene Caps
–4		1	Polystyrene Sheet
–5		1	Cardboard Box
–6		1	Plastic Bag 250mm x 450mm
–7		1	Cardboard Corner

Asm–Index	Part Number	Units	Description
9–	39M5123	1	Line Cord Europe
–	39M5151	1	Line Cord United Kingdom
–	39M5165	1	Line Cord Italy
–	39M5158	1	Line Cord Switzerland
–	39M5130	1	Line Cord Denmark
–	39M5144	1	Line Cord South Africa
–	39M5172	1	Line Cord Israel

Asm–Index	Part Number	Units	Description
–	39M5081	1	Line Cord U.S.A. 9 foot
–	39M5080	1	Line Cord U.S.A. 6 foot
–	39M5102	1	Line Cord Australia
–	39M5095	1	Line Cord South America
–	39M5206	1	Line Cord China
–	39M5068	1	Line Cord Argentina
–	39M5247	1	Line Cord Taiwan

Part number index

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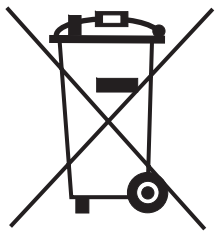

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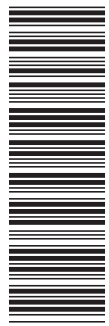

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