

Replacing the ML2430-HS1 MnLiO2 Rechargeable Lithium RTC battery in the LeCroy Series 93XX Digital Storage Oscilloscopes

Note: Under no circumstances should a non-rechargeable battery be installed in the CPU board as the circuitry on the board trickle charges the battery. **Charging a non-rechargeable (primary) Lithium battery can cause the battery to overheat and explode.** Best case it would make a mess of the insides of your scope. Worst case you would rather not know.

There are only so many perfect scopes in this world and it would be a shame to ruin yours.

(Paraphrased with great liberty from the movie “The Princess Bride”)

Just like in school **read this entire document before doing anything.** Take your time. Now for the standard disclaimer:

NOTE:

USE ONLY THE CELL SPECIFIED BELOW. THE INFORMATION IN THIS DOCUMENT IS BELIEVED TO BE CORRECT, HOWEVER, AS YOU MIGHT GUESS THE AUTHOR CANNOT ASSUME RESPONSIBILITY FOR YOUR WORK. IF YOU HAVE DOUBTS IN YOUR ABILITY TO DO ANY OF THE WORK REQUIRED, PLEASE FIND A COMPETENT ELECTRONICS TECHNICIAN WHO KNOWS HOW TO USE A SOLDERING IRON AND HOW TO WORK AROUND CRTS!

Step 1: Turn the scopes’ power off and disconnect the power plug. **It is best to remove the CPU card from the instrument to replace the battery.** This will greatly reduce the risk of solder balls or solder splashes from falling into the instrument. Believe me, it can happen, and you may not even notice it until you turn on the power!

The section of the 9314 series maintenance manual dealing with disassembly of the instrument is duplicated below for reference.

Warnings: ***FIRST OF ALL WEAR SAFETY GLASSES WHEN WORKING WITH CRT’S AND HOT SOLDER***

- Take note of all cables that you disconnect so that you know exactly how they were connected. A digital camera is great for this purpose! Take special care with ribbon cables that run along the backside of circuit boards to prevent scraping or puncturing the cable insulation. Troubleshooting intermittent shorts is never fun.
- Do not place too much sideways pressure on any of the control knobs as the shafts of the encoders are plastic and can be sheared off easier than you might think.
- Before removing the CRT/Front Panel Assembly, discharge the second anode (HV) connector to the frame ground (metal rear panel chassis) of the scope. Disconnect all of the connectors before removing the CRT. When removing, support the CRT by the bell, **never** the neck. Take extra care that you do not bump the neck or move the deflection yoke when removing the assembly.
- If you are lucky enough to have a front panel cover use it to cover the CRT/Front Panel Assembly after you remove it. If you do not have the front cover, get some 2 inch soft polyurethane foam (the type used for upholstery) to set the assembly upon. Put the CRT/Front Panel assembly aside. For added protection, find a strong cardboard box that is taller than the CRT/Front Panel Assembly and large enough to cover the entire assembly. Place the box over the assembly, inverted bottom side up.
- **Keep pets and children of all ages away from the work and parts staging area until the scope is fully reassembled.**

Step 2 – CPU Board Removal

Disconnect the ribbon cables from the CPU board. There is a large one in the rear, and two in the front. These cables connect to the CRT driver board and the front panel board. You probably disconnected them when you separated the CRT/Front Panel Assembly.

Pull the CPU board straight up. You may have to gently rock the board back and forth to free it from the connector. It should take very little force to free the board.

Measure the new battery voltage with a DMM. Note the reading. Chances are that the battery will arrive to you partially if not fully charged.

Remove the old battery and solder the new one in place noting the position of the tab. The correct position is positive side up.

After soldering the battery in place, measure the voltage by placing the positive probe on the top of the battery, and the negative probe on one of the large square ground pads near the gray connector at the bottom of the board. See the picture of a typical CPU2 PCB below for details. The voltage that you measure should be fairly close to the voltage that you measured above.

If your measured voltage is drastically different, then you may have a short or leakage in the battery circuit or the battery has a weak surface charge. Time to get out the CPU schematics and do some troubleshooting. This exercise is left up to the reader as they say...

Re-install the CPU board and reassemble the scope in reverse order. Refer to the manual reprint section below for details. Take care around the CRT (don't bump it) and the knobs/encoder shafts as stated earlier.

When re-installing the CRT/Front Panel Assembly, the hardest part of the re-assembly process is locating the position of the MC01 front slot that guides the PCMCIA card insertion

Step 3 – Check Out

Power up the scope and go to the utilities menu and set the time and date. You might want to check the battery voltage between the positive terminal and any convenient ground and make note of the reading. After being powered on for several hours, you can re-check the battery and confirm that it is being charged.

When measured with the instrument power off, the voltage should be greater than the voltage noted when the battery was measured as received.

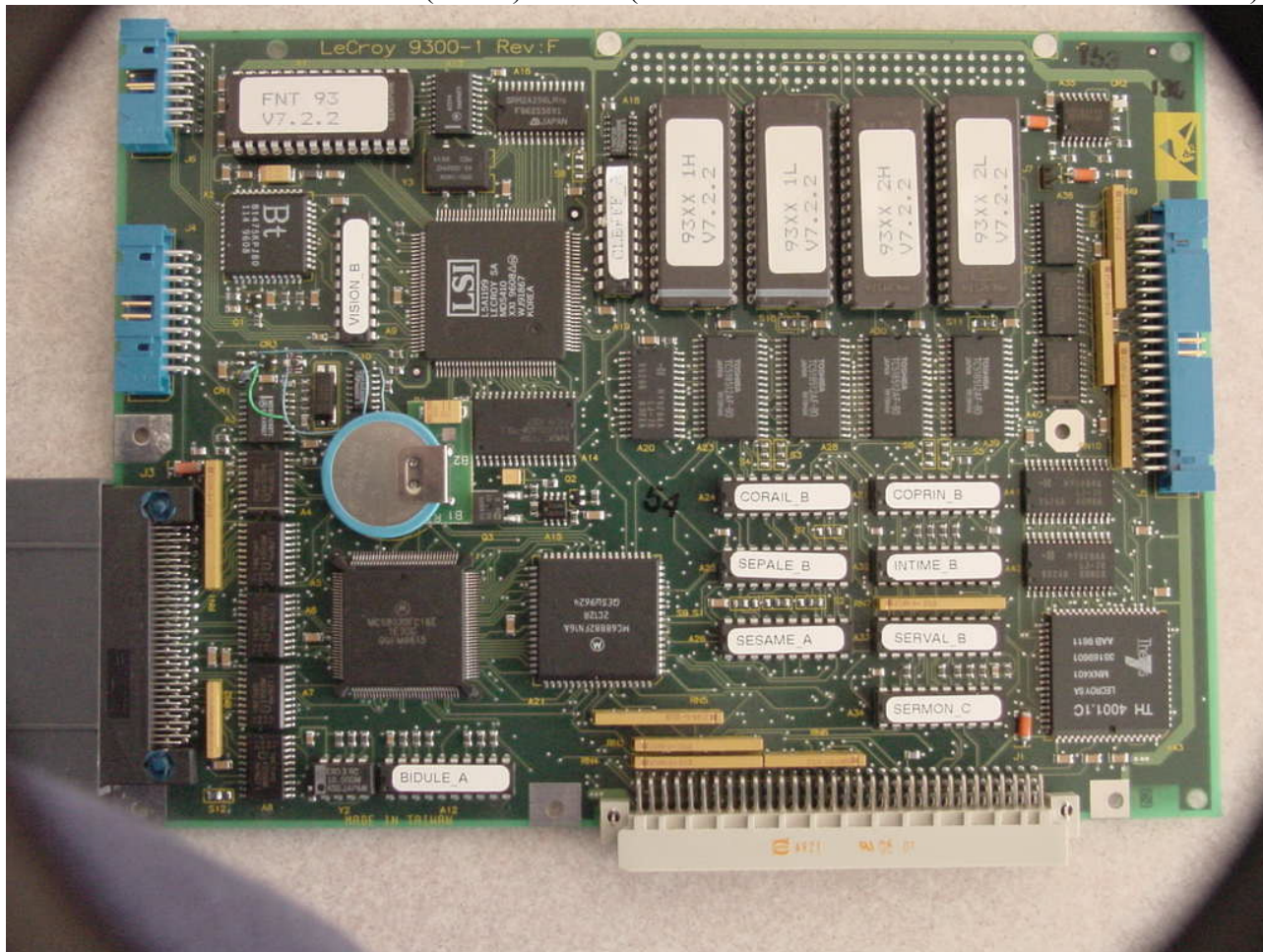
You will also notice that on the system status screen, the last digits of the serial number are all zeros. To fix this you need a GPIB card and a PC running LeCroy ScopeExplorer. Use the terminal mode to send commands and refer to the "Scopes Tips and Tricks" Excel spreadsheet (located in the files section of the LeCroy_Owners_Group) under the GPIB tab to reset the serial number.

ML2430-HS1		
Dimensions	Height	3.0 mm
	Diameter	24.5 mm
Nominal Voltage		3.0V
Nominal Capacity		100mAh
Charging Method	Constant Voltage	3.1V
	Current	0.5mA
Max Discharge	Continuous	10mA
	Pulse	20mA
Charge/Discharge Cycles	5% Depth of Discharge	3000
	20% Depth of Discharge	500
Terminals		3 pin (H)
Weight		4.1 grams
PDF Specs		BACK
www.batterystore.com		Buy Now \$5.50



THE BATTERY IS AVAILABLE FROM www.batterystore.com for \$5.50 each (USD)

PICTURE OF LECROY CPU2 (68020) 9300-1 (THE CPU3 IS SIMILAR IN CONSTRUCTION)



SECTION 7 MAINTENANCE**7.1 Introduction**

This section contains information necessary to disassemble, assemble, maintain, calibrate and troubleshoot the LeCroy 9314A, 9314AM, and 9314AL oscilloscope.

7.2 Disassembly and Assembly Procedure

The disassembly and assembly procedures detailed below refer to the assembly and disassembly diagram 7.2.3, and the view of figures 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7. Please study the diagram and figures before attempting disassembly.

WARNING

Before removing any parts from the LeCroy 9314A/M/L, be sure to read carefully the instructions referring to those parts, noting any precautions needed to avoid problems caused by mechanical behavior, high voltage supplies, etc.

CAUTION

The usual precautions against static electricity are required, (see 1.10)

7.2.1 Removal of the Upper Cover (5.10)

The top cover (5.10) is secured by two M4x5 screws (5.12) on both sides of the front panel assembly (2), and by two M4x8 screws (5.11) on the rear panel (3). Remove the screws and carefully slide the cover off the unit to the rear. Removal of the top cover gives access to the boards and parts listed in section 7.2.3.

7.2.2 Removal of the 93XX-PS1715 Power Supply (4)**WARNING**

Ensure the line cord is disconnected. Remove the following:

- Top cover (7.2.1).
- One M4X8 screw (5.2) from left side of the bottom cover (1.1).
- Two M4X8 screws (5.1) from left side of the rear panel (3).

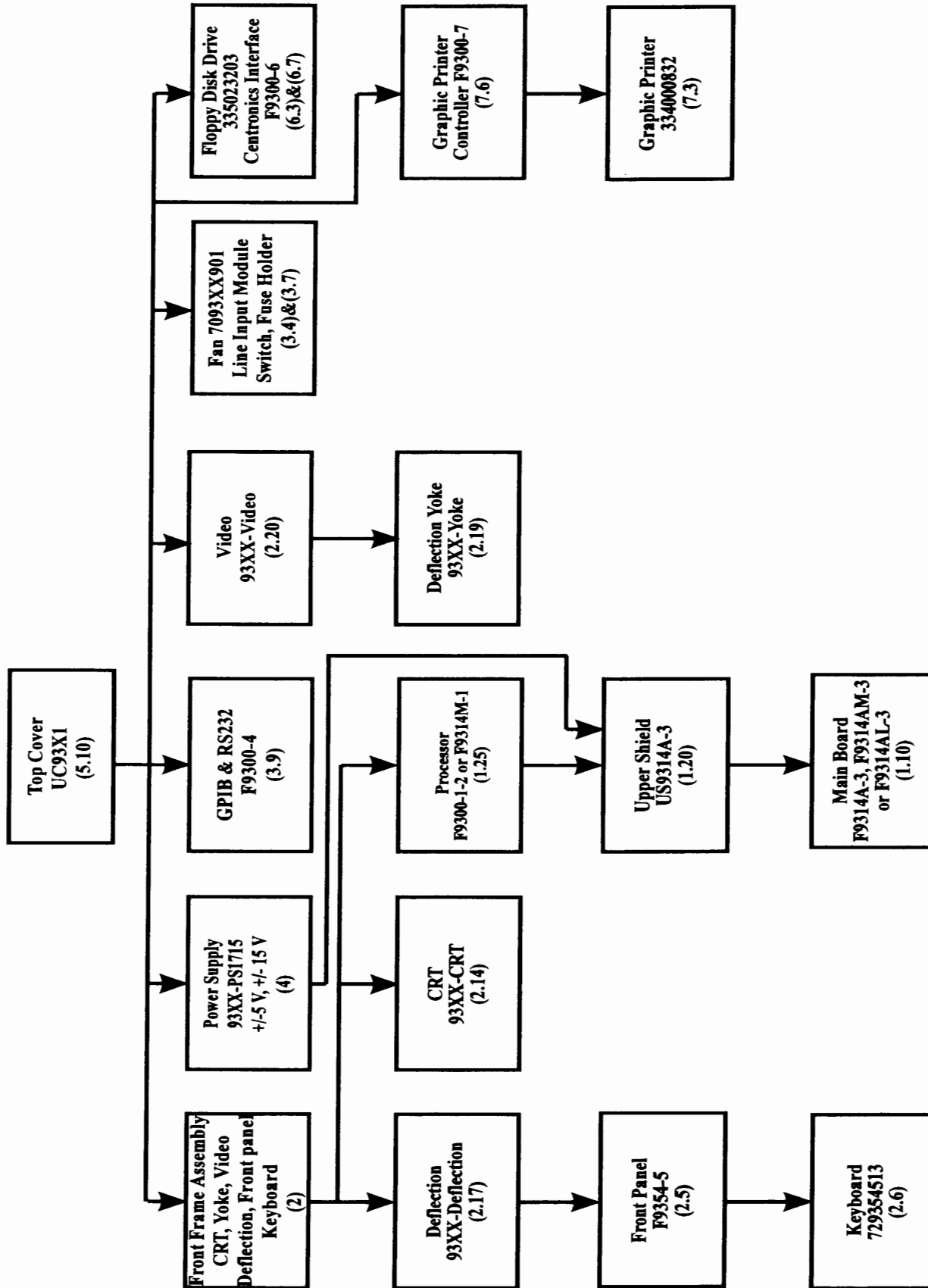
Disconnect the following:

- Base card power cable (5.9), from base board connector J2.
- Line input cable from line input module (3.7).

The power supply can now be removed vertically from the oscilloscope.

7.2.3 Disassembly and Assembly Diagram

Disassembly : If it becomes necessary to replace a board or a part, use the disassembly diagram to disassemble the unit. Any board can be removed if items higher in the diagram and connected by a line are already out.



Assembly : Reassemble the unit in the reverse order.

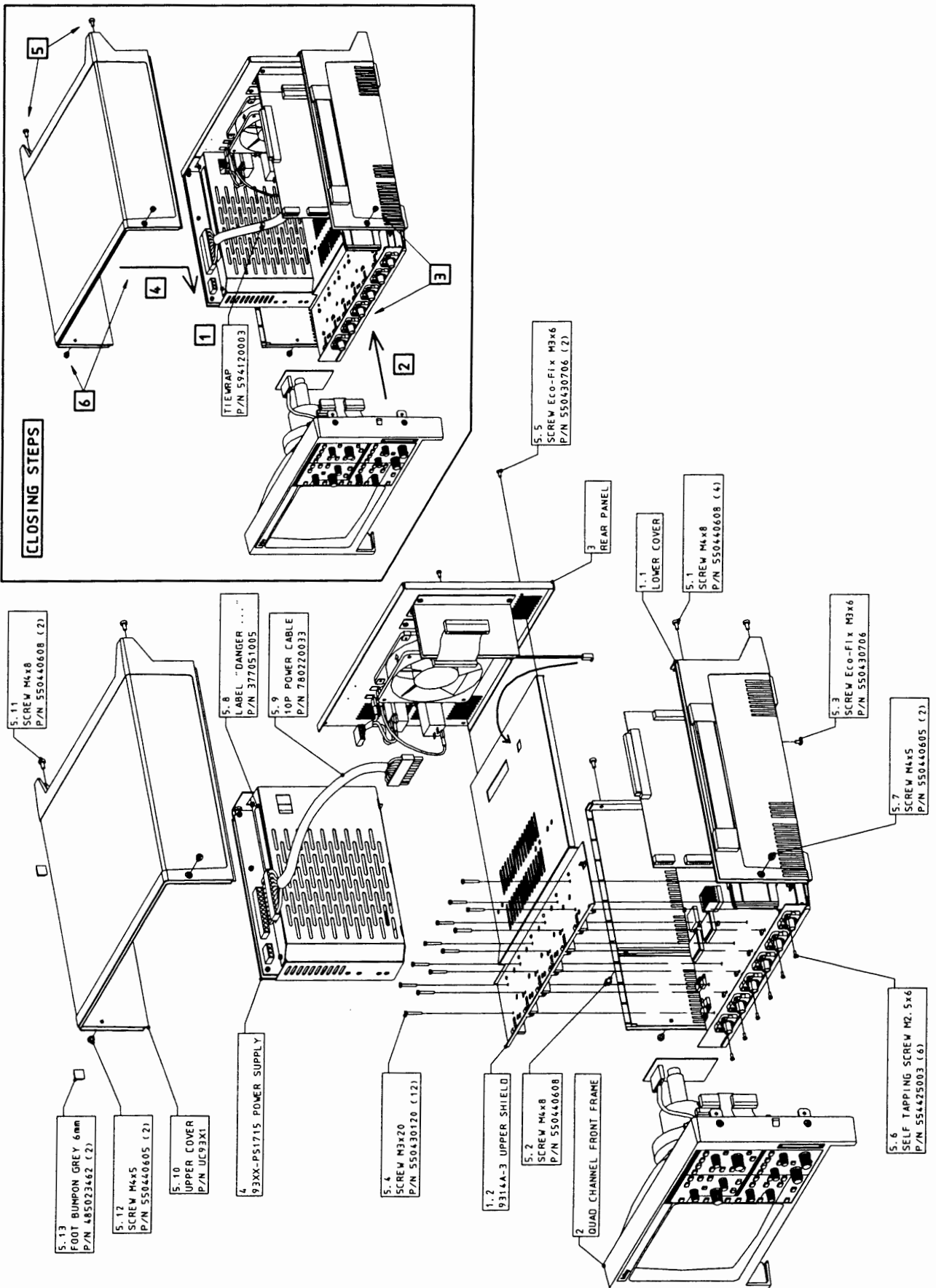


Figure 7.1 : 9314A/M/L Assembly

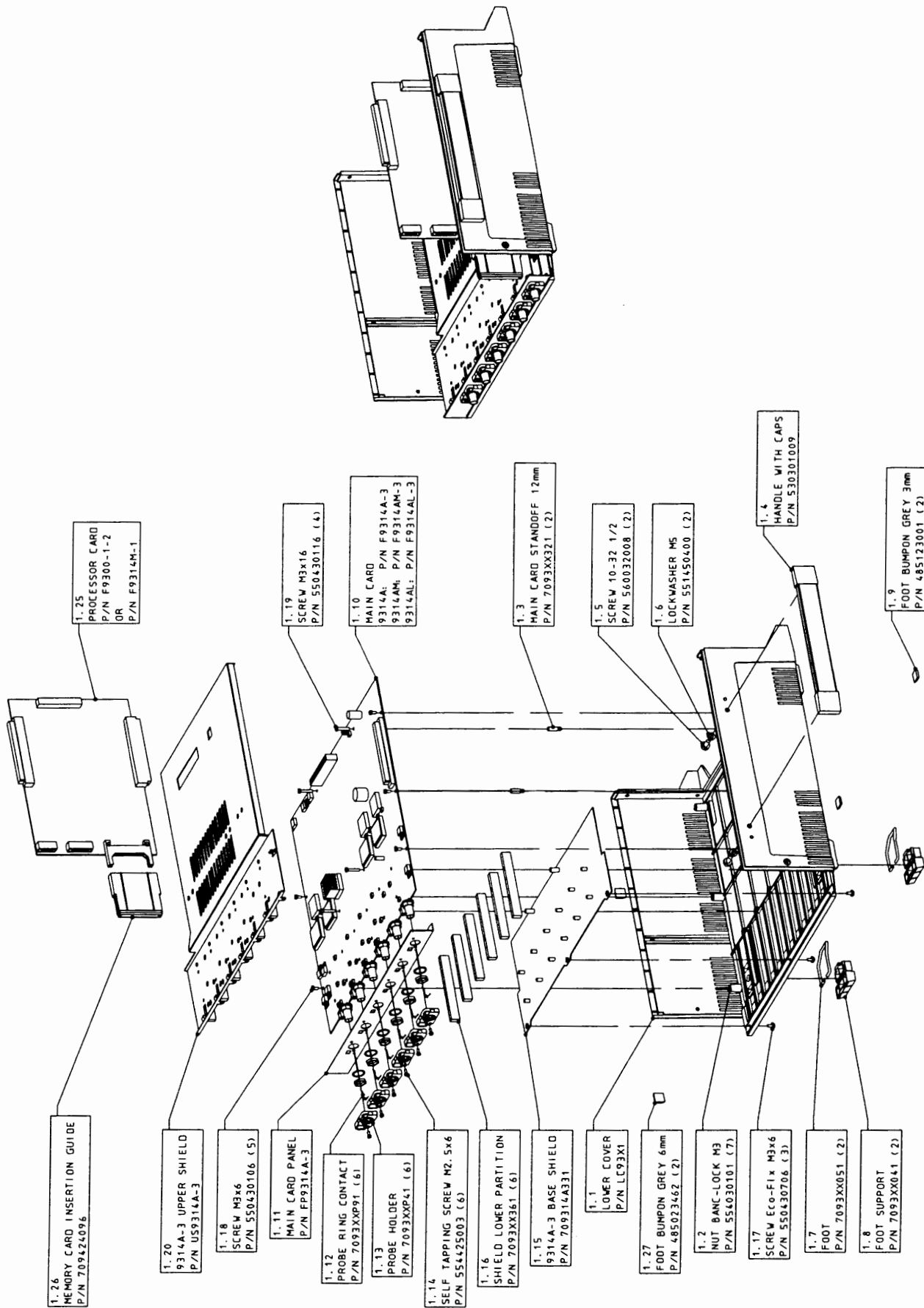


Figure 7.2 : 9314A/M/L Lower Cover Assembly

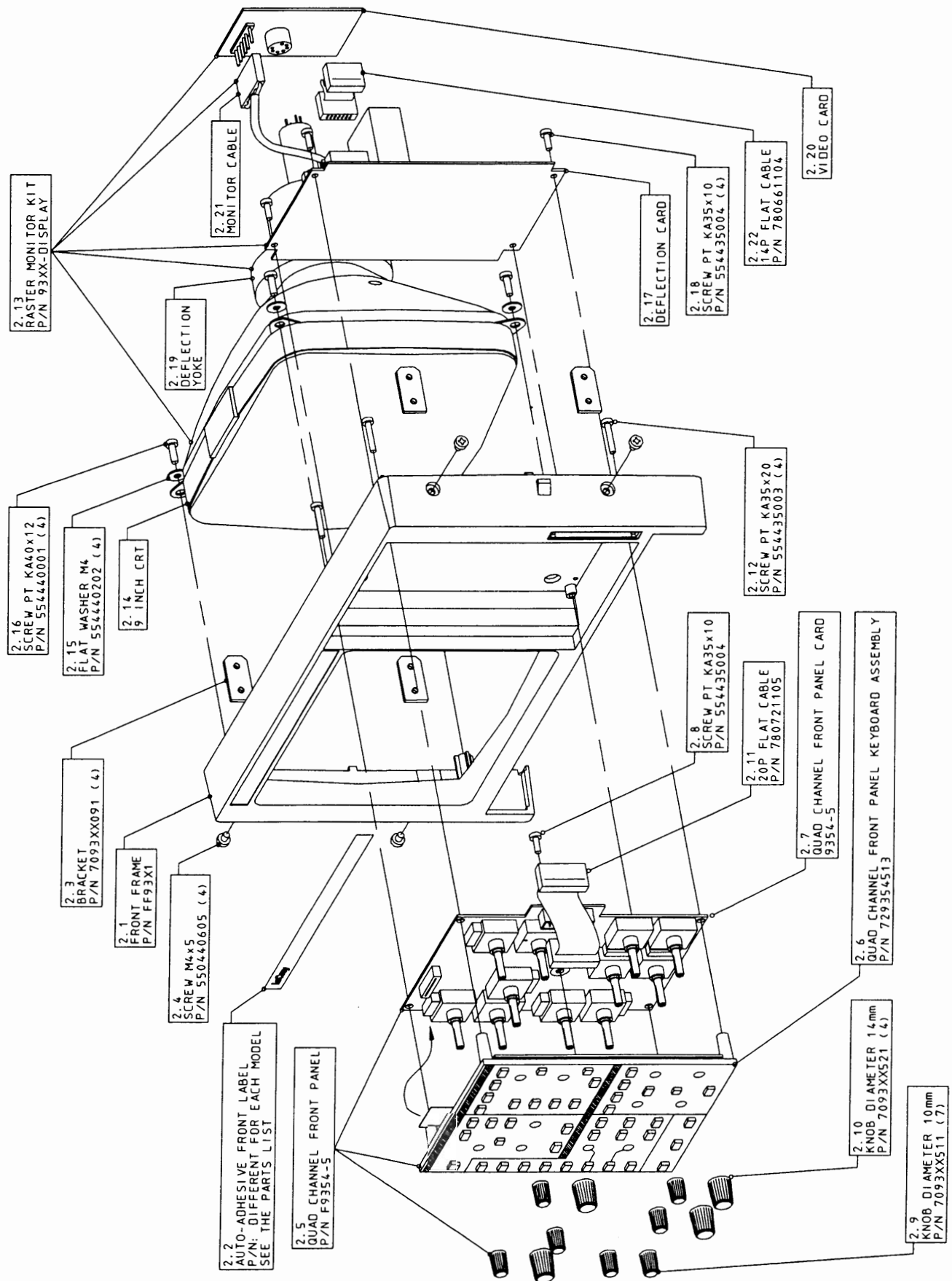


Figure 7.3 : 9314A/M/L Front Frame Assembly

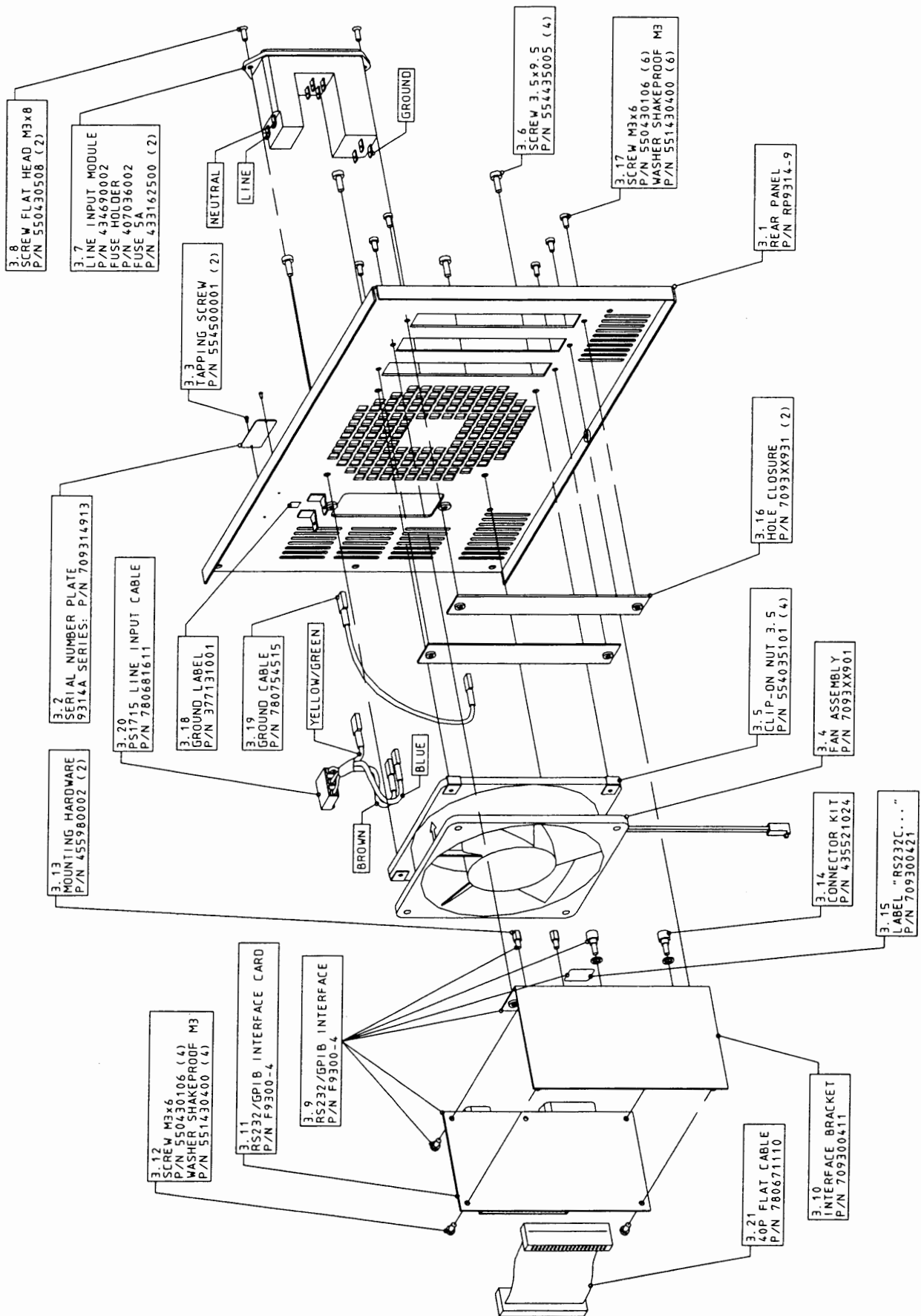


Figure 7.5 : 9314A/M/L Rear Panel Assembly (ECO 1001)

7.2.4 Removal of the F9300-4 GPIB/RS232 Interface (3.9)

The GPIB/RS232 interface (3.9) is vertically mounted on the rear panel (3.1).

Remove the following:

- Top cover (7.2.1).
- Two M3x6 screws (3.17) and washers from the rear panel (3.1).
- Disconnect the flat cable (3.21) from the processor board (1.25) connector J5.

The GPIB/RS232 board can be removed forward from the rear panel.

7.2.5 Removal of the Fan (3.4)

Remove the following:

- Top cover (7.2.1)
- Four screws (3.6) and nuts (3.5) from the rear panel (3.1).
- Disconnect the fan power cable from the main card F9314A-3 connector J3.
- On scope at ECO 1000, remove the fan grid (3.22).

The fan (3.4) part number : 7093XX901 can be removed from the unit.

CAUTION

Note the air flow, the fan extracts air from the unit and expels it.

7.2.6 Removal of the Line Input module (3.7)

WARNING

Disconnect the power cord.

Remove the following:

- Top cover (7.2.1).
- Two screws (3.8) from the rear panel.
- Disconnect the power cable from the power supply connector.
- Disconnect the earth cable (3.19).

The fuse holder assembly (3.7) can be removed from the rear panel (3.1).

7.2.7 Removal of the 93XX-Video (2.20)

- Remove the top cover (7.2.1).
- Disconnect the ground cable from CRT (black wire)
- Disconnect the monitor cable (2.21) from the deflection board, connector W301 & W302

Ease the video board (2.20) carefully toward the back of the DSO, until it is free.

7.2.8 Removal of the 93XX-Yoke (2.19)

- Remove the top cover (7.2.1).
- Remove the 93XX-video board (7.2.7)
- Disconnect the cable from the deflection board connector W201.
- Loose the screw on the yoke ring holder.

The deflection yoke (2.19) can be removed from the cathode ray tube (2.14).

7.2.9 Removal of the front frame Assembly (2)

Remove the following:

- Top cover (7.2.1)
- Two screws (5.7) that secure the front frame assembly (2) to the lower cover (1.1).
- Disconnect the front panel flat cable (2.11) from the processor (1.25) connector J4.
- Disconnect the deflection flat cable (2.22) from the processor board (1.25) connector J6.

The front frame assembly (2) with the CRT (2.14), yoke (2.19), video (2.20), deflection (2.17), front panel (2.7) and keyboard (2.6) can with care be removed forward from the unit.

CAUTION

Hold the CRT very carefully, or place soft padding under it.

7.2.10 Removal of the 93XX-Deflection (2.17)

The deflection board (2.17) is situated to the back of the front panel (2.5).

Remove the following

- Top cover (7.2.1).
- Front frame assembly (7.2.9).
- Disconnect the monitor cable (2.21) which lead to the video board (2.20), connector W301 and W302.
- Disconnect the cable from the deflection yoke, connector W201.
- Disconnect the EHT plug from the receptable at the right side of the CRT (2.14).

WARNING

Touch the free end of the EHT cable to the ground, this ensures that no significant charge remains. The CRT must be discharged similarly, using a tool or a long screw driver which is first placed to the ground and on the CRT receptable.

Remove the four M35x10 screws (2.18) that secure the deflection board to the plastic front frame.

The board (2.17) can now be removed from the unit.

7.2.11 Removal of the 93XX-CRT (2.14)

It is necessary to remove the front frame assembly (7.2.9). The CRT is secured to the plastic front frame by four screws (2.16).

- Remove the 93XX-video (7.2.7).
- Remove the 93XX-yoke (7.2.8).
- Disconnect the EHT cable from the deflection board. Discharge the tube.
- Remove the four screws.

The CRT can now be removed from the front frame.

W A R N I N G

Use care when handling the CRT. Avoid striking it on any object which may cause the tube to implode. Store the cathode ray tube face down on a soft surface. To avoid electrical shock the CRT should be discharged after the 9314A/M/L oscilloscope is powered OFF. After disconnecting the EHT plug, ground the CRT anode lead to the metallic display support, repeat the operation to fully dissipate the charge.

7.2.12 Removal of the F9354-5 Front Panel (2.5)

Remove the following:

- Upper cover (7.2.1).
- Front frame assembly (7.2.9).
- 93XX-deflection board (7.2.10).
- Four screws (2.12) that secure the front panel.

The front panel (2.5) with the keyboard (2.6) can be removed forward from the unit.

7.2.13 Removal of the Front Panel Keyboard (2.6)

Remove the following:

- Upper cover (7.2.1).
- Front frame assembly (7.2.9).
- 93XX-deflection board (7.2.10).
- F9354-5 front panel (7.2.12).
- The 11 rotary knobs (2.9 and 2.10). Take great care of the soft plastic
- One screw (2.8) that secures the keyboard to the front panel.
- Disconnect the flat ribbon cable from the front panel connector J2, and remove the keyboard P/N : 729354513.

C A U T I O N

When removing or installing the keyboard or the front panel, be careful of the fragile flat ribbon cable and connector.

7.2.14 Removal of the Processor (1.25)

The processor F9300-1-2 or F9314M-1 board is located along the right side of the instrument.

Remove the following:

- Top cover (7.2.1).
- Front frame assembly (7.2.9).
- Disconnect the flat cable (3.21) from the F9300-4 GPIB interface connector J5

The processor can be removed vertically from the main card (1.10) F9314A/M/L-3 connector J1

CAUTION

Static electricity can damage components (RAM, Eproms, microprocessor...). Antistatic precautions are required.

7.2.15 Removal of the F9314A/M/L-3 Main Card (1.10)

Remove the following:

- Top cover (7.2.1).
- Front frame assembly (7.2.9).
- Power supply (7.2.2).
- Processor (7.2.14).

The main board with the upper shield (1.2) is horizontally mounted to the lower case cover (1.1).

- Remove the twelve M3x20 screws (5.4), two M3x6 (5.5) and six M2.5x6 (5.6) that secure the upper shield (1.2) to the main board, rear panel and front panel.
- Disconnect the fan cable from connector J3.

The upper shield (1.2) can be removed forward from the main board.

- Remove the five M3x6 screws (1.18), four M3x16 (1.19) and three M3x6 flat head screws (1.17) that secure the board to the lower cover (1.1).

The main board F9314A/M/L-3 (1.10) with base shield (1.15) and card panel (1.11) can be removed from the scope.

CAUTION

Antistatic precautions are required.

7.2.16 Removal of the Handle (1.4)

The handle with two black end caps is secured to the right side of the lower cover (1.1) by two screws (1.5) and washers (1.6).

- Remove the upper cover (7.2.1), and processor board (7.2.14).

The handle can be removed from the lower case.

7.2.17 Removal of the Foot Support (1.8)

The two foot supports are clipped on the lower cover (1.1).

- Remove the foot (1.7) or the support (1.8) by inserting a small flat screwdriver under the support

7.2.18 Removal of the 93XX-FD01 Floppy Disk Drive Option

- Remove the upper cover (7.2.1).
- Disconnect the flat ribbon cable from the F9300-6 interface (see figure 7.6).
- Remove the two M3x6 screws that secure the floppy drive support to the upper cover.
- Remove the support 70FD01021 and frame 70FD01031 from the cover.
- Remove the four M2.5x4 screws that secure the floppy to the support

The floppy disk drive (6.3) p/n: 335023203 can be removed from the frame

7.2.19 Removal of the 93XX-GP01 Graphic Printer and F9300-7 Controller Option

- Remove the upper cover (7.2.1).
- Disconnect the power cable (7.13) from the 93XX-PS1715 power supply (see figure 7.7).
- Disconnect the flat ribbon cable (780791604) from the F9300-7 controller (see figure 7.7).
- Disconnect the flat ribbon cable (780721022) between the F9300-6 interface and F9300-7 controller.
- Remove the four M3x6 screws that secure the F9300-7 controller to frame (70GP01031).
- Remove the F9300-7 controller
- Remove the two M3x6 screws that secure the printer to the frame

The graphic printer (7.3) can now be removed from the upper cover.

7.2.20 Removal of the F9300-6 Centronics Interface Option

- Remove the upper cover (7.2.1).
- Remove the two M3x6 screws from the rear panel
- Disconnect the flat cable from the F9300-4 GPIB/RS232 board (see figure 7.6 or 7.7).

The graphic printer, floppy disk drive, and centronics interface board can be removed forward from the rear panel.

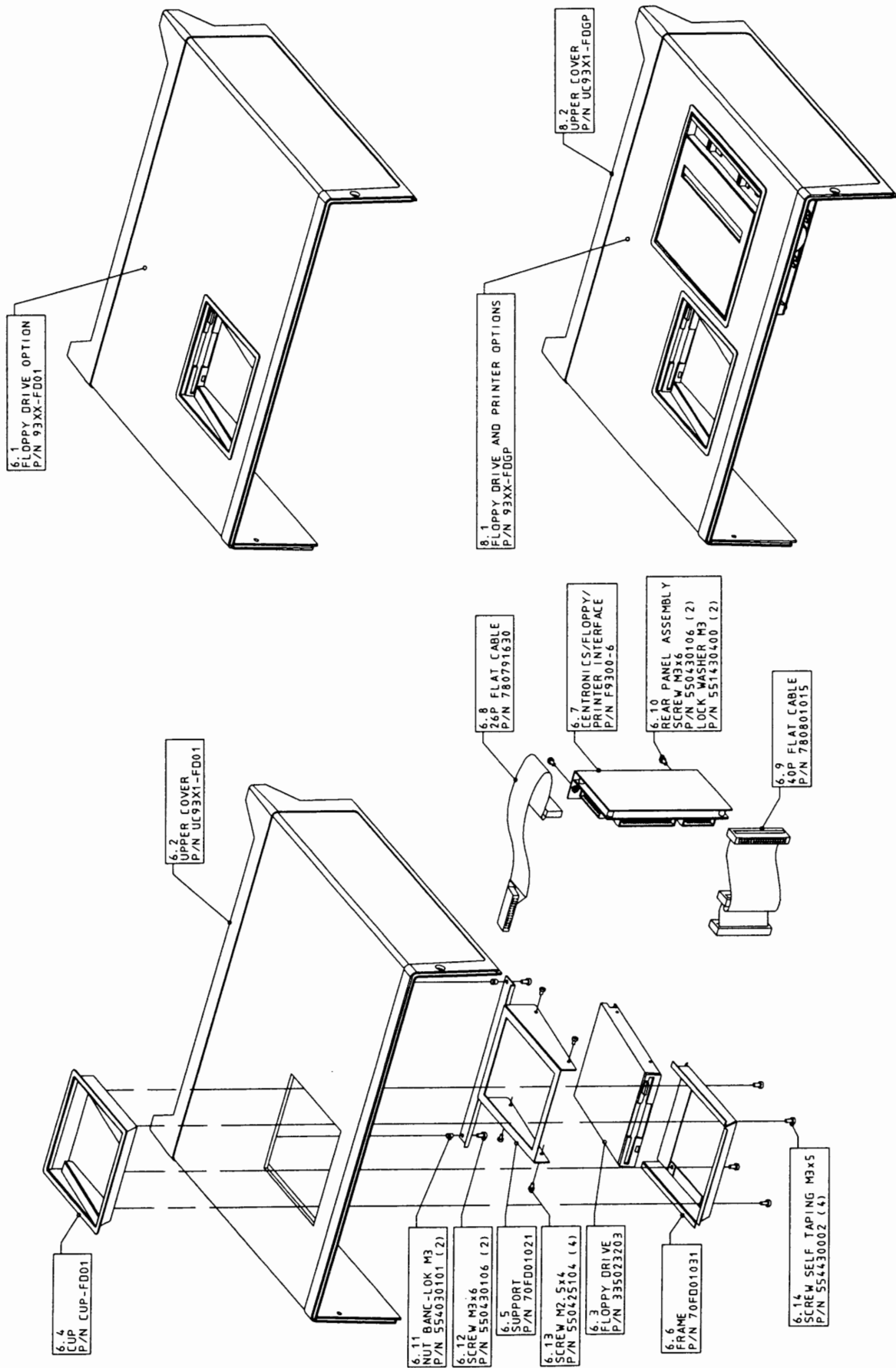


Figure 7.6 : 9314A/M/L Floppy Option Assembly

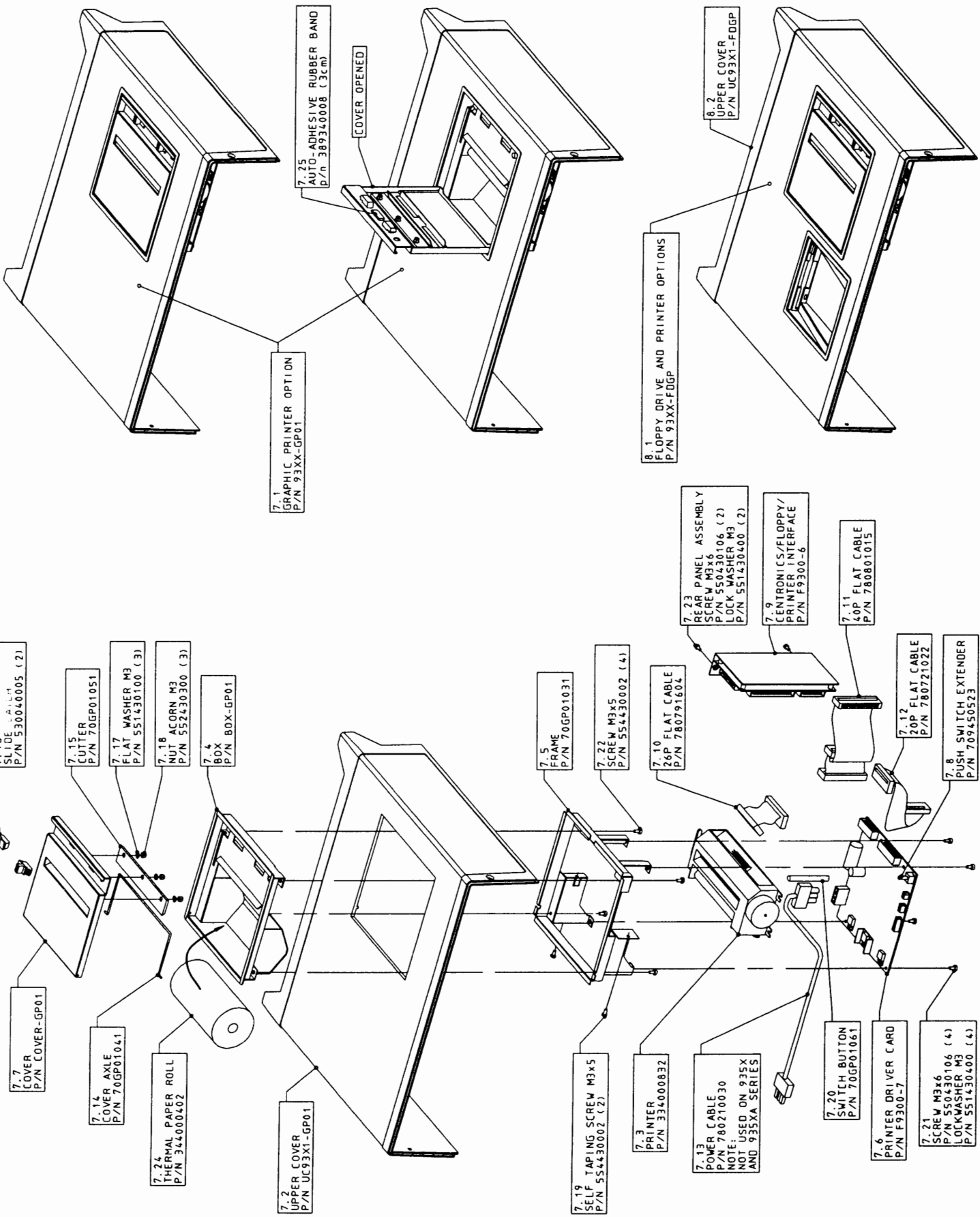


Figure 7.7 : 9314A/M/L Graphic Printer Assembly