HEWLETT ®
PACKARD

HP 5973
Mass Selective Detector

Hardware Installation Manual

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Document History

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Noise Declaration

Deutsch

LpA << 70 dB am Arbeitsplatz normaler Betrieb nach EN 27779:1991

English

LpA << 70 dB operator position normal operation per ISO 7779:1988

Instrument Identification

Each HP 5973 MSD is identified by a unique 10-character serial number. This serial number is located on a label on the lower left side near the front of the instrument. On CI upgrades, a serial number is posted on the flow module.

When corresponding with Hewlett-Packard about your instrument, be sure to include the model number and both full 10-character serial numbers.

Manual Conventions

Cautions

Cautions call attention to procedures which, if not correctly performed or adhered to, could result in ***damage to the instrument***.

Warnings

Warnings call attention to procedures which, if not correctly performed or adhered to, could result in ***personal injury***.

Part Numbers

In this manual, Hewlett-Packard part numbers are generally listed in parentheses after the name of the part or in tables in the *Parts* chapter. Most Hewlett-Packard part numbers are either four-digit-by-four-digit (1234-1234) numbers or five-digit-by-five-digit (12345-12345) numbers.

A few tools and supplies listed have no part numbers and are not available from Hewlett-Packard. Most of these can be obtained from laboratory supply companies.

Safety Information

Safety Symbols

The following symbols may be posted on HP instruments:


Refer to operating instructions


Indicates hazardous voltage


Indicates hot surface


Indicates earth (ground) terminal

Safety Information

Safety class

The HP 5973 Mass Selective Detector (MSD) is a Safety Class I instrument and has been designed and tested in accordance with IEC Publication 1010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

WARNING

Connecting an MSD to a power source which is not equipped with a protective earth contact creates a shock hazard for the operator and can damage the instrument. Likewise, interrupting the protective conductor inside or outside the MSD or disconnecting the protective earth terminal creates a shock hazard for the operator and can damage the instrument.

WARNING

Make sure that only fuses with the required current rating and of the specified type are used for replacement. The use of incorrect or makeshift fuses or the short-circuiting of fuse holders creates a shock hazard for the operator and can damage the instrument.

WARNING

Any adjustment, maintenance or repair of the opened instrument while it is connected to a power source should be avoided if possible and, if required, should be carried out only by trained persons who are aware of the hazards involved.

Safety Information **continued on the inside of the back cover.**

1

General Information

Introduction

This document provides installation instructions for the HP 5973 Mass Selective Detector (MSD). Installation must be performed by a Hewlett-Packard service representative.

The HP 5973 MSD system consists of:

- **Mass Selective Detector**

  HP G1098A — Vapor diffusion pump version of the HP 5973 MSD ("Diffusion pump MSD")

  or

  HP G1099A — Turbo molecular pump version of the HP 5973 MSD ("Turbo pump MSD")

  or

  HP G1999A —PCI/NCI Turbo molecular pump version of the HP 5973 MSD ("CI MSD")

- **Gas Chromatograph**

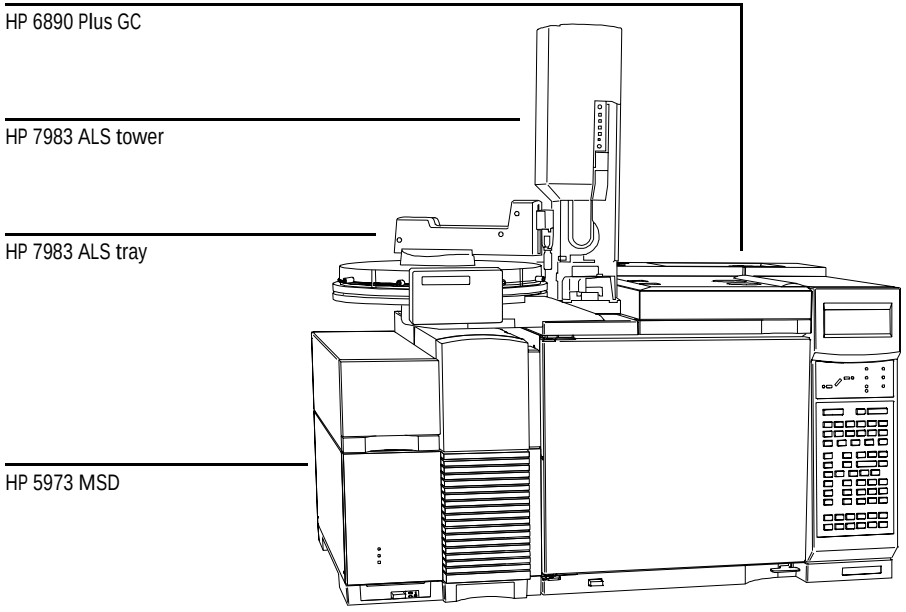
  HP 6890 Plus GC, with options #112 ***and*** #201
  HP 7683 Automatic Liquid Sampler (optional).

- **PC and MSD ChemStation software**

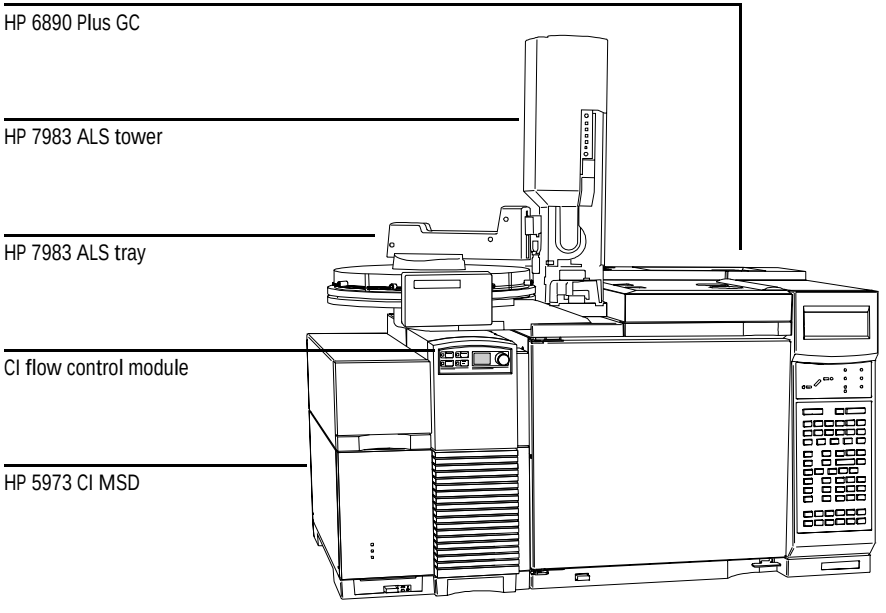
  Refer to your MSD ChemStation documentation for additional information

- **Optional software**

  Mass spectral libraries
  Chemical structures library
  Refer to your MSD ChemStation documentation for additional information.



HP 5973 MSD system



HP 5973 CI MSD system

Customer responsibilities

The following are not included in the standard installation. They are the responsibility of the customer unless previous arrangements have been made between the customer and the Hewlett-Packard Customer Service Organization.

- Preparation of all site facilities including the provision of adequate space, supporting bench, and ac power to match the unit purchased
- Operating supplies: high-purity carrier gas, syringes, vials, and solvents
- ***Required*** high-purity methane reagent gas for PCI/NCI MSD
- Optional other reagent gas(es) for CI MSD
- Additional methane/isobutane gas purifier if isobutane will we used.
- Hose for venting pump exhaust outside or to a fume hood, if toxic chemicals will be analyzed or if dangerous carrier or CI reagent gases will be used.
- Installation and testing of additional detectors on the HP 6890 Series GC
- Training for programs not specifically listed in this document
- Tests of customer-supplied samples or equipment
- Any tasks not described in this manual

In addition, the customer is required to:

- Provide someone to help lift the GC onto the bench
- Have a user present during installation and familiarization

Site requirements

Space requirements

Adequate space for the MSD, GC, data system, and other peripheral devices must be provided. The sizes and weights of the MSD system components are listed in Table 1. A minimum of 30 cm of unobstructed distance between the rear of the MSD and the nearest wall must be provided for service access and air circulation.

Telephone

A telephone with a cord long enough to be used at the computer will allow the MSD operator to communicate with HP support personnel. In addition, a second, analog phone line is strongly recommended to allow remote control and diagnosis of the MSD through a modem. This is required for some service contracts.

Environmental requirements

Indoor use only.
Thermal outputs of the MSD system components are listed in Table 1.

Temperature

Operating: 15°C – 35°C (constant temperature = ±2°C per hour)
Storage: -20°C – 70°C

Humidity

Operating: 15% - 95% relative humidity
Storage: 65°C at 90% relative humidity for 24 hours

Altitude

Operating: 4.6km (15,000 ft)
Storage: 4.6km (15,000 ft)

Power requirements

If possible, all components should be connected to the same line voltage supply circuit. This avoids voltage differences between components. All circuits ***must*** have a common ground.

Grounding

The three-conductor power outlet provided for the MSD must conform to the International Electrotechnical Commission (IEC) requirement for grounding of electrical instruments. This requirement provides that the ground contact be connected to a suitable earth ground.

The power cord connector (plug) provided will be compatible with the line voltage outlets in the country of destination unless otherwise specified in the purchase order.

Power Specifications (MSD only)

120 V ac ***or*** 220–240 V ac (+5%, -10%), 47.5–63 Hz, single-phase, nominal
900 VA maximum
400VA maximum for foreline pump only
IEC Transient Overvoltage Category (Overvoltage Category) II
IEC Pollution Degree 2

Gases

GC carrier gas

A regulated supply of high-purity (99.999%) carrier gas (typically helium) is required. A two-stage regulator should be used at the gas supply to eliminate pressure surges. If other gases are required for GC operation, refer to the GC hardware manual. Installation, check-out, and verification of the system will ***only*** be performed using helium as carrier gas. The customer is responsible for changing to any other carrier gas after installation.

A three-stage trap is supplied for installation between the carrier gas supply and the GC.

W A R N I N G

Hydrogen is potentially explosive. Take extreme care when using hydrogen as the GC carrier gas in a GC/MS system. Read the *Hydrogen Carrier Gas Safety Guide* (5955-5398) before operating the MSD with hydrogen carrier gas.

Table 1 Size, weight, and power specifications

Instrument	Height (cm)	Width (cm)	Depth (cm)	Weight (Kg)	Power (Volt-Amps)	Heat (KJoules/hr)
HP 5973 MSD						
Diffusion Pump MSD	40.6	29.8	54	36.3	900	3,164
Turbo Pump MSD	40.6	29.8	54	41	900	3,164
PCI/NCI Turbo Pump MSD	40.6	30.3	54	44	900	3,164
HP 6890 Plus GC	50	58.5	50	50	2,250	8,100
Fast heating oven	---	---	---	---	2,950	10,620
HP 6890 Series ALS						
HP 7683 Injector (above GC)	44	---	---	---	---	---
HP 7683 Tray (left of GC)	30.3	---	---	---	---	---

Instrument	Height (inches)	Width (inches)	Depth (inches)	Weight (pounds)	Power (Volt-Amps)	Heat (Btu/hr)
HP 5973 MSD						
Diffusion Pump MSD	16.0	11.75	21.25	80	900	3,000
Turbo Pump MSD	16.0	11.75	21.25	90	900	3,000
PCI/NCI Turbo Pump MSD	16	12	21.25	97	900	3,000
HP 6890 Series GC	21	23	21	110	2,250	7,681
Fast heating oven	---	---	---	---	2,950	10,071
HP 6890 Series ALS						
HP 7683 Injector (above GC)	17	---	---	---	---	---
HP 7683 Tray (left of GC)	9	---	---	---	---	---

Reagent gases and regulators for PCI/NCI MSD

The following reagent gases and hardware may be required for operation of the CI HP 5973 MSD (depending on your choice of reagent). Always use the highest purity gases available. The hardware items listed below are available from Matheson and Swagelok. They are representative of products that are appropriate for the purpose.

A gas purifier (G1999-80410) is provided for use with methane. Another one will be needed for isobutane. The gas purifier can cannot be used with ammonia.

Clean, stainless-steel 1/8-inch tubing is supplied for use with the reagent gas. Copper tubing is not recommended for carrier gas, and ***must not*** be used with ammonia.

Methane (required)

UHP 99.97%
Regulator 3320
Stand, model J05
Swagelok female connector, SS-200-7-2

Isobutane (optional)

Instrument grade, 99.5% pure
Regulator 3321 or 3320
Stand, model J05
Swagelok female connector SS-200-7-2

Ammonia (optional)

Anhydrous 99.99% pure
Regulator 3332
Stand, model J05
Swagelok female connector, SS-200-7-4

W A R N I N G **Methane is flammable, and ammonia is corrosive and toxic. Read and follow the safety information that comes with the gases.**

Other documentation

Additional information is contained in the following documentation:

- HP 5973 MSD Hardware Manual and online help
- HP MSD ChemStation manuals and online help
- HP 5973 MSD Reference Collection CD-ROM set
- HP 6890 Series GC manuals and online help
- HP GC accessories (autosampler, etc.) manuals and online help
- PC installation manuals
- PC peripheral manuals (printer, backup drives, etc.)
- Application note *Optimizing splitless injections on your GC for high performance MS analysis* (5091-4587E)
- *Hydrogen Carrier Gas Safety Guide* (5955-5398)
- Windows ® NT 4.0 manual and online help

2

Installation

Installation

This chapter contains instructions for installing the HP 5973 MSD system.

Installation of any MSD system includes the following steps:

- Inspection of shipped materials
- GC installation and preparation
- MSD installation
- Data system installation
- GC and MSD integration
- Performance evaluation
- Customer familiarization

Installing the CI MSD system requires additional steps:

- Methane/isobutane gas purifier installation
- Methane reagent gas line and gas purifier purge
- Methane reagent gas line hookup

After system performance has been verified in EI mode, the MSD must be switched to CI mode and evaluated:

- CI ion source and CI interface tip seal installation
- Bakeout and purge at least 2 hours
- CI setup
- PCI autotune and sensitivity verification
- NCI autotune and sensitivity verification

The EI/CI interface on the CI MSD requires a different column installation procedure.

The HP 59864B vacuum gauge controller is required for CI operation.

Inspecting the shipped materials

Shipping containers should ***not*** be opened until a Hewlett-Packard representative is present to verify the contents of each container. Warranty claims for missing items will not be honored unless an HP representative verifies the contents of each shipping container as it is unpacked.

1 **Check each item off on the packing list, and verify serial numbers.**

2 **Record the serial numbers in the installation documentation.**

3 **Retain shipping containers and material until contents are checked for completeness and instrument performance is verified.**

4 **If there are any discrepancies, contact the distribution center.**

Installing the GC

Materials needed:

Column cutter (5181-8836)
Flat-blade screwdriver
Wrenches, 7/16 inch, open-ended (2 needed) (8710-0806

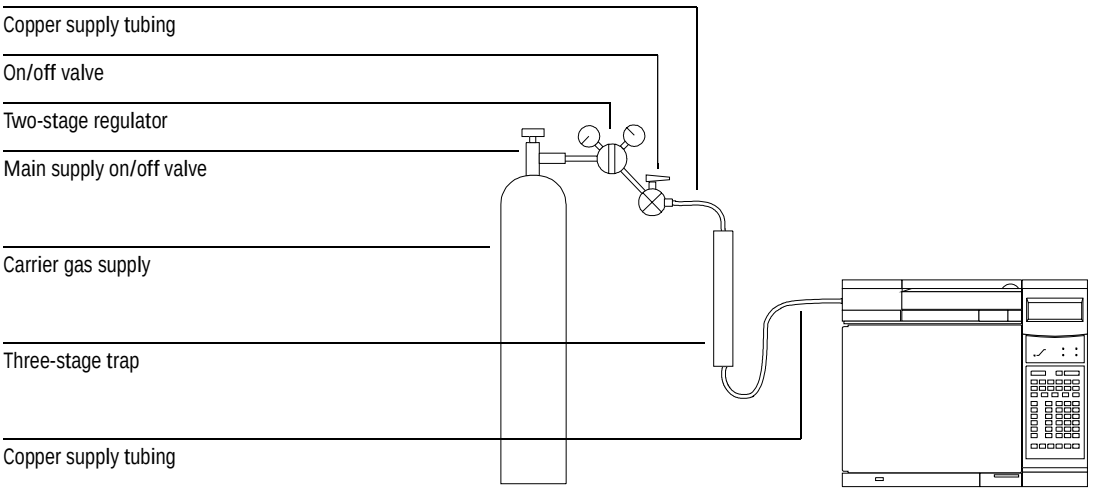
Please refer to the GC/MS application note, *Optimizing splitless injections on your GC for high-performance MS analysis* before installing the GC.

1 Verify the electrical outlet is suitable for the GC and that the line voltage is correct.

2 Unpack the GC and place it on the bench.

This job requires assistance from another person. Do not take the Swagelok fittings off the EPC ports until the carrier gas supply is ready to be connected to the GC. The system was sealed containing helium gas to prevent contamination by air.

3 Connect the 6-foot copper tubing (or a custom length) to the carrier gas supply line.



WARNING **If you are using hydrogen as a carrier gas, read the *Hydrogen Carrier Gas Safety Guide* (5955-5398) before operating the MSD with hydrogen carrier gas.**

4 **Turn on the carrier gas flow at a low pressure, 5 - 8 psi (35 - 55 KPa).**

5 **Connect the other end of the tubing to the input of the three-stage trap.**

6 **Connect one end of the another length of copper tubing to the output of the trap.**

7 **Remove the brass fittings that seal the EPC system.**

8 **Connect the other end of the tubing to the input of the EPC controller.**

Purge the flow system for 20 minutes. You can continue with the next step while you wait.

9 **Connect a remote cable for the MSD to one of the remote connectors on the back of the GC.**

10 **Connect both HP-IB cables to the HP-IB connector on the back of the GC.**

11 **Connect the GC power cord to the appropriate electrical outlet.**

12 **Turn on the GC and verify that the GC passes self test.**

Keep the GC oven turned off.

13 **Set the HP-IB address in the GC to 15.**

On the GC keypad, select Options/Communication/HP-IB address/15/ and then press **Enter**.

14 **Configure the column parameters for the MSD column that is installed in the GC.**

On the GC keypad, select Config/Column 1/ column parameters.

Length:	30 M
ID:	0.25
Type:	HP-5 MS
Part number:	19091S-433 MS

15 **Increase the supply pressure of the carrier gas to approximately 50 psi.**

16 **Set the carrier gas flow rate to 7 ml/minute.**

17 **Remove the septum covering the free end of the GC column and cut about 1 cm off the end of the column.**

Place the free end of the column into a beaker of solvent and check for bubbles to verify helium flow. Do not leave the beaker in the oven.

18 **Optional – install the Merlin Microseal.**

Follow the directions provided with the Merlin Microseal.

19 **Set the injection port temperature to 250°C.**

20 **Turn on the oven, and ramp the oven temperature from 40°C to 280°C at 15°C per minute and hold for 10 minutes, then reset to 35°C.**

While the oven is heating, proceed with the next steps. Work quickly to remove the oven wall knockout before the oven gets too hot.

21 **Remove the left side panel of the GC.**

22 **Remove the upper front knockout from the exterior oven wall, using a flat-blade screwdriver.**

23 **Do not remove the insulation between the exterior and interior oven walls, but move it aside. Use the screwdriver, *not* your fingers.**

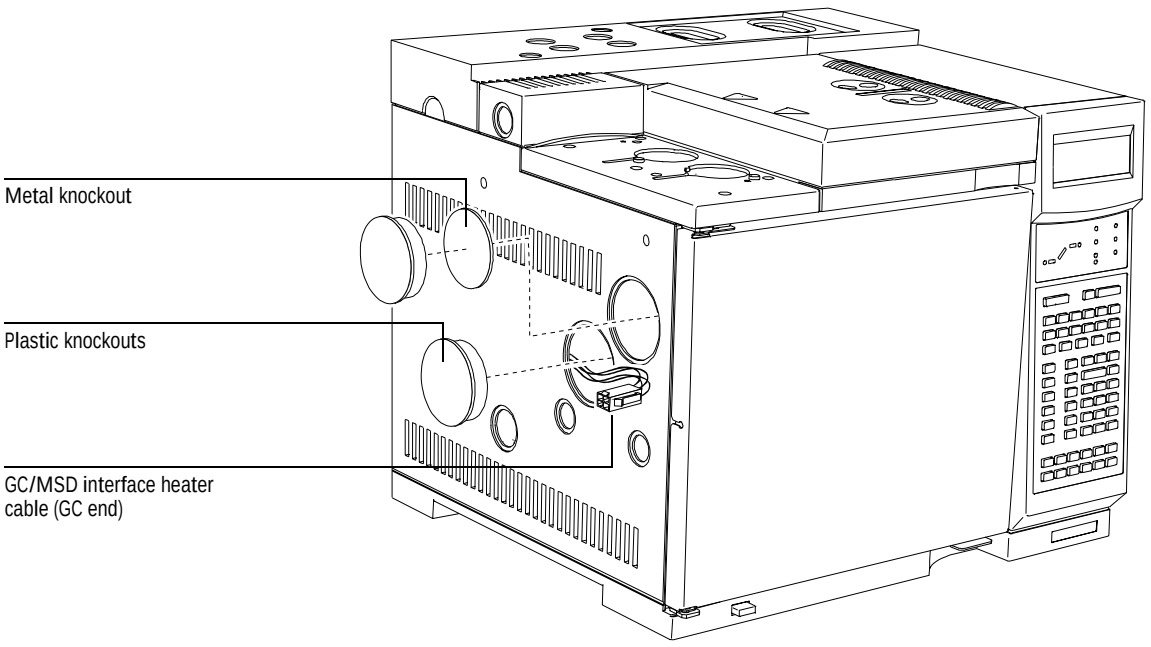
24 **Pop out the two large plastic knockouts from the GC left side panel.**

25 **If there is an ALS, install it now.**

Follow the instructions in the ALS documentation.

26 **When the temperature program is complete, turn the GC power *off*.**

27 **Reinstall the GC left side panel cover and route the GC end of the GC/MSD interface heater cable through the lower hole.**


Metal knockout
Plastic knockouts
GC/MSD interface heater cable (GC end)

Installing the MSD

Materials needed:

HP 5973 MSD Hardware Manual (G1099-90001)
HP 5973 MSD Hardware Manual Supplement (G1099-90009)
HP 5973 MSD PCI/NCI Hardware Manual (G1999-90001)
Tygon tubing or hose for pump exhaust
Wrench, 1/4-inch × 5/16-inch open end (8710-0510)
HP 5973 MSD Shipping Kit (G1099-60565)
HP 5973 MSD CI Shipping Kit (G1999-60582)

1 Verify that the available ac power matches the power configuration for the MSD.

2 Unpack the MSD.

3 Place the MSD and foreline pump on the bench.

4 Prepare the foreline pump.

— Remove the red plug from the outlet of the pump before switching on the power. Operation with the plug in place will result in severe damage to the pump.

— If the carrier gas, solvents and analytes to be used are ***non-toxic*** and ***non-flammable***, install the blue pump exhaust oil trap on the outlet of the foreline pump. Otherwise, install a hose to take the exhaust to a fume hood or outside. Obey all local safety and environmental regulations.

CAUTION

Remove the red plug from the outlet of the pump before switching on the power. Operation with the plug in place will destroy the pump.

WARNING

The pump exhaust contains carrier gas and traces of solvents, analytes, and foreline pump oil. The supplied oil trap stops only pump oil. It does *not* trap or filter out toxic chemicals. If you are using toxic solvents or toxic or flammable carrier gas, or analyzing toxic chemicals, do not install the oil trap. Install a hose to take the pump exhaust to a fume hood. Do not use the oil trap on a CI MSD.

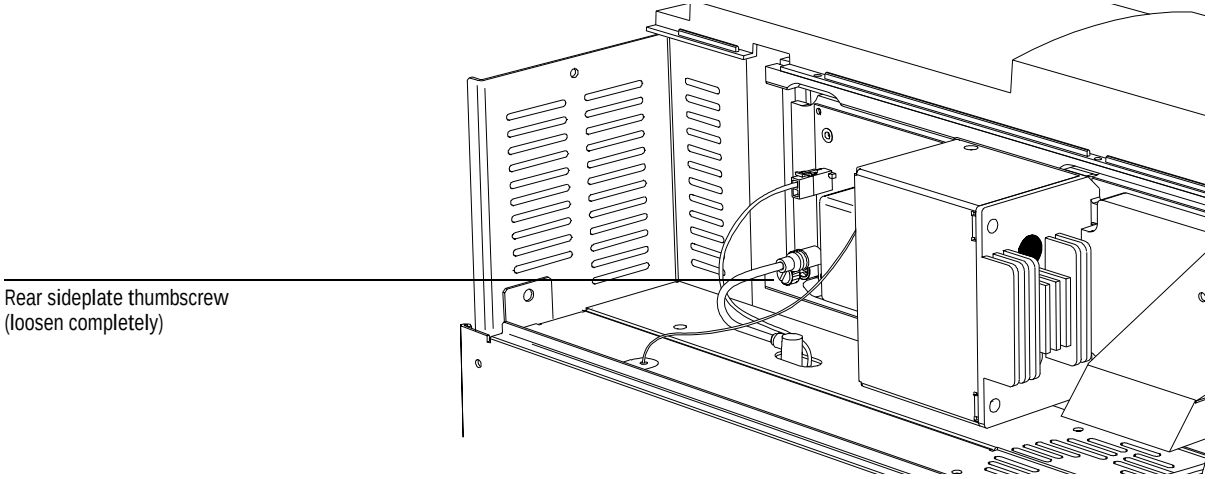
5 If the MSD is equipped with a cap on the diffusion pump (option #990), remove the cap now.

CAUTION

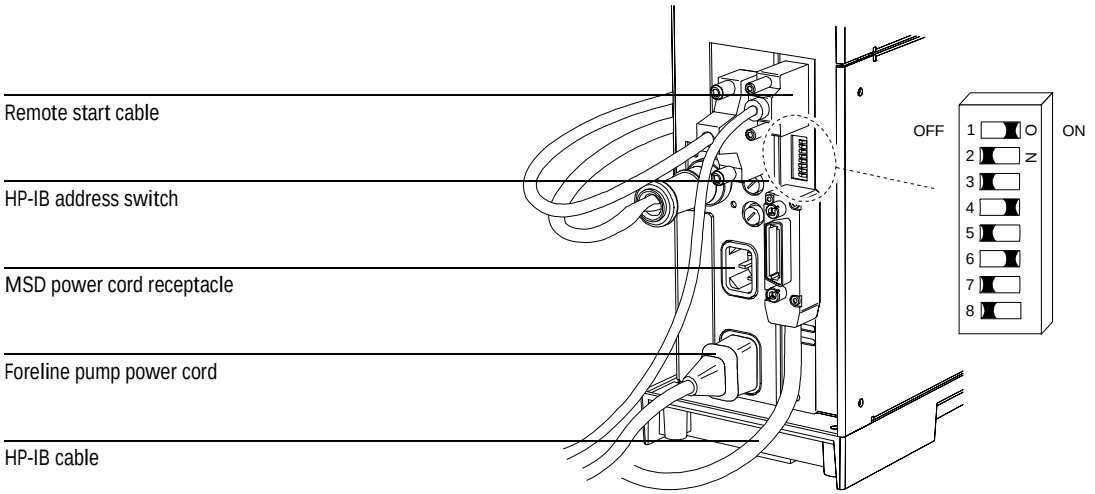
Turning on the power to the MSD with the cap installed will result in serious damage to the instrument. See the instructions taped to the MSD.

6 Remove the top cover of the MSD (see the *Operating the MSD* chapter in the MSD hardware manual).

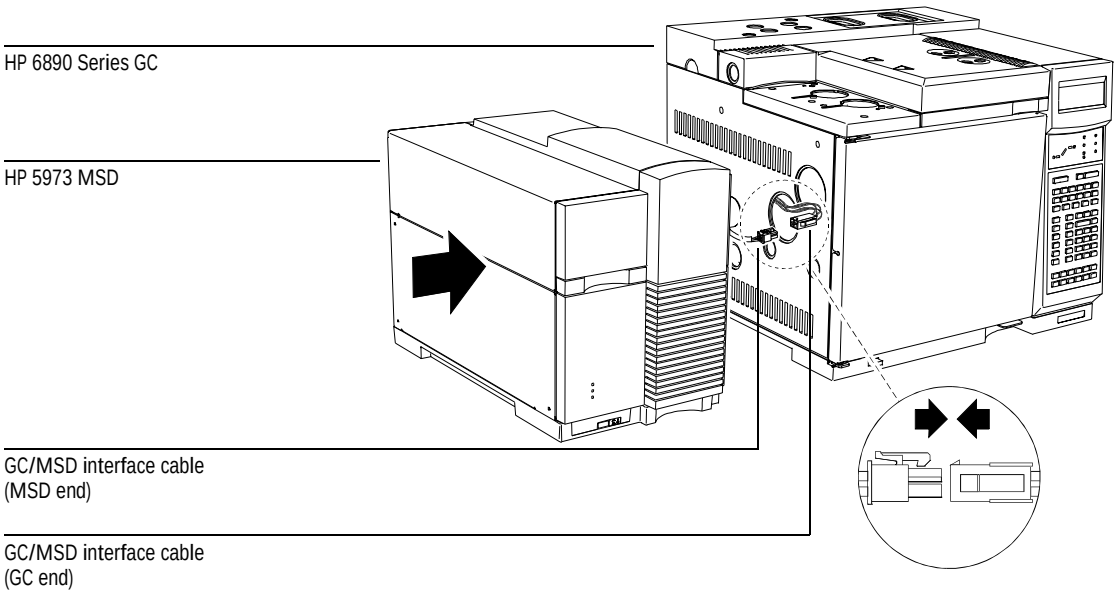
7 Loosen the rear sideplate thumbscrew completely.



8 Verify the HP-IB address on the HP-IB/MSD control card is set to 20.



9 Connect the MSD end of the GC/MSD interface cable to the GC end of the GC/MSD interface cable.



10 Connect the HP-IB cable from the GC to the MSD.

11 Carefully position the MSD next to the GC.

When positioned properly, the end of the GC/MSD interface will protrude into the GC oven. The end of the interface on a CI MSD will not protrude as far into the GC oven as that on an EI MSD.

12 Connect the remote start cable from the GC to the MSD.

Special procedure for CI MSD

13 Plumb the methane to the CI gas flow control module. See page 26.

14 Install the optional HP 59864B Gauge Controller (*required* for CI MSD).

See **(see the *Operating the MSD* chapter in the MSD hardware manual).**

W A R N I N G **The gauge controller must be properly grounded. See the manufacturer's manual supplied with the gauge controller.**

15 Connect the foreline pump power cord to the receptacle on the rear of the MSD.

16 Connect the MSD power cord to an appropriate ac outlet.

17 Turn the GC on.

18 Set the GC carrier gas flow to 1.0 ml/min with constant flow enabled.

19 Remove the interface column nut and blank ferrule from the end of the GC/MSD interface.

Special procedure for CI MSD

Refer to the *HP 5973 MSD CI Hardware Manual* (G1999-90001)

20 Install the column in the GC/MSD interface.

See the *Installing GC Columns* in the MSD hardware manual ***or*** *CI Setup* the ***CI*** MSD hardware manual. The column installation tool is located in a clear plastic tube in the MSD tool kit.

21 Pump down the MSD.

See the revised procedure in the *HP 5973 MSD Hardware Manual Supplement*.

22 Reinstall the top cover.

Plumbing the methane line to the CI MSD flow module

Special procedure for CI MSD

Refer to the *HP 5973 MSD PCI/NCI Hardware Manual* (G1999-90001)

Materials needed:

Methane supply with regulator
Methane/isobutane gas purifier (G1999-80410)
Stainless-steel tubing, 1/8-inch (7157-0210)
Swagelok fittings and ferrules for 1/8-inch tubing
Wrench, 7/16-inch open-end, two needed (8710-0806)

CAUTION Only remove the caps in the gas stream, or the gas purifier will be contaminated by air. This will ***ruin*** the gas purifier.

WARNING **Methane is flammable and explosive. Extinguish all sources of flame or spark in the room. Only perform this procedure in a well-ventilated room. Obey all local safety and environmental regulations.**

CAUTION Do not remove the Swagelok caps from the Gas A and Gas B inlets until you are ready to hook up the gas lines.

1 **Install the methane/isobutane gas purifier. Follow the instructions on the gas purifier.**

2 **Set the pressure on the methane regulator to 20 psig.**

3 **Connect one piece of the 1/8-inch tubing to the methane supply regulator.**

4 **Turn on the gas flow slightly.**

5 **Connect the other end of the tubing to the inlet of the gas purifier.**

6 **Connect the second piece of tubing to the outlet of the gas purifier.**

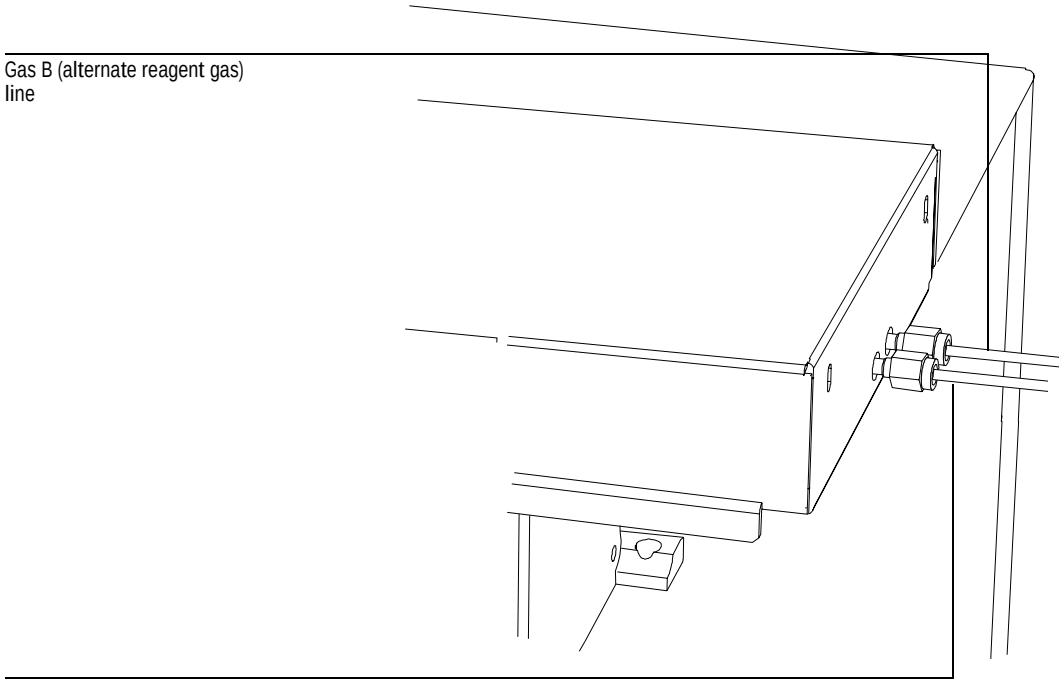
7 **Let the lines purge into a fume hood while you install the column into the CI interface.**

8 Connect the other end of the tubing to the Gas A fitting on the flow module.

9 If another reagent gas is to be used, connect it to the Gas B fitting.

If you are going to connect isobutane, you will need another gas purifier for the Gas B line.

C A U T I O N Do not connect isobutane without a gas purifier. Do not use the gas purifier with ammonia.



Installing the MSD ChemStation

1 **Unpack the PC, monitor, printer, and, if present, the modem.**

2 **Position the PC on the bench.**

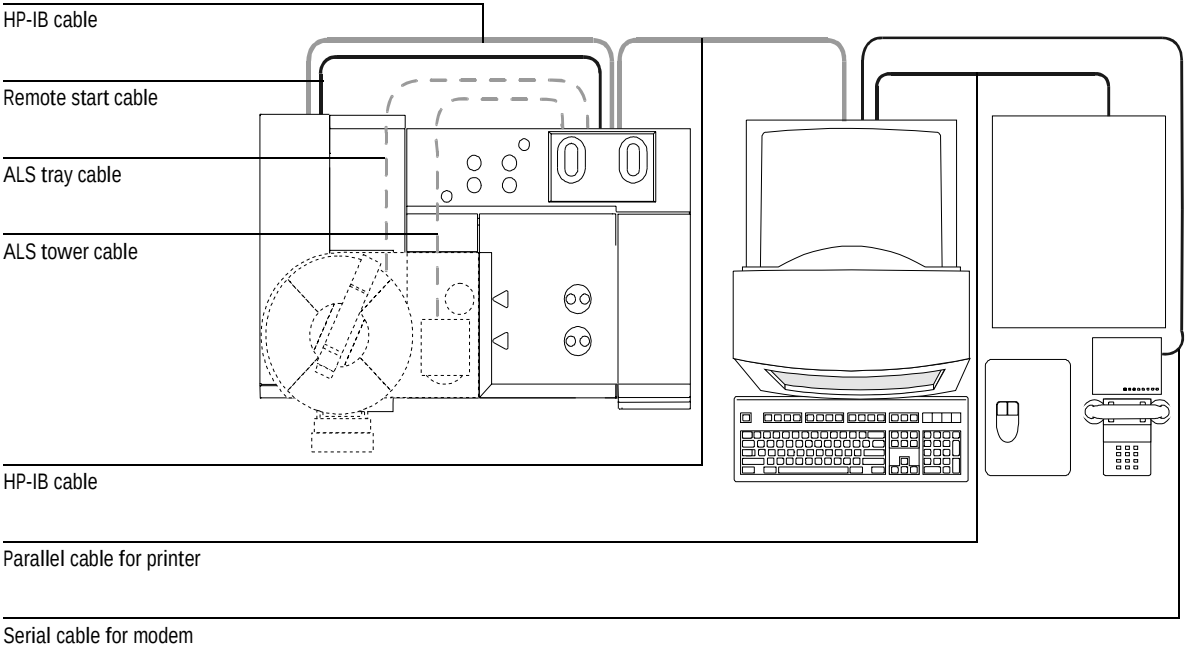
3 **Install the PC.**
See the PC installation documentation.

4 **Connect the HP-IB cable from the GC to the PC.**

5 **Install the printer.**
See the printer installation documentation.

6 **Install the modem.**
See the modem installation manual. Not all ChemStations have modems supplied.

7 **Turn on the modem, printer, monitor, and PC, in that order.**



Integrating the GC, MSD, and ChemStation

Materials needed: MSD ChemStation software installation manual (G1701-90031)

1 Start up the Carbon Copy software and configure the modem (if your ChemStation includes a modem.)

2 In the Productivity Tools group, click the MS Config icon and configure the MSD and GC for the MSD ChemStation software.

Be sure to select **Chemical Ionization** for the CI MSD.

3 Click on the instrument icon to start up the MSD ChemStation software.

4 Monitor the pump down. The MSD should already be pumping down, but now you can monitor the status.

— Select **Diagnostics / Vacuum Control** from the View menu. Select **Pumpdown** from the Vacuum menu.

— When the pumpdown is complete, follow the instructions to set the GC/MSD interface temperature to 280°C.

5 Enter parameters in ATUNE.U to match those in the tune report from the factory.

— In the Diagnostics/Vacuum Control view, select **Edit MS Params** from the Diagnostics menu. Edit parameters as necessary.

— Select **Temperatures** from the MoreParams menu. Verify the MSD temperatures:

MS Source:	230°C
MS Quad:	150°C

— Click **OK** to close the MS Zones dialog box.

6 Perform a profile scan.

— Click **Prof**. Verify that there are peaks visible for all three masses.

— Click **Stop**. Click **MSOff**.

— Click **OK** to close the Edit Parameters window.

— Do ***not*** run Autotune or the Air and Water Check at this time. The MSD must stabilize for at least 60 minutes.

7 Save the tune parameters.

Select **Save Tune Values** from the File menu.

Verifying EI system performance

Verifying the tune performance

1 **Verify that the system has been pumping down for at least 60 minutes.**

2 **Set the GC oven temperature to 150°C, and the column flow to 1.0 ml/min.**

3 **In the Instrument Control view, select Checkout Tune from the Qualify menu.**
The software will perform an Autotune and print out the report.

4 **When the autotune has completed, select Tune Evaluation from the Qualify menu.**
The software will evaluate the last autotune and print a System Verification – Tune report.

5 **Examine the report. All parameters should be OK.**

Verifying the sensitivity performance

1 **Prepare a vial with the 1 pg/µl (0.001 ppm) OFN sample (8500-5441).**

2 **Set up to inject 1 µl either with the ALS or manually.**

3 **In the Instrument Control view, select Sensitivity Check from the Qualify menu.**
The software will load and resolve the method C:\HPCHEM\1\5973\OFN_SN.M.

4 **Click the appropriate icons in the Instrument | Edit window to edit the method for the type of injection.**

5 **Click OK to run the method.**

6 **When the method is completed, a sensitivity evaluation report will print out. Verify that rms signal-to-noise ratio is at least 10:1.**

Switching from EI to CI operating mode

Special procedure for CI MSD

Refer to the *HP 5973 MSD PCI/NCI Hardware Manual* (G1999-90001)

Always set up the CI MSD in PCI first, even if you are going to run NCI.

1 **Vent the MSD. See page 38 of the MSD CI hardware manual.**

2 **Open the analyzer.**

3 **Remove the EI ion source.**

C A U T I O N Electrostatic discharges to analyzer components are conducted to the side board where they can damage sensitive components. Wear a grounded anti-static wrist strap (see page 98 of the HP 5973 MSD Hardware Manual) and take other anti-static precautions ***before*** you open the vacuum manifold.

4 **Install the CI ion source. See page 46 of the MSD CI hardware manual.**

5 **Install the interface tip seal. See page 48 of the MSD CI hardware manual.**

6 **Pump down the MSD. See page 40 of the MSD CI hardware manual.**

7 **Bake out the MSD for *at least* two hours.**

8 **Set up the software for CI operation. See page 52 of the MSD CI hardware manual.**

9 **Set up the methane reagent gas flow. See page 54 of the MSD CI hardware manual.**

10 **Verify that there is no visible peak at *m/z* 32, and that the peak at *m/z* 19 is smaller than that at *m/z* 17.**

Verifying CI performance

Special procedure for CI MSD

Refer to the *HP 5973 MSD PCI/NCI Hardware Manual* (G1999-90001)

1 **Perform a positive CI autotune. See page 57 of the MSD CI hardware manual.**

2 **Verify positive CI performance. See page 59 of the MSD CI hardware manual.**

Verify that rms signal-to-noise ratio is at least 75:1.

3 **Perform a negative CI autotune. See page 58 of the MSD CI hardware manual.**

4 **Verify negative CI performance. See page 60 of the MSD CI hardware manual.**

Verify that rms signal-to-noise ratio is at least 500:1.

NOTE There are no criteria for a “passing” CI autotune. If the CI autotune completes, it passes.

Familiarizing the customer

Follow the Customer Familiarization checklist.

Important points about the CI MSD to cover include:

- Cleanliness is the ***most*** important factor for success in CI, especially negative mode. This includes air leaks, water, and residual PFDTD calibrant.
- NCI reagent gas setup:

  There are no negative reagent ions formed. To set up for NCI mode, tune in PCI mode, then load NCI tune file to switch parameters, set gas flow to 40%; adjust if necessary for specific analyte.

- NCI operation:

  Gas flow, source temperature, and emission current are the three most important parameters for optimizing NCI.

- No PFDTD calibrant ions are formed in PCI with isobutane or ammonia. Tune with methane, and copy parameters to new file: e.g., PCINH3.U.
- The gas purifier can ***not*** be used with ammonia.
- Must ballast foreline pump ***daily*** if running ammonia Refer to the maintenance chapter of the 5973 MSD CI manual.

3

Checklists

Installation checklist

☐ Inspection of shipped materials

- ☐ Shipping containers must be opened only with a Hewlett-Packard representative is present to verify the contents of each container.
- ☐ Check each item off on the packing list, and verify serial numbers.
- ☐ Record the serial numbers in the installation documentation.
- ☐ Retain shipping containers and material until contents are checked for completeness and instrument performance is verified.
- ☐ Notify the distribution center of any missing or damaged items.
- ☐ Shipment damaged or incomplete:

Distribution center notified (date)

Person contacted

DM notified (date)

Carrier notifed (date)

Damaged or missing material:

☐ GC installation

- ☐ Line voltage and outlet verified
- ☐ GC unpacked and placed on an appropriate bench top
- ☐ Carrier gas, trap, and GC plumbed with copper tubing
- ☐ Plumbing purged with helium at 5 - 8 psi (35 - 55 KPa)
- ☐ HP-IB and remote cables for MSD connected
- ☐ Cables for ALS to the GC connected (optional)
- ☐ GC plugged in and turned on
- ☐ Verify that the GC passes self test
- ☐ HP-IB address in the GC set to 15
- ☐ Column parameters configured
- ☐ Carrier gas line pressure set to approximately 50 psi (345 KPa)
- ☐ Carrier gas flow rate set to 7 ml per minute
- ☐ Septum plugging end of column removed and end of column trimmed
- ☐ Helium flow through column verified
- ☐ Merlin Microseal installed (optional)
- ☐ Injection port temperature set to 250°C
- ☐ Oven temperature ramped from 40°C to 280°C at 15°C per minute and held for 10 minutes.
- ☐ Upper front knockout in the GC exterior oven wall removed
- ☐ The two large plastic knockouts removed from the GC left side panel.
- ☐ ALS installed
- ☐ Left side panel reinstalled, and GC/MSD interface cable routed through the rear hole
- ☐ GC power off (after temperature cycle complete)

☐ MSD installation

- ☐ AC power and outlet verified
- ☐ MSD unpacked
- ☐ MSD and foreline pump placed on the bench
- ☐ Plug removed from the foreline pump outlet
- ☐ Pump exhaust vented to a fume hood or the oil trap installed
- ☐ Diffusion pump cap removed (option #990 only)
- ☐ MSD positioned
- ☐ Rear side plate thumbscrew loosened *completely*
- ☐ GC/MSD interface heater cable connected
- ☐ HP-IB address on the back of the MSD is set to 20
- ☐ HP-IB and remote cables from the GC to the MSD connected
- ☐ Methane/isobutane gas purifier installed and purged (CI MSD only)
- ☐ Methane reagent gas lines plumbed to flow module (CI MSD only)
- ☐ Optional HP 59864B Gauge Controller installed (required for CI MSD)
- ☐ Foreline pump and ac supply power cords connected to the MSD.
- ☐ MSD power cord connected to the appropriate ac outlet
- ☐ GC turned on
- ☐ GC carrier gas flow set to 1.0 ml per minute with constant flow enabled
- ☐ Column installed in the GC/MSD interface
- ☐ MSD power on
- ☐ Foreline pump and the front fan operation verified
- ☐ Foreline pump stops gurgling within 60 seconds verified

☐ MSD ChemStation installation

- ☐ PC, monitor, printer, and modem unpacked and positioned on the bench
- ☐ PC Installed
- ☐ HP-IB cable from the GC to the PC connected
- ☐ Printer installed
- ☐ Modem installed (if present)
- ☐ Modem, printer, monitor, and PC turned on (in that order)

☐ GC and MSD integration

- ☐ Modem configured with Carbon Copy
- ☐ MSD and GC configured using MS Config icon
- ☐ MSD ChemStation software started up by clicking instrument icon
- ☐ Pumpdown completed
- ☐ Factory tune and temperature parameters set in **Edit MS Params**
- ☐ Profile scan successful
- ☐ Tune parameters saved

☐ **Performance verification**

- ☐ Tune performance verified
- ☐ Sensitivity performance verified

☐ **Switch CI MSD to CI operating mode**

- ☐ MSD vented
- ☐ EI ion source removed
- ☐ CI ion source installed
- ☐ CI interface tip seal installed
- ☐ MSD pumped down and baked out for 2 hours
- ☐ Software set up for CI operation
- ☐ Methane reagent gas flow set up
- ☐ Acceptable air and water background verified

☐ **CI performance verification**

- ☐ PCI autotune performed
- ☐ PCI sensitivity verified
- ☐ NCI autotune performed
- ☐ NCI sensitivity verified

☐ **Instrument log book entries completed**

☐ **Signal-to-noise results faxed or mailed to the factory**

HP 5973 MSD serial number

EI S/N (rms)

PCI S/N (rms)

NCI S/N (rms)

Customer familiarization checklist

The purpose of customer familiarization is to demonstrate the steps required to:

- Perform a basic analysis using an HP standard sample
- Evaluate the acquired data
- Perform routine maintenance

Much of the familiarization is accomplished while the hardware is being installed and checked out. For this reason, at least one operator must be present throughout installation and familiarization.

Familiarization is intended to give operators a basic overview of the operation and maintenance of new instruments, systems, and applications software. It is ***not*** a substitute for a full operator training course.

☐ Topics *not* included in familiarization

—Training on PC, Windows NT 4.0, or other Windows applications
—Advanced mass spectral processing
—Analysis of unknown samples
—Analysis of customer standards or samples
—Network setup of the MSD ChemStation with other PCs
—Methods development
—Commands and their use in creating macros using notepad
—Customization of the system (including macro writing)
—Executing a macro via methods (deuser.mac) or from command Line
—Special macros
—Any US EPA quantitation functions
—Any reformulated gasoline quantitation functions
—Any Drug Analysis quantitation functions

☐ Hardware overview

- ☐ MSD
- ☐ CI MSD (if applicable)
- ☐ Gas chromatograph
- ☐ ALS (if applicable)
- ☐ Barcode reader (if applicable)
- ☐ PC hardware and peripherals

☐ System operation

- ☐ Switching on instruments, PC, and peripherals
- ☐ Starting Windows NT 4.0 and using online help
- ☐ Starting MSD ChemStation software
- ☐ Switching between EI and CI operation (CI MSD only)

☐ MSD ChemStation software overview

- ☐ Software configuration of the instruments (MS Config) demonstrated
- ☐ Different quantitation modes and how to switch between them demonstrated
- ☐ Views and menu structure demonstrated

☐ MSD ChemStation software familiarization

- ☐ Autotune described
- ☐ Autotune demonstrated and explain the tune report
- ☐ Importance of retaining tuning and maintenance records discussed
- ☐ Manual tune explained

☐ Methods

- ☐ Edit entire method demonstrated with OFN_SN.M, explaining the GC and MS Scan Parameters.
- ☐ Scan and SIM acquisition modes described
- ☐ Data file naming demonstrated
- ☐ Method save demonstrated
- ☐ Data acquisition demonstrated while running the signal-to-noise test for customer
- ☐ Snapshot demonstrated

☐ Data analysis

- ☐ Loading data files demonstrated
- ☐ Data analysis screen explained, including the TIC and spectrum windows, command line, and title bar
- ☐ TIC, spectra, and extracted ion chromatogram demonstrated
- ☐ Integration explained
- ☐ Library search demonstrated
- ☐ Difference between standalone and online data analysis explained
- ☐ Quantitative report (ESTD or ISTD) demonstrated, using provided demonstration files

☐ Sequence

- ☐ Sequence loading demonstrated
- ☐ Sample log table editing demonstrated
- ☐ Saving a sequence demonstrated
- ☐ Running, halting, and position and run demonstrated

☐ MSD ChemStation maintenance

- ☐ Directory structure and maintenance of HPCHEM files discussed
- ☐ Data backup options discussed

☐ Instrument maintenance

- ☐ GC inlet maintenance described
- ☐ MSD vent and pumpdown procedures described
- ☐ Hardware manual, online help, and hardware maintenance section of HP MSD Reference Collection CD demonstrated:
  - —Ion source cleaning
  - —Electron multiplier replacement
  - —Preventative maintenance of the vacuum system

☐ Troubleshooting (diagnostics)

- ☐ Carbon Copy demonstrated
- ☐ Tune charts under Qualify menu demonstrated
- ☐ Online help for troubleshooting demonstrated

☐ Additional support information

- ☐ Use the manuals, online help and HP MSD Reference Collection CD explained
- ☐ HP support services and how to obtain help explained
  - — Hardware
  - — Software
  - — Assist Packages
  - — Additional Training
  - — Consulting
- ☐ Warranty and warranty enhancements explained

Company Name

Customer Signature/Date

Engineer Signature/Date

Sales Order Number

Safety Information – *Continued*

Electrical Safety

WARNING

Connecting the MSD to power sources which are not equipped with protective earth contacts creates a shock hazard for the operator and can damage the instrument.

Interrupting the protective conductor inside or outside the MSD or disconnecting the protective earth terminal creates a shock hazard for the operator and can damage the instrument.

Make sure the power cords supplied with the MSD are appropriate for your country and site before using them. Maintain easy access to the power cords so they can be disconnected during maintenance.

WARNING

The use of incorrect or makeshift fuses or the short-circuiting of fuse holders creates a shock hazard for the operator and can damage the instrument. Replace fuses only with fuses of identical current rating and type.

WARNING

Dangerous voltages are present inside the MSD even if the power switches are off. Turn off the MSD power switches and disconnect the MSD power cords from their outlets before removing any covers unless you are specifically instructed to do otherwise by this manual.

WARNING

Excessive fluctuations in the line voltage can create a shock hazard and can damage the instrument. Make sure the supply voltage does not fluctuate more than +5% or -10% from the rated voltage. This equipment must be installed in a Category II environment as defined in IEC664.

Thermal Safety

WARNING

Many parts of the MSD operate at dangerously high temperatures. Make sure the MSD is off and these parts are cool before removing any covers unless you are specifically instructed to do otherwise by this manual.

Chemical Safety

WARNING

The foreline pump exhaust and split vent exhaust will contain traces of the chemicals you are analyzing. These could potentially be toxic. Vent the foreline pump exhaust and split vent exhaust outside your laboratory or into a fume hood. Be sure to comply with all local environmental regulations.

Hydrogen carrier gas is extremely flammable. Explosions can result if hydrogen is allowed to build up in the MSD or GC oven. Study the Hydrogen Carrier Gas Safety Guide (HP Part No. 5955-5398) before operating the MSD with hydrogen carrier gas.

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