Compuprint 4247 Serial Matrix Printers

Compuprint 4247 Model X03 Printer: Maintenance Manual

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Preface

November 2011 Rev. 1 (AA)

This Maintenance Manual contains detailed technical information regarding the serviceability of the Compuprint 4247-X03 dot Matrix printer.

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Safety and environmental notices

Safety notices

There are two levels of safety notices: **Danger** and **Cautions**.

Danger hazard level

The word **Danger** indicates the presence of a hazard that has the potential of causing death or serious personal injury.

DANGER notices are numbered **<1-1>**, **<1-2>**, and so forth where they appear in the text of this manual..

Example of a **Danger** notice:

DANGER

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

Caution hazard level

The word **Caution** indicates the presence of a hazard that has the potential of causing moderate or minor personal injury.

CAUTION notices are numbered **<2-1>**, **<2-2>**, and so forth where they appear in the text of this manual.

Example of a **Caution** notice:

CAUTION:
<2-22> Carefully follow all cleaning instructions, using only the materials and solutions recommended.

Attention notices

The word **Attention** calls attention to the possibility of damage to a program, device, system, or data.

Attention notices are not numbered.

Examples of an **Attention** notices:

Attention: This is an ESD sensitive device.

Safety precautions

Electrical safety

This printer is inspected and listed by recognized national testing laboratories, such as Underwriters Laboratories, Inc. (UL) in the U.S.A. and Canadian Standards Association (CSA) in Canada. Listing of a product by a national testing laboratory indicates that the product is designed and manufactured in accordance with national requirements intended to minimize safety hazards. This equipment meets a very high standard of safety in design and manufacture. Remember, however, that this product operates under conditions of high electrical potentials and heat generation, both of which are functionally necessary.

Because the paper used in the printer can burn, you should take normal precautions to prevent fire. These precautions include common sense measures, such as keeping potentially combustible materials (for example, curtains and chemicals) away from the printer, providing adequate ventilation and cooling, limiting unattended operation, and having trained personnel available and assigned to the printer.

Electrostatic discharge (ESD) procedures

Read the following electrostatic discharge (ESD) information because, if discharged into the circuitry of an integrated circuit, static electricity can damage the circuit. The following **Attention** notice in the text of this book warns of possible damage caused by ESD.

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

Follow these guidelines to prevent damage to ESD-sensitive components:

- Keep an ESD-sensitive part in its original shipping container, usually a protective bag, until you are ready to install it.
- Make the fewest possible movements to minimize static electricity.
- Touch the metal frame of the printer or the assembly to discharge static electricity in your body just before touching the ESD-sensitive part.
- Hold the ESD-sensitive part by its edges. Do not touch any components, pins, or connectors. If possible, keep one hand on the frame while you are installing or removing an ESD-sensitive part.
- Do not place an ESD-sensitive part on anything that can provide a discharge path from your body through the ESD-sensitive part. If you need to put down the ESD-sensitive part, first put it into the ESD protective wrapper in which it was shipped.
- Prevent ESD-sensitive parts from being touched by other persons.
- Cables may connect to engine cards or boards that are ESD-sensitive. Be careful when working with connectors.
- Be careful when working with ESD-sensitive parts when the humidity is low. Low humidity increases static electricity.

Using the ESD kit

To safely discharge all static electricity, use the ESD kit following the guidelines under Electrostatic discharge (ESD) procedures.

- Turn off the printer before you put on the ESD wrist band.
- Connect the wrist band to an unpainted, frame-ground point of the printer.

- Remove the ESD wrist band when working on any part of the printer that has power turned on.
- Do not put the ESD mat near any electrical circuit that has power turned on. The internal resistance (1 megohm) in the ESD cable limits the current if it touches a high voltage.
- Do not put the ESD mat near a grounded surface. Ground the ESD mat only through the ESD cable. The ESD cable supplies a high resistance to ground for your safety. If the ESD mat touches a grounded surface, the high resistance in the ESD cable is bypassed, which causes the ESD mat not to work as expected.

Approved power cord and receptacle

DANGER

<1-11> 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.

Electrical safety and portable power strip receptacles

Extension cords

DANGER

<1-12> Do not use an extension power-cord.

The customer must supply the correct electrical outlet which must meet the requirements stated underApproved power cord and receptacle.

Portable power strip receptacles (temporary power taps)

Portable power strip receptacles (referred to as “temporary power taps” by the National Electrical Code) may be used if they are fully approved in the customer's geographic location. It is the customer's responsibility to supply a fully approved “temporary power tap”, if one is to be used.

Connecting or disconnecting a communication port, a teleport, or an attachment connector

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.

Servicing during an electrical storm

DANGER

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

Safety inspection

Instructions

Perform this safety inspection before performing any of the following tasks:

- Accept a machine for service agreement
- Provide per-call service
- Relocate a machine
- Review changes or attachments on any machine that is leased, on service agreement, or on per-call service

Ensure that you correct unsafe conditions before you continue.

Possible safety hazards are:

- **Electrical**—An electrically charged frame, exposed wires or connections, can cause serious electrical shock.
- **Mechanical**—A missing safety cover or shield is hazardous. Moving parts, such as gears, shaft, and pulleys are hazardous.
- **Chemical**—Use only approved cleaning agents. Do not use other solvents or chemicals.

Reference items

You will need the following items:

- A copy of the machine EC history
- A list of current safety ECs

Safety inspection procedure

1. Check that the printer is installed near the socket-outlet and that the socket-outlet is easily accessible.
2. Turn off and unplug the printer.
3. Check exterior covers for damage (loose, broken, or sharp edges).
4. Check top main cover interlock operation (see T&D17—Top cover interlock test).

5. Check the Small Rear Cover with Interlock Board and ensure it is properly installed. See Figure 3 for the location of the Small Rear Cover and Interlocks for information about both of the cover interlocks.
6. 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.
   b. A power connector ground wire fastened with a screw and star washer near the power supply. Repair as needed.
   c. A second star washer between the frame ground and the wire lug.
   d. A power cord of the appropriate type, shipped for the 4247 printer.
   e. Insulation in good condition (not frayed nor worn).
7. Remove the covers (see Removing Covers).
8. Check that the power supply cover has not been removed nor tampered with.
9. Check for any obvious alterations.
10. 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.
11. Check for worn, frayed, or pinched 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 X03 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.

Notes:

1. Use only the applicable high-voltage probes. 4247 Model X03 nominal AC input power requirements gives the appropriate voltage ranges.
2. The printer electrical outlet and any temporary power tap must meet the requirements as stated in 4247 Model X03 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 X03 nominal AC input power requirements

Nominal Voltage	Voltage Range	Amps	Phase / Hz
100–230 Vac	90–264 Vac	3.8–1.6 A	Single phase / 50–60 Hz

Ground connectors check

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

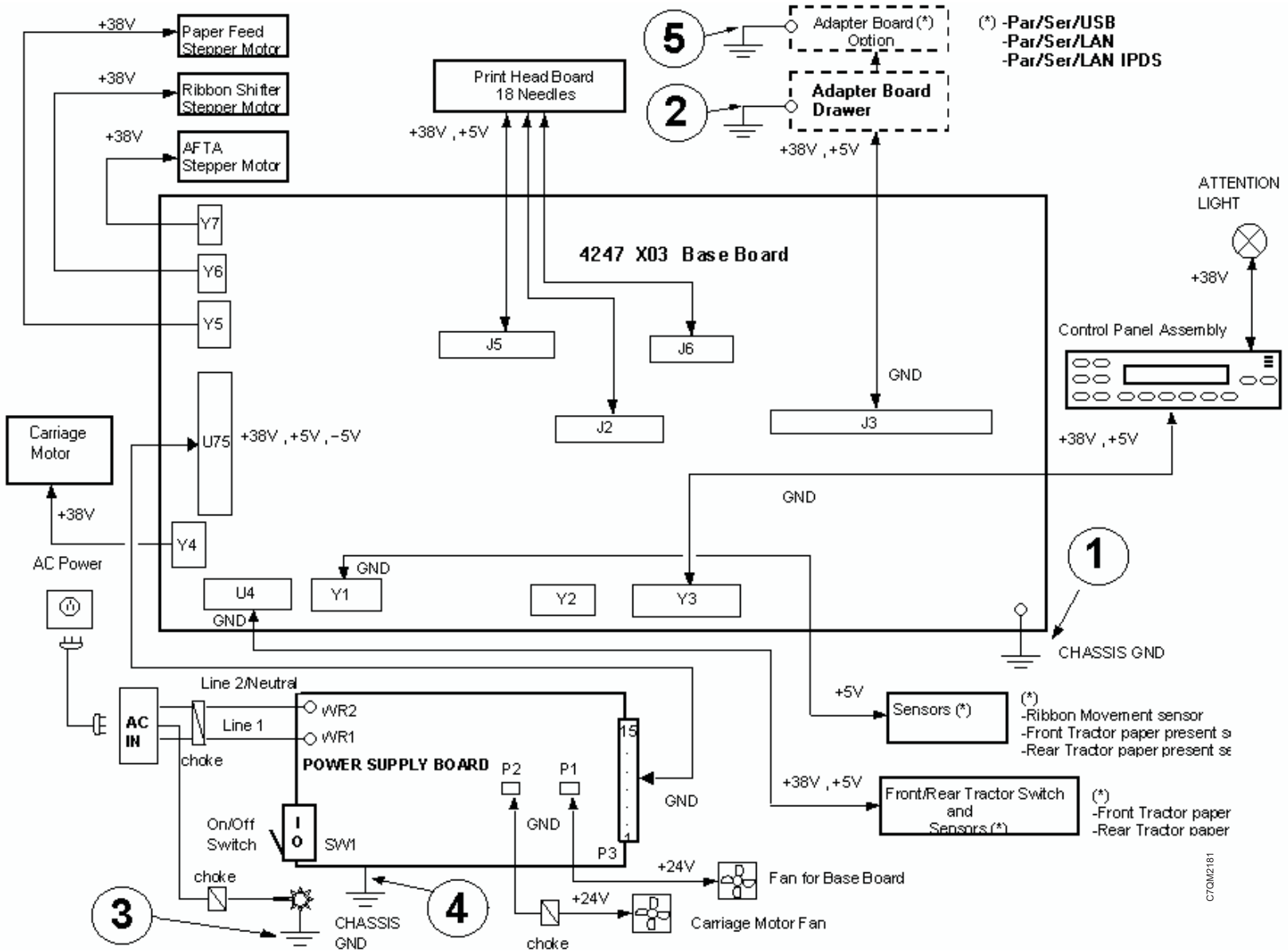


Figure 1. Ground path diagram

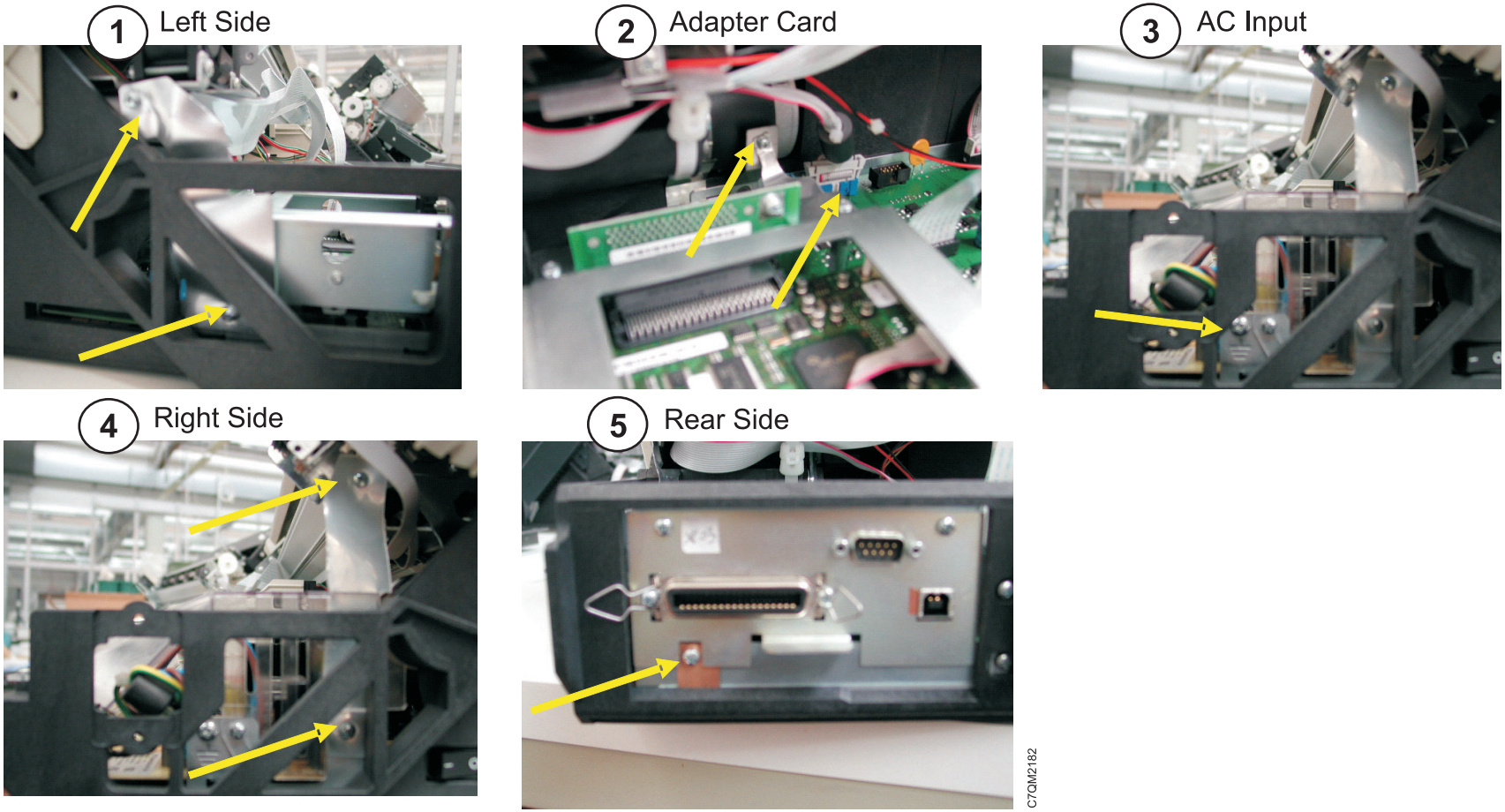


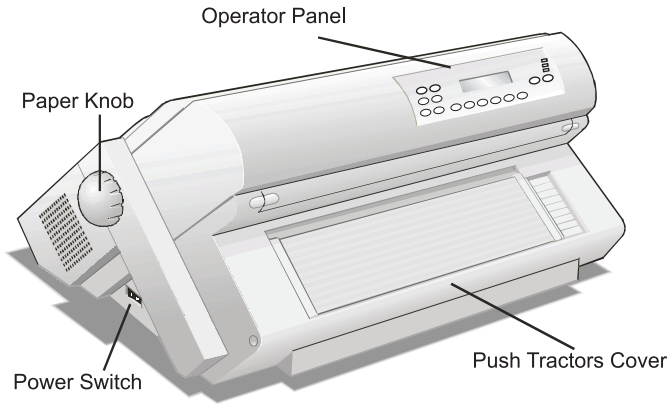
Figure 2. Ground path illustrations

The 4247 Model X03 Serial Matrix Impact Printer

The 4247 Model X03 is a professional, industrial impact-matrix printer capable of printing at speeds of up to 800 characters per second (cps) at 10 characters per inch (cpi) in Data Processing (DP) mode. The 4247 Model X03 is a rugged printer and is designed for harsh environments and demanding applications. It is complementary with previous IBM® 4247 models and offers interface cards that can be installed by the user.

The 4247 Model X03 can have either one or two straight continuous-forms paper paths. One paper path is standard and the second path is an optional feature. The printer operator panel is common with the Model Z03 and includes the same full-function, full-size, 2 line by 24 character display, making messages and menus easy to understand.

Front View



Rear View

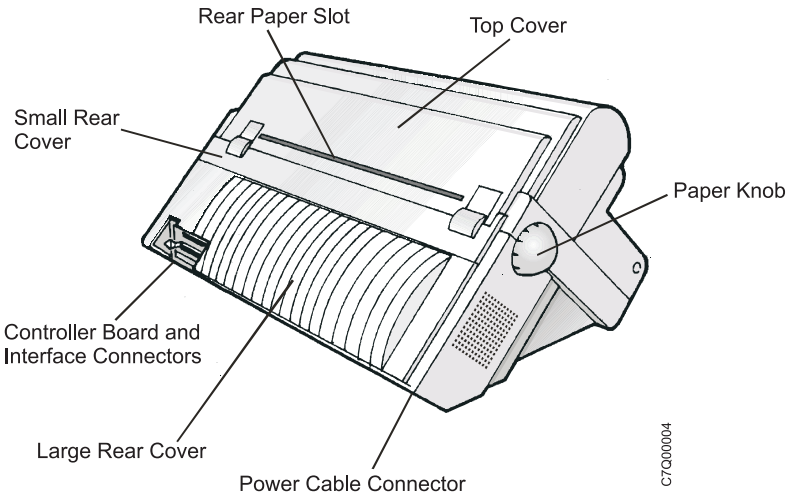


Figure 3. Covers, Front and Rear View

Print quality choices are DP mode (DP), DP Text mode (DP Text), and Near Letter Quality mode (NLQ). Versatile paper handling capability provides printing on up to 8-part forms. Typical applications include transaction processing for invoices, office or internal business documents, barcodes, labels, and multipart forms.

Print speeds

The 4247 Model X03 print speeds in cps are up to:

- 800 cps in DP mode at 10 cpi
- 400 cps in DP Text mode at 10 cpi
- 200 cps in NLQ at 10 cpi

Paper paths

The 4247 Model X03 printer provides exceptional forms handling flexibility. The base printer includes one continuous-form tractor paper-path, a second tractor paper path is optional. Both continuous form paper paths are front loading.

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 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 the *front tractor* and the base tractor becomes the *rear tractor*.

Print qualities

Print qualities for the 4247 Model X03 are: Data Processing (DP), Data Processing Text (DP Text), Near Letter Quality (NLQ), OCR-A, and OCR-B. These print qualities on the 4247 Model X03 are equivalent in character size, shape, and resolution to the print qualities available on the 4247 Model Z03 printer.

Print quality selection

Print quality can be selected via program control or through the printer operator panel. Program control datastream commands take precedence over operator panel settings and can not be overridden.

Available printer operator panel settings are:

Print Quality = DP (default setting)

Print Quality = DP TEXT

Print Quality = NLQ

Print Quality = OCR-A

Print Quality = OCR-B

4247 Model X03 differences and commonality with other models

Controller boards

Controller board part numbers are not common between the models X03 and Z03 printers (for example, Controller Boards are not interchangeable). However, the controller board types for the X03 and Z03 are:

- Parallel, serial, and USB 2.0 interfaces
- Parallel and ASCII Ethernet 10/100 LAN interfaces
- Parallel and ASCII/IPDS Ethernet 10/100 LAN interfaces

Carriage

The 4247 Model X03 carriage is driven by a stepper motor. An optical sensor mounted to the print head carriage travels along a linear encoder strip. The sensor detects marks along the encoder strip, and returns pulses to the Engine board that are used to control the speed and position of the print head.

Covers

The 4247 Model X03 covers are heavy duty and extremely durable plastic.

Flash memory download and printer microcode file

The 4247 Model X03 flash download code is a single file that supports all printer attachment configurations. The download program, which can be executed from a DOS command window from any computer, sends code to the printer through the parallel or Ethernet ports.

Interlocks

The 4247 Model X03 printer has two cover interlocks. It is important to be aware of these interlocks as the printer's behavior is a function of whether or not the interlocks are engaged.

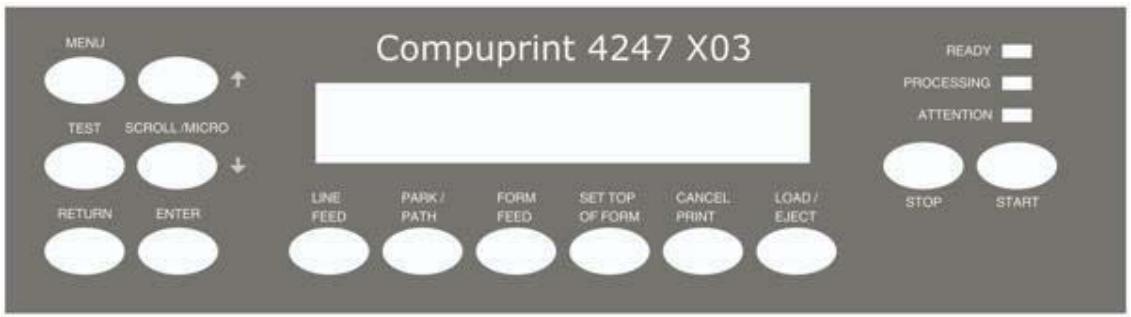
The Top Cover Interlock (magnet) is located under the top cover in the vicinity of the adjacent operator panel and is engaged when the magnet is installed and the Top Cover is closed while the operator panel is properly installed.

The Small Rear Cover Interlock (PC Board) is located underneath the Small Rear Cover and is engaged when the PC Board is properly inserted into the Rear Tractor Cable Assembly Connector.

Note: The 4247 X03 model printer does not offer a Rear Tractor option. The Small Rear Cover should always be present.

Operator panel

The 4247 Model X03 operator panel is common with the model Z03 printer. The operator panel features three status indicators (READY, PROCESSING, and ATTENTION), 14 printer function keys, 2 line by 24 character display panel, and an audible alarm.



Paper paths

The 4247 Model X03 has 2 front-loading push tractor paper paths. With fewer paper paths than some previous models, the printer mechanism contains fewer parts while in general maintaining some commonality.

Printhead

The 4247 Model X03 print head is a 18-wire moving ruby print head capable of printing at speeds of up to 800 characters per second in DP mode. The 4247 Model X03 print head includes a new cable/connector not found on earlier 003 model print heads. This connector drives the carriage encoder optical sensor.

Printhead mask

The 4247 Model X03 print head mask is an easy-change metal spring attached to the carriage by two easy-access screws.

Ribbon cartridge

The 4247 Model X03 ribbon is specifically designed for the faster print speeds of the X03 printer. The ribbon cartridge and ribbon support brackets are keyed to prevent earlier model ribbons from being used on this printer. The ribbon cartridge is common for 4247 model X03, Z03, and V03 printers. Use part number 57P1743 when ordering a replacement ribbon cartridge.

Test & Diagnostics

The 4247 Model X03 T&Ds are similar to T&Ds found on earlier models. The T&D numbering scheme has changed on this model, as have the test names displayed on the operator panel (due to the new 2 line by 24 character display) and the T&Ds instructions (due to new button designations).

Chapter 1. Diagnosing Problems

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,” or the *User's Guide*.
- Verify that the environment, paper, and forms used are within specifications. See Appendix B, “Supplies, Forms, Paths, & Environmental Considerations”.
- 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 Support 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 power off (O) 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

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
OVFL	Overflow
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 1. MAP 0100: Start of call

Step	Questions/Actions	Yes	No
1.	**Has the Customer completed the Problem Solving Procedures in the** *User's Guide*.	Go to step 2.	Attempt recovery using the Problem Solving Procedures in *User's Guide*. Go to step 2 as needed.
2.	**Does the printer display a message?**	Go to Reference table 1, 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 *User's Guide* for other messages. If you cannot find the message, go to step 3.	Go to step 3.

Table 1. MAP 0100: Start of call (continued)

Step	Questions/Actions	Yes	No
3.	**Is the problem no print?**	Print the print test (see Printing the printer demonstration). 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 220 Serial DSR error 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 Print** mode. Refer to *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

Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

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

Table 2. 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. Press **STOP** and **TEST**, and scroll down to PRINTER CONFIGURATION and press **ENTER**. To print the current configuration (**<X>** on the display). Ensure that the following settings match the host settings for your parallel, serial, or USB attachment: **Attachment:** HOT PORT SWITCH, PARALLEL, SERIAL, USB **ASCII Configuration:** EMULATION MODE, CHARACTER SET, PRINT LANGUAGE **Parallel Interface:** INTERFACE TYPE, SELECT-IN **Serial Interface:** INTERFACE TYPE, DATA BITS, BAUD RATE, PARITY, PACING PROTOCOL, CONNECTION TYPE b. 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. c. Ensure that cable length restrictions are not exceeded. Refer to the signal cable information in “Appendix A. Printer Specifications” of the *User's Guide* for attachment cable configurations. **Is the problem fixed?**	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.

Table 2. MAP 0120: Parallel, Serial, or USB Interface (continued)

Step	Questions/Actions	Yes	No
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).
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 and actions, 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 and actions, 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

Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

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. Press **STOP** then **TEST** and scroll down to Printer Configuration and press **ENTER**. Ensure that the Attachment parameter is set to Hot Port Switch or LAN. 2. Have the customer “ping” the printer to verify communications. 3. Have the customer verify host and print server configuration. Including IP address, gateway address, and subnet mask. 4. Have the customer check physical network cabling.

Symptom	Probable cause	Action
LAN card communicates with host but printer does not print or the printout is garbled.	Data stream problem	1. Press **STOP** then **TEST** and scroll down to Printer Configuration and press **ENTER**. Ensure that the Emulation Mode, Character Set, and Print Language parameters are set correctly. 2. Have the customer check print job stream. 3. Take a data trace of the attachment and contact support.
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 099 Forms jammed 001 End of forms (forms did not load)	Paper feed motor
	Engine board
	Mechanical parts

Table 3. 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. **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. **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 3. MAP 0130: No paper movement (continued)

Step	Questions/Actions	Yes	No
4.	Disconnect the paper feed motor connector from the Engine board. See Paper Feed Motor Wiring 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 Feed 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 Feed 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
001 END OF FORMS	Paper sensor failure
	Engine board
	Sensor cable assembly

Table 4. 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 **STOP** key to make the printer Not Ready. 8. Press the **LOAD/EJECT** 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
053 MACHINE CHECK 3 X X 053 MACHINE CHECK 4 3 X 056 MACHINE CHECK 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
	Encoder (board on carriage or codestrip) is damaged
	Mechanical interference
	Printhead gap is incorrect
	Engine board is defective
	Power supply is for wrong AC voltage
	Printhead is defective
	Printhead cable is defective or has bad connection

Table 5. MAP 0140: Printhead drive

Step	Questions/Actions	Yes	No
1.	The ribbon lift bar, lift bracket, and ribbon guide are part of the ribbon assembly. These parts can cause printhead drive problems. Remove the ribbon. Print a print test, see Printing the printer demonstration, and repeat the test at least 5 times (10 pages). **Was the printhead drive OK during the 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.
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 AFTA service check (see Print Head Gap Service Checks). **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.	Put the covers in the service position (see Removing Covers). Disconnect the carriage motor connector from the Engine board. See Carriage Motor Wiring 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 Drive Motor Assembly and Fan). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).

Table 5. 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). See 18-Wire printhead resistance checks 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. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).

Table 5. MAP 0140: Printhead drive (continued)

Step	Questions/Actions	Yes	No
6.	Disconnect the 26-conductor printhead cable from the Engine board (see Figure 17 in Chapter 4, “Locations”). See Printhead cable wiring 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. Install a new carriage motor (see Carriage Drive Motor Assembly and Fan). - or - Install a new Engine board (see Engine Board). - or - Install a new encoder board (see Encoder board). - or - Install a new encoder board strip (see Encoder board). 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). 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 6. 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 6. MAP 0150: Power supply (continued)

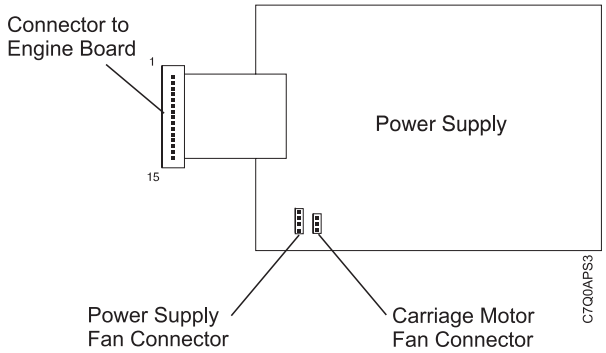
	Questions/Actions	Yes	No
3.	a. Remove the rear cover (see Removing Covers). b. Disconnect the power supply fan from the power supply board. Power Supply Pins and Connectors:  c. Disconnect the carriage motor fan from the power supply board. d. Disconnect the power supply cable from the Engine board. 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). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).

Table 6. 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 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 6. 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 6. 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 and ribbon lift

Symptom explanation	Suspected FRUs/causes
053 MACHINE CHECK 4 0 X 089 RIBBON JAM Ribbon Feed or Lift Failures No visible print Print quality problems	Ribbon installation
	Ribbon cartridge (customer responsibility)
	Ribbon drive motor
	Ribbon lift motor
	Printhead cables
	Ribbon motion sensor (sensor cable)
	Engine board
	AFTA setting

Table 7. MAP 0160: Ribbon feed and ribbon lift

Step	Questions/Actions	Yes	No
1.	The following items are possible causes for ribbon feed or lift failures: • Ribbon installed incorrectly • Ribbon cartridge bad • Printhead cables not installed correctly 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.	Turn on the printer. **Are you here because of an `053` or an `089` display message:**	Go to step 3.	Go to step 4.

Table 7. MAP 0160: Ribbon feed and ribbon lift (continued)

Step	Questions/Actions	Yes	No
3.	**Does the ribbon motor run continuously?**	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).	Go to step 4.
4.	Perform the ribbon service check (see Ribbon Feed and Ribbon Lift Service Check). **Is the service check OK?**	Go to step 5.	Repair as needed.
5.	Ensure that a ribbon is installed. Run T&D09 in single test mode to test ribbon feed and lift (see Running the test and diagnostic (T&D) programs). **Does the ribbon feed OK?**	Go to step 6.	Go to step 7.
6.	**Did the ribbon lift OK?**	Return to the step that sent you to this MAP.	Go to step 8.

Table 7. MAP 0160: Ribbon feed and ribbon lift (continued)

Step	Questions/Actions	Yes	No
7.	Turn off the printer. Disconnect the ribbon motor connector at the Engine board. See Ribbon Feed Motor Wiring 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 Drive Motor and Drive Assembly). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).	Install a new ribbon drive motor (see Ribbon Drive Motor and Drive Assembly). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).
8.	Turn off the printer. Disconnect the ribbon lift motor connector at the printhead. Measure the resistance of the motor windings (see Ribbon Lift Motor Wiring). **Is the resistance correct?**	Go to step 9.	Install a new ribbon lift motor (see Ribbon Lift Motor). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).

Table 7. MAP 0160: Ribbon feed and ribbon lift (continued)

Step	Questions/Actions	Yes	No
9.	Remove the printhead (see Printhead). Measure the resistance between the connector pins **on the printhead**; See Reference table 6, ribbon lift and 26-pin cable connectors. **Is the resistance 5 ohms or less for all measurements?**	Put back the printhead. Install a new Engine board, see Engine Board. - or - Install new printhead cables. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).	Install a new printhead (see Printhead). 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
096 NOT READY/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 8. 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
002 FORMS JAMMED FRONT 020 FORMS JAMMED REAR 088 INVALID PAPER SOURCE 099 FORMS JAMMED 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 9. 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. The error messages **002 FORMS JAMMED**, **020 FORMS JAMMED**, and **099 FORMS JAMMED** display when forms jam in the printer or if the sensor circuit senses an incorrect situation or fails. Either the printer sensed that the forms have stopped processing through the printer, or the printer sensed forms are present when no forms were expected. The messages **002** and **020** are sensed by the tractor sensors. These messages indicate that forms have stopped. Message **099** is sensed by the paper presence sensor (located near the platen), and indicates unexpected forms are present. Turn off the printer. **Is this a 002 or a 020 jam message?**	Go to step 2.	Go to step 15.
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 9. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
3.	Check for paper debris, such as chad, stuck inside the tractor jam sensors. **Are the sensors free of chad?**	Go to step 4.	Wipe the sensors with a soft cloth to remove the chad. Remove the tractor and wipe the upper and lower surfaces of 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. Run T&D in automatic test mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).
4.	Check for worn tractor jam sensors. Examine the plastic surfaces of the sensor for signs of wear. **Are the sensor surfaces OK?**	Go to step 5.	Replace the tractor assembly. Run T&D in automatic test mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).

Table 9. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
5.	Look closely at the tractor sensor in dim light. There is a small red LED visible in the sensor surface, over which the forms pass. You may need to cup your hand around the sensor to be able to see the LED. This LED lights if the tractor is correctly connected and the electrical circuits are OK. **Is the red LED lighted?**	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).	Remove and reinstall the tractor assembly, making sure that the electrical connector tab is fully seated in the connector. Check if the red LED is now lighted. If the red LED is still not lighted, check that the small flat ribbon cable in the tractor is fully connected to the tractor motor. Check if the red LED is now lighted. If the red LED is still not lighted, install a new tractor assembly cable. Check if the red LED is now lighted. Replace the tractor assembly and check if the red LED is now lighted. If the red LED is still not lighted, install a new tractor assembly cable. Check if the red LED is now lighted. If the red LED is still not lighted, 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).
6.	**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 7.	Go to step 7.

Table 9. MAP 0190: Forms feed problems (continued)

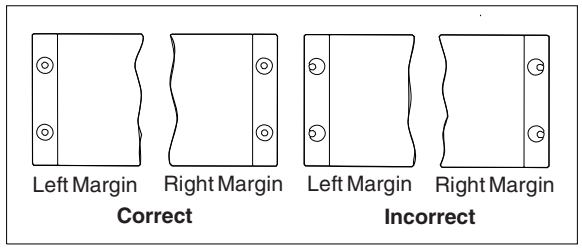
Step	Questions/Actions	Yes	No
7.	Make the following checks: a. Forms input and output stacking follows the recommendations in Forms Stacking Recommendations. b. Input forms are aligned to feed straight into the printer. c. Input forms are not catching on the edge of the forms carton. d. Printer is properly 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 Appendix B, “Supplies, Forms, Paths, & Environmental Considerations”. g. Label forms meet specifications described in Appendix B, “Supplies, Forms, Paths, & Environmental Considerations.” h. The environment meets the specifications described in Environmental Requirements. **Are the checks OK?**	Go to step 8.	Repair, as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs). Continue with step 8.

Table 9. MAP 0190: Forms feed problems (continued)

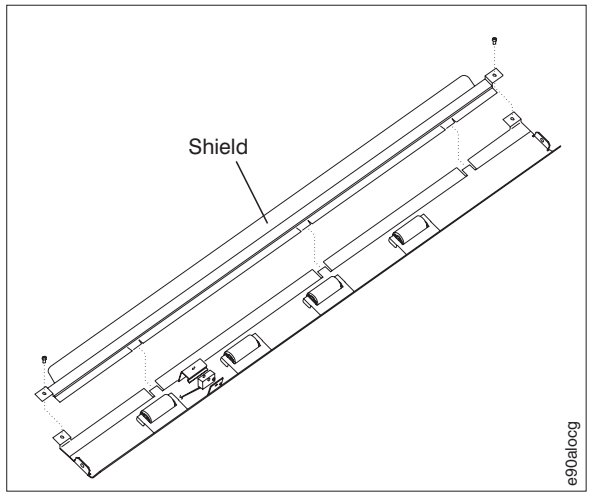
Step	Questions/Actions	Yes	No
8.	Make the following checks: • Inspect the condition of the paper bail plastic shield and lower plastic shield. Ensure that the shields are firmly attached. **Note:** If you suspect lower plastic shield damage, remove the screws to remove the plastic shield, and inspect 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 9.	Repair, as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).

Table 9. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
9.	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 Printhead Mask). **Are these checks OK?**	Go to step 10.	Repair, as needed (see Printhead Mask). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).
10.	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 11.	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).
11.	**Do the forms jam after they leave the tractor assembly?**	Go to step 12.	Go to 14.
12.	Perform the main paper drive service check. Go to Main Paper Drive Check and Adjustment. **Is the service check OK?**	Go to step 13.	Repair, as needed. Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).

Table 9. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
13.	Perform the AFTA service check. Go to Main Paper Drive Check and Adjustment. **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).
14.	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).
15.	This is a 099 message. Check for customer operating errors. **Was the customer performing a PARK operation?**	Tear off the forms in the area between the printhead and the tear bar. Complete the Park operation. Inform the customer that forms must be torn off at the tear bar before he confirms the Park operation. The **099** message occurred because the printer could not completely back the forms up onto the tractor.	Go to step 16.

Table 9. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
16.	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 **099** message occurred because the printer sensors were already sensing forms in the path when the customer tried to load forms.	Go to step 17.
17.	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 18.

Table 9. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
18.	A paper presence sensor failure can cause a **099** forms jam message to display instead of an **001 End of Forms** message. **Did the printer fail to detect end of forms?**	Run T&D18, including performing a sensor tune, and verify correct sensor operation. 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).	Go to step 19.

Table 9. MAP 0190: Forms feed problems (continued)

Step	Questions/Actions	Yes	No
19.	A paper presence sensor failure can cause an **099** forms jam message to display after a Park or Eject operation. **Did a Park or Eject operation cause the error message?**	Run T&D18, including performing a sensor tune, and verify correct sensor operation. 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 (see Sensor Cable Assembly). Run T&D in automatic mode to verify correct printer operation (see Running the test and diagnostic (T&D) programs).	Go to step 20.
20.	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: 055 AFTA errors

Symptom explanation	Suspected FRUs/causes
055 MACHINE CHECK The AFTA sensor circuit did not detect that needle 5B moved at the correct time during the AFTA routine. The needle either failed to extend or was not detected when it was pushed back.	Printhead misaligned and loosely fastened
	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 10. MAP 0200: 55 AFTA errors

Step	Questions/Actions	Yes	No
1.	Perform the Standard AFTA Service Check (see Print Head Gap Service Checks). **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 10. MAP 0200: 55 AFTA errors (continued)

Step	Questions/Actions	Yes	No
2.	Check the printhead cables. a. Remove the printhead (see Printhead). 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 19 and 20 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). 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.

Model X03 generates Error Logs and Usage Metrics

For information about error logs and usage metrics (see Printing and clearing the error log, and printing the usage metrics).

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 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, error messages

Table 11. Error messages

Message	Description	Action
001 END OF FORMS	Forms do not load when **LOAD/EJECT** is pressed. No forms movement.	See MAP 0130: No paper movement.
001 END OF FORMS	Forms are visible between the printhead and the platen. Forms path sensor cannot sense paper.	See MAP 0131: Paper path sensor.
002 FORMS JAMMED FRONT CLEAR JAM RELOAD FORMS	Jam detected at the front tractor sensor.	See MAP 0190: Form feed problems.
005 MARGIN ERROR ADJ MARGIN/LINE LENGTH	Left margin incorrect.	Press **STOP**, then **START**. Left margin value will be reset to 10 for current line only.
014 INVALID FORMS SELECT/FORM NAME SELECT NEW DEVICE (Message and form name alternate on the first line of the display)	Printer received a request for forms type not supported in current forms configuration.	Perform one of the following: • Restart job. • Cancel job. • Select another source and restart the job. • Run the job with current source. Refer to a 4247 User's Guide for more detail.
020 FORMS JAMMED REAR CLEAR JAM RELOAD FORMS	Jam detected at the rear tractor sensor.	See MAP 0190: Form feed problems.

Table 11. Error messages (continued)

Message	Description	Action
050 MACHINE CHECK XXX	Firmware error in supervisor code.	Turn off and then turn on the printer. If message remains, install a new Controller Board. Turn off and on the printer again. If the message remains, install a new Engine Board (see Engine Board).
051 MACHINE CHECK XXX	Firmware error in interpreter code.	Turn off and then turn on the printer. If message remains, install a new Controller Board. Turn off and on the printer again. If the message remains, install a new Engine Board (see Engine Board).
052 MACHINE CHECK XXX	Firmware error in print manager code.	Turn off and then turn on the printer. If message remains, install a new Controller Board. Turn off and on the printer again. If the message remains, install a new Engine Board (see Engine Board).
053 MACHINE CHECK 2XX 053 MACHINE CHECK 42X	Firmware error in engine code.	Turn off and then turn on the printer. If message remains, install a new Controller Board. Turn off and on the printer again. If the message remains, install a new Engine Board (see Engine Board).
053 MACHINE CHECK 3XX	The firmware detected a data integrity error.	Turn off and then turn on the printer. If message remains, see MAP 0140: Printhead drive.
053 MACHINE CHECK 40X	Firmware error detected during initialization of ribbon motion sensor.	Turn off and then turn on the printer. If message remains, see MAP 0160: Ribbon feed and ribbon lift.

Table 11. Error messages (continued)

Message	Description	Action
053 MACHINE CHECK 41X 053 MACHINE CHECK ERR 43X	Firmware error detected during initialization of printhead.	Turn off and then turn on the printer. If message remains: 1. Ensure no paper or debris is blocking the printhead encoder. 2. Ensure all Engine board connectors are connected. 3. See MAP 0140: Printhead drive.
054 MACHINE CHECK	Power on initialization error	1. Power off the printer, reseat the Controller Board, and power on. 2. If the error message repeats, replace the Controller Board.
055 MACHINE CHECK	AFTA failure.	Turn off and then turn on the printer. If message remains, see MAP 0200: 055 AFTA errors.
056 MACHINE CHECK	The printhead encoder has detected an error in the location or motion of the printhead carriage.	Turn off and then turn on the printer. If message remains, see MAP 0140: Printhead drive.
068 DATA CLEARED PRESS STOP THEN START	Clear command received when the printer was not ready.	Press **STOP**, then **START**.
070 PRINTER BOARD CHANGED VERIFY MENU SETTINGS	Occurs when printer Engine board or microcode version has been replaced.	Verify printer configuration settings and Custom Sets.
086 INTERLOCK ERROR CHECK INSERTION (**Model X03 only**)	Small Rear Cover Interlock being detected.	Turn the power off. Ensure the Small Rear Cover is properly installed. Turn the power on.

Table 11. Error messages (continued)

Message	Description	Action
088 INVALID PAPER SOURCE Use Front or Change Menu.	Incorrect Power On Paper Source selected in configuration.	1. Change the configuration to an available paper source. See the *User's Guide*. 2. See "MAP 0190: Form feed problems" on page 58.
089 RIBBON JAM 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 and ribbon lift.
096 COVER OPEN False Message	The cover open sensor has detected an error.	See MAP 0180: Top cover interlock.
097 FUNCTION NOT AVAILABLE MENU LOCKED	The operator panel has been locked. This means the Configuration Menu and Printer Adjustments functions in the Test Menu cannot be used.	Use the procedure in Unlocking and locking printer configuration menu: • If you need to use these functions. • If the customer had the operator panel locked. Always lock the operator panel after completing your service procedures by performing this procedure (see Unlocking and locking printer configuration menu).
099 FORMS JAMMED CLEAR JAM PRESS START (All paper paths)	Path sensor sensed paper still present after attempted Park or Eject. For fanfold forms, this message can display if you park but do not tear off the output. Path sensor detected forms already present when you tried to load forms into a fanfold path.	1. Ensure fanfold forms are torn off before parking the forms. 2. Ensure fanfold forms are loaded onto the tractor pins, with the leading edge visible on the tractor. 3. Check for pieces of paper in the paper path and under the platen. 4. If message remains, see MAP 0190: Form feed problems.

Table 11. Error messages (continued)

Message	Description	Action
220 SERIAL DSR ERROR SEE USER'S GUIDE	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.
221 SERIAL OVERFLOW SEE USER'S GUIDE	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 hosts pacing protocol. 4. Restart the print job.

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 Service Checks. 3. See MAP 0160: Ribbon feed and ribbon lift.
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 and ribbon lift. 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 Service Checks. 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 and ribbon lift. 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 and ribbon lift. 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 Service Checks. 2. See Print Quality Service Checks.
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
When **MENU** is pressed, the operator panel displays RECALL CUSTOM SET VALUES. You cannot get other configuration menu selections to display.	This means the menu is locked. For more detail, see the Message/Description/Action information for message 097 in the table for Reference table 1, error messages.
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 Attachment is set to Hot Port Switch, 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 ensure the desired Quality setting 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).
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.
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).
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 1/2 speed. Disable Quiet Print. See the *User's Guide*.

Description of Failure	Action
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.
AFTA wheel indications varies on same paper-weight.	See Print Head Gap Service Checks.
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 and ribbon lift.
Ribbon feed or lift failure.	See MAP 0160: Ribbon feed and ribbon lift.
Fanfold stacking problems.	See the *User's Guide*.
Forms damage at perforations of multiple-part forms or heavy stock.	1. Use Perforation Safety feature (see the *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 12. 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 (V clamp from head circuit)
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 to +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.

Reference table 6, ribbon lift and 26-pin cable connectors

Table 13. Connectors

Ribbon Lift Connector	26-Pin Connector
Pin 1	Pin 25
Pin 2	Pin 23
Pin 3	Pin 24
Pin 4	Pin 26

See Ribbon Lift Motor Wiring for details on the location of the pins on the connector.

Chapter 2. Diagnostics

Test and diagnostic information—Model X03

Printing the printer demonstration

1. Power off the printer.
2. Load the printer with at least 22 in. (55.9 cm) of blank, fanfold forms in the same tractor and forms path the customer is using.
3. Power on the printer.
4. Press the **STOP** key to make the printer Not Ready.
5. Press the **TEST** key. The message **OPERATOR PRINT TESTS** appears.
6. Press the **SCROLL/MICRO ↓** key until the **Printer Demonstration** test is displayed below **OPERATOR PRINT TESTS**.
7. Press the **ENTER** key, and wait for the test to finish.
8. Press the **CANCEL PRINT** (or **RETURN)** key to exit test mode.

Printing the firmware, part number, and version levels

1. Power off the printer.
2. Load the printer with at least 22 in. (55.9 cm) of blank, fanfold forms in the same tractor and forms path the customer is using.
3. Power on the printer.
4. Press the **STOP** key to make the printer Not Ready.
5. Press the **TEST** key. The message **OPERATOR PRINT TESTS** appears.
6. Press the **SCROLL/MICRO ↓** key until the **Firmware Information** test is displayed below **OPERATOR PRINT TESTS**.
7. Press the **ENTER** key, and wait for the firmware, part number, Controller and Attachment Code versions to print.
8. Press the **CANCEL PRINT** (or **RETURN)** key to exit test mode.

Printing the printer configuration and the custom sets

It is possible to store up to 8 custom configurations. The current printer configuration is shown on the operator panel display in the upper right corner as **<X>**.

1. Load the printer with at least 22 in. (55.9 cm) of blank, fanfold forms in the same tractor the customer is using.
2. Press the **STOP** key to make the printer Not Ready.
3. Press the **TEST** key. The message **OPERATOR PRINT TESTS** appears.
4. Press the **SCROLL/MICRO ↓** key until the **Printer Configuration** test is displayed below **OPERATOR PRINT TESTS**.
5. Press the **ENTER** key, and wait for the configuration to print. To print a custom set:
   a. Press the **SCROLL/MICRO ↓** key until **Print Custom Sets** is displayed.
   b. Press the **ENTER** key and wait.
6. Press the **CANCEL PRINT** (or **RETURN**) key to exit test mode.

Printing and clearing the error log, and printing the usage metrics

Error Log: When a previously not logged error is encountered during printer operation, the Code Description is entered into the Print Error Log and the Count is set to **00001**. If the Code Description existed in the error log from a previous posting, the Count is incriminated to the next higher number (see Figure 4).

The Print Error Log has a maximum capacity of 8 Code Description entries. If fewer than 8 Code Descriptions are encountered, the unused entries remain at zero. When a ninth Code Description is encountered, the oldest entry is deleted from the Print Error Log, and the new entry is included in the list. Stated another way, only the 8 most current errors are maintained in the Print Error Log.

The maximum Count that will register for an Error is 256.

Print Usage Metrics:

The test prints decimal values for the following data:

- Power-on hours
- Power-on cycles
- DP, DP text, and NLQ characters
- Number (quantity) of barcodes
- Number (quantity) of pages with graphics or images

Printing Error Logs and Print Usage Metrics:

Use the following procedure to print or clear the error log, or to print usage metrics:

1. Select the paper path from which you are going to print the error log or usage metrics.
2. Load the printer with at least 22 in. (55.9 cm) of blank, fanfold forms in the same tractor the customer is using.
3. Load forms in the selected path.
4. Press the **STOP** key to make the printer Not Ready.
5. Press and hold the **TEST** key. While holding the **TEST** key, press the **START** key.
6. Release both keys; the operator panel display message **PRESS STOP** appears.
7. Do not press the **STOP** key. Press the **MENU** key.
8. **OPERATOR PRINT TESTS** is displayed on line one and a test name on line two.
9. Press the **SCROLL/MICRO ↓** key to scroll through the menu to **Print Error Log**, **Clear Error Log**, or **Print Usage Metrics**.
   - At the **Print Error Log** display, press the **ENTER** key; wait for the error log to print.
   - At the **Clear Error Log** display, press the **ENTER** key.
   - At the **YES** display, press the **ENTER** key. The message **Error Log Cleared** displays.
   - At the **Print Usage Metrics** display, press the **ENTER** key, and wait for the usage metrics to print.
10. To exit test mode:
    - Press the **RETURN** key to return to offline Not Ready.

      - or -
    - Press the **CANCEL PRINT** key to return to online Ready.

Figure 4 shows a sample printout of the error log. The asterisk (*) indicates the most recent error. Figure 5 shows a sample printout of the print usage metrics.

```
Print Error Log
Count   Code Description
00007   *002 FORMS JAMMED FRONT
00001   051 MACHINE CHECK
00003   020 FORMS JAMMED REAR
00001   055 MACHINE CHECK
00000   000
00000   000
00000   000
00000   000
```

Figure 4. Sample of Error Log

```
Print Usage Metrics
  Power-on Hours                          84
  Power-on Cycles                        136
  DP Characters                    1,541,409
  DP Text Characters                     131
  NLQ Characters                           0
  Number of Barcodes                       0
  Pages with Graphics or Images            0
```

Figure 5. Sample of Print Usage Metrics

Running the test and diagnostic (T&D) programs

The T&D program can be run in two modes: Single Test Mode or Automatic Test Mode. Single Test Mode is used to run individual tests, for example, to perform an adjustment or print a print test. Automatic Test Mode, which runs all the tests sequentially, is used to verify correct printer operation. Automatic mode requires manual intervention for several of the tests.

1. Power off the printer.
2. **Remove all paper from the paper paths.**

   Tests T&D09 through T&D14 and T&D18 can perform paper path sensor tuning. If sensors are tuned with paper in the path, paper will not feed correctly.

Note: T&D06 and T&D07 require the use of parallel and serial loopback connectors, respectively.

3. Hold the **TEST** and **SCROLL/MICRO ↓** keys at the same time.
4. Power on the printer.
5. When the display is:

RELEASE KEYS

Release the **TEST** and **SCROLL/MICRO ↓** keys.

6. The following message will be displayed.

TEST & DIAGNOSTIC START UP		
SINGLE	YES	NO

7. To run all the tests sequentially, go to **Automatic Test Mode** step 9.

   To run specific tests, go to the **Single Test Mode** in the next step.

8. **Single Test Mode:**

   Note: If you are running T&Ds in single test mode, you can only increment forward (by pressing **LOAD/EJECT**) through the tests. T&D tests increment forward in a continuous loop giving you access to any T&D through a series of **LOAD/EJECT** key presses.

TEST & DIAGNOSTIC START UP		
SINGLE	YES	NO

   a. Press the **SET TOP OF FORM** key to select YES (run single test mode). The following message will be displayed:

T&DXX Test Description		
RUN TEST?	YES	NO

   b. To scroll to the desired test, press the **LOAD/EJECT** (NO) key.
   c. To run the currently displayed test, press the **SET TOP OF FORM** (YES) key.

      For a description of each test, go to Test Descriptions or return to the step that sent you here.
   d. If the test is completed successfully, the present test description is displayed again.

e. If an error is detected, an audible alarm will sound. All LEDs will flash. An error message will be displayed.

```
KO(n1) FRU(N2) [N3]
```

Where: *n*1 is the number of the forced test; *n*2 is the FRU related to the fault; *n*3 is the Diagnostic Error Code.

f. For a description of error messages, go to T&D error messages and actions.
g. Press any key to return to the beginning of the failed test.
h. The following message will be displayed:
i. Single test mode description stops here.

9. **Automatic Test Mode:**

```
TEST & DIAGNOSTIC START UP
SINGLE                    YES                    NO
```

a. Press the **LOAD/EJECT** key to select NO (run automatic test mode instead). You will be prompted by the display or the instructions in T&D procedures to press keys or install paper.
b. If the test is completed successfully, the present test description is displayed again.
c. If an error is detected, an error message will be displayed.

```
KO(n1) FRU(N2) [N3]
```

Where: *n*1 is the number of the forced test; *n*2 is the FRU related to the fault; *n*3 is the Diagnostic Error Code.

d. For a description of error messages, go to T&D error messages and actions.
e. If all the tests run OK, the following message will be displayed:

```
END T&D.....
```

f. To exit the T&D program, power off the printer, and remove any loop-back connector (if installed).

T&D procedures

1. If an error message is displayed during the T&D program, note the error information.

```
KO(n1) FRU(N2) [N3]
```

   Where: *n*1 is the number of the forced test; *n*2 is the FRU related to the fault; *n*3 is the Diagnostic Error Code.
2. Press any of the keys.
3. The following message will be displayed:

```
RUN  TEST?                YES                NO
```

4. To repeat the last test, press the **SET TOP OF FORM** key.
5. To skip to the next test, press the **LOAD/EJECT** key.
6. To restart the T&D program from the beginning, power off the printer, then press and hold **TEST** and **SCROLL/MICRO ↓** simultaneously while powering the printer back on.
7. For error code descriptions and repair action, go to T&D error messages and actions.

T&D03—NVM RAM test

Display:

```
T&D03  NVM  RAM  TEST
RUN  TEST?                YES                NO
```

1. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.
2. If an error message is displayed, go to T&D error messages and actions.
3. The test completed successfully if the present test is displayed again. Press **LOAD/EJECT** to skip to the next test.

T&D04—NVM Check test

Display:

```
T&D04 NVM CHECK TEST
RUN TEST?                YES                NO
```

1. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.
2. If an error message is displayed, go to T&D error messages and actions.
3. The test completed successfully if the present test is displayed again. Press **LOAD/EJECT** to skip to the next test.

T&D05—Operator panel LED and key test

Refer to Figure 6 for this test.

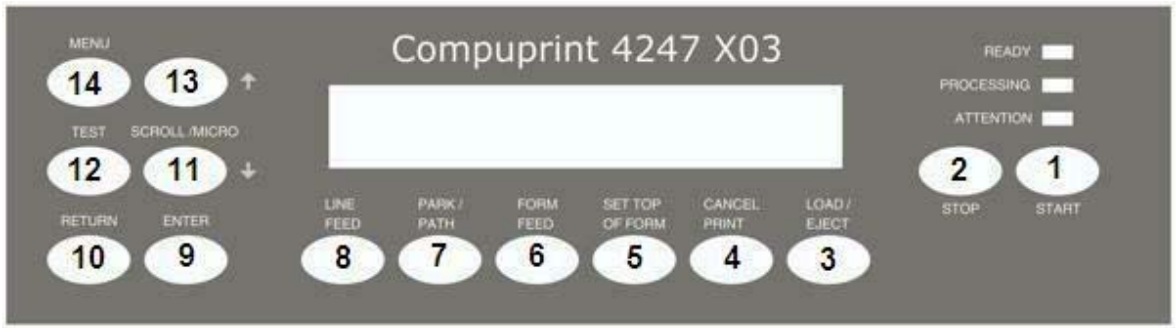


Figure 6. Operator Panel

Display:

```
T&D05 O.P. LED & KEY TEST
RUN TEST?                YES                NO
```

Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.

Execution of test requires one to press each key in succession (Refer to figure for sequence: 1 thru 14) and to observe for proper LED behavior. Be sure to press each key within approximately 15 seconds from the previous key or an error message will occur. After pressing the **MENU** key (key 14), the display shows “xxxxxVERIFY LEDSxxxxxx”. Press any key to complete this test. Refer to the following table for the test sequence and LED behavior.

Note: The following table has been added for reference only.

Test Sequence	Press Key to Advance to the Next Test Sequence	READY LED	PROCESSING LED	ATTENTION LED
1	START	BLINK	—	—
2	STOP	—	BLINK	—
3	LOAD/EJECT	—	—	BLINK
4	CANCEL PRINT	BLINK	—	BLINK
5	SET TOP OF FORM	BLINK	BLINK	—
6	FORM FEED	—	BLINK	BLINK
7	PARK/PATH	BLINK	ON	—
8	LINE FEED	ON	BLINK	—
9	ENTER	ON	ON	—
10	RETURN	—	ON	BLINK
11	SCROLL/MICRO↓	—	BLINK	ON
12	TEST	—	ON	ON

Test Sequence	Press Key to Advance to the Next Test Sequence	READY LED	PROCESSING LED	ATTENTION LED
13	SCROLL/MICRO↑	OFF	OFF	OFF
14 **Note:** After pressing the **MENU** key (key 14), the display shows "xxxxxVERIFY LEDSxxxxxx". Press any key to complete this test.	MENU	ON	ON	ON
15	ANY KEY	BLINK	BLINK	BLINK

1. If an error message is displayed, go to T&D error messages and actions.
2. The test completed successfully if the present test is displayed again. Press **LOAD/EJECT** to skip to the next test.

T&D06—Parallel interface test

The parallel loop-back connector (PN 08H7269) needs to be installed for this test.

Note: If the loop-back connector is not installed, an error message will be displayed. To bypass this message, press any key, then the **LOAD/EJECT** key to advance to the next test.

Display:

```
T&D06 PAR. INTERFACE TEST
RUN TEST?                YES                NO
```

1. Install parallel loop-back connector.
2. Press **SET TOP OF FORM** to execute test.

3. If an error message is displayed, go to T&D error messages and actions. The test completed successfully if the present test is displayed again. Press **LOAD/EJECT** to skip to the next test.
4. Remove parallel loop-back connector.

T&D07—Serial interface test

Note: If a serial card is not installed, see T&D09—Sensor tune/ribbon test.

The serial RS-232 loop-back connector (PN 41U2467) needs to be installed for this test.

If a loop-back connector is not installed, an error message will be displayed. To bypass this message, press any key, then the **LOAD/EJECT** key to advance to the next test.

```
T&D07 SER. INTERFACE TEST
RUN TEST?                YES                NO
```

1. Install RS-232 loop-back (9-pin) connector.
2. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.
3. If an error message is displayed, go to T&D error messages and actions.
4. The test completed successfully if the present test is displayed again. Press **LOAD/EJECT** to skip to the next test.

T&D08—LAN interface test

```
T&D08 LAN INTERFACE TEST
RUN TEST?                YES                NO
```

1. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.
2. If an error message is displayed, go to T&D error messages and actions.
3. The test completed successfully if the present test is displayed again. Press **LOAD/EJECT** to skip to the next test.

T&D09—Sensor tune/ribbon test

Note: Ensure that there is **no** paper in any paper path. This test does the paper path sensor tuning but does not tune the tractor jam sensors, as these sensors are not adjustable.

1. Display:

```
T&D09 SENSOR TUNE/RIBBON
RUN TEST?                YES                NO
```

2. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.
3. The next part of this test is forms path sensor tuning.

> **Important**
> The forms path sensors were tuned. The tuning must be done with all paper removed. If paper is installed, remove the paper and repeat T&D09

4. When the sensors are tuned, You will be prompted to the “RIBBON RUN” test. The following message will display:

```
T&D09 SENSOR TUNE/RIBBON
TO RUN                   PRESS
```

5. Press **SET TOP OF FORM** to execute ribbon test. Visually inspect for correct ribbon movement. Press **LOAD/EJECT** to stop ribbon movement.
6. The ribbon feed and the ribbon lift motors run continuously during this test. This feeds the ribbon, and raises and lowers the ribbon lift. You must press the **LOAD/EJECT** key to stop the test. If either motor fails, go to MAP 0160: Ribbon feed and ribbon lift.
7. If an error message is displayed, go to T&D error messages and actions.
8. The test completed successfully if the present test is displayed again. Press **LOAD/EJECT** to skip to the next test.

T&D10—AFTA calibrate test

You must complete this test to:

- Calibrate the microcode for the printhead
  - and -
- Adjust the gap between the printhead needles and the platen

Note: Do not run T&D10 unless instructed to do so by the Print Head Gap Service Checks or the Automatic Forms Thickness Adjustment (AFTA).

Display:

```
T&D10 AFTA CALIBRATE
RUN TEST?                YES                NO
```

Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.

If any error messages display during this test, go to T&D error messages and actions.

If the AFTA mechanism is malfunctioning or not repeatable, perform the Print Head Gap Service Checks.

Display:

```
T&D10 AFTA CALIBRATE
AFTA CALIBRATE
```

Since two tractor configurations are possible (one tractor installed or two tractors installed) the procedure followed depends on which configuration the printer is in. For the one tractor installed configuration (default tractor only), the display is:

```
T&D10 AFTA CALIBRATE
USER FRONT FF?     YES                NO
```

If YES:

```
T&D10 AFTA CALIBRATE
LOAD PAPER
```

Load 20 lb (80 g/m²) paper in front tractor and press **SET TOP OF FORM** to execute calibration using fanfold forms.

If NO:

```
T&D10 AFTA CALIBRATE
INSERT SING. SHEET ON UP
```

Manually load a single sheet of 20 lb (80 g/m²) paper into the upper paper path. Locate the hole in the base frame and black taped area of the Guide Assembly. Insert paper into this area of the Upper Tractor Path (approximately 4 1/2 inches in board from the left edge of the Tractor Assembly).

Continue with Calibrate the microcode.

For the two tractor installed configuration the display is:

```
T&D10 AFTA CALIBRATE
USER REAR FF?      YES                NO
```

If YES:

```
T&D10 AFTA CALIBRATE
LOAD PAPER
```

Load 20 lb (80 g/m²) fanfold paper in rear (lower) tractor and press **SET TOP OF FORM** to execute calibration using fanfold forms.

If NO:

```
T&D10 AFTA CALIBRATE
INSERT SING. SHEET ON UP
```

Manually load a single sheet of 20 lb (80 g/m²) paper into the upper paper path. Locate the hole in the Base frame and black taped area of the Guide Assembly. Insert paper into this area of the upper tractor path. (Approximately 4 1/2 inches inboard from the left edge of the tractor assembly.)

Continue with Calibrate the microcode.

Calibrate the microcode: Place 20 lb (80 g/m²) paper in the appropriate paper path.

Display:

```
T&D10 AFTA CALIBRATE
PAPER          +          RUN          –
```

Press **LOAD/EJECT** to move the paper down, or **SET TOP OF THE FORM** to move the paper up until the red dot painted on the left end of the platen shaft is aligned with the white dot on the left bearing. This is the position of the maximum platen eccentricity (minimum gap) where the calibration of the microcode should be made. If the platen assembly does not have a painted red dot, the procedure must be repeated at least 3 times on different points along the diameter of the platen. Select the point where the AFTA marker has the minimum value and paint a red dot on the left end of the platen shaft for later use.

Press **CANCEL PRINT** to execute AFTA.

Display:

```
T&D10 AFTA CALIBRATE
STORE                    YES              NO
```

Press **LOAD/EJECT** to change the AFTA calibrate value.

Press **SET TOP OF THE FORM** to store the AFTA calibrate value which completes the test.

To change the AFTA calibrate value if NO is selected:

Display:

```
T&D10 AFTA CALIBRATE
AFTA (n)          +          RUN          –
```

Press **LOAD/EJECT** to decrease the AFTA value.

Press **SET TOP OF THE FORM** to increase the AFTA value.

Press **CANCEL PRINT** to execute AFTA using the displayed AFTA(*n*) value.

T&D11—First line adjustment test

This test allows you to adjust the first print-line for the lower (default) forms path and the front (second or optional) forms path (if it is installed) from the operator panel (see Paper path nomenclature). This procedure assumes both tractors are installed. The difference with the “Default Tractor Only Test” is that this tractor becomes the “Front Tractor” and the display messages reflect this difference.

The value set by this test becomes the first print-line position when the configuration menu item **Paper Load Position** is set to **0**.

Note: If you adjust this value you also must run T&D13 "Tear-off line adjustment test".

1. Display:

```
T&D11 FIRST LINE ADJ TST
RUN TEST?              YES              NO
```

2. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.

```
T&D11 FIRST LINE ADJ TST
FF REAR ADJ?           YES              NO
```

Selecting "YES" will result in the following message:

```
T&D11 FIRST LINE ADJ TST
FANFOLD REAR CALIBRATE
```

3. To adjust the first print-line for the front tractor feed at this time, press the **LOAD/EJECT** key. However, the test will automatically advance to the front tractor first print-line adjustment after you complete the rear (base) (see Paper path nomenclature).
4. The procedure to adjust either front- or rear-tractor first print-line is the same.
5. If fanfold paper is not loaded, display:

```
T&D11 FIRST LINE ADJ TST
LOAD PAPER
```

6. Install fanfold paper in the tractor assembly.
7. Press the **SET TOP OF FORM** key.
8. The following message will be displayed:

```
T&D11 FIRST LINE ADJ TST
STORE                    YES              NO
```

9. A line of **E**'s will be printed on the first printing line, and then the paper will feed to a position for viewing. The **E**'s should be completely on the paper. The top of the **E**'s should be approximately 1 mm (0.04 in.) below the perforation.
10. If the first print-line adjustment is correct, press the **SET TOP OF FORM** key to store the first print-line position. If the optional tractor is installed, load the paper in the optional tractor and repeat the above procedure to adjust the first print line for that tractor.
11. If the first print-line adjustment is **not** correct, press the **LOAD/EJECT** key to get the next display.

```
T&D11 FIRST LINE ADJ TST
FRONT (n)          +          RUN          -
```

12. Press the **SET TOP OF FORM** key once to increase the space between the top of the form and the top of the print test, or press the **LOAD/EJECT** key once to decrease the space between the top of the form and the top of the print test. The value changes on the operator panel display.
13. Press the **CANCEL PRINT** key to run the test.
14. Go to T&D11 step 9, and repeat until the line of **E**'s is just below the edge of the form.
15. To exit this test without adjusting the optional second tractor first print-line, press the **LOAD/EJECT** key.
16. If an error message is displayed, go to T&D error messages and actions.
17. The test completed successfully if the present test is displayed again. Press the **LOAD/EJECT** key to skip to the next test.

T&D12—Bidirectional adjustment test

Note: This test allows the bidirectional adjustment to be made from the operator panel.

1. Display:

```
T&D12 BIDIR. ADJ. TEST
RUN TEST?                YES                NO
```

2. Press the **SET TOP OF FORM** key to execute the bidirectional test on lower (default) path.
3. Press **LOAD/EJECT** to skip to next test.
4. If test is executed, display shows:

```
T&D12 BIDIR. ADJ. TEST
VERTICAL ADJUST
```

5. If fanfold paper is not loaded, display:

```
T&D12 BIDIR. ADJ. TEST
LOAD PAPER
```

6. Install fanfold paper on the lower (default) tractor assembly, and press the **SET TOP OF FORM** key.
7. Two rows of vertical bars are printed using each bidirectional adjustment value of from –8 to +8.

   The alignment is correct when the 2 rows of vertical bars form a continuous vertical line segment.

This 2-row pattern is repeated.

8. The following message will be displayed:

```
T&D12 BIDIR. ADJ. TEST
STORE                    YES                    NO
```

9. If the bidirectional adjustment printout is correct, press the **SET TOP OF FORM** key to store the value.
10. If the bidirectional adjustment printout is **not** correct, press the **LOAD/EJECT** key to enter a change to vertical adj. value:

```
T&D12 BIDIR. ADJ. TEST
VERT. (n)          +          RUN          -
```

11. Press the **SET TOP OF FORM** key once to shift the bottom row of **I**'s to the right, or the **LOAD/EJECT** key to shift the bottom row of **I**'s to the left. The value changes on the operator panel display.
12. Press **CANCEL PRINT** to execute the vertical adjustment test and to print the selected pattern.
13. If an error message is displayed, go to T&D error messages and actions.
14. If satisfied with the results, press the **SET TOP OF FORM** key to store the values. The display shows:

```
T&D12 BID. ADJ TEST
TEAR   &   PUSH KEY
```

Tear output and press any key to perform that action.

Press the **LOAD/EJECT** key to skip to the next test.

T&D13—Tear-off line adjustment test

This test allows you to adjust the tear-off position from the operator panel. Load fanfold paper into the appropriate tractor(s).

The value set by this test becomes the tear-off position when the configuration menu item **Tear Adjustment** is set to **0** at the operator panel.

1. Display:

```
T&D13 TEAR-OFF LINE ADJ
RUN TEST?                YES                NO
```

2. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.

   IF the Default Tractor and optional Second Tractor are installed, the printer displays:

```
T&D13 TEAR-OFF LINE ADJ
REAR ADJ?                YES                NO
```

   To adjust the tear-off line for the front tractor feed (when optional tractor is installed), press the **LOAD/EJECT** key and the tractor feed will switch to the front.

   If only the default tractor is installed, the printer displays:

```
T&D13 TEAR-OFF LINE ADJ
FRONT ADJ?               YES                NO
```

3. With the appropriate tractor feed (Front or Rear) selected, press **SET TOP OF FORM** to run the test.
4. The procedure to adjust either front or rear tear-off line is the same.
5. A line of **X**'s will be printed on the first print-line. The paper will feed to the tear-off bar for viewing. The **X**'s should be completely on the paper. The top of the **X**'s should be approximately 1 mm (0.04 in.) below the perforation. If this condition does not exist, perform T&D11—First line adjustment test, and then return here.
6. The following message displays:

```
T&D13 TEAR-OFF LINE ADJ
REAR. (n)      +      RUN      -
```

7. Figure 7 shows the correct position of the perforation for a clean tear-off.

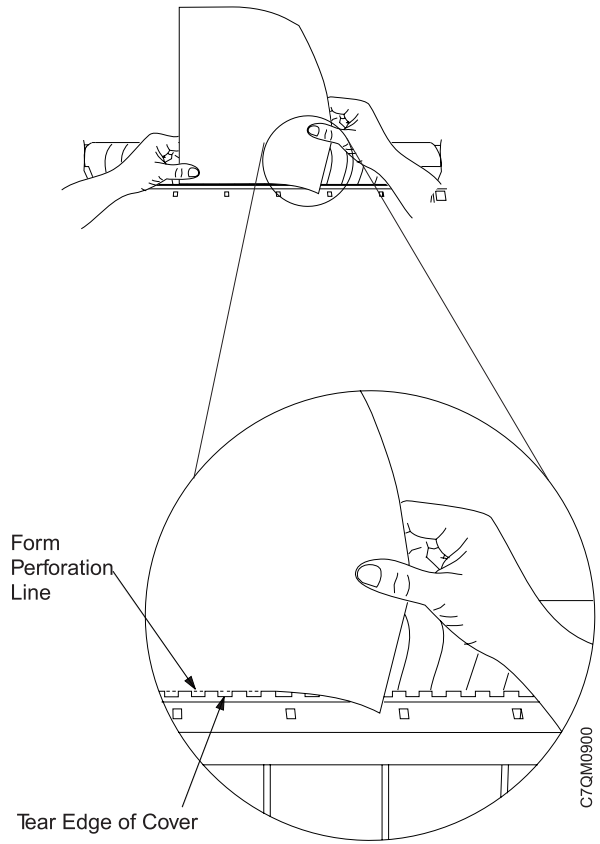


Figure 7. Tear-Off Position

   If the tear-off needs to be adjusted, press the **SET TOP OF FORM** key to move the paper up, or press the **LOAD/EJECT** key to move the paper down.

   The range is -128 to +127. Each unit is approximately 0.2 mm (0.008 in.).

   When the tear-off is correct, go to the next step.
8. Press the **CANCEL PRINT**. The following message will display:

```
T&D13 TEAR-OFF LINE ADJ
STORE?                    YES                    NO
```

9. If the tear-off adjustment is correct, press the **SET TOP OF FORM** key to store the tear-off position.

   If the tear-off adjustment is **not** correct, press the **LOAD/EJECT** key, and return to step 7.
10. If the optional front tractor is installed, install the paper in the optional front tractor and repeat the above procedure to adjust the tear-off line for the optional front tractor.
11. If an error message is displayed, go to T&D error messages and actions.
12. The test completed successfully if the paper feeds back into the printer and the present test is displayed again.

T&D14—Fanfold form printout test

Note: Use this test to check print quality, print wires, printhead wire shifter (18-wire printhead only), carrier movement, paper feed, line skew, and bidirectional (vertical) alignment. See Print Quality Service Checks for symptoms and for an example of a print sample.

1. Display:

```
T&D14 FANFOLD FORM PRINT
RUN TEST?                 YES                    NO
```

2. Press **SET TOP OF FORM** to execute test. Press **LOAD/EJECT** to skip test.
3. If fanfold paper is not loaded, the printer will display:

```
T&D14 FANFOLD FORM PRINT
LOAD PAPER
```

4. Install at least two fanfold forms (11 or 12 inch) in the rear tractor assembly (see Paper path nomenclature), and press the **SET TOP OF FORM** key.

   The print test will print, and the display will be:

```
T&D14 FANFOLD FORM PRINT
TEST RUNNING
```

5. When the print test is complete, the following message is displayed:

```
T&D14 FANFOLD FORM PRINT
TEAR   &   PRESS KEY
```

6. Tear off the single page printout, and press any key.
7. For printout analysis, see Print Quality Service Checks.
8. If an error message is displayed, go to T&D error messages and actions.
9. The test completed successfully if the present test is displayed again. Press the **LOAD/EJECT** key to skip to the next test.

T&D17—Top cover interlock test

Ensure the top cover interlock magnet is properly installed.

The display shows:

```
T&D17 TOP COVER TEST
RUN TEST?                YES                NO
```

1. Press the **SET TOP OF FORM** to execute test.

   It the top cover is open (or if the interlock magnet is not present) when this tests starts, the display shows:

```
T&D17 TOP COVER TEST
CLOSE COVER
```

2. Close the cover (or properly install the interlock magnet) within 10 seconds, or an error message is generated. If an error message is generated, press **LOAD/EJECT** to resume test.
3. Press **SET TOP OF FORM** to execute the test. Press **LOAD/EJECT** to skip to the next test.

The following message is displayed upon test execution:

```
T&D17 TOP COVER TEST
OPEN COVER
```

If you do not open the top cover within 10 seconds, an error message is generated, press **LOAD/EJECT** to resume test.

This display will instruct you to OPEN COVER and then CLOSE COVER.

The test completed successfully if the present test is displayed again. Press the **LOAD/EJECT** key to skip to the next test.

T&D18—Paper path sensor test

T&D18 provides information on the operation of the front fanfold presence sensor and rear fanfold presence sensor. Use the test to verify correct sensor operation.

Verify sensor operation by inserting and removing a form from a forms path, and checking for correct changes in the display status given in step 4.

1. Display:

```
T&D18 SENSORS TEST
RUN TEST?              YES              NO
```

2. Press **SET TOP OF FORM** to execute sensors tune test. Press **LOAD/EJECT** to skip test; sensor status.
3. The following displays:

```
T&D18 SENSORS TEST
PATH STAT?             YES              NO
```

4. Press the **SET TOP OF FORM** key to display sensor status.

   Verify sensor operation by inserting and removing a form from a forms path, and checking for correct changes in the display status given in this step.

   Press the **LOAD/EJECT** key to skip to step 5.

   If both tractors are installed, the current path status displays:

```
REAR        :          X
FRONT       :          X          PRESS A KEY
```

where:

- Rear: is status of the rear (default) fanfold sensor
- Front: is status of the front (second or optional) fanfold sensor
- x will be B or F to indicate PATH BLOCKED or PATH FREE

If the optional second tractor is not installed, the current path status displays:

```
T&D18 SENSORS TEST
FRONT:          :          X          PRESS A KEY
```

where:

- Front: is status of the front (default) fanfold sensor
- x will be B or F to indicate PATH BLOCKED or PATH FREE

The display is continuously updated to indicate sensor status changes. Inserting paper into a path changes the display from :F (free) to :B (blocked).

Press any key to go to step 5.

5. The following displays:

```
T&D18  SENSORS  TEST
THRESH?                YES                NO
```

This part of the test is intended for use by Product Engineering, and allows the user to examine internal sensor threshold values stored in NVRAM.

6. Press the **LOAD/EJECT** key to skip to step 7.

   Press the **SET TOP OF FORM** key to enter. Threshold values written in NVRAM display. If both tractors are installed, threshold values written in NVRAM display.)

```
REAR           :          X1
FRONT          :          X2          PRESS  A  KEY
```

where:

- X1 is the threshold for the rear (default) path
- X2 is the threshold for the front (second or optional) path
- X1, X2 are numbers in hexadecimal format, which correspond to the measured voltages, resolution of 20 mV.

If the optional second tractor is not installed, threshold values written in NVRAM display:

```
T&D18 SENSORS TEST

FRONT          :          X1          PRESS A KEY
```

where:

- x1 is the threshold for the front (default) tractor
- x1 is a number in hexadecimal format, which correspond to the measured voltages, resolution of 20 mV.

Press any key to go to step 7.

7. The following displays:

```
T&D18 SENSORS TEST
SENS. LEV.                YES                NO
```

This part of the test is intended for use by Product Engineering, and allows the user to examine sensor output voltages.

8. Press the **LOAD/EJECT** key to skip to step 9.

   Press the **SET TOP OF FORM** key to enter.

   If both tractors are installed, the current sensor measurements display:

```
REAR           :          X1
FRONT          :          X2          PRESS A KEY
```

where:

- x1 is rear (base) path measurement

- x2 is front (second or optional) path measurement
- x1, x2 are numbers in hexadecimal format, which correspond to the measured voltages, resolution of 20 mV.

The display continuously updates to track sensor output changes.

If the optional second tractor is not installed, the current sensor measurements display:

```
T&D18 SENSORS TEST
FRONT      :        X1              PRESS A KEY
```

where:

- x1 is rear tractor path measurement rear tractor.
- x1 is a number in hexadecimal format, which correspond to the measured voltages, resolution of 20 mV.

The display continuously updates to track sensor output changes.

Press any key to go to step 9.

9. The following displays:

```
T&D18 SENSORS TEST
REP. TEST                YES                NO
```

Press the **SET TOP OF FORM** key to restart from path status, step 2.

Press the **LOAD/EJECT** key to end the test.

The present test will be displayed again. Press the **LOAD/EJECT** key again to return to T&D13—Tear-off line adjustment test.

T&D error messages and actions

Error messages are in the following format:

K0(*n*1) FRU(*n*2) [*n*3]

where "*n*1" is the number of the forced test, "*n*2" is the FRU related to the fault, and "*n*3" is the diagnostic error code.

Table 14 shows the complete list of tests with description and the Field Replaceable Unit (F.R.U.) under test.

Table 14. T&D Tests List

TEST NUMBER (*n*1)	TEST DESCRIPTION	FIELD REPLACEABLE UNIT
T&D00	Reserved	N/A
T&D01	Reserved	N/A
T&D02	Reserved	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 TEST (Centronix)	CONTROLLER BOARD
T&D07	SERIAL INTERFACE TEST	CONTROLLER BOARD
T&D08	LAN INTERFACE TEST	CONTROLLER BOARD
T&D09	SENSOR TUNE / RIBBON TEST	ENGINE BOARD / MOTORS / RIBBON DRIVE ASSEMBLY
T&D10	AFTA CALIBRATE TEST	ENGINE BOARD / MOTOR / PRINT HEAD / MECHANISM
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 PRINT TEST	PRINT HEAD / ENGINE BOARD / MECHANISM
T&D15	Reserved	N/A
T&D16	Reserved	N/A
T&D17	TOP COVER INTERLOCK TEST	MECHANISM / ENGINE BOARD / OPERATOR PANEL
T&D18	PAPER SENSOR TEST	MECHANISM / ENGINE BOARD / SENS. CABLE
T&D19	Reserved	N/A

Table 15 shows the list of Field Replaceable Units (FRUs) involved in the diagnostic phase.

Table 15. FRU List

FRU (*n*2)	DESCRIPTION
0	Controller or Engine Board
1	Operator Panel Board
2	Sensors
3	Mechanical Parts
4	Flash on Controller Board
5	Supervisor SW

Table 15. FRU List (continued)

FRU (*n*2)	DESCRIPTION
6	Tractors
7	Print Head
8	Options

The following error codes are sorted by FRU and are not specified for one test.

Table 16. T&D Error Codes

FRU (*n*2)	ERROR CODE (*n*3)	ERROR DESCRIPTION	FIELD REPLACEABLE UNIT	IMPACTED AREA
0	1	Loop strobe-busy	CONTROLLER BOARD	PARALLEL I/F
0	2	Loop Slct init	CONTROLLER BOARD	PARALLEL I/F
0	3	Loop ACK-autofeed	CONTROLLER BOARD	PARALLEL I/F
0	4	Loop Pe^fit-sctin	CONTROLLER BOARD	PARALLEL I/F
0	5	Test pattern tx-rx	CONTROLLER BOARD	PARALLEL I/F
0	6	EPROM Write	ENGINE BOARD	NVM
0	7	EPROM Read	ENGINE BOARD	NVM
0	8	EPROM compare data (check)	ENGINE BOARD	NVM
0	9	Test pattern rx-tx	CONTROLLER BOARD	SERIAL I/F
0	10	Loop dtr-dsr	CONTROLLER BOARD	SERIAL I/F
0	11	Loop rts-cts	CONTROLLER BOARD	SERIAL I/F
0	12	Loop srts-dcd	CONTROLLER BOARD	SERIAL I/F
0	13	not recognized error	CONTROLLER BOARD	SERIAL I/F
0	14	Loop on CTS	CONTROLLER BOARD	SERIAL I/F
0	15	AFTA values out-of-range	ENGINE BOARD/MECHANISM	NVM/AFTA
0	16	LAN open	CONTROLLER BOARD	LAN I/F
1	1 to 14	Key 1 error to key 14	OPERATOR PANEL BOARD	KEYS
1	15	General	OPERATOR PANEL	KEYS
1	16	Cover open	OPERATOR PANEL	INTERLOCK
1	17	Cover close	OPERATOR PANEL	INTERLOCK
2	1	Paper sensor	MECHANICAL	SENSOR
2	2	Ribbon blocked sensor	MECHANICAL/SENSOR/ENGINE BOARD	SENSOR
2	3	Carriage sensor during initialization	MECHANICAL/SENSOR/ENGINE BOARD	SENSOR

Table 16. T&D Error Codes (continued)

FRU (*n*2)	ERROR CODE (*n*3)	ERROR DESCRIPTION	FIELD REPLACEABLE UNIT	IMPACTED AREA
2	4	Carriage sensor	MECHANICAL/SENSOR/ENGINE BOARD	SENSOR
3	1	Data Integrity	MECHANICAL/SENSOR/ENGINE BOARD	CARRIAGE MOVEMENT
3	2	Paper loading	MECHANICAL/SENSOR/ENGINE BOARD	PAPER MOVEMENT
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	TRACTOR / ENGINE BOARD / MECHANISM	TRACTOR
6	2	First (default) tractor (lower)	TRACTOR / ENGINE BOARD / MECHANISM	TRACTOR
6	3	Second (optional) tractor (upper)	TRACTOR / ENGINE BOARD / MECHANISM	TRACTOR
7	1	AFTA	PRINTHEAD / ENGINE BOARD / MECHANISM	PRINTHEAD
7	2	Thermal sensor on print head	PRINTHEAD / ENGINE BOARD / MECHANISM	PRINTHEAD
7	3	AFTA offset	PRINTHEAD / ENGINE BOARD / MECHANISM	PRINTHEAD
7	4	Head temperature out-of-range	PRINTHEAD / ENGINE BOARD / MECHANISM	PRINTHEAD

Test Descriptions

T&D03 - NVM RAM TEST

Note: This test must be run when a “neutral” Engine board is installed as a spare part.

This test checks the capability of the non-volatile RAM memory (NVM) to retain data.
A write pattern 0x55 and 0xAA and a read verify.
If the test result is positive, the DEFAULT parameters are loaded.
It correctly initialized the NVM for the specific Device ID.

T&D04 - NVM CHECK TEST

This test checks for correct read access and the checksum, and adjustment data CRC.

Note: See Engine Board for T&D requirements when installing a new Engine board.

T&D05 - OPERATOR PANEL LED & KEY TEST

This test checks the integrity of the 14 keys and the 3 LEDs on the Operator Panel.
If one key is damaged (short circuit), an error message is displayed and the T&D is halted.
All of the LEDs are lit and then go off. Then the LEDs are lit sequentially from right to left for approximately .5 second with an associated buzzer sound.
The test requests you to sequentially push the 14 keys from right to left.
At each step the display shows the message “PUSH KEY (*n*)”.
A buzzer sounds twice if the wrong key is pressed.
An error message is displayed if the requested key is not activated within a few seconds.

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.

Note: You must have the parallel interface connector installed onto 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 RS-232 interface. You must have the serial interface connector installed onto the Controller Board to run this test.

T&D08 - LAN INTERFACE TEST

If this interface is present, this test verifies the MAC address on the LAN.

T&D09 - SENSOR TUNE/RIBBON TEST

This test checks the correct movement of the ribbon and the ribbon lift motors.
If the **SET TOP OF FORM** key is pressed, the test is performed and the ribbon motor is activated together with the ribbon lift motor.
If the **LOAD/EJECT** key is pressed, the test is stopped.

T&D10 - AFTA CALIBRATE TEST

This test checks the AFTA to ensure it is functioning correctly.
Calibrating the AFTA is necessary if some mechanical parts related to printing are removed (carriage assembly, AFTA motor, platen assembly, and so forth).

T&D11 - FIRST LINE ADJUSTMENT TEST

This test calibrates the first print line on the lower tractor paper path. It also tests the calibration of the upper tractor path if the optional upper tractor is installed.
Setting the printout for a specific customer application is useful.

T&D12 - BIDIRECTIONAL ADJUSTMENT TEST

This test calibrates bidirectional printing.
If mechanical parts related to carriage movement are removed (carriage assembly, carriage motor, carriage belt, and so forth), and are out of tolerance with respect to the factory settings, this test is used to set the printout for best performance.

T&D13 - TEAR-OFF LINE ADJUSTMENT TEST

This test calibrates the tear-off margin.
Setting the printout for a specific customer application is useful.

T&D14 - FANFOLD FORM PRINTOUT TEST

The printout for this test is a standard module (132 characters, 66 or 72 lines) to check the parts involved in printing such as the printhead, needles, carriage, and so forth.
After this test the operator tears off the printed form.

T&D17 - TOP COVER INTERLOCK TEST

This test checks the function of the micro switch installed on the operator panel board.
The display shows the “OPEN COVER” message during this test.
The printer stays in the wait state until the magnetic switch detects the cover open condition.
The display then shows the “CLOSE COVER” message and the printer will be in the wait state to detect the cover close condition.
If the actions are not performed in time, the diagnostic stops and an error is displayed.

T&D18 - PAPER PATH SENSOR TEST

This test shows the function of the paper sensors and their margins.

Chapter 3. Wiring diagrams

18-Wire printhead resistance checks

The printhead is electromagnetic and has two columns which contain 9 wires. The left column (viewed from the platen or paper side) is the B side with wire 1B at the top. The right column is the A side with wire 1A at the top. The A side is raised and lowered (by an electromagnet), to increase print quality. Needle 5B is used for AFTA paper thickness measurements. The printhead is connected to the Engine board by a 22-pin cable, a 26-pin cable, and a 12-pin cable. (The 4247 Model X03 does not use the 12-pin cable.)

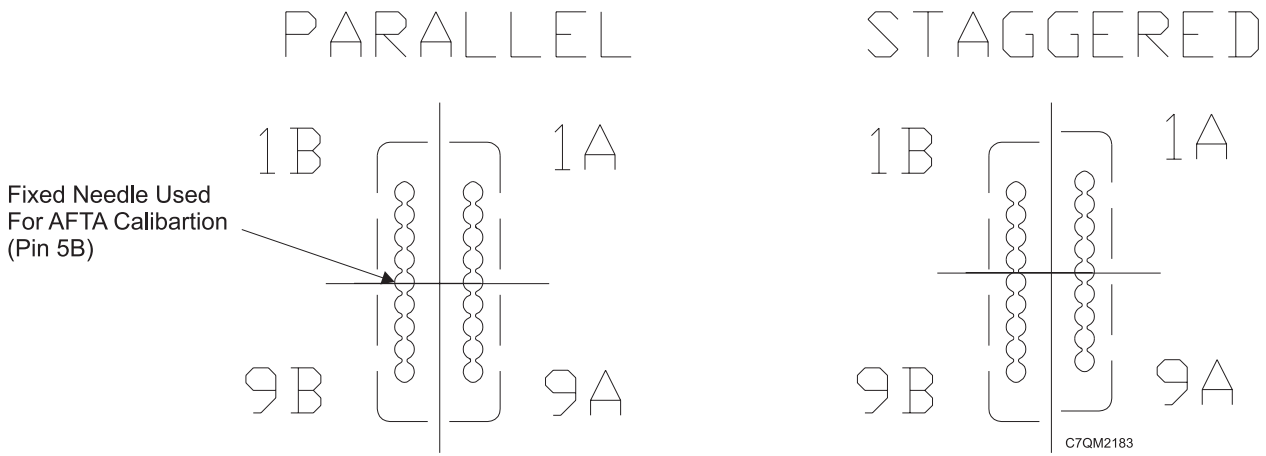
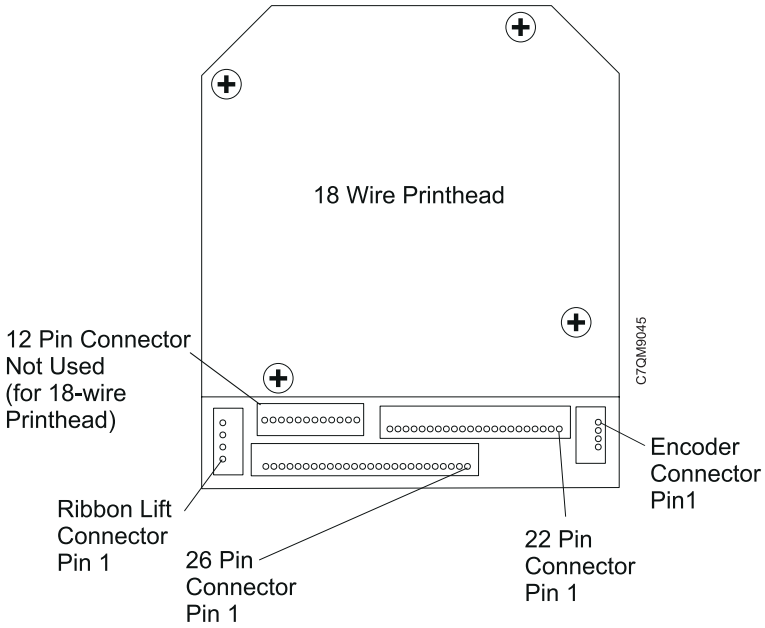


Figure 8. Print Head Needles Viewed from the Platen or Paper Side



Resistance measurements

Attention: Allow the printhead to cool before taking resistance measurements.

Part	Resistance	Temperature
Print wire coil	4 Ohms ±10%	20°C (68°F)
Column A shifter coil	12 Ohms ±5%	20°C (68°F)
Thermal sensor	1000 Ohms ±6%	20°C (68°F)

18-Wire printhead resistance checks continues

Attention: Allow the printhead to cool before taking resistance measurements.

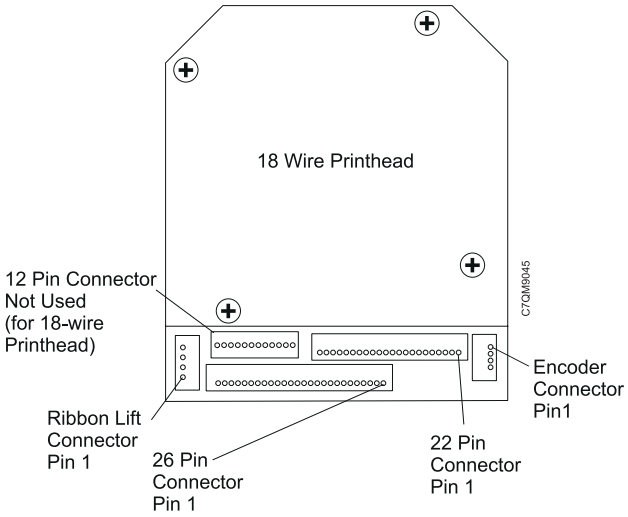
To measure the resistance of the coil for print wire 1A, measure between pins 1 and 2 of the 22-pin cable connector.

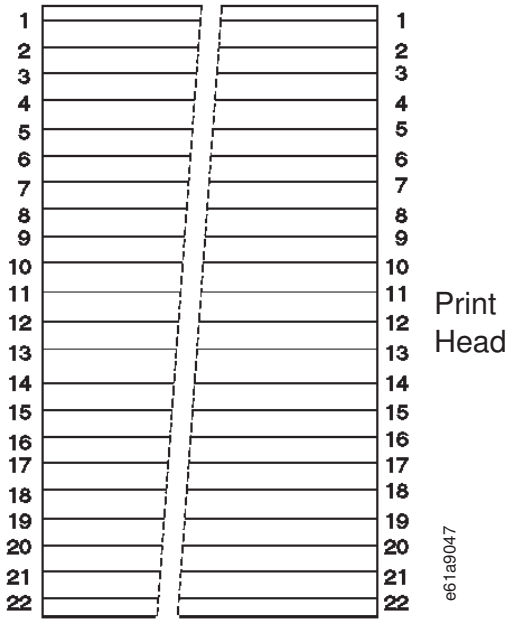
18-Wire printhead resistance checks

22-Pin printhead connector			
Pin	**Name**	**Pin**	**Name**
1	Wire 1A coil	2	Wire 1A coil
3	Column A shifter coil	4	Column A shifter coil
5	Wire 2A coil	6	Wire 2A coil
7	Wire 3A coil	8	Wire 3A coil
9	Wire 4A coil	10	Wire 4A coil
11	Wire 5A coil	12	Wire 5A coil
13	Wire 6A coil	14	Wire 6A coil
15	Wire 7A coil	16	Wire 7A coil
17	Wire 8A coil	18	Wire 8A coil
19	Wire 9A coil	20	Wire 9A coil
21	Wire 9B coil	22	Wire 9B coil

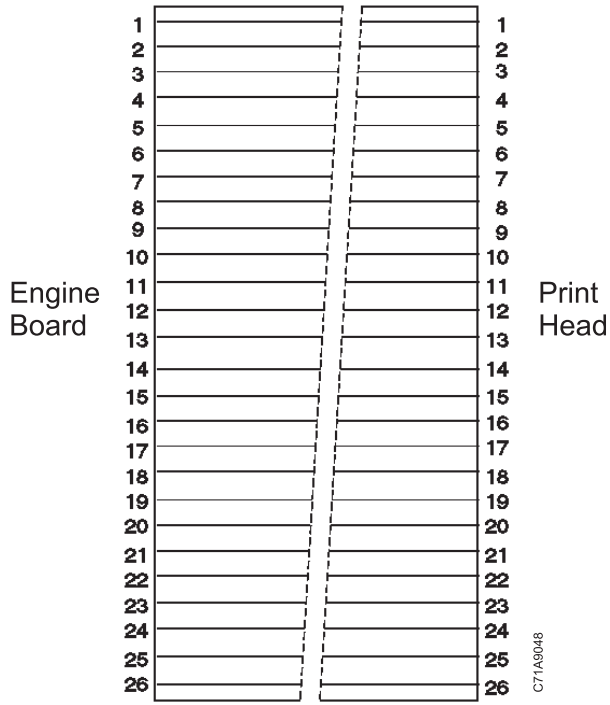
26-Pin printhead connector			
Pin	**Name**	**Pin**	**Name**
1	To encoder connector pin 1	2	To encoder connector pin 2
3	To encoder connector pin 3	4	To encoder connector pin 4
5	Thermal sensor ground	6	Thermal sensor
7	Wire 2B coil	8	Wire 2B coil
9	Wire 3B coil	10	Wire 3B coil
11	Wire 4B coil	12	Wire 4B coil
13	Wire 8B coil	14	Wire 8B coil
15	Wire 7B coil	16	Wire 7B coil
17	Wire 6B coil	18	Wire 6B coil
19	Wire 5B coil	20	Wire 5B coil
21	Wire 1B coil	22	Wire 1B coil
23	To ribbon lift connector pin 2	24	To ribbon lift connector pin 3
25	To ribbon lift connector pin 1	26	To ribbon lift connector pin 4

Printhead cable wiring





22 PIN CABLE



26 PIN CABLE

Note: The 4247 Model X03 does not use the 12-pin connector.

Carriage Motor Wiring

The carriage motor is a stepper motor with a 1.8° step angle. The motor connects directly to the Engine board.

RESISTANCE MEASUREMENTS

Note: Allow the carriage motor to cool before taking resistance measurements.

Table 17. Carriage Motor Resistance

Pins	Resistance	Temperature
1 and 2	0.2 ± 10% Ohm (±4.5%)	20°C (68°F)
3 and 4	0.2 ± 10% Ohm (±4.5%)	20°C (68°F)

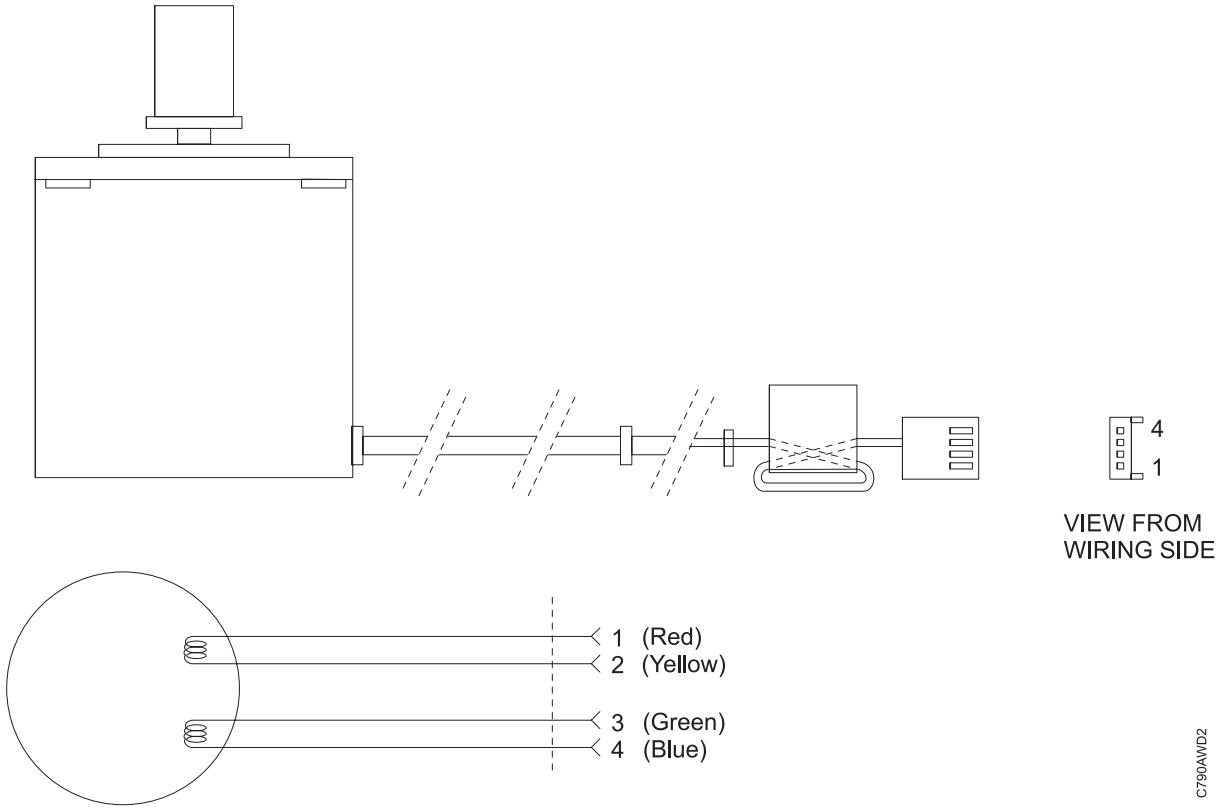


Figure 9. Carriage Motor Wiring

Paper Feed Motor Wiring

The paper feed motor is a stepper motor with a 1.8° step angle. The motor connects directly to the Engine board.

RESISTANCE MEASUREMENTS

Note: Allow the paper feed motor to cool before taking resistance measurements.

Table 18. Paper Feed Motor Resistance

Pins	Resistance	Temperature
1 and 2	0.2 Ohm ± 10%	20°C (68°F)
3 and 4	0.2 Ohm ± 10%	20°C (68°F)

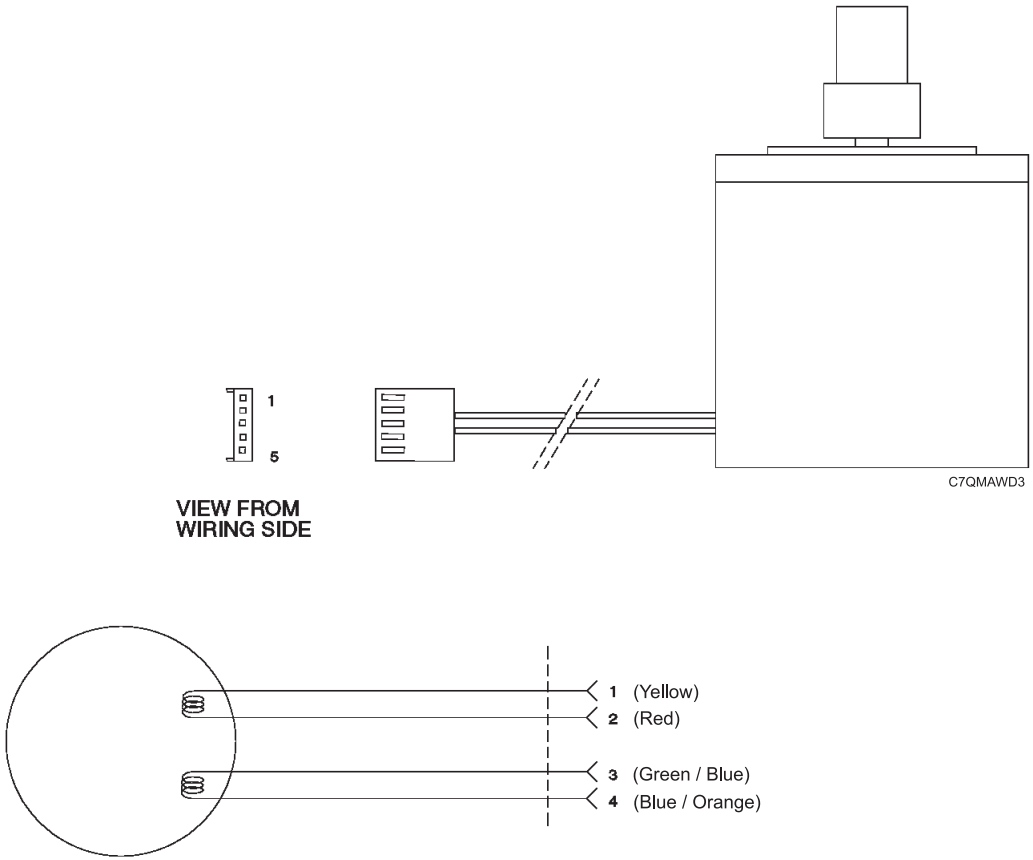


Figure 10. Paper Feed Motor Wiring

AFTA Motor Wiring

The AFTA motor is a stepper motor with a 3.6° step angle. The motor connects directly to the Engine board.

RESISTANCE MEASUREMENTS

Note: Allow the AFTA motor to cool before taking resistance measurements.

Table 19. AFTA Motor Resistance

Pins	Resistance	Temperature
1 and 2	19 Ohm ±10%	20°C (68°F)
3 and 4	19 Ohm ±10%	20°C (68°F)

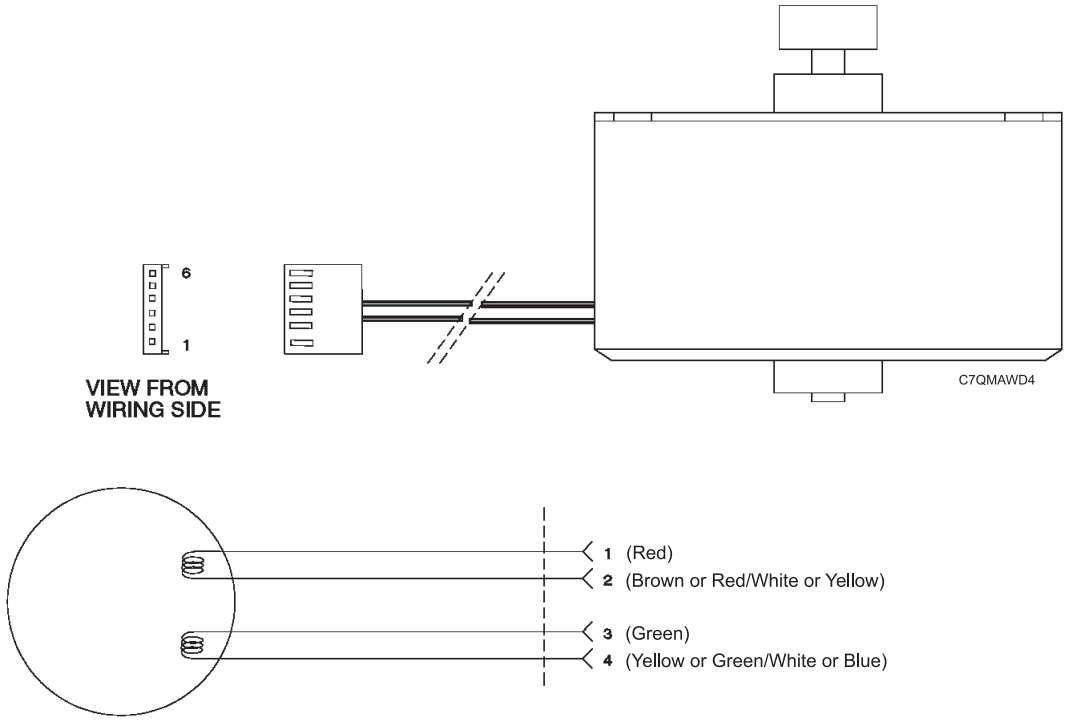


Figure 11. AFTA Motor Wiring

Ribbon Feed Motor Wiring

The ribbon feed motor is a stepper motor with a 7.5° step angle. The motor connects directly to the Engine board.

RESISTANCE MEASUREMENTS

Note: Allow the ribbon feed motor to cool before taking resistance measurements.

Table 20. Ribbon Feed Motor Resistance

Pins	Resistance	Temperature
1 and 3	14 Ohm ± 10%	20°C (68°F)
2 and 4	14 Ohm ± 10%	20°C (68°F)

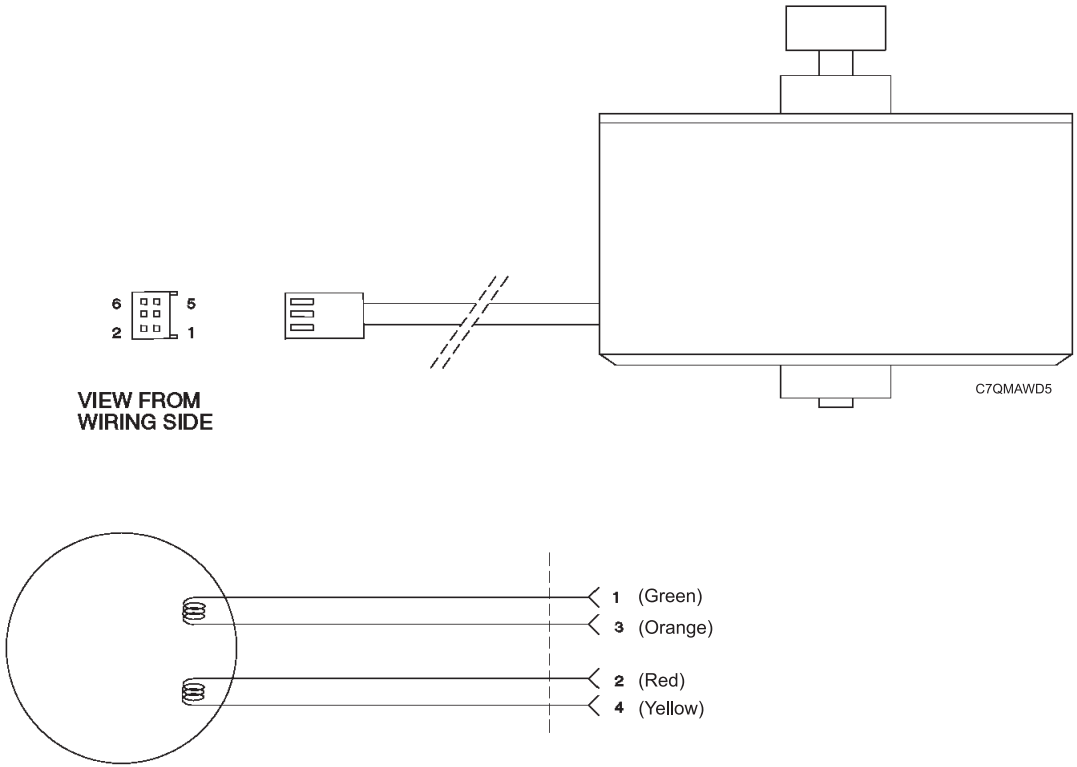


Figure 12. Ribbon Feed Motor Wiring

Ribbon Lift Motor Wiring

The ribbon lift motor is a linear actuator stepper motor with travel of 18 mm (0.71 inch). The motor connects to the printhead, and the printhead cable connects to the Engine board.

RESISTANCE MEASUREMENTS

Note: Allow the ribbon lift motor to cool before taking resistance measurements.

Table 21. Ribbon Lift Motor Resistance

Pins	Resistance	Temperature
1 and 2	150 Ohm ±10%	20°C (68°F)
3 and 4	150 Ohm ±10%	20°C (68°F)

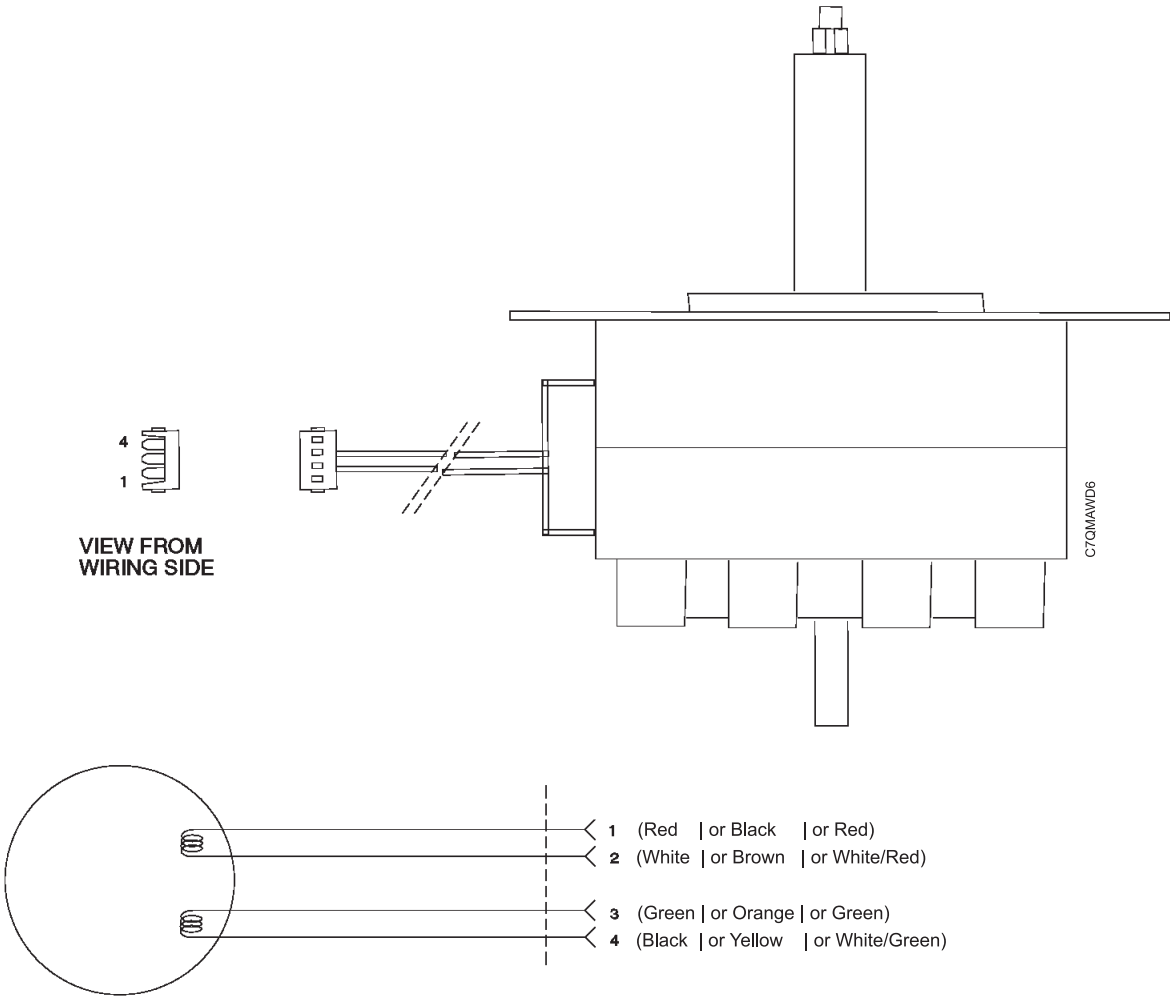


Figure 13. Ribbon Lift Motor Wiring

Cable Diagrams

Operator Panel Cable Wiring

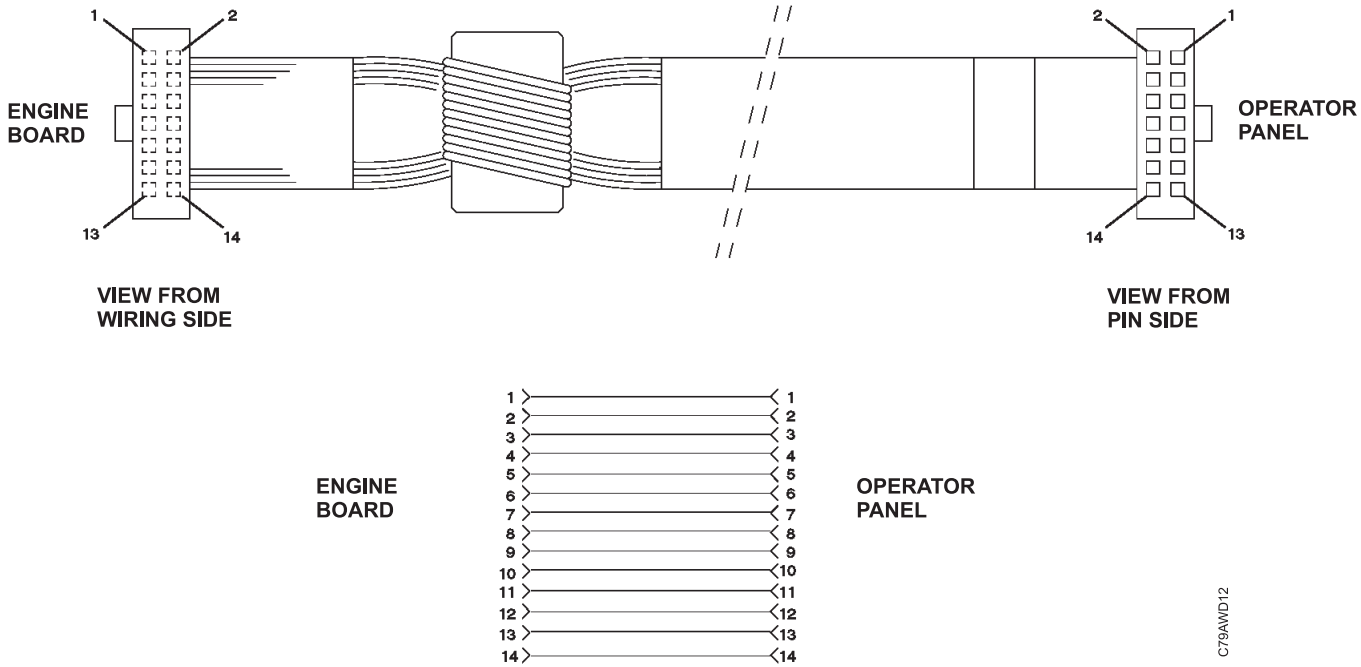


Figure 14. Operator Panel Cable Wiring

Sensor Cable Assembly Wiring

The sensor cable assembly has three optical sensors. The ribbon motion sensor is an interrupter sensor. The two paper-presence sensors are reflective type sensors.

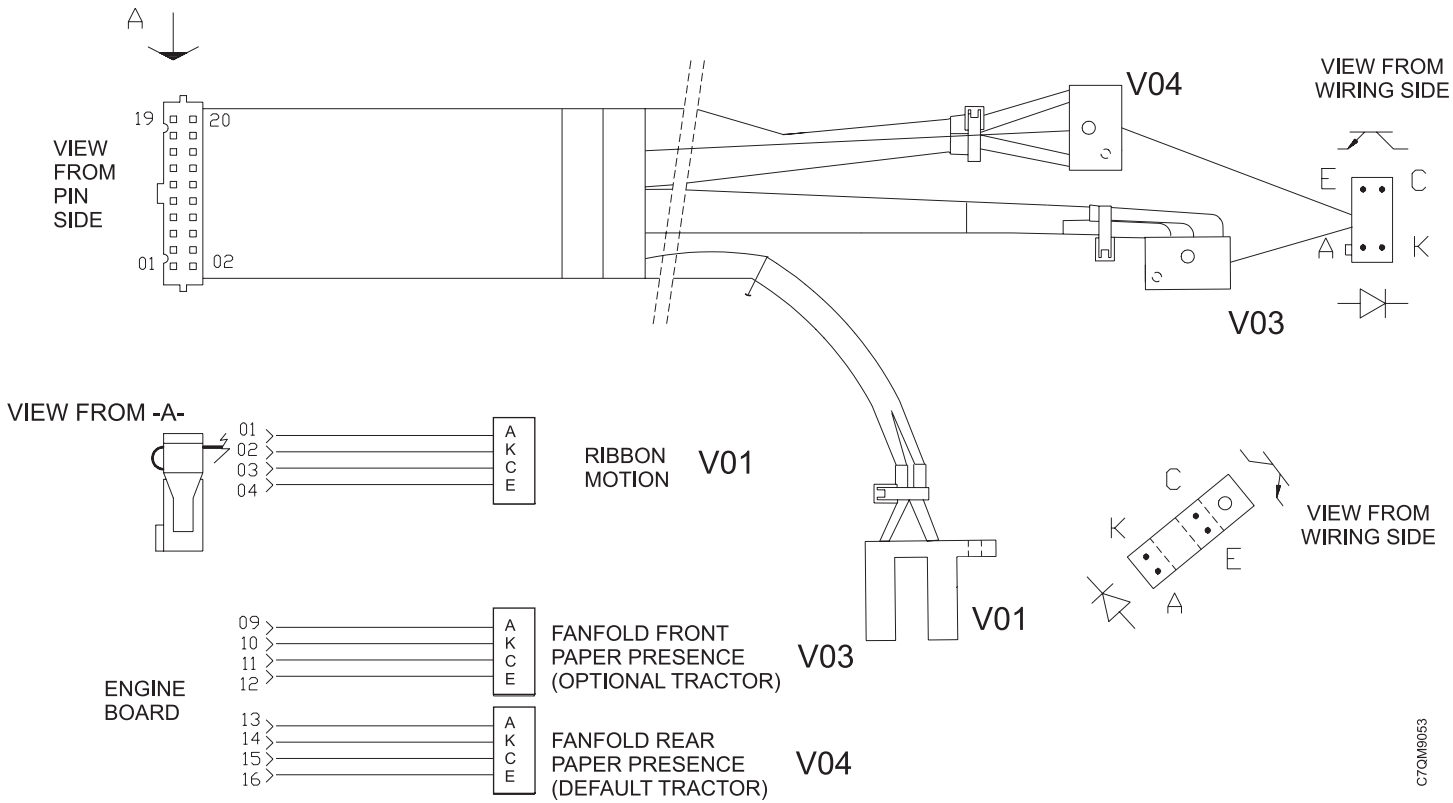


Figure 15. Sensor Cable Assembly Wiring

Tractor Assembly Cable Wiring

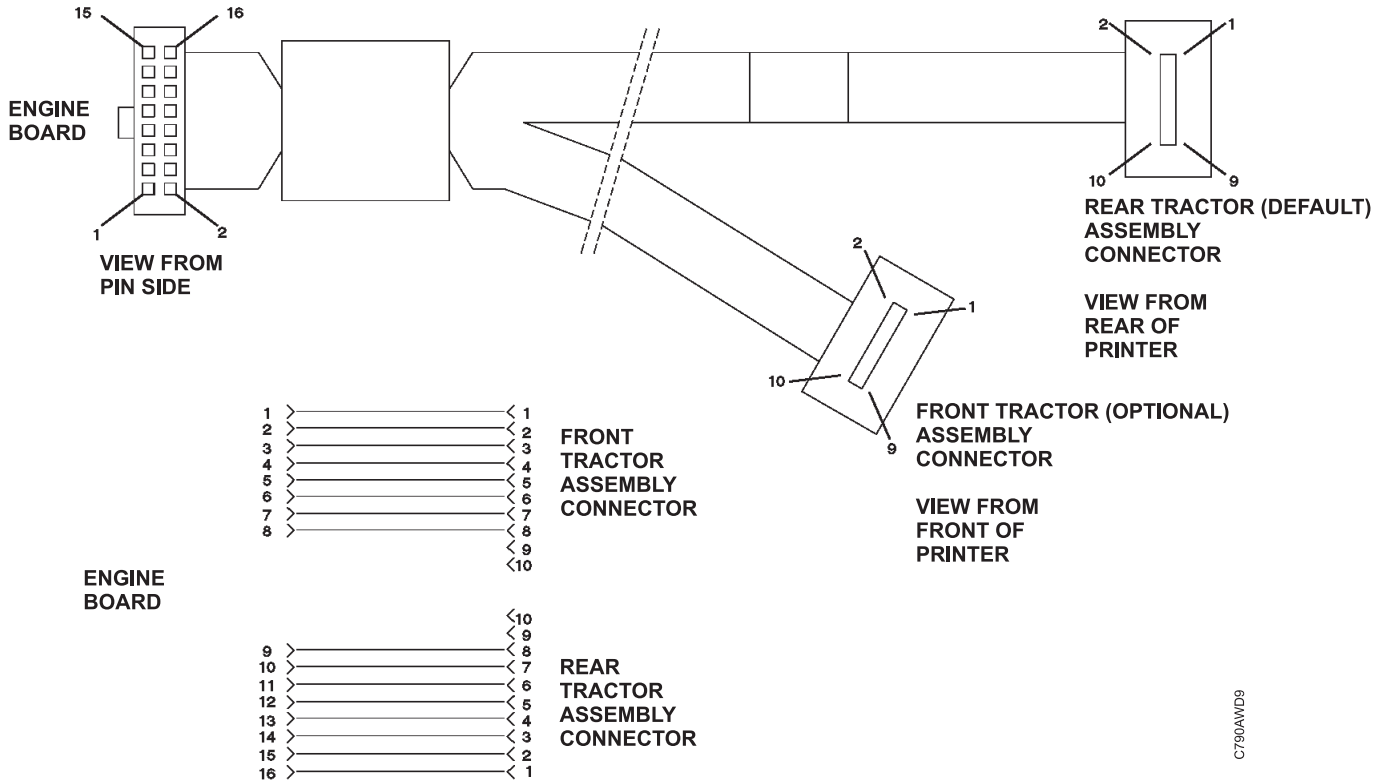


Figure 16. Tractor Assembly Cable Wiring

Attachment Connectors

Table 22. 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 23. 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.

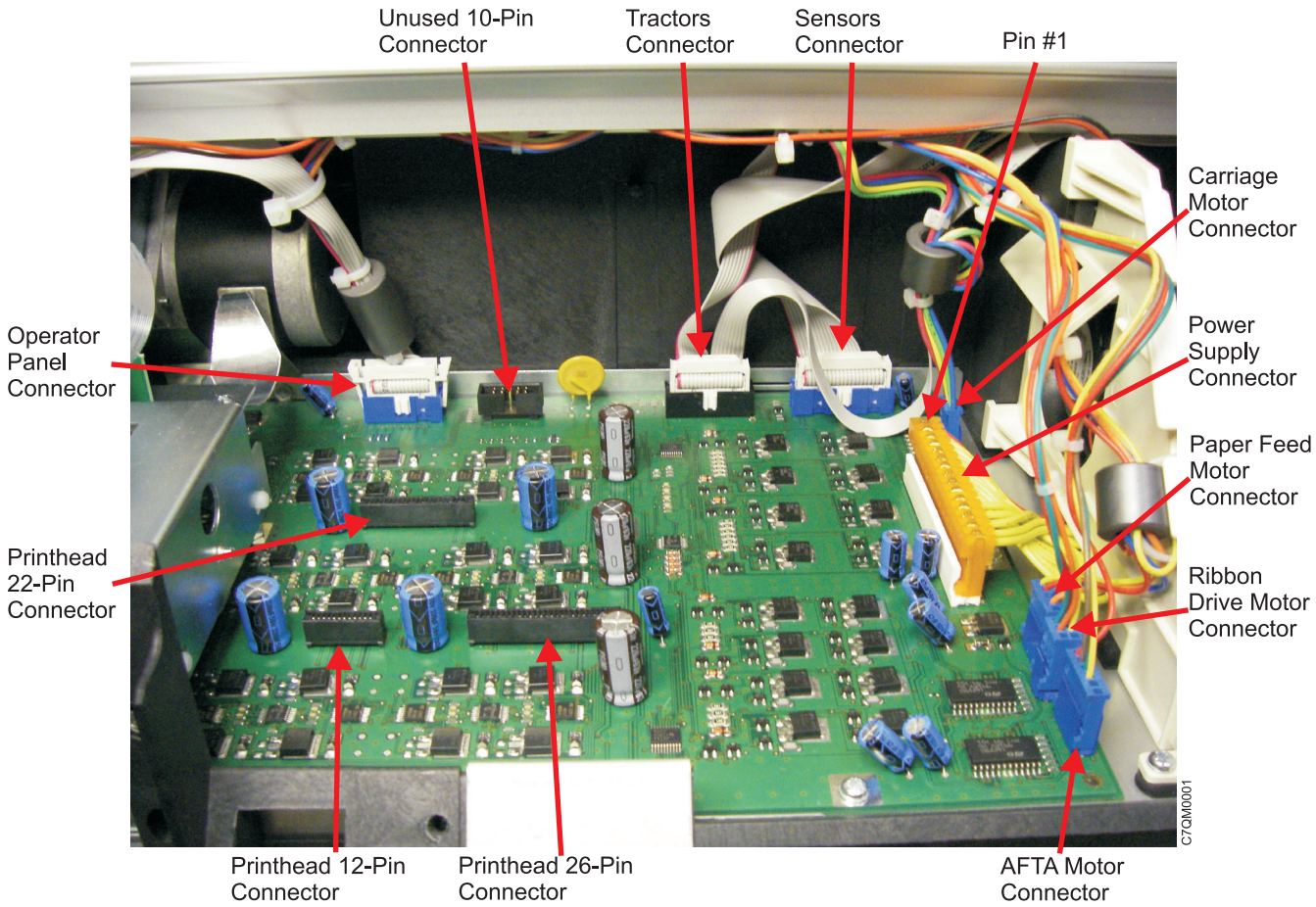


Figure 17. Engine Board

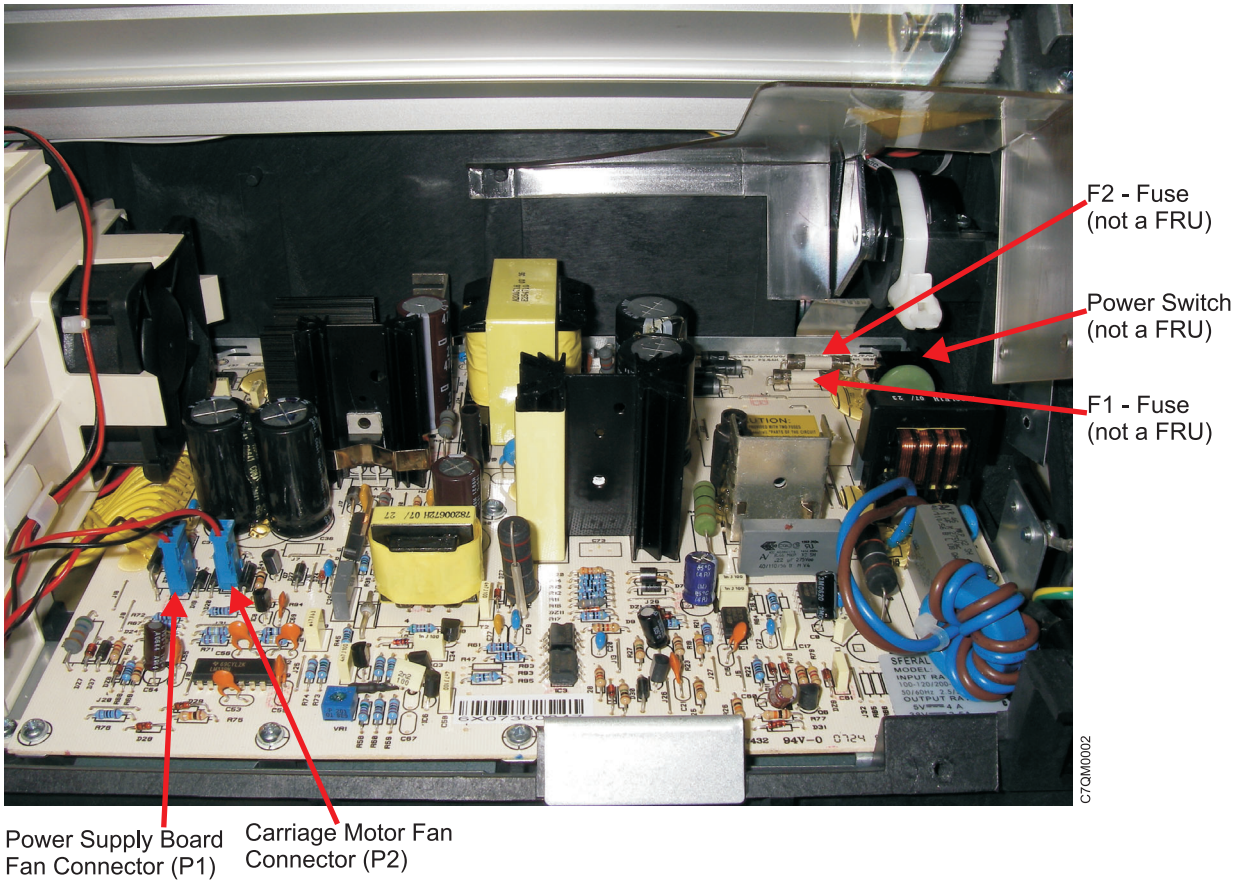


Figure 18. Power Supply

Chapter 5. Removals, Service Checks, and Adjustments

Removing Covers

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 cable.

DANGER

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

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 on page 144 if the replacement of the magnetic interlock is not required.

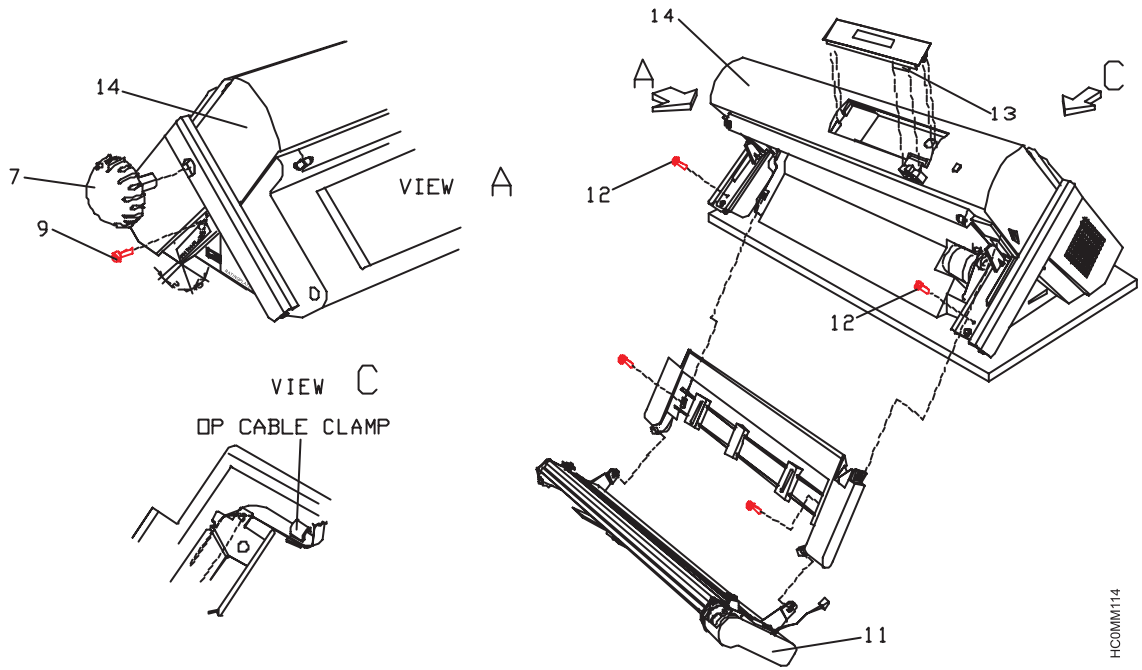


Figure 19. Cover Parts

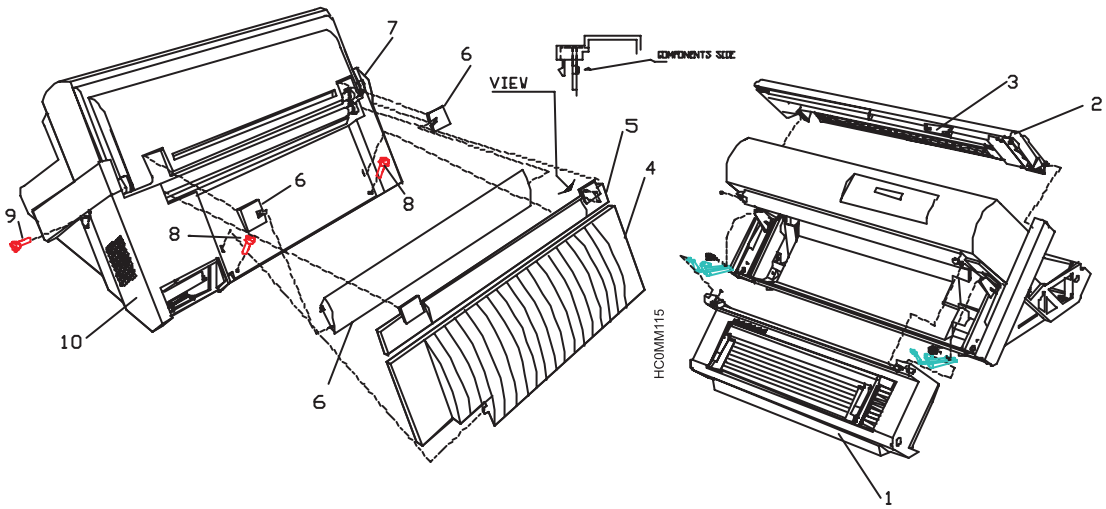


Figure 20. Cover Parts (cont.)

Service Checks and Adjustments

Carriage Drive Belt

Service Check

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. Power off (O) the printer.
2. Remove the ribbon cartridge. See Ribbon Cartridge.
3. Move the printhead to the right side stop.
4. Using a push-pull scale (such as P/N 44D9056) to check the belt tension, apply pressure to the upper half of the belt (at a point midway between the printhead and the left side frame) until it begins to touch the bottom half of the belt. To accurately measure the tension, it is critical for the raised surfaces of the teeth to align, as shown in Figure 21.

   The correct force required to bring the top of the belt into contact with the bottom of the belt is 0.9 ±0.05 kg (2.0 ±0.1 lb).
5. If the measurement is correct, the service check is complete. Stop here and return to the step that sent you here.

   If the measurement is not correct, go to the adjustment.

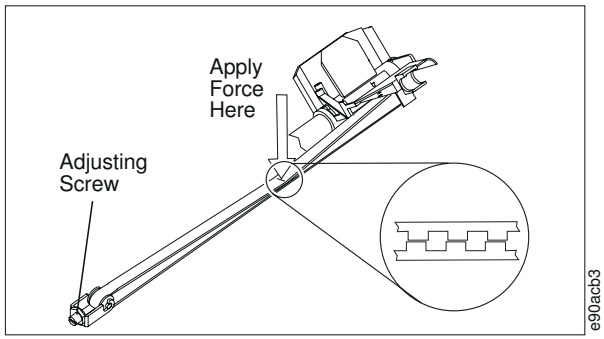


Figure 21. Carriage Belt. (Viewed From Top) - Teeth must align during measurement.

Adjustment

1. Remove the printer covers. See Removing Covers.
2. Loosen the lock nut and adjust the screw until a force of 0.85 to 0.95 kg (1.9 - 2.1 lb) is required to push the upper half of the belt (center between the printhead and the left side frame) to touch the bottom half of the belt.
3. Tighten the lock nut and check the adjustment again.
4. Repeat steps 2 and 3, as needed. Incorrect belt tension contributes to '056' errors (also seen as margin shifts and printhead slams).

Carriage Support Shaft

Service Check and Adjustment

1. Remove all paper, the ribbon cartridge, and the paper bail assembly.
2. Loosen the right side support shaft screw.
3. Measure the gap between the printhead and the platen at both ends of the platen, right and left.
   The correct gap is 0.25 to 0.30 mm (0.010 to 0.012 in.) when the AFTA indicator is pointed at 1.
   The correct difference in the gap between the left and right ends is ≤0.08 mm (0.003 in.).

4. Using pliers, rotate the eccentric bushing until a minimum difference between the left and right end gaps is obtained. See Figure 22.
5. While holding the eccentric bushing with pliers to prevent it from moving, firmly tighten the right side support shaft screw.

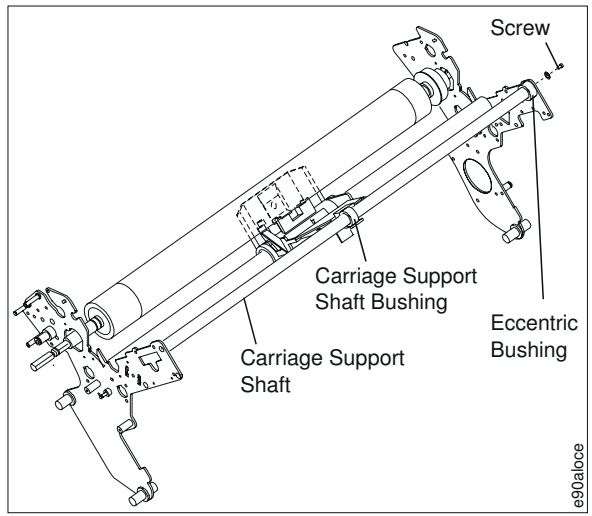


Figure 22. Carriage Support Shaft

Paper Feed Belt

Service Check

1. Power off (O) the printer.
2. Remove the printer covers. See Removing Covers.
3. Remove the Rear (default) Tractor assembly.
4. Use a push-pull scale (P/N 44D9056, or equivalent) to push on the lever to verify that the tension on the belt is between 0.55 and 0.75 kg (1.2 - 1.6 lb).

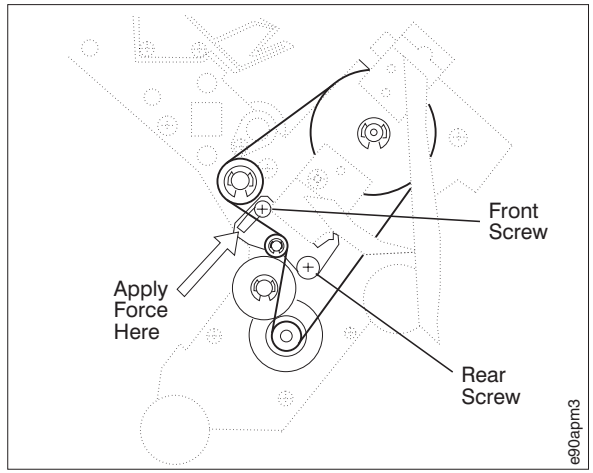


Figure 23. Paper Feed Belt Tension Lever. (Viewed From Right Side)

Adjustment

1. Loosen the 2 screws that mount the tension lever.
2. Use the push-pull scale to push on the lever to tension the belt to 0.55 to 0.75 kg (1.2 - 1.6 lb).
3. Tighten the front screw first, then the rear screw.

Automatic Forms Thickness Adjustment (AFTA)

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 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 by rotating the upper feed roller shaft 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 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 AFTA position near the left end of the platen if no mark is present.

   Note: The AFTA position nominally corresponds to to print position 10.

d. Slide 1-part paper (nominal 20 lb. (80 gram/m^2) up past the carriage. Rotate the 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.

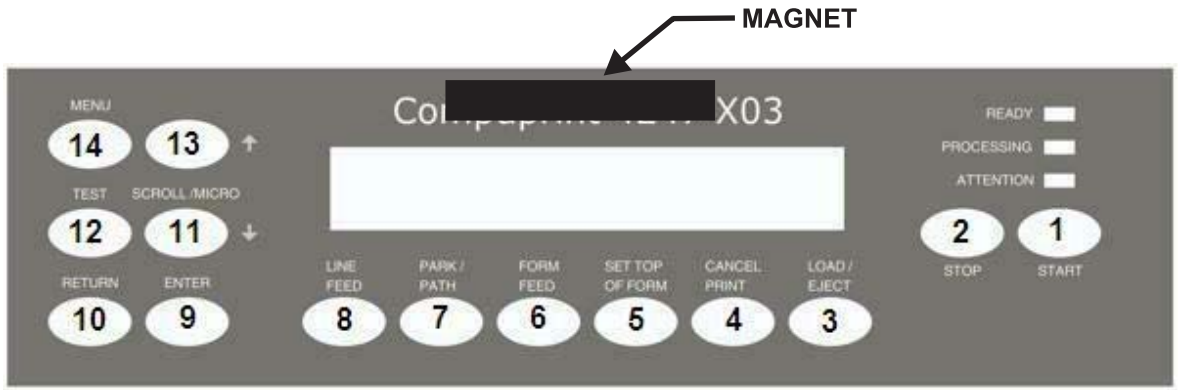
g. This Wheel position number is the minimum carriage to platen gap required for 1-part Paper Sliding. Determine the minimum gap for reliable paper feeding by adding 0.5 to this Paper Sliding AFTA Wheel position number.

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

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

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

b. 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 **TEST** and **SCROLL/MICRO↓** keys to enter the T&D menu. Verify that T&D10—AFTA calibrate test is set to '0' value and STORE the value. Power off to exit the T&D menu and then back on.

d. Power off and then power on the printer. 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) Load forms on the front tractors.
2) Press **STOP**, **TEST**, and **SCROLL/MICRO↓** until “OPERATION PRINT/TEST Printer Adjustments” displays.
3) Press **ENTER** and “Front AFTA” displays.
4) Press **ENTER**, scroll to “Fixed 1”, and then press **ENTER** again.

5) Press **START** and record the actual wheel position corresponding to the print sample that just printed.
6) Repeat step 5 after scrolling to “Front AFTA = Fixed 2” and pressing **ENTER**.
7) Repeat step 5 after scrolling to “Front AFTA = Fixed 3” and pressing **ENTER**.
8) Repeat step 5 after scrolling to “Front AFTA = Fixed 4” and pressing **ENTER**.
9) Repeat step 5 after scrolling to “Front AFTA = Fixed 5” and pressing **ENTER**.

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 24, 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 T&D10—AFTA calibrate test to decrease the gap by the value by –4. This will make the samples look like Examples 1, 2, or 3.

Table 24. Fixed Gap Settings

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

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

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

Step 4. **Calibrate AFTA using T&D10—AFTA calibrate test.**

a. Change the T&D10 AFTA value until the wheel goes to the chosen wheel position from Step 3.
b. Store this value and exit the T&Ds.

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

- Remove covers.
- Loosen both AFTA wheel screws.
- Hold the 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

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

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 “055 AFTA Machine Check” errors.
- 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.

AFTA Power Off Checks

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

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

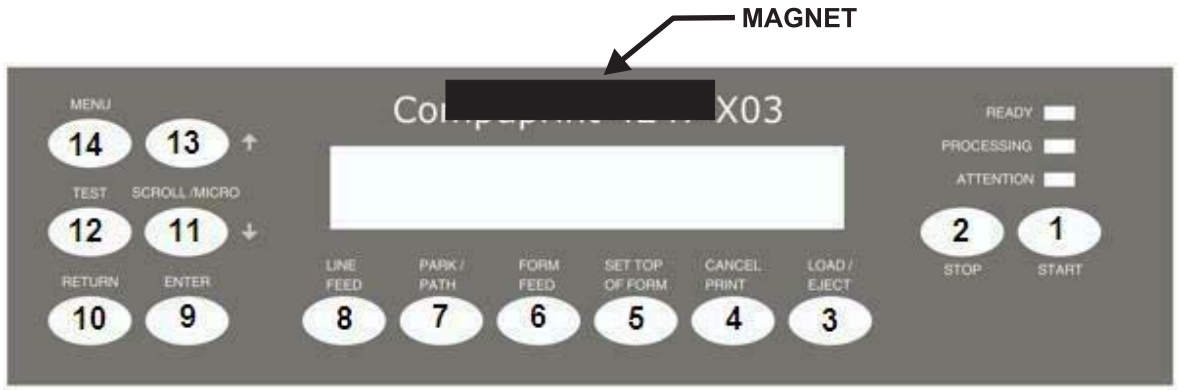
How to correct the location: To achieve the correct adjustment, loosen the 2 screws of the carriage shaft retainer to relieve the bind. Bias the carriage shaft retainer toward the lower carriage shaft retainer screw (the 5 o'clock position), and retighten the screws. With Correct location: When you grasp 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.

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 AFTA operation with single-part forms.**
   - Remove the top cover magnet and place this magnet above the top right side of the 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 Front AFTA = 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 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 1 layer of single part form.
   - Park the single-part forms.
   - Set the operator panel menu item Front AFTA = 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 T&D10—AFTA calibrate test*, then return to Verify 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 AFTA calibration using single-part forms.
  * Set the T&D10—AFTA calibrate test adjustment value to 0 (zero) and STORE.

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

   This section will use the FIXED GAP setting to give final verification that the AFTA setup is complete.
   - Set the Front AFTA in this printer configuration to Fixed 1.
   - 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 1.0 is different than the number you noted at **A**, run T&D10—AFTA calibrate test 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 AFTA = 0 and FIXED 1.0. The wheel should go to the same position. Repeat step above if the wheel positions are different by more than +/–0.5.

AFTA Print Quality Check

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

In above procedures the AFTA operation has been verified. In this procedure, samples will be printed to allow you to verify 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 1.0, 2.0, 3.0 and 4.0 settings

1. Load forms on the front tractors.
2. Press **STOP**, **TEST**, and **SCROLL/MICRO↓** until "OPERATION PRINT/TEST Printer Adjustments" displays.
3. Press **ENTER** and "Front AFTA" displays.
4. Press **ENTER**, scroll to "Fixed 1", and then press **ENTER** again.
5. Press **START** and record the actual wheel position corresponding to the print sample that just printed.
6. Repeat step 5 after scrolling to "Front AFTA = Fixed 2" and pressing **ENTER**.
7. Repeat step 5 after scrolling to "Front AFTA = Fixed 3" and pressing **ENTER**.
8. Repeat step 5 after scrolling to "Front AFTA = Fixed 4" and pressing **ENTER**.

Inspect the print samples for the proper print darkness.

Proper gap:

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

Gap is too small:

– If the FIXED 1.0 sample is dark, the FIXED 2.0 sample is also dark, and the FIXED 3.0 sample is light (gray), you should create a FIXED 4.0 sample. The FIXED 4.0 sample should appear light, and exhibit some missing dots.
– Using T&D10—AFTA calibrate test, 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 AFTA Gap Check.

Gap is too large:

– If the FIXED 1.0 sample is light, the FIXED 2.0 sample is very light with missing dots and the FIXED 3.0 sample is unreadable (due to lightness), the gap is too large.
– Using T&D10—AFTA calibrate test, 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 AFTA Gap Check.

AFTA Gap Check

1. Set the menu configuration to Front AFTA = 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 AFTA Wheel number (it should be indicating near '1').
4. Move the print head carriage 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 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 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.

First Line Printing

This adjustment uses T&D11 to locate the first print-line using the operator panel.

Service Check

The Vert and Load values should be zero and the first line on the print test should be below the perforation.

Adjustment

1. Run the T&D program in single test mode (see Running the test and diagnostic (T&D) programs).
2. Scroll to T&D11.

Bidirectional Printing

This procedure uses T&D12 and T&D14 to perform bidirectional adjustment from the operator panel.

Run the T&D program in single test mode (see Running the test and diagnostic (T&D) programs).

Service Check

Use T&D14 to print NLQ characters. If the vertical bars on the characters are not aligned, perform the adjustment. As an aid in evaluating the print, see Print Quality Service Checks.

Adjustment

1. Scroll to T&D12
2. Run the Bidirectional Printing test and make adjustments, as needed (see T&D12—Bidirectional adjustment test.)
3. Scroll to T&D14
4. Run the Fanfold Form Printout test and check vertical alignment on Line 7 of the printout. For more information, see Figure 35 (see T&D14—Fanfold form printout test).
5. Repeat the adjustment steps until you have obtained the best alignment of vertical lines on the T&D14 printout.

Tear-Off Line

Use T&D13 to adjust the tear-off line, using the operator panel.

Service Check

1. Load forms into the tractors.
2. Press **STOP** to make the printer **Not Ready**.
3. Press **LOAD/EJECT**, **FORM FEED**, then **LOAD/EJECT**. This advances the forms to the tear position.
4. Compare the alignment of the perforations on the forms to the tear edge of the printer cover. Perform the Adjustment, if indicated.

Adjustment

1. See Running the test and diagnostic (T&D) programs.
2. Scroll to T&D13.

Sensor Service Checks

You are here because the printer displayed a '002/020/099 FORMS JAMMED' message, or an unrecoverable '001 END OF FORMS' message.

Note: If the printer displays a 001 END OF FORMS message **after** you load forms, proceed to Paper Presence Sensor Check.

To determine whether you should investigate the FORMS JAMMED message as a paper presence sensor condition or a tractor sensor condition, perform this test. While the message is in the display, open and close the printer top cover.

- If the carriage moves across the print line and returns, follow the Paper Presence Sensor Check.
  - or -
- If the carriage does **not** move across the print line, follow the Tractor Sensor Check and Adjustment beginning on 163.

Paper Presence Sensor Check

This Check informs you when to use T&D09—Sensor tune/ribbon 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.

Note: Do not perform T&D09 until you are instructed to do so.

1. If the printer displayed a '099 FORMS JAMMED' message during Load or Park operations, determine the cause. Load and Park problems are often customer-use problems. Do **not** perform T&D09 because of a Load or Park problem.

   - or -

   If the printer displayed a '099 FORMS JAMMED' 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.

- or -

If the printer displayed a '099 FORMS JAMMED' message while an operator was performing a Park operation, advise the operator that the forms perforation must be torn off at the tear bar before confirming the Park operation. The error occurs when the printer backs up the forms, but does **not** detect that the paper is back on the tractor. The printer stops and displays '099 FORMS JAMMED.'

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/EJECT** 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 '001 END OF FORMS' 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 '099 FORMS JAMMED' message when a paper load is attempted using the **LOAD/EJECT** 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 rear path sensor threshold level. This should remove the '099' FORMS JAMMED message.

Note: If the printer is using a rear and front path, repeat steps 2 and 3 at the beginning of this service check.

Tractor Sensor Check and Adjustment

Use this procedure when the printer displays a '002/020 FORMS JAMMED' message that is caused by a forms tractor sensor.

To verify that the tractor sensor is requesting the message, with the '002/020 FORMS JAMMED' message in the display, open and close the printer top cover. If the carriage does **not** move across the print line, investigate the tractor sensor.

The tractor sensor is located under the black cover on each tractor assembly. When the printer is operating correctly, a light beam between the transmitter and receiver of the tractor is interrupted by the tractor holes in the forms as the forms travel through the tractor.

Attention: Do **not** use T&D09 for this procedure. T&D09 only applies to the paper presence sensors.

When the printer displays a '002/020 FORMS JAMMED' message, examine the tractor for damaged forms.

- If you **do** find damaged forms in the tractor, go to MAP 0190: Form feed problems to check the forms path.
  - or -
- If you **do not** find damaged forms in the tractor:

1. Look for paper chad inside the tractor sensor. If you find chad:
   a. Use a lint-free cloth to wipe the sensor. As a preventative measure, apply antistatic liquid (P/N 2200118) to the sensor, using a lint-free cloth. Consider occasional treatment, if problem recurs.
   b. If you find chad, and judge it to be excessive, advise the customer to:
      - Frequently clean out the chad.
      - Ask the forms supplier to reduce the chad.
2. With the printer powered on, look at the back of the tractor sensor. In a darkened room, you should be able to see the red dot of the light emitting diode (LED). If the LED is not lighted, verify that the tractor is plugged correctly into the electrical socket. If you determine the mechanical connection is adequate but the LED is not lighted, replace the tractor assembly.
3. Verify the sensor can read the tractor holes in the forms.
   a. Mount forms onto the tractor pins.
   b. While holding the paper in place, advance the forms by hand cycling the upper feed roller.
   c. Ensure the sensor is positioned so the LED light passes through the tractor holes.
   d. If adjustment is indicated, loosen and retighten the sensor.
   e. If adjusting the sensor does not correct the condition, replace the tractor assembly.

Paper Path Service Checks

Main Paper Drive Check and Adjustment

1. Power off (O) the printer.
2. Remove the printer covers (see Removing Covers).

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

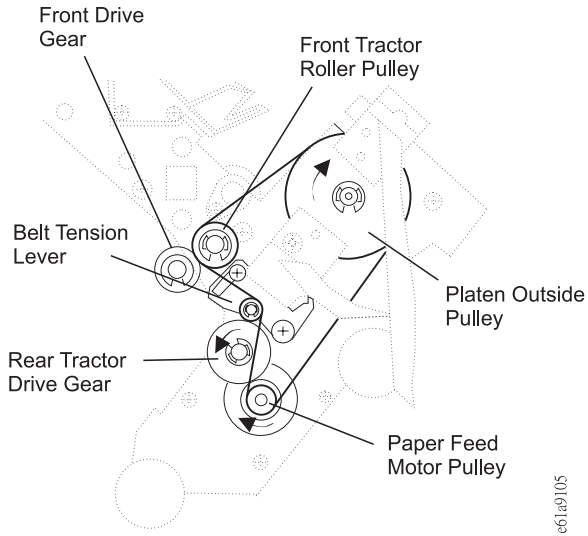


Figure 24. Paper Feed Main Drive. (Viewed From Right Side) Arrows show forward (up) paper feed.

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.

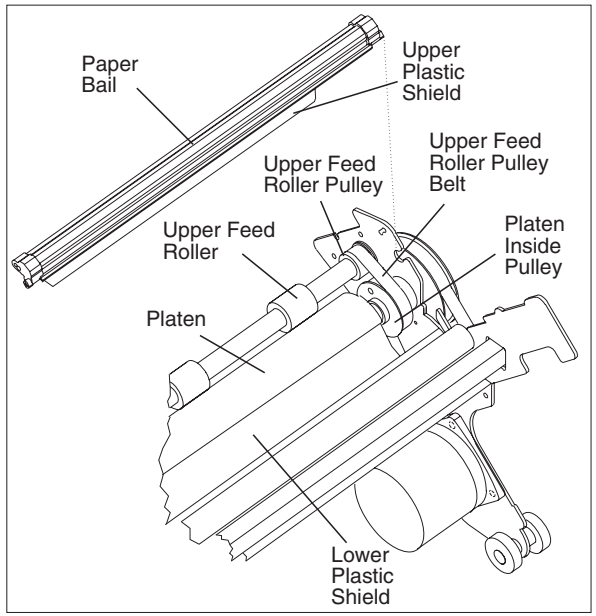


Figure 25. Paper Feed Main Drive. (Viewed From Top)

5. The following adjustments, when out of range, can cause paper feed failures. Ensure that they are correct:
   a. Print Head Gap Service Checks.
   b. Sensor Service Checks.
   c. Paper Feed 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.

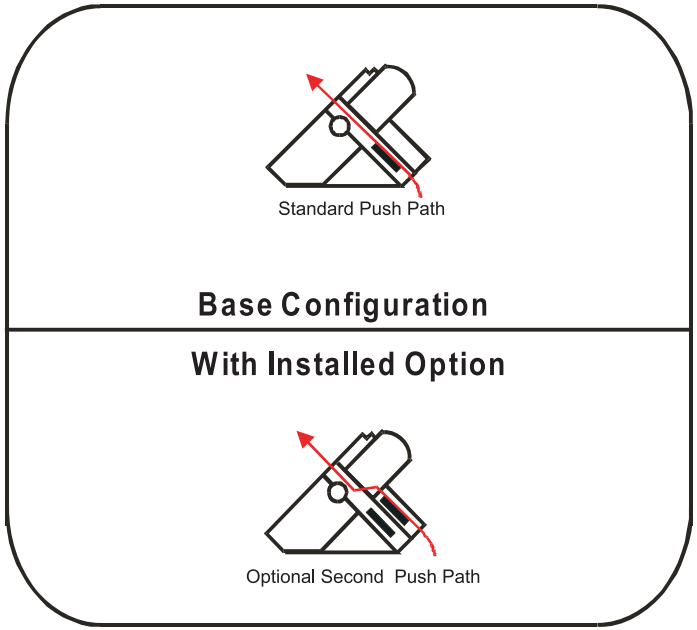


Figure 26. Standard and Optional Second Paper Paths. (Viewed From Left Side)

5. Return to the step that sent you here.

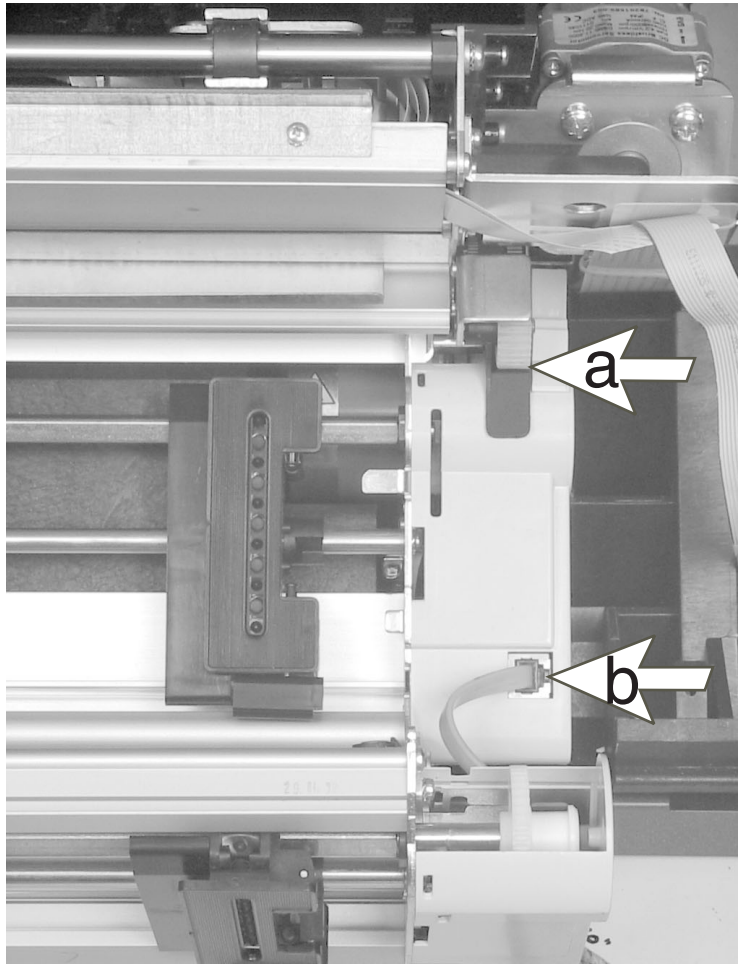
Tractor Assembly Service Check

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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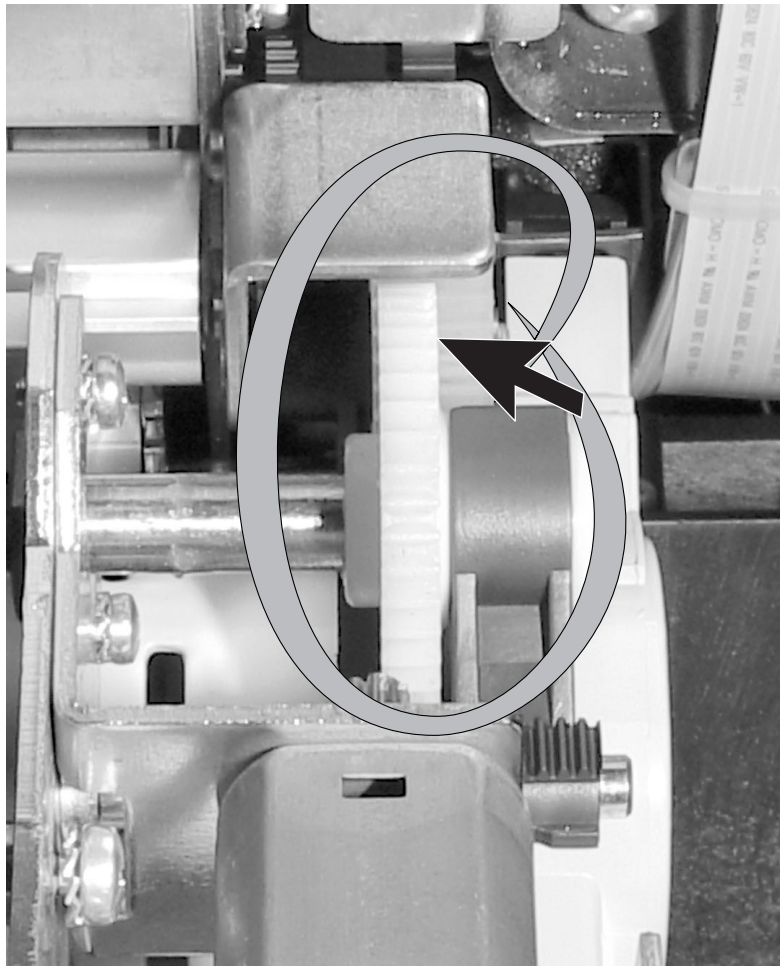
1. Turn off (O) the printer and remove forms from the tractor.
2. Front tractor service check (if present):
   a. Inspect and clean the front tractor pin feed belts and pins.
3. Rotate the front tractor forward as shown at left and inspect the following:
   a. Inspect and clean the printer drive gear (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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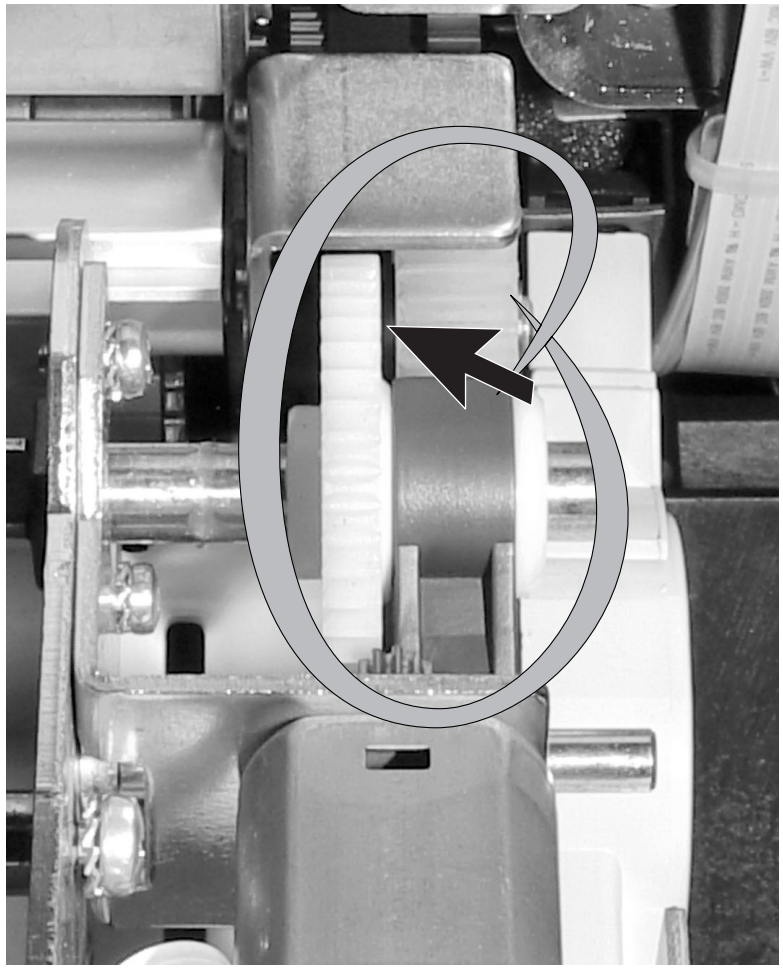
4. Observe the position of the tractor drive gear.
   - In the engaged position, the tractor drive gear drives the pin feed belts.
   - In the idle position, the tractor drive gear does not drive the pin feed belts.
5. Move the drive gear to the right (drive position).
6. Perform the Rear tractor service check.

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



e61a9110

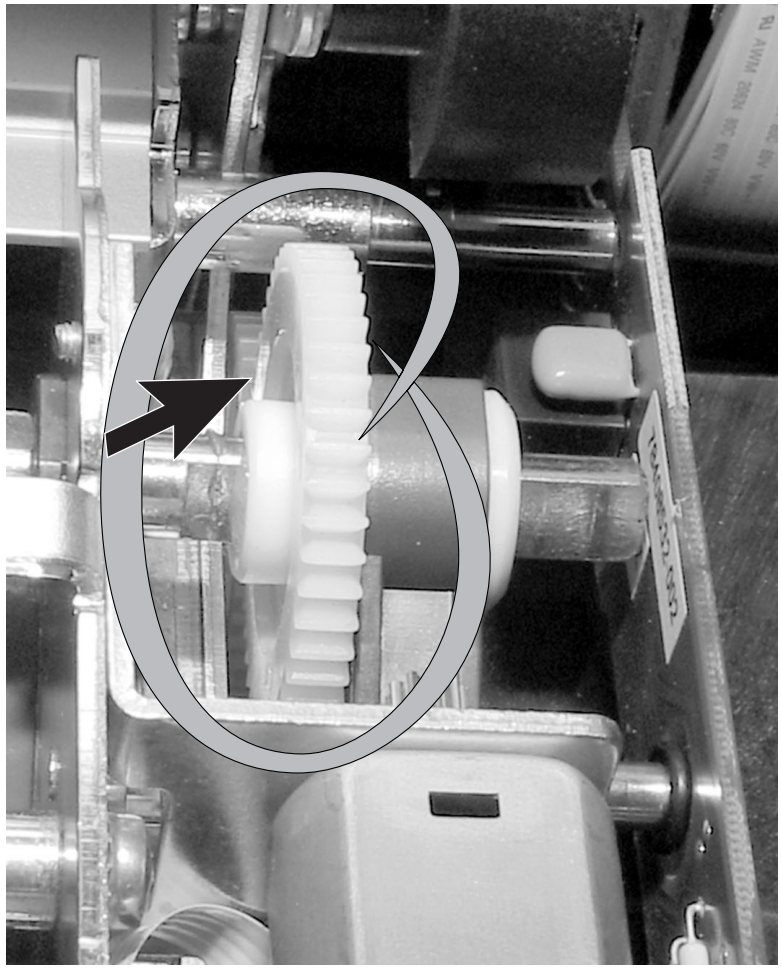
7. Turn on the printer.

   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)

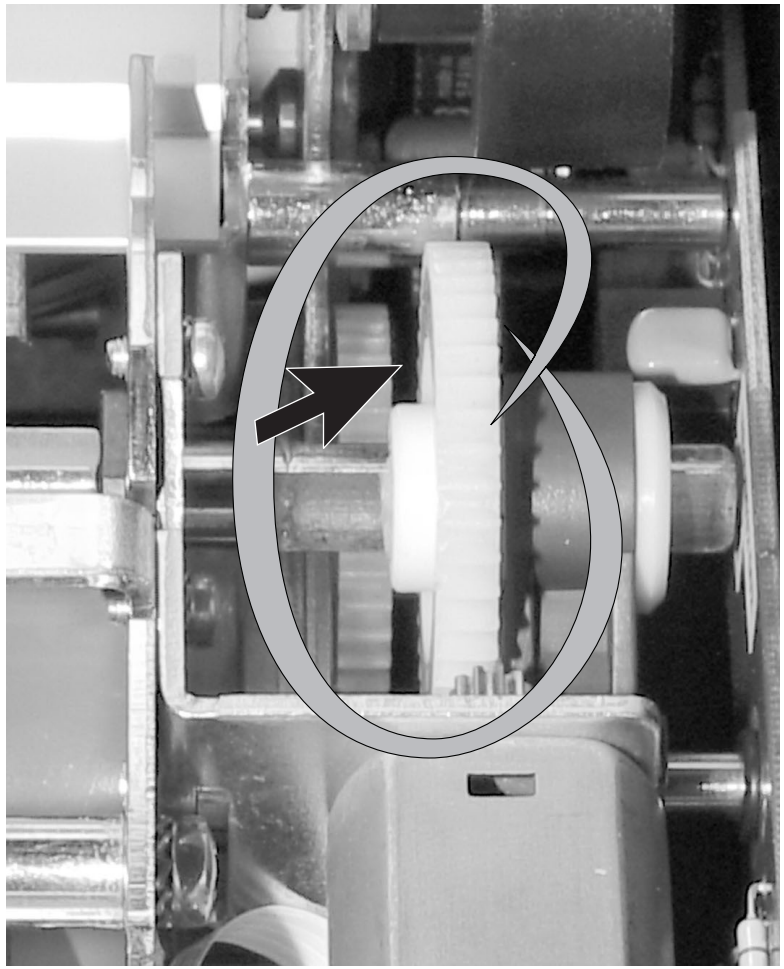


e61a9111

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 and Ribbon Lift Service Check

You are here because of an 089 RIBBON JAM message or any of the other symptoms in MAP 0160: Ribbon feed and ribbon lift.

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.

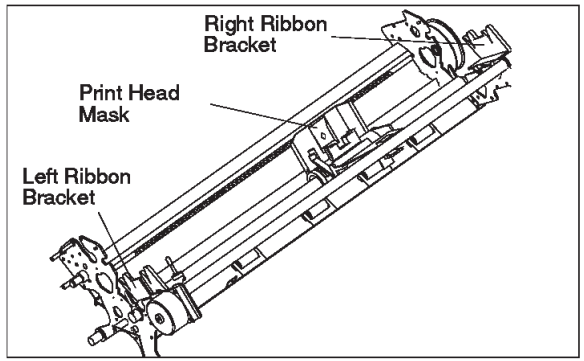


Figure 27. Ribbon Carriage and Ribbon Brackets. (Viewed From Top Left)

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.

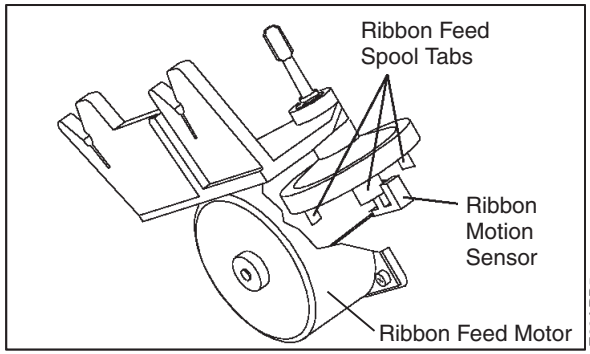


Figure 28. Ribbon Spool Tabs/Sensor

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 lift motor mounting screws are tight.
7. Ensure that the lift motor connector is connected to the printhead assembly.
8. Ensure there are no breaks in the ribbon lift motor cable.

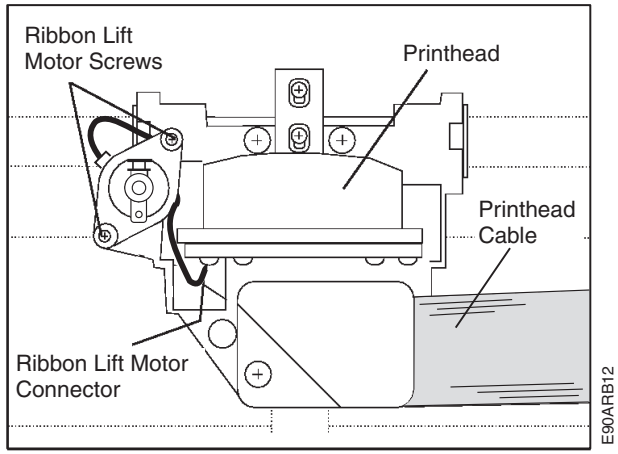


Figure 29. Ribbon Lift Motor. (Viewed From Top)

9. Ensure that the printhead cables are connected at both ends correctly.
10. Install the ribbon cartridge.
11. Perform T&D09. Verify that the ribbon is driven up and down by the ribbon lift motor, and pulled to the left by the ribbon feed motor.
12. Return to the step that sent you here.

Note: If the Ribbon Lift Motor lifts and lowers the ribbon during T&D09, but not during printing, the cause might be a faulty Controller board. Replace the Controller board.

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 encoder sensor and encoder strip for cleanliness, damage, or a loose mounting.

Figure 30. Encoder Sensor and Encoder Strip

5. 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.

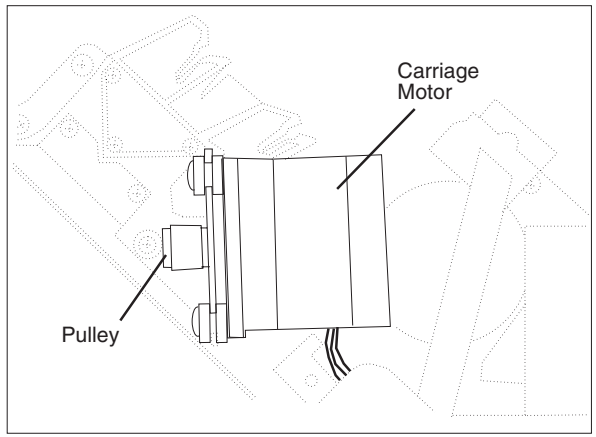


Figure 31. Carriage Motor. (Viewed From Right Side)

6. 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 Drive Belt.

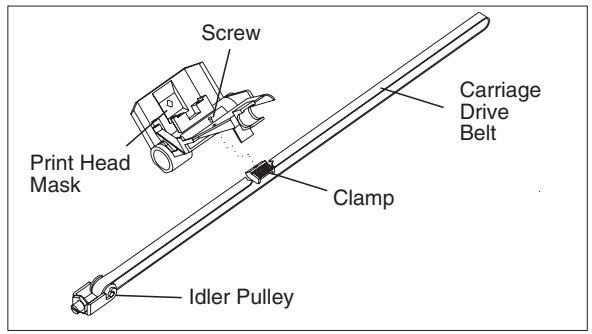


Figure 32. Carriage Drive Belt. (Viewed From Top)

7. 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.

8. 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.

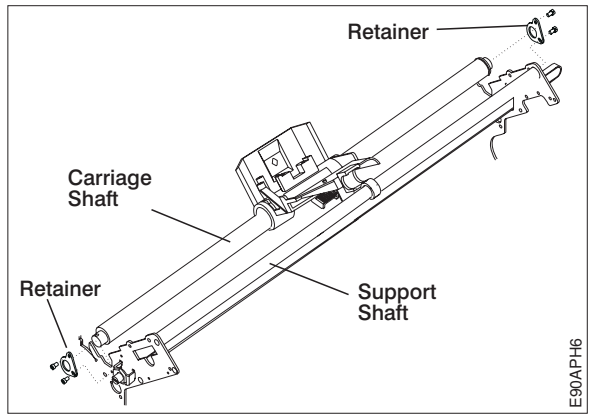


Figure 33. Carriage Shaft Components. Viewed From Top

9. 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.

   To replace the printhead mask, remove the support shaft and platen to gain access to the front of the carriage.

10. Inspect for wear or damage the plastic shields that cover the platen.

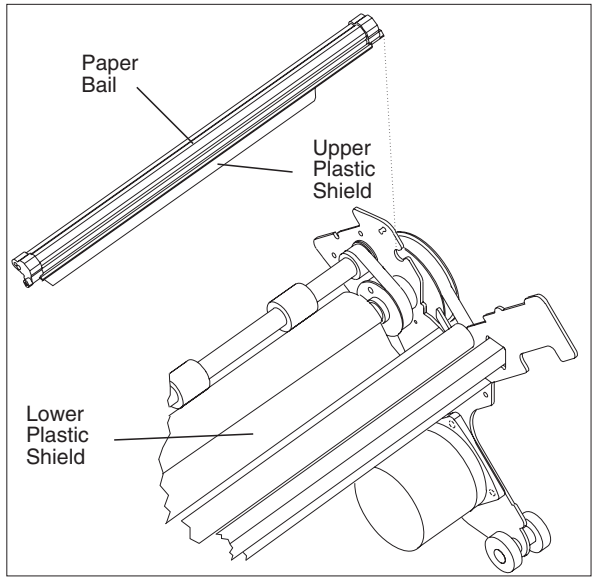


Figure 34. Plastic Shields. (Viewed From Top)

11. 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 25 to analyze the printout in Figure 35.

Table 25. 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 NLQ 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 18-wire printhead print wires are numbered 01A - 09A and 01B - 09B (see Figure 35). The wire numbers are printed under each group. Look for light or missing dots. The 18-wire printhead xxB line segments (see Figure 35) should be slightly lower than the xxA line segments.	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. 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 25. 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 Bidirectional Printing. 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 Bidirectional Printing. 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 NLQ mode.	See Printhead Drive Service Check.
9	Printhead wire shifter test. Prints two lines. To print in NLQ mode, one set of nine wires (1B to 9B) is shifted up, by a solenoid, relative to the fixed set of nine wires (1A to 9A). In this test, the first line prints a *less than* (<) symbol (NLQ mode), *tilde* (~) (draft mode), and a *greater than* (>) symbol (NLQ mode). The second line prints a *less than* symbol (draft mode), *tilde* (NLQ mode), and a *greater than* symbol (draft mode).	1. Install a new printhead. See Printhead. 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 25. 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.

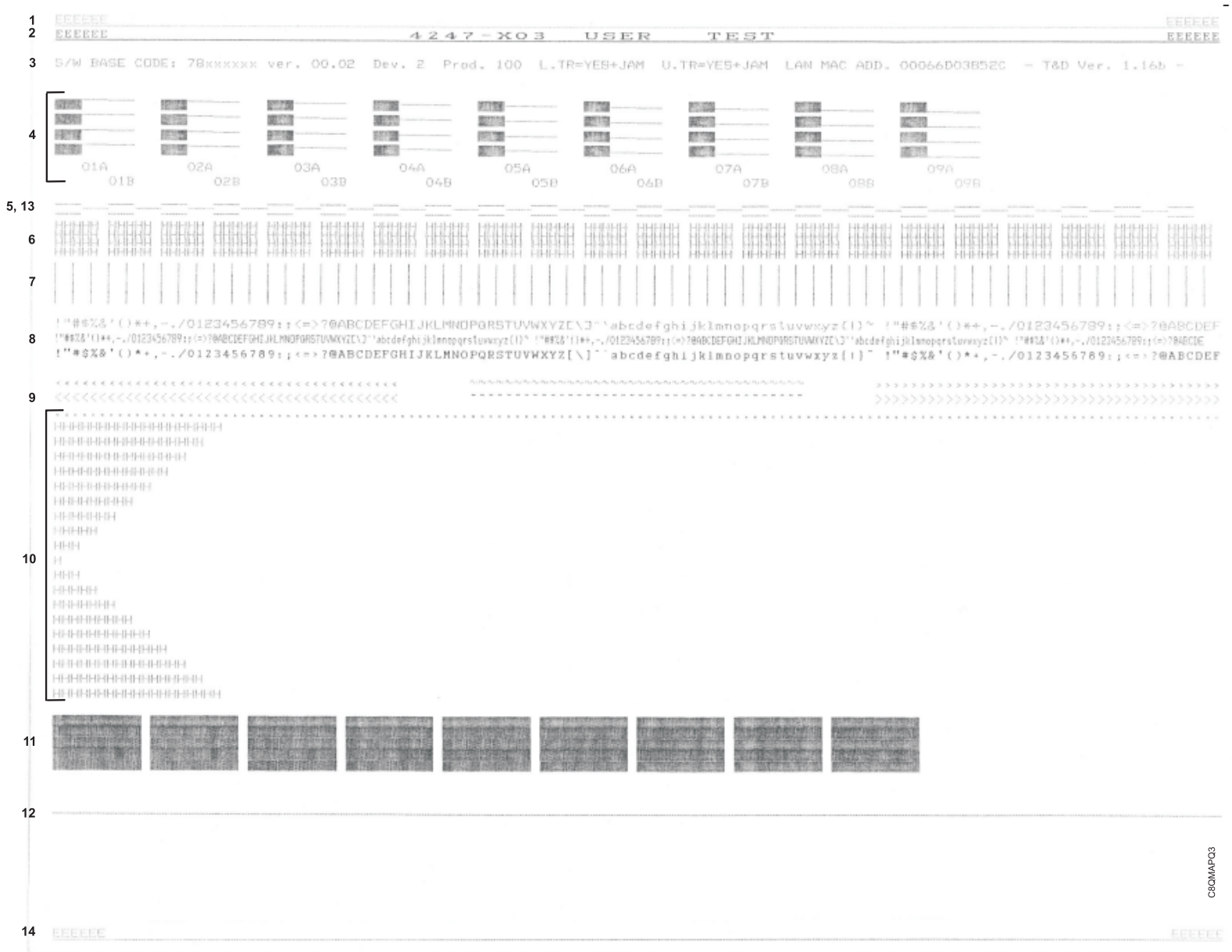


Figure 35. Print Quality Sample

Removals/Replacements

Overview

This section describes the removal and installation of the printer parts, and contains two levels of safety notices.

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 electronic parts of this printer can be damaged by electrostatic discharge (ESD). Use ESD protection devices and procedures, including a static discharge wrist strap, while working on the printer.

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.

Printer Covers

See “Removing Covers” on page 144.

Ribbon Cartridge

Removal

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. Push the printhead to the center of the printer.
3. Turn the ribbon advance knob to maintain fabric tension.
4. Press the tab **1** to the rear while pulling tab **2** up to disengage the ribbon from the lift assembly.

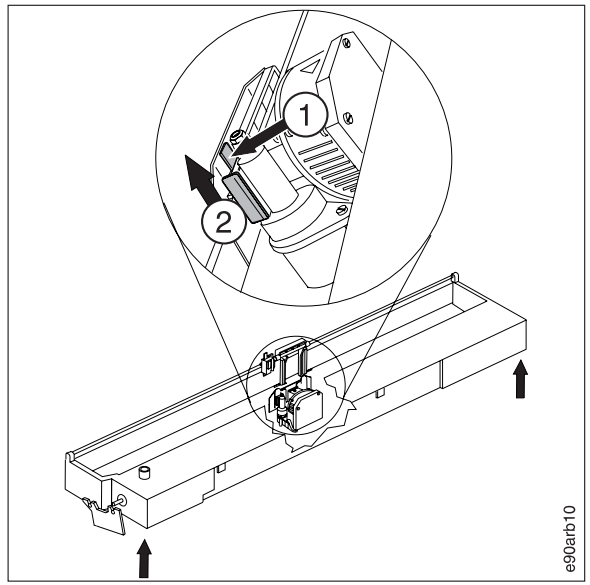


Figure 36. Moving the Carriage to Center - Close-up

5. Pull the ribbon cartridge upwards until both ends snap free from the cartridge supports.
6. Lift the ribbon cartridge from the printer.

Installation

1. Before installing, turn the ribbon advance knob in order to maintain fabric tension. If the ribbon does not move, replace the ribbon cartridge.
2. Move the printhead to center.
3. Push the ribbon cartridge downwards until both ends snap into the cartridge supports.
4. Insert the ribbon guide between the ribbon/printhead mask and the printhead. Position the white snap arm on to the ribbon lift assembly with the tab pointing upwards. Push the snap arm downwards until it snaps. If it does not snap, repair or replace the ribbon cartridge.

Operator Panel

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

1. Power off the printer.
2. Open the top cover (item 1) and remove the ribbon cartridge.
3. Unplug the cable connector (item 2) from the rear of the Operator Panel (item 3).
4. Disengage the Operator Panel from the cover by pressing inward 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.

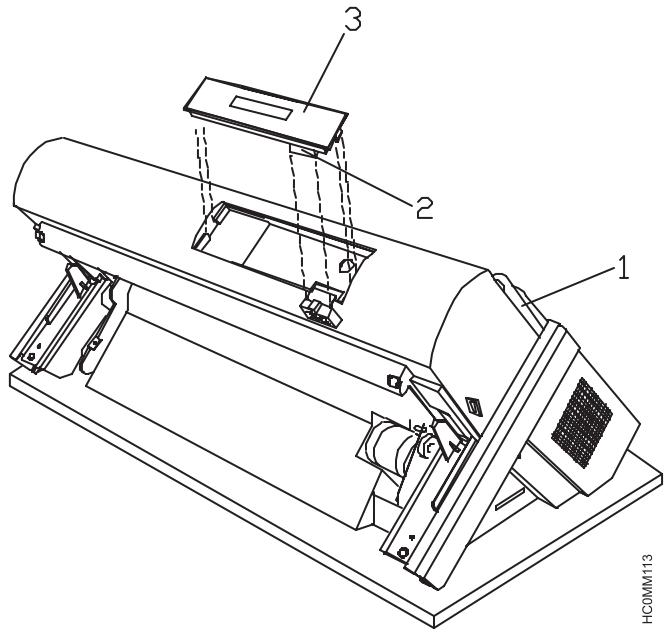
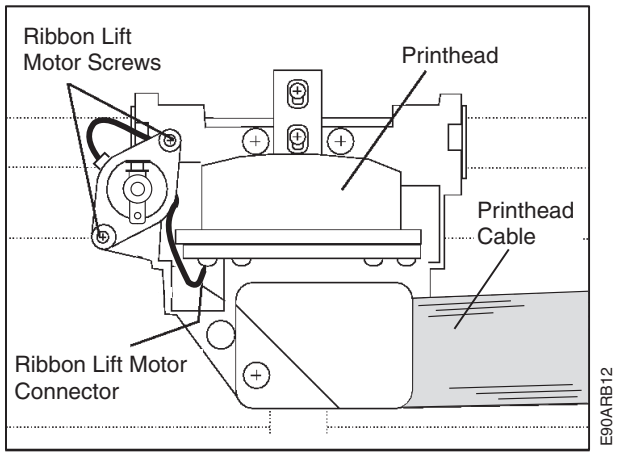


Figure 37. Operator Panel removal

Printhead

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. Turn off the printer and disconnect the power cord from the rear of the printer.
2. Open the top cover and remove the ribbon.
3. Move the printhead to the center of the printer.
4. Remove the cable clamp screw and cable clamp.
5. Remove the 2 printhead screws.

Attention: In the next step, use care not to pull the wires out of the ribbon lift connector. Hold the printhead cable (or the encoder cable) just above the connector and pull the cable out of the connector (these are not locking connectors).

6. Disconnect the ribbon lift cable.
7. Disconnect the encoder cable.
8. Disconnect the printhead cables.
9. Remove the printhead.

Installation notes

When you reinstall the printhead:

1. Push the printhead toward the platen with equal pressure on both sides of the printhead.
2. Tighten the printhead mounting screws while continuing to push the printhead toward the platen.
3. Perform the AFTA service check (see Print Head Gap Service Checks).

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

The Controller Board is located in the slot assembly that plugs into the Engine Board. The Controller Board is customer installable and is easily removed or installed from the rear of the printer.

The Controller Board provides the input commands for the Engine Board, the management of the parallel interface, the serial RS-232 (9-pin) interface, and the Ethernet 10/100 (ASCII and ASCII-IPDS) LAN interface.

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

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.

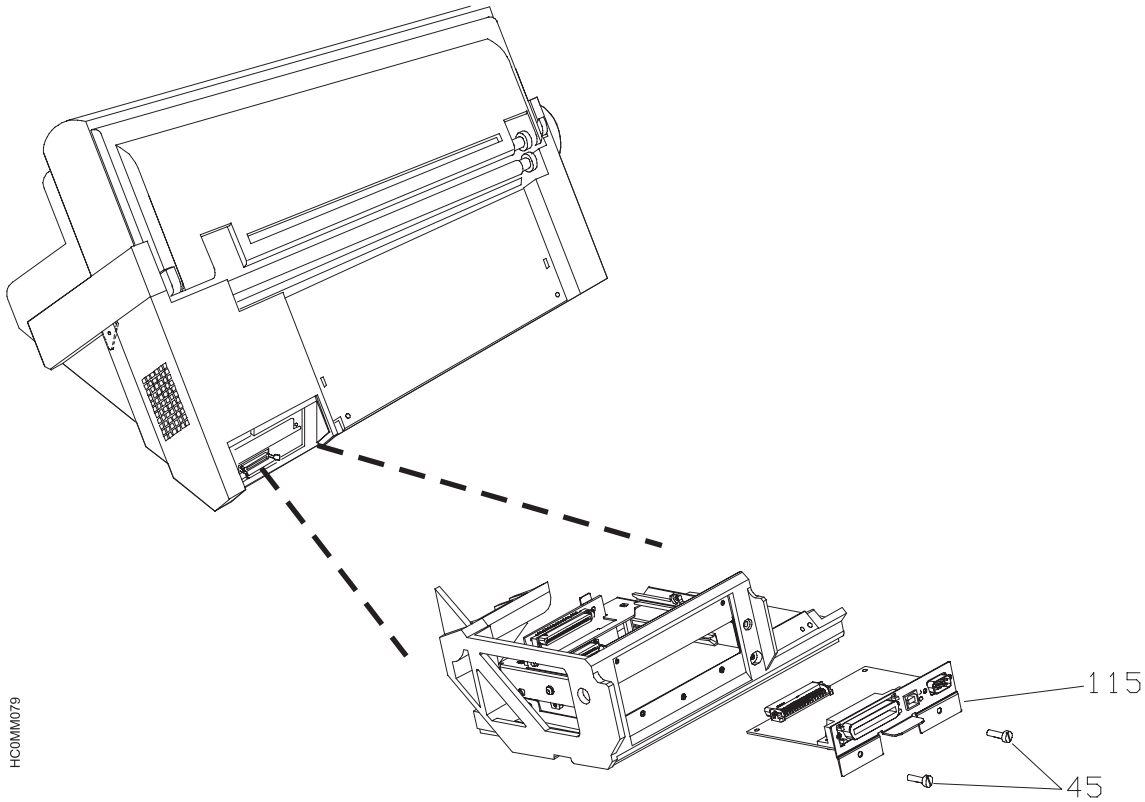


Figure 38. Controller Board

Slot Assembly

DANGER

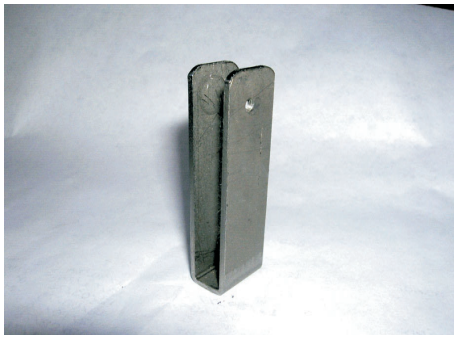
<1-13> Do not connect or disconnect a communication port, a teleport, or any other connector during an electrical storm.

DANGER

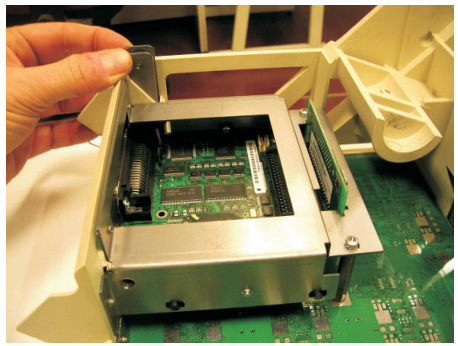
<1-14> Switch off printer power and unplug the printer power cord before connecting or disconnecting a communication port, a teleport, or other attachment connector.

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.

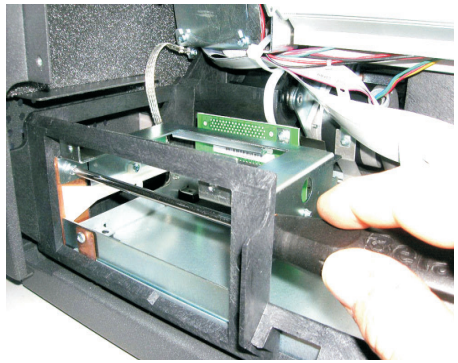
Note: Using a screwdriver, remove the screw that attaches the Slot Assembly to the metal insert by passing the screwdriver through the access hole. This screw is located at the opposite side of the Slot Assembly from the access hole (see Figure 39).



Metal Insert



Slot Assembly installed to the Base Assembly



Screw removal with minimum 5” screwdriver

Figure 39. Slot Assembly

Note: When reordering the Slot Assembly Kit (P/N 44D8979), this metal insert is included. Models X03 and Z03 are shipped with this insert installed at the factory. Save or discard the spare.

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).

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. Remove the Rear Cover Group.
2. Remove the Controller Board and the Slot Assembly.
3. Remove the Back Panel Board (item 110) from the Engine board.
4. Unplug all the connectors from the Engine board by acting on their bends.
5. Unscrew the seven screws (4 self-tapping screws 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.

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

Note: When a new engine board spare part is installed, the printer after initialization will automatically display the message "RUN T&D". You need to run T&D03—NVM RAM test to write the printer model (device ID) into the non-volatile memory on the new Engine Board.

1. Enter T&D in the **Single Test Mode** (see Running the test and diagnostic (T&D) programs).
2. Run T&D03 NVM Test in **Single Test Mode**.
3. Power off the printer. At this point NVM has the X03 device ID written into it and the Engine Board can be used in normal operation.

A new engine board contains all adjustments stored in NVM as manufacturing default values. Therefore, it is mandatory to run the following T&Ds that save adjustment values:

T&D10—AFTA calibrate test
T&D11—First line adjustment test
T&D12—Bidirectional adjustment test
T&D13—Tear-off line adjustment test
T&D18—Paper path sensor test.

Note: Use the Printer Configuration printout to verify configuration settings.

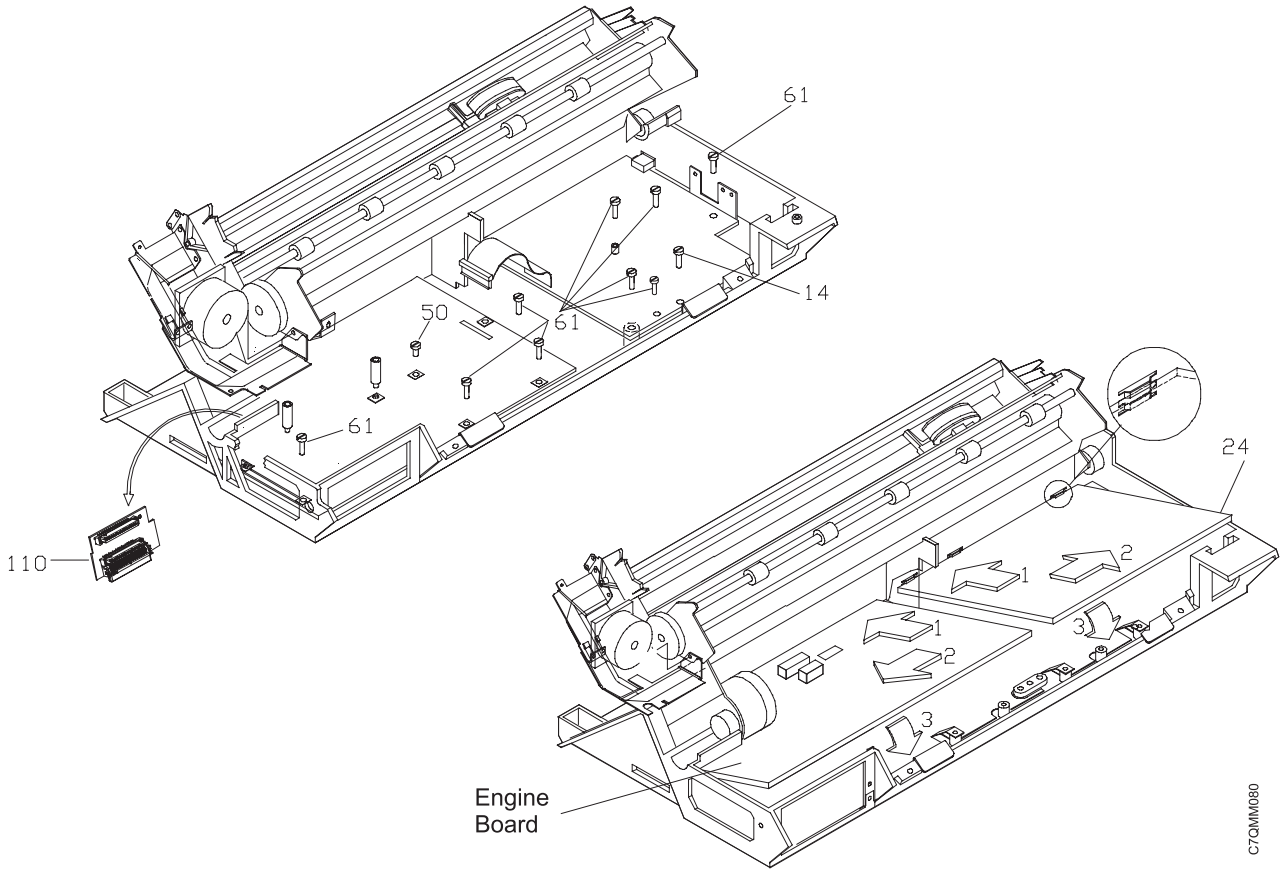


Figure 40. Engine Board

Power Supply

Removal

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 with the fan assembled.
4. Unscrew the screw securing the inlet bracket (item 37) and remove it.
5. Unscrew the screw (item 62) securing the ground cable to the metal shield.
6. Unscrew the screw (item 45) fixing the ground strip of the mechanical assembly to the lower shield.
7. Unscrew the screws securing the power supply cover (item 49) to the lower shield and remove it.
8. Unscrew the six screws securing the power supply board to the base unit.
9. Unplug the connector from the Engine board and gently extract the power supply board from the printer.

Note: Note the type and location of each screw.

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

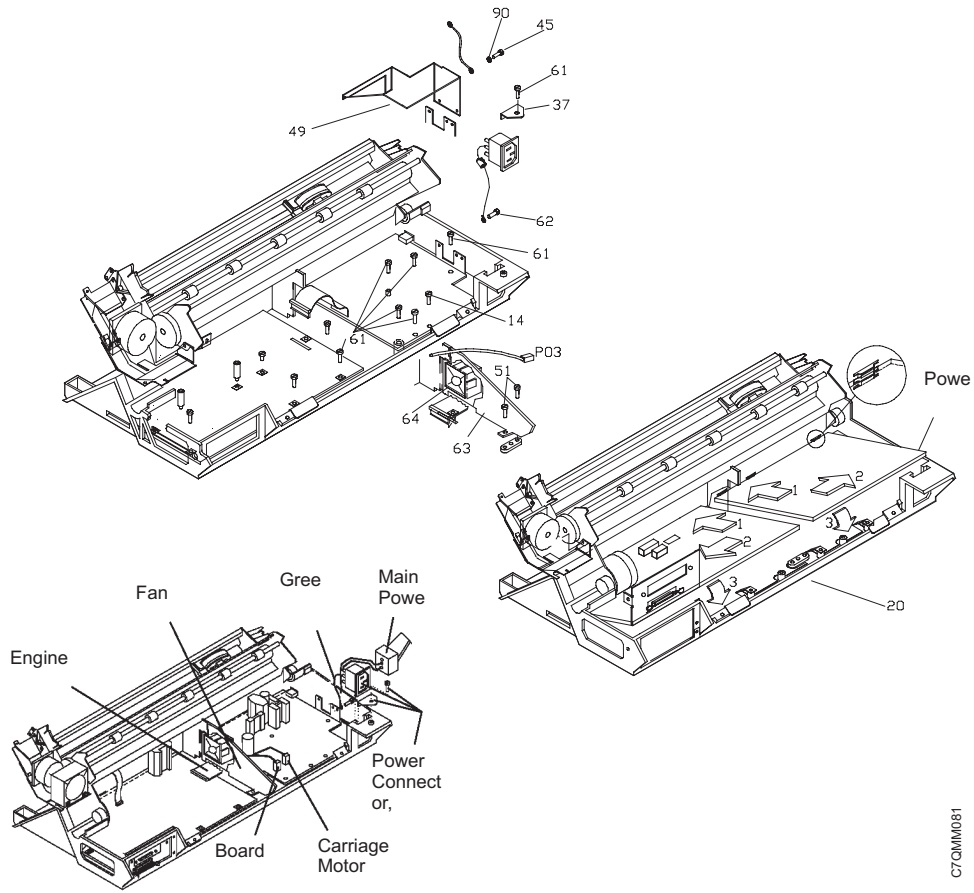


Figure 41. Power Supply Board

Note: When installing the green/yellow ground wire, the second star washer must be located between the wire lug and the frame.

Ribbon Drive Motor and Drive Assembly

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

Removal

1. Turn off power and disconnect the power cord from the rear of the printer.
2. Remove the main, rear, and front covers. See Removing Covers.
3. Remove the ribbon. See Ribbon Cartridge.
4. Disconnect the ribbon motor cable connector from the Engine board (see Figure 17 in Chapter 4, “Locations”). Note the location of the connector and the cable path to aid installation.

   Note: If the motor is being removed only to access other parts, do not disconnect the connector.
5. Remove the ribbon motor mounting screws and remove the ribbon drive motor. Note the type and location of each screw to aid installation.

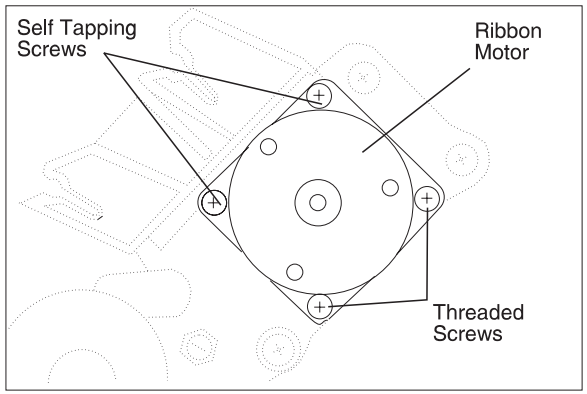


Figure 42. Ribbon Motor Screws. (Viewed From Left Side)

6. Remove the retaining clip from the drive shaft and then lift the shaft out of the bracket.

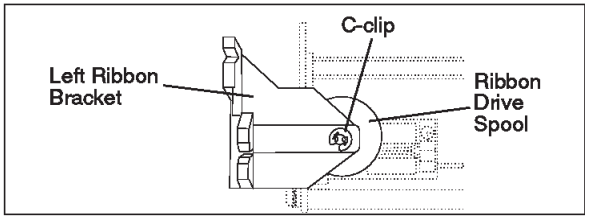


Figure 43. Ribbon Drive Spool Retaining Clip. (Viewed From Top)

7. Lift the left ribbon bracket up and out of the printer.

Replacement

Follow the removal steps in reverse order.

Ribbon Lift Motor

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

Removal

1. Turn off power and disconnect the power cord from the rear of the printer.
2. Open the top cover and remove the ribbon.
3. Remove the 2 ribbon lift motor screws, and unplug the connector from the socket on the printhead circuit card.
   Attention: Do not pull the wires out of the connector.

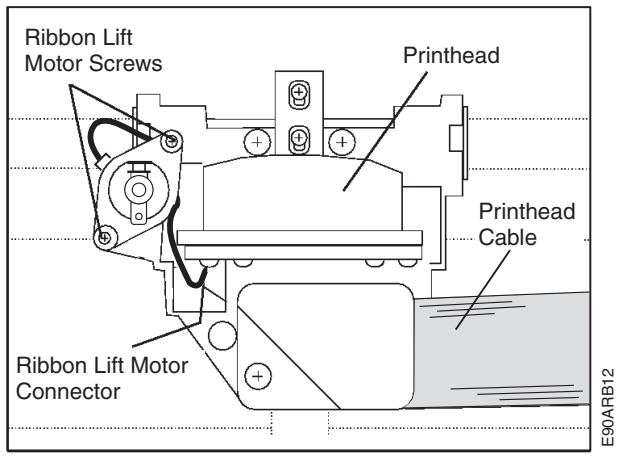


Figure 44. Ribbon Lift Motor. (Viewed From Top)

Replacement

1. Carefully route the cable around the platen side of the motor between the mounting post and the motor body.
2. Ensure the cable does not contact any moving parts.
3. Reinstall the ribbon lift motor screws.
4. Reinstall the ribbon, and close the cover.

Automatic Forms Thickness Adjust (AFTA) Assembly

Removal

1. Turn off the power and remove the power cord.
2. Remove the main, rear, and front covers. See Removing Covers.
3. Record the indicator setting.
4. Disconnect the AFTA motor connector from the Engine board (see Figure 17 in Chapter 4, “Locations”).
5. Remove the cable from the cable retainers located in the rear part of the mechanical assembly.
   Note the location of the connector and the cable path as a guide for reinstallation.

   Note: If the motor is being removed only to access other parts, do not disconnect the connector.
6. Remove the 2 AFTA motor screws and remove the motor.

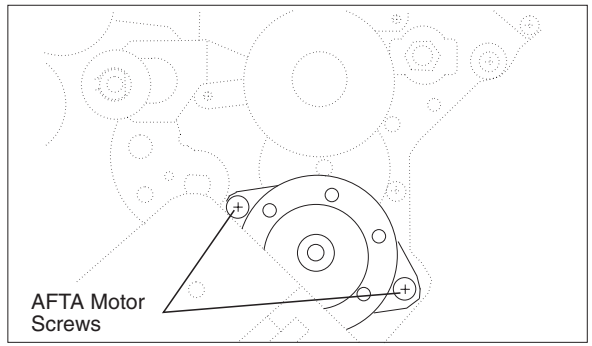


Figure 45. AFTA Motor Screws. (Viewed From Left Side)

7. Remove the 2 AFTA indicator mounting screws and remove the indicator.

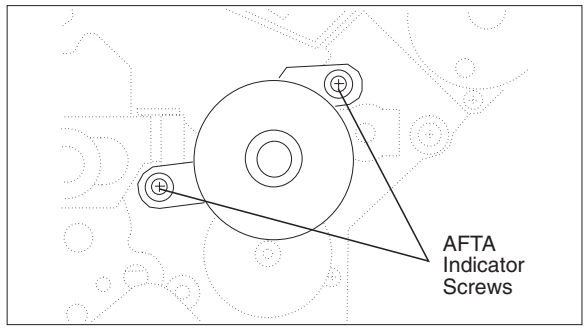


Figure 46. AFTA Indicator Screws. (Viewed From Left Side)

8. Remove the retaining clip and the intermediate gear.

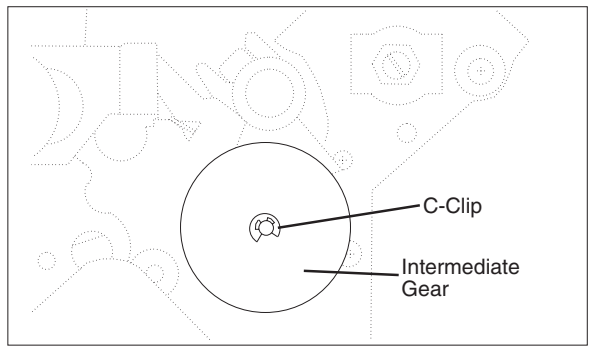


Figure 47. Intermediate Gear Retaining Clip. (Viewed From Left Side)

9. Remove the screw and the carriage shaft gear.

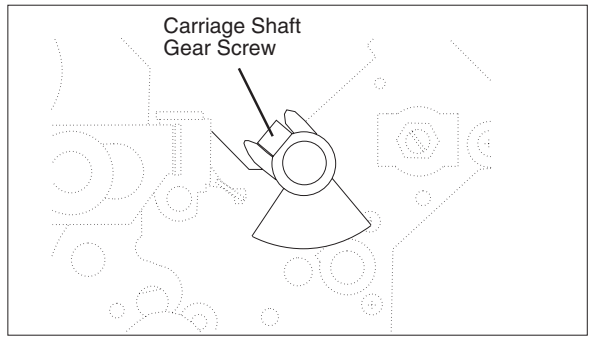


Figure 48. Carriage Shaft Gear Screw. (Viewed From Left Side)

Replacement

1. Follow the removal steps in reverse order.
2. If the carriage shaft has not been moved, install the indicator set to the number noted in step 3.
3. Perform the AFTA service check. See Print Head Gap Service Checks.

Carriage Drive Motor Assembly and Fan

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

Removal

1. Turn off power and disconnect the power cord from the rear of the printer.
2. Open the top cover and Remove the ribbon.
3. Remove the main, rear, and front covers. See Removing Covers.
4. Disconnect the Carriage Motor Fan connector (P02) from the ***power supply board*** and remove the cable from the cable retainers located in the rear part of the mechanical assembly (see Figure 18 in Chapter 4, “Locations”).
5. Disconnect the carriage motor connector from the **Engine board** and remove the cable from the retainers located in the rear part of the mechanical assembly (see Figure 17 in Chapter 4, “Locations”).

   Note: If the motor and fan are being removed only to access other parts, do not disconnect the connectors.
6. Remove the following:
   - Fan nuts and screws (items 66 and 67)
   - Fan

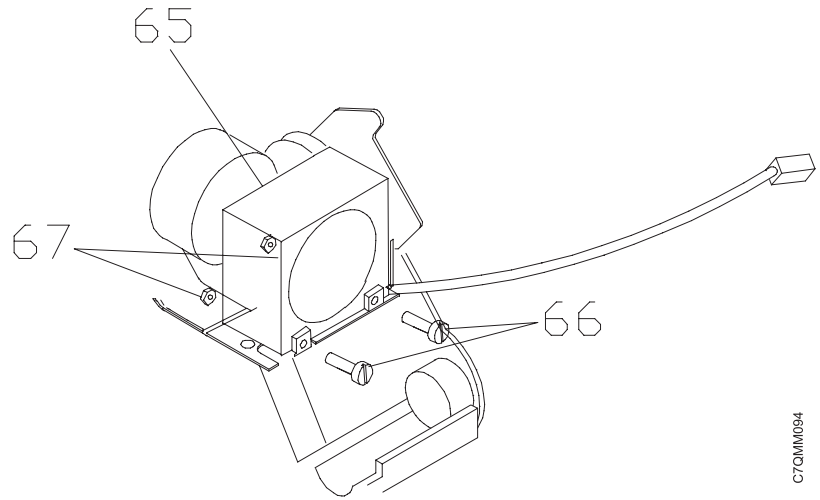


Figure 49. Carriage Drive Motor Fan

7. Perform the following:
   a. Cut the self-lock plastic strips retaining the cables to the carriage motor bracket.
   b. Unscrew the two screws securing the motor bracket both on the right side of the mechanical assembly and to the ground shield.
   c. Remove the M3 nut which secures the motor bracket to the front tractor connector support.
   d. Remove the rear motor bracket (item 193) by taking it from the rear.
   e. Unscrew the four studs securing the carriage motor to its support.
   f. Slide off the carriage belt from the carriage motor pulley.
   g. Remove the carriage motor assembly.

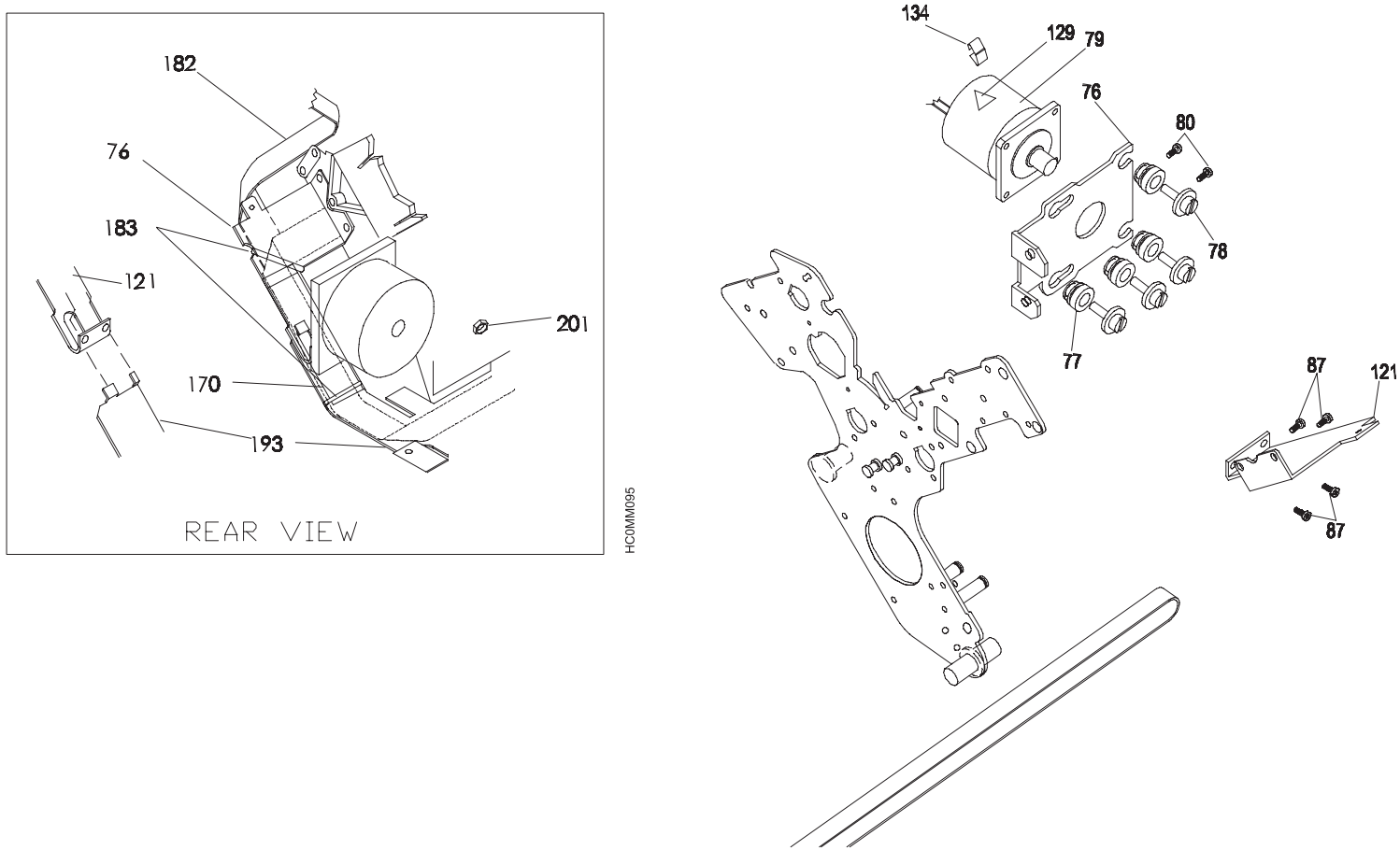


Figure 50. Carriage Motor

Replace the carriage motor and fan by following the above instruction in 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. Perform the carriage belt tension service check. See Carriage Drive Belt.
5. Perform the bidirectional printing service check. See Bidirectional Printing.

Carriage Drive Belt

Removal

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 main, rear, and front printer covers. See Removing Covers.
2. Remove the ribbon. See Ribbon Cartridge.
3. Move the printhead to the center of the printer.
4. Remove the printhead cable clamp.
5. Remove the printhead screws.
6. Disconnect the Encoder Cable (if necessary) from the Printhead Connector. Do not disconnect the other cables. Place the printhead beside the carriage.

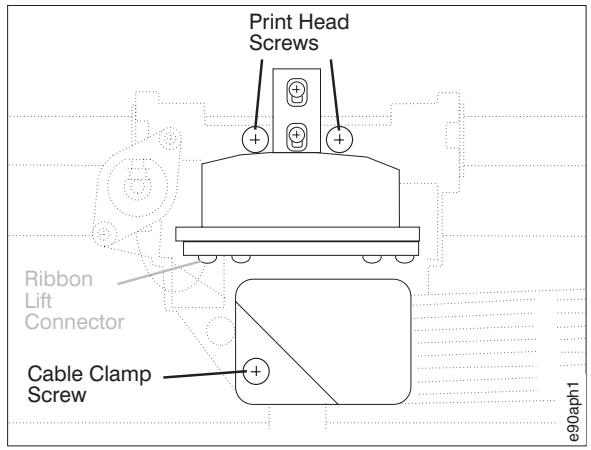


Figure 51. Printhead. (Viewed From Top)

7. Loosen but do not remove the belt clamp screw that is installed underneath the Printhead. Slide the belt laterally towards the front of the printer and away from the Belt Clamp located underneath the Belt Clamp screw.

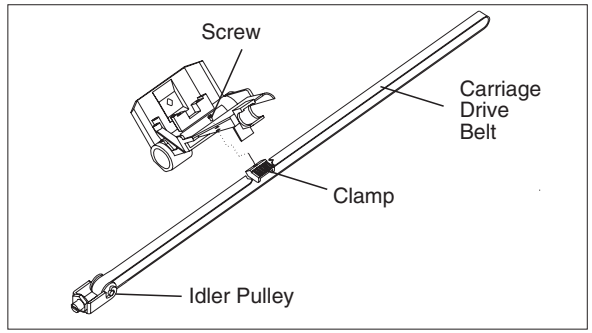


Figure 52. Carriage Drive Belt Clamp. (Viewed From Top)

8. Loosen the idler pulley hex nut and then slacken the belt by turning the Idler Pulley screw.
9. Remove the belt.

Replacement

1. Follow the removal steps in reverse order.

   Note: Ensure that the front edge of the belt is flush with the front edge of the belt clamp. The belt halves should be parallel including while the carriage is in motion.
2. Perform the carriage belt tension service check. See Carriage Drive Belt.
3. Perform the bidirectional printing service check. See Bidirectional Printing.
4. Perform the AFTA service check. See Print Head Gap Service Checks.

Paper Bail Assembly

Removal

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. Power off (O) the printer and remove the power cord.
2. Open the Top Cover and remove the ribbon. See Ribbon Cartridge.
3. Move the printhead to the far right.
4. Note the position of the paper bail (assembly).
5. To remove the paper bail, grasp it as shown in Figure 53. Rotate the paper bail toward the front of the printer until the pivot posts on the sides can disengage.

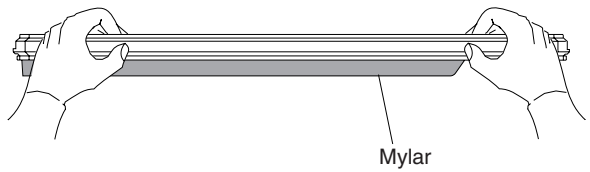


Figure 53. Grasping Paper Bail

Installation

1. Move the printhead to the far right.
2. Grasp the paper bail, as shown in Figure 53.

Important

To avoid damaging the plastic strip, ensure the plastic strip points down.

3. Insert the left and right paper bail end caps, and pivot the paper bail down into the side frames.

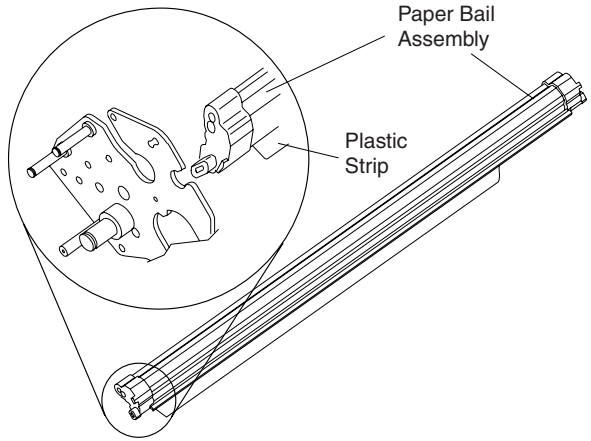


Figure 54. Installing Paper Bail While Noting Position of End Cap

4. Rotate the paper bail toward the back of the printer, closing it as far as it will go.
5. Reinstall the ribbon cartridge.

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.

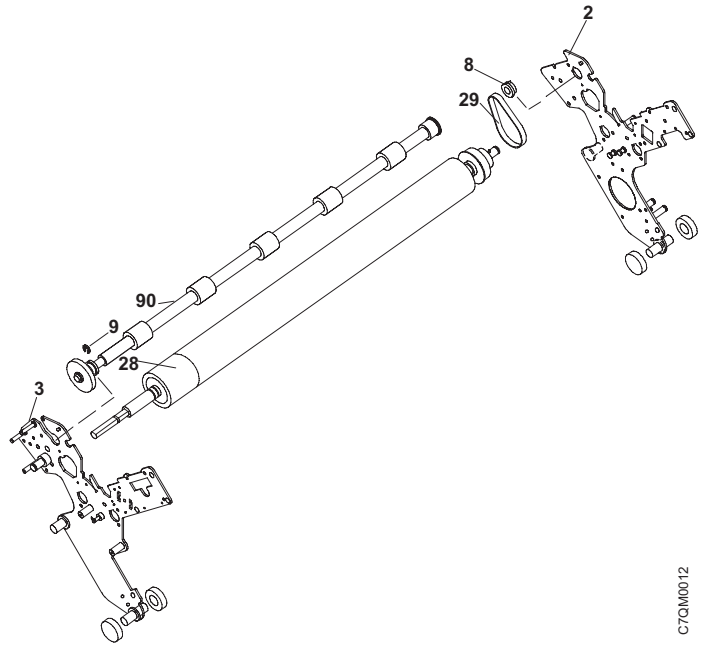


Figure 55. Upper Feeder Assembly

Platen Assembly

Removal

1. Remove the main, rear, and front printer covers. See Removing Covers.
2. Remove the ribbon.
3. Remove the Upper Feeder Assembly. See Upper Feeder Assembly.
4. Set the AFTA indicator on its highest setting to move the printhead away from the platen.
5. Remove the retaining clip.
6. Loosen the paper feed drive belt tension screws.

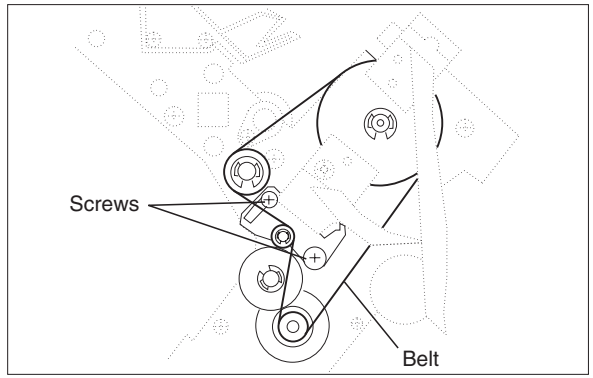


Figure 56. Paper Feed Drive Belt Tension Screws

7. Remove the following:
   - Drive pulley retaining clip
   - Left side bearing screws
   - Left side bearing and special washer

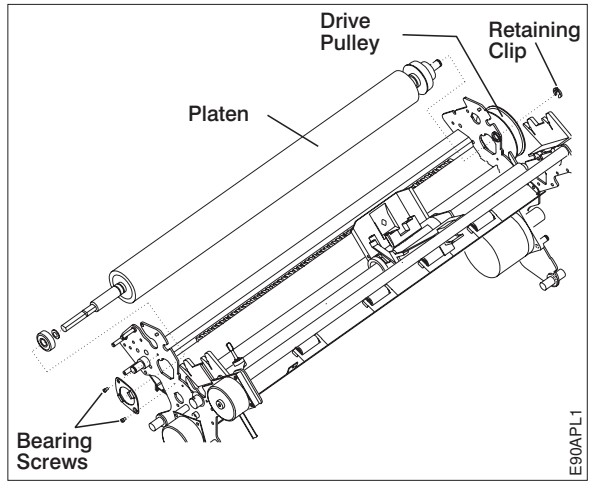


Figure 57. Platen. (Viewed From Top)

8. Slide the platen to the left until the right side is free; lift and remove.

Replacement

1. Follow the removal steps in reverse order.

   Note: Ensure the upper feed roller shaft drive belt is installed on the feed roller shaft.
2. Reinstall the bearing retainer; position it in a way that eliminates any radial looseness of the bearing.

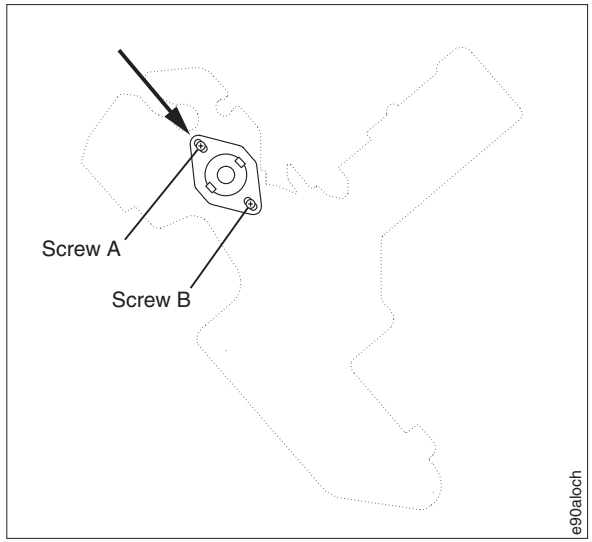


Figure 58. Platen Bearing Retainer. Push Retainer in Direction of Arrow

To do this, push the retainer toward the front bottom corner of the printer (shown by arrow in Figure 58) while you tighten the screws.

3. Perform the paper feed belt tension adjustment. See Paper Feed Belt.
4. Perform AFTA service check. See Print Head Gap Service Checks.
5. Ensure there is no end play in the Platen and that the Platen rotates freely without binding.

Printhead 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 Printhead Mask following the above instructions in the reverse order.

Note: You may find it useful to remove the Printhead (without disconnecting any of the Printhead cables) and the Paper Bail Assembly to facilitate removing the Printhead Mask.

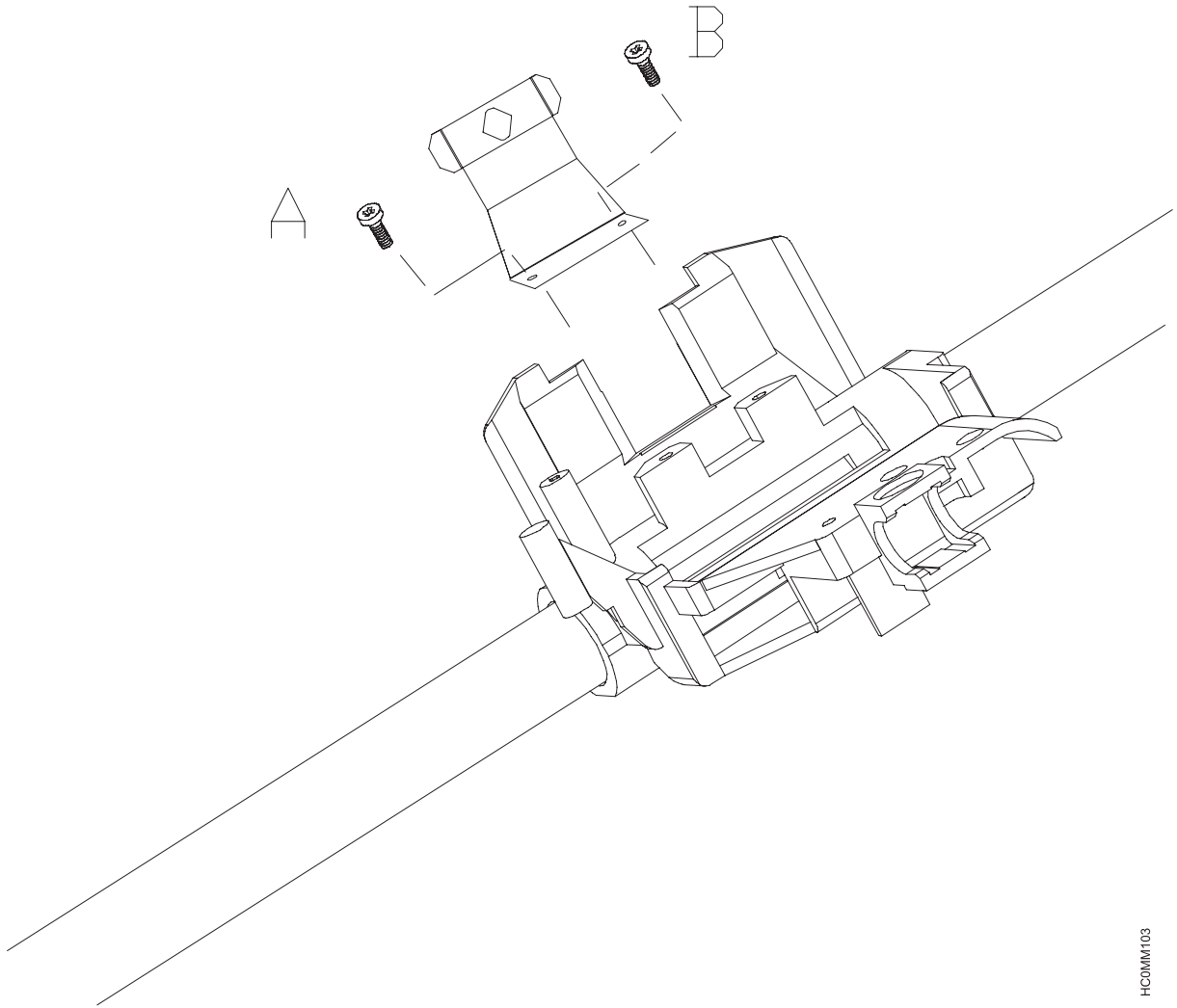


Figure 59. Printhead Mask Removal

Carriage Assembly

Removal

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. Power off the printer and remove the power cable.
2. Remove the printer covers. See Removing Covers.
3. Remove the printhead. See Printhead.
4. Remove the AFTA assembly. See Automatic Forms Thickness Adjust (AFTA) Assembly.
5. Remove the paper bail assembly. See Paper Bail Assembly.

   Attention: Use care not to damage the Encoder Strip.
6. Perform the following:
   a. Loosen the carriage belt clamp screw and remove the belt from the clamp.
   b. Remove the left carriage shaft screws and retainer.

      Attention: Small sheet metal wear surfaces may be present straddling the side frame where the carriage shaft was resting; they are easily lost.
   c. Remove the carriage and shaft.

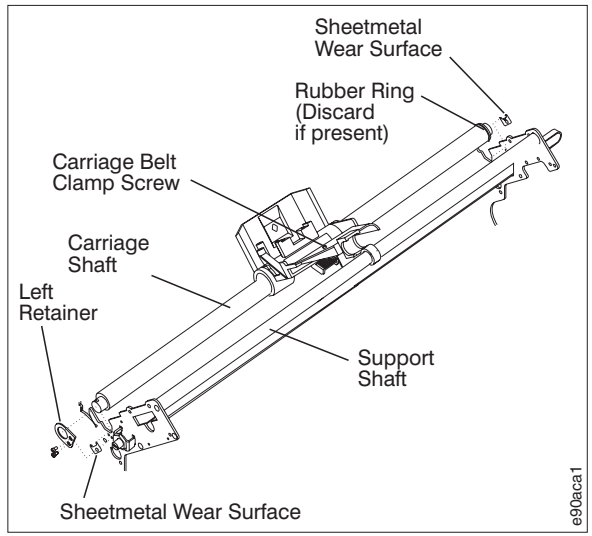


Figure 60. Carriage and Shaft. (Viewed From Top)

Replacement

1. Follow the removal steps in reverse order.
2. Ensure the sheet metal wear surfaces (if present) are seated correctly on the side frame.
3. Ensure the end of the carriage shaft with the screw hole is on the left side.
4. Install the felt wipers after you place the carriage and black plastic holders on the shaft.
   a. Wrap the wipers around the shaft. Slip them into the black plastic holders, then snap the holders into the carriage.
   b. Do **not** lubricate the felt wipers.
5. Reinstall the left retainer; position it in a way that eliminates any radial looseness of the carriage shaft.
   To do this, push the retainer lightly toward the front bottom corner of the printer (shown by arrow in Figure 61) while you tighten the screws.

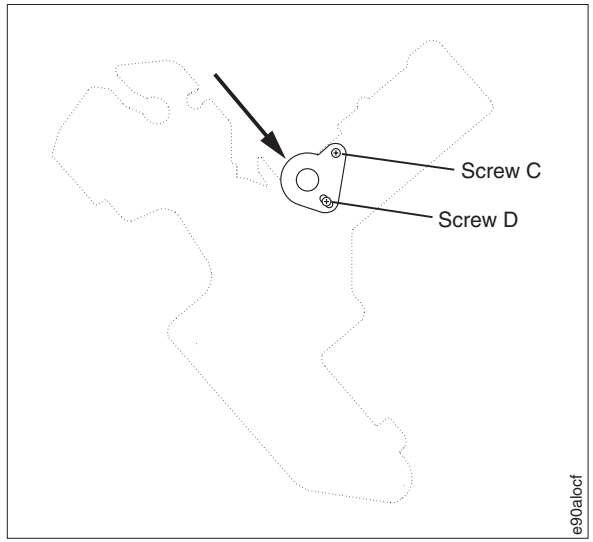


Figure 61. Carriage Left Retainer. Push Retainer in Direction of Arrow

6. Perform the AFTA adjustment. See Print Head Gap Service Checks.
7. Perform the carriage drive belt service check. See Carriage Drive Belt.
8. Perform the bidirectional adjustment. See Bidirectional Printing.

Carriage Support Shaft

Removal

1. Remove the main and front covers.
2. Mark the position of the eccentric adjustment bushing for reference during installation.

   Attention: Use care not to damage the Encoder Strip.

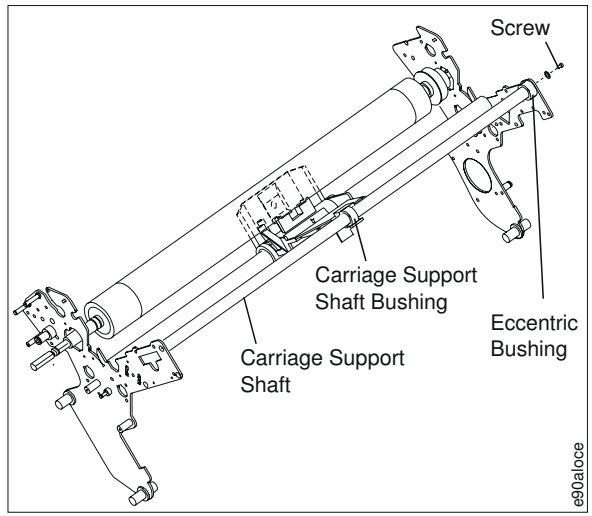


Figure 62. Carriage Support Shaft Components

3. Remove the left and right (carriage) support shaft screws.
4. Remove the old support shaft from the printer.

Installation

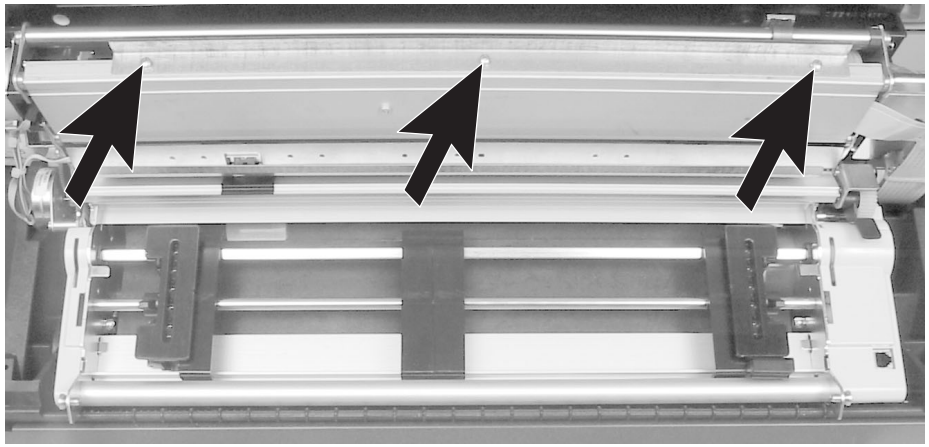
1. Install the carriage assembly support bushing on the new shaft.
2. Install the eccentric bushing onto the flat end of the new shaft.
3. Install the new shaft into the printer, with the eccentric bushing on the right side.
4. Position the eccentric bushing to the reference mark.
5. Install the support shaft into the right side of the frame using the screw.

6. Install the support shaft into the left side of the frame using the screw.
7. Perform the carriage support shaft adjustment. See Carriage Support Shaft.

Encoder board

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



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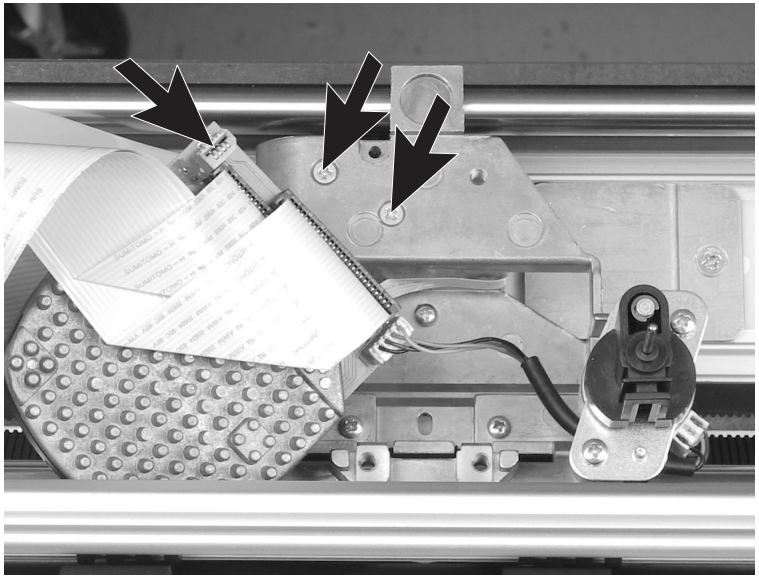
Perform the following procedures first:

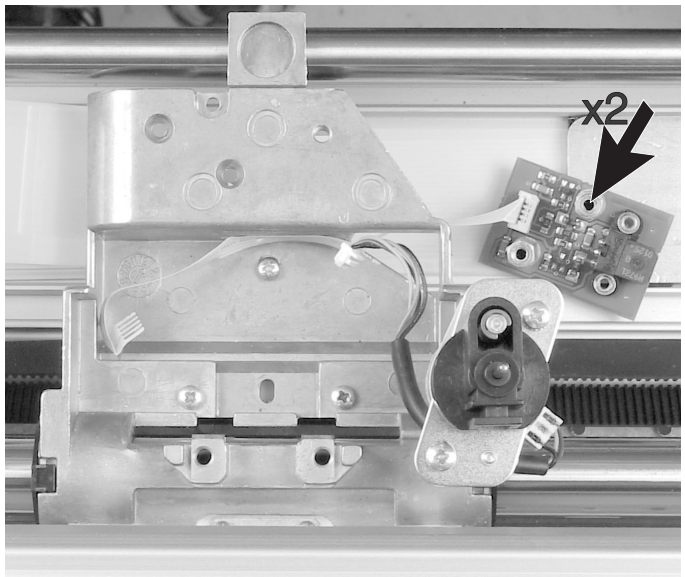
1. Remove the rear and top cover (see Removing Covers.)
2. Remove the Printhead.
   Do not remove the printhead cables yet.

Then:

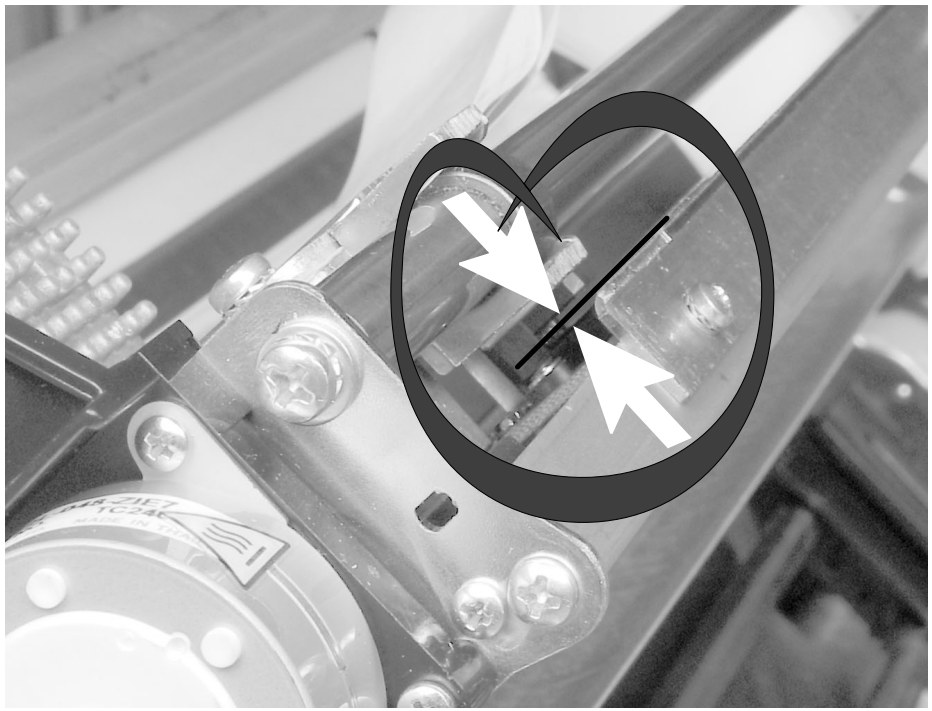
1. **Attention:** Use care not to scratch the encoder strip in this step.
   Remove the 3 screws holding the encoder strip, and carefully remove the encoder strip.



2. Disconnect the encoder cable from the encoder cable from the printhead.
3. Remove the 2 screws holding the encoder asm.



4. Remove the 2 stand-offs from the encoder board.



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Installation notes:

1. Manually set the AFTA wheel in sector 3 and insert the encoder strip into the encoder sensor slot.
2. Ensure that the encoder strip is centered within the encoder sensor the entire length of carriage travel.

Sensor Cable Assembly

Removal

1. Power off the printer and remove the power cable.
2. Remove the main, rear, and front printer covers. See Removing Covers.
3. Remove the ribbon drive motor and lift ribbon cartridge support. See Ribbon Drive Motor and Drive Assembly.
4. Remove the upper feed roller assembly. See Upper Feeder Assembly.
5. Remove the platen assembly (some steps are completed). See Platen Assembly.
6. Disconnect the sensor cable connector from the Engine board (see Figure 17 in Chapter 4, “Locations”). Note the location and path of the cable to aid installation.
7. Remove the screws for each of the 3 sensors and remove the cable assembly.

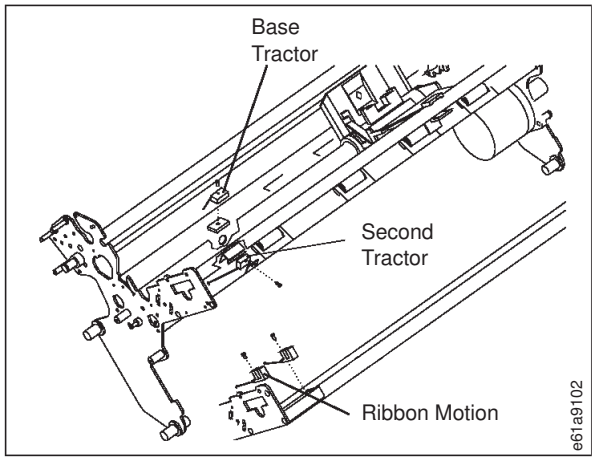


Figure 63. Sensor Cable and Sensor Locations

Replacement

1. Follow the removal steps in reverse order.
2. Perform the sensor tuning service check. See Sensor Service Checks.

3. Perform the AFTA service check. See Print Head Gap Service Checks.
4. Perform the first line printing service check. See First Line Printing.

Printer Mechanical Assembly

Removal

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 the main, rear, and front covers. See Removing Covers.
2. Remove the Front (optional second) Tractor.
3. Remove the Rear (base) Tractor.
4. Disconnect all connectors from the Engine board (see Figure 17 in Chapter 4, “Locations”).
5. Disconnect the carriage motor fan connector from the power supply (Figure 18 in Chapter 4, “Locations”).
6. Perform the following:
   a. Remove the 2 ground strip screws.
   b. Remove the 2 mounting screws.

      Note: The right side screw can be accessed through the cable slot in the fan mounting bracket, or by using an offset screwdriver.
   c. Remove the 2 wire ties.

Note: The printer mechanical assembly will not come straight up. Pivot it to the front, disengaging the rubber grommets, and then lift it out.

d. Remove all of the screws holding the Mechanical Assembly onto the Base Assembly and remove the Mechanical Assembly.

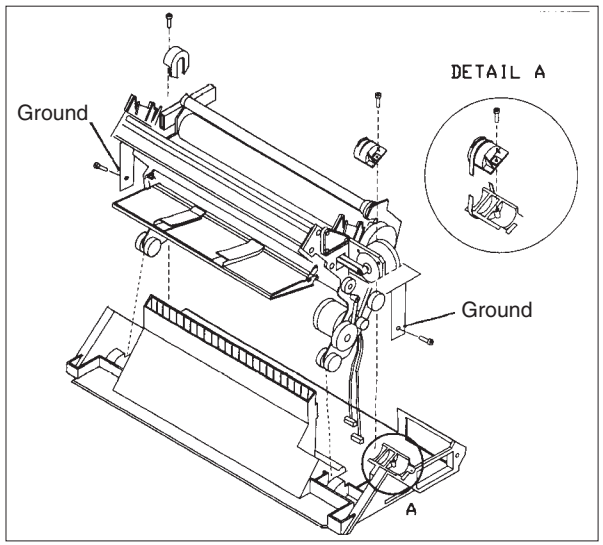


Figure 64. Printer Mechanical Assembly

Replacement

Follow the removal steps in reverse order.

Attention: Do not pinch the cables during installation.

Paper Feed Motor

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

Removal

1. Remove the main, rear, and front covers. See Removing Covers.
2. Remove the printer mechanical assembly. See Printer Mechanical Assembly.
3. Loosen the paper belt tension lever screws and remove the paper drive belt from the paper feed motor gear. Note the path of the belt to aid installation.

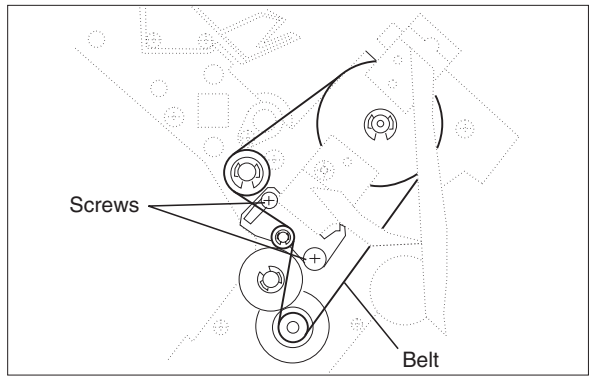


Figure 65. Paper Feed Motor Belt. (Viewed From Right Side)

4. Remove the 4 mounting screws and remove the motor.

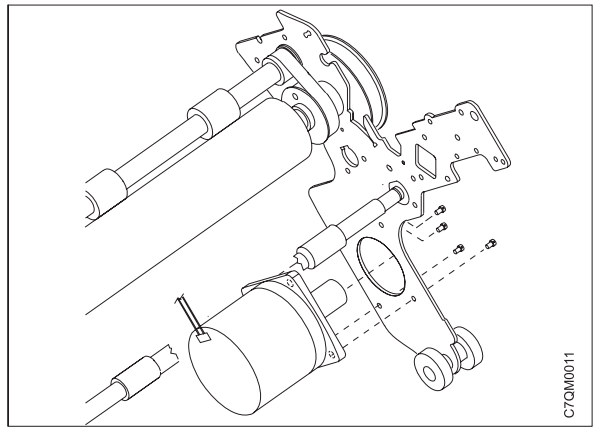


Figure 66. Paper Feed Motor

Replacement

1. Follow the removal steps in reverse order.
2. Perform the paper feed belt tension service check. See Paper Feed Belt.

Paper Feed Motor Drive Belt

Removal

Perform the following procedure first:

1. Remove the main, rear, and front covers. See Removing Covers.

Then:

2. Remove the nut from the front tractor connector housing.

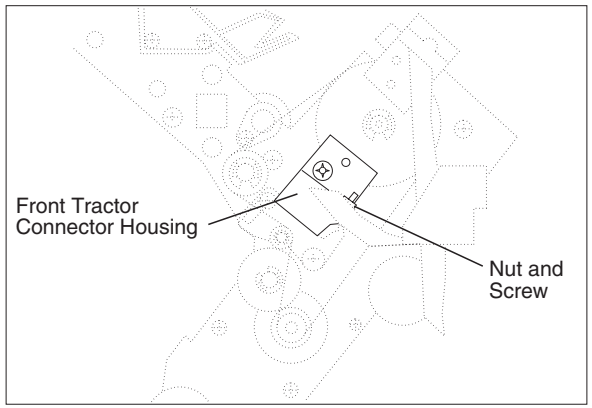


Figure 67. Front Tractor Connector Housing

3. Remove the stop screw from the front tractor connector housing.
4. Slide the cable and connector out of the housing.

5. Loosen the paper feed belt tension lever screws through the access holes in the frame and remove the paper feed belt. Note the path of the belt to aid installation.

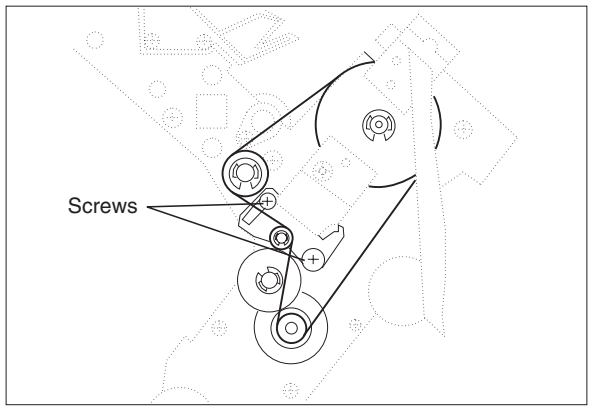


Figure 68. Paper Feed Belt

Replacement

1. Follow the removal steps in reverse order.

   Attention: Ensure that cables do not rub on paper feed belt.
2. Perform the paper feed belt tension service check. See Paper Feed Belt.

Lower Plastic Shield/Lower Mylar

Removal

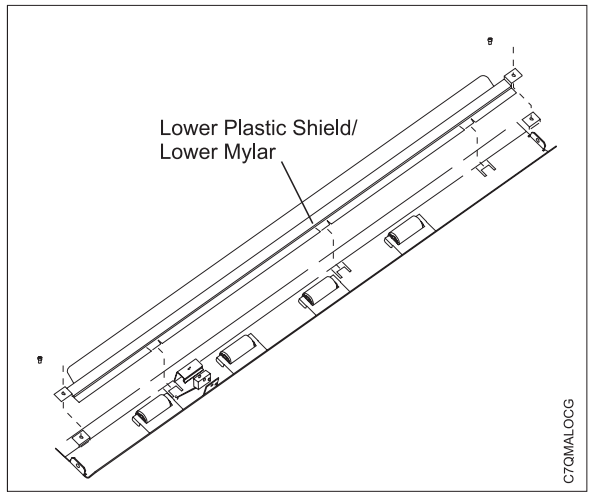


Figure 69. Lower Plastic Shield/Lower Mylar

1. Open the Top Cover and remove the ribbon cartridge. See Ribbon Cartridge.
2. Remove the Bail Assembly.
3. Remove the screw on each end of the plastic shield assembly.
4. Remove the Lower Plastic Shield by sliding it between the Mask and the Platen.

   Note: To simplify this operation, move the AFTA Marker in order to put the Printhead at the furthest position from the Platen.

Replacement

Follow the removal steps in reverse order being careful not to damage the Printhead Mask.

Tractor Assemblies

Attention: Do not remove or install the tractor assemblies with the printer powered on.

Front (Optional, Second) Tractor

Note: 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 is the *rear tractor*.

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.

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.

Rear (Default, Base) Tractor

Note: 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.

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.

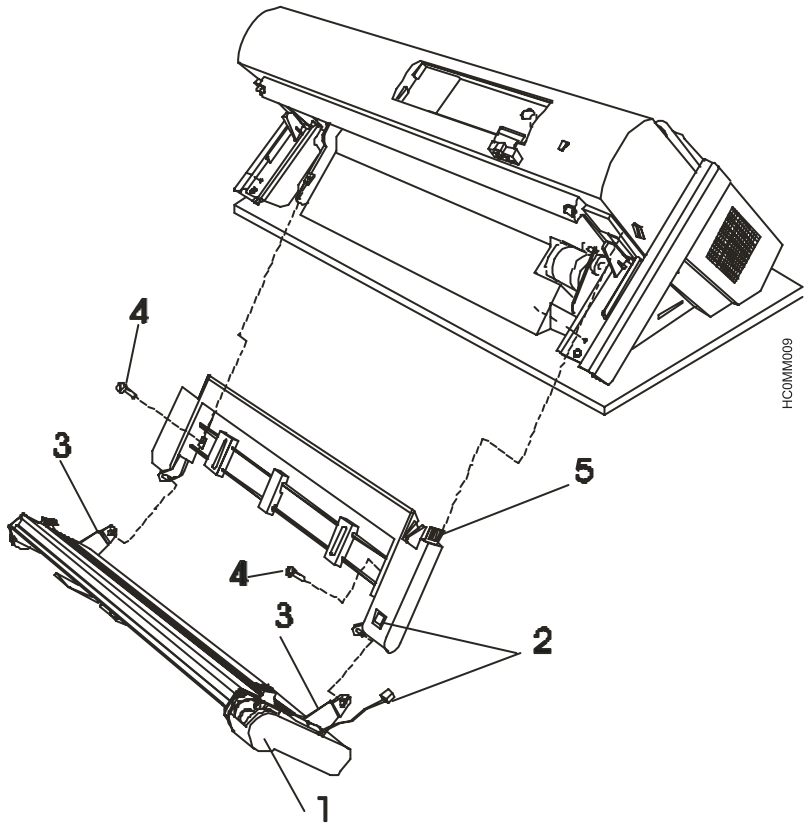


Figure 70. Tractor Assemblies

Chapter 6 Parts Catalog

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
LOWER MYLAR ASSY	78399660-003	6	149
KIT TRACTOR PAPER SUPPORT	78900067-001	9 / 10	13 / 49 / 50
KIT OILFELT	78900669-001	7	201
LOWER FEEDER ASSY	78900701-001	6	6
SUPPORT SPRING ASSY	78900703-002	6	7
CODESTRIP ASSY	78900704-001	6	138
OPTICAL REFLECTION SENSOR	78900706-001	6	V01 / V03
MAGNET INTERLOCK	78900708-001	2	26-A
PLATEN BELT TOOTHED	78900710-001	6	29
PAPER BELT TOOTHED	78900711-001	6	81
TRACTOR PAPER LEFT 6 PIN	78900713-001	9 / 10	11
TRACTOR PAPER RIGTH 6 PIN	78900714-001	9 /10	12
PULLEY	78900717-001	6	41
FRONT PULLEY	78900718-001	6	10

Recommended Spare Parts List (continued)

SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
AGA GEAR	78900719-001	8	84
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
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
PIVOT ASSY	78900757-001	8	103
ENC99 CABLE	78900760-001	7	59B
DUAL TRACTOR GEAR	78900761-001	6	160
PRINT HEAD MASK	78900767-001	7	35
PROT. MYLAR FOR PH CABLE	78900768-001	5	196
CARRIAGE ASSY (w. MASK)	78900786-002	7	59
JAM SENSOR CABLE	78900790-001	9 / 10	42
OPTO INTERRUPTER SENSOR	78900797-002	6	V02
KIT PULLEY ASSY	78900801-002	7	73 / 74
ALTERNANCE CABLE	78900808-001	6 / 8	114
CARRIAGE BELT	78900813-001	7	60
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

Recommended Spare Parts List (continued)

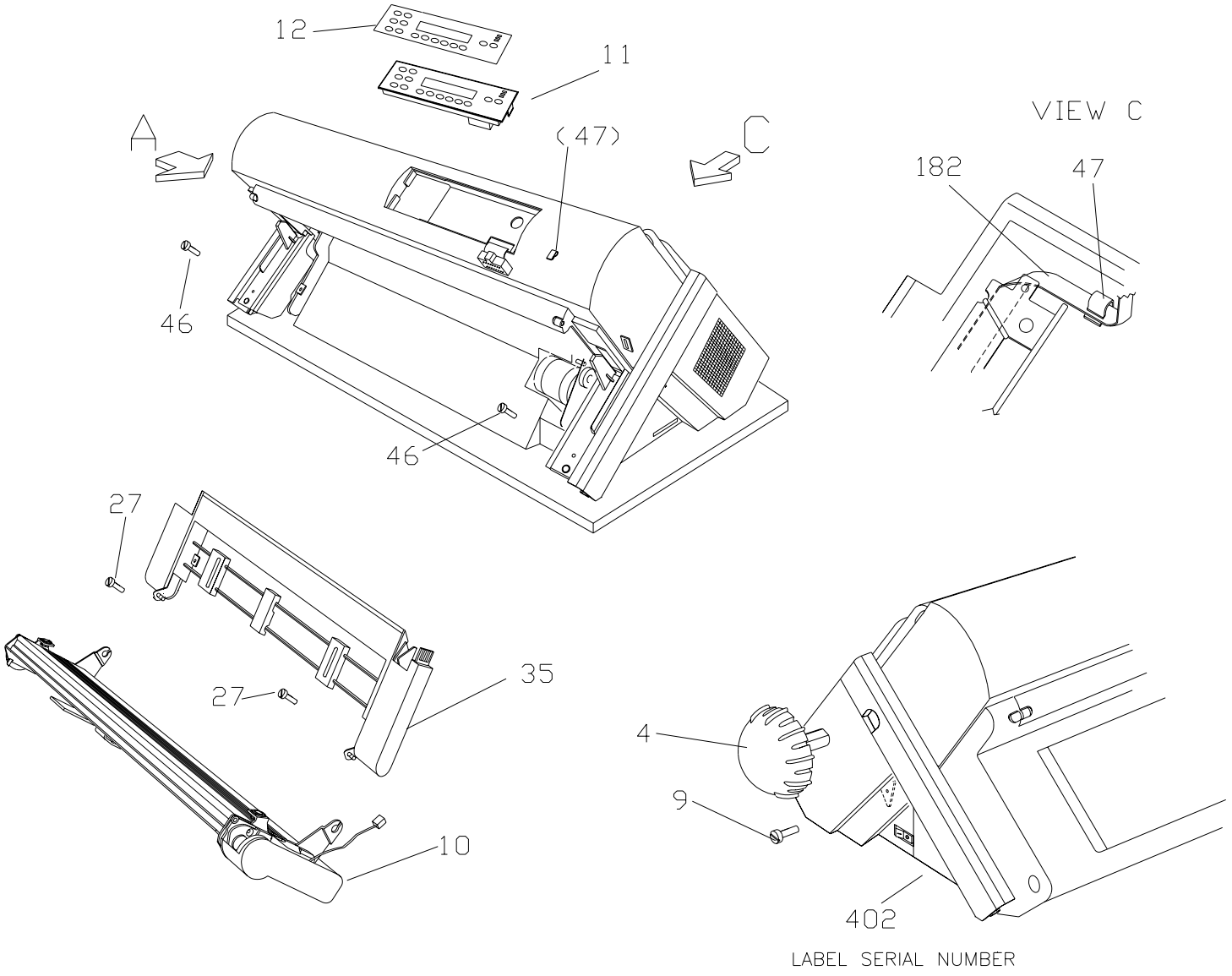
SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
JAM SENSOR SUPPORT	78900926-001	9 / 10	40
JAM SENSOR PROTECTION	78900927-001	9 / 10	41
PULLEY BRACKET ASSY	78900929-001	7	70 / 72 /117
CARTRIDGE SUPPORT RIGHT	78900950-001	8	108
LEFT CARTRIDGE SUPPORT	78900951-001	8	102
ASF COVER 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
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
PRINT HEAD ER18 C+	78902565-001	5	60
2A9CBP BOARD	78902524-001	4	110
OPERATOR PANEL ASSY (no membrane)	78902564-001	1	11
4247X03 MEMBRANE	78902561-001	1	12
CARRIAGE MOTOR ASSY	78902530-001	7	79

Recommended Spare Parts List (continued)

SPARE PARTS DESCRIPTION	PART NUMBER	PART LIST REFERENCE	
		ASSEMBLY	INDEX
LOWER (FIX.) TRACTOR ASSY	78902531-001	1	25
UPPER (REM.) TRACTOR ASSY	78902532-001	1	10
SENSOR CABLE ASSY	78902533-001	5	19
CONTROLLER ASSY (PAR/SER/USB)	78902568-001	4	115
CONTROLLER ASSY (PAR/LAN)	78902569-001	4	115
CONTROLLER ASSY (PAR/LAN IPDS)	78902570-001	4	115
CARRIAGE FAN ASSY	78902536-001	4	65
COLOR MOTOR	79399167-001	5	297
2EN99 PWA	79900702-001	7	59A
RIBBON MOTOR ASSY	79900715-001	8	105
TRACTOR MOTOR ASSY	79900723-001	9 / 10	14
AGA MOTOR ASSY	79900727-001	8	86
PWA 2TRTUJ	79900744-001	10	70A
PWA 2TRJMS	79900745-001	9	32
PWA GX2INT	79900746-001	2	75
PWA GX2JAM	79900791-001	9 / 10	43
POWER SUPPLY UNIVERSAL (110-240)	79900901-003	4	24

Assemblies

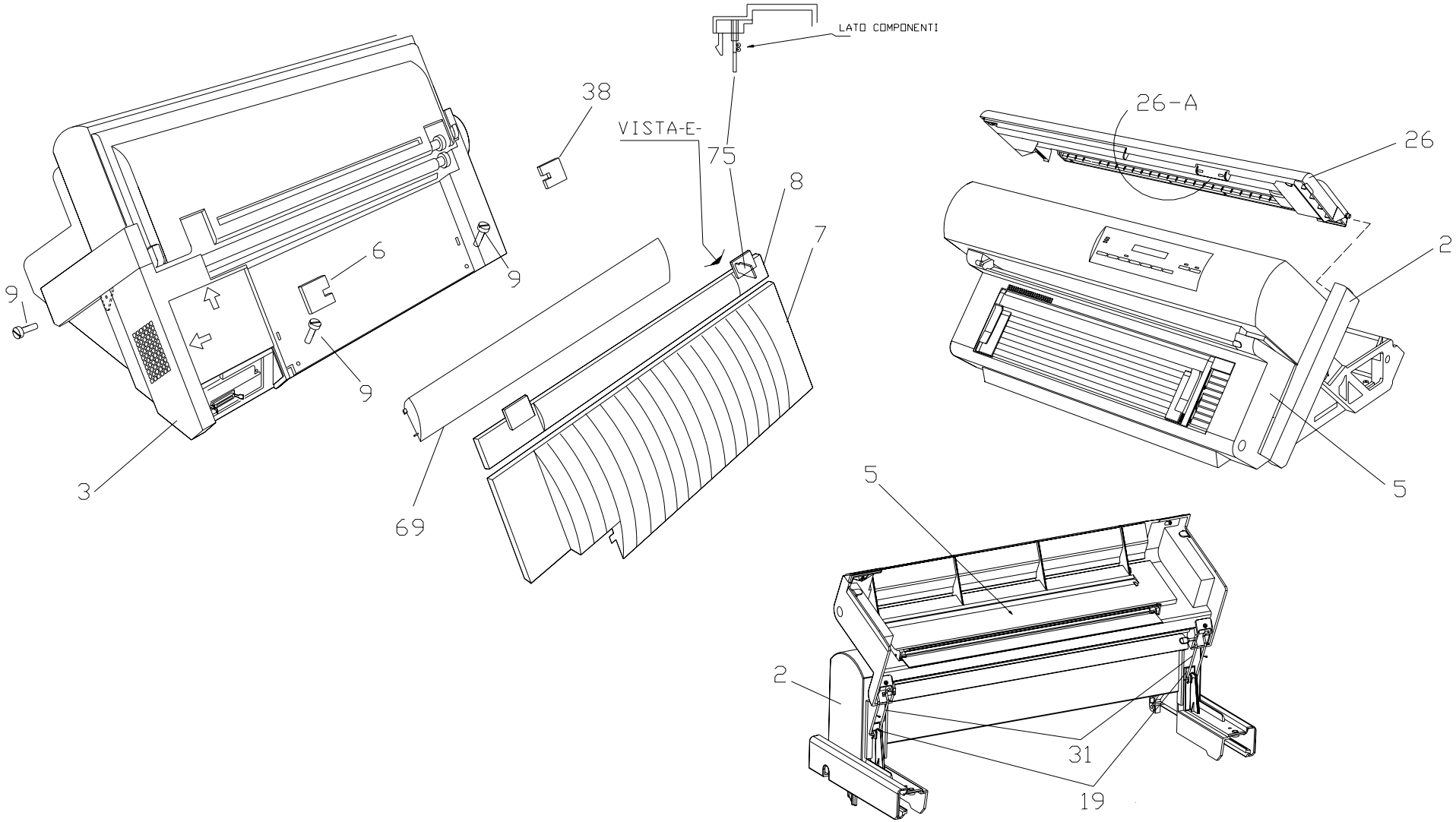
Assembly 1 : COVER ASSEMBLY I



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	78902532-001	1	Upper Tractor Assembly 6 pin (Opt.)
-11	78902564-001	1	Operator Panel Assembly (no membrane)
-12	78902561-001	1	4247-X03 O.P. Overlay
-27	78399161-004		Screw M3x8 (misc. Kit Item .15)
-35	78902531-001	1	Lower Tractor Assembly 6 pin
-46	78399162-003	2	Screw T.C.I.C 3.9x25 (misc. Kit Item 18)
-47	78399158-005	1	Clamp for Cable (misc. Kit Item 13)
-182	78900748-001	1	Operator Panel Cable

Assembly 2 : COVER ASSEMBLY II



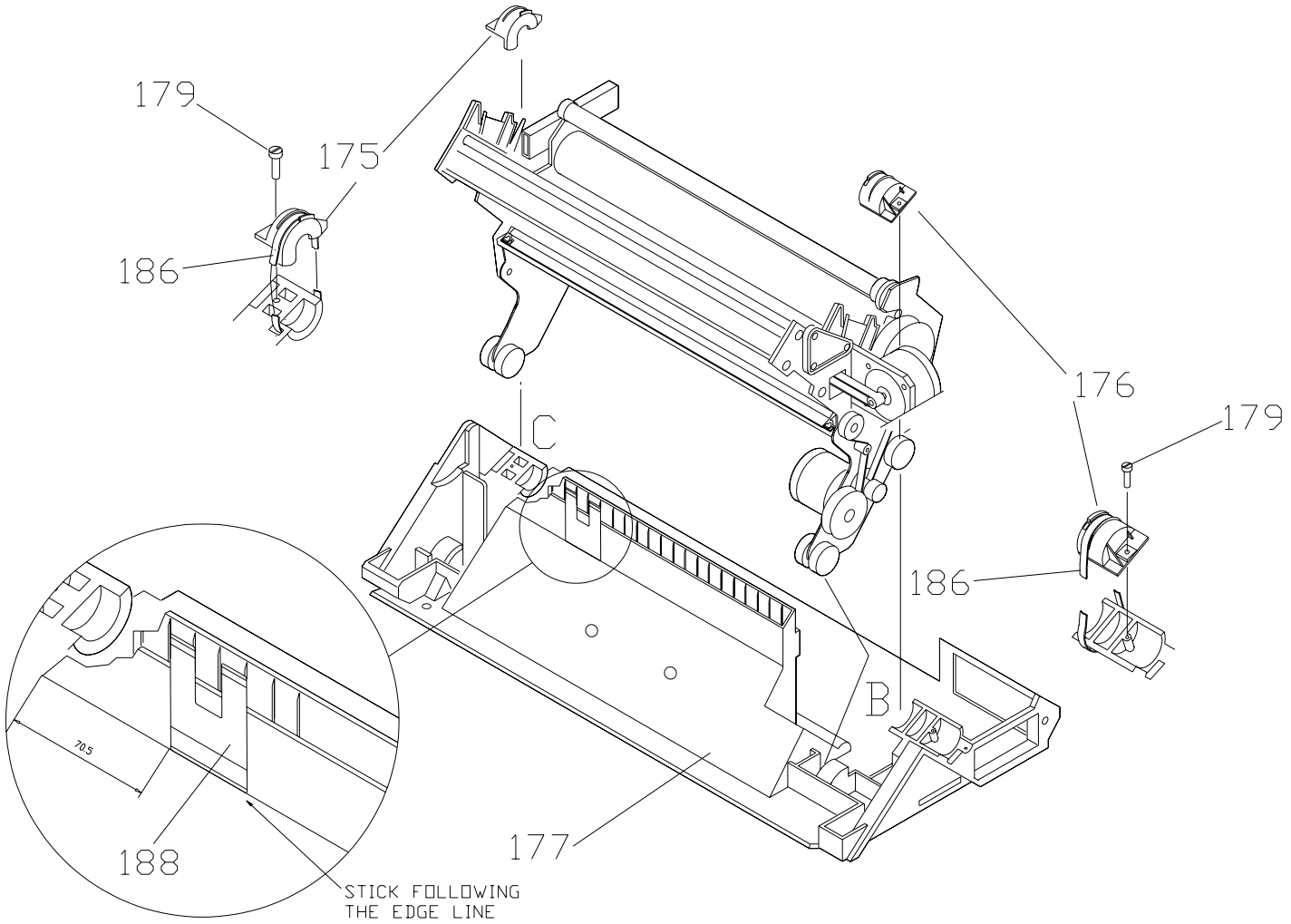
Assembly 2 (continued)

Asm-Index	Part Number	Units	Description
2-2	N.P.	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.

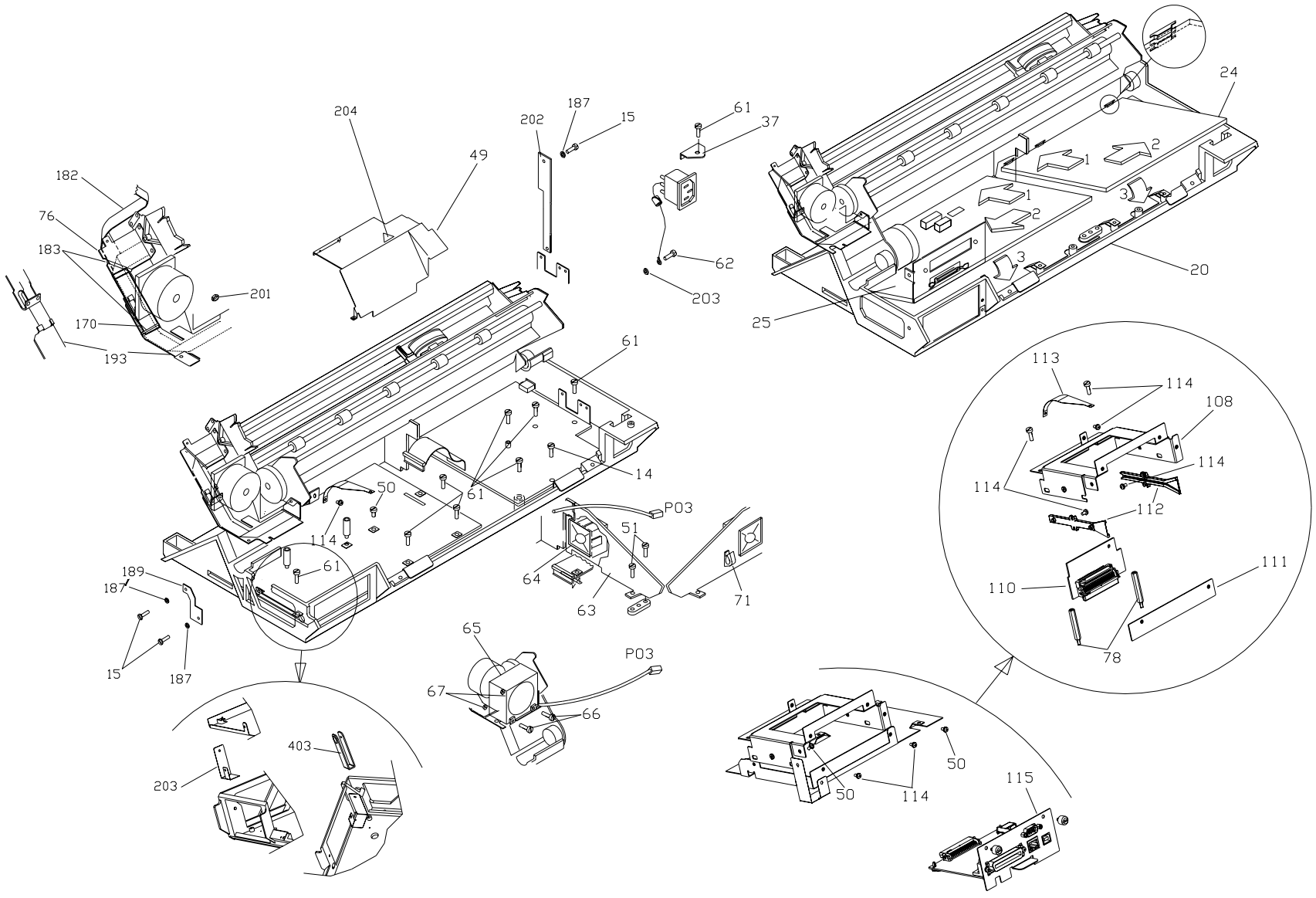
Assembly 3 : BASIC ASSEMBLY I



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)

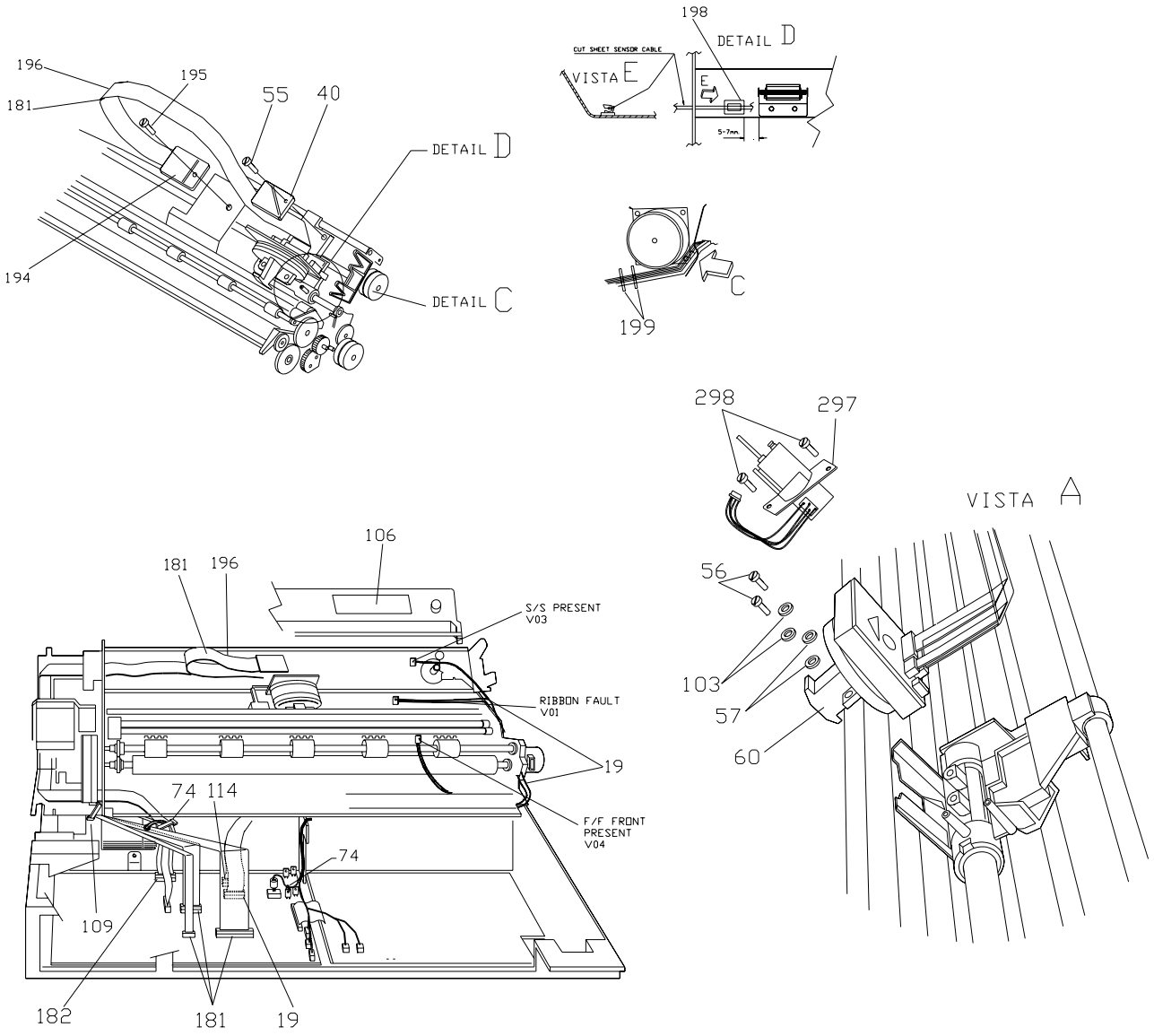
Asm-Index	Part Number	Units	Description
4-14	78399161-004	1	Screw M3x6 (misc. Kit Item 1)
-15	78399161-004	2	Screw M3x4 (misc. Kit item 3)
-20	78900816-002	1	Base Assembly
-24	79900901-003	1	Power Supply 120-240V
-25	78902519-001	1	Engine Board
-37	N.P.	1	Inlet
-49	N.P.	1	Power Supply Cover
-50	78399161-004	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	78902536-001	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)
-76	N.P.	1	Carriage Motor Support

Asm-Index	Part Number	Units	Description
-78	N.P.	2	Slot Assembly (note 1)
-108	78902521-001	1	Back Panel Board
-110	78902524-001	1	Ground Strip
-113	N.P.	1	Screw M3x6 (misc. Kit Item 13)
-114	78399161-004	6	Controller Parallel,Serial,
-115	78902568-001	1	USB2.0 (note 2)
			Controller Parallel,Ethernet
-115	78902569-001	1	10/100 ASCII (note 2)
			Controller Parallel,Ethernet
-115	78902570-001	1	10/100 ASCII-IPDS (note 2)
			Protection Mylar
-170	N.P.	1	O.P. Cable
-182	78900748-001	1	Fastener Loop Self-Lock
-183	78399159-007	2	Washer Split D 3.2 (misc. Kit Item 13)
-187	78399163-005	3	Ground Strip (misc. Kit Item 26)
-189	N.P.	1	Bracket group
-193	N.P.	1	Nut M3
-201	78399163-005	1	Ground Strip (misc. Kit Item 17)
-202	N.P.	1	Ground Strip
-203	N.P.	1	Warning Label
-204	N.P.	1	Grounding plate
-403	N.P.	1	

Notes:

1. Item 110 is the back panel board of the Slot Assembly and is plugged into the engine board
2. Controller firmware included. There is no need to flash download firmware into new controller under normal conditions.

Assembly 5 : BASIC ASSEMBLY III



Assembly 5 (continued)

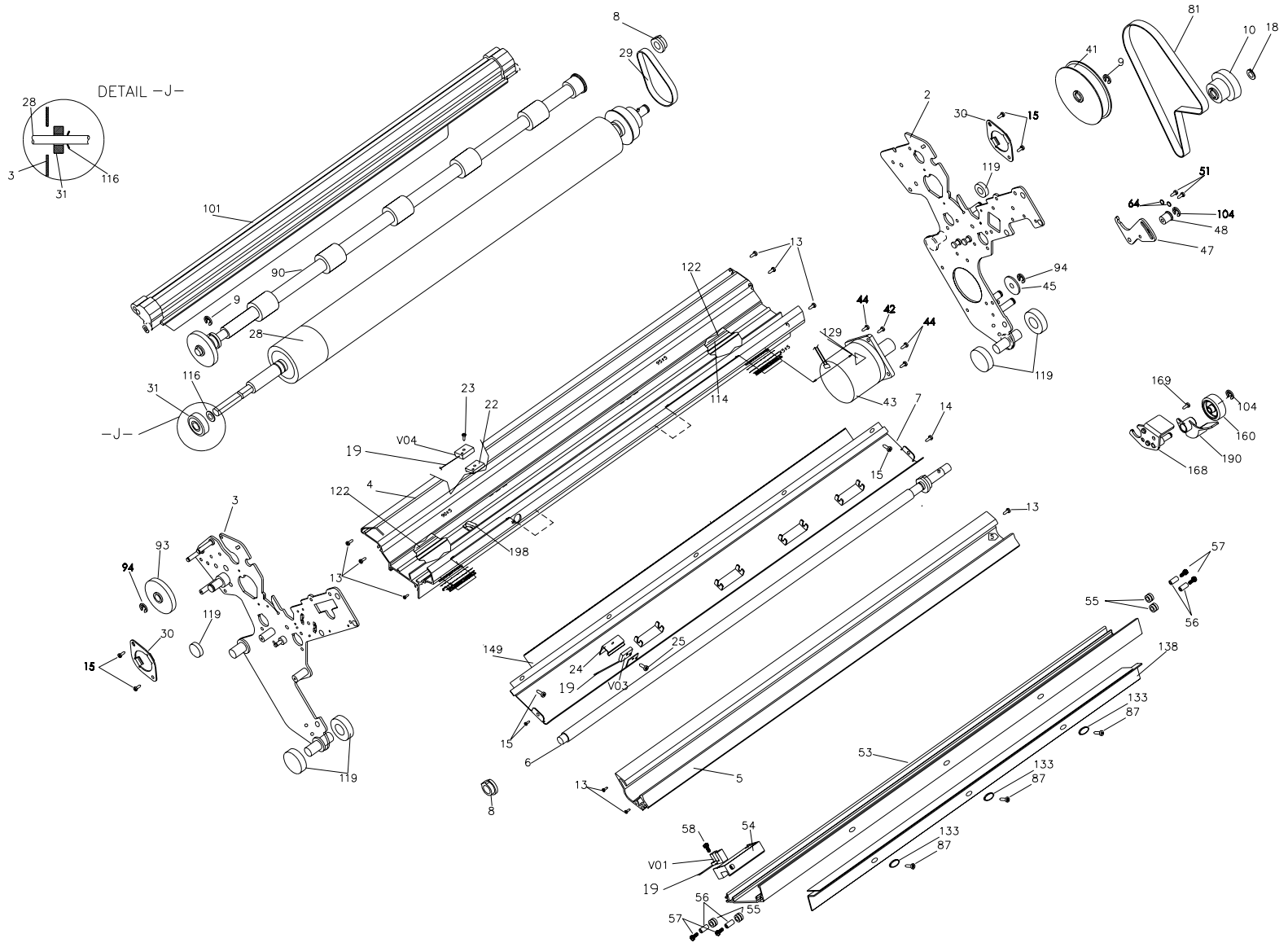
Asm-Index	Part Number	Units	Description
5-19	78902533-001	1	Sensors Cable Assembly
-40	N.P.	1	P.H. Bracket
-55	78399161-004	1	Screw M4x8 (misc. Kit Item 10)
-56	78399161-004	2	Screw M4x14 (misc. Kit Item 2)
-57	79399163-005	2	Washer (misc. Kit Item 8)
-60	78902565-001	1	Print Head ER18MR C+
-74	78399159-007	2	Fastener Loop Self-Lock (misc. Kit Item 13)
-103	78399163-005	2	Washer Internal Teeth (misc. Kit Item 25)
-106	57P1743-C	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
-195	78399161-004	2	Screw M4x6 Flat Head (note 1 misc. Kit Item 23)
-196	78900768-001	1	Protection Mylar for PH
-198	78399158-005	1	Cable Clamp (misc. Kit Item 12)
-199	78399158-005	2	N.P.
-298	78399161-004	2	Screw M3x8 (Misc. Kit Item 13)
-297	79399167-001	1	Color Motor Assy

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	78900703-002	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 2.2x13 (misc. Kit Item 5)
-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
-19	78902533-001	1	Sensor Cable Assy
-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 Feed Belt Tension
-48	78900731-001	1	Lever
-51	78399161-004	1	Idle Screw M4x6
-53	N.P.	1	(misc. Kit Item 9)
-54	N.P.	1	Front Frame
-55	78399158-005	4	Home Sensor Support Damper Vga
-56	78399158-005	4	(Misc. Kit item 2) Damper Spacer
-57	78399162-003	4	(Misc. Kit Item 7) Screw 3.5x16
-58	78399162-003	2	(Misc. Kit Item 7) Screw 2.9x9.5 (Misc. Kit Item 8)

Assembly 6 (continued)

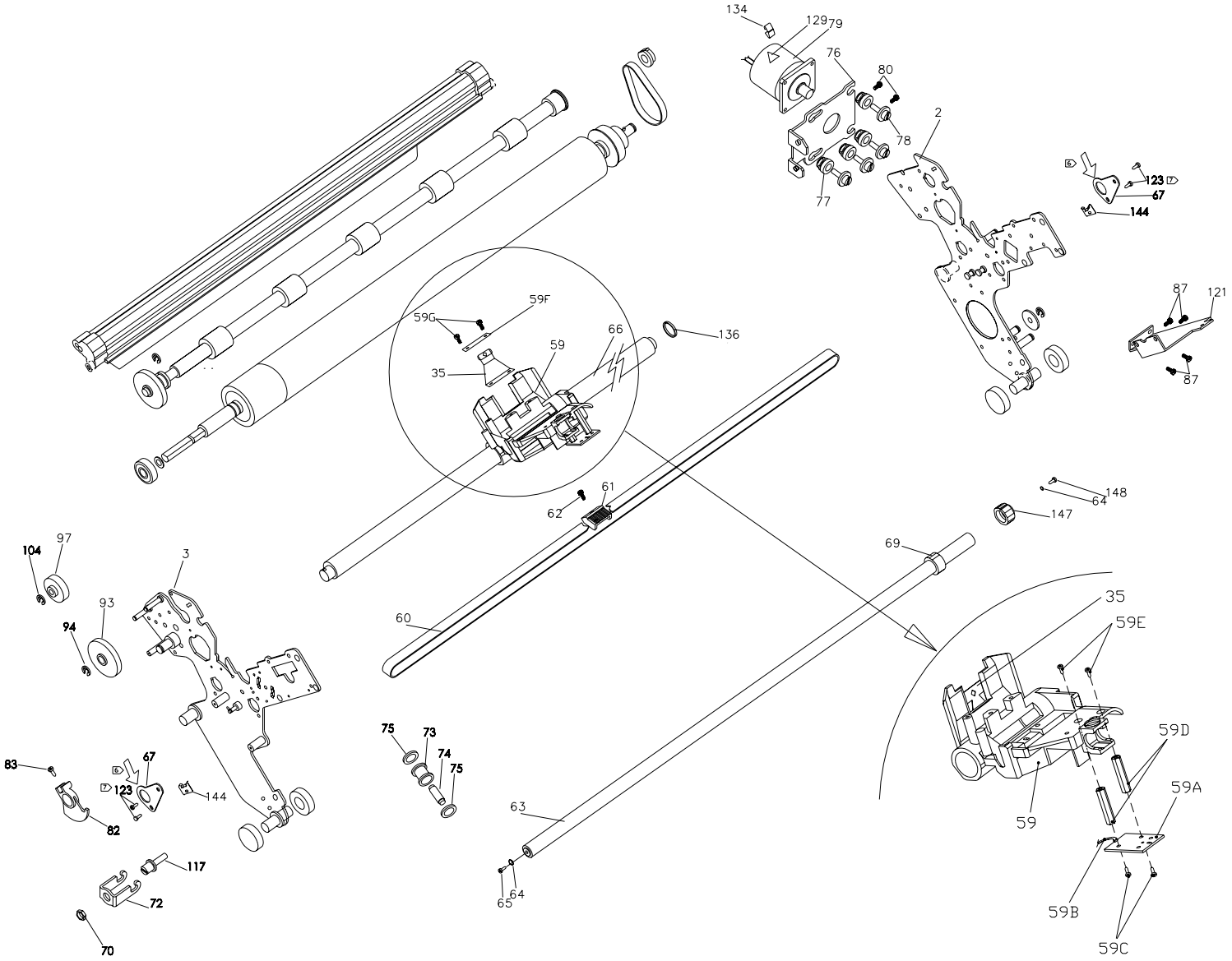
Asm-Index	Part Number	Units	Description
-64	78399163-005	1	Washer D3.2
	78900711-001		(Misc. Kit Item 8)
-81	78399161-004	1	Paper Belt Toothed
-87		3	Screw M3x6
	78399633-001		(misc. Kit Item 13)
-90	78900751-001	1	Upper Feeder Assembly
-93	78399163-005	1	Double Gear
-94		1	Ring Benzing D.6
	78900919-001		(misc. Kit item 5)
-101	78399163-005	1	Bail Assembly
-104		1	Ring Benzing D.4
	78900808-001		(misc. Kit Item 3)
-114	78399163-005	1	Alternance Cable
-116		2	Thrust Washer
	78399158-005		(misc. Kit Item 11)
-119		6	Vibrodamp
	78399158-005		(misc. Kit Item 1)
-122		2	Cable Clamp
	78399163-005		(misc. Kit Item 11)
-133		3	Washer D 3.2
			(Misc. Kit Item 20)

Asm-Index	Part Number	Units	Description
-138	78900704-001	1	Codestrip Assy
-149	78399660-003	1	Lower Mylar Assembly
-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)
-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)
V03	78900706-001	1	V03 Opto Interrupter
			(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 V03) and Reflective Sensors (V04) are also included in the Sensors Cable Assembly.

Assembly 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 (Note 1)
-59	78900786-002	1	Carriage Assembly (note 1)
-59A	79900702-001	1	2EN99 Pwa
-59B	78900760-001	1	Cable ENC99
-59C	78399161-004	2	Screw M3x8 (Misc. Kit item 7)
-59D	N.P.	2	Spacer Sensor
-59E	78399161-004	2	Screw M3x8 (Misc. Kit item 15)
-59F	78900786-002	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
-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 (note 5 misc. Kit Item 18)
-72	78900929-001	1	Loose Pulley Support (note 5)
-73	78900801-002	1	Pulley Assembly (note 4)
-74	78900801-002	1	Pivot (note 4 misc. Kit Item 10)
-75	78399159-007	2	Spacer (misc. Kit Item 9)
-76	N.P.	1	Carriage Motor Support
-77	78399158-005	4	Motor Damp (misc. Kit Item 3)
-78	78399158-005	4	Stud (misc. Kit Item 9)
-79	79902530-001	1	Carriage Motor Assembly
-80	78399161-004	2	Screw M4x6 (misc. Kit Item 11)

Assembly 7 (continued)

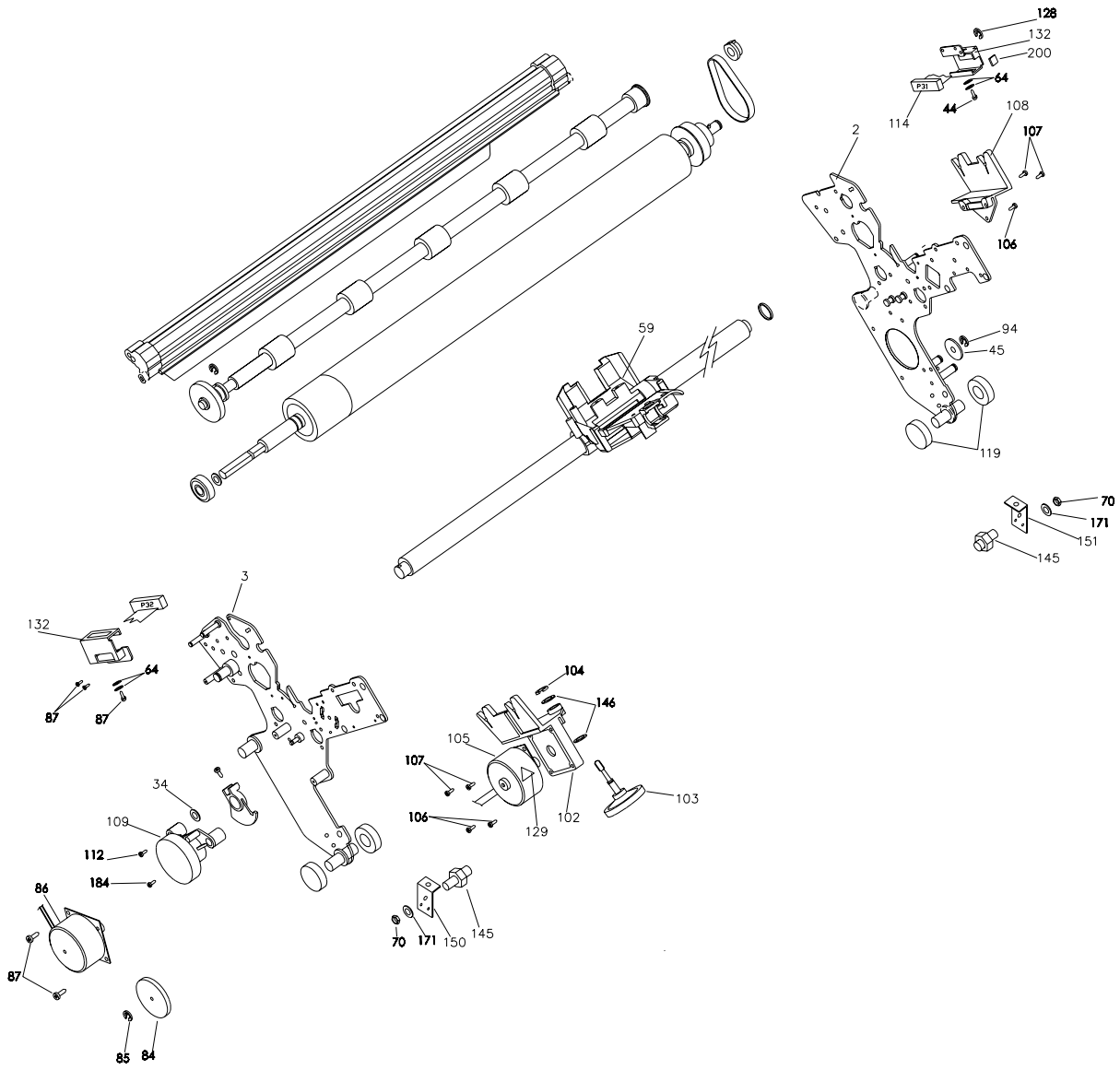
Asm-Index	Part Number	Units	Description
-82	78900725-001	1	AGA Sector
-83	78399161-004	1	AGA Stud
			(misc. Kit Item 22)
-87	78399161-004	4	Screw M3x6
			(misc. Kit Item 13)
-93	78900751-001	1	Double Gear
-94	78399163-005	1	Ring D.6
			(misc. Kit Item 5)
-97	78900726-001	1	Movable Gear
-104	78399163-005	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	N.P.	1	O-Ring
-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 59A though 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) is 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.

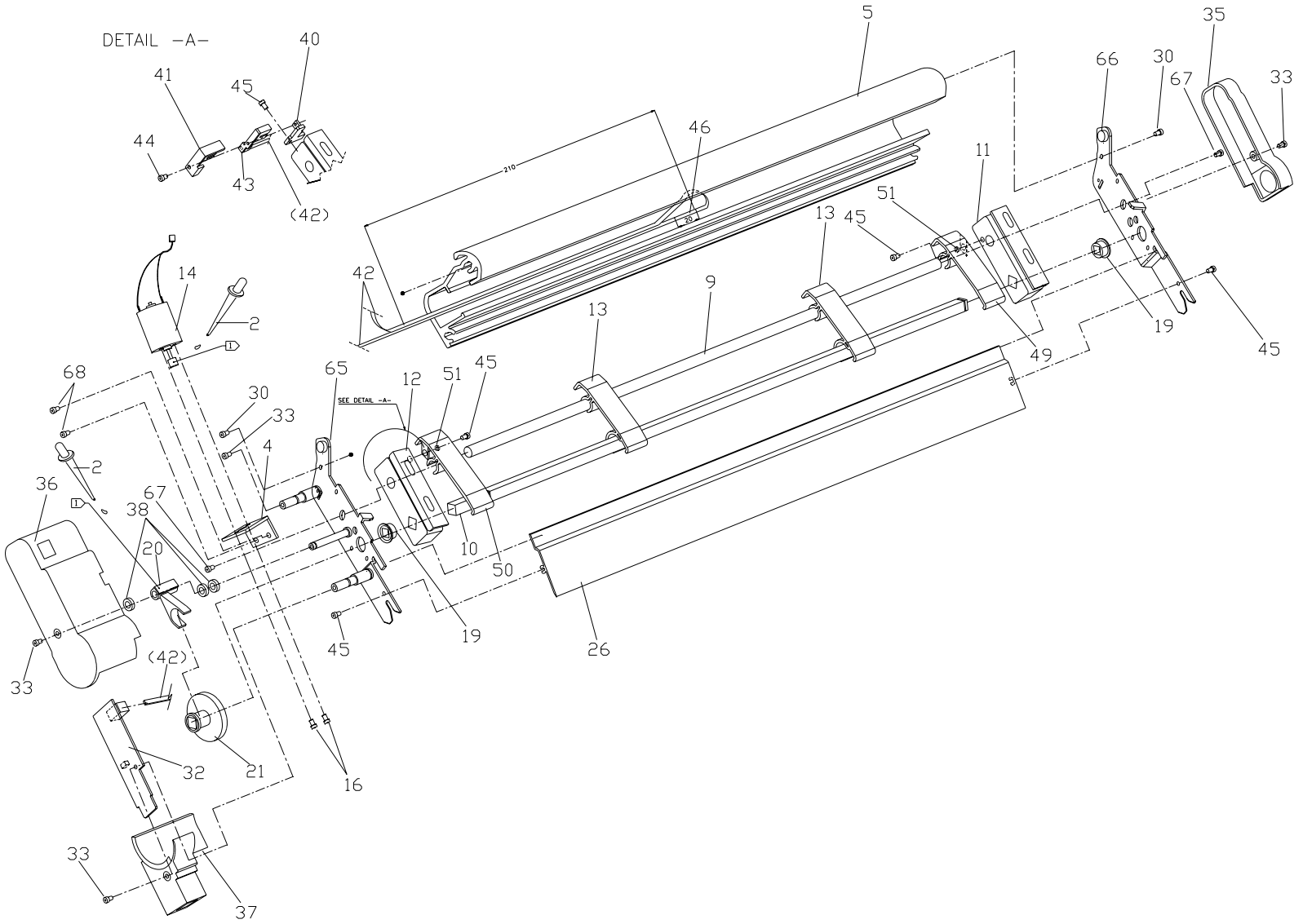
Assembly 8 : MECHANICAL ASSEMBLY III



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	78900951-001	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)
-107	78399162-003	4	Screw 2.9.x19 (misc. Kit Item 10)
-108	78900950-001	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. (misc. Kit Item 27)
-146	78399163-005	1	Washer 60D (misc. Kit Item 26)
-150	N.P.	1	Tractor Sup. Bracket Right
-151	N.P.	1	Tractor Sup. Bracket Left
-171	78399163-005	2	Washer Lock D5.3 (misc. Kit Item 28)
-184	78399161-004	1	Screw M3x6 (misc. Kit Item 17)
-200	N.P.	1	Foam Strip

Assembly 9 : LOWER TRACTOR ASSEMBLY



Assembly 9 (continued)

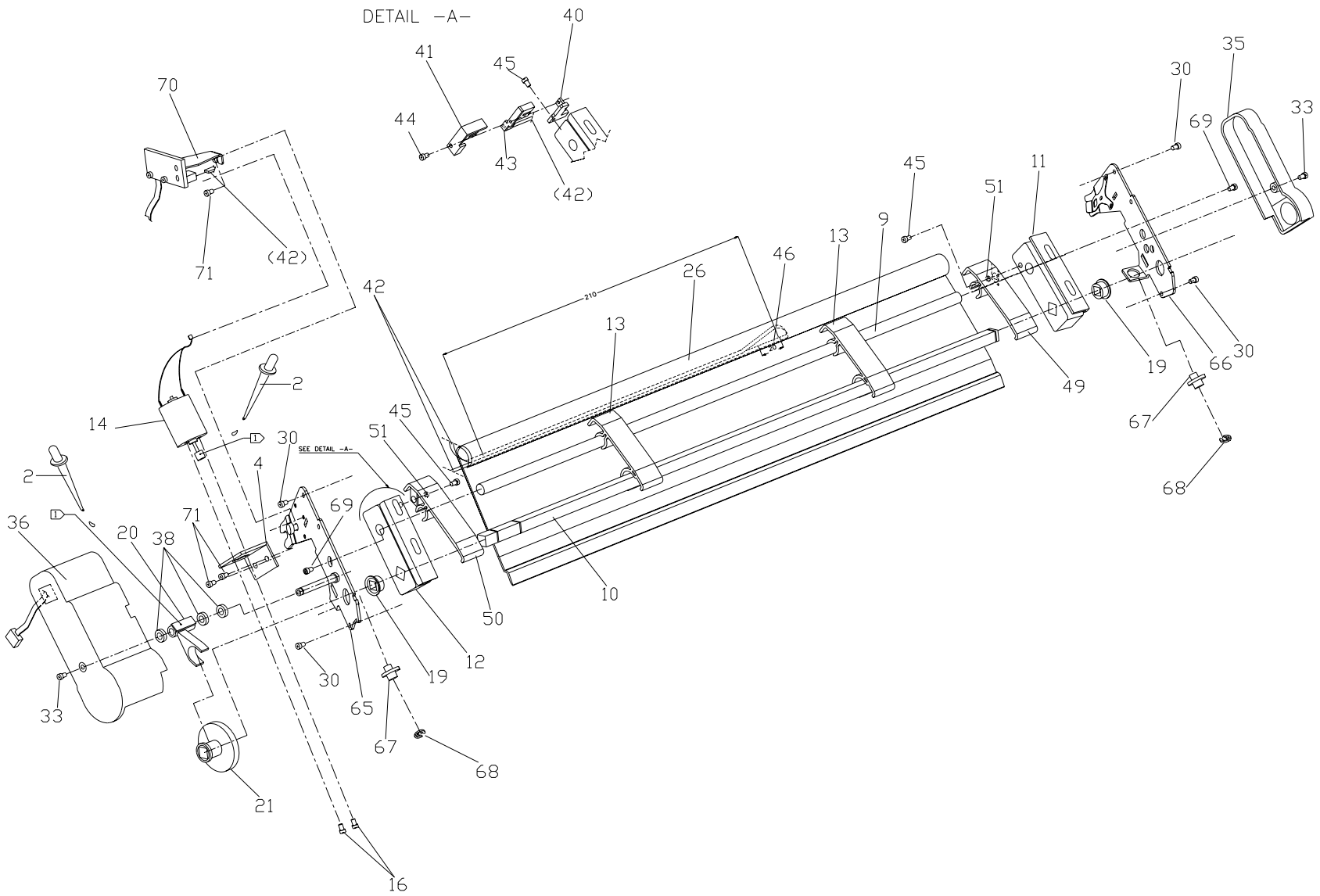
Asm-Index	Part Number	Units	Description
9-Assy	78902531-001	1	Lower Tractor Assy
-4	N.P.	1	Motor Support
-5	N.P.	1	Tractor Profile
-9	N.P.	1	Tractor Spacer
-10	N.P.		Tractor Bar
-11	78900713-001	1	Tractor Paper Left 6 pin
-12	78900714-001	1	Tractor Paper Right 6 pin
-13	78900067-001	2	Paper Support (see Note 1)
-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	789399161-004	2	Screw 3.5x13 (Misc. Kit item 13)
-32	79900745-001	1	PWA 2TR4JMS
-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.

Asm-Index	Part Number	Units	Description
-37	78902518-001	1	Connector Cover Black
-38	78399159-007	3	O Ring (Misc. Kit Item 14)
-40	78900926-001	1	Jam Sensor Support
-41	78900927-001	1	Jam Sensor Protection
-42	78900790-001	1	Jam Sensor Cable
-43	79900791-001	1	PWA GX2JAM
-44	78399161-044	1	Screw M3x12 (Misc. Kit Item 8)
-45	78399162-003	2	Screw 2.9x9.5 (Misc. Kit item 12)
-46	N.P.	1	Adhesive Tape
-49	78900067-001	1	Tractor Support Right (note 1)
-50	78900067-001	1	Tractor Support Left (note 1)
-51	N.P.	2	Spacer
-52	78399161-004	2	Screw M4x8 (Misc. Kit Item 8)
-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 Tractor Support Right, the Tractor Support Left and #2 of Paper Support are included in a single spare part.

Assembly 10 : UPPER TRACTOR ASSEMBLY



Assembly 10 (continued)

Asm-Index	Part Number	Units	Description
10-Assy	78902532-001	1	Upper Tractor Assy
-4	N.P.	1	Motor Support
-9	N.P.	1	Tractor Spacer
-10	N.P.		Tractor Bar
-11	78900713-001	1	Tractor Paper Left 6 pin
-12	78900714-001	1	Tractor Paper Right 6 pin
-13	78900067-001	2	Paper Support
			(see Note 1)
-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	789399161-004	2	Screw 3.5x13
			(Misc. Kit item 13)
-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.
-38	78399159-007	3	O Ring
			(Misc. Kit Item 14)
-40	78900926-001	1	Jam Sensor Support
-41	78900927-001	1	Jam Sensor Protection

Asm-Index	Part Number	Units	Description
-42	78900790-001	1	Jam Sensor Cable
-43	79900791-001	1	PWA GX2JAM
-44	78399161-044	1	Screw M3x12
			(Misc. Kit Item 8)
-45	78399162-003	2	Screw 2.9x9.5
			(Misc. Kit item 12)
-46	N.P.	1	Adhesive Tape
-49	78900067-001	1	Tractor Support Right
			(note 1)
-50	78900067-001	1	Tractor Support Left
			(note 1)
-51	N.P.	2	Spacer
-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)
-69	78399161-004	2	Screw M4x8
			(Misc. Kit Item 19)
-70A	79900744-001	1	PWA 2TRTUJ

Notes:

1. The Tractor Support Right, the Tractor Support Left and #2 of Paper Support are included in a single spare part.

Assembly 11 : Part 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

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-	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

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-	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

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

Assembly 11 (continued)

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

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Chapter 7. Preventative Maintenance

There are no Preventative Maintenance Procedures for the 4247 Printer.

Appendix A. Printer configuration

This section contains information for configuring the 4247 Model X03 printer.

You will find directions for viewing, changing and printing the menus. Use this section as an aid while verifying or changing configuration items.

Unlocking and locking printer configuration menu

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.

Follow this procedure to unlock or lock the printer configuration menu.

1. Press the **STOP** key.
2. Press and hold the **TEST** key. While holding the **TEST** key, press the **START** key.
3. Release both keys. The printer displays “PRESS STOP”.
4. Do not press the **STOP** key. Press **SET TOP OF FORM**. The configuration menu lock will toggle from locked to unlocked or from unlocked to locked when this full procedure is repeated.

Printing the printer configuration and the custom sets

Load the printer with at least 22 in. (55.9 cm) of blank, fanfold forms in the same tractor the customer is using.

1. Press the **STOP** key to make the printer **NOT READY**.
2. Press the **TEST** key. The message **OPERATOR PRINT TESTS** appears.
3. Press the **SCROLL/MICRO ↓** key until the **Printer Configuration** test is displayed below **OPERATOR PRINT TESTS**.
4. Press the **ENTER** key, and wait for the configuration to print.

   To print a custom set:

   a. Press the **SCROLL/MICRO ↓** key until **Print Custom Sets** is displayed.

   b. Press the **ENTER** key and wait.
5. Press the **CANCEL PRINT** key to exit test mode.

Factory defaults

Configuration values that have been changed from default values are indicated with an asterisk (*****).

Changing a value in the printer configuration menu

1. Press **STOP**. The printer becomes *not ready.*
2. Press **MENU** to display the CONFIGURATION MENU on the operator panel display.
3. Press **SCROLL/MICRO ↑** or **SCROLL/MICRO ↓** until you find the Category you want.
4. Press **ENTER** to select that Category.
5. Press **SCROLL/MICRO ↑** or **SCROLL/MICRO ↓** until you find the Parameter you want.
6. Press **ENTER** to select that Parameter.
7. Press **SCROLL/MICRO ↑** or **SCROLL/MICRO ↓** until you find the Value you want.
8. Press **ENTER** to select a new Value. An asterisk (*) appears to indicate the new current Value.
9. To return to the CONFIGURATION MENU, press **RETURN** to return to the Parameter level, and then press **RETURN** again.
10. To save changes to a Custom Set, return to the CONFIGURATION MENU. Select Configuration Storage. Select Save Current Values. Select a Custom Set.
11. To return the printer to *ready* from any level, press **START**.

IPDS configuration

See Chapter 6: “IPDS configuration” of the *User's Guide*.

ASCII configuration

For information about parallel, serial, and LAN interfaces, see Chapter 7: “ASCII configuration” of the *User's Guide*.

LAN attachment configuration

See the AXIS Online CD that is shipped with the LAN controller board or visit the Axis website at www.axis.com.

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

Overview

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

Supplies

Ribbon cartridges and paper are the only supplies you need for your printer. The correct part number for a ribbon cartridge is **57P1743**. Contact your place of purchase to order ribbon cartridges.

Choosing a Forms Path for Your Needs

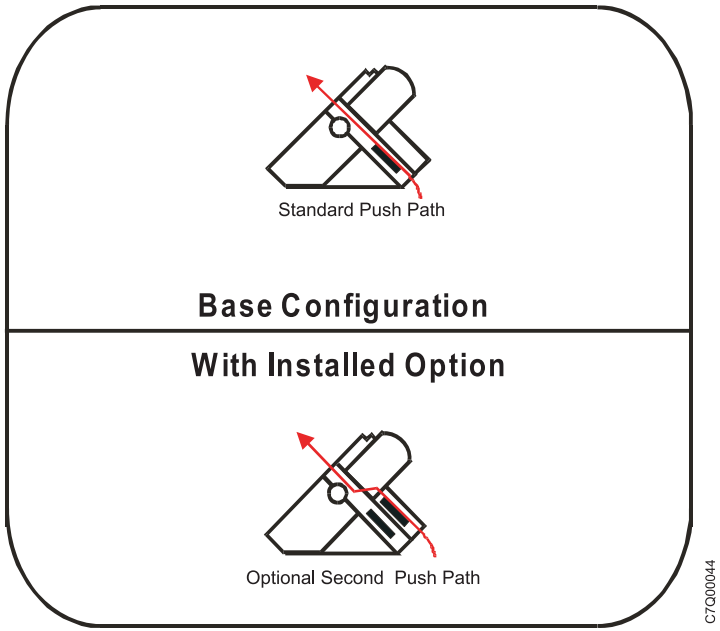


Figure 71. Forms Handling Paper Paths

Table 27. 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 28 when you are choosing which path to use for special forms or paper.

Table 28. 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 27 or Table 29 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 29 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 29 lists various paper and forms specifications. The customer's forms should meet the following specifications.

Table 29. 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:

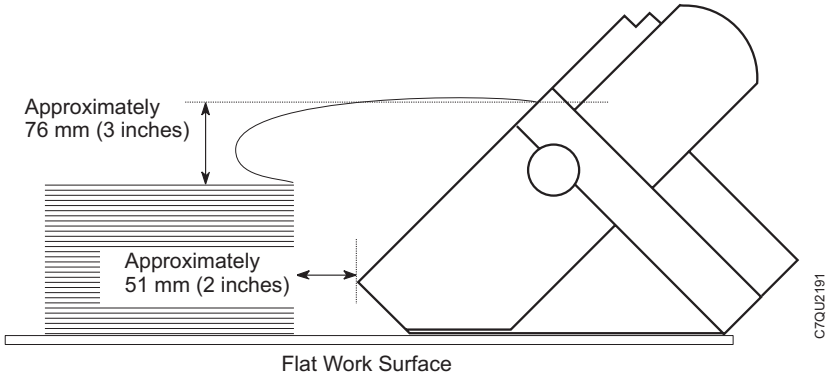
1. Test forms less than 152.4 mm (6 in.) in length or width for satisfactory stacking. These forms may require additional operator attention.
2. For optimum performance, restrict the printable area to be within 6.4 mm (0.25 in.) from all edges, holes, or folds on the forms.
3. Some multiple-part forms (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 doe 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

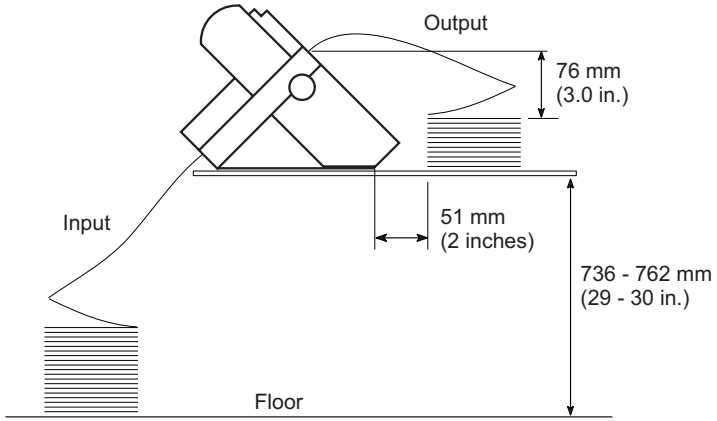
See the diagrams on the following pages for ways to stack input and output forms for your printer.

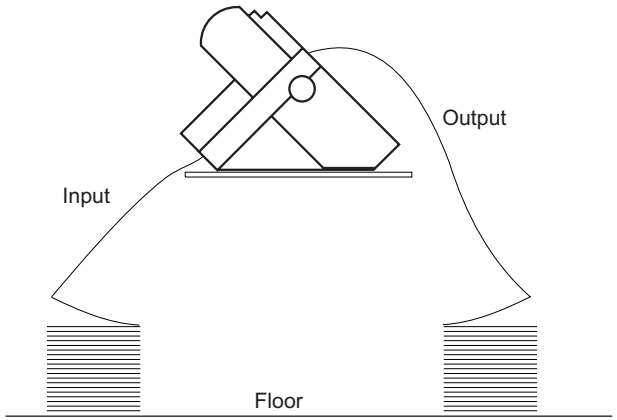
For satisfactory stacking results, the distance from the printer table to the floor should be 736 to 762 mm (29 to 30 in.) and the distance between the shelf and the floor should be 381 mm (15 in.). We offer an optional printer stand that is specially designed for the 4247 Printer. For more information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

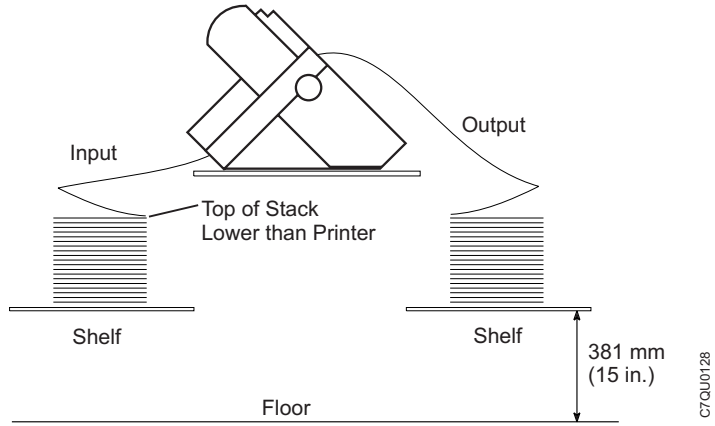
Note: For successful forms parking, the input forms stack MUST always be lower than the printer.

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.

Appendix C. Firmware Downloading

4247 X03 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.

   a. Load forms in the front tractor and power on.
   b. Press the **STOP** key to make the printer *NOT READY*.
   c. Press the **TEST** key and the printer displays **OPERATOR PRINT TESTS**.
   d. Press the **SCROLL/MICRO ↓** key until **Printer Configuration** displays below OPERATOR PRINT TESTS.
   e. Press the **ENTER** key and wait for the configuration to print.
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 **START** and **STOP** keys and power on the printer.
6. Release the keys after **RELEASE KEYS** displays and **WAITING CODE** will display with all LEDs flashing.
7. In a DOS window type: copy *drive*:*directory**filename.bin* lpt1: /b <enter>
   For example: copy c:\temp\4247-X03_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 (as described above) 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. Label this set of configurations as 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.
   a. Load forms in the front tractor.
   b. Press the **STOP** key to make the printer *NOT READY*.
   c. Press the **TEST** key and the printer displays **OPERATOR PRINT TESTS**.
   d. Press the **SCROLL/MICRO ↓** key until **Print Custom Sets** displays below OPERATOR PRINT TESTS.
   e. Press the **ENTER** key and wait for the configuration to print.

f. Press the **RETURN** key until **READY** displays

2. Make sure the code file is in the same directory that you will launch the FTP service from.
3. In Windows:
   a. Click Start → Control Panel → Network and Internet Connections.
   b. Click “Network Connections”.
   c. Double click “Local Area Connections”.
   d. Highlight “Internet Protocol (TCP/IP)”.
   e. Click “Properties”.
   f. Set “Subnet Mask” and “Default Gateway” to the values on the printer Configuration Setup Printout.
   g. 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`.
   h. 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-X03_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 be corrupted or incompatible with this printer model. After displaying 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: Change the path in the DOS window to the directory where the code file is located.

1. For models X03 and Z03 printers, code is not compatible between the two printers, that is, the Z03 code may not be installed on a X03 Controller Board or X03 code on an Z03 Controller Board.

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