Compuprint 4247 Serial Matrix Printers

Compuprint 4247 Model L03 Printer: Maintenance Manual

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Preface

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This Maintenance Manual contains detailed technical information regarding the serviceability of the Compuprint 4247-L03 dot Matrix printer.

Contents

Figures 8

Tables 11

Safety Information 13
Safety Notices 13
General Safety 15
Electrical Safety 16
Pre-Service Inspection 18
Performing a power-receptacle safety-check 19
4247 Model L03 nominal AC input power requirements 20
Ground connectors check 20
Environmental notices 23
Product recycling and disposal 23

About this publication 24
General Overview 24
Scope of the Product 24
Printer Base Model 25
Physical Overview 27
Printer Structure 28
4247-L03 Printers Technical Specifications 35
MEDIA FORMS SPECIFICATIONS 42
ENVIRONMENTAL REQUIREMENTS 43
MAINTAINING PARAMETERS 44
Set-Up 44
Cleaning 45
Lubrication 45
Consumables 45

Paper Handling 45
Front Tractors 46

Chapter 1. Diagnosing problems 48
Maintenance Analysis Procedures (MAPs) 49
Defining the problem 49
MAP 0100: START of call 52
MAP 0120: Parallel, serial, or USB interface 54
MAP 0122: LAN Interface 57
MAP 0130: No paper movement 60
MAP 0131: Paper path sensor 62
MAP 0140: Printhead drive 63
MAP 0150: Power supply 66
MAP 0160: Ribbon feed 72
MAP 0180: Top cover interlock 74
MAP 0190: Form feed problems 75
MAP 0200: AGA (AFTA) not operational 82
MAP 0210: Intermittent failures 84
MAPs reference tables 86
Reference table 1, recoverable error messages 86
Reference table 1a, unrecoverable errors 89
Reference table 2, no printed characters 95
Reference table 3, print quality failures 96
Reference table 4, operator panel and miscellaneous problems 97
Reference table 5, power supply connector pins and voltages 99

Chapter 2. Diagnostics 101
Initializing Phase 101
OFFLINE PRINTER VERIFICATION SELF TEST 102
HEX DUMP 104
Running the test and diagnostic (T&D programs) 105
T&D Structure 105

T&D Kit . . . 105
Execution of User T&D . . . 106
Loop-Back Connectors . . . 107
T&D DESCRIPTION . . . 109

Chapter 3. Electromechanical Devices and Wiring Diagrams . . . 127
Print Head . . . 127
Print Head Specifications . . . 129
Motors . . . 132
Carriage Motor . . . 132
Paper Motor . . . 134
AGA (AFTA) Motor . . . 136
Ribbon Motor . . . 138
Tractor Gear Alternance Motor . . . 140
Cables . . . 142
Sensors Cable . . . 142
Tractor Cable . . . 143
Operator Panel Cable . . . 144
Attachment Connectors . . . 145

Chapter 4. Locations . . . 147

Chapter 5. Removal and Replacement . . . 149
Recommended Hand Tools and Equipment . . . 149
F.R.U. ORDER OF ACCESS . . . 150
Front Tractor Group . . . 151
Operator Panel . . . 153
Print Head . . . 154
Cover Parts Removal . . . 156
Controller Board . . . 159
Slot Assembly . . . 161
Main Fan . . . 163

Engine Board . . . 164
Power Supply Board . . . 167
Ribbon Cartridge . . . 169
Ribbon Motor . . . 171
AGA (AFTA) Motor . . . 173
AGA (AFTA) Marker . . . 173
Carriage Motor and Fan . . . 175
Bail Assembly . . . 178
Upper Feeder Assembly . . . 180
Platen Assembly . . . 182
Lower Feeder Assembly . . . 185
Carriage Assembly . . . 187
Sensor Cable Assembly . . . 190
Mechanical Assembly . . . 192
Paper Motor . . . 194
Ribbon Mask . . . 196
Lower Mylar . . . 198

Chapter 6. Service Checks & Adjustments . . . 199
Carriage Belt . . . 199
Paper Belt . . . 201
Print Head Gap Adjustment . . . 203
Print Head Gap Adjustment (using Feeler-Gauge) . . . 203
Print Head Gap Adjustment (without using a Feeler-Gauge) . . . 210
Print Head Gap Service Checks . . . 214
AGA (AFTA) Calibrate (T&D 10) . . . 221
First Printing Line (T&D 11) . . . 221
Vertical (bidirectional printing) (T&D 12) . . . 222
Tear-off Line (T&D 13) . . . 224
Sensor Tuning (T&D 9, 14, 18) . . . 224
Sensor Service Checks . . . 226

Paper Presence Sensor Check . . . 226
Paper Path Service Checks . . . 227
Main Paper Drive Check and Adjustment . . . 227
Forms Paths Checks . . . 230
Tractor Assembly Service Check . . . 231
Ribbon Feed Service Check . . . 237
Printhead Drive Service Check . . . 239
Print Quality Service Checks . . . 243
Fanfold Forms Printout . . . 243

Chapter 7. Parts Catalog . . . 249
Recommended Spare Parts List . . . 250
Basic Printer Exploded Views . . . 254
Assembly 1: COVERS ASSEMBLY I . . . 255
Assembly 2: COVERS ASSEMBLY II . . . 258
Assembly 3: BASIC ASSEMBLY I . . . 260
Assembly 4: BASIC ASSEMBLY II (boards and fans) . . . 262
Assembly 5: BASIC ASSEMBLY III . . . 265
Assembly 6: MECHANICAL ASSEMBLY I . . . 267
Assembly 7: MECHANICAL ASSEMBLY II . . . 270
Assembly 8: MECHANICAL ASSEMBLY III . . . 273
Assembly 9: Parts, kits, tools, and line cords . . . 275

Appendix A. Printer configuration information . . . 286
Unlocking and locking printer configuration menu . . . 286
Printing the PROGRAM SETUP PRINTOUT or the CONFIGURATION SETUP PRINTOUT . . . 287

Appendix B. Firmware Downloading . . . 288
Loading code though the Parallel Port . . . 288
Loading code though the Ethernet Port . . . 289
ERROR MESSAGES . . . 291

Appendix C. Supplies, Forms, Paths, & Environmental Considerations 292
Overview 292
Supplies 292
Choosing a Forms Path for Your Needs 293
Choosing a Forms Path for Special Forms 295
Other Considerations for Forms 296
Forms and Paper Specifications 296
Forms Stacking Recommendations 299
Forms Stack Input and Output Locations 299
Forms Paths 300
Environmental Requirements 301
Operating Environment. 301
Shipping Environment 301
Storage Environment. 302

Figures

1. Ground path diagram 21
2. Ground path illustrations 22
3. 4247 Printer: Front and Rear Views 27
4. Operator Panel for 4247 L03 Printers 33
5. not used
6. not used
7. not used
8. Single Tractor version 46
9. Dual Tractor version 47
10. Hex-Dump Printout 105
11. Parallel I/F Loop-Back Diagrams 108
12. Flowchart of the T&D procedures 111
13. Print Head Internal Components 127
14. Needle Operation 128
15. Printhead Needles Positions (Rear View) 129
16. P.H. Electrical interface layout (front view) 130
17. Carriage Motor 133
18. Paper Motor 135
19. AGA (AFTA) Motor 137
20. Ribbon Motor 139
21. Alternamce Motor 141
22. Sensors Cable 142
23. Tractor Cable 143
24. Operator Panel Cable 144
25. Engine Board 147
26. Power Supply 148

27. Front Tractor Group . . . 152
28. Operator Panel removal . . . 153
29. Print Head . . . 155
30. Cover Parts . . . 157
31. Cover Parts (cont.) . . . 158
32. Controller Board . . . 160
33. Slot Assembly . . . 162
34. Main Fan . . . 163
35. Engine Board . . . 166
36. Power Supply Board . . . 168
37. Sliding the ribbon guide out of the print head . . . 169
38. Removing the used ribbon cartridge by lifting it up . . . 170
39. Ribbon Motor and left cartridge support . . . 172
40. AGA (AFTA) Motor and AGA (AFTA) Marker . . . 174
41. Carriage Motor Fan . . . 176
42. Carriage Motor . . . 177
43. Bail Assembly . . . 179
44. Upper Feeder Assembly . . . 181
45. Platen Assembly . . . 183
46. Force for fixing platen and main shaft of carriage assembly . . . 184
47. Lower Feeder Assembly . . . 186
48. Carriage Assembly . . . 188
49. Particular of little spring and main shaft . . . 189
50. Sensor Cable Assembly . . . 191
51. Mechanical Assembly . . . 193
52. Paper Motor . . . 195
53. Ribbon Mask removal . . . 197
54. Lower Mylar . . . 198
55. Carriage Assembly Belt Adjustment . . . 200
56. Paper Belt Adjustment . . . 202
57. Print Head Gap Adjustment . . . 207

58. Print Head Gap Adjustment 208
59. AGA (AFTA) Marker Adjustment 209
60. Vertical Adjustment Test 223
61. Paper Feed Main Drive 228
62. Paper Feed Main Drive 229
63. Standard and Optional Second Paper Paths 231
64. Ribbon Carriage and Ribbon Brackets 237
65. Ribbon Spool Tabs/Sensor 238
66. Carriage Motor 239
67. Carriage Drive Belt 240
68. Carriage Shaft Components 241
69. Plastic Shields 242
70. Printout Standard Module 246
71. Forms Handling Paper Paths 293

Tables

1. Controller Board Options 31
2. CHARACTERS 35
3. PERFORMANCE 36
4. GRAPHICS 37
5. PRINT HEAD 37
6. RIBBON TYPE 38
7. PAPER HANDLING 39
8. USER INTERFACE 39
9. INTERFACES & EMULATIONS 40
10. STANDARDS & GENERAL 41
11. MAP 0100: Start of call 52
12. MAP 0120: Parallel, Serial, or USB Interface 55
13. MAP 0130: No paper movement 60
14. MAP 0131: Paper path sensor 62
15. MAP 0140: Printhead drive 63
16. MAP 0150: Power supply 67
17. MAP 0160: Ribbon feed and ribbon lift 72
18. MAP 0180: Top cover interlock 74
19. MAP 0190: Forms feed problems 75
20. MAP 0200: AGA (AFTA) not operational 82
21. Error messages 86
22. Unrecoverable Error Display Messages (Bootstrap Phase) 89
23. Unrecoverable Supervisor Faults 91
24. Unrecoverable Interpreter Faults 92
25. Unrecoverable Print Manager Faults 92
26. Unrecoverable LAN Faults 93
27. Unrecoverable Engine Faults 94
28. Voltages 99

29. Self-Test Printout . . . 103
30. 232/C Serial I/F Loop-Back Diagram . . . 107
31. T&D Step-by-Step Procedure Flowchart . . . 112
32. T&D Tests List . . . 120
33. FRU List . . . 121
34. T&D Error Codes . . . 122
35. Connections . . . 131
36. RS232/C serial interface signals . . . 145
37. Parallel Connector Pin Assignments . . . 146
38. FRU ORDER OF ACCESS . . . 150
39. Fixed Gap Settings . . . 213
40. Wheel Position Lookup Table . . . 213
41. Print Quality Tests and Actions (Fanfold) . . . 243
42. Recommended Spare Parts List for basic printer . . . 250
43. Considerations For Choosing a Path . . . 294
44. Selecting Path for Special Forms Types . . . 295
45. Forms and Paper Specifications . . . 297

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.

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.

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

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, non-grounded 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 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. Check the Small Rear Cover with Interlock Board to ensure it is properly installed. See Figure 5 on page 27.
2. Ensure that all safety labels are in place.
3. Inspect the customer's power source/receptacle.
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 156.
7. Check that the power supply cover has not been removed nor tampered with.

8. Check for any obvious alterations. Use good judgement about the safety of any 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 cords or cables.

Performing a power-receptacle safety-check

A trained service representative or a qualified electrician should perform all checks necessary to ensure safe operation. These should include the following checks and any other required by local regulations.

- Check the AC voltage at all associated power receptacles (see 4247 Model L03 nominal AC input power requirements).
- Check that all associated power receptacles are properly grounded.

Check safety documentation for the correct test equipment and procedures before performing any of the following tasks:

- Checking AC voltage at all associated power receptacles
- Checking that all associated power receptacles are properly grounded

DANGER

<1-10> Hazardous voltages are present. Do not touch the pins or sockets of the power receptacle.

Use only the applicable high-voltage probes. 4247 Model L03 nominal AC input power requirements gives the appropriate voltage ranges.

The printer electrical outlet and any temporary power tap must meet the requirements as stated in 4247 Model L03 nominal AC input power requirements.

Attention: If the voltages are not within the correct operating range, allow correction before the equipment is plugged in and operated.

For pluggable equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.

4247 Model L03 nominal AC input power requirements

Nominal Voltage	Voltage Range	Amps	Phase / Hz
100–230 Vac	90–264 Vac	2.9–1.3 A	Single phase / 50–60 Hz

Ground connectors check

Using Figure 1 and Figure 2, ensure that all safety grounds are correctly installed.

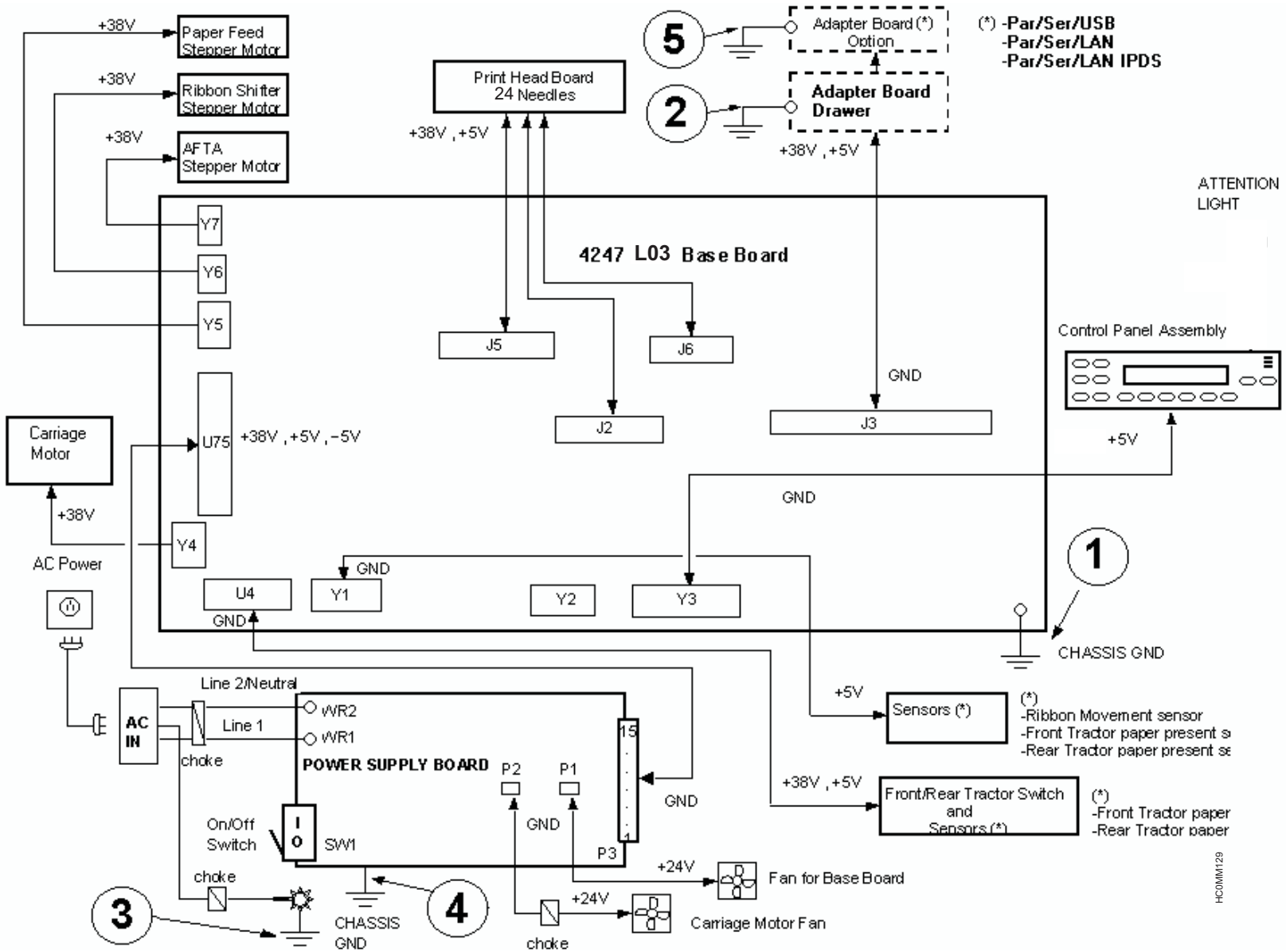

Figure 1. Ground path diagram

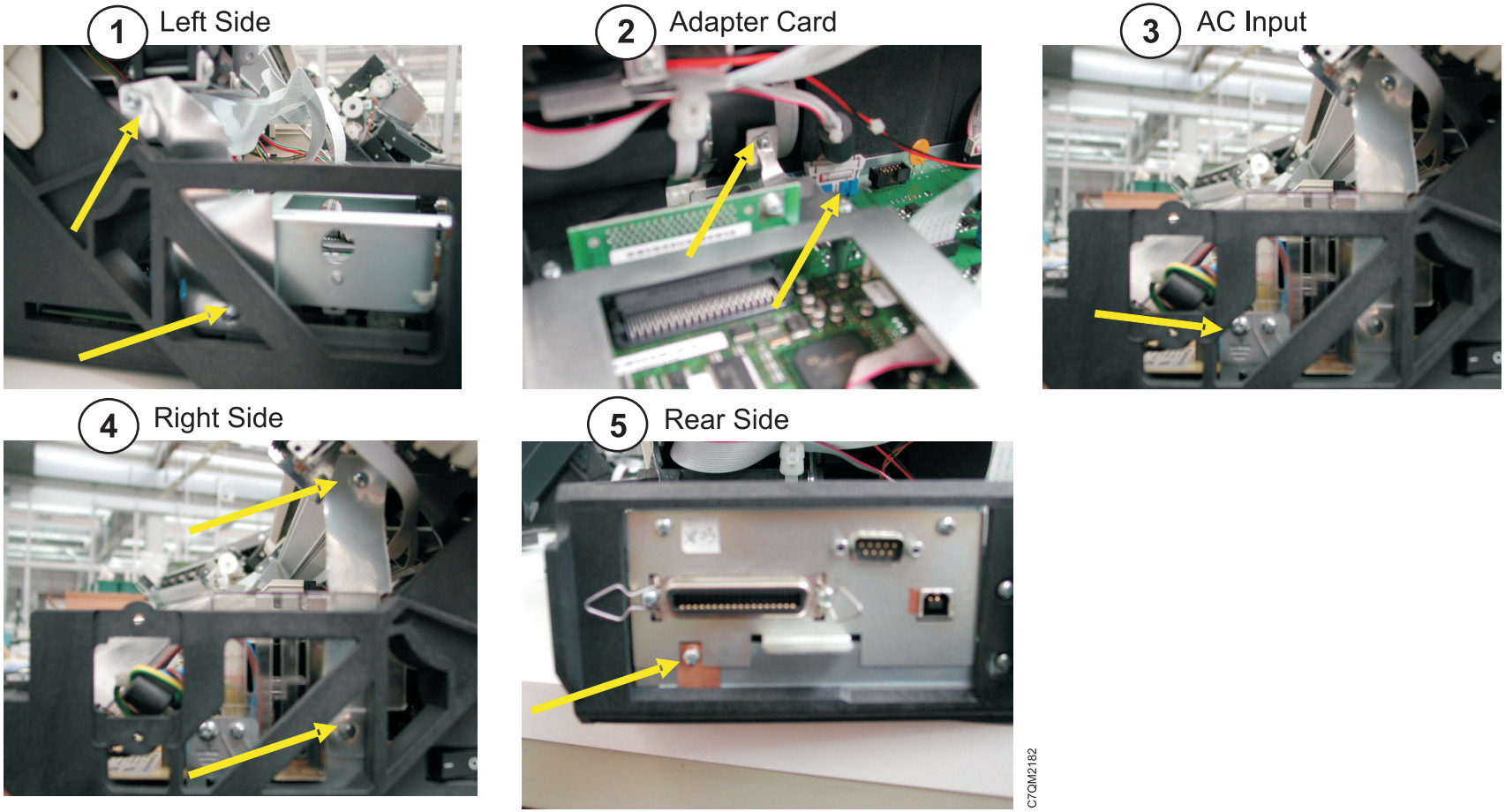

Figure 2. Ground path illustrations

Environmental notices

Product recycling and disposal

We encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed.

About this publication

This Maintenance Manual focuses on the maintenance activities on the 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, we cannot assume responsibility for any errors that may appear in this document or their consequences.

General Overview

This Manual describes the features and the maintenance procedures for the 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 4247-L03 comes standard with 1 tractor.

Physical Overview

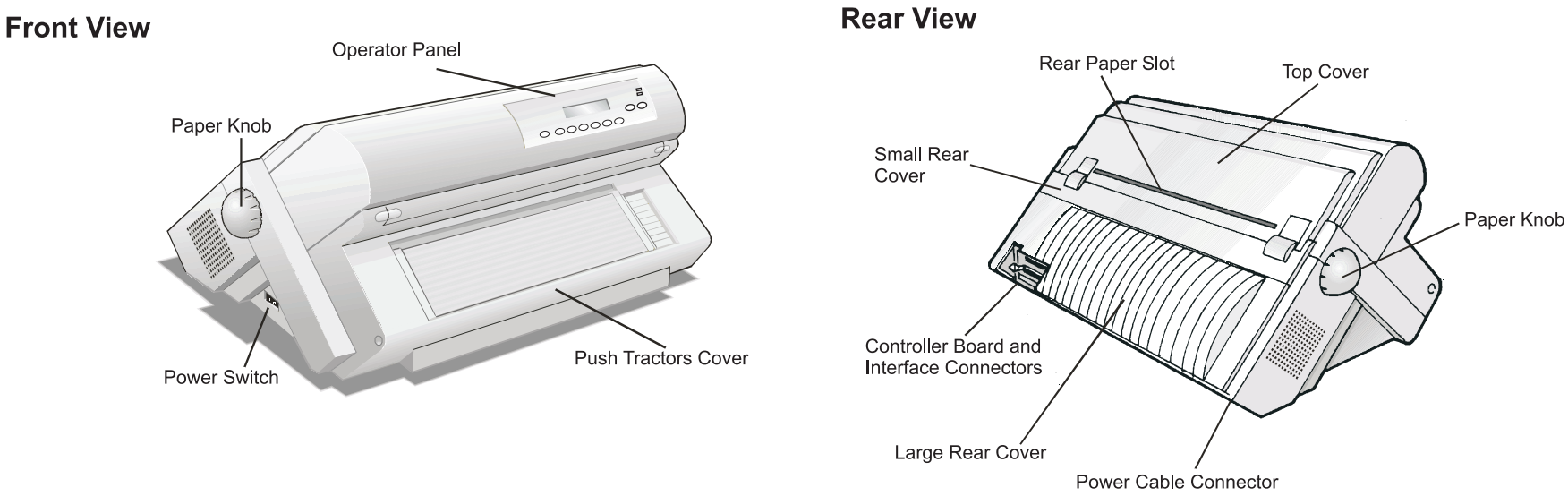

Figure 3. 4247 Printer: Front and Rear Views

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. 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:

The Controller Board is inserted into the slot assembly 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 pin Serial Interface RS-232, USB 2.0, and Ethernet 10/100 interface connections.

There are two controller board options of the 4247 L03 printer:

Table 1. Controller Board Options

Controller Board	PN	Interfaces	Emulations
SBCS parallel, serial, USB	45U2368-C	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	45U2369-C	Parallel, Ethernet 10/100	IBM Proprinter XL24/XL24 AGM, IBM 2391 Personal Printer, ANSI X3.64, Epson ESC/P LQ Series

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

Note: Controller Board FRUs include preinstalled 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) (see Chapter 4, “Locations”). 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 Vac.

Operator Panel Board:

The Operator Panel 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 settings for the menu operation.

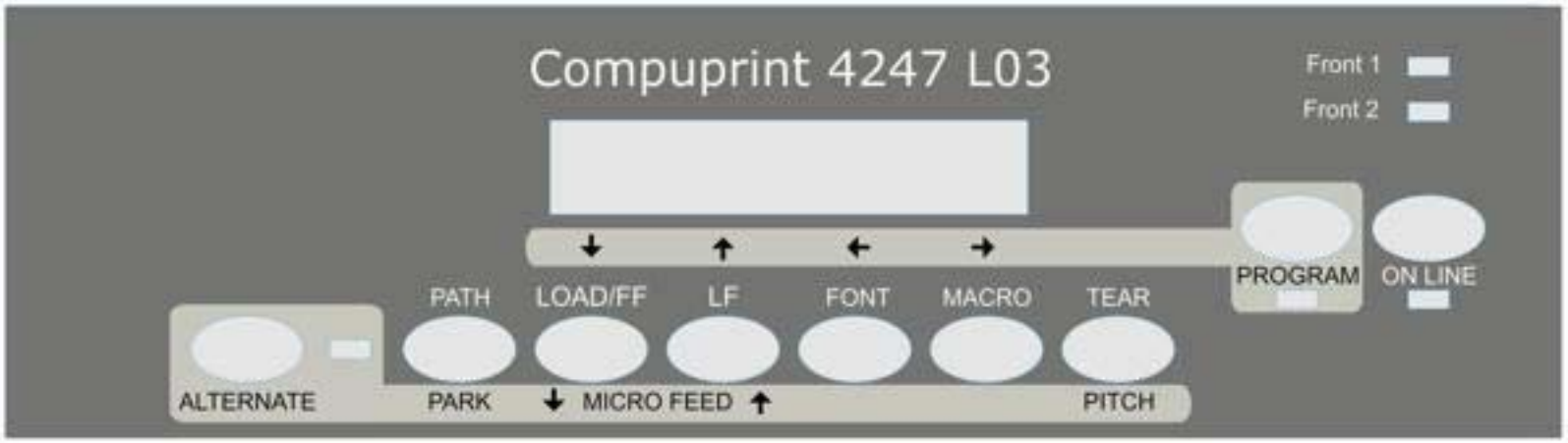

Figure 4. Operator Panel for 4247 L03 Printer

INKED RIBBON CARTRIDGE

The cartridge is fixed on both sides at 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.

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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.

Table 3. PERFORMANCE (continued)

Draft 720	
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

Table 5. PRINT HEAD (continued)

Needle Diameter (mm)	0.25
Needle Frequency (Hz)	2400 Text - 2400 Graphic
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, 5 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, ANSI X3.64, and Sferal WWT 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 Parallel, Serial, USB 2.0, and Ethernet 10/100 BaseT LAN.
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, XP, Vista, and Windows 7.

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		55-150 g/m2 (15-40 lbs)	0.635mm (0.025") max	3" — 17"	24" max
MULTI-PART (with carbon) 1+5 copies max.	First sheet	55-150 g/m2 (15-40 lbs)			
	Attached sheet	45-75 g/m2 (12-20 lbs)			
	Carbon	14-35 g/m2 (4-9 lbs)			
MULTI-PART (chemical) 1+7 copies max	First and other copies	45-75 g/m2 (12-20 lbs)			

ENVIRONMENTAL REQUIREMENTS

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

– Temperature range –35° C to +65° C (-31° F to 149° F)

– Humidity range 5% RH to 95% RH (non condensing)

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

– Temperature range +10° C to +40° C (50° to 104° F)

– 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 (60.8° F to 75.2° F)
– 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 Field Replaceable Unit (FRU) level; it is estimated in 30 minutes. It includes the following operations:

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

LIFE

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

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.

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

We recommend 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.

Paper Handling

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 8 and Figure 9 on page 47 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 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).

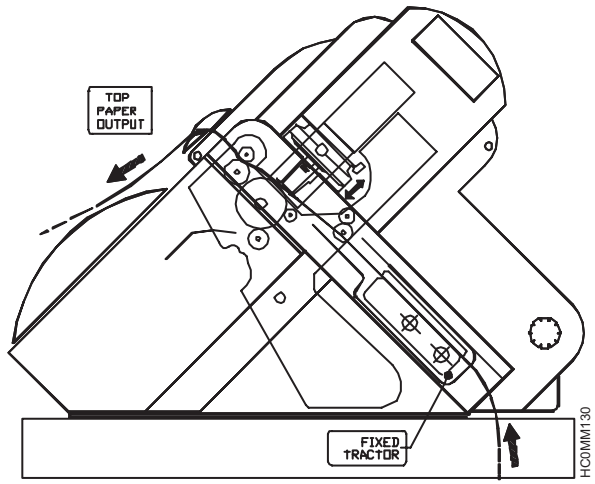


Figure 8. Single Tractor version

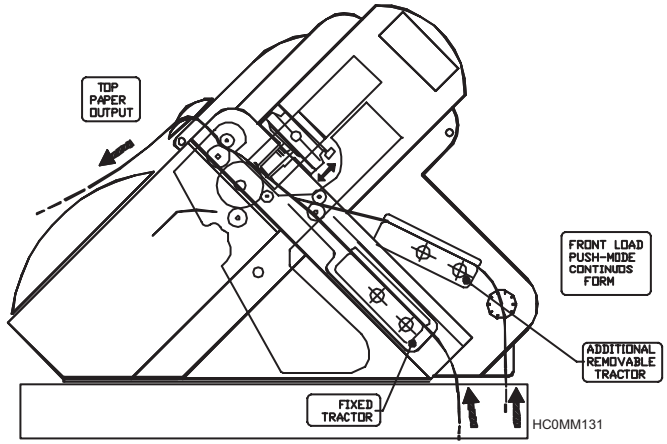


Figure 9. Dual Tractor version

Chapter 1. Diagnosing problems

Maintenance Analysis Procedures (MAPs) 49
Defining the problem 49
MAP 0100: START of call 52
MAP 0120: Parallel, serial, or USB interface 54
MAP 0122: LAN Interface 57
MAP 0130: No paper movement 60
MAP 0131: Paper path sensor 62
MAP 0140: Printhead drive 63
MAP 0150: Power supply 66
MAP 0160: Ribbon feed 72
MAP 0180: Top cover interlock 74
MAP 0190: Form feed problems 75
MAP 0200: AGA (AFTA) not operational 82
MAP 0210: Intermittent failures 84
MAPs reference tables 86
Reference table 1, recoverable error messages 86
Printer Errors 86
Reference table 1a, unrecoverable errors 89
Reference table 2, no printed characters 95
Reference table 3, print quality failures 96
Reference table 4, operator panel and miscellaneous problems 97
Reference table 5, power supply connector pins and voltages 99

Maintenance Analysis Procedures (MAPs)

Defining the problem

These Maintenance Analysis Procedures (MAPs) are designed to aid in diagnosing printer problems. The MAPs use a sequential plan for isolating the possible causes of printer problems and point you to the part needing adjustment, repair, or exchange.

Suggestions for Using the MAPs

- Discuss the printer symptoms with the operator.
- Verify that the current configuration is correct. See Appendix A, “Printer configuration information.”
- Verify that the environment, the paper and the forms used are within specifications. See (MEDIA FORMS SPECIFICATIONS).
- Make a quick visual inspection for problems — loose or broken parts, disconnected connectors, or forms jams. This check may quickly identify problem areas.
- The normal place to start a service call in these MAPs is at MAP 0100: START OF CALL. This MAP sends you to a Field Replaceable Unit (FRU) or to another MAP that is indicated by the symptoms. If you bypass MAP 0100: START OF CALL, and start the service with another MAP, you may be using the wrong MAP. The questions in that MAP may not refer to your symptom and may send you to the wrong resolution.
- These MAPs are an aid in solving most problems. If you misunderstand instructions or questions, a MAP may lead you to an incorrect resolution. Start again in the MAPs and read each step carefully. If, after going through the MAPs a second time you still have no solution to the problem, the printer may have two interrelated problems or an intermittent problem. Use other diagnostic techniques or call for aid.
- **Read carefully!** The MAPs will aid you in resolving the situation only if you follow every instruction and answer each question accurately.
- **Follow the sequence!** Always do one question at a time. When a procedure precedes the question, do all of the steps in the procedure before answering the question. Some steps have additional information that pertains to that step. This information is in the map flow and is an aid in describing why questions or actions are needed to find the correct failing FRU.

- **Follow instructions!** Instructions must be followed exactly in the order given. Questions rely on the instructions immediately before the questions. Do not change the conditions prepared by the instructions before answering the question. Do not turn off the printer or disconnect any cable unless you are instructed to do so. Whenever possible, the MAPs are written so that **No** is the error path answer.
- **Verify repair or exchange FRU!** When a card or a cable is identified as the failing FRU, reseat it and verify that the same problem remains. If the problem continues, exchange the FRU. Start again at MAP 0100: START of call, to ensure the correct operation of the printer before returning it to the customer.

Intermittent strategy: For intermittent symptoms, see MAP 0210: Intermittent failures.

Voltage/continuity readings: When taking voltage or continuity readings, do exactly as the MAP instructs.

Abbreviations used in this book

AGA (AFTA) automatic forms thickness adjustment

CPI characters per inch

CPU central processing unit

EMI electromagnetic interference

EPA environmental protection agency

MAP maintenance analysis procedure

NLQ near letter quality

NVRAM non-volatile random access memory

T&D Test and diagnostic

IPDS™ Intelligent Printer Data Stream™

FRU Field replaceable unit

ESD Electrostatic discharge

MAP 0100: START of call

Intermittent strategy

For intermittent symptoms, see MAP 0210: Intermittent failures).

Note: MAPs will not diagnose mechanical noise problems. This type of problem should be solved by identifying the cause of the noise and then repairing or installing new parts.

MAP 0100: Start of call

Table 11. MAP 0100: Start of call

Step	Questions/Actions	Yes	No
1.	**Has the Customer completed the Problem Solving Procedures in the the** *4247 Model L03: User's Guide*.	Go to step 2.	Attempt recovery using the Problem Solving Procedures in the *4247 Model L03: User's Guide*. Go to step 2 as needed.
2.	**Does the printer display a message?**	Go to Reference table 1, recoverable error messages. **Note:** This table does not list all the messages that might appear in the display, such as informational messages that do not indicate an error. Refer to the *4247 Model L03: User's Guide* for other messages. If you cannot find the message, go to step 3.	Go to step 3.

Table 11. MAP 0100: Start of call (continued)

Step	Questions/Actions	Yes	No
3.	**Is the problem no print?**	Print the offline print verification self test (see "OFFLINE PRINTER VERIFICATION SELF TEST" on page 102). Find the description of the failure in Reference table 2, no printed characters, and perform the action suggested.	Go to step 4.
4.	**Is the problem print quality?**	Find the description of the failure in Reference table 3, print quality failures, and perform the action suggested.	Find the description of the failure in "Reference table 4, operator panel and miscellaneous problems" and perform the action suggested.

MAP 0120: Parallel, serial, or USB interface

Symptom explanation	Suspected FRUs/causes
Communication failures No print, but print test is OK Not correct printout	Printer configuration
	Host cable
	Controller board

Notes:

1. Printing in hexadecimal code is available to aid service personnel and programmers for host program debug. On the operator panel, enter **Hex Dump** mode. Refer to the *4247 Model L03: User's Guide* for instructions.
2. A computer, such as a laptop, can be connected to the printer parallel-port as input to help isolate some communications problems.

DANGER

<1-13> Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

<1-14> Switch off printer power and unplug the printer power cord before connecting or disconnecting a communication port, a teleport, or other attachment connector.

Table 12. MAP 0120: Parallel, Serial, or USB Interface

Step	Questions/Actions	Yes	No
1.	The following items are listed with the most probable failing item first. Check the first list item and test the printer. If the printer still fails, continue with the next list item. a. Check the printer Configuration settings and ensure that they match the host settings for your parallel, serial, or USB attachment. • 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 b. Check the communications cable and connector pins. Reseat host cable on both ends of connection, or swap host cable with a working one. Replace or repair host cable as needed.	Run T&D in Automatic Mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Go to step 2.
2.	**Is the failure with the parallel attachment?**	Go to step 6.	Go to step 3.
3.	**Is the failure with the serial attachment?**	Go to step 4.	No trouble found. Run T&D in Automatic Mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 12. MAP 0120: Parallel, Serial, or USB Interface (continued)

Step	Questions/Actions	Yes	No
4.	Install the RS-232C loop-back connector (P/N 41U2467). Run T&D07 in Single Test Mode to test the serial attachment circuits (see Running the test and diagnostic (T&D programs)). **Did T&D07 run without errors?**	Go to step 5.	Record the display message and go to T&D ERROR MESSAGES TABLES: KO(n1) FRU(n2) [n3], and perform the suggested action.
5.	Install the loop-back connector on the host end of the cable and run T&D07 (see Running the test and diagnostic (T&D programs)). If there is a 25-pin D Shell on the cable, then use P/N 08H7268 loop-back connector. **Did T&D07 run without errors?**	No trouble found. Run T&D in Automatic Mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Install a new host cable. Run T&D in Automatic Mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
6.	Install the parallel loop-back connector (P/N 08H7269). Run T&D06 in Single Test Mode to test the parallel attachment (see Running the test and diagnostic (T&D programs)). **Did T&D06 run without errors?**	Install a new host parallel cable. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Record the display message and go to T&D ERROR MESSAGES TABLES: KO(n1) FRU(n2) [n3], and perform the suggested action.

MAP 0122: LAN Interface

Symptom explanation	Suspected FRUs/causes
Communications failure	Host and print server configuration
	LAN cable
	Controller board

DANGER

<1-13> Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

<1-14> Switch off printer power and unplug the printer power cord before connecting or disconnecting a communication port, a teleport, or other attachment connector.

Symptom	Probable cause	Action
LAN card will not communicate with host	Network problem	1. Check the printer Configuration settings and ensure that they match the host settings for your parallel, serial, or USB attachment. • 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 2. Ensure that the Attachment parameter is set to Hot Port Switch or LAN. 3. Have the customer "ping" the printer to verify communications. 4. Have the customer verify host and print server configuration. Including IP address, gateway address, and subnet mask. 5. Have the customer check physical network cabling.
LAN card communicates with host but printer does not print or the printout is garbled.	Data stream problem	1. Check the printer Configuration settings and ensure that they match the host settings for your parallel, serial, or USB attachment. • 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 2. Ensure that the Emulation Mode, Character Set, and Print Language parameters are set correctly. 3. Have the customer check print job stream. 4. Take a data trace of the attachment and contact support.

Symptom	Probable cause	Action
Note: The term “ping” means to send a signal in anticipation of a return response. The return response indicates that the printer and the host are communicating.		

MAP 0130: No paper movement

Symptom explanation	Suspected FRUs/causes
Paper Load and Feed Failures No Paper Movement Load Front n (message, but forms did not load)	Paper feed motor
	Engine board
	Mechanical parts

Table 13. MAP 0130: No paper movement

Step	Questions/Actions	Yes	No
1.	Turn off the printer a. Open the top cover. b. Remove the paper bail. c. Rotate the upper feed roller by hand. **Do the failing tractor pin-feed belts move?**	Go to step 4.	Go to step 2.
2.	Perform the “Tractor Assembly Service Check” on page 231. **Is the service check OK?**	Go to step 3.	Repair as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
3.	Perform the “Main Paper Drive Check and Adjustment” on page 227. **Are the service checks OK?**	Go to step 4.	Repair as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 13. MAP 0130: No paper movement (continued)

Step	Questions/Actions	Yes	No
4.	Disconnect the paper feed motor connector from the Engine board. See “Paper Motor” on page 134 to measure the resistance of the motor windings. **Is the measurement correct for both windings?**	Install a new Engine board (see Engine Board). - or - Install a new tractor assembly cable. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)). - or - Install a new paper drive motor (see Paper Motor). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Install a new paper drive motor (see Paper Motor). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

MAP 0131: Paper path sensor

Symptom explanation	Suspected FRUs/causes
LOAD FRONT 1 - or - LOAD FRONT 2	Paper sensor failure
	Engine board
	Sensor cable assembly

Table 14. MAP 0131: Paper path sensor

Step	Questions/Actions	Yes	No
1.	Try to load forms from the failing forms path. **Does the form load, and is it visible between the printhead and the platen?**	Go to step 2.	Probable forms-loading problem (see MAP 0130: No paper movement).
2.	Black back forms will not work in all forms paths, and can cause false forms path sensor errors. **Are you trying to load black back forms?**	Black back forms will work only in the second tractor forms path (see Paper path nomenclature).	Go to step 3.
3.	1. Remove the forms. 2. Run T&D09 to tune the sensors (see Running the test and diagnostic (T&D programs)). 3. Turn off the printer 4. Load forms. 5. Close the top cover. 6. Turn on the printer. 7. After the printer is completely powered on, press the **ONLINE** key to make the printer Not Ready. 8. Press the **LOAD/FF** key **Is there a false paper path sensor message?**	Run T&D18 and verify correct sensor operation. If not OK: • Install a new Engine board (see Engine Board). - or - • Install a new sensor cable assembly (see Sensor Cable Assembly). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

MAP 0140: Printhead drive

Symptom explanation	Suspected FRUs/causes
Print Integrity Carriage Slams Into Sides Printing Slows or Stops Carriage does not move	Ribbon defective or incorrectly installed
	Ragged tear-offs on continuous forms
	Corner on the leading edge of the forms is catching in printhead mask/mask damaged
	Carriage belt tension is incorrect
	Carriage belt clamp is loose
	Carriage motor is defective / mounting hardware
	Carriage belt idler is not turning
	Mechanical interference
	Printhead gap is incorrect
	Engine board is defective
	Printhead is defective
	Printhead cable is defective or has bad connection

Table 15. MAP 0140: Printhead drive

Step	Questions/Actions	Yes	No
1.	The ribbon can cause printhead drive problems. Remove the ribbon. Print a print test, see OFFLINE PRINTER VERIFICATION SELF TEST. **Was the printhead drive OK during at least a 10-page print test?**	The problem may have been caused by a ribbon cartridge that was not correctly installed. Go to step 2.	Go to step 2.

Table 15. MAP 0140: Printhead drive (continued)

Step	Questions/Actions	Yes	No
2.	Turn off the printer. Perform the printhead drive service check (see Printhead Drive Service Check). **Is the service check OK?**	Go to step 3.	Repair as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
3.	When the print wires are too close to the platen, they can cause printhead drive problems. Perform the Print Head Gap service check (see Print Head Gap Adjustment). **Is the AFTA service check OK?**	Go to step 4.	Repair as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
4.	Disconnect the carriage motor connector from the Engine board. See “Carriage Motor” on page 132 to measure the resistance of the motor windings. **Is the measurement correct for each winding?**	Go to step 5.	Install a new carriage motor (see Carriage Motor and Fan). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 15. MAP 0140: Printhead drive (continued)

Step	Questions/Actions	Yes	No
5.	An open printhead thermal sensor can cause the printhead drive to stop or to slow. Remove the printhead (see Printhead Drive Service Check). See Print Head to measure the resistance of the thermal sensor. Measure between pins 5 and 6 on the printhead 26-pin connector. **Is the resistance 1000 ohms ±6% (60 ohms)?**	Go to step 6.	Install a new printhead. Carefully follow the replacement procedure, "Printhead Drive Service Check" on page 239. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
6.	Disconnect the 26-conductor printhead cable from the Engine board (see Figure 25). See Print Head to measure the resistance of pin 5 end-to-end and pin 6 end-to-end. **Is the resistance 5 ohms or less for both pins?**	Reinstall the printhead. Carefully follow the replacement procedure, "Printhead Drive Service Check" on page 239. Install a new carriage motor (see Carriage Motor and Fan). - or - Install a new Engine board (see Engine Board). - or - Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs).	Install new printhead cables. Re-install the printhead. Carefully follow the replacement procedure (see Printhead Drive Service Check). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

MAP 0150: Power supply

The printer has a auto-ranging universal power supply.

Symptom explanation	Suspected FRUs/causes
Display blank and keys do not operate Power failure	Power supply
	Power cord
	Engine board
	Operator panel
	Sensors
	Motors
	Controller board
	Tractor assembly
	Cables

Table 16. MAP 0150: Power supply

	Questions/Actions	Yes	No
1.	Turn off the printer. Unplug the power cord from the voltage source. Verify that the power source voltage is correct. Power Source Min Normal Max Frequency ±3 Hz Low 90 120 137 50/60 Hz High 180 220 264 50/60 Hz **Is the voltage correct?**	Go to step 2.	Have the customer repair the voltage problem. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
2.	Disconnect the power cord from the printer. Check the power cord continuity. **Is there continuity?**	Go to step 3.	Install a new power cord.

Table 16. MAP 0150: Power supply (continued)

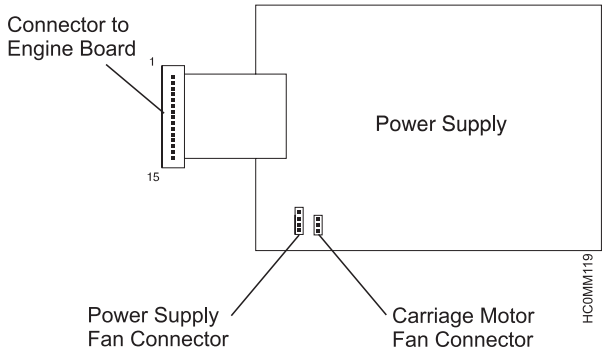
	Questions/Actions	Yes	No
3.	a. Remove the rear cover (see Cover Parts Removal). b. Disconnect the power supply fan from the power supply board. Power Supply Pins and Connectors:  c. Disconnect the carriage motor fan from the power supply board. d. Disconnect the power supply cable from the Engine board. e. Plug the power cord to the printer, then to the power source. f. Turn on the printer. g. Measure the power supply connector voltages. Measure between a connector ground pin and the voltage pins. See Reference table 5, power supply connector pins and voltages for pins and voltages. **Are the voltage measurements OK?**	Go to step 4.	Install a new power supply (see Power Supply Board). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 16. MAP 0150: Power supply (continued)

	Questions/Actions	Yes	No
4.	a. Turn off the printer. b. Connect the power supply cable to the Engine board. c. Disconnect all loads from the Engine board except the operator panel (see Figure 25 in Chapter 4, “Locations”). • Printhead ribbon cables • Sensor cable • Tractor cable asm. • AFTA motor • Paper feed motor • Carriage motor • Ribbon motor d. Turn on the printer. **Does the operator panel display work?**	Go to step 5.	Go to step 6.

Table 16. MAP 0150: Power supply (continued)

	Questions/Actions	Yes	No
5.	a. Turn off the printer. b. Connect **1** of the disconnected Engine board loads. c. Turn on the printer and observe the operator panel display If the operator panel display works and remains on after approximately 1 minute, the just connected load is not the problem. d. Repeat steps 1, 2, and 3 (connecting the following, one at a time) until the failing load is found. • Printhead ribbon cables • Sensor cable • Tractor cable asm. • AFTA motor • Paper feed motor • Carriage motor • Ribbon motor e. After all Engine board loads have been connected, connect the power supply fan and the carriage motor fan to P1 and P2 on the power supply board. **Does the operator panel display work after each load is connected?**	No problem found.	Replace the faulty load FRU.
6.	a. Turn off the printer. b. Connect the carriage and board fans to the power supply. c. Turn on the printer. **Does the carriage fan turn on after about 1 minute?**	Go to step 7.	Install a new Controller Board - or - Engine board - or - Back Panel board.

Table 16. MAP 0150: Power supply (continued)

	Questions/Actions	Yes	No
7.	1. Turn off the printer. 2. Reseat the operator panel cable connection at the Engine board and operator panel assembly. 3. Turn on the printer. **Does the carriage fan turn on after about 1 minute?**	No trouble found. Run T&D in automatic mode.	Install a new operator panel - or - Operator panel cable - or - Engine board.

MAP 0160: Ribbon feed

Symptom explanation	Suspected FRUs/causes
RIBBON BLOCKED CHECK RIBBON Ribbon Feed Failures No visible print Print quality problems	Ribbon installation
	Ribbon cartridge (customer responsibility)
	Ribbon drive motor
	Ribbon motion sensor (sensor cable)
	Engine board
	AGA (AFTA) setting

Table 17. MAP 0160: Ribbon feed and ribbon lift

Step	Questions/Actions	Yes	No
1.	The following items are possible causes for ribbon feed failures: • Ribbon installed incorrectly • Ribbon cartridge bad • Remove the ribbon and turn the tension knob to make sure that the ribbon is not jammed. Repair as needed. **Does the problem still exist?**	Go to step 2.	Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
2.	Perform the ribbon service check (see Ribbon Feed Service Check). **Is the service check OK?**	Go to step 3.	Repair as needed.

Table 17. MAP 0160: Ribbon feed and ribbon lift (continued)

Step	Questions/Actions	Yes	No
3.	Ensure that a ribbon is installed. Run T&D09 in single test mode to test ribbon feed (see Running the test and diagnostic (T&D programs)). **Does the ribbon feed OK?**	No trouble found. Return to the step that sent you to this MAP.	Go to step 4.
4.	Turn off the printer. Disconnect the ribbon motor connector at the Engine board. See Ribbon Motor wiring diagram to measure the resistance of the motor windings. **Is the resistance correct?**	Install a new Engine board (see Engine Board). - or - Install a new sensor cable (see Sensor Cable Assembly). - or - Install a new ribbon drive motor (see Ribbon Motor). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Install a new ribbon motor (see Ribbon Motor). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

MAP 0180: Top cover interlock

Symptom explanation	Suspected FRUs/causes
COVER OPEN (False Message) CLOSE COVER (False Message) T&D17 TOP COVER INTERLOCK TEST FAILURE	Top cover
	Top cover magnet
	Operator panel
	Printer Engine board
	Operator panel cable

Table 18. MAP 0180: Top cover interlock

Step	Questions/Actions	Yes	No
1.	Inspect the following parts: • Top cover magnet (Located near the right side of the operator panel, when the cover is closed) • Operator panel cable and connectors **Are the parts OK?**	Install a new operator panel (see Operator Panel). - or - Install a new operator panel cable. - or - Install a new Engine board (see Engine Board). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Repair as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

MAP 0190: Form feed problems

Symptom explanation	Suspected FRUs/causes
PAPER JAM CHECK ALL PATHS Forms Jam Forms Stick Together	Debris or unwanted paper in forms path
	Tractor assembly
	Mechanical parts
	Engine board
	Tractor assembly cable
	Static charge build-up

Table 19. MAP 0190: Forms feed problems

Step	Questions/Actions	Yes	No
1.	Forms feed problems can have multiple causes. While following this MAP, do not stop your search after resolving the first cause. This is especially true when you are investigating environmental and usage problems. Search for additional causes. Message **PAPER JAM CHECK ALL PATHS** is sensed by the paper presence sensor (located near the platen), and indicates unexpected forms are present. Turn off the printer. **Is this a PAPER JAM CHECK ALL PATHS message?**	Go to step 12.	Go to step 2.
2.	Examine the tractors for jammed or damaged forms. **Are the forms OK?**	Go to step 3.	Remove any jammed or damaged forms. You should investigate further to find the root cause of the jamming. Go to step 3.

Table 19. MAP 0190: Forms feed problems (continued)

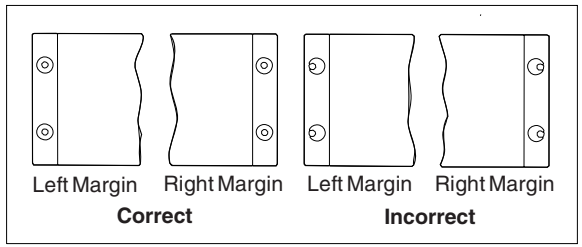
Step	Questions/Actions	Yes	No
3.	**Are the forms sticking together or sticking to the covers?**	Static electricity is present in the forms. Contact Level 2 Support for guidance. Go to step 4.	Go to step 4.
4.	Make the following checks: a. Forms input and output stacking follows the recommendations in Forms Stacking Recommendations. b. Input forms are aligned to feed straight into the printer. c. Input forms are not catching on the edge of the forms carton. d. Printer is properly positioned on the work surface (front edge of the printer at the front edge of the work surface) to provide unrestricted forms feed for front and rear push forms paths. e. Forms tension between the left and right tractors is properly adjusted.  f. Forms meet specifications described in MEDIA FORMS SPECIFICATIONS. g. Label forms meet specifications described in MEDIA FORMS SPECIFICATIONS. h. The environment meets the specifications described in Environmental Requirements. **Are the checks OK?**	Go to step 5.	Repair, as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 19. MAP 0190: Forms feed problems (continued)

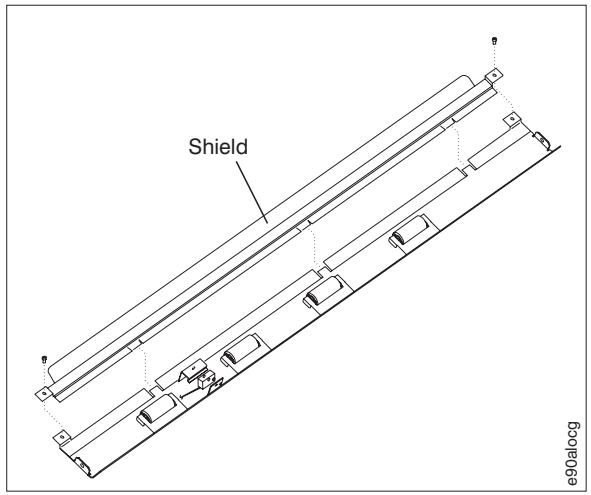
Step	Questions/Actions	Yes	No
5.	Make the following checks: • Inspect the condition of the paper bail plastic shield and lower plastic shield. Ensure that the shields are firmly attached. **Note:** If you suspect lower plastic shield damage, remove the screws to remove the plastic shield, and inspect it for damage.  • Locate and remove any paper debris, label debris, or label adhesive from the forms path. **Are these checks OK?**	Go to step 6.	Repair, as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 19. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
6.	Make the following checks of the printhead mask: • Locate and remove debris or adhesive from the printhead mask opening. • Check the printhead mask for damage or incorrect installation (see Ribbon Mask). **Are these checks OK?**	Go to step 7.	Repair, as needed (see Ribbon Mask). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
7.	The paper bail assembly plastic shield is spring loaded away from the platen. Remove the ribbon. Remove the forms. Move the printhead as far to the right as possible. **Is there spring tension holding the paper bail plastic shield open approximately 10 mm (0.39 in.)?**	Go to step 8.	Install a new paper bail assembly plastic shield and spring. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
8.	**Do the forms jam after they leave the tractor assembly?**	Go to step 9.	Go to 11.
9.	Perform the main paper drive service check. Go to Main Paper Drive Check and Adjustment. **Is the service check OK?**	Go to step 10.	Repair, as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 19. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
10.	Perform the AGA (AFTA) service check. Go to "Main Paper Drive Check and Adjustment" on page 227. **Is the service check OK?**	Replace the upper feed roller if worn rollers are suspected. (This procedure is complete.)	Repair, as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
11.	Perform the tractor assembly service check (see Tractor Assembly Service Check). **Is the service check OK?**	You have completed this procedure.	Repair as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).
12.	Check to see if the customer loads forms beyond the tractors so that they block the paper presence sensor. **Does the customer load forms far enough to block the sensor?**	Remove and reload the forms so that the leading edge of the forms is near the square drive shaft on the tractor assembly. Show the customer that this is the correct way to mount the forms. The **PAPER JAM CHECK ALL PATHS** message occurred because the printer sensors were already sensing forms in the path when the customer tried to load forms.	Go to step 13.

Table 19. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
13.	Examine the sensors and the area around the sensors for pieces of paper or chad, which the printer will sense as forms. **Is there chad?**	Vacuum or blow out all the chad. Wipe the sensor with antistatic liquid (P/N 2200118). If you judge the amount of chad to be excessive, advise the customer to: • Frequently clean out the chad. • Ask the forms supplier to reduce the chad.	Go to step 14.
14.	A paper presence sensor failure can cause a **PAPER JAM CHECK ALL PATHS** forms jam message to display. Run T&D18, including performing a sensor tune, and very correct sensor operation. **Are the Sensors operating correctly?**	Go to step 15.	If not OK: • Install a new Engine board (see Engine Board). • If the printer is still failing after the Engine board has been changed, install a new sensor assembly cable (go to Sensor Cable Assembly). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 19. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
15.	Check the sensor cable assembly for wear or damage. **Is it OK?**	Install a new Engine board. Run T&D in automatic test mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).	Install a new sensor cable assembly. Run T&D in automatic test mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

MAP 0200: AGA (AFTA) not operational

Symptom explanation	Suspected FRUs/causes
A.G.A. NOT OPER ADJUST THE GAP The AGA (AFTA) sensor circuit did not detect that needle 15 moved at the correct time during the AGA (AFTA) routine. The needle either failed to extend or was not detected when it was pushed back.	Printhead misaligned and loosely fastened
	AGA (AFTA) motor defective
	26-conductor printhead cable damaged or poor connection
	Mechanical parts damaged or binding
	Printhead defective
	Engine board defective

CAUTION:
The printhead may be hot. Wait for it to cool down.

Table 20. MAP 0200: AGA (AFTA) not operational

Step	Questions/Actions	Yes	No
1.	Perform the Standard AGA (AFTA) Service Check (see Print Head Gap Adjustment). **Is the service check OK?**	Go to step 2.	Repair as needed. Mount forms, and try loading and parking forms several times. Run T&D in automatic test mode to verify correct printer operation (see Running the test and diagnostic (T&D programs)).

Table 20. MAP 0200: AGA (AFTA) not operational (continued)

Step	Questions/Actions	Yes	No
2.	Check the printhead cables. a. Remove the printhead (see Printhead Drive Service Check). b. Inspect the printhead flat cables for damage. • Disconnect the 26-conductor printhead cable from the Engine board and from the printhead. • Check the continuity of conductors 17 and 18 from end-to-end. Inspect the contacts at the ends of the cable for delamination and other damage. **Are the cables OK?**	Go to step 3.	Install new printhead cables and reassemble the printer. Mount forms, and try loading and parking forms several times. If the error occurs again, continue with 3.
3.	Install a new printhead (see Printhead Drive Service Check). Load and park forms several times. **Did the error occur again?**	Install a new Engine board (see Engine Board).	Return the printer to service.

MAP 0210: Intermittent failures

Symptom explanation	Suspected FRUs/causes
Intermittent Failures	Loose connectors
	ESD grounds
	Damaged wires

General information

All possible indications and symptoms should be recorded to aid you in using this MAP. System error logs, when available, aid in identifying intermittent problems. Obtain all information concerning the failure from operator system aids and information:

- Error/Status codes - displayed on operator panel
- System error log - host system information
- Online problem - operator identified
- System identified problem
- Power on failure - cold start
- Long run - time failures - hot, overheated

An online program can be used to find intermittent failures. Ask the operator to run the failing job for you to observe, if possible.

Power

Intermittent problems may be caused by faulty voltages. Check the voltages by following the procedures in MAP 0150: Power supply.

Electrostatic discharge (ESD)

Intermittent problems can also be caused by build up of electrostatic charge on the forms or bad electrostatic ground (ESD) connections. If you suspect the forms, contact level 2 support for guidance. If you suspect the problem is caused by a bad ground, perform the following check, perform Ground connectors check.

Set the meter to the lowest resistance scale and measure for 0.1 ohms or less between the ground pin of the power cord and the following parts:

Attachment

Ensure that the printer is not operated with loop-back connectors installed.

Try another host communications cable or move the failing printer to the location of a working printer and swap the host communications cable.

Environmental requirements

See Environmental Requirements.

Miscellaneous

Check for lost screws under the power supply or under the Engine board.

MAPs reference tables

Reference table 1, recoverable error messages

Printer Errors

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

- Status errors
- Recoverable errors
- Unrecoverable 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 *4247 Model L03: 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.

Unrecoverable Errors: See "Reference table 1a, unrecoverable errors" on page 89.

Table 21. Error messages

Message	Description	Action
LOAD FRONT 1 - or - LOAD FRONT 2	Forms do not load when **LOAD/FF** is pressed. No forms movement.	See MAP 0130: No paper movement.

Table 21. Error messages (continued)

Message	Description	Action
LOAD FRONT 1 - or - LOAD FRONT 2	False message. Forms are visible between the printhead and the platen. Forms path sensor cannot sense paper.	See MAP 0131: Paper path sensor.
PRINT INTEGRITY	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.	Turn off and then turn on the printer. If message remains, see MAP 0140: Printhead drive.
NVM CHANGE REMOVE PAPER PRESS A KEY	Occurs when printer Engine board or microcode version has been replaced.	Verify printer configuration settings and Custom Sets.
INTERLOCK ERROR	Small Rear Cover Interlock not being detected.	Turn the power off. Ensure the Small Rear Cover is properly installed. Turn the power on.
RIBBON BLOCKED CHECK RIBBON	The ribbon motion sensor has detected an error.	Turn off and then turn on the printer. If message remains, see MAP 0160: Ribbon feed.
COVER OPEN - or - CLOSE COVER False Message	The cover open sensor has detected an error.	See MAP 0180: Top cover interlock.

Table 21. Error messages (continued)

Message	Description	Action
STARTING UP (fixed) # SOFTWARE ERROR # ENGINE DRIVER # PM SET-UP ER # VOID EXEC LIST # MFILE CHECKSUM # UNK MFILE TYPE # TOO MANY FILES # NVRAM DRIVER NVM # MFLIST MEM ERR	Unrecoverable error.	See “Reference table 1a, unrecoverable errors” on page 89.
PAPER JAM CHECK ALL PATHS	Path sensor detected forms already present when you tried to load forms into a fanfold path.	1. Ensure fanfold forms are loaded onto the tractor pins, with the leading edge visible on the tractor. 2. Check for pieces of paper in the paper path and under the platen. 3. If message remains, see “MAP 0190: Form feed problems” on page 75.
DATA SET OFF - or - FRAMING ERROR WRONG CHARACTER - or - OVERRUN ERROR CHARACTER LOST - or - PARITY ERROR WRONG CHARACTER	A remote connection serial interface error condition was detected. The Data Set Ready or Data Carrier Detect signal was not sensed.	See “MAP 0120: Parallel, serial, or USB interface” on page 54.

Table 21. Error messages (continued)

Message	Description	Action
BUFFER OVERFLOW CHARACTER LOST	A serial input buffer overflow error condition was detected. Data has been lost.	1. Press stop to clear the message. 2. Increase the buffer size and/or: 3. Check the SERIAL PACING PROTOCOL value set in the printer configuration against the host's pacing protocol. 4. Restart the job.

Reference table 1a, 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 “Running the test and diagnostic (T&D programs)” on page 105 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 22. 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

Table 22. Unrecoverable Error Display Messages (Bootstrap Phase) (continued)

MESSAGE	MEANING	POSSIBLE F.R.U.
# 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 23 on page 91 through Table 26 on page 93.

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 23. 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	F.R.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 24. 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 25. 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	Y value	DESCRIPTION
3	Set up error	1	Allocated memory block not found
4	Unknown command code	2	Unbalance graphics list counter
5	Invalid command argument	3	Unbalanced cache counter
6	Unrecoverable runtime error	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 26. 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 27. 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 27. 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 on the Flash memory, 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.

Reference table 2, no printed characters

Failure: No printed characters appear	Action
No print from any source (host or print test).	If there is no carriage motion: • See MAP 0140: Printhead drive. • See MAP 0150: Power supply. If there is carriage motion: 1. Check that the ribbon is seated correctly. 2. See Print Head Gap Adjustment. 3. See MAP 0160: Ribbon feed.

Failure: No printed characters appear	Action
No print from serial, parallel, or USB interfaces, but print test is OK.	See MAP 0120: Parallel, serial, or USB interface.
No print from LAN attachment, but printer demonstration is OK.	See MAP 0122: LAN Interface.
Print test starts to print one line, then printer hangs.	See MAP 0140: Printhead drive.

Reference table 3, print quality failures

Print quality failures (darkness, location, quality)	Action
Print density varies, or is too light or too dark.	1. See MAP 0160: Ribbon feed. 2. See Print Quality Service Checks.
Character or line spacing uneven or overprinting.	1. See Main Paper Drive Check and Adjustment. 2. See Printhead Drive Service Check.
Multiple-part form copies too light or missing dots.	1. See Print Head Gap Adjustment. 2. See Print Quality Service Checks.
Smearing or smudging at perforations on multiple-part forms or heavy stock.	1. Use Perforation Safety feature. Refer to a 4247 User's Guide. 2. See MAP 0160: Ribbon feed. 3. See Main Paper Drive Check and Adjustment. 4. See Printhead Drive Service Check. 5. Check for excessive ribbon inking.
Smearing or smudging.	1. See MAP 0160: Ribbon feed. 2. See Main Paper Drive Check and Adjustment. 3. See Printhead Drive Service Check. 4. Check for excessive ribbon inking.
Missing dots or characters.	1. See Print Head Gap Adjustment. 2. See Print Quality Service Checks.

Print quality failures (darkness, location, quality)	Action
Incorrect print, garbled print, or wrong characters print.	See one of the following: • MAP 0120: Parallel, serial, or USB interface • MAP 0122: LAN Interface
Horizontal misalignment (dots or characters move left or right).	See Print Quality Service Checks.
Vertical misalignment (dots or characters move up or down).	See Print Quality Service Checks.
Vertical print line misalignment (lines move upward, page-to-page).	1. Install a new upper feed roller. 2. Install a new paper bail assembly.

Reference table 4, operator panel and miscellaneous problems

Description of Failure	Action
The Printer Configuration (program) menu is locked.	This means the menu is locked.
Printer powers on to **READY** state with “Parallel” displayed instead of Serial, USB, or LAN.	This could mean data has not been sent from the Host over Serial, USB, or LAN connection. If the Printer Interface is set to AUTO, the printer will automatically switch to Serial, USB, or LAN connection when data arrives from the Host.
Printer is printing in a Quality mode when another print quality is desired.	Check the Configuration to make sure the desired quality has been selected. It is possible that the print job is selecting a different quality setting.
Operator panel keys operate OK but display is blank and LEDs are off.	Install a new operator panel (see Operator Panel).
Operator panel display is blank, LEDs are off, and keys do not operate.	1. Ensure that the operator panel cable is connected correctly at both ends. 2. See MAP 0150: Power supply. 3. Install a new operator panel (see Operator Panel).

Description of Failure	Action
A line of black squares appears on the top row of the Operator Panel Display after power on.	1. Power off the printer, then remove the Controller Board and check the part number on the back of the board. Ensure the part number is compatible with this printer. 2. Reinstall the Controller Board and power on. If the failure symptom repeats, install a new compatible Controller Board.
Buzzer sounds continuously.	Install a new Engine board (see page Engine Board). Install a new operator panel.
Printing stops or slow printing.	1. See MAP 0140: Printhead drive. 2. If Quiet Print function is enabled, the printer operates at ½ speed. Disable Quiet Print. See the *4247 L03: User's Guide*.
Printhead carriage only moves approximately 1 inch.	See MAP 0140: Printhead drive.
Printing starts to print 1 line, then printer hangs.	See MAP 0140: Printhead drive.
Printhead crashes into left or right side frame, or the margins shift.	See MAP 0140: Printhead drive.
AGA (AFTA) wheel indications varies on same paper-weight.	See Print Head Gap Adjustment.
Fanfold paper does not load or feed. No paper movement.	See MAP 0130: No paper movement.
Fanfold paper jams.	See MAP 0190: Form feed problems.
Fanfold paper print line skew. Print line too high or low on one end of line.	See Paper Path Service Checks.
Ribbon life failures.	See MAP 0160: Ribbon feed.
Ribbon feed failure.	See MAP 0160: Ribbon feed.
Fanfold stacking problems.	See the *4247 Model L03: User's Guide*.
Forms damage at perforations of multiple-part forms or heavy stock.	1. Use Perforation Safety feature (see the *4247 Model L03: User's Guide*). 2. See MAP 0190: Form feed problems.
Forms damage.	See MAP 0190: Form feed problems.

Reference table 5, power supply connector pins and voltages

Table 28. Voltages

Pin	Voltage
Pin 1	N/A
Pin 2	–5 Vdc
Pin 3	+5 Vdc (power down signal)
Pin 4	+5 Vdc
Pin 5	+5 Vdc
Pin 6	Ground
Pin 7	Ground
Pin 8	Ground
Pin 9	Ground
Pin 10	Ground
Pin 11	+38 Vdc
Pin 12	+38 Vdc
Pin 13	+38 Vdc
Pin 14	+90 Vdc
Pin 15	Fan control (see note)

Notes:

1. Pin 15 is the idle control input signal from the Engine board, and will measure 0 Vdc when the power supply is disconnected from the Engine board.

2. When connected to the Engine board, pin 15 will raise +4.8 to 5.2 Vdc when the carriage fan is turned on, and 0.0 Vdc after the printer is idle for approximately 30 seconds and the carriage fan is turned off.

Chapter 2. Diagnostics

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. 1.05**.

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.

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 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 29. Self-Test Printout

SELF TEST PRINTOUT

PRINTER MODEL: 4247-L03
PRINTER CODE: Version 00.09
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, including 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.

Notes:

1. The printer can be left in connection with the host line.
2. This status is reset when the printer is powered off.

The format of the hexadecimal dump printout is shown in Figure 10 on page 105.

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 10. Hex-Dump Printout

Running the test and diagnostic (T&D programs)

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

Parallel loop-back connector	P.N. 08H7269
RS-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 RS-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 32 on page 120 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 wires that connect the output signals with the input signals of the interface.

Parallel Interface loopback.
It is composed of wires that connect the output signals with the input signals of this interface plus an integrated circuit (parallel latch) that provides the correct handling 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 30 shows the diagrams of these loop-backs.

Table 30. 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

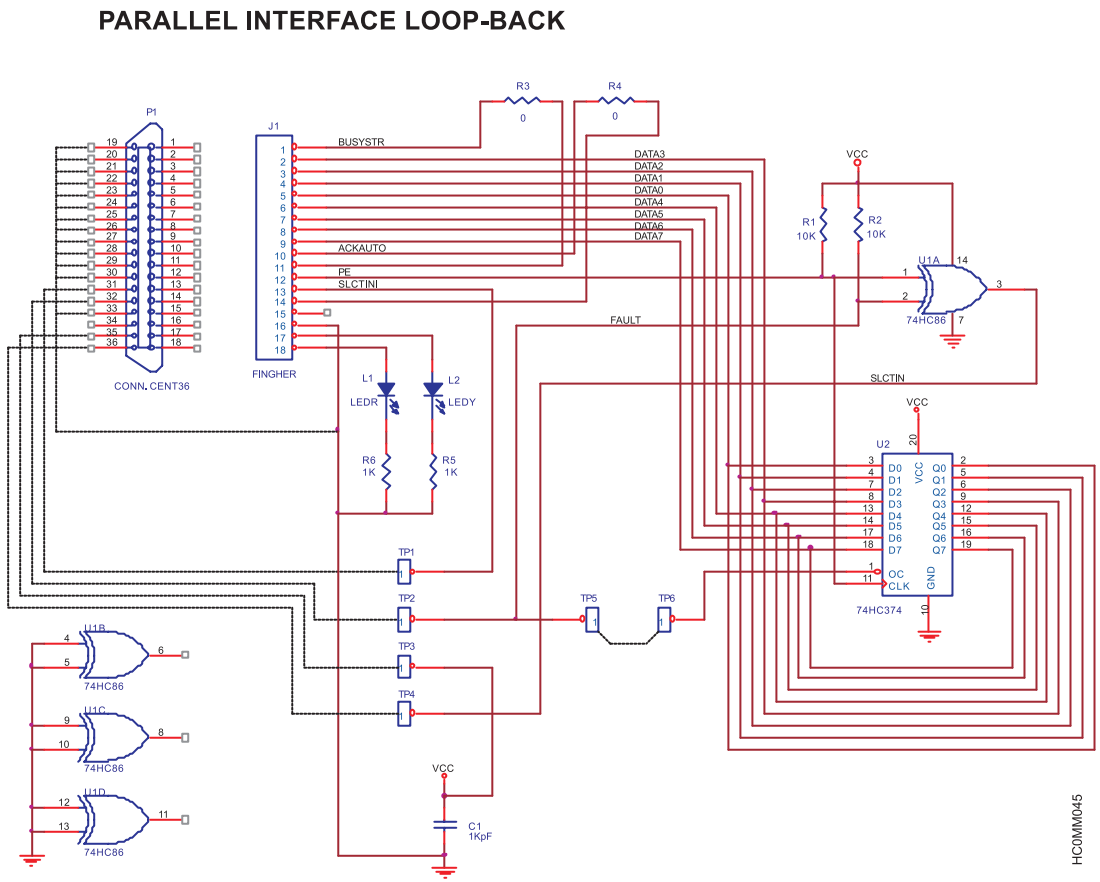


Figure 11. Parallel I/F Loop-Back Diagrams

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.

Notes:

1. The T&D procedure is interactive and prompts the user to perform actions.
2. If step-by-step (that is, single test) mode is desired, you must press **LOAD/FF** within 3 seconds after releasing keys.

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 shown by the display.

<<SBS CMPL>>

where:

SBS: Executes tests step-by-step, one at a time (single test mode).

CMPL: Executes all tests together in a complete chain (automatic test mode).

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 complete automatic sequence test is started.

In the case of the 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 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 32 on page 120.)
*n*2 the implied faulty F.R.U. (indicated as F.R.U. in Table 33 on page 121)
*n*3 the diagnostic error code (indicated as ERROR CODE in Table 34 on page 122)

T&D USER FLOW CHART

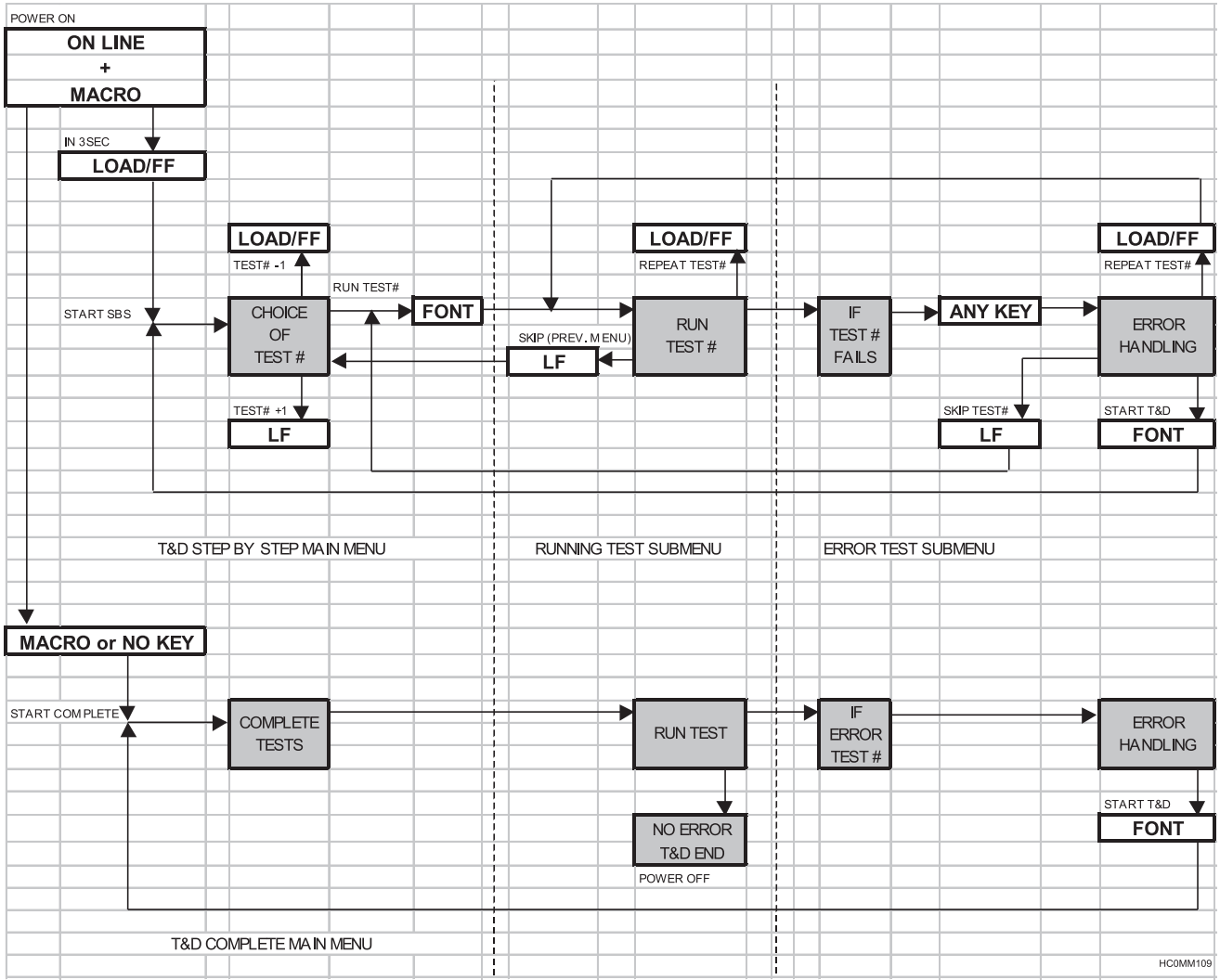


Figure 12. Flowchart of the T&D procedures

T&D STEP BY STEP SCHEMATIC FLOW CHART

Table 31 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 110.

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

"LCD MESSAGE"

Table 31. 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 31. 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	PROGRAM LED blinks
	"PUSH KEY 3"	TEAR	Test Key TEAR	FRONT1 LED blinks
	"PUSH KEY 4"	MACRO	Test Key MACRO	FRONT2 LED blinks
	"PUSH KEY 5"	FONT	Test Key FONT	ALTERNATE LED blinks
	"PUSH KEY 6"	LF	Test Key LF	ONLINE+PROGRAM LEDS blink
	"PUSH KEY 7"	LOAD/FF	Test Key LOAD/FF	FRONT1+FRONT2 LEDs blink
	"PUSH KEY 8"	PATH	Test Key PATH	PROGRAM+ALTERNATE LEDS blink
	"PUSH KEY 9"	ALTERNATE	Test Key ALTERNATE	FRONT2+ALTERNATE LEDs blink
	"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 31. 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 31. 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 31. 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 31. 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 PRINT"			Load exactly two 11-inch or 12-inch fanfold forms into FRONT1. The printout is ejected when the test is completed.

Table 31. T&D Step-by-Step Procedure Flowchart (continued)

RUNNING TEST	DISPLAY MESSAGE	PUSHED KEY	KEY'S ACTION	PRINTER's ACTION
INTERLOCK test	"T&D17 COVER"			
	"OPEN COVER"			Manually Open the top cover
	"CLOSE COVER"			Manually Close the top cover
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 Engine Board
		ANY KEY	Skips to next test (Sensor Level)	

Table 31. 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) FRU(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 32. 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&D02	Reserved Future Use	N/A
T&D03	NVM RAM TEST (non-volatile memory)	ENGINE BOARD
T&D04	NVM CHECK TEST (non-volatile memory)	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 INTERFACE TEST	CONTROLLER BOARD
T&D09	RIBBON TEST	ENGINE BOARD / MOTORS / RIBBON DRIVE ASSEMBLY
T&D10	AGA (AFTA) CALIBRATE TEST	ENGINE BOARD / MOTOR / PRINT HEAD / MECH.
T&D11	FIRST LINE ADJUSTMENT TEST	MECHANISM / ENGINE BOARD
T&D12	BIDIRECTIONAL ADJUSTMENT TEST	MECHANISM / CARRIAGE BELT / ENGINE BOARD
T&D13	TEAR-OFF LINE ADJUSTMENT TEST	MECHANISM / ENGINE BOARD
T&D14	FANFOLD FORM PRINTOUT TEST	PRINT HEAD / ENGINE BOARD / MECHANISM
T&D15	Not Used	N/A
T&D16	Not Used	N/A
T&D17	TOP COVER 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 33. FRU List

FRU (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 sorted by F.R.U. and are not specified for one test.

Table 34. T&D Error Codes

FRU (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 34. T&D Error Codes (continued)

FRU (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 RAM TEST: This test checks the capability of the non-volatile ram memory (NVM) to retain data by performing a write pattern (0x55 and 0xAA) and a read verify. If the test result is positive, the DEFAULT parameters are loaded and the device ID is written into NVM.
This test must be run for any engine board installed as a spare part to clear any previously stored device IDs.

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 sequentially push 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 connector, for the correct operation of control, status and data signals of the bidirectional interface. You must have the Parallel Interface Connector installed on the Controller Board to run this test.

T&D07 - SERIAL INTERFACE TEST: This test checks by means of a loopback connector, for the correct operation of control, status and data signals of the serial RS232 interface. You must have the Serial Interface Connector installed on the Controller Board to run this test.

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

T&D09 - RIBBON MOTOR TEST: This test checks the correct movement of the inked ribbon cartridge.
If the LOAD/FF key is pressed, the test is executed, the ribbon motor is activated, and the display shows "STOPPING →".
If the MACRO key is pressed, the test will be stopped.

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 221.

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 221.

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 (bidirectional printing) (T&D 12)” on page 222.

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 224.

T&D14 - FANFOLD FORM 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 “Print Quality Service Checks” on page 243 for specific details.
After this test the operator tears off the printed form.

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 224.

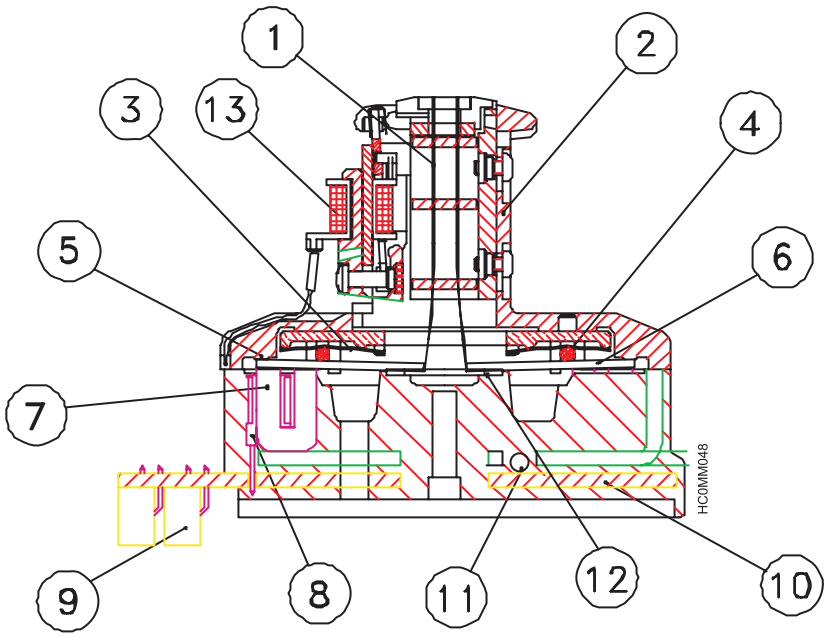
Chapter 3. Electromechanical Devices and Wiring Diagrams

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 13 shows a cross section of the print head and a description of the main parts.



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		

Figure 13. Print Head Internal Components

OPERATION

With reference to Figure 14, 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).

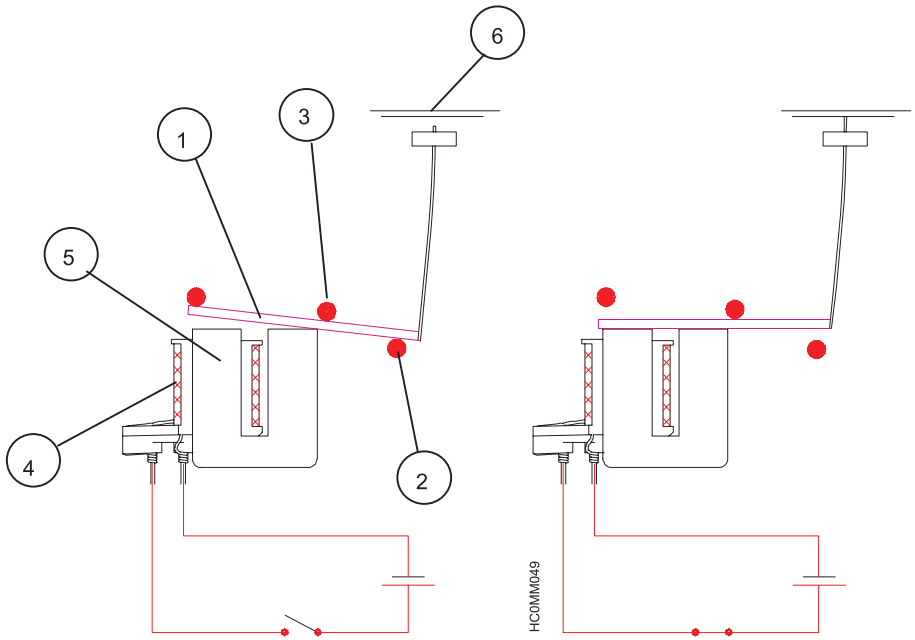


Figure 14. Needle Operation

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.

Moving ruby needle numbers: 1, 3, 5 ... 23
Stationary needle numbers: 2, 4, 6 ... 24
AGA (AFTA) needle numbers: 14

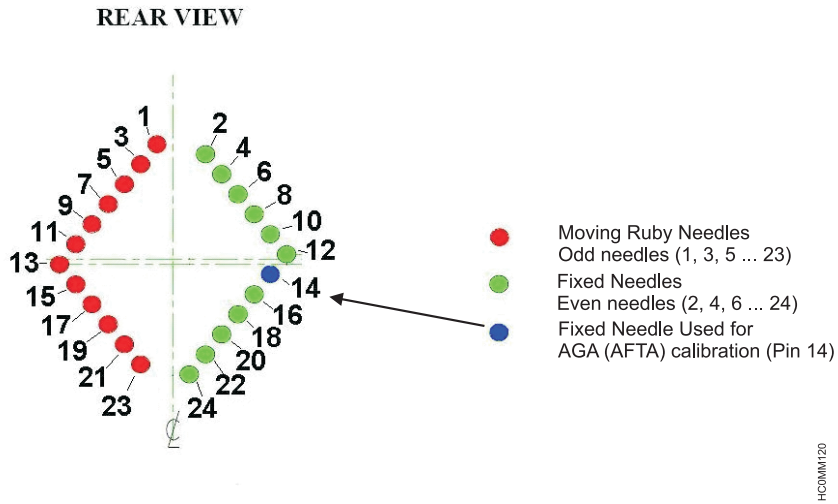


Figure 15. Printhead Needles Positions (Rear View)

ELECTRICAL REQUIREMENTS

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

Mechanical Requirements

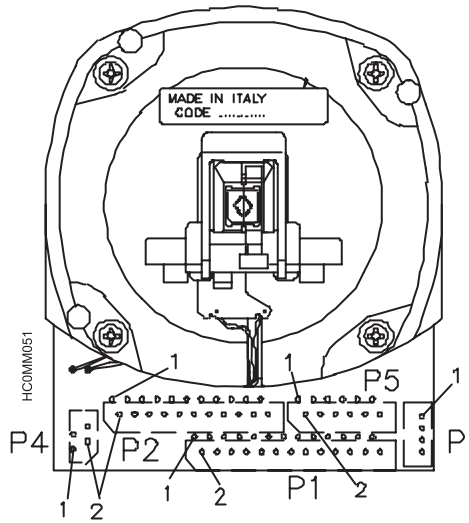


Figure 16. P.H. Electrical interface layout (front view)

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

Table 35. 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

Note: The AGA (AFTA) needle is number 14.

Motors

Carriage Motor

The carriage motor is a 1.8° hybrid bipolar stepper motor. The motor connects directly to the Engine board.

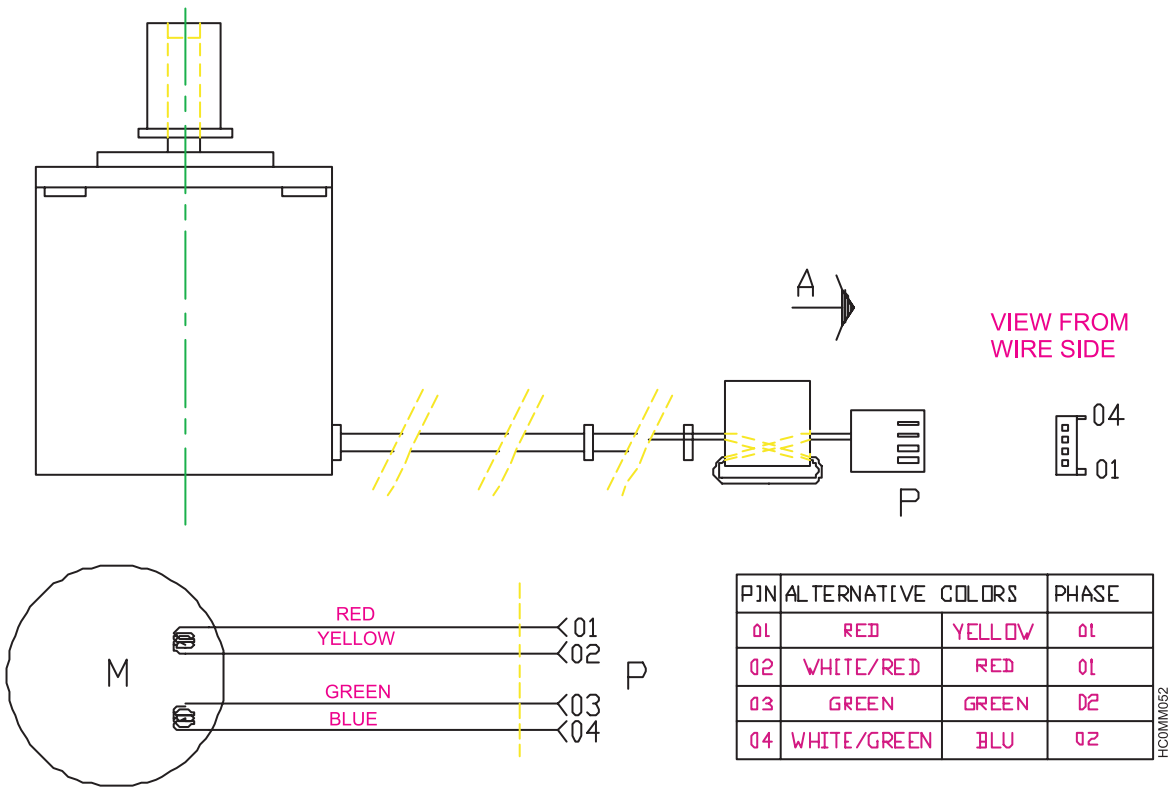
ELECTRICAL REQUIREMENTS

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 17 on page 133.



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

Figure 17. Carriage Motor

Paper Motor

The paper motor is a 1.8° hybrid bipolar stepper motor. The motor connects directly to the Engine board.

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 18 on page 135.

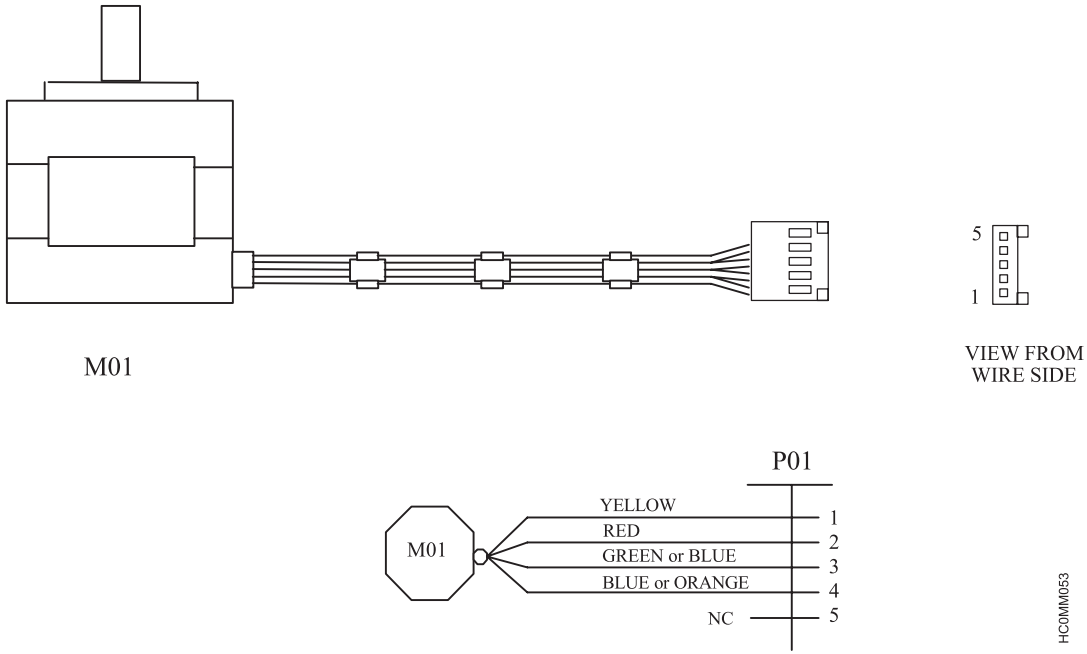


Figure 18. Paper Motor

AGA (AFTA) Motor

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

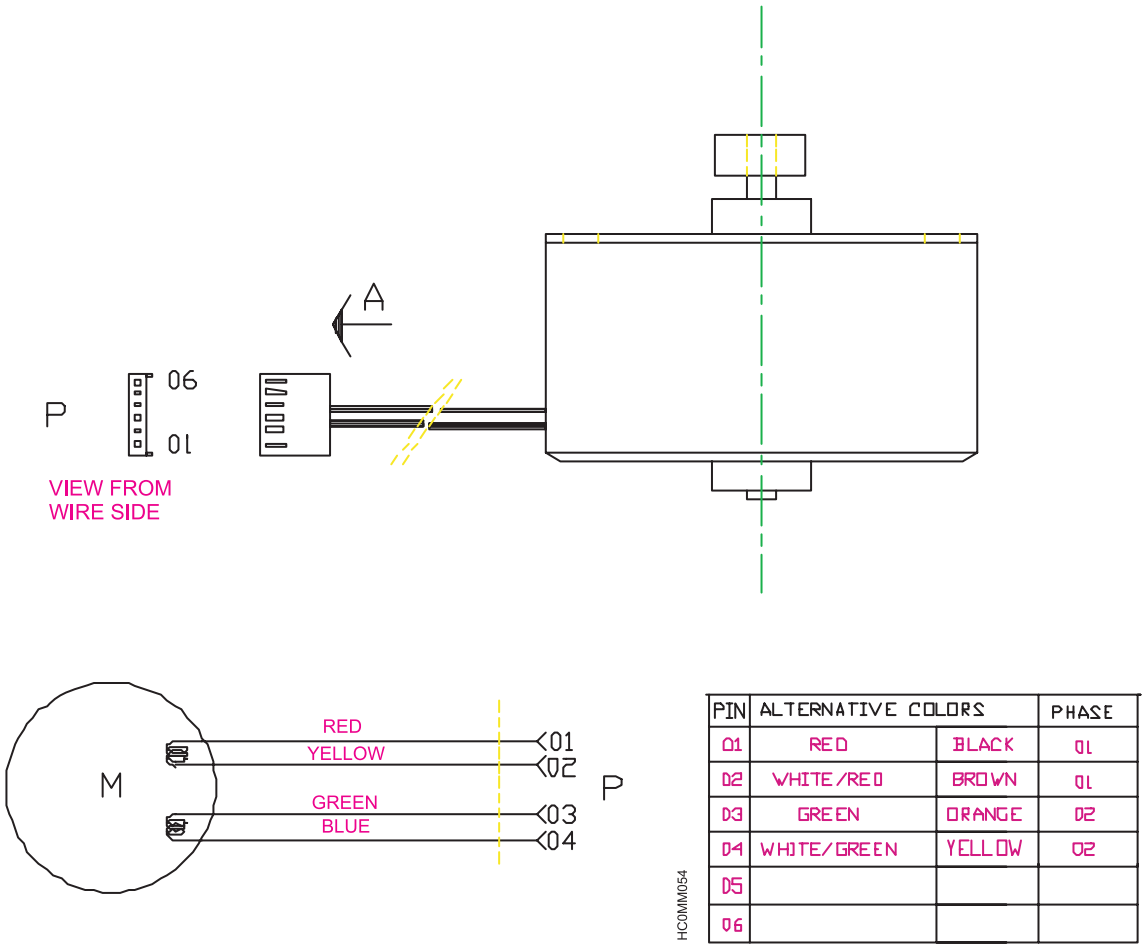
ELECTRICAL REQUIREMENTS

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 19 on page 137.



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 19. AGA (AFTA) Motor

Ribbon Motor

The ribbon motor is a 7.5° permanent magnet bipolar stepper motor. The motor connects directly to the Engine board.

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 20 on page 139.

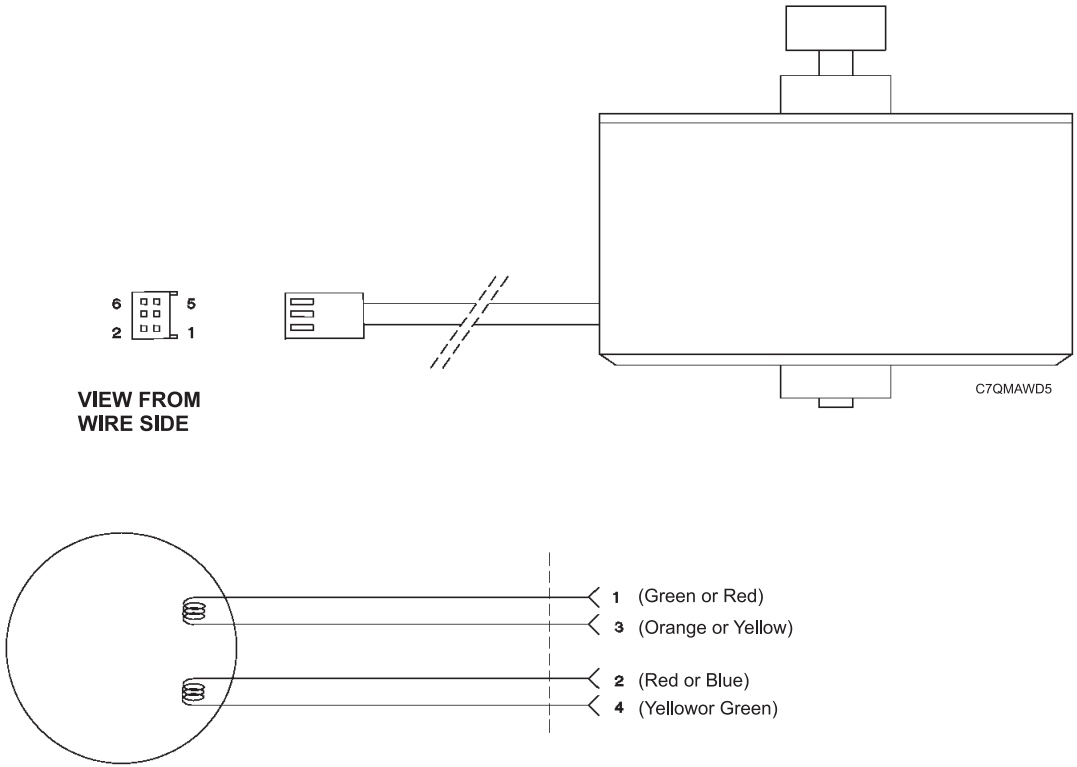


Figure 20. Ribbon Motor

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.

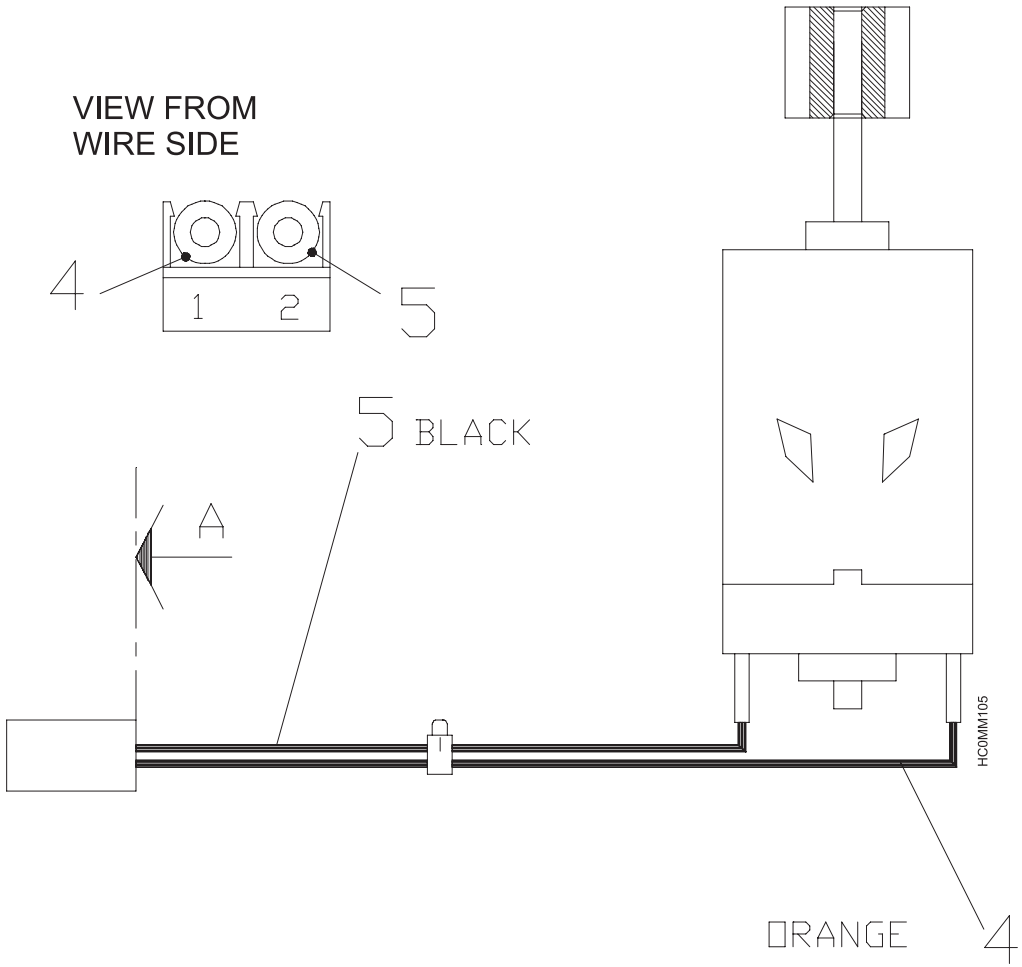


Figure 21. Alternamce Motor

Cables

Sensors Cable

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

Figure 22 shows the electrical connections of this cable.

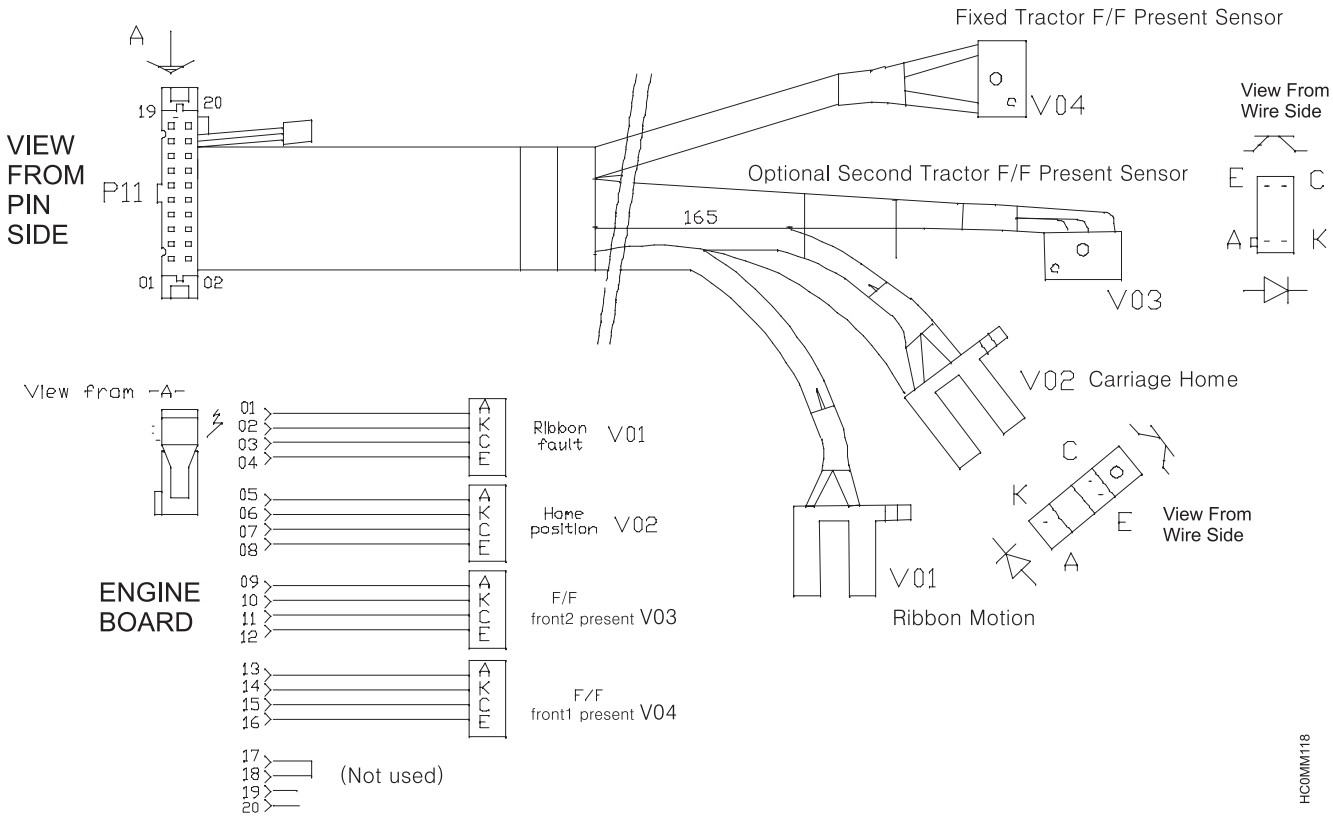


Figure 22. Sensors Cable

Tractor Cable

Figure 23 shows the electrical connections of this cable.

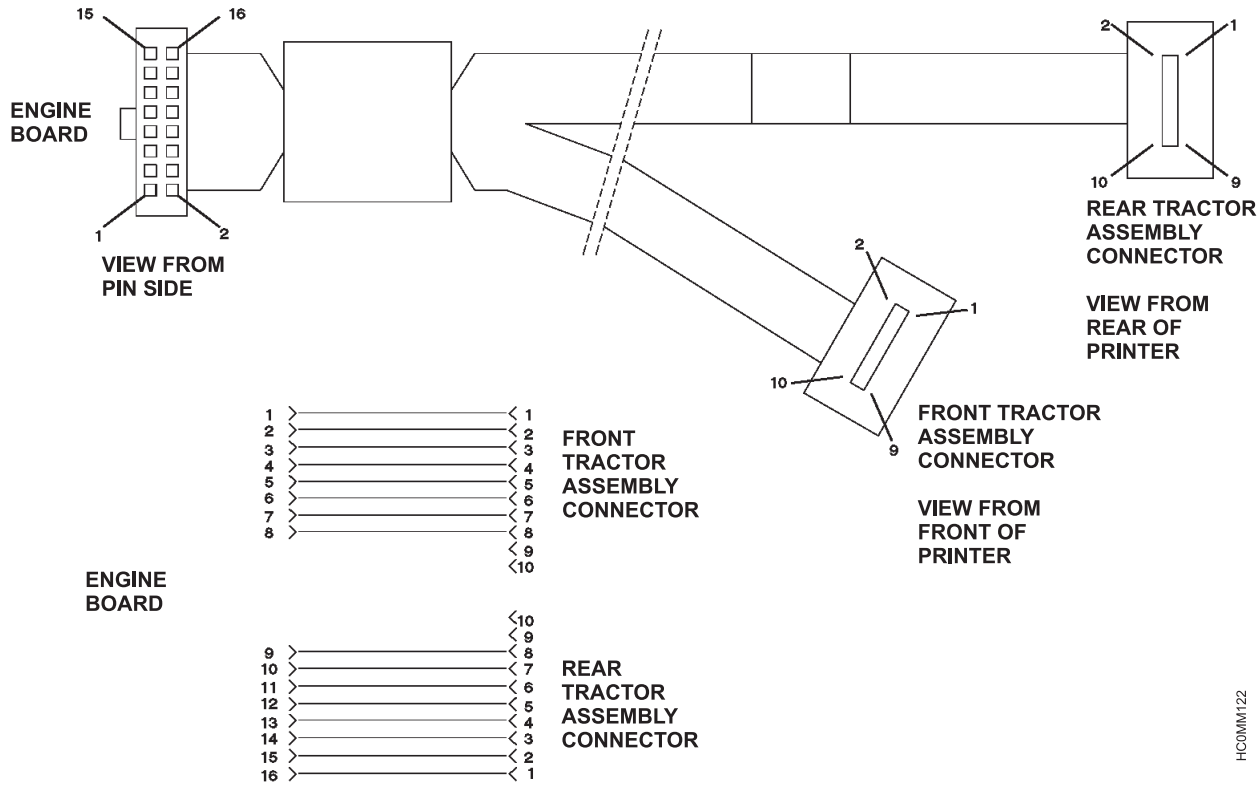


Figure 23. Tractor Cable

Operator Panel Cable

Figure 24 shows the electrical connections of this cable.

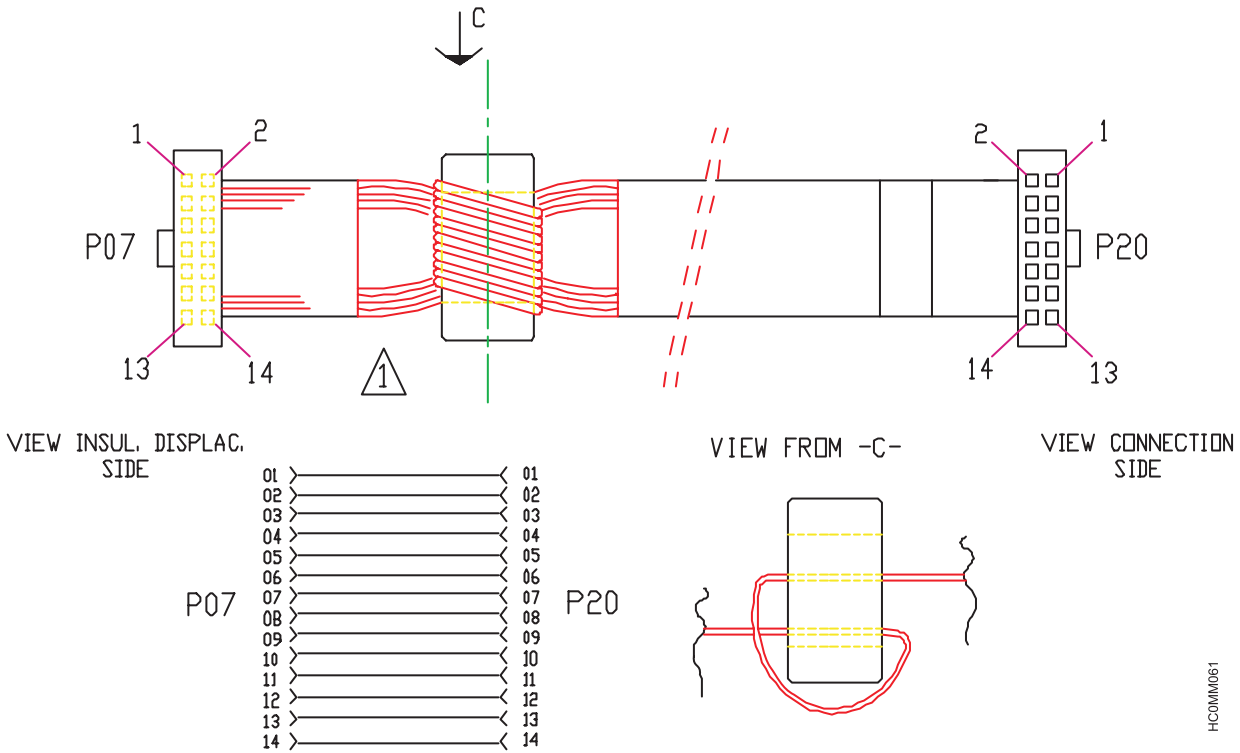


Figure 24. Operator Panel Cable

Attachment Connectors

Table 36. RS232/C serial interface signals

Signal Name	Pin Number	Local Connect. Source	Remote Connect. Source	Description
SIGNAL GROUND	5	–	–	Always connected to the 0 Volts of the Power Supply
TXD	3	Printer	Printer	Transmitted Data Signal (an output from printer). A MARK condition is held during IDLE communication state. An indeterminate state is present when printer is powered off.
RXD	2	Host	Data Set	Received data signal (an input to printer).
RTS	7	Printer	Printer	Request to Send Signal (an output from printer). Active HIGH level signal. It is HIGH until the printer is powered off, then an indeterminate state is present .
CTS	8		Data Set	Active HIGH level signal indicates that the host or data set is ready to receive data from the printer.
DSR	6		Data Set	Active HIGH level signal. Indicates that the host or data set is ready to be connected to the printer and is ready for data transfer.
DCD	1		Data Set	Active HIGH level signal. Indicates that the host is transmitting or the data set is receiving the Data Carrier signal.
2nd RTS	9	Printer		Functionally equivalent to the DTR signal.
DTR	4	Printer	Printer	Data Terminal Ready. Normally HIGH (ON). Indicates that the printer is ready to initiate a connection.

Table 37. Parallel Connector Pin Assignments

Pin	Signal Name	Description
1	-STROBE	Strobe
2-9	Data	Eight Data Lines
10	-ACKNLG	Acknowledge
11	BUSY	Busy
12	PE	Out of Paper
13	SLCT	Printer Selected
14	-AUTO FEED XT	Automatic Line Feed on EOL
15	Unused	
16	LOGIC GROUND	Logic Ground
17	CHASSIS GROUND	Chassis Ground
18	+5 V DC	External Power
19-30	GROUND	Ground
31	-INIT	Initialize Printer
32	-ERROR	Printer Error
33	GROUND	Ground
34, 35	Unused	
36	-SLCT IN	Make Printer Selected

Chapter 4. Locations

Attention: The electronic parts of this printer can be damaged by electrostatic discharge (ESD). Ensure that ESD protection devices and procedures, including a static discharge wrist strap are used while working on this printer.

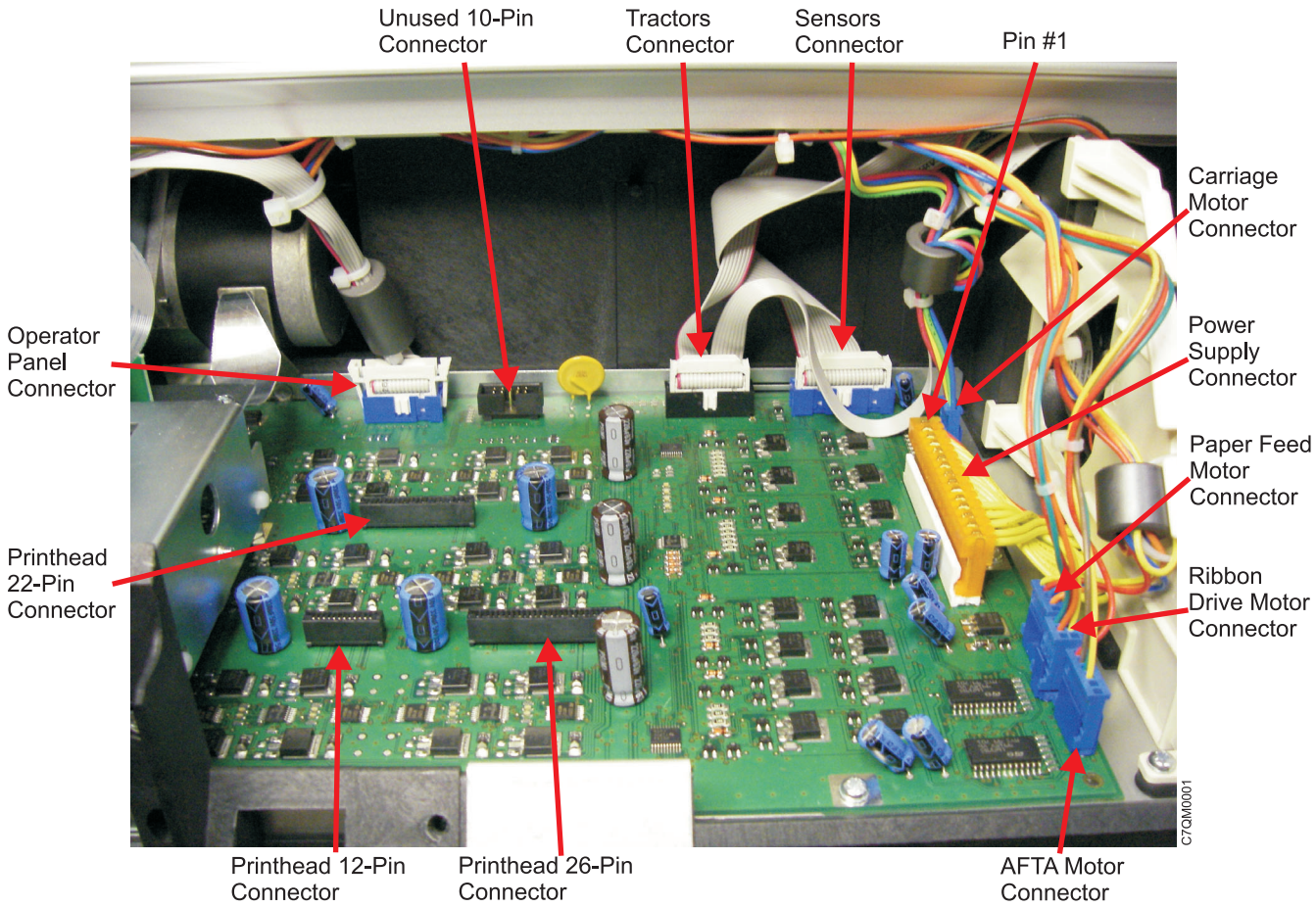


Figure 25. Engine Board

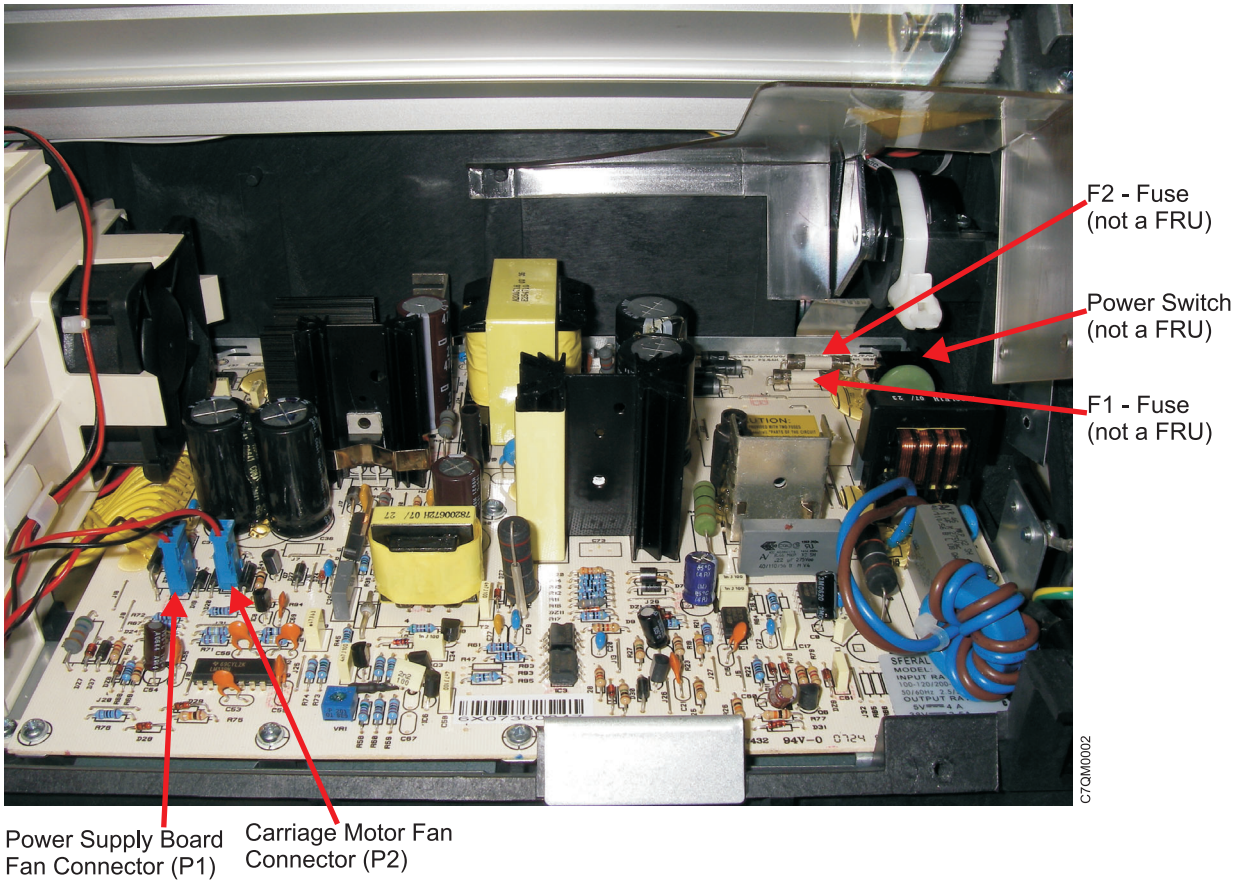


Figure 26. Power Supply

Chapter 5. 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 disassemble 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 RS-232 Loop-Back Connector (9-pin) P.N. 41U2467
  - Serial RS-232 (Cable Side) Loop Back Connector P.N. 08H7268

F.R.U. ORDER OF ACCESS

Table 38 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 38. FRU ORDER OF ACCESS

To Remove FRU:		**Requires these procedures in the shown order:**		
1)	Front Tractor Group	1	page 151	
2)	Operator Panel	2	page 153	
3)	PRINT HEAD	3	page 30	(*)
4)	Cover Parts Removal	1, 2, 5	page 156	
5)	Main Fan	5, 7	page 163	
6)	Engine Board	5, 8	page 164	(*)
7)	Power Supply Board	5, 7, 9	page 167	
8)	Ribbon Motor	1, 2, 5, 10	page 171	
9)	AGA (AFTA) Motor	1, 2, 5, 11	page 173	(*)
10)	AGA (AFTA) Marker	1, 2, 5, 12	page 173	
11)	Carriage Motor and Fan	1, 2, 5, 13	page 175	(*)
12)	Bail Assembly	14	page 178	
13)	Upper Feeder Assembly	1, 2, 5, 14, 15	page 180	
14)	Platen Assembly	1, 2, 5, 14, 15, 16	page 182	(*)
15)	Lower Feeder Assembly	1, 2, 5, 12, 17	page 185	(*)
16)	Carriage Assembly	1, 2, 3, 5, 18	page 187	(*)
17)	Sensor Cable Assembly	1, 2, 5, 19	page 190	(*)
18)	Mechanical Assembly	1, 2, 5, 20	page 192	
19)	Paper Motor	1, 2, 5, 20, 21	page 194	(*)
20)	Ribbon Mask	22	page 196	
21)	Lower Mylar	23	page 198	

Note: Procedures marked with an asterisk (*) require an ADJUSTMENT PROCEDURE (see Chapter 6, “Service Checks & Adjustments,” on page 199 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.

CAUTION:
<2-53> If the second tractor unit is not installed, make sure the gear protector cover is closed. Do not touch inside the printer or insert any object into the gears.

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.

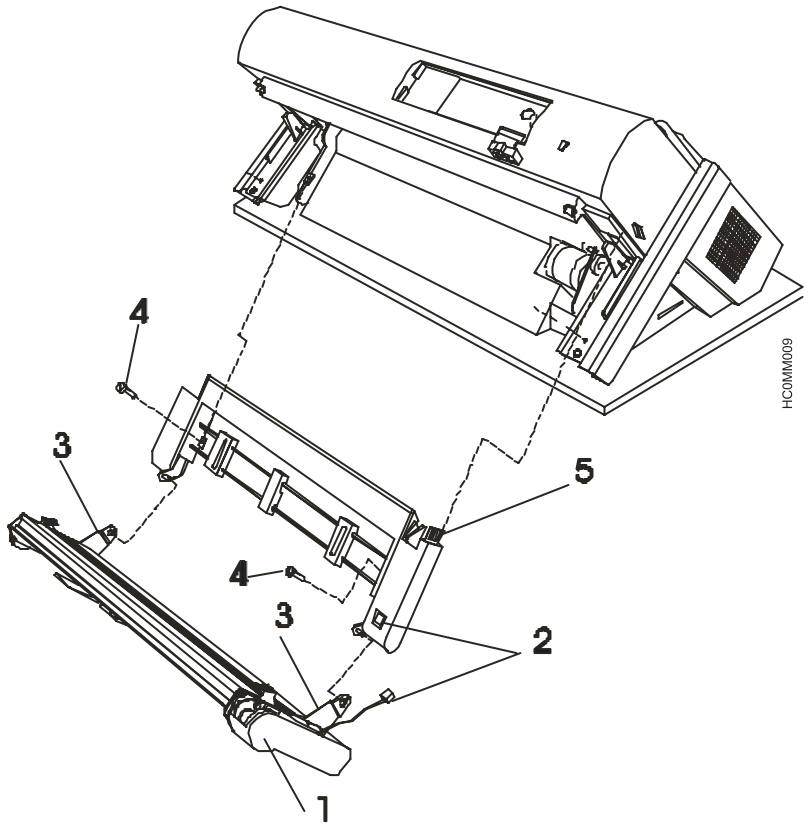


Figure 27. Front Tractor Group

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 pressing inwards on the left tab on the Operator Panel Bracket from inside and under the Top Cover.

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

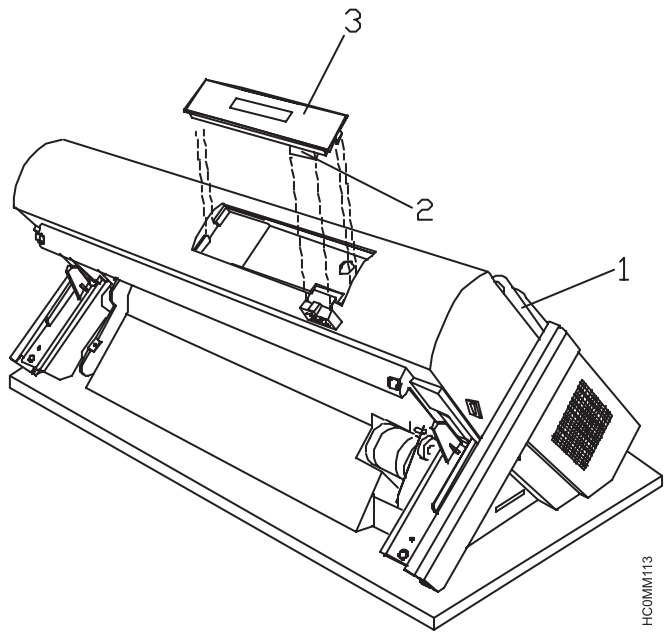


Figure 28. Operator Panel removal

Print Head

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

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 (AFTA) calibrate routine to adjust the gap.

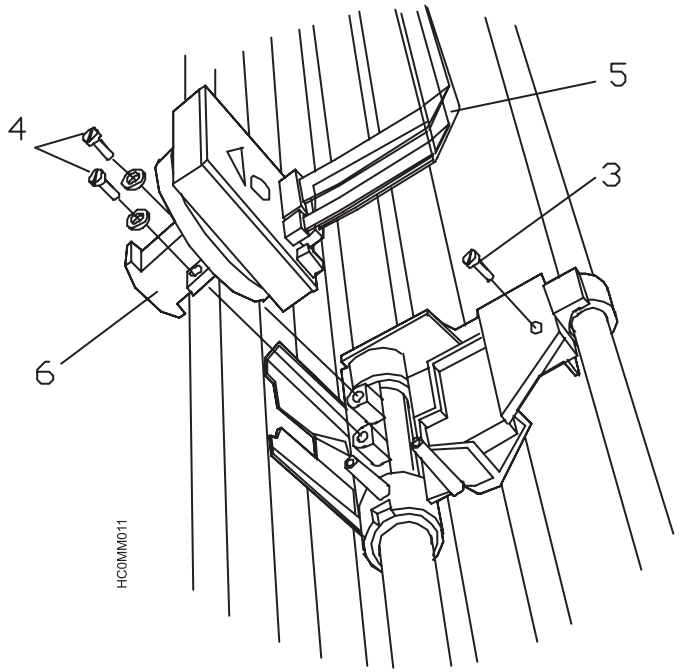


Figure 29. Print Head

Cover Parts Removal

Attention: Turn off the printer and disconnect the power cord from the rear of the printer.

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.

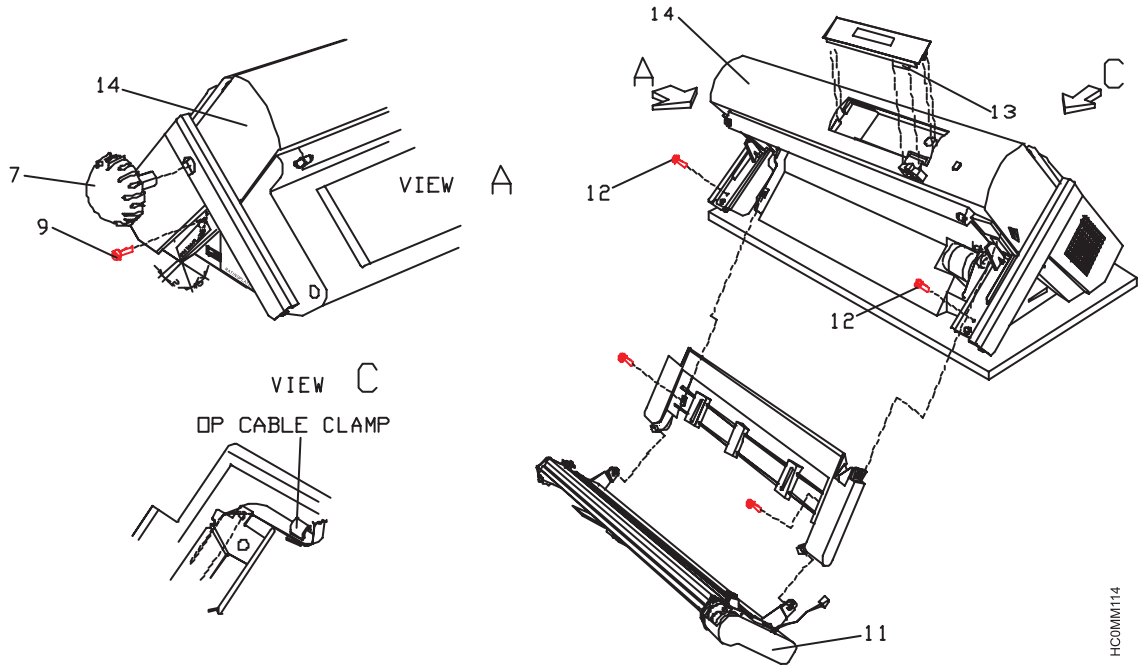


Figure 30. Cover Parts

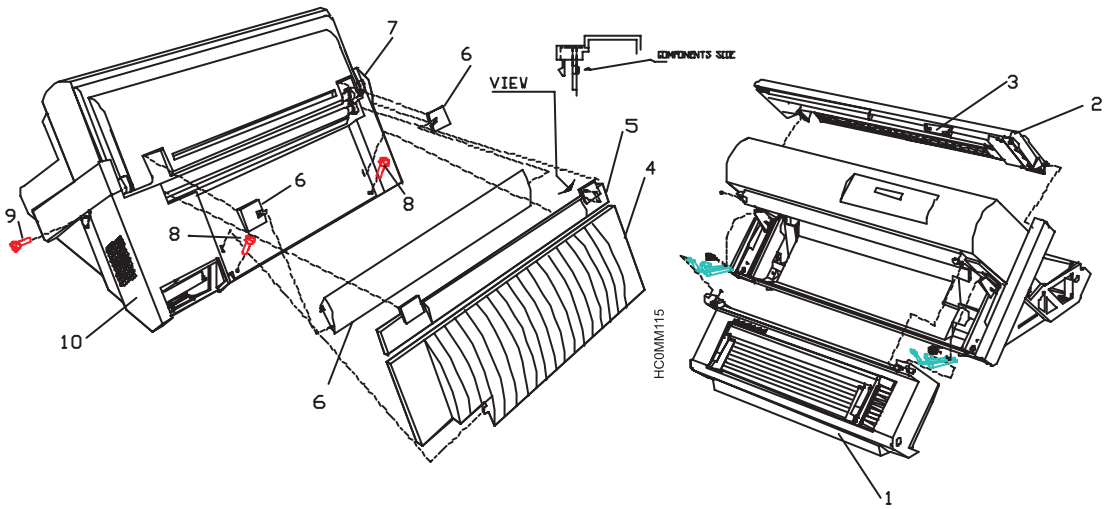


Figure 31. Cover Parts (cont.)

Controller Board

DANGER

<1-13> Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

<1-14> Switch off printer power and unplug the printer power cord before connecting or disconnecting a communication port, a teleport, or other attachment connector.

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.

The Controller Board includes flash memory with firmware and character generator. This facilitates downloading firmware version updates to the Controller. 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.

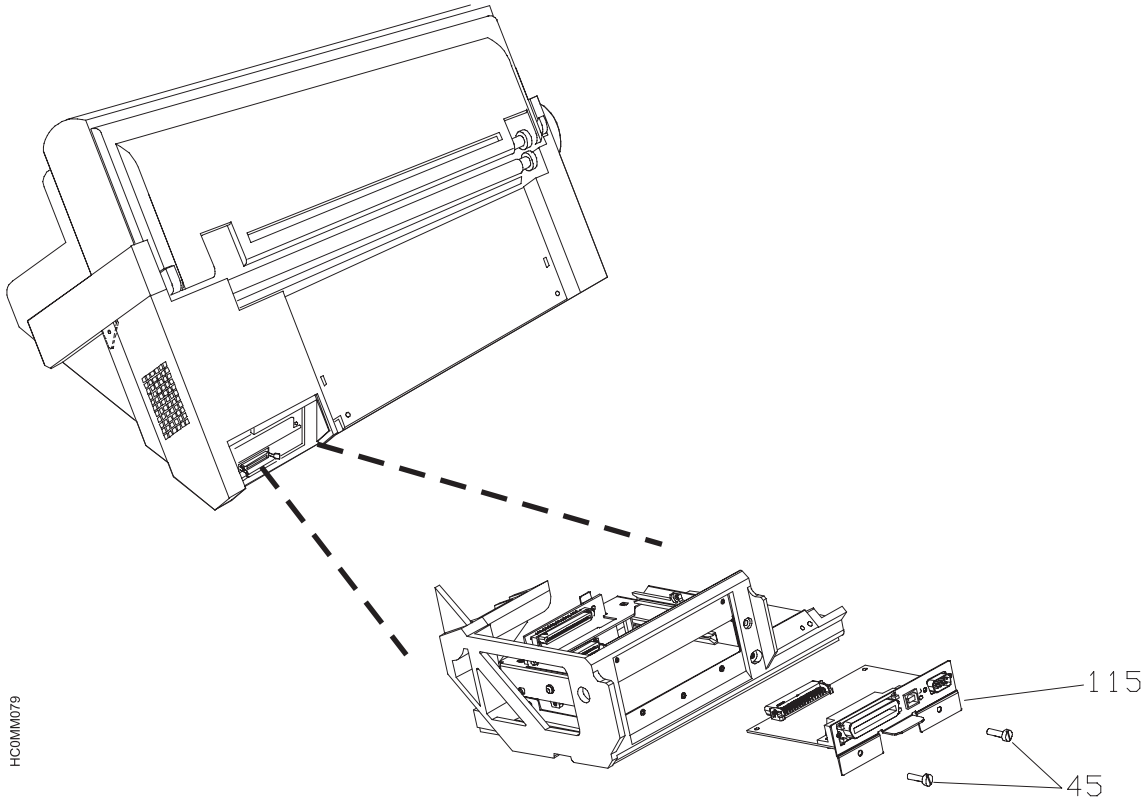


Figure 32. Controller Board

Slot Assembly

DANGER

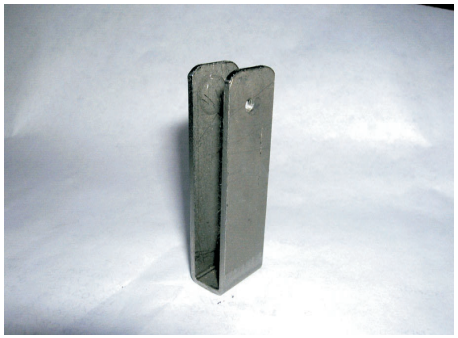
<1-13> Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

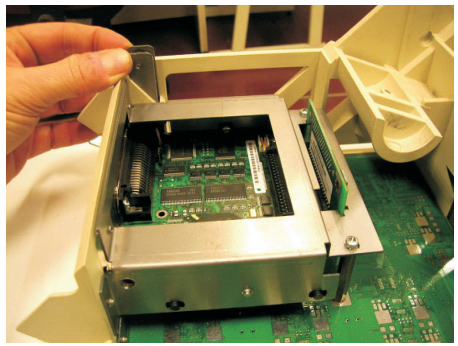
<1-14> Switch off printer power and unplug the printer power cord before connecting or disconnecting a communication port, a teleport, or other attachment connector.

1. Remove the Controller Board.
2. Remove the Rear Cover Group.
3. Unscrew the six screws on the top, lateral, and rear sides of the Slot Assembly.

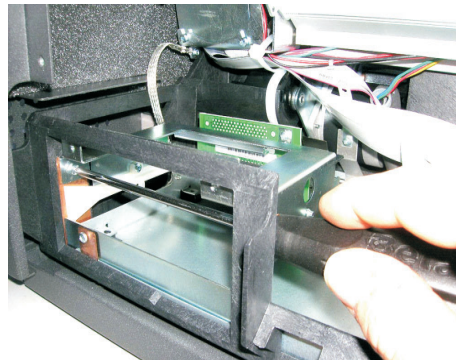
Note: Using a screwdriver, remove the screw that attaches the Slot Assembly to the metal insert by passing the screwdriver through the access hole. This screw is located at the opposite side of the Slot Assembly from the access hole (see Figure 33).



Metal Insert



Slot Assembly installed to the Base Assembly



Screw removal with minimum 5” screwdriver

Figure 33. Slot Assembly

Note: When reordering the Slot Assembly Kit (P/N 44D8979), this metal insert is included.

4. When removing the Slot Assembly, first lift up on the Back Panel Board Connector (the Back Panel Board Connector mounts to the Engine 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.

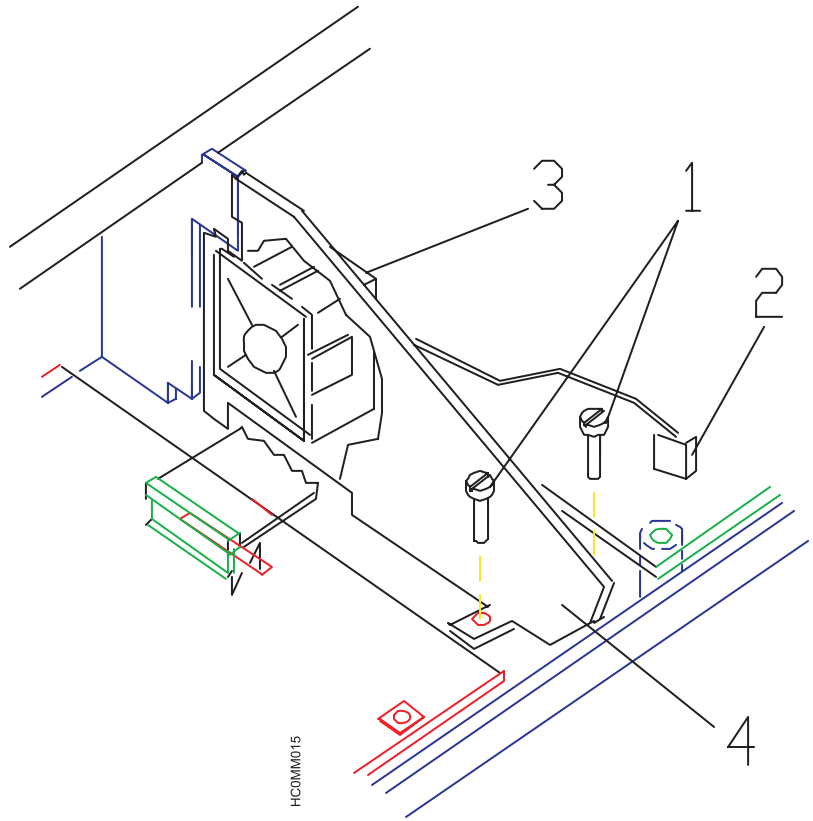


Figure 34. Main Fan

Engine Board

DANGER

<1-13> Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

<1-14> Switch off printer power and unplug the printer power cord before connecting or disconnecting a communication port, a teleport, or other attachment connector.

Attention: This is an ESD sensitive area. See Electrostatic Discharge (ESD) procedures before working with parts that are sensitive to ESD.

Note: Power off (O) the printer and unplug the power cord from the printer.

1. Power off (O) and unplug the power cord from the printer.
2. Remove the rear cover group.
3. Remove the Controller Board, Slot Assembly. and Back Panel Board from the Engine board.
4. Unplug all the connectors from the Engine board.
5. Unscrew the seven screws (4 self-tapping and 3 threaded screws; 2 are posts) securing the Engine board and extract it from the base.

   Note: Note the type and location of each screw.

6. Insert the new Engine board into the base.
7. Secure the Engine board and reassemble the printer following the above instructions in reverse order, paying attention to both the rear horizontal guides and relevant bottom shield.
8. Plug in the printer power cord.
9. Power on (|) the printer with the **TEST + SCROLL/MICRO** keys pressed to enter T&Ds.

   Note: For model L03 printers with the 41U2473 Operator Panel, hold the **ONLINE + MACRO** keys. At the end of initialization the display shows: "SBS CMPL". Press **LOAD/FF** within 3 seconds to run Step-By-Step mode.
10. Enter **Single Test Mode**.
11. Run **T&D03 - NVM TEST**. Press 'Set Top of Form' to run the test.

    Notes:
    a. Performing **T&D03 - NVM TEST** test will write the printer model (device ID) into the nonvolatile memory on the new Engine board. If the error 'WRONG DEVICE UNIT' is encountered, power off the printer and go to step 9 of this procedure.
    b. A new Engine board contains all adjustments stored in NVM as manufacturing default values. Therefore, it is MANDATORY to run the remaining T&Ds that save adjustment values.
12. Run “T&D10 - AGA (AFTA) CALIBRATE TEST” on page 125
13. Run “T&D11 - FIRST LINE CALIBRATE TEST” on page 125
14. Run “T&D12 - VERTICAL (Bidirectional printing) CALIBRATE TEST” on page 125
15. Run “T&D13 - TEAR OFF CALIBRATE TEST” on page 125
16. Run “T&D18 - PAPER SENSOR TEST” on page 126

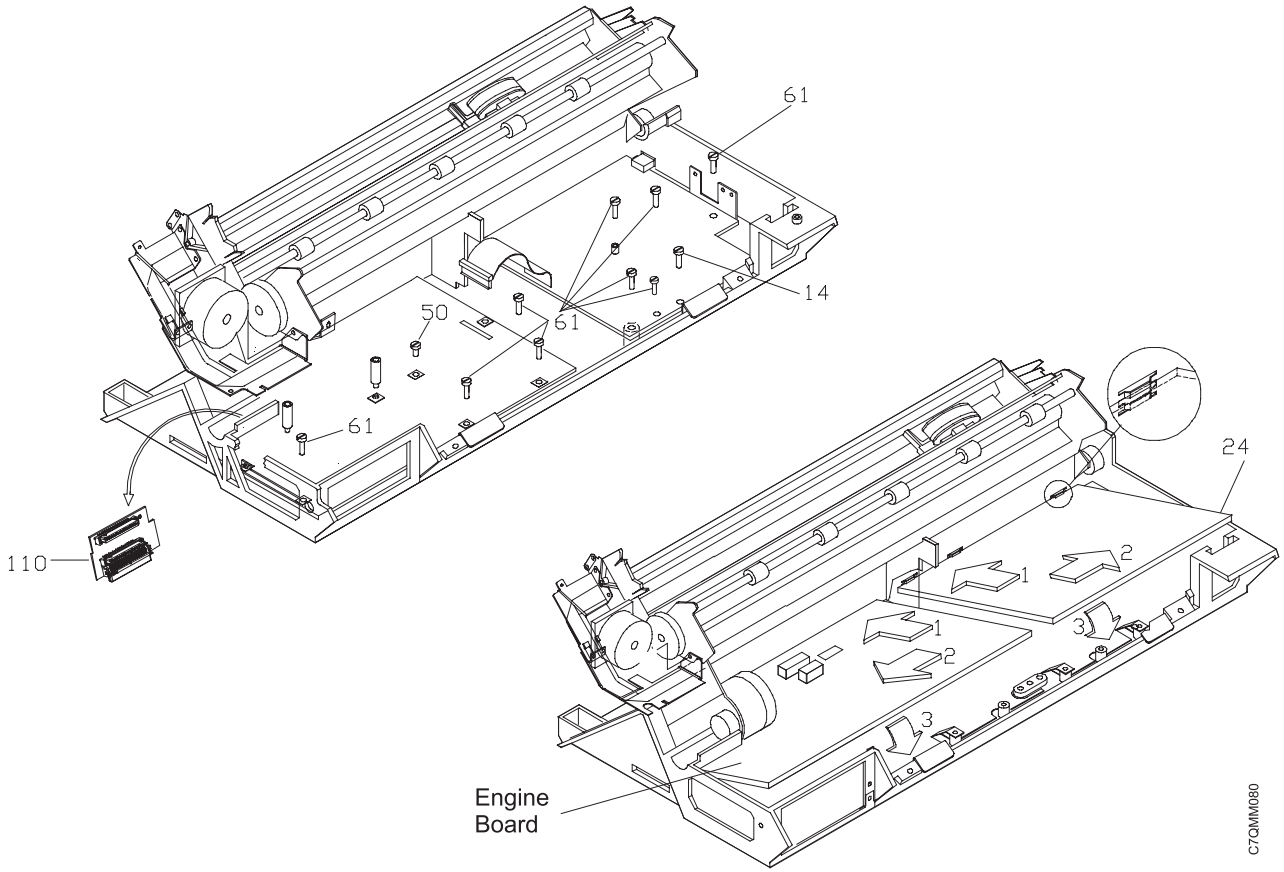


Figure 35. Engine Board

Power Supply Board

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the interface cable, set the printer power switch to O (Off) and unplug the power cord.

DANGER

Primary power is present on the power supply when the power cord is connected, even when the power switch is set to O (Off).

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

1. Remove the main rear covers.
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.

   Note: Note the type and location of each screw.
9. Unplug the connector from the Engine 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.

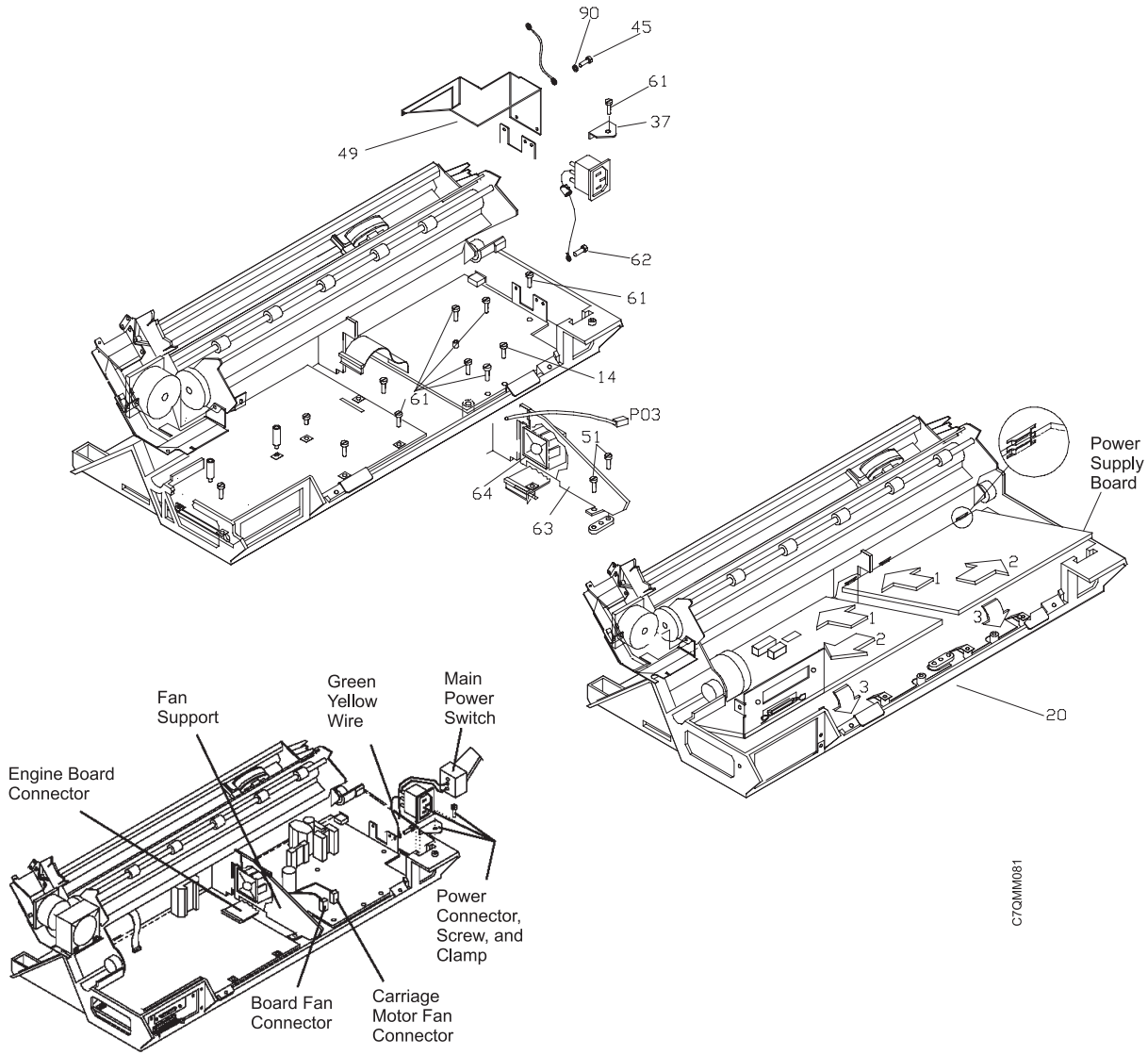


Figure 36. Power Supply Board

Ribbon Cartridge

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

1. Open the top printer cover.
2. Slide the ribbon guide out of the print head.

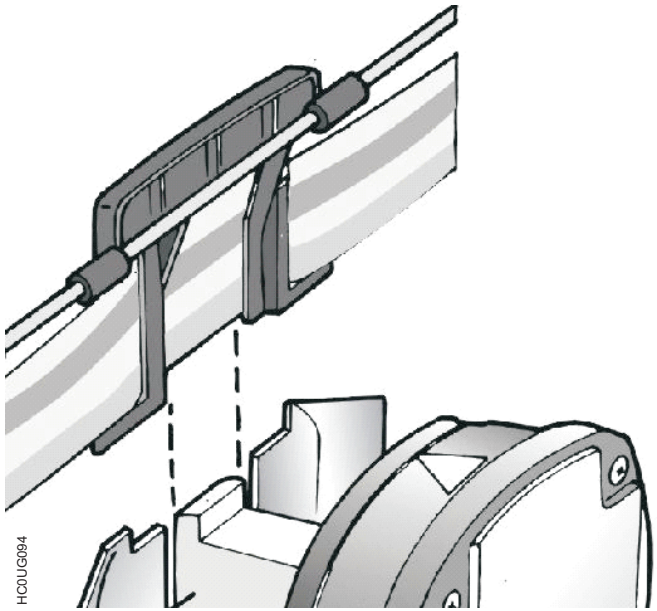


Figure 37. Sliding the ribbon guide out of the print head.

3. Remove the ribbon cartridge by lifting it up.

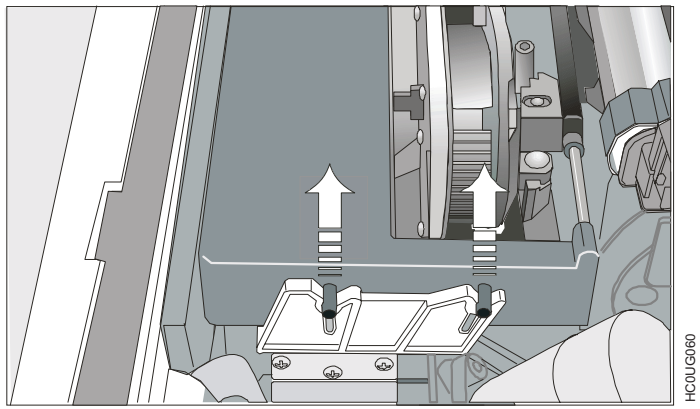


Figure 38. Removing the used ribbon cartridge by lifting it up.

Ribbon Motor

CAUTION:
The ribbon motor may be hot. Wait for it to cool down.

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.

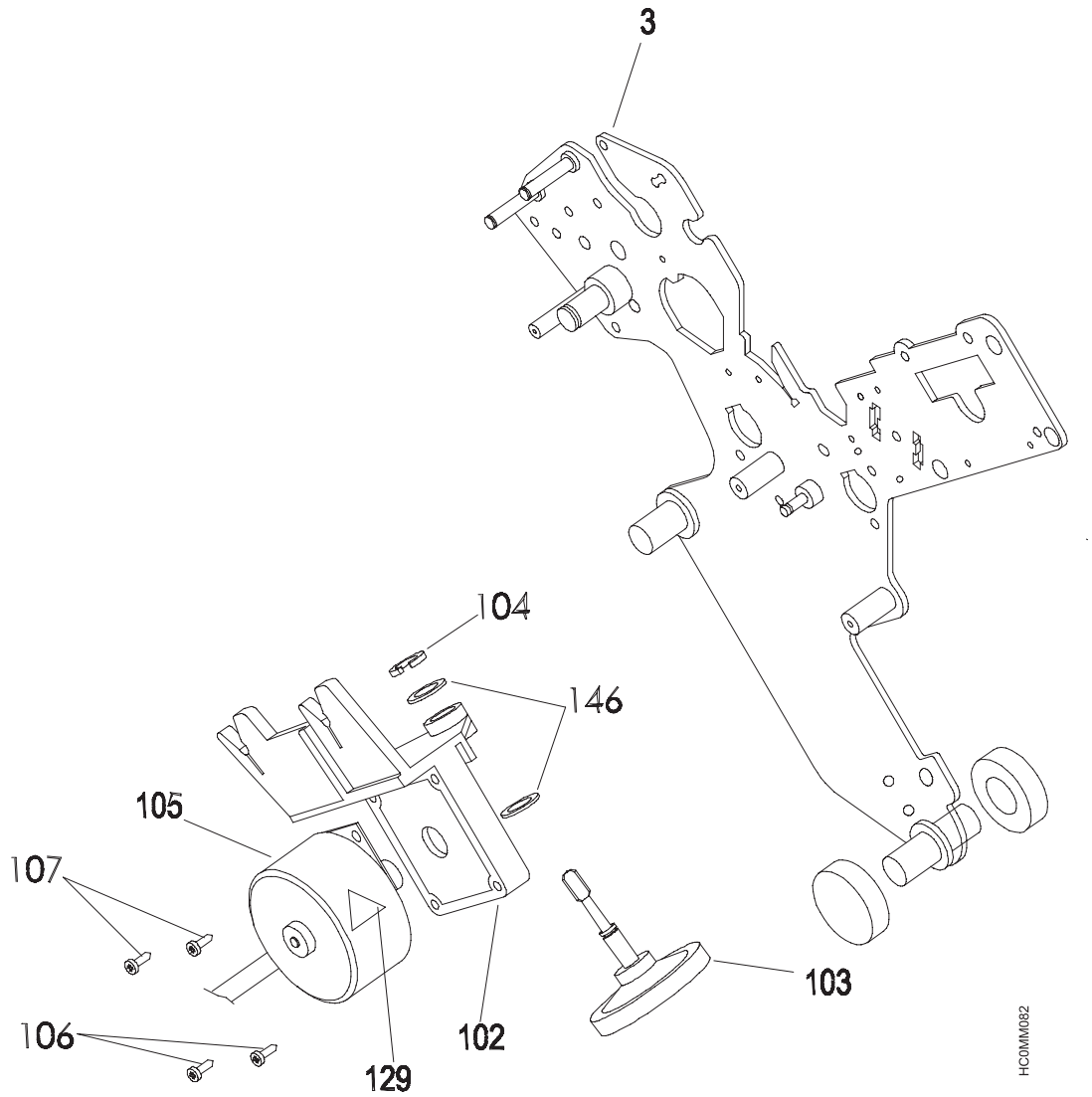


Figure 39. Ribbon Motor and left cartridge support

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.

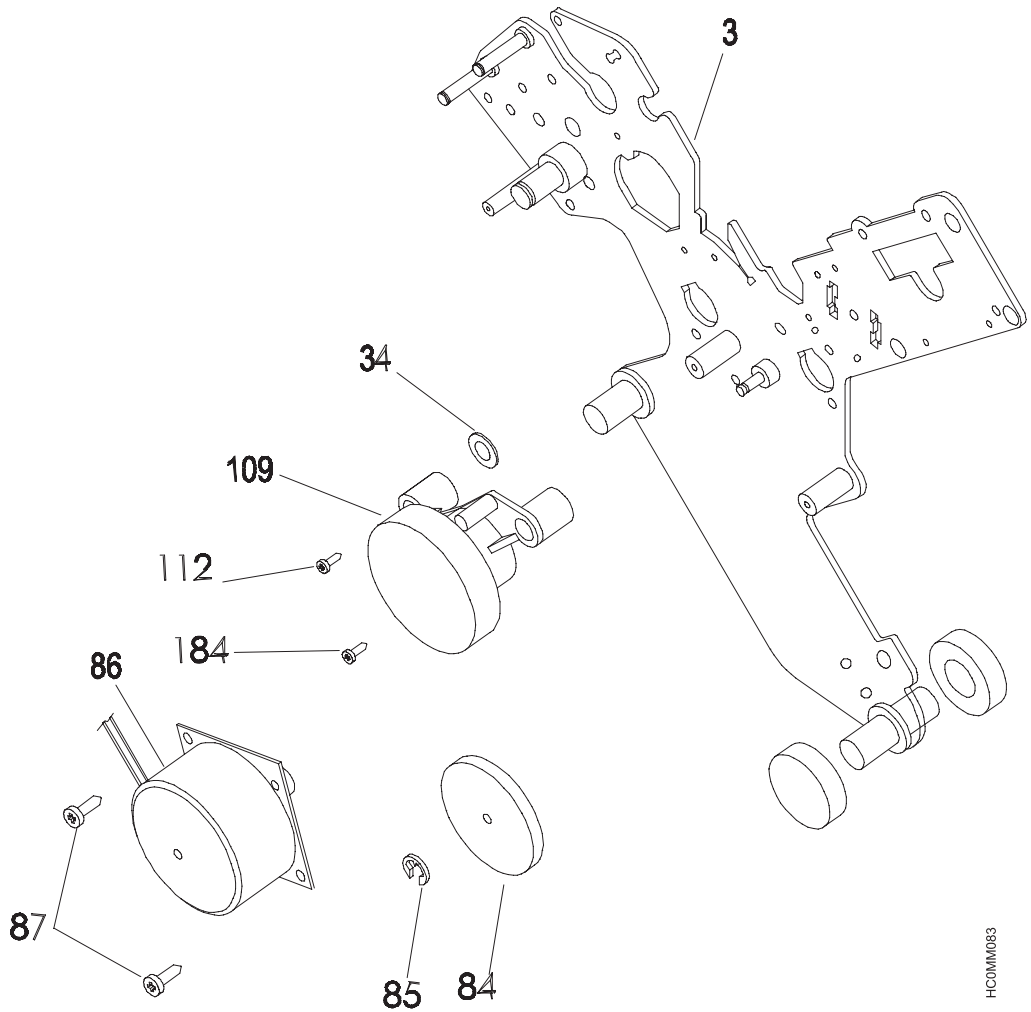


Figure 40. AGA (AFTA) Motor and AGA (AFTA) Marker

Carriage Motor and Fan

CAUTION:
The carriage motor may be hot. Wait for it to cool down.

1. Remove the Main, Rear, and Front Covers.
2. Unplug the carriage motor fan connector (P03) from the power supply board and remove 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 Engine 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.

Notes:

1. If needed, loosen the idler pulley to install the belt on the motor pulley.
2. The Engine and Power Supply board connectors are keyed. Ensure that they are installed correctly.

3. Install new cable ties.
4. The carriage motor replacement requires an appropriate carriage belt adjustment (refer to Chapter 6, “Service Checks & Adjustments,” on page 199 for details).

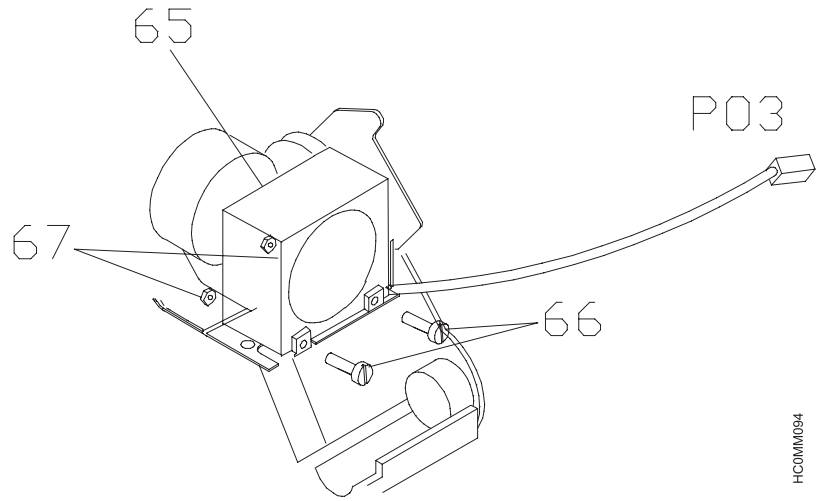


Figure 41. Carriage Motor Fan

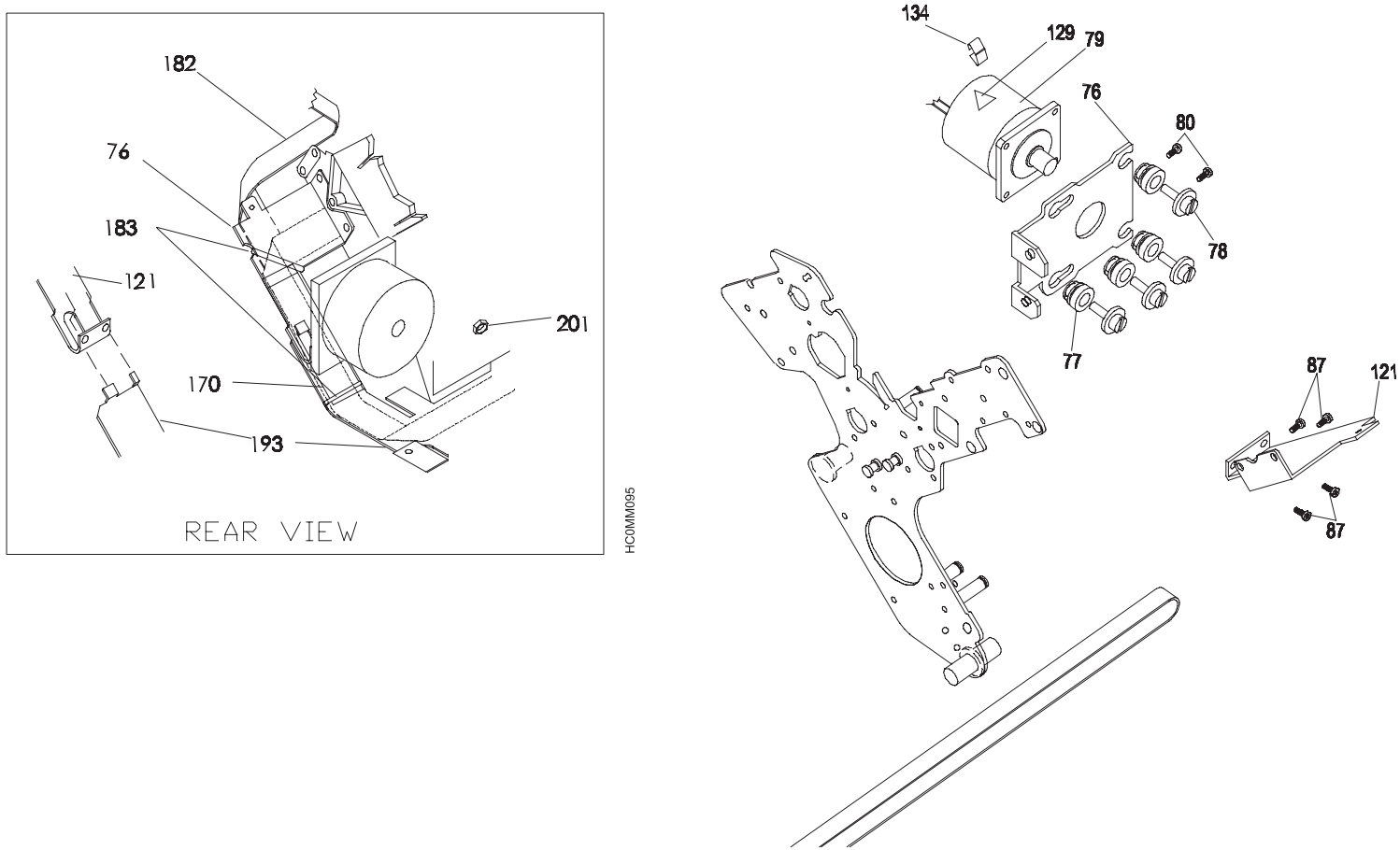


Figure 42. Carriage Motor

Bail Assembly

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

1. Open the top cover group and remove the ribbon.
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.

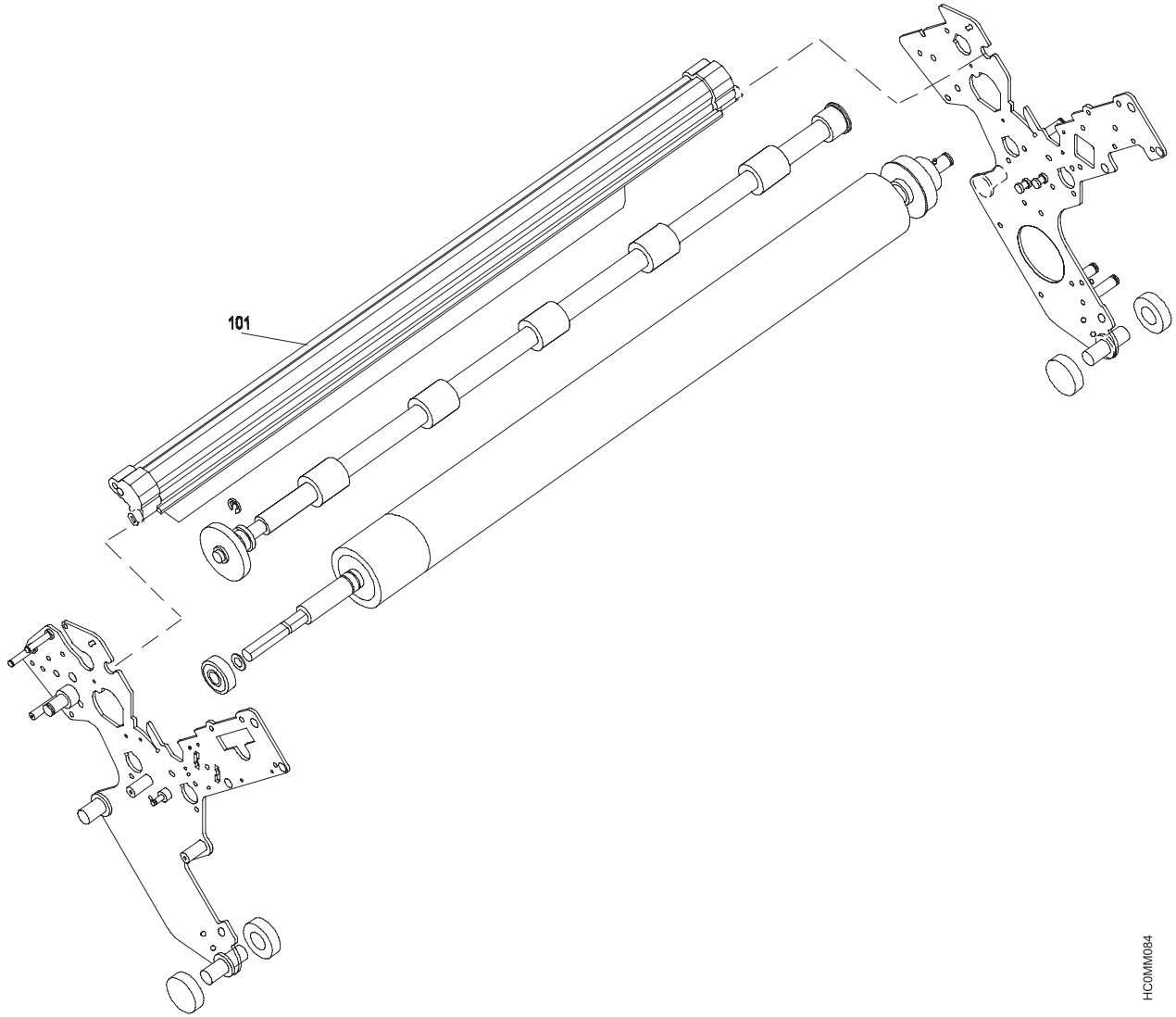


Figure 43. Bail Assembly

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.

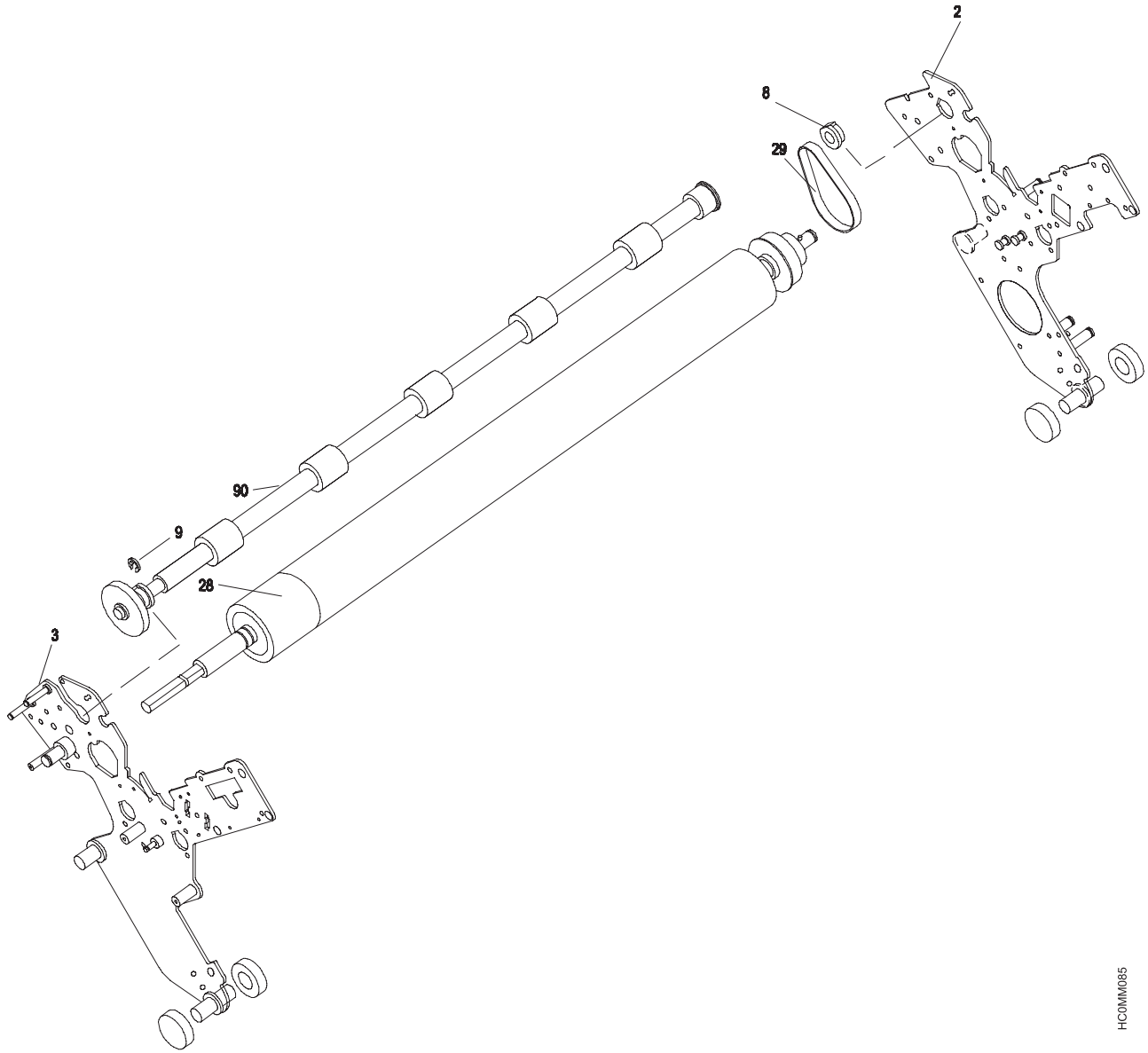


Figure 44. Upper Feeder Assembly

Platen Assembly

1. Remove the Main, Rear, and Front Covers.
2. Remove the ribbon.
3. Remove the upper feeder assembly.
4. Remove the AGA (AFTA) Marker.
5. Remove the “C” ring (item 9) which retains the platen assembly to the pulley gear.
6. Unscrew the two screws securing the bearing bracket (item 30) to the left side of the mechanism and remove it.
7. Remove both the bearing (item 31) and the special washer (item 116) from the platen axis.
8. Put the print head to its maximum distance from the platen assembly.
9. Gently shift the platen assembly (item 28) to the left from its position, then remove it from the left side of the mechanical assembly.

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

Note: Before tightening the platen retainer screws, push down the retainer as indicated in Figure 46 on page 184, 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 6, “Service Checks & Adjustments,” on page 199 for details).

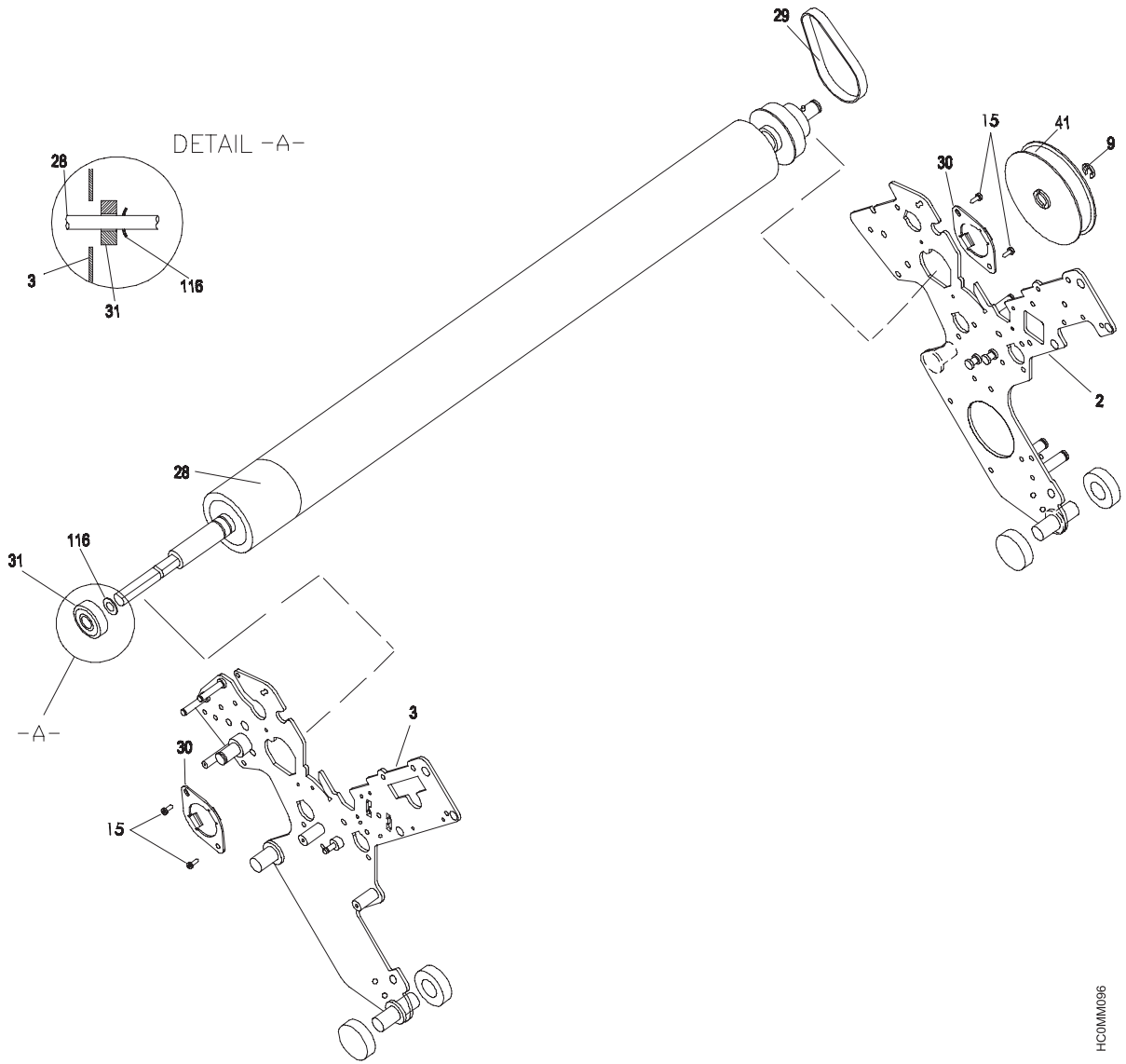


Figure 45. Platen Assembly

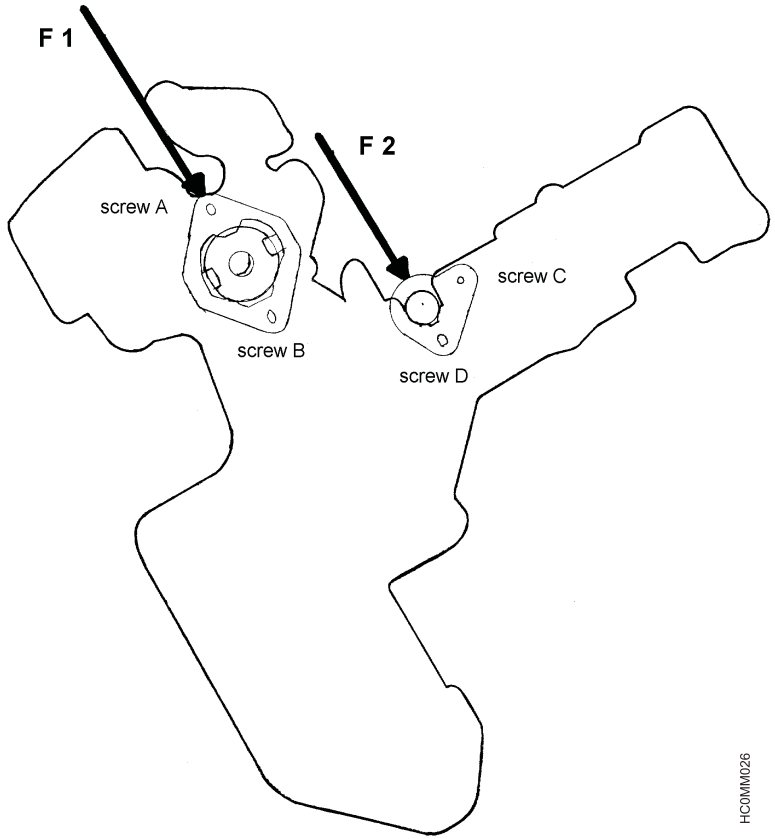


Figure 46. Force for fixing platen and main shaft of carriage assembly

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 6, “Service Checks & Adjustments,” on page 199 for detailed information).

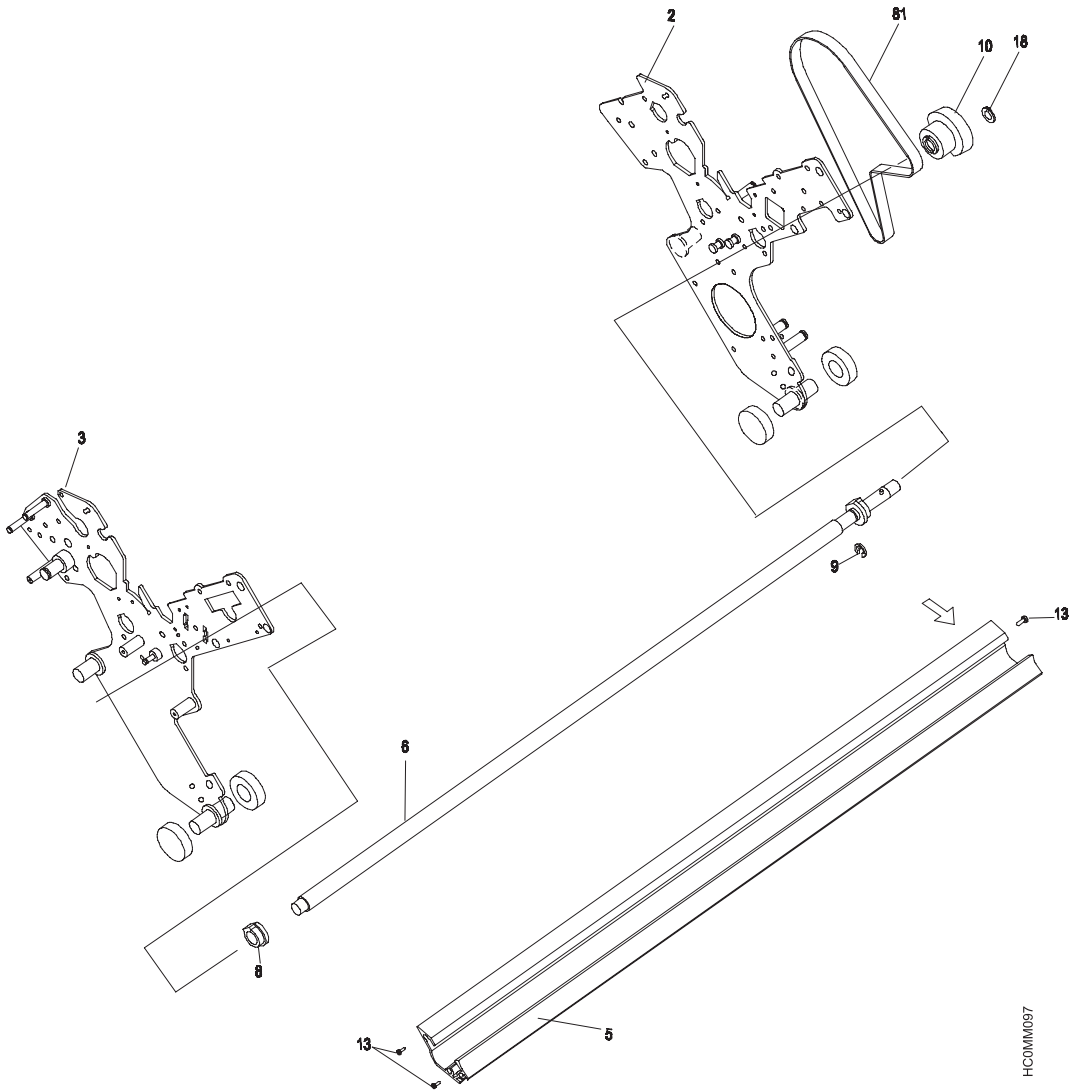


Figure 47. Lower Feeder Assembly

Carriage Assembly

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

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 to the left at the same time in order to remove it.

   Be careful not to damage the little springs (item 144 of Figure 48 on page 188 and Figure 49 on page 189) 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 46 on page 184, 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 6, “Service Checks & Adjustments,” on page 199 for detailed information). Slowly insert the front bar into the carriage holes, being careful with the oil-felt inside it.

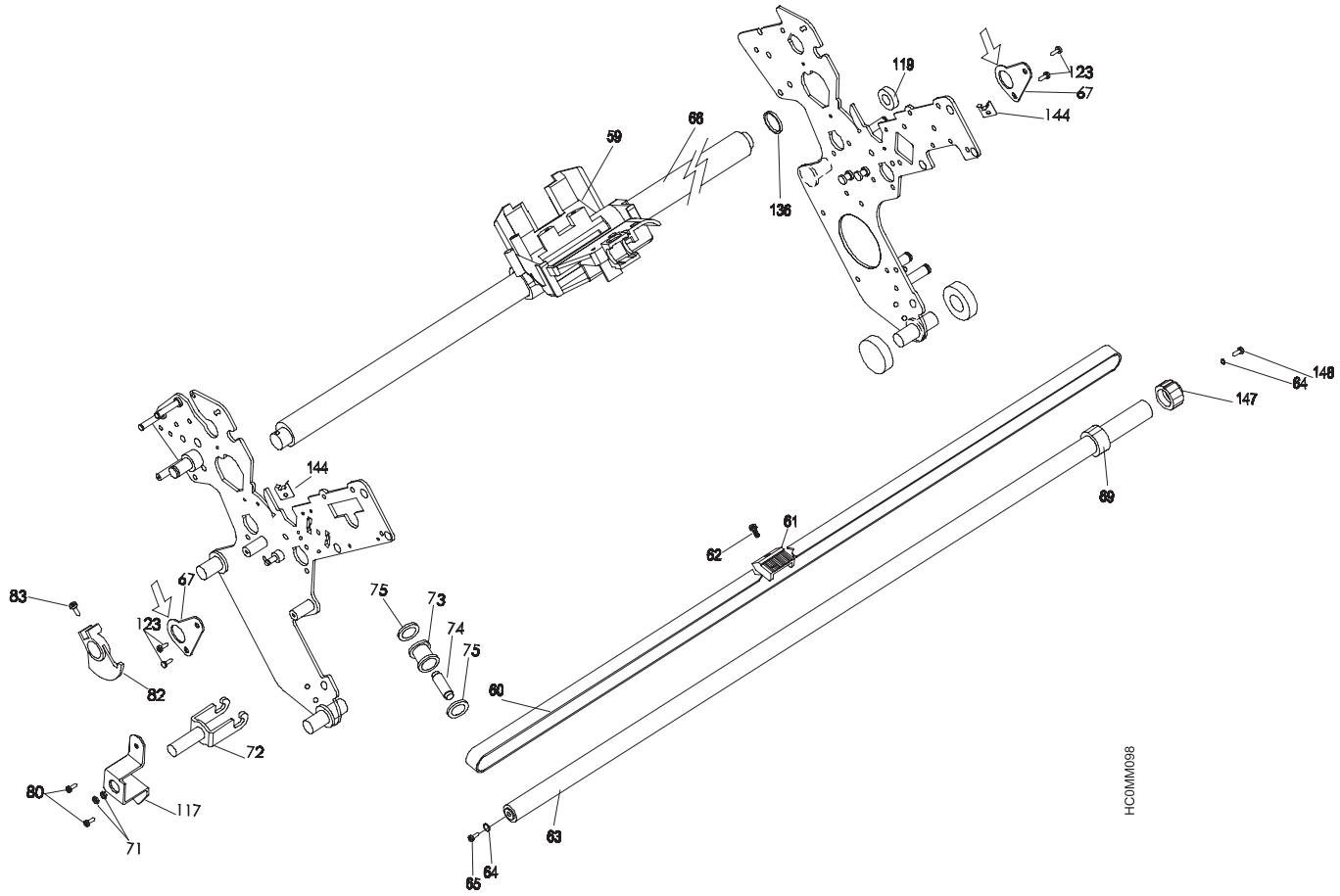


Figure 48. Carriage Assembly

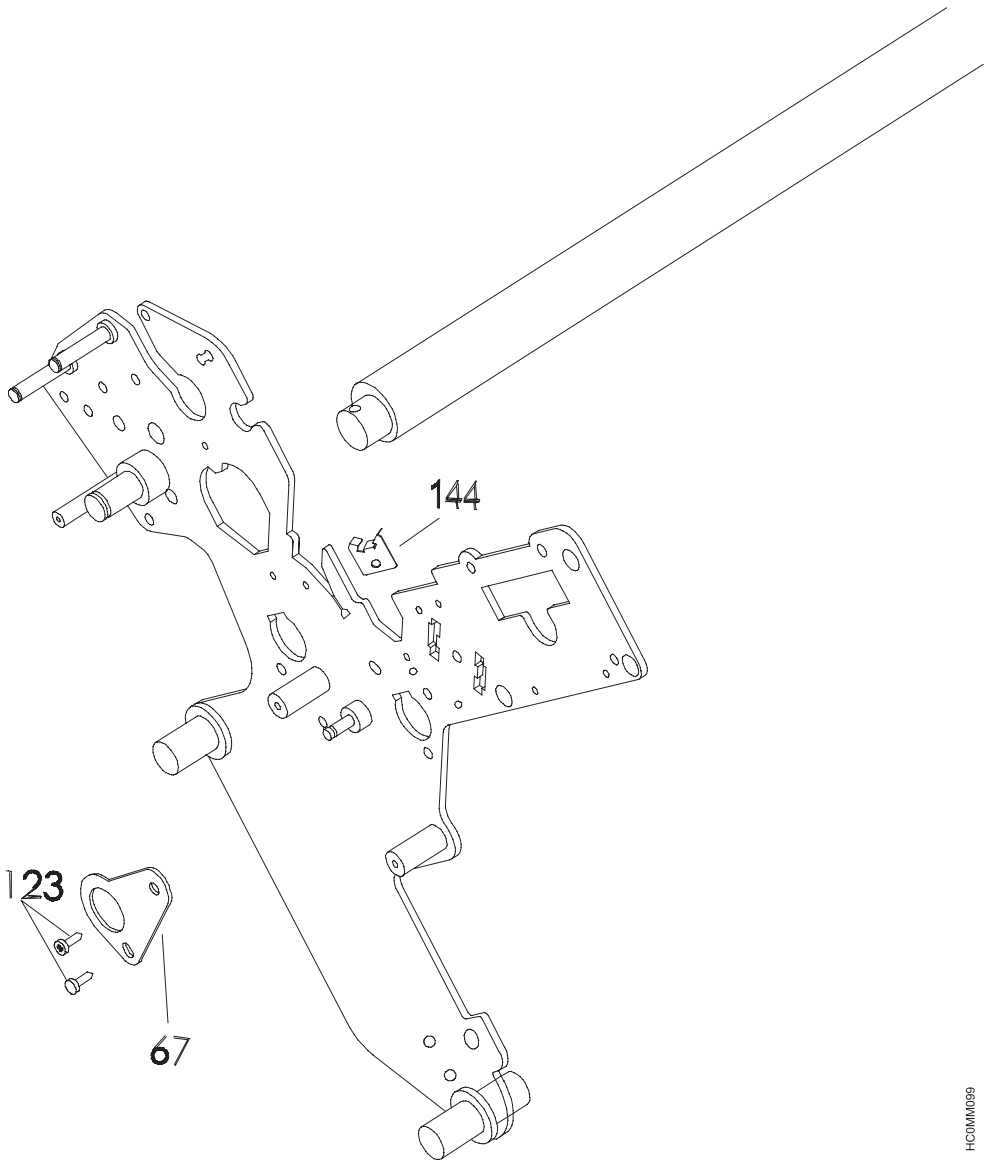


Figure 49. Particular of little spring and main shaft

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 “Sensor Tuning (T&D 9, 14, 18)” on page 224 for details).

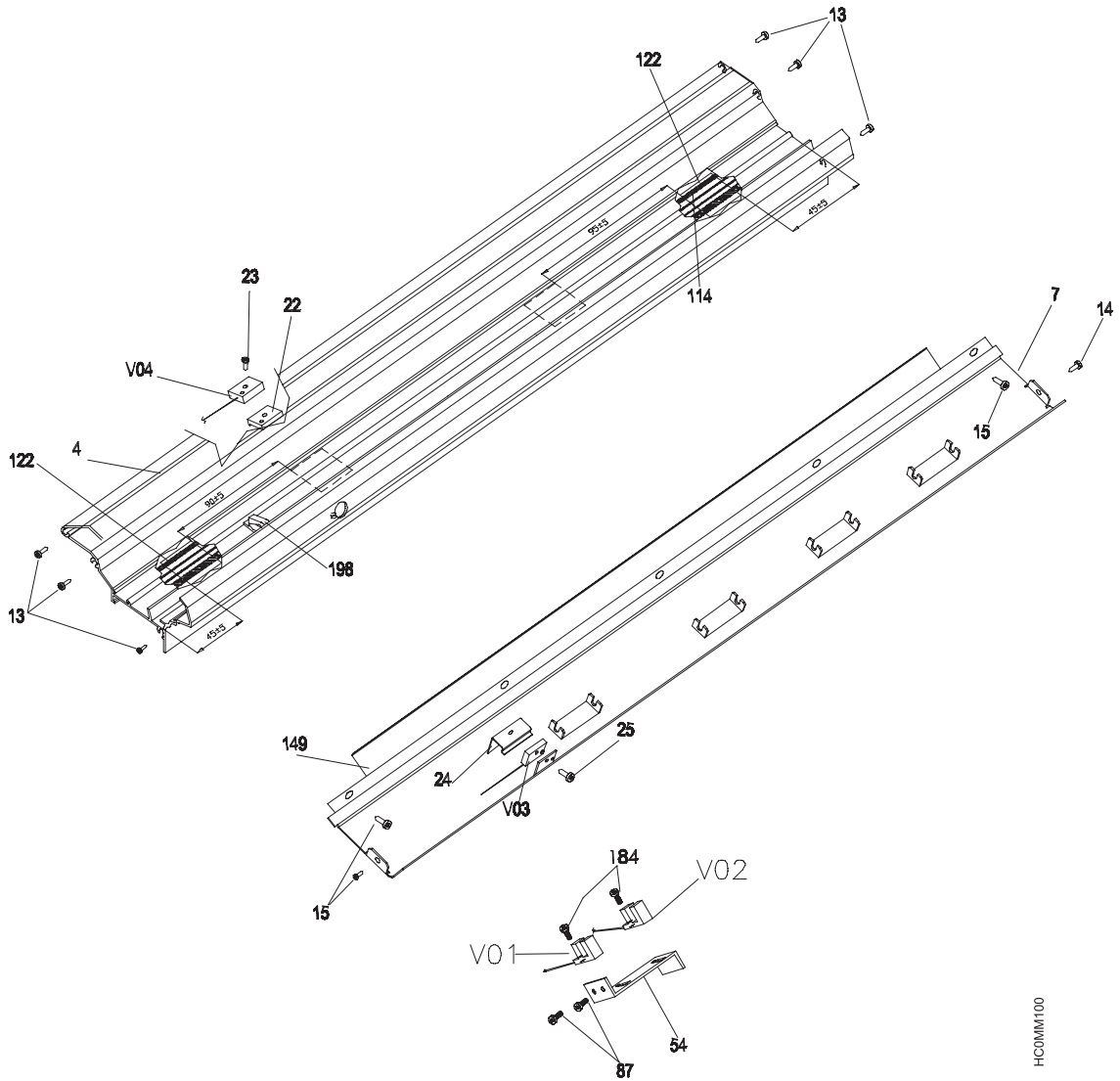


Figure 50. Sensor Cable Assembly

Mechanical Assembly

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the interface cable, set the printer power switch to O (Off) and unplug the power cord.

DANGER

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

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 Engine board and the connector of the carriage fan from the power supply.
5. Unscrew the two screws (item 179) retaining the mechanical block to the base assembly.
6. Cut the two plastic self-locked strips (item 186) 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 2, “Diagnostics,” on page 101).

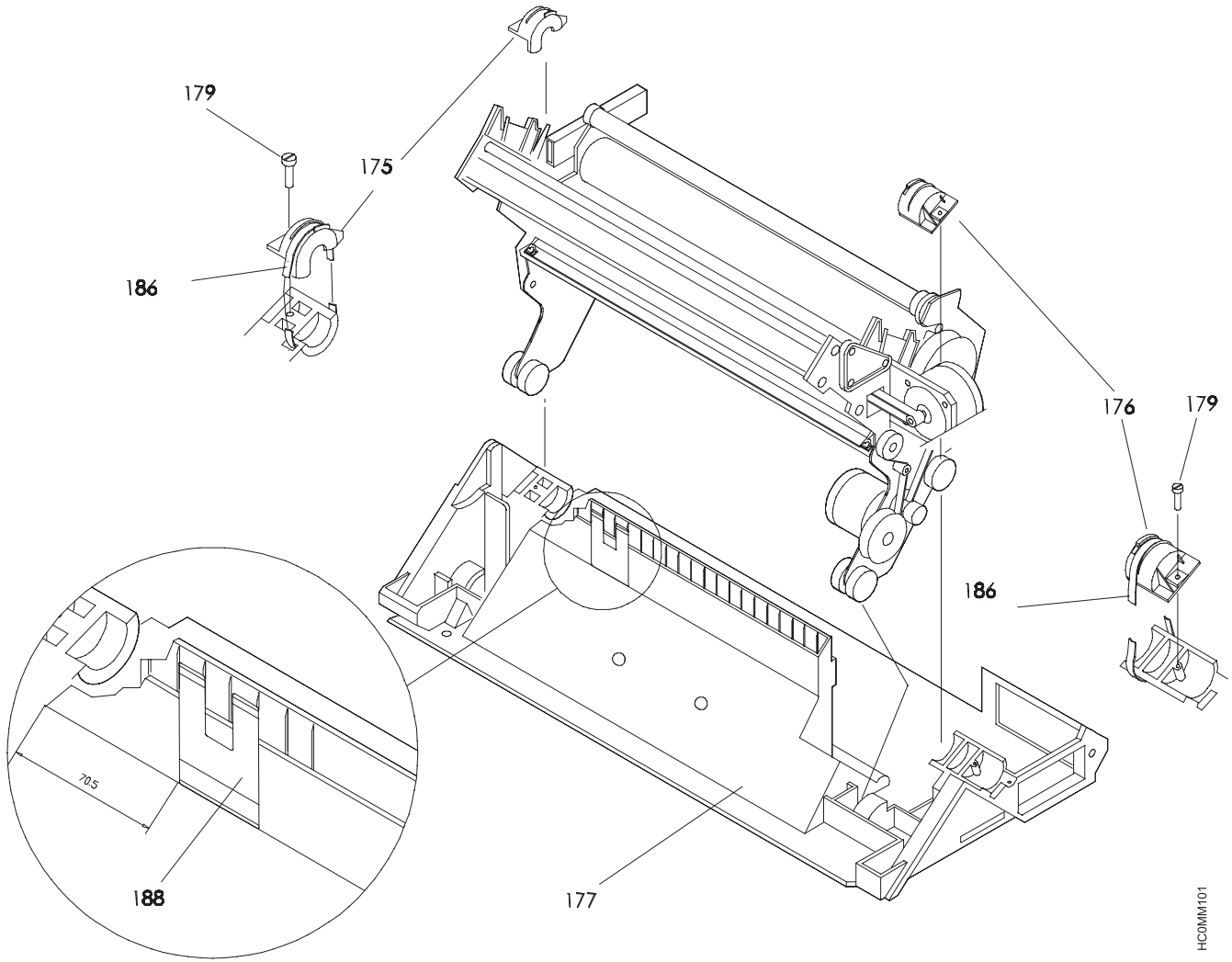


Figure 51. Mechanical Assembly

Paper Motor

CAUTION:
The paper feed motor may be hot. Wait for it to cool down.

1. Remove the Main, Rear, and Front Covers.
2. Remove the mechanical assembly.
3. Loosen the paper belt tensioning lever (item 47) by 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 6, “Service Checks & Adjustments,” on page 199 for detailed information).

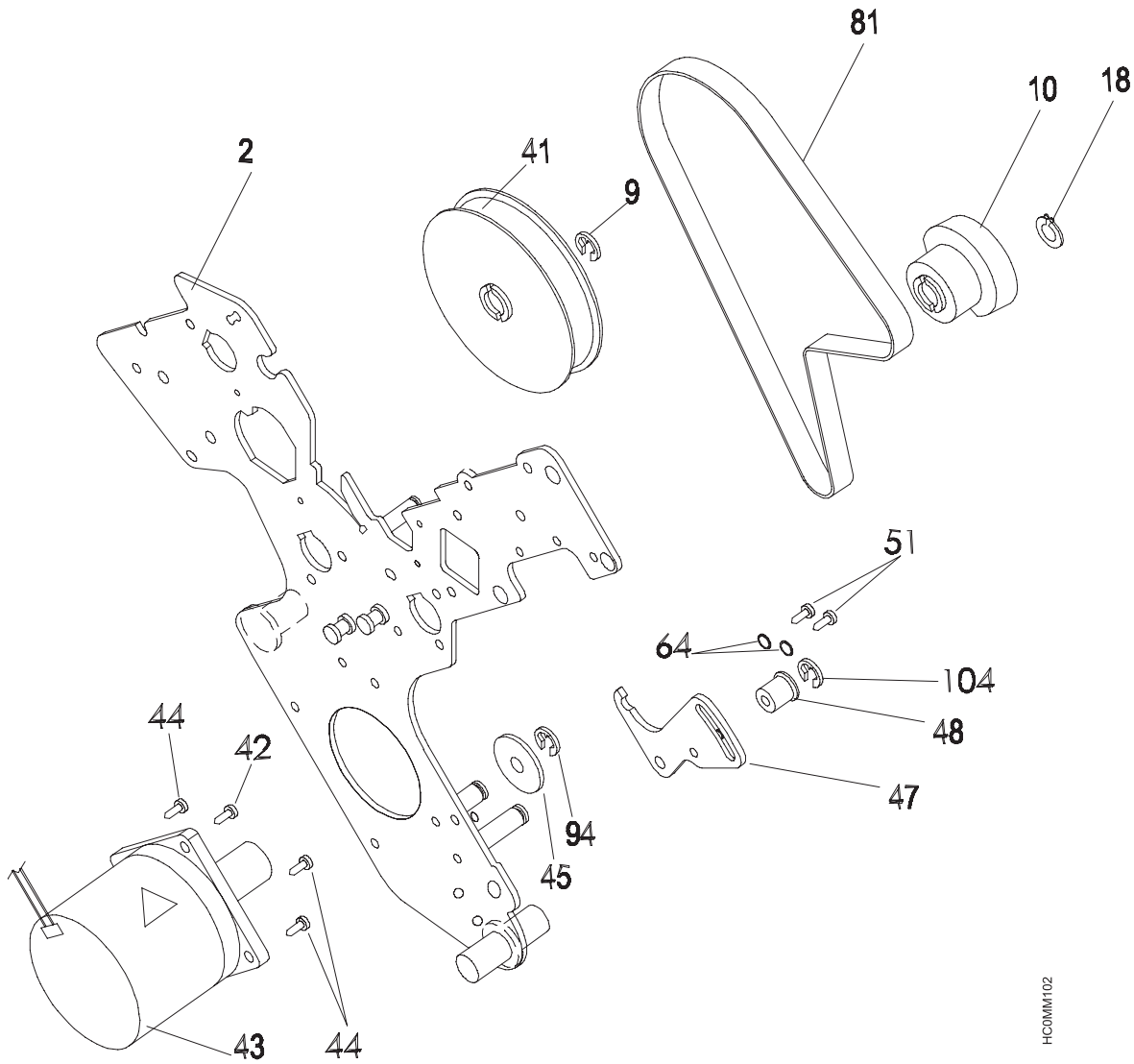


Figure 52. Paper Motor

Ribbon Mask

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

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.

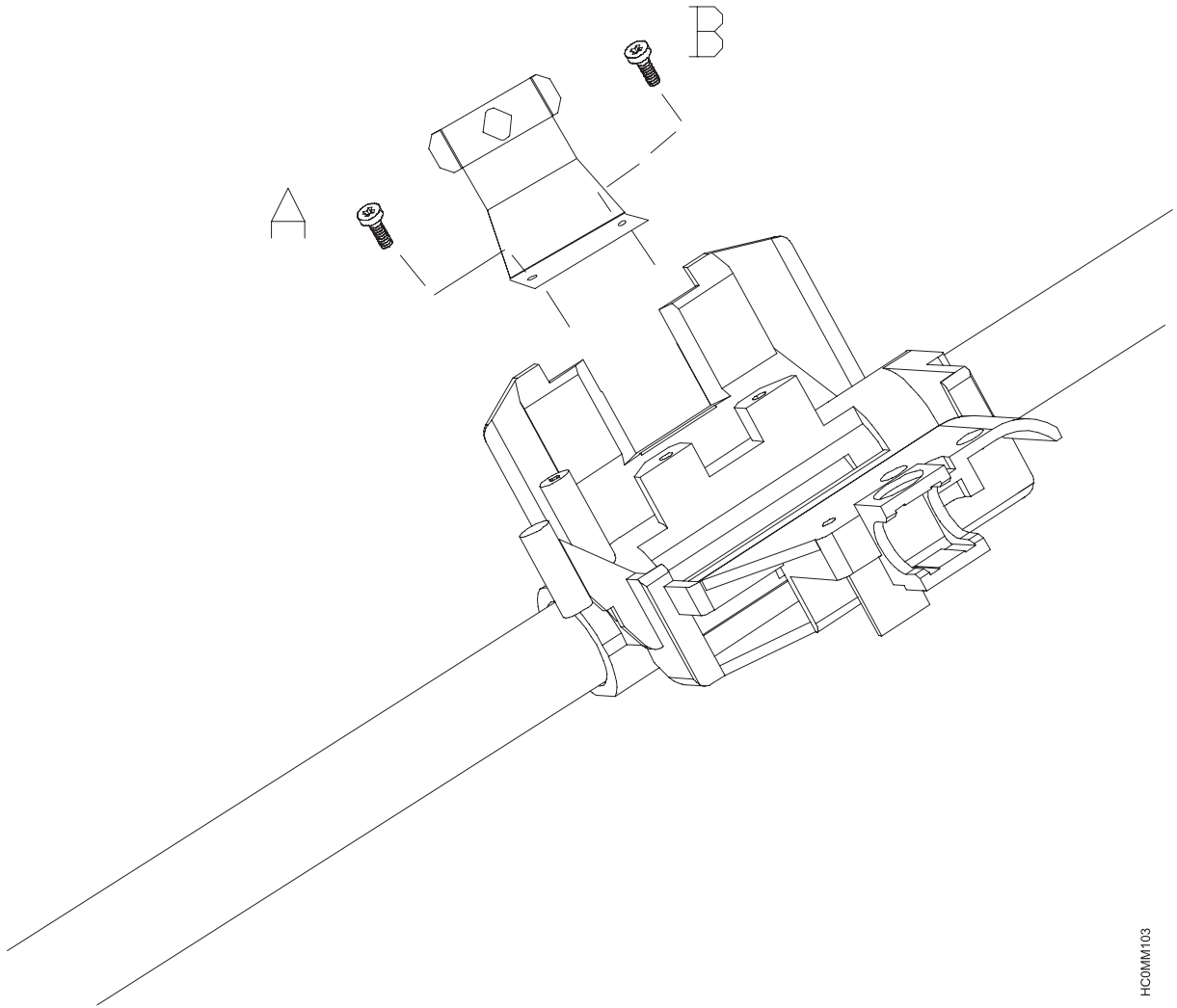


Figure 53. Ribbon Mask removal

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) by sliding it between the mask and the platen. To simplify this operation, move the AGA marker in order to put the printhead at the furthest position from the platen.

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

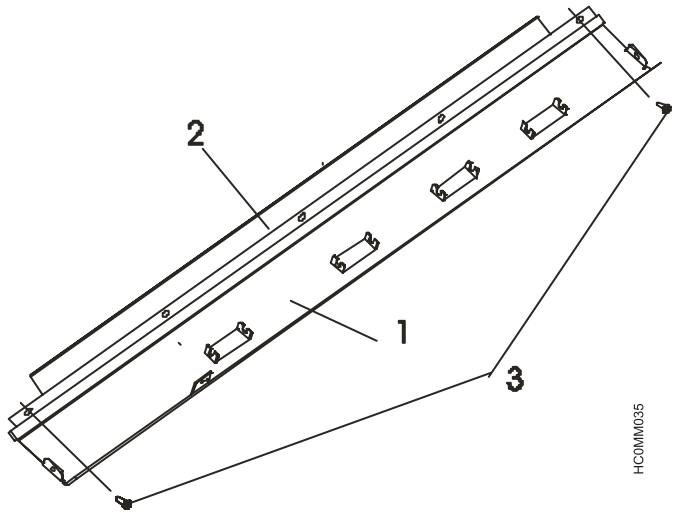


Figure 54. Lower Mylar

Chapter 6. Service Checks & Adjustments

This section describes the adjustment procedures for the 4247 L03 printer.

Carriage Belt

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

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 PN 44D9056, 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 2, “Diagnostics,” on page 101 in T&D tests description) to guarantee the best performances of the printer.

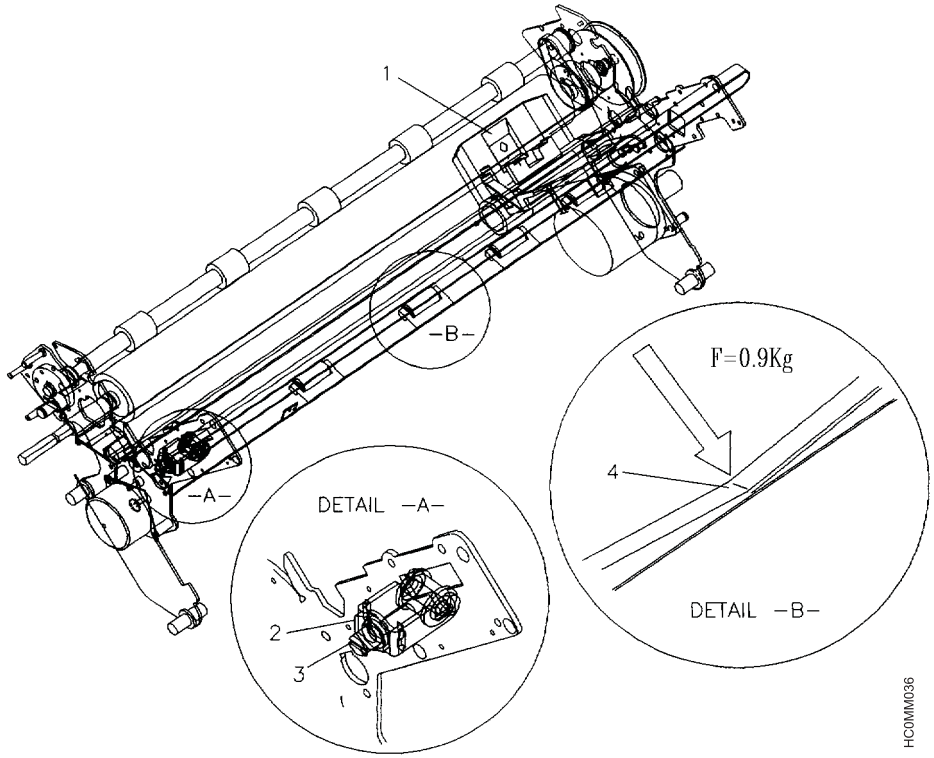


Figure 55. Carriage Assembly Belt Adjustment

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 PN 44D9056, 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 56 on page 202, 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 “Running the test and diagnostic (T&D programs)” on page 105 for details) to verify the correct forward/backward paper advancing with fanfold paper.

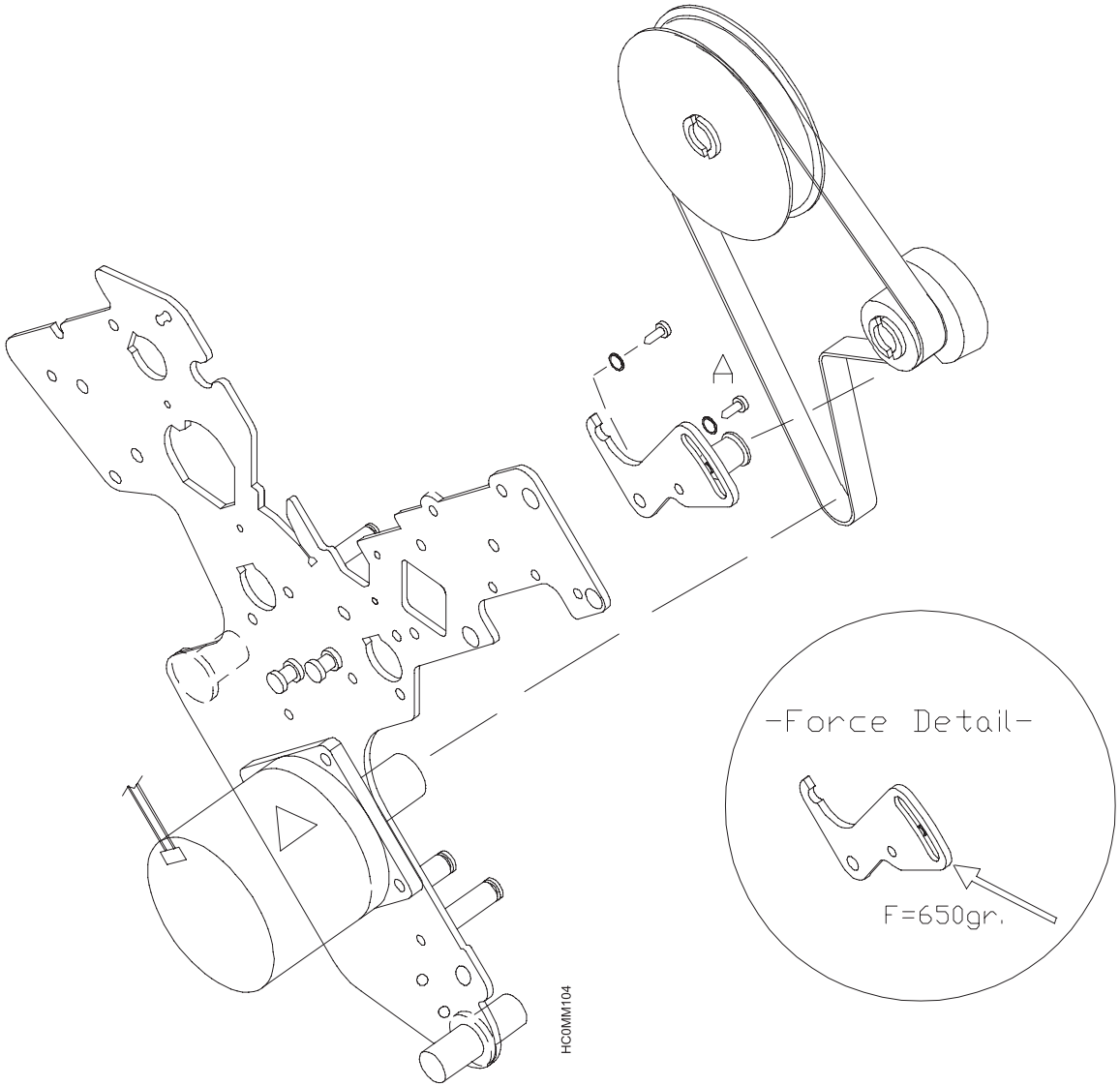


Figure 56. Paper Belt Adjustment

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 214.

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.

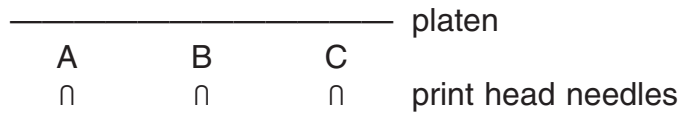
Follow these steps, in order to ensure the correct print head gap for all the carriage movements:

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

1. Remove the paper, ribbon cartridge, and 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 57 on page 207).
7. Furthermore, the platen ends must be aligned with the print head by 0.08mm (0.003 inch).

Example:



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 59 on page 209 (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 59 on page 209).
   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 221 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.

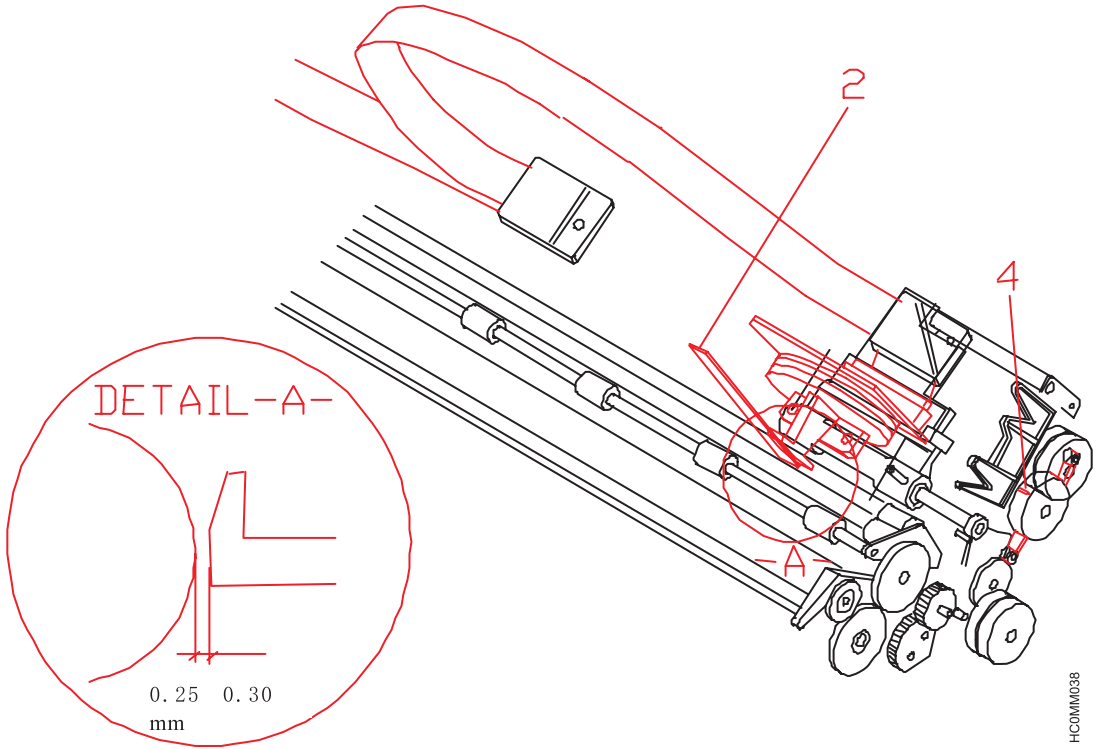


Figure 57. Print Head Gap Adjustment

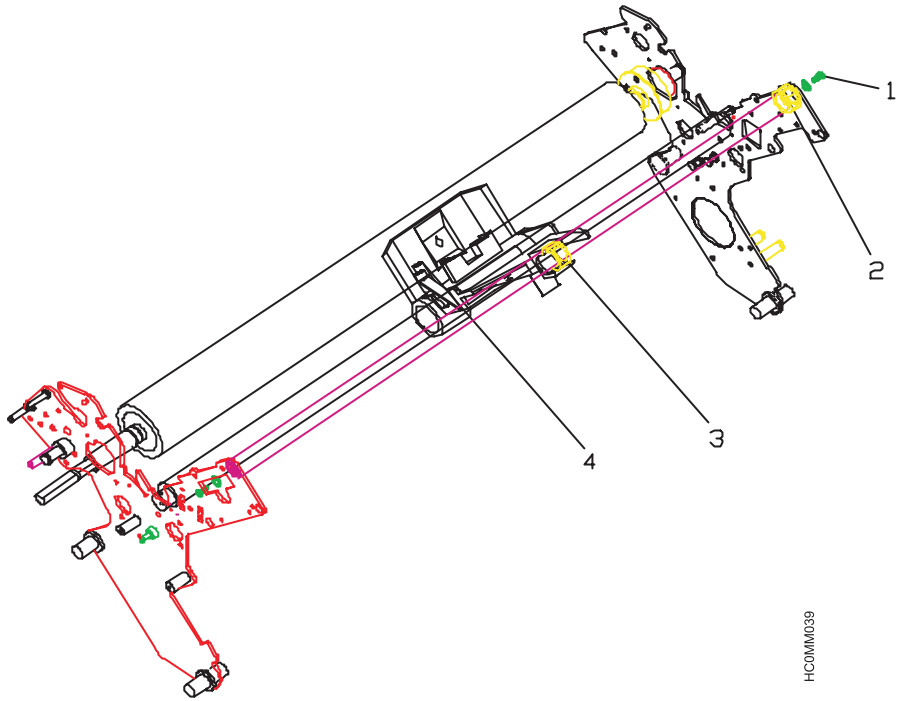


Figure 58. Print Head Gap Adjustment

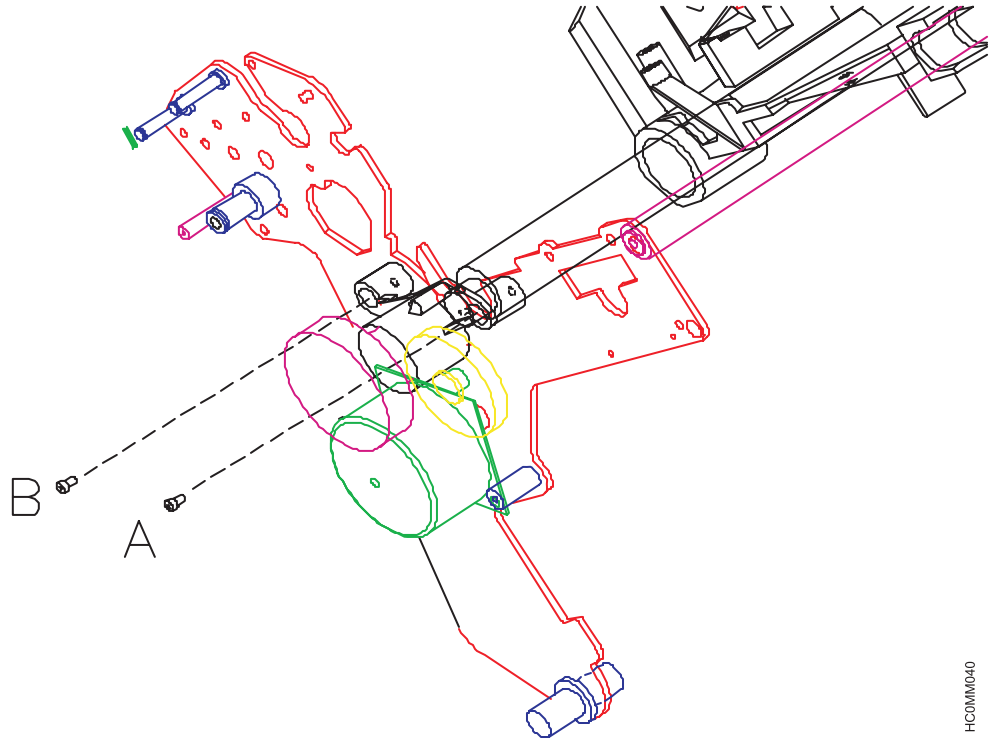


Figure 59. AGA (AFTA) Marker Adjustment

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

CAUTION:
<2-25> High temperature; switch off the printer and allow at least 20 minutes for parts in this area to cool before handling.

- 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.**

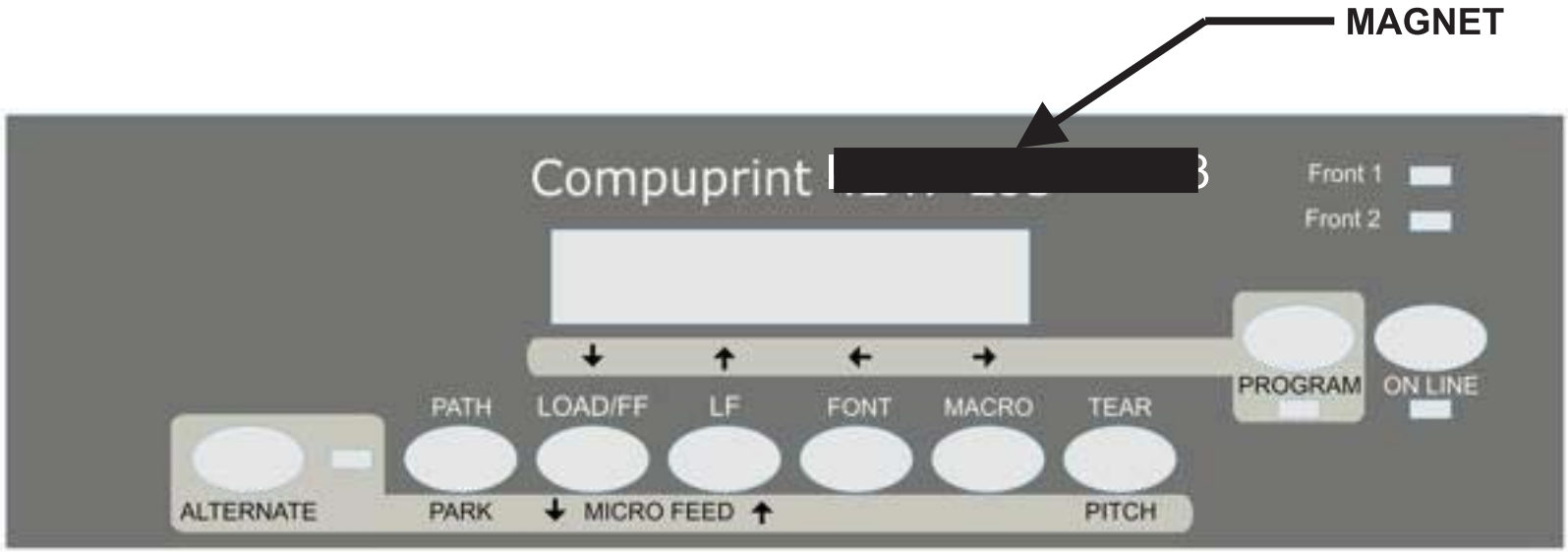
a. Power off and remove the paper bail and ribbon.
b. Advance the platen using the paper advance knob until the WHITE dot on the left end of the platen shaft is aligned with the WHITE mark on the shaft bearing.
c. Rotate the AGA (AFTA) Wheel to the full open gap position. Move the print head carriage 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.

Note: ***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. 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.



c. Power on holding the ONLINE and MACRO keys to enter the T&D menu. Verify that “AGA (AFTA) Calibrate (T&D 10)” on page 221 is set to '0' value and STORE the value. Power off to exit the T&D menu and then back 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 39, 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 39. 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

Note: ***Gap B → The Wheel position where DARK characters begin is Print Head Gap 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 40. Wheel Position Lookup Table

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

Table 40. Wheel Position Lookup Table (continued)

Gap A versus Gap B Comparison	Chosen Wheel Position
If Gap B is LESS than Estimate A, the print needles are worn down	Replace print head & repeat samples

Step 4. **Calibrate AGA (AFTA) using T&D10.**

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 59 on page 209.
- 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 AGA (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 AGA (AFTA) Indicator Wheel will adjust to point to '1' when single part 20 lb. (80 gram/m^2) 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.

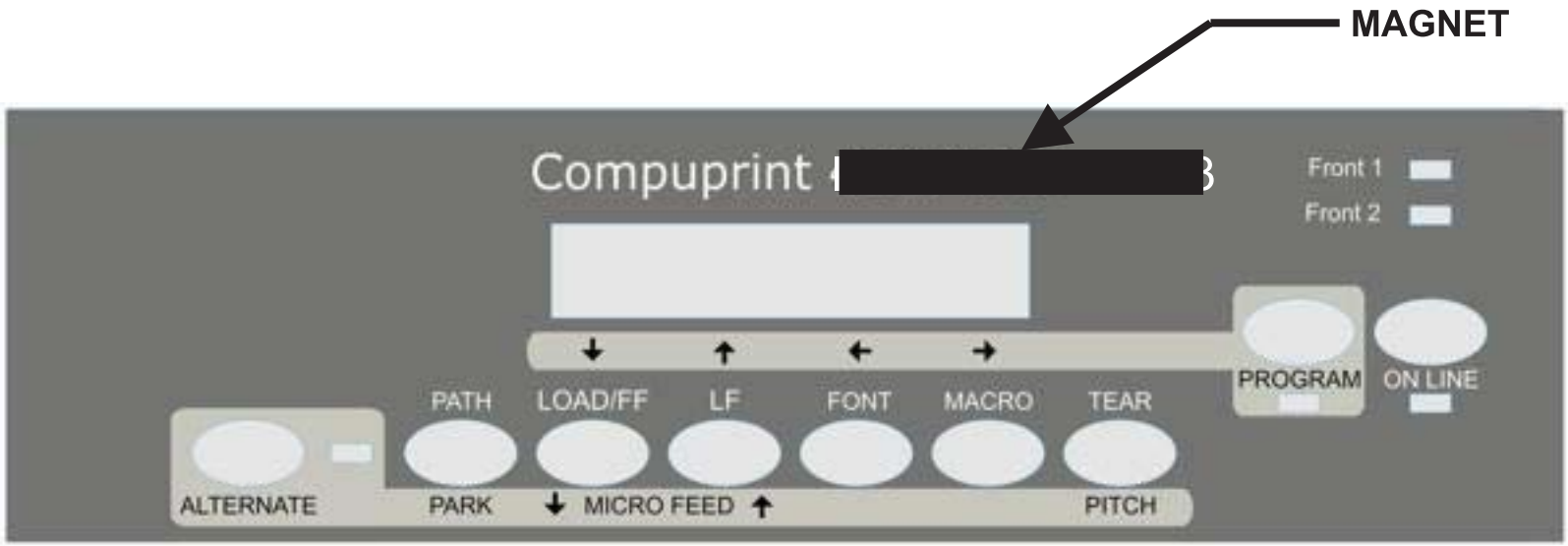
6. **Inspect the print head cable for damage and a poor connection at the print head.**

   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 AUTOGAP 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 the 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.”

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 268) and black taped area of the Guide Assembly (6–5 on page 268). 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 (bidirectional 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 60. 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”. F is displayed when no paper is present and B is displayed when paper is manually inserted. 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 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.

Sensor Service Checks

You are here because the printer displayed a 'PAPER JAM CHECK ALL PATHS' message, or an unrecoverable 'LOAD FRONT“N”' message.

Note: Proceed to Paper Presence Sensor Check.

Paper Presence Sensor Check

This Check informs you when to use T&D09 - RIBBON MOTOR TEST.

The two paper presence sensors are located near the platen in the Front Push and the Rear Push paper paths. Before you perform T&D09, follow these steps to verify that you actually need to perform T&D09. Do not perform T&D09 until you are instructed to do so.

1. If the printer displayed a 'PAPER JAM CHECK ALL PATHS' message after the operator loaded forms, the forms may have been loaded too far onto the tractor or blocked the paper presence sensor. Thus, when attempting to reload the forms, the sensor has already sensed paper and will display the message.

   Instruct the customer that when loading forms to install the forms with the top edge of the first form to be near the square drive shaft of the tractor assembly.
2. Load forms into one of the push tractors. The top of the forms should be near the square drive shaft of the tractor. Do not push the forms into the printer. This would block the paper presence sensor.
3. Press the **LOAD/FF** key. The first form moves into the print area.

   Note: If the forms move into the print area, but the top of the forms move past the printhead, and the 'LOAD FRONT“N”' message returns to the display, perform T&D09. The paper presence sensor in that forms path did not sense the forms.
4. If your printer displays a 'PAPER JAM CHECK ALL PATHS' message when a paper load is attempted using the **LOAD/FF** key or under host command, you may have paper already in one of these paths. Remove the paper; look for debris or chad. Remove all paper debris.
5. If it appears you have paper loaded into a path, press the **PARK/PATH** key. If the Path message changes to a different path, perform T&D09. The paper presence sensor in that path does not recognize that forms are present.

6. Perform T&D09 to reset the paper path sensor threshold levels. This should remove the 'PAPER JAM CHECK ALL PATHS' message.

Paper Path Service Checks

Main Paper Drive Check and Adjustment

1. Power off (O) the printer.
2. Remove the printer covers (see Cover Parts Removal).
3. Inspect the following parts for wear, damage, or binds. Hand cycle the paper feed mechanism. Install new parts, as needed.

   Note: Remove the Paper Bail and use the Rollers on the Upper Feed Roller Assembly to hand cycle the hardware while inspecting the parts.

   - Drive belt
   - Pulleys
   - Bearings or bushings
   - Gears

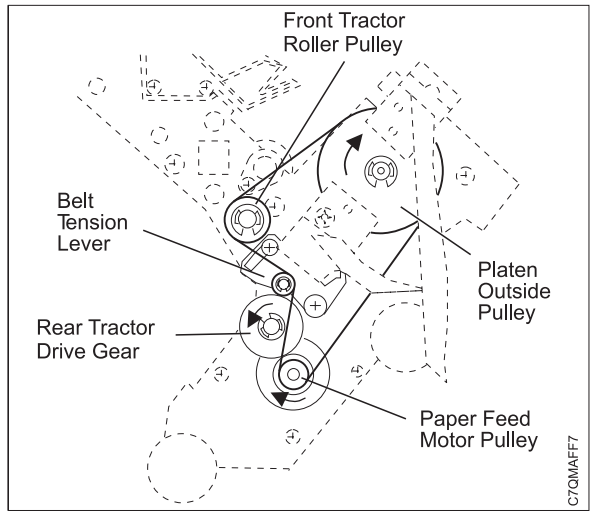


Figure 61. Paper Feed Main Drive. (Viewed From Right Side) Arrows show forward (up) paper feed.

4. Perform the following:
   a. Remove all forms.
   b. Open the Top Cover and remove the ribbon (see Ribbon Cartridge).
   c. Move the printhead to the far right.
   d. Inspect the paper bail.
      Ensure that the upper plastic shield is spring-loaded **away from the platen**. This allows the paper to feed under the upper plastic shield when the carriage is at the right side. The paper bail plastic shield should be held open approximately 10 mm (0.4 in.) by spring tension.
   e. Inspect the following parts for wear, damage, or binds. Install new parts, as needed.
      - Upper feed roller
      - Upper feed roller pulley
      - Upper feed roller drive belt
      - Platen
      - Platen inside pulley
      - Lower plastic shield
      - Bearings or bushings

f. Reinstall any parts that were removed or not replaced in this procedure.

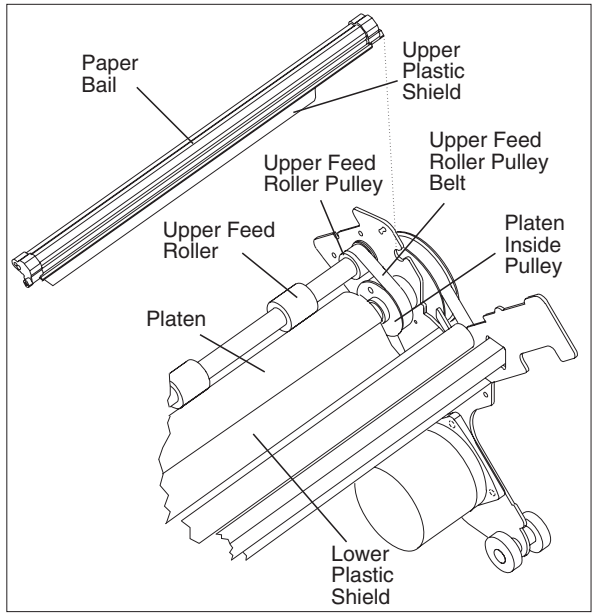


Figure 62. Paper Feed Main Drive. (Viewed From Top)

5. The following adjustments, when out of range, can cause paper feed failures. Ensure that they are correct:
   a. Print Head Gap Adjustment.
   b. Sensor Service Checks.
   c. Paper Belt.
6. Clean the following parts with isopropyl alcohol (PN 2155966):

CAUTION:
Isopropyl Alcohol is flammable. Avoid sparks and open flame.

- Upper feed rollers
- Platen
- Lower plastic shield
- Paper bail rollers
- Upper plastic shield

7. Use a lint-free cloth to clean the tractor assembly jam sensor.
8. If a problem still exists, continue with the next section.

Forms Paths Checks

Front and Rear Push Path Check

1. Locate and remove from the forms path torn pieces of paper or other foreign material that can cause forms jams.
2. Inspect the following parts for wear, damage, or binds. Install new parts, as needed.
   - Front and rear tractor drive gear
   - Tractors and feed pins
   - Paper bail
3. Ensure that the paper bail is in the lower, detented position (touching the upper feed roller assembly).
4. Use a lint-free cloth to clean the jam sensor, which is located on the tractor assembly.

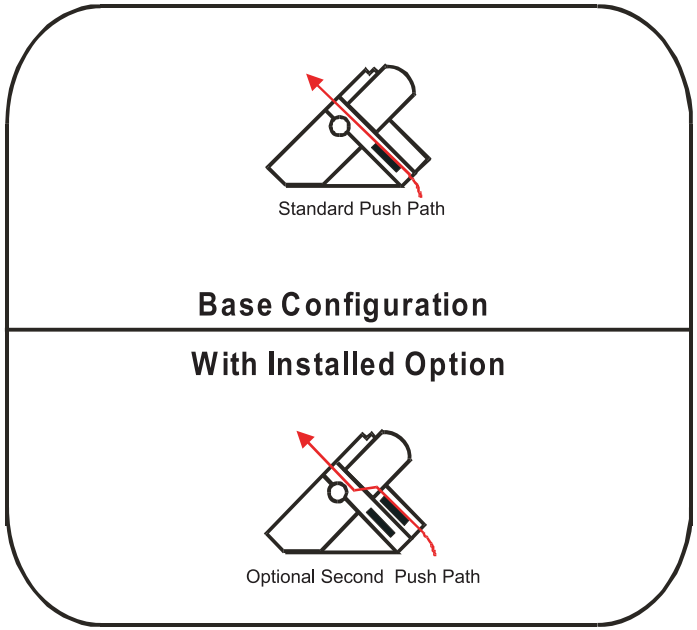


Figure 63. Standard and Optional Second Paper Paths. (Viewed From Left Side)

5. Return to the step that sent you here.

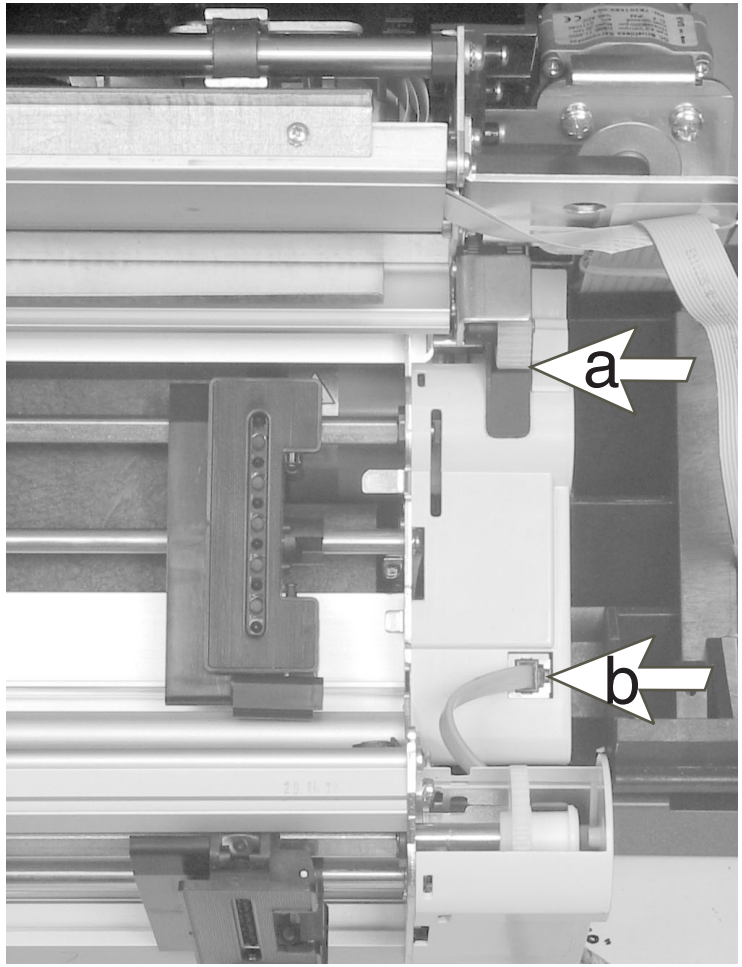
Tractor Assembly Service Check

Paper path nomenclature

Base tractor (*rear tractor* ***when a second tractor is installed):*** This tractor is installed at the factory on all machines. In a single tractor machine the base tractor is called the front tractor. The base tractor becomes the (*rear tractor* when a second (optional) tractor is installed.

Second tractor (optional, becomes *front tractor****):*** This tractor can be installed in front of the base tractor as an option. In a two tractor machine the second (optional) tractor is called the *front tractor* and the base tractor becomes the *rear tractor*.

Front tractor service check



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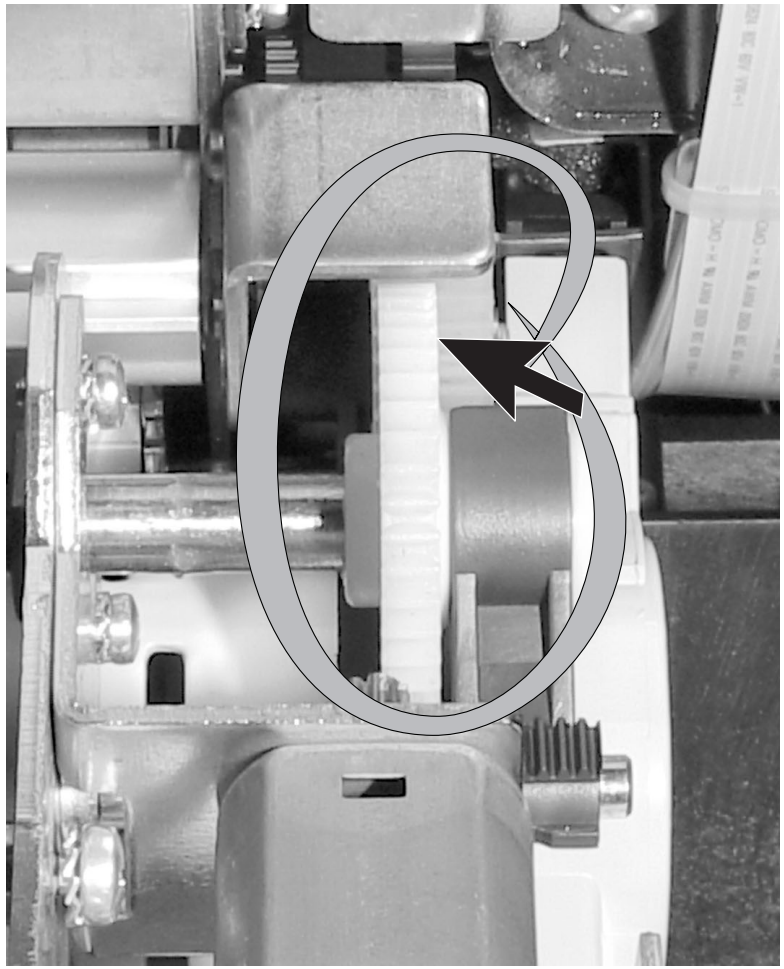
1. Turn off (O) the printer and remove forms from the tractor.
2. Front tractor service check (if present):
   a. Inspect and clean the front tractor pin feed belts and pins.
3. Rotate the front tractor forward as shown at left and inspect the following:
   a. Inspect and clean the printer drive gear (the drive gear cover should be open).
   b. Disconnect, inspect, and connect the rear tractor connector.

Tractor drive gear in the *drive* position (engaged)



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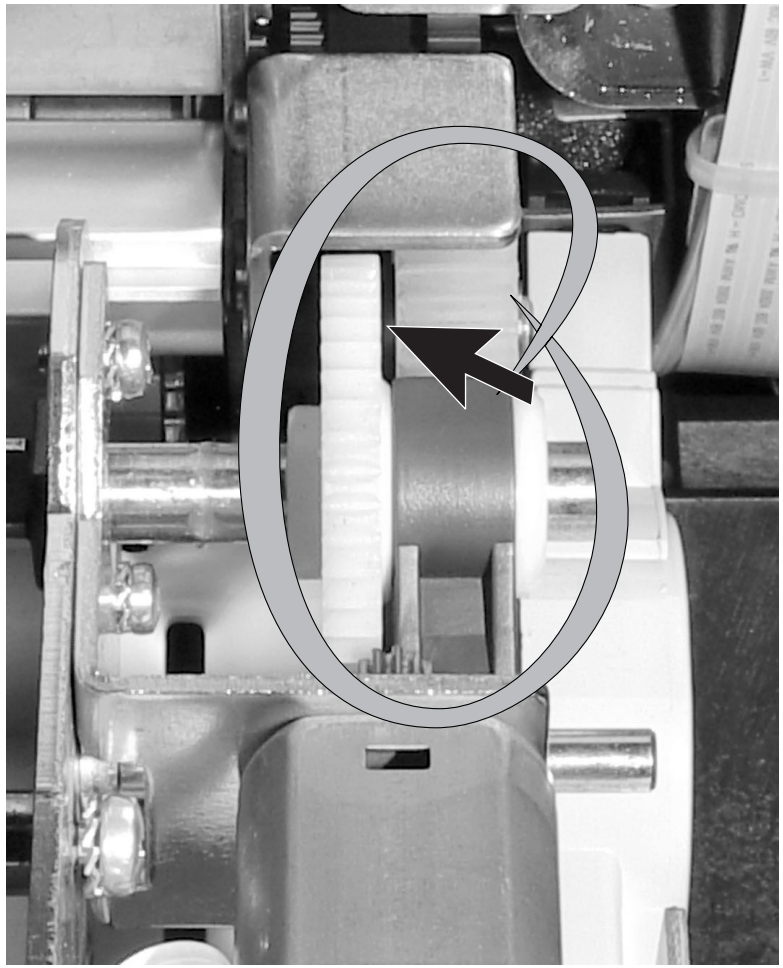
4. Observe the position of the tractor drive gear.
   - In the engaged position, the tractor drive gear drives the pin feed belts.
   - In the idle position, the tractor drive gear does not drive the pin feed belts.
5. Move the drive gear to the right (drive position).
6. Perform the Rear tractor service check.

Tractor drive gear in the *idle* position (not engaged)



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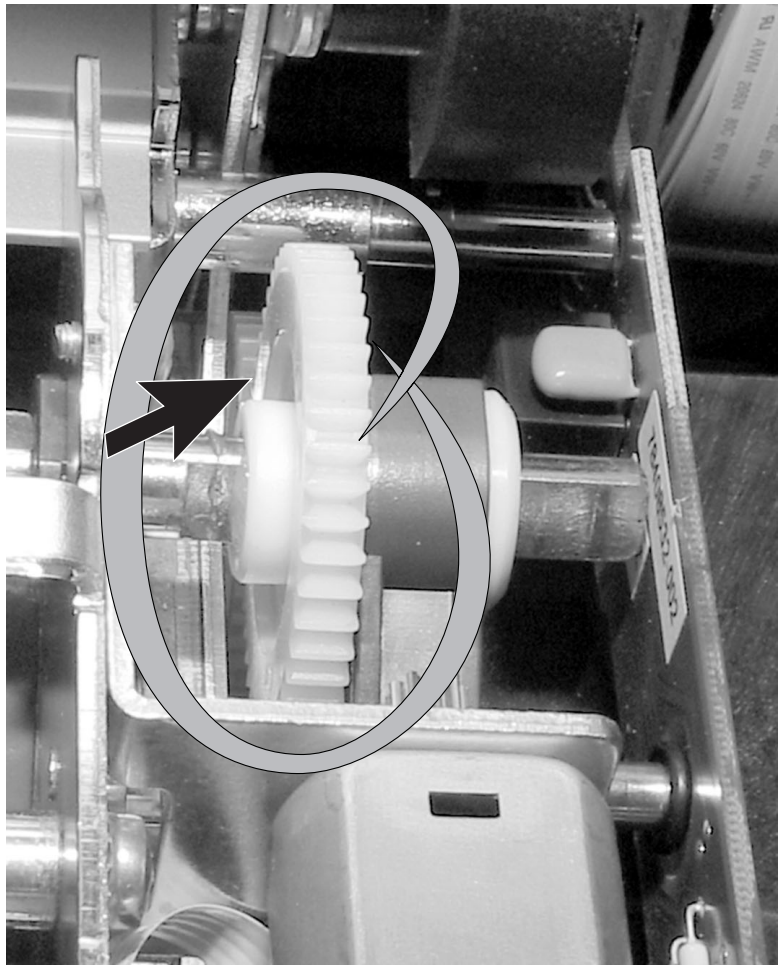
7. Turn on the printer.

   The drive gear should move left (idle position).
8. Select the front tractor path at the operator panel if **READY Front** is not displayed by pressing the **STOP** and the **PARK/PATH** keys.
9. Press **LOAD/EJECT**.

   The drive gear should move right (drive position).
10. If the front tractor drive gear fails to smoothly move in both directions, exchange the following FRUs one at a time. Test each FRU. If the problem remains, reinstall the original FRU and continue.
    a. Front tractor asm.
    b. Engine board
    c. Tractor cable asm.

Rear tractor service check

Tractor drive gear in the *drive* position (engaged)

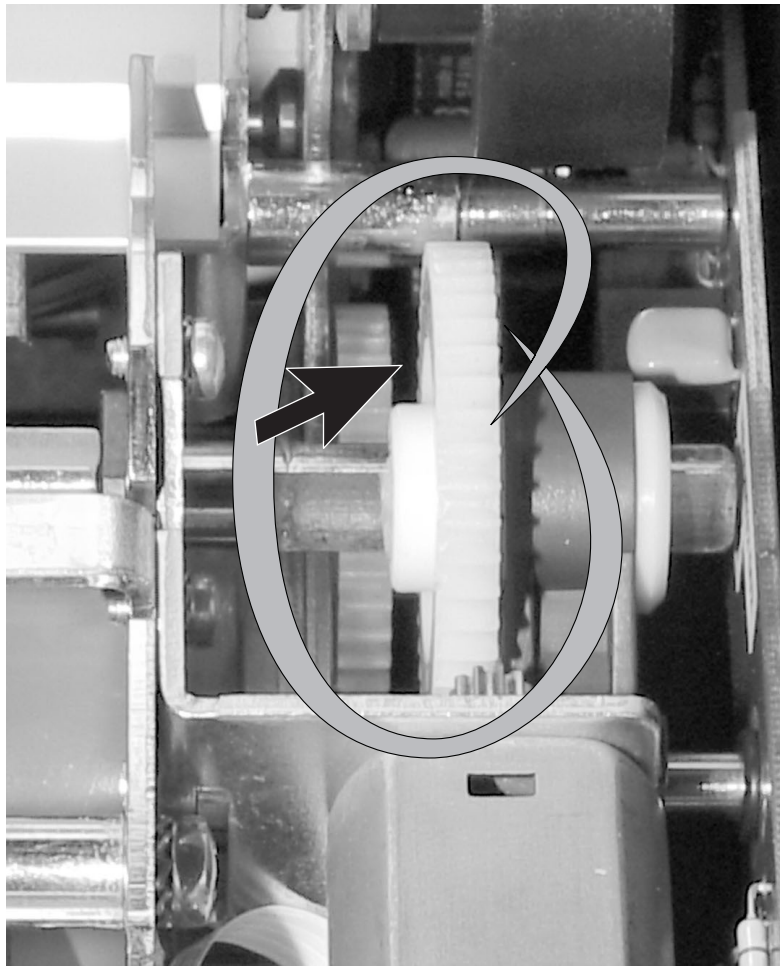


e61a9111

1. Turn off the printer.
2. Perform the Front tractor service check.
3. Remove the front tractor asm.
4. Inspect and clean the rear tractor pin feed belts and pins.
5. Remove the 2 screws and remove the rear tractor asm.
6. Observe the position of the rear tractor drive gear.
   - In the engaged position, the tractor drive gear drives the pin feed belts.
   - In the idle position, the tractor drive gear does not drive the pin feed belts.
7. Move the drive gear to the right (idle position).
8. Install the rear tractor into the printer.
9. Turn on the printer.
10. When the power-on sequence completes, turn off the printer.
11. Remove the rear tractor and look at the rear tractor drive gear.

    The gear should have moved left (drive position).

Tractor drive gear in the *idle* position (not engaged)



e61a9112

12. Install both tractors.
13. Turn on the printer.
14. Select the front tractor path at the operator panel if **READY Front** is not displayed by pressing the **STOP** and the **PARK/PATH** keys.
15. Press **LOAD/EJECT**.
16. Turn off the printer.
17. Remove both tractor assemblies.
18. Look at the rear tractor asm.

    The drive gear should have moved right (idle position).
19. If the rear tractor drive gear fails to smoothly move in both directions, exchange the following FRUs one at a time. Test each FRU. If the problem remains, reinstall the original FRU and continue.
    a. rear tractor asm.
    b. Engine board
    c. Tractor cable asm.

Ribbon Feed Service Check

You are here because of a RIBBON JAM message or any of the other symptoms in MAP 0160: Ribbon feed.

1. Open the Top Cover and remove the ribbon cartridge. See Ribbon Cartridge.
2. Advance the ribbon by turning the knob in the direction of the arrow. The ribbon should freely advance without the ribbon folding over. Replace the ribbon cartridge if you locate a problem such as a ribbon that binds or is folded over.

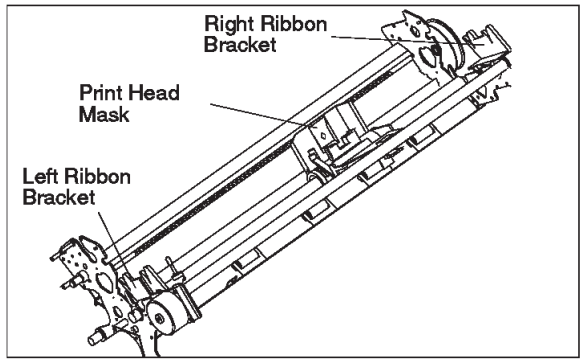


Figure 64. Ribbon Carriage and Ribbon Brackets. (Viewed From Top Left)

3. Inspect the left ribbon bracket for wear, damage, or binds. Repair the following parts, as needed:
   - Ribbon feed spool tabs
   - Ribbon motion sensor
   - Ribbon spool teeth

   Note: The ribbon feed spool has three tabs on the bottom that interrupt the ribbon motion sensor.

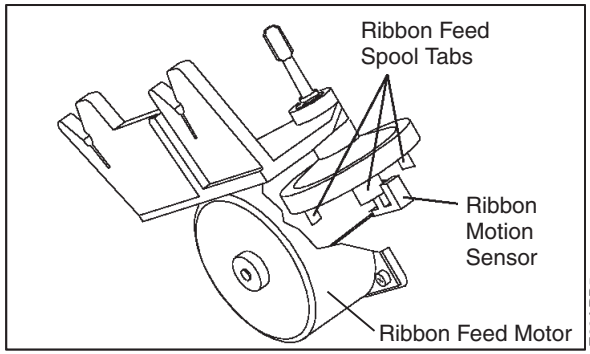


Figure 65. Ribbon Spool Tabs/Sensor

4. Use a lint-free cloth to clean the ribbon motion sensor.
5. Inspect the following parts for wear, damage, or binds. Repair as needed.
   - Printhead carriage
   - Printhead mask (mounted on carriage between ribbon and platen)
   - Ribbon mounting brackets
6. Ensure that the printhead cables are connected at both ends correctly.
7. Install the ribbon cartridge.
8. Perform T&D09. Verify that the ribbon pulled to the left by the ribbon feed motor.
9. Return to the step that sent you here.

Printhead Drive Service Check

Note: In any steps in this procedure, replace any parts you find to be broken or irreparably loose.

1. Power off (O) the printer.
2. Locate and remove from the forms paths torn pieces of paper or other foreign material that can cause forms jams. Also inspect the printhead movement area.
3. Remove the printer covers.
4. Inspect the carriage motor and pulley for wear, damage, binds, or looseness. Ensure that the 4 screws and grommets that support the carriage motor are not damaged. Verify that the cooling fan is installed correctly and air is blowing towards the motor.

   To inspect the carriage motor, remove the printhead and loosen the belt clamp to free the belt. Move the belt to rotate the motor pulley and the idler pulley. If the rotation indicates bearing damage, replace the idler pulley or the carriage motor.

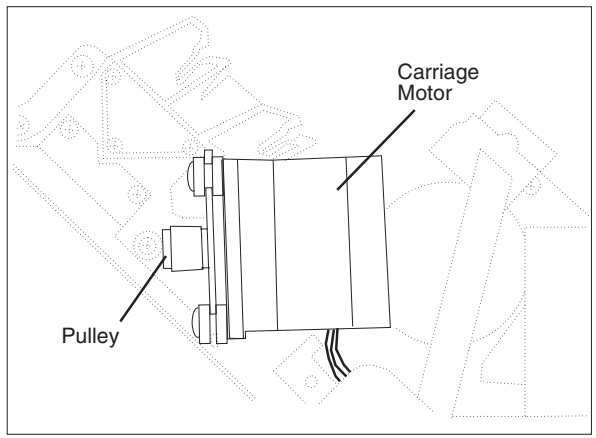


Figure 66. Carriage Motor. (Viewed From Right Side)

5. Inspect the following parts associated with the carriage drive belt for wear, damage, binds, and correct adjustment and installation.

- Carriage drive belt idler pulley must be free-turning. Slide the carriage throughout the full travel, and ensure that the pulley turns.
- Carriage drive belt clamp must properly mesh with the belt teeth, and be fastened tightly. Replace the clamp if the screw will not tighten.
- Carriage drive belt tension must be correct. See Carriage Belt.

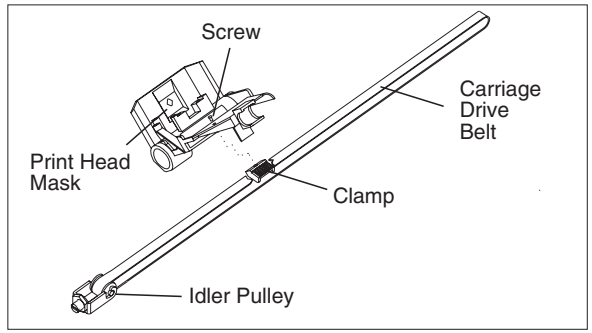


Figure 67. Carriage Drive Belt. (Viewed From Top)

6. Inspect the carriage shafts and the attached hardware. Look for damage, binds, or incorrect installation.

   Note: Do not lubricate the shafts.

   You should find the carriage shafts to be clean. If the (small) carriage support shaft is coated with a thick, viscous film, replace the carriage support shaft bushing. If the (large) carriage shaft is coated, replace the carriage assembly.
7. Verify that the carriage shaft retainers and the sheetmetal wear surfaces are installed correctly. The retainers are installed correctly when the shafts are pinched into location on the printer side frames.

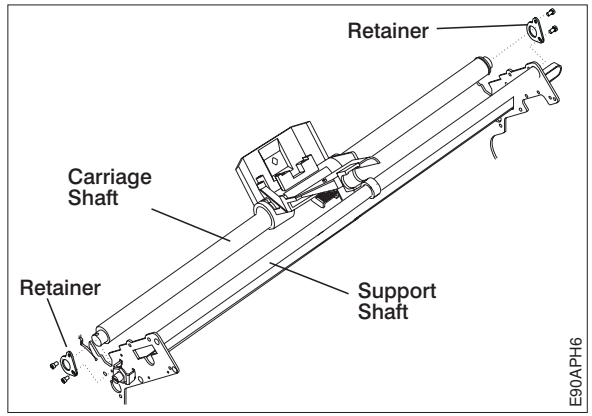


Figure 68. Carriage Shaft Components. Viewed From Top

8. Inspect the printhead mask for wear, damage, and correct installation. Ensure the corners of the forms are not jamming in the diamond-shaped hole.

   To inspect both sides of the mask, remove the printhead and open the gap.
9. Inspect for wear or damage the plastic shields that cover the platen.

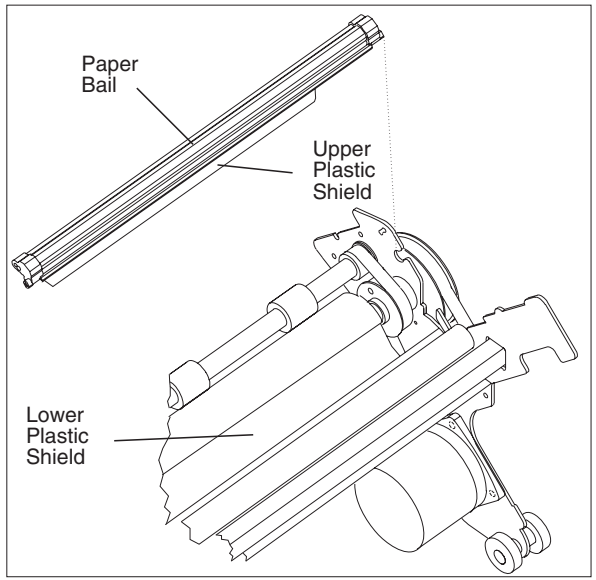


Figure 69. Plastic Shields. (Viewed From Top)

10. Return to the step that sent you here.

Print Quality Service Checks

Fanfold Forms Printout

1. Print the T&D14 fanfold print test on 14 $^{7}/_{8}$ x 11 in. white, fanfold forms, and using a new ribbon (see Running the test and diagnostic (T&D programs)).
2. If you are here due to problems with multiple-part forms, use the problem forms to print this print test.
3. Use the information in Table 41 to analyze the printout in Fanfold Forms Printout.

Table 41. Print Quality Tests and Actions (Fanfold)

Line	Description	Action, if failure
1	Skew test in draft mode. The line should print parallel to the edge of paper.	See Main Paper Drive Check and Adjustment. The upper right corner may be catching in printhead mask.
2	Skew test in LQ mode. The line should print parallel to the leading edge of paper.	See Main Paper Drive Check and Adjustment.
3	Logic and microcode data.	
4	Printhead wire test. The 24-wire printhead print wires are numbered 1 - 24 (see Fanfold Forms Printout). The wire numbers are printed under each group. Look for light or missing dots.	Print the T&D14 fanfold print test after completing each of the following steps: 1. Check the printhead cable connections. Repair as needed. 2. Install a new printhead. See Printhead Drive Service Check. 3. Install a new Engine board. See Engine Board. 4. Install new printhead cable. 5. Run T&D in automatic mode to verify correct printer operation. See Running the test and diagnostic (T&D programs).

Table 41. Print Quality Tests and Actions (Fanfold) (continued)

Line	Description	Action, if failure
5	Paper feed test. Prints three lines of alternating line segments and spaces. The top and bottom lines are printed first. The middle line is printed after line 12 prints and the paper feeds back to line 5. The middle line should be centered between the first and third lines.	See Main Paper Drive Check and Adjustment.
6	Bidirectional printing test. Prints four lines. Each H should align with the H above or below.	1. See Vertical (bidirectional printing) (T&D 12). 2. See Printhead Drive Service Check.
7	Bidirectional printing test. Prints four lines. Each vertical line should align with the vertical line above or below.	1. See Vertical (bidirectional printing) (T&D 12). 2. See Printhead Drive Service Check.
8	The first line is 10 CPI draft mode, the second line is 17.1 CPI draft mode, and the third line is 10 CPI LQ mode.	See Printhead Drive Service Check.
9	Printhead wire shifter test. Prints two lines. To print in LQ mode, one set of twelve wires is shifted up, by a solenoid, relative to the fixed set of twelve wires. In this test, the first line prints a *less than* (<) symbol (LQ mode), *tilde* (~) (draft mode), and a *greater than* (>) symbol (LQ mode). The second line prints a *less than* symbol (draft mode), *tilde* (LQ mode), and a *greater than* symbol (draft mode).	1. Install a new printhead. See Printhead Drive Service Check. 2. Install a new Engine board. See Engine Board. 3. Install new printhead cables.
10	Printhead drive test. Prints 20 lines: one full line of dots and 19 lines of “H” pattern. The left margin should be even.	See Printhead Drive Service Check.

Table 41. Print Quality Tests and Actions (Fanfold) (continued)

Line	Description	Action, if failure
11	Colored ribbon test.	Ignore. Color ribbon option not available on this printer.
12	Continuous straight line.	1. See Main Paper Drive Check and Adjustment. 2. See Printhead Drive Service Check.
13	See line 5.	
14	Skew test in draft mode. The line should print parallel to the edge of paper.	See Main Paper Drive Check and Adjustment.

Note: The standard fanfold 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.

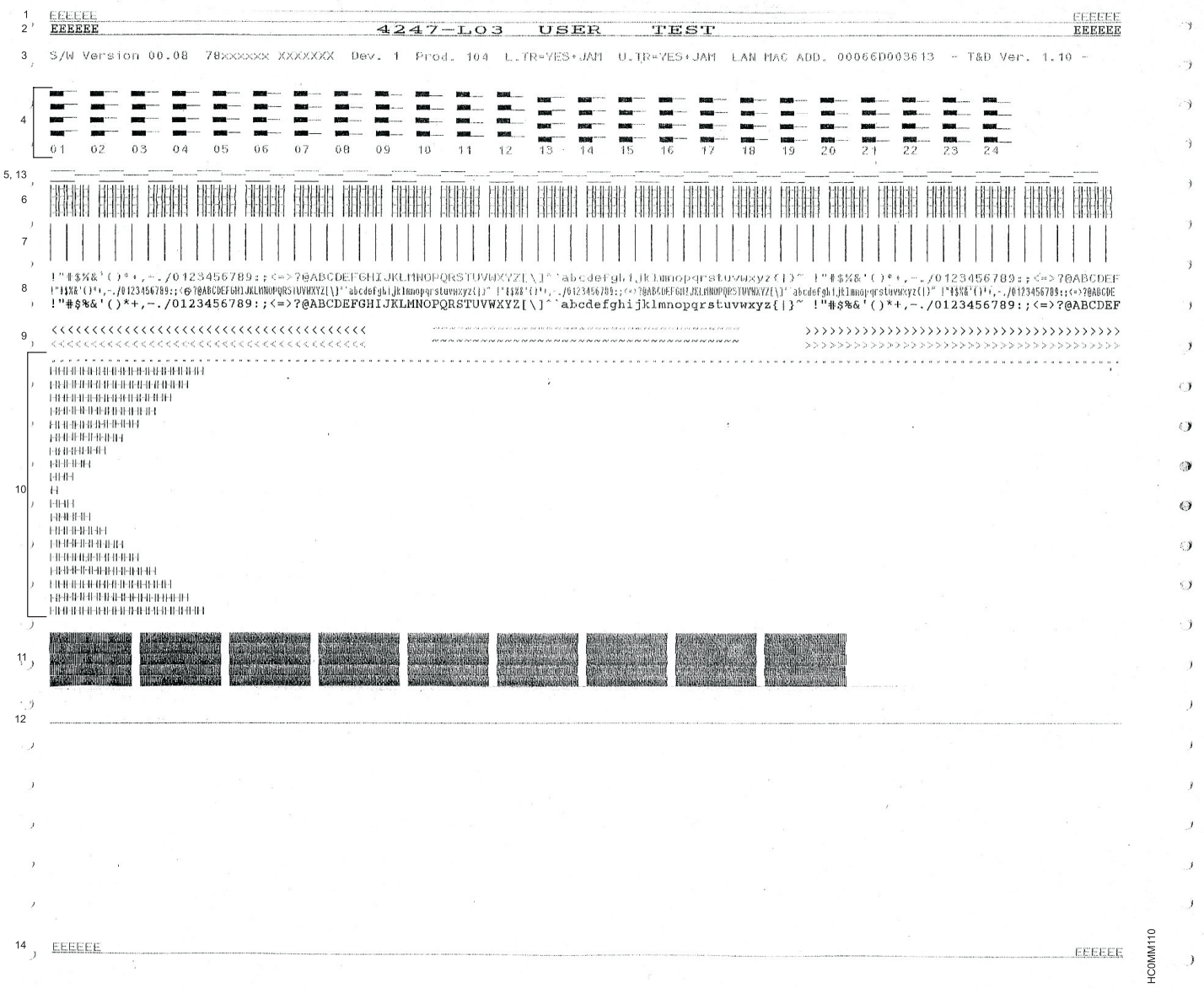
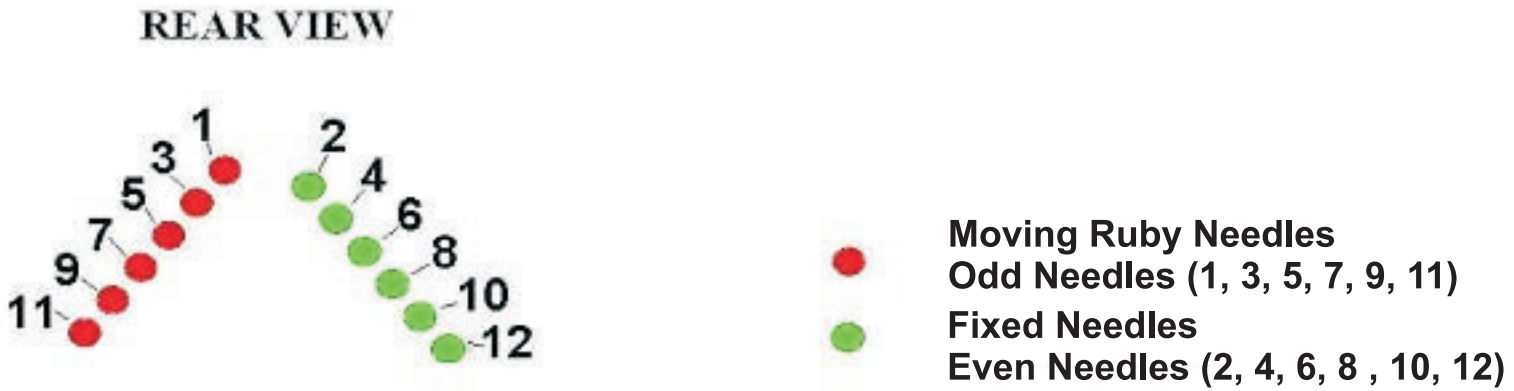


Figure 70. Printout Standard Module

Notes:

1. T&D14 Fanfold Forms Printout - Needles 1 to 12 (upper side of the printhead):
   Blocks are printed with needles 1 to 12, lines are printed with needles 1 to 12 (one at a time).

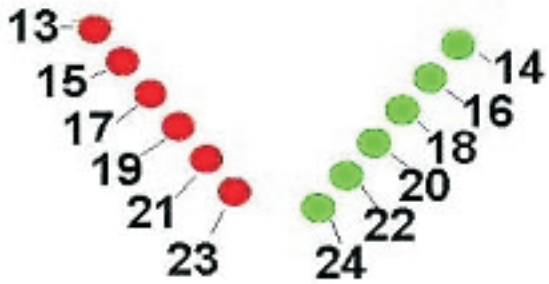
HC0MM123



2. T&D14 Fanfold Forms Printout - Needles 13 to 24 (lower side of printhead):
   Blocks are printed with needles 13 to 24, lines are printed with needles 13 to 24 (one at a time).

HC0MM124

REAR VIEW



Moving Ruby Needles
Odd Needles (13, 15, 17, 19, 21, 23)

Fixed Needles
Even Needles (14, 16, 18, 20, 22, 24)

Chapter 7 Parts Catalog

How to use this parts catalog 249
Recommended Spare Parts List 250
Assemblies 254
Assembly 1: COVERS ASSEMBLY I 255
Assembly 2: COVERS ASSEMBLY II 257
Assembly 3: BASIC ASSEMBLY I 259
Assembly 4: BASIC ASSEMBLY II 261
Assembly 5: BASIC ASSEMBLY III 263
Assembly 6: MECHANICAL ASSEMBLY I 265
Assembly 7: MECHANICAL ASSEMBLY II 268
Assembly 8: MECHANICAL ASSEMBLY III 271
Assembly 9: LOWER TRACTOR 273
Assembly 10: UPPER TRACTOR 275
Assembly 11: PART KITS, TOOLS..... 277

How to use this parts catalog

This document 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 next page, while the detail of parts referred to their mounting position over the printer, is shown in "Assemblies" later on.

When a part number is written with remark (Misc. Kit Item xx), please refer to "Assembly 11: PART KITS" 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 N.P. is written , this part is Not Procurable.

Recommended Spare Parts List

SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
KIT MECHANICAL PARTS I	78399157-003	N.A.	N.A.
KIT MECHANICAL PARTS II	78399158-005	N.A.	N.A.
KIT PLASTIC PARTS	78399159-007	N.A.	N.A.
KIT METRIC-THREAD SCREWS	78399161-004	N.A.	N.A.
KIT SELF-TAPPING SCREWS	78399162-003	N.A.	N.A.
KIT WASHER & SEEGER	78399163-005	N.A.	N.A.
PLATEN ASSY	78399631-001	6	28
UPPER FEEDER ASSY	78399633-001	6	90
MAIN SHAFT	78399645-001	7	66
REAR BAR KIT	78399655-001	7	63
SUPPORT SPRING ASSY	78399659-004	6	7
LOWER MYLAR ASSY	78399660-003	6	149
CARRIAGE ASSY (w. MASK)	78399661-004	7	59
KIT OILFELT	78900669-001	7	201
KIT TRACTOR LEFT+RIGHT	78900690-005	9 / 10	11 / 12
LOWER FEEDER ASSY	78900701-001	6	6
OPTICAL REFLECTION SENSOR	78900706-001	6	V04
MAGNET INTERLOCK	78900708-001	2	26-A
PLATEN BELT TOOTHED	78900710-001	6	29
PAPER BELT TOOTHED	78900711-001	6	81
PULLEY	78900717-001	6	41
FRONT PULLEY	78900718-001	6	10
AGA GEAR	78900719-001	8	84
CARTRIDGE SUPPORT RIGHT	78900720-001	8	108

Table 1. Recommended Spare Parts List for Basic Printer

Recommended Spare Parts List (continued)

SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
TRACTOR GEAR BUSH	78900722-001	9 / 10	20
AGA SECTOR	78900725-001	7	82
MOVABLE GEAR	78900726-001	7	97
IDLE GEAR	78900730-001	6	45
IDLE	78900731-001	6	48
AGA INDICATOR GROUP	78900733-001	8	109
FAN SUPPORT	78900735-001	4	63
PAPER SUPPORT	78900740-001	9 / 10	13
OPERATOR PANEL CABLE	78900748-001	1	182
PRINTING POSITION MYLAR	78900749-001	3	188
DOUBLE GEAR	78900751-001	7	93
WEAR RESISTANT SPRING	78900753-001	7	144
LEFT CARTRIDGE SUPPORT	78900754-001	8	102
PIVOT ASSY	78900757-001	8	103
DUAL TRACTOR GEAR	78900761-001	6	160
PRINT HEAD MASK	78900767-001	7	35
PROT. MYLAR FOR PH CABLE	78900768-001	5	196
OPTO INTERRUPTER SENSOR	78900797-002	6	V01 / V02
KIT PULLEY ASSY	78900801-002	7	73 / 74
ALTERNANCE CABLE	78900808-001	6 / 8	114
CARRIAGE BELT	78900813-001	7	60
CARRIAGE FAN ASSY	78900815-001	4	65
BASE ASSY	78900816-002	3	177
PRINT HEAD CABLE 24	78900823-001	5	181
FAN ASSY	78900824-001	4	64
BAIL ASSY	78900919-001	6	101
TRACTOR GEAR	78900924-001	9 / 10	21
PULLEY BRACKET ASSY	78900929-001	7	70 / 72 /117

Recommended Spare Parts List (continued)

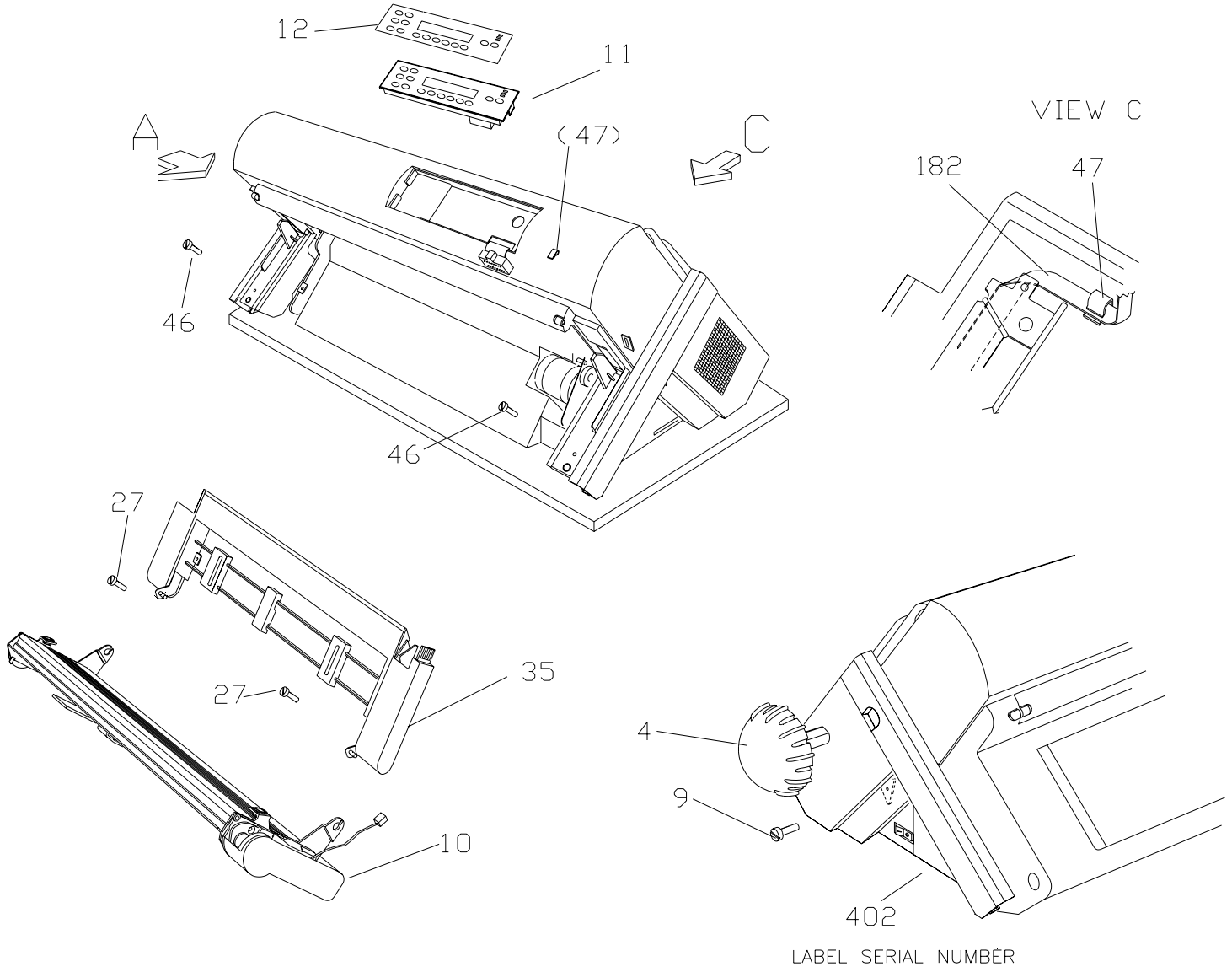
SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
RIBBON MOTOR ASSY	79900715-001	8	105
TRACTOR MOTOR ASSY	79900723-001	9 / 10	14
AGA MOTOR ASSY	79900727-001	8	86
PWA 2TRTUP	79900729-001	10	70A
PWA GX2INT	79900746-001	2	75
CARRIAGE MOTOR ASSY	79900827-001	7	79
POWER SUPPLY UNIVERSAL (110-240)	79900901-003	4	24
PWA 2TR4PS	79900925-001	9	32
4247-L03 MEMBRANE	78902560-001	1	12
ASF COVER BLACK	78902504-001	2	7
REAR TRACTOR COVER BLACK	78902505-001	2	8
FIXED TRACTOR COVER RIGHT BLACK	78902506-001	9	36
REM. TRACTOR COVER RIGHT BLACK	78902507-001	10	36
TRACTOR ASSY LEFT COVER BLACK	78902508-001	9 / 10	35
DEFLECTOR BLACK	78902509-001	2	69
RIGHT GEAR COVER BLACK	78902510-001	2	38
LEFT GEAR COVER BLACK	78902511-001	2	6
REAR COVER BLACK	78902512-001	2	3
HAND GRIP BLACK	78902513-001	1	4
TOP COVER ASSY BLACK	78902514-001	2	26
FRONT CABINET BLACK	78902515-001	2	2
LOWER (FIX.) TRACTOR ASSY	78902516-001	1	25
UPPER (REM.) TRACTOR ASSY	78902517-001	1	10
CONNECTOR COVER BLACK	78902518-001	9	37
ENGINE BOARD	78902519-001	4	25
PAPER MOTOR ASSY	78902520-001	6	43
INTERFACE SLOT ASSY	78902521-001	4	108

Recommended Spare Parts List (continued)

SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
SENSOR CABLE ASSY	78902522-001	5	19
PRINT HEAD ER24 C+	78902523-001	5	60
2A9CBP BOARD	78902524-001	4	110
OPERATOR PANEL ASSY (without membrane)	78902563-001	1	11
CONTROLLER ASSY (PAR/SER/USB)	78902566-001	4	115
CONTROLLER ASSY (PAR/LAN/USB)	78902567-001	4	115

Assemblies

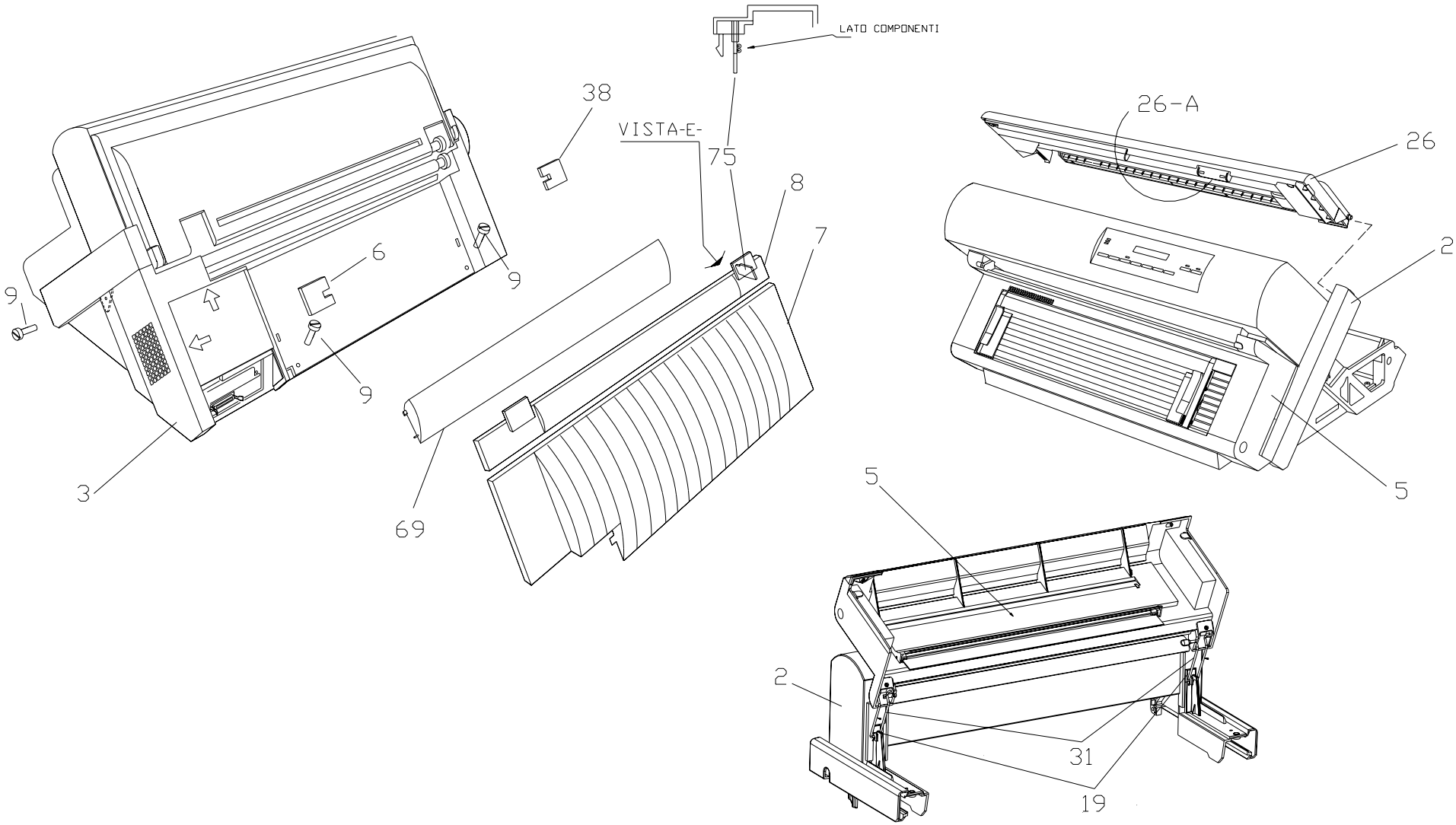
Assembly 1 : COVER ASSEMBLY I



Assembly 1 (continued)

Asm-Index	Part Number	Units	Description
1-4	78902513-001	1	Hand grip
-9	78399162-003	2	Screw 3.9x16 (misc. Kit Item 17)
-10	78902517-001	1	Upper Tractor Assembly 4 pin (Opt.)
-11	78902563-001	1	Operator Panel Assembly (14 keys)
-12	78902560-001	1	9065 O.P. Overlay
-12	78902503-001	1	9065N O.P. Overlay
-27	78399161-004		Screw M3x8 (misc. Kit Item .15)
-35	78902516-001	1	Lower Tractor Assembly 4 pin
-46	78399162-003	2	Screw T.C.I.C 3.9x25 (misc. Kit Item 18)
-47	N.P.	1	Clamp for Cable
-182	78900748-001	1	Operator Panel Cable

Assembly 2 : COVER ASSEMBLY II



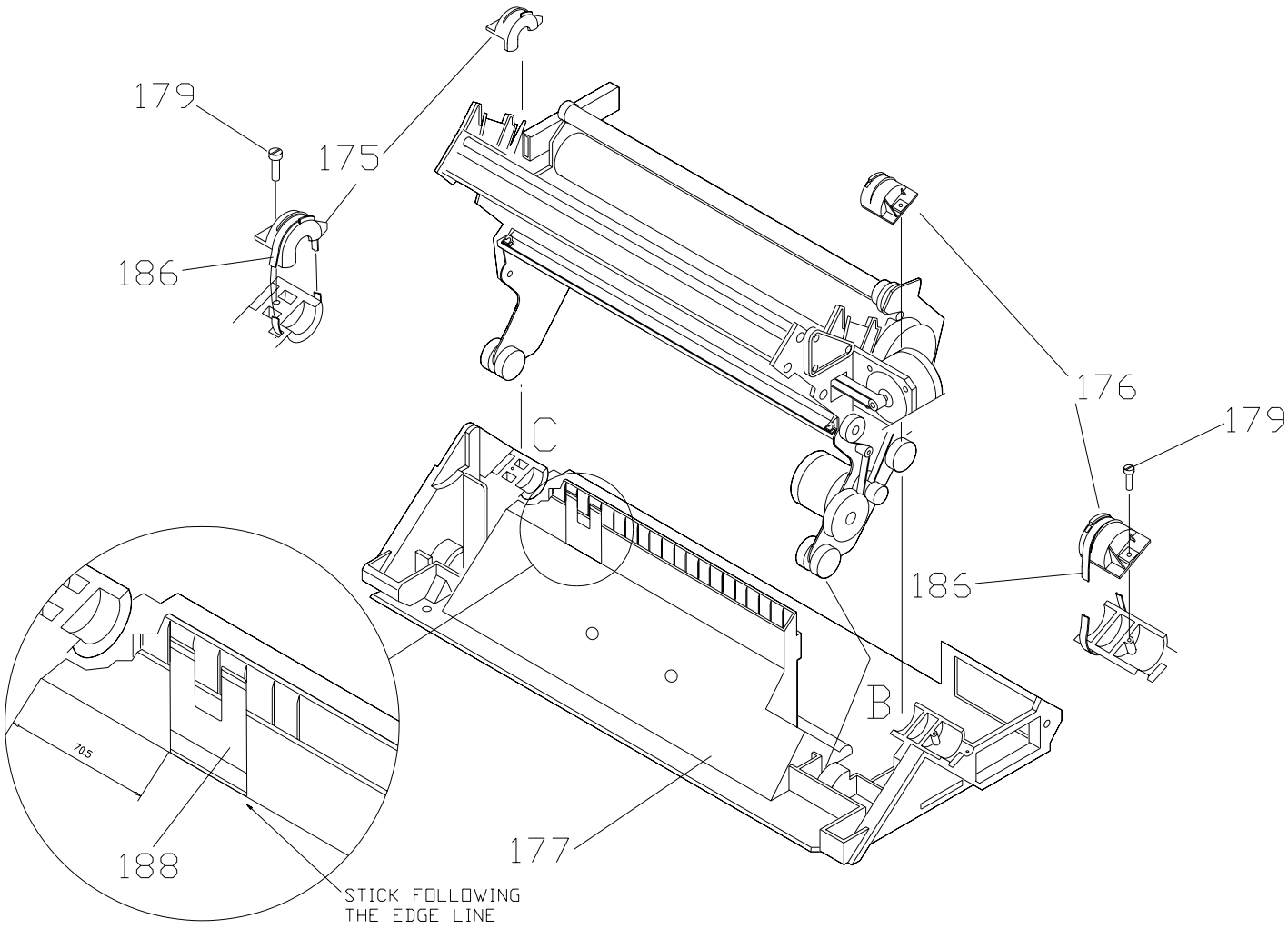
Assembly 2 (continued)

Asm-Index	Part Number	Units	Description
2-2	78902515-001	1	Main Cover Group (note 1)
-3	78902512-001	1	Rear Cover Group
-5	78902515-001	1	Front Cover Group (note 1)
-6	78902511-001	1	Gear Cover Left
-7	78902504-001	1	ASF Cover Group
-8	78902505-001	1	Rear Tractor Cover
-9	78399162-003	4	Screw 3.9x13 (misc. Kit Item 17)
-19	78902515-001	2	Bracket (note 1)
-26	78902514-001	1	Top Cover Group
-26A	78900708-001	1	Magnet Interlock (note 2)
-26B	N.P.	2	Magnet Circuit (note 2)
-31	78902515-001	2	Slide (note 1)
-38	78902510-001	1	Gear Cover Right
-69	78902509-001	1	Rear Deflector
-75	79900746-001	1	PWA GX2INT Board

Notes:

1) The Front Cover Assy is composed by the item 2, 5, 19, 31 assembled together.
2) The Top Cover Assy is composed by the item 26, 26A and 26B assembled together.

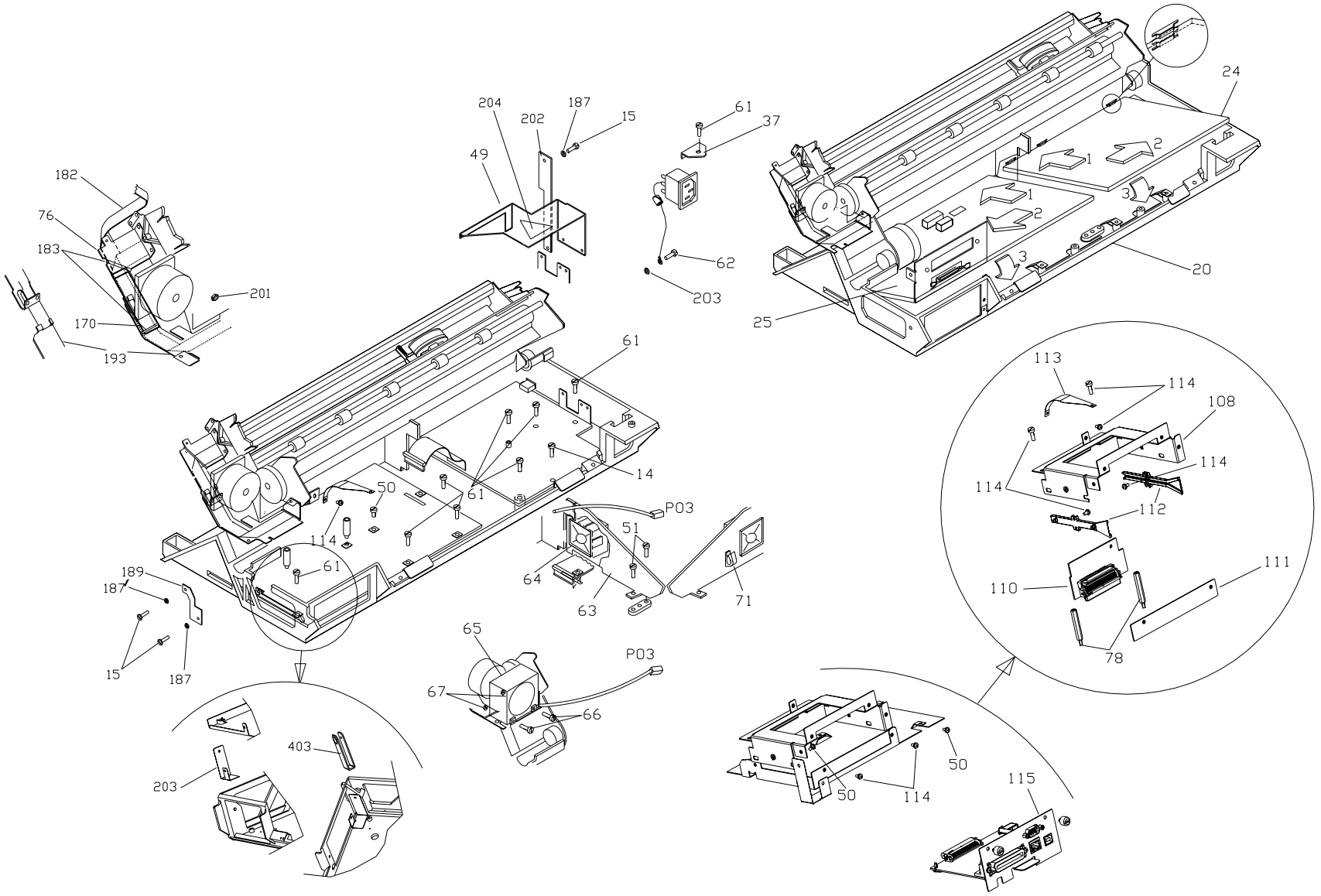
Assembly 3 : BASIC ASSEMBLY I



Assembly 3 (continued)

Asm-Index	Part Number	Units	Description
3-175	78399157-007	1	Mechanical Block (misc. Kit Item 1)
-176	78399157-007	1	Mechanical Block 1 (misc. Kit Item 2)
-177	78900816-002	1	Base Assembly
-179	78399162-003	2	Screw 3.9x16 (misc. Kit Item 17)
-186	78399159-007	2	Fastener Loop Self-Lock (misc. Kit Item 12)
-188	78900749-001	1	Paper Position Mylar

Assembly 4 : BASIC ASSEMBLY II



Assembly 4 (continued)

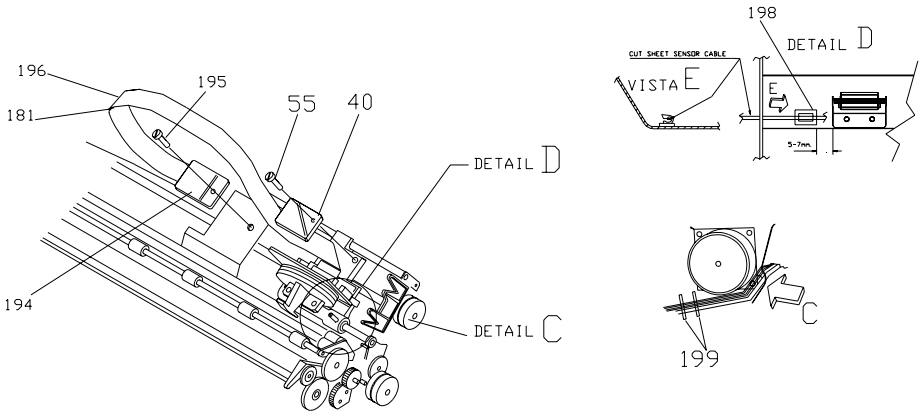
Asm-Index	Part Number	Units	Description
4-14	78399161-004	1	Screw M3x6 (misc. Kit Item 1)
-15	78399161-004	2	Screw M3x4 (misc. Kit item 3)
-20	78900816-002	1	Base Assembly
-24	79900901-003	1	Power Supply 120-240V
-25	78902519-001	1	Engine Board
-37	N.P.	1	Inlet
-49	N.P.	1	Power Supply Cover
-50	78399161-004	5	Screw M3x8 (misc. Kit Item 5)
-51	78399162-003	2	Screw 2.2x9.5 (misc. Kit Item 8)
-61	78399162-003	10	Screw 2.9x9.5 (misc. Kit Item 13)
-62	78399161-004	1	Screw M4x6 (misc. Kit item 11)
-63	78900735-001	1	Fan Support
-64	78900824-001	1	Fan Assembly
-65	78900815-001	1	Carriage Fan Assembly
-66	78399161-004	2	Screw M3x30 (misc. Kit Item 21)
-67	78399163-005	2	Nut M3 (misc. Kit item 17)
-71	78399158-005	1	Cable Clamp (misc. Kit Item 12)

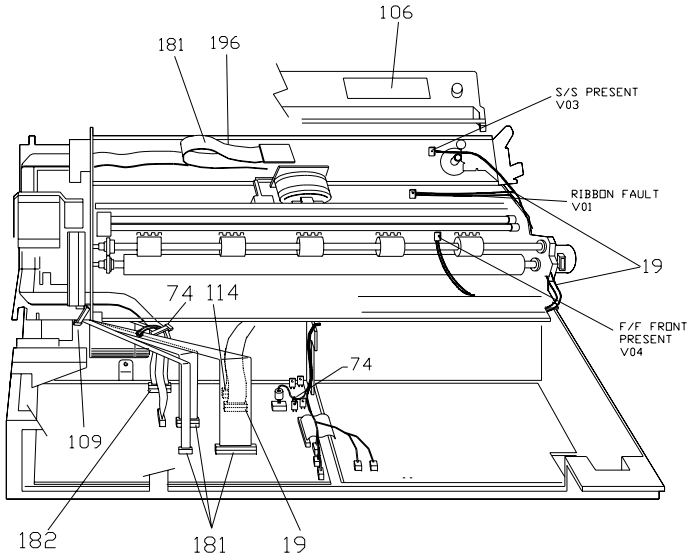
Asm-Index	Part Number	Units	Description
-76	N.P.	1	Carriage Motor Support
-78	N.P.	2	Support
-108	78902521-001	1	Slot Assembly (note 1)
-110	78902524-001	1	Back Panel Board
-113	N.P.	1	Ground Strip
-114	78399161-004	6	Screw M3x6 (misc. Kit Item 13)
-115	78902566-001	1	Controller Parallel,Serial, USB2.0 (note 2)
-115	78902567-001	1	Controller Par. Ethernet 10/100, (note 2)
-170	N.P.	1	Protection Mylar
-182	78900748-001	1	O.P. Cable
-183	78399159-007	2	Fastener Loop Self-Lock (misc. Kit Item 13)
-187	78399163-005	3	Washer Split D 3.2 (misc. Kit Item 26)
-189	N.P.	1	Ground Strip
-193	N.P.	1	Bracket group
-201	78399163-005	1	Nut M3 (misc. Kit Item 17)
-202	N.P.	1	Ground Strip
-203	N.P.	1	Ground Strip
-204	N.P.	1	Warning Label
-403	N.P.	1	Grounding plate

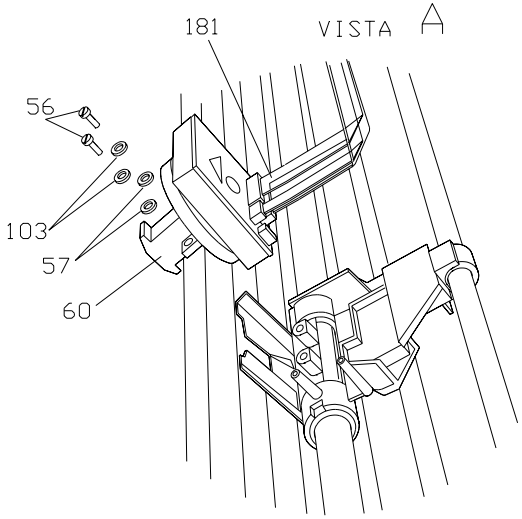
Notes:

1. The Interface Slot Assy is composed by the item 108, 112 assembled together.

Assembly 5 : BASIC ASSEMBLY III







Assembly 5 (continued)

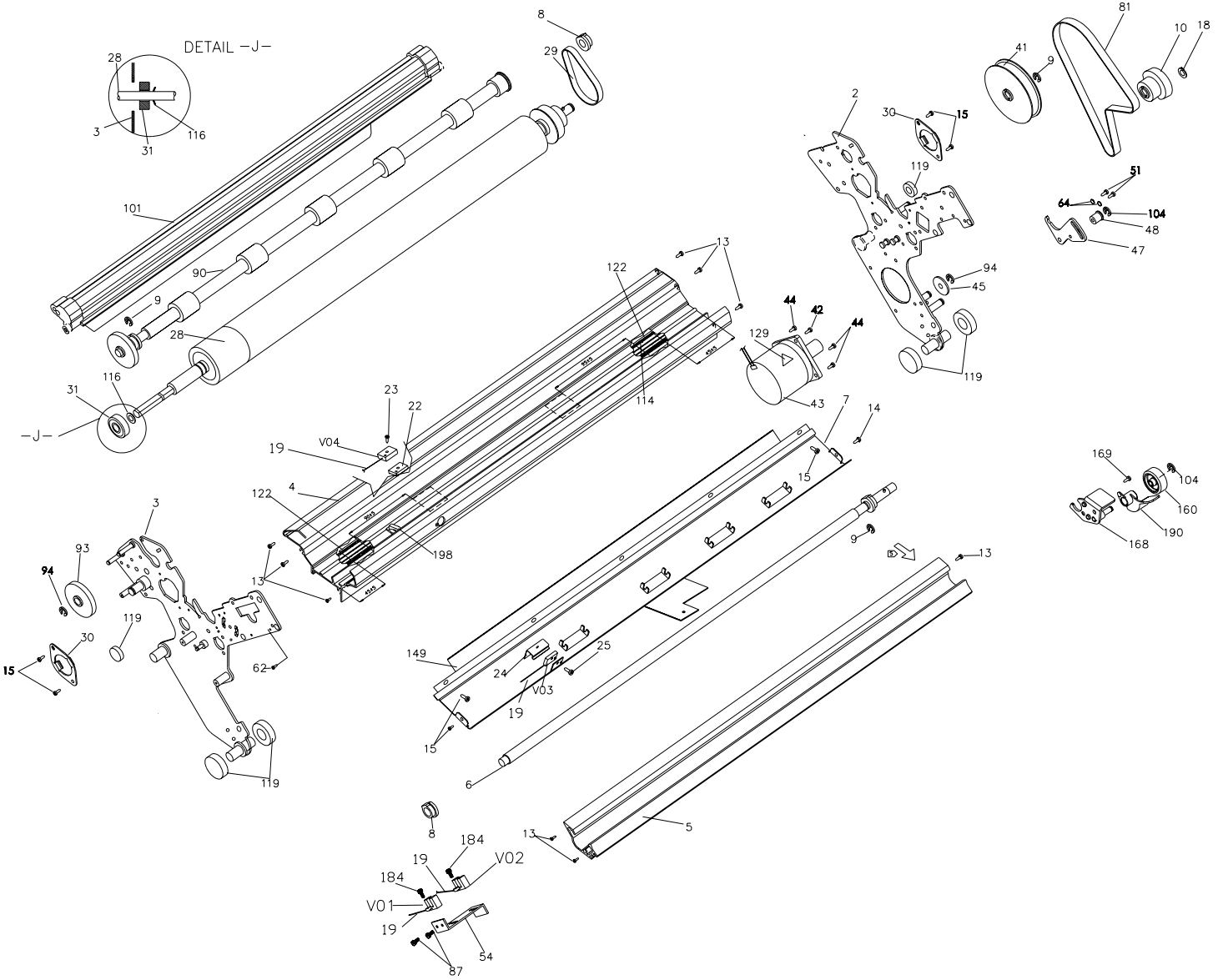
Asm-Index	Part Number	Units	Description
5-19	78902522-001	1	Sensors Cable Assembly
-40	N.P.	1	P.H. Bracket
-55	78399161-004	1	Screw M4x8 (misc. Kit Item 10)
-56	78399161-004	2	Screw M4x14 (misc. Kit Item 2)
-57	79399163-005	2	Washer (misc. Kit Item 8)
-60	78902523-001	1	Print Head ER18MR C+
-74	78399159-007	2	Fastener Loop Self-Lock (misc. Kit Item 13)
-103	78399163-005	2	Washer Internal Teeth (misc. Kit Item 25)
-106	PRKN407-1	1	Ribbon Cartridge (note 1)
-109	78399159-007	1	Fastener Loop Self-Lock (misc. Kit Item 16)

Asm-Index	Part Number	Units	Description
-114	78900808-001	1	Alternance Cable
-181	78900823-001	1	P.H. Cable 24 (3 cables)
-182	78900748-001	1	O.P. Cable
-194	N.P.	1	Frame Bracket
-195	78399161-004	2	Screw M4x6 Flat Head (note 1 misc. Kit Item 23)
-196	78900768-001	1	Prot. Mylar for PH Cable
-198	78399158-005	1	Cable Clamp (misc. Kit Item 13)
-199	N.P.	2	Fastener Loop-Self-Lock

Notes:

1. The Ribbon Cartridge is a Consumable part.

Assembly 6 : MECHANICAL ASSEMBLY I



Assembly 6 (continued)

Asm-Index	Part Number	Units	Description
6-2	N.P.	1	Right Frame
-3	N.P.	1	Left Frame
-4	N.P.	1	Base Frame
-5	N.P.	1	Guide Assembly
-6	78900701-001	1	Lower Feeder Assembly (note 1)
-7	78399659-004	1	Support Spring Assembly
-8	78399157-003	2	Bush (misc. Kit Item 8)
-9	78399163-005	3	Ring Benzing D. 7 (misc. Kit Item 6)
-10	78900718-001	1	Front Pulley
-13	78399162-003	9	Screw 3.5x13 (misc. Kit Item 1)
-14	78399161-004	1	Screw M3x6 (misc. Kit Item 1)
-15	78399161-004	6	Screw M3x4 (misc. Kit Item 3)
-18	78399162-003	1	Ring Ret. D.8 (misc. Kit Item 7)
-22	78399157-007	1	Spacer (misc. Kit Item 3)
-23	78399162-003	1	Screw 2.2x9.5 (misc. Kit Item 4)
-24	78399158-005	1	Sensor Plate (misc. Kit Item 5)
-25	78399161-004	1	Screw M2x8 (misc. Kit Item 4)

Asm-Index	Part Number	Units	Description
-28	78399631-001	1	Platen Assembly
-29	78900710-001	1	Platen Belt Toothed
-30	78399158-005	2	Bearing Retainer (misc. Kit Item 5)
-31	78399157-003	1	Bearing (misc. Kit Item 10)
-41	78900717-001	1	Pulley
-42	78399161-004	2	Screw M3x8 (misc. Kit Item 7)
-43	78902520-001	1	Paper Motor Assembly
-44	78399161-004	2	Screw M3x10 (misc. Kit Item 8)
-45	78900730-001	1	Idle Gear
-47	N.P.	1	Paper Belt Tension Lev.
-48	78900731-001	1	Idle
-51	78399161-004	1	Screw M4x6 (misc. Kit Item 9)
-54	N.P.	1	Home Sensor Support
-19	78902522-001	1	Sensor Cable Assy

Assembly 6 (continued)

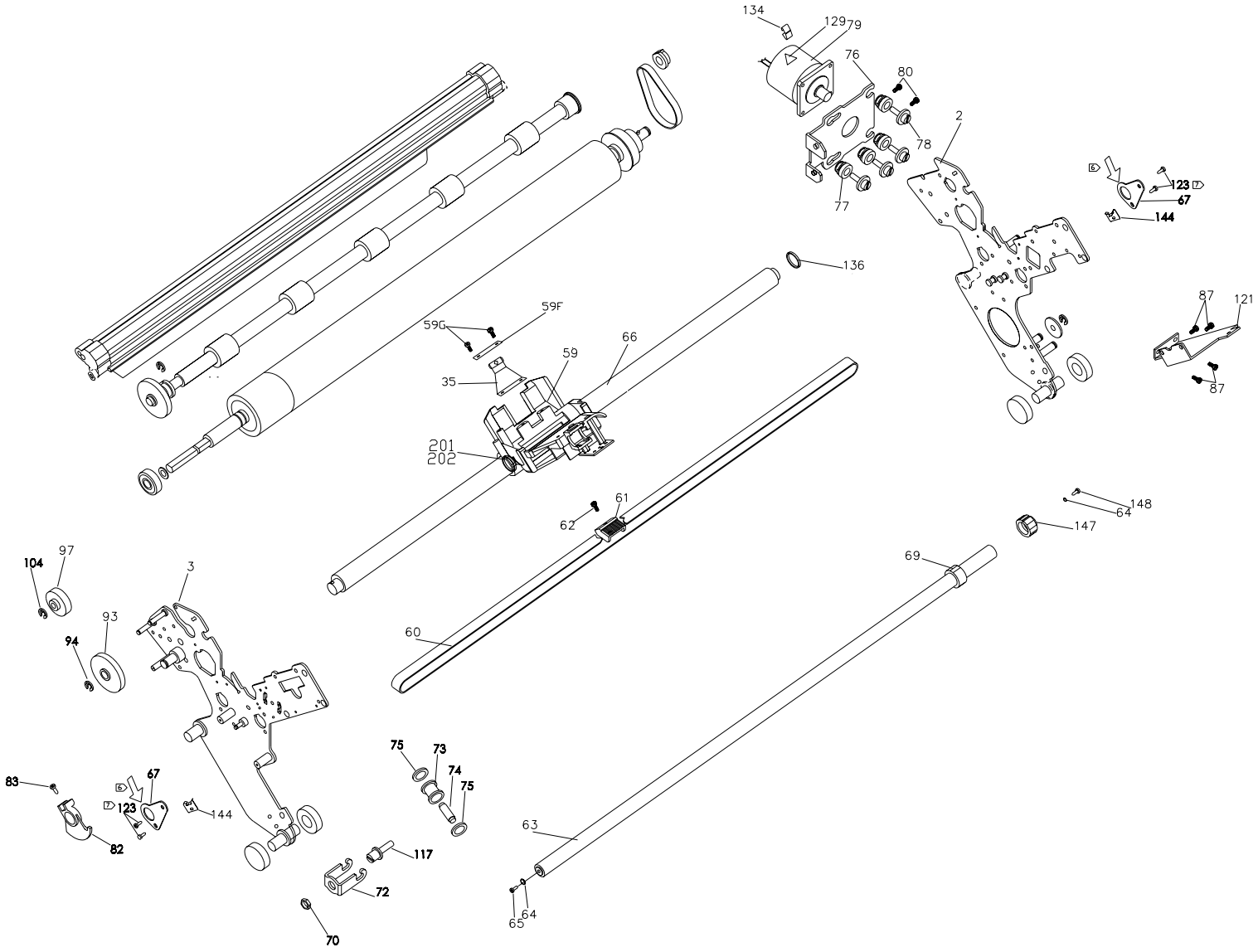
Asm-Index	Part Number	Units	Description
-81	78900711-001	1	Paper Belt Toothed
-87	78399161-004	3	Screw M3x6 (misc. Kit Item 13)
-90	78399633-001	1	Upper Feeder Assembly
-93	78900751-001	1	Double Gear
-94	78399163-005	1	Ring Benzing D.6 (misc. Kit item 5)
-101	78900919-001	1	Bail Assembly
-104	78399163-005	1	Ring Benzing D.4 (misc. Kit Item 3)
-114	78900808-001	1	Alternance Cable
-116	78399163-005	2	Thrust Washer (misc. Kit Item 11)
-119	78399158-005	6	Vibrodamp (misc. Kit Item 1)
-122	78399158-005	2	Cable Clamp (misc. Kit Item 11)

Asm-Index	Part Number	Units	Description
-149	78399660-003	1	Lower Mylar A.ssy
-160	78900761-001	1	Dual Tractor Gear
-168	N.P.	1	Bracket Pulley Pivot
-169	78399162-003	1	Screw 3.5x19 (misc. Kit Item 17)
-184	78399161-004	1	Screw M3x6 (misc. Kit Item 13)
-190	N.P.	1	Gear Protection (misc. Kit Item 3)
-198	78399158-005	2	Cable Clamp (misc. Kit Item 13)
V01	78900706-001	1	V01 Opto Interrupter (note 2)
V02	78900706-001	1	V02 Opto Interrupter (note 2)
V03	78900797-002	1	V03 Reflective Sensor (note 2)
V04	78900797-002	1	V04 Reflective Sensor (note 2)

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 also included in the Sensors Cable Assembly (item19).

Asssembly 7 : MECHANICAL ASSEMBLY II



Assembly 7 (continued)

Asm-Index	Part Number	Units	Description
7-2	N.P.	1	Right Frame
-3	N.P.	1	Left Frame
-35	78900767-001	1	Ribbon Mask
-59	78399661-004	1	Carriage Assembly (note 1)
-59F	78399661-004	1	Mask Plate (note 1)
-59G	78399162-003	2	Screw M 2.5x4 (note 1 misc. Kit Item 11)
-60	78900813-001	1	Carriage Belt Toothed
-61	78399159-007	1	Belt Bracket (note 1 misc. Kit Item 6)
-62	78399162-003	1	Screw 2.9x13 (note 1 misc. Kit Item 9)
-63	78399655-001	1	Rear Bar (note 2)

Asm-Index	Part Number	Units	Description
-64	78399163-005	2	Washer (misc. Kit Item 8)
-65	78399161-004	1	Screw M4x8 (misc. Kit Item 10)
-66	78399645-001	1	Main Shaft
-67	78399158-005	2	Shaft Retainer (misc. Kit Item 8)
-69	78399157-003	1	Carriage Bush (Note 1 misc. Kit Item 13)
-70	78900929-001	1	Nut hexagonal M5
-72	78900929-001	1	(note 5 misc. Kit Item 18)
-73	78900801-002	1	Loose Pulley Support (note 5)
-74	78900801-002	1	Pulley Assembly (note 4)
-75	78399159-007	2	Pivot (note 4 misc. Kit It. 10)
-76	N.P.	1	Spacer (misc. Kit Item 9)
-77	78399158-005	4	Carriage Motor Support Motor Damp (misc. Kit Item 3)
-78	78399158-005	4	Stud (misc. Kit Item 9)
-79	79900827-001	1	Carriage Motor As.y
-80	78399161-004	2	Screw M4x6 (misc. Kit Item 11)

Assembly 7 (continued)

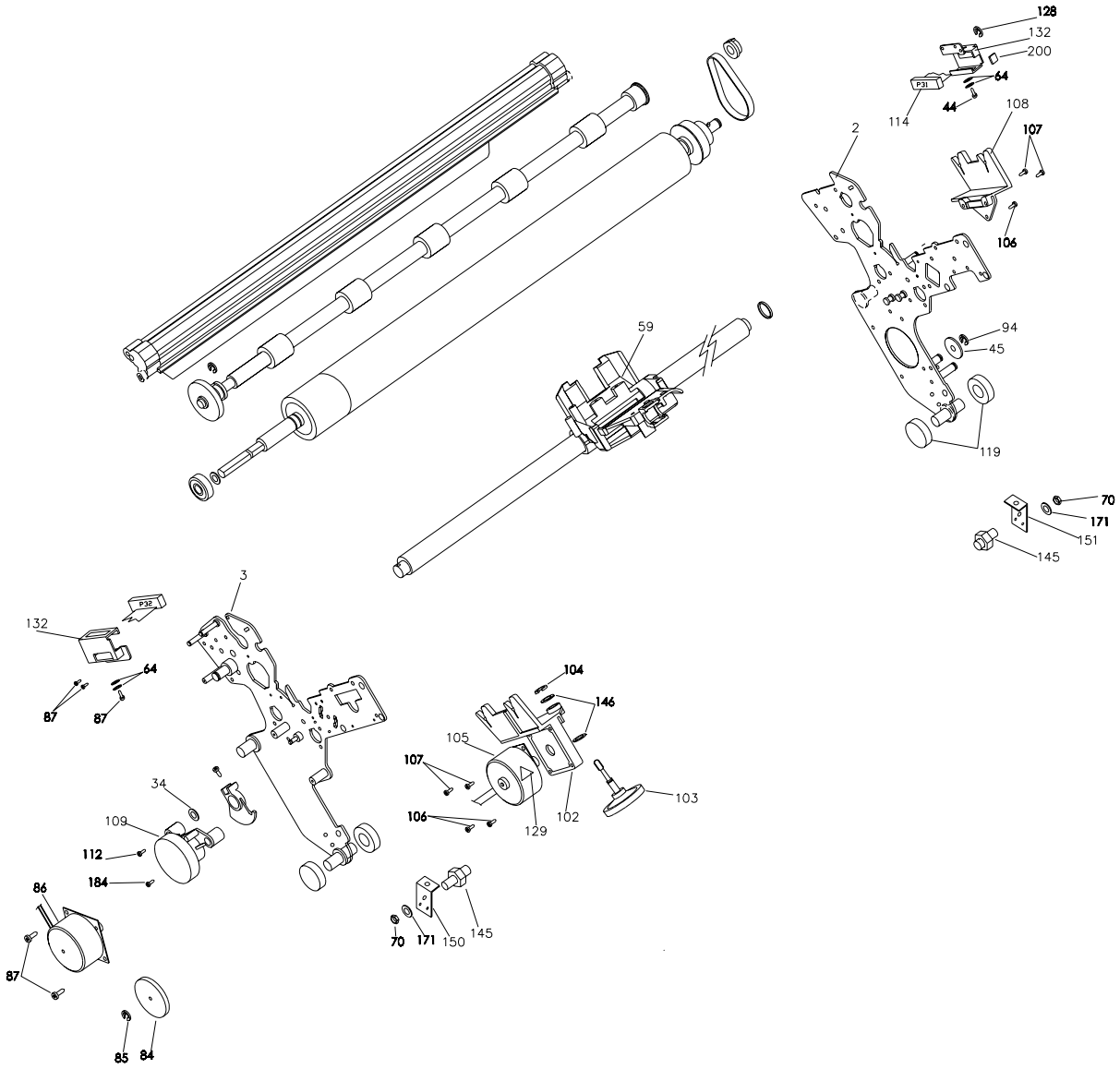
Asm-Index	Part Number	Units	Description
-82	78900725-001	1	AGA Sector
-83	78399161-004	1	AGA Stud
			(misc. Kit Item 22)
-87	78399161-004	4	Screw M3x6
			(misc. Kit Item 13)
-93	78900751-001	1	Double Gear
-94	78399163-005	1	Ring D.6
			(misc. Kit Item 5)
-97	78900726-001	1	Movable Gear
-104	78399163-005	1	Ring Benzing D.4
			(misc. Kit Item 3)
-117	78900929-001	1	Loose Pivot
			(note 5)
-121	78399158-005	1	Clamp 79
		1	(misc. Kit item 15)
-129	N.P.	4	Thermal Label
-123	78399161-004		Screw M3x4
			(misc. Kit Item 16)

Asm-Index	Part Number	Units	Description
-134	N.P.	1	Finger Soft Grounding
-136	78399159-007	1	O-Ring
			(misc. Kit Item 15)
-144	78900753-001	2	Wear Resistant Spring
			(misc. Kit Item 12)
-147	78399655-001	1	Eccentric Bushing
			(note 2)
-148	78399655-001	1	Screw M4x12
			(note 2)
-201	78900669-001	2	Olifelt
			(note 3)
-202	78399661-004	2	Flange
			(note 1)

Notes:

1. Carriage Assembly (item 59) includes item 59F-59G. Also pre-assembled on the carriage, two bushing, two oiled felts (item 201), two flanges (item 202), the carriage bush (item 69), the belt bracket (item 61), the relative screw (item 62) and the Ribon Mask (item 35).
2. Rear Bar Kit includes item 63, 147 and 148.
3. A set of # 2 pre-oiled oilfet i(item 201) s available as separate spare part
4. The pulley assembly item 73 and the pivot item 74 are included in the same spare part.
5. The Pulley bracket assy is composed by the item 70. 72,117.

Assembly 8 : MECHANICAL ASSEMBLY III

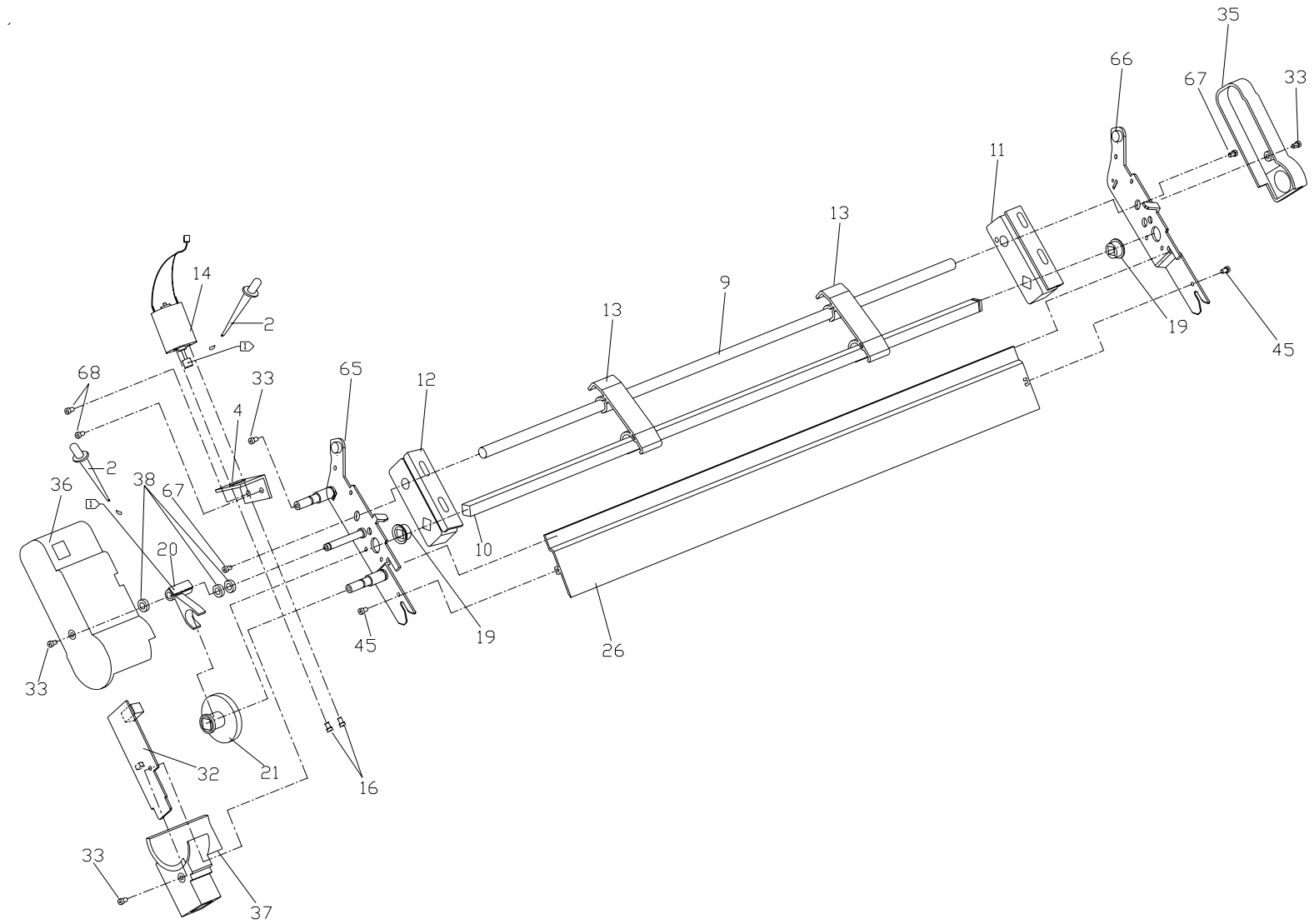


Assembly 8 (continued)

Asm-Index	Part Number	Units	Description
8-2	N.P.	1	Right Frame
-3	N.P.	1	Left Frame
-34	78399158-005	1	Spacer
			(misc. Kit Item 16)
-44	78399161-004	1	Screw M3x10
			(misc. Kit Item 8)
-64	78399163-005	1	Washer
			(misc. Kit Item 8)
-70	78399163-005	2	Nut Hexagonal M5
			(misc. Kit Item 18)
-84	78900719-001	1	AGA Gear
-85	78399163-005	1	Ring D.2.3
			(misc. Kit Item 1)
-86	79900727-001	1	AGA Motor Assembly
-87	78399161-004	5	Screw M3x6
			(misc. Kit Item 13)
-102	78900754-001	1	Left Cartridge Support Assy
-103	78900757-001	1	Pivot Assembly
-104	78399163-005	1	Ring Benzing D.4
			(misc. Kit Item 3)
-105	79900715-001	1	Ribbon Motor Assembly
-106	78399161-004	2	Screw M3x14
			(misc. Kit Item 14)

Asm-Index	Part Number	Units	Description
-107	78399162-003	4	Screw 2.9.x19
			(misc. Kit Item 10)
-108	78900720-001	1	Right Cartridge Support
-109	78900733-001	1	AGA Indicator Group
-112	78399161-004	2	Screw M3x8
			(misc. Kit Item 15)
-114	78900808-001	2	Alternance Cable Assy
-128	78399163-005	1	Washer D.3
			(misc. Kit Item 15)
-129	N.P.	1	Warning Label
-132	N.P.	1	Tractor Cable Connector
-145	78399163-005	2	Plate
			Pivot Mech.
-146	78399163-005	1	(misc. Kit Item 27)
			Washer 60D
-150	N.P.	1	(misc. Kit Item 26)
-151	N.P.	1	Tractor Sup.Bracket R.
-171	78399163-005	2	Tractor Sup. Bracket L.
			Washer Lock D5.3
-184	78399161-004	1	(misc. Kit Item 28)
			Screw M3x6
-200	N.P.	1	(misc. Kit Item 17)
			Foam Strip

Assembly 9 : LOWER TRACTOR ASSEMBLY



Assembly 9 (continued)

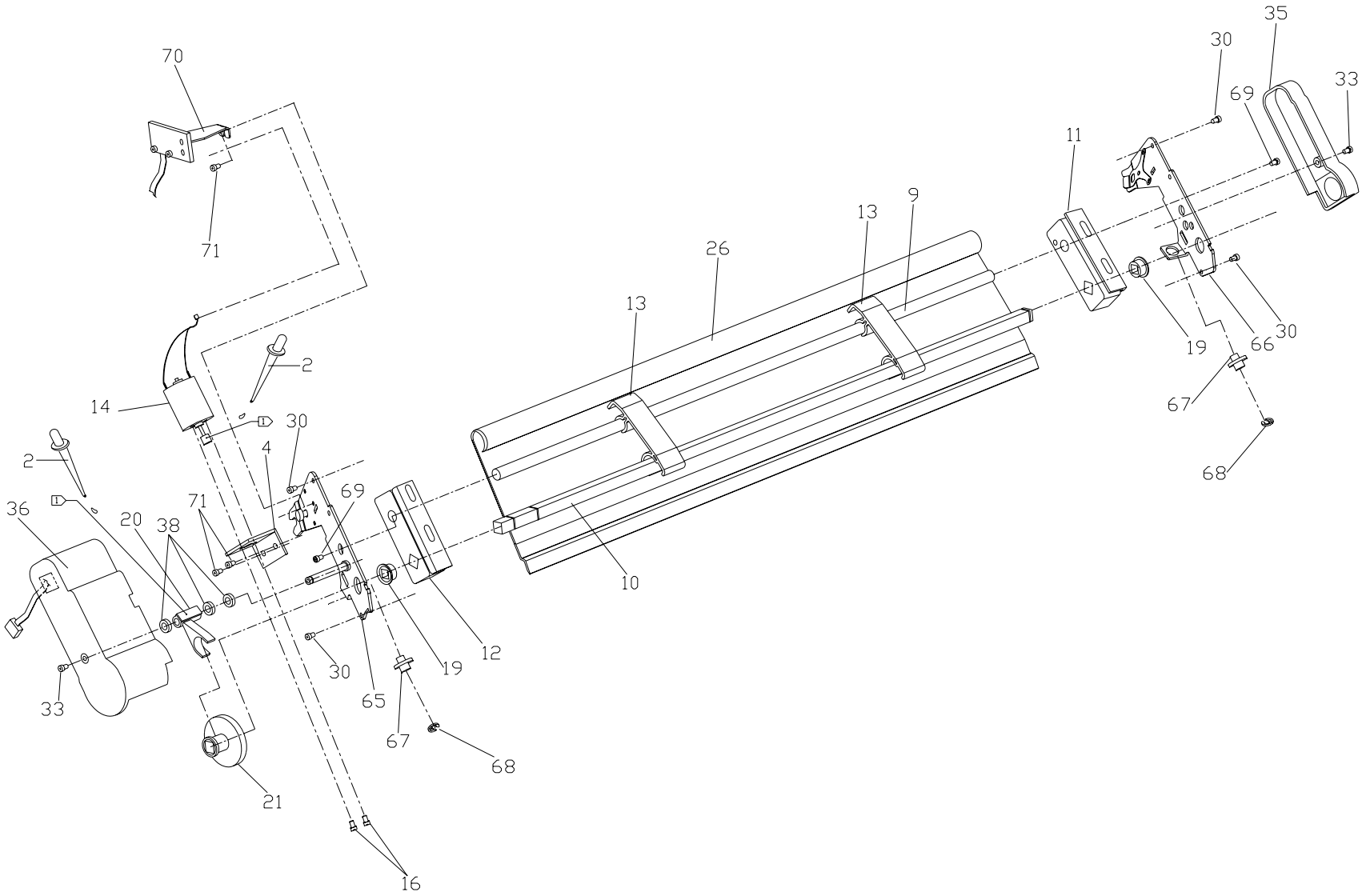
Asm-Index	Part Number	Units	Description
9-Assy	78902516-001	1	Lower Tractor Assy
-4	N.P.	1	Motor Support
-9	N.P.	1	Tractor Spacer
-10	N.P.		Tractor Bar
-11	78900690-005	1	Tractor Paper Left
		1	(note 1)
-12	78900690-005	1	Tractor Paper Right
			(note 1)
-13	78900740-001	2	Paper Support
-14	79900723-001	1	T/F Motor Assembly
-16	N.P.	2	Special Screw
-19	78399157-003	2	Bush
			(Misc. Kit item 7)
-20	78900722-001	1	Tractor Gear Bush
-21	78900924-001	1	Tractor Gear
-26	N.P.	1	Tractor Profile
-32	79900925-001	1	PWA 2TR4PS
-33	78399161-004	4	Screw M3x6
			(misc. Kit item 17)
-35	78902508-001	1	Tractor Left Cover Black
-36	78902506-001	1	Fix. Tractor Right Cover Bl.
-37	78902518-001	1	Connector Cover Black

Asm-Index	Part Number	Units	Description
-38	78399159-007	3	O-Ring
			(Misc. Kit item 14)
-45	78399162-003	2	Screw 2.9x9.5
			(Misc. Kit item 12)
-64	78399161-004	2	Screw M4x8
			(Misc. Kit item 10)
-65	N.P.	1	Right Lower Support
-66	N.P.	1	Left Lower Support
-67	78399161-004	2	Screw M4x8
			(Misc. Kit Item 19)
-68	78399161-004	2	Screw M3x6
			(Misc. Kit item 13)

Notes:

1. The Left and Right tractor are included in a single spare part.

Assembly 10 : UPPER TRACTOR ASSEMBLY



Assembly 10 (continued)

Asm-Index	Part Number	Units	Description
9-Assy	78902517-001	1	Lower Tractor Assy
-4	N.P.	1	Motor Support
-9	N.P.	1	Tractor Spacer
-10	N.P.		Tractor Bar
-11	78900690-005	1	Tractor Paper Left
		1	(note 1)
-12	78900690-005	1	Tractor Paper Right
			(note 1)
-13	78900740-001	2	Paper Support
-14	79900723-001	1	T/F Motor Assembly
-16	N.P.	2	Special Screw
-19	78399157-003	2	Bush
			(Misc. Kit item 7)
-20	78900722-001	1	Tractor Gear Bush
-21	78900924-001	1	Tractor Gear
-26	N.P.	1	Tractor Profile
-30	78399162-003	4	Screw 3.5x13
			(Misc. Kit item 16)
-33	78399161-004	4	Screw M3x6
			(misc. Kit item 17)
-35	78902508-001	1	Tractor Left Cover Black
-36	78902507-001	1	Rem.. Tractor Right Cover Bl.

Asm-Index	Part Number	Units	Description
-38	78399159-007	3	O-Ring
			(Misc. Kit item 14)
-65	N.P.	1	Right Lower Support
-66	N.P.	1	Left Lower Support
-67	N.P.	2	Magnet Assy
-68	N.P.	2	Seeger D.10
-69	78399161-004	2	Screw M4x8
			(Misc. Kit Item 19)
-70A	79900729-001	1	2TRTUP Board
-71	78399161-004	1	Screw M3x6
			(Misc. Kit item 13)

Notes:

1. The Left and Right tractor are included in a single spare part.

Assembly 11 Parts Kits, Tools

Asm-Index	Part Number	Units	Description
11-	78399157-003		KIT MECHANICAL I
-1		1	Spring 3
-2		2	Spring
-3		2	Spring
-6		2	Spring
-7		1	Bush
-8		2	Bush 20
-9		2	Bush Sint.
-10		1	Bearing
-11		1	Pivot
-12		1	Roller Sprinr
-13		1	Bush-700

Assembly 11 Parts Kits, Tools

Asm-Index	Part Number	Units	Description
11-	78399158-005		KIT MECHANICAL II
-1		1	Vibrodamp
-2		2	Damper VGA
-3		2	Latch Magnetic
-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 Ratainer 2
-11		1	Spacer ST
-12		2	Clamp for Cable
-13		1	Clamp for Cable
-14		1	Clamp 79
-15		1	Spacer

Assembly 11 (continued)

Asm-Index	Part Number	Units	Description
11-	78399159-007		KIT PLASTIC PARTS
-1		1	Mechanical Block
-2		1	Mechanical Block 1
-4		1	Spacer
-5		1	Support Sensor
-6		1	Belt Bracket
-7		1	Slide
-8		2	Bush
-9		2	Spacer
-10		1	Spacer
-11		2	Bushing
-12		6	Fastener Loop Self Lock
-13		12	Fastener Loop Self Lock
-14		3	O Ring D4.48
-15		3	O Ring D 5
-16		2	Fastener Loop Self Lock
-17		2	Fastener Loop Self Lock

Assembly 11 (continued)

Asm-Index	Part Number	Units	Description
11-	78399161-004		KIT METRIC SCREWS
-1		3	Screw TSIC M3x6
-2		4	Screw TCCE M4x14
-3		3	Screw TCIC M3x4
-4		3	Screw TCIC M2x8
-5		3	Screw TCIC M3x8
-6		3	Screw TSIC M3x4
-7		3	Screw TSIC M3x8
-8		3	Screw TCIC M3x10
-9		3	Screw TCIC M4x6
-10		3	Screw TCIC M4x8
-11		3	Screw TCIC M4x6
-12		3	Screw TCCI M3x6
-13		3	Screw TCIC M3x6
-14		3	Screw TCIC M3x14
-15		3	Screw TCIC M3x8
-16		3	Screw TCIC M3x4
-17		3	Screw TCIC M3x6
-18		3	Screw TCCI M3x10
-19		3	Screw TCIC M4x8
-20		3	Screw TCIC M3x4
-21		3	Screw TCIC M3x30
-22		3	AGA Stud
-23		3	Screw TSIC M4x6

Assembly 11 (continued)

Asm-Index	Part Number	Units	Description
11-	78399162-003		KIT SELF TAPPING SCREWS
-1		5	Screw TCIC M3.5x13
-4		5	Screw TCIC M2.2x6.5
-5		5	Screw TCIC M2.2x13
-6		5	Screw TCIC M2.2x9.5
-7		5	Screw TCIC M3.5x16
-8		5	Screw TCIC M2.9x9
-9		5	Screw TCIC M2.9x13
-10		5	Screw TCIC M2.9x19
-11		5	Screw TCIC M2.5x4
-12		5	Screw TSIC M2.9x9.5
-13		5	Screw TCICB 2.9x9.5
-14		5	Screw ST 2.9x9.5
-15		5	Screw ST 2.9x6.5
-16		5	Screw TSIC 3.5x13
-17		5	Screw TCIC 3.9x13
-18		5	Screw TCIC 3.9x25
-19		5	Screw TSIC 3.5x19

Assembly 11 (continued)

Asm-Index	Part Number	Units	Description
11-	78399163-005		KIT WASHER-CIRCLIPS
-1		5	Ring Benzig D.2.3
-2		5	Ring Benzig D.3.2
-3		5	Ring Benzig D.4
-4		5	Ring Benzig D.5
-5		5	Ring Benzig D.6
-6		5	Ring Benzig D.7
-7		5	Ring Benzig D.8
-8		5	Special Washer
-9		5	Ring Ret D.4
-10		5	Ring Ret D.8
-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		2	Washer 60D
-22		2	Screw TCCI M2x6
-23		2	Washer D. 2.2
-24		5	Thrust Washer
-25		5	Washer Internal Teeth
-26		2	Washer Slip D.3.2
-27		2	Pivot Mech.
-28		2	Washer Lock D5.3
-29		2	Nut Hexagonal M4

Assembly 11 (continued)

Asm-Index	Part Number	Units	Description
11-1	78901385-001	1	RS232 9pin Loop-back
11-2	78900884-001	1	PARALLEL Loop-Back

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Appendix A. Printer configuration information

This section contains information for about printer configuration the 4247 Model L03 printer.

For information about changing printer configuration values, see the *4247 L03: User's Guide*.

Unlocking and locking printer configuration menu

To prevent unauthorized persons from changing the printer setup parameters, it is possible to lock/unlock access to the printer setups. This procedure is the same as for both locking and unlocking the menu.

Note: With a locked printer configuration menu you can only recall Saved Custom Sets A through H and prevent an unauthorized user from changing parameter values. Unlocking the Printer Configuration menu allows a full range of Configuration Parameter settings.

1. Press the **ONLINE**, **MACRO**, and **ALTERNATE** keys at the same time and keep them pressed while powering the printer on until the following message is displayed:

Release Keys

2. Release the keys. The printer will continue through its normal power-up initialization sequence while the following is displayed:

Starting Up

3. Once completed, one of the following is displayed depending on the previous state (Locked or Unlocked) of the menu:

Locked Menu

   or

Unocked Menu

4. The previous message will only be displayed for a short time before the following is displayed:

ONLINE

Note: To check the current state of the menu, press **ONLINE** (to take the printer Offline), then **PROGRAM**. If the printer displays **"LOCKED MENU"**, then the menu is locked from unauthorized access. Otherwise, the printer is not locked and the configuration parameters may be changed.

5. Follow the procedures from Step 1 to change the state of the menu as desired.

Printing the PROGRAM SETUP PRINTOUT or the CONFIGURATION SETUP PRINTOUT

Load forms in the front tractor and power on.

1. Press the ON LINE key to take the printer OFF LINE.
2. Press the PROGRAM key and the printer displays **PRINT OUT? NO**.
3. Press the → key and **PRINT OUT? YES** displays while the **PROGRAM SETUP PRINTOUT** prints.
4. Press the ↓ key until **CONFIG MENU NO** displays
5. Press the → key and **CONFIG MENU YES** displays
6. Press the ↓ key and **PRINT OUT? NO** displays
7. Press the → key and **PRINT OUT? YES** displays while the **CONFIGURATION SETUP PRINTOUT** prints.

Appendix B. 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 **"NVM CHANGE"** 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 **ONLINE 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.[1]

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.

---

1. For Model L03: DBCS code may not be installed onto the SBCS Controller Board and SBCS code may not be installed on the DBCS Controller Board.

Appendix C. Supplies, Forms, Paths, & Environmental Considerations

Overview

This section outlines some of the information provided to the customer in the *4247 Model L03 User's Guide*.

Supplies

Ribbon cartridges and paper are the only supplies you need for your printer. Contact your place of purchase to order ribbon cartridges.

Choosing a Forms Path for Your Needs

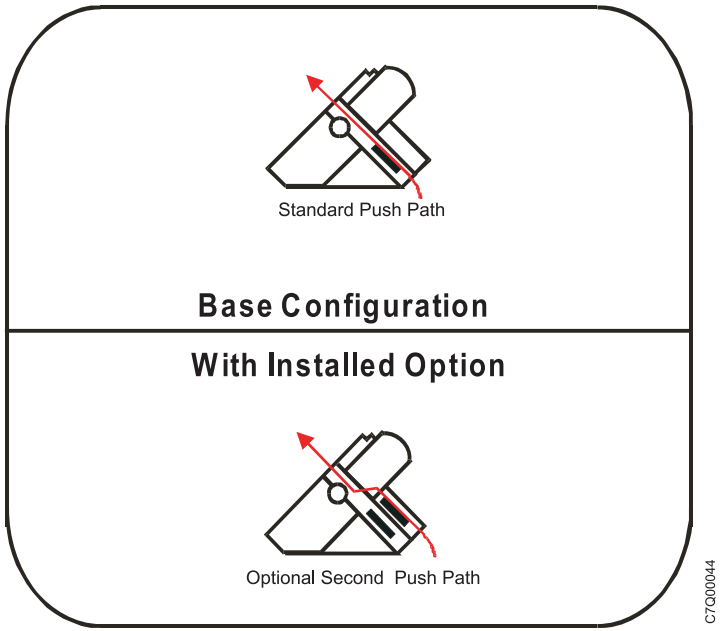


Figure 71. Forms Handling Paper Paths

Table 43. Considerations For Choosing a Path

Function	Rear Tractor[1]	Front Tractor[2]	Comments
Autoload	X	X	
Document on Demand (DOD) / Tear Off	X	X	
Tear Off Adjustment	X	X	
Dual Path Forms Input	X	X	Requires 2 tractors. We recommend the optional printer stand
Park	X	X	Requires manual tear off
Quiet Mode	X	X	Reduces throughput by 50%
AFTA	X	X	
Top of Form	X	X	
Vertical Adjustment	X	X	
Horizontal Adjustment	X	X	

Notes:

1. Base Tractor (Rear Tractor when an optional tractor is installed). This tractor is installed at the factory on all machines. In a single tractor machine, the Base Tractor is the Front Tractor. The Base Tractor becomes the Rear Tractor when a second optional tractor is installed.
2. Second tractor (optional, becomes Front Tractor). This tractor can be installed in front of the Base Tractor as an option. In a two tractor machine, the second (optional) tractor is the Front Tractor and the Base Tractor becomes the Rear Tractor.

Choosing a Forms Path for Special Forms

Note: We recommend selecting first the front push then the rear push as your choices for forms paths.

The 4247 Printer can print on various sizes, dimensions, and weights of forms. We recommend you test all forms for your application before ordering large quantities. Use Table 44 when you are choosing which path to use for special forms or paper.

Table 44. Selecting Path for Special Forms Types

Forms Type	Rear Tractor[1]	Front Tractor[2]	Comments
Black-Back Forms		X	Must be used on the optional second tractor
Labels or form stock with stick-on card or form, or forms of varying thicknesses.	X	X	Do not back up forms through the printer mechanism. Do not use Park. Do not use Document on Demand (DOD) / Tear Off.
1-Part to 8-Part	X	X	

Notes:

1. Base Tractor (Rear Tractor when an optional tractor is installed). This tractor is installed at the factory on all machines. In a single tractor machine, the Base Tractor is the Front Tractor. The Base Tractor becomes the Rear Tractor when a second optional tractor is installed.
2. Second tractor (optional, becomes Front Tractor). This tractor can be installed in front of the Base Tractor as an option. In a two tractor machine, the second (optional) tractor is the Front Tractor and the Base Tractor becomes the Rear Tractor.
3. This printer does **not** support the following types of forms:
   - Greater than 8-part forms
   - Greater than 40 lb paper
   - Greater than 0.64 mm (0.025 in.) total forms thickness
   - Less than 15 lb paper
   - Less than 0.08 mm (0.003 in.) paper thickness

Other Considerations for Forms

Consider the following items, unless Table 43 or Table 45 provides other direction.

- We recommend you test the Park function when you intend to run multiple-part forms. If you notice forms feed problems, try using the Eject function. If using the Eject function is effective, disable the Park function.
- When your printer is loaded with different forms in the front push and the rear push tractors, your job (or the operator) can select the desired source and alternate between the two paths. The operator must tear off the forms to allow the printer to change paths.
- See Table 45 for recommended paper weight and thickness.
- For forms stacking convenience, consider ordering and using the optional 4247 printer stand.

Forms and Paper Specifications

The 4247 Printer prints on continuous forms. The customer should test and evaluate all forms in the anticipated physical environment, and should consider the affects of such factors as temperature and humidity on forms handling, print registration, and print quality before ordering large quantities of forms. See Environmental Requirements.

Table 45 lists various paper and forms specifications. The customer's forms should meet the following specifications.

Table 45. Forms and Paper Specifications

FANFOLD FRONT 1 **FANFOLD FRONT 2**		**WEIGHT**	**THICKNESS**	**WIDTH**	**LENGTH**
SINGLE PART		55-150 g/m2 (15-40 lbs)	0.635mm (0.025") max	3" — 17"	24" max
MULTI-PART (with carbon) 1+5 copies max.	First sheet	55-150 g/m2 (15-40 lbs)			
	Attached sheet	45-75 g/m2 (12-20 lbs)			
	Carbon	14-35 g/m2 (4-9 lbs)			
MULTI-PART (chemical) 1+7 copies max	First and other copies	45-75 g/m2 (12-20 lbs)			

Continuous Forms Notes:

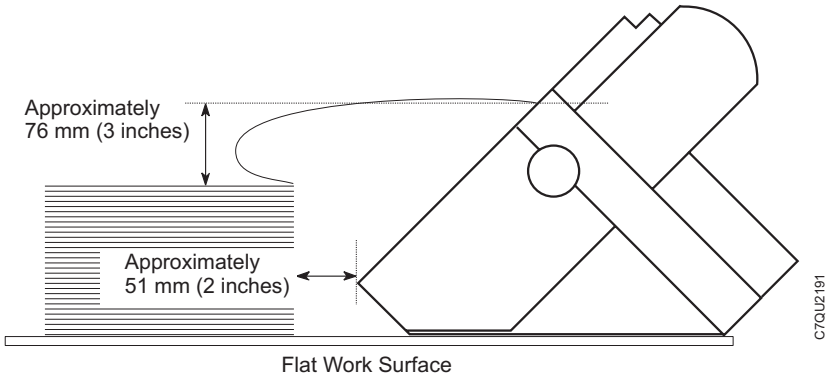
1. Test forms less than 152.4 mm (6 in.) in length or width for satisfactory stacking. These forms may require additional operator attention.
2. For optimum performance, restrict the printable area to be within 6.4 mm (0.25 in.) from all edges, holes, or folds on the forms.
3. Some multiple-part forms (such as mailers or forms with thick/heavy perforations) may cause problems when using the Park function. Try the forms first. To minimize parking problems, discuss your needs with your forms supplier when selecting forms.
4. We do not recommend continuous forms with adhesive labels.
5. To prevent the separation of labels from continuous-forms when using the **LOAD/EJECT** or **PARK/PATH** keys, set “Front Forms Backup = Disabled” or “Rear Forms Backup = Disabled” in the Configuration menu. Making this configuration change does the following:
   - Disables the **LOAD/EJECT** key, and tear-off function

- Modifies how the **PARK/PATH** key works. You cannot back up the forms to park them. Break the forms at a perforation before they enter the printer. Press **PARK/PATH** twice, and the forms will move forward until ejected from the printer.

6. Black-back forms must be run on the optional second tractor.

Forms Stacking Recommendations

We recommend the following maximum stacking height when stacking continuous forms on the same work surface as the printer.



Forms Stack Input and Output Locations

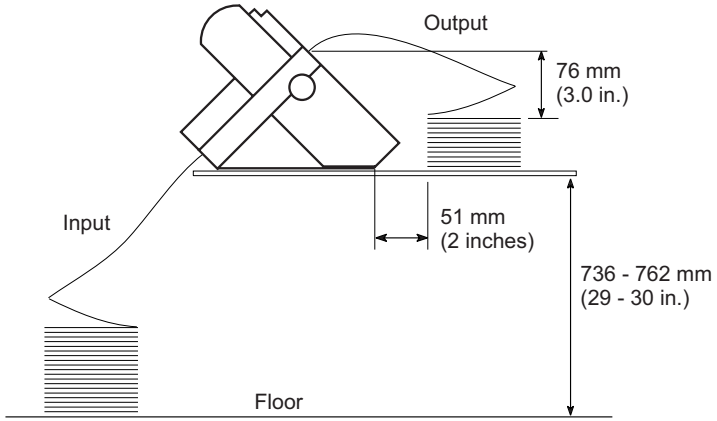
See the diagrams on the following pages for ways to stack input and output forms for your printer.

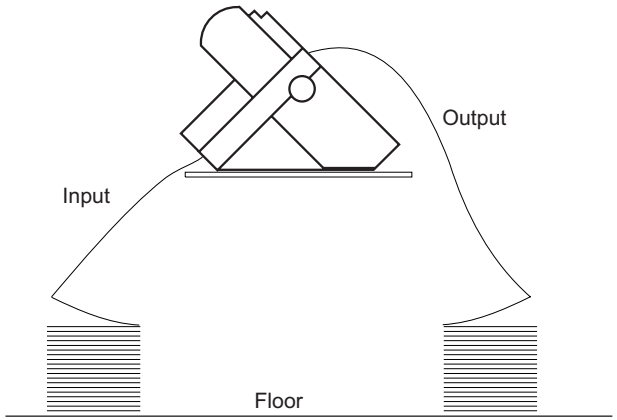
For satisfactory stacking results, the distance from the printer table to the floor should be 736 to 762 mm (29 to 30 in.) and the distance between the shelf and the floor should be 381 mm (15 in.). An optional printer stand is offered that is specially designed for the 4247 Printer. For more information on this printer stand, contact your place of purchase.

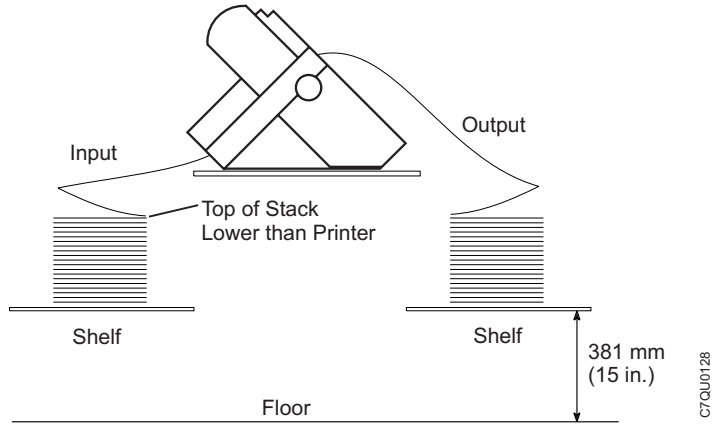
Note: For successful forms parking, the input forms stack MUST always be lower than the printer.

Forms Paths

Front Push Forms Path







Environmental Requirements

The printer operates correctly in environments that are typical of most business offices.

Attention: Damage to the printer can result if you power on (|) the printer immediately after the printer has been moved from an environment that does not meet the following operating requirements. If the printer has been in such a location, ensure you move the printer to the recommended operating environment at least 24 hours before you power on (|) the printer.

Operating Environment

The following tables show the operating environment requirements for the printer.

Environment	Requirement
Temperature range	10° to 40° C (50° to 104° F)
Relative humidity range	10% to 90% RH (non-condensing)

Note: The best conditions for feeding and stacking are within a temperature range of 15.6 to 32.2°C (60 to 90°F) and a relative humidity range of 26 to 62%.

Shipping Environment

The following table shows the shipping environment requirements for the printer.

Environment	Requirement
Temperature range	–35° to 65° C (–31° to 149° F)
Relative humidity range	5% to 95% RH (non-condensing)

Storage Environment

The following table shows the storage environment requirements for the printer.

Environment	Requirement
Temperature range	–35° to 65° C (–31° to 149° F)
Relative humidity range	5% to 95% RH (non-condensing)

Note: Ribbon performance and print quality may degrade when exposed to temperatures in excess of 41°C (105°F) for an extended period of time.

Printed in Italy

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