HP 5970B

Mass Selective Detector

Limited Availability
Parts Grade / As-Is

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HP 5971A Mass Selective Detector
HP G1030A MS ChemStation (DOS series)

Installation Manual

HEWLETT PACKARD

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1 General Information

Introduction

Customer responsibilities

Site requirements

Other documentation

Warranty

Introduction

This document provides unique information for installation of the HP 5971A Mass Selective Detector (MSD) and the HP G1030 MS ChemStation (DOS series), with Version A.00.00 software.

The MSD system consist of:

- **Mass Selective Detector**
  HP 5971A
- **Gas Chromatograph**
  HP 5890 SERIES II
  HP 7673 Autosampler (optional)
- **Software**
  MS-DOS, Version 3.3
  Microsoft Windows 386, Version 2.11
  HP G1034A MS ChemStation Software
  Libraries (optional)
- **MS ChemStation**
  Intel 80386-based PC
  3-Mbyte RAM (minimum)
  Hewlett-Packard HP-IB interface
  Monitor (VGA)
  Disk Drive (hard disk and flexible disk)
  Keyboard
  Mouse
  Printer
  Plotter (optional)

Installation of an MSD system includes the following steps:

- Site selection
- MSD installation
- ChemStation installation
- GC preparation and installation
- Functional performance verification

Customer responsibilities

The following are not included in the standard installation. They are considered to be 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 table, gases and AC power to match the unit purchased
- Installation and testing of additional detectors on the HP 5890A SERIES II GC
- Operational training for programs not specifically listed in this document
- Tests using customer-supplied analytical samples or equipment
- Any other tasks not described in this manual

Site requirements

Location

The HP 5971A is designed as a table-top instrument. A minimum of 5 cm of unobstructed distance between the rear of the MSD and the nearest wall must be provided for service access and air circulation.

In addition, adequate space for the GC, ChemStation and other peripheral devices must be provided. The sizes and weights of the MSD system components are:

- **HP 5971A MSD**
  34 H x 17 W x 65 D (cm), (13.4 x 6.7 x 25.6 inches)
  21 kg (46 pounds) excluding the external mechanical pump
- **HP 5890 SERIES II GC**
  47 H x 71 W x 55 D (cm), (18.5 x 28 x 21.5 inches)
  36.4 kg (80 pounds)

- **MS ChemStation**
  See the individual manuals. The placement of the computer, monitor, keyboard and HP-HIL devices affect the total space required.
- **Mass Storage**
  See individual manuals

Environmental requirements

The HP 5971A is air-cooled and therefore requires only ambient room air and electrical power for its operation. The MSD operates within specifications in a temperature environment between 15°C and 35°C.

Power requirements

Line voltage

The HP 5971A MSD mainframe operates on 120 VAC (+5%, -10%), single phase, 15 amperes. Optional factory configuration for 240 VAC (+5%, -10%) must be specified at the time of purchase. Line frequency is 48 to 66 Hz. The MSD is rated at 1800 VA, maximum.

MS ChemStation requirements are outlined in the HP Vectra documentation.

To avoid voltage differences between the components and to ensure reliable system operation, it is recommended that all units be connected to the same line voltage supply circuit, if possible. All units should have a common ground.

Grounding

The three-conductor power outlet provided for the MSD conforms 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.

To preserve this feature, the power cable connector (plug) provided will be compatible with the line voltage outlets in the country of destination unless otherwise specified in the purchase order.

Gases A regulated supply of high purity (≥ 99.999%) carrier gas is required. If other gases are required for GC operation, refer to the GC Hardware Manual.

Other documentation

Additional information is contained in the following manuals:

- HP 5971A Hardware Manual (HP 05971-90001)
- Installing the MS ChemStation (HP G1034-90001)
- MS ChemStation Workbook (HP G1030-90004)
- MS ChemStation Handbook (HP G1030-90005)
- Commands (HP G1030-90006)
- HP 5890 SERIES II Gas Chromatograph manuals
  GC Accessories (autosampler, etc)
  HP Vectra Installation
  Computer Peripheral manuals (Printer, Plotter, etc)

Warranty

Hewlett-Packard (HP) warrants its analytical products against defects in materials and workmanship for the warranty period. During the warranty period, HP will, at its option, repair or replace products which prove to be defective. Products that are installed by HP are warranted from the installation date, all others from the date of delivery.

If Buyer schedules or delays installation more than 30 days after delivery, then the warranty periods starts on the 31st day from the date of delivery.

HP software and firmware products which are designated by HP for use with a hardware product, when properly installed on that hardware product, are warranted not to fail to execute their programming instructions due to

defects in materials and workmanship. If HP receives notice of such defects during the warranty period, HP shall repair or replace software media and firmware which do not execute their programming instructions due to such defects. HP does not warrant that the operation of the software, firmware or hardware shall be uninterrupted or error free.

Within HP service travel areas, warranty services for products installed by HP and certain other products designated by HP will be performed at Buyer's facility at no charge. For installation and warranty services outside of HP's service travel area, HP will provide a quotation for the applicable additional services. The foregoing warranty shall not apply to defects resulting from:

1. Improper or inadequate maintenance, adjustment, calibration or operation by User.
2. User-supplied software, hardware, interfacing or consumables.
3. Unauthorized modification or misuse.
4. Operation outside of the environmental and electrical specifications for the product.
5. Improper site preparation and maintenance.
6. Customer induced contamination or leaks.

This warranty may be modified in accordance with the laws of your country. Please consult your local HP Sales/Service Office for the period of the warranty, for shipping instructions and for the applicable wording of the local warranty.

Warranty claims If physical damage is found or if operation is not as specified when the instrument is first received, notify the carrier and the nearest Hewlett-Packard Sales/Service Office immediately. The Sales/Service Office will arrange for repair or replacement of the instrument without waiting for settlement of a claim with the carrier. For other than initial inspection warranty claims, contact your local HP Sales/Service Office.

Service agreements

Several service agreements are available, each designed to meet a specific need. In addition to a preventive maintenance agreement, others cover specified repair/maintenance services for the HP 5971A and can provide for the extension of warranty beyond the initial three-month period.

Details of these agreements, together with prices applicable to the particular installation, can be obtained from your local HP Sales/Service Office.

2 Installation

ChemStation installation

MSD installation

GC installation and preparation

GC and MSD integration

ChemStation installation

The MS ChemStation consists of the components listed in Chapter 1. For additional information, refer to *Installing the MS ChemStation (HP G1034-90001).*

1. **Verify HP-IB is installed in the computer**
   The proper switch settings for the HP-IB card are shown in Figure 2-1.

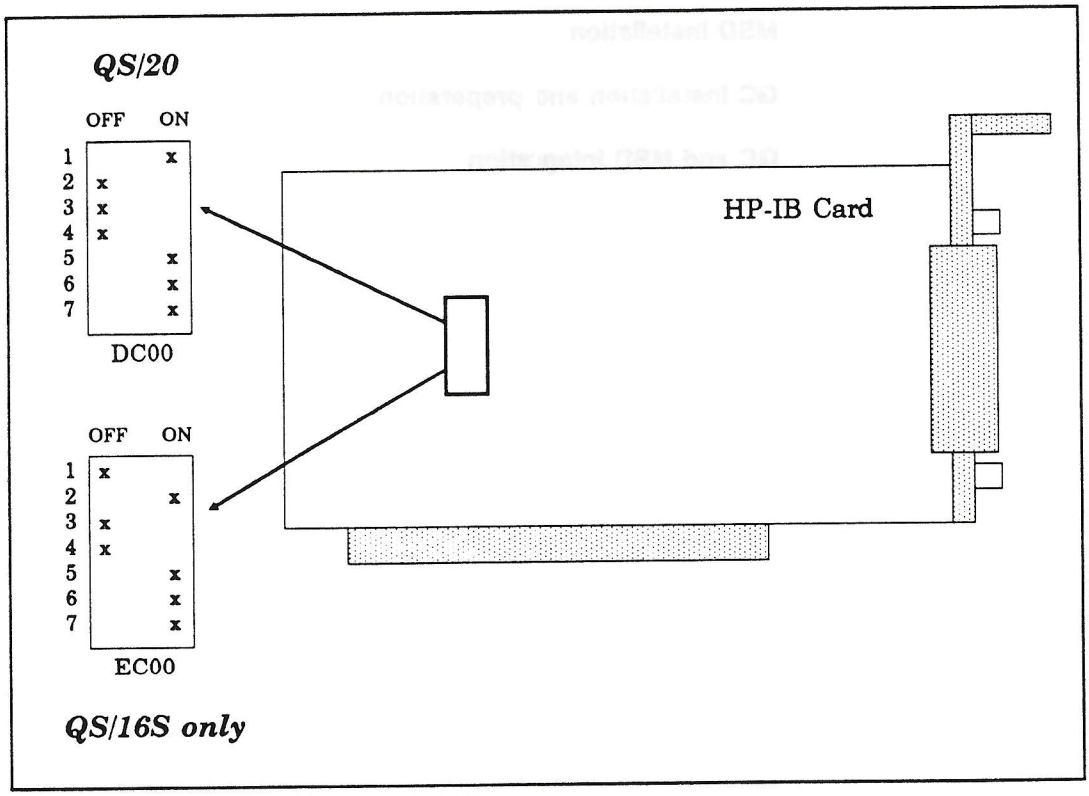

Figure 2-1. Switch settings for the HP-IB card

2. **Connect PC components and cables**
   Connect all MS ChemStation components (keyboard, mouse, printer, etc.) as described in the PC documentation.

3. **Verify computer configuration**
   Turn on the computer and monitor. Within 30 seconds, information should appear on the monitor to indicate that the total memory is at least 3 Mbytes.

If necessary, turn off the computer and correct all problems before proceeding.

4. **Verify MS software is present**
   If MS software is present, the following subdirectories will be present on the hard disk:

```
CHEMPC    (this name may be different)
  DATA
  EXE
  METHODS
  SEQUENCE
  TEMP
```

If the system software is absent or incorrect, refer to *Installing the MS ChemStation (HP G1034-90001)*.

5. **Go to Manual Tune**
   Select Manual Tune from the Tune MS menu. Then open the Status menu and select Vacuum Status.

   If the Manual Tune choice does not appear in the Tune MS menu, select Full Menus (from the Utilities menu) then retry.

MSD installation

1. **Uncrate the MSD**
   Remove both the MSD and rough pump from the shipping container.

The MSD must remain upright.

2. **Position MSD and rough pump**
   Position the HP 5971A on the benchtop.

   The rough pump may be positioned on either the benchtop or the floor.

3. **Install Interface**
   Remove the $^{1}/_{4}$-inch cap then slowly open the valve to vent the MS system.

   Remove the interface clamp then remove the valve assembly.

   Install the interface supplied with the MSD.

Verify that a plug and column nut are installed in the interface.

Replace the interface clamp (see Figure 2-2).

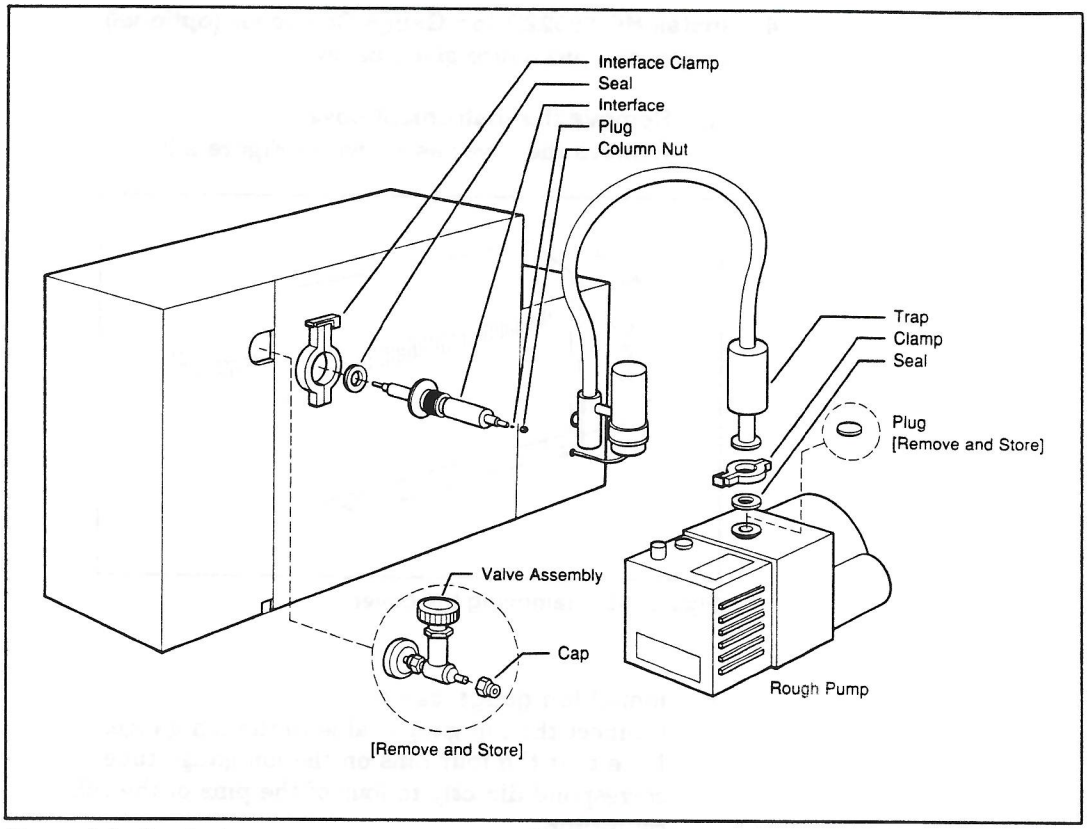

Figure 2-2. Replacing the Interface

4. **Install HP 59822B Ion Gauge Controller (optional)**
Follow the procedure given below.

   a. **Remove the instrument cover**
   Remove the cover as shown in Figure 2-3.

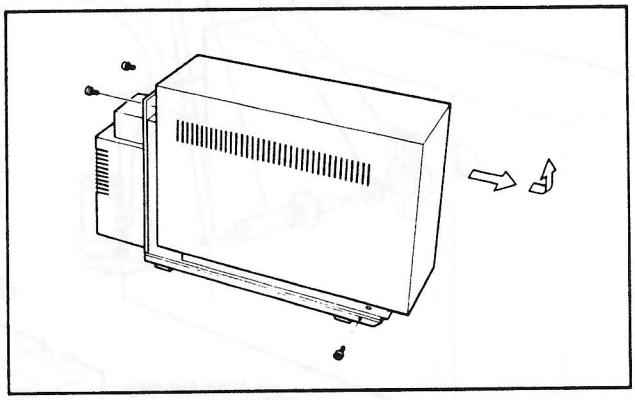

Figure 2-3. Removing the cover

   b. **Install ion gauge cable**
   Connect the ion gauge cable to the ion gauge. Note that the four pins on the ion gauge tube correspond directly to four of the pins of the cable connector.

   Attach the single wire of the cable to the single pin of the ion gauge tube.

   c. **Route cable**
   Route the cable as shown in Figure 2-4.

   d. **Connect cable to controller**
   Connect the cable to the gauge controller then refer to the controller manual for additional installation information.

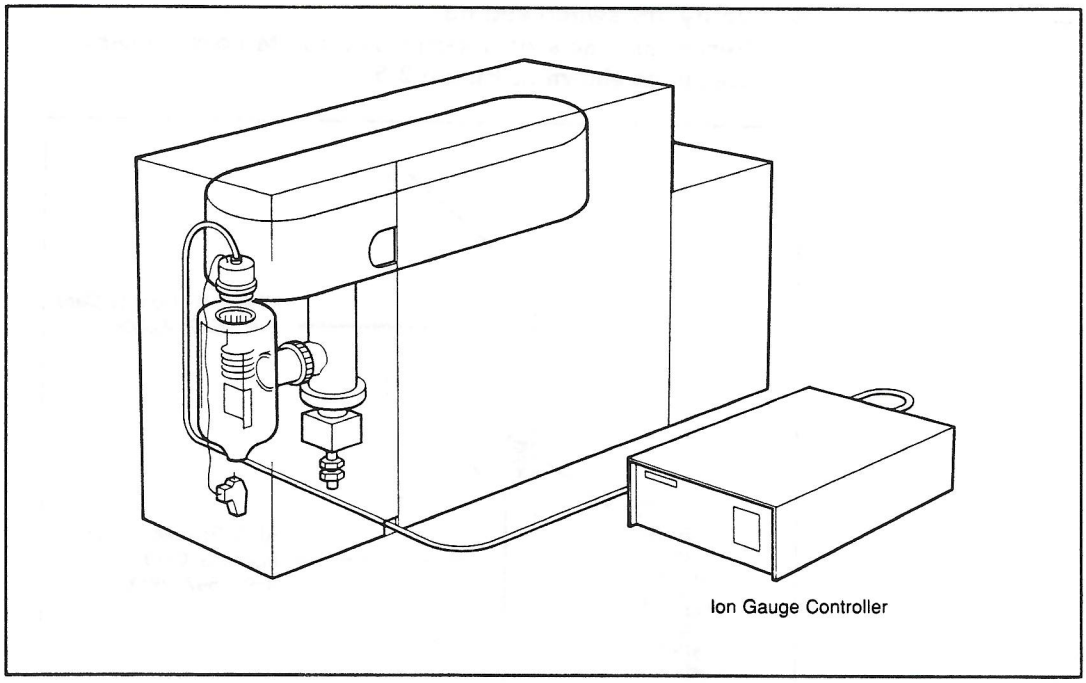

Figure 2-4. Connecting the ion gauge controller

5. **Verify MS switch setting**
   Verify that the switch settings on the MS control card are set as shown in Figure 2-5.

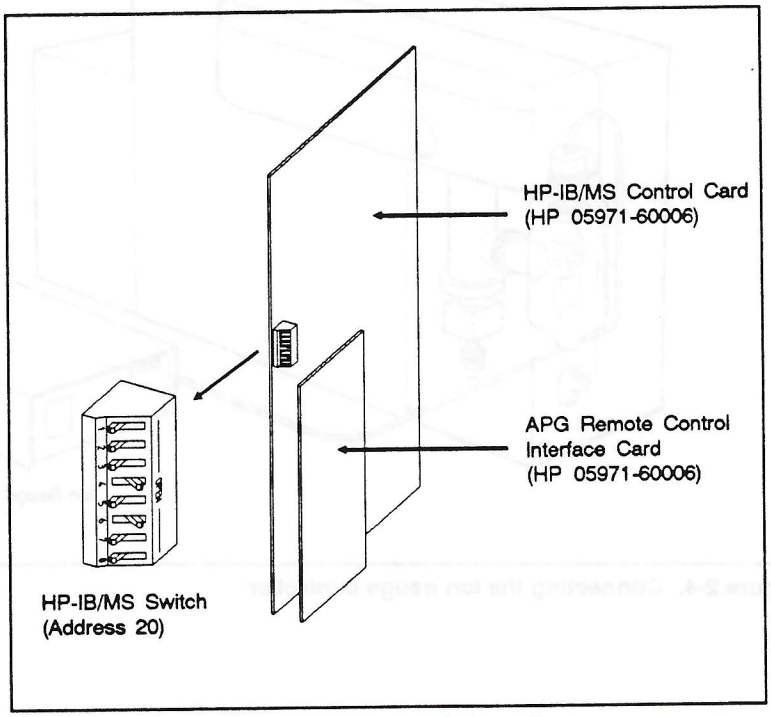

Figure 2-5. HP-IB/MS control card switch settings

6. **Connect rough pump hose**
   Remove the blank flange from the absorbent trap then attach the trap to the rough pump.

7. **Complete AC power connections**
   Connect the rough pump power cord to the receptacle on the rear of the MSD.

   Verify that the available AC power matches the power configuration for the MSD. Connect the instrument power cord to an appropriate AC receptacle.

8. **Initial pump down**
   Turn on the switch at the rear of the instrument. Verify that the rough pump and the fan at the rear of the instrument are on.

   Within one minute, the sound of the rough pump should change from loud and gurgling to relative quiet. If the sound does not change, momentarily press down on the analyzer to facilitate sealing.

9. **Monitor pump down**
   From the Manual Tune window, open the Status menu and select Vacuum Status. Within five minutes, the measured rough vacuum should be less than 300 mTorr. When this occurs, the diffusion pump heater LED should begin to blink.

   After an additional 20 to 30 minutes, the diffusion pump status will change from COLD to HOT.

10. **Perform initial spectrum scan**
    Exit the Vacuum Status utility.

    a. Set the DC polarity and other parameters as indicated in the factory test data. To do this, use the Quadrupole DC menu selection of the AdjParam menu.

    b. Select Spectrum Scan from the Execute menu. Even though the system is not yet at temperature or at vacuum equilibrium, the scans may be acquired without generating error messages.

    c. Evaluate any error messages that are generated. Correct all problems before proceeding.

11. **Save DC polarity information**
    Save the DC polarity information by selecting Save Tune Values from the File menu.

GC installation and preparation

1. **Install HP 5890 Series II GC**
   Install the GC as described in the Gas Chromatograph documentation. This includes:

   - Unpacking the GC
   - Connecting the appropriate utilities (gases, AC power)
   - Connecting the HP-IB cable between the GC and the PC
   - Connecting the HP-IL cable to the Instrument Network connectors
   - Connecting the remote start cable (HP 35900-60700) between the GC and the MS

   The proper switch settings for the GC HP-IB board are shown in Figure 2-6.

2. **Remove knock-out and insulation**
   Use a flat-blade screwdriver to remove the MSD knock-outs (see Figure 2-7) from exterior and interior GC walls. Remove the insulation.

3. **Verify heater connection**
   The power and control for heating the MSD interface and analyzer is supplied by the GC. The heater connection shown in step 2 must be present. This cable assembly (HP 05988-60016) connects the MSD heater and sensor to the DETECTOR B circuitry of the GC. The two violet wires connect to P7 and the two white-gray-red wires connect to J9 of the main GC circuit board.

4. **Autosampler (optional)**
   Refer to the autosampler manual for installation information. The proper switch settings are shown in Figure 2-8.

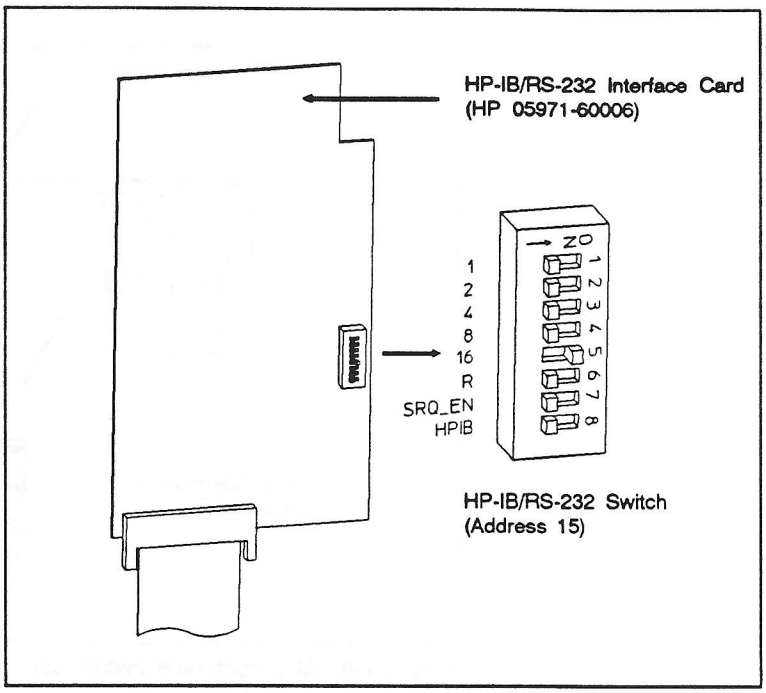

Figure 2-6. HP-IB/RS-232 Interface switch settings

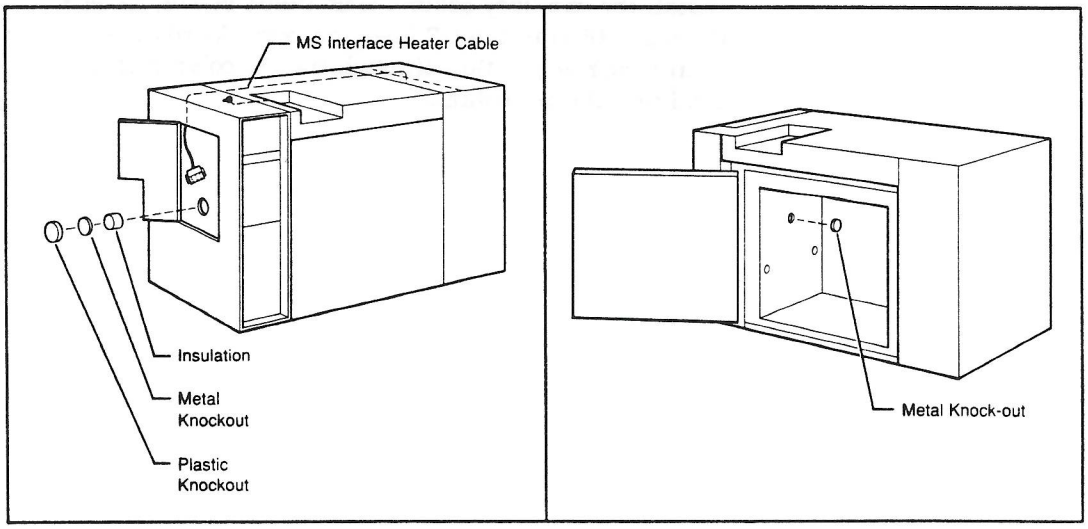

Figure 2-7. Removing the knockouts

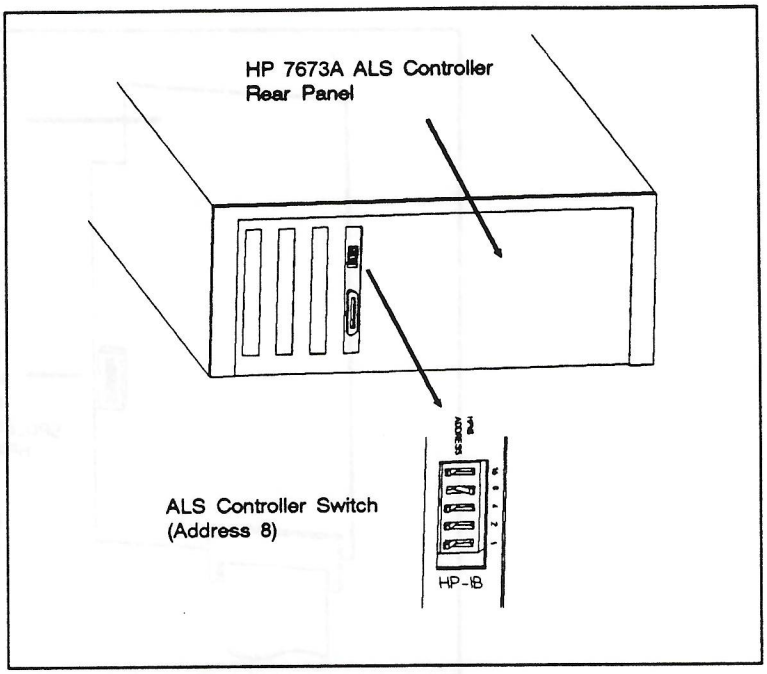

Figure 2-8. ALS controller switch settings

5. **Install and condition GC column**
   Install the capillary column (HP 19091-60312, 12 M x 0.2 mm, HP-1) in the GC injection port. Verify the proper carrier gas flow through the GC column then condition the GC column.

GC and MSD Integration

After it has been determined that the GC, ChemStation and MSD are functional, the chromatographic and heating connections can be made between the GC and MSD.

1. **Vent the MSD**
   Return to the Vacuum Control utility and initiate the vent sequence. After about 10 minutes, the message `OK to vent` will be displayed.

   After this message has been displayed, verify that the air exiting from the rear of the instrument is near room temperature and the reported analyzer temperature is less than 100°C. If these conditions have been met, turn off the switch at the rear of the MSD.

   Remove the column nut and plug from the interface to physically vent the instrument.

2. **Connect the interface heater**
   After the GC has been installed and the GC column has been conditioned, turn off the GC. Place the MSD near the GC then connected the interface heater.

If the GC is not *off* when the heater is connected, a GC fuse may blow.

3. **Position the MSD**
   Position the MSD next to the GC. The interface should protrude in the GC oven.

4. **Connect GC column**
   For additional information, refer to *Section 3* of the *HP 5971 Hardware Manual.*

5. **Connect all components**
Connect the GC, MS, ALS (optional) and PC components as shown in Figure 2-9.

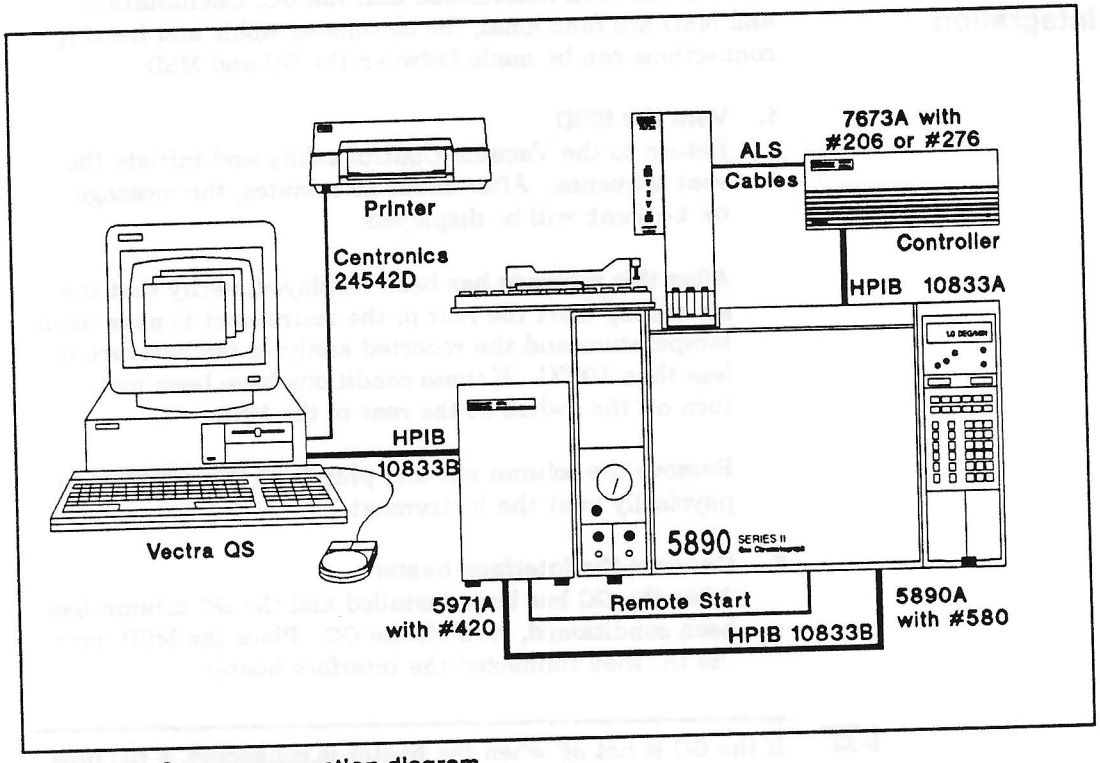

Figure 2-9. System connection diagram

6. **Turn on GC and MSD**
Turn on the GC.

Turn on the MSD. Within one minute, the sound of the rough pump should change from loud and gurgling to relative quiet. If the sound does not change, momentarily press down on the analyzer to facilitate sealing.

7. **Monitor pump down**
   From the Manual Tune window, select Vacuum Status from the Status menu. Within five minutes, the measured rough vacuum should be less than 300 mTorr. When this occurs, the diffusion pump heater LED should begin to blink.

   Within 30 minutes the vacuum control screen should report that the diffusion pump temperature is HOT. Following this, the temperature of the MS interface (detector B) is automatically set to 280°C and the analyzer begins heating.

8. **Replace MSD cover**
   Replace the cover of the MSD.

9. **Perform Autotune**
   After four to eight hours of temperature and vacuum equilibrium, initiate Autotune.

3 Installation Checklist

Unpacking and setup

ChemStation installation

MSD installation

GC installation and preparation

GC and MSD integration

Performance verification

Basic operation

Advanced topics

Unpacking and setup

- ☐ Unpack and verify shipment against packing list
  - ☐ Shipment OK
  - ☐ Shipment damaged or incomplete
    - ☐ Product Support notified

      date _____ person contacted _____
    - ☐ DM notified (date) _____
    - ☐ Carrier notified (date) _____
    - ☐ Damaged/missing material _____

      _____

      _____
- ☐ Check customer line voltage and plug polarity, _____VAC
- ☐ Check voltage markings and/or switch settings on the rear of all components of the system. They must match the intended AC power source. Make adjustments, if necessary, as described in each product manual.

ChemStation installation

- ☐ Verify shipment is complete
- ☐ Verify switch settings are correct
- ☐ Assemble ChemStation
- ☐ Verify MS software is present (load software if necessary)

MSD installation

- ☐ Position MSD and rough pump
- ☐ Install interface
- ☐ Install optional gauge controller
- ☐ Verify switch settings
- ☐ Connect rough pump
- ☐ Connect AC power
- ☐ Pump down system and monitor
- ☐ Set preferred DC polarity
- ☐ Perform 'cold' spectrum scan

GC installation and preparation

- ☐ Connect GC to AC and gas(es)
- ☐ Connect HP-IB cable and set HP-IB switches
- ☐ Remove MS knock-out and cut insulation
- ☐ Verify interface heater cable is present
- ☐ Install optional GC accessories
- ☐ Install column in injection port and condition column

GC and MSD integration

- ☐ Verify that ChemStation, MSD and GC are functional
- ☐ Vent MSD
- ☐ Turn off GC then connect interface heater
- ☐ Complete installation of GC column
- ☐ Initiate MSD pump down sequence and monitor
- ☐ Perform Autotune after temperature and vacuum equilibrium (4 hours)

Performance verification

- ☐ Verify that %502 >1%
- ☐ Verify that abundances of masses 18, 28 and 32 are <20% of mass 69

Computer-based training tutorial

- ☐ Install
- ☐ Review

Basic operation

- ☐ **Tuning**
  - ☐ Perform Autotune and explain final tune report
  - ☐ Instruct customer to retain Autotune reports
  - ☐ Discuss ion source contamination and diagnosing contamination
  - ☐ Discuss use of Manual Tune

☐ **Data Acquisition**

Describe the steps involved in acquiring data:

1. Developing an analytical method for MSD and GC parameters to run both scan and SIM.
2. Designating a file to store the data
3. Saving the Acquisition Parameters as part of a Method
4. Inject the performance evaluation sample, solution A using method EVAL.A
5. Acquire SIM data for solution B

☐ **Data Analysis**

Demonstrate manipulation of data and use of menu items.

Perform the following operations:

- ☐ Display TIC, spectrum, and extracted ion profile
- ☐ Perform integration
- ☐ Perform library search

☐ **Quantitative Reports**

Obtain a quantitative report (ESTD or ISTD) using system files.

☐ **File Management and Utilities**

In this section, a number of additional tasks can be carried out with the MS ChemStation (e.g., keeping track of files on the disc drive, copying files, configuring the system, etc.). Explain the MS Windows file management system and how to copy and delete data files and methods using the MS ChemStation Utilities menu items.

☐ **Hardware maintenance**

Describe the following:

- ☐ Proper MSD venting procedure using vacuum control utility
- ☐ Electron multiplier replacement
- ☐ Preventative maintenance
- ☐ Troubleshooting
- ☐ Ion source cleaning (video taped instructions are provided)

Advanced topics

☐ **Creating macros**

Describe briefly what a macro is and how to execute a macro in data analysis.

☐ **Methods**

Methods automate data acquisition the processing and reporting of data. Explain how to use Methods by specifying a complete experimental method and preparing a data analysis report (area percent, library search or quantitative).

☐ **Data Analysis commands**

The Data Analysis commands are accessed from the Data Analysis command line. Describe how these commands provide considerable flexibility in presentation and analysis of the GC/MS data.

☐ **Notepad text editor**

Explain how Windows Notepad enables you to create, change, store and retrieve both macros and text files.

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