HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

Table of Contents

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 1
Top Assembly

This section contains a breakdown of the HP 5890 Series II Gas Chromatograph. As major subassemblies are addressed, reference is made to later sections, in this document, which contain further breakdowns of the applicable subassembly.

Item	Description	HP Part No.	Qty.	New Part I.D.	Price
1	Flow (Left) Side Panel Door	05890–40135	1		
2	Flow (Left) Side Panel	05890–40105	1		
3	Injection Ports: (Refer to Section 5)		2		
4	Detectors: (Refer to Section 2)		2		
5	Electronic Flow Sensor (EFS) (optional; not compatible with PCOC Electronic Pressure Control)	19237–60500	1		
6	Flow Carrier	05890–40170	1		
7	Screw, M4 x 0.7 x 20mm	0515–0982	2		
8	Flow Bezel	05890–40065	1		66^{00}/ea.
9	Flow Mounting Panel	~~05890–00210~~	1	05890-00215	41^{30}/ea.
10	Detector Flow Manifold (Refer to Section 3) Blocks:		2		
11	Cryogenic Valve (Refer to Section 6)		1		
12	Flow Bezel Detector Label Plate (self adhesive):		1		
	• Blank Detector Plate	05890–90715	–		
	• FID/AUX Label Plate	19231–90715	–		
	• TCD/AUX Label Plate	19232–90715	–		
	• ECD/AUX Label Plate	19233–90725	–		
	• ECD/AUX Series II Label Plate	19233–90815	–		
	• NPD/AUX Label Plate	19234–90715	–		
	• FPD/AUX Label Plate	19256–90705	–		
13	Flow Bezel Injector Label Plate (self adhesive):		1		
	• Blank Injection Plate	05890–90705	–		
	• Packed Column Inlet Label Plate	19243–90705	–		
	• Purged Packed Inlet	19243–90715	–		
	• Split/Splitless Capillary Inlet	19244–90705	–		
	• PCOC/MPC Inlet Label Plate	19245–90705	–		
	• PCOC/EPC Inlet Label Plate	19245–90715	–		
14	Injection Port Flow (Refer to Section 4) Modules:		2		
15	Screw, Thrd Self Tapping	0624–0665	10		
16	PCOC Electronic (Refer to Section 4) Pressure Control (optional; not compatible with Electronic Flow Sensor (EFS))		1		
17	Chemical Filter Assy. (Molecular Sieve) (optional)	05890–61260	1		
18	Filter Bracket	05890–00810	1		
19	O–ring (pkg. 10)	5180–4181	1		

Figure 1. HP 5890 Series II Top Assembly (Sheet 1 of 6).

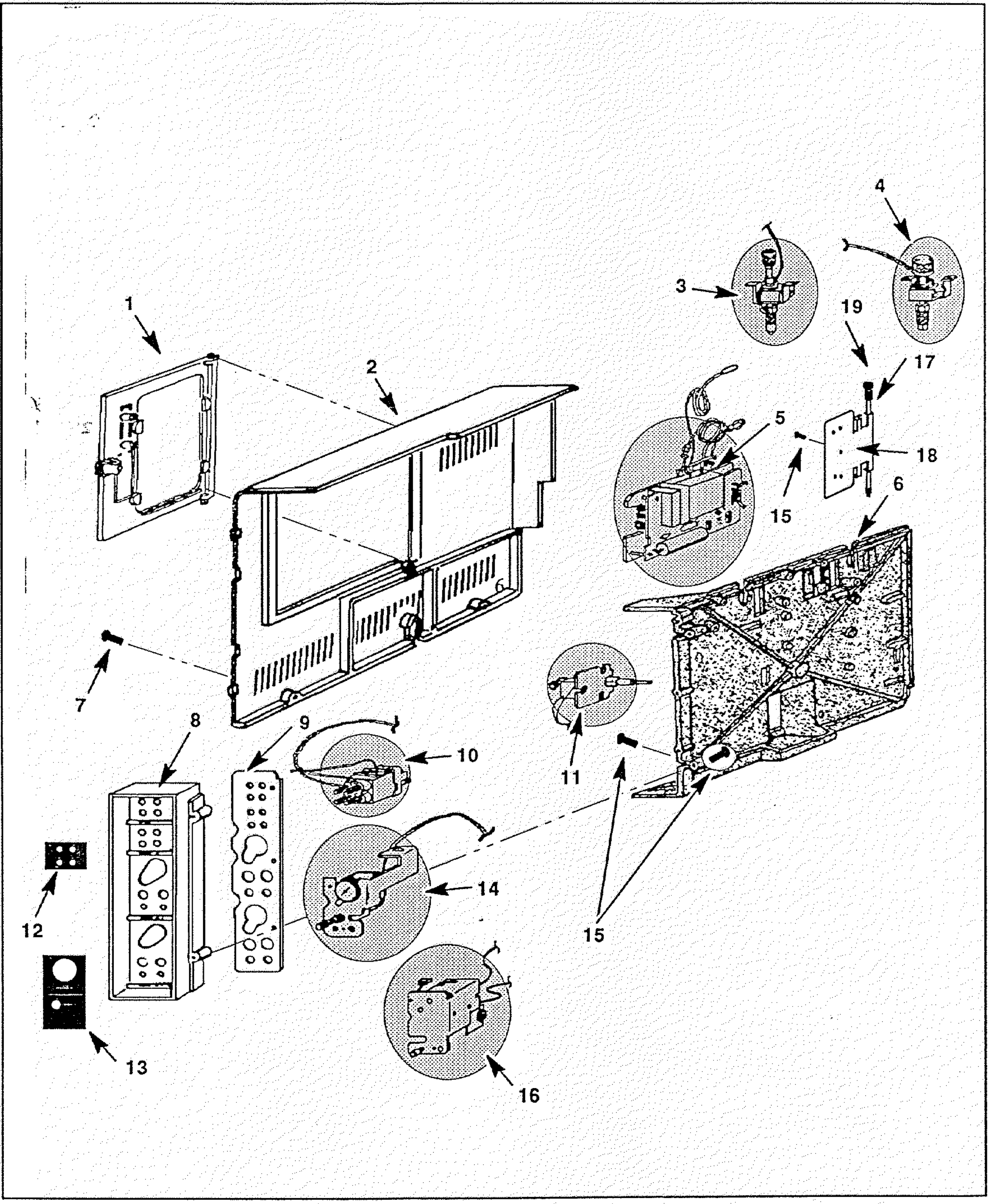


Figure 1. HP 5890 Series II Top Assembly (Sheet 2 of 6).

Item	Description	HP Part No.	Qty.
20	Injection Port Cover	05890-40072	1
21	Lid Shaft	05890-20780	1
22	Top Cover:		1
	• Series II Top Cover (Series II only)	05890-00405	–
	• Series II Upgrade Cover (Series I only)	05890-00402	–
	• GC Special (to accommodate fourth actuator in valve box)	05890-00401	–
	• 5921A Lid	05890-00920	–
	• Manual Valves Lid	05890-00940	–
	• FPD Lid	19256-00075	–
	• FPD/Manual Valve Lid	18900-00843	–
23	Washer, Flat	3050-1178	2
24	Screw, Pan-Head	0515-0904	2
25	Oven Exhaust Deflector	19247-60510	1
26	Rear Cover Assy.	05890-00395	1
–	Rear Cover Assy. (with optional HPIB/RS-232 cutout)	19257-00035	–
27	Valve Box Top (Refer to Section 7)		1
28	Valve Box Bottom (Refer to Section 7)		1
29	Injector/Detector Blank Cover Plate	05890-00680	4
30	Valve Box Opening Blank Cover Plate	19300-01230	1
31	Valve Solenoids (Refer to Section 7)		–
32	Dual Duct Assembly	05890-80680	1
33	Valve Driver Board (optional)	19238-60010	1
34	Oven Flap Assy. (Refer to Section 6)		1
35	Cable Tray	05890-40200	1
36	Bezel, Front	05890-40242	1
37	Screw, Pan-Head	0515-0910	3
38	Bottom Door Hinge	05890-00295	1
39	Top Door Hinge	05890-00285	1
40	Oven Motor Assy., 120 V	05890-61310	1
–	240 V	05890-61320	–
41	Oven Door and Shell Assy.	05890-60835	1
	• Oven Door only	05890-60815	1
42	Oven Door Latch	05890-00100	1
43	Power Cords:		1
	• USA, 120 V	05890-60870	–
	• Europe, 220 V	05890-60880	–
	• Great Britain, 220 V/240 V	05890-60890	–
	• Australia, 240 V	05890-60910	–
	• Europe, Split-Phase, 220 V	05890-60960	–
	• USA, 240 V	05890-60900	–
	• Japan, 200 V	05890-60920	–
	• China, 220 V	05890-60910	–
	• Denmark, 220 V	05890-60880	–
	• Switzerland, 220 V	05890-60880	–
	• S. Africa, 240 V	05890-60890	–
44	Oven Heater Shroud Assy. (Refer to Section 6)		1
45	Fan Blade, Standard	3160-0446	1
–	Fan Blade, Stainless Steel	05890-80270	–
46	AC Power Supply Ground Wire	19350-60670	1
47	AC Power Supply (Refer to Section 8)		1
48	AC Power Supply Base	05890-00240	1
49	Base	05890-40160	1
50	Foot (self-adhesive)	0403-0424	4
51	Oven/Base Shield	05890-00700	1
52	Series II logo plate on oven bezel	05890-91000	1
53	Inlet Cooling Fan Assembly (Refer to Section 5)		1

Figure 1. HP 5890 Series II Top Assembly (Sheet 3 of 6).

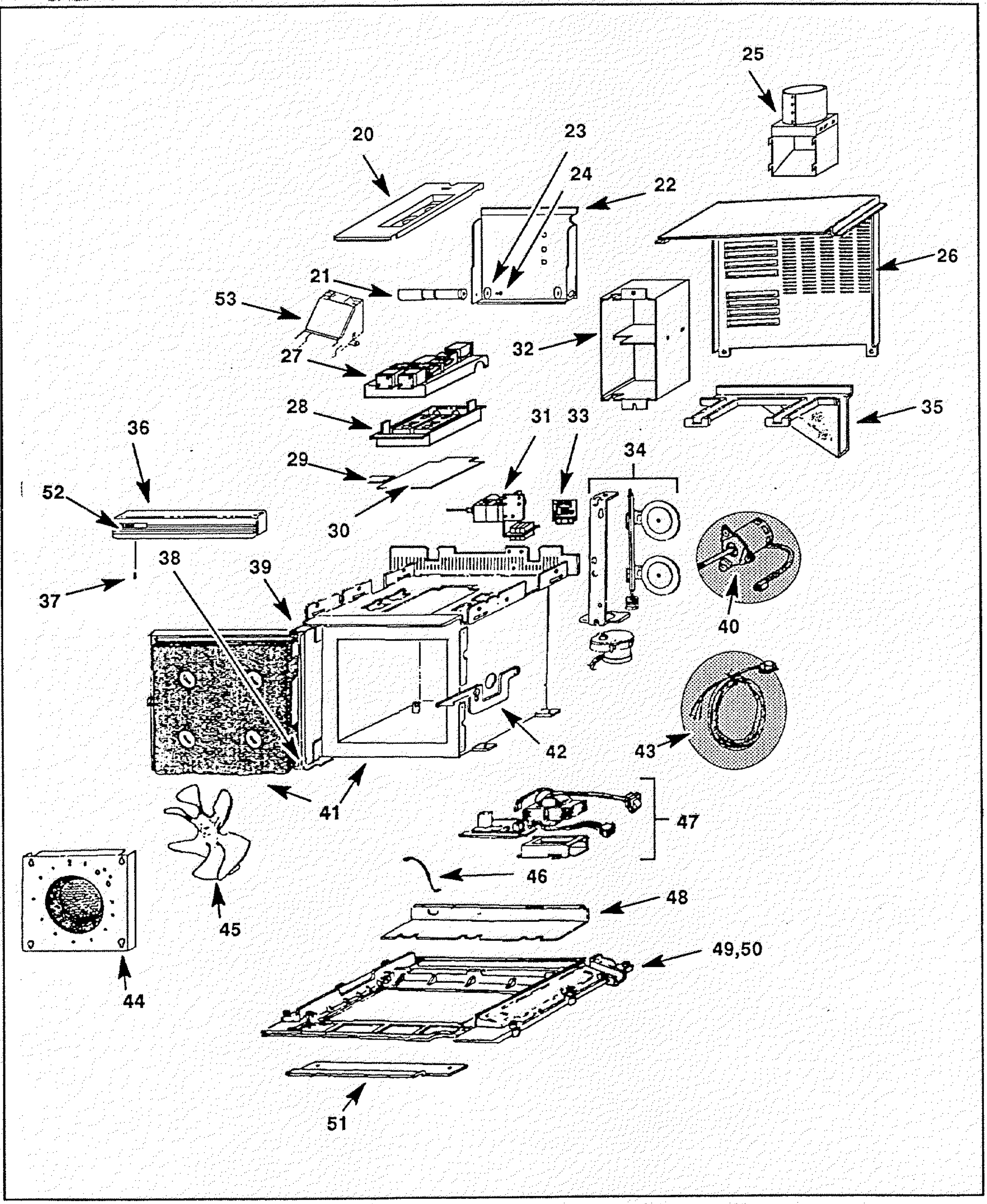


Figure 1. HP 5890 Series II Top Assembly (Sheet 4 of 6).

Item	Description	HP Part No.	Qty.	New #
54	Keyboard Assembly	Invalid ⇒ 05890-61365	→ 1	→ 05890-61367
55	• Keyboard Bezel	05890-60745	1	
56	• Keyboard Connector Element	1252-0001	1	
57	• Keyboard Connector Body	05890-40080	1	
58	• Display PCB	05890-60035	1	
59	Electronics Carrier Top Cover	05890-40125	1	
60	Electronics Carrier	05890-40185	1	
61	Main Printed Circuit Board (PCB) (Refer to Section 9)	05890-60015	1	
62	Pressure Control PCB:		1	
	• Manual Pressure Control	19245-60040	–	
	• Electronic Pressure Control	19245-60020	–	
63	Communications Interface PCB:		1	
	• BUFFERED INET Interface	19242-60015	–	
	• Non-BUFFERED INET Interface	19242-60010	–	
	• RS-232	19242-60030	–	
	• HPIB/RS-232 Interface	19257-60010	–	
64	High Voltage Cover	05890-40150	1	
65	Electronics Bezel	05890-40145	1	
66	Electronics Bezel Label Plates (self-adhesive):		2	
	• Blank Label Plate	19234-90725	–	
	• NPD "A" Label Plate	19234-90735	–	
	• NPD "B" Label Plate	19234-90745	–	
67	Screw, Thrd Cting	0624-0665	6	
68	Screw, Ground M4 x .7 x 45	0515-0964	1	
69	Screw, Self-Tapping 8.32 x .5	0624-0596	6	
70	Detector PCB:		2	
	• FID	19231-60010	–	
	• NPD	19234-60010	–	
	• ECD (spec. and gen. license)	19233-60010	–	
	• ECD Series II (spec. and gen. license)	19233-60015	–	
	• TCD	19232-60010	–	
	• TCD Series II	19232-60020	–	
	• FPD	19256-60010	–	
	• ANALOG INPUT PCB	19261-60010	–	
71	Screw, Machine M4 x .7 x 12	0515-0909	2	
72	Right Side Panel	05890-40115	1	
73	Screw, Machine M4 x .7 x 20	0515-0982	2	
74	Paint, Spray:			
	• Dove Grey (for Series II mainframe) 6.5 oz.	6010-1146	–	
	• Pearl Grey (for Series I mainframe) 6.5 oz.	6010-0695	–	
	• Cobblestone Grey (for Series II panel label plates, keyboard) 6.5 oz.	6010-1150	–	
	• Cocoa Brown (for Series II panel label plates, keyboard) 6.5 oz.	6010-0694	–	
	• Cocoa Black (for Series I door lettering)	6010-0927	–	
75	Ink, Charcoal Black (for Series II door lettering)	6009-0158	–	

Figure 1. HP 5890 Series II Top Assembly (Sheet 5 of 6).

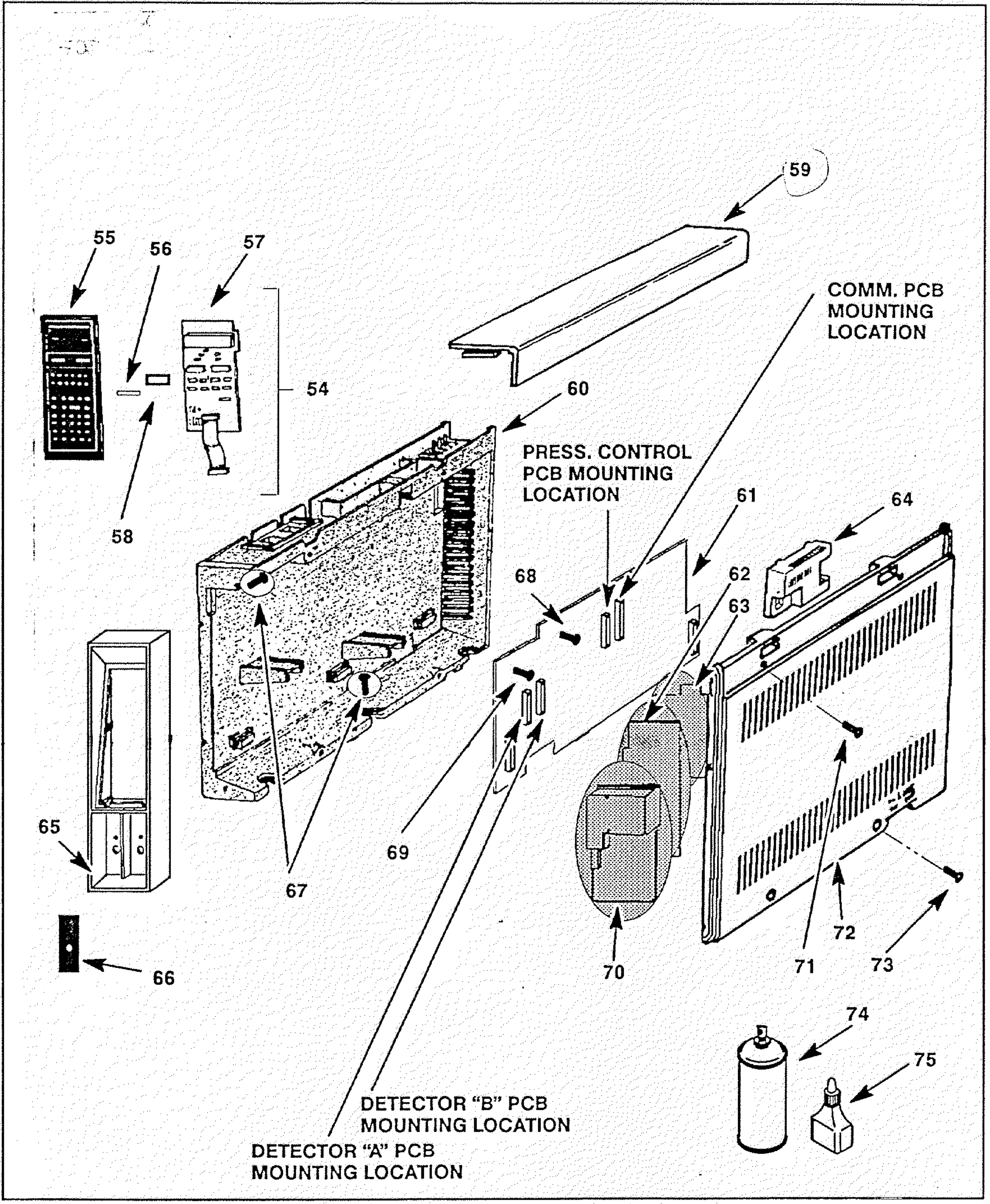


Figure 1. HP 5890 Series II Top Assembly (Sheet 6 of 6).

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 2
Detector Options

This section contains breakdowns of the various detector options available with the HP 5890 Series II Gas Chromatograph. Only the detectors are addressed in this section. Refer to section 3 for breakdowns of the associated detector flow manifold assemblies. Refer to section 9 for diagrams of the Printed Circuit Boards (PCBs) and electronic components associated with the detectors.

Item	Description		HP Part No.	Qty.
1	Thermal Strap		19232–00040	1
2	Insulation		19232–40010	1
3*	TCD Assembly:	(new)	19232–60670	1
		(rebuilt)	19232–69510	1
4	Heater/Sensor Assy		05890–61140	1
5	• Heater, 70 W		19231–60620	1
6	• Contact		1251–1679	2
7	• PRT Sensor		19231–60660	1
8	• Contact		1251–5963	2
9	• PRT Delta–T Sensor		19232–60660	1
10	• Flexible Sleeving, (ordered by the inch)		0890–0737	22
11	Screw, M4 x 8 mm long		0515–0910	8
12	Switching (Solenoid) Valve Assy		19232–60570	1
13	Fitting, Plastic		05890–40050	1
14	TCD Mounting Bracket		19232–00030	1
15	TCD Make–up Gas Adaptor		19232–80550	1
	(Refer to Figure 7 for additional adaptors)			
16	Ref. Gas 1/16–inch Tubing		19232–80500	1

Figure 1. Thermal Conductivity Detector (TCD) (Sheet 1 of 2).

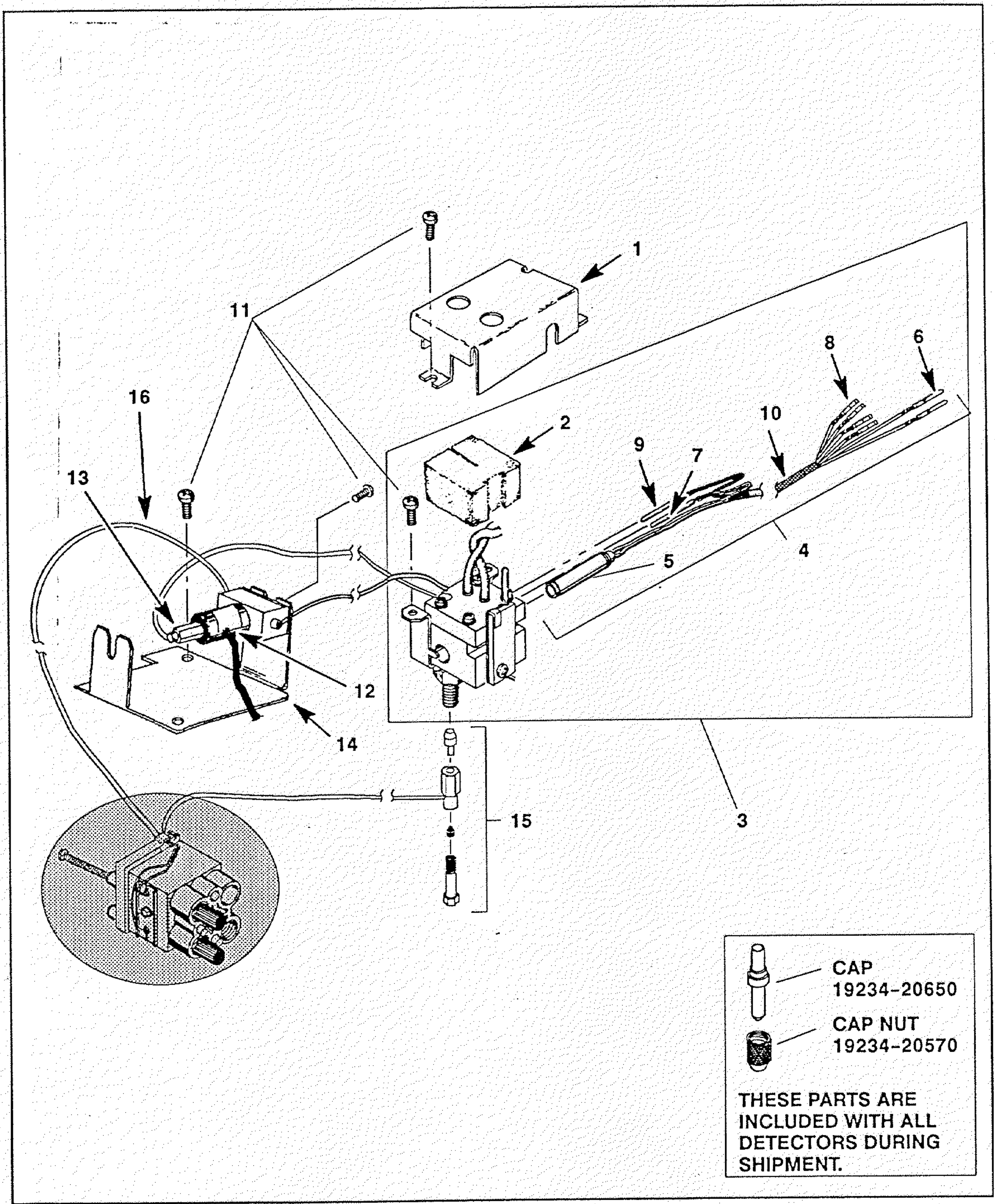


Figure 1. Thermal Conductivity Detector (TCD) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Collector Assembly:	19231-60690	1
2	● PTFE Chimney (optional)	19231-21050	1
3	● Collector Nut	19231-20940	1
4	● Spring Washer	3050-1246	1
5	● Ignitor Castle or optional hastelloy component*	19231-20910 19231-21060	1
6	● Ignitor (Glow Plug) Assembly	19231-60680	1
7	● Upper Collector Insulator	19231-20970	1
8	● Collector Body or optional hastelloy component*	19231-20960 19231-21080	1
9	● Lower Collector Insulator	19231-20950	1
10	● Spanner Nut (Collector)	19231-20980	1
11	● Collector Mount	19231-20930	1
12	● Collector Housing	19231-20920	1
13	● Gasket	0905-0915	1
14	Screw, M4 x 25 mm	0515-0981	3
15	Jets:		1
–	● Packed Column (0.018-inch id)	18710-20119	–
–	● Simulated Dist (0.030-inch od)	18789-80070	–
–	● Capillary Column (0.011-inch id)	19244-80560	–
16	Base Spanner Nut	19231-20990	1
17	Thermal Strap	19231-40050	1
18	J-Clamp	19231-00040	1
19	Screw, M4 x 8 mm	0515-0910	8
20	Detector Weldment	19231-80580	1
21	Heater/Sensor Assembly:	05890-61140	1
22	● PRT Sensor	19231-60660	1
23	● Contact	1251-5963	2
24	● Heater, 70W	19231-60620	1
25	● Contact	1251-1679	2
26	● Flexible Sleeving (ordered by the inch)	0890-0737	22
27	Insulation	19231-00080	1
28	Insulation Plate	19231-00090	1
29	Side Shield	19231-00100	2
30	Diode Bridge Assembly	19231-60025	1
31	Interconnect Assembly:	19231-60710	1
32	● Coil Spring	1460-2142	1
33	Hex Nut, M3 x 0.5	0535-0004	3
34	Lock Washer	2190-0407	3
35	Adapters: (Refer to Figure 7)		1

* hastelloy components may be employed when analyzing highly corrosive materials.

Figure 2. Flame Ionization Detector (FID) (Sheet 1 of 2).

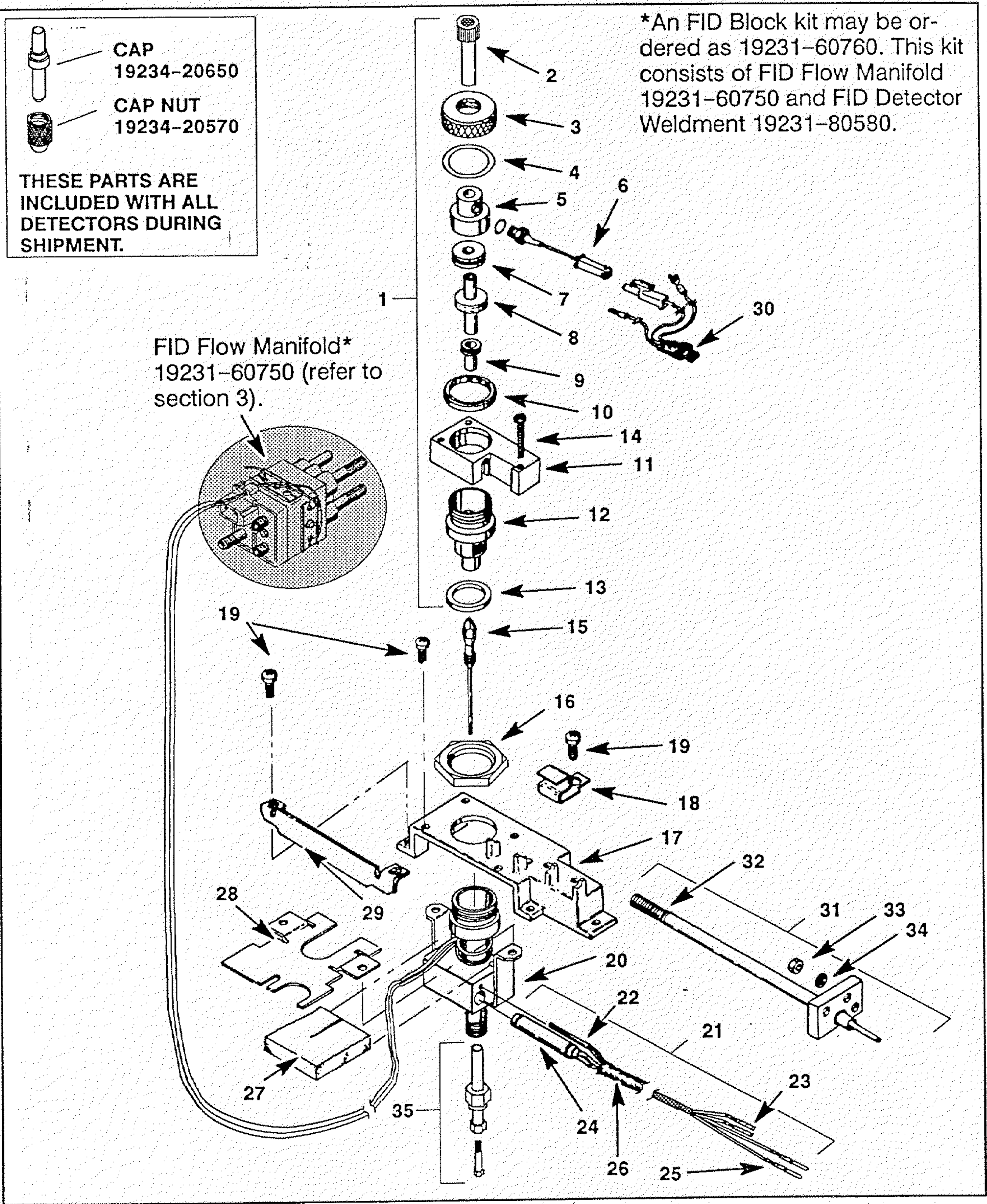


Figure 2. Flame Ionization Detector (FID) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Screw, M3 x 6 mm	0515-0924	4
2	Screw, M4 x 8 mm	0515-0910	13
3	NPD Cover	19234-80020	1
4	Connector	1251-8328	1
5	Cable	8120-2277	1
6	Set Screw	0515-0117	3
7	Contact	19234-20610	1
8	Insulator	19234-20600	1
9	NPD Body Assembly	19234-80510	1
10	Gasket	0905-0915	1
11	Toroid/Spacer Assembly	19234-60640	1
12	• Toroid Assembly	19234-60580	1
13	• Toroid Seat	4040-2120	2
14	O-Ring, Viton	0905-1014	1
	package of 12	5180-4182	–
15	Retainer Nut	19234-20630	1
16	NPD Collector Assembly	19234-60540	1
17	Jets:		
	• Packed Column (0.018-inch id)	18710-20119	1
	• Simulated Distillation (0.030 inch id)	18789-80070	1
	• Capillary Column (0.011 inch id)	19244-80560	1
18	Contact Pin (P/O Toroid Assy)	19301-21450	1
19	Side Shield	19231-00100	2
20	Spanner Nut	19231-20580	1
21	J-Clamp	19231-00040	1
22	Thermal Strap	19231-40050	1
23	Insulation Plate (Retainer)	19231-00090	1
24	Insulation	19231-00080	1
25	Detector Weldment	19231-80580	1
26	Interconnect Assembly	19231-60710	1
27	• Coil Spring	1460-2142	1
28	Hex Nut, M3 x 0.5	0535-0004	3
29	Lock Washer	2190-0407	3
30	Heater/Sensor Assembly:	05890-61140	1
31	• PRT Sensor	19231-60660	1
32	• Contact	1251-5963	2
33	• Heater, 70 W	19231-60620	1
34	• Contact	1251-1679	2
35	• Flexible Sleeving (ordered by the inch)	0890-0737	22
36	Detector Adaptor (Refer to Figure 7)		1

Figure 3. Nitrogen Phosphorus Detector (NPD) (Sheet 1 of 2).

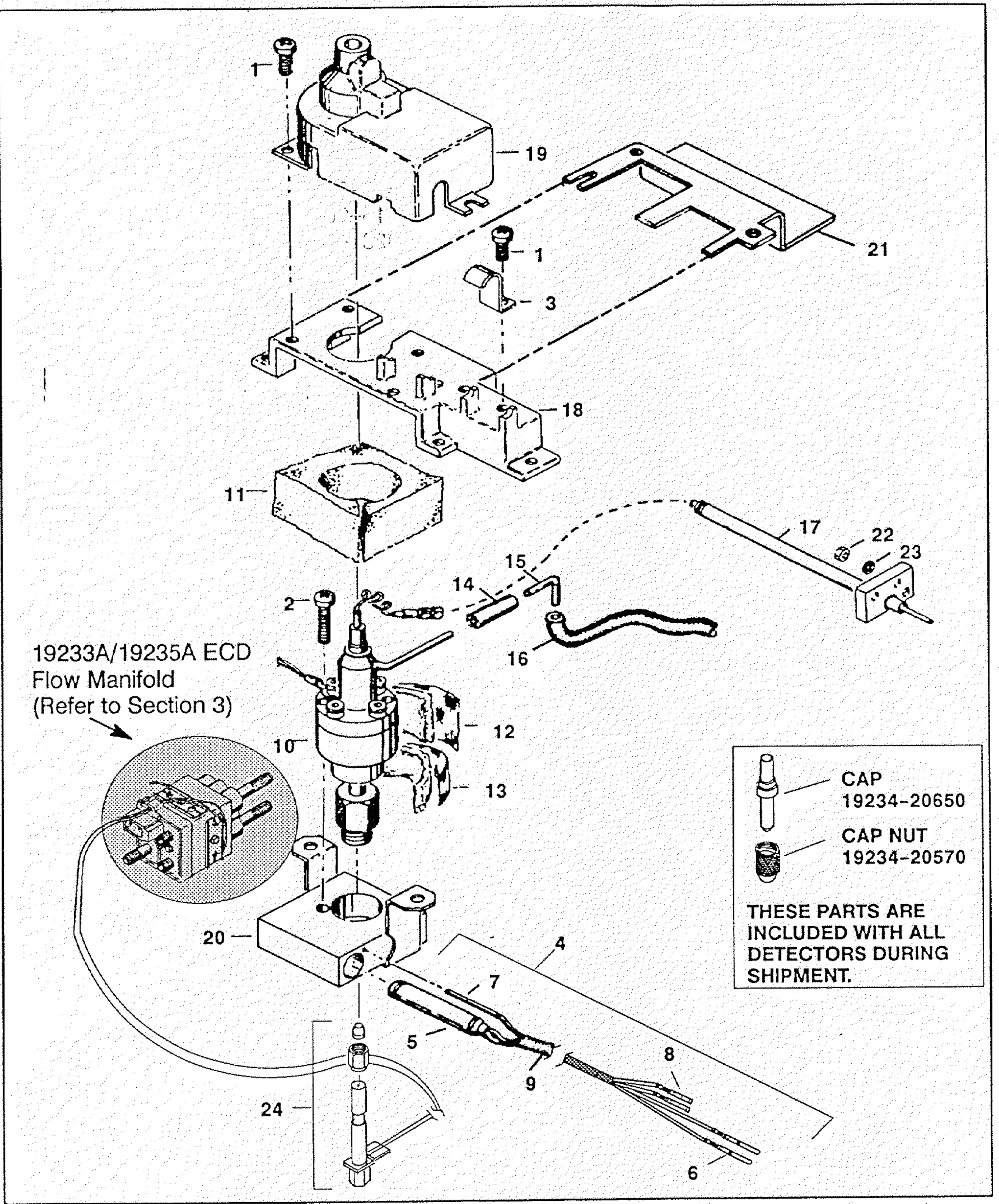


Figure 4. 19233A/19235A Electron Capture Detector (ECD) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Cover	19233-00085	1
2	Anode/Ferrule/Nut Assembly	19233-67010	1
3	• Anode Weldment	19233-80585	1
4	• Anode Retaining Nut	19233-20725	1
5	• Anode Ferrule	19233-20695	1
6	ECD Cover	19233-00075	1
7	Screw	0515-0964	2
8	Upper Heater Block	19233-20525	1
9	Screw-Socket M4 x 0.7	0515-0321	4
10	Upper Cell Weldment	19233-80525	1
11	Plated Lower Body	not available*	1
12	Mounting Strap	19231-00145	1
13	ECD Flange Insulation	19233-40015	1
14	Bottom Insulation	19233-40016	1
15	Lower Heater Block	19233-20515	1
16	Heater/Sensor Assy	19233-60625	1
17	• PRT Sensor	19231-60660	1
18	• Contact	1251-5963	2
19	• Heater, 60 W	19233-60627	1
20	• Contact	1251-1679	2
21	• Flexible Sleeving (ordered by the inch)	0890-0737	22
22	Adapter (Refer to Figure 7)		1
23	Interconnect Lead	19233-60635	1
24	Interconnect Assembly	19233-60600	1
25	Hex Nut, M3	0535-0407	3
26	Lock Washer	2190-0407	3
27	Thermal Cover Clip	19233-00095	1
28	Screw	0515-0910	1

* = restricted article; replace entire detector:
General License – 19233-69576
Specific License – 19235-69536

Figure 5. G1223A/G1224A Electron Capture Detector (ECD) (Sheet 1 of 2).

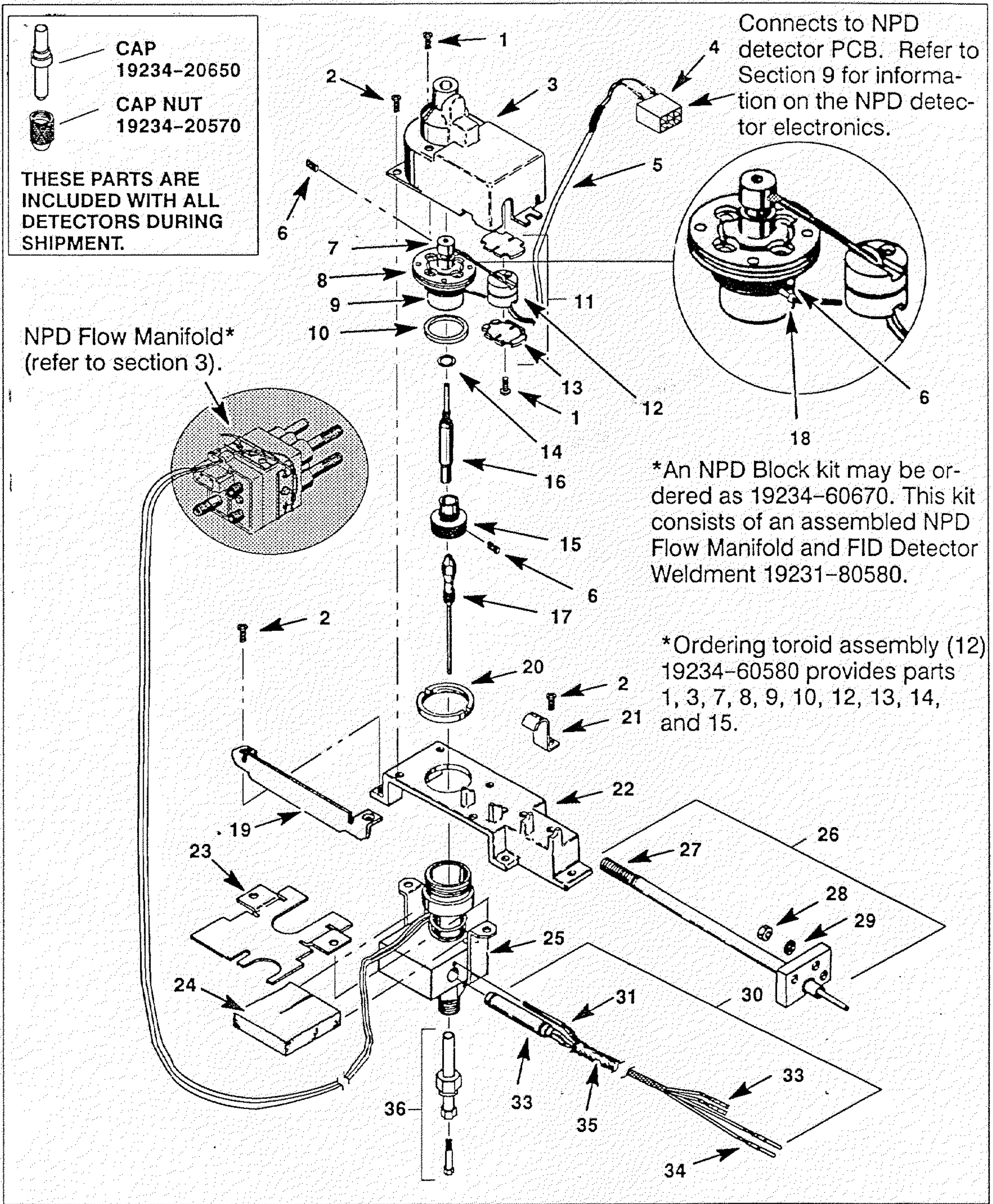


Figure 3. Nitrogen Phosphorus Detector (NPD) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Screw, M4 x 6 mm long	0515-0070	2
2	Screw, M4 x 25 mm long	0515-0072	2
3	J-Clamp	19231-00040	1
4	Heater/Sensor Assembly:	05890-61140	1
5	• Heater	19231-60620	1
6	• Contact	1251-1679	2
7	• PRT Sensor	19231-60660	1
8	• Contact	1251-5963	2
9	• Flexible Sleeving (ordered by the inch)	0890-0737	20
10	ECD Assembly, General License	not available*	1
	or Specific License (Not Shown)	not available*	1
11	Top Insulation	19233-40020	1
12	Flange Insulation	19233-40010	1
13	Transfer Line Insulation	19232-00090	1
14	Tubing Adaptor	5020-8231	1
15	Vent Elbow, Stainless Steel	19303-20590	1
16	Flexible Vent Tube, 48 inches long	0890-0934	1
17	Interconnect Assembly	19233-60600	1
18	Thermal Strap	19133-80010	1
19	Thermal Cover	19233-80040	
20	ECD Heated Block Weldment	19233-80510	1
21	Shield (Front "A")	19233-00040	1
	(Rear "B")	19233-00050	1

NOTE

The shield is different depending on which detector opening is being used ("A" or "B"). Detector is shown installed in the "B" position.

Item	Description	HP Part No.	Qty.
22	Hex Nut, M3	0535-0004	3
23	Lock Washer	2190-0407	3
24	Makeup Gas Adaptor	19233-80550	1

(Refer to Figure 7 for additional adaptors)

* = restricted article; replace entire detector:
General License – 19233-69570
Specific License – 19235-69530

Figure 4. 19233A/19235A Electron Capture Detector (ECD) (Sheet 1 of 2).

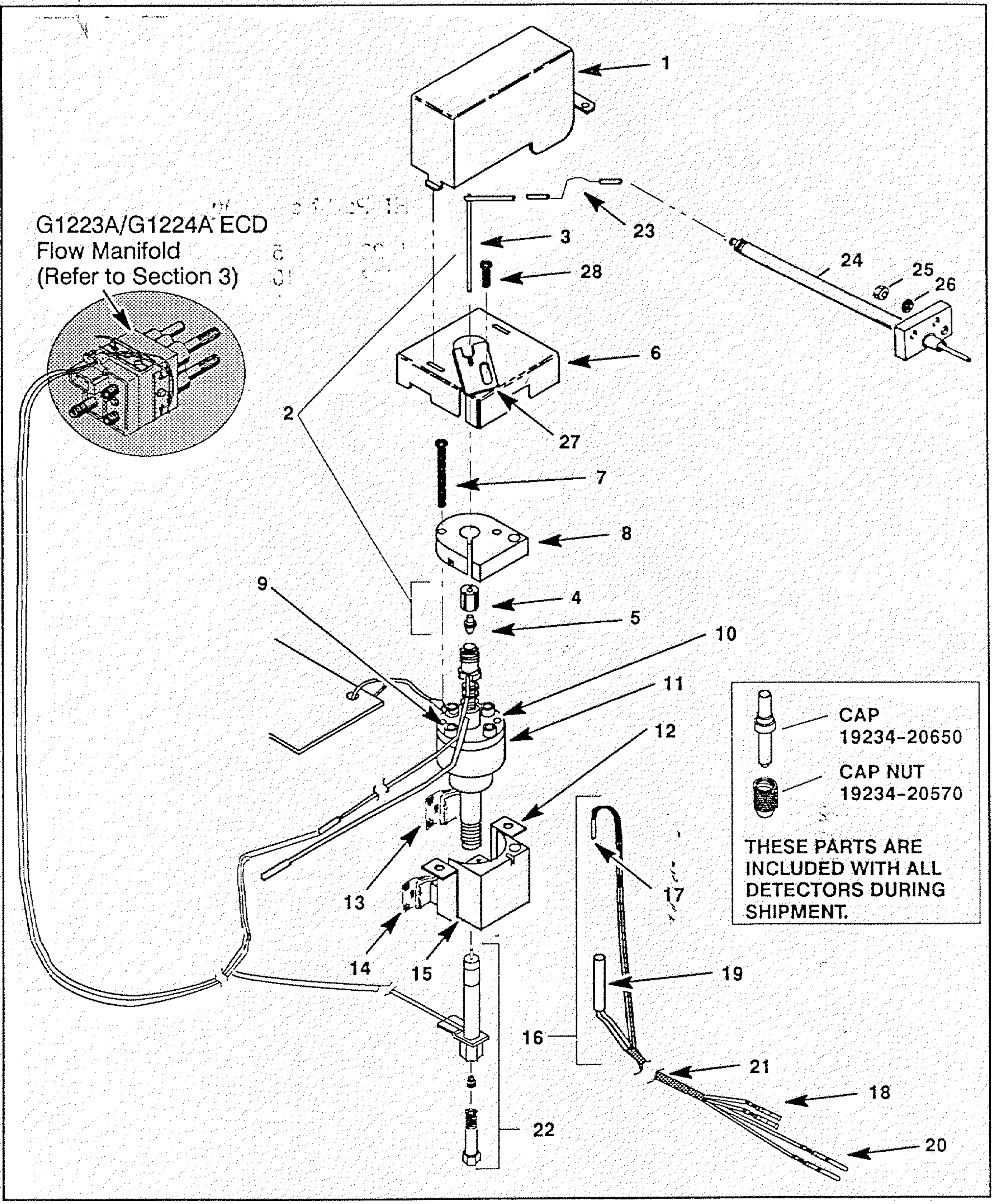


Figure 5. G1223A/G1224A Electron Capture Detector (ECD) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Chimney	19256-80510	1
2	Screw, M4 x 25 mm long	0515-0065	14
3	PMT Assembly	19256-60510	1
4	• Tube Body	19256-20780	1
5	• Photo-Multiplier Tube	19256-80050	1
6	• O-ring	0905-1099	1
7	• End Cap	19256-20790	1
8	• Cable Assembly	19256-60580	1
9	Chimney Back	19256-00100	1
10	Main Bracket	19256-00060	1
11	Support Bracket	19256-00080	1
12	Heater/Sensor Assembly	05890-61140	1
13	• Heater	19231-60620	1
14	• Contact	1251-1679	2
15	• PRT Sensor	19231-60660	1
16	• Contact	1251-5963	2
17	• Flexible Sleeving 1/4 x 20 inches	0890-0862	1

NOTE: A second heater element is used in the FPD detector; HP Part No. 19256-60540 (refer to Sheet 6 for illustration).

Figure 6. Flame Photometric Detector (FPD) (Sheet 1 of 6).

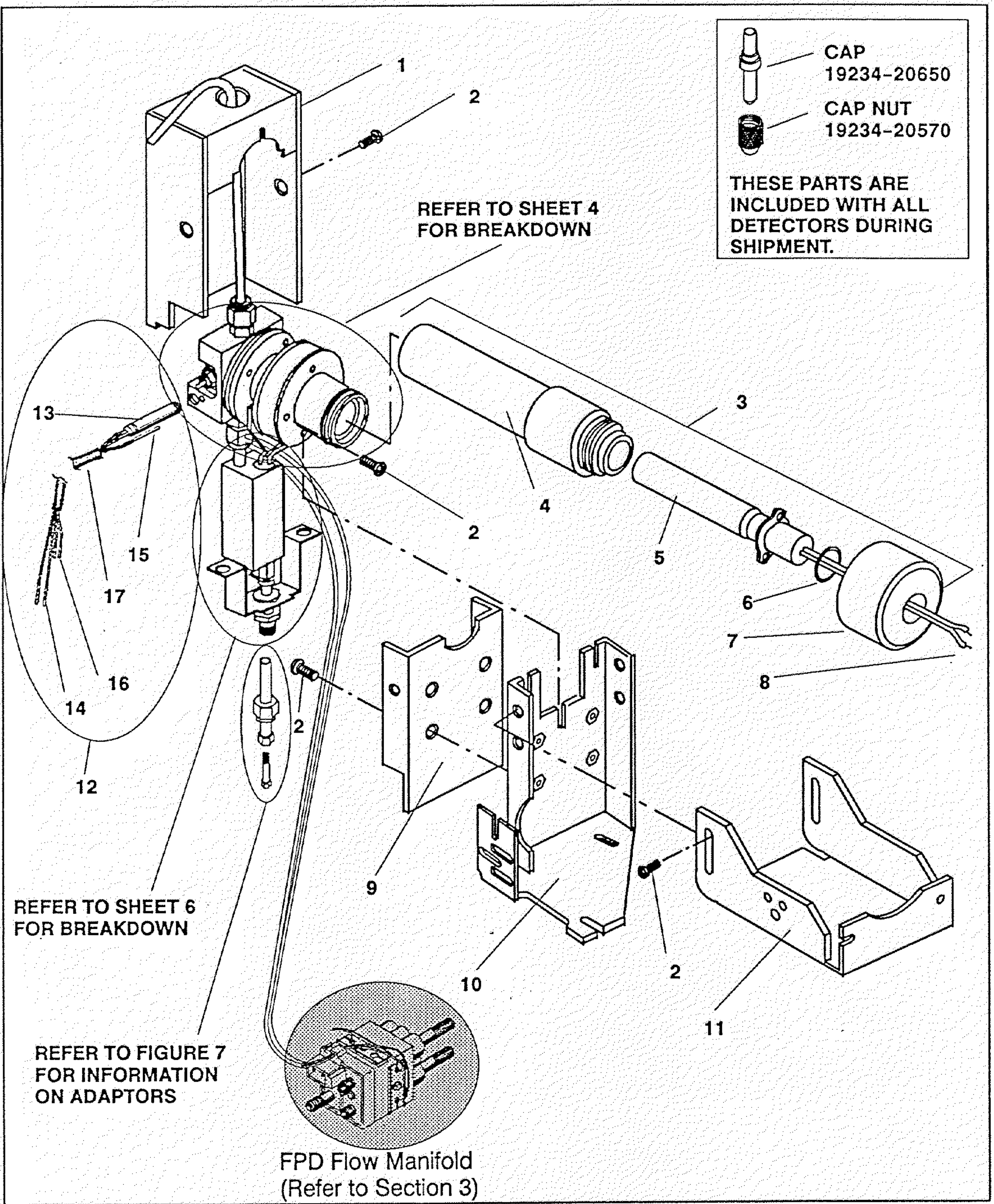


Figure 6. Flame Photometric Detector (FPD) (Sheet 2 of 6).

Item	Description	HP Part No.	Qty.
18	O–ring, Silicone .926–inch id	0905–0955	1
19	Second Heat Shield Window	19256–80060	1
20	O–ring, Silicone 1.05–inch id	0905–1104	1
21	Flange Adaptor	19256–20510	1
22	Flange Ring	19256–00200	1
23	O–ring, Viton 1.239–inch id	0905–1100	1
24	Filter, Sulphur		1
	393 Nm	19256–80000	–
	525 Nm	19256–80010	–
25	Drip Tube	19256–20730	1
26	Clamp	19256–00090	1
27	Screw, M3 x 25 mm–long	0515–0065	4
28	Exit Tube Assembly	19256–20700	1
29	Brass Nut, 1/4–inch	0100–0056	1
30	Vespel Ferrule, 1/4–inch id	0100–1061	1
31	Block Weldment	19256–80560	1
32	Heat Shield Gasket	19256–80040	1
33	First Heat Shield Window	19256–80030	1
34	Heat Shield Disk	19256–20580	1
35	Stainless Steel Coupling	19256–20550	1
36	Lock Washer	2190–0108	4
37	Screw, M3 x 12 mm–long	0515–0105	4
38	O–ring, Kalrez 2010	0905–1102	1
39	Ignitor Spacer	19256–20590	1
40	Glow–Plug	0854–0141	1
41	Diode Bridge Assembly.	19256–60570	1

Figure 6. Flame Photometric Detector (FPD) (Sheet 3 of 6).

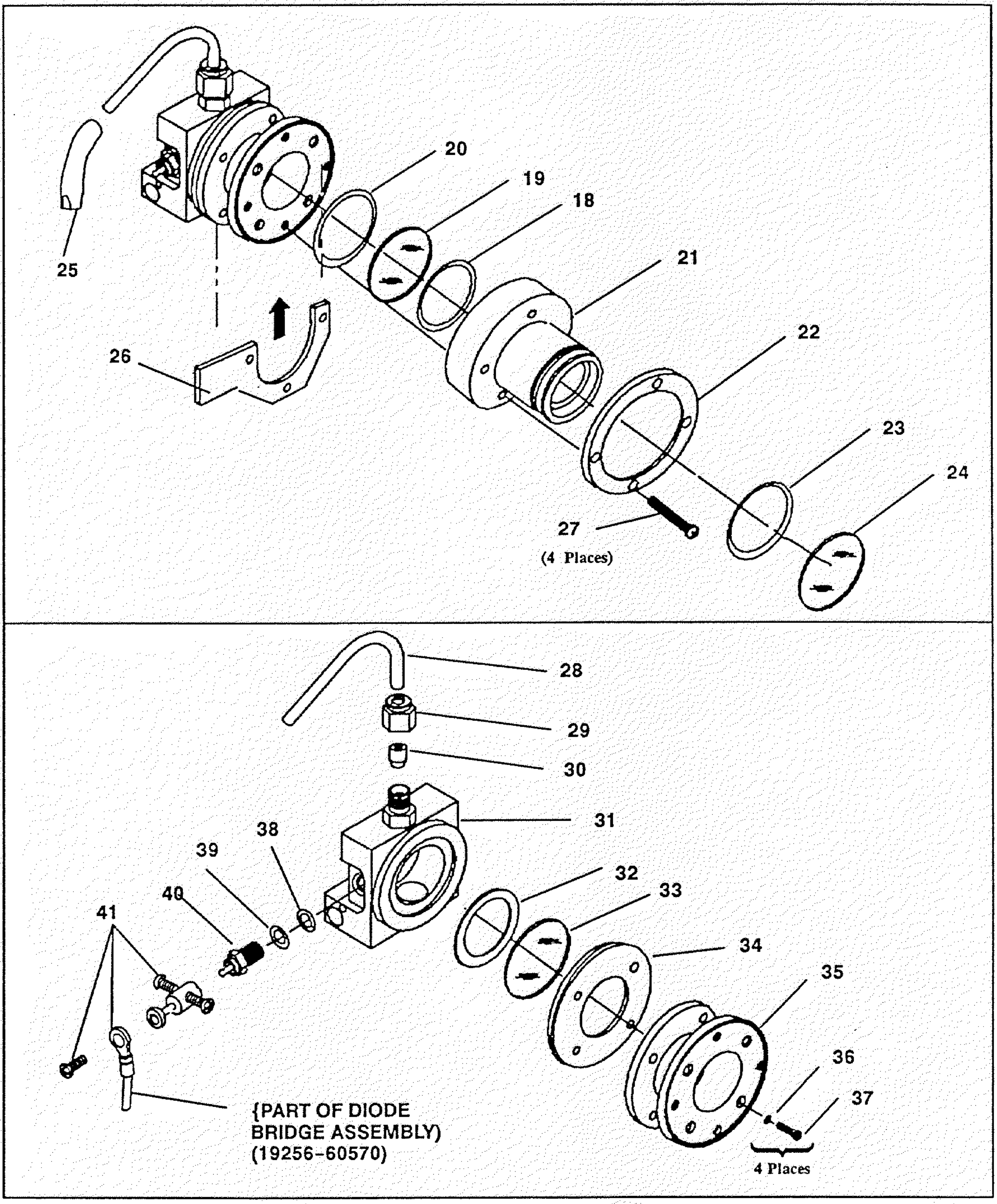


Figure 6. Flame Photometric Detector (FPD) (Sheet 4 of 6).

Item	Description	HP Part No.	Qty.
42	O-ring, Kalrez	0905-1103	1
43	Jet Weldment	19256-80580	1
44	Vespel Ferrule, 1/4-inch id	0100-1061	1
45	Brass Nut, 1/4-inch	0100-0056	1
46	Heater Assy.	19256-60540	1
47	Lower Heater Block	19256-20500	1
48	O-ring, Kalrez	0905-1101	1
49	Transfer Tube Weldment	19256-80550	1
50	Gigabore Liner/Ferrule	19256-60590	1
51	Base Weldment	19256-80540	1

Figure 6. Flame Photometric Detector (FPD) (Sheet 5 of 6).

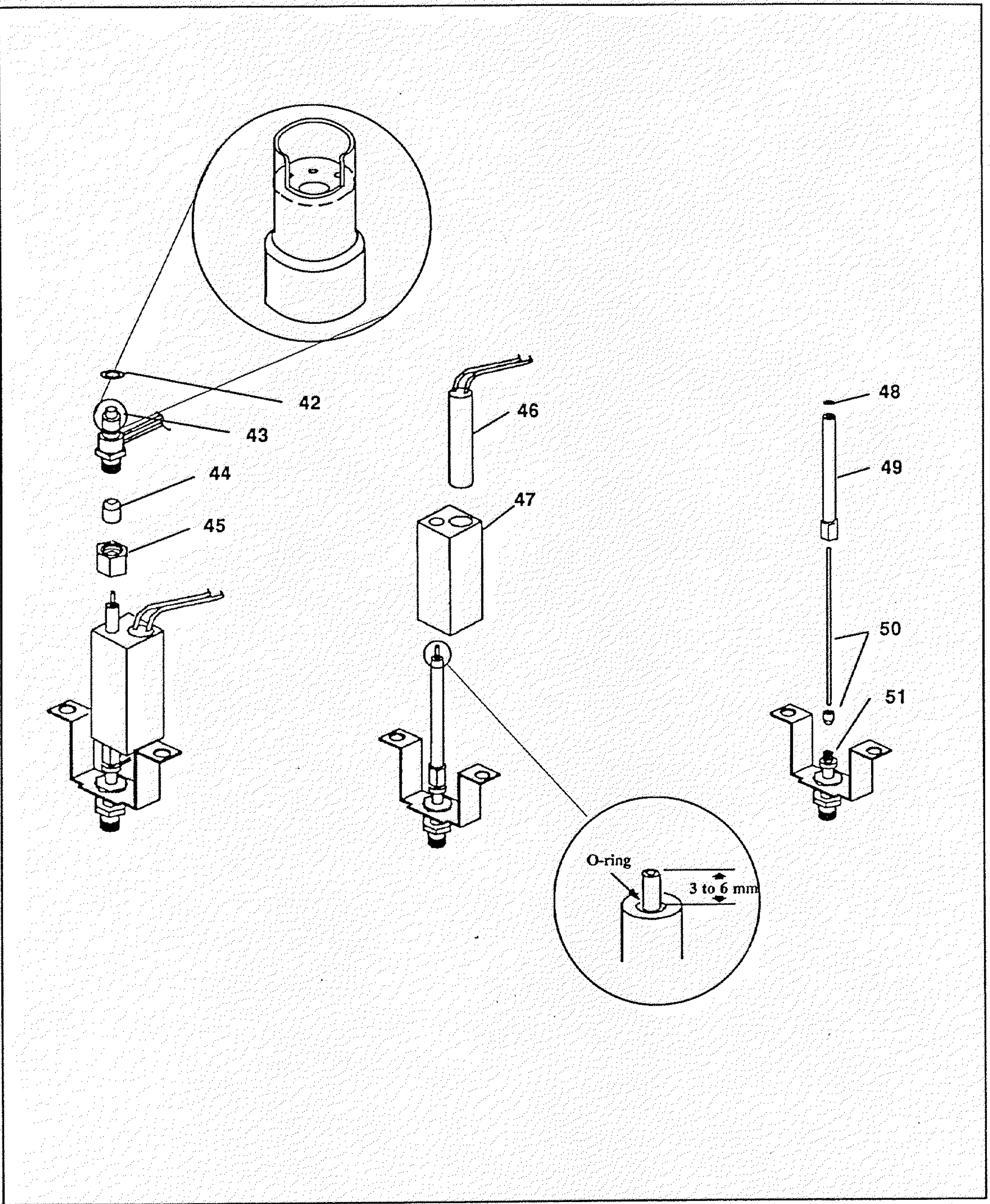
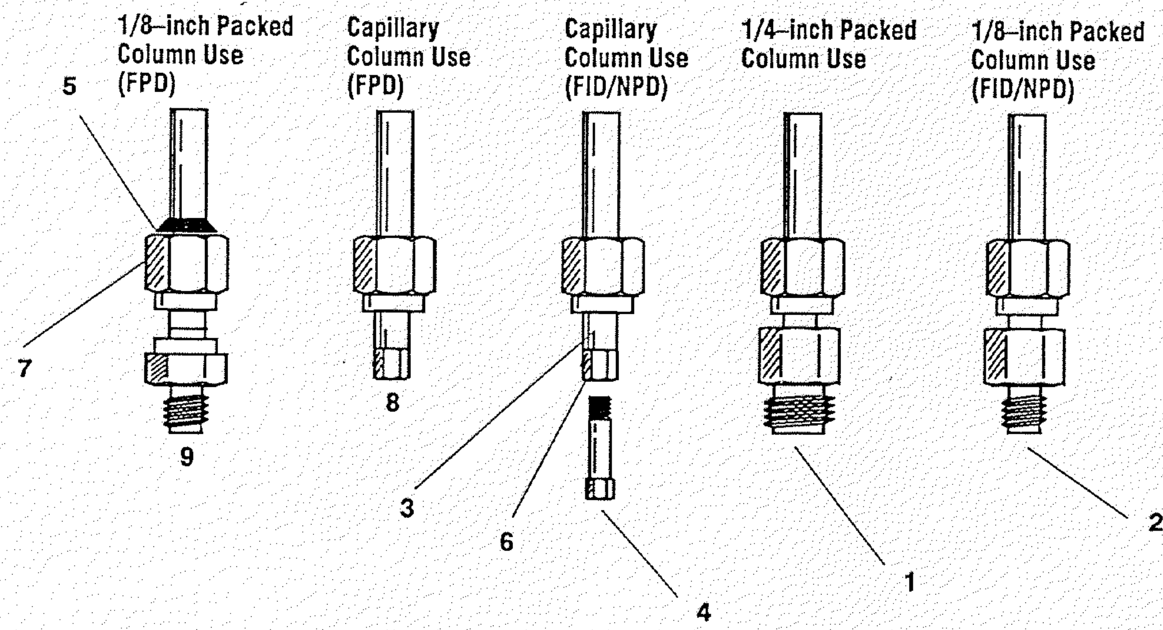
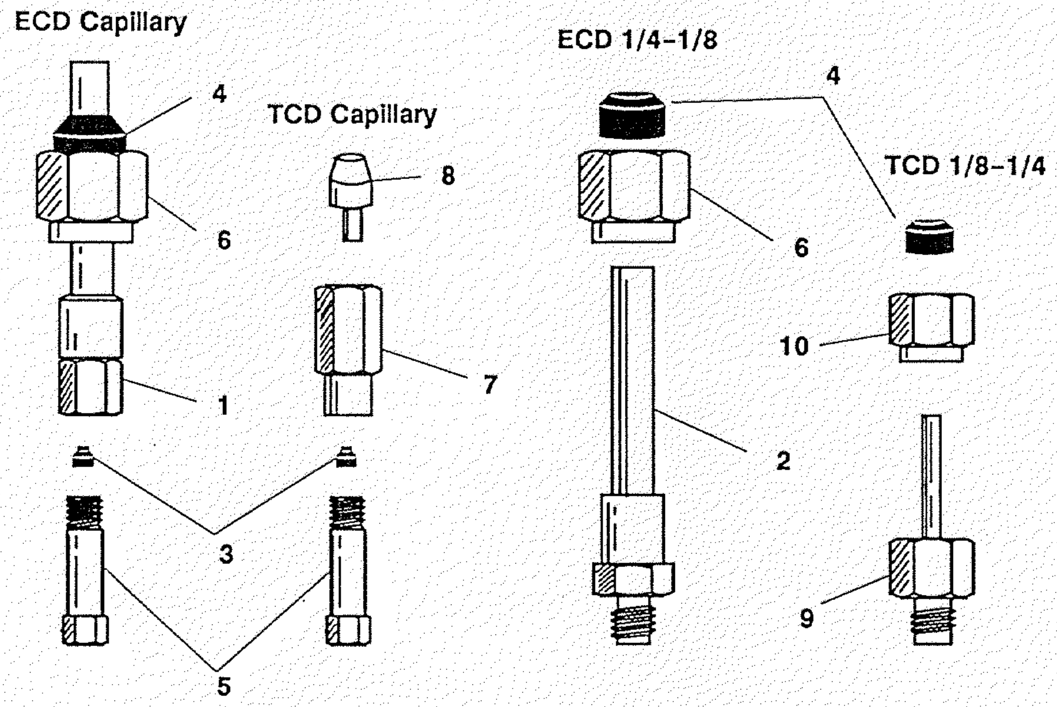


Figure 6. Flame Photometric Detector (FPD) (Sheet 6 of 6).



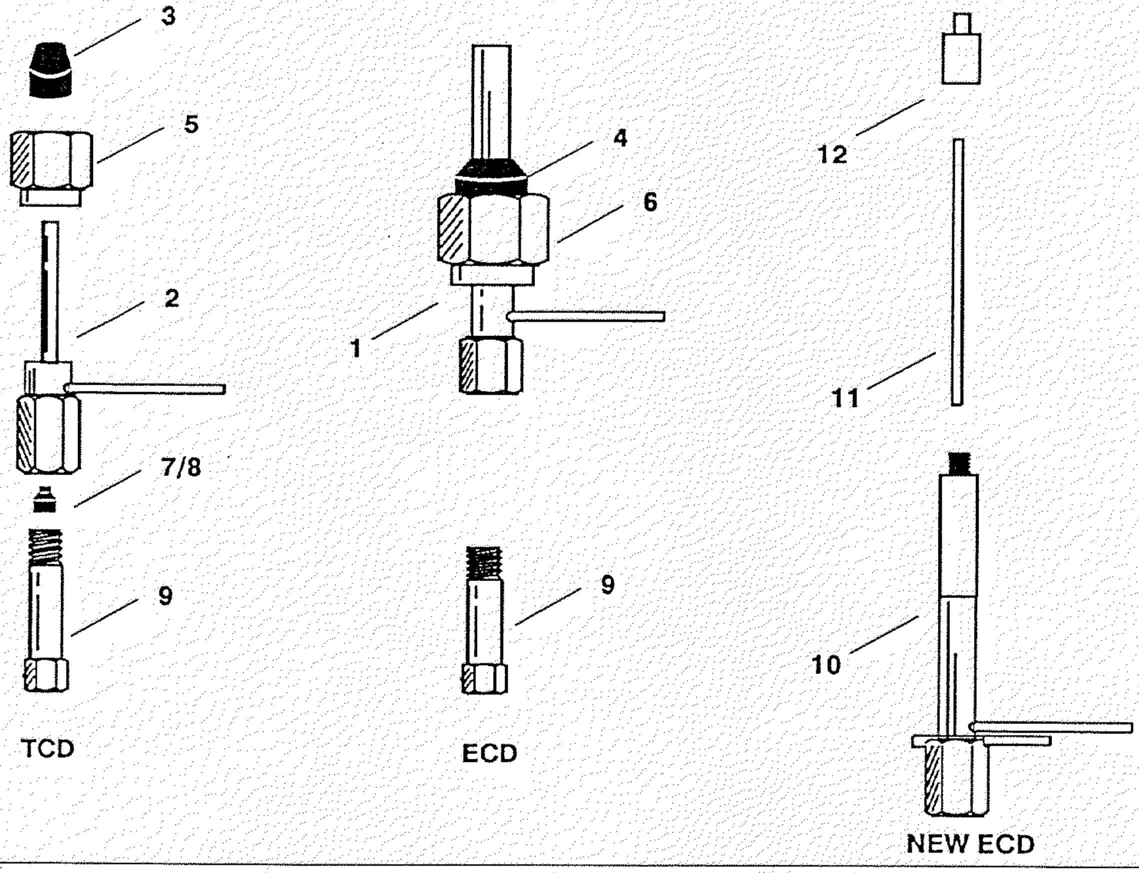
Item	Detector	Column Type	HP Part No.
1	FID/NPD	1/4–inch Packed Column	19231–80530
2	FID/NPD	1/8–inch Packed Column	19231–80520
3	FID/NPD	Capillary Column and	19242–80610
4	FID/NPD	Capillary Column nut	18740–20870
5	FID/NPD	Vespel Ferrule, 1/4–inch	5080–8774
6	FID/NPD	Graphite Ferrule, 0.5 or 1–mm	Table 4–1
7	FID/NPD	Tubing Nut, 1/4–inch	0100–0056
–	TCD/ECD	(Refer to Sheet 3)	–
8	FPD	Capillary Column	19256–80570
9	FPD	1/8–inch Packed Column	19256–80590

Figure 7. Detector Column and Makeup Gas Adaptors (Sheet 1 of 3).



Item	Description	HP Part No.
1	ECD Column Adaptor for Glass and HP Series 530 μ	19244-80550
2	ECD Column Adaptor, 1/4-inch to 1/8-inch metal	19301-80530
3	Vespel Ferrule, 1/4-inch id (graphitized or plain)	Table 4-1
4	Graphite Ferrule, 0.5 or 1.0-inch id	Table 4-1
5	Capillary Column Nut	18740-20870
6	Tubing Nut, 1/4-inch tube (brass)	0100-0056
7	TCD Column Adaptor Nut for Glass/HP Series 530 μ	18740-20960 and
8	TCD Column Adaptor Seal	18740-20950
9	TCD Column Adaptor, 1/8-inch to 1/4-inch Glass	19302-80020
10	Tubing Nut, 1/8-inch tube (brass)	0100-0058

Figure 7. Detector Column and Makeup Gas Adaptors (Sheet 2 of 3).



Item	Description of Liner	HP Part No.
1	Makeup Gas Adapter, ECD	19233–80550
2	Makeup Gas Adaptor	19232–80550
3	Vespel Ferrule*, 1/8–inch id	Table 4–1
4	Vespel Ferrule*, 1/4–inch id	Table 4–1
5	Tubing Nut, 1/8–inch tube (brass)	0100–0058
6	Tubing Nut, 1/4–inch tube (brass)	0100–0056
7	Graphite Ferrule, 0.5–mm id (10 pack)	Table 4–1
8	Graphite Ferrule, 1.0–mm id (10 pack)	Table 4–1
9	Capillary Column Nut	18740–20870
10	New ECD Makeup Gas Adapter	19233–80565
11	Gigabore Liner	19233–20625
12	End Cap	19233–20755

* = Graphitized Vespel Ferrule or Plain Vespel Ferrule

Figure 7. Detector Column and Makeup Gas Adaptors (Sheet 3 of 3).

Table 1. Typical Fittings for Columns and Inlet/Detector Liners, Adaptors, and Inserts.

Type	Description	Typical Use	HP Part No.
1/4–inch swage stainless steel, pkg. of 20 each	nut front ferrule back ferrule	1/4–inch packed metal columns	5080–8753
1/8–inch swage stainless steel, pkg. of 20 each	nut front ferrule back ferrule	1/8–inch packed metal columns	5080–8751
1/4–inch swage brass, pkg. of 20 each	nut front ferrule back ferrule	1/4–inch packed metal columns	5080–8752
1/8–inch swage brass, pkg. of 20 each	nut front ferrule back ferrule	1/8–inch packed metal columns	5080–8750
Vespel pkg. of 10	1/4–inch ferrule	inlet/detector liners, 1/4–inch glass packed columns	5080–8774
Vespel pkg. of 10	1/8–inch ferrule	metal columns	0100–1107
Graphite, pkg. of 10	1.0–mm ferrule	capillary columns	5080–8773
Graphite, pkg. of 10	0.5–mm ferrule	capillary columns	5080–8853
Graphite	6.35–mm O–ring	inlet/detector liners, 1/4–inch glass packed columns split capillary inlet insert	0905–0767
Graphite	6.52–mm O–ring	splitless capillary inlet insert	0905–1004
Silicone	6.0–mm O–ring	inlet/detector liners 1/4–inch glass packed columns split/splitless capillary inserts	0905–0322
Silicone	1.0–mm O–ring	capillary columns	0905–0759

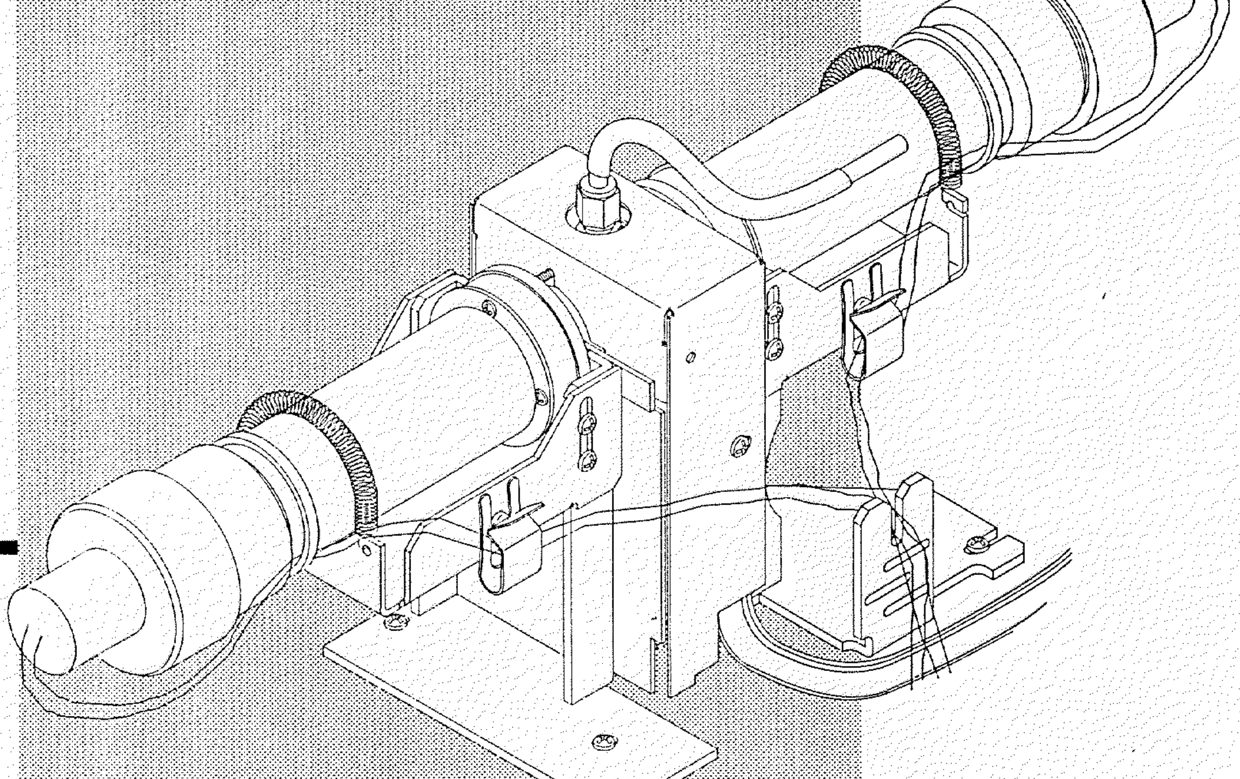
NOTE: Dimensions given are ids of O–rings/Ferrules.

HEWLETT PACKARD

HP 5890A#241

Dual Wavelength Flame Photometric Detector

Illustrated Parts Breakdown



The Dual Wavelength Flame Photometric Detector

The Dual Wavelength FPD Lid

Item	Description	HP Part No.	Qty
1	Dual Wavelength FPD Lid	19256-00250	1

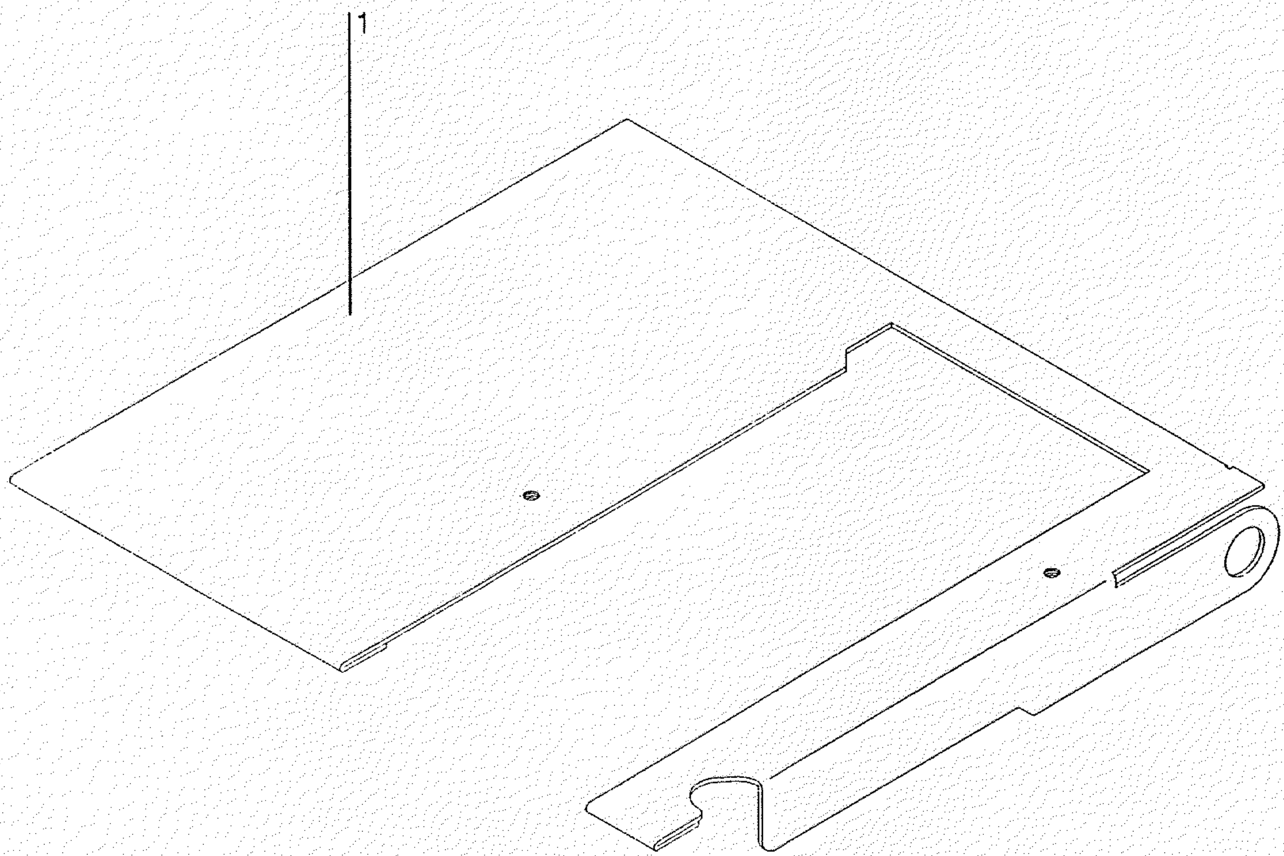


Figure 1. The Dual Wavelength FPD Lid

The Front Bracket Assembly

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm long	0515-0910	7
2	Support Bracket	19256-00080	1
3	Clip	05890-80070	1
4	Front Bracket	19256-00220	1
5	Chimney Front	19256-00270	1

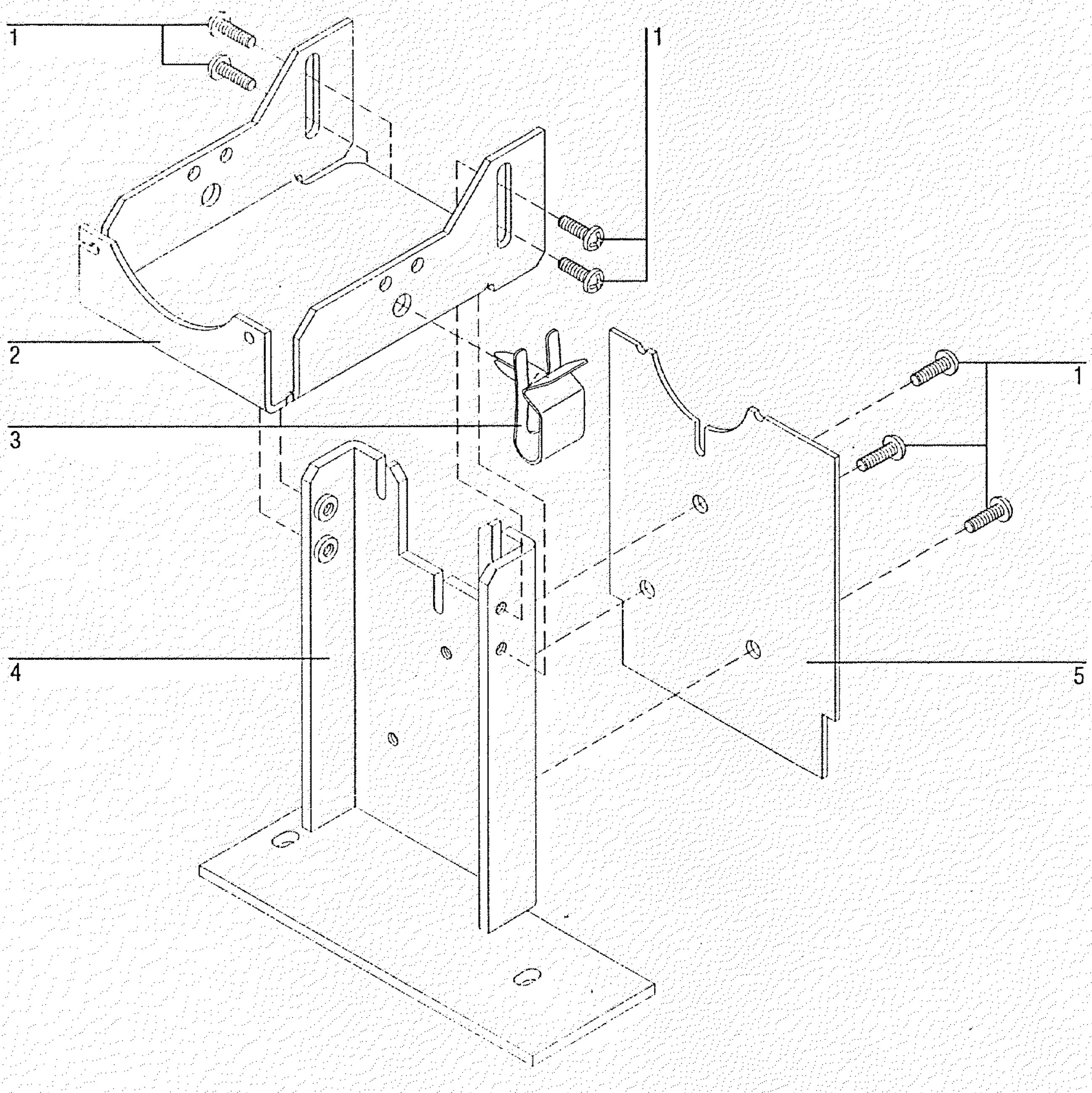


Figure 2. The Front Bracket Assembly

The Back Bracket Assembly

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm long	0515-0910	8
2	Chimney Back	19256-00100	1
3	Support Bracket	19256-00080	1
4	Clip	05890-80070	1
5	Back Bracket	19256-00060	1

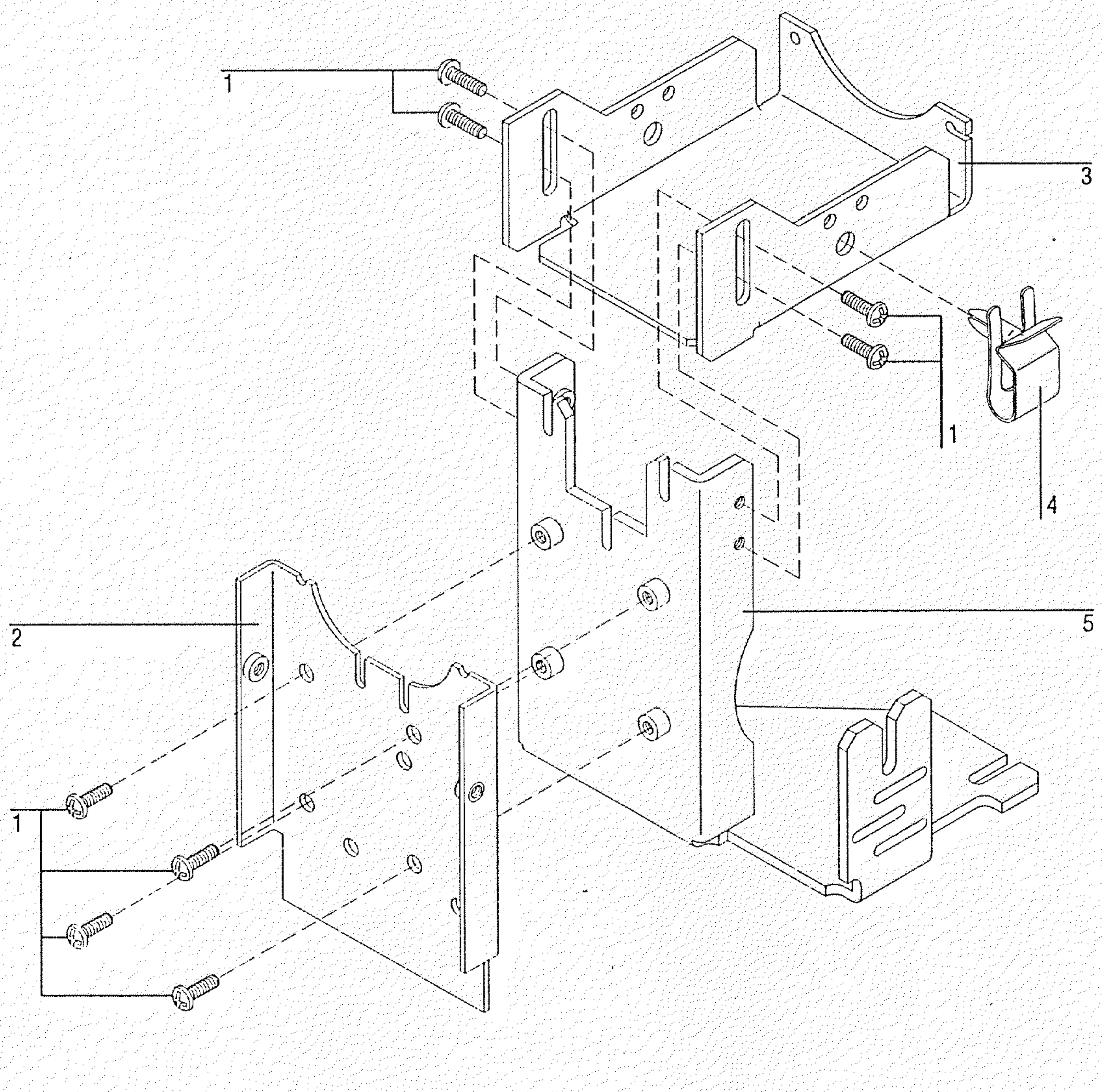


Figure 3. The Back Bracket Assembly

The Detector Block Assembly

Item	Description	HP Part No.	Qty
1	O-ring, Kalrez	0905-1103	1
2	Jet Weldment	19256-80580	1
3	Vespel Ferrule, 1/4-inch id (Package of 10)	5080-8774	1
4	Brass Nut, 1/4 inch (Package of 10)	5180-4105	1
5	Lower Heater Block	19256-20500	1
6	O-ring, Kalrez	0905-1101	1
7	Transfer Tube Weldment	19256-80550	1
8	Gigabore Liner/Ferrule	19256-60590	1
9	Screw, M4 x 8 mm long	0515-0910	2
10	Base Weldment	19256-80540	1

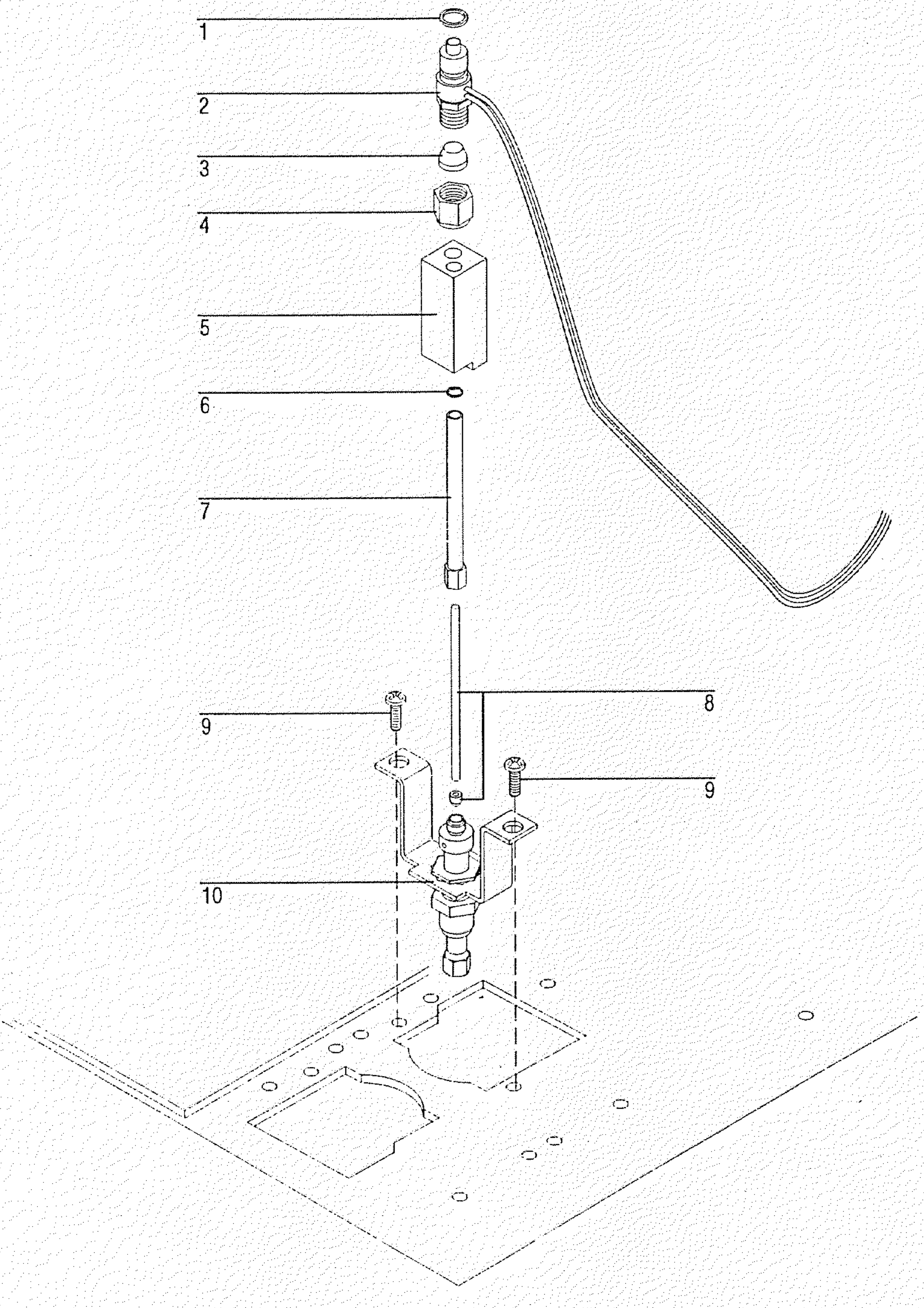


Figure 4. The Detector Block Assembly

Mounting the Bracket Assemblies

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm long	0515-0910	4
2	Front Bracket Assembly	NA	1
3	Back Bracket Assembly	NA	1

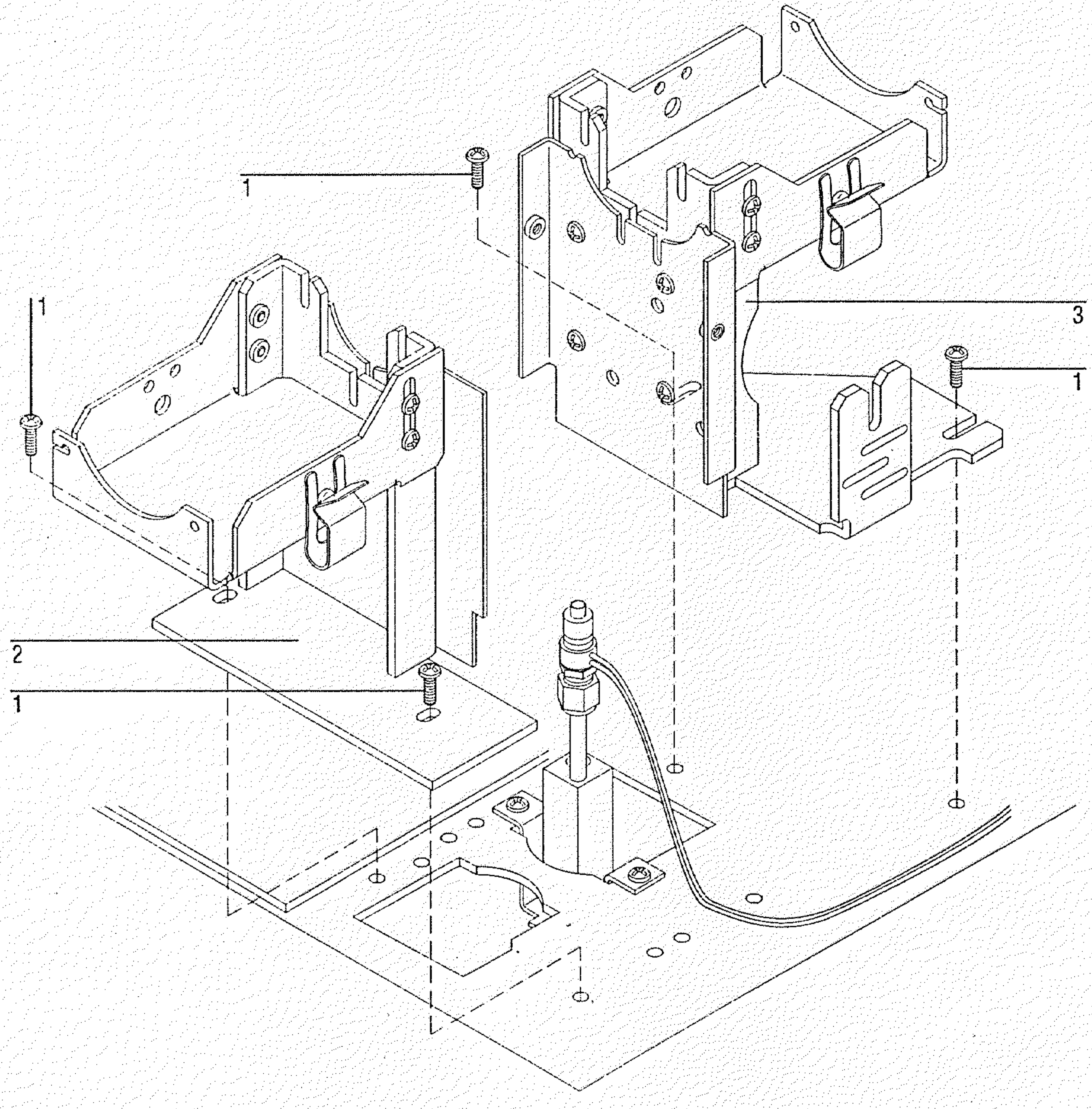


Figure 5. Mounting the Bracket Assemblies

The Front Stainless Steel Coupling

Item	Description	HP Part No.	Qty
1	Heat Shield Gasket	19256-80040	1
2	First Heat Shield Window	19256-80030	1
3	Heat Shield Disk	19256-20580	1
4	Stainless Steel Coupling	19256-20550	1
5	Lock Washer	2190-0584	4
6	Screw, M3 x 12 mm long	0515-0105	4
7	Dual Wavelength FPD Block Weldment	19256-80600	1

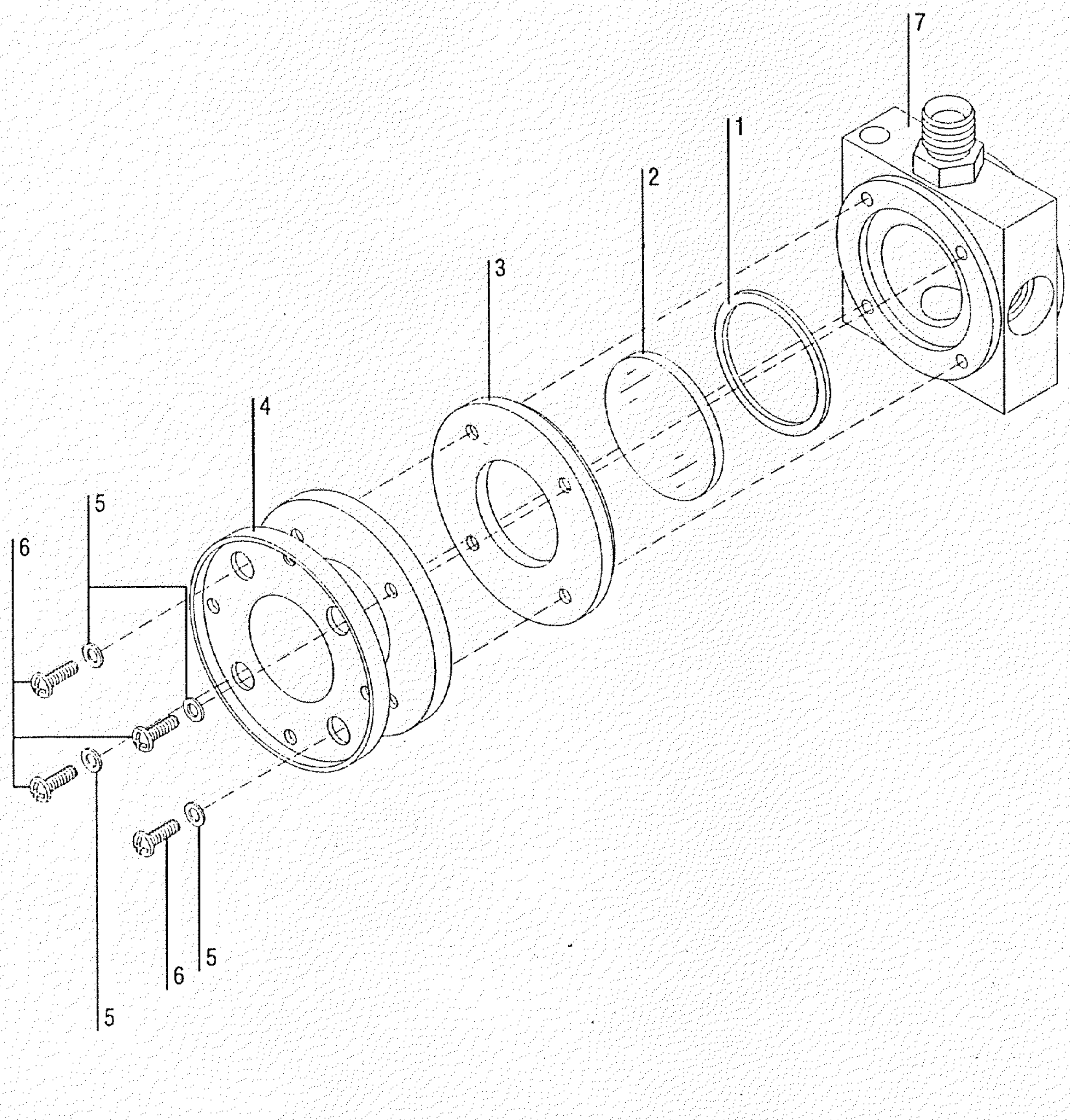


Figure 6. The Front Stainless Steel Coupling

The Back Stainless Steel Coupling

Item	Description	HP Part No.	Qty
1	Heat Shield Gasket	19256-80040	1
2	First Heat Shield Window	19256-80030	1
3	Heat Shield Disk	19256-20580	1
4	Stainless Steel Coupling	19256-20550	1
5	Lock Washer	2190-0584	4
6	Screw, M3 x 12 mm long	0515-0105	4

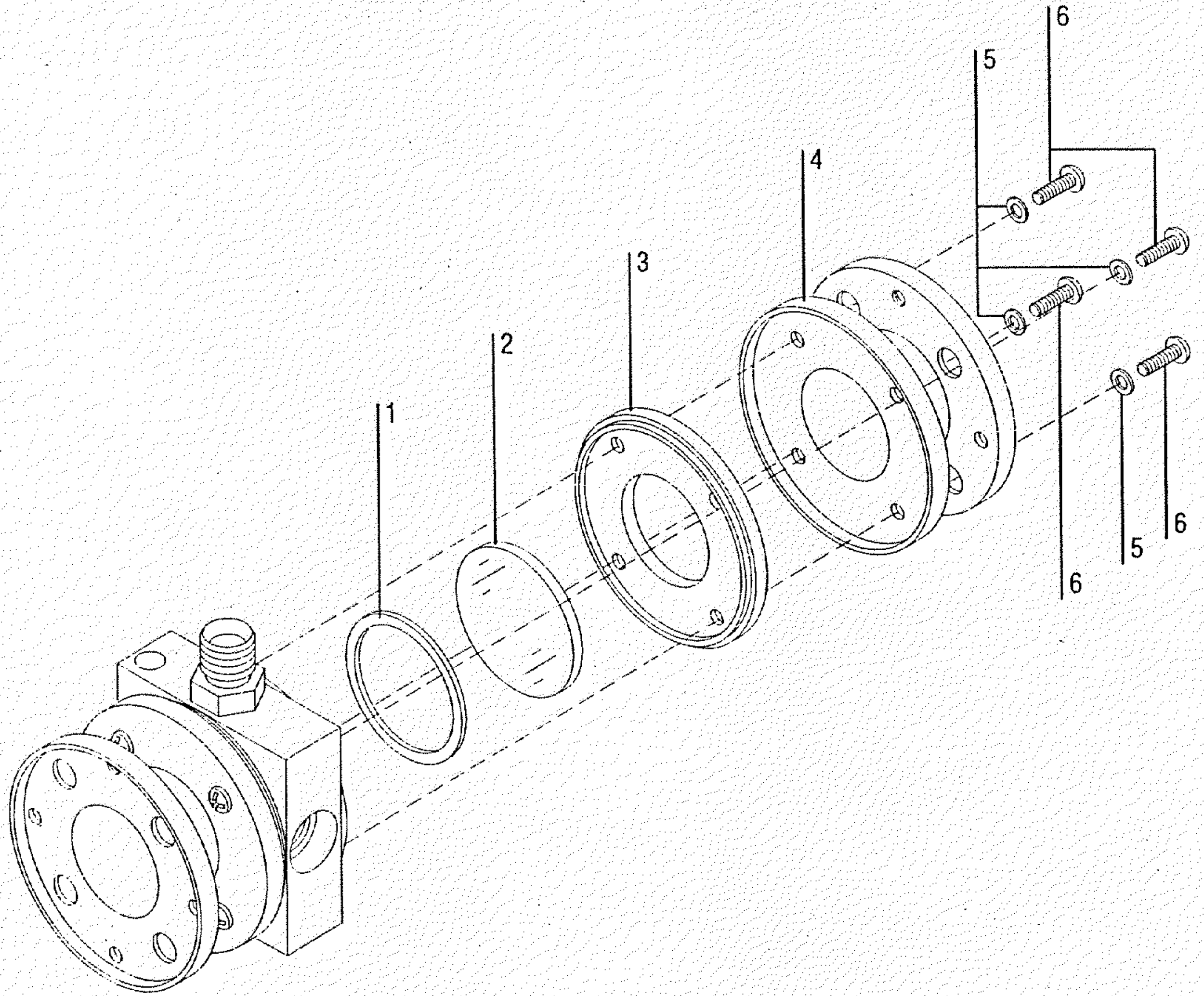


Figure 7. The Back Stainless Steel Coupling

The Front Flange Adaptor

Item	Description	HP Part No.	Qty
1	O-ring, Silicone 1.05-inch id	0905-1104	1
2	O-ring, Silicone 0.926-inch id	0905-0955	1
3	Second Heat Shield Window	19256-80060	1
4	Flange Adaptor	19256-20510	1
5	Flange Ring	19256-00200	1
6	Screw, M3 x 25 mm long	0515-0065	1
7	O-ring, Viton 1.239-inch id	0905-1100	1
8	Filter, Sulphur		1
	393 nm	19256-80000	
	525 nm	19256-80010	
9	Clamp	19256-00090	1

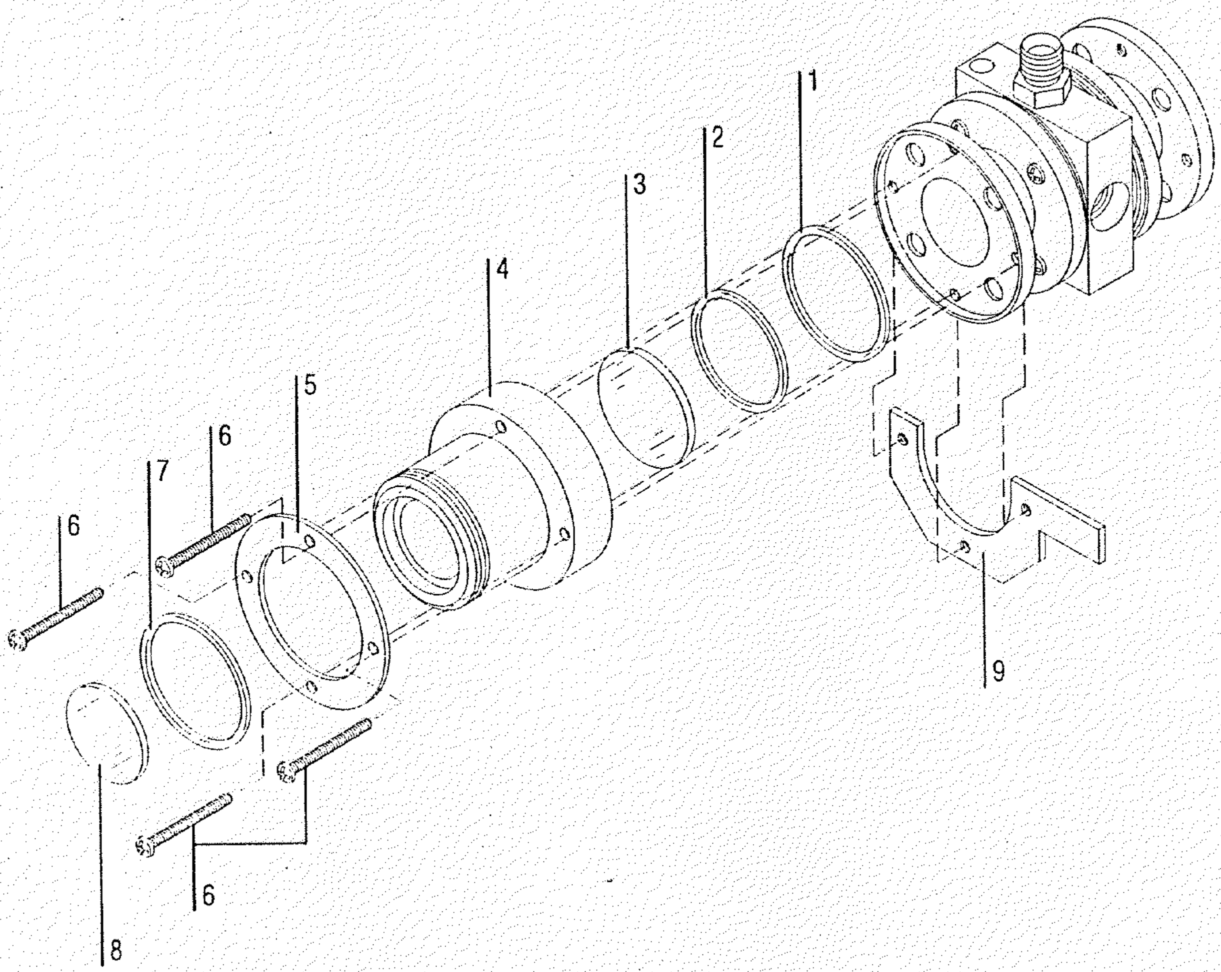


Figure 8. The Front Flange Adaptor

The Back Flange Adaptor

Item	Description	HP Part No.	Qty
1	O-ring, Silicone 1.05-inch id	0905-1104	1
2	O-ring, Silicone 0.926-inch id	0905-0955	1
3	Second Heat Shield Window	19256-80060	1
4	Flange Adaptor	19256-20510	1
5	Flange Ring	19256-00200	1
6	Screw, M3 x 25 mm long	0515-0065	1
7	O-ring, Viton 1.239-inch id	0905-1100	1
8	Filter, Sulphur		1
	393 nm	19256-80000	
	525 nm	19256-80010	
9	Clamp	19256-00090	1

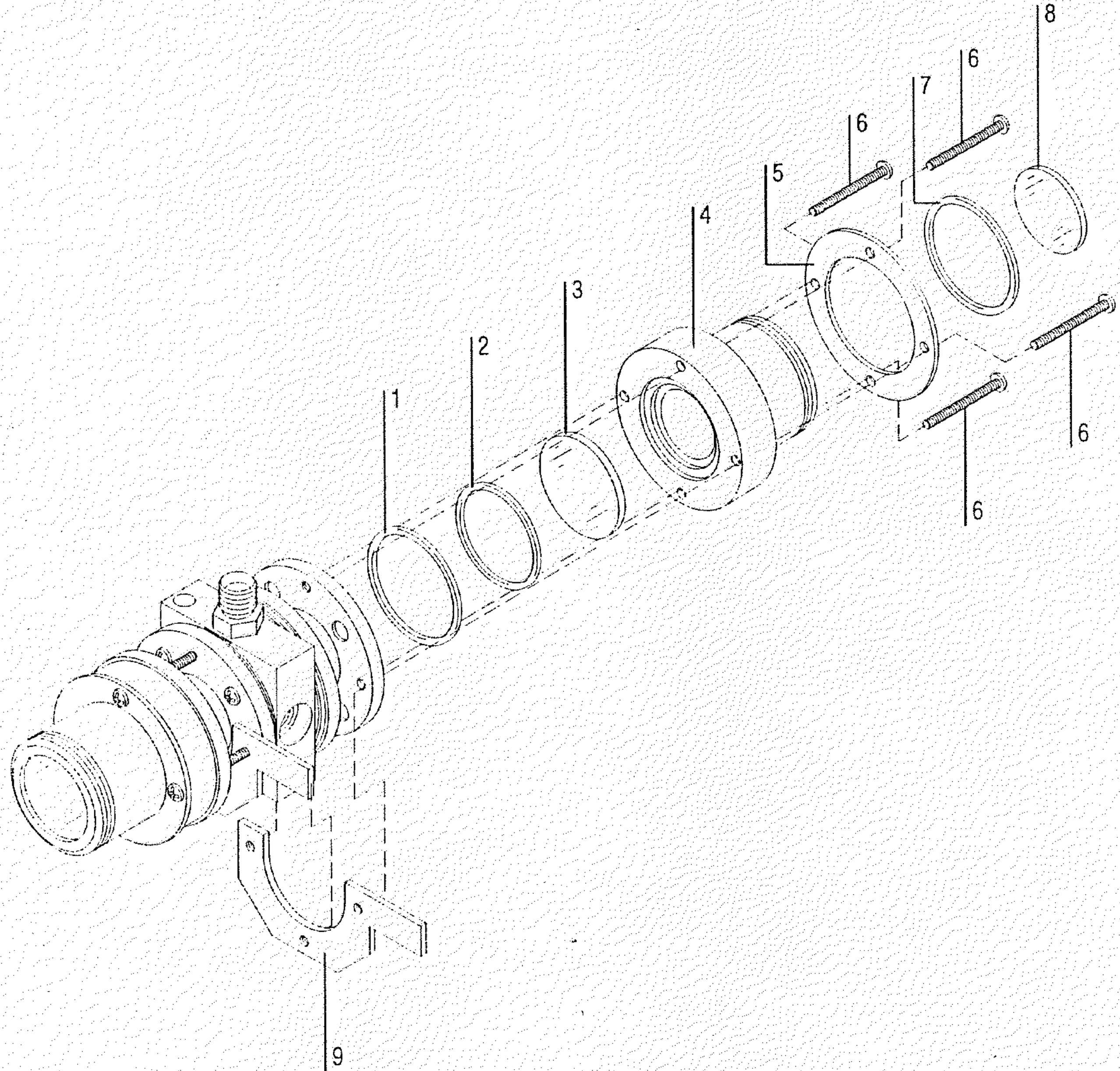


Figure 9. The Back Flange Adaptor

Mounting the Detector

Item	Description	HP Part No.	Qty
1	Detector	NA	1
2	Front Bracket Assembly	NA	1
3	Back Bracket Assembly	NA	1

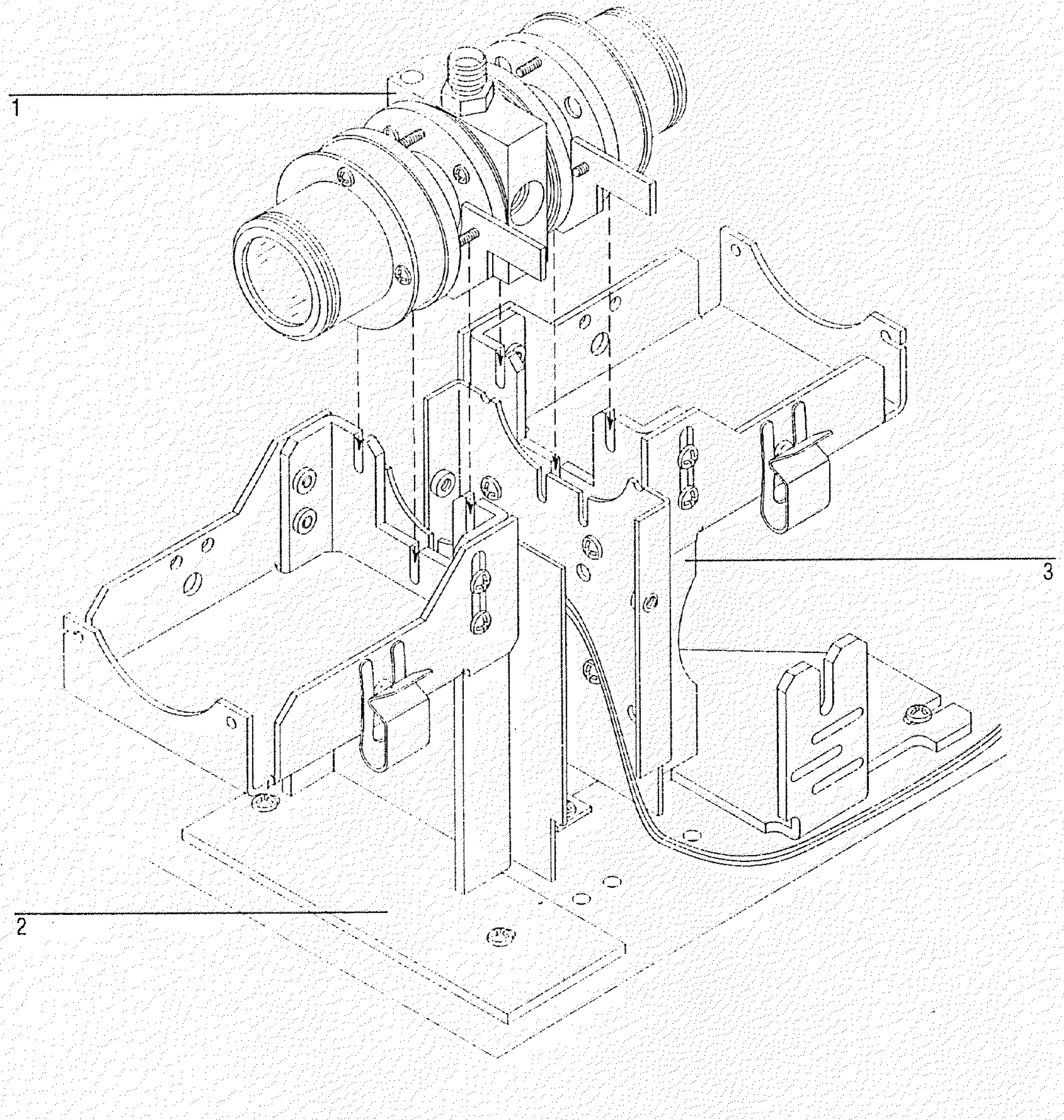


Figure 10. Mounting the Detector

Installing the Heater Assembly

Item	Description	HP Part No.	Qty
1	Dual Wavelength FPD Block Weldment	19256-80600	1
2	Flat Washer	3050-0891	1
3	Screw, M3 x 6 mm long	0515-0924	1
4	Lower Heater Block	19256-20500	1
5	Heater Assembly	19256-60540	1

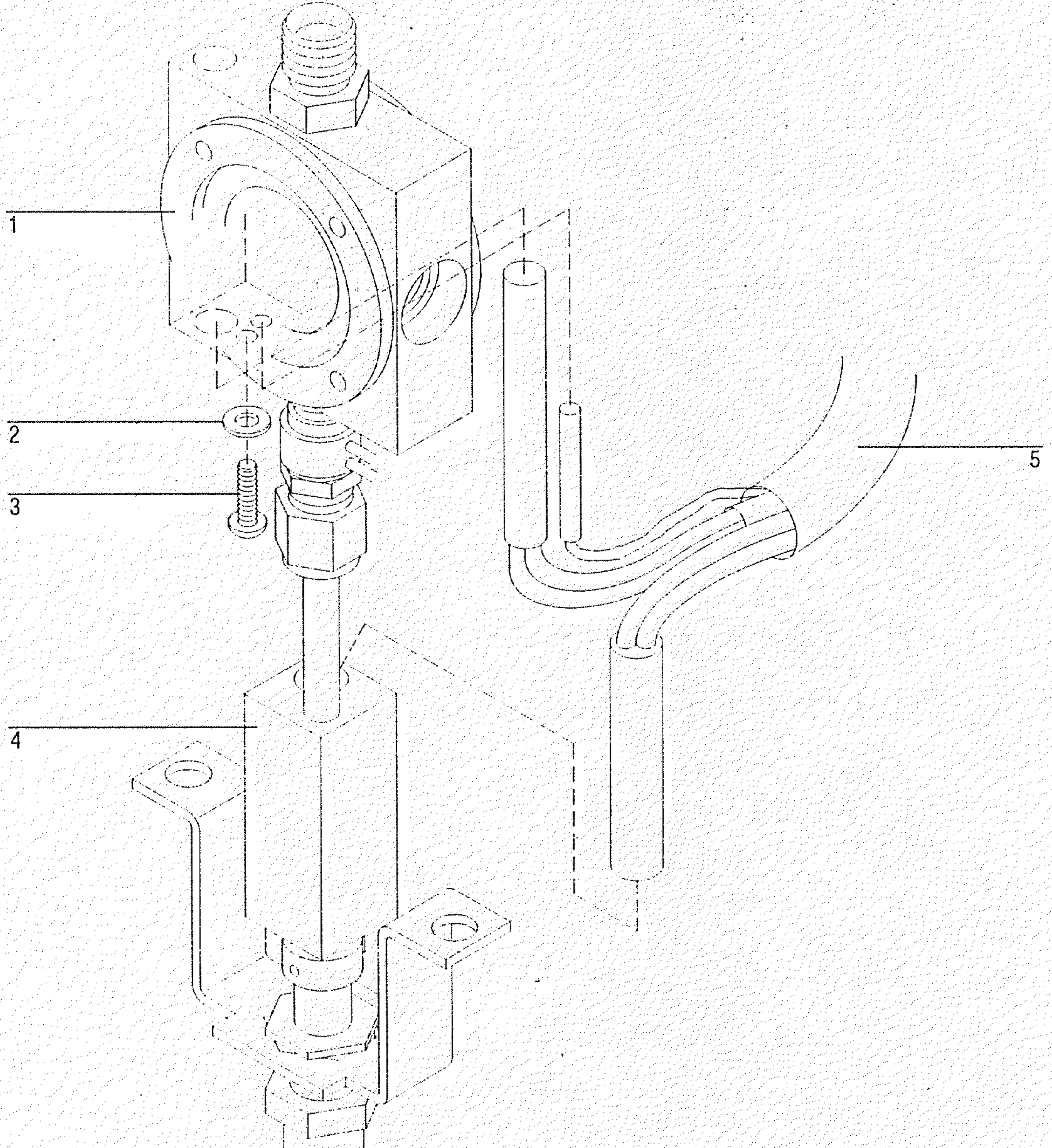


Figure 11. Installing the Heater Assembly

Final Assemblies

Item	Description	HP Part No.	Qty
1	PMT Assembly	19256-60510	2
2	Extension Spring Clamp	1460-1160	2
3	Chimney Cover	19256-80610	1
4	Screw, M4 x 8 mm long	0515-0910	2
5	O-ring, Kalrez 2010	0905-1102	1
6	Ignitor Spacer	19256-20590	1
7	Glow Plug	0854-0141	1
8	Diode Bridge Assembly	19256-60570	1

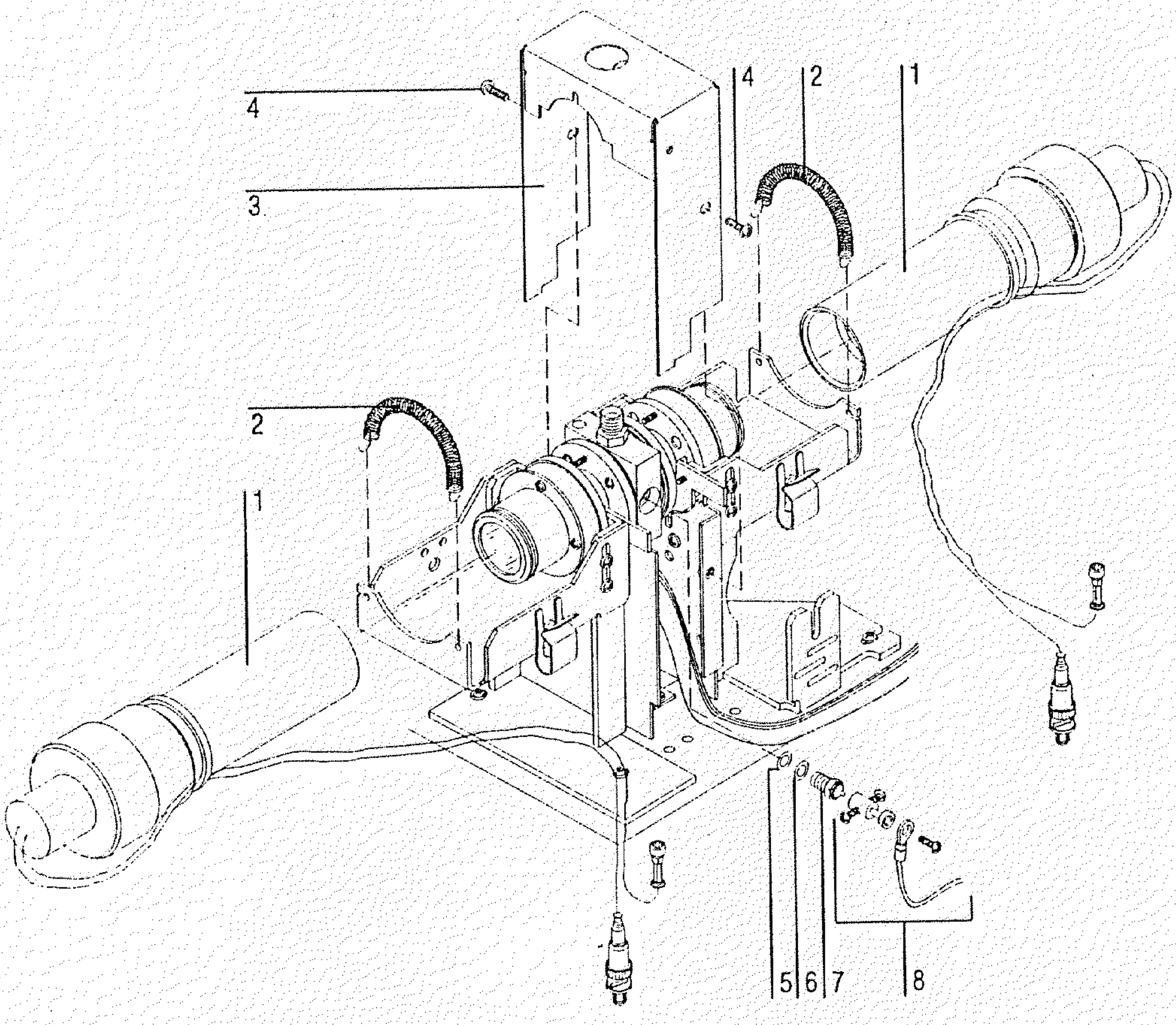


Figure 12. Final Assemblies

The Exit Tube Assembly

Item	Description	HP Part No.	Qty
1	Exit Tube Assembly	19256-20700	1
2	Brass Nut, 1/4 inch (Package of 10)	5180-4105	1
3	Back ferrule, 1/4 inch (Package of 10)	5180-4117	1
4	Front Ferrule, 1/4 inch (Package of 10)	5180-4111	1
5	Clip	05890-80070	2

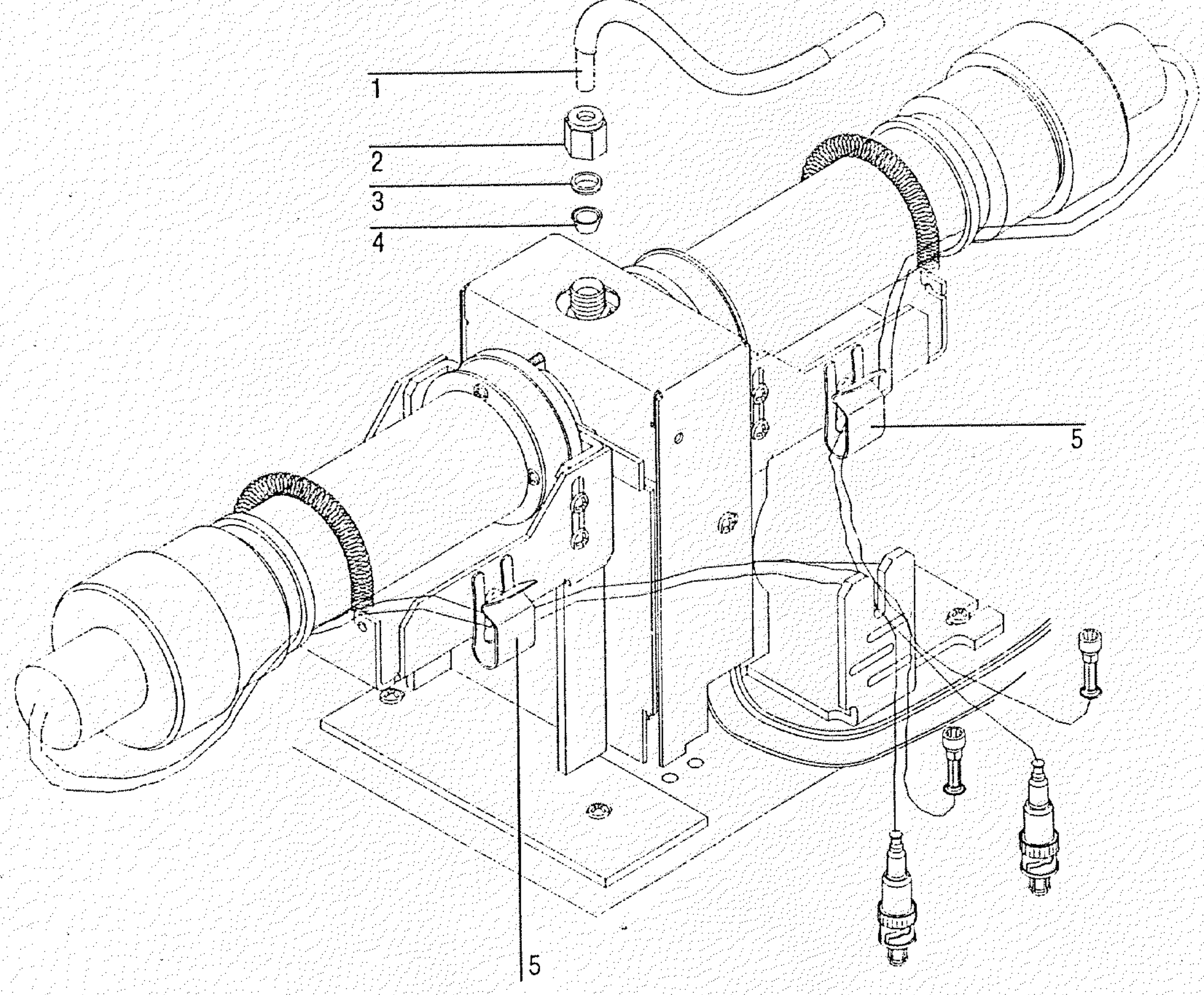


Figure 13. The Exit Tube Assembly

The Cover Assembly

Item	Description	HP Part No.	Qty
	Dual Wavelength FPD Cover Assembly	19256-80620	1
1	Front Cover	NA	1
2	Back Cover	NA	1
3	Screw, M4 x 8 mm long	0515-0910	4

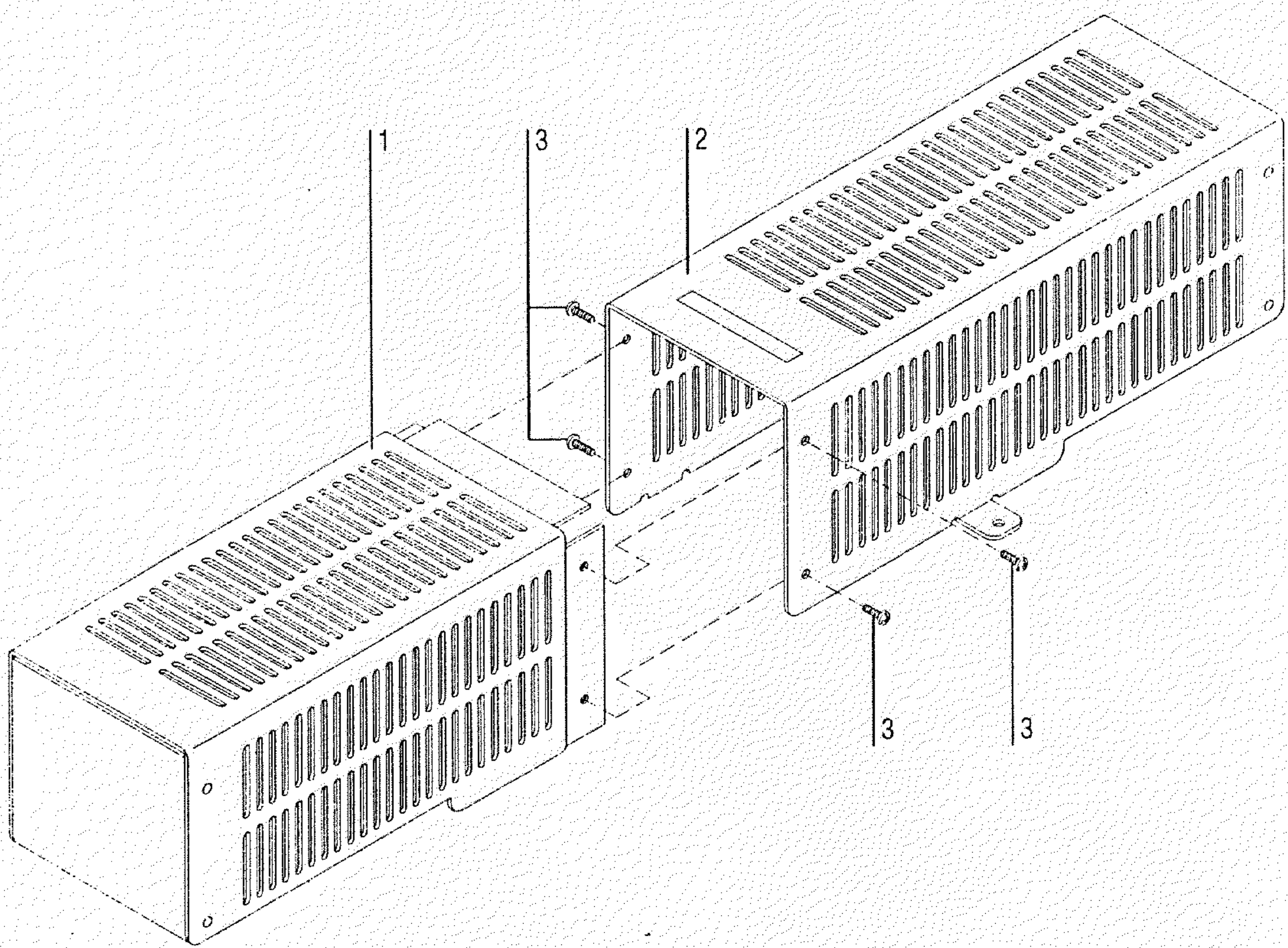


Figure 14. The Cover Assembly

Mounting the Cover Assembly

Item	Description	HP Part No.	Qty
1	Thumb Screws	19256-20770	2
2	Dual Wavelength FPD Cover Assembly	19256-80620	1

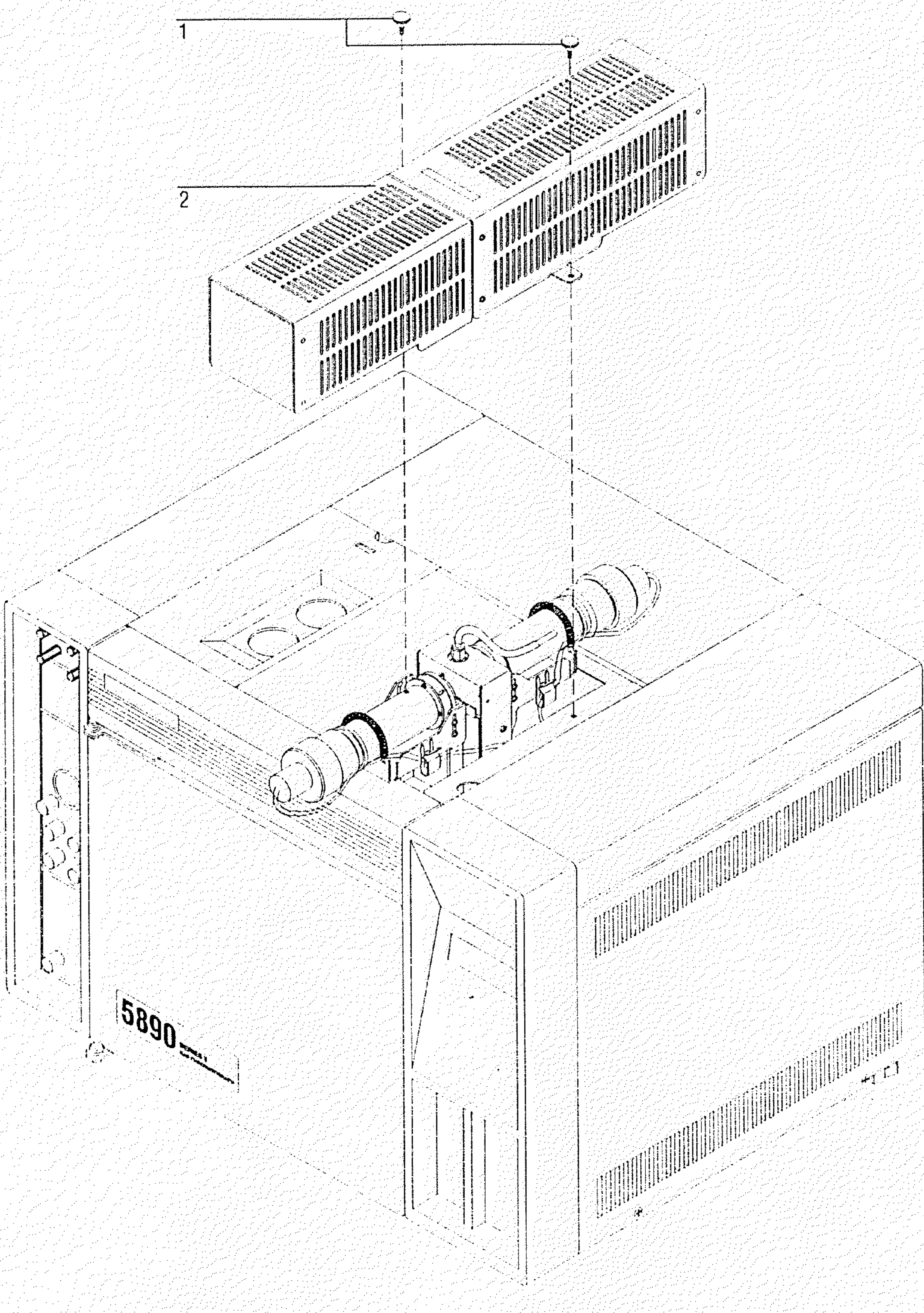


Figure 15. Mounting the Cover Assembly

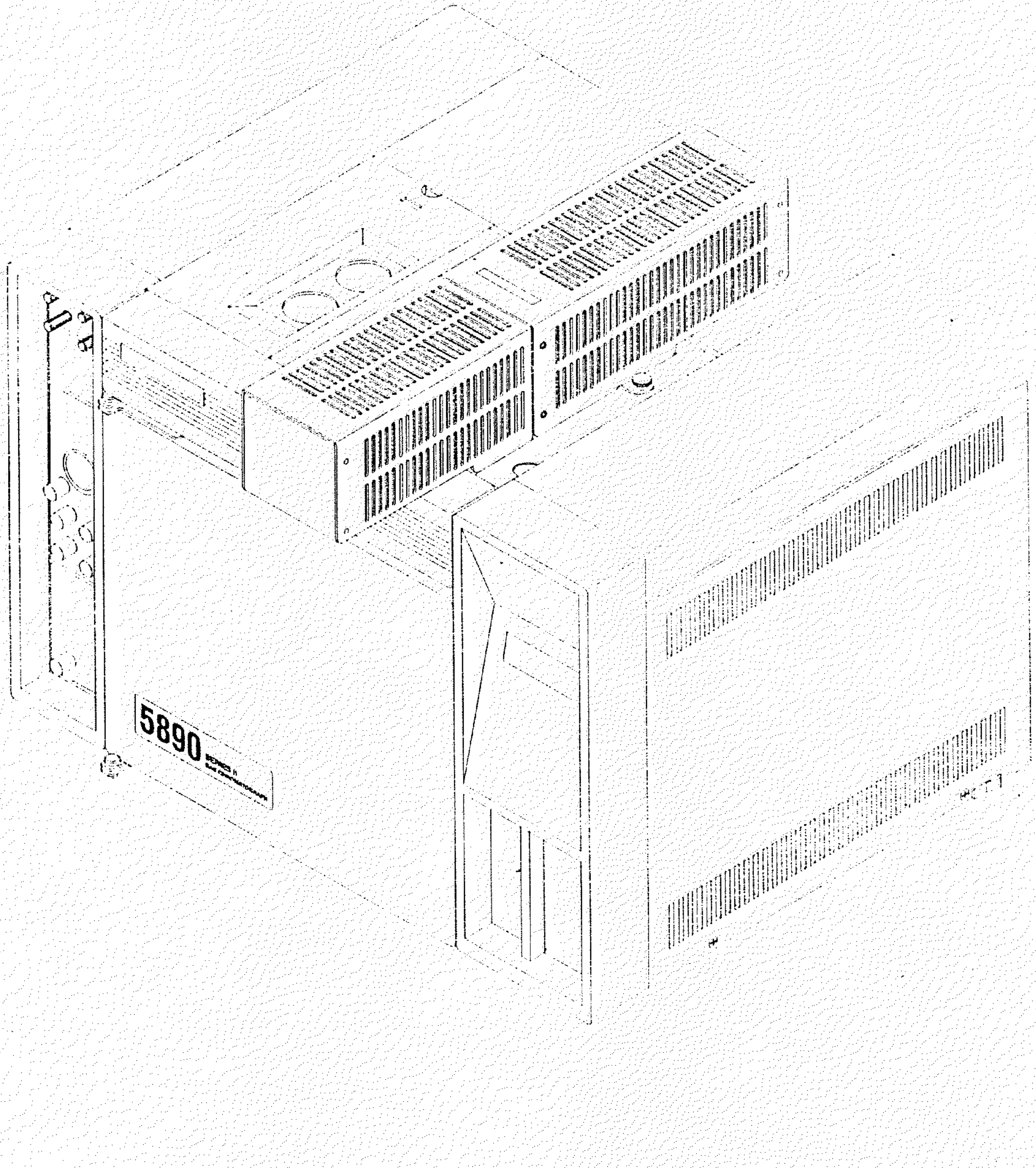


Figure 16. The Dual Wavelength FPD Mounted on the HP 5890 Series II GC

Manual Part No. 19256-90130
Printed in USA (June 1993)

HEWLETT
PACKARD

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 3
Detector Flow Manifold Assemblies

This section contains breakdowns of the various detector flow manifold assemblies available with the HP 5890 Series II Gas Chromatograph. Only the detector flow manifolds are addressed in this section. Refer to section 2 for breakdowns of the associated detectors. Refer to section 9 for diagrams of the Printed Circuit Boards (PCBs) and electronic components associated with the detectors.

Item	Description	HP Part No.	Qty
1	Flow Manifold Block, TCD and ECD	19232–20500	1
2	O–Ring, 0.239–inch id	0905–1014	2
	package of 12	5180–4182	–
3	Restrictor, TCD Ref, Yellow	19232–60650	1
4	Inlet Fitting	19231–20560	2
5	Rear Clamping Plate	19231–40010	1
6	Screw, M4 x 12 mm	0515–0909	3
7	Restrictor, TCD Makeup Gas, Black	19232–60610	1
8	Needle Valve Assembly (4 of Item 9 installed on each)	19231–60650	2
9	Non–Greased O–Ring, 0.208–inch id "Viton"	0905–0999	8
	package of 12	5061–5867	–
	package of 2, greased	5181–1251	–
10	Front Clamping Plate	19231–40070	1
11	Mounting Screw, M4 x 45 mm long	0515–0964	1
12	Outlet Fitting Plate	19231–00060	1
13	Front Ferrule, Brass, 1/8–inch tube	0100–0032	2
14	Back Ferrule, Brass, 1/8–inch tube	0100–0036	2
15	Hex Nut, Brass, 1/8–inch tube	0100–0058	2
16	Non–greased O–Ring, 0.114–inch id	0905–1039	3
	package of 12	5180–4181	–
17	Weldment, Makeup Gas	19232–80550	1
18	Weldment, Reference Gas	19232–80500	1

Figure 1. TCD Flow Manifold Block Assembly (Sheet 1 of 2).

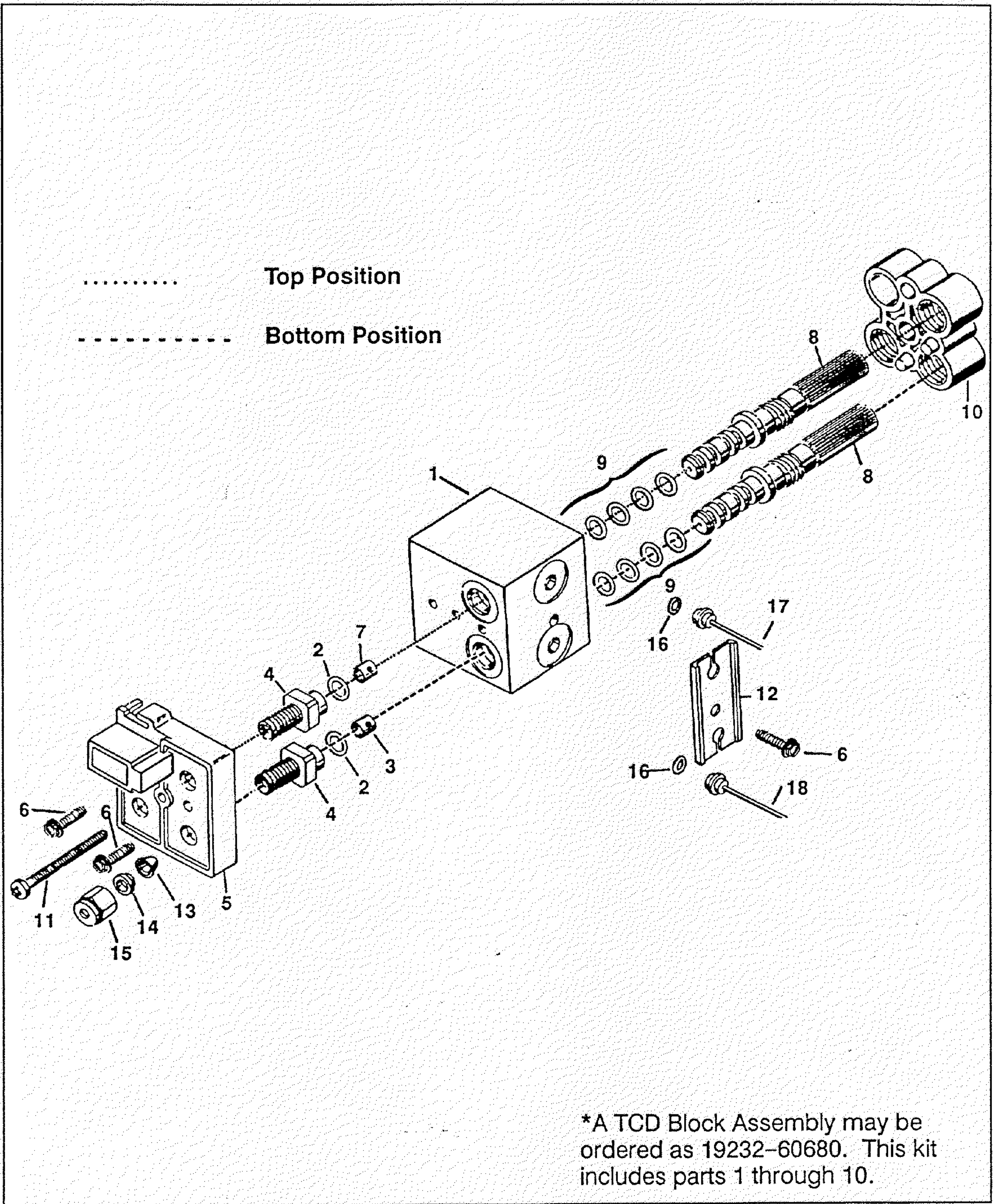
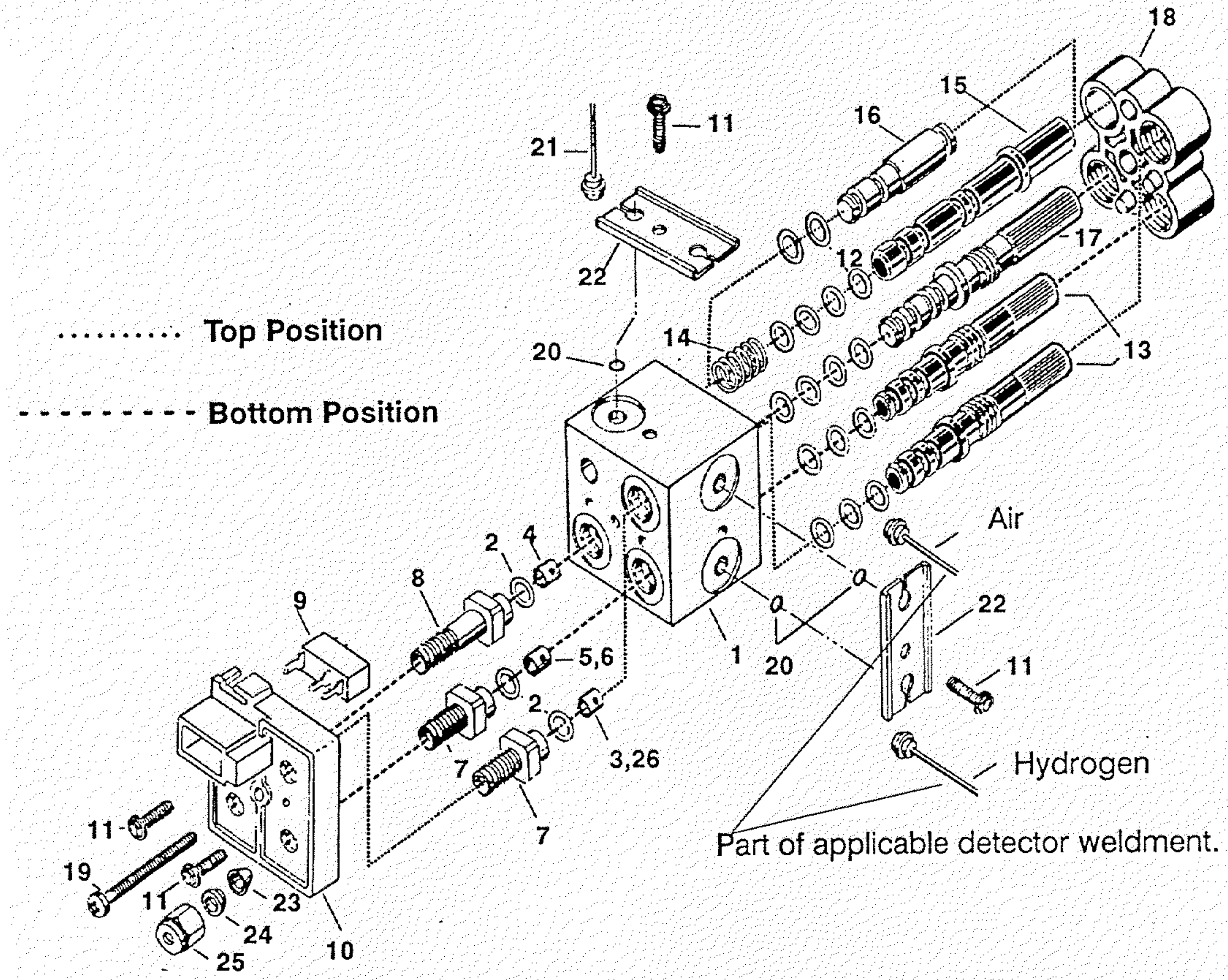


Figure 1. TCD Flow Manifold Block Assembly (Sheet 2 of 2).

Item	Description	HP Part No.	Use	Qty
1	Flow Manifold Block, FID/NPD	19231-20520	A,B,C	1
2	O-Ring, 0.239-inch id "Viton"	0905-1014	A,B,C	3
	package of 12	5180-4182	–	–
3	Restrictor, Air, Brown	19231-60610	B	1
4	Restrictor, Aux, Green	19234-60570	A,B,C	3
5	Restrictor, Hyd.	19231-60770	B	1
6	Restrictor, Blue (3.3-NPD)	19234-60660	A	1
7	Inlet Fitting	19231-20560	A,B,C	2
8	Inlet Fitting, Auxiliary	19231-20570	A,B,C	1
9	Micro Switch, FID Ignition	3101-0472	B,C	1
10	Rear Clamping Plate	19231-40010	A,B,C	1
11	Screw—M4 x 12 mm	0515-0909	A,B,C	4
12	Non-Greased O-Ring, 0.208-inch id "Viton"	0905-0999	A,B,C	20
	package of 12	5061-5867	–	–
	package of 2, greased	5181-1251	–	–
13	Valve, On/Off	19231-20540	A,B,C	2
14	Compression Spring	1460-2039	B	1
15	FID Ignition Valve	19231-20550	B,C	1
16	Plug Valve	19231-20530	A	1
17	Needle Valve Assembly (has 4 of Item 12 installed)	19231-60650	A,B,C	1
18	Front Clamping Plate	19231-40070	A,B,C	1
19	Screw, M4 x 45 mm	0515-0964	A,B,C	1
20	O-Ring (0.114-inch id)	0905-1039	A,B,C	3
	package of 12	5180-4181	–	–
21	FID Ignition Dump Weldment	19231-80500	B	1
22	Outlet Fitting Plate	19231-00060	A,B,C	2
23	Front Ferrule, Brass, 1/8-inch tube	0100-0032	A,B,C	3
24	Back Ferrule, Brass, 1/8-inch tube	0100-0036	A,B,C	3
25	Hex Nut, Brass, 1/8-inch tube	0100-0058	A,B,C	3
26	Restrictor, NPD Air, Green & Brown	19234-60600	A	1

Use: A = NPD
B = FID
C = FPD

Figure 2. FID/FPD/NPD Flow Manifold Assembly (Sheet 1 of 2).

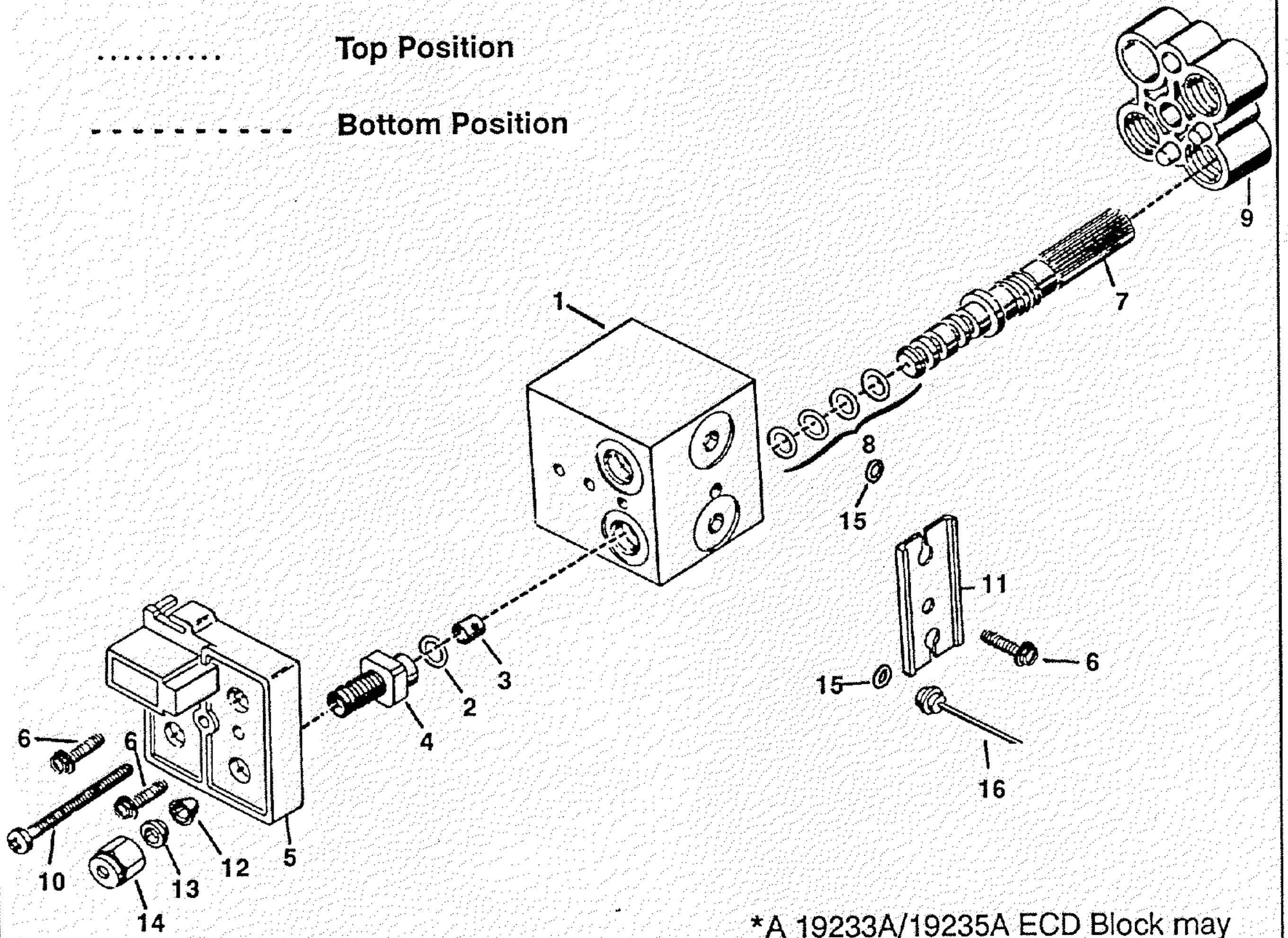


*An FPD Block kit may be ordered as 19256–60640. This kit consists of an assembled FPD Manifold Block Assembly (19256–60630) and an FPD Detector Weldment (19256–80540) (Parts 1, 2, 4, 7 – 15, 17, and 18).	*An FID Block kit may be ordered as 19231–60760. This kit consists of an assembled FID Flow Manifold 19231–60750 and FID Detector Weldment 19231–80580 (Parts 1 – 5, 7 – 15, 17, and 18.	*An NPD Block kit may be ordered as 19234–60670. This kit consists of an assembled NPD Flow Manifold Block Assy (19234–60650) and FID Detector Weldment 19231–80580 (Parts 1, 2, 4, 6 – 8, 10 – 13, 16 – 18, 25, and 26).

Figure 2. FID/FPD/NPD Flow Manifold Assembly (Sheet 2 of 2).

Item	Description	HP Part No.	Qty
1	Flow Manifold Block, TCD and ECD	19232-20500	1
2	O-Ring, 0.239-inch id	0905-1014	1
	package of 12	5180-4182	–
3	Restrictor, ECD Air, Green	19234-60570	1
4	Inlet Fitting	19231-20560	1
5	Rear Clamping Plate	19231-40010	1
6	Screw, M4 x 12 mm	0515-0909	3
7	Needle Valve Assembly (4 of Item 8 installed on each)	19231-60650	1
8	Non-Greased O-Ring, 0.208-inch id "Viton"	0905-0999	4
	package of 12	5061-5867	–
	package of 2, greased	5181-1251	–
9	Front Clamping Plate	19231-40070	1
10	Mounting Screw, M4 x 45-mm long	0515-0964	1
11	Outlet Fitting Plate	19231-00060	1
12	Front Ferrule, Brass, 1/8-inch tube	0100-0032	1
13	Back Ferrule, Brass, 1/8-inch tube	0100-0036	1
14	Hex Nut, Brass, 1/8-inch tube	0100-0058	1
15	O-Ring, 0.114 -inch id	0905-1039	3
	package of 12	5180-4181	–
16	Weldment, ECD Makeup Gas	19233-80550	1

Figure 3. 19233A/19235A ECD Flow Manifold Block Assembly (Sheet 1 of 2).



*A 19233A/19235A ECD Block may be ordered as 19233-60610 (Parts 1 through 9).

*A 19233A/19235A ECD Block, which includes make-up gas adapter weldment 19233-80550, may be ordered as 19233-60670 (Parts 1 through 9, and 16).

Figure 3. 19233A/19235A ECD Flow Manifold Block Assembly (Sheet 2 of 2).

Item	Description	HP Part No.	Qty
1	Flow Manifold Block, TCD and ECD	19232-20500	1
2	Restrictor, Blue Dot	19234-60660	1
3	Restrictor, Red Dot	19231-60770	1
4	O-ring	0905-1014	2
5	Wye Brazement	19233-80615	1
6	Rear Clamping Plate	19231-40010	1
7	Machine Screw M4 x 0.7 x 12	0515-0909	3
8	Mounting Screw M4 x 45 mm long	0515-0964	1
9	Hex Nut, Brass, 1/8-inch tube	0100-0058	2
10	Back Ferrule, Brass, 1/8-inch tube	0100-0036	2
11	Front Ferrule, Brass, 1/8-inch tube	0100-0032	2
12	O-ring	0905-1039	2
13	Outlet Fitting Plate	19231-00060	1
14	Short Purge Brazement	19233-80606	1
15	Make-up Gas Adaptor	19233-80565	1
16	Greased O-ring	5181-1251	2
17	Non-Greased O-ring .208 id	0905-0999	4
18	On/Off Valve	19231-20540	2
19	Clamp Block	19231-40070	1

Figure 4. G1223A/G1224A ECD Flow Manifold Block Assembly (Sheet 1 of 2).

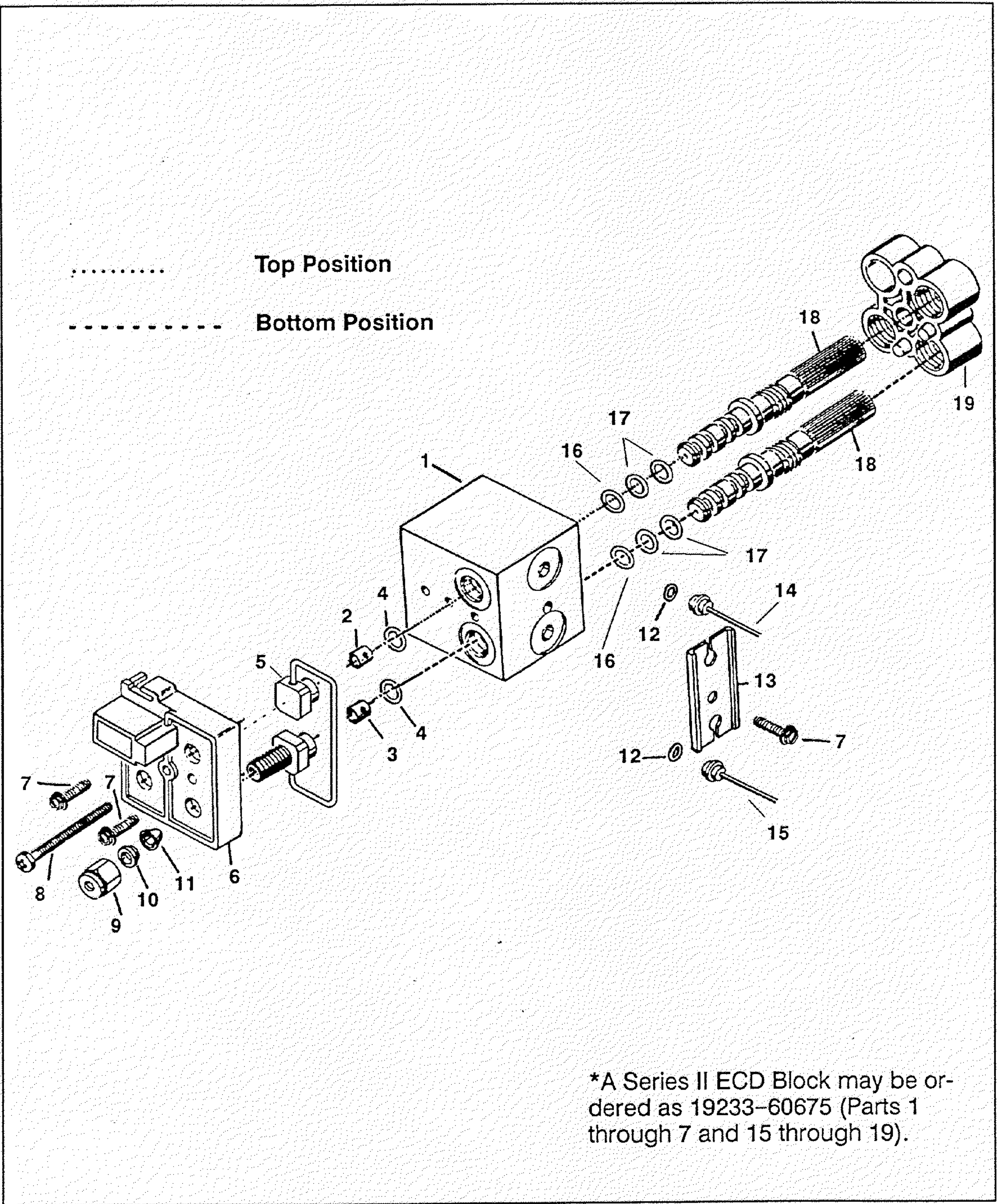
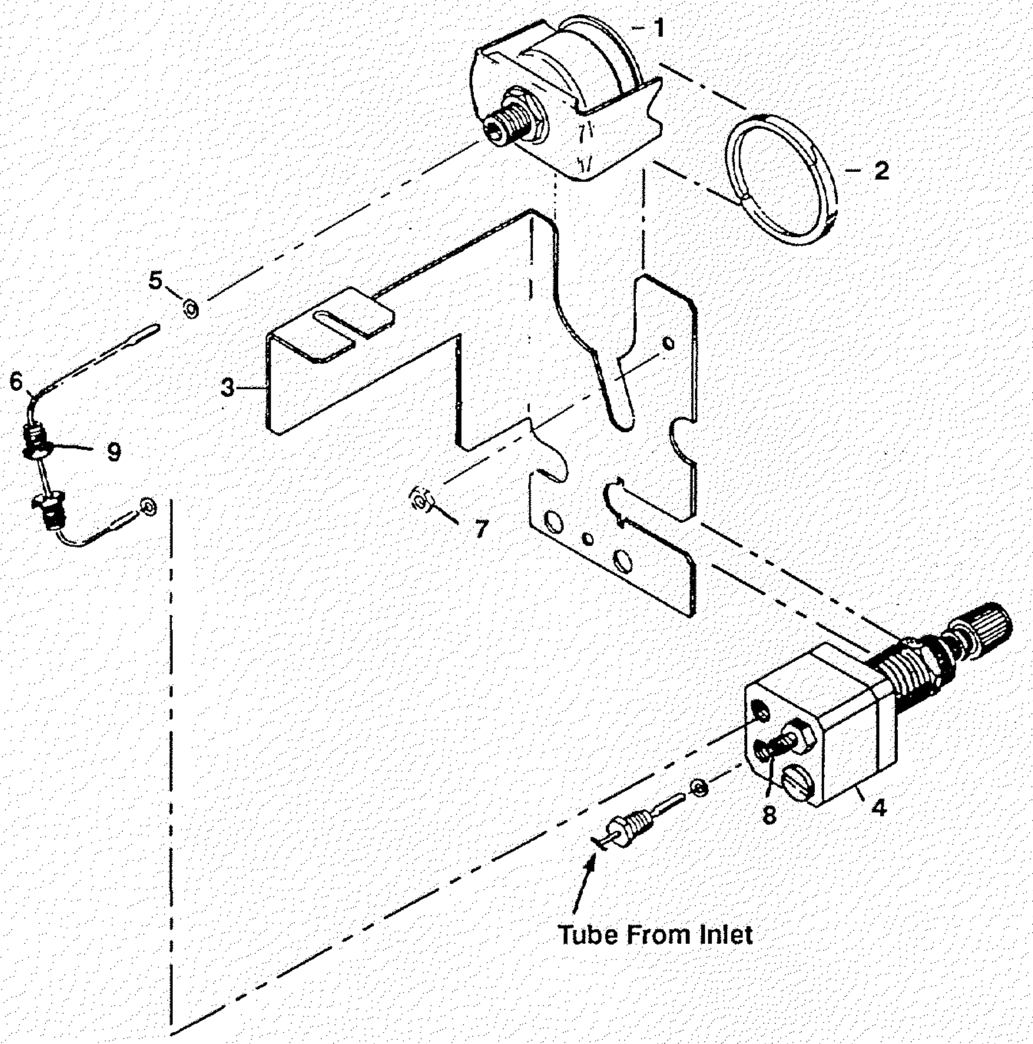


Figure 4. G1223A/G1224A ECD Flow Manifold Block Assembly (Sheet 2 of 2).

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

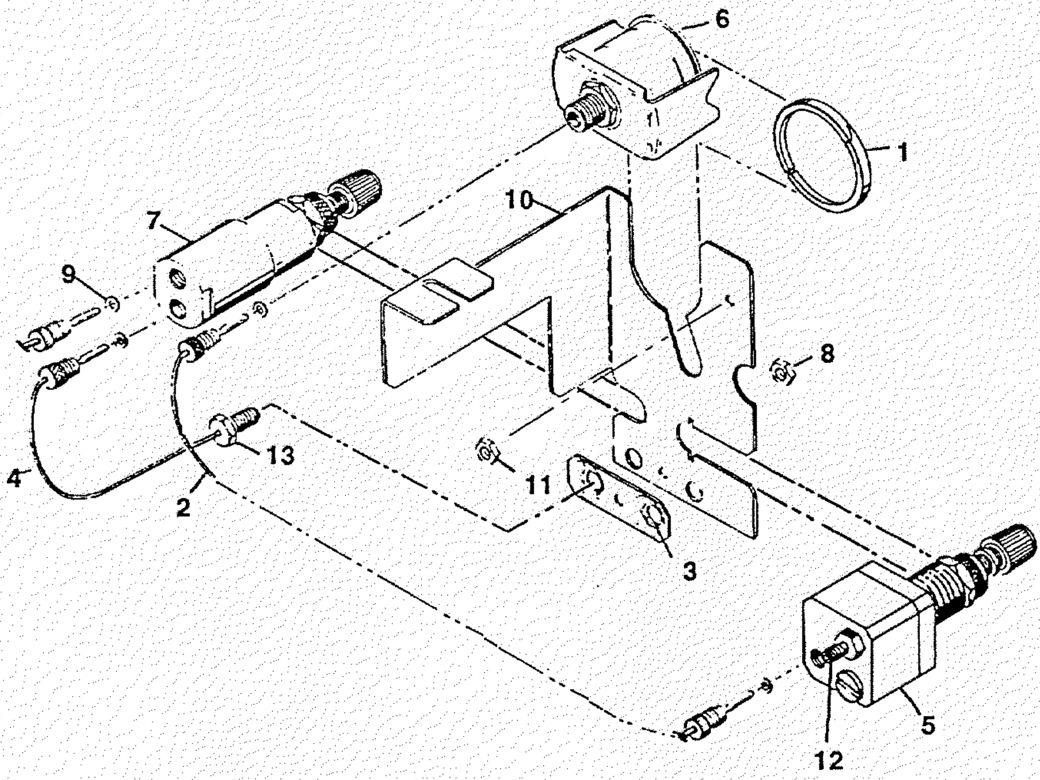
SECTION 4
Injection Port Flow/Pressure Control Modules

This section contains breakdowns of the various injection port flow/pressure control options available with the HP 5890 Series II Gas Chromatograph. Only the flow and pressure control modules are addressed in this section. Refer to section 5 for breakdowns of the associated inlets.



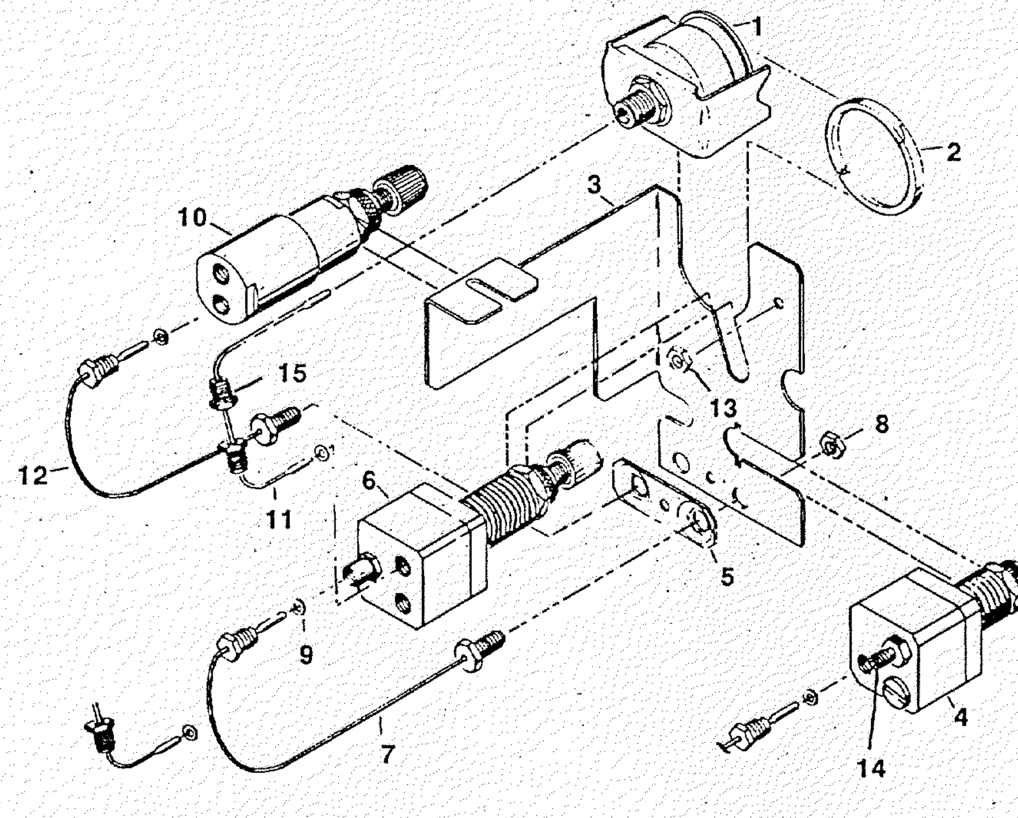
Item	Description	HP Part No.	Qty.
1	Pressure Gauge, 0–100 psi	19361-60560	1
2	Pressure Gauge Spacer	19243-40010	1
3	Flow Module Bracket	19243-00040	1
4	Mass Flow Controller	19362-60560	1
5	O-ring	0905–1039	3
	package of 12	5180–4181	–
6	Jumper Tube, 120 mm long	19243–80550	1
7	Nut	0535–0043	2
8	Fitting, Swagelok	0100–1115	1
9	Fitting, M8 Plastic	05890–40050	2

Figure 1. Packed Column Inlet Flow Control Module.



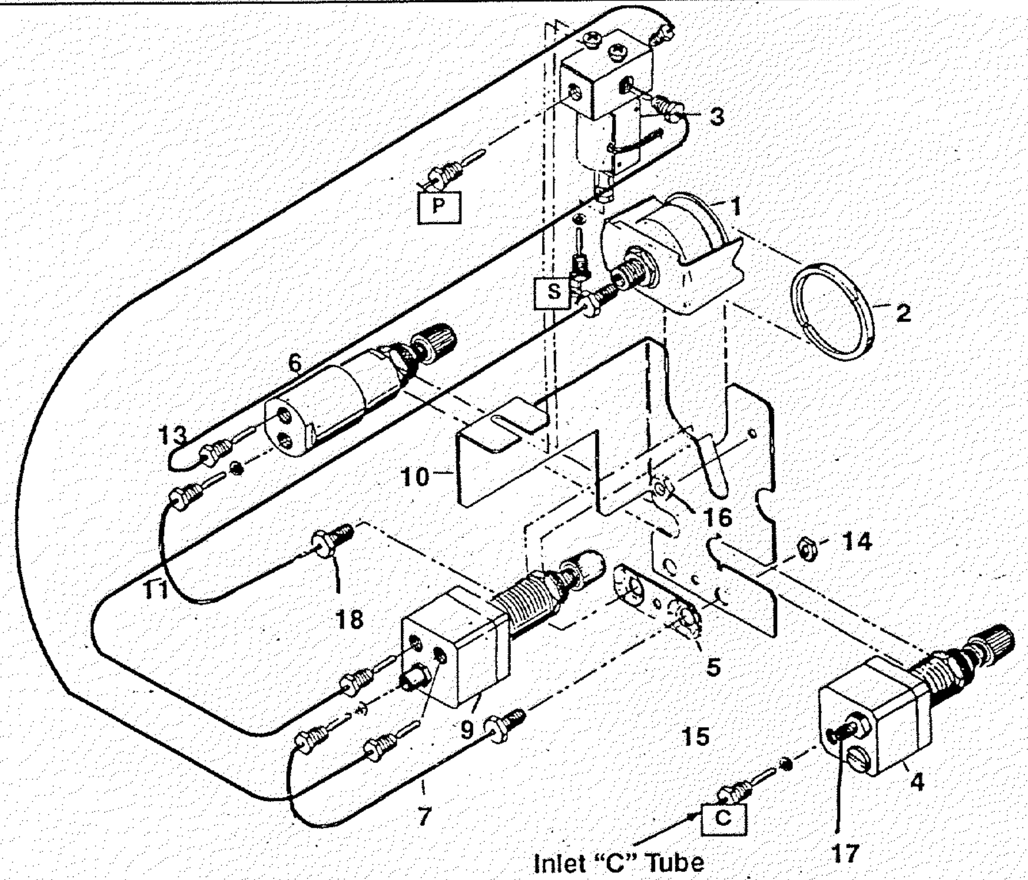
Item	Description	HP Part No.	Qty.
1	Pressure Gauge Spacer	19243-40010	1
2	Jumper Weldment	19243-80550	1
NS	Adhesive Label Plate for PPIP	19243-90715	1
3	Vent Torque Plate	19244-00030	1
4	Purge Restrictor (Vent Tube)	19244-80590	1
5	Purge Regulator	19246-60530	1
6	Pressure Gauge (0–100 psi)	19361-60560	1
7	Mass Flow Controller	19362-60560	1
8	Hex Nut, 5-1/2 16–20	2950-0203	1
9	O–ring	0905–1039	5
	package of 12	5180–4181	–
10	Flow Module Bracket	19243-00040	1
11	Nut	0535–0043	2
12	Fitting, Swagelok	0100–1115	1
13	Fitting, M8 Plastic	05890–40050	6

Figure 2. Septum-Purged Packed Column Inlet Flow Control.



Item	Description	HP Part No.	Qty.
1	Pressure Gauge, 0–30 psi	19320-60650	1
2	Pressure Gauge Spacer	19243-40010	1
3	Flow Module Bracket	19243-00040	1
4	Mass Flow Controller	19362-60570	1
5	Vent Torque Plate	19244-00030	1
6	Backpressure Regulator, 0–30 psi	19246-60570	1
7	Vent Tube Weldment	19244-80580	1
8	Vent Tube Weldment Nut, 5/16 inch	2950-0203	1
9	O–ring	0905–1039	4
	package of 12	5180–4181	–
10	Purge Pressure Regulator	19246-60530	1
11	Jumper Tube, 200 mm long	19243-80550	1
12	Purge Restrictor Weldment	19244-80590	1
13	Nut	0535–0043	2
14	Fitting, Swagelok	0100–1115	1
15	Fitting, M8 Plastic	05890–40050	9

Figure 3. Split-Only Capillary Inlet Flow Control.



Item	Description	HP Part No.	Qty.
1	Pressure Gauge, 0–30 psi	19320-60650	1
2	Pressure Gauge Spacer	19243-40010	1
3	Solenoid Valve Assembly	19251–60560	1
4	Mass Flow Controller	19362-60570	1
5	Vent Torque Plate	19244-00030	1
6	Purge Pressure Regulator	19246-60530	1
7	Vent Tube Weldment	19244-80580	1
8	O–ring	0905–1039	1
	package of 12	5180–4181	–
9	Backpressure Regulator, 0–30 psi	19246-60570	1
10	Flow Module Bracket	19243-00040	1
11	Purge Restrictor Weldment	19244-80590	1
12	Dual Elbow (Tee)	19361-20760	1
13	Jumper Tube, 200 mm long	19243-80550	3
14	Vent Tube Weldment Nut, 5/16–inch	2950-0203	2
15	Plug, 1/8–inch	19361-20770	1
16	Nut	0535–0043	2
17	Fitting, Swagelok	0100–1115	1
18	Fitting, M8 Plastic	05890–40050	8

Figure 4. Split/Splitless Capillary Inlet Flow Control.

Item	Description	HP Part No.	Qty.
1	0–30 Pressure Gauge	19320–60650	1
2	O–ring	0905–1174	5
3	Spacer, Pressure Gauge	19243–40010	1
4	Swagelok Plastic Cap, 1/8–inch	05890–40050	2
5	0–30 Forward Pressure Regulator	19245–60690	1
6	Screw, Machine, M4 x 0.7 x 8	0515–0910	3
7	FPR Clamp Plate	19245–20700	1
8	Inlet Fitting	19231–20560	1
9	FID Air Restrictor (brown dot)	19231–60610	1
10	O–ring, 0.239 id	0905–1014	1
11	Nut, Hex with Lock Washer	0535–0043	2
12	Screw, Thread Cutting	0624–0665	1
13	PCOC Purge Regulator	19245–60530	1
14	PCOC Purge Restrictor Assy.	19245–80530	1
15	Vent Torque Plate	19244–00030	1
16	MPCOC Flow Bracket	19245–00100	1
17	Hex Nut, 5/16–inch	2950–0203	1

Figure 5. PCOC Manual Pressure Control (Sheet 1 of 2).

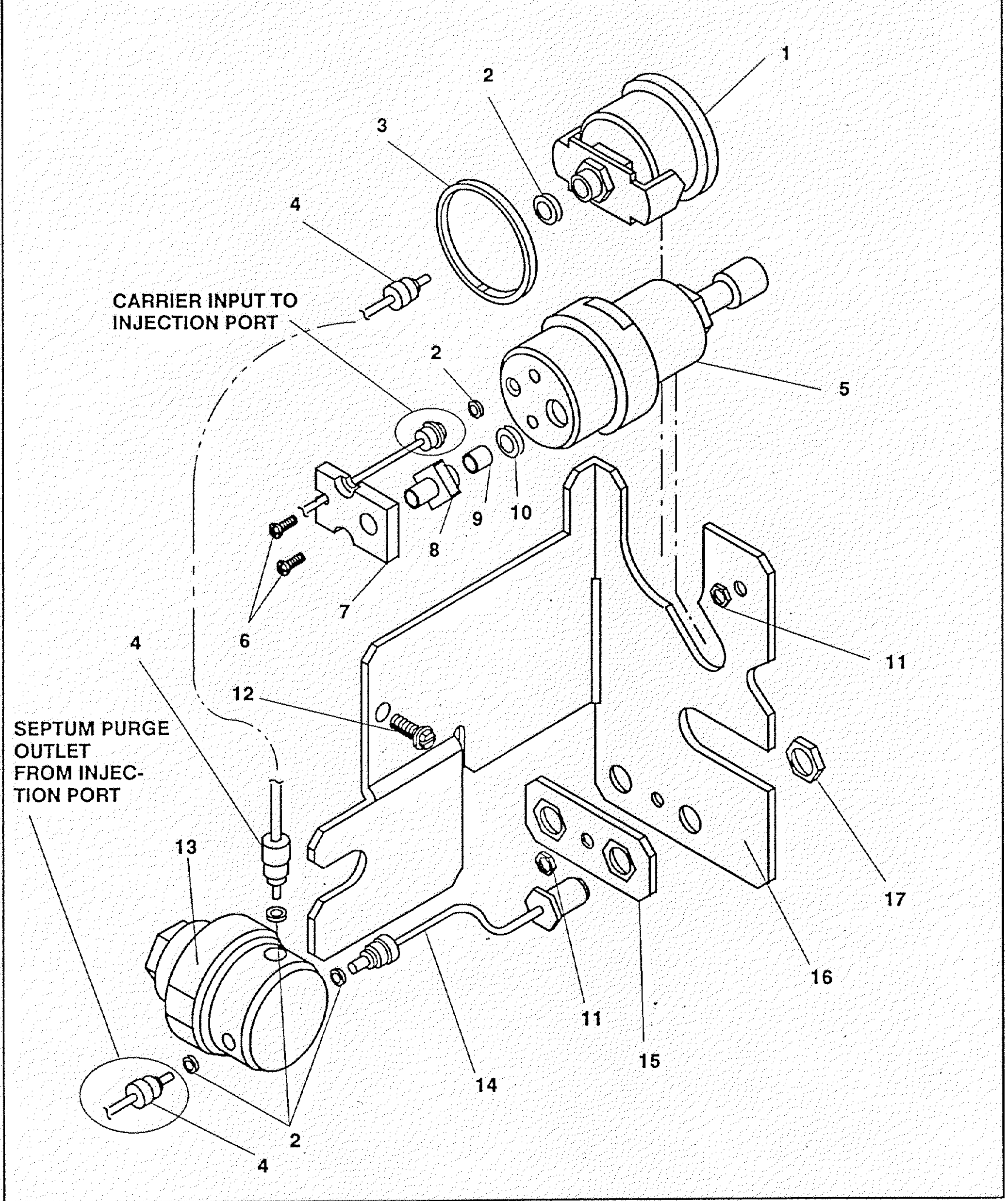


Figure 5. PCOC Manual Pressure Control (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Screw, Machine, M4 x 0.7 x 6	0515–0915	2
2	EPC Flow Bracket	19245–00070	1
3	Nut, Hex with Lock Washer	0535–0043	4
4	Screw, Thread Cutting	0624–0665	1
5	Plug 1/8–inch	19361–20770	1
6	Nut, Hex, 5/16	2950–0203	1
7	EPC Sensor Board	19245–60020	1
8	Screw, Machine M3 x 0.5 x 8	0515–0912	2
9	M8 Swagelok Plastic Cap, 1/8–inch	05890–40230	2
10	O–ring	0905–1174	6
11	PCOC Purge Restrictor Assembly	19245–80530	1
12	Vent Torque Plate	19244–00030	1
13	O–ring, 0.239 id	0905–1014	2
14	PPIP High Pressure Restrictor (red/blue)	19243–60560	1
15	Screw, Machine, M4 x 0.7 x 12	0515–0909	4
16	Valve Transducer Brazement	19245–80540	1
17	Fitting Housing	19245–20750	1
18	Screw, Machine, M4 x 0.7 x 8	0515–0910	5
19	Sealing Plate	19245–00140	1
20	PCOC Proportional Control Valve	19245–60540	1
21	FID Air Restrictor (brown)	19231–60610	1
22	PCOC Inlet Brazement	19245–80580	1
23	Inlet Bypass Clamp	19245–20890	1
24	Interface Cable	19245–60700	1
25	PCOC Purge Regulator	19245–60530	1

Figure 6. PCOC Electronic Pressure Control (Sheet 1 of 2).

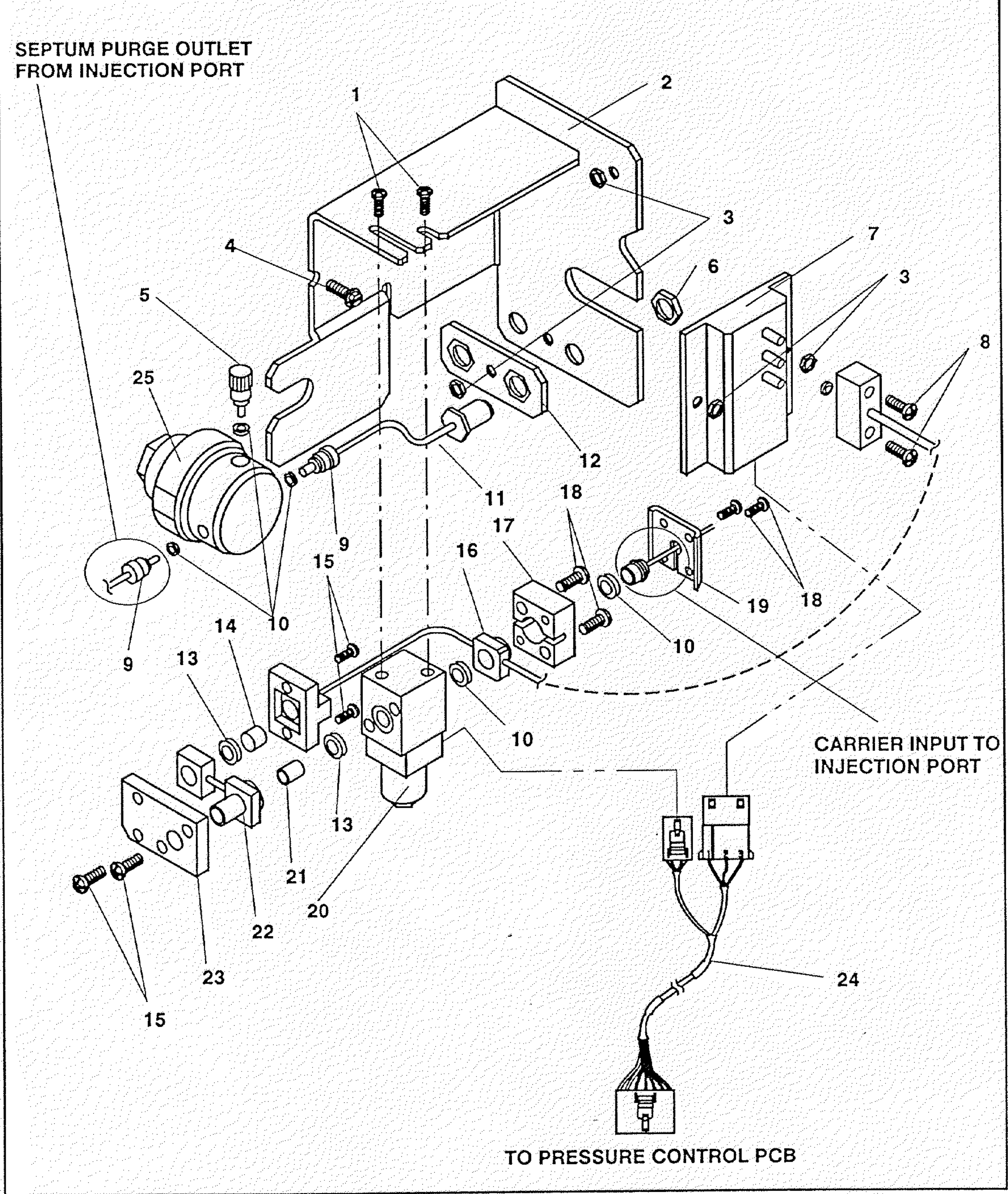
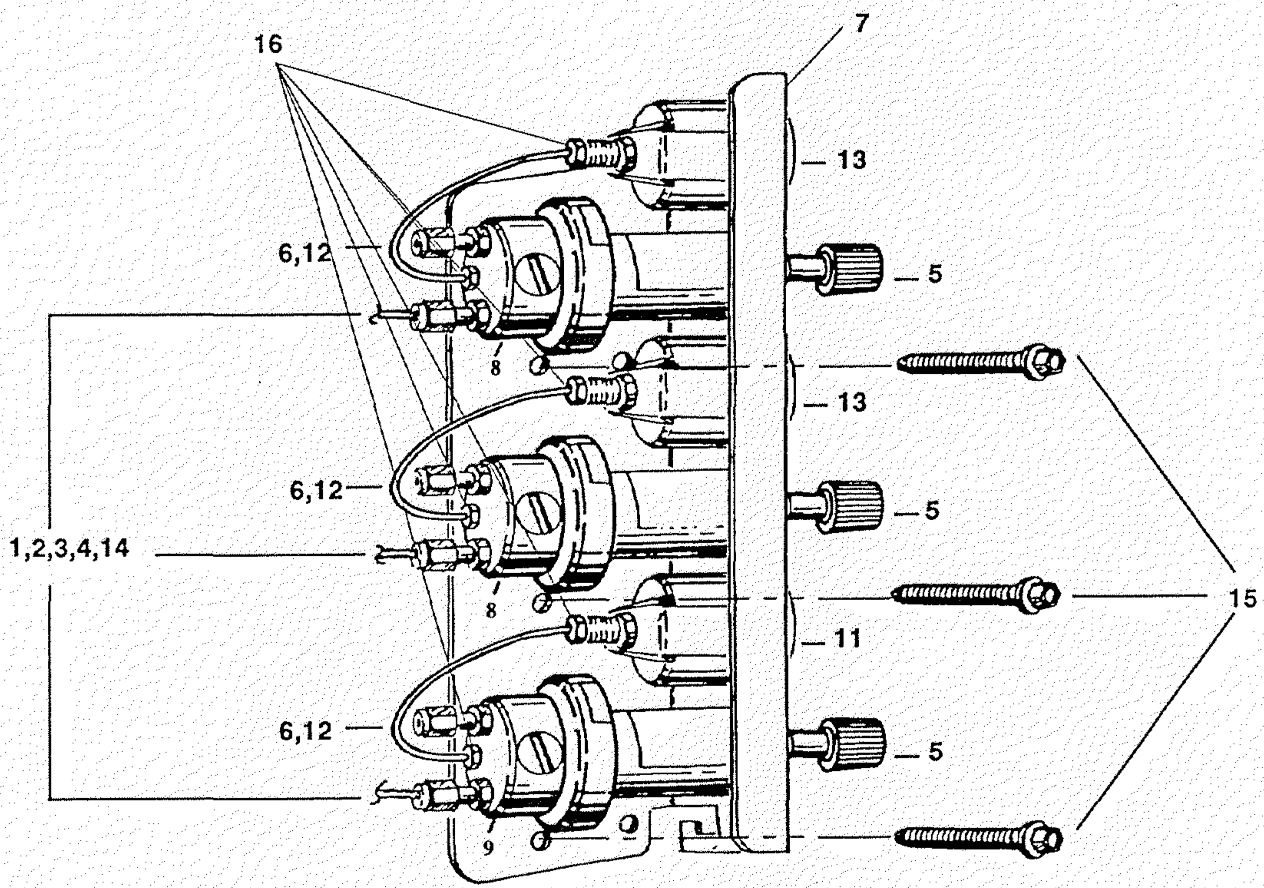


Figure 6. PCOC Electronic Pressure Control (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Front Ferrule, 1/8 T, brass*	0100-0032	6
2	Back Ferrule, 1/8 T, brass*	0100-0036	6
3	Nut, 1/8T, brass	0100-0058	6
4	Male Connector	0100-1115	6
5	Knob, plastic, black	0370-3110	3
6	O–ring*	0905–1039	6
	package of 12	5180–4181	–
7	Mounting Bracket	19246-00010	1
8	Pressure Regulator, 0–60 psi	19246-60540	2
9	Pressure Regulator, 0–100 psi	19246-60550	1
10	Labels, Pressure Sensitive*	19246-90700	1
11	Pressure Gauge, 0–100 psi	19361-60560	1
12	Jumper Tube, 200 mm long	19243-80550	3
13	Pressure Gauge, 0–60 psi	19363-60500	2
14	Copper Tube, 1/8-in. od x 17 1/4 in.	5020-8256	3
15	Screw, Tapping 8–16 x 3/4 in.	0624-0546	3
16	M8 Plastic Fitting	05890–40050	6
	*Not shown.		

Figure 7. Auxiliary Flow Panel (HP 19246A) (Sheet 1 of 2).



NOTES

1. Items 1-4 are supplied with the pressure regulators (8 and 9).
2. Item 10 is to be applied by the user.
3. Item 15 is for mounting the assembly.
4. During shipment, item 16 is not installed. In its place (6 places total) is protective cap 1401-0044.

Figure 7. Auxiliary Flow Panel (HP 19246A) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Screw, Self-tapping, 8–16 x 3/4-inch	0624-0546	2
2	Label, Pressure Sensitive	19246-90700	1
3	Mounting Bracket	19246-00080	1
4	O–ring	0905–1039	4
	package of 12	5180–4181	–
5	Hex Nut, 1/2–20	0590-0007	1
6	Internal Tooth Lock Washer	2190-0562	1
7	Retrofit Mounting Bracket	19246-00070	1
8	Pressure Gauge, 0–10 psi	19246-60590	1
9	Jumper Weldment —360 mm (tube)	19302-80560	1
10	HP-M8 Tee Fitting	19361-20760	1
11	Jumper Weldment—200 mm (tube)	19243-80550	1
--	Installation Instructions (not shown)	19247-90100	1

Figure 8. Gauge Assembly, 0–10psi (HP 19247A) (Sheet 1 of 2).

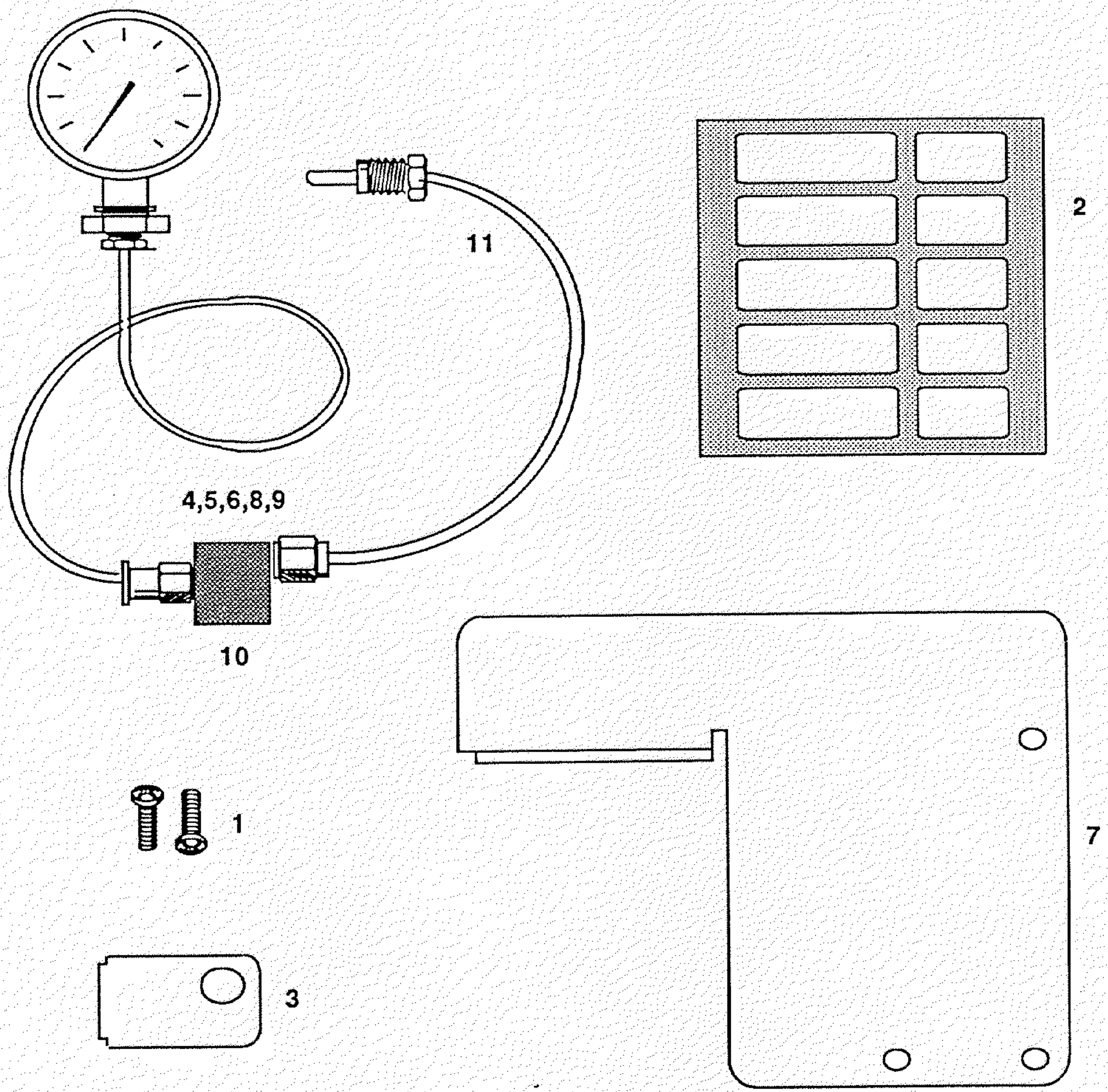


Figure 8. Gauge Assembly, 0–10psi (HP 19247A) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	CGM Assembly	19247-60520	1
2	HP 5890A CGM Bracket	19247-00020	1
3	HP 5890A CGM Bracket	19247-00010	1
4	Screw, Pozidriv M4 x 45 mm (HP 5890A)	0515-0964	1
5	SS Hex Panel Nut (HP 5880A)	2950-0203	3
6	Screw, Self-tapping 8–16 x 3/4-inch (HP 5890A)	0624-0665	3
7	Front Ferrule, 1/8-inch T, brass	0100-0032	5
8	Back Ferrule, 1/8-inch T, brass	0100-0036	5
9	Tubing Nut, 1/8-inch T, brass	0100-0058	5
10	Tubing Tee Union, brass	0100-0090	1
11	Copper Tube, 48-inch	5020-8261	1
12	Copper Tube, 5-inch	5020-8275	2
--	Installation Instructions (not shown)	19247-90150	1

Figure 9. Carrier Gas Miser (CGM), (HP19247B) (Sheet 1 of 2).

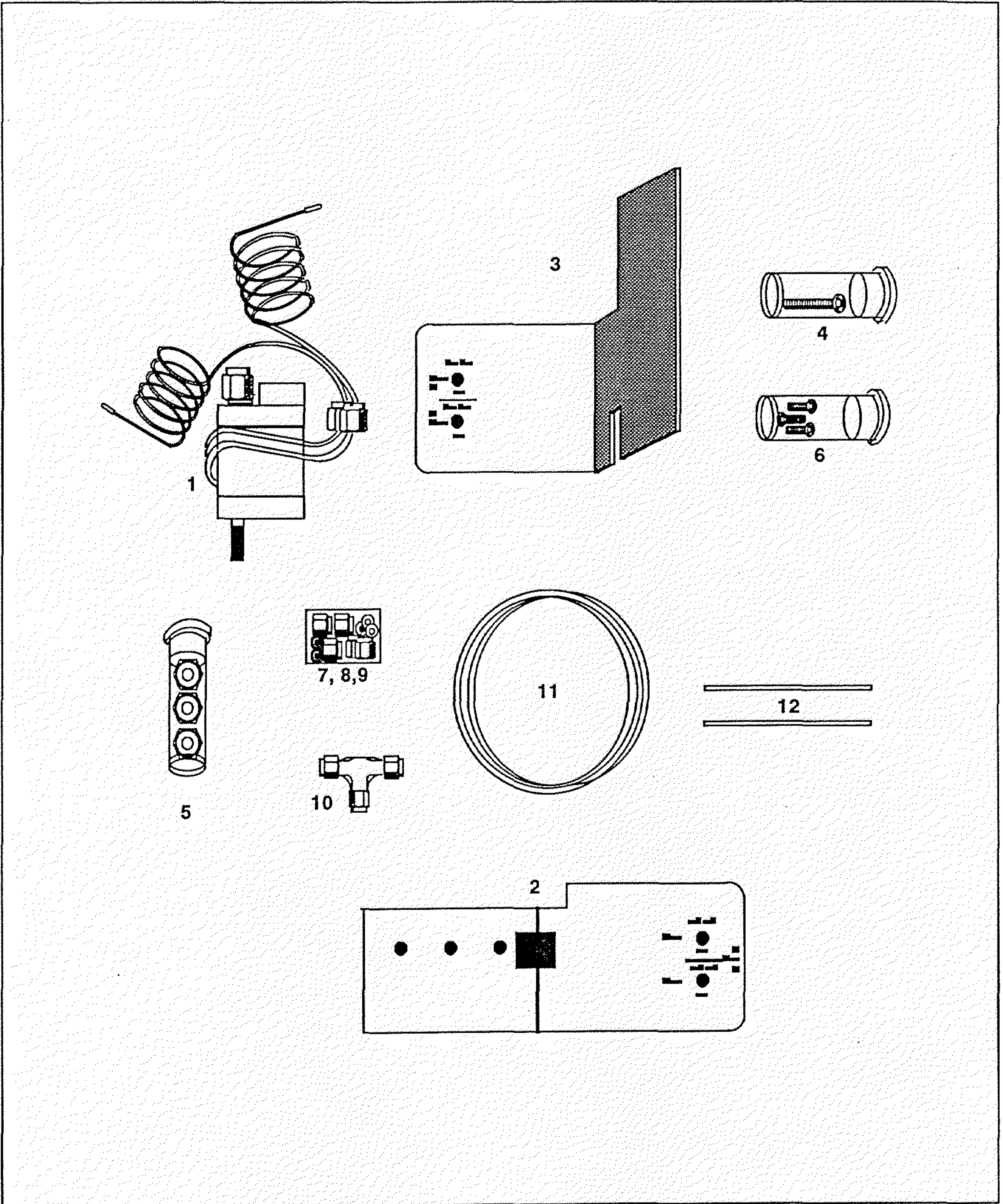


Figure 9. Carrier Gas Miser (CGM), (HP19247B) (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	Front Ferrule, 1/8-inch T, brass	0100-0032	3
2	Back Ferrule, 1/8-inch T, brass	0100-0036	3
3	Tubing Nut, 1/8-inch, brass	0100-0058	3
4	Tube Union, Cross, 1/8 inch x 4	0100-0161	1
5	Screw, Self-Tapping 8–16 x 3/4 inch	0624-0665	3
6	Purge Regulator	19232-60620	1
7	TCD-COC Restrictor Assy	19247-60530	1
8	Mounting Bracket	19246-00010	1
9	Pressure Gauge, 0–15 psi	19246-60520	1
10	Pressure Regulator, 0–60 psi	19246-60540	1
11	Pipe Plug, 1/8 inch	19361-20770	1
12	Jumper Tube, 200 mm long	19243-80550	1
13	Jumper Tube, 360 mm long	19361-80120	1
14	MFC Restrictor Assy, 0–20 ml/min	19362-60510	1
15	Pressure Gauge, 0–60 psi	19363-60500	1
16	Hex Nut, 5/16–20	2950-0203	1
17	Copper Tubing, 1/8 x 17-1/4 inches	5020-8256	1
18	Copper Tubing, 1/8 x 10-1/4 inches	5020-8262	3
19	O–ring	0905–1039	6
	package of 12	5180–4181	–

Figure 10. Flow-Controlled, On-Column Panel (HP 19247C) (Sheet 1 of 2).

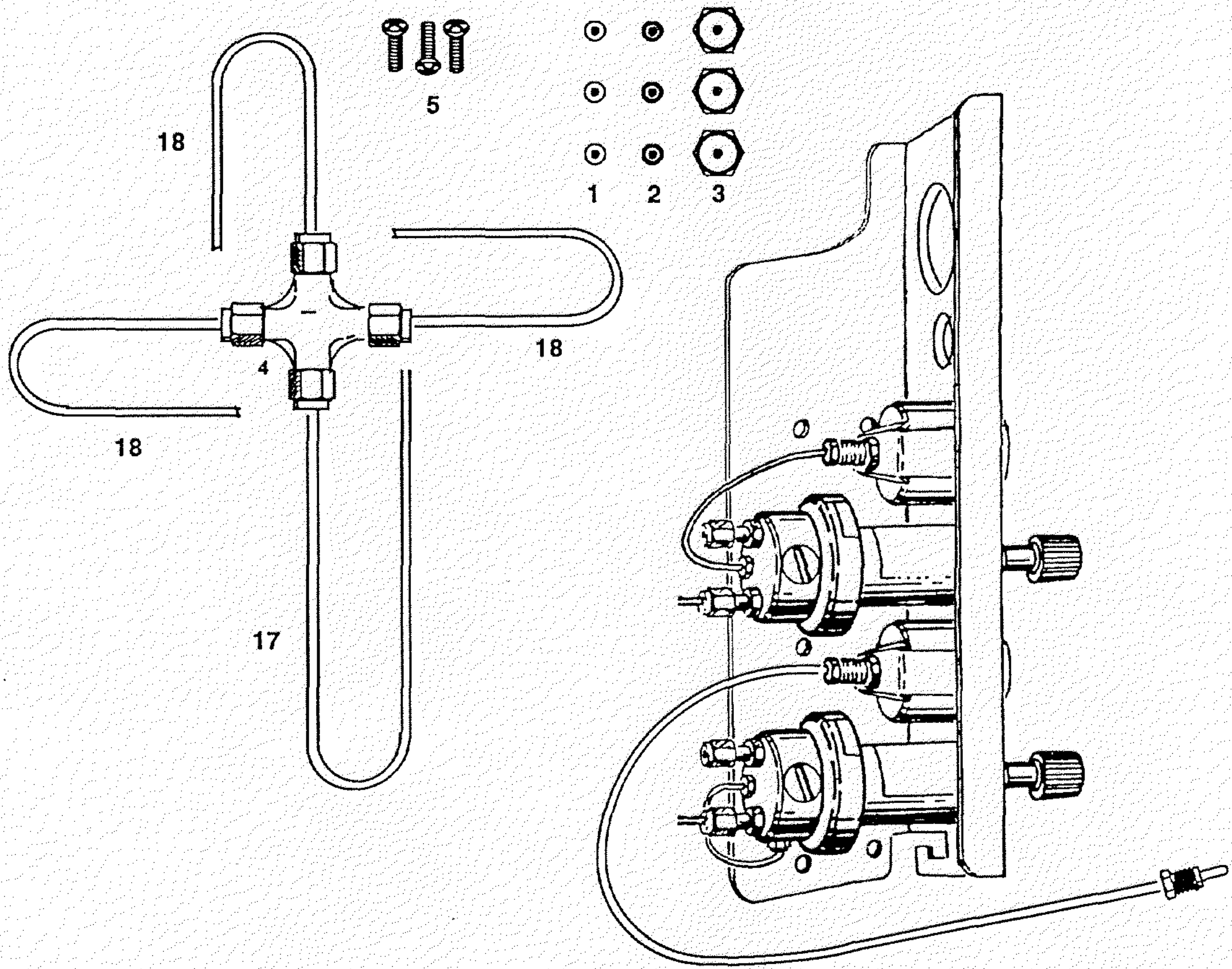
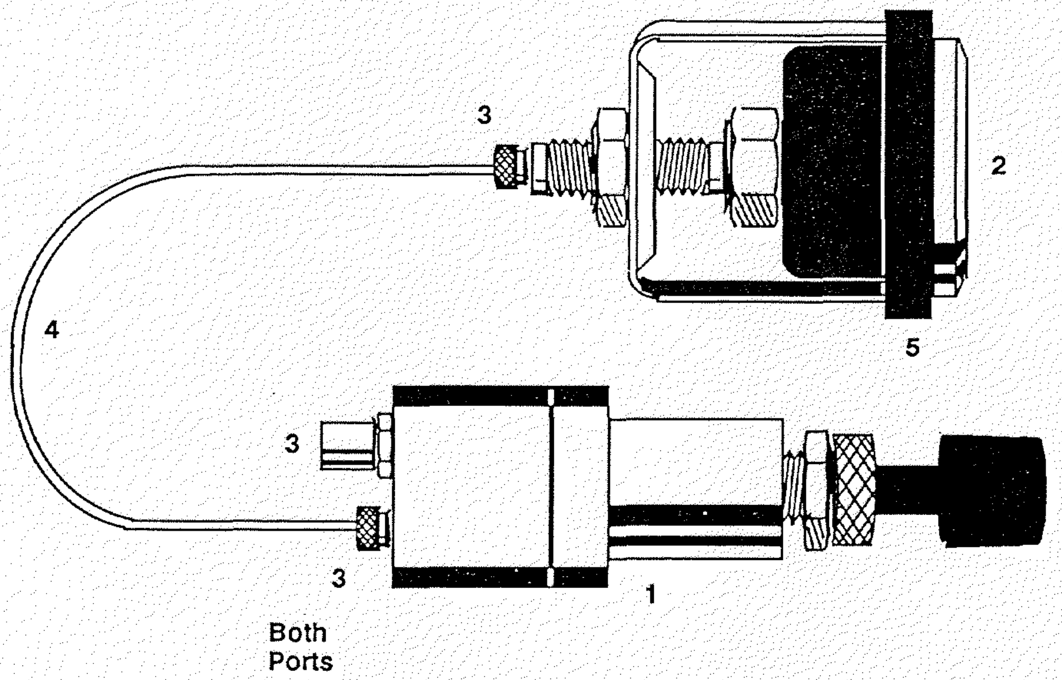


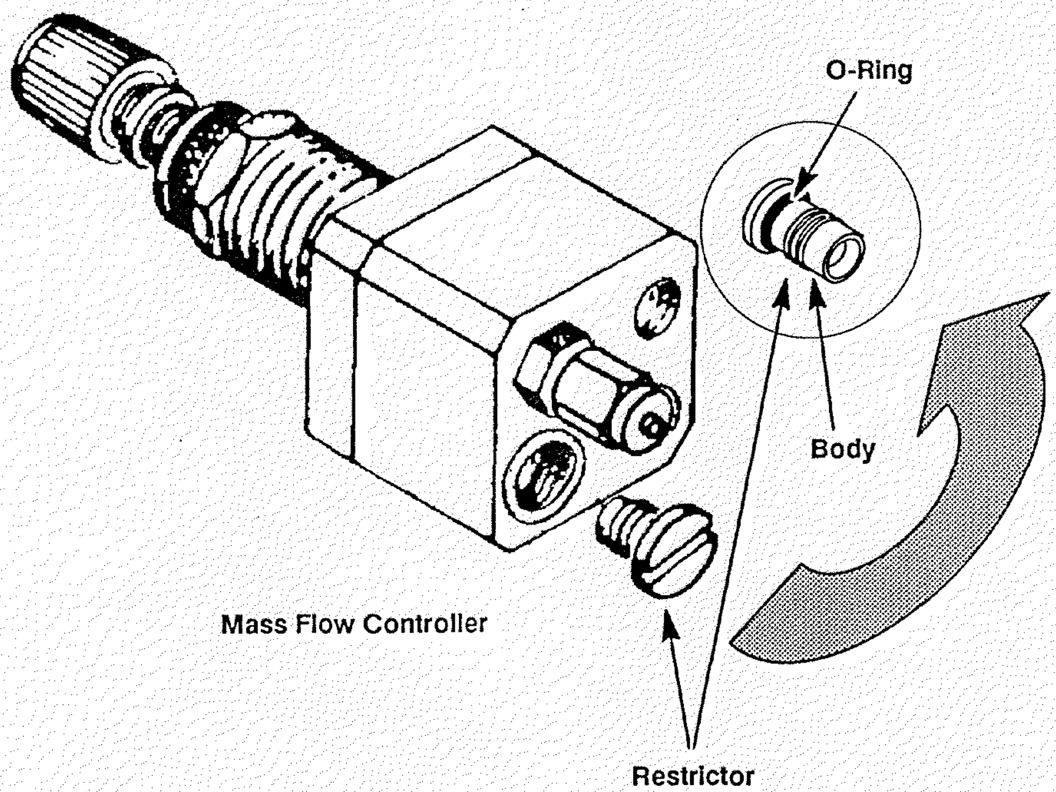
Figure 10. Flow-Controlled, On-Column Panel (HP 19247C) (Sheet 2 of 2).



Item	Description	HP Part No.	"15"	"60"	"100"
–	0–15 psi Backpressure Reg/Gauge Kit	19246-60620	1	0	0
–	0–60 psi Backpressure Reg/Gauge Kit	19246-60630	0	1	0
–	0–100 psi Backpressure Reg/Gauge Kit	19246-60700	0	0	1
	Assy consist of:				
1	0–15 psi Backpressure Regulator or	19246-60560	1	0	0
	0–60 psi Backpressure Regulator	19246-60580	0	1	0
	0–100 psi Backpressure Regulator	19246-60690	0	0	1
2	0–15 psi Pressure Gauge or	19246-60520	1	0	0
	0–60 psi Pressure Gauge	19246-60500	0	1	0
	0–100 psi Pressure Gauge	19361-60560	0	0	1
3	O–ring*	0905–1039	4	4	4
	package of 12	5180–4181	–	–	–
4	Jumper Weldment, 200 mm long	19243-80550	1	1	1
5	Plastic Pressure Gauge Spacer	19243-40010	1	1	1
6	Nut Driver, 7 mm *	8710-1217	1	1	1
7	Open End Wrench, 17 mm and 19 mm*	8710-1589	1	1	1
8	Installation Instructions*	19246-90120	1	1	1

* Not shown

Figure 11. Back Pressure Regulator/Gauge Assemblies.



Flow Controller HP Part No.	Restrictor HP Part No.	Flow Range (1)	Color Code	Color Code
19362–60560	19362-60530	0–110 ml/min	GREEN	(2)
19362–60570	19362-60540	0–400 ml/min	BLACK	(2)

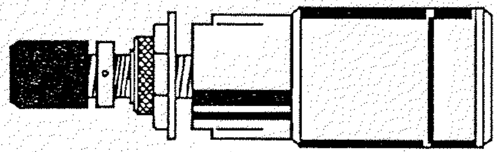
Optional Restrictors

Restrictor HP Part No.	Flow Range (1)	Color Code	Color Code
19362-60510 (use with 60560)	0–20 ml/min	RED	SILVER
19362-60520 (use with 60560)	0–60 ml/min	RED	(2)
19362-60550 (use with 60570)	0–750 ml/min	SILVER	GREEN

(1) Normal flow range of the Mass Flow Controller with 50 psiG at the inlet and at least 15 psi delta across the Mass Flow Controller.

(2) 19362–60560 is used for packed columns; 19362–60570 is used for capillary columns.

Figure 12. Mass Flow Controllers and Replaceable Restrictors

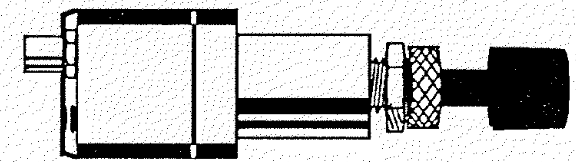


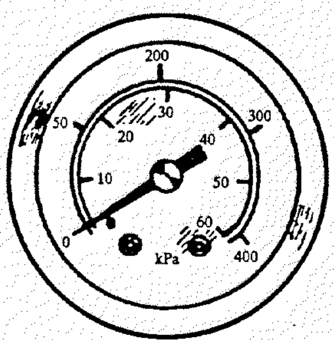
Forward Pressure Regulators

Range	HP Part No.
0–10 psig (0–67 kPa)	19246-60530
0–60 psig (0–400 kPa)	19246-60540
0–100 psig (0–667 kPa)	19246–60650

Backpressure Regulators

Range	HP Part No.
0–15 psig (0–100 kPa)	19246–60560
0–30 psig (0–200 kPa)	19246–60570
0–60 psig (0–400 kPa)	19246–60580
0–100 psig (0–667 kPa)	19246–60690





Pressure Gauges

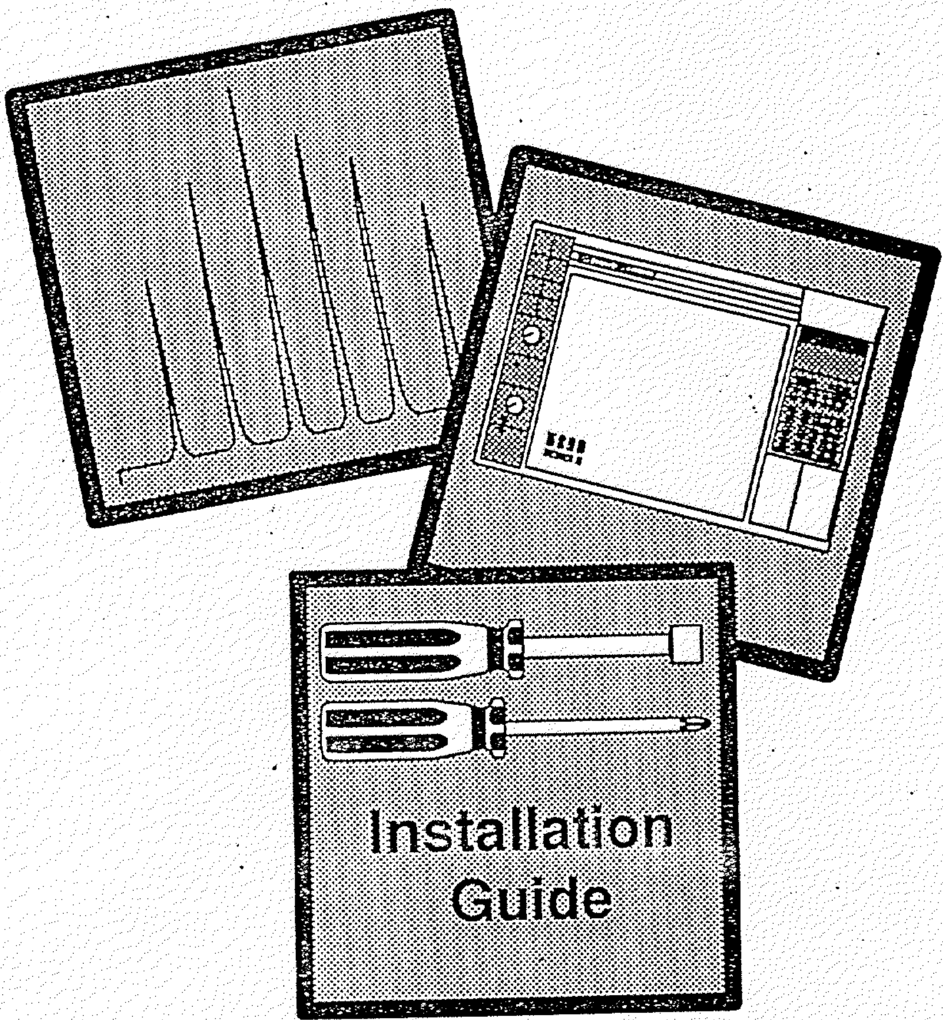
Range	HP Part No.
0–15 psig (0–100 kPa)	19246-60520
0–30 psig (0–200 kPa)	19320-60650
0–60 psig (0–400 kPa)	19363-60500
0–100 psig (0–667 kPa)	19361-60560

Figure 13. Pressure Regulators and Pressure Gauges

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 10
Electronic Pressure Controlled Inlets

HEWLETT-PACKARD



HP 5890 Series II Gas Chromatograph

Accessory 19251E

Electronic Pressure Control

Safety Considerations

The manual set supplied with the HP 5890 Series II gas chromatograph, and certain installation instructions furnished with accessories contain **WARNING** and **CAUTION** notes detailing potential hazards associated with working on and operating the instrument.

In addition, the following *common sense* safety considerations should be followed at all times:

1. Hydrogen (H_2) is flammable and is an explosion hazard when confined in an enclosed space (for example, the oven). In any application using H_2, turn off the supply at its source before working on the instrument.

2. The oven, inlet, and/or detector zone(s) may be hot enough to cause burns. Turn off heated zones and allow time for cooling before working on the instrument.

3. To avoid shock hazard, turn off instrument power and disconnect the line power cord from its receptacle whenever the rear cover panel must be removed.

4. Wear safety glasses when using compressed gas, and when handling glass or fused silica capillary columns. It is good practice to wear safety glasses at all times when working with the instrument.

5. Be careful to avoid skin punctures in handling fused silica capillary columns, particularly 530 μ columns.

WARNING

Hazardous voltages are present in the instrument when the power cord is connected. Avoid a potentially dangerous shock hazard by disconnecting the power cord before working on the instrument. The flame ionization detector (FID), nitrogen-phosphorus detector (NPD), and flame photometric detector (FPD) use hydrogen gas as a fuel. Be sure all hydrogen gas is shut off to the detectors before shutting off the power to the instrument.

CAUTION

The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap, HP part no. 9300-0969 (large) or HP part no. 9300-0970 (small), connected to a suitable ground, such as an unpainted part of the GC oven top. Lacking any available grounding strap, it is possible to do the following procedures with one hand while grounding to the GC oven top with the other hand.

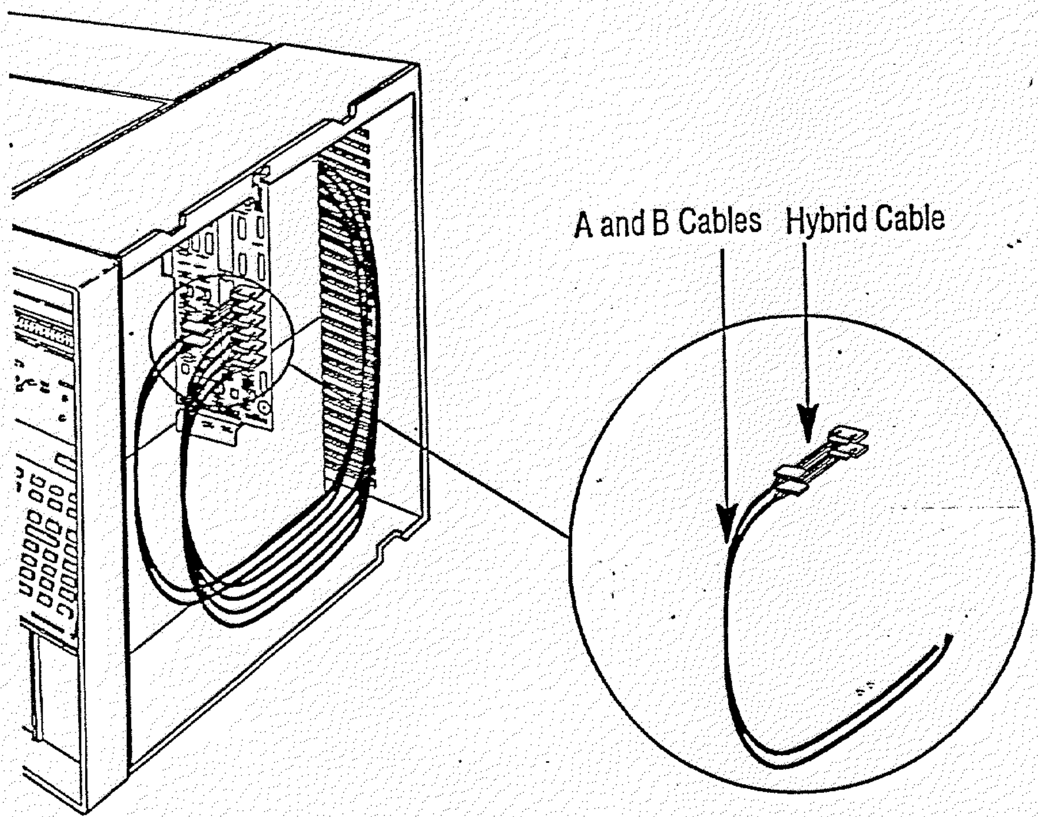
Installing Accessory 19251E

19251E – Electronic Pressure Control Upgrade Kit

The installation instructions for Accessory 19251E are divided into four sections:

1. Replacing the left door panel
2. Installing the electronic pressure control (EPC) flow module
3. Upgrading the EPROMs
4. Configuring the electronic control board

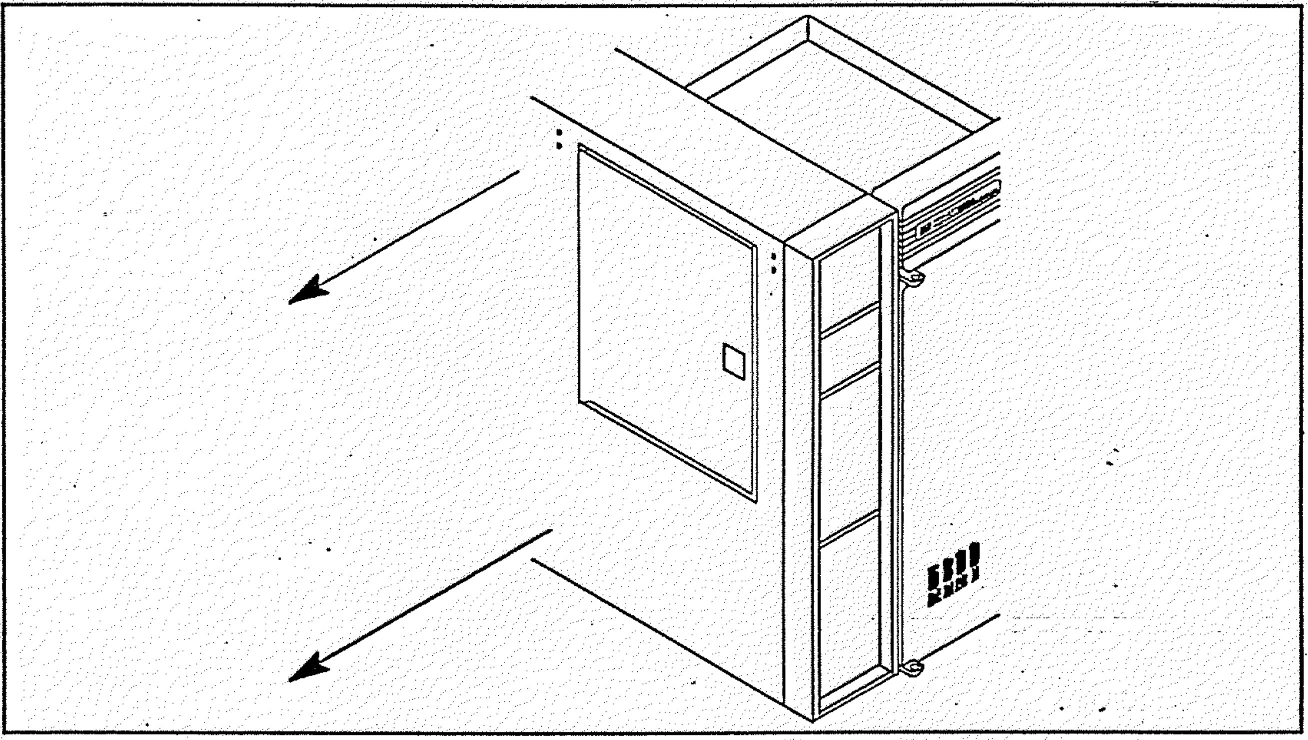
Note If you purchased the EPC control board, HP 19230W, after September, 1992, you must use the enclosed adapter cable to connect the inlet cables to the control board as shown below.



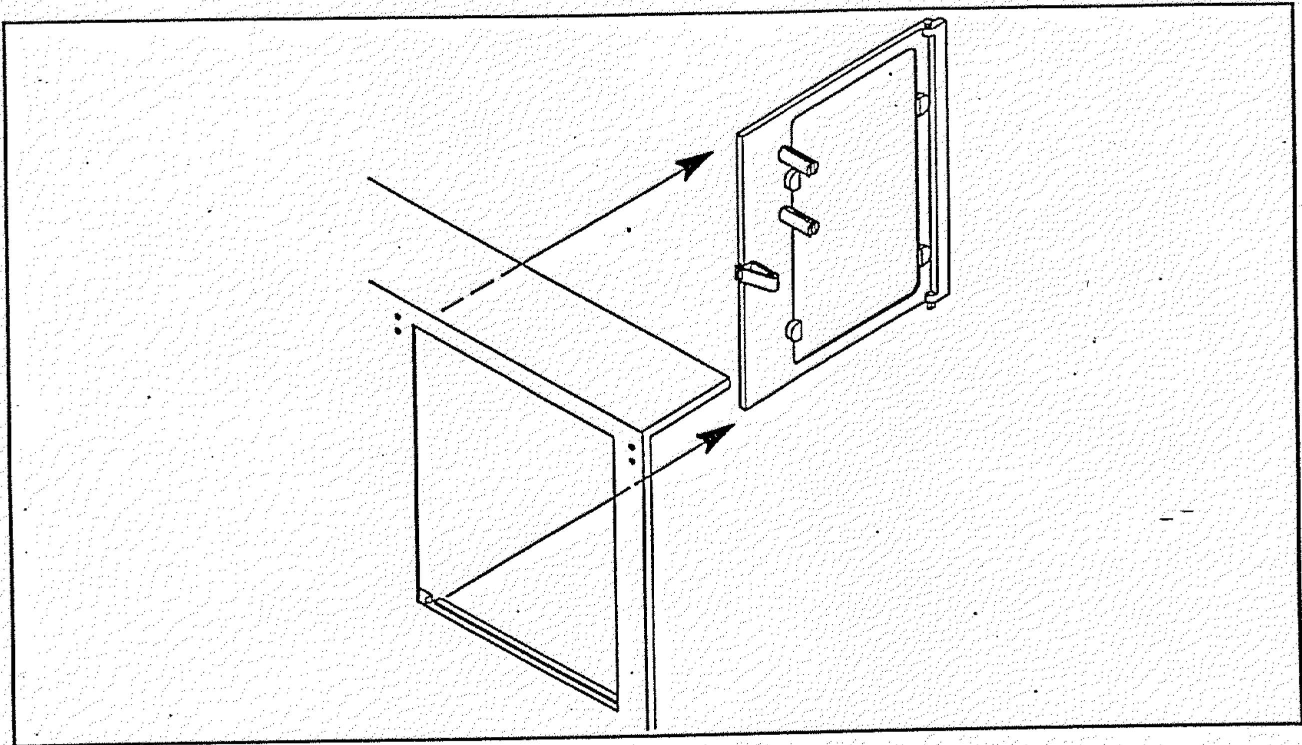
1

Replacing the Left Panel Door

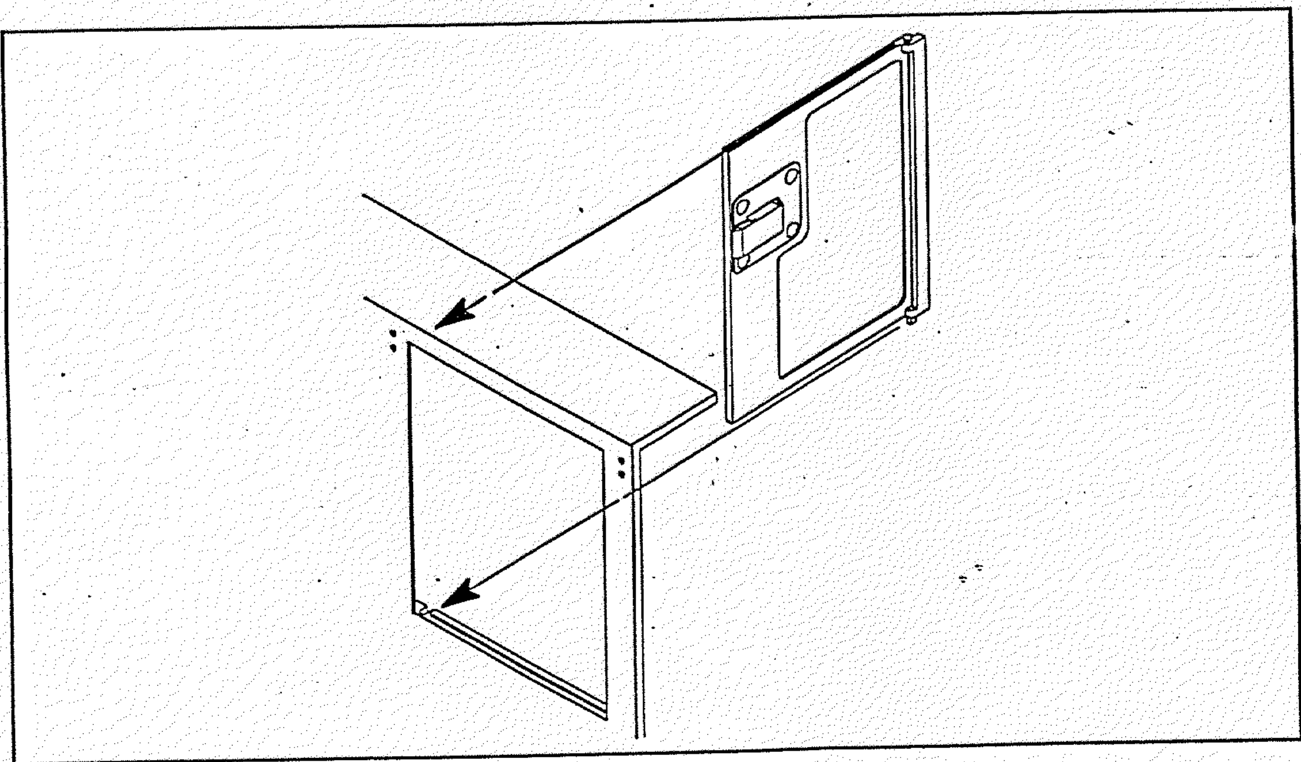
1. Turn the main power switch off and disconnect the power cord from its receptacle.
2. Allow time for all heated zones to cool, then turn off supply gases at their sources.
3. Remove the left side panel by removing the two screws at the bottom of the panel and sliding the panel back to disengage the fastener.



4. Open the left panel door and push the outer edge of the door inward so it slides out of the grooves on the panel.



. Slide the new door into the grooves on the left panel and push it into place.

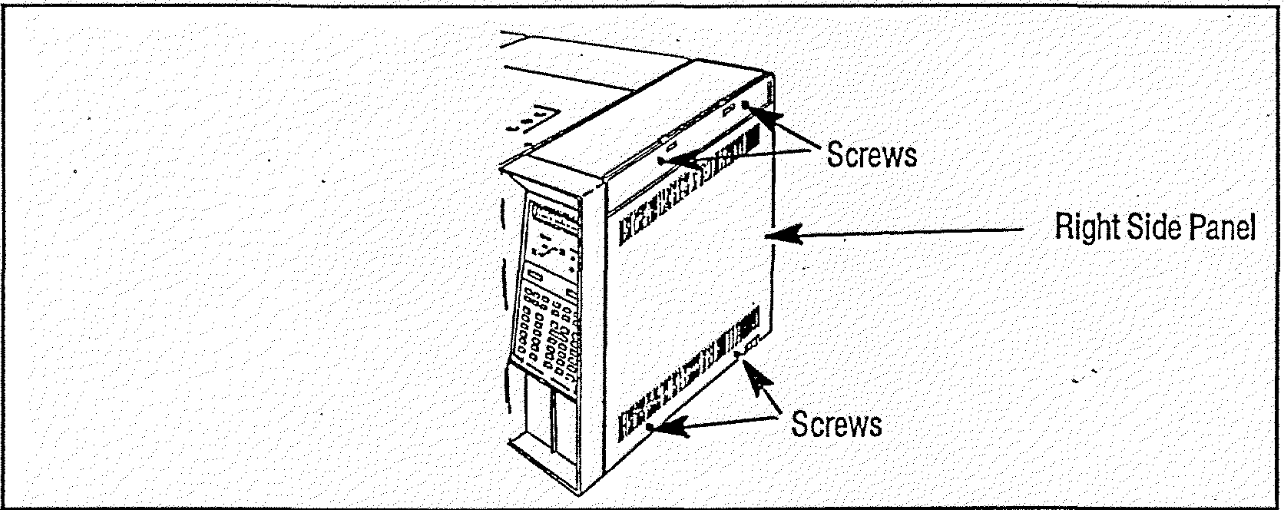


2

Installing the Electronic Pressure Control Flow Module

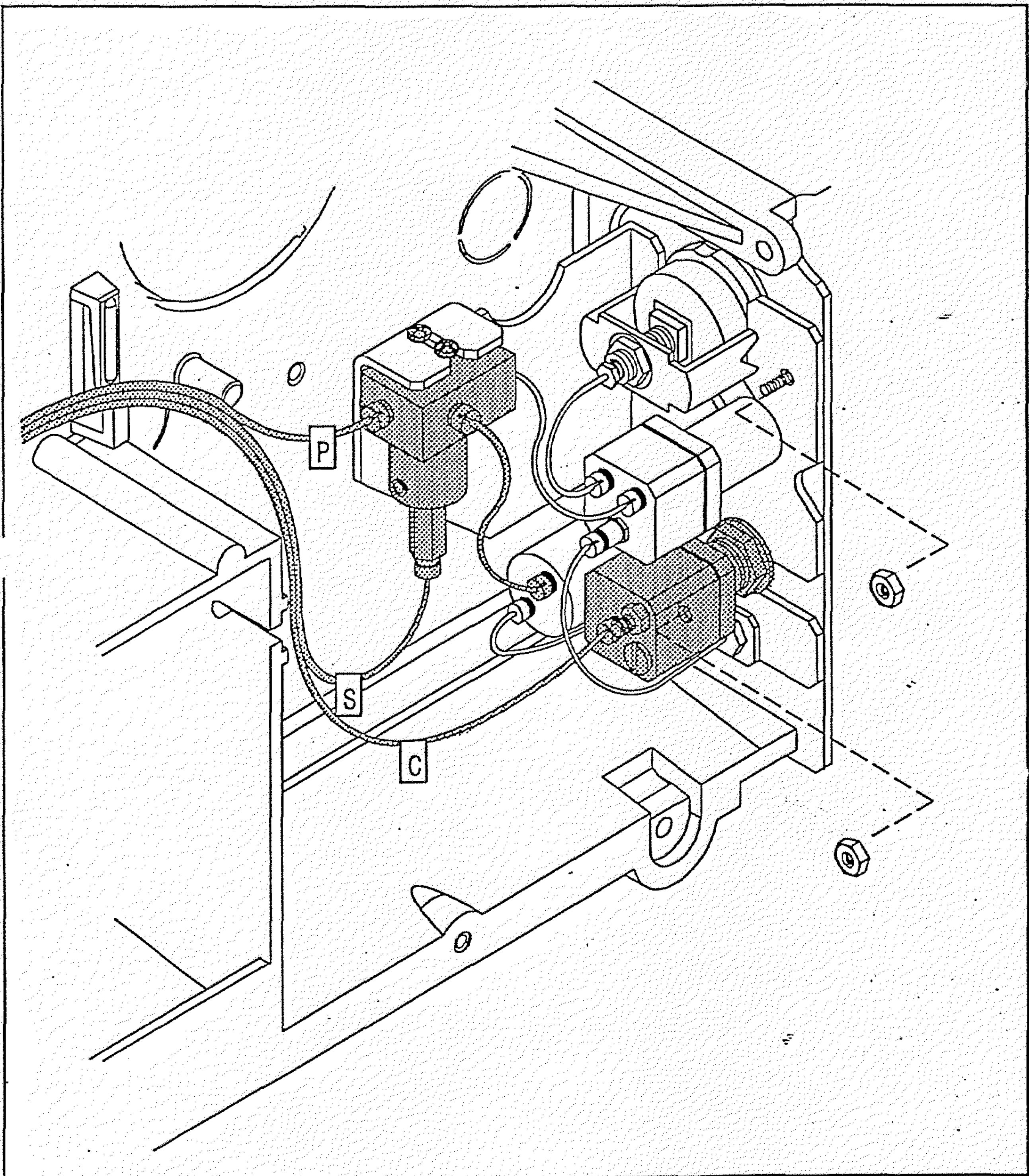
Note: Check that the main power switch is turned off, the power cord is unplugged, and the heated zones are cool.

1. Remove the electronics carrier top cover.
2. Remove the right side panel by removing the top right panel and then removing the four side panel screws, two along the top edge and two along the lower edge.



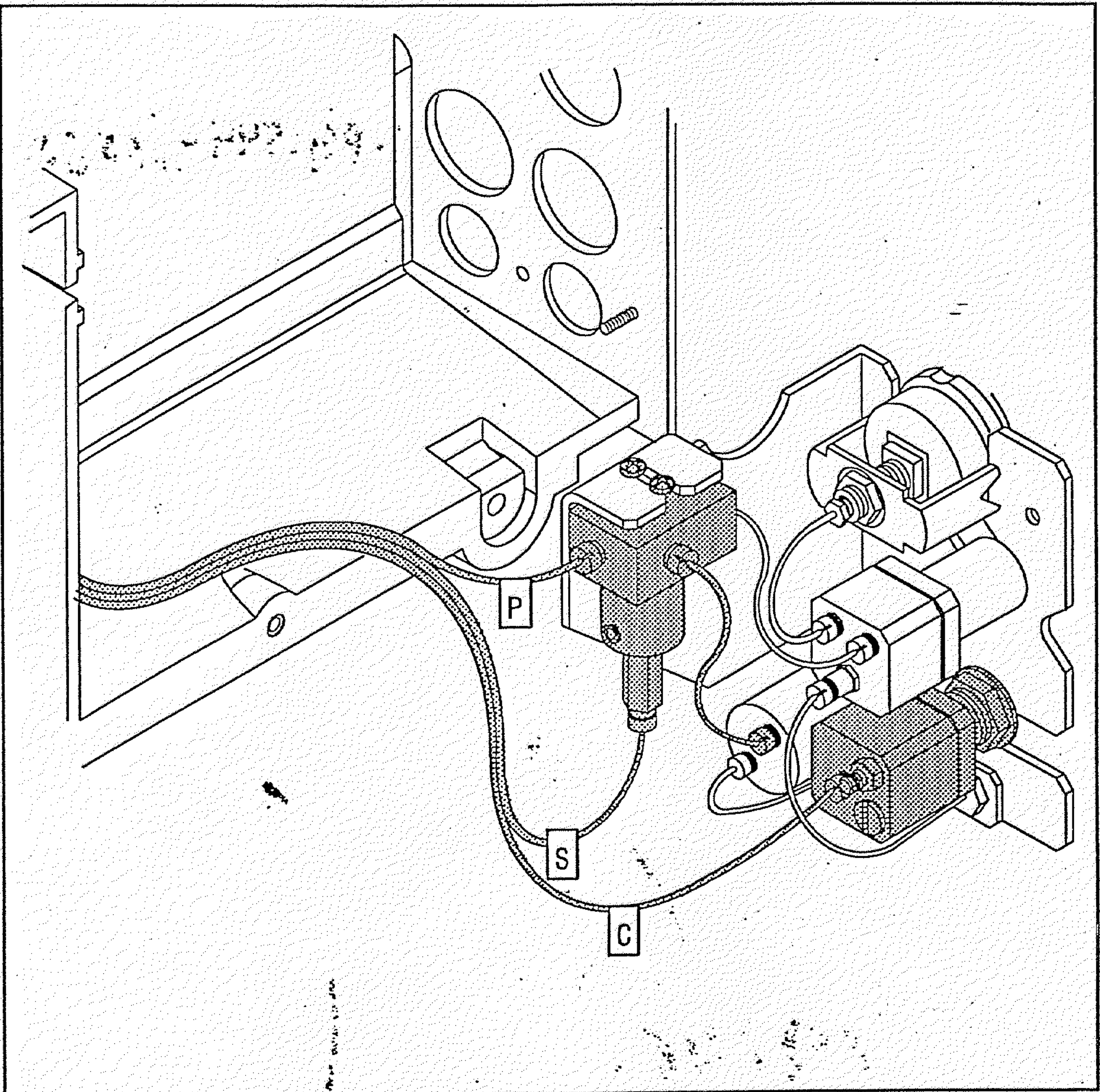
3. On the left side of the instrument, unscrew the two screws that hold the manual pressure control bracket to the front of the instrument.

   Note: Do not force rigid gas lines to bend. If tubing does not bend easily, disconnect it during EPC installation and reconnect it afterwards.



4. Slide the bracket as far away from the instrument as you can.

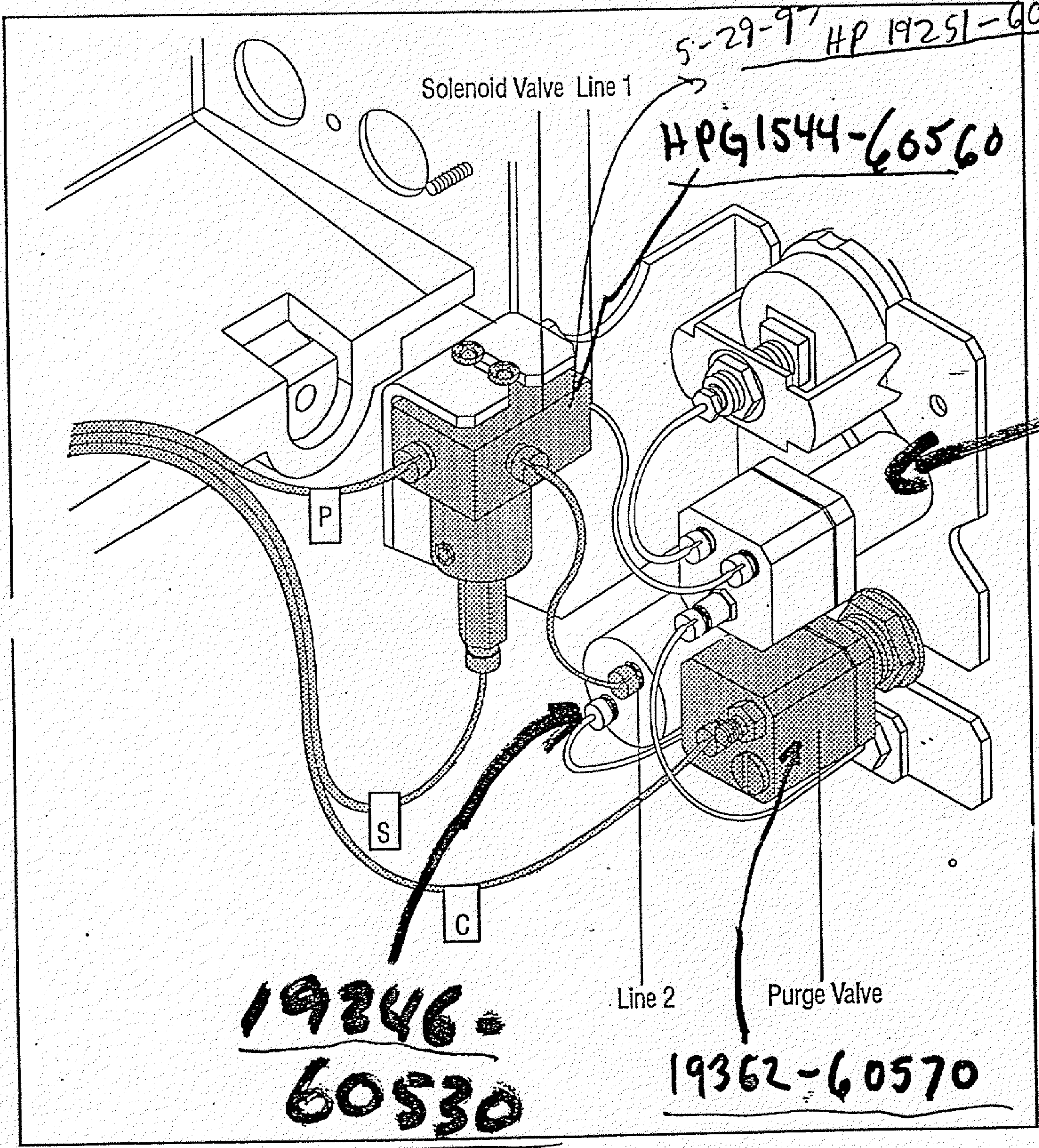
   Note: Lines from the manual control bracket are still connected to the instrument.



100 psi
19251-

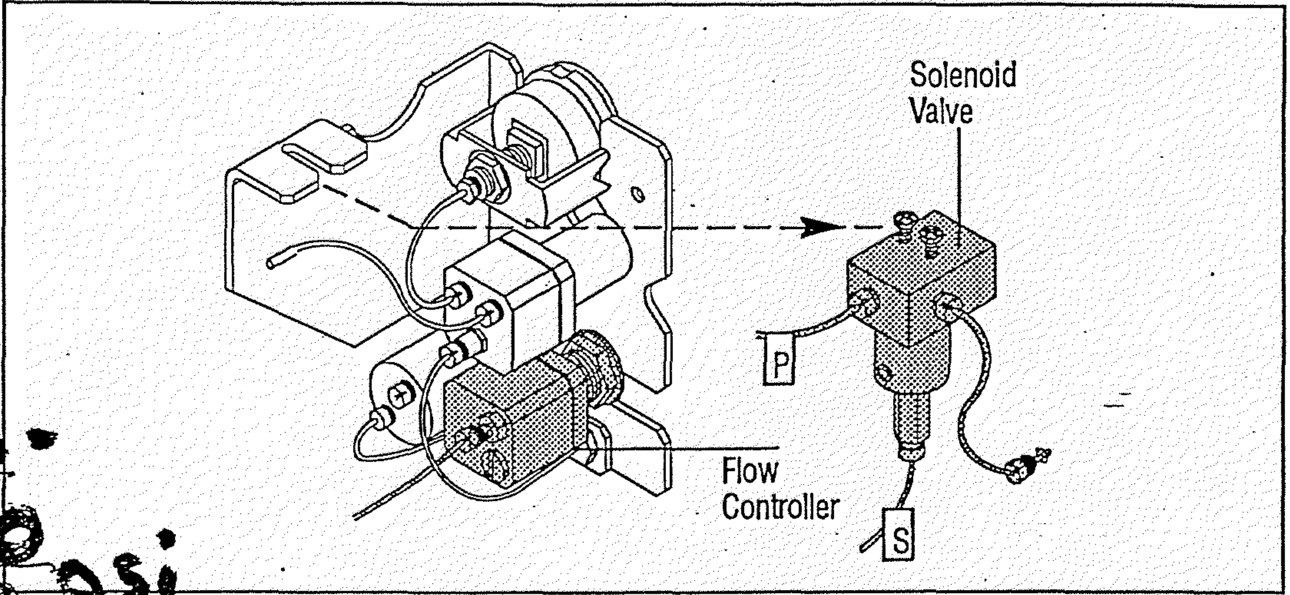
5. Unhook line 1 from the solenoid valve.

Unhook line 2 from the purge valve.



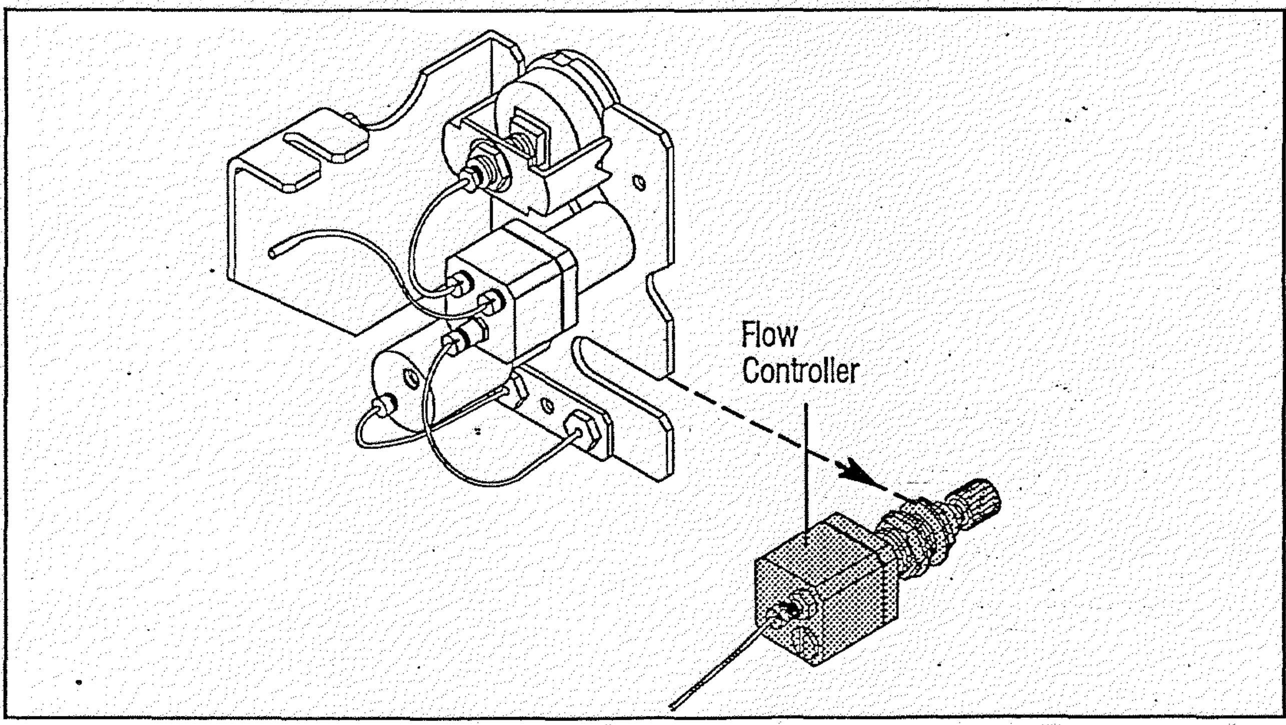
0-400 sccm

7. Remove the solenoid valve from the bracket by unscrewing the two screws holding it to the bracket. Slide the solenoid valve out of the groove.



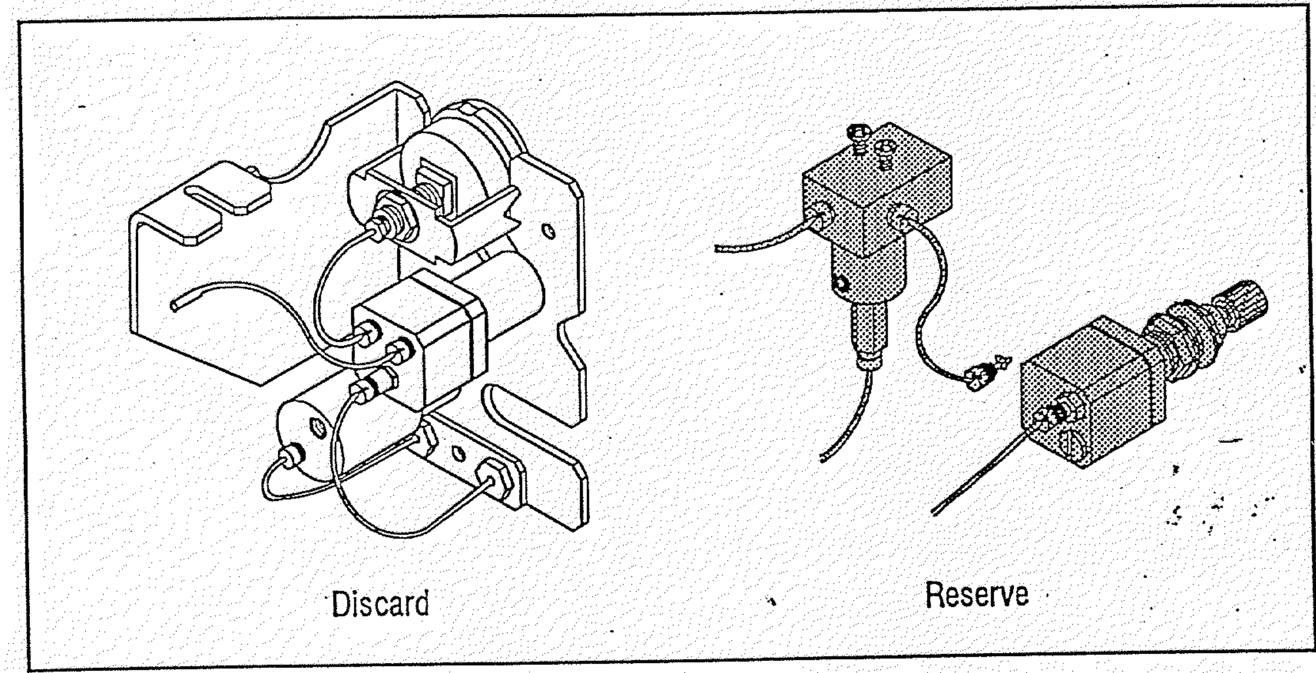
16-
70
30 psi

8. Remove the flow controller from the bracket by gripping the body of the flow controller with a wrench and loosening the nut. Slide the flow controller out of the groove.



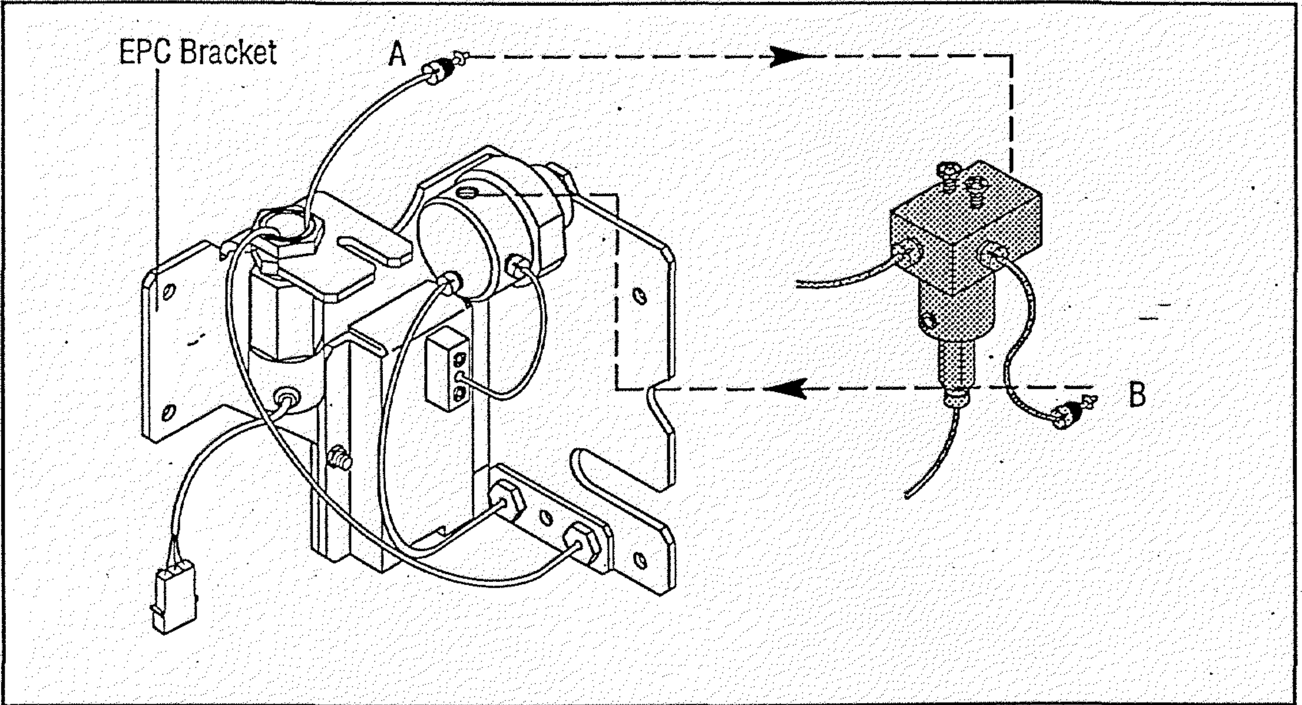
9. Discard the manual bracket assembly.

Note: Do not discard the solenoid valve and the flow controller that are still attached to the instrument.

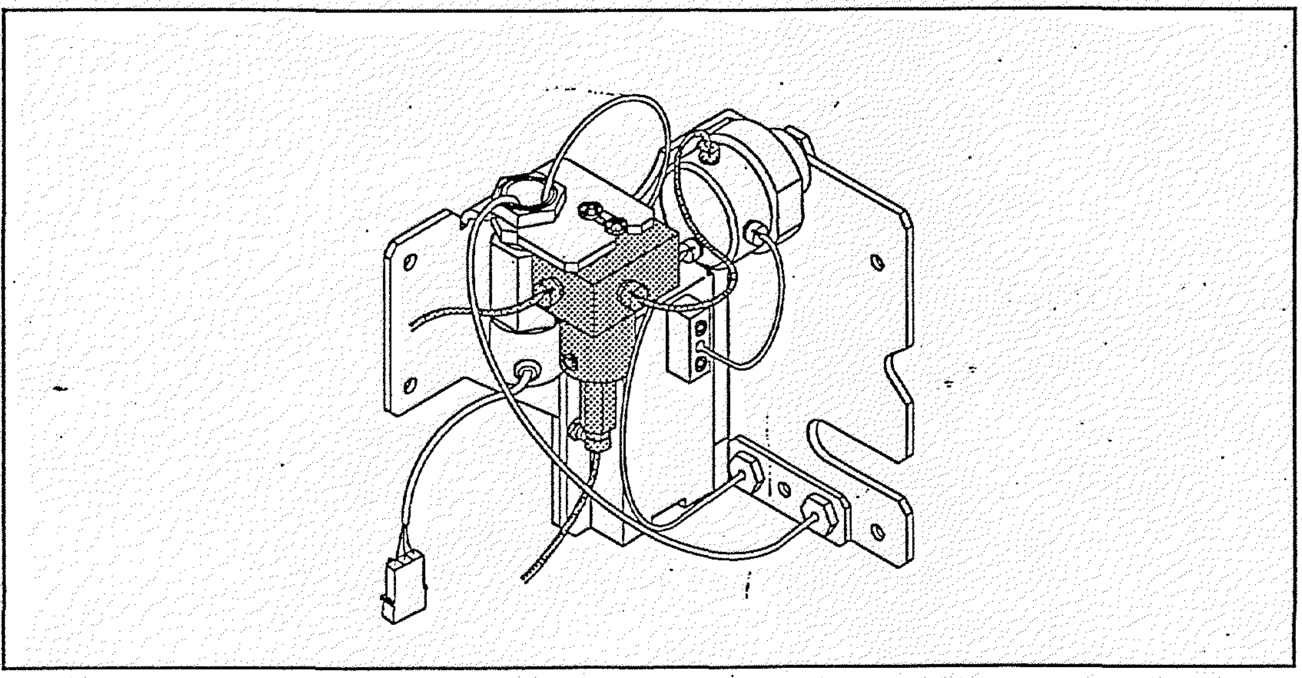


10. Pick up the new electronic pressure control (EPC) bracket. Connect the tube from the top of the electronic pressure valve (A) into the solenoid valve as indicated.

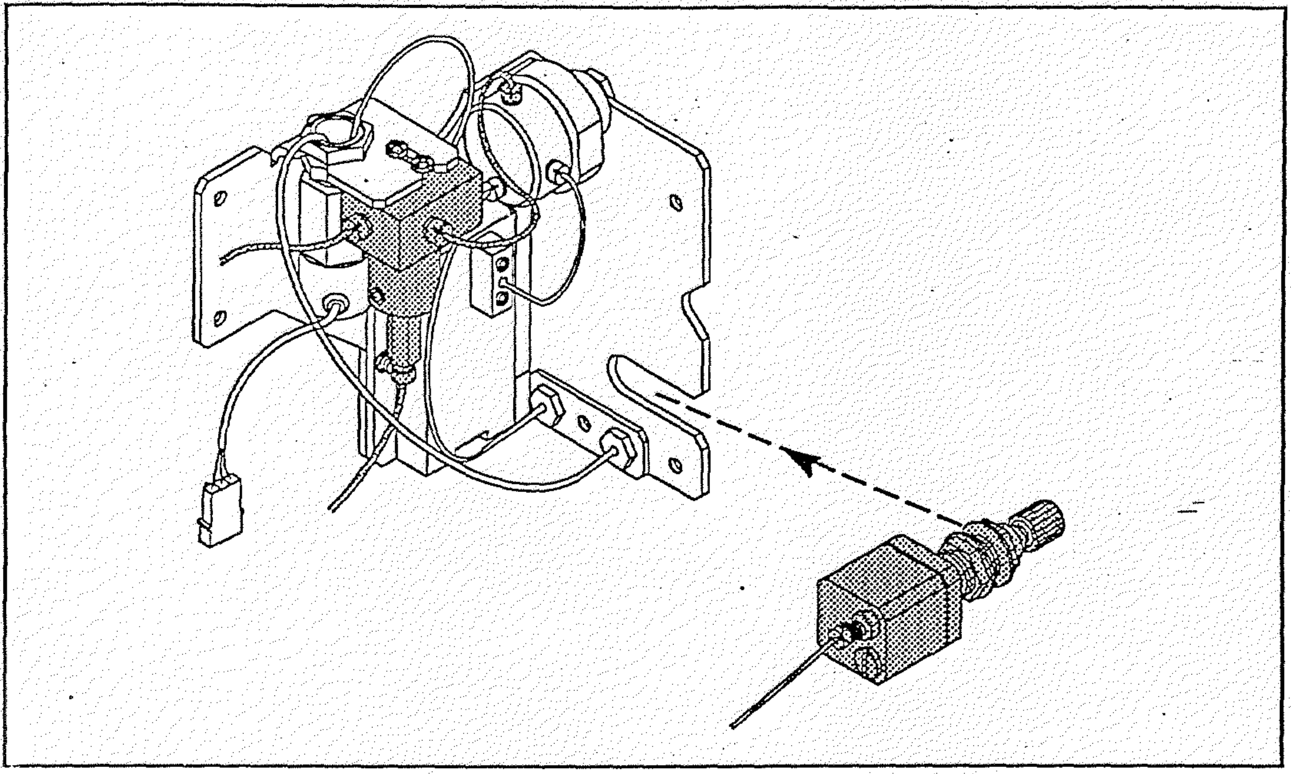
11. Connect the tube from the solenoid valve (B) to the gas gauge.



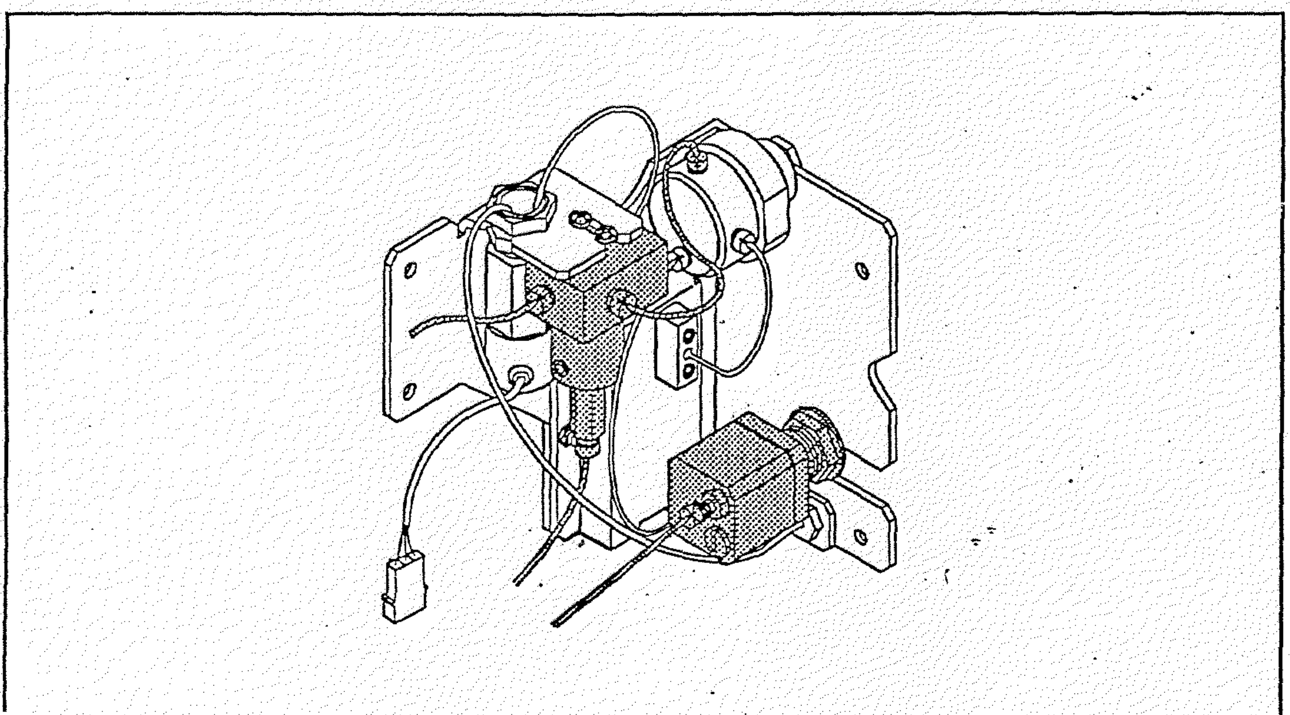
12. Slide the solenoid valve into the groove on the top of the bracket. Tighten the screws.



13. Slide the flow controller into the groove on the bracket. There will be a washer and nut on either side of the groove.

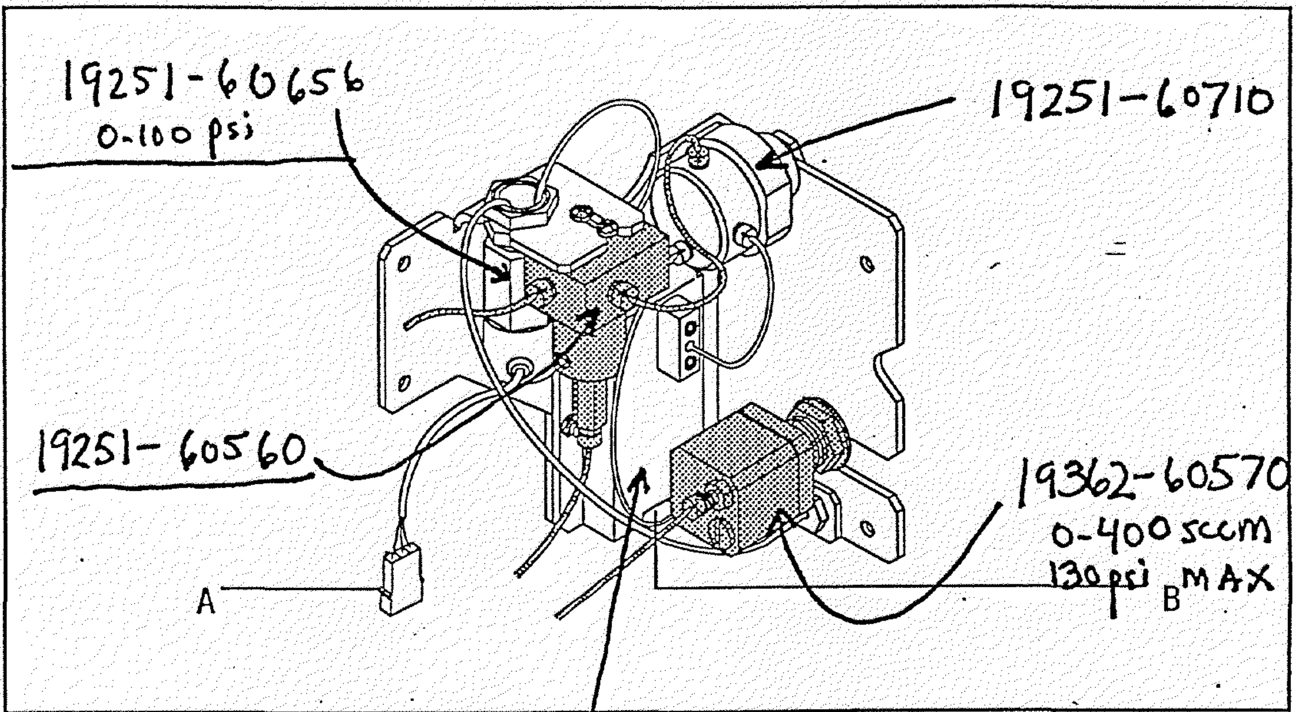


14. Grip the body of the flow controller with a wrench and tighten the nut.



15. Remove the EPC cable from its packaging. Connect the electronic pressure valve connector (white, three-pronged connector) to the connector hanging from the electronic pressure valve (A).

16. Connect the sensor board cable connector (black connector) to the receptacle EPC flow module (B).



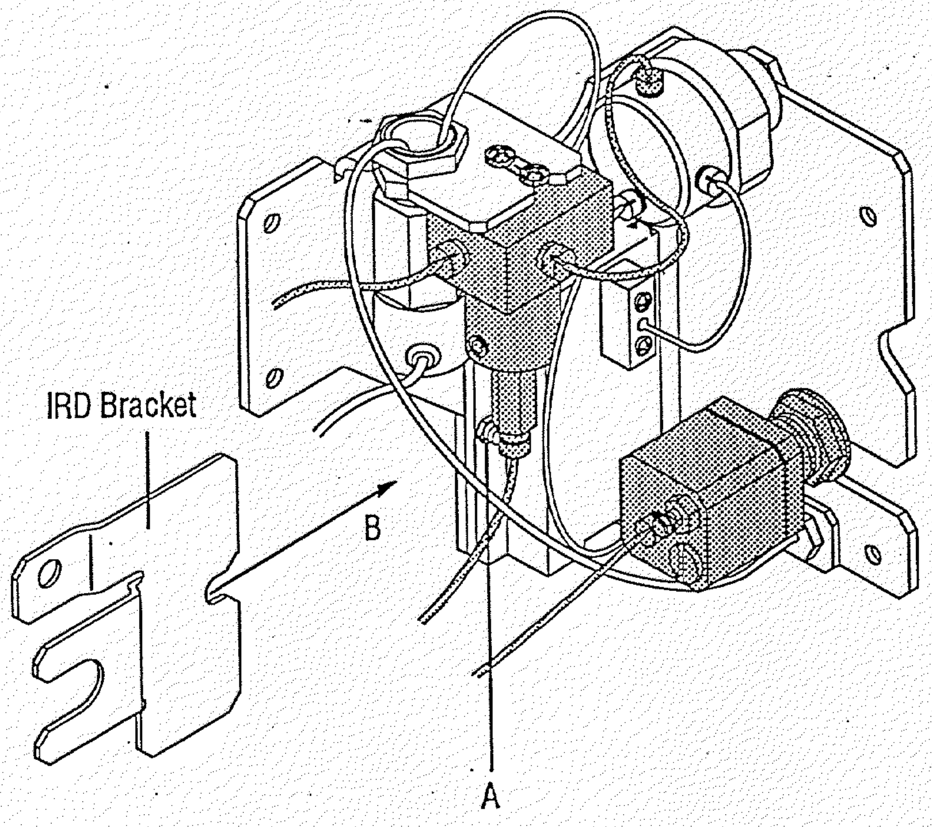
19245-60025 (Type II)
0-100 psi
"7-pin" box

Type I Box is a "4-pin" box

Note: Perform the steps in the figure only if you use an infrared detector (IRD).

1. Insert the IRD bracket behind the solenoid valve.

Note: To install the IRD bracket, loosen the nut on the back of the EPC bracket (A). Slide the IRD bracket between the nut and the EPC bracket (B). Tighten the nut.

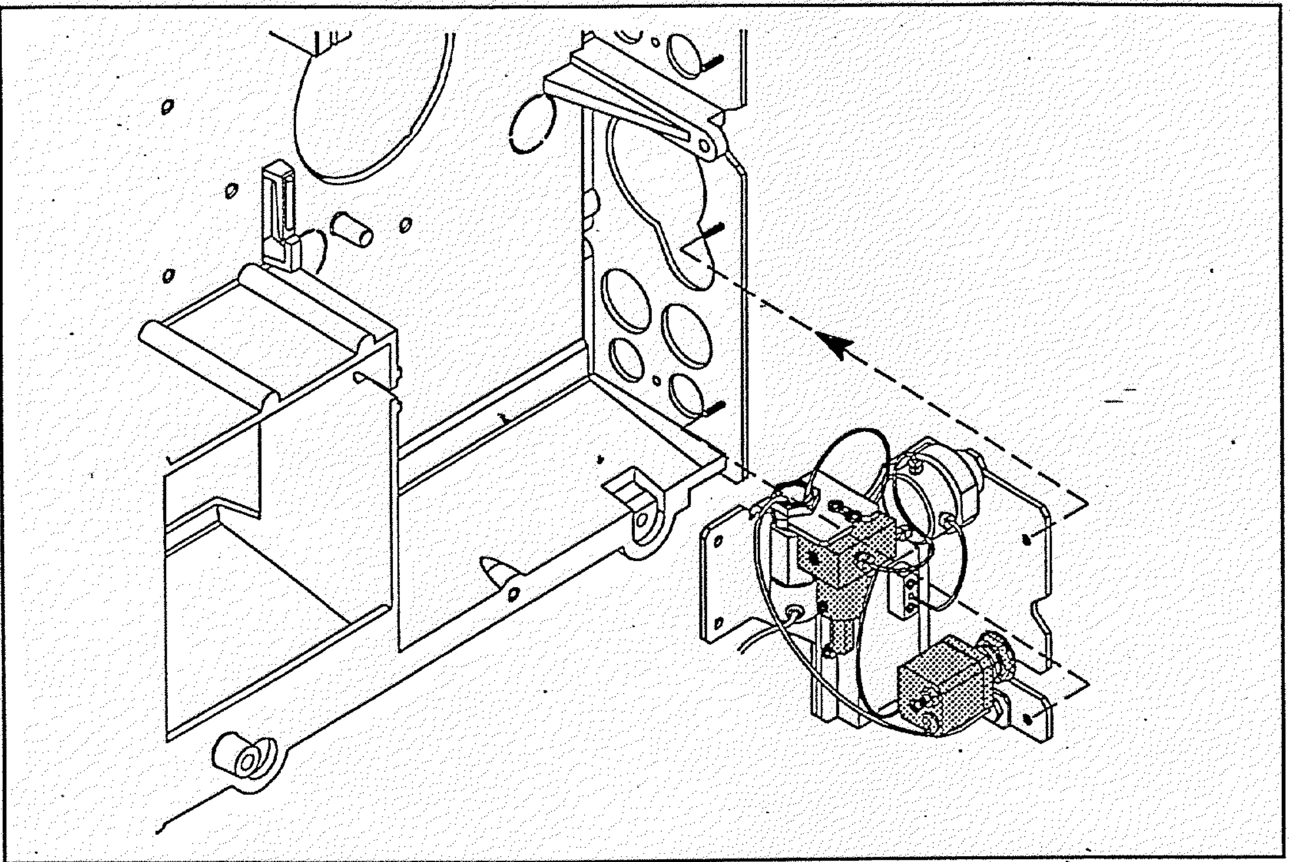


17. Remove the old control panel sticker from the outside front panel. Discard.

18. Peel off the backing to the new control panel front and push it onto the front panel.

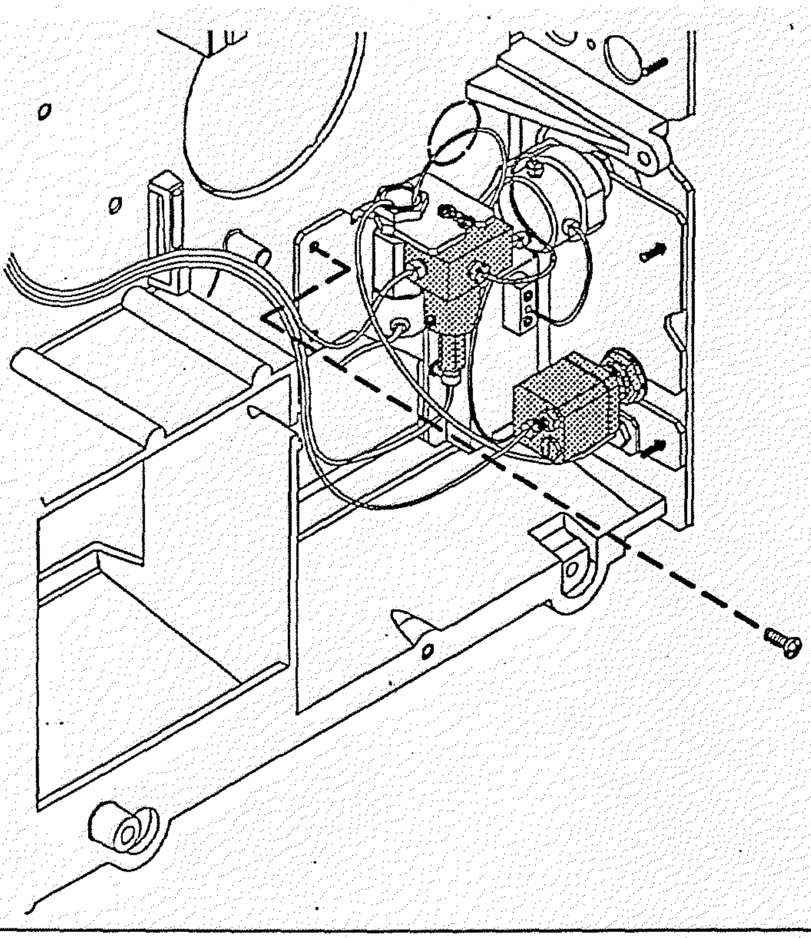
Note: Because model types vary, two shades of control panel fronts are included. Use the appropriate color sticker for your model and discard the other.

19. Insert the EPC flow module in the same place on the GC that the manual pressure control flow module was. Tighten the two nuts holding it to the bezel.



20. Use the self-tapping screw to secure the flow module to the instrument.

Note: Because model types vary, some instruments may not have a predrilled hole for the self-tapping screw. If no hole exists, do not use the self-tapping screw.



If your system is configured only in split mode, use the enclosed hex nut to connect the split line and the pressure regulated valve.

3

Changing the EPROMs

You should check the main board and communication board EPROMs. If the part numbers on your EPROMs do not match the following, they need to be changed:

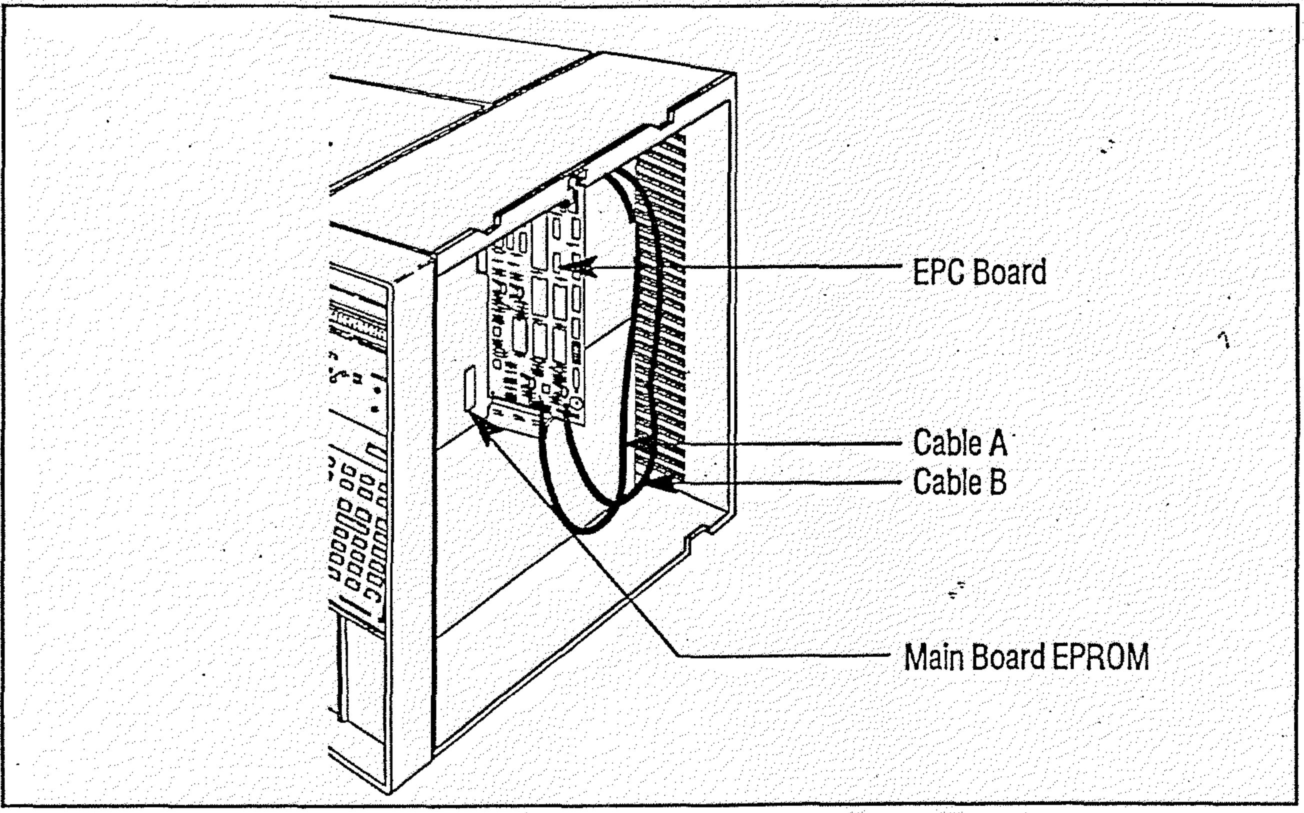
main board EPROM part number 05890–80310

communication board EPROM part number 19257–80040.

CAUTION

The procedure below requires protection against ESD (Electro-Static Discharge). Ground yourself by connecting a grounded wrist strap to a suitable ground, such as an unpainted part of the GC.

1. Ground yourself by attaching a grounding strap to the sheet metal of the oven top.
2. Pry off the existing main board EPROM with an EPROM puller. You may have to remove the EPC board, if one is already installed



Note: If you do not have an EPROM puller, carefully pry off the EPROM with a small screwdriver.

3. Remove the new EPROM from the grounding material (the grey foam material). Insert the old EPROM onto the grounding, and reserve for later use.

   Note: Store the old EPROM in the electrostatic bag for further protection.

7. Inspect the new EPROM for uneven or misaligned pins.

8. Press the EPROM gently on its side onto a hard, level surface (such as the top of the GC) to bend the pins in slightly. Repeat on the opposite side.

   Note: During packaging, EPROM pins are spread apart to ensure a good connection.

9. Align the EPROM with the outline of the EPROM on the main board. Match the notch on the top of the EPROM to the notch at the top of the outline.

10. Push the EPROM gently onto the board.

    Note: If the EPROM does not fit easily, or if any of the pins bend on contact, remove the EPROM, straighten the pins, and reinsert.

Use the same steps to replace the communications board EPROM.

Verifying the EPROM Installation

1. Remove the grounding strap from the instrument.

2. Plug in the instrument, and turn the power on.

3. Check the display panel for lights and operation.

   Note: If no lights appear, the EPROM is not completely connected. Turn off the power, unplug the instrument, replace the grounding strap, and repeat the installation procedure.

4

Configuring the EPC Board

The examples below show how to set the set the configuration switches on an EPC board with auxiliary EPC functions (HP 19230W).

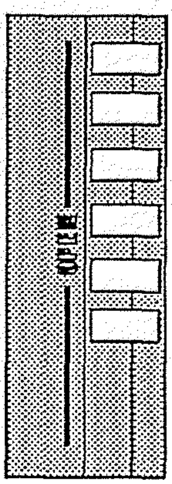
If you you purchased a board before September 1, 1992, go to page 21 to set your switches.

IN A1 or IN B1	Right, currently unused PID
IN A0 or IN B0	Left, Programmable Cool On-Column (PID) / Right, Purged Packed Inlet & Split/Splitless Capillary Inlet (PID)
MODE A or MODE B	Left, (FPR) Programmable Cool On-Column Inlet & Purged Packed Inlet / Right, (BPR) Split/Splitless Capillary Inlet
	PID = Proportional / Integral / Differential heated zone FPR = Forward Pressure Regulating mode BPR = Back Pressure Regulating mode

These switches are present only on boards purchased before September 1, 1992

EPC A or EPC B	Left, Electronic Pressure Control present / Right, Electronic Pressure Control not present

Inlet B = Split/Splitless Inlet with **Electronic Pressure Control**
Inlet A = Any Non-Electronic Pressure Controlled Inlet

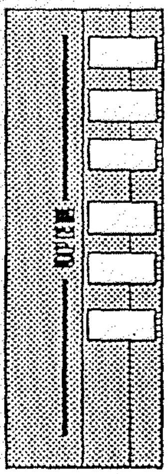


IN B1 → Right
IN B0 → Right
MODE B → Right
IN A1 → Right
IN A0 → Right
MODE A → Right

Note:
← Left = Open
→ Right = Closed

Note:
This group of switches controls the **A** position inlet. If another EPC inlet is installed in the A position, this group of switches must be set according to the instructions for that particular inlet.

Inlet B = Any Non-Electronic Pressure Controlled Inlet
Inlet A = Split/Splitless Inlet with **Electronic Pressure Control**



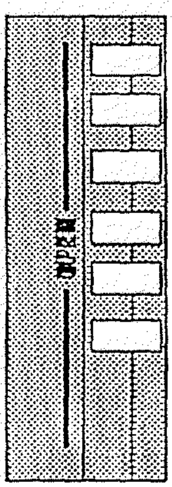
IN B1 → RIGHT
IN B0 → RIGHT
MODE B → RIGHT

Note:
This group of switches controls the **B** position inlet. If another EPC inlet is installed in the A position, this group of switches must be set according to the instructions for that particular inlet.

IN A1 → RIGHT
IN A0 → RIGHT
MODE A → RIGHT

Note:
← Left = Open
→ Right = Closed

Inlet B = Split/Splitless Inlet with **Electronic Pressure Control**
Inlet A = Split/Splitless Inlet with **Electronic Pressure Control**

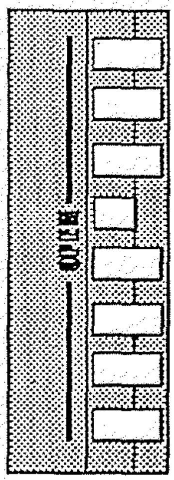


IN B1 → Right
IN B0 → Right
MODE B → Right
IN A1 → Right
IN A0 → Right
MODE A → Right

Note:
← Left = Open
→ Right = Closed

These configuration settings are for EPC boards bought before September, 1992.

Inlet B = Split/Splitless Inlet with **Electronic Pressure Control**
Inlet A = Any Non-Electronic Pressure Controlled Inlet

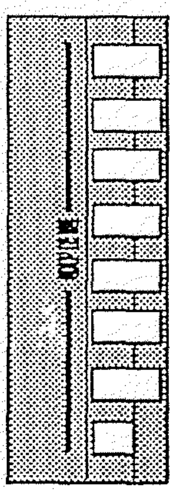


IN B1 → Right
IN B0 → Right
MODE B → Right
EPC B ← Left
IN A1 → Right
IN A0 → Right
MODE A → Right
EPC A → Right

Note: This group of switches controls the **A** position inlet. If another EPC inlet is installed in the A position, this group of switches must be set according to the instructions for that particular inlet.

Note:
← Left = Open
→ Right = Closed

Inlet B = Any Non-Electronic Pressure Controlled Inlet
Inlet A = Split/Splitless Inlet with **Electronic Pressure Control**

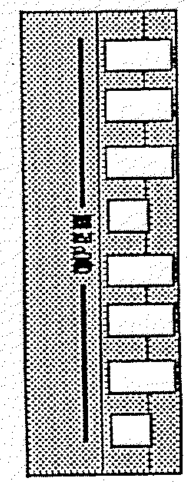


IN B1 → RIGHT
IN B0 → RIGHT
MODE B → RIGHT
EPC B → RIGHT
IN A1 → RIGHT
IN A0 → RIGHT
MODE A → RIGHT
EPC A ← LEFT

Note: This group of switches controls the **B** position inlet. If another EPC inlet is installed in the A position, this group of switches must be set according to the instructions for that particular inlet.

Note:
← Left = Open
→ Right = Closed

Inlet B = Split/Splitless Inlet with **Electronic Pressure Control**
Inlet A = Split/Splitless Inlet with **Electronic Pressure Control**



IN B1	→	Right
IN B0	→	Right
MODE B	→	Right
EPC B	←	Left
IN A1	→	Right
IN A0	→	Right
MODE A	→	Right
EPC A	←	Left

Note:
← Left = Open
→ Right = Closed

Verifying the Installation

1. Install the column.

2. With all the connections made, restore carrier gas flow and leak test the new installation.

3. If the system is leak-free, reinstall panels and covers. Reconnect the instrument power cord and restore power. Refer to the HP 5890 Series II manual set for operation instructions.

Item	Description	HP Part No.
1	Plastic M8 fitting (Nut)	05890-40050
	(Package of 10)	5181-3394
2	O-ring	0905-1039
	(Package of 12)	5180-4181
3	EPC[1]/BPR[2] bracket	19243-00125
4	1/8-in. Swagelok plastic cap	05890-40230
5	5/16-in. hex nut	2950-0203
6	0-400 mass flow controller	19362-60575
	For replacement parts see Section 4	
7	Machine screw M3 x 0.5 x 8 mm	0515-0912
8	Transducer brazement	19243-80600
9	Hex nut with lockwasher	0535-0043
10	EPC sensor PCB assembly	
	0-100 psi (2 channel)	19245-60020
	0-100 psi (6 channel)	19245-60025
	0-15 psi (6 channel)	19245-60050
11	Vent torque plate	19244-00030
12	Septa vent tube weldment	19244-80580
13	Proportional control valve	19251-60720
14	Solenoid valve assembly	19251-60560
15	Connects to insert assembly[3]	
16	Septa purge regulator (Approx. 3 ml)	19251-60710
Not Shown:		
	Cable, 6 channel EPC	19245-60705
	Cable, 2 channel EPC	19245-60700
	Cable, 2 to 6 channel adapter	19245-60702

[1]EPC—Electronic Pressure Control

[2]BPR—Back Pressure Regulator

[3]See Item 22 of next figure

Figure 1. EPC Split/Splitless Capillary Inlet Flow Module (Sheet 1 of 2).

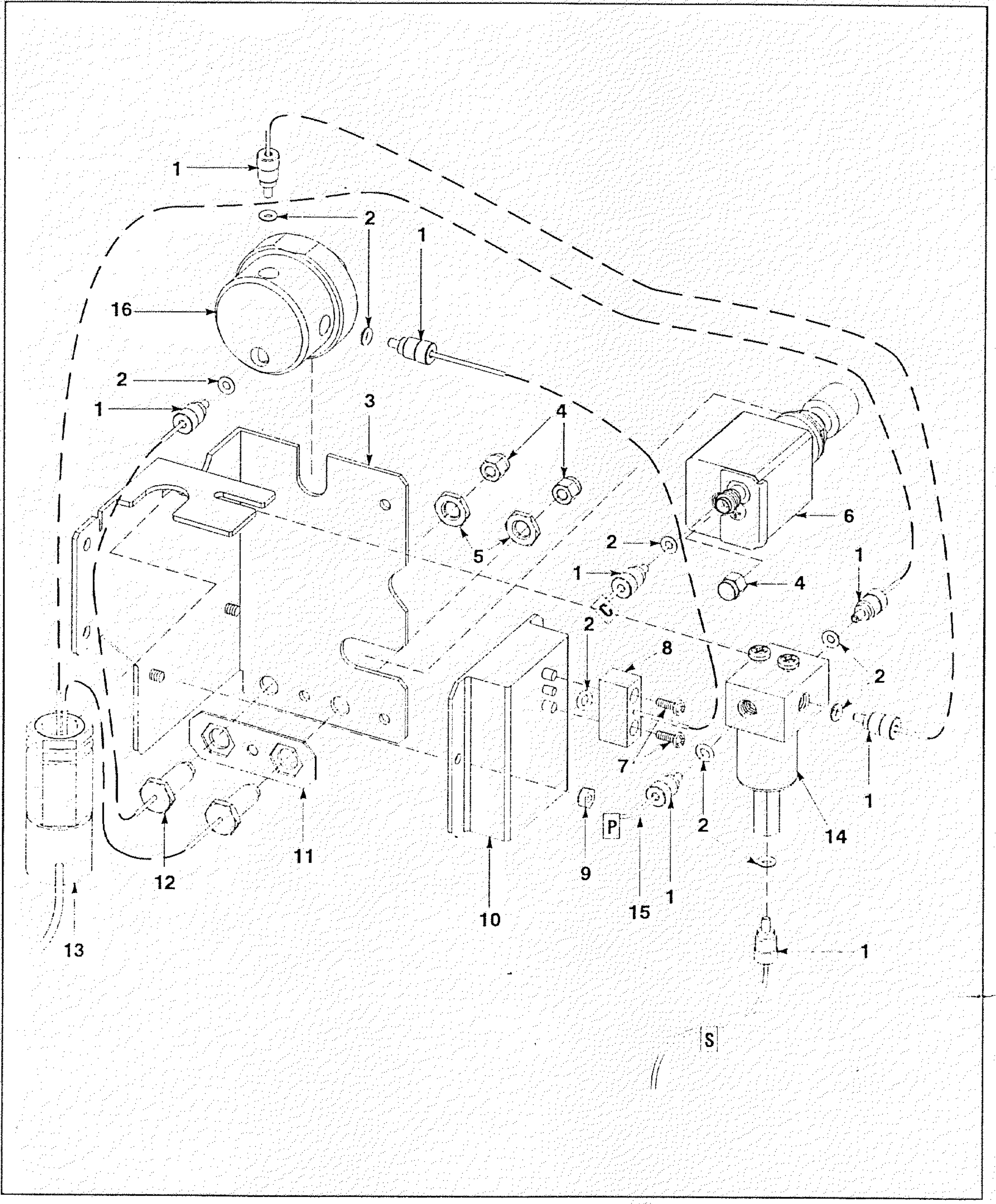


Figure 1. EPC Split/Splitless Capillary Inlet Flow Module (Sheet 2 of 2).

Item	Description	HP Part No.
1	Heater/sensor assembly	05890-61140
2	• Contact	1251-1679
3	• Contact	1251-5963
4	• Flexible sleeving (Ordered by the inch)	0890-0737
5	• PRT assembly	19231-60660
6	• Heater, 70 W	19231-60620
7	Tubing nut, 1/8-inch brass	0100-0058
8	Back ferrule, 1/8-inch brass	0100-0036
9	Front ferrule, 1/8-inch brass	0100-0032
10	Splitter tube	19251-80525
11	Septa retainer (Standard)	18740-60835
	Retainer nut for headspace	18740-60830
12	Septa, low bleed (Package of 25)	5080-8894
13	Insert assembly	19251-60575
14	O-ring—High temp. (Package of 12)	5180-4182
	Graphite seal for split liner (Pkg of 12)	5180-4168
	Graphite seal for splitless liner (Pkg of 12)	5180-4173
15	Liner—Split/Splitless (4 mm id)	19251-60540
	Split-Packed (4 mm id)	18740-60840
	Split-Unpacked (4 mm id)	18740-80190
	Splitless (2 ± 0.2 mm id)	18740-80220
	Direct (1.5 ± 0.2 mm id)	18740-80200
	Split/Splitless with glass wool (4 mm id/deactivated)	5062-3587
	Splitless tapered one end (4 mm id/deact.)	5181-3316
	Splitless double tapered (4 mm id/deact.)	5181-3315
16	Shell weldment	19251-80570
17	Glass cloth	9300-0713
18	Insulation	0340-0686
19	Insulation	19251-00120
20	Heat sink	18740-20940
21	Shaped insulation	19251-00020
22	Retaining nut	19251-20620
23	Gold plated seal	18740-20885
	Stainless steel seal	18740-20880
24	Flat washer, stainless steel	2190-0701
	(Package of 12)	5061-5869
25	Reducing nut	18740-20800
26	Insulation	19243-00065
27	Lower insulation	19243-00060
28	Lower insulation cover	19243-00070
29	Column seal/ferrule (See consumables catalog)	
30	Column nut	5181-8830
Not Shown		
	Split vent trap (Recommended)	19251C

Figure 2. EPC Split/Splitless, Split-Only Capillary Inlet (Sheet 1 of 2).

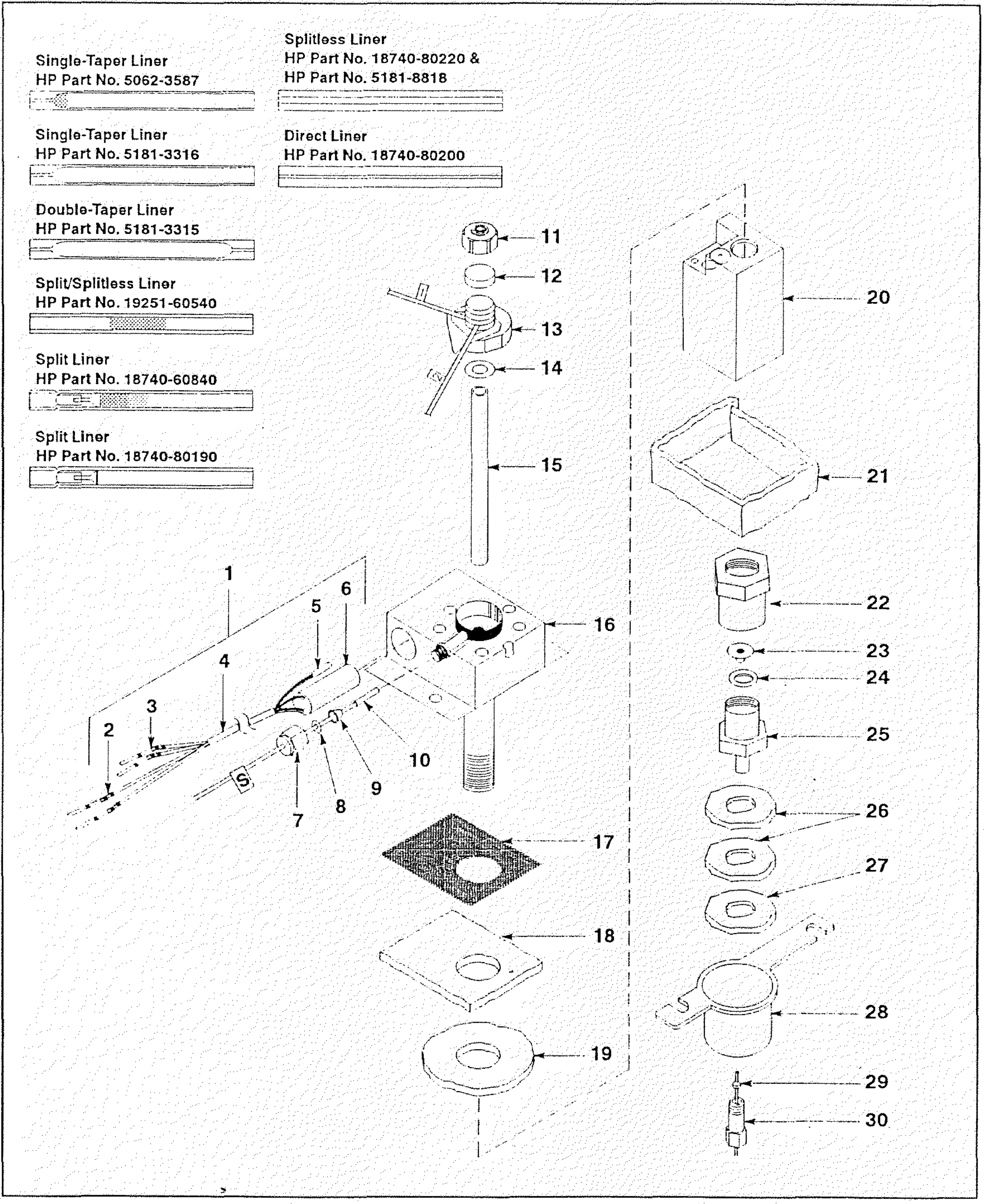


Figure 2. EPC Split/Splitless, Split-Only Capillary Inlet (Sheet 2 of 2).

Item	Description	HP Part No.
1	M8 plastic fitting (Package of 10)	5181-3394
2	O-ring (Package of 12)	5180-4181
3	M8 x M8 side tube weldment	19245-80640
4	M8 brass plug	19361-20770

Shown

Relocation of pressure sensing to ahead of the proportional valve.

Figure 3. Back Pressure-Controlled Split/Splitless Capillary Inlet (19245H) (Sheet 1 of 2).

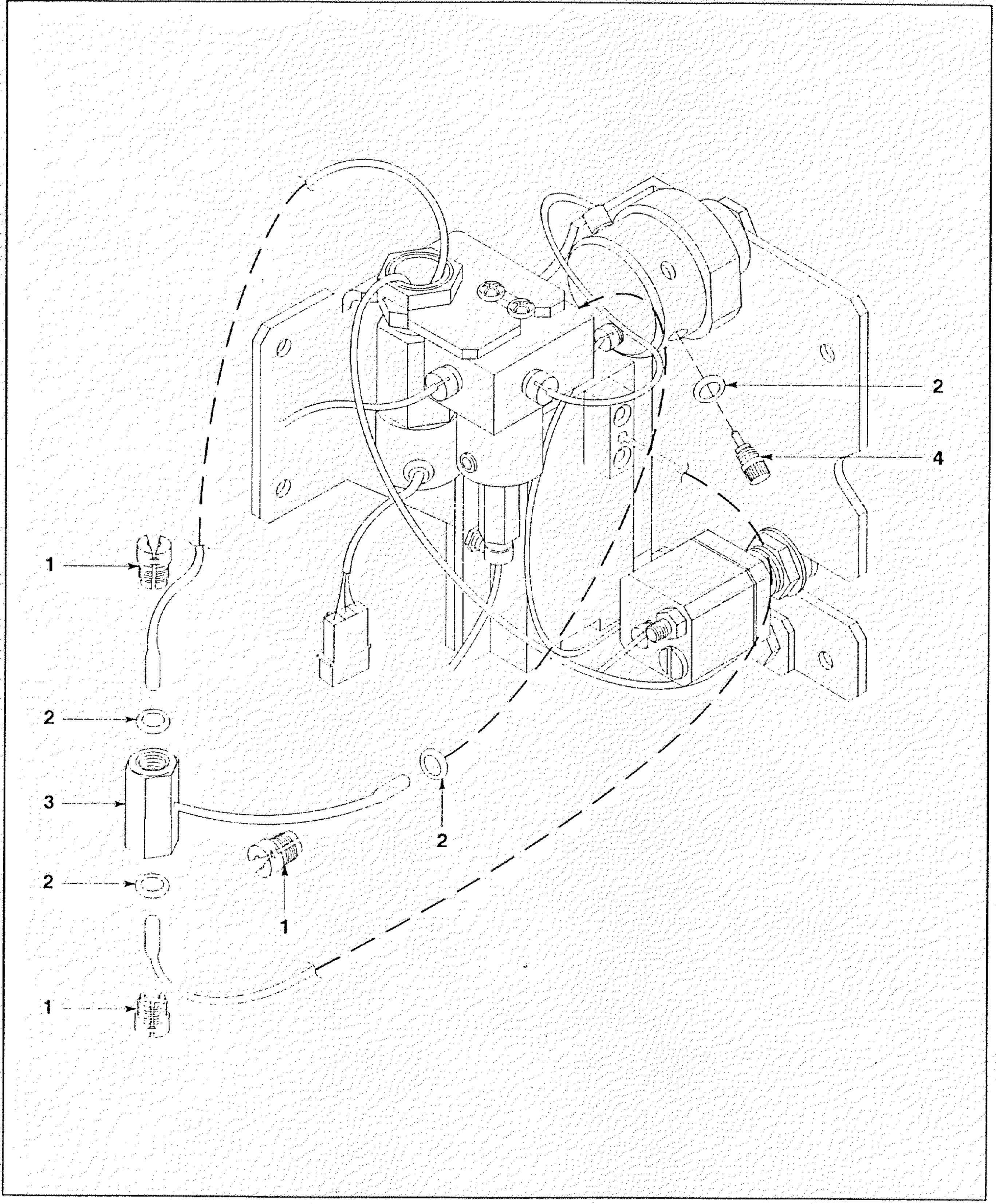


Figure 3. Back Pressure Controlled Split/Splitless Capillary Inlet (19245H) (Sheet 2 of 2).

Item	Description	HP Part No.
1	Proportional control valve replacement kit[1]	19245-60890
	• Proportional control valve	19245-60950
	• EPC bracket	19245-00077
	• FID air restrictor	19231-60610
	• M12 x Swagelok fitting	19243-20680
	• 0.239-in id O-Ring	0905-1014
2	Purge regulator kit (Approx.14 ml)	19245-60532
	• Purge regulator (With internal restriction)	19245-60535
	• Vent tube weldment	19244-80580
3	FPR[2]/EPC bracket	19245-00077
4	EPC sensor PCB assembly	
	0-100 psi (2 channel)	19245-60020
	0-100 psi (6 channel)	19245-60025
	0-15 psi (6 channel)	19245-60050
5	Vent torque plate	19244-00030
6	Ungreased O-Ring	0905-1039
	(Package of 10)	5180-4181
7	Vent tube weldment (Without restriction)	19244-80580
8	Hex nut with lockwasher	0535-0043
9	Hex nut	2950-0203
10	M12 x Swg. fitting	19243-20680
11	PPIP transducer weldment	19243-80600
12	Sealing plate	19245-00140
13	Screw, M4 x 0, 7 x 8	0515-0910
14	EPC valve seal brazement, FPR	19245-80600
15	M8 plastic fittings (Package of 10)	5181-3394
16	Machine screw M3 x 0.5 x 8 mm	0515-0912
Not Shown:		
	EPC cable (2 channel)	19245-60700
	EPC cable (6 channel)	19245-60705
	Jumper cable	
	(2 channel sensor to 6 ch. EPC brd.)	19245-60702
	PCOC EPC label plate	19245-90825

[1]Kit replacement necessary on early production instruments

[2]FPR—Forward Pressure Regulator

Figure 4. EPC Programmable Cool On-Column Inlet Flow Module (Sheet 1 of 2).

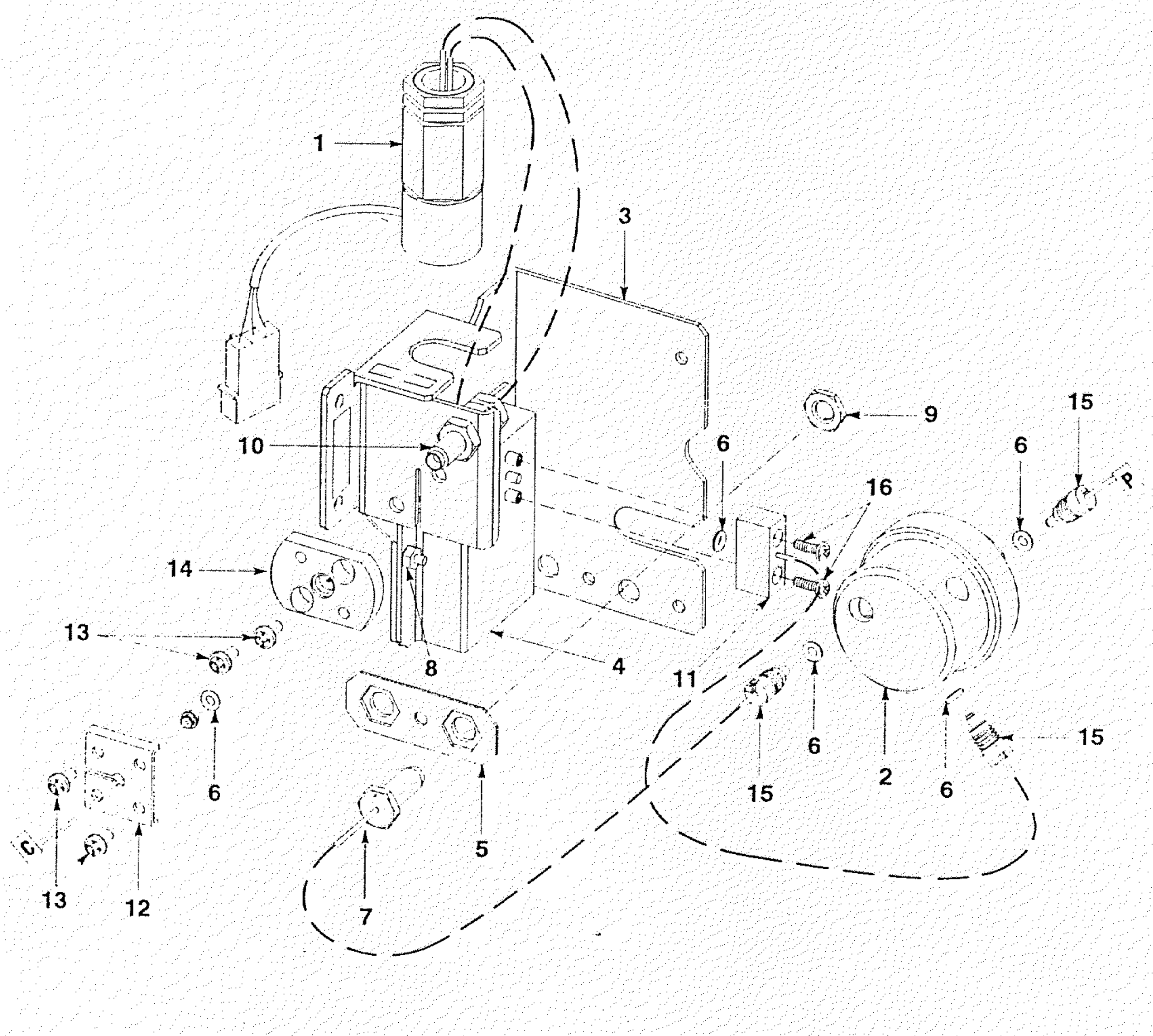


Figure 4. EPC Programmable Cool On-Column Inlet Flow Module (Sheet 2 of 2).

Item	Description	HP Part No.
1	Automatic injection assembly	
	• Needle guide top	19245-20670
	• Septum nut base assembly	19245-80520
	• Septum (Package of 25)	5181-1260
1a	Manual injection assembly	
	• Cooling tower assembly/needle guide	19320-80625
	• Duckbill (Package of 10)	19245-40050
2	PCOC insert spring	19245-60760
3	Inserts:	
	Note	
	Inserts are identified by the number of rings around them	
	• Narrow bore insert; 200 μ (1 ring)	19245-20510
	• 250 μ (2 rings)	19245-20515
	• 320 μ (5 rings)	19245-20525
	• 530 μ (0 rings)	19245-20580
	• 530 μ AL clad column, black AL coating	19245-20780
	• Glass capillary columns (3 rings)	19245-20550
4	Screw, M4 x 8 mm	0515-0910
5	Heater clamp	19245-00095
6	On-column weldment	19245-80507
7	PCOC inlet insulation	19245-20630
8	Lower insulation	19243-00065
9	Glass cloth	9300-0713
10	PCOC cavity sleeve	19245-00060
11	Ferrules (Package of 10)	
	• Vespel 2% graphite for 530 μ col	5062-3511
	• Vespel 2% graphite for 320 μ col	5062-3513
	• Vespel 2% graphite for 200 μ col	5062-3515
	• Vespel 10% graphite for 530 μ col	5062-3512
	• Vespel 10% graphite for 320 μ col	5062-3514
	• Vespel 10% graphite for 200 μ col	5062-3516
12	Column nut	18740-20870
13	Heater/sensor assembly	19245-60520
14	• Heater, cartridge, 60 W	19245-60570
15	• Contact	1251-1679
16	• PRT assembly	19231-60660
17	• Contact	1251-5216
18	• Insulation sleeving (Ordered by the inch)	0890-0737
Not Shown		
	Cleaning wire kit	5180-4153
	Screw, M4 x 0.7 x 8	0515-0106

Figure 5. EPC Programmable Cool On-Column Inlet (Sheet 1 of 2).

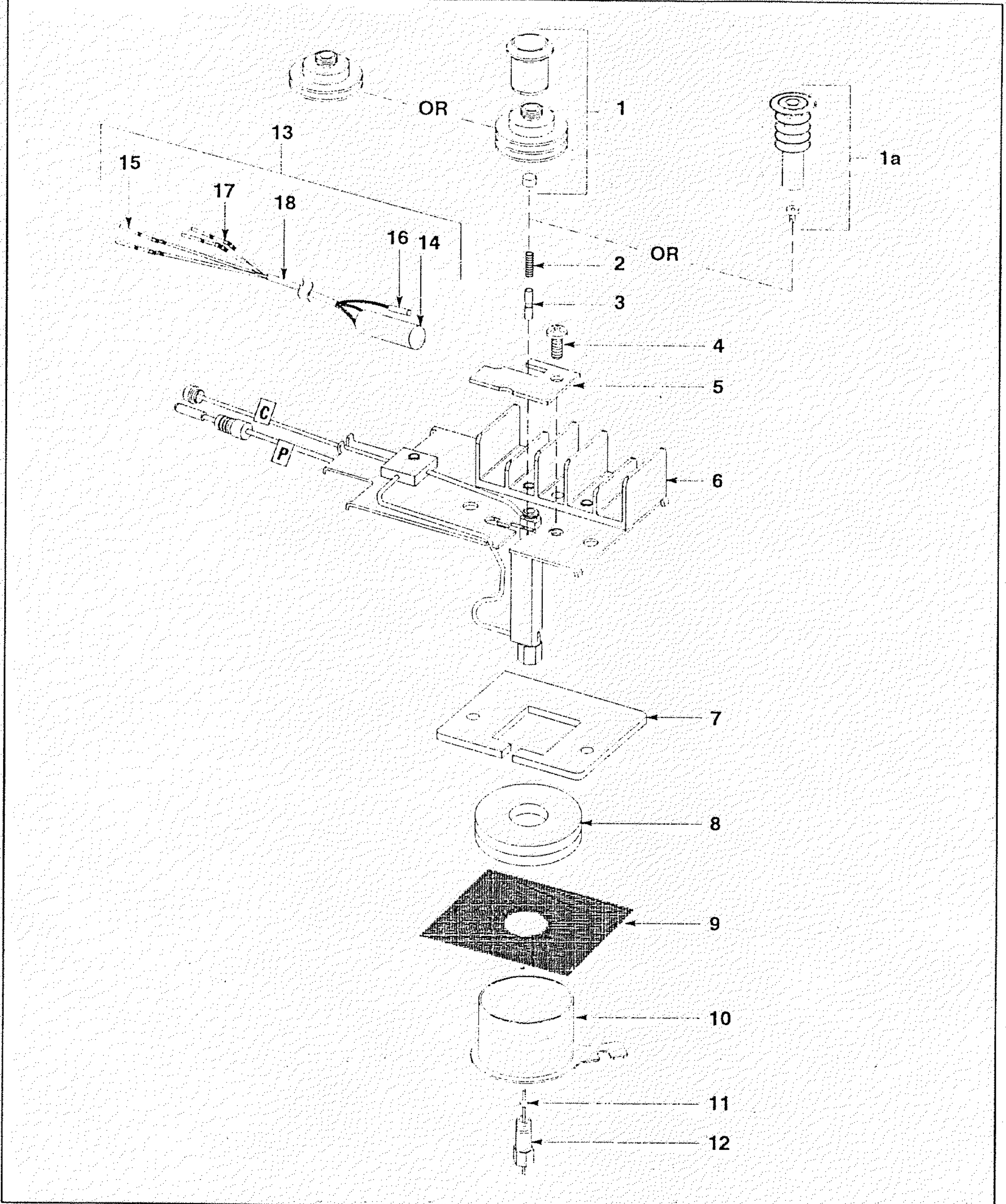


Figure 5. EPC Programmable Cool On-Column Inlet (Sheet 2 of 2).

Item	Description	HP Part No.
1	Proportional control valve replacement kit*	19245-60890
	• Proportional control valve	19245-60950
	• EPC bracket	19245-00077
	• FID air restrictor	19231-60610
	• M12 x Swg. fitting	19243-20680
	• 0.239-in id O-ring	0905-1014
2	Purge regulator (Approx. 1.5 ml)	19243-60650
3	EPC bracket	19245-00077
4	Sensor board, 2 channel	19245-60020
5	Vent torque plate	19244-00030
6	Ungreased O-ring	0905-1039
	(Package of 12)	5180-4181
7	Vent tube weldment (Without restriction)	19244-80580
8	Hex Nut with Lockwasher	0535-0043
9	Hex Nut	2950-0203
10	M12 x Swg. fitting	19243-20680
11	PPIP transducer weldment	19243-80600
12	Sealing plate	19245-00140
13	Screw, M4 x 0, 7 x 8	0515-0910
14	EPC valve seal brazement, FPR	19245-80600
15	M8 plastic fitting (Package of 10)	5181-3394
16	Machine screw M3 x 0.5 x 8 mm	0515-0912
NOT SHOWN:		
	EPC cable, 2 channel	19245-60700
	PPIP EPC label plate	19243-90795
	EPC cable, 6 channel	19245-60705
	2 channel to 6 channel adapter	19245-60702

*Kit replacement necessary on early production instruments

Figure 6. EPC Purged Packed Inlet Flow Module (Sheet 1 of 2).

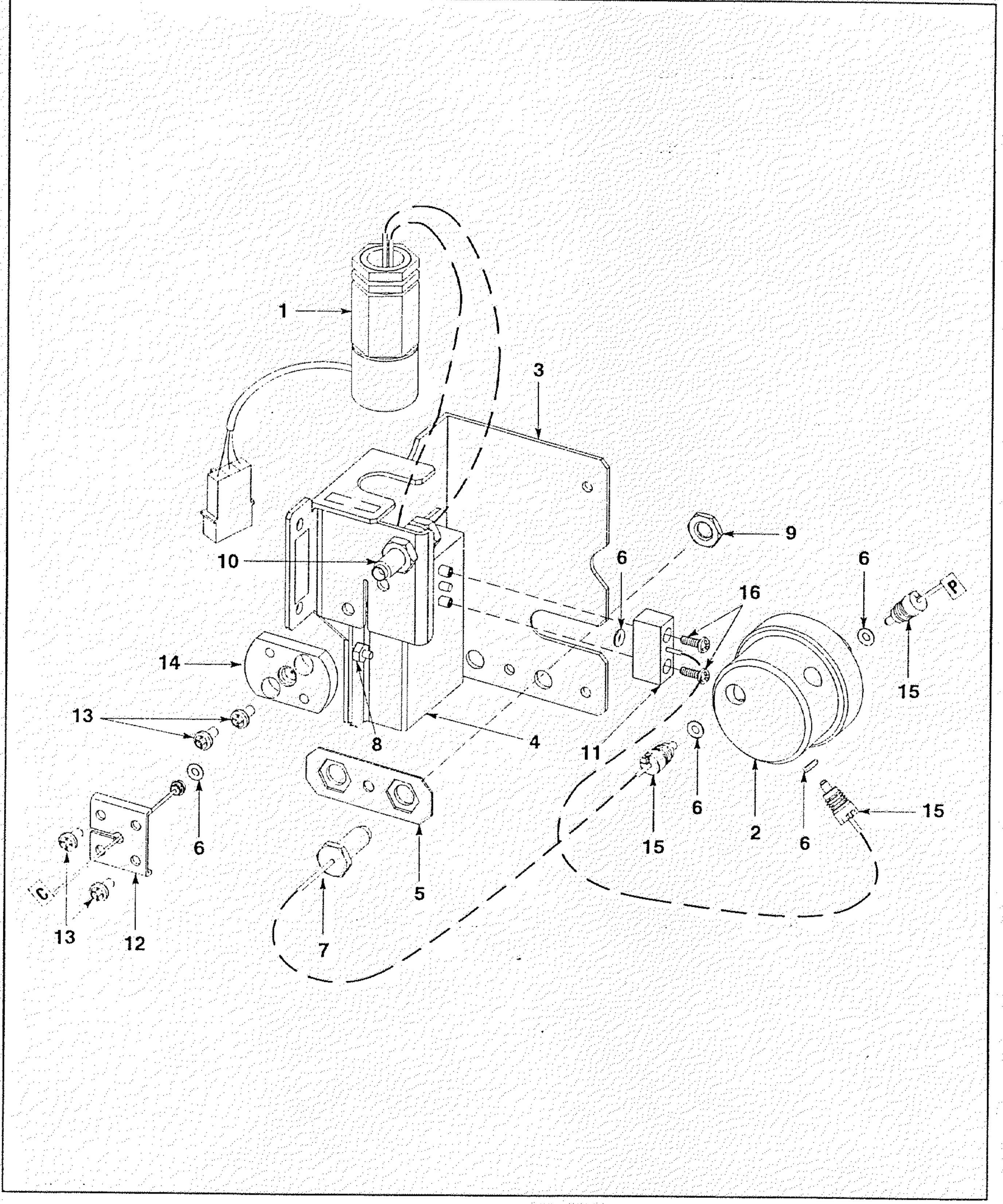


Figure 6. EPC Purged Packed Inlet Flow Module (Sheet 2 of 2).

Item	Description	HP Part No.
1	Machine screw	0515-0910
2	Top cover	19243-00085
3	Insulation	19243-00100
4	Insulation	19243-00155
5	PPIP assembly	
6	• Heater sensor assembly	05890-61540
	Flex cover	0890-0737
	PRT assembly	19231-60660
	70W heater	19243-60640
7	• Machine screw, M4 x 0.7 x 45 mm	0515-0964
8	• Septum nut assembly	18740-60835
	Headspace septum nut	18740-60830
9	• Top insert assembly	19243-80570
10	• O-ring (Package of 12)	5080-8898
11	• PPIP brazement	19243-60605
12	• Lock plate	19243-00135
13	• Heated block	19243-20765
14	• Thermal strap	19243-00145
15	Ferrules (Package of 10)	
	• Vespel 2% graphite for 530 μ col	5062-3511
	• Vespel 2% graphite for 320 μ col	5062-3513
	• Vespel 2% graphite for 200 μ col	5062-3515
	• Vespel 10% graphite for 530 μ col	5062-3512
	• Vespel 10% graphite for 320 μ col	5062-3514
	• Vespel 10% graphite for 200 μ col	5062-3516
16	Column nut	18740-20870
17	Nutwarmer insulation	19234-60710
18	Nutwarmer cup assembly	19234-60700
Not Shown		
	Inlet liners	
	1/4" column with glass inserts	19243-80540
	1/4" column without glass inserts	19243-80520
	1/8" column with glass inserts	19243-80530
	1/8" column without glass inserts	19243-80510
	Capillary column, 530 μ	19244-80540
	Glass inserts	
	Deactivated	5181-3382
	Nondeactivated	5080-8732

Figure 7. EPC Purged Packed Inlet (Sheet 1 of 2).

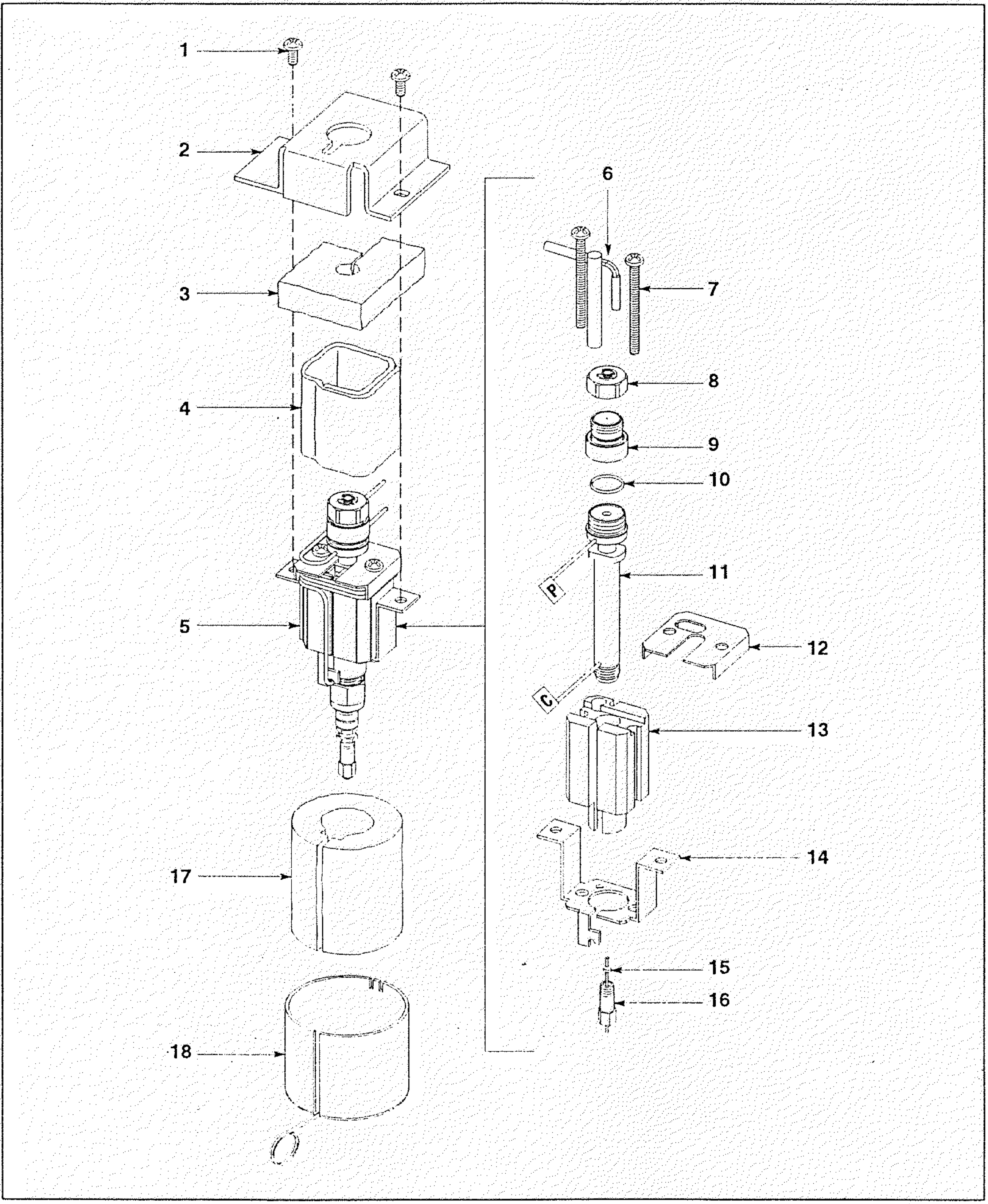


Figure 7. EPC Purged Packed Inlet (Sheet 2 of 2).

Item	Description	HP Part No.
1	External Sampler Interface (ESI)	19245-80630
2	O-ring (Package of 12)	5180-4181
3	Machine screw, M4 x 0.7 x 8 mm	0515-0910
4	3-way valve	0101-0653
5	HPM8 plug	19361-20770

For other pneumatic components, see Figures 6 and/or 7 (Purged Packed)

Note

This figure is used for relocation of the pressure sensor to just after the proportional valve on PPIP inlets.

Figure 8. Standard Configuration of the External Sampler Interface (19245H) (Sheet 1 of 2).

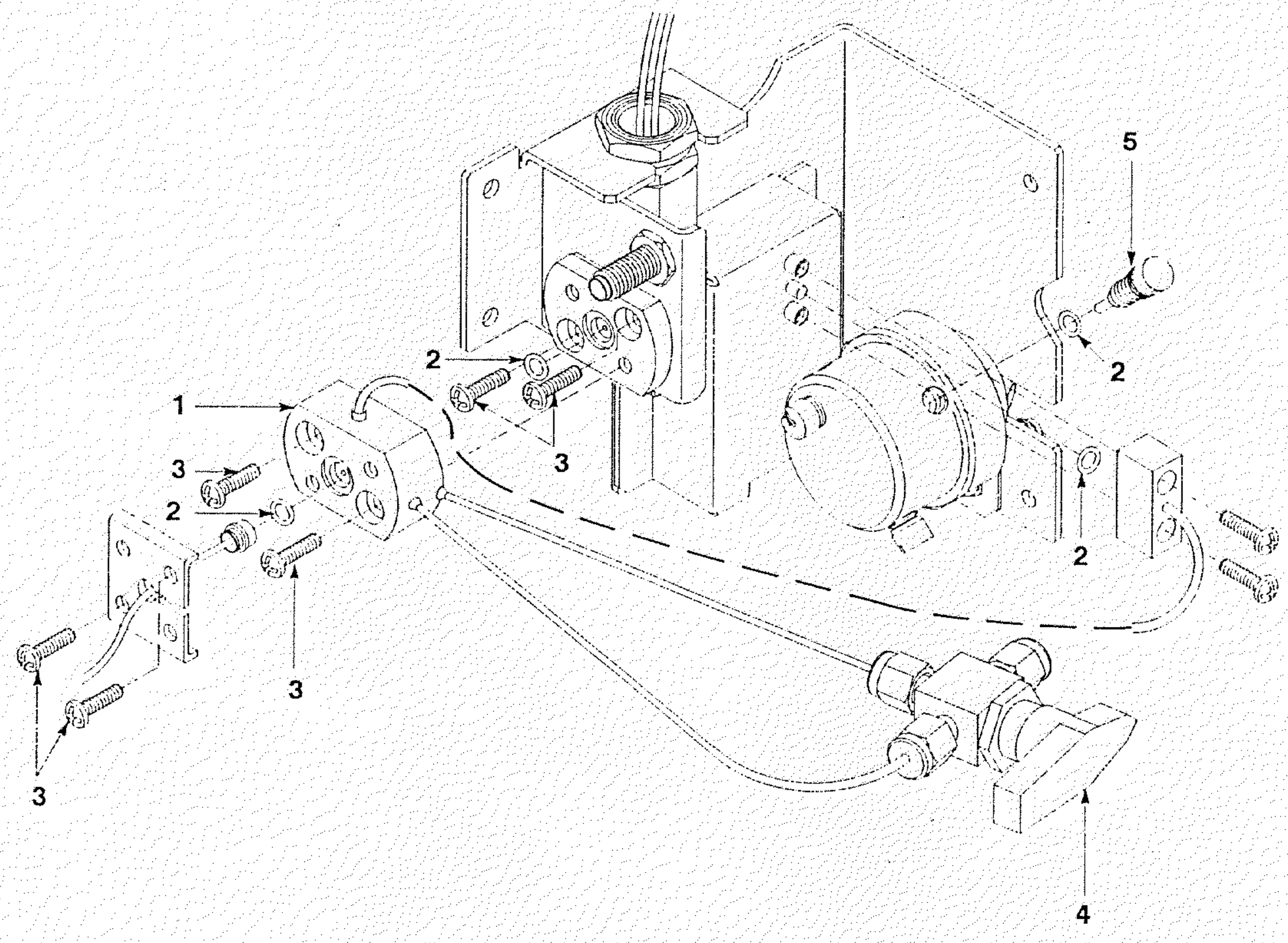


Figure 8. Standard Configuration of the External Sampler Interface (19245H) (Sheet 2 of 2).

Item	Description	HP Part No.
1	External Sampler Interface	19245-80630
2	O-ring (Package of 12)	5180-4181
3	Machine screw, M4 x 0.7 x 8 mm	0515-0910
4	1/8-in stainless steel union	0100-0126
5	1/8-in stainless steel fitting plug	0100-0071
6	3-Way valve	0101-0653
7	HPM8 plug	19361-20770

For other pneumatic components, see Figures 6 and/or 7 (Purged Packed)

Figure 9. Modified Configuration of the External Sampler Interface (19245H) (Sheet 1 of 2).

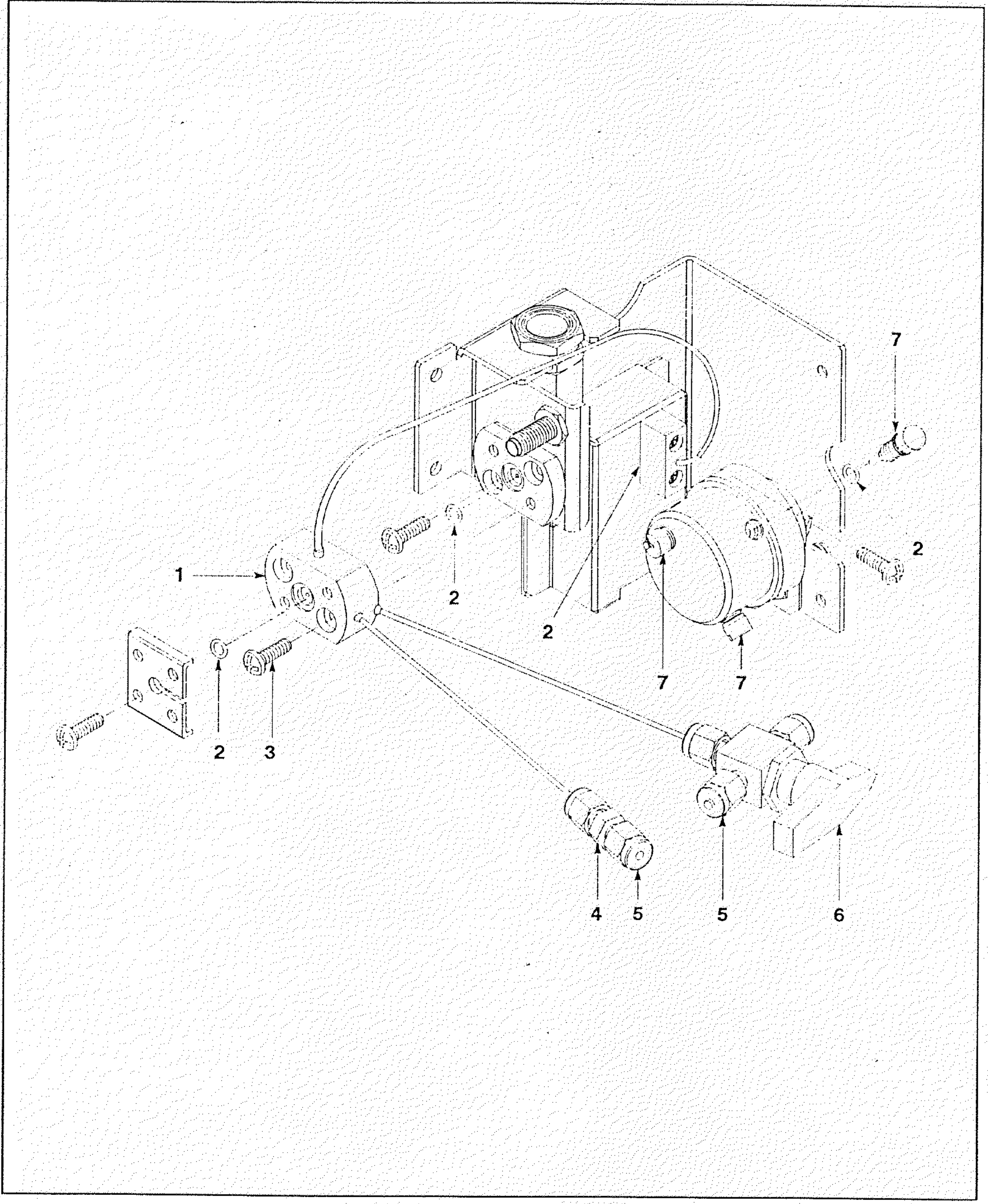


Figure 9. Modified Configuration of the External Sampler Interface (19245H) (Sheet 2 of 2).

Item	Description	HP Part No.
1	Screw, M3 x 0.5 x 16 mm	0515-0920
2	Screw, M2.5 x 0.45 x 16 mm	0515-0951
3	Valve (Proportional)	G1531-60540
4	Sensor board assembly, 0–100 psi	19245-60025
5	EPC mounting bracket	19245-00170
6	Screws (2) (M3 x 0.5 x 8 mm)	0515-0912
7	Valve transducer block assembly	19246-80530
8	O–ring (Package of 12)	5180-4181
9	Nut with lockwasher	0535-0043
10	Gas supply inlet fitting assembly	
	• Swagelok x M12 female SST fitting	19243-20685
	• 0–1750 ml/minute restrictor	19362-60555
	• Hex nut, 5/16 inch	2950-0203
Not Shown		
	6 channel cable	19245-60705
	Sensor board assembly, 0–15 psi	19245-60050

Figure 10. Auxiliary EPC Flow Module (Sheet 1 of 2).

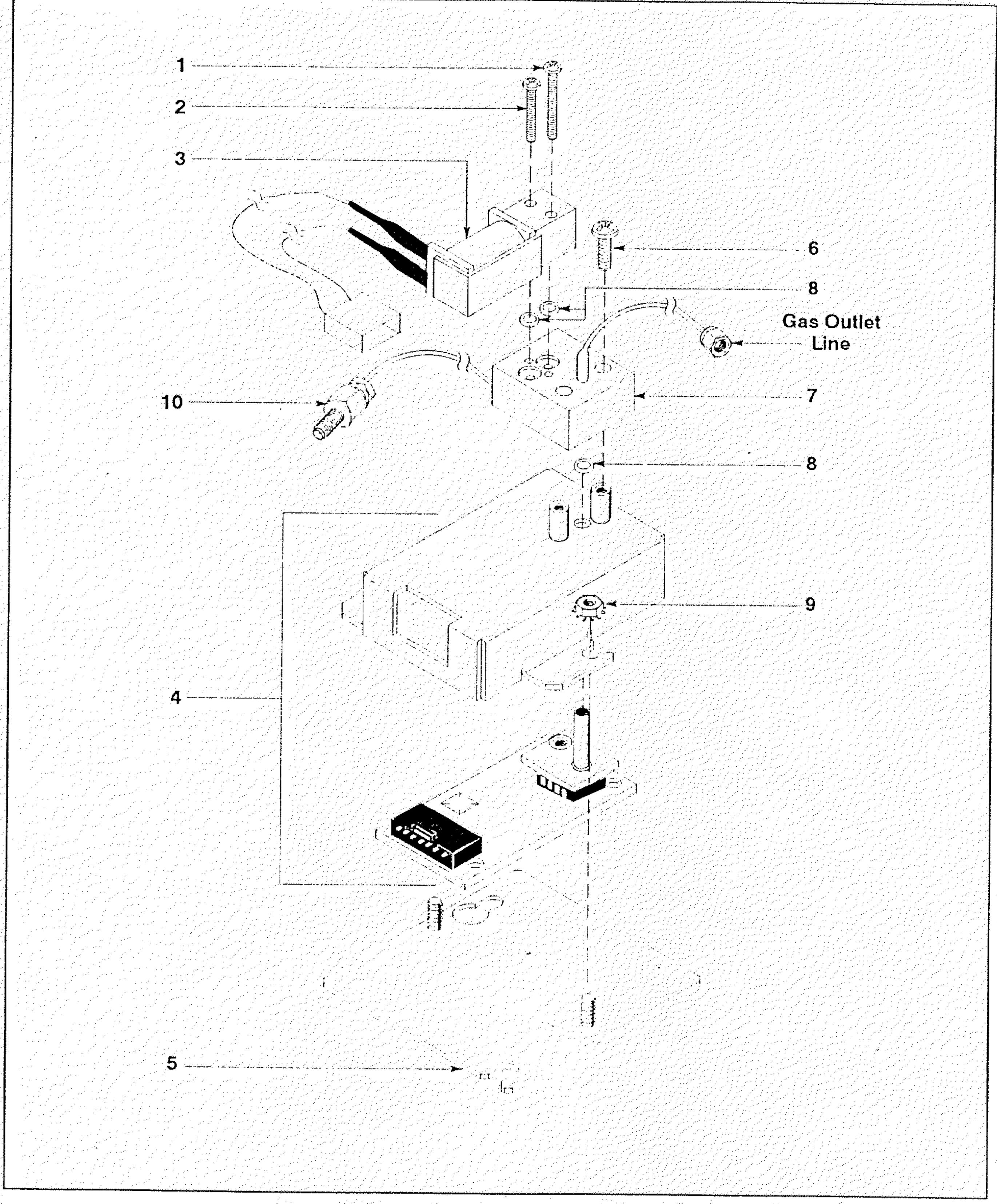


Figure 10. Auxiliary EPC Flow Module (Sheet 2 of 2).

Item	Description	HP Part No.
1	Auxiliary EPC retrofit flow bracket (L43 area)	19245-00190
2	Auxiliary EPC retrofit flow bracket (Flow sensor area)	19245-00160
3	Machine screw, M4 x 0.7 x 8 mm	0515-0910
4	Thread cutting screw	0624-0665

Figure 11. Auxiliary EPC Retrofit Flow Module Bracket (Sheet 1 of 2).

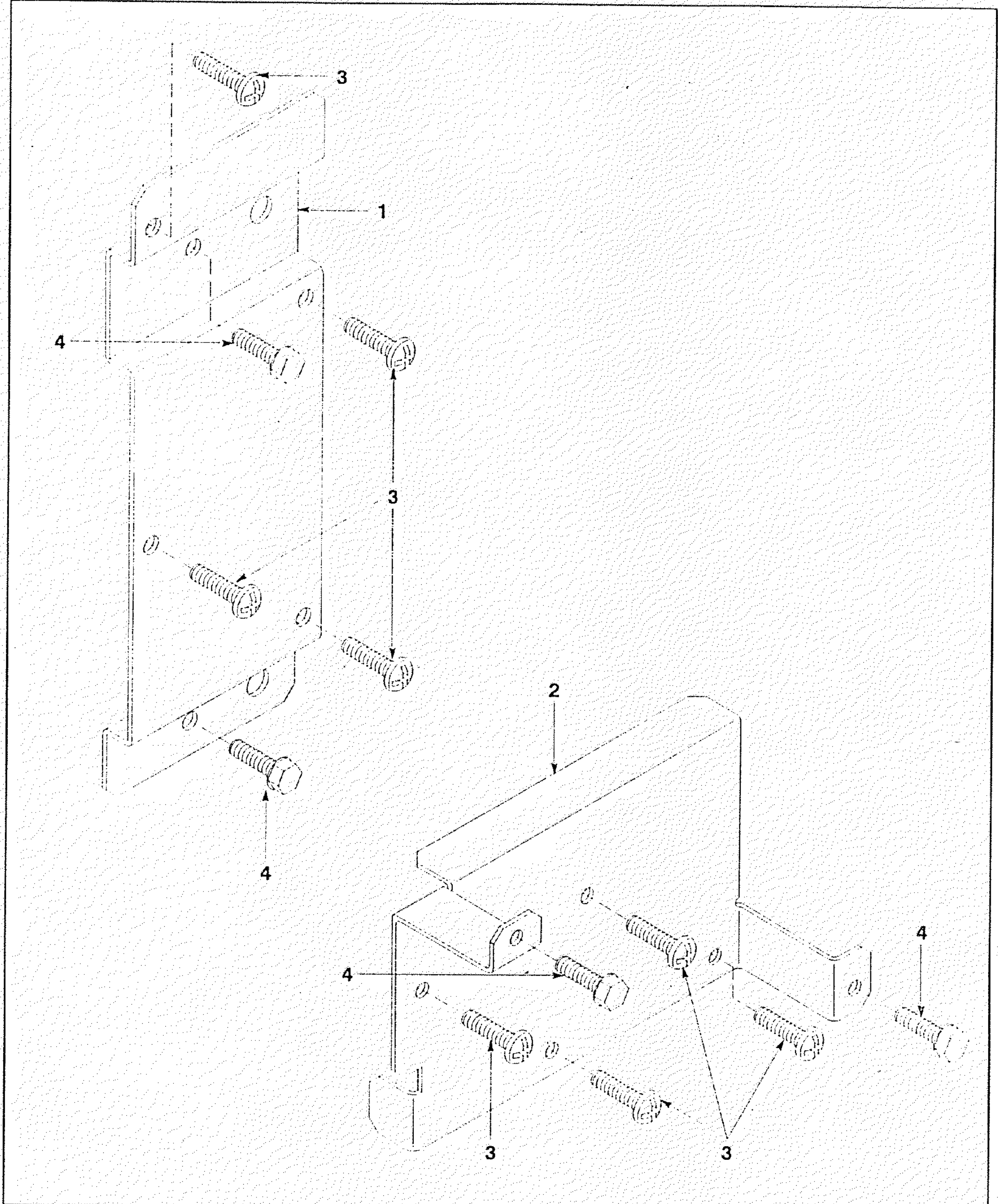


Figure 11. Auxiliary EPC Retrofit Flow Module Brackets (Sheet 2 of 2).

Item	Description	HP Part No.
1	Bracket for HP 5890 Series II GCs built after January, 1, 1992	19246-00110
2	Bracket for HP 5890 Series II GCs built before January, 1, 1992	19246-00120
3	Thread cutting screw	0624-0665

Figure 12. Gas Line Brackets for EPC (Sheet 1 of 2).

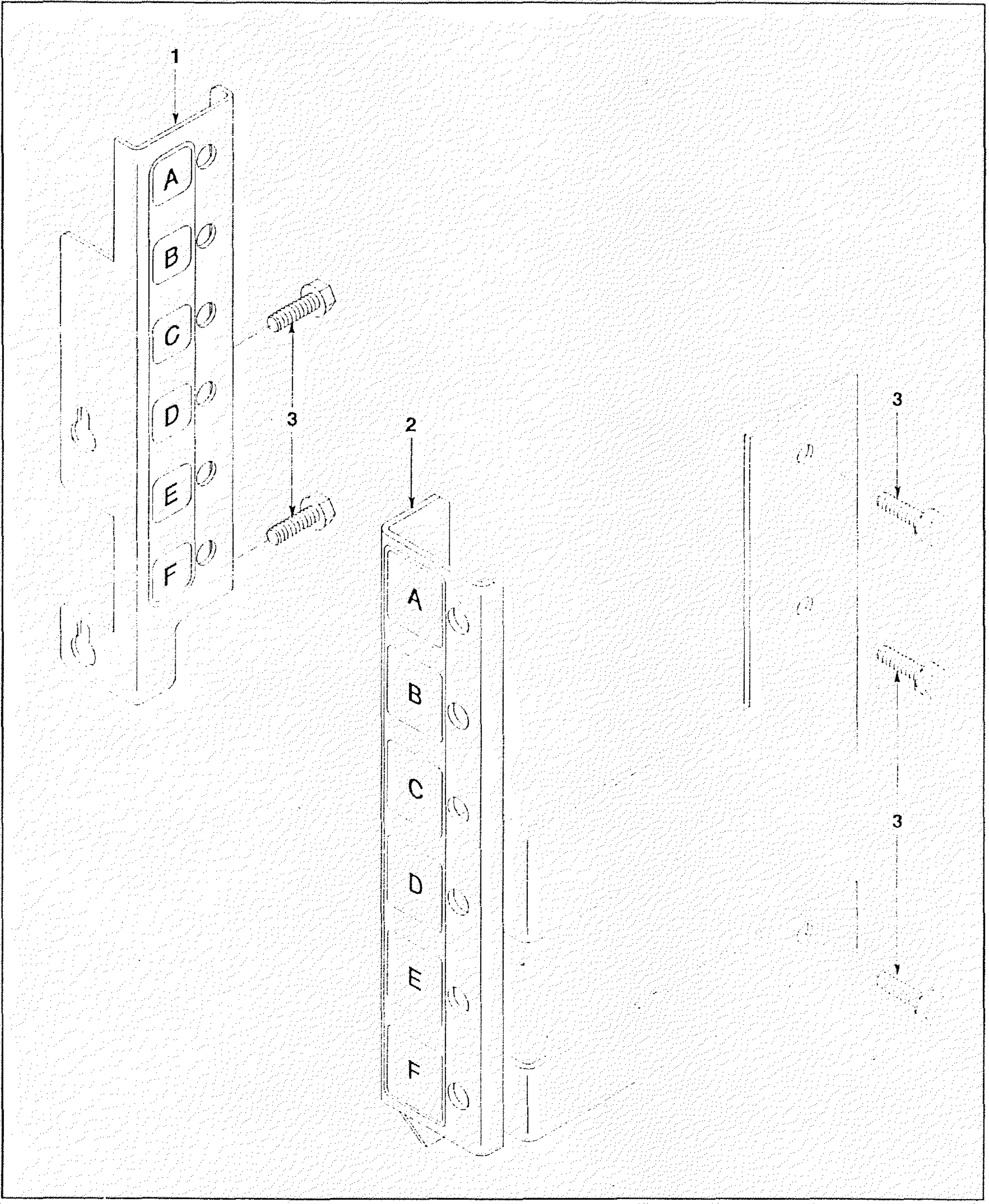


Figure 12. Gas Line Brackets for EPC (Sheet 2 of 2).

Item	Description	HP Part No.
1	Keyboard label for HP 5890A GCs	05890-96080
2	Main board EPROM	05890-80310
3	Ferrite clamps with case	9170-1547
4	EPC 6 Channel board EPROM	19245-80060
5	Dice board ROM	19257-80040
6	EPC cable bundle (6 cables)	19245-60970
7	Keyboard label for HP 5890 Series II GCs	05890-96085

Figure 13. Cables and EPROM for EPC Modules (Sheet 1 of 2).

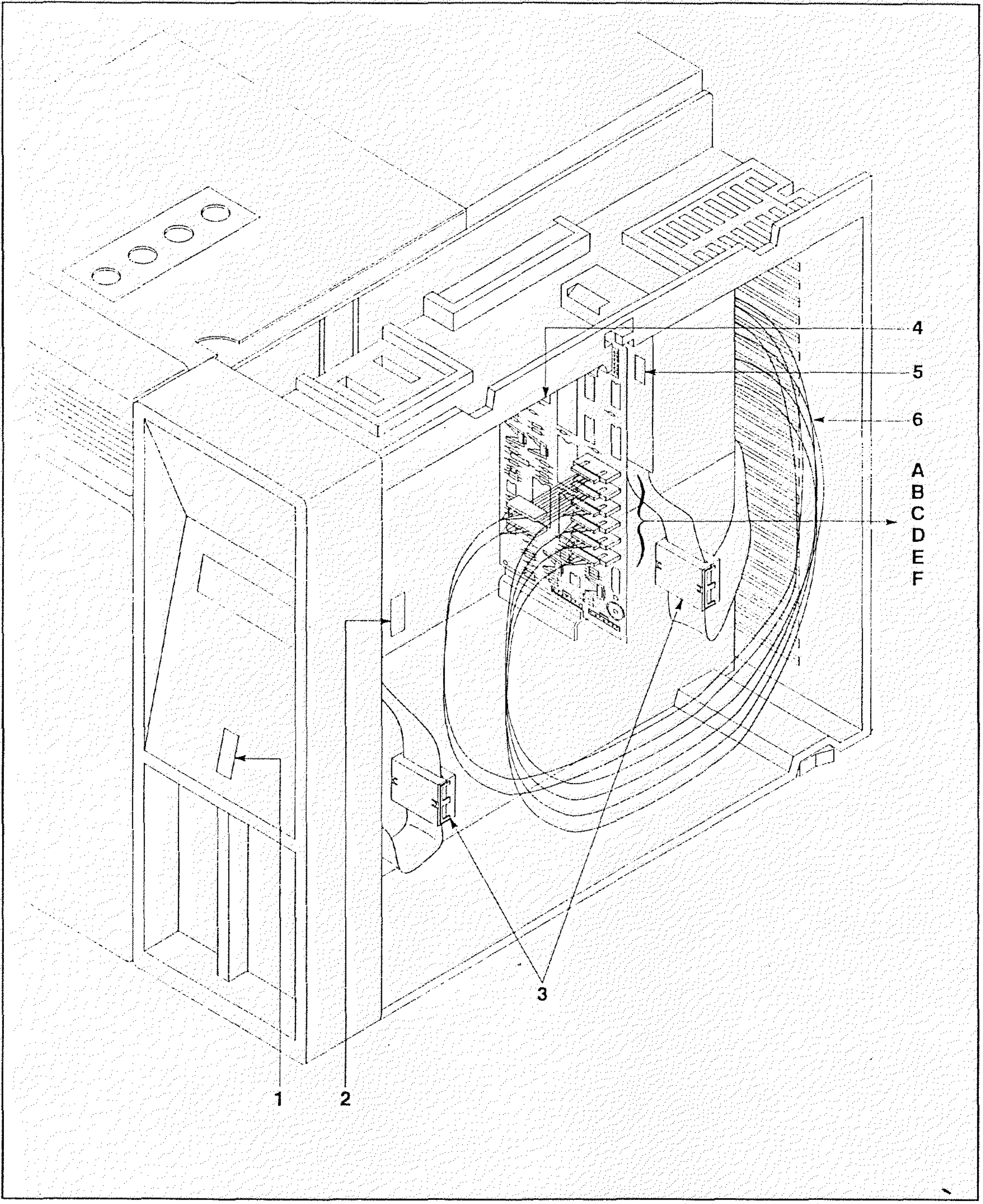


Figure 13. Cables and EPROM for EPC Modules (Sheet 2 of 2).

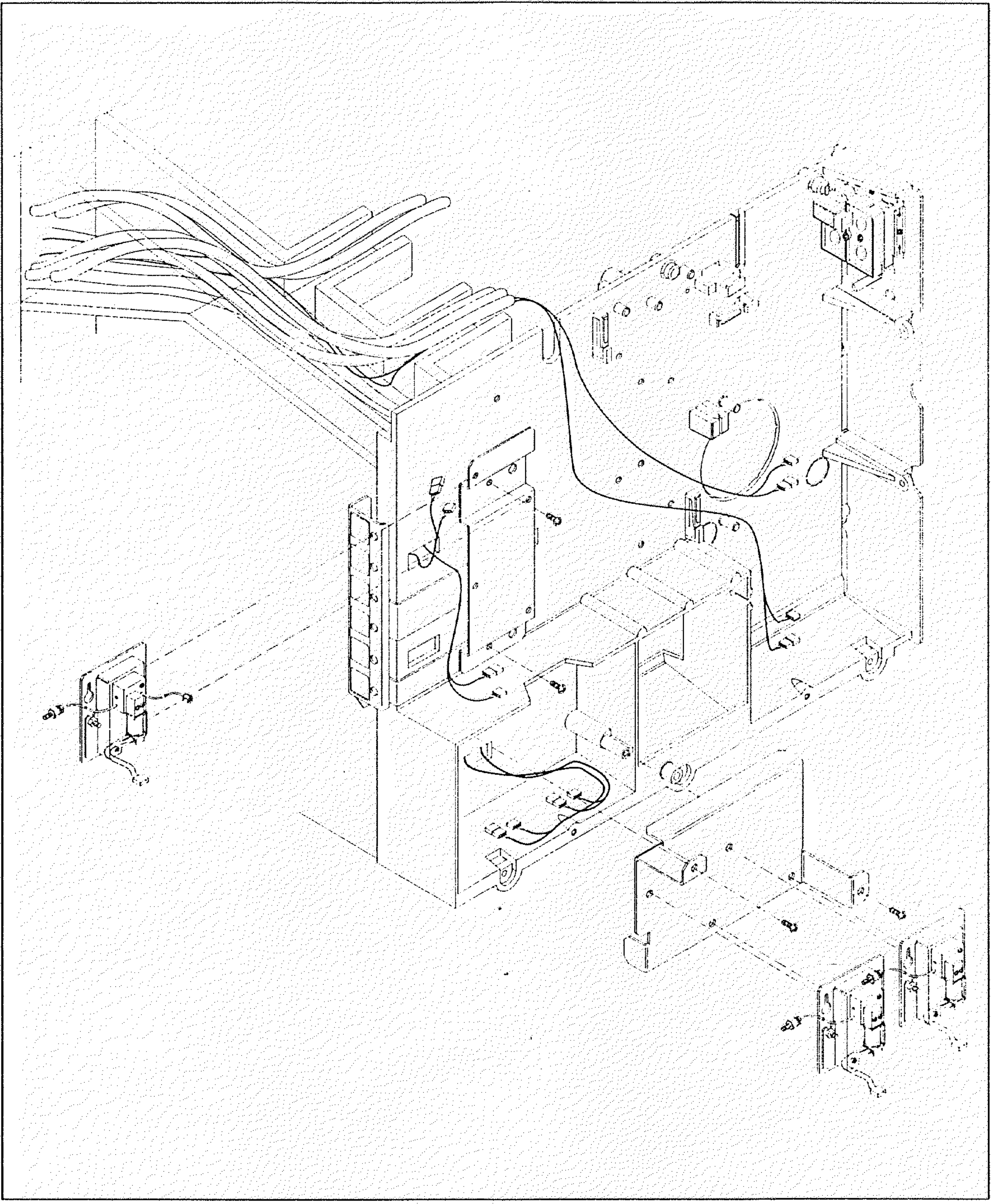


Figure 14. Cabling Diagram for HP 5890 Series II GCs purchased before January, 1992 (Sheet 1 of 1).

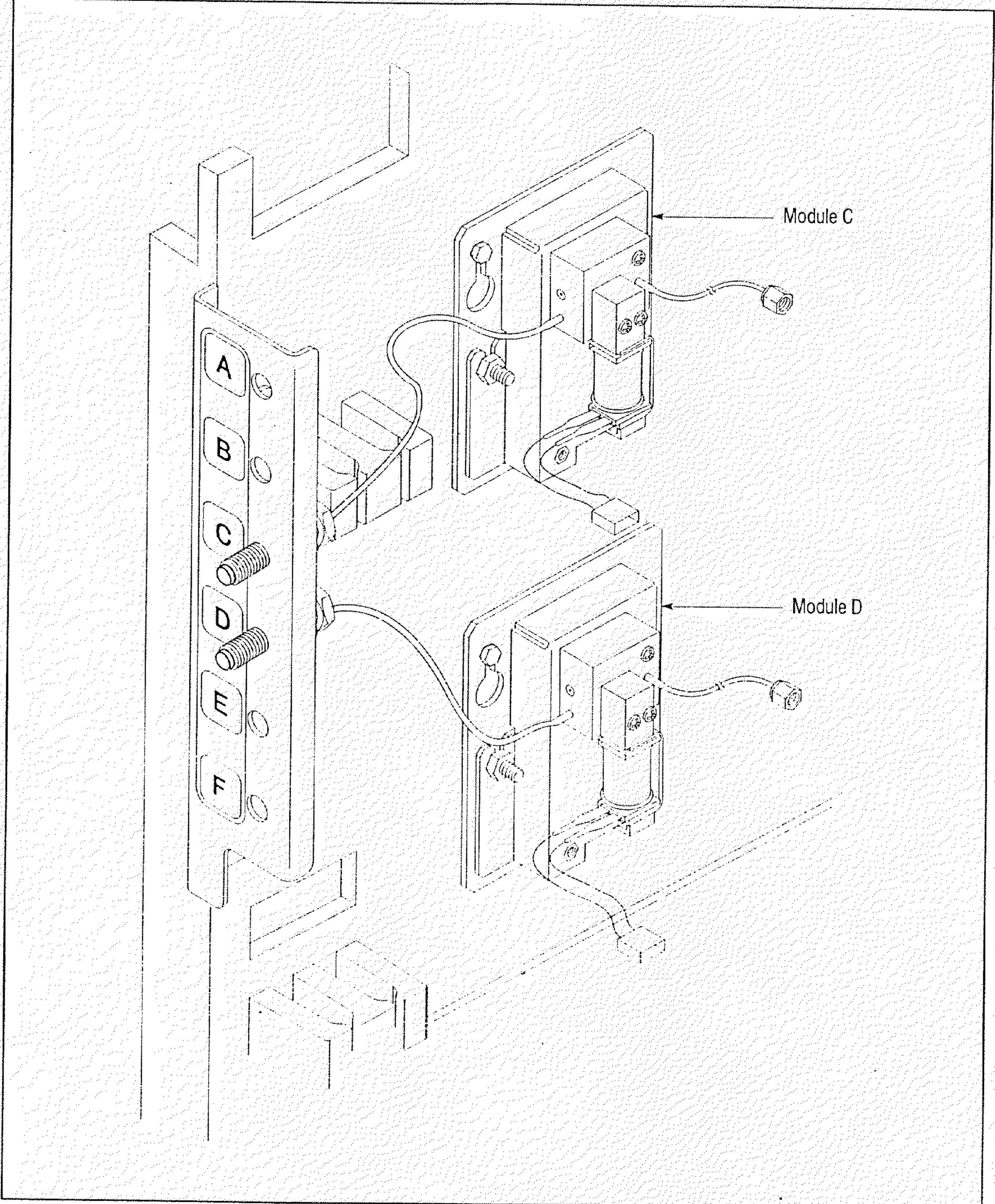


Figure 15. Modules C and D Mounted on HP 5890 Series II GC Built after January, 1992 (Sheet 1 of 1).

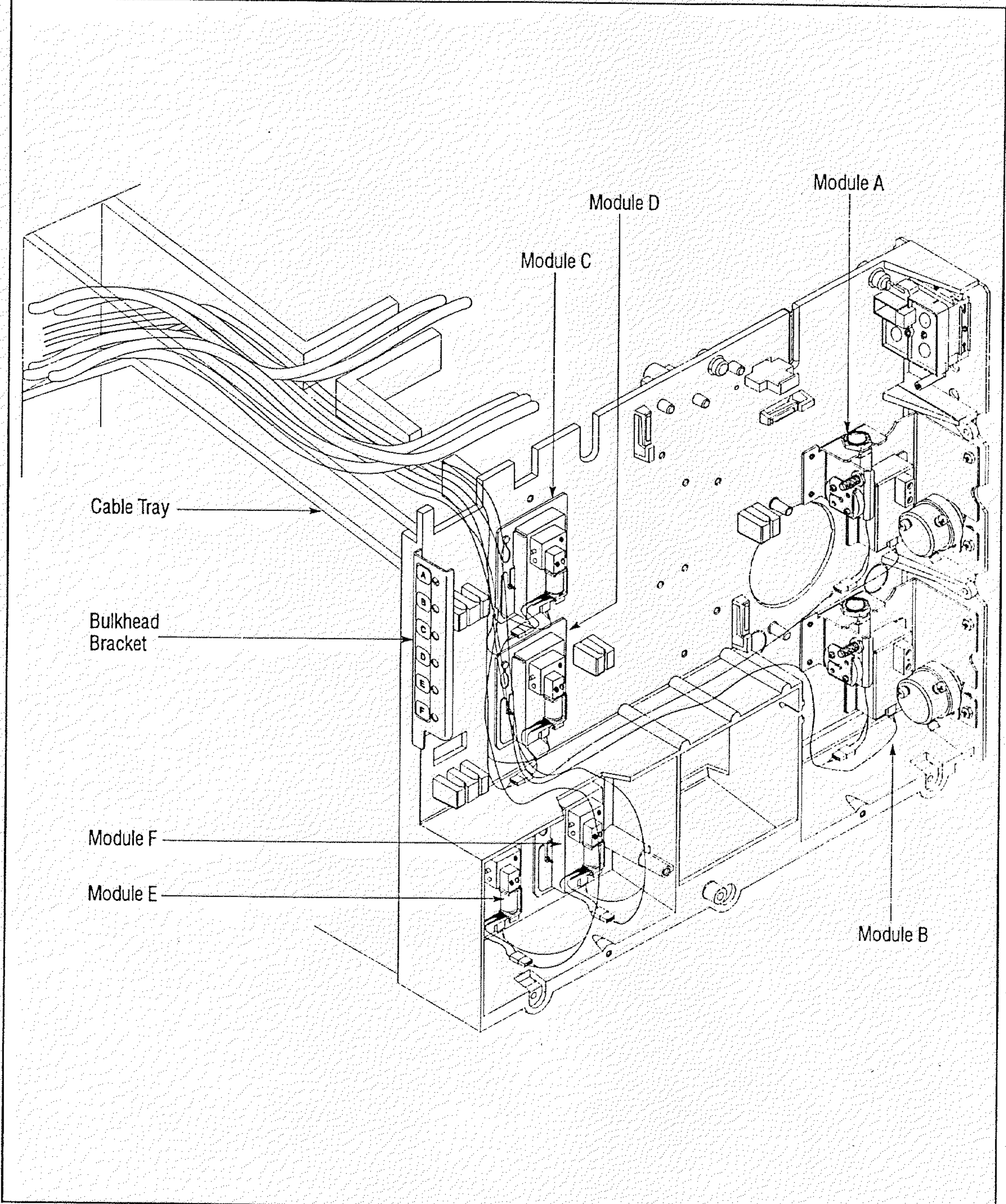


Figure 16. Modules C and D Mounted on HP 5890 Series II GC Built after January, 1992 (Sheet 1 of 1).

Manual Part No. 05890-90350
Printed in USA. (June 1993)

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HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 5
Inlet Components

This section contains breakdowns of the various injection port options available with the HP 5890 Series II Gas Chromatograph. Only the inlets are addressed in this section. Refer to Section 4 for breakdowns of the associated injection flow/pressure control assemblies.

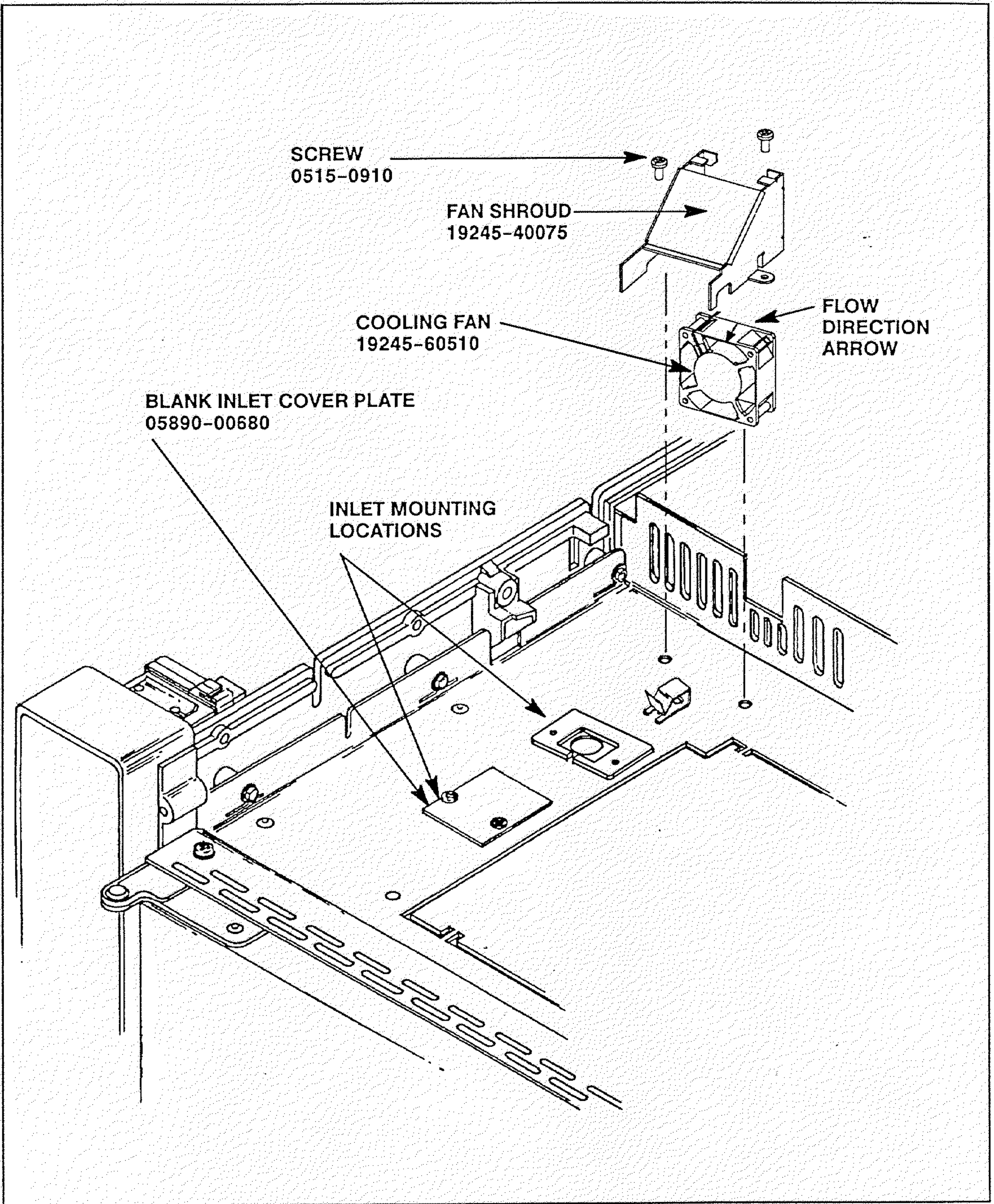


Figure 1. HP 5890 Series II Inlet Cooling Fan Mounting Details, General.

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm	0515-0910	2
2	Septum Nut Assy	19243-60500	1
3	Septa (Pkg of 24)	5080-8728	1
4	Insulation Plate (Retainer) (used on older models)	19243-00050	1
5	Insulation	19231-00080	1
6	Injection Port Weldment	19243-80500	1
7	Heater/Sensor Cable Assy	05890-61140	1
8	• Heater, 70 W	19231-60620	1
9	• Contact	1251–1679	2
10	• PRT Sensor	19231-60660	1
11	• Contact	1251–5963	2
12	• Flexible Sleeving (ordered by the inch) 1/4 inch x 22 inch	0890–0737	22
13	Vespel Ferrule, 1/4 inch	0100-1061	1
14	Brass Nut, 1/4 inch	0100-0056	1
15	Liner: (Refer to Figure 6)		1
16	Top Cover (used on newer models)	19243–00080	1
17	Top Insulation (used with new top cover only)	19243–00100	1

Figure 2. Packed Column Inlet (Sheet 1 of 2).

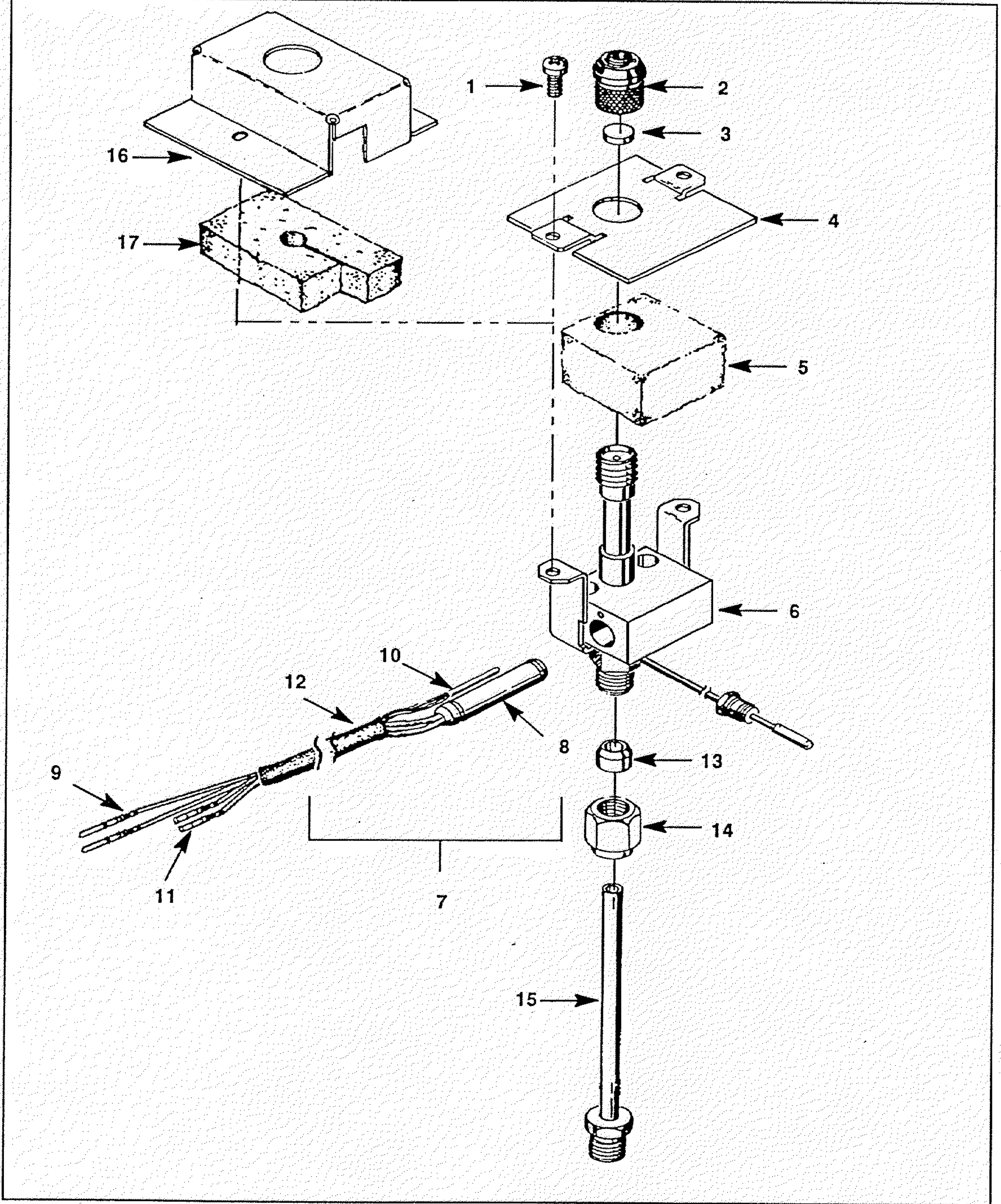


Figure 2. Packed Column Inlet (Sheet 2 of 2).

Item	Description	HP Part No.	Qty
1	Screw, M4 x 12 mm	0515-0910	6
2	Fin	19243-00110	1
3	Top Cover	19243-00080	1
4	Top Insulation	19243-00100	1
5	Heater/Sensor Assembly	05890-61140	1
6	• Cartridge Heater, 70 W	19231-60620	1
7	• Contact	1251–1679	2
8	• PRT (Sensor) Assembly	19231-60660	1
9	• Contact	1251–5963	2
10	• Insulation Sleeving (ordered by the inch)	0890–0737	22
11	Purged-Packed Inlet Weldment Assembly (See sheet 4 for breakdown)		1
12	Bottom Insulation	19243-00060	1
13	Bottom Insulation Cover	19243-00070	1

Figure 3. Septum-Purged Packed Column Inlet (Sheet 1 of 4).

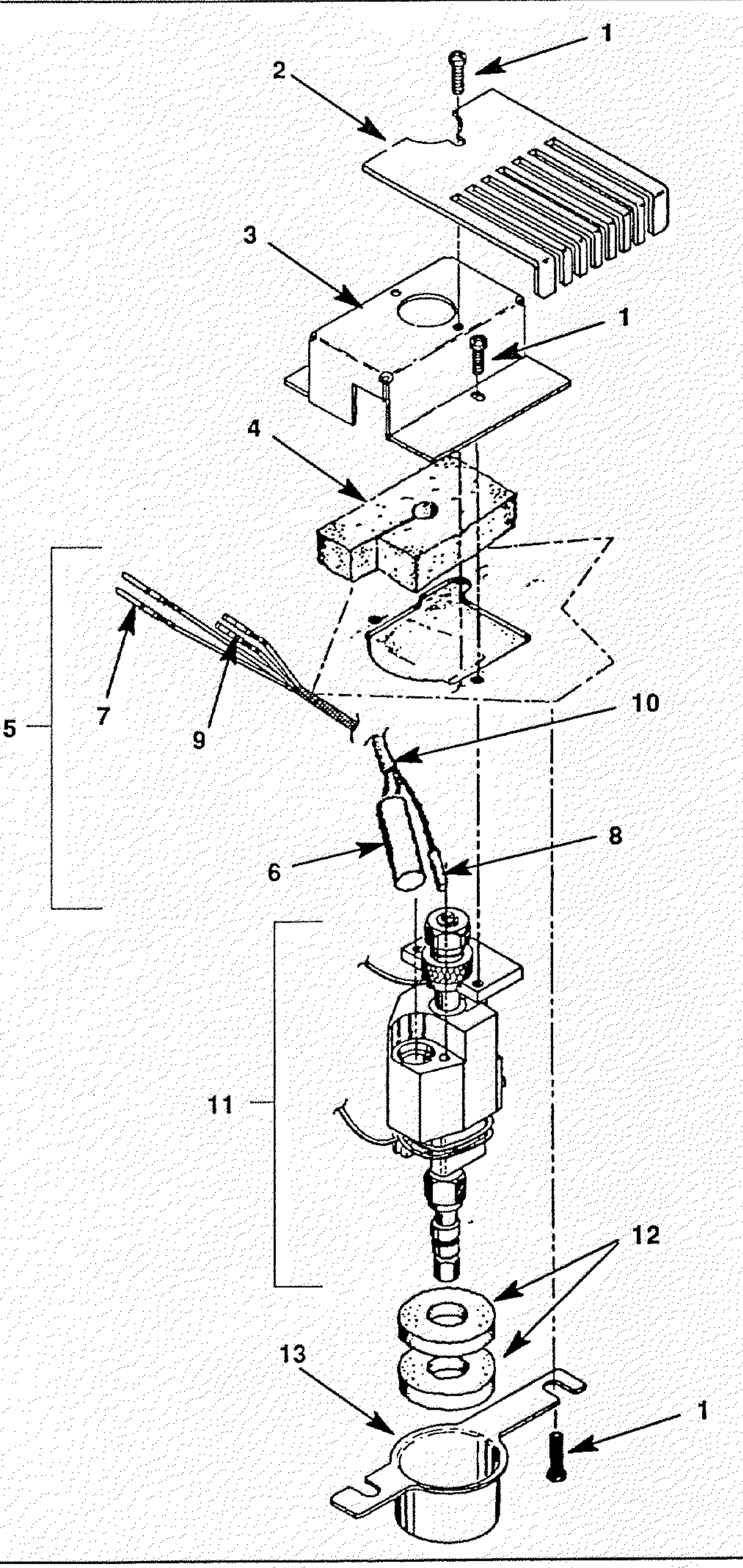


Figure 3. Septum-Purged Packed Column Inlet (Sheet 2 of 4).

Item	Description	HP Part No.	Qty
14	Septum Nut Assembly	18740-60830	1
	or Nonpurging Septum Nut Assembly	19243-60570	1
15	Septa, Gray, 11-mm od (Pkg/25)	5080-8896	1
16	Top Insert Weldment	19243-80570	1
17	Viton O-ring (Pkg/12)	5080-8898	
18	Packed-Purged Base Weldment	19243-80560	1
19	Heated Block Strap	19243-20750	1
20	Heated Block	19243-20710	1
21	Screw, M4 x 8 mm	0515-0910	1
22	Vespel Ferrule	0100-0061	1
	(Pkg/10)	5080–8774	–
23	Tubing Nut, 1/4-inch brass	0100-0056	1
24	Glass Insert (Pkg/25)	5080–8732	1
25	Capillary Column Adaptor, for 530 μ Columns	19244-80540	1
NS	Capillary Column Nut	18740-20870	1

NS = Not Shown

Figure 3. Septum-Purged Packed Column Inlet (Sheet 3 of 4).

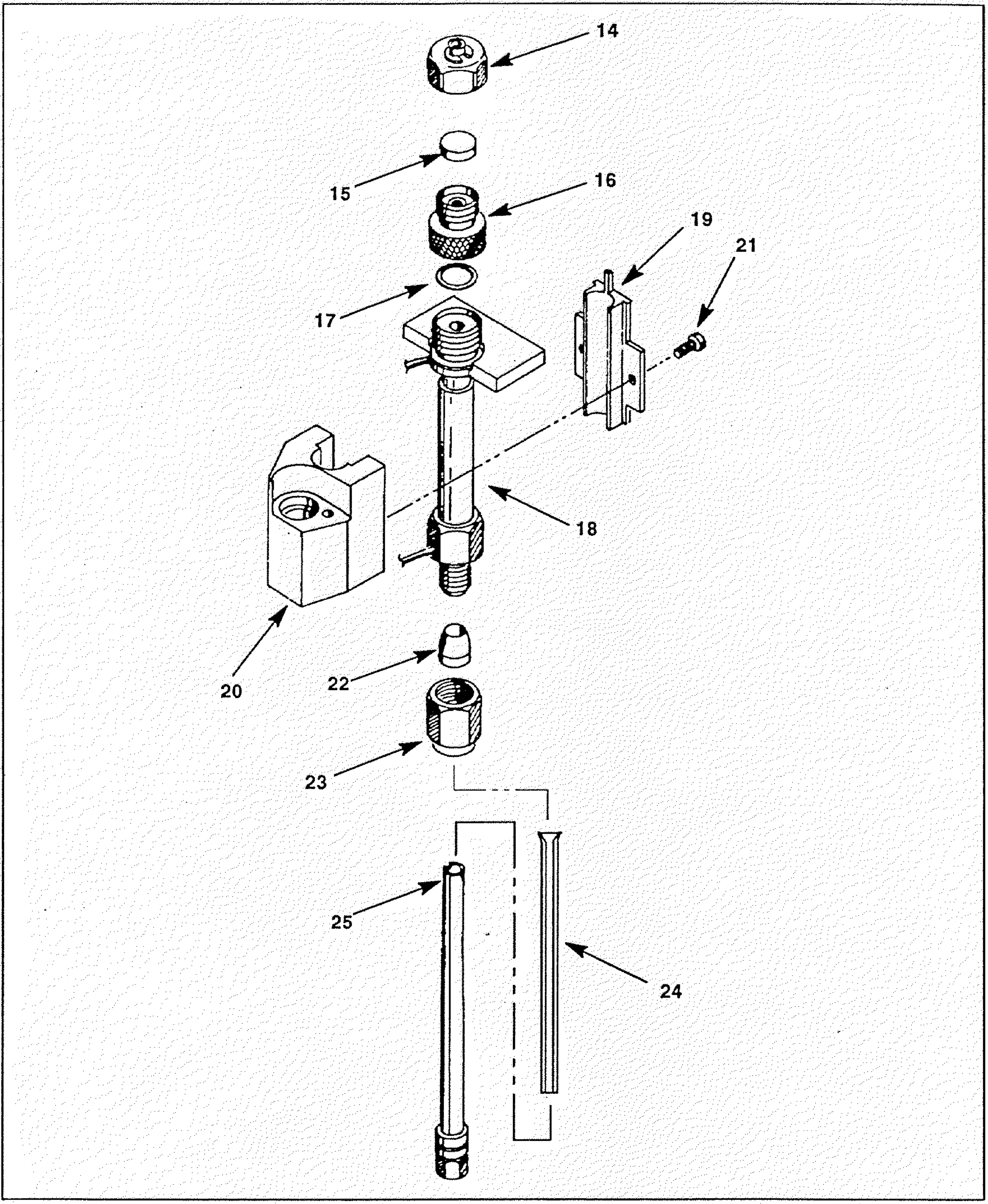


Figure 3. Septum-Purged Packed Column Inlet (Sheet 4 of 4).

Item	Description	HP Part No.	Qty
1	Heater/Sensor Assembly	05890-61140	1
2	• Heater, 70 W	19231-60620	1
3	• Contact	1251-1679	2
4	• PRT Assembly	19231-60660	1
5	• Contact	1251-5963	2
6	• Flexible Sleeving (ordered by the inch)	0890-0737	22
7	Shell Weldment	19251-80570	1
8	Glass Cloth	9300-0713	1
9	Insulator	0340-0686	1
10	Heat Sink	18740-20940	1
11	Shaped Insulation	19251-00020	1
$55 ← 12	Splitter Tube	19251-80520	1
13	Front Ferrule, 1/8-inch brass	0100-0032	1
14	Back Ferrule, 1/8-inch brass	0100-0036	1
15	Tubing Nut, 1/8-inch brass	0100-0058	1
16	Retaining Nut	19251–20620	1
17	Seal, Anealed	18740-20880	–
18	Flat Washer, Stainless Steel	2190-0701	1
19	Reducing Nut	18740-20800	1
20	Lower Insulation	19243-00060	3
21	Lower Insulation Cover	19243-00070	1
22	Insert Assy	19251-60570	1
23	Septa Retainer	18740-60830	1
24	Insulation	19251–00120	1
25	O–ring		1
	Viton, High Temp. (Pkg/12)	5180–4182	–
	Graphite for Split Liner (Pkg/12)	5180–4168	–
	Graphite for Splitless Liner (Pkg/12)	5180–4173	–
26	Liner		1
	Split/Splitless (4 mm id)	19251–60540	–
	Split–Packed (4 mm id)	18740–60840	–
	Split–Unpacked (4 mm id)	18740–80190	–
	Splitless (2 ± 0.2 mm id)	18740–80220	–
	Direct (1.5 ± 0.2 mm id)	18740–80200	–
27	Septa, Grey (Pkg/144)	5080–8894	1

Figure 4. Split/Splitless, Split-Only Capillary Inlet (Sheet 1 of 2).

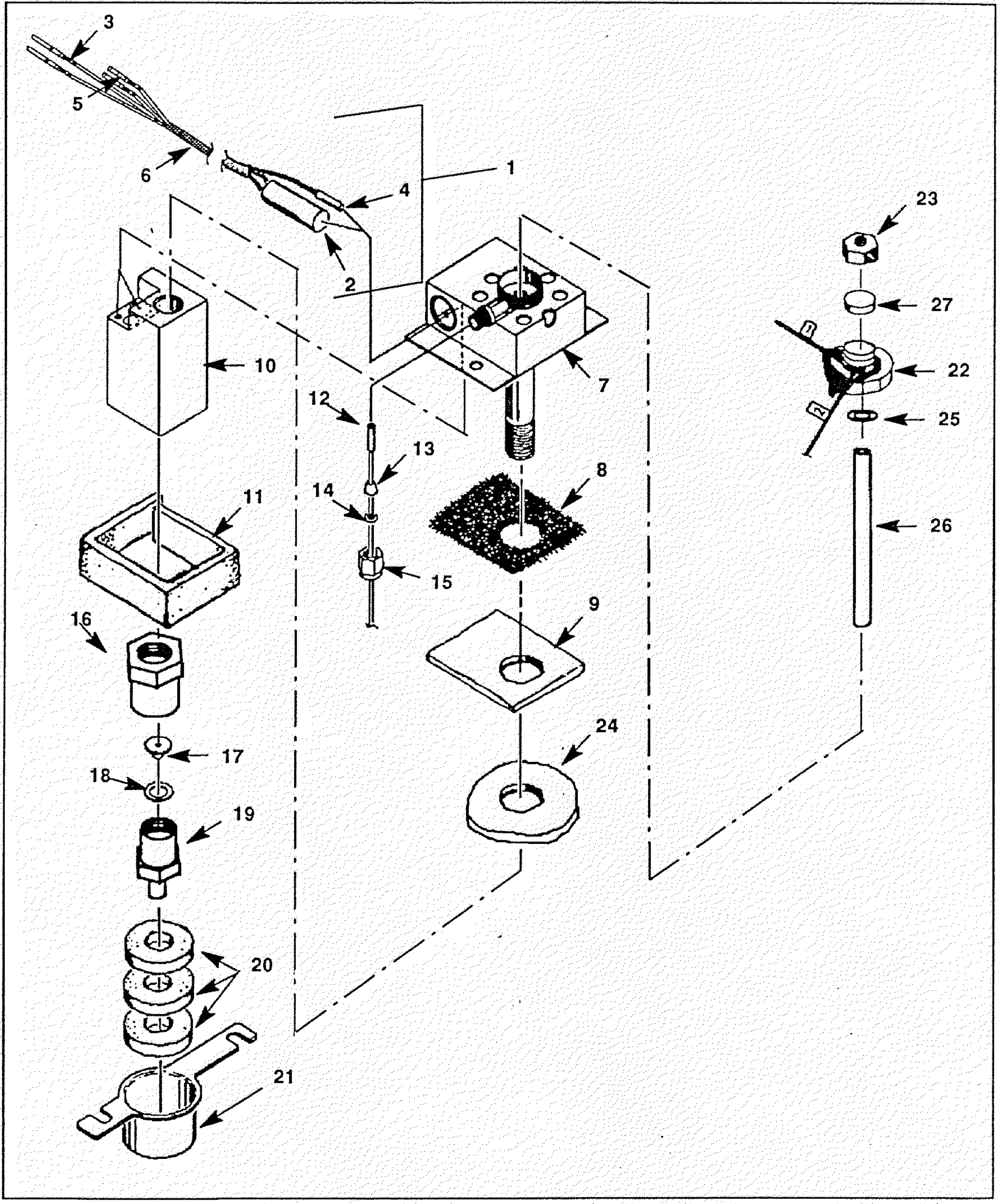


Figure 4. Split/Splitless, Split-Only Capillary Inlet (Sheet 2 of 2).

Item	Description	HP Part No.	Qty
1	Automatic Injection Assembly:		1
	• Needle Guide Top	19245-20670	–
	• Septum Nut Base Assembly	19245-80520	–
2	Screw, M4 x 8 mm	0515-0910	4
3	Septum (Pkg/24)	9301-0682	–
4	PCOC Insert Spring	19245-60760	1
5	Inserts:		1
	NOTE		
	Inserts may be identified by the number of rings around them.		
	• Narrow Bore Insert; 200 µ 1 silver ring	19245-20510	
	• Wide Bore Insert; 320 µ 2 silver rings	19245-20520	
	• Megabore Insert; 530 µ 0 rings	19245-20580	
	• Capillary Insert for Glass Columns; 3 silver rings	19245-20550	
6	Air Deflector	19245-00090	1
7	On-Column Weldment	19245-80505	
8	PCOC Inlet Insulation	19245-20630	1
9	PCOC Cavity Sleeve	19245-00060	1
10	Screw, M4 x 0.7 x 8	0515-0106	1
11	Ferrules (Pkg/10)		1
–	Vespel 2% Graphite for 530 µ col	5062-3511	–
–	Vespel 2% Graphite for 320 µ col	5062-3513	–
–	Vespel 2% Graphite for 200 µ col	5062-3515	–
–	Vespel 10% Graphite for 530 µ col	5062-3512	–
–	Vespel 10% Graphite for 320 µ col	5062-3514	–
–	Vespel 10% Graphite for 200 µ col	5062-3516	–
12	Column Nut	18740-20870	1
13	Heater/Sensor Assembly	19245-60520	1
14	• Heater, Cartridge, 60 W	19245-60570	1
15	• Contact	1251-1679	2
16	• PRT Assembly	19231-60660	1
17	• Contact	1251-5963	2
18	• Insulation Sleeving (ordered by the inch)	0890-0737	22
19	Optional Manual Injection Assembly:		
	• Cooling Tower Assembly/ Needle Guide	19320-80625	–
20	Duckbill (Pkg/10)	19245-40050	–
NS	Cleaning Wire	19245-20570	–

Figure 5. Programmable Cool On-Column Capillary Inlet (Sheet 1 of 2).

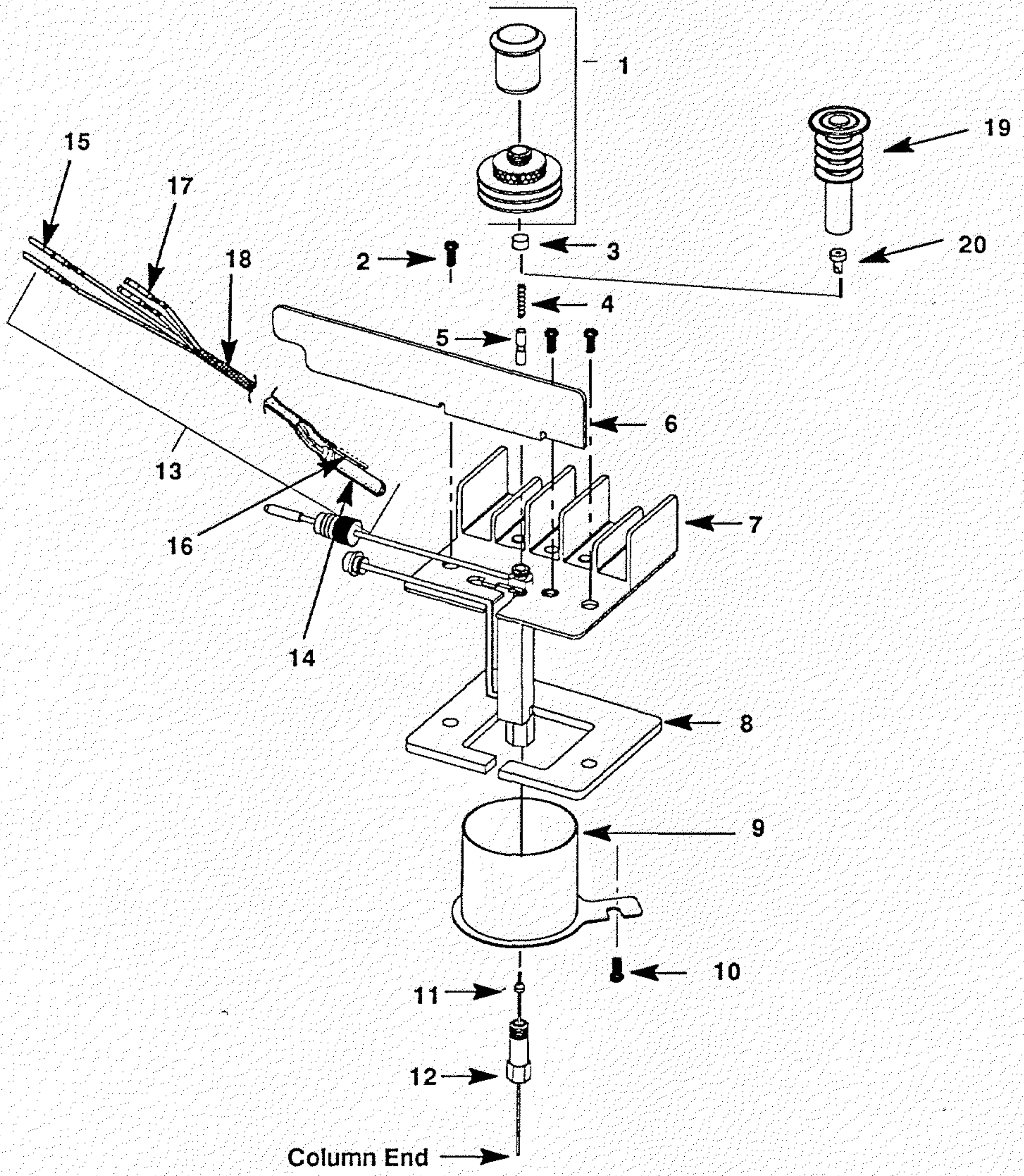
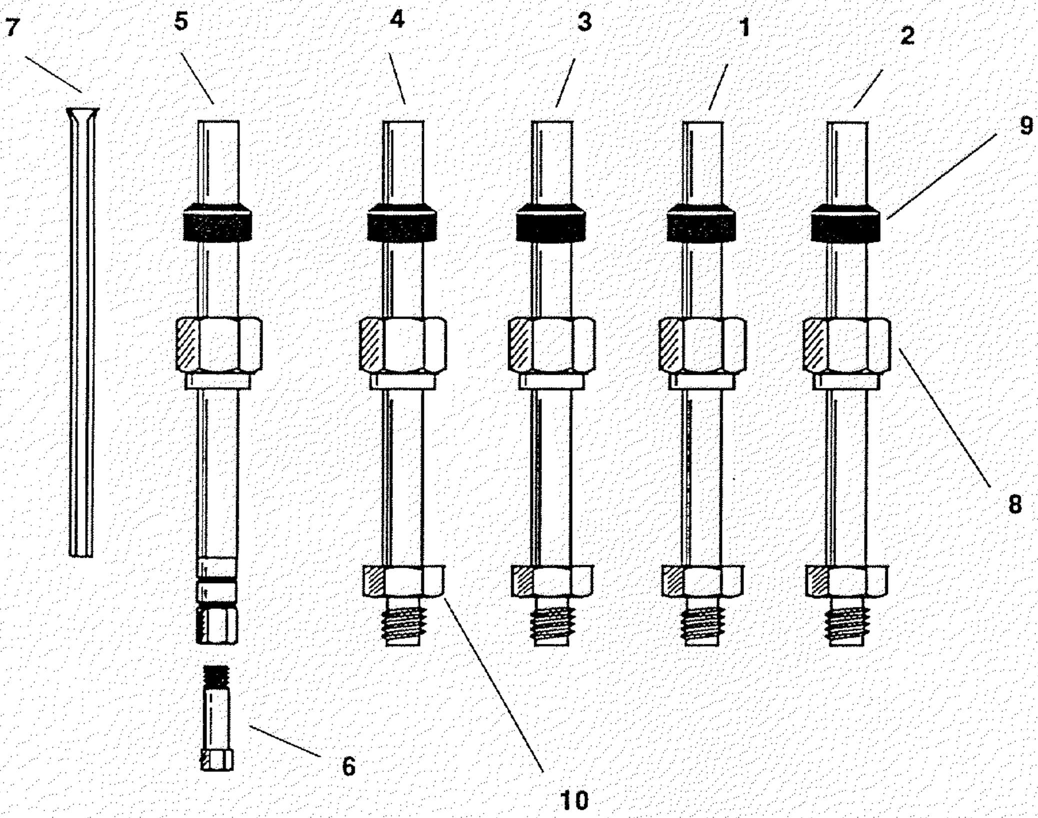


Figure 5. Programmable Cool On-Column Capillary Inlet (Sheet 2 of 2).



Item	Description of Liner	Preferred Column Use	HP Part No.
1	1/4–inch swage–type	1/4–inch metal	19243–80520
2	1/4–inch swage–type	1/4–inch metal or glass	19243–80540
3	1/8–inch swage–type	1/8–inch metal	19243–80510
4	1/8–inch swage–type	1/8–inch metal	19243–80530
5	1/8–inch swage–type	"HP Series 530 μ" capillary	19244–80540
6	Capillary Column Nut	(for item 5)	18740–20870
7	Glass Insert (25 pack)	Required for items 2, 4, & 5	5080–8732
8	Tubing Nut, 1/4–inch	Required for items 1 thru 5	0100–0056
9	Vespel Ferrule. 1/4–inch	Required for items 1 thru 5	5080–8774
10	Graphite Ferrule, 1–mm	Required for item 5	5080–8773

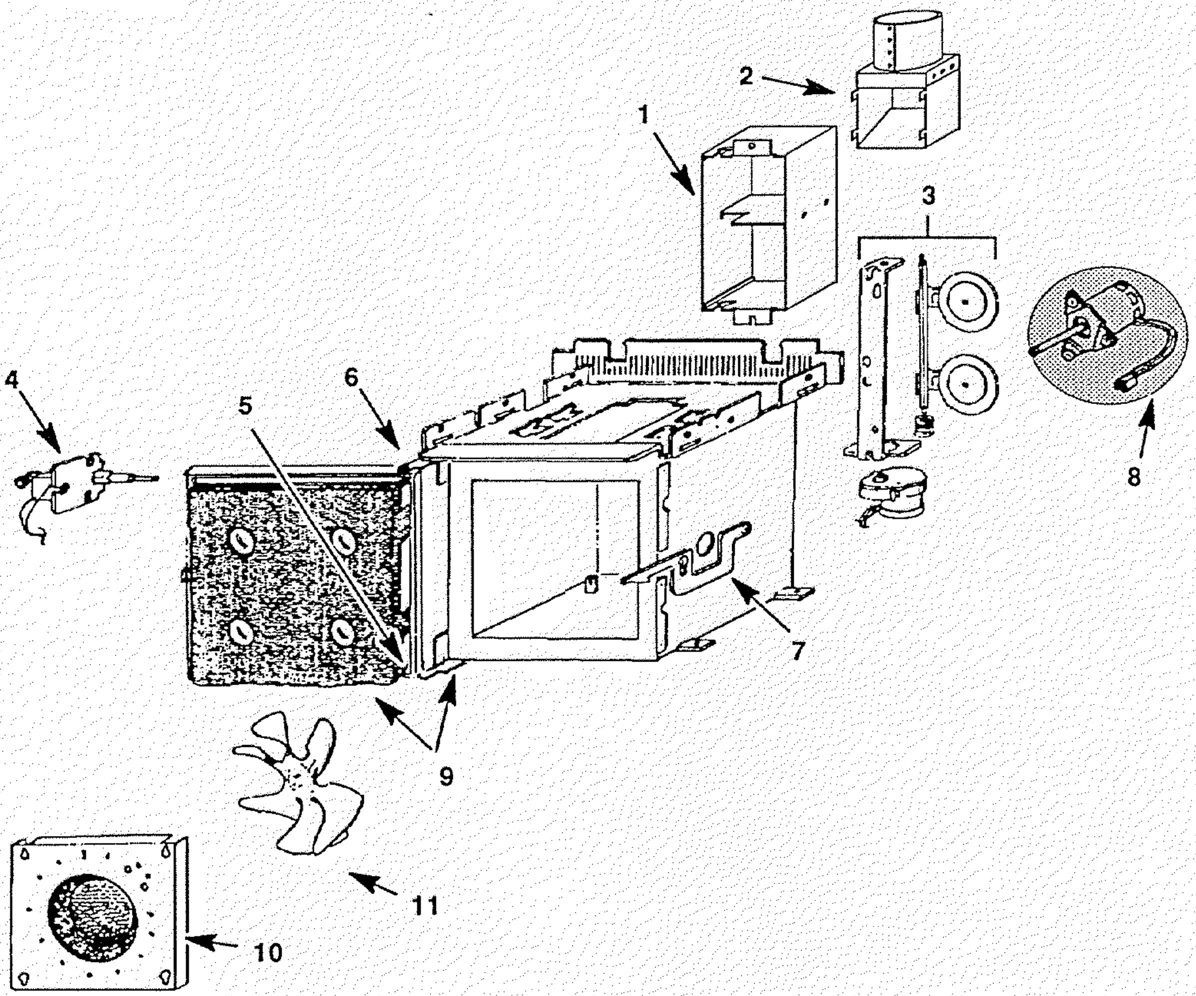
Figure 6. Inlet (Injection Port) Liners for Connecting Columns.

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 6
Oven Assembly

Table 1. Oven Fan Motors and Heaters.

DESTINATION	OVEN FAN MOTOR HP HP Part No.	OVEN HEATER HP HP Part No.
120 V USA	05890-61310	19300-80710
220 V Europe	05890-61320	19300-80730
220 V Great Britain	05890-61320	19300-80730
240 V Great Britain	05890-61320	19300-80720
240 V Australia	05890-61320	19300-80720
220 V Split Phase Europe	05890-61320	19300-80730
240 V USA	05890-61320	19300-80720
200 V Japan	05890-61320	05890-80630
220 V China	05890-61320	19300-80730
220 V Denmark	05890-61320	19300-80730
220 V Switzerland	05890-61320	19300-80730
240 V S. Africa	05890-61320	19300-80720

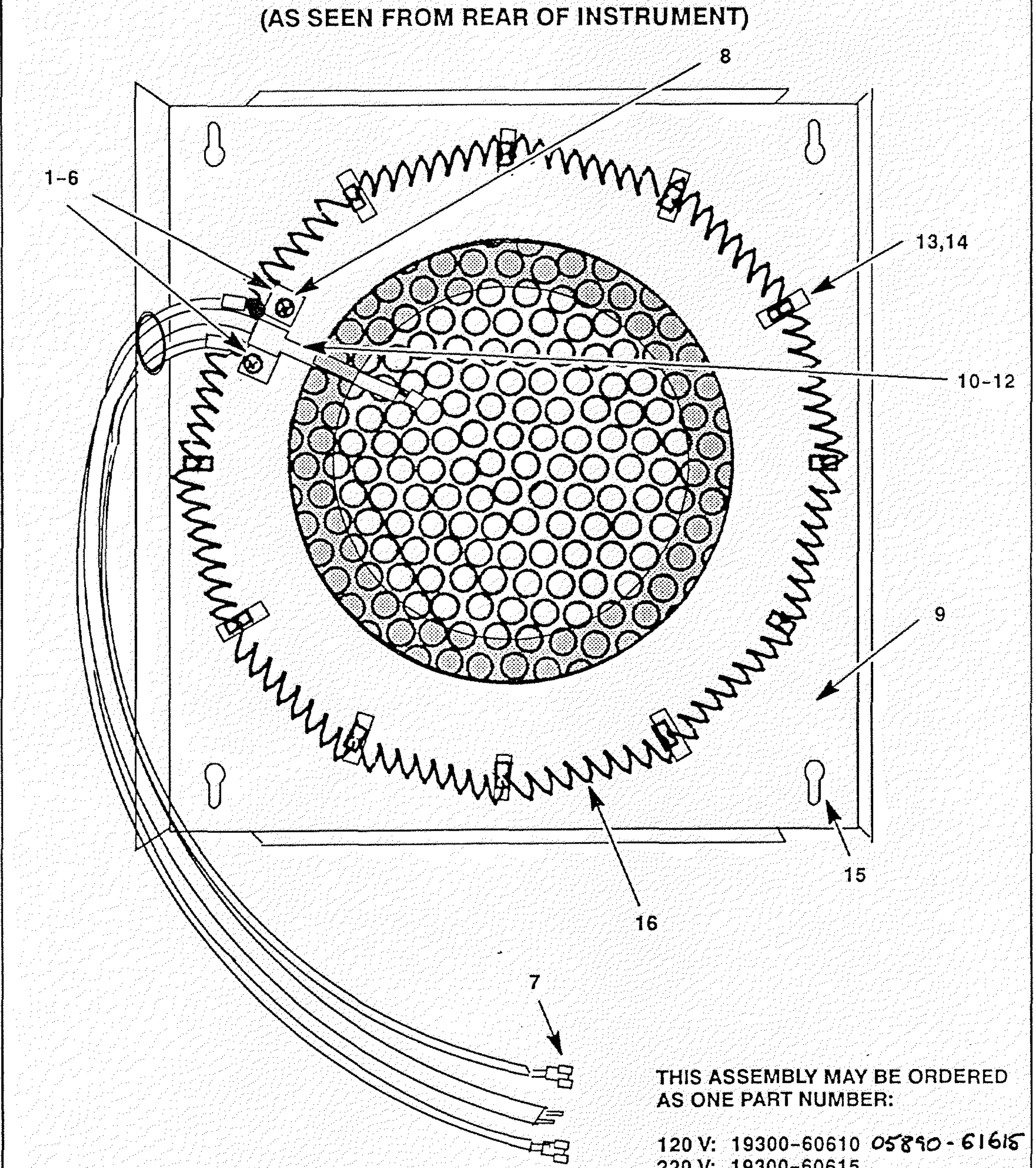


Item	Description	HP Part No.	Qty.	New Part I.D.
1	Dual Duct Assembly	05890–80680	1	
2	Oven Exhaust Deflector	19247–60510	1	
3	Oven Flap Assy. (Refer to Figure 4)		–	
4	Cryogenic Valve (Refer to Figures 5 thru 8)		1	
5	Bottom Door Hinge	05890–00295	1	
6	Top Door Hinge	05890–00285	–	
7	Oven Door Latch	05890–00100	1	
8	Oven Motor Assy.		1	
	• All Except Japan	05890–61320	–	
	• Japan	05890–61310	–	
9	Oven Door and Shell Assy.	05890–60835	1	
	• Oven Door only	05890–60815	1	
10	Oven Heater Shroud Assy. (Refer to Figure 2)		1	
11	Fan Blade	~~3160–0446~~	1	05890-80270 55.00/ea

Figure 1. HP 5890 Series II Oven Assembly and Associated Components.

Item	Description	HP Part No.	Qty
1	Screw, 6-32 x 5/16 inch	2360-0195	2
2	Flat Washer	3050-0959	2
3	Heater Elements:	(refer to Table 1)	1
4	Heater Leads Assembly	05890-60860	1
5	Hex Nut	2420-0003	2
6	Ceramic Standoff, 1/2-inch long (6–32 threaded through)	0380-0344	2
7	Contact	0362–0340	2
8	Contact	0362–0393	2
9	Shroud	05890–61150	1
10	Screw, M4 x 8 mm	0515-0106	4
11	PRT/Shroud Clip	05890-00670	1
12	Oven Sensor Assy	05890-61030	1
13	Ceramic Heater Element Insulator	0340-0877	11
14	Insulator Retaining Clip	0510-0593	11
15	Screw	0515–0106	4
16	Heater Element Wire: (ordered in millimeters, contracted)		
	120 V	0854–0306	136
	220 V	0854–0243	180
	240 V	0854–0243	214

Figure 2. Repair Oven Heater Shroud Assembly (Sheet 1 of 2).



THIS ASSEMBLY MAY BE ORDERED AS ONE PART NUMBER:

120 V: 19300-60610 05890-61615 146[20]
220 V: 19300-60615
240 V: 19300-60720

Figure 2. Repair Oven Heater Shroud Assembly (Sheet 2 of 2).

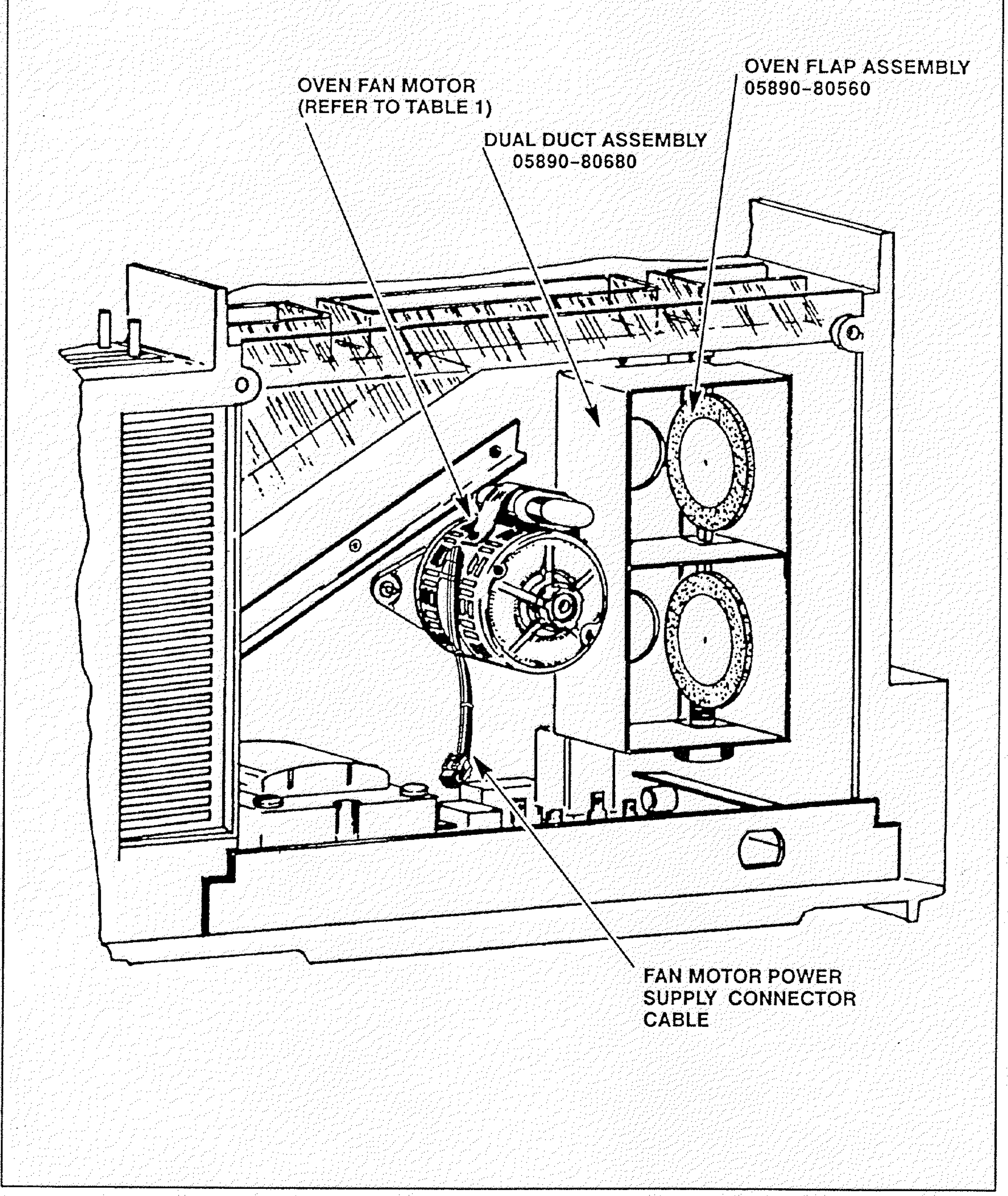


Figure 3. Oven Fan Motor.

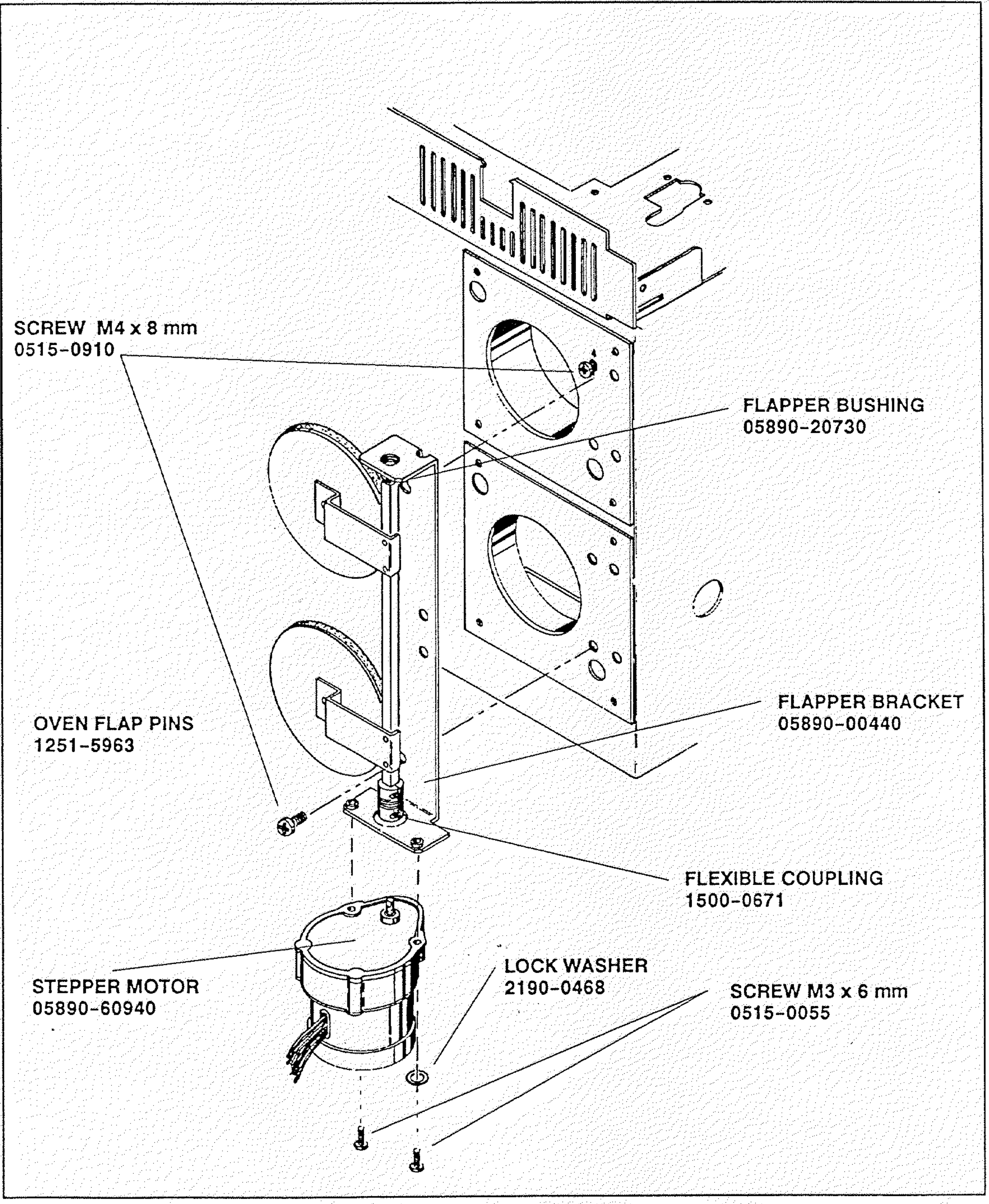


Figure 4. Oven Flap Assembly (05890-80560)

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm	2510–0043	2
2	Sound Damping Foil	19239–20540	1
3	Mounting Bracket	19239–00010	1
4	Grommet	0400–0099	3
5	Nut	0535–0043	3
6	Lock Washer	3050–0540	3
7	CO_2 Nozzle	19239–80505	1
8	Teflon Tape	0460–0016	–
9	CO_2 Tube Fitting	0100–0112	1
10	CO_2 Cryogenic Valve	19239–60545	1
11	Sound Insulation Kit	19239–20550	1

Figure 5. CO_2 Cryogenic Valve Assembly (Sheet 1 of 2).

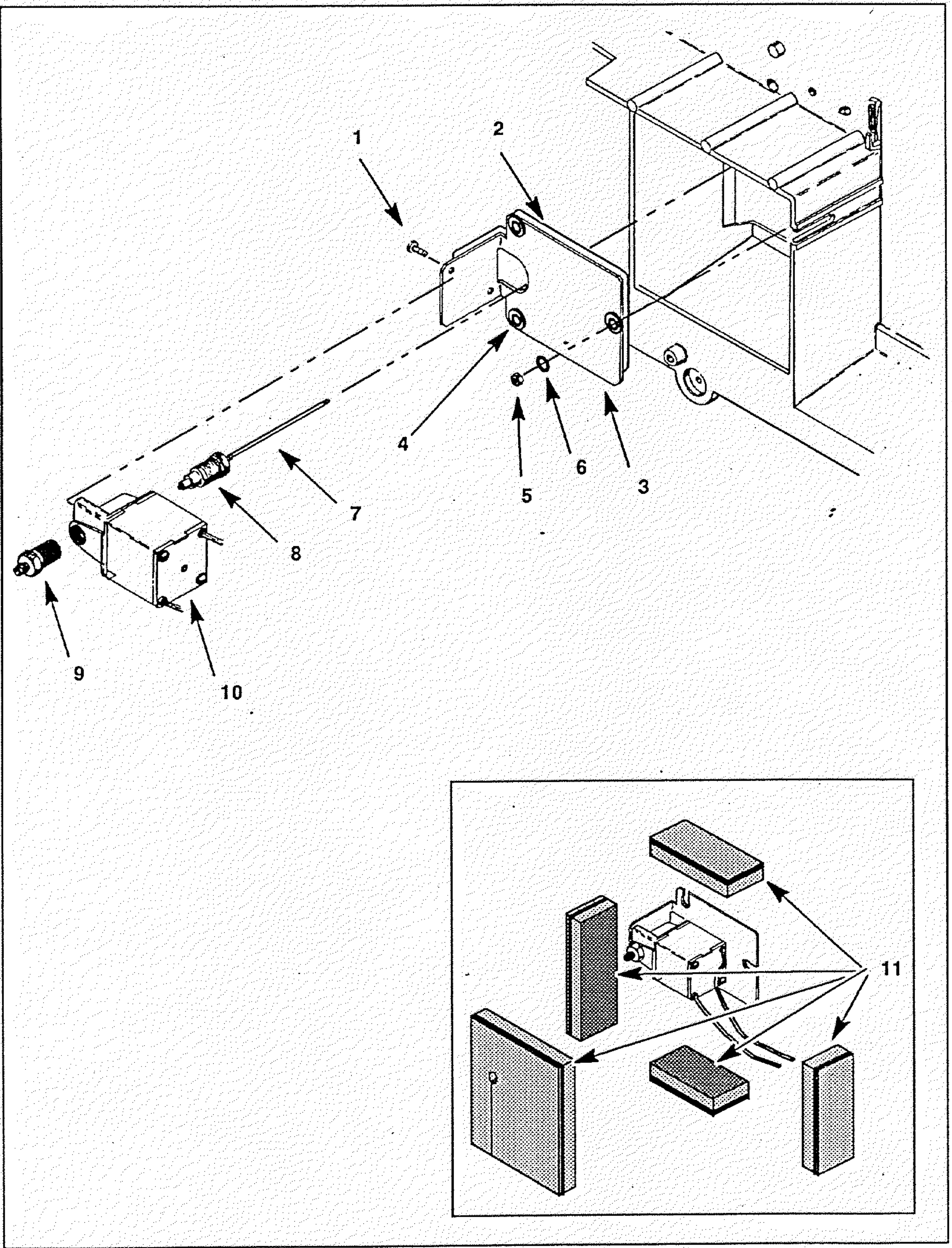


Figure 5. CO_2 Cryogenic Valve Assembly (Sheet 2 of 2).

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm	2510–0043	2
2	Sound Damping Foil	19239–20540	1
3	Mounting Bracket	19239–00010	1
4	Grommet	0400–0099	3
5	Nut	0535–0043	3
6	Lock Washer	3050–0540	3
7	N_2 Nozzle	19310–20500	1
8	Teflon Tape	0460–0016	–
9	N_2 Tube Fitting	0100–1249	1
10	N_2 Cryogenic Valve	19239–60555	1
11	Sound Insulation Kit	19239–20550	1

Figure 6. N_2 Cryogenic Valve Assembly (Sheet 1 of 2).

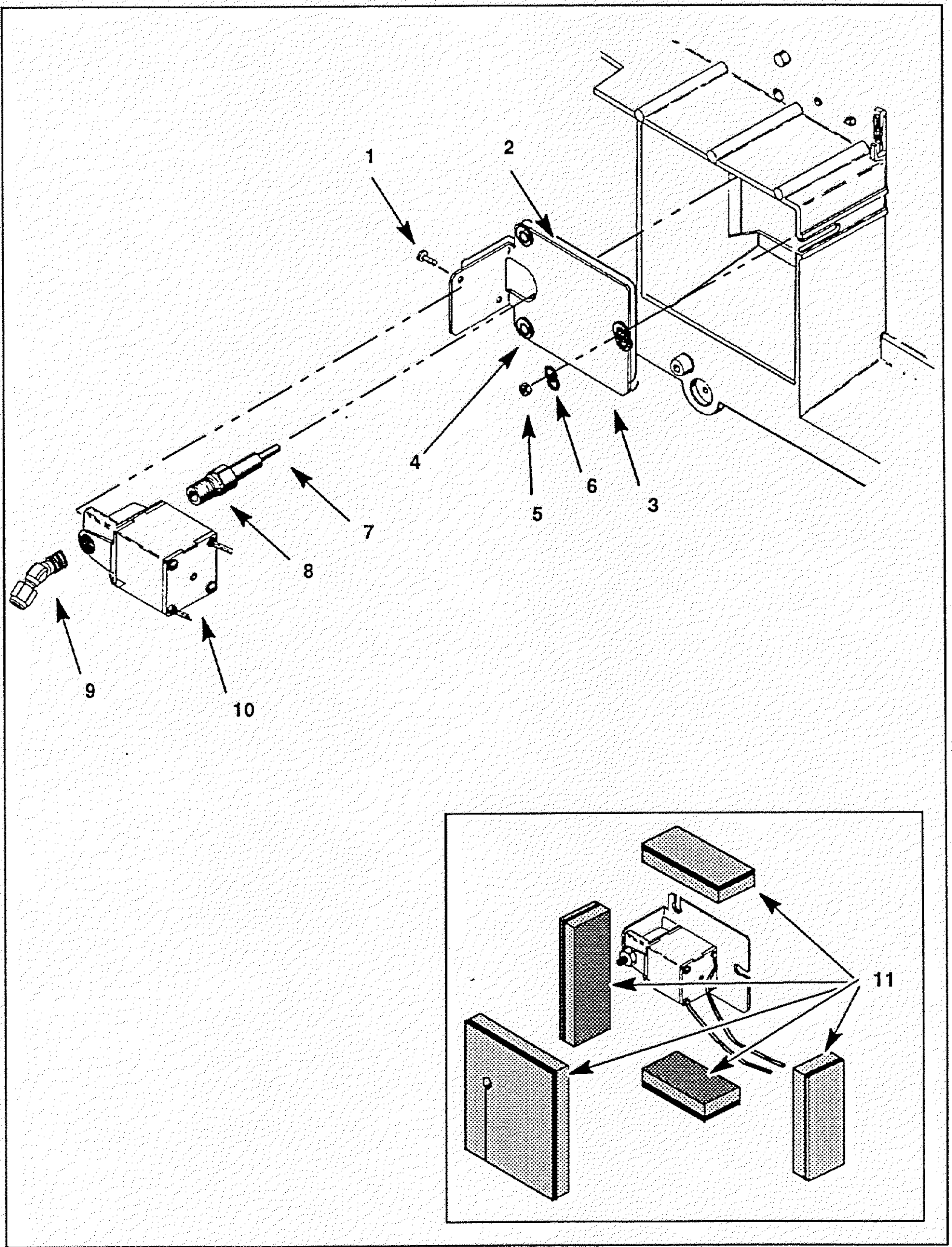


Figure 6. N_2 Cryogenic Valve Assembly (Sheet 2 of 2).

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm	2510-0043	2
2	Sound Damping Foil	19239-20540	1
3	Mounting Bracket	19239-00010	1
4	Grommet	0400-0099	3
5	Nut	0535-0043	3
6	Lock Washer	3050-0540	3
7	CO_2 Cryo Blast Nozzle	19245-80550	1
8	CO_2 Cryo Blast Restrictor Brazement	19245-80590	1
9	• Tubing 360-mm	1530-2163	1
10	• 1/8 to 1/16-inch Adapter	19360-20510	1
11	• 2uM Filter	SNR 124770	1
12	• Tubing 254-mm	1530-2183	1
13	• Cryo Blast Plate	19245-00150	1
14	• Cryo Blast Fitting	19245-20835	1
15	• NPD Air Restrictor	19234-60600	1
16	Union	0100-0125	1
16	Teflon Tape	0460-0016	–
17	CO_2 Tube Fitting	0100-0012	1
18	CO_2 Cryogenic Valve	19239-60545	1
19	Sound Insulation Kit	19239-20550	1

Figure 7. CO_2 Cryo Blast Valve Assembly (Sheet 1 of 2).

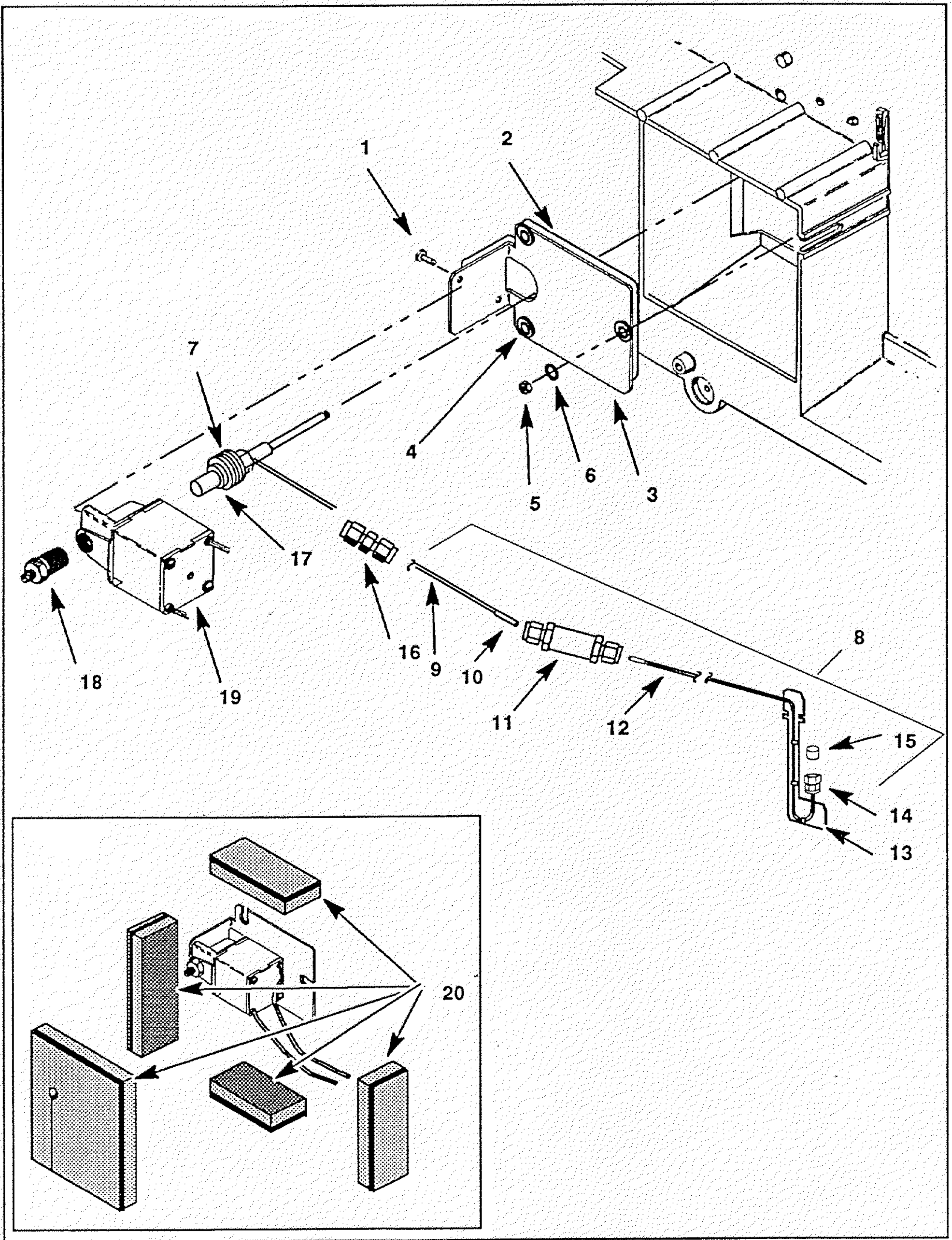


Figure 7. CO_2 Cryo Blast Valve Assembly (Sheet 2 of 2).

Item	Description	HP Part No.	Qty
1	Screw, M4 x 8 mm	2510–0043	2
2	Sound Damping Foil	19239–20540	1
3	Mounting Bracket	19239–00010	1
4	Grommet	0400–0099	3
5	Nut	0535–0043	3
6	Lock Washer	3050–0540	3
7	N_2 Cryo Blast Nozzle	19239–80535	1
8	Union	0100–0125	1
9	N_2 Restriction Tube	19239–20575	1
10	Teflon Tape	0460–0016	–
11	N_2 Tube Fitting	0100–1249	1
12	N_2 Cryogenic Valve	19239–60555	1
13	Sound Insulation Kit	19239–20550	1

Figure 8. N_2 Cryo Blast Valve Assembly (Sheet 1 of 2).

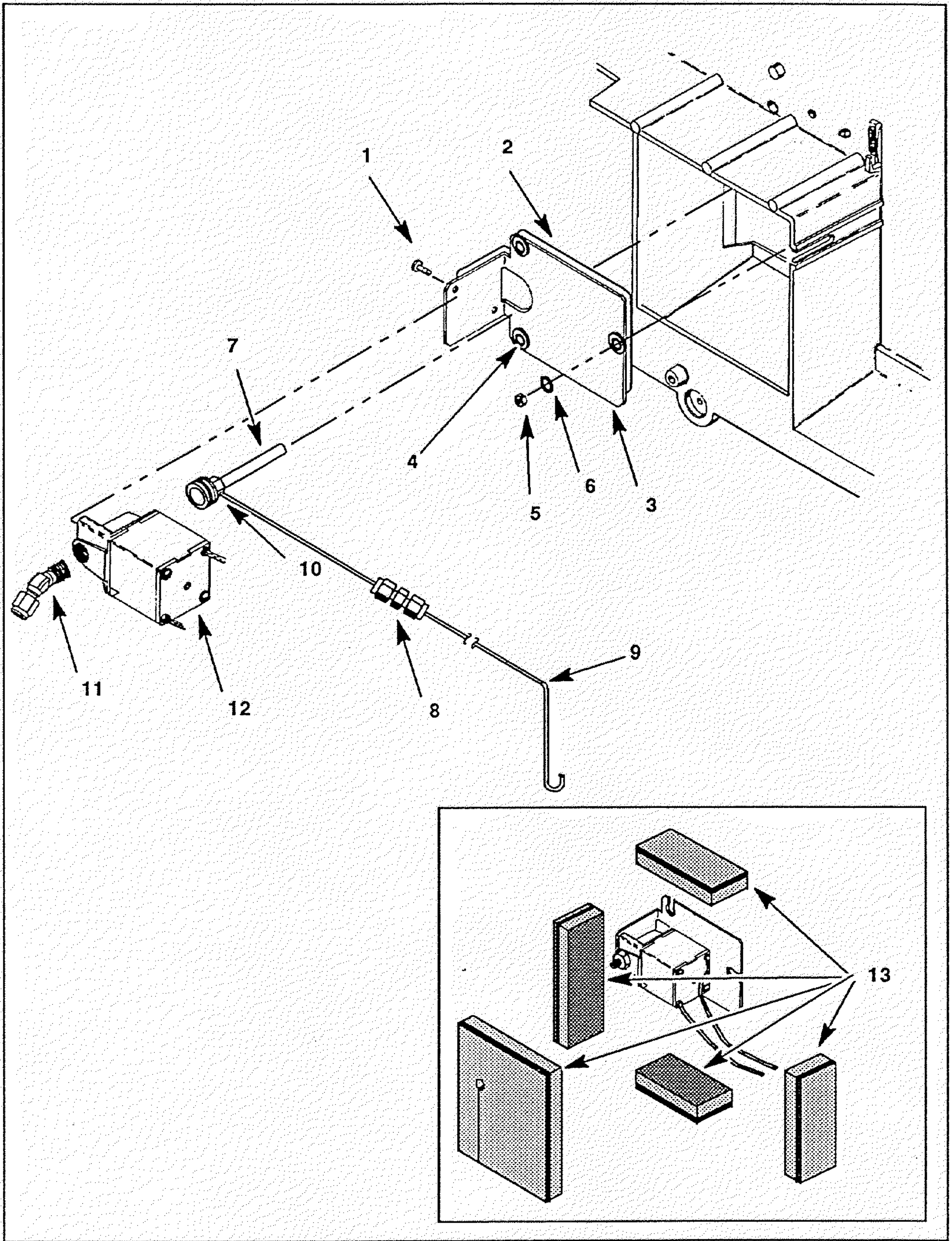


Figure 8. N_2 Cryo–Blast Valve Assembly (Sheet 2 of 2).

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 7
Valves

Item	Description	Part Number	Qty
1	Actuator Assembly (Refer to Figure 5)	19325-60660	1 per valve
2	Screw, M4 x 8 mm	0515-0106	12
3	MS 4 x 0.7 x 16 mm long	0515–0071	2 per bracket
4	Micrometering Needle Valve Mounting Bracket	18900–00430	up to 2
5	Valve Box Top	19238-00030	1
6	MS 4 x 0.7 x 8 mm long	0515–0106	2
7	Insulator	0340-0647	1
8	Insulation Plate	19358-00030	1
9	MS 3 x 0.5 x 20 mm long	0515–0057	2 per valve
10	Heated Block	19358-20520	2
11	Screw, M3 x 12 mm	0515-0105	2
12	Valves (Refer to Figure 6)		up to 4
13	Rectangular Standoff	19238-20500	2
14	Valve Box Bottom	19238-00010	1
15	Shoulder Screw	19238–20510	2
16	Socket Head Screw, M4 x 8 mm	0515-0153	2
17	Screw, M3 x 8 mm	0515-0104	4 per heated block
18	Heater/Sensor Cable Assembly, C/O	05890-61140	1 per heated block
19	• Cartridge Heater, 70W (includes contact 1251–1679)	19231-60620	1
20	• Contact	1251–1679	2
21	• PRT Sensor (includes contact 1251–5963)	19231-60660	1
22	• Contact	1251–5963	2
23	• Flexible Sleeving, (ordered by the inch)	0890-0737	22
24	Hex Standoff, M3 x 16 mm	0380-1102	4 per heated block
Items Not Shown:			
	Column Retaining Bracket	05890–80660	4
	Tie Wraps	1400–0249	4
	Adhesive Marker "A"	7120–5376	1
	Adhesive Marker "1"	7124–0438	3
	Adhesive Marker "2"	7124–0439	3
	Adhesive Marker "3"	7124–0440	3
	Valve Driver Cable	05890–61350	1

Figure 1. Valve Box Assembly (Sheet 1 of 2).

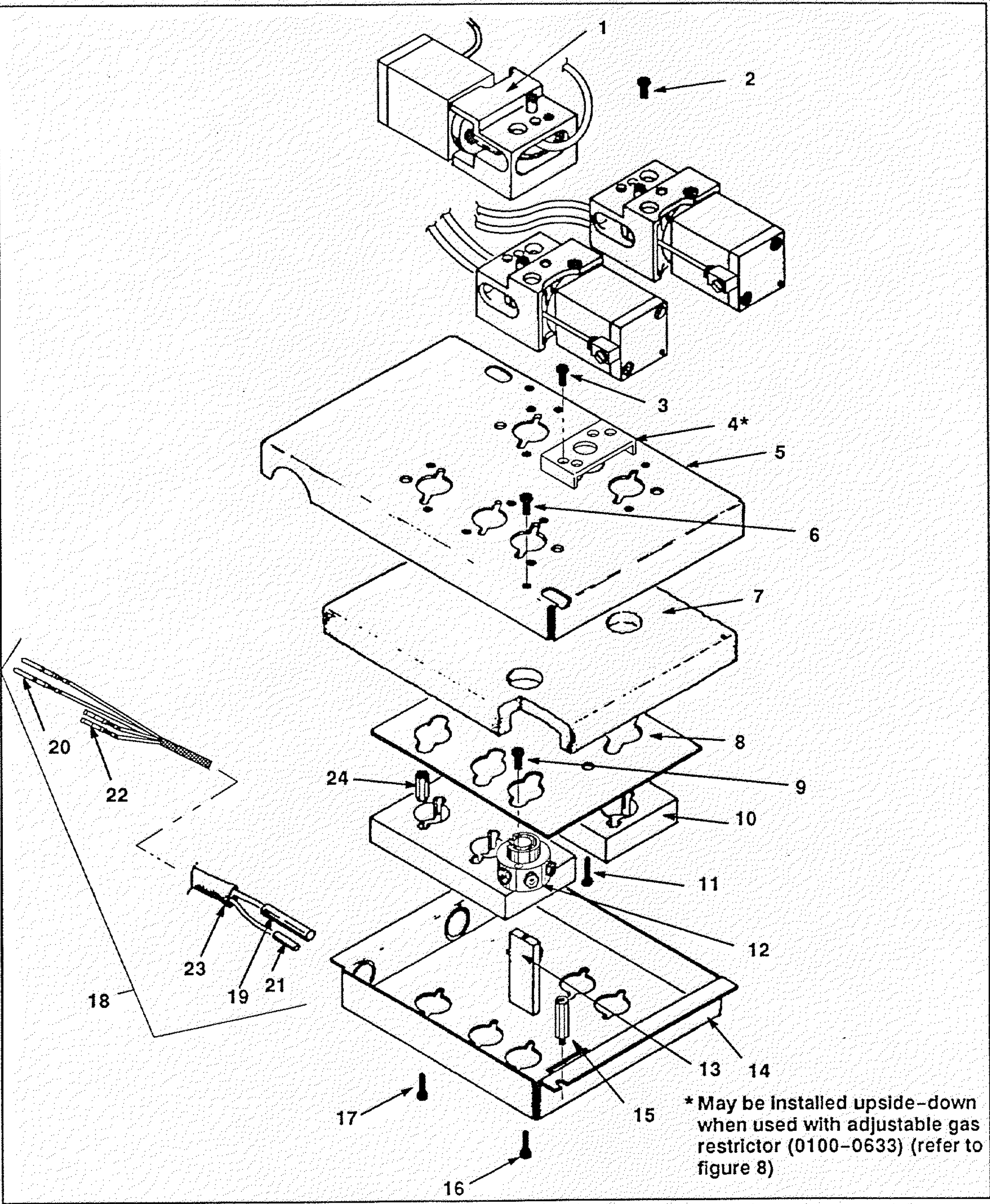


Figure 1. Valve Box Assembly (Sheet 2 of 2).

Item	Description	Part Number	Qty
1	Manual Actuator Handle	18900-20995	1 per valve
2	Screw	0515-0982	4
3	Manual Valve Control Panel	18900-00950	1
4	Spacer, Round .625 lg	0380-0010	4
5	Valve Actuator Coupler	18900-20990	1 per valve
6	MS 4 x 0.7 x 16 mm long	0515-0071	2 per bracket
7	Micrometering Needle Valve Mounting Bracket	18900-00430	up to 2
8	Valve Box Top	19238-00030	1
9	MS 4 x 0.7 x 8 mm long	0515-0106	2
10	Insulator	0340-0647	1
11	Insulation Plate	19358-00030	1
12	MS 3 x 0.5 x 20 mm long	0515-0057	2 per valve
13	Heated Block	19358-20520	2
14	Screw, M3 x 12 mm	0515-0105	2
15	Valves (Refer to Figure 5)		up to 4
16	Rectangular Standoff	19238-20500	2
17	Valve Box Bottom	19238-00010	1
18	Shoulder Screw	19238-20510	2
19	Socket Head Screw, M4 x 8 mm	0515-0153	2
20	Screw, M3 x 8 mm	0515-0104	4 per heated block
21	Heater/Sensor Cable Assembly, C/O	05890-61140	1 per heated block
22	• Cartridge Heater, 70W	19231-60620	1
23	• Contact	1251-1679	2
24	• PRT Sensor	19231-60660	1
25	• Contact	1251-5963	2
26	• Flexible Sleeving, (ordered by the inch)	0890-0737	22
27	Hex Standoff, M3 x 16 mm	0380-1102	4 per heated block
28	Actuator Handle Set Screw	3030-0079	1 per valve
Items Not Shown:			
	Hex Key Wrench, 3 mm A/F	8710-0911	1
	Column Retaining Bracket	05890-80660	4
	Tie Wraps	1400-0249	4
	Adhesive Marker "A"	7120-5376	1
	Adhesive Marker "1"	7124-0438	3
	Adhesive Marker "2"	7124-0439	3
	Adhesive Marker "3"	7124-0440	3
	Heater Connector Shell	1252-0757	1

Figure 2. Manual Valve Box Assembly (Sheet 1 of 2).

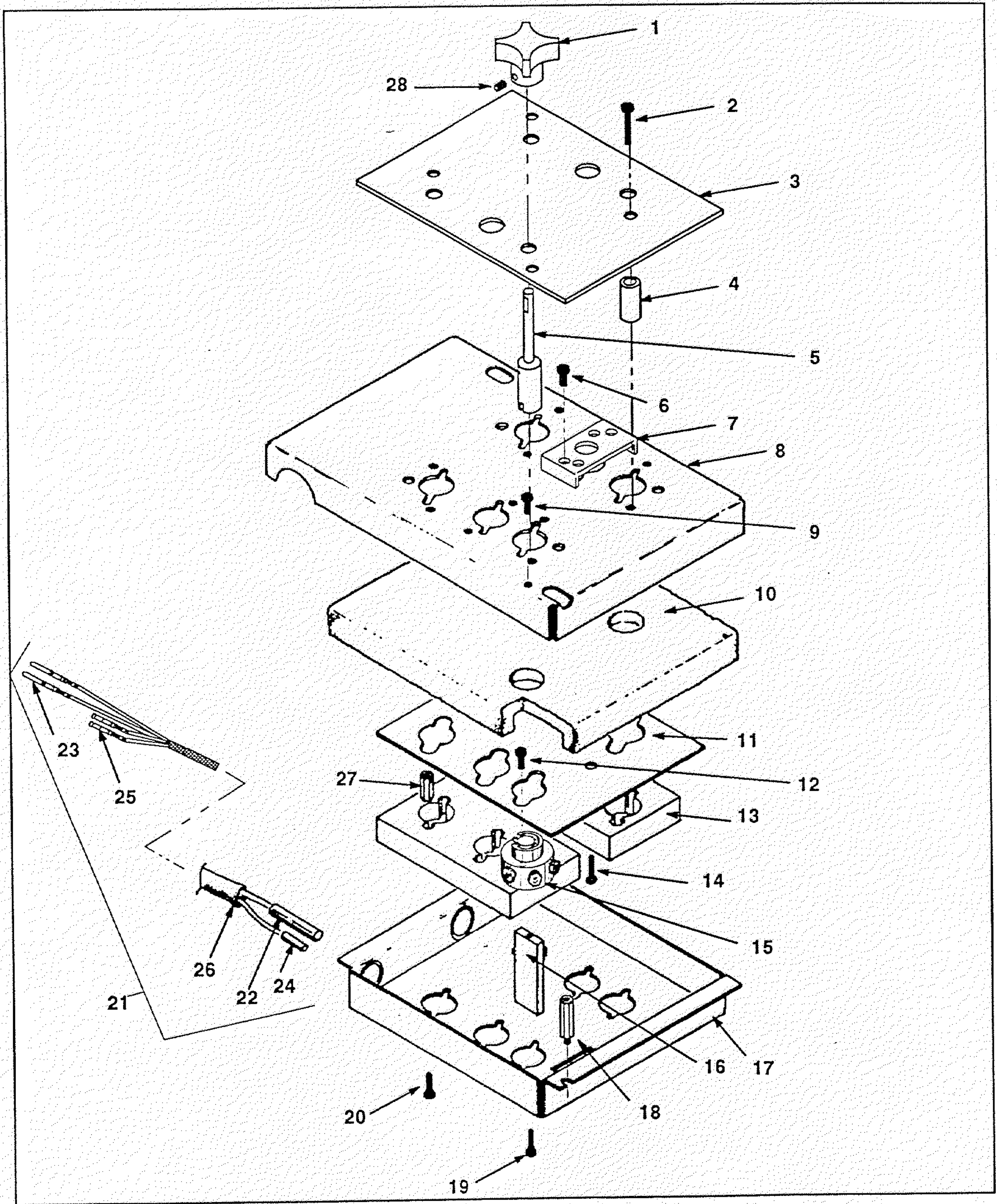


Figure 2. Manual Valve Box Assembly (Sheet 2 of 2).

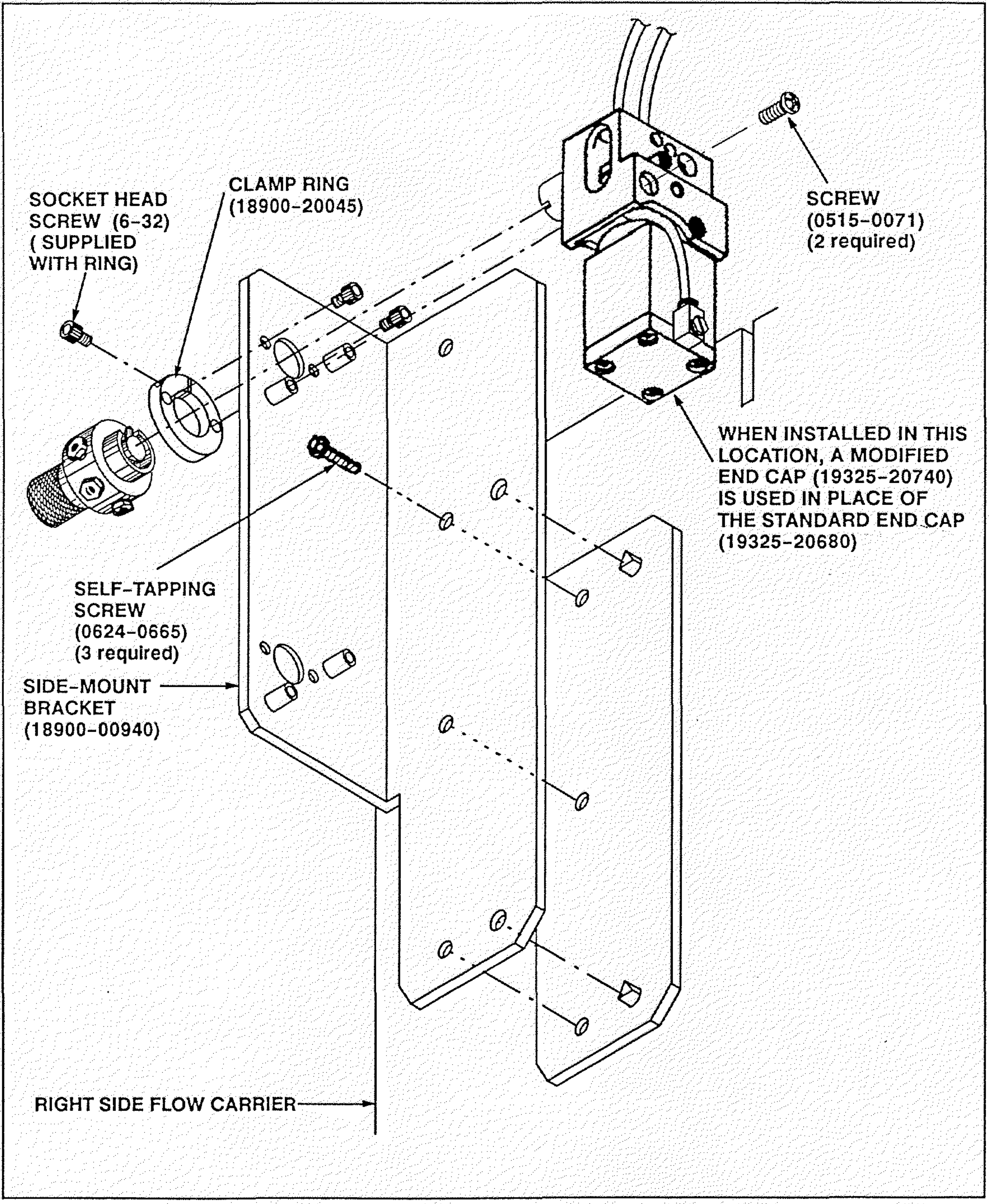
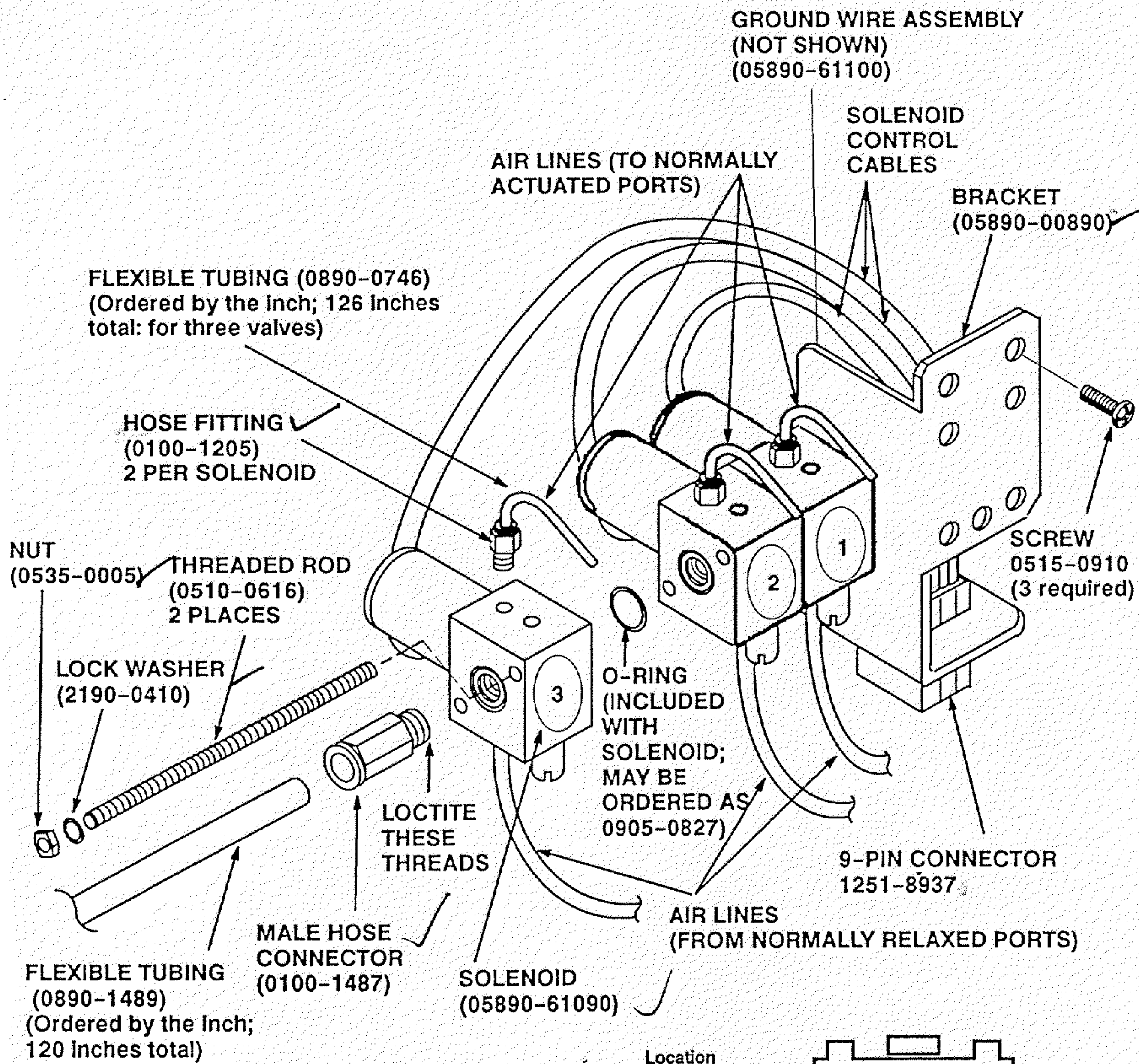
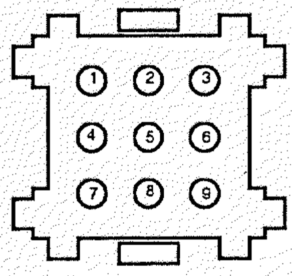


Figure 3. GSV/LSV Side Mount Valve/Actuator Bracket.

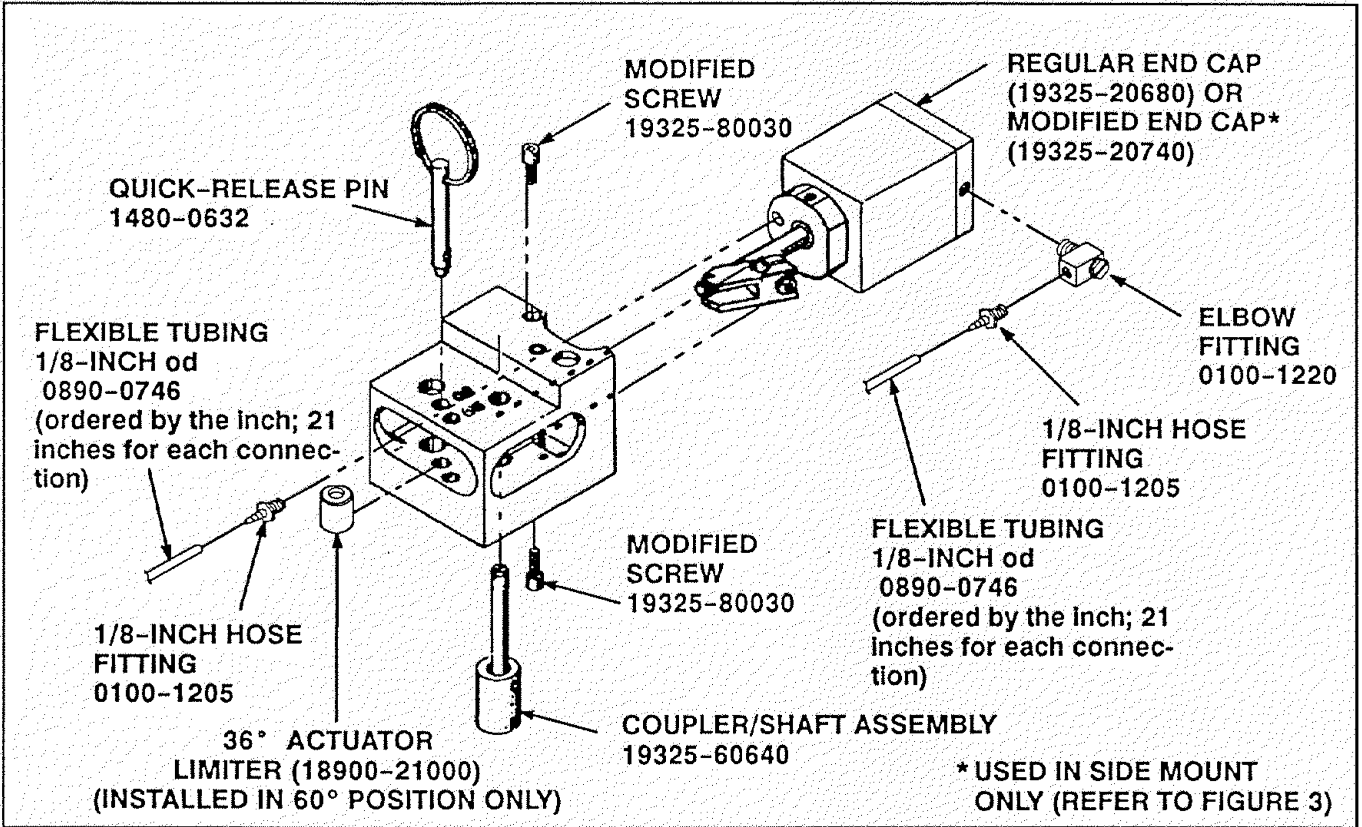


Wire Color	To	Location in Plug
Blue	(SOLENOID 1)	1
Blue	(SOLENOID 2)	2
Blue	(SOLENOID 2)	3
Blue	(SOLENOID 1)	4
Grn/Yel	(GROUND)	5
Blue	(SOLENOID 4)	6
Blue	(SOLENOID 3)	7
Blue	(SOLENOID 3)	8
Blue	(SOLENOID 4)	9



AS SEEN FROM WIRED SIDE

Figure 4. Valve Control Solenoids.



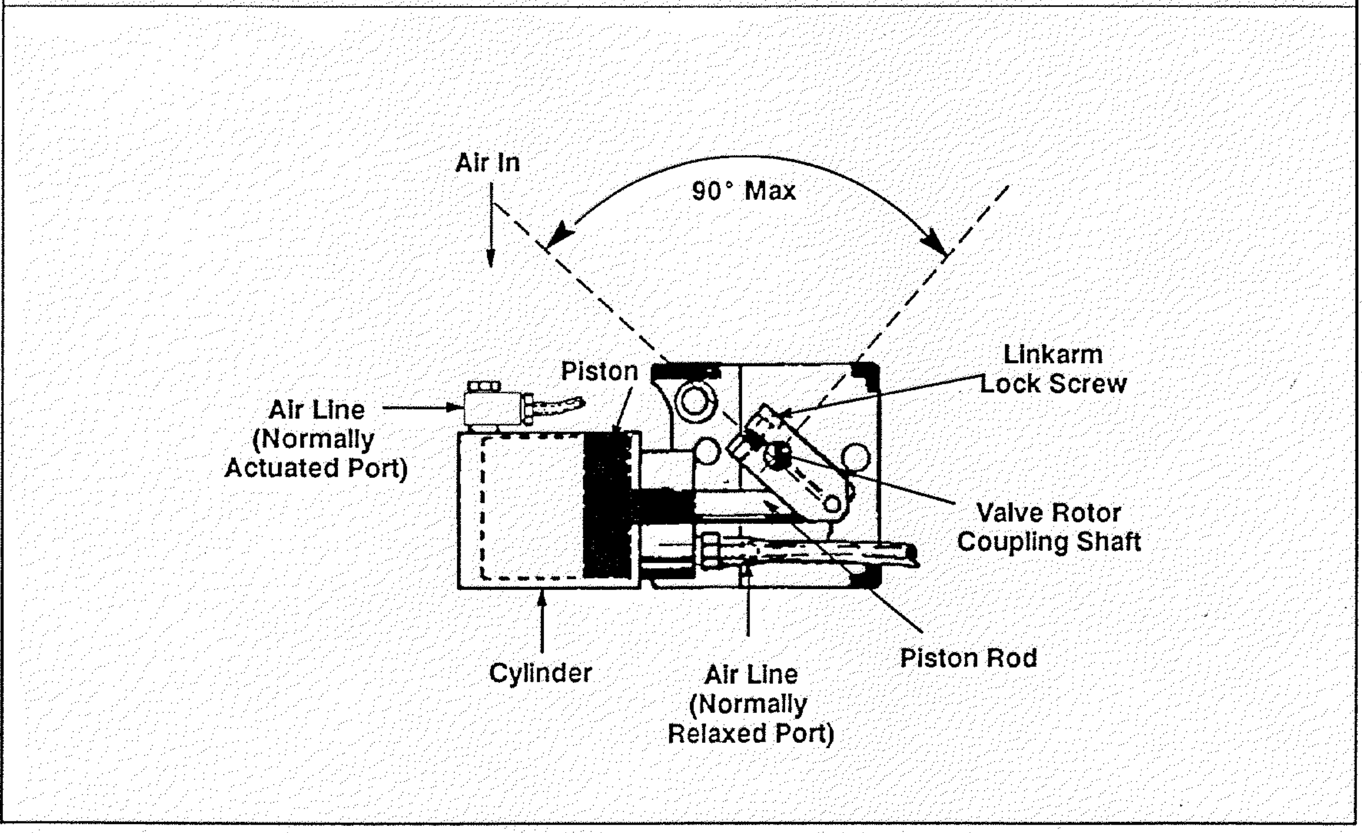
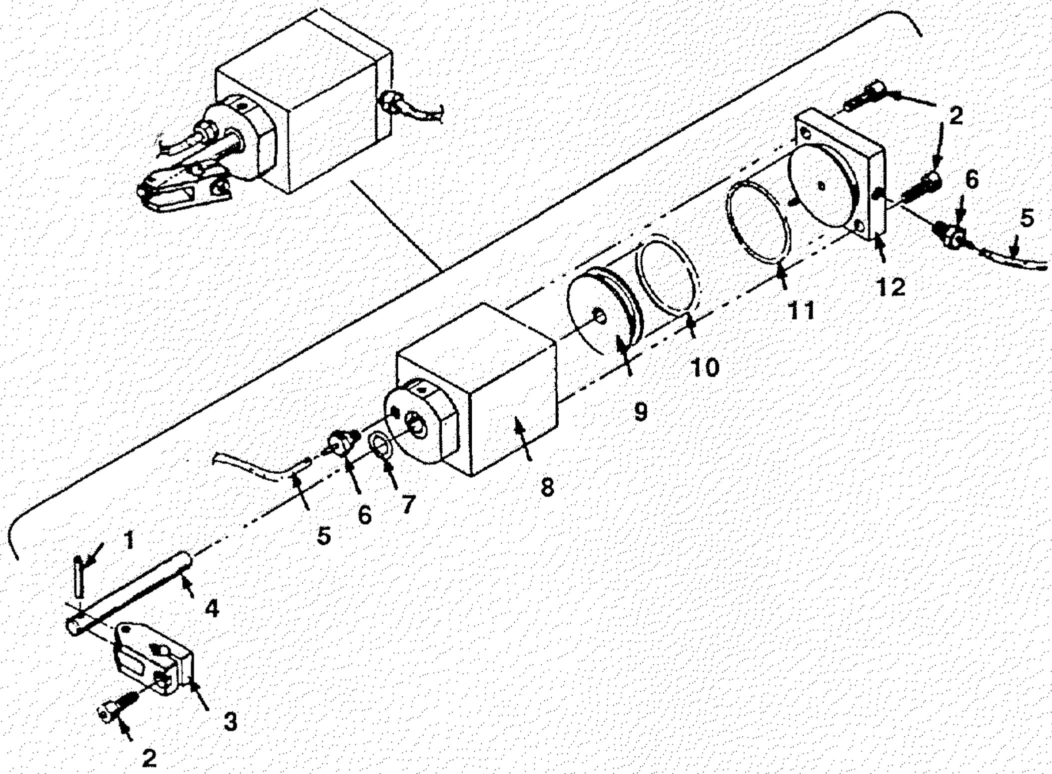
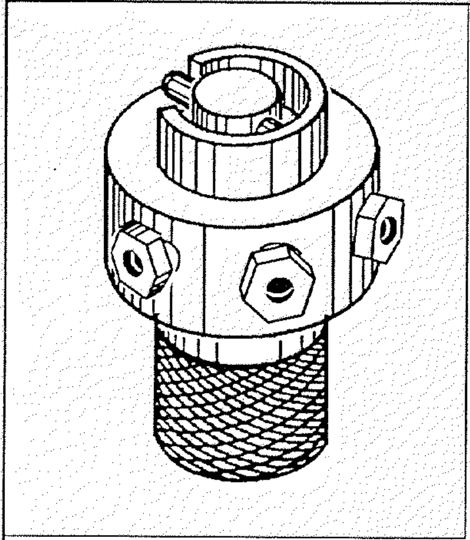


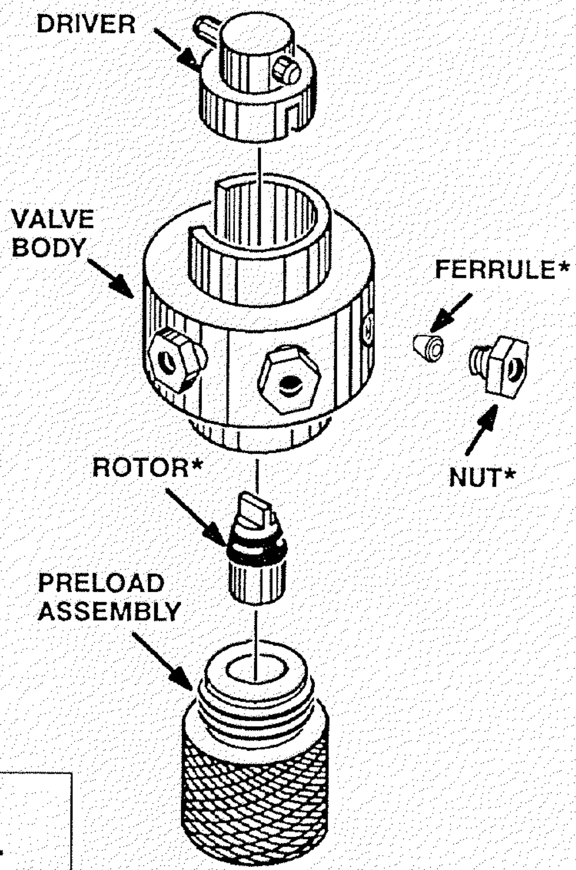
Figure 5. Valve Actuator Assembly (19325-60660) (Sheet 1 of 2).



Item	Description	Part Number	Qty
1	Dowel Pin	1480–0017	1
2	Socket Head Screw, M4 x 8–mm	0515–0153	3
3	Link	19325–80010	1
4	Piston Rod	19325–20650	1
5	Teflon Tubing, 1/8–inch o.d. x 30 inches	0890–0746	1
6	Hose Fitting	0100–1205	2
7	O–ring, 0.239–inch i.d.	0905–0103	1
8	Actuator Cylinder	19325–20630	1
9	Piston	19325–20640	2
10	O–ring, 1.046–inch i.d.	0905–0626	1
11	O–ring, 1.176–inch i.d.	0905–0997	1
12	Cylinder End Cap	19325–20680	1

Figure 5. Valve Actuator Assembly (19325–60660) (Sheet 2 of 2).





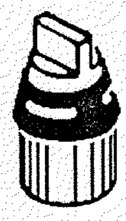
Item Description	HP Part No.
Gas Sampling Valves (GSV)	
6–port valve (175°C max)	0101–0629
6–port valve (350°C max)	0101–0584
6–port valve (hastelloy, 175°C max)	0101–0634
10–port valve (175°C max)	0101–0630
10–port valve (350°C max)	0101–0585
10–port valve (hastelloy, 175°C max)	0101–0635
Liquid Sampling Valves (LSV)	
4–port valve (Internal Sample Injector) (.2ml, 1000 psi, Option 151)	0101–0636
4–port valve (Internal Sample Injector) (.5ml, 1000 psi, Option 152)	0101–0637
4–port valve (Internal Sample Injector) (1.0ml, 1000 psi, Option 153)	0101–0638
4–port valve (Internal Sample Injector) (.5ml, 5000 psi, Option 162)	0101–0639

*REPLACEMENT ROTORS, NUTS, AND FERRULES MAY BE ORDERED SEPARATELY (REFER TO FIGURE 7 FOR ROTOR, NUT, AND FERRULE PART NUMBERS)

Figure 6. "W" Series Valve (Typical).

General Purpose Teflon Valve Rotors

Description	HP Part No.
6-port (175°C max)	5062–3557
10-port (175°C max)	5062–3558
6-port (350°C max)	1535-4952
10-port (350°C max)	1535-4954



Standard Pressure Liquid Sample Valve Rotors

Description	HP Part No.
0.2 µl 4-port (1000 psig max)	5062–3563
0.5 µl 4-port (1000 psig max)	5062–3562
1.0 µl 4-port (1000 psig max)	5062–3559

Nuts and Ferrule for "W" Series Valves

Description	HP Part No.
Nut	0100–0791
Ferrule	0100–1022

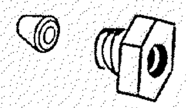


Figure 7. Valve Components.

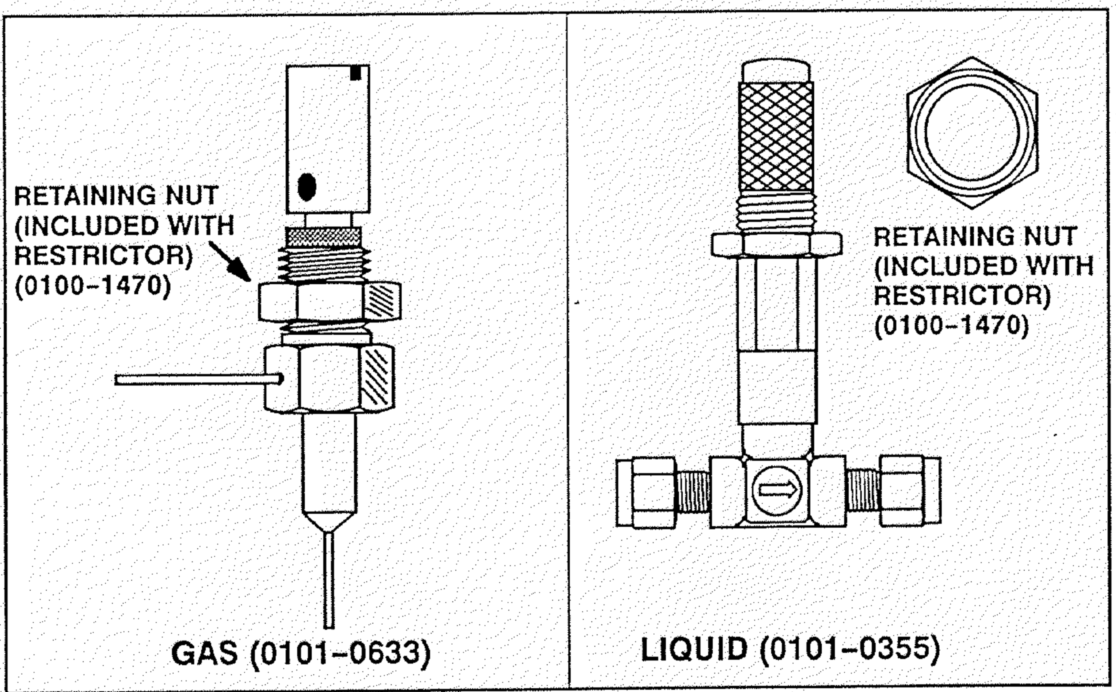
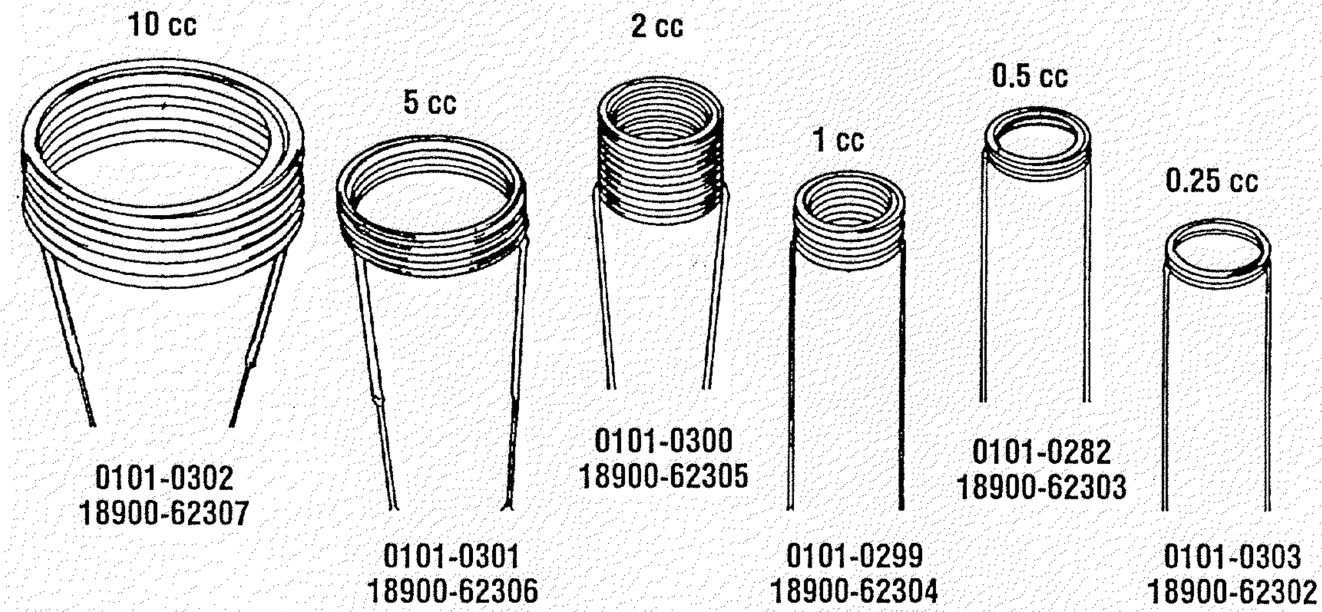


Figure 8. Adjustable Restrictors (Micrometering Needle Valves).

18900-62XXX series numbers are for sets consisting of a loop, nuts, and ferrules. The 0101–0XXX series numbers, shown are for the loops only. All loops connect to valves using Valco 1/16–inch nuts and ferrules. (Nickel loops and smaller loops do not include nuts and ferrules.) Part numbers for attaching hardware are nut (0100–0791) and ferrule (0100–1022).



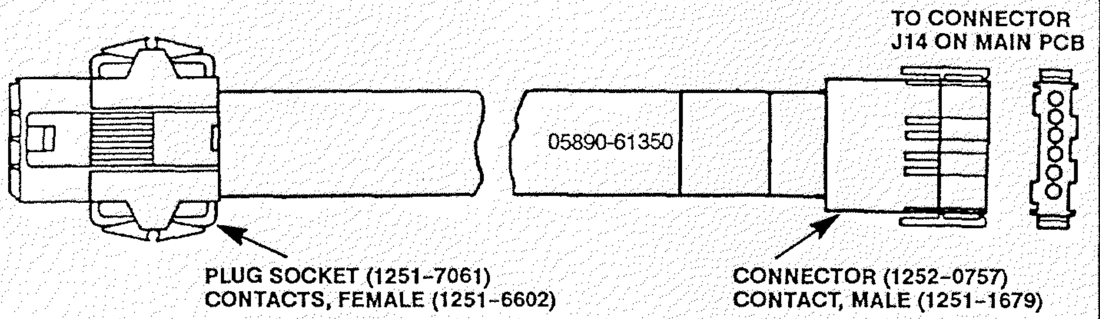
Nickel Sample Loops:

.25 cc	18900–20502
.50 cc	18900–20503
1.0 cc	18900–20504
2.0 cc	18900–20505

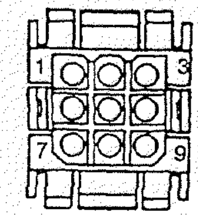
Smaller Sample Loops:

25 µL	0101–0665
50 µL	0101–0667
100 µL	0101–0666

Figure 9. Sample Loops.

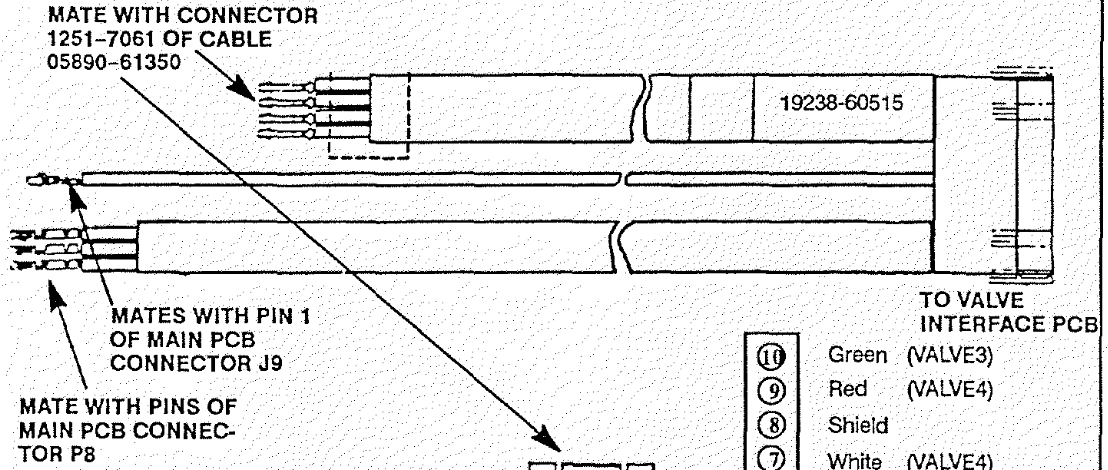


Wire Color	To	Location in Plug
Red	(VALVE 1)	1
Green	(VALVE 2)	2
Black	(VALVE 2)	3
White	(VALVE 1)	4
Shield		5

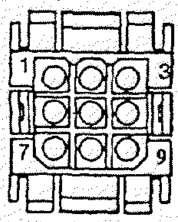


OPEN END VIEW

6	Red	(VALVE1)
5	White	(VALVE1)
4	Green	(VALVE2)
3	Black	(VALVE2)
2	Red	(AUX ZONE)
1	Red	(AUX ZONE)



Wire Color	To	Location in Plug
White	(VALVE 4)	6
Black	(VALVE 3)	7
Green	(VALVE 3)	8
Red	(VALVE 4)	9

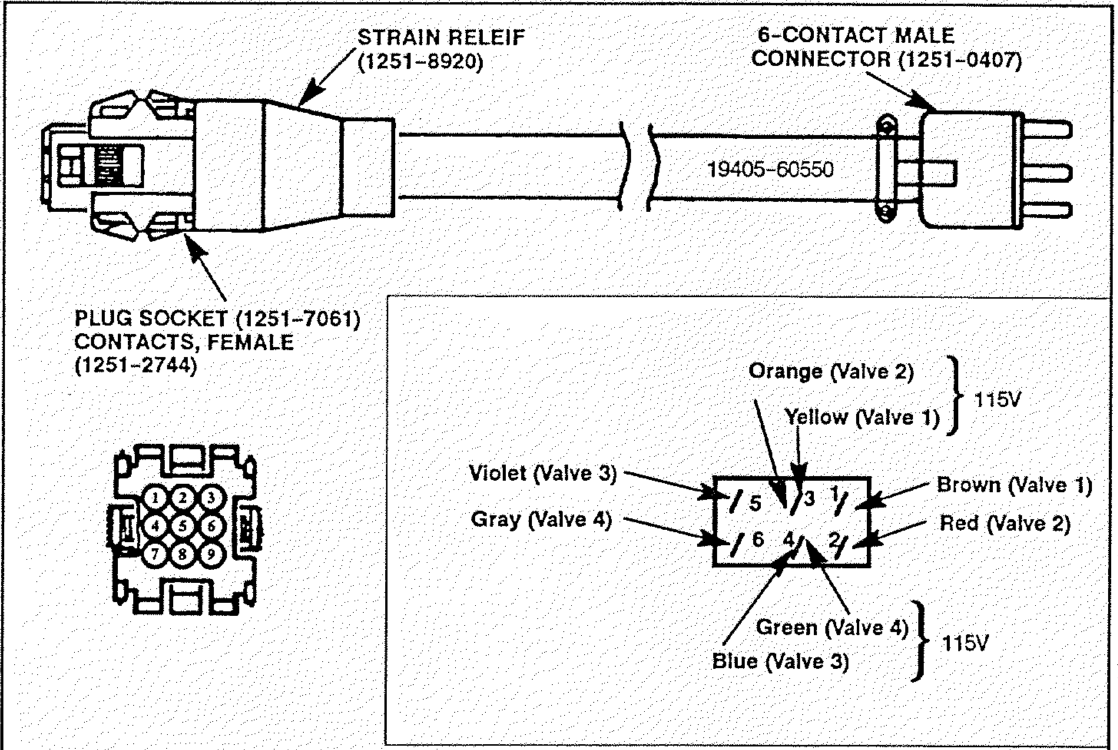


OPEN END VIEW

10	Green	(VALVE3)
9	Red	(VALVE4)
8	Shield	
7	White	(VALVE4)
6	Black	(VALVE 3)
5	Red	(PIN 1, J9)
4	Shield	
3	White	(PIN 4, P8)
2	Black	(PIN 6, P8)
1	Red	(PIN 5, P8)

Contacts for valve/aux connection @ main PCB are 1251–1679

Figure 10. Valve Control Cables (Sheet 1 of 2).

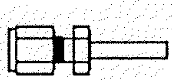


Wire Color	To	Location in Plug
Brown	(VALVE 1)	1
Red	(VALVE 2)	2
Orange	(VALVE 2)(115V)	3
Yellow	(VALVE 1)(115V)	4
Shield		5
Green	(VALVE 4)(115V)	6
Blue	(VALVE 3)(115V)	7
Violet	(VALVE 3)	8
Gray	(VALVE 4)	9

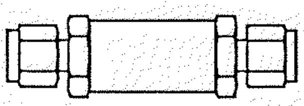
Figure 10. Valve Control Cables (Sheet 2 of 2).

1/8-INCH SS NUT (0100-0057), FRONT FERRULE (0100-0034), AND BACK FERRULE (0100-0038) (A PACKAGE OF 20 SETS OF NUTS AND BOTH FERRULES IS AVAILABLE AS 5080-8751)

1/16-INCH REDUCER/RESTRICTOR (18900-80210)



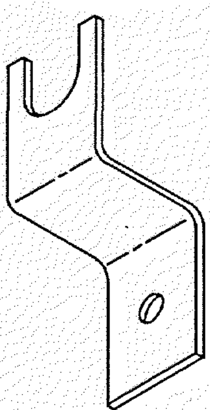
1/16-INCH TUBE REDUCING UNION (0100-0073)

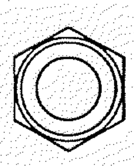


7µM SAMPLE INLET FILTER (0101-0532)

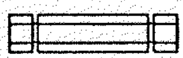
1/16-INCH SS UNION (0100-0124)

MICROMETERING NEEDLE (ADJUSTABLE RESTRICTOR) VALVE MOUNTING BRACKET (LOCATED ON LEFT SIDE CARRIER BEHIND ACCESS DOOR (18900-00980)

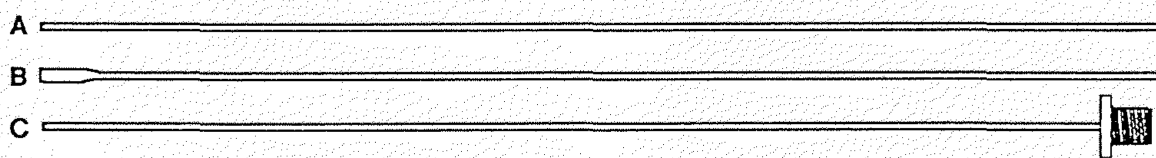




BRASS RETAINER NUT (0590-0385) (USED WITH 07675-80050)

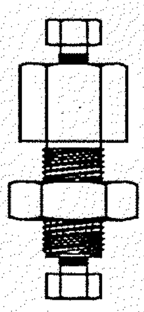


1/16-INCH ZERO DEAD VOLUME UNION (0100-0900)

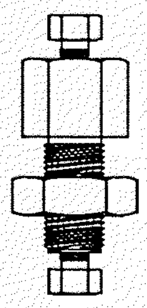


A:	Tube, 1/16-Inch SS 102-mm long	18900-20230
	Tube, 1/16-Inch SS 203-mm long	18900-20240
	Tube, 1/16-Inch SS 400-mm long	18900-20280
	Tube, 1/16-Inch SS 575-mm long	18900-20281
	Tube, 1/16-Inch SS 510-mm long	18900-20290
	Tube, 1/16-Inch SS 560-mm long	18900-20300
	Tube, Nickel, 1/16-Inch 460-mm long	18900-20506
	Tube, Nickel, 1/16-Inch 663-mm long	18900-20507
B:	Tube, 1/16-Inch w/1/8-Inch flare SS 360 mm long	1530-2163
	Tube, 1/16-Inch w/1/8-Inch flare SS 520 mm long	1530-2167
	Tube, 1/16-Inch w/1/8-Inch flare SS 280 mm long	18900-20250
C:	Tube, 1/16-Inch w/1/8-Inch bulkhead fitting 520 mm long	07675-80050
	Tube, Nickel, 1/16-Inch w/1/8-Inch bulkhead fitting 460 mm long	18900-80255

Figure 11. Miscellaneous Hardware (Sheet 1 of 2).

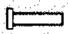


SS BULKHEAD ZERO DEAD VOLUME UNION
(FOR .530 CAPILLARY COLUMNS)
(0100-1515)



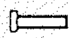
SS BULKHEAD ZERO DEAD VOLUME UNION
(FOR .320 CAPILLARY COLUMNS)
(0100-1527)

1/16-INCH I.D. POLYIMIDE
FERRULE (0100-1512)



POLYIMIDE LINER (0.6-0.8 mm O.D.)
(FOR .530 CAPILLARY COLUMNS)
(0100-1513)*

1/16-INCH COUNTERBORE NUT
(0100-1511)



POLYIMIDE LINER (0.5 mm O.D.)
(FOR .320 CAPILLARY COLUMNS)
(0100-1514)*

*Assembly tool for liners shown above is 18900-20850.

Figure 11. Miscellaneous Hardware (Sheet 2 of 2).

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 8
AC Power Supply

Item	Description	HP Part No.	Qty.
1	AC Power Supply (Refer to Figure 2)		1
2	AC Power Supply Ground Wire	19350–60670	1
3	Power Cords:		1
	• USA, 120 V	05890–60870	–
	• Europe, 220 V	05890–60880	–
	• Great Britain, 220 V/240 V	05890–60890	–
	• Australia, 240 V	05890–60910	–
	• Europe, Split–Phase, 220 V	05890–60960	–
	• USA, 240 V	05890–60900	–
	• Japan, 200 V	05890–60920	–
	• China, 220 V	05890–60910	–
	• Denmark, 220 V	05890–60880	–
	• Switzerland, 220 V	05890–60880	–
	• S. Africa, 240 V	05890–60890	–
4	AC Power Supply Base	05890–00240	1

Figure 1. AC Power Components (Sheet 1 of 2).

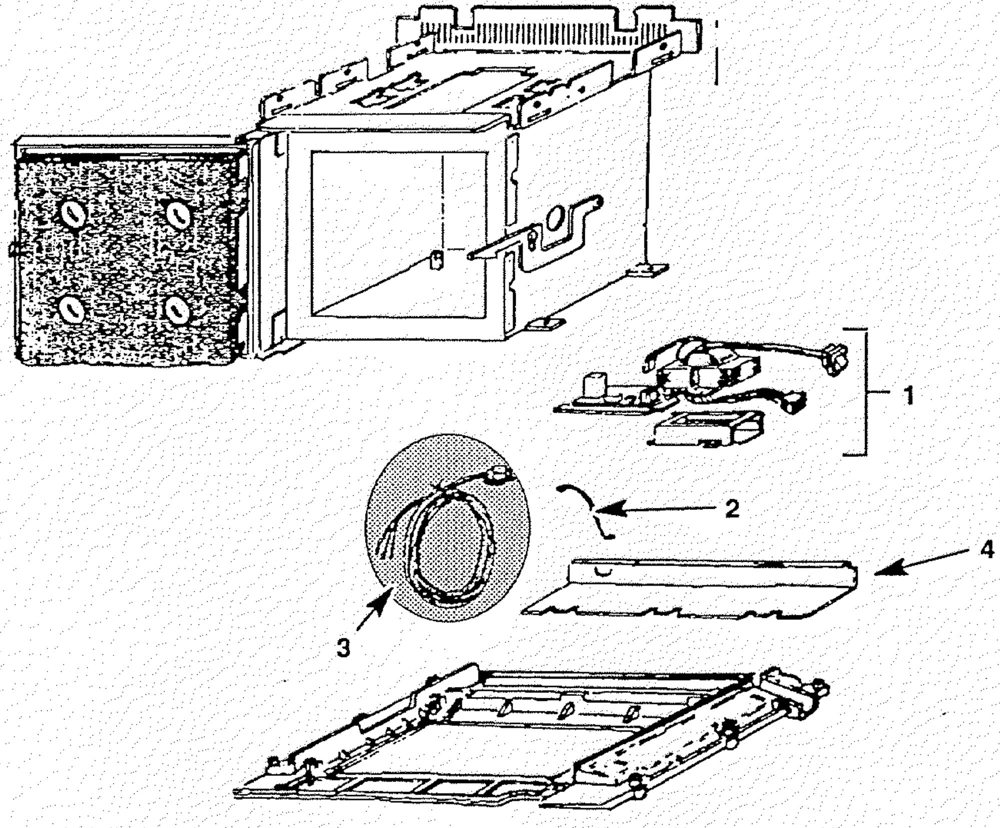


Figure 1. AC Power Components (Sheet 2 of 2).

Item	Description	HP Part No.	Qty.
1	DPST Rocker Switch (Power Switch)	3101–0402	1
2	Nut/Lock Washer	0535–0043	7
3	Screw	0515–1276	4
4	Insulator Bushing	0340–0793	4
5	AC Printed Circuit Board (Refer to Table 1)		1
6	Screw	0515–0910	1
7	Lock Washer	2190–0409	1
8	AC Power Supply Ground Wire	19350–60670	1
9	AC Power Supply Base	05890–00240	1
10	Transformer Bracket	05890–80690	1
11	Transformer (Refer to Table 1)		1
12	Extension Cable for upgraded Series I	05890–61340	1

Figure 2. AC Power, Common (Sheet 1 of 2).

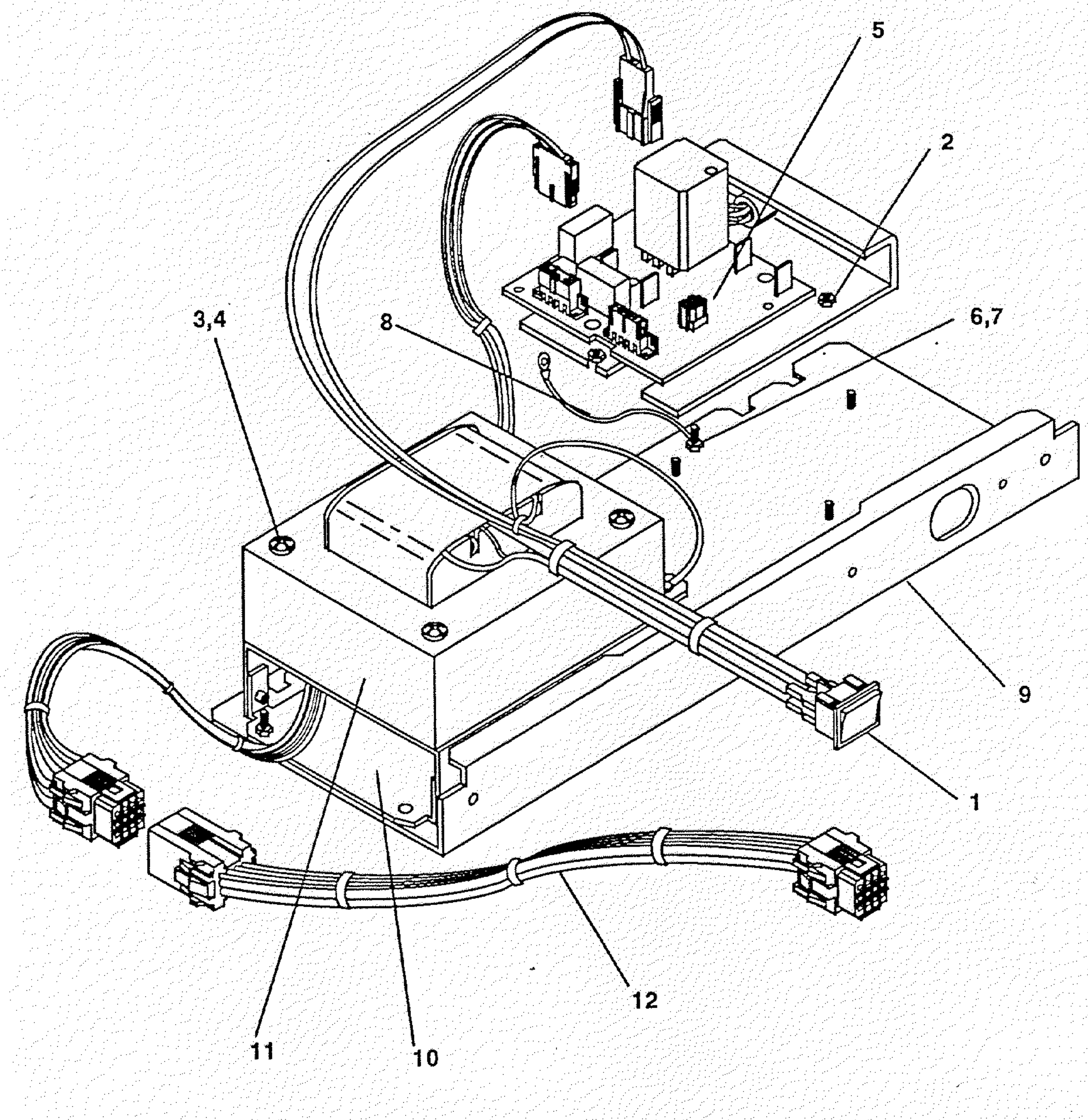
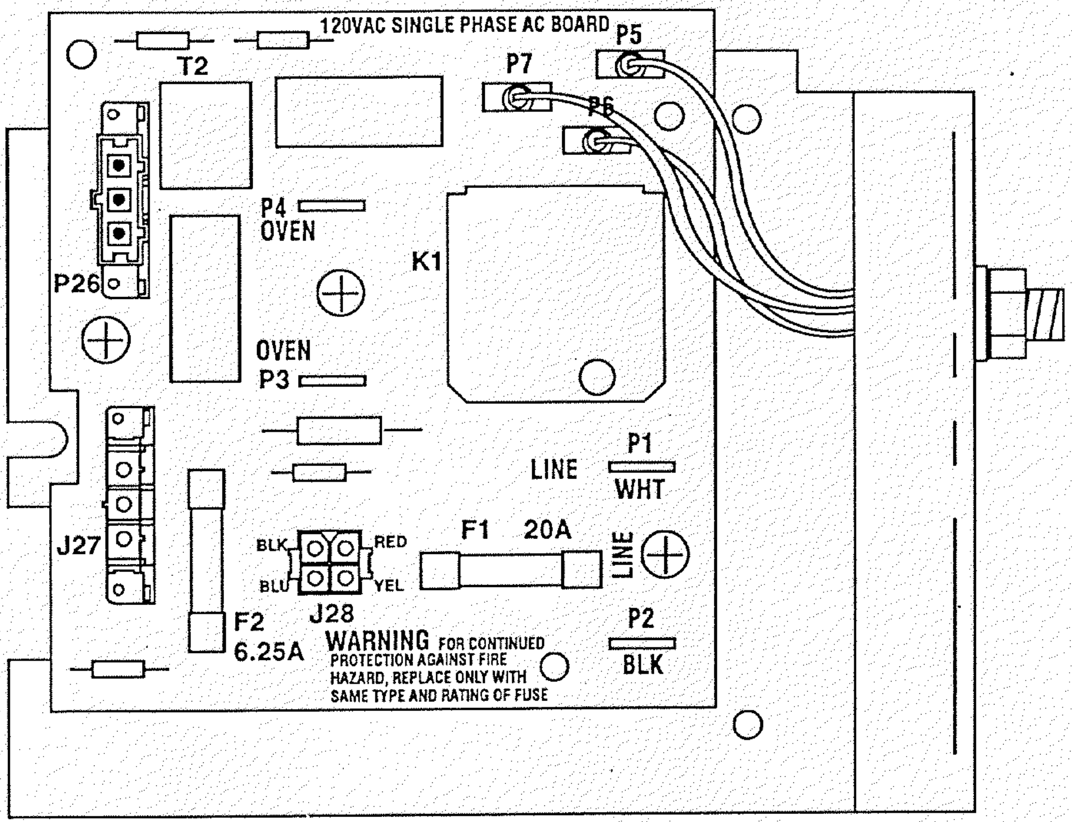


Figure 2. AC Power, Common (Sheet 2 of 2).

Table 1. AC Power Components.

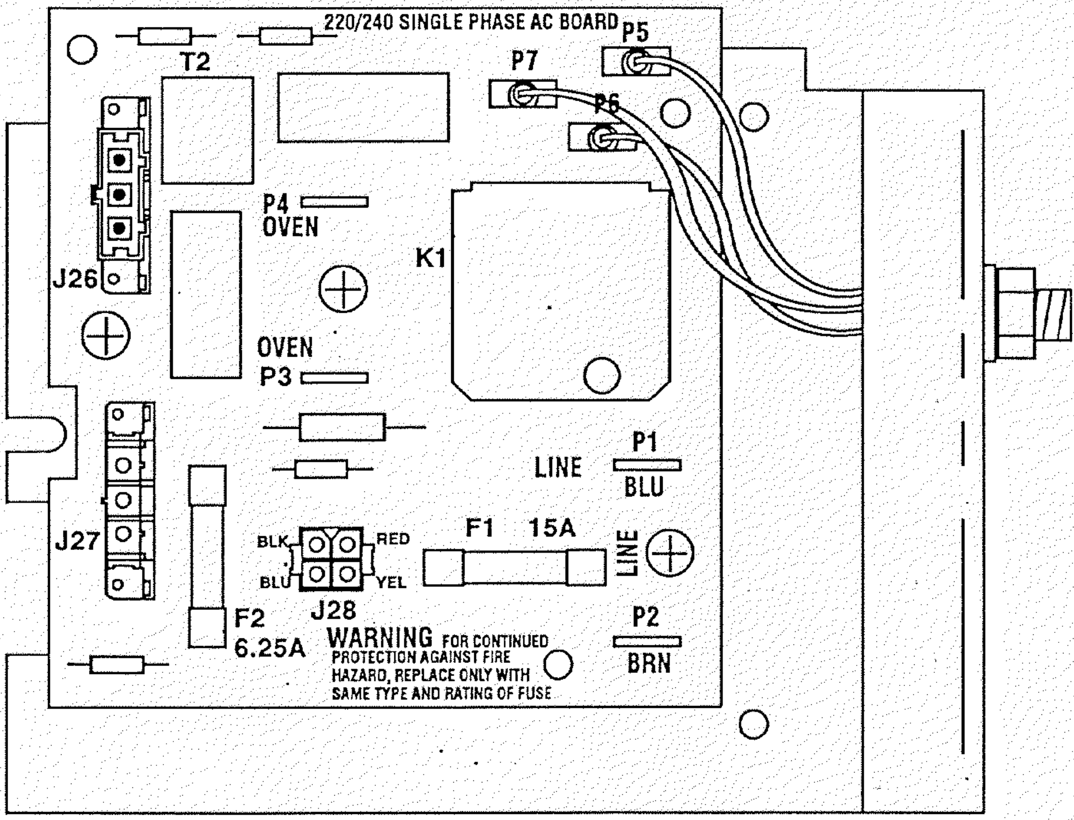
	PCB HP Part No.	XFMR HP Part No. $239^{\underline{00}}$	CABLE HP Part No.
$307^{\underline{00}}$ 120 V USA	05890–60050	05890–60970	05890–60870
220 V Europe	05890–60060	05890–60990	05890–60880
220 V Great Britain	05890–60060	05890–60990	05890–60890
240 V Great Britain	05890–60060	05890–61000	05890–60890
240 V Australia	05890–60060	05890–61000	05890–60910
220 V Split Phase Europe	05890–60070	05890–60990	05890–60960
240 V USA	05890–60070	05890–61000	05890–60900
200 V Japan	05890–60070	05890–60980	05890–60920
220 V China	05890–60060	05890–60990	05890–60910
220 V Denmark	05890–60060	05890–60990	05890–60880
220 V Switzerland	05890–60060	05890–60990	05890–60880
240 V S. Africa	05890–60060	05890–61000	05890–60890

NOTE: Refer to figures 3, 4, and 5 for illustrations of the AC PCBs.



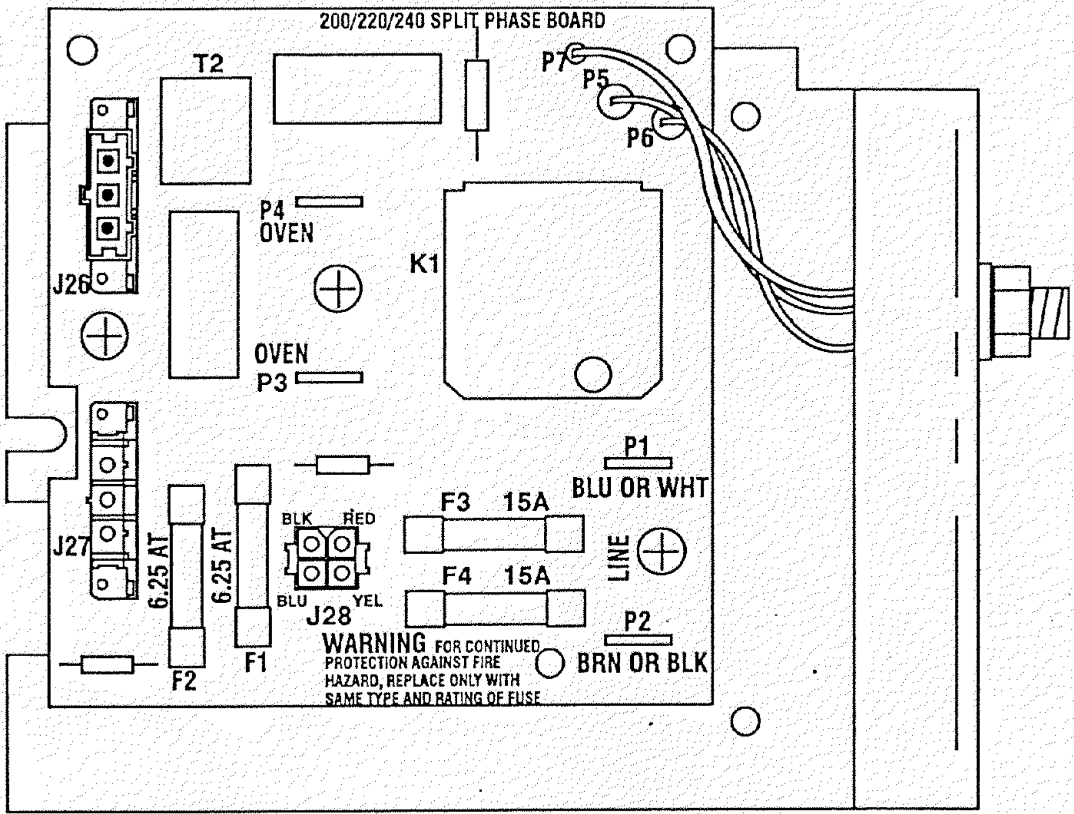
Item	Description	HP Part No.	Qty.
1	Fuse, 6.25 A, 250 V	2110–0422	1
2	Fuse, 20 A, 250 V	2110–0098	1

Figure 3. AC Power PCB 05890–60050.



Item	Description	HP Part No.	Qty.
1	Fuse, 6.25 A, 250 V	2110–0422	1
2	Fuse, 15 A, 250 V	2110–0054	1

Figure 4. AC Power PCB 05890–60060.



Item	Description	HP Part No.	Qty.
1	Fuse, 6.25 A, 250 V	2110–0422	2
2	Fuse, 15 A, 250 V	2110–0054	2

Figure 5. AC Power PCB 05890–60070.

HP 5890 Series II
ILLUSTRATED PARTS BREAKDOWN

SECTION 9
Electronics

Item	Description	HP Part No.	Qty.
1	Main Printed Circuit Board (PCB)	05890–60015	1
2	Keyboard Assembly	05890–61365	1
3	• Keyboard Bezel	05890–60745	1
4	• Keyboard Connector Body	05890–40080	1
5	• Display PCB	05890–60035	1
6	• Keyboard Connector Element	1252–0001	1
7	High Voltage Cover	05890–40150	1
8	Communications Interface PCB:		1
	• INET (BUFFERED)	19242–60015	–
	• RS–232	19242–60030	–
	• HPIB/RS–232 INTFC.	19257–60010	–
9	Pressure Control PCB:		1
	• Manual Pressure Control	19245–60040	–
	• Electronic Pressure Control	19245–60010	–
10	Detector PCB:		2
	• FID	19231–60010	–
	• TCD Series II	19232–60020	–
	• TCD	19232–60010	–
	• FPD	19256–60010	–
	• NPD	19234–60010	–
	• ECD (spec. and gen. license)	19233–60010	–
	• ECD Series II (spec. and gen. license)	19233–60015	–
	• ANALOG INPUT PCB	19261–60010	–

Figure 1. HP 5890 Series II Electronic Components (Sheet 1 of 2).

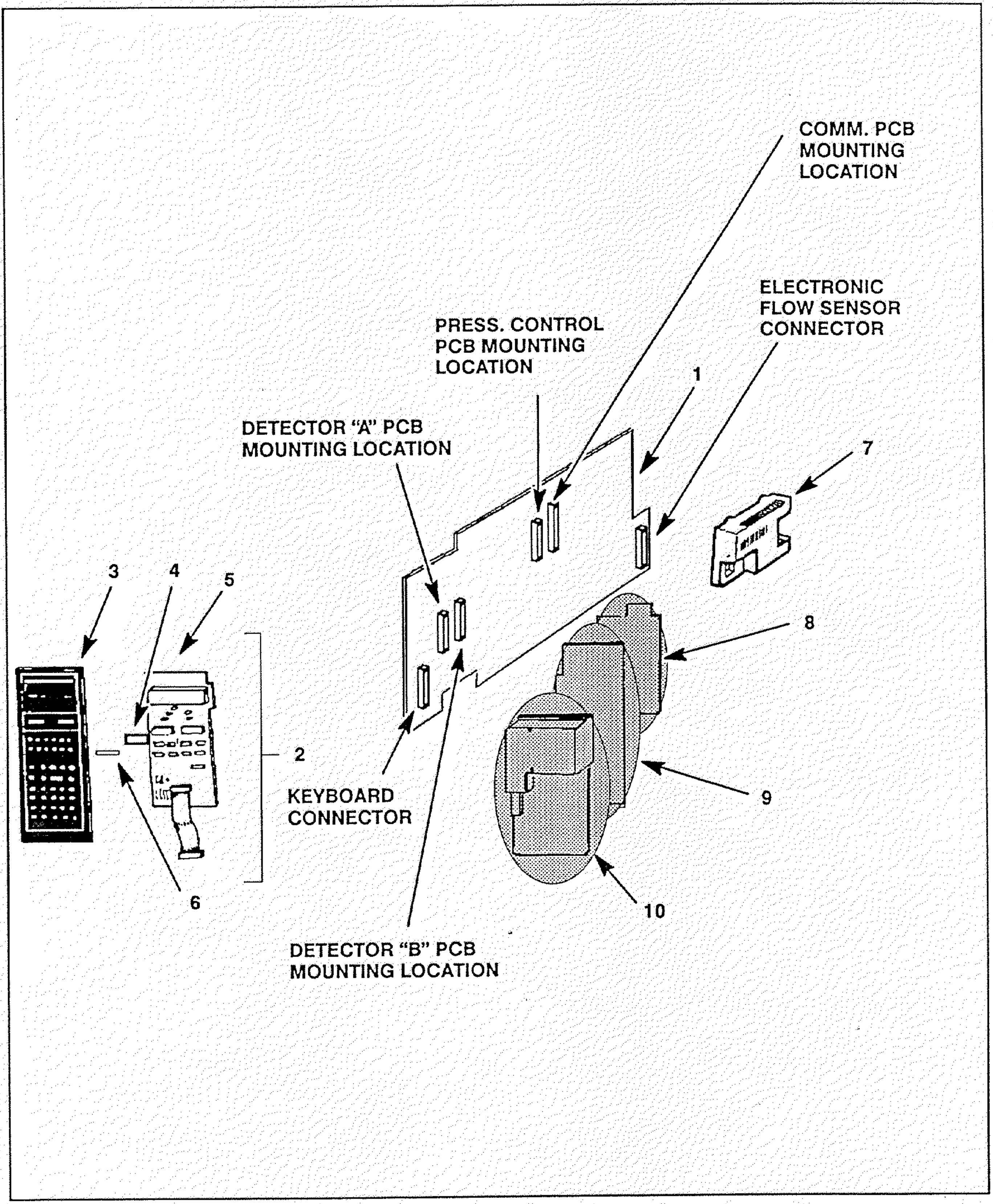


Figure 1. HP 5890 Series II Electronic Components (Sheet 2 of 2).

Item	Description		Qty.
1	Connector P1; mates with ribbon cable from Keyboard/Display Assembly		1
2	Connector P2; mates with detector PCB "A"		1
3	Connector P3; mates with detector PCB "B"		1
4	Connector P4; mates with analog signal output (sig 1)		1
5	Connector P5; mates with analog signal output (sig 2)		1
6	Connector P6; mates with remote input/output control cable		1
7	Connector P7; mates with heater sensor/AUX/fan cables; cable hood number is 1251–7519; connector part number is 1251–8655.		1
8	Connector P8; mates with ignitor/flaps control cable; cable hood part number is 1251–8325; polarizing cover is part number 1251–8326; connector part number is 1251–8751.		1
9	Connector P9 (Heater Driver Connector); mates with Heater/Sensor assemblies; cable hood part number is 1251–7519		1
10	Connector P10; mates with AC power transformer cable (Refer to Section 8)		1
11	Connector P11; mates with EFS ribbon cable (05890–61390)		1
12	Connector P12; mates with communications PCB		1
13	Connector P13; mates with Pressure Control PCB		1
14	Connector J14 (Valve/Aux Control); mates with valve driver cable 05890–61350; cable hood part number is 1252–0757		1
15	Fuse, 5A, 250 V	2110–0010	5
16	ROM, Main PCB (as of this printing, this is the latest ROM update; see service notes for specific ROM information.)	05890–80280	1

Figure 2. HP 5890 Series II Main PCB (05890–60015) (Sheet 1 of 2).

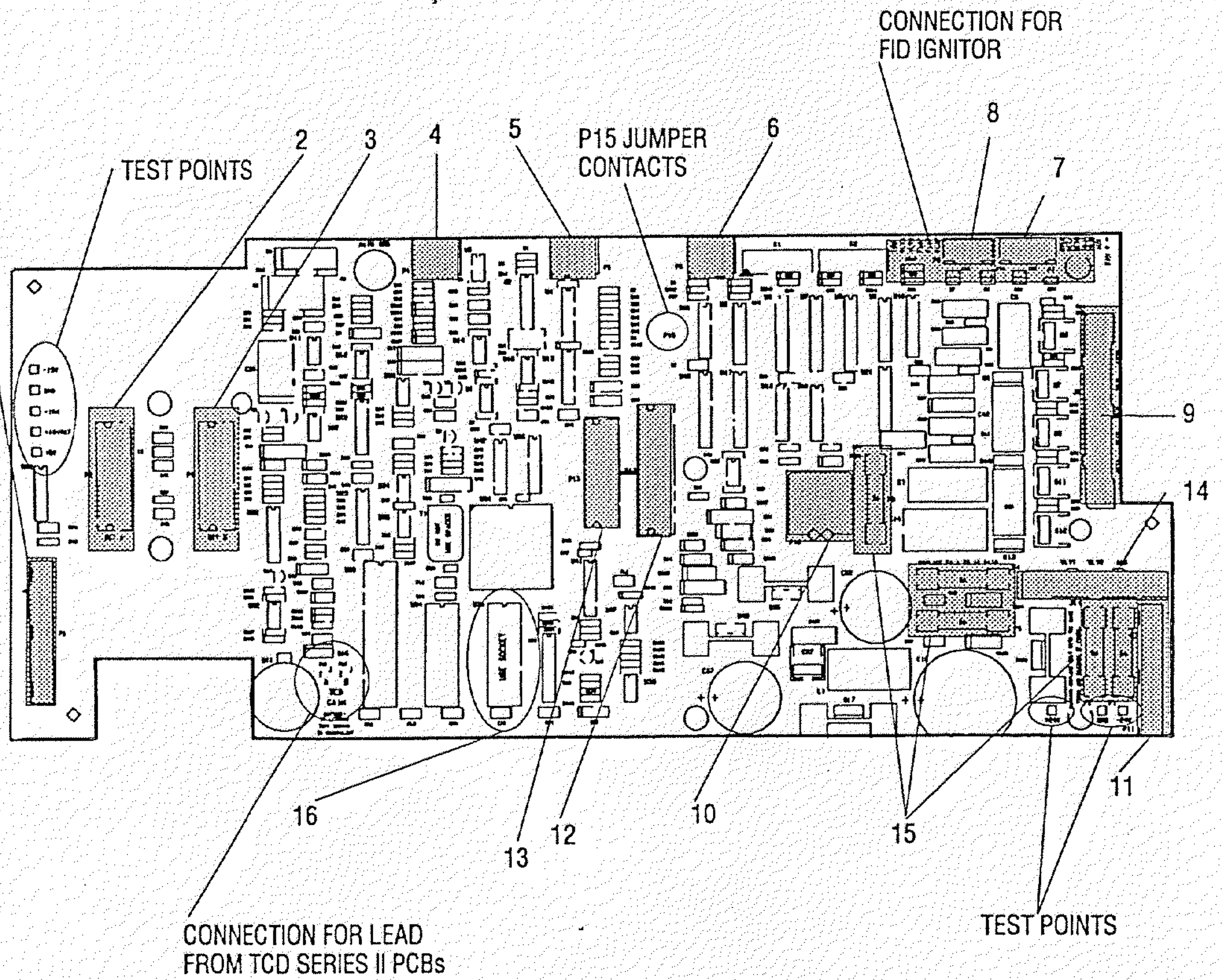


Figure 2. HP 5890 Series II Main PCB (05890–60015) (Sheet 2 of 2).

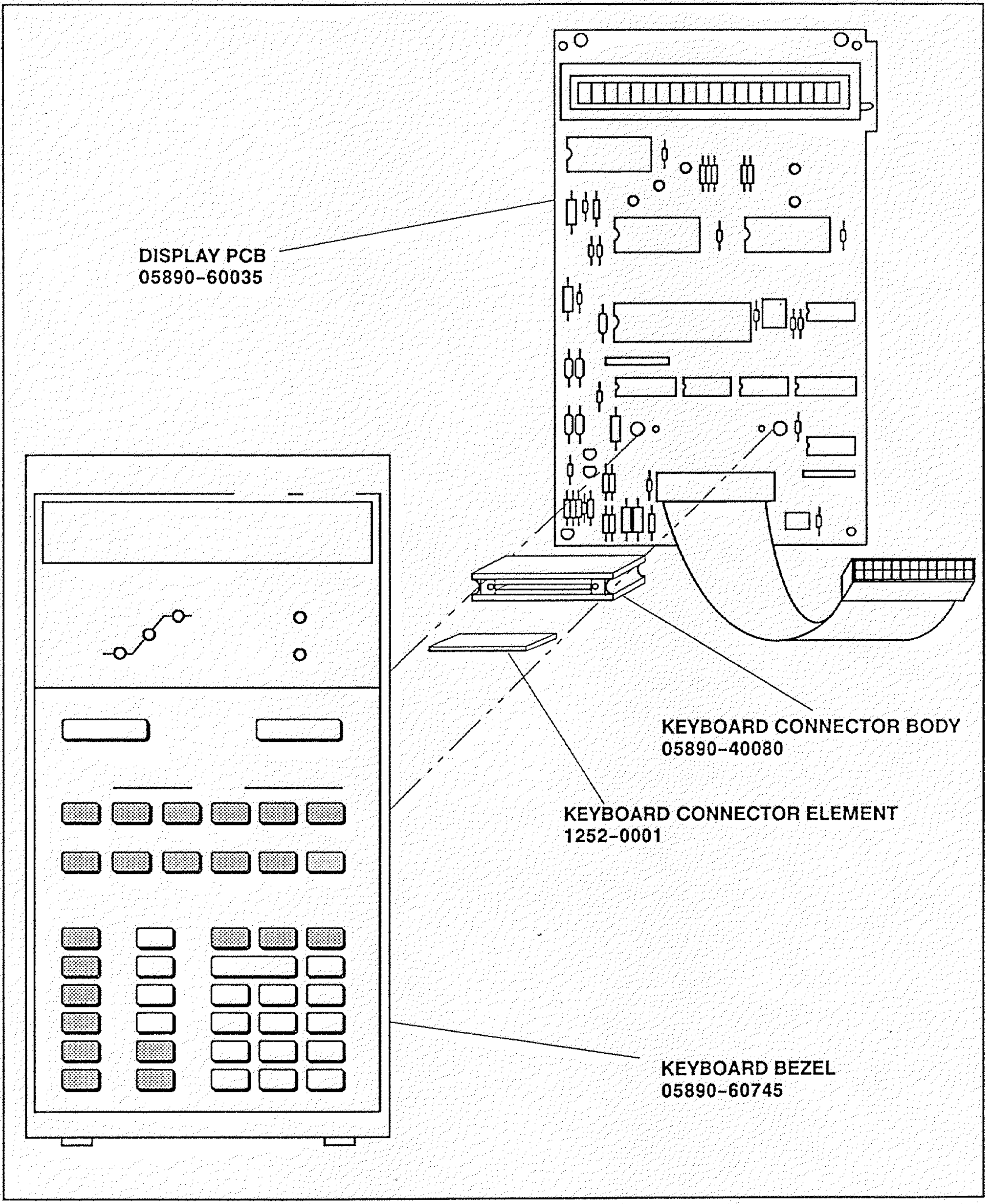


Figure 3. Display PCB Assembly (05890-61365).

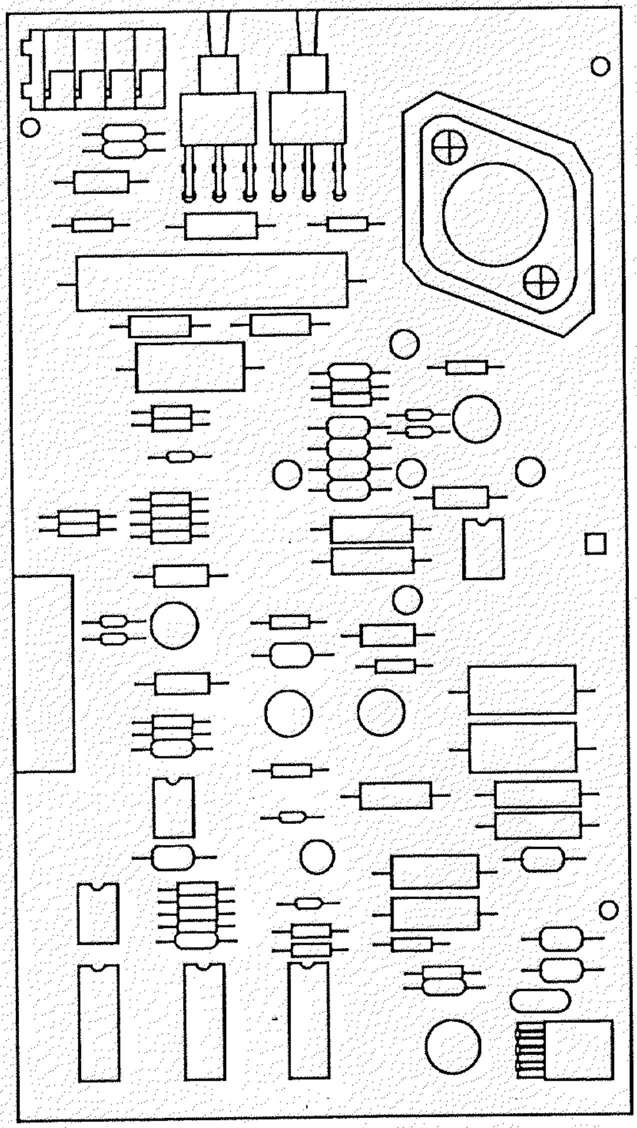


Figure 4. TCD Series I Detector PCB (19232–60010).

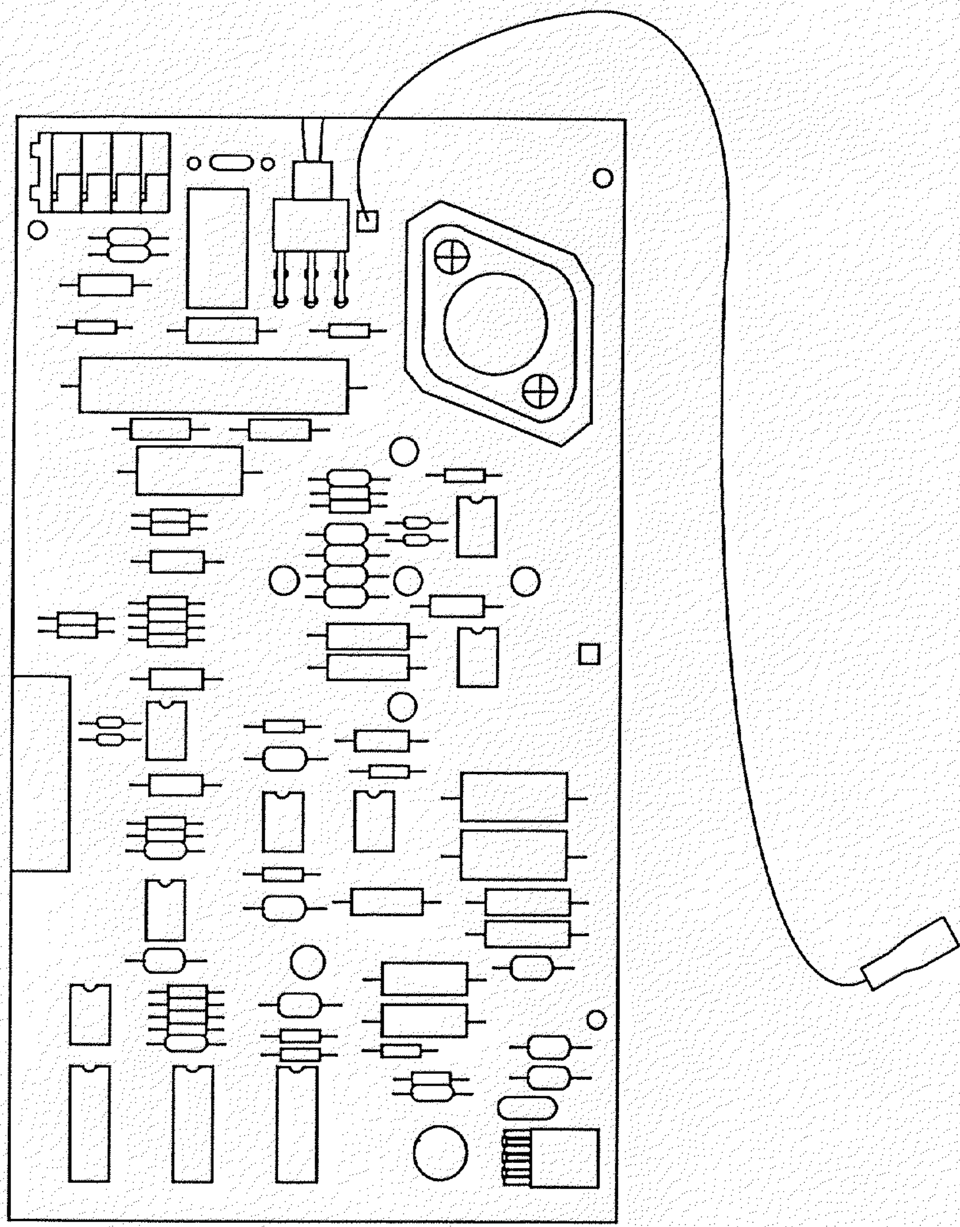


Figure 5. TCD Series II Detector PCB (19232–60020).

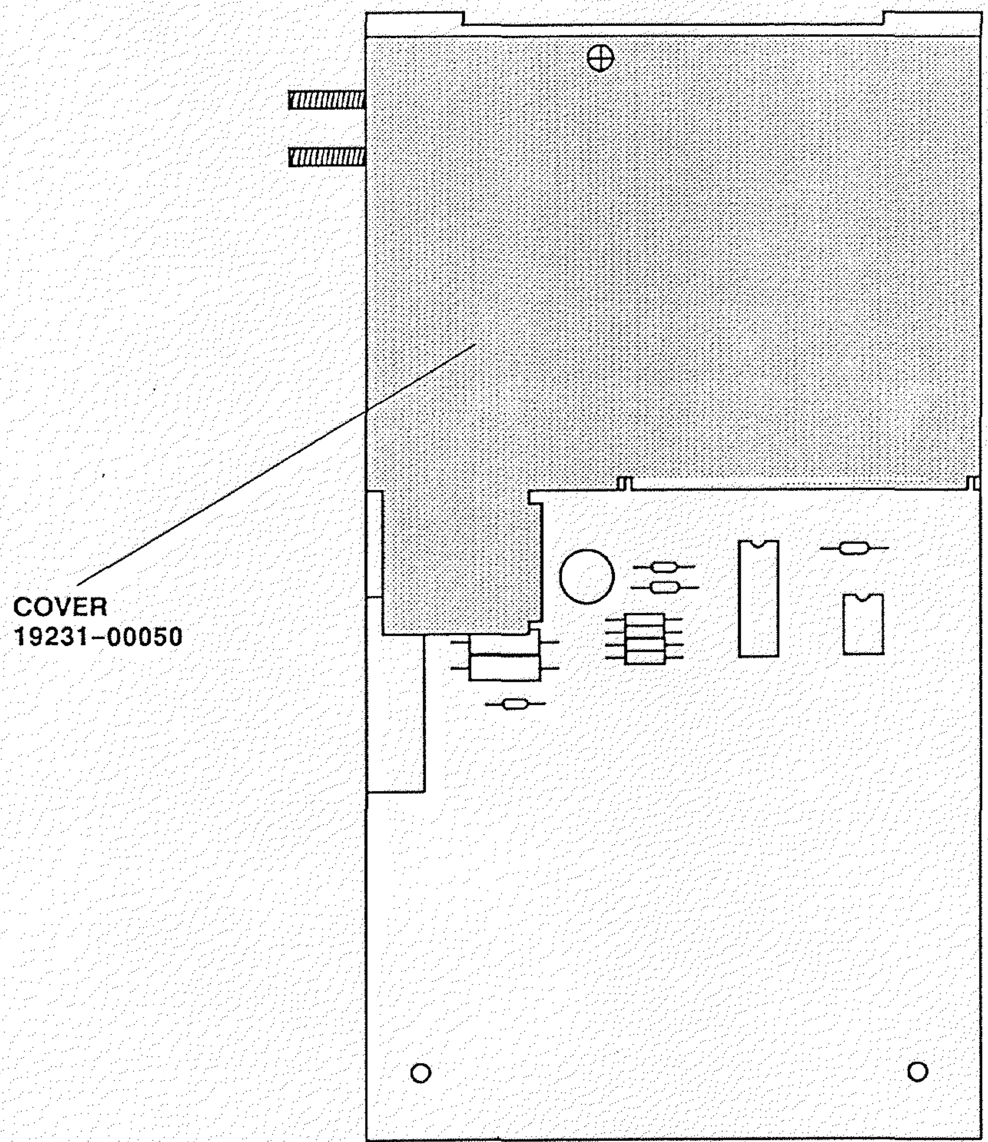


Figure 6. FID Detector PCB (19231-60010).

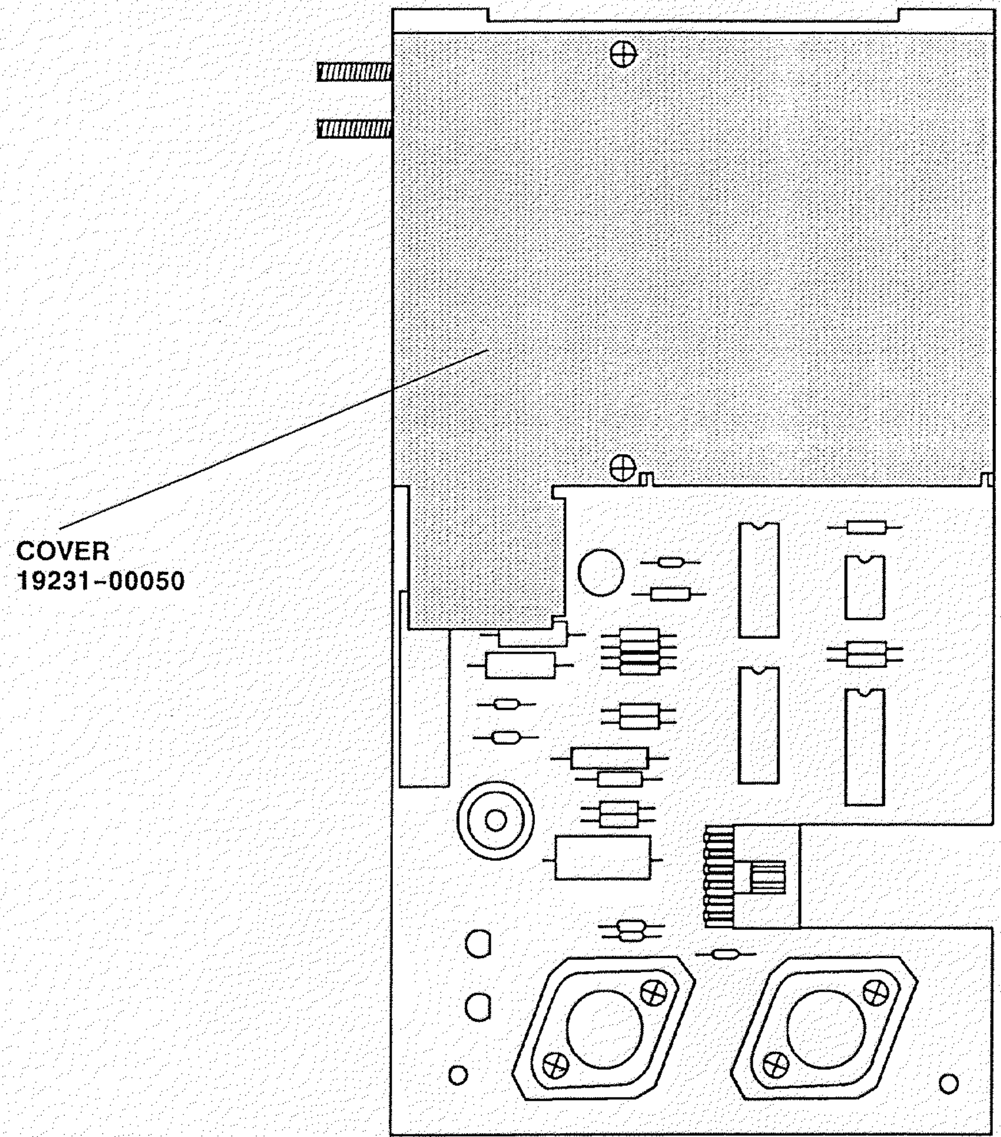


Figure 7. NPD Detector PCB (19234–60010) (Sheet 1 of 2).

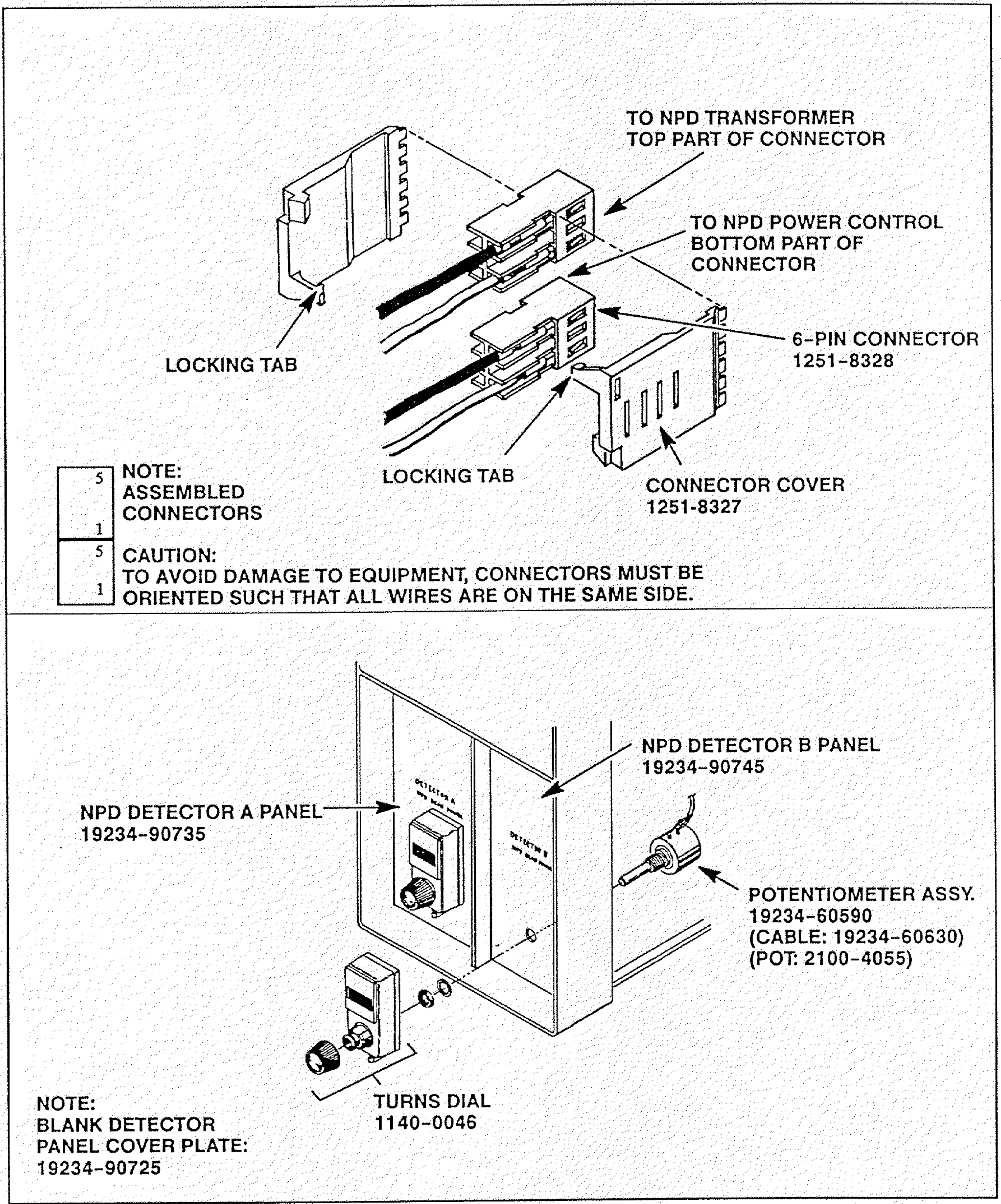


Figure 7. NPD Detector PCB (19234-60010) (Sheet 2 of 2).

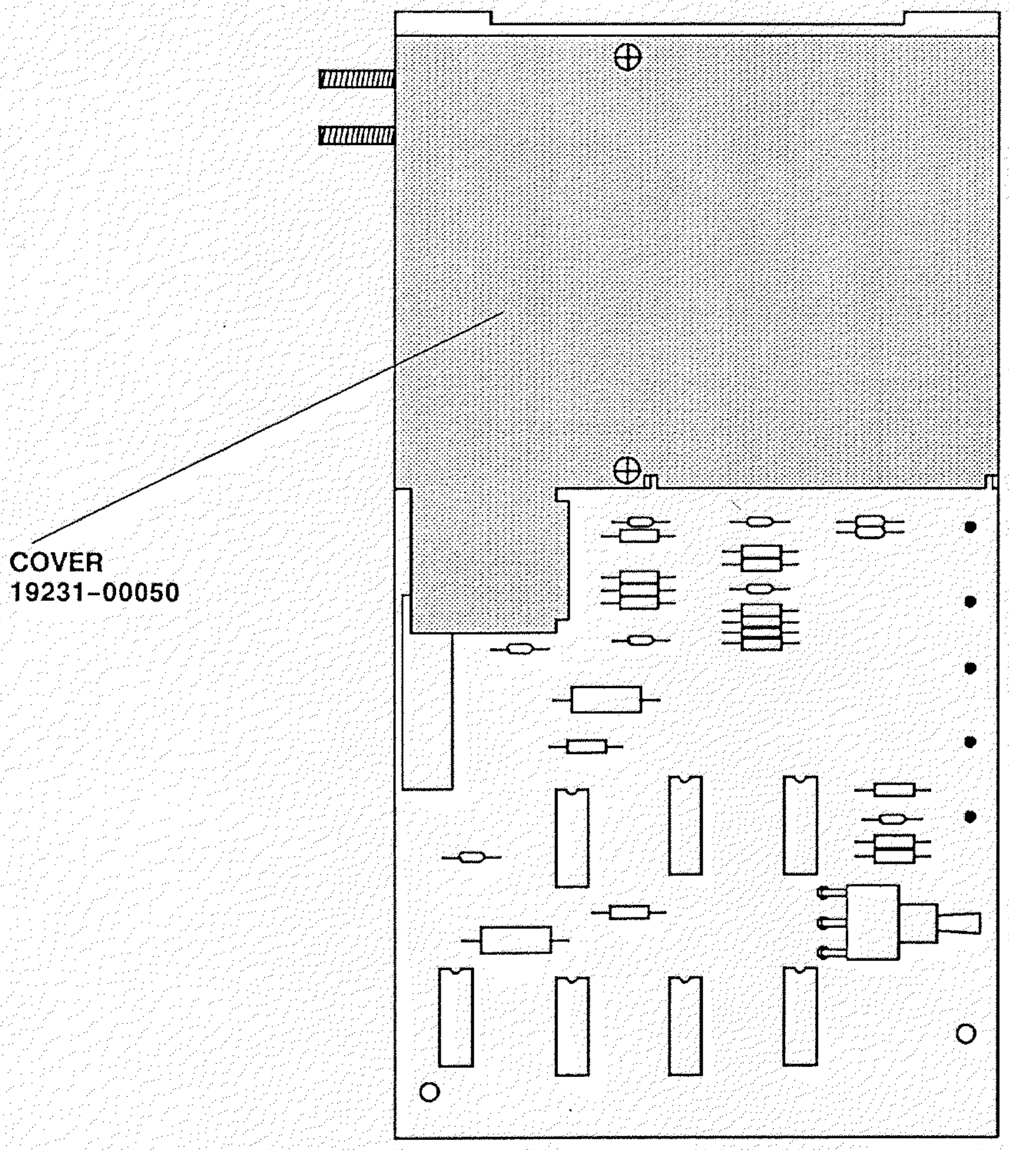


Figure 8. ECD Series I Detector PCB (19233-60010).

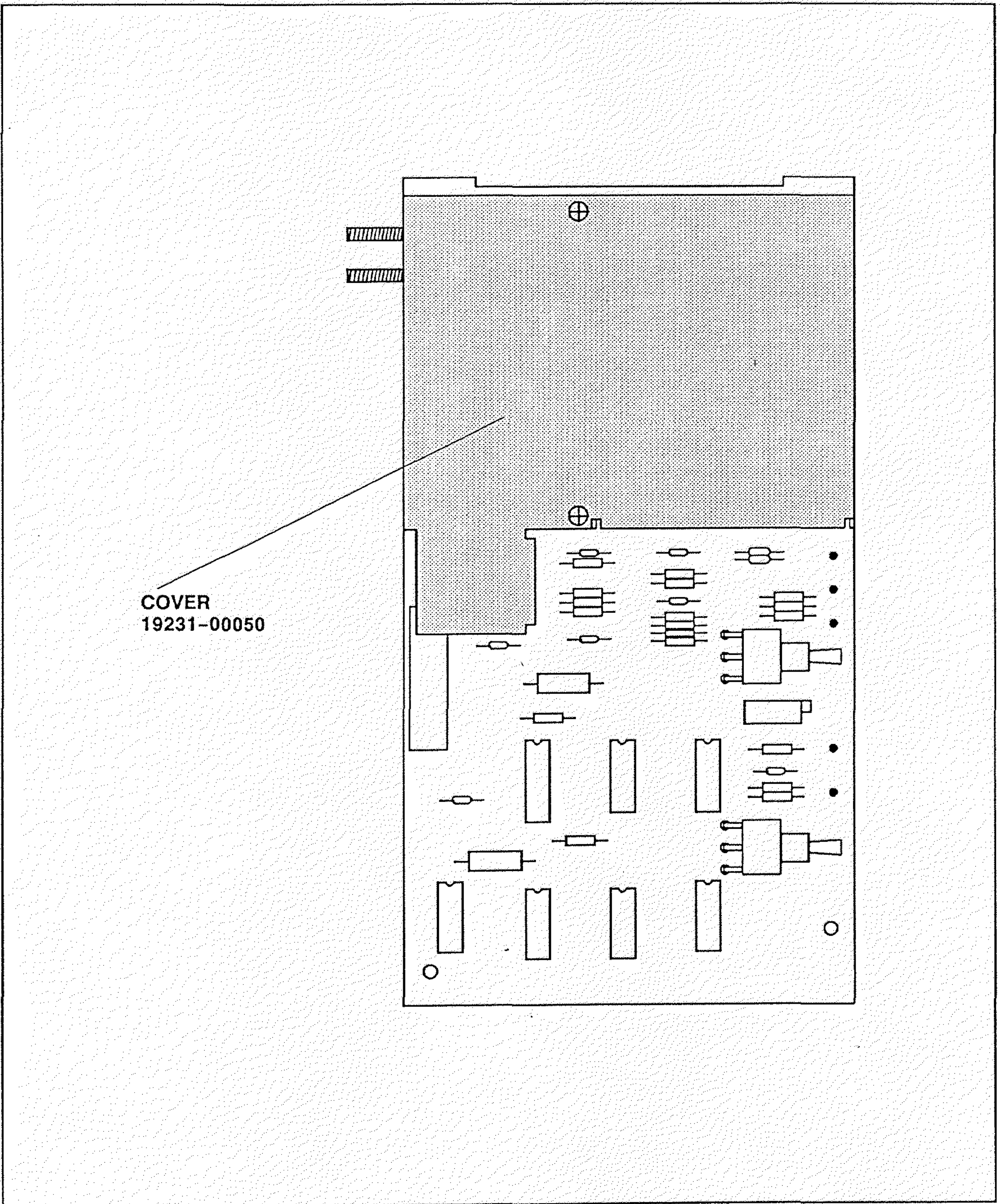


Figure 9. ECD Series II Detector PCB (19233-60015).

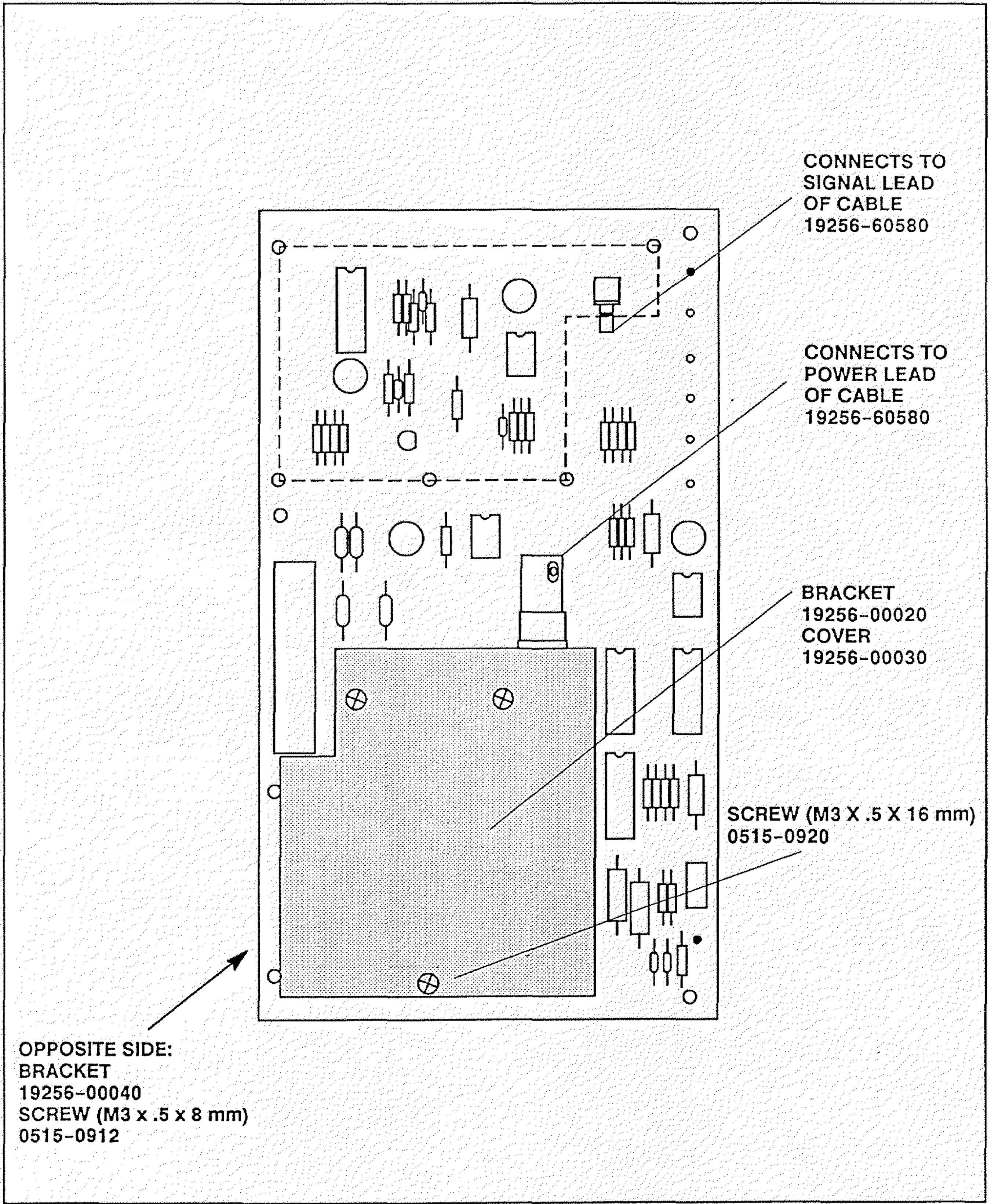


Figure 10. FPD Detector PCB (19256-60010).

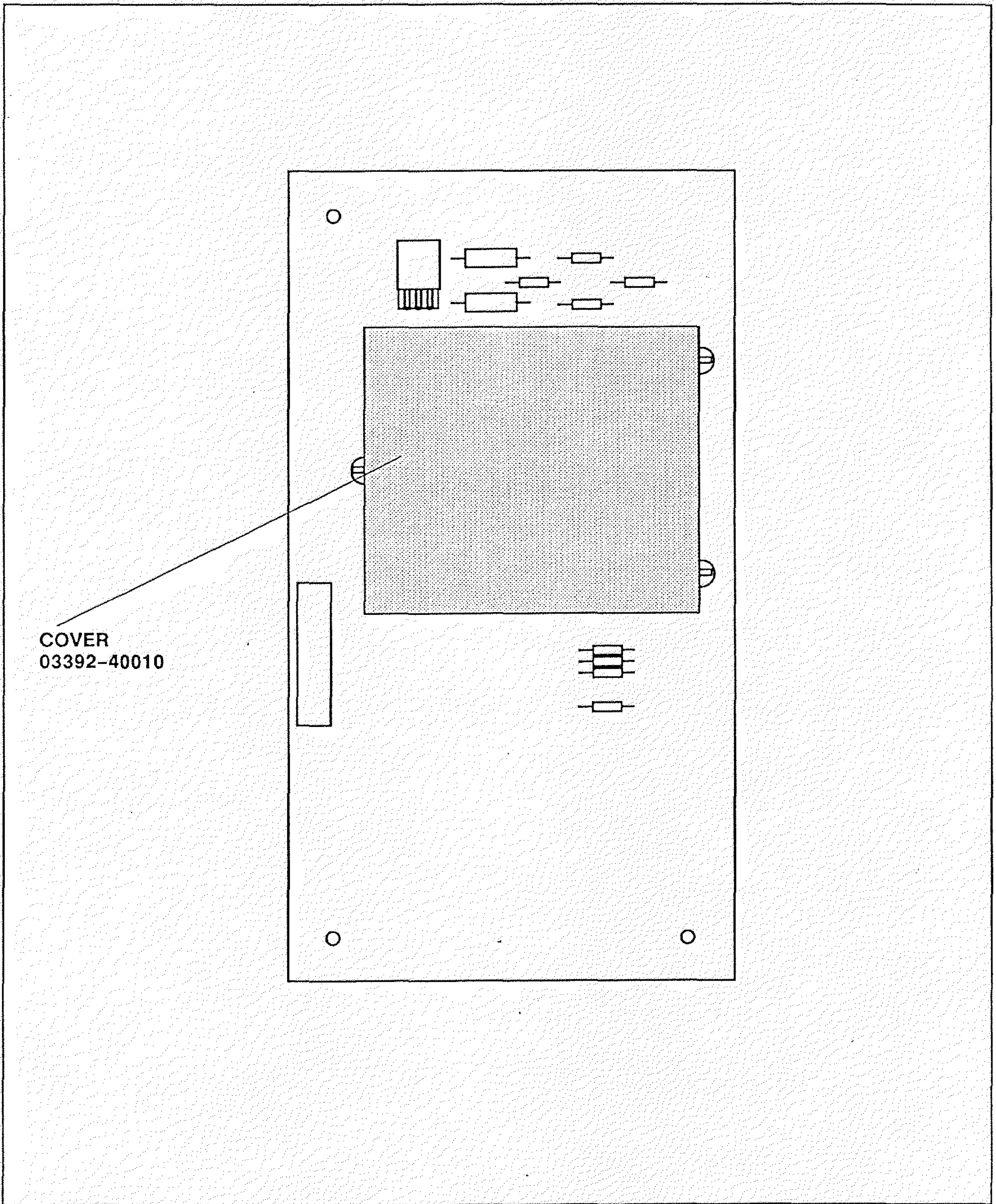


Figure 11. Analog Input Communications PCB (19261-60010).

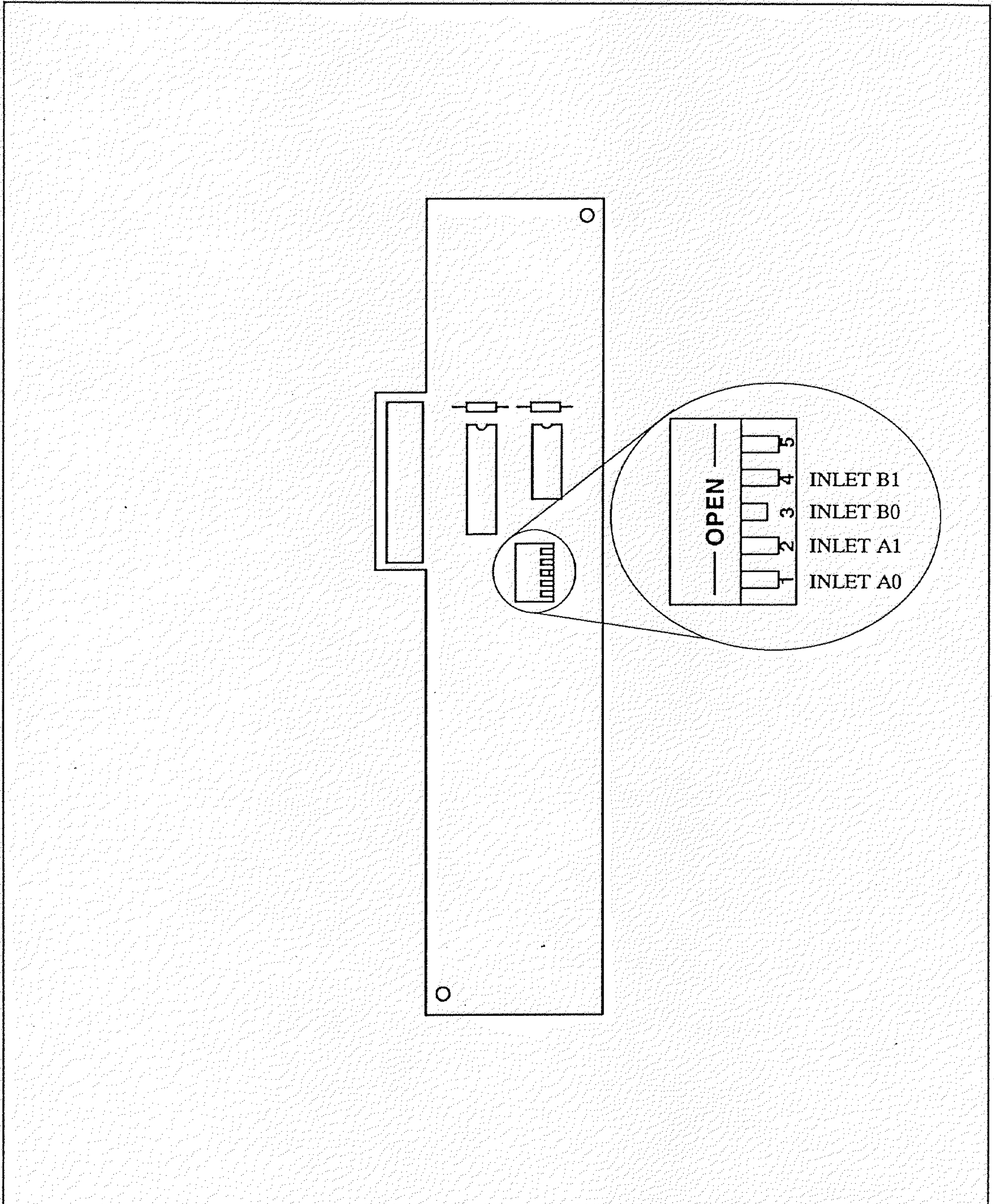
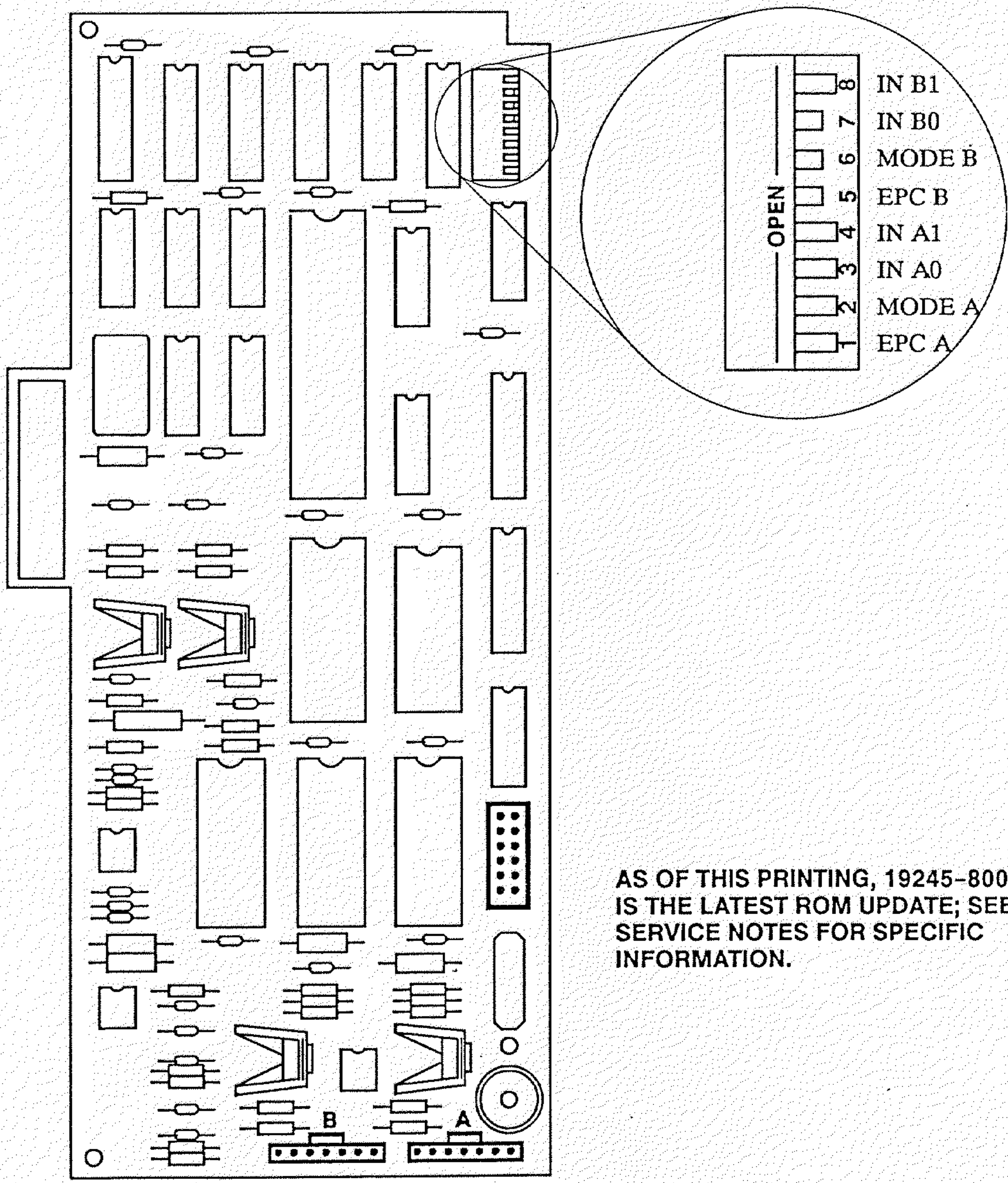
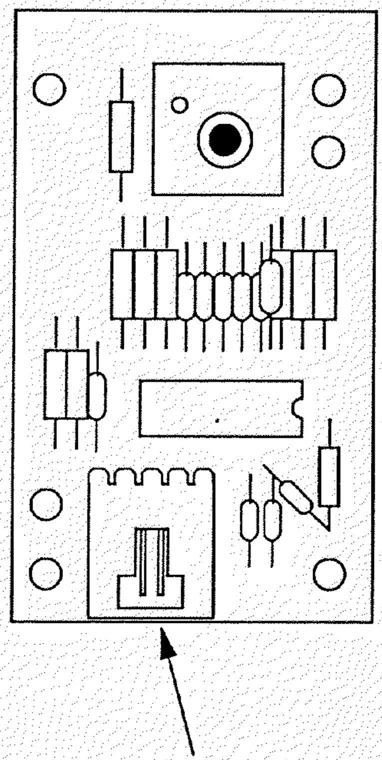


Figure 12. Manual Pressure Control PCB (19245-60040).



AS OF THIS PRINTING, 19245-80030 IS THE LATEST ROM UPDATE; SEE SERVICE NOTES FOR SPECIFIC INFORMATION.

Figure 13. Electronic Pressure Control PCB (19245-60010).



PIN NO.	COLOR	FUNCTION
1	RED	+15 V
2	BLK	+5 V REF
3	BRN	ACOM
4	WHT	P-SNS

Figure 14. Electronic Pressure Control Sensor PCB (19245-60020).

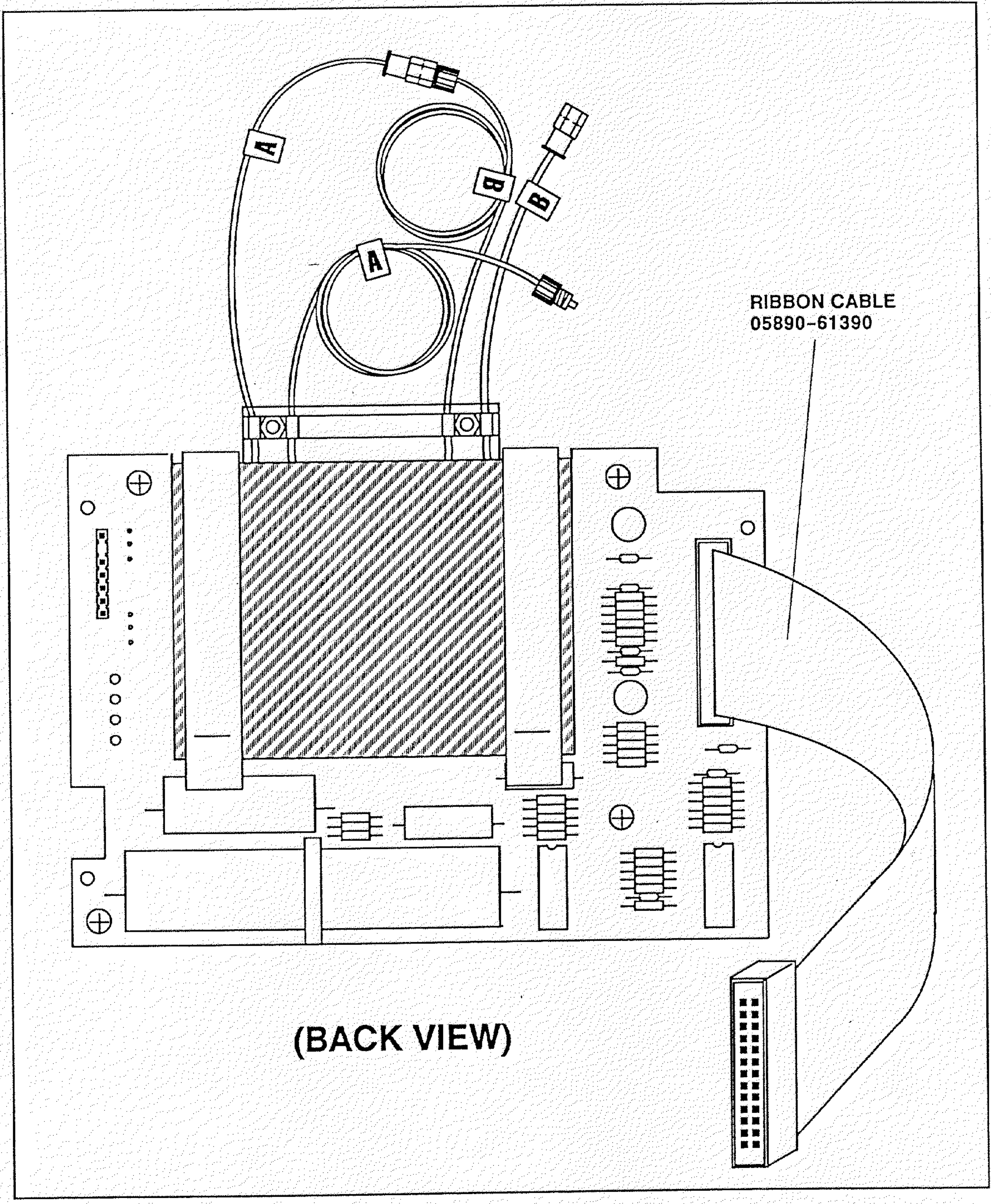
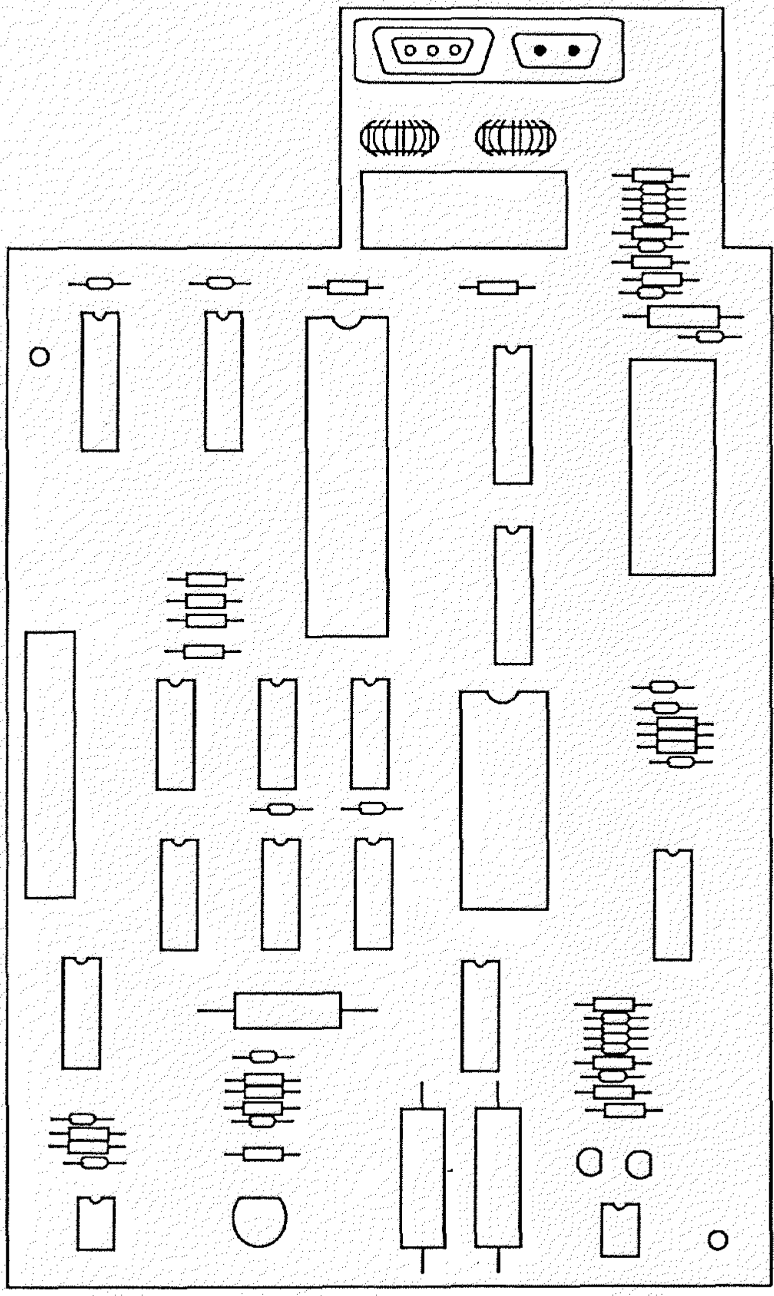
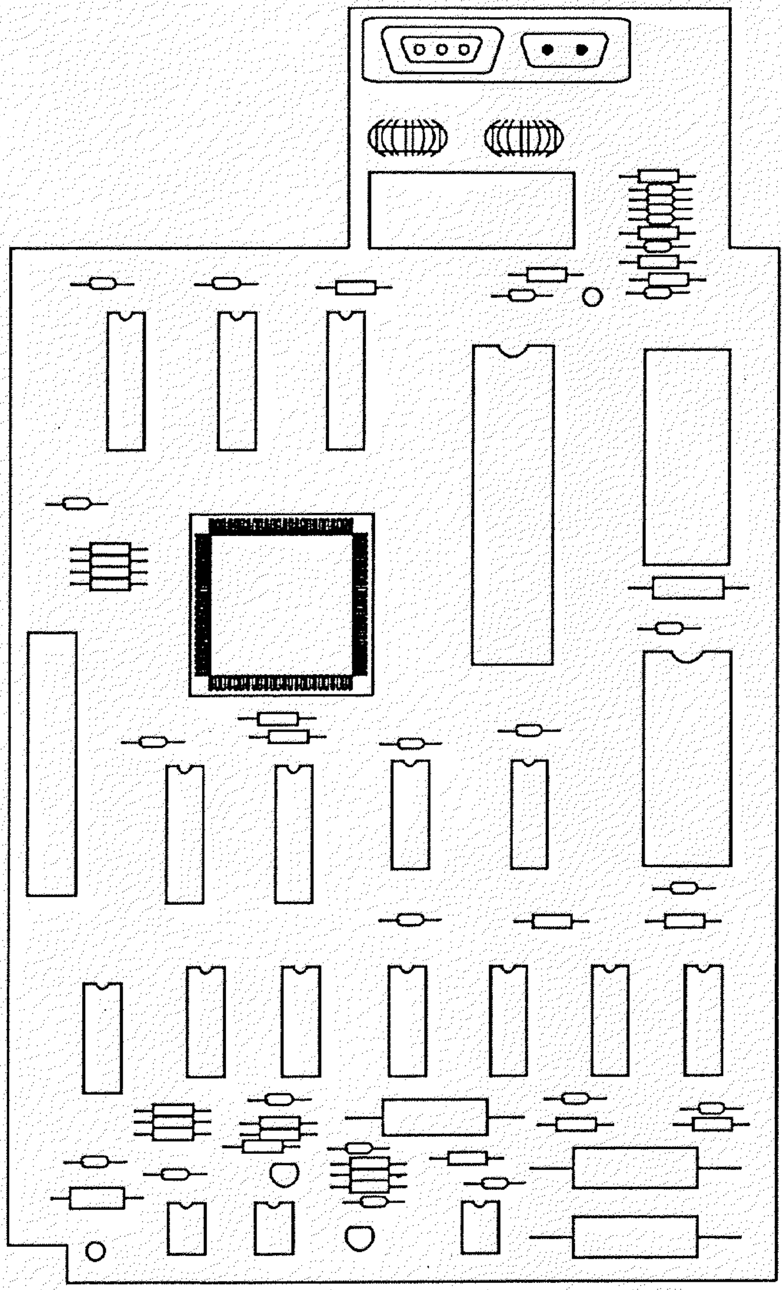


Figure 15. Electronic Flow Sensor (19237-60500).



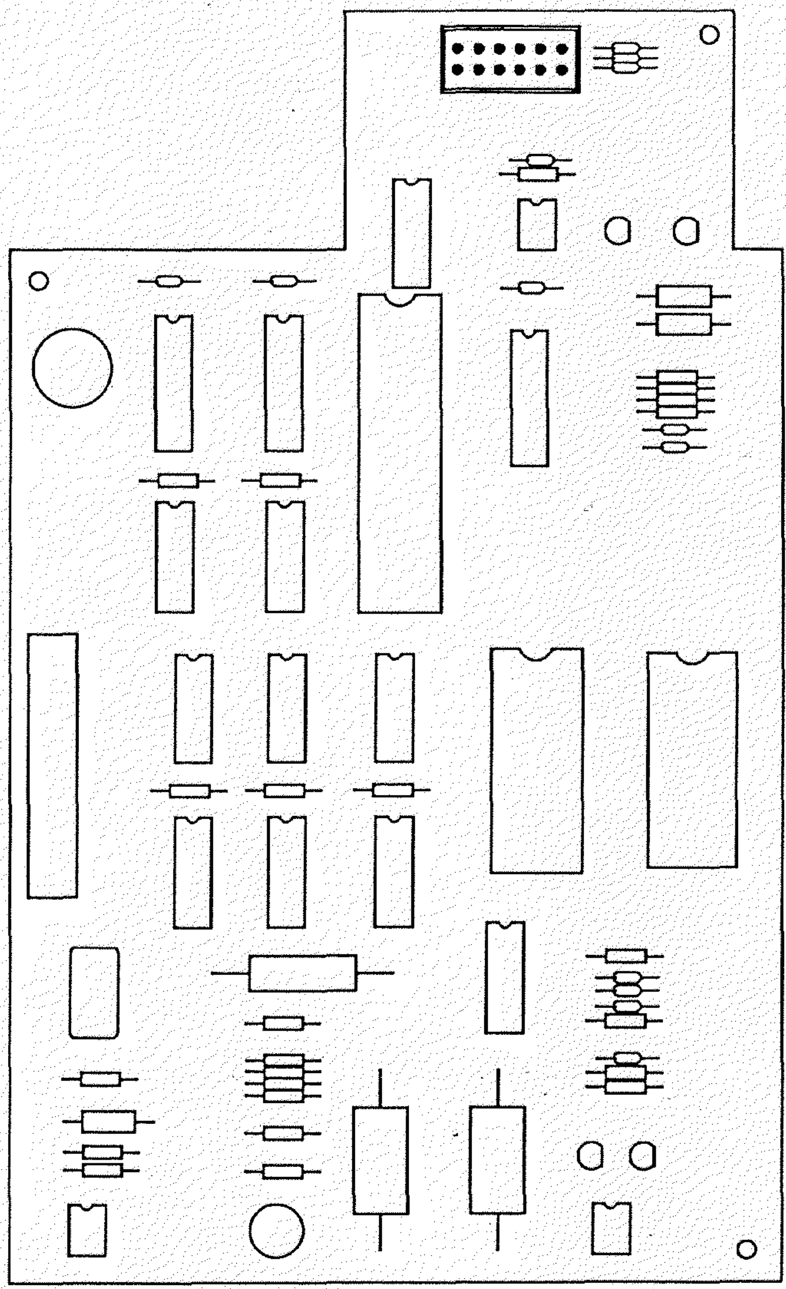
AS OF THIS PRINTING, 19242-80020 IS THE LATEST ROM UPDATE; SEE SERVICE NOTES FOR SPECIFIC INFORMATION.

Figure 16. Non-Buffered INET Communications PCB (19242-60010).



AS OF THIS PRINTING, 19242-80060 IS THE LATEST ROM UPDATE; SEE SERVICE NOTES FOR SPECIFIC INFORMATION.

Figure 17. Buffered INET Communications PCB (19242–60015).



AS OF THIS PRINTING, 19242-80040 IS THE LATEST ROM UPDATE; SEE SERVICE NOTES FOR SPECIFIC INFORMATION.

Figure 18. RS-232-C Communications PCB (19242-60030).

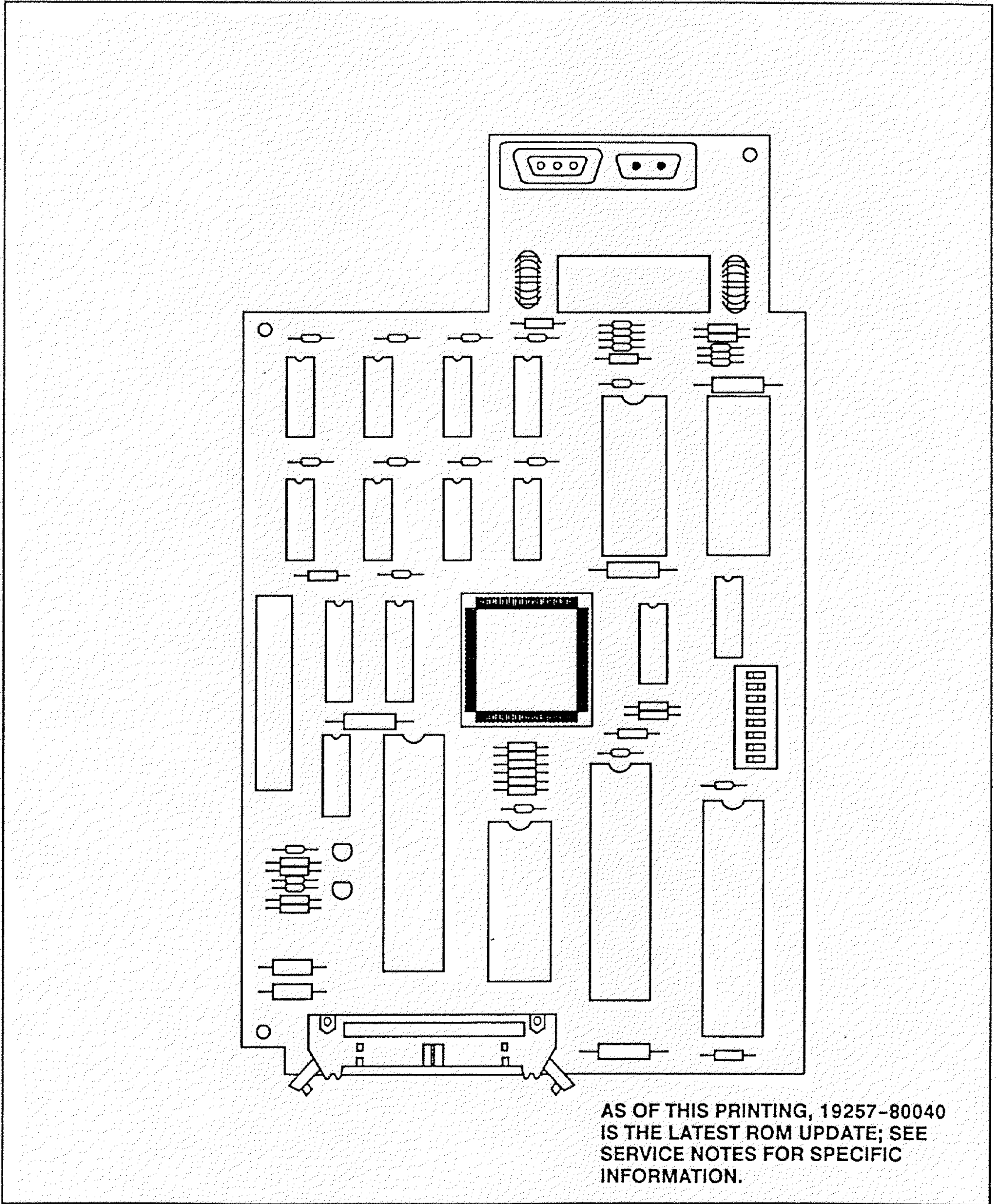


Figure 19. HPIB/RS-232-C (DICE) Communications PCB (19257-60010).

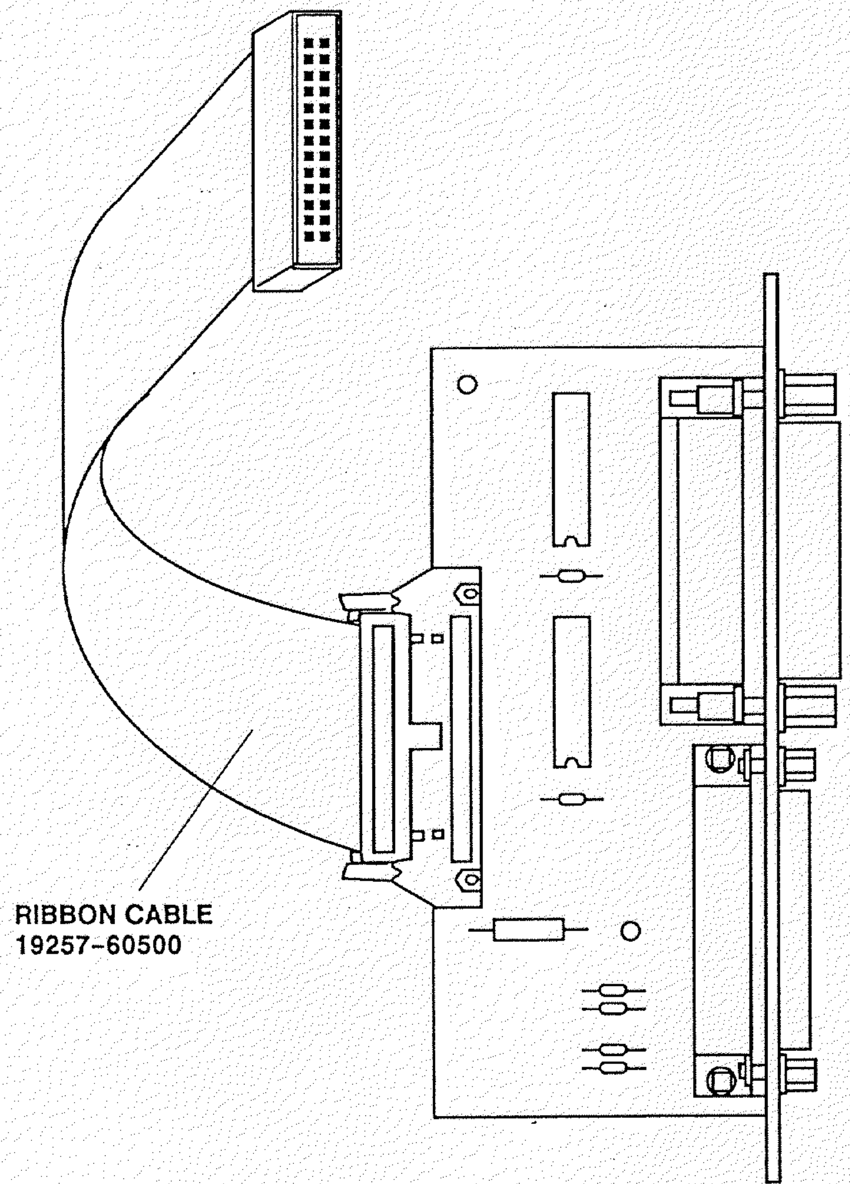
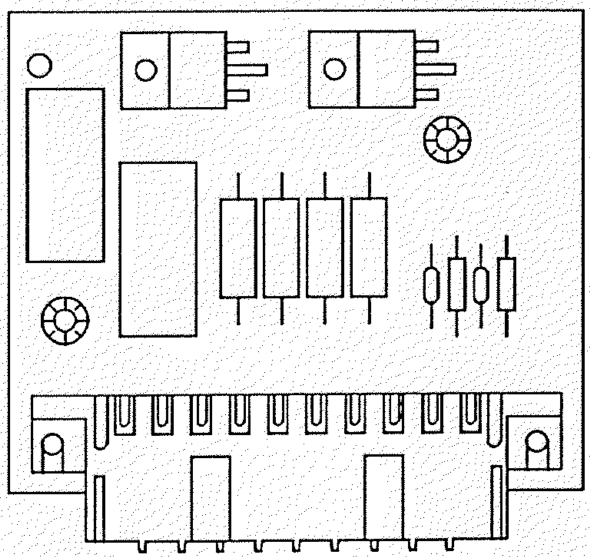
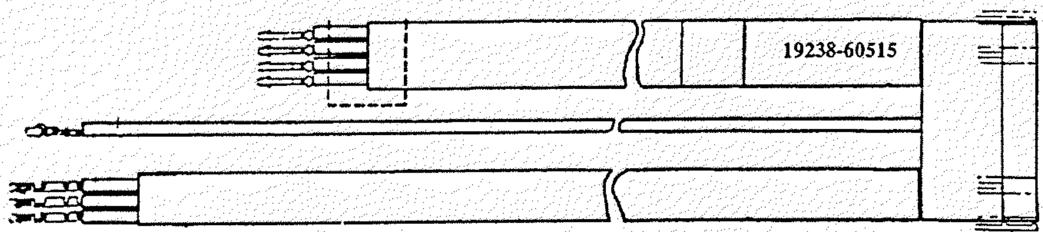


Figure 20. Rear Panel Connector PCB for DICE Communications PCB (19257-60020).





Termination Pinout
(as viewed from wire side)

Pin No.	Wire Color
10	Green
9	Red
8	Shield
7	White
6	Black
5	Red
4	Shield
3	White
2	Black
1	Red

Figure 21. Valve Driver PCB (19238–60010) and Control Cable (19238–60515).

Table 1. HP 5890 Series II Miscellaneous Accessory Cables.

Option No.	Cable Type	HP Part No.
5890A#011	CABLE – 3390	05890–60760
5890A#012	CABLE – 3350	05890–60790
5890A#013	CABLE – GENERAL	05890–60800
5890A#014	CABLE – 3388	05890–60780
5890A#021	3390 RMT START/STOP CABLE	05890–61050
5890A#022	3392 RMT START/STOP CABLE	05890–61060
5890A#023	LAS RMT START/STOP CABLE	05890–61070
5890A#024	GEN RMT START/STOP CABLE	05890–61080
5890A#025	18652A RMT START/STOP CABLE	05890–61160
5890A#026	3388A RMT START/STOP CABLE	05890–61170
5890A#027	18762A RMT START/STOP CABLE	05890–61180
03394–60560	Non–INET HP 3394/96 START/STOP	03394–60560
35900–60700	HP 35900B RMT START CABLE	35900–60700
82167A	INET (HPIL) Cable (0.5–m lg)	82167A
82167B	INET (HPIL) Cable (1.0–m lg)	82167B
82167C	INET (HPIL) Cable (5.0–m lg)	82167C
19242–60500	RS–232–C Cable (used with RS–232–C Communications PCB)	19242–60500

Section 10

NOTES

This section is a place to insert notes or other information that you think may be helpful in servicing your instrument. One good suggestion is to keep a copy of your instrument's shipping papers in this section. Be certain that model numbers and serial numbers are indicated.

As an additional aid, the next several pages contain a cross–reference listing of part numbers found in the first nine sections of the Illustrated Parts Breakdown. The part numbers are listed in numerical order. Adjacent to the part number is the page where that number can be found. Be sure to look to see if the part number can be found on more than one page.

HP Part No.	Page No.
0340-0647	7 – 2
0340-0647	7 – 4
0340-0686	5 – 10
0340-0793	8 – 4
0340-0877	6 – 4
0362-0340	6 – 4
0362-0393	6 – 4
0370-3110	4 – 10
0380-0010	7 – 4
0380-0344	6 – 4
0380-1102	7 – 2
0380-1102	7 – 4
0400-0099	6 – 10
0400-0099	6 – 12
0400-0099	6 – 14
0400-0099	6 – 8
0403-0424	1 – 4
0460-0016	6 – 10
0460-0016	6 – 12
0460-0016	6 – 14
0460-0016	6 – 8
0510-0593	6 – 4
0510-0616	7 – 7
0515-0055	6 – 7
0515-0057	7 – 2
0515-0057	7 – 4
0515-0065	2 – 14
0515-0070	2 – 8
0515-0071	7 – 2
0515-0071	7 – 4
0515-0071	7 – 6
0515-0072	2 – 8
0515-0104	7 – 2
0515-0104	7 – 4
0515-0105	2 – 14
0515-0105	7 – 2
0515-0105	7 – 4
0515-0106	5 – 12
0515-0106	6 – 4
0515-0106	6 – 4
0515-0106	7 – 2
0515-0106	7 – 2
0515-0106	7 – 4
0515-0117	2 – 6
0515-0153	7 – 2
0515-0153	7 – 4
0515-0153	7 – 9
0515-0321	2 – 10
0515-0321	2 – 12
0515-0904	1 – 4
0515-0909	1 – 6
0515-0909	3 – 2
0515-0909	3 – 4
0515-0909	3 – 6
0515-0909	3 – 8
0515-0909	4 – 8
0515-0910	1 – 4
0515-0910	2 – 10
0515-0910	2 – 12
0515-0910	2 – 2
0515-0910	2 – 4
0515-0910	2 – 6
0515-0910	4 – 6
0515-0910	4 – 8
0515-0910	5 – 12
0515-0910	5 – 3
0515-0910	5 – 4
0515-0910	5 – 6
0515-0910	5 – 8
0515-0910	6 – 7
0515-0910	7 – 7
0515-0912	4 – 8
0515-0912	9 – 14
0515-0915	4 – 8
0515-0920	9 – 14
0515-0920	9 – 14
0515-0924	2 – 6
0515-0964	1 – 6
0515-0964	2 – 10
0515-0964	2 – 12
0515-0964	3 – 2
0515-0964	3 – 4
0515-0964	3 – 6
0515-0964	3 – 8
0515-0964	4 – 14
0515-0981	2 – 4
0515-0982	1 – 2
0515-0982	1 – 6
0515-0982	7 – 4
0515-1276	8 – 4
0535-0004	2 – 4
0535-0004	2 – 6
0535-0004	2 – 8
0535-0005	7 – 7
0535-0043	4 – 2
0535-0043	4 – 3
0535-0043	4 – 4
0535-0043	4 – 5
0535-0043	4 – 6
0535-0043	4 – 8

HP Part No.	Page No.
05890-60880	8 – 6
05890-60880	8 – 6
05890-60880	8 – 6
05890-60890	1 – 4
05890-60890	1 – 4
05890-60890	8 – 2
05890-60890	8 – 2
05890-60890	8 – 6
05890-60890	8 – 6
05890-60890	8 – 6
05890-60900	1 – 4
05890-60900	8 – 2
05890-60900	8 – 6
05890-60910	1 – 4
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HP 5890 Series II
MAINTENANCE PROCEDURES

Table of Contents

Section 1

INTRODUCTION

HP 5890 SERIES II GAS CHROMATOGRAPH

This section is intended to help the technician isolate problems to a specific component or components. The HP 5890 Series II may be found in many different configurations, with varying component options. This complicates the process of providing detailed troubleshooting procedures for even general problems. But, by using the general troubleshooting techniques presented here, along with the functional diagrams found at the end of this section, successful results should be achieved.

There are five inlet options and six detector options which may be encountered when servicing an HP 5890 Series II Gas Chromatograph, as well as a wide variety of flow and pressure control components. All of these common inlet and detector components are represented by the functional diagrams at the end of this section. When troubleshooting inlets, detectors, and/or the flow/pressure systems, fold out the page corresponding to the employed detector, while leaving the book open to the page corresponding to the employed inlet. Maintenance procedures for most of the components are given in the following sections. Procedures are supplied to remove, replace, and/or clean various subassemblies, based on the current maintenance philosophy, i. e., to allow replacement of the lowest level components applicable for a particular item.

Specific part numbers are not given in this portion of the service manual. For all replacement part numbers, refer to the IPB portion of this document.

This document is not meant to provide instruction for first time installation of any of the options discussed. The add-on sheets, which accompany the various options, exist for just this purpose, and should be referenced when performing a first time installation.

TABLE OF CONTENTS

Electronic Troubleshooting

INTRODUCTION

This section is intended to aid the operator and service engineer in the troubleshooting process, i.e., of going from symptom to cause. It has been subdivided into four subsections by type of symptom.

Part A covers the most obvious indications of problems. The instrument apparently (generally when first turned on) doesn't work at all. **(NON-FUNCTIONING INSTRUMENT)**

Part B includes the symptoms that can appear as a visual indication or message on the front of the keyboard/display module. These messages are a result of the instrument's extensive automonitoring system. **(AUTOMONITOR MESSAGES)**

Part C discusses the visual information that the operator can instigate and use as part of the troubleshooting process. These visual indications are normally not available unless specifically requested by the operator. **(OPERATOR INSTIGATED INDICATIONS)**

Part D contains symptoms (other than those that appear on the visual display) that indicate a possible problem. Typically, these types of symptoms can be associated with a specific functional area of the instrument. **(FUNCTIONAL SYMPTOMS)**

Electrical Safety Precautions

In all nonelectrically oriented sections of this manual, the standard Hazardous Voltage Warning strongly recommends turning off all of the power to the instrument. However, this section, as well as most of Service Section, requires that some electrical measurements be made on active (energized) circuits.

WARNING

MEASUREMENTS AND/OR TESTS THAT NEED TO BE MADE ON ELECTRICALLY ENERGIZED PORTIONS OF THE INSTRUMENT SHOULD BE PERFORMED ONLY BY SERVICE-TRAINED PERSONNEL WHO ARE AWARE OF ALL INVOLVED HAZARDS.

The Service Section of this manual contains proper step by step procedures for replacing electronic boards and other major assemblies. These procedures include instructions that should be followed for both personnel and instrument welfare.

CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

Recommended Test Equipment

The only piece of test equipment required to troubleshoot the instrument is a good, volt/ohmmeter.

PART A NON-FUNCTIONING INSTRUMENT

A totally non-functioning or DEAD instrument is one that apparently isn't working at all. It has no visual indications (i.e., messages) on its front panel and produces no noise or heat.

The most obvious cause for such a problem is that line power is not reaching the instrument or that the instrument is not turned on. First check that the Line Power Switch is ON. Then verify that the instrument power cord is plugged into a proper receptacle. If neither of these acts restore the instrument to operation, suspect that there may be a problem with the receptacle or the power being supplied to it. This type of situation generally requires that a local electrical maintenance person be informed to remedy the problem. However, on the rare occasion that power is being provided, but the instrument is not working, the problem area must be isolated by tests and measurements on the instrument.

WARNING

MEASUREMENTS AND/OR TESTS THAT NEED TO BE MADE ON ELECTRICALLY ENERGIZED PORTIONS OF THE INSTRUMENT SHOULD BE PERFORMED ONLY BY SERVICE-TRAINED PERSONNEL WHO ARE AWARE OF ALL INVOLVED HAZARDS.

Any one of several problems internal to the instrument can cause the non-functioning symptom. Since the instrument operates under processor control, a faulty component in the CPU or Clock sections of the Main Board may be the source of the problem. More commonly, a problem in the instrument's power supply would be the most likely to cause this type of problem.

Two bits of information, plus the use of IPB, should enable service-trained personnel to isolate and then correct the cause of the problem if it is power related. The first important bit of information is about the fuses that are internal to the instrument. The second bit is the normal sequence of events that occurs as the instrument is energized (Power On Sequence).

Fuse Information

Fuses have been installed at several locations within the instrument for the protection of major power circuits. They are designed to open as quickly as possible to prevent damage to other components within the circuit. Occasionally, an opened fuse may have been caused by a short onetime surge; however, it is far more common that a component within the protected circuit has failed. When an open fuse is noticed, replace it once. If the replacement blows, suspect a component failure.

Fuses are located on the AC Power Board and on the Main Board. The AC Power Board fuses protect the two high-power circuits. One fuse, (F1) or two in a split phase circuit (F3 & F4), protects the column oven heater and fan. Another fuse (F2) or two in a split phase circuit (F1 & F2) protects the main power transformer. (Refer to Section 8 of the IPB portion of this document for power supply PCB information. Refer to Section 9 of the IPB portion of this document for main PCB information.)

The three secondary voltages of the main power transformer are protected with fuses located on the Main Board. F3 protects the 120 VAC secondary which ultimately provides heater power for all of the zones. F4 and F5 protect the 40 VAC secondary which ultimately provides all of the DC supply voltages (+5, +10, +15, -15, +24, -24). Fuses protect the 3 VAC secondary that is used for FID ignitor (F1) and electronic flow sensor voltages (F2).

Power On Sequence

As long as correct Line Voltage is provided to the instrument, the following events should occur when the instrument's Line Power Switch is placed in its ON position. Main Transformer (T1) primary winding is energized (fused by F2 on AC Board or F1 & F2 if split phase). (Refer to Section 9 of the IPB portion of this document for main PCB information.)

The three secondary windings (3 VAC, 40 VAC, and 120 VAC) of T1 are energized. All are fused on the Main Board. These voltages arrive on the main board through connector J10. (Refer to appendix A of this document for all connector information.)

The 40 VAC is rectified and divided to produce +24 VDC and +15 VDC.

From these DC supplies, the +10 VDC, the +5 VDC, and the Master Oscillator (for clocks) begin to function.

As these other supplies begin, the (POWER ON PULSE) and the CPU portion of the circuitry begin to initialize, first themselves, and then through the Data Bus and other portions of the instrument.

One of the initializations that occurs through the Data Bus is in the Triac Control section to produce the control signal for K3 (zone power relay) on the Main Board and the signal for K1 (oven contactor) on the AC Board.

K3 relay allows distribution of the fused 120 VAC secondary from the Main Transformer.

K1 power contactor on the AC Board allows line power distribution to the Oven Fan Motor and to the Oven Heater Triac circuit. Note that the oven fan will run as long as power is allowed (under software control) through K1. However, the oven heater is NOT energized until oven heat is requested.

PART B AUTOMONITOR MESSAGES

This section includes the symptoms that can appear as a visual indication or message on the front of the keyboard/display module. These messages may appear (depending upon their seriousness) either at the time that the problem occurs or in the instrument's Self Test.

Messages resulting from the automonitoring software within the instrument will be one of four classes:

FATAL ERR:

H2 ALARM –

FAULT:

WARN:

The FATAL ERR: message is the most serious. This class of message indicates that the HP 5890 SERIES II is essentially nonfunctional. The instrument will always go to a NOT READY state and even the keyboard is inoperative.

FATAL ERR: EPP & FLOW Indicates Electronic Pressure Control (EPC) and Electronic Flow Sensor(EFS) modules are installed simultaneously. The instrument must be powered down and one of two modules must be removed to correct this situation. No damage should occur to the instrument.

FATAL ERR: BAD RAM indicates a problem with RAM chip and its circuitry in the CPU Section of Main Board. Replace Main Board.

FATAL ERR: BAD ROM indicates a problem with ROM chip and its circuitry in the CPU Section of Main Board. Replace Main Board.

FATAL ERR: > !25 MS indicates that the 40 Hz task couldn't complete within !25 milliseconds. Suspect a problem with the Clock Section of the Main Board; however, the CPU Section could also cause this indication. Replace Main Board.

FATAL ERR: STACK ERR indicates that stack is beyond legal limits. Suspect a problem in the CPU Section of the Main Board. Replace Main Board.

FATAL ERR: RUN CNTL indicates that the Run Control task couldn't complete within 25 milliseconds. Suspect a problem with the Clock Section of the Main Board; however, the CPU Section could also cause this indication. Replace Main Board.

As can be seen from the FATAL ERR: message listing above, they are generally an indication that a failure exists either in the Clock or CPU Sections of the Main Board. The Clock Section operation can be easily checked by measuring the frequencies on its outputs. Once the clocks are verified to be good, the CPU (Z80) could be checked by substitution.

The H2 ALARM message indicates a failure of the system to hold or reach the electronic pressure setpoint. All electronic pressures and heated zones will be shut off. To recover, the problem must be corrected and the GC power cycled.

H2 ALARM – EPP A indicates electronic pressure problem with
the A systems ability to hold pressure. Possibly a leak, trouble shoot the proportional control valve, pressure transducer and the inlet in the case of the EPC. Trouble shoot the forward pressure regulator and gage in the case of the MPC.

H2 ALARM - EPP B indicates electronic pressure problem with the B systems ability to hold pressure. Possibly a leak, trouble shoot the proportional control valve, pressure transducer and the inlet in the case of the EPC. Trouble shoot the forward pressure regulator and gage in the case of the MPC.

The FAULT: message indicates that a major subsystem of the HP 5890 SERIES II is not functioning properly. Although the operation of the suspected subsystem is suspended until the problem is corrected, the balance of the GC is operational. Note that the instrument can never reach a fully READY state when a FAULT condition exists.

FAULT: ADC OFFSET indicates a problem with the thermal ADC offset reading. Replace the Main Board.

FAULT: LINE SENSE indicates a problem either with the actual line voltage or with the sensing circuit. Measure the line voltage and if the measurement is between +5% and-10% of the instruments stated rating then the line voltage is O.K. Determine if the 120 VAC secondary exists and if its fuse (F3) is open. If both F3 and the 120 VAC secondary are good then their is a failure in the line sense circuit and the main board should be replaced.

FAULT: OVEN > MAX+20 indicates that the oven senses its temperature has exceeded the current setpoint value by more than 20 degrees C. This message (as any FAULT message regarding a temperature problem) shuts down all of the temperature systems. The problem could be either in the oven sensing or in the oven control circuits. List the oven temperature; if the display indicates that the actual valve is above 800 degrees C, most likely the oven sensor is open (although it could be some component in the sensing circuit). If the actual value of the oven temperature seems reasonable, the problem is likely to be in the oven control circuitry.

FAULT: (ZONE NAME) TEMP RDG where the ZONE NAME could be OVEN, INJA, INJB, DETA, DETB, or AUX. Any of these messages indicates that the specified zone (or oven) temperature reading was out of acceptable range. This most often is the result of an inoperative sensor in the named zone.

FAULT: (OUTPUT NAME) TEST where the OUTPUT NAME could be DAC1, DAC2, ATTN1, or ATTN2. If thermal fault messages also appear, suspect the A/D Converter circuitry. The A/D Converter section of the Main Board is used to measure DAC and ATTN outputs. However, if only this test message appears, the most obvious area to suspect is the D/A Converter portion of the appropriate board. DAC2 or ATTN2 indicates the D/A section of the Interface Board; whereas the DAC1 or ATTN1 indicates the D/A portion of the Main Board. Other areas that could be at fault include the CPU and A/D sections of the Main Board, but are less likely. Occasionally, multiple faults messages may exist at the same time. Only the last message to occur will automatically be displayed on the front panel of the instrument. Others will be retained in the instrument's memory. By pressing the CLEAR key, the instrument will roll through all of its Not Ready states (which include all FAULTs).

FAULT: EPP RAM TEST indicates the RAM has failed selftest. This requires board replacement.

FAULT: EPP ROM TEST indicates the ROM has failed selftest and should be replaced.

FAULT: INET CPU indicates that the Communications Interface Board is not responding properly. Typically, this message is caused by a faulty microprocessor (CPU) on the Interface Board.

FAULT: INET CPU RAM indicates that the read/write memory internal to the CPU on the Interface Board is not functioning as expected. Replace either the Interface Board or its CPU.

FAULT: INET RAM indicates that the RAM chip on the Interface Board is not responding properly. Typically, the RAM chip on the Interface Board should be replaced.

FAULT: INET ROM indicates that the ROM chip on the Interface Board is not responding properly. Typically, the ROM chip on the Interface Board should be replaced.

Another good technique to investigate multiple messages, after noting the currently displayed message, is to switch the power line switch of the instrument off, and then on. This will force the instrument to process through its initializing SelfTest. During this testing sequence, indications other than the previously displayed message may appear to provide more information.

By running the instrument SelfTest ((either at power turn-on or through the Calib and Test (Clear Dot) Modes)), WARN: messages may appear.

The WARN: message indicates that a condition exists that may need attention. Generally, the instrument remains fully operational, except for the function indicated on the visual display. Pressing any instrument function will erase the WARN: message. The following five WARN: messages will only appear via the SelfTest.

WARN: MEMORY RESET indicates that the instrument memory has been reset to the default setpoints including flow and oven calibrations. This could have been done by operator keyboard entry (see Section 13 of this manual), by RAM replacement, or by removing the battery.

WARN: SIGNAL CHANGED indicates that a detector that was previously assigned to a particular signal is no longer recognized. The instrument will reconfigure the signal. This may occur as a result of detector boards having been removed during a repair. If these boards have not been recently removed, suspect a failure and refer to Detector Problems later in this section.

WARN: NO DETECTORS indicates that no detector boards are installed or that they are not recognized as being installed by the processor. If detector boards are physically installed and not recognized, suspect the boards, the I/O section, or the CPU section of the Main Board.

The WARN: OVEN SHUT OFF message is somewhat of a hybrid between other WARN: messages and a FAULT: message. Similar to other WARN: messages, the WARN: OVEN SHUT OFF message occurs most often as a result of inoperative hardware (rather than software). This may be something as simple as the operator leaving the oven door open. However, different from other WARN: (similar to FAULT:) messages, the WARN: OVEN SHUT OFF message may occur any time that conditions warrant. The operator need not run the SelfTest for this message to be displayed. WARN: OVEN SHUT OFF indicates that the oven temperature has been shut off because it could not heat as quickly as it should or because it cooled more slowly than it should. Suspect that the oven flap could be stuck, or that a large thermal leak from the oven has occurred (make sure that the oven door is shut). Once the WARN: OVEN SHUT OFF is displayed, the oven temperature will remain off until the message is cleared. The operator need only to press the

PART C OPERATOR INSTIGATED INDICATIONS

This section discusses the visual information that the operator can instigate and use as part of the troubleshooting process. These visual indications are normally not available unless specifically requested by the operator.

There are several functions of the CALIB AND TEST (Clear Dot) modes that can be used as a diagnostic tool. Similarly, the TEST CHROMATOGRAM can be extremely useful. Each of these operator instigated functions is specifically designed to aid the overall troubleshooting process and is activated from the keyboard.

Of the ten functions accessible through the CALIB AND TEST (Clear Dot), five may be thought of as servicing functions. The other five functions are generally thought of as operational functions. These are explained in the operation and reference manuals.

To enter any of the CALIB AND TEST (Clear Dot) modes, press: the Clear key, the Decimal key and a number from 0 through 9. The actual digits 4,5,7,8,9 represent the typical test modes. These are as follows:

CLEAR DOT 4	DISPLAY MEMORY
CLEAR DOT 5	SELFTEST
CLEAR DOT 7	HPIL LOOPBACK TEST
CLEAR DOT 8	SET PID CONTROLS
CLEAR DOT 9	DISP TEMP & DEMAND

To escape from any of the CALIB AND TEST (Clear Dot) modes press any of the instrument function keys.

Calib and Test (Clear Dot 4) Display Memory

This diagnostic routine is initiated from the keyboard by pressing: Upon entering this mode, a single memory address (ADDR:) and a value (VAL:) will appear on the instrument front panel visual display. At this time, both the address and the value will be displayed in hexadecimal. In this hexadecimal mode, the value displayed is two bytes (four digits) of information. The rightmost two digits (one byte) represent the actual contents of the indicated address. The other two digits correspond to the contents of the next address. For example, if address 1111 were keyed in and the value F224 resulted, 24 is the contents of address 1111 and F2 is the contents of address 1112. This could be verified by addressing 1112; then the F2 would become the two rightmost digits (i.e., 3DF2).

In the Display Memory mode, some keys on the keyboard are redefined:

A key becomes A in hexadecimal.
B key becomes B in hexadecimal.
COL COMP1 key becomes C in hexadecimal.
COL COMP2 key becomes D in hexadecimal.
ON key becomes E in hexadecimal.
OFF key becomes F in hexadecimal.

The Decimal Point key increments the address.

The Minus key decrements the address.

The ENTER key switches the type of value presentation. The binary display mode can be entered from the hexadecimal mode by pressing . If already in the binary mode, it will return to the hexadecimal mode.

The binary mode is very similar to the hexadecimal mode except that the value of the address, and only that value (one byte), is displayed in the binary code. If the next value (one byte in binary) is desired, simply increment the address, which is always displayed in hexadecimal. The incrementing and decrementing of addresses in the binary mode are done in the same manner as in the hexadecimal mode.

To leave this Display Memory routine, press any of the instrument function keys. This also reestablishes the normal key definitions.

Calib and Test (Clear Dot 5) SelfTest

This instrument test is exactly the same as the one that occurs automatically at power turn on, except it is entered whenever the operator decides. It is initiated from the keyboard by pressing: The first indication a user has that the instrument is working is when the unit tests its RAM (Random Access Memory) and the visual display portion of the front panel. The entire visual display (all possible dots) and all LEDs turn on for a few seconds.

The next indication is when the unit displays TESTING MEMORY. During this time, the unit tests most of the processor memory (ROM) circuits. Note that during this time only the NOT READY LED remains lit.

The third indication is when the unit displays TESTING SIGNAL PATH. During this phase of the selftest, the unit actually exercises most of the signal handling sections of the Main Board. Note that the analog sensors (i.e., temperature sensors) are NOT tested at this time; they are tested after the selftest. However, by linking the A/D through the CPU to the D/A and by looping the D/A output back as an input to the A/D, most of the Main Board's signal handling circuits are checked.

The fourth (and unless an error is found, the final) indication is the PASSED SELFTEST message. This message verifies that the selftest sequence has been completed. The PASSED SELFTEST display remains until some further action is taken by the operator or some area not tested during the SelfTest is detected.

By pressing the clear key, the visual display should change to some message about OVEN TEMP. This action, with its resulting message, verifies that the keyboard is communicating with the CPU.

Calib and Test (Clear Dot 7)

HPIL Loopback Test This diagnostic test requires that one of the HPIL cables be connected from the OUT to the IN. The test is then initiated from the keyboard by pressing: By entering this test, 128 frames will be transmitted from the CPU through the Communications Interface Board. With the HPIL cable installed, the same word should be transmitted back to the Z80 processor, sensed and compared with the transmitted word. If the comparison verifies correct transmission and reception, a PASSED SELFTEST message will be displayed on the instrument's front panel visual display. Note that this is the HPIL SelfTest and is not the same as the instrument SelfTest done at power turn on.

If a component failure exists in the HPIL circuitry, or if either the Interface Board or HPIL Cable is not properly installed, a FAILED SELFTEST message will be displayed.

To leave this mode of testing, press any of the instrument function keys.

Calib and Test (Clear Dot 8) Set PID Controls

Calib and Test (Clear Dot 9) Disp Temp & Demand

Test Chromatogram Signal Output Test

This diagnostic test is selected from the keyboard by pressing One of the signal selection keys either SIG 1 or SIG 2 and the 9 key on the numeric key pad and the ENTER key. Test plot mode is confirmed by the display showing SIGNAL 1 (or 2) TEST PLOT. Pressing SIG 1 (or 2) a second time displays the current signal level value (which is 0.0 initially). This permits monitoring the output signal.

The test chromatogram, which is permanently stored in the HP 5890 SERIES II, is initiated by pressing the START key. Each chromatographic cycle consists of three peaks. Each peak is about 1/10 the height of the previous peak, with the first (tallest) peak having a height value of about 125 mV at = 0 (+1 V analog output); halfheight width of this peak is about 0.13 minutes. Each cycle is about 1.5 minutes in length. The chromatogram will continue to cycle until the STOP key is pressed. The test chromatogram is useful as a troubleshooting aid in deciding whether a lost or noisy signal observed at a connected integrating or chart recording device is due to a chromatographic problem (lost sample due to leaks, noise due to a dirty detector, etc.), versus problems either with the integrating/recording device itself, or in its connecting cables.

If the test chromatogram does not exhibit any problems at the integrating/recording device, a chromatographic problem is likely to exist; if the test chromatogram exhibits noise, or does not appear at all, the problem is most likely to be hardware related. Check setpoints on both the HP 5890 SERIES II and the integrating/recording device.

PART D FUNCTIONAL SYMPTOMS

This section contains symptoms (other than those that appear on the visual display) that indicate a possible problem. Typically, these types of symptoms can be associated with a specific functional area of the instrument.

Zone doesn't heat all other zones O.K.

With an Ohm meter measure the resistance of the cartridge heater (should be about 200-220 ohms). With the power removed this can be measured by removing the J9 connector for INJA, INJB, DETA, and DETB. To measure the AUX zone remove the J14 connector. The pins are labeled on the main board next to the appropriate J connector. Replace the cartridge heater if it is open or shorted. If the cartridge heater tests O.K. and sensor test O.K. (see temperature sensor resistance chart), the problem is in the zone control on the main board and the main board should be replaced. To measure resistance of sensors remove connector P7, sensors are labeled on main PCB.

Zone temperature is unstable.

If Zone will not reach desired temperature or cycles over more then plus or minus 1 degree C then the insulation around the zone and the insulation of the oven shell should be examined and additional insulation added if necessary. Also refer to the operating manual to verify the zone is being used properly(i.e., oven at -50 degrees C, injection port at 100 degrees C). This type of operation will not work.

The Main Board is generally serviced from a replacement aspect, the introduction includes an illustration of its functional configuration followed by information about its connectors and test points.

Any replacement or space electrical parts that are subject to damage by static electricity will be shipped in static-protective bags or containers. Be certain to utilize these protective devices when storing items of this nature.

Generally, since board or module replacement constitutes the majority of electronic repairs, the only electronic test equipment necessary is a quality Volt Ohm Ampmeter.

The HP 5890 Series II GC contains a minimum of four and a maximum of nine electronic boards. The four boards always installed are one of the AC Power Boards, the Keyboard and Display Board(usually done as one module), and the Main Board. The actual AC Power Board located in the rear of the instrument behind the column oven compartment is one of three possible boards based on the voltage and phase configuration of the line. The Keyboard and Display Board are two boards located on the front of the Electronics Module. The Keyboard plugs directly into the Display Board. The Main Board is mounted inside the right side panel of the instrument and occupies most of the space in the Electronics Module. More importantly, the Main Board contains most of the instrument's electronics.

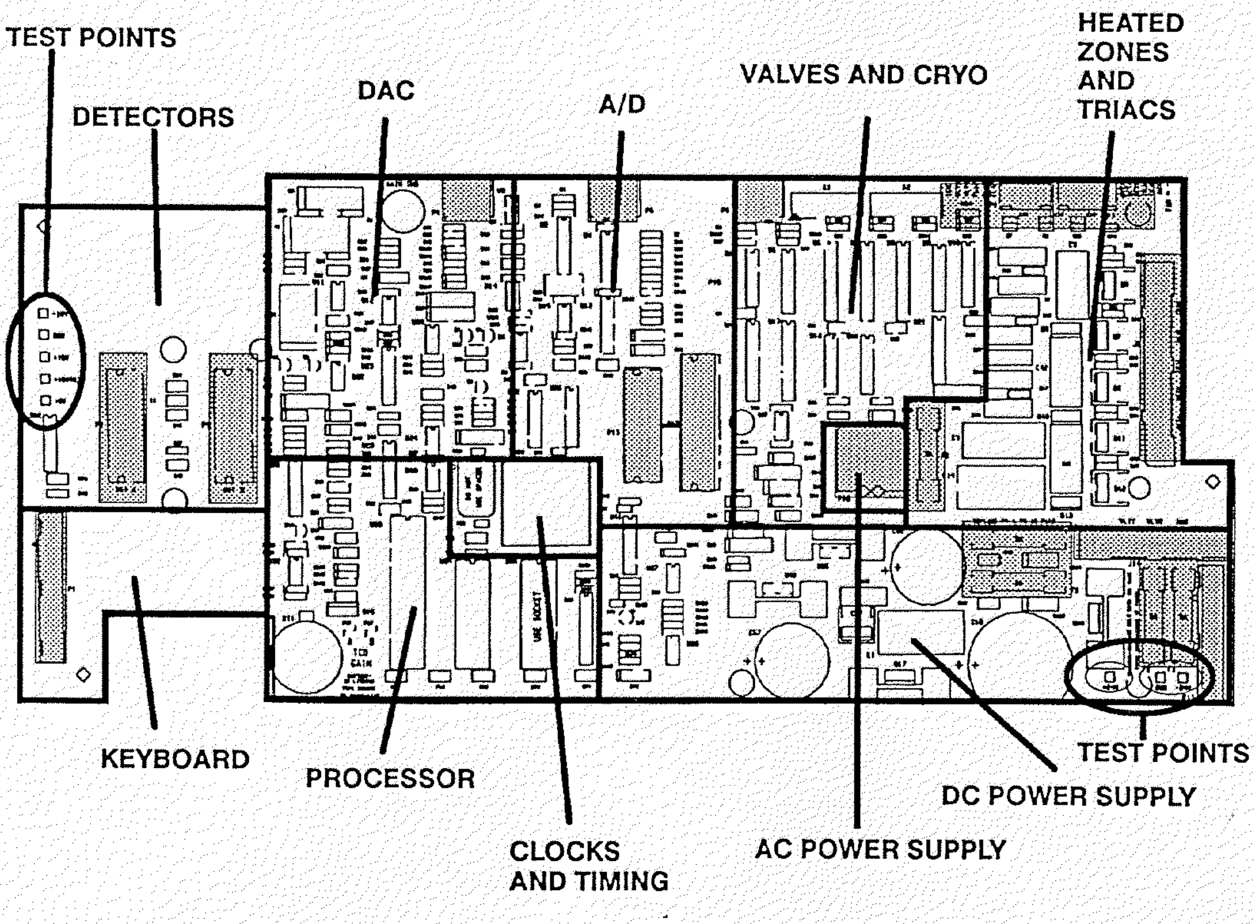
General Description:

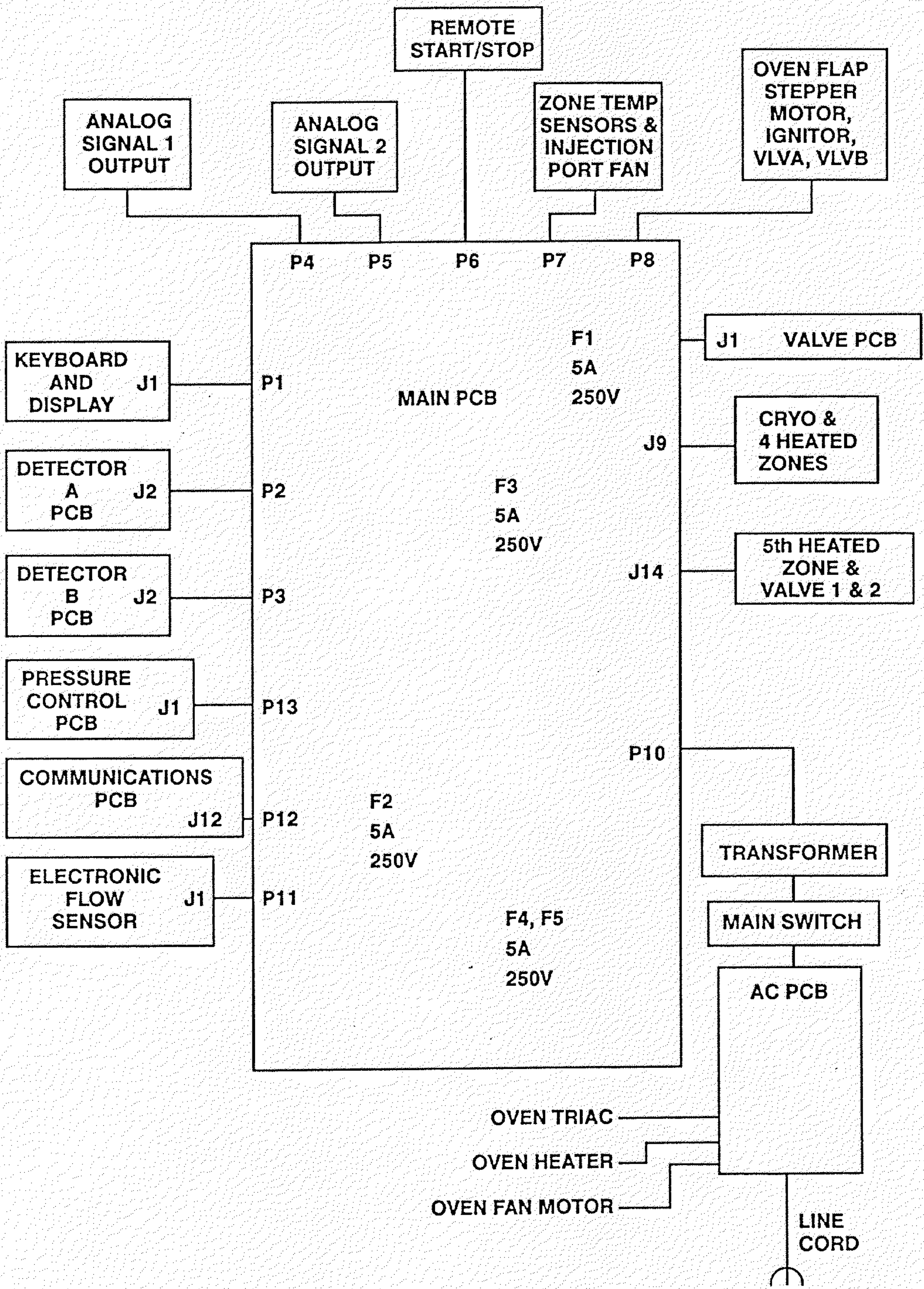
The 05890-60015 PC board is a collection of circuits which allow operation of the 5890 Series II gas chromatograph. The circuits on the new board include power supplies, CPU, A/D converter, D/A converter, clocks and general control circuits. (Refer to the main PCB diagrams, pages SVC 1 - 12 and SVC 1 - 13.)

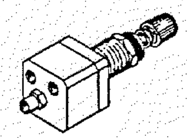
The functions provided by the new PC board are the same as those provided by the original HP 5890A GC except that components have been added to control an additional heated zone and 2 AC valves. The new board differs only in its implementation of these functions. The foremost change is the use of a 68 pin PLCC custom IC which performs the same functions as do 26 TTL IC's on the original 05890-60010 board

Connectors 1 thru 15 are used to connect the Main Board either with the other electronic assemblies within the instrument or external devices, such as an integrator. (Refer to the main PCB diagrams, pages SVC 1 - 13 and SVC 1 - 14. Refer to appendix a of this document for information on the main PCB connectors.)

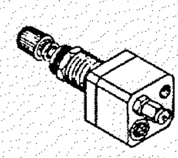
MAIN PCB FUNCTIONAL ZONES



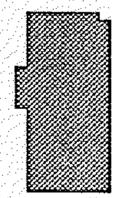

REMOTE START/STOP
ANALOG SIGNAL 1 OUTPUT
ANALOG SIGNAL 2 OUTPUT
ZONE TEMP SENSORS & INJECTION PORT FAN
OVEN FLAP STEPPER MOTOR, IGNITOR, VLVA, VLVB
P4
P5
P6
P7
P8
KEYBOARD AND DISPLAY J1
P1
MAIN PCB
F1 5A 250V
J1 VALVE PCB
J9
CRYO & 4 HEATED ZONES
DETECTOR A PCB J2
P2
F3 5A 250V
DETECTOR B PCB J2
P3
J14
5th HEATED ZONE & VALVE 1 & 2
PRESSURE CONTROL PCB J1
P13
P10
COMMUNICATIONS PCB J12
P12
F2 5A 250V
TRANSFORMER
ELECTRONIC FLOW SENSOR J1
P11
MAIN SWITCH
F4, F5 5A 250V
AC PCB
OVEN TRIAC
OVEN HEATER
OVEN FAN MOTOR
LINE CORD



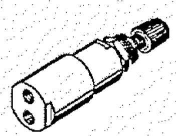
Back Pressure Regulator (BPR)



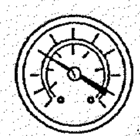
Manual Flow Control (MFC)



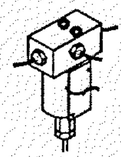
Electronic Control Board



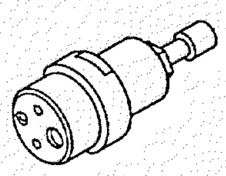
Forward Pressure Regulator (FPR)



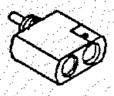
Column Head Pressure Gauge



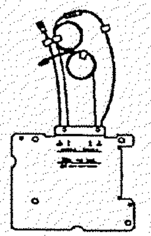
Solenoid Valve



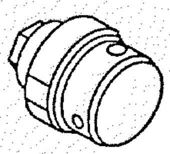
Forward Pressure Regulator (FPR)



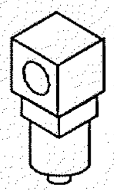
Tee Fitting



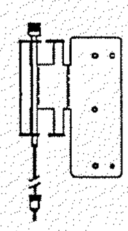
Electronic Flow Sensor (EFS)



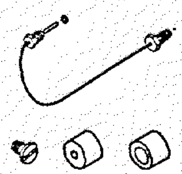
Preset Forward Pressure Regulator (FPR)



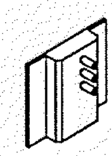
Proportional Control Valve



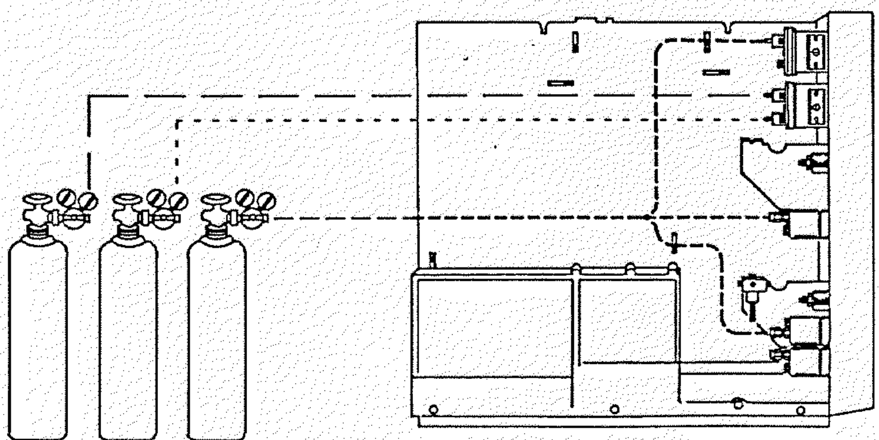
Mole Sieve



Restrictors



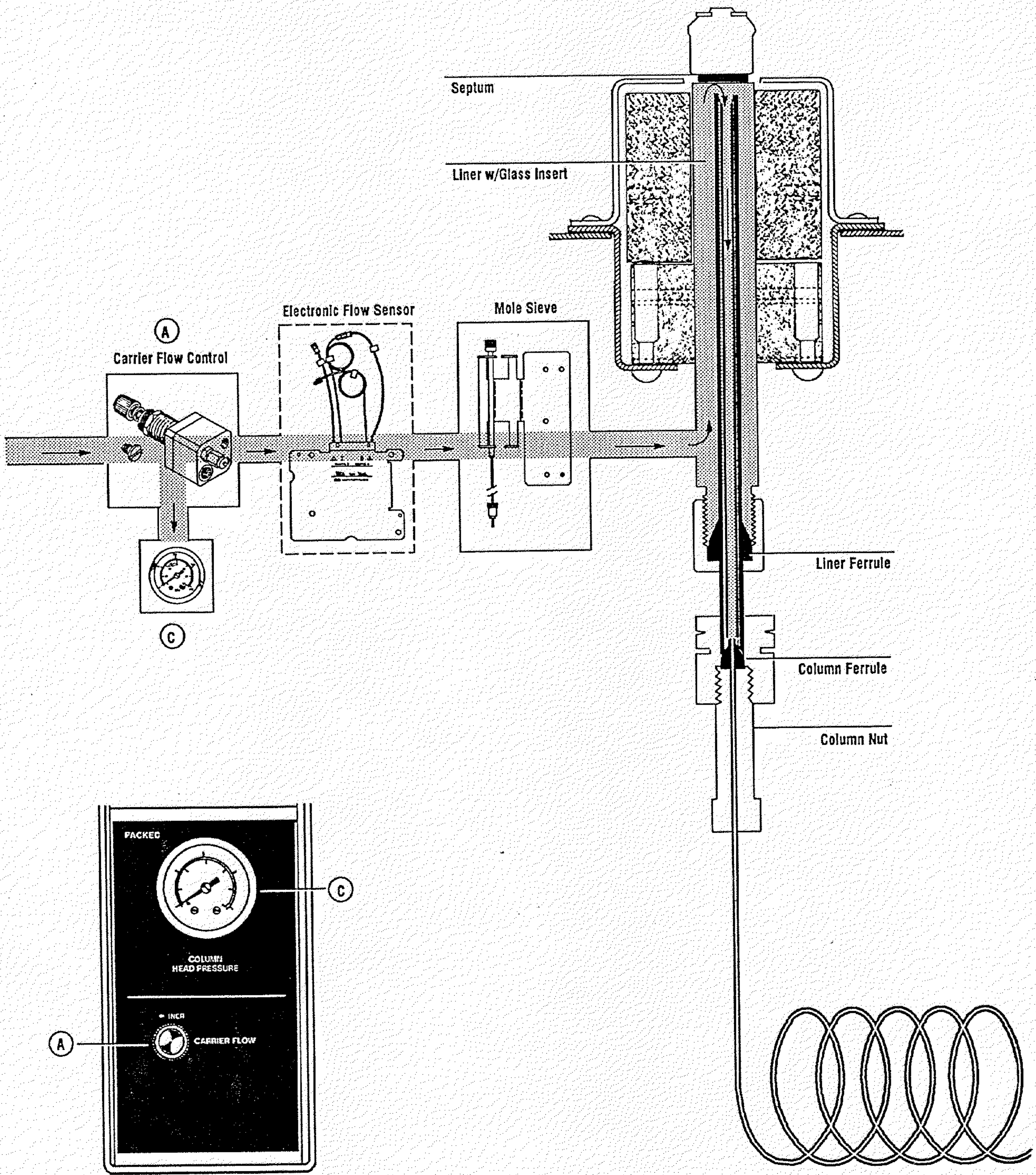
Electronic Pressure Transducer



GC with Left Side Cover Removed

Note: Check external tanks, pressure regulators, ON/OFF control valves, tubing unions and tees, and chemical filters for leaks or plugging.

Packed Inlet



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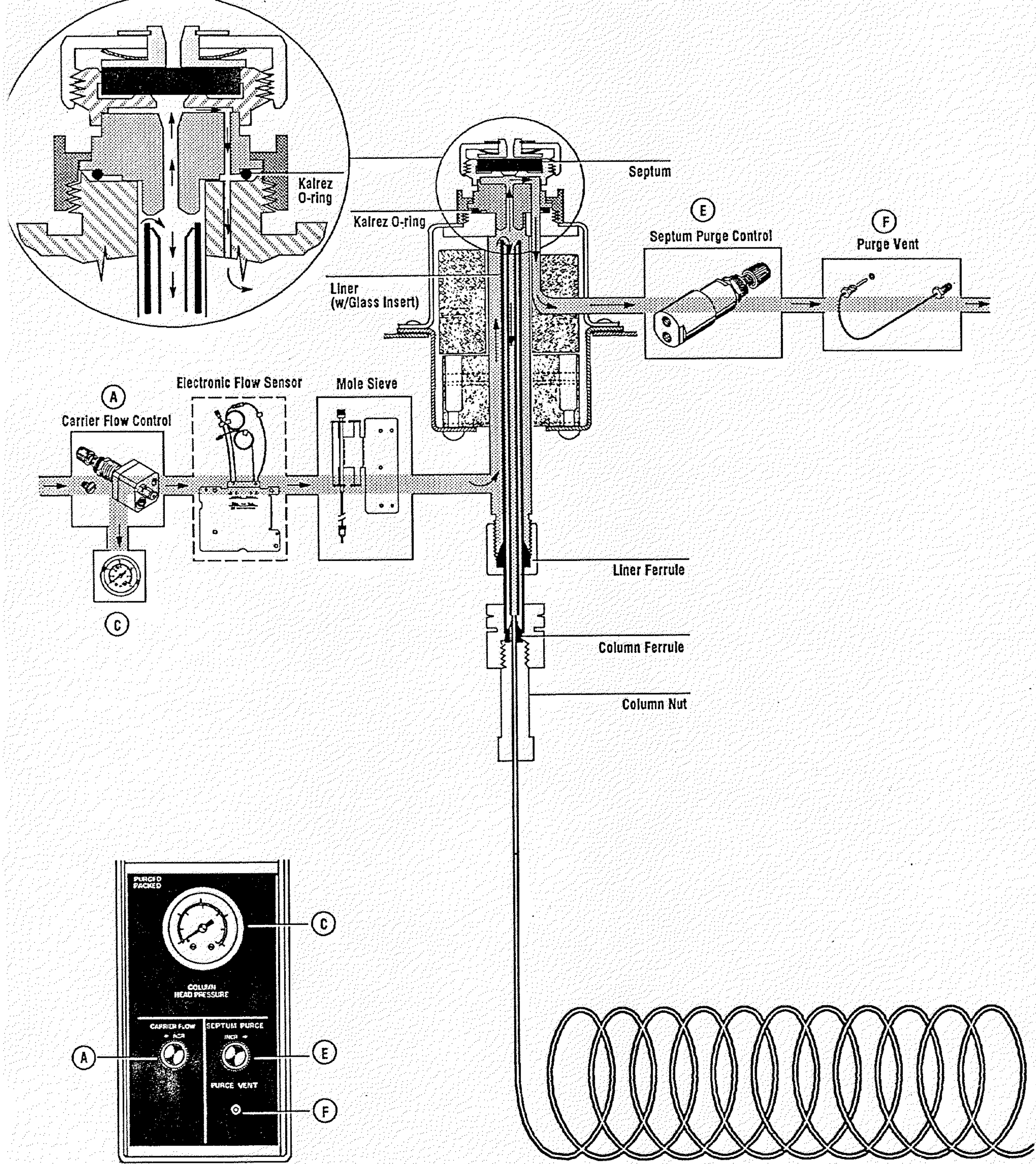
Purged Packed Inlet



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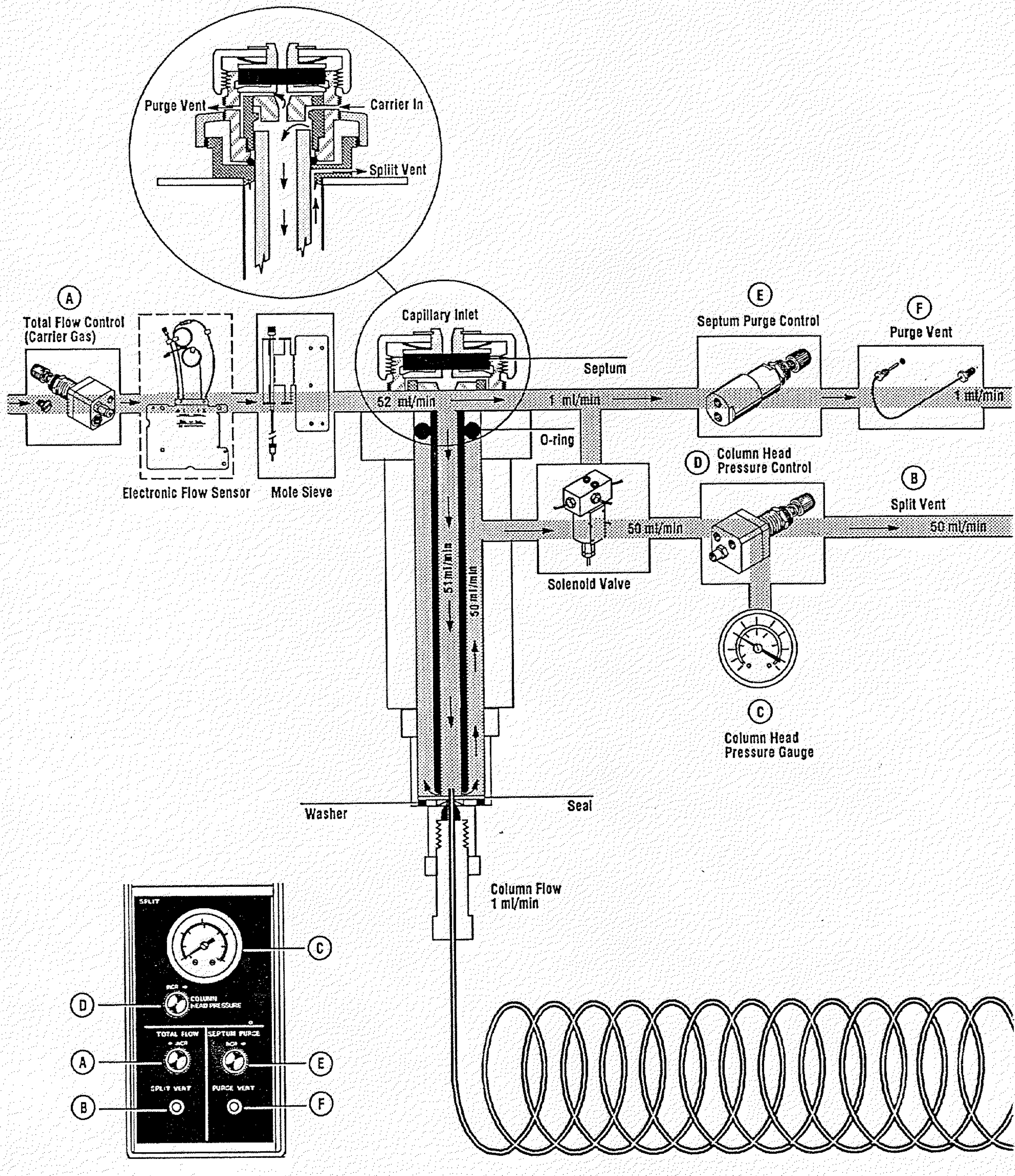
Split/Splitless Capillary Inlet
Splitless Mode — Purge On



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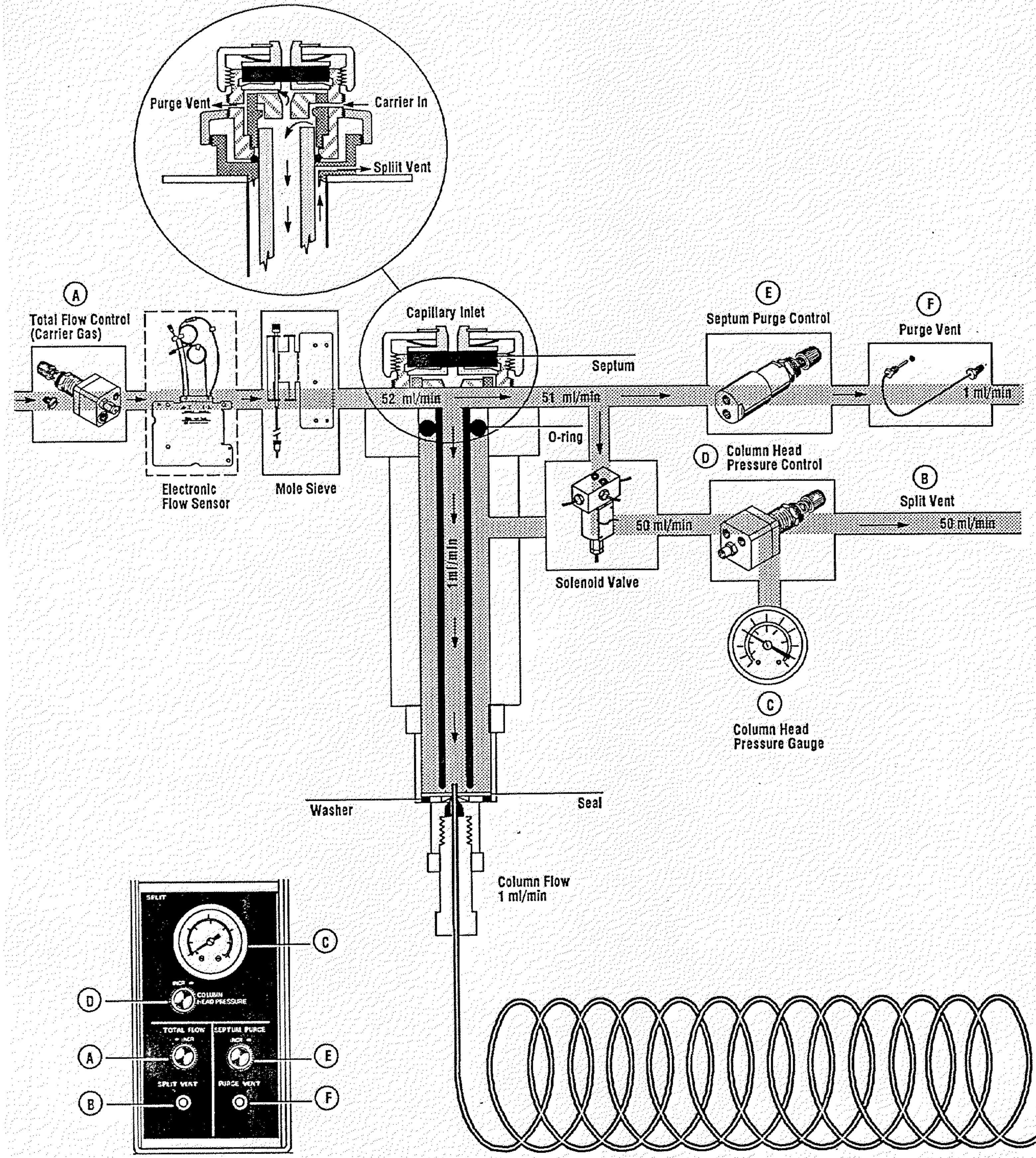
Split/Splitless Capillary Inlet
Splitless Mode—Purge Off



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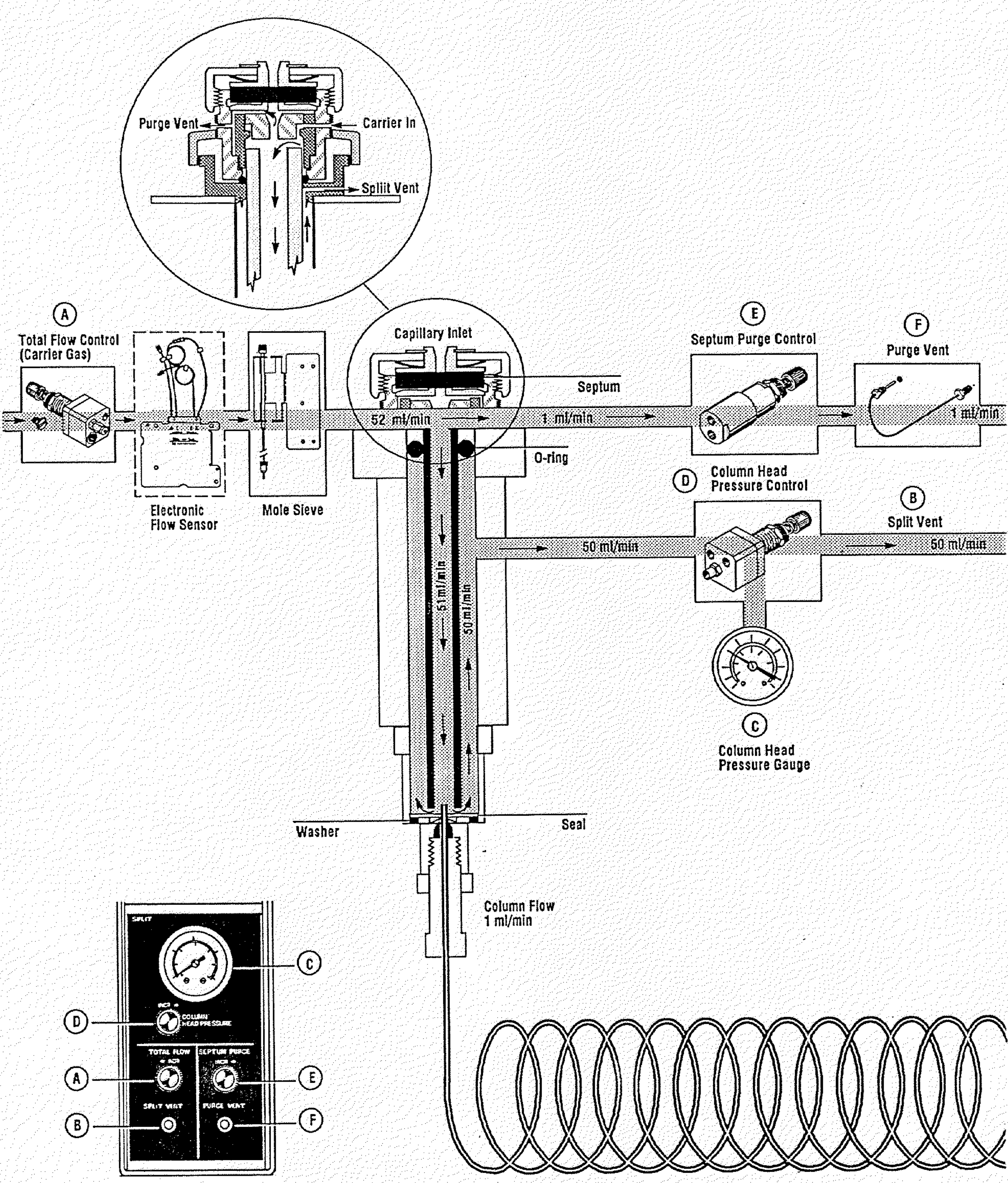
Split Only Capillary Inlet



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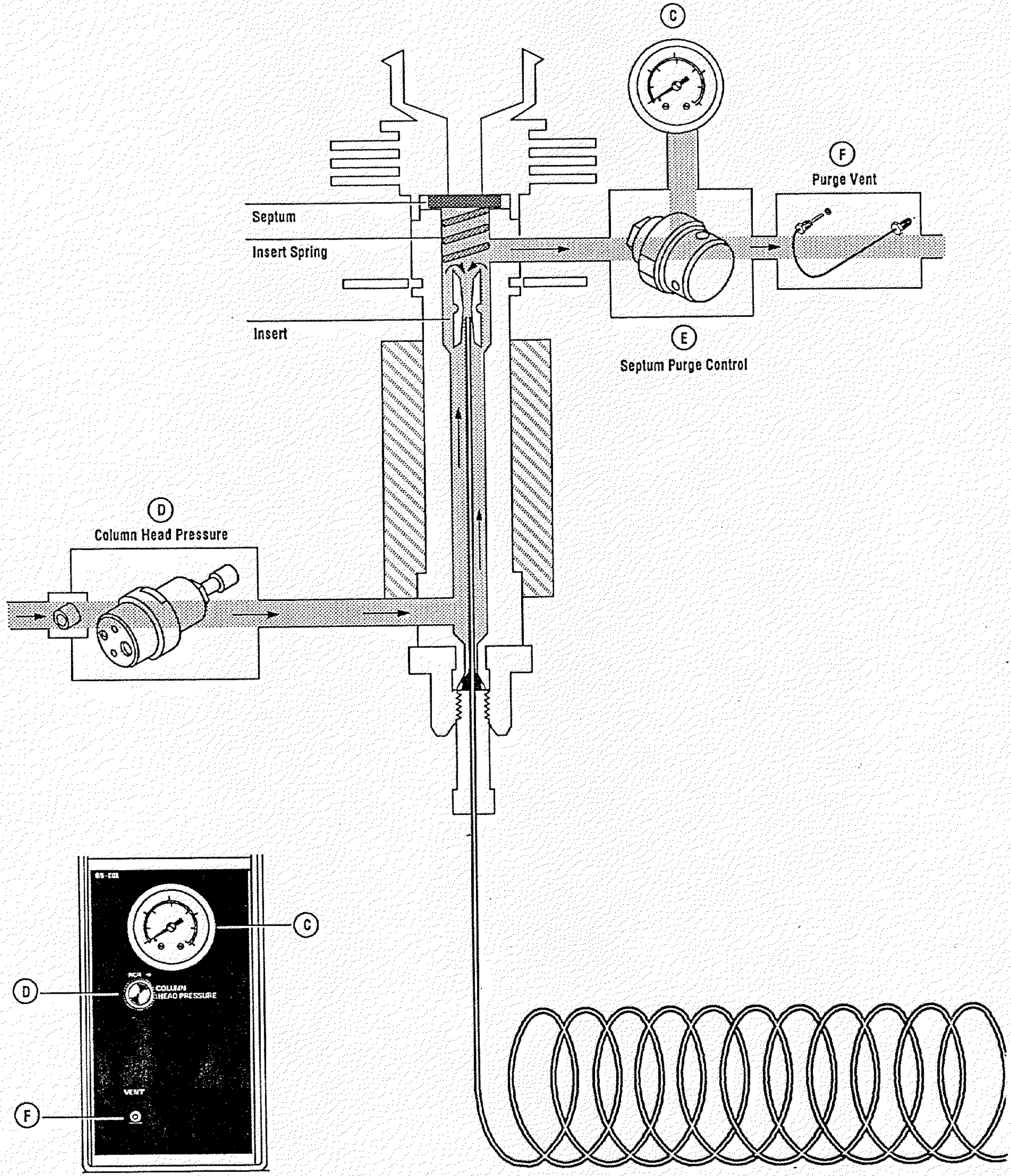
Programmable Cool On/Column Inlet
(PCOC)Manual Pressure Controller (MPC)



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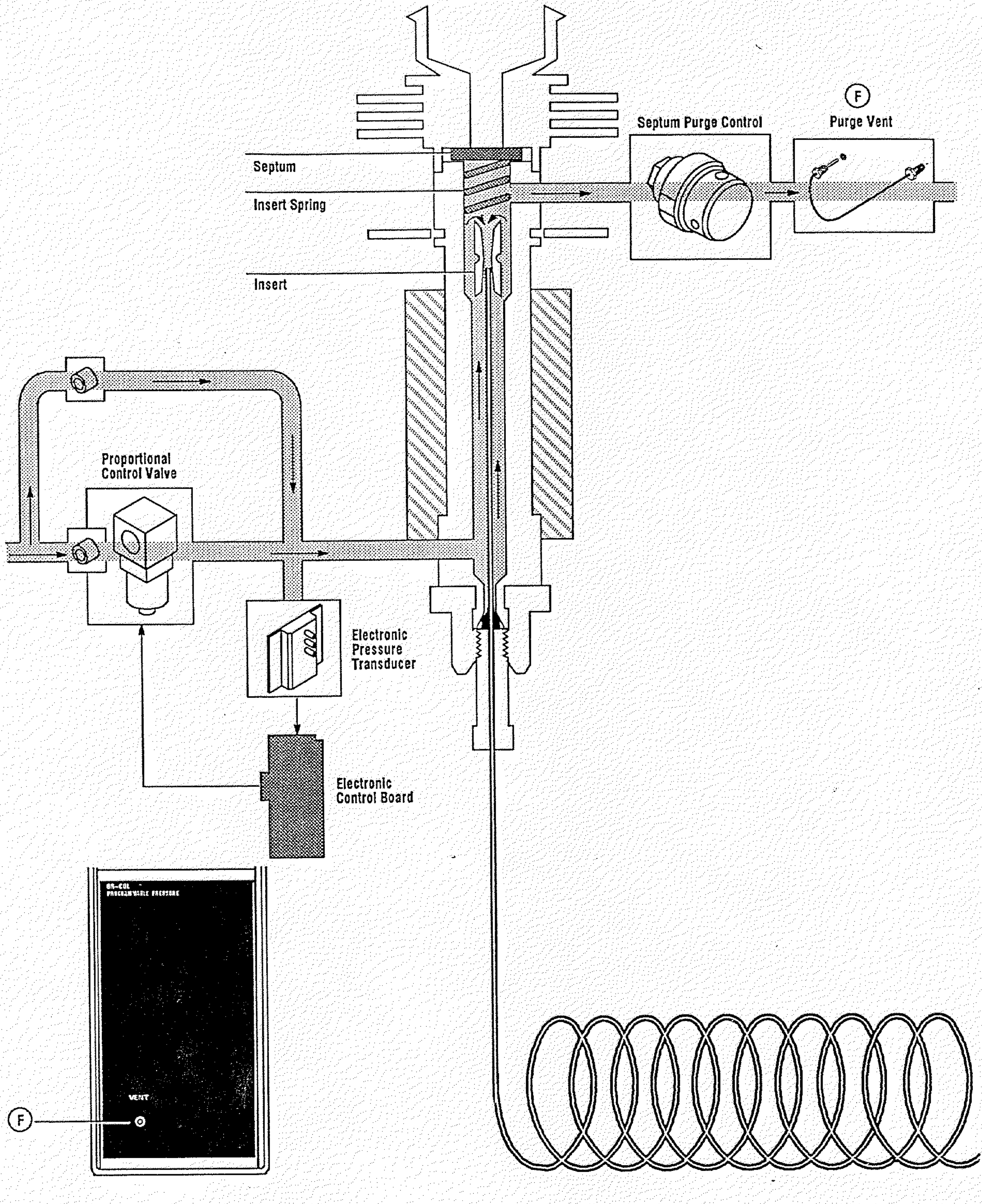
Programmable Cool On/Column Inlet (PCOC)
Electronic Pressure Controller (EPC)



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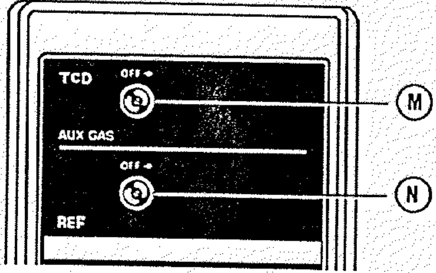
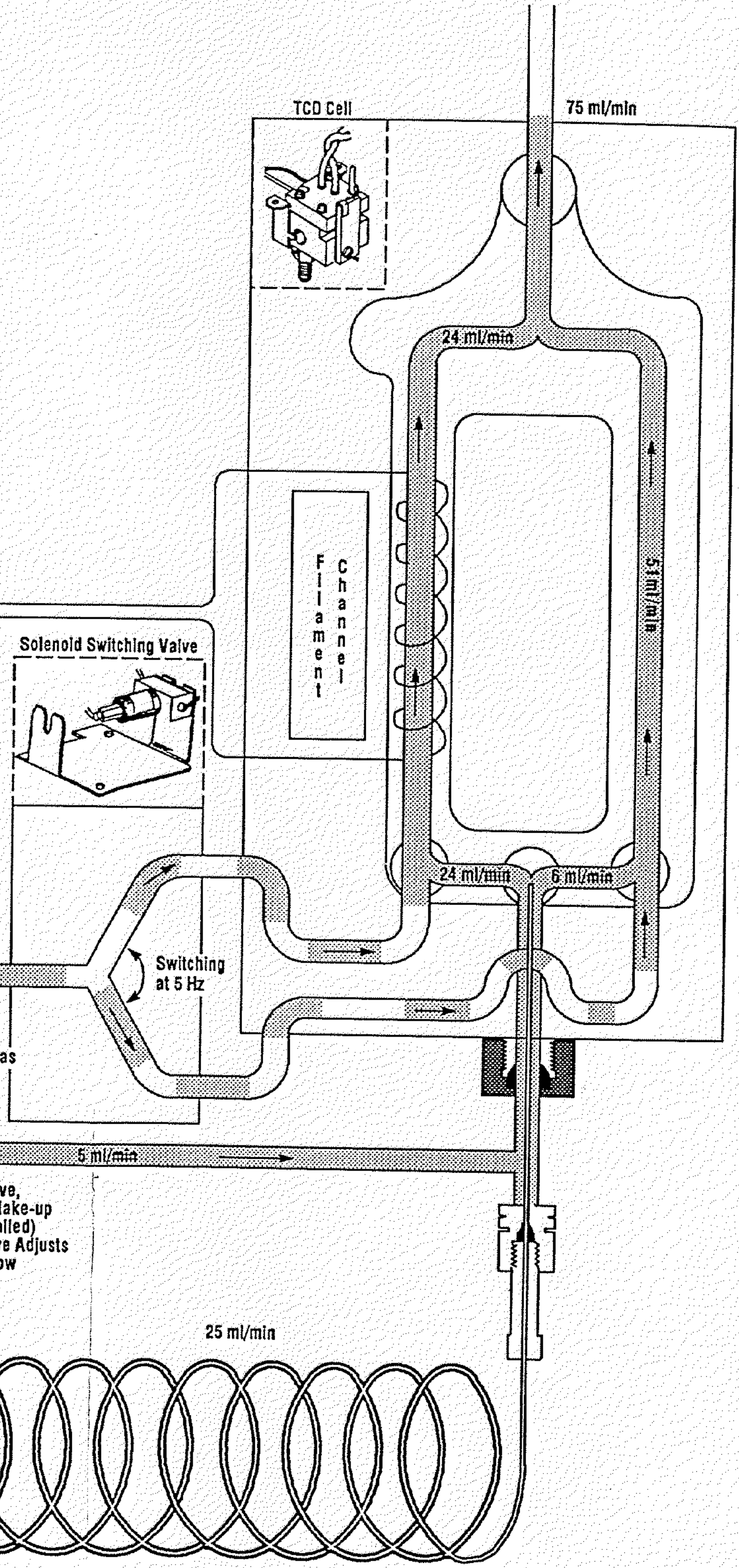
TCD



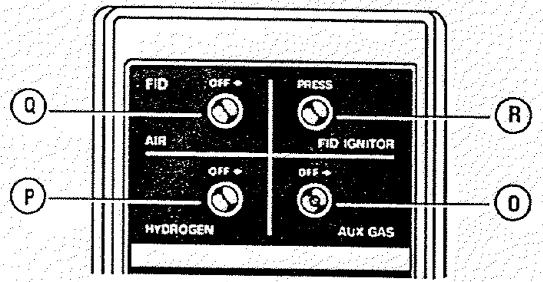
Gas flows shown represent typical flow systems. These examples show functionality and flow distribution and do not represent all of the possibilities. Each flow scheme depends on a number of variables including column selection, carrier gas make-up, and detector setup.

ReF = 1.5 (Makeup+col)
Same gas

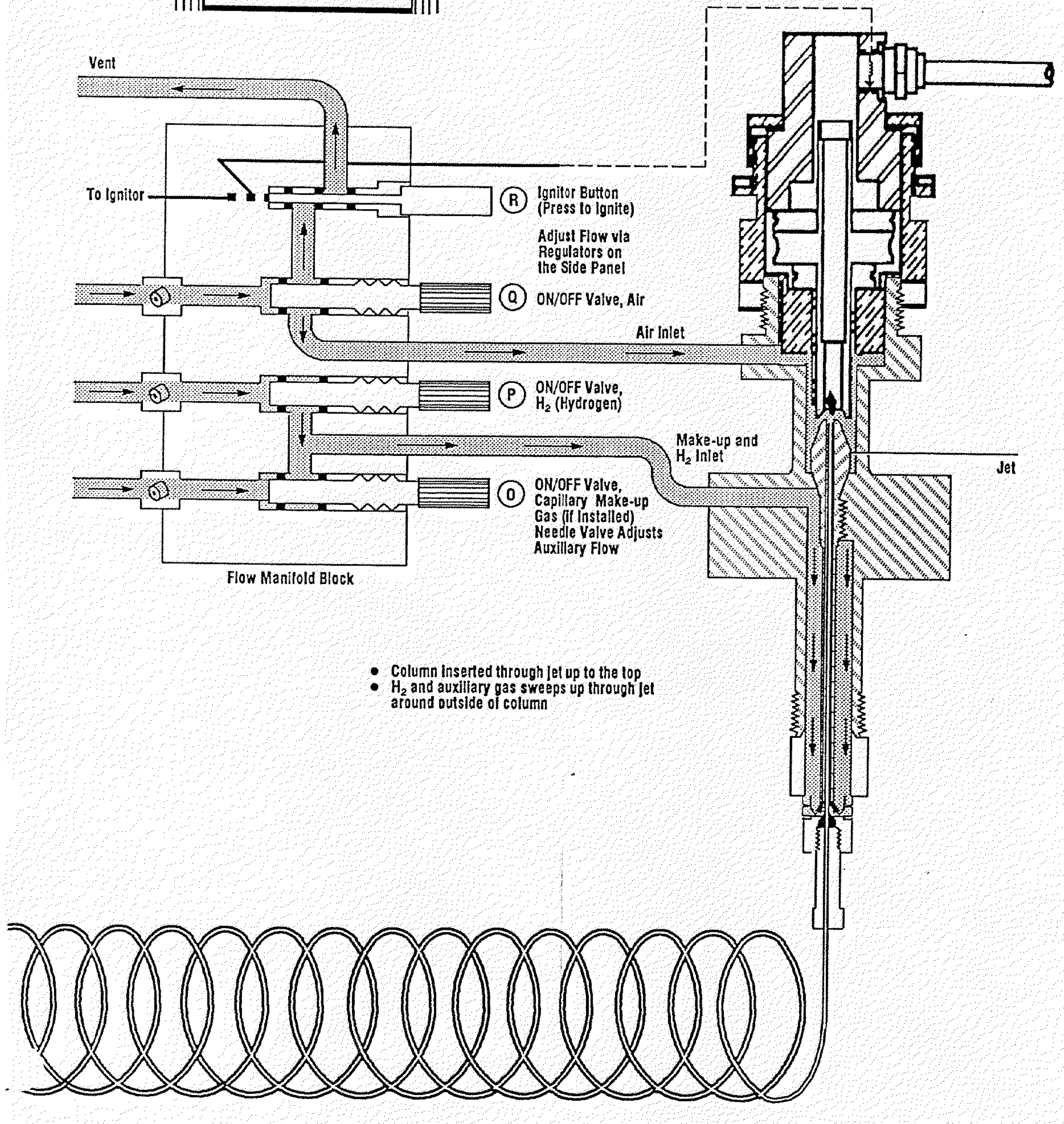


FID

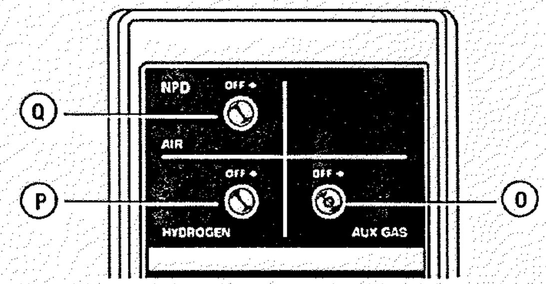
Air : H
10 : 1



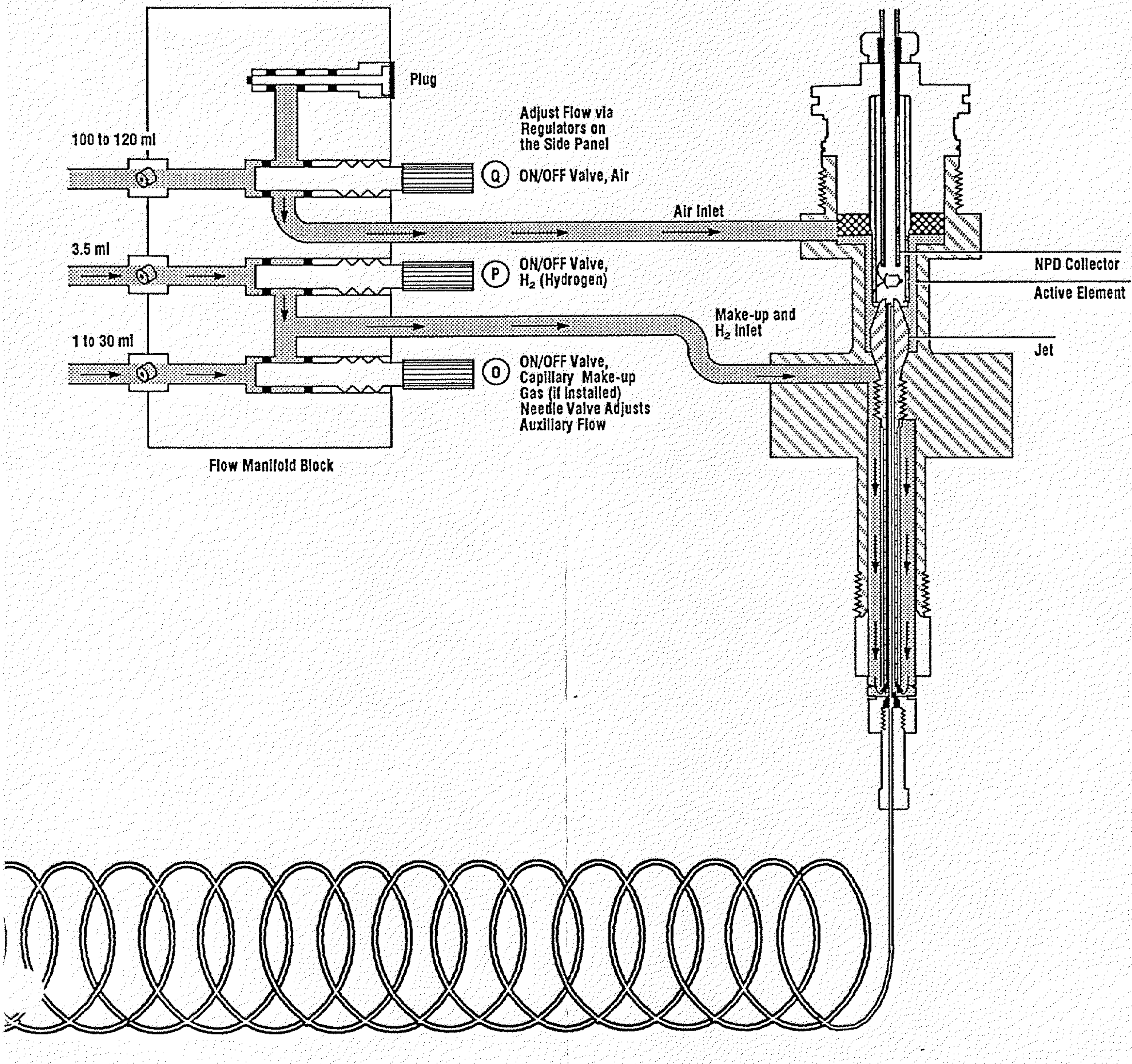
Gas flows shown represent typical flow systems. These examples show functionality and flow distribution and do not represent all of the possibilities. Each flow scheme depends on a number of variables including column selection, carrier gas make-up, and detector setup.



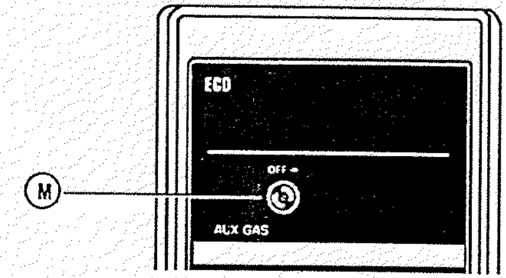
NPD



Gas flows shown represent typical flow systems. These examples show functionality and flow distribution and do not represent all of the possibilities. Each flow scheme depends on a number of variables including column selection, carrier gas make-up, and detector setup.

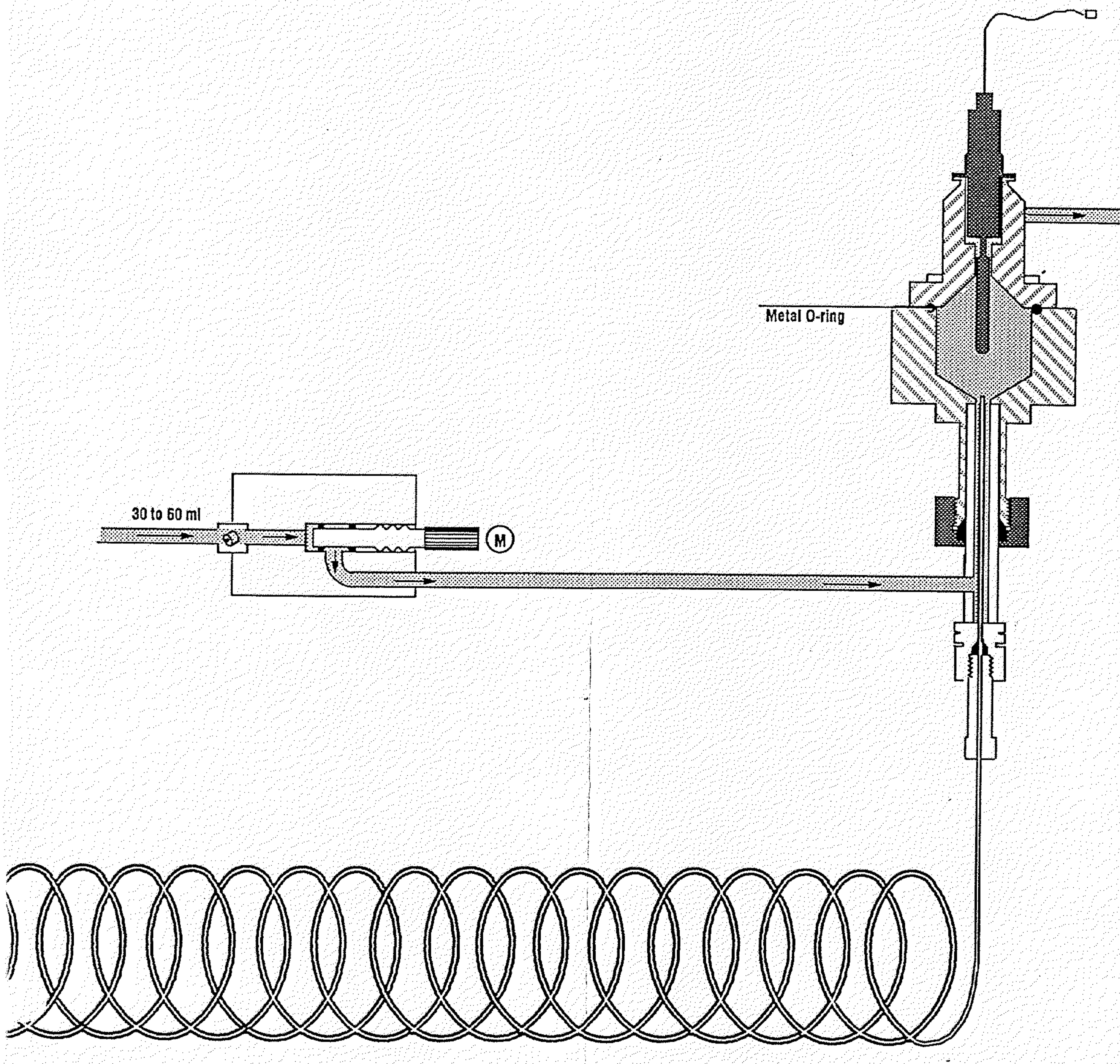


ECD

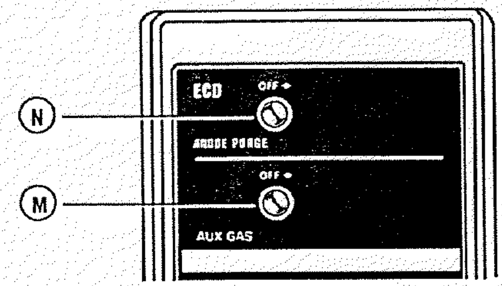


60

Gas flows shown represent typical flow systems. These examples show functionality and flow distribution and do not represent all of the possibilities. Each flow scheme depends on a number of variables including column selection, carrier gas make-up, and detector setup.

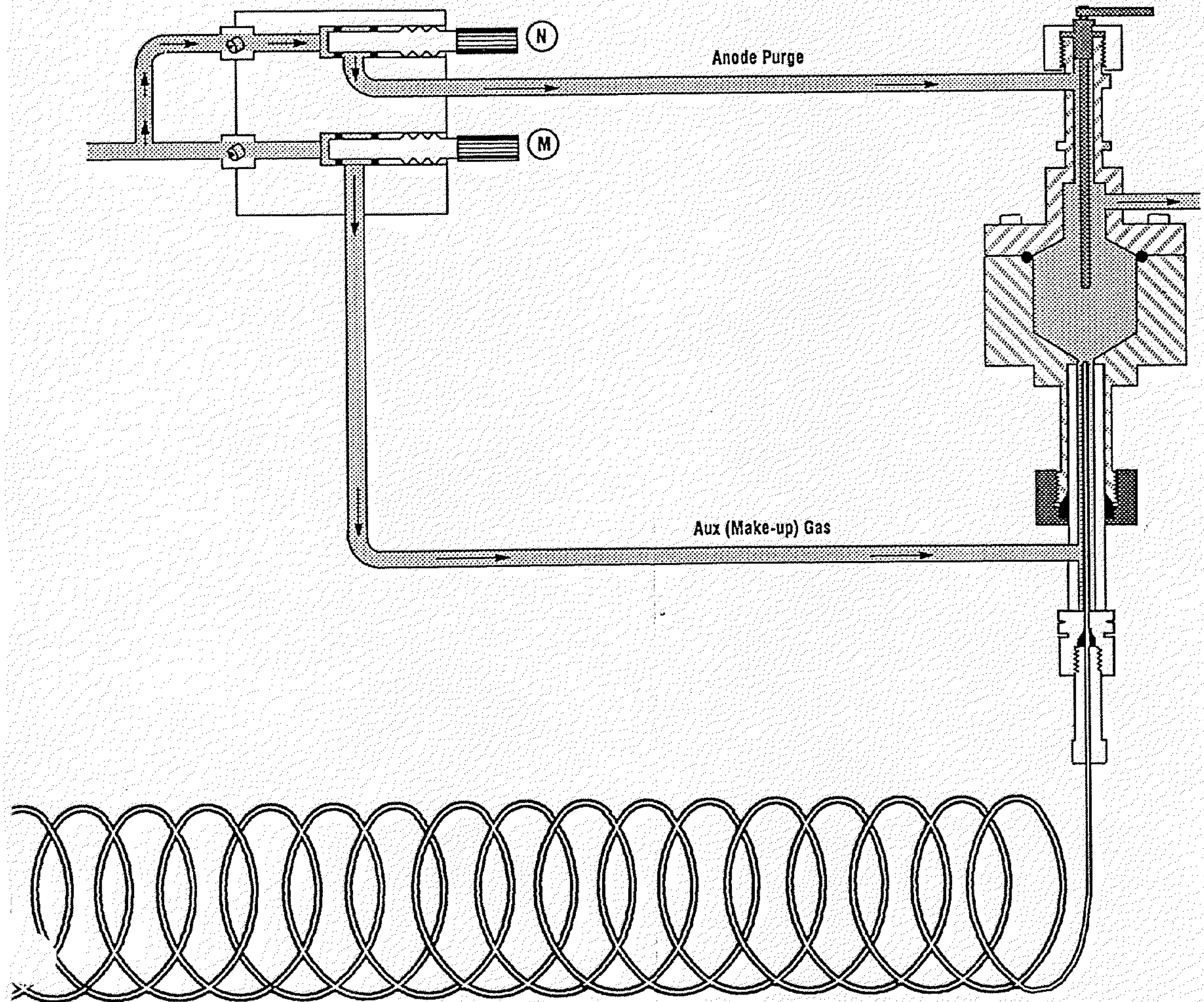


Purged Anode ECD

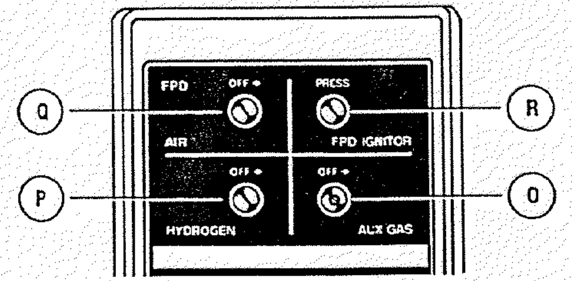


= 60-70

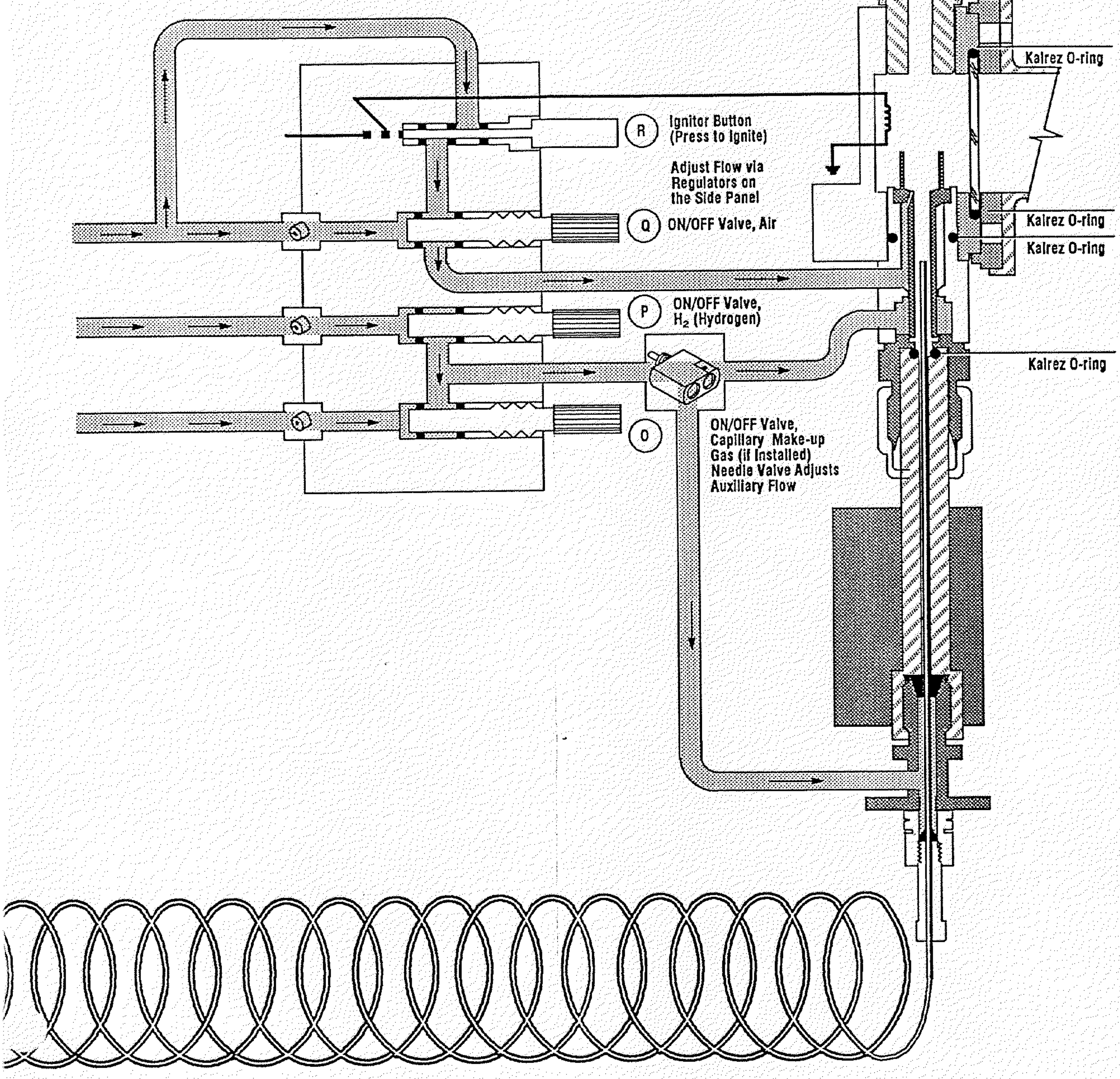
Gas flows shown represent typical flow systems. These examples show functionality and flow distribution and do not represent all of the possibilities. Each flow scheme depends on a number of variables including column selection, carrier gas make-up, and detector setup.



FPD



Gas flows shown represent typical flow systems. These examples show functionality and flow distribution and do not represent all of the possibilities. Each flow scheme depends on a number of variables including column selection, carrier gas make-up, and detector setup.



Section 2

INLET COMPONENTS

REPLACING INLET COMPONENTS

There are five inlet options available for the HP 5890 Series II Gas Chromatograph; packed column, packed column with septum purge, split/splitless capillary, split-only capillary, and Programmable Cool On-Column capillary (PCOC). Maintenance procedures for all the inlets are given in the following pages. Procedures are supplied to remove, replace, and/or clean various subassemblies, based on the current maintenance philosophy, i. e., to allow replacement of the lowest level components applicable for a particular inlet.

Specific part numbers are not given in this section. For all replacement part numbers, refer to Section 5 of the IPB portion of this document (Inlet Components).

All of the inlets are heated using a heater/sensor setup which consists of at least one heater cartridge and one sensor cartridge. Heating of the inlet zones is not covered in this section. For information on the zone heater/sensor systems, refer to Section 6 of the service portion of this document (Zone Temperature).

This document is not meant to provide instruction for first time installation of the inlet options discussed. Add-on sheets exist for just this purpose, and should be referenced when performing a first time installation.

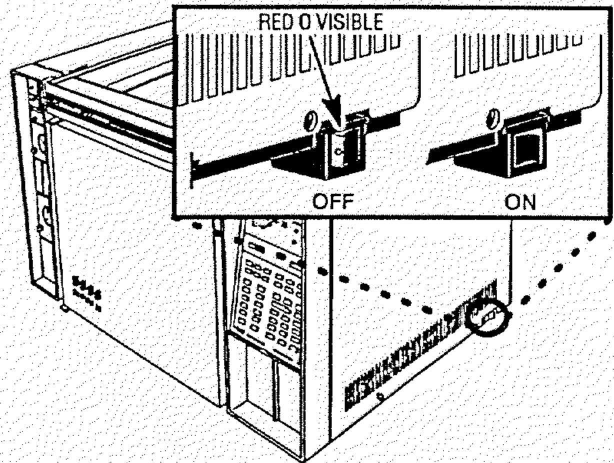
TABLE OF CONTENTS

PACKED COLUMN INLET

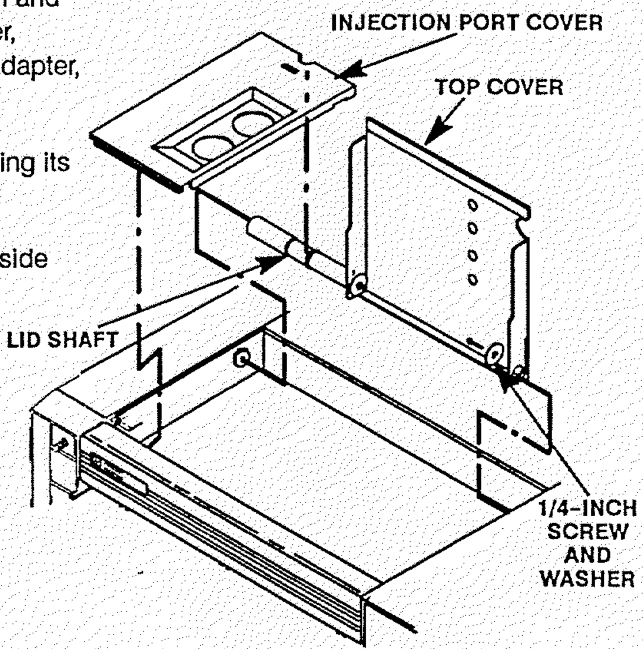
Remove/Replace Packed Column Inlet

WARNING

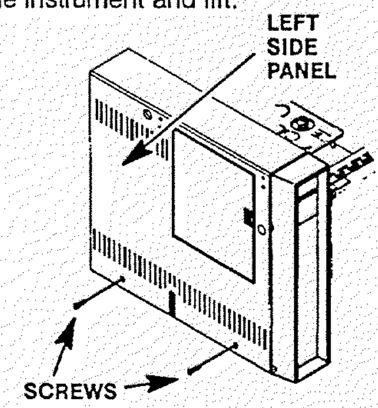
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.



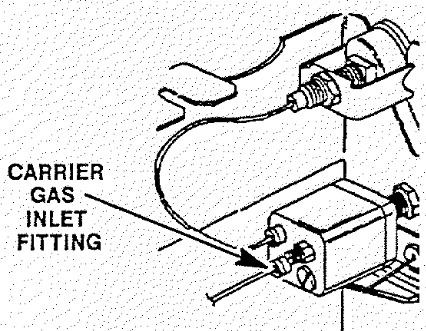
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the inlet(s) to be removed, inside the column oven, remove the column and hardware associated with the inlet(s) (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).



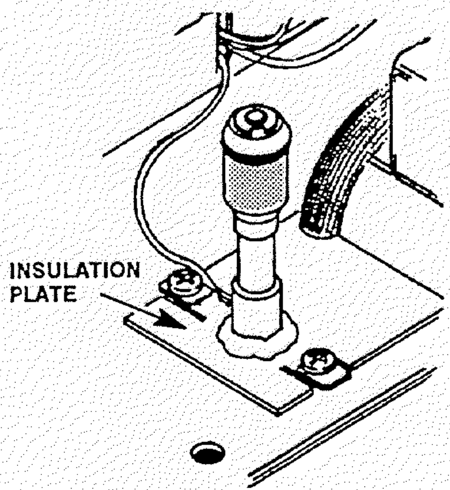
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.

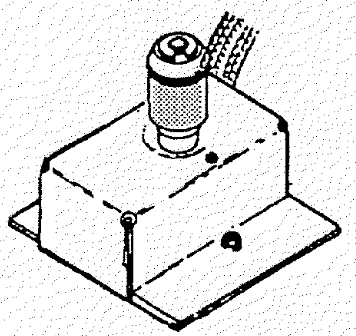


9. Disconnect the Carrier Gas Inlet which connects to a fitting either at the EFS, a chemical filter, or a mass flow controller mounted on the flow panel.
10. Inside the column oven, cap the base of the inlet.



11. Remove any insulation from around the top of the inlet.
12. Use a Pozidriv screwdriver to remove the two screws securing the inlet and insulation plate to the instrument. (Depending on the age of the instrument, the insulation plate may be flat, as shown at the left, or may be a box, as shown below.





13. Lift the inlet enough to expose the heated block and heater/sensor wiring.
14. Remove any insulation from around the base of the inlet.

CAUTION

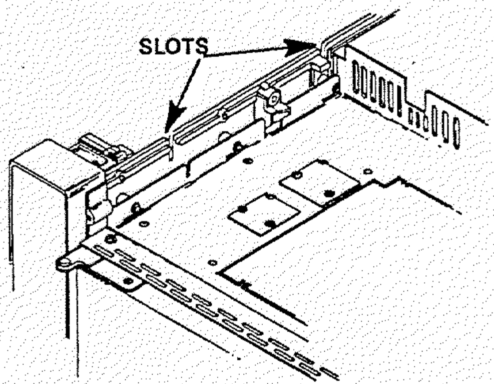
Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

15. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.

CAUTION

Use caution to avoid sharp bends when bending tubing. Sharp bends may crimp the tubing.

16. If the inlet is to be replaced, prepare the replacement inlet by pre-bending its tubing into orientations similar to that of the removed inlet.
17. Slide the heater and sensor cartridges into the heated block of the inlet being installed.
19. Replace any insulation that was removed from around the base of the inlet.
18. Carefully install the inlet and insulation plate, securing it to the instrument with two Pozidriv screws.
19. Replace any insulation that was removed from around the inlet.
20. Bend the tube running from the installed inlet to the inlet flow control components so that it lays within the "U"-shaped channels to the left of the inlet.



21. Connect the Carrier Gas Inlet, disconnected in step 9.

22. Install the liner and all other hardware (except the column) removed during step 5.

23. Restore the supply gas pressure.

24. Check for leaks at all of the newly mated fittings.

25. Ensure that the septum is properly installed, and in good condition.

25. Turn off the supply gas.

26. Remove the cap/plug from the end of the inlet.

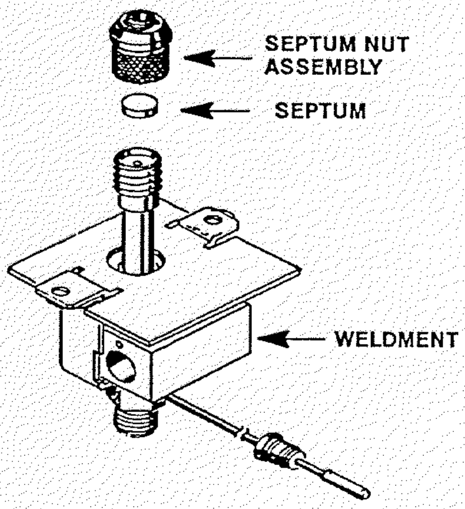
27. Install the column and associated hardware removed in step 5.

28. Restore the supply gas pressure.

29. Install the left side panel and secure using two screws.

30. Install the injection port cover.

31. Restore power to the HP 5890 Series II.

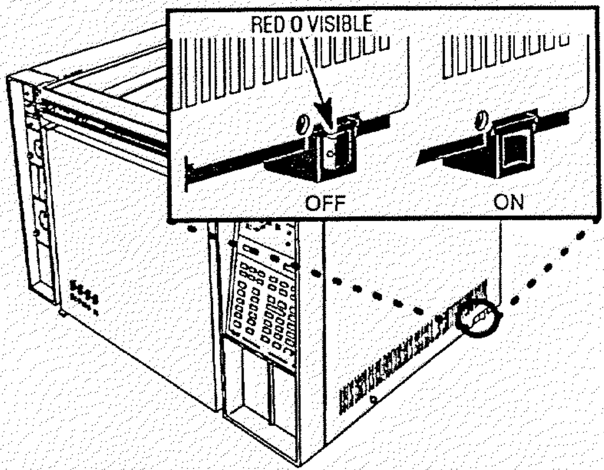


SEPTUM-PURGED PACKED COLUMN INLET

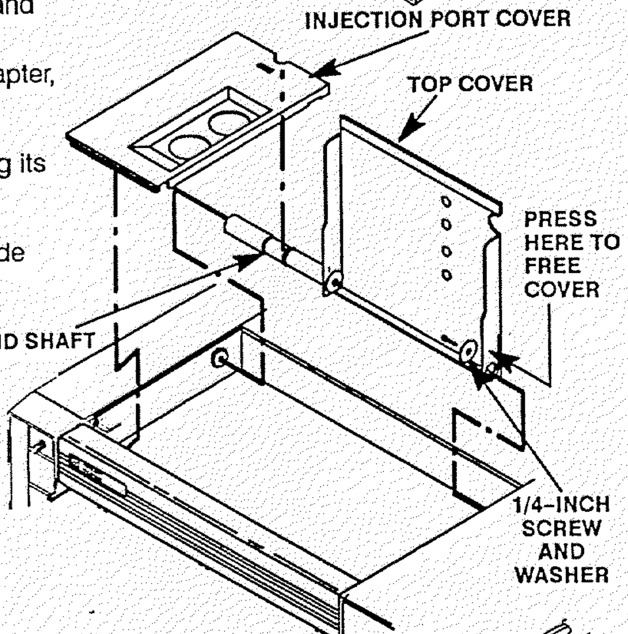
Remove/Replace Septum-Purged Packed Column Inlet

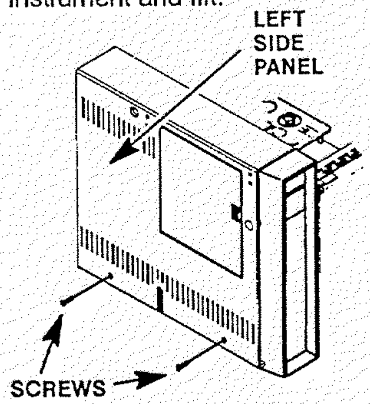
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

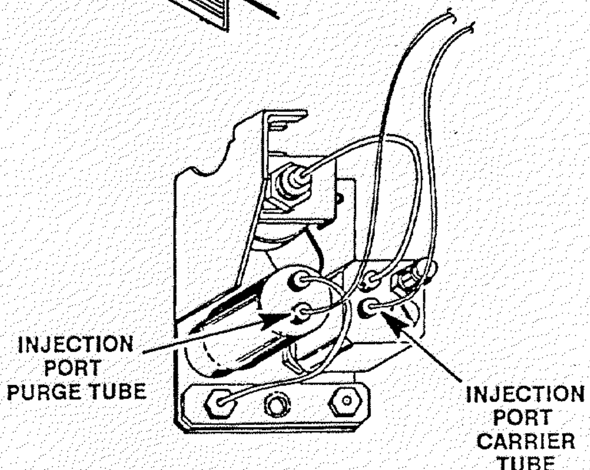


1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the inlet(s) to be removed, inside the column oven, remove the column and hardware associated with the inlet(s) (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.

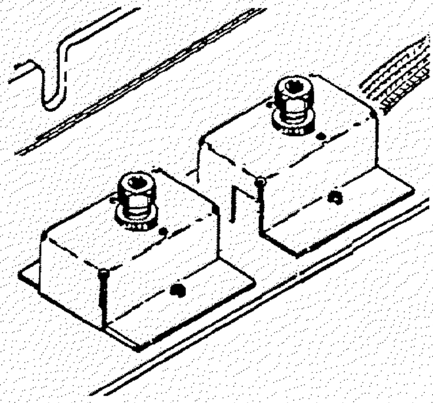




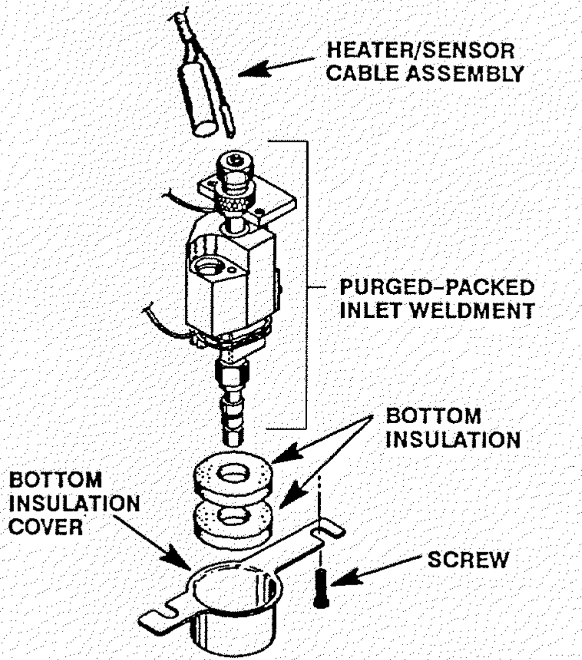
9. Disconnect the Carrier Gas Inlet (labelled “C”) which connects to a fitting either at the EFS, or at a mass flow controller mounted on the flow panel.
10. Disconnect the Septum Purge Outlet (labelled “P”) which connects to a pressure regulator (“IN” fitting) mounted on the flow panel.



11. Cap the base of the inlet.



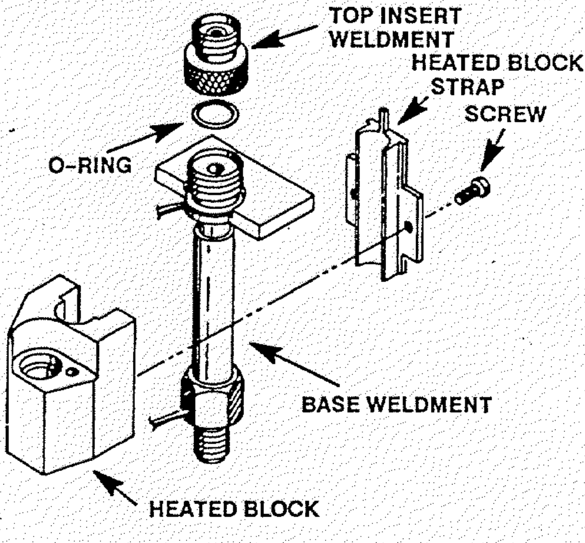
12. Remove the two screws in the top of the inlet top cover (these screws secure the inlet base weldment to the inlet top cover).
13. Use a Pozidriv screwdriver to remove the two screws securing the top cover to the instrument.
14. Lift the inlet top cover off of the inlet.
15. Remove any insulation from around the top of the inlet.
16. Lift the inlet enough to expose the heated block and heater/sensor wiring.



CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

15. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.
16. Lift the inlet out of the instrument.
17. Remove the heated block and heated block strap from the base weldment by removing two screws.
18. Remove the top insert weldment and o–ring from the base weldment.

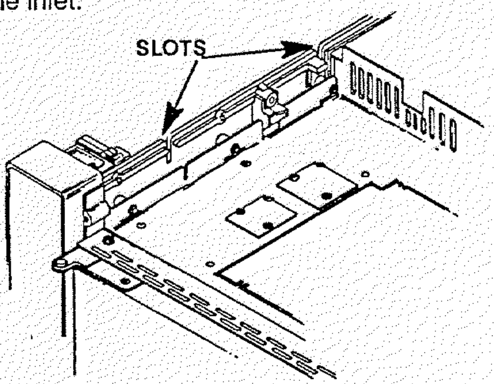


CAUTION

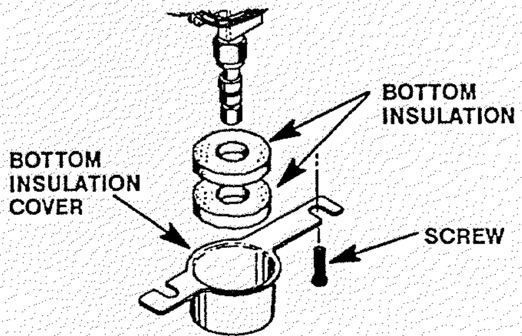
Use caution to avoid sharp bends when bending tubing. Sharp bends may crimp the tubing.

19. If the inlet base weldment is to be replaced, prepare the replacement by pre–bending its tubing into orientations similar to that of the removed inlet.
20. Secure the heated block and heated block strap to the base weldment using two screws.
21. Slide the heater and sensor cartridges into the heated block of the inlet being installed.
22. Install the top insert weldment and associated o–ring onto the base weldment, ensuring that the o–ring is installed and seated properly.

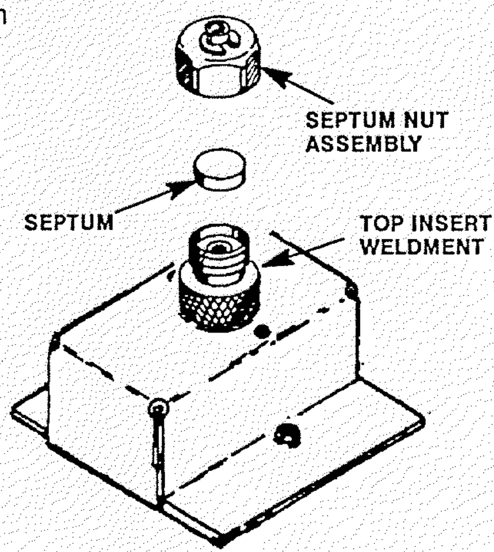
23. Carefully install the inlet into its inlet opening in the top of the instrument.
24. Replace any insulation that was removed from around the inlet.
25. Install the top cover over the inlet.
26. Secure the inlet to the top cover using two screws.
27. Secure the top cover and inlet to the instrument using two screws.
28. Bend the tubes running from the installed inlet to the inlet flow control components so that they lay within the "U"-shaped channels to the left of the inlets.



29. Install the tubes removed in steps 9 and 10.
30. Install the liner and all other hardware (except the column) removed in step 5.
31. Loosen the two screws securing the bottom insulation cover, inside the column oven.
32. Rotate the bottom insulation cover to free it and the bottom insulation from the wall of the column oven.
33. Inspect the insulation to ensure that it is in good condition. Replace if required.



34. Install the bottom insulation and bottom insulation cover on the column oven wall.
35. Tighten the two screws securing the bottom insulation cover to the column oven wall.
36. Remove the septum nut assembly from the top insert weldment.
37. Inspect the septum to insure that it is properly installed and in good condition. Replace if required.
38. Install the septum nut assembly.
39. Restore the supply gas pressure.
40. Check for leaks at all of the newly mated fittings.
41. Turn off the supply gas.
42. Remove the cap/plug from the end of the inlet.
43. Install the column and associated hardware removed in step 5.
44. Install the left side panel and secure using two screws.
45. Install the injection port cover.
46. Restore power to the HP 5890 Series II.

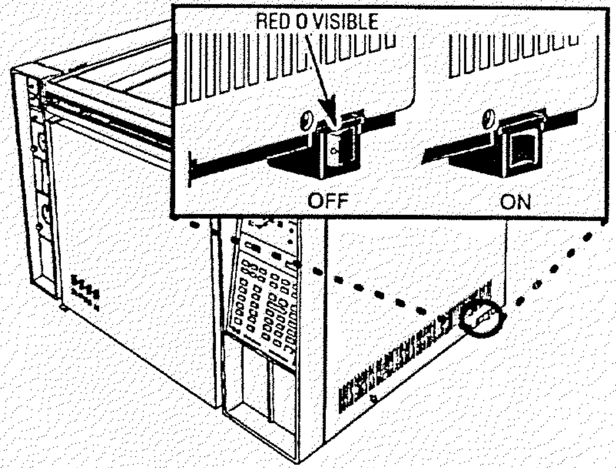


SPLIT-ONLY CAPILLARY INLET

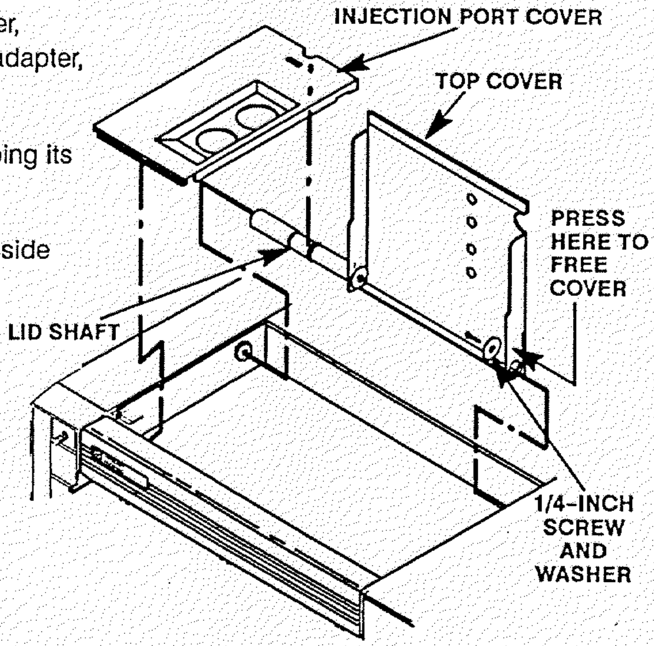
Remove/Replace Split-Only Capillary Inlet

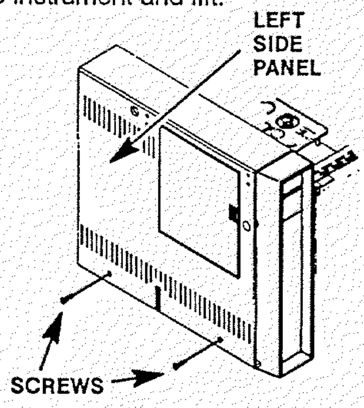
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.



1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the inlet(s) to be removed, inside the column oven, remove the column and hardware associated with the inlet(s) (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.





9. Disconnect the Carrier Gas Inlet (labelled "C") which terminates at a fitting either at the EFS, a chemical filter, or a mass flow controller mounted on the flow panel.

10. Disconnect the Septum Purge Outlet (labelled "P") which terminates at the splitless solenoid valve ("normally closed" fitting) mounted inside the flow module.

11. Disconnect the Split Vent Outlet (labelled "S") which terminates at a splitless solenoid valve (normally "open" fitting) mounted inside the flow module.

12. Remove any insulation from around the top of the inlet.

13. Detach and remove the insert assembly from the shell weldment using a ???-inch wrench.

14. Detach and remove the tubing nut from the fitting on the shell weldment.

15. Loosen the two screws securing the insulation cover inside the column oven.

16. Rotate the cover, freeing it from its securing hardware, and remove the cover and three pieces of lower insulation.

17. Remove the reducing nut, flat washer, and anealed seal, using a 1/2-inch wrench.

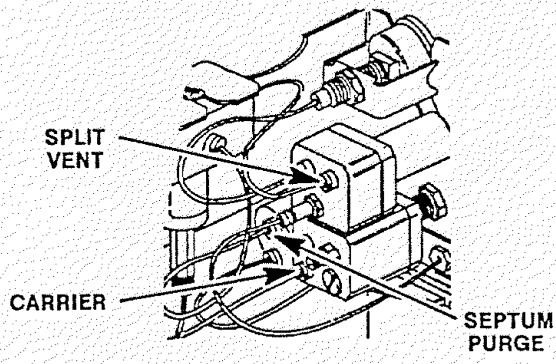
18. Use a 3/4-inch wrench to loosen (but not remove) the retaining nut below the heated block.

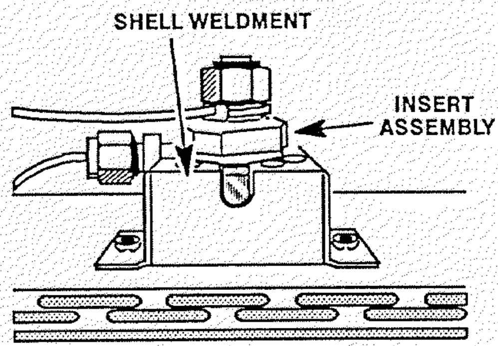
19. Use a Pozidriv screwdriver to remove the two screws securing the inlet to the instrument.

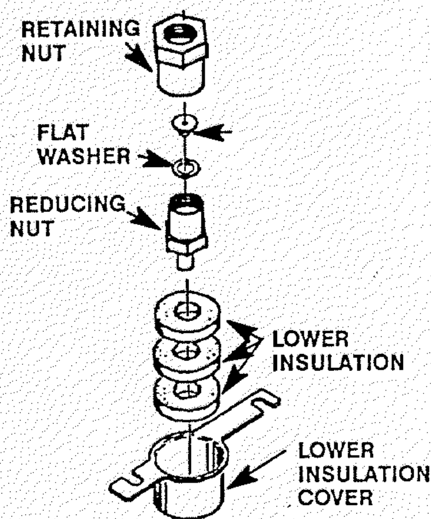
20. Gently pull the inlet up and out of its instrument cavity.

21. Remove the retaining nut loosened in step 18.

22. Slide the heated block off of the shell weldment.



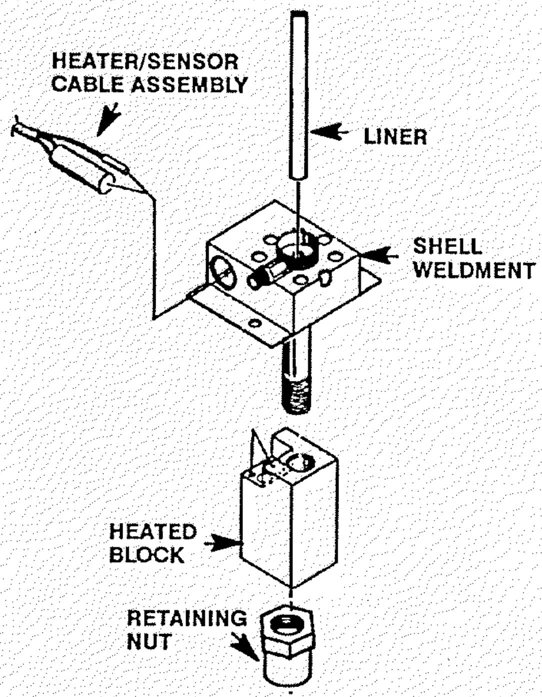




CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

23. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.



CAUTION

Use caution to avoid sharp bends when bending tubing. Sharp bends may crimp the tubing.

24. Remove any insulation from the shell weldment.

25. Remove the liner from the shell weldment.

26. If the inlet is to be replaced, prepare the replacement inlet by pre-bending its tubing into orientations similar to that of the removed inlet.

27. Install the liner in the shell weldment.

28. Install any removed insulation which wraps around the tube in the shell weldment.

30. Slide the heater and sensor cartridges into the heated block of the inlet being installed.

31. Install the heated block onto the stem of the shell weldment.

32. Install the retaining nut on the base of the shell weldment securing the heated block to the shell weldment.

33. Install any removed insulation around the heated block (within the cavity provided in the shell weldment).

34. Carefully install the inlet, securing it to the instrument with two Pozidriv screws.

NOTE

To lessen the possibility of pressure leaks, always install a new anealed seal, when the old seal has been removed.

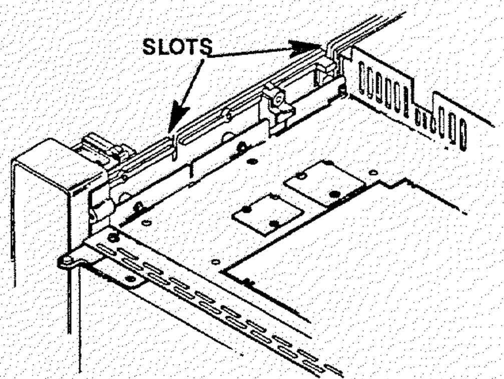
35. Tighten the retaining nut at the base of the shell weldment.

36. Install the reducing nut, flat washer, and anealed seal onto the base of the retaining nut.

37. Install the lower insulation cover and three pieces of lower insulation, inside the column oven.

38. Tighten the two screws which secure the lower insulation cover inside the column oven.

39. Replace any insulation that was removed from around the inlet.



40. Bend the tubes running from the new insert assembly and split vent tube to the inlet flow control components so that they lay within the "U"-shaped channels to the left of the inlets.

41. Install the tubes removed in steps 9 through 11.

42. Install the insert assembly on the shell weldment and secure using a ???-inch wrench.

43. Install the tubing nut (and associated split vent tube) on the shell weldment and secure using a 1/2-inch wrench.

44. Install the liner in the shell weldment.

45. Install a cap or plug on the end of the inlet (inside the column oven).

46. Restore the supply gas pressure.

47. Check for leaks at all of the newly mated fittings.

48. Turn off the supply gas.

49. Remove the cap/plug from the end of the inlet.

50. Install the column and associated hardware removed in step 5.

51. Install the left side panel and secure using two screws.

52. Install the injection port cover.

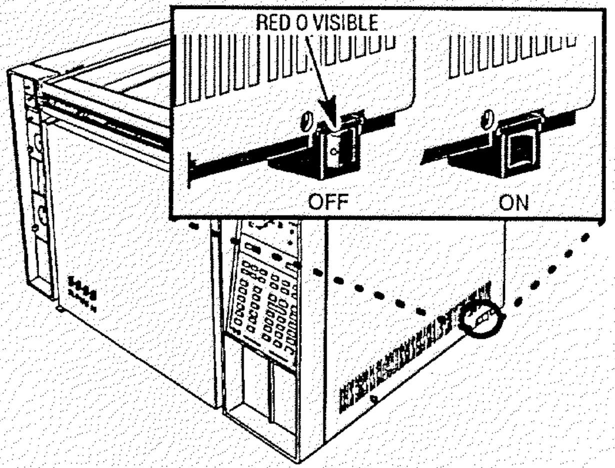
53. Restore power to the HP 5890 Series II.

SPLIT/SPLITLESS CAPILLARY INLET

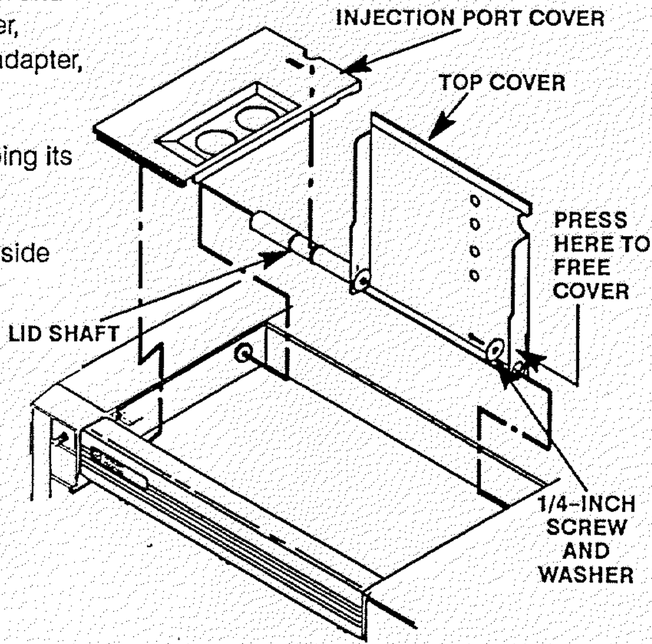
Remove/Replace Split/Splitless Capillary Inlet

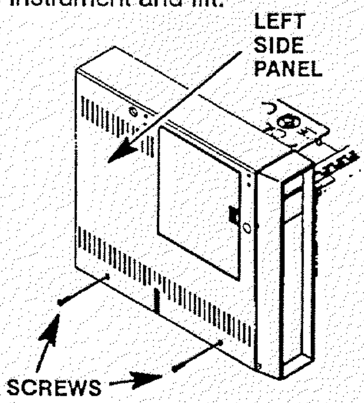
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

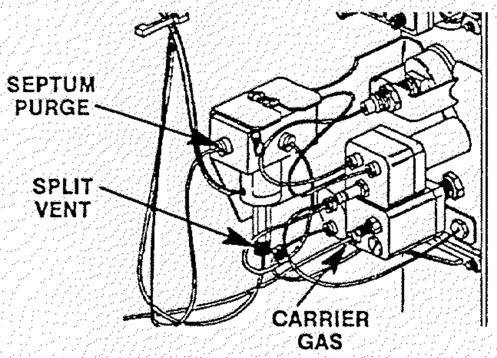


1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the inlet(s) to be removed, inside the column oven, remove the column and hardware associated with the inlet(s) (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.



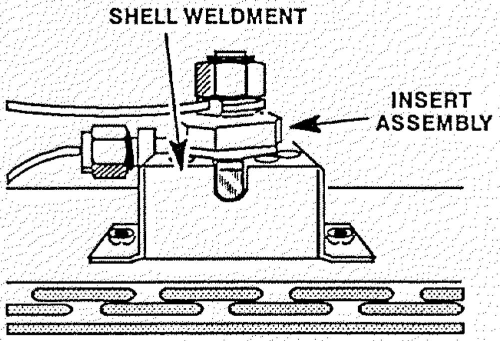


9. Disconnect the Carrier Gas Inlet (labelled "C") which terminates at a fitting either at the EFS, a chemical filter, or a mass flow controller mounted on the flow panel.



10. Disconnect the Septum Purge Outlet (labelled "P") which terminates at the splitless solenoid valve ("normally closed" fitting) mounted inside the flow module.

11. Disconnect the Split Vent Outlet (labelled "S") which terminates at a splitless solenoid valve (normally "open" fitting) mounted inside the flow module.



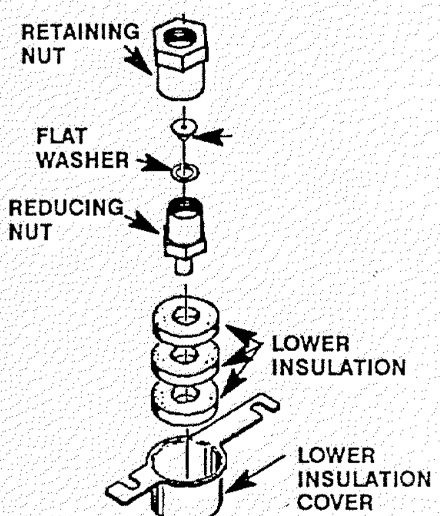
12. Remove any insulation from around the top of the inlet.

13. Detach and remove the insert assembly from the shell weldment using a ???-inch wrench.

14. Detach and remove the tubing nut from the fitting on the shell weldment.

15. Loosen the two screws securing the insulation cover inside the column oven.

16. Rotate the cover, freeing it from its securing hardware, and remove the cover and three pieces of lower insulation.



17. Remove the reducing nut, flat washer, and anealed seal, using a 1/2-inch wrench.

18. Use a 3/4-inch wrench to loosen (but not remove) the retaining nut below the heated block.

19. Use a Pozidriv screwdriver to remove the two screws securing the inlet to the instrument.

20. Gently pull the inlet up and out of its instrument cavity.

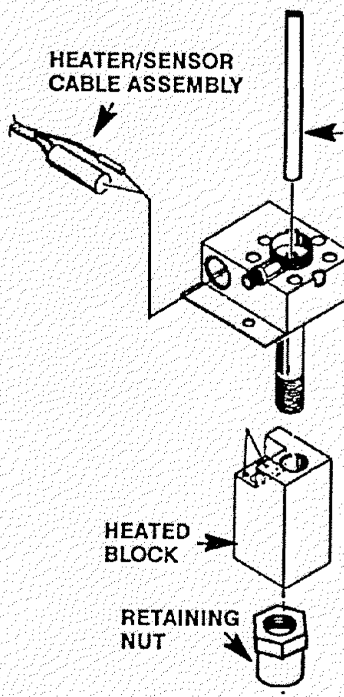
21. Remove the retaining nut loosened in step 18.

22. Slide the heated block off of the shell weldment.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

23. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.



CAUTION

Use caution to avoid sharp bends when bending tubing. Sharp bends may crimp the tubing.

24. Remove any insulation from the shell weldment.

25. Remove the liner from the shell weldment.

26. If the inlet is to be replaced, prepare the replacement inlet by pre-bending its tubing into orientations similar to that of the removed inlet.

27. Install the liner in the shell weldment.

28. Install any removed insulation which wraps around the tube in the shell weldment.

30. Slide the heater and sensor cartridges into the heated block of the inlet being installed.

31. Install install the heated block onto the stem of the shell weldment.

32. Install the retaining nut on the base of the shell weldment securing the heated block to the shell weldment.

33. Install any removed insulation around the heated block (within the cavity provided in the shell weldment).

34. Carefully install the inlet, securing it to the instrument with two Pozidriv screws.

NOTE

To lessen the possibility of pressure leaks, always install a new anealed seal, when the old seal has been removed.

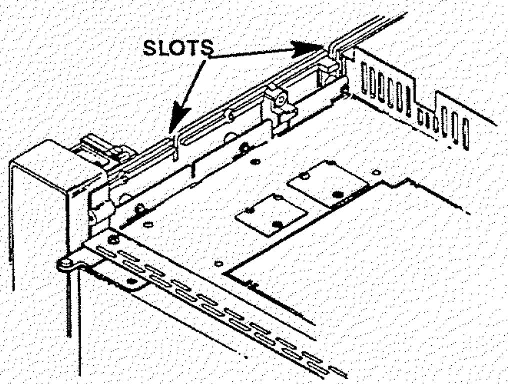
35. Tighten the retaining nut at the base of the shell weldment.

36. Install the reducing nut, flat washer, and anealed seal onto the base of the retaining nut.

37. Install the lower insulation cover and three pieces of lower insulation, inside the column oven.

38. Tighten the two screws which secure the lower insulation cover inside the column oven.

39. Replace any insulation that was removed from around the inlet.



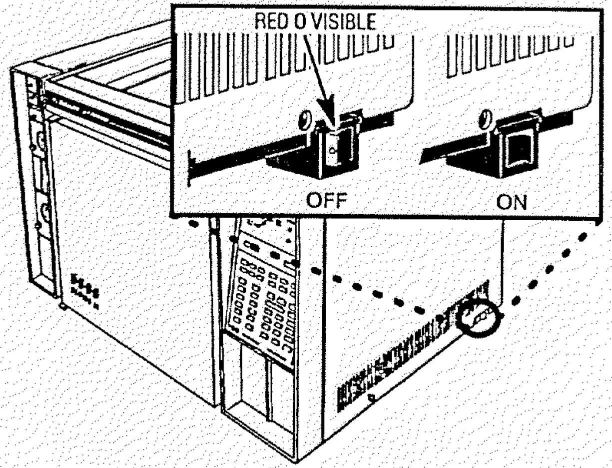
40. Bend the tubes running from the new insert assembly and split vent tube to the inlet flow control components so that they lay within the "U"-shaped channels to the left of the inlets.
41. Install the tubes removed in steps 9 through 11.
42. Install the insert assembly on the shell weldment and secure using a ???-inch wrench.
43. Install the tubing nut (and associated split vent tube) on the shell weldment and secure using a 1/2-inch wrench.
44. Install the liner in the shell weldment.
45. Install a cap or plug on the end of the inlet (inside the column oven).
46. Restore the supply gas pressure.
47. Check for leaks at all of the newly mated fittings.
48. Turn off the supply gas.
49. Remove the cap/plug from the end of the inlet.
50. Install the column and associated hardware removed in step 5.
51. Install the left side panel and secure using two screws.
52. Install the injection port cover.
53. Restore power to the HP 5890 Series II.

PROGRAMMABLE COOL ON COLUMN INLET (PCOC)

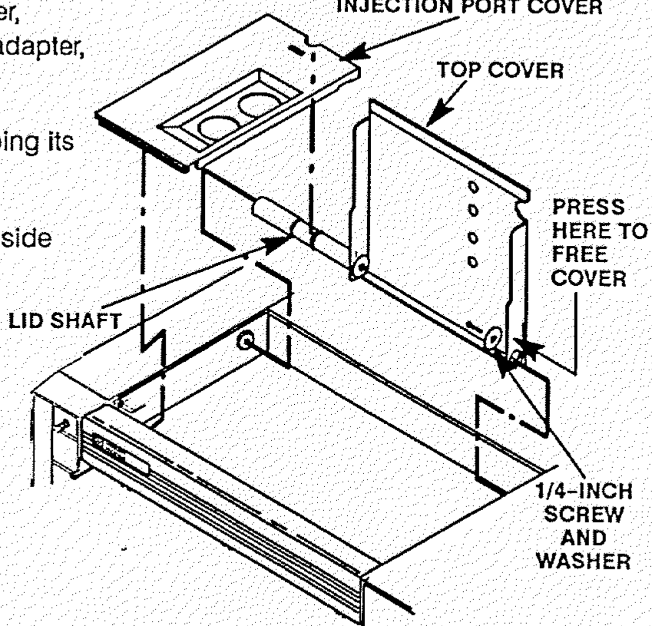
Remove/Replace PCOC Inlet

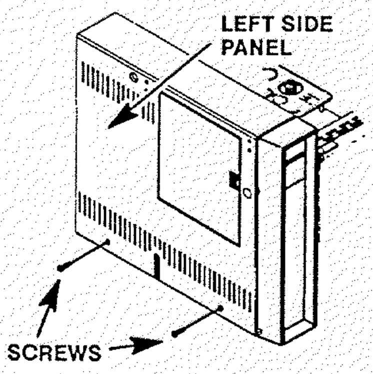
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

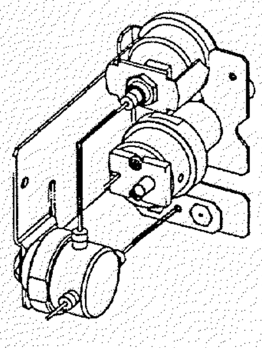


1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the inlet(s) to be removed, inside the column oven, remove the column and hardware associated with the inlet(s) (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.



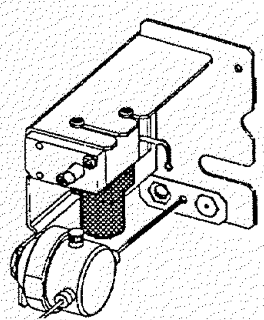


9. Disconnect the Carrier Gas Inlet which terminates either at the Forward Pressure Regulator (for Manual Pressure Control) or the PCOC Proportional Control Valve (for Electronic Pressure Control).

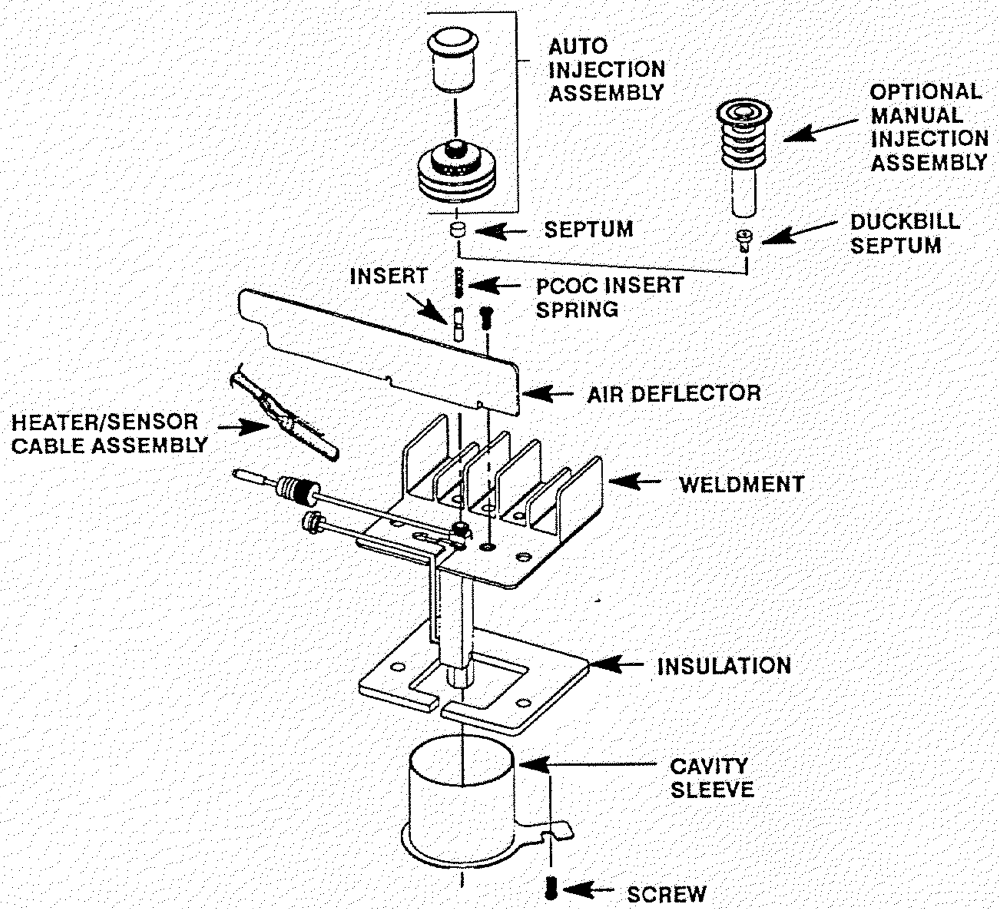


10. Disconnect the Septum Purge Outlet which terminates at the PCOC Purge Regulator, mounted inside the flow module.

11. Cap the base of the inlet, inside the column oven.



12. Remove the auto-injection assembly (or optional manual injection assembly) by rotating it counter-clockwise). Be careful not to loose the septum, insert, or PCOC insert spring which are installed under the injection assembly.



13. Remove the air deflector using a Pozidriv screwdriver to remove the screw securing the air deflector to the inlet weldment.

CAUTION

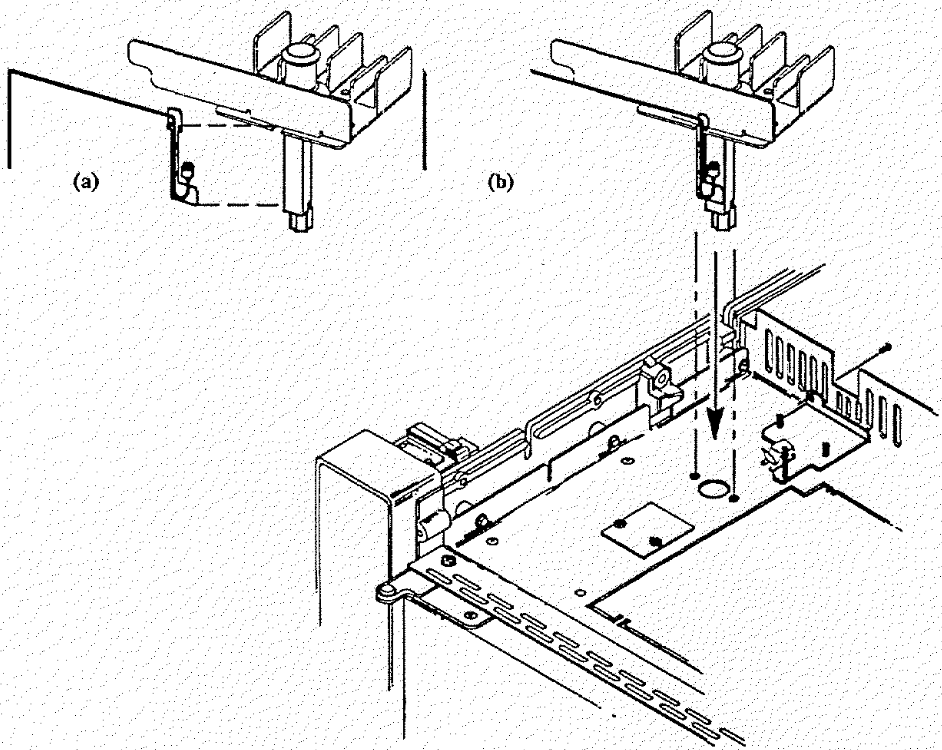
Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

14. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.

15. Use a Pozidriv screwdriver to remove the two screws securing the inlet to the instrument.

16. Lift the inlet enough to expose the heated block.

17. If installed, remove the cryo-blast tube from the inlet weldment.



18. Remove any insulation from around the inlet.

CAUTION

Use caution to avoid sharp bends when bending tubing. Sharp bends may crimp the tubing.

19. If the inlet is to be replaced, prepare the replacement inlet by pre-bending its tubing into orientations similar to that of the removed inlet.

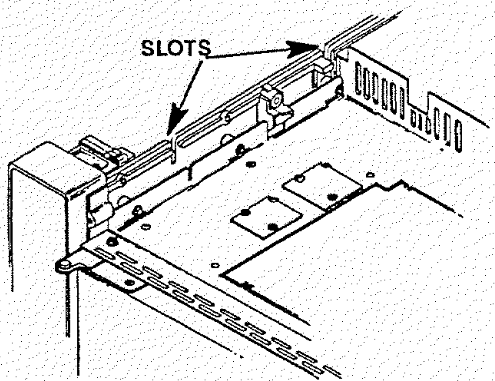
20. Replace any insulation that was removed from around the inlet.

21. Bend the tubes running from the installed inlet to the inlet flow control components so that they lay within the "U"-shaped channels to the left of the inlets.

22. Install the tubes removed from the employed flow controller in steps 9 and 10.

23. If employed, install the cryo-blast weldment onto the inlet weldment.

24. Secure the inlet to the instrument using two screws.



CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

25. Carefully slide the heater and sensor cartridges into the heated block portion of the inlet.

26. Install the air deflector and secure it to the weldment using one screw.

27. Install the injection assembly, septum,PCOC insert spring, and insert (the injection assembly secures the other items to the inlet weldment).

28. Install the liner and all other hardware (except the column) removed in step 5.

29. Restore the supply gas pressure.

30. Check for leaks at all of the newly mated fittings.

31. Turn off the supply gas.

32. Remove the cap/plug from the end of the inlet.

33. Install the column and associated hardware removed in step 5.

34. Install the left side panel and secure using two screws.

35. Install the injection port cover.

36. Restore power to the HP 5890 Series II.

INJECTION PORT COOLING FAN

Remove/Replace Cooling Fan

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.

NOTE

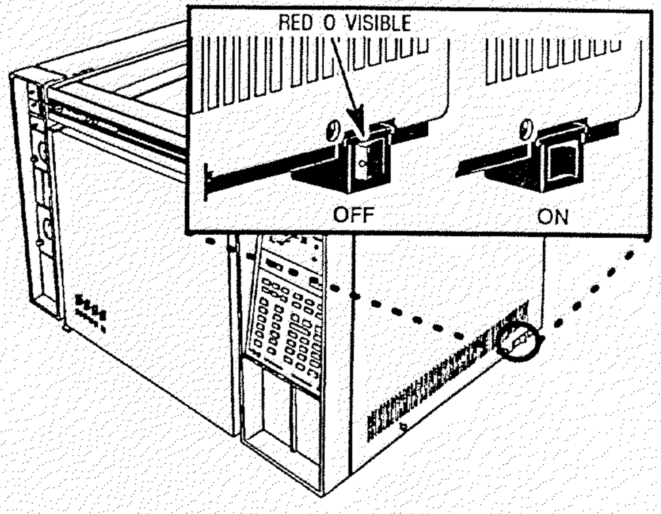
If an autosampler is installed, the injection port cover will not be present.

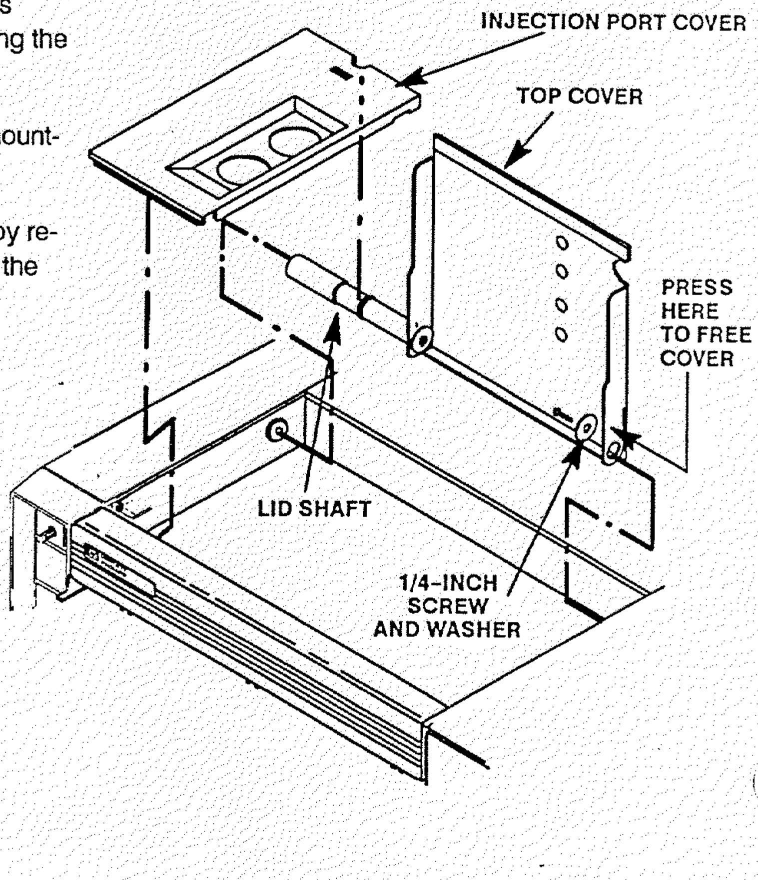
3. Remove the injection port cover by grasping its back edge and lifting it upward.
4. If an autosampler is installed on the instrument, it will be necessary to remove it and its mounting bracket to allow removal of the left side cover as follows:

   a. Remove the autosampler tray from its mounting bracket by first simultaneously lifting and turning the two tray locks which hold it in position, then sliding the tray away from the instrument.

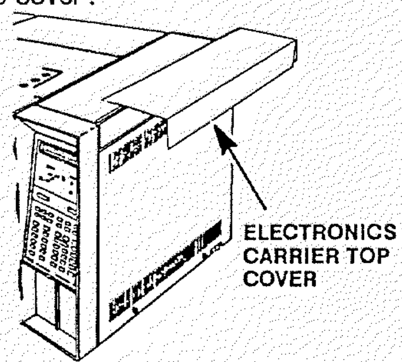
   b. Lift the autosampler tray from its mounting bracket and set it aside.

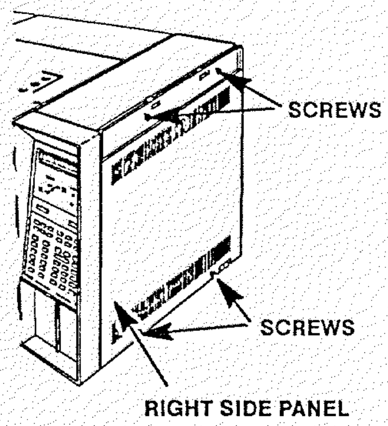
   c. Remove the autosampler bracket by removing the 6 screws securing it to the instrument.





5. Remove the electronics carrier top cover .



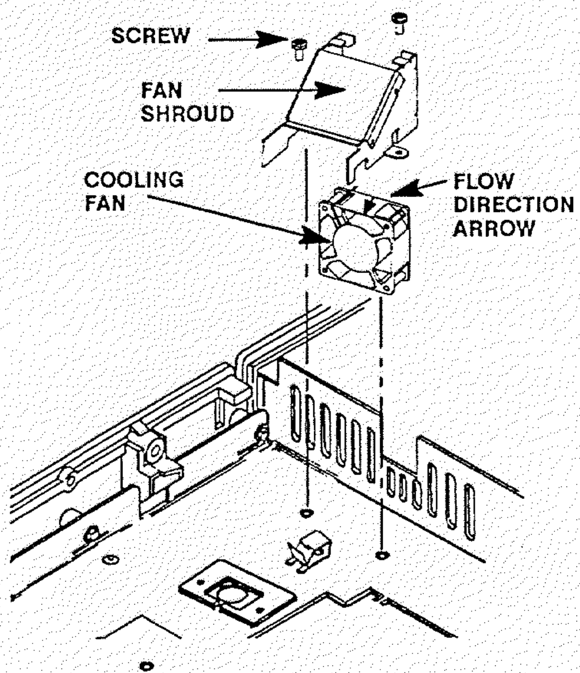


6. Remove the right side panel by removing four screws: two each along its top and bottom edges.

7. Remove the back cover of the instrument by removing four screws and sliding the cover off of the rear of the instrument.

8. Remove the PCOC fan cover by removing the two screws securing it to the instrument. (Removal of the fan cover frees the fan.)

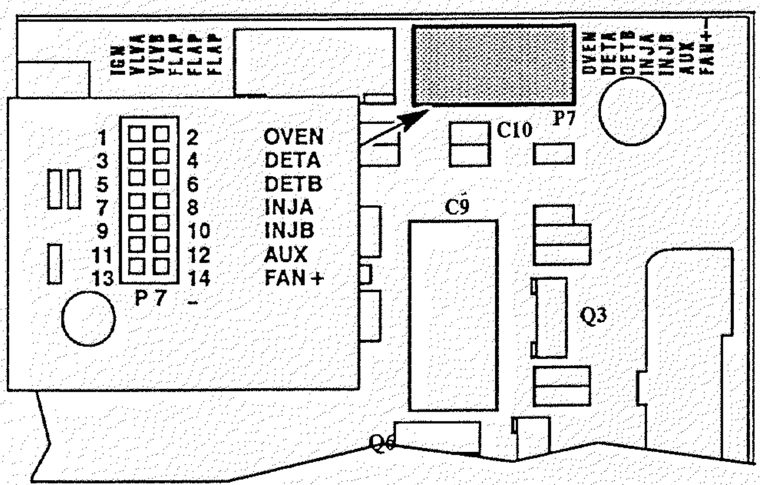
9. Trace the fan power wires to there destination at connector P7 on the main PCB (exposed right side of instrument).



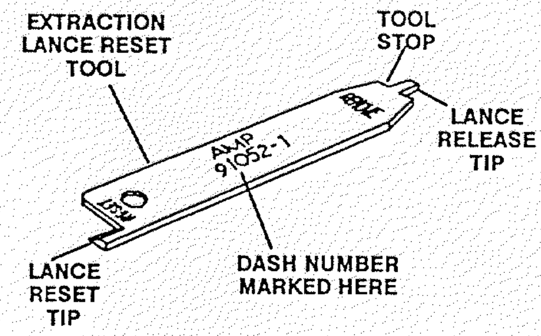
CAUTION

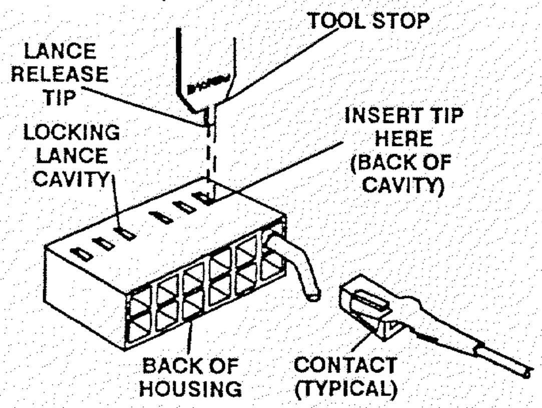
WHEN DISCONNECTING A PLUG, PULL ON THE PLUG NOT ON ITS WIRES. PULLING ON THE WIRES MAY CAUSE BREAKAGE.

10. Disconnect connector P7 from its receptacle by pulling it straight off. (Heated zones corresponding to sensor lead locations are labeled to the right of the P7 connector receptacle on the main PCB.)



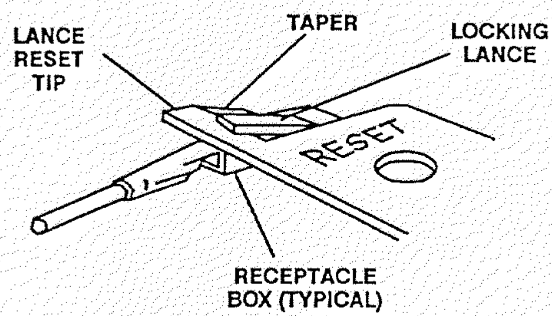
11. Use the lance release tip of an AMP pin extraction/lance reset tool (8710-1542) to remove the appropriate pins from connector P7. (The tool features a lance release tip and a lance reset tip. The lance release tip is used to depress the pin locking lance to extract the pin from a connector. The lance reset tip positions a locking lance to its proper height to ensure retention of the pin in the connector.)





12. Prepare the pins corresponding to the replacement fan by adjusting their locking lances using the lance reset portion of the tool.

13. Insert the pins for the replacement fan into their appropriate locations in the plug, making sure the locking lance on each pin seats into its hole through the side of the plug.



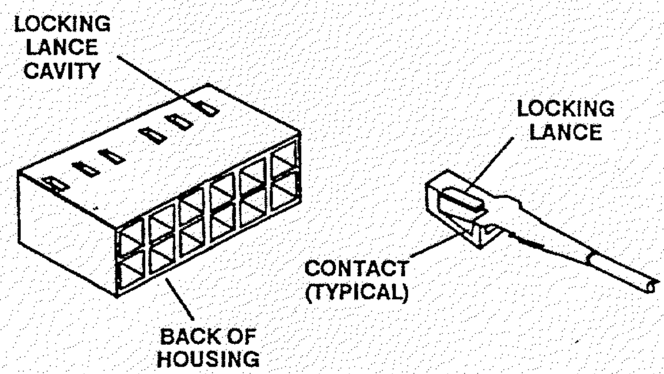
14. Gently pull on the wire to ensure that the pin is locked in the connector.

15. Insert connector P7 into its corresponding receptacle on the main PCB.

16. Install the new fan and fan cover and secure using two screws.

17. Install the rear panel and secure it to the instrument using four screws.

18. Install the right side panel and secure using four screws.



19. Install the electronics carrier top cover.

20. If removed, install autosampler and associated bracketry.

21. Install the injection port cover.

22. Restore power to the instrument.

Section 3

FLOW/PRESSURE CONTROL COMPONENTS

FLOW/PRESSURE CONTROL COMPONENTS

Flow and pressure control components include pressure regulators, pressure gauges, mass flow controllers, capillary solenoid valves, detector flow manifold blocks, and the Electronic Flow Sensor (EFS) module. There are many options available for the HP 5890 Series II. Maintenance procedures for the most common items found in the instrument. Procedures are supplied to remove, replace, and/or clean various subassemblies, based on the current maintenance philosophy, i. e., to allow replacement of the lowest level components applicable for a particular assembly.

Specific part numbers are not given in this section. For all replacement part numbers, refer to Sections 3 and 4 of the IPB portion of this document (Detector Flow Manifold Assemblies and Injection Port Flow/ Pressure Control Modules, respectively).

This document is not meant to provide instruction for first time installation of any of the options discussed. Add–on sheets exist for just this purpose, and should be referenced when performing a first time installation.

TABLE OF CONTENTS

PCOC EPC/MPC TROUBLESHOOTING

The Programmable Cool On Column (PCOC) injection port is designed to allow the injection syringe to admit sample directly into the capillary column(320, 200, 100 micron id). This is accomplished by the use of an insert which serves to align the syringe with the capillary column and make a seal with both the column and the syringe needle. Maximum sample volumes are smaller compared with other inlets, typically in the range of 0.5 microlitre to 2.0 microlitre. The ideal volume depends on the column id, the compatibility of the sample solvent and the stationary phyase, sample concentration, stationary phase film thickness, and column flow rate. Usually the smaller the sample the better, providing that sensitivity requirements are met.

The Programmable Cool On Column injection port operates by forward pressure control of the inlet and the inclusion of a preset foward pressure contolled septum purge vent carries septum bleed out to vent.

A typical example of pressure setting and associated flows would be: 50psi for the carrier with a setting of 10 to 20psi in the injection port. This will also yeild a 10 to 20 ml/min septum purge vent flow.

Expected ranges of operation follow:

Temperature Control

Range: Ambient +4 Degrees C to 450 Degrees C
Temperature Programming: 0 to 100 Degrees c/minute
Typical Cooling Rate:
oven fan only(Standard) 10.5 mins
CO_2 Cryo Blast 7.5 mins
LN_2 Cryo Blast 4.5 mins
Oven Track Mode(Standard): Injection prot temperature is adjusted real time to lead oven temperature program by 3 Degrees C.

Pressure Control

Range: 1 to 100 psi
Flow range(dependent on column): 10-250 ml/min
Pressure Programming: 0.01 to 99psi/minute
Retention Time Reproducibility 0.001 - 0.004 minutes.*
*Average performance for C10 - C40 hydrocarbon mixture. Most compounds 0.001 - 0.002 minute
Repeatability of Set Point Values <0.050psi(0.35kPa)
Stability over 72 hours <0.060 psi (0.42kPa)
Pressure Noise (high frequency) <0.025psi (0.17kPa)
Average Linearity(2-80psi) <0.100psi (0.7kPa)
Midrange Accuracy(20-40psi) <0.050psi(0.35kPa)

Pressure recovery after system disturbance

Repeatability of set point value agter septum change and 5-minute equilibration
1. Manual Pressure Control: 0.1-0.2psi(0.7-1.4kPa)
Electronic Pressure Control: 0.050psi(0.35kPa)

Manual Pressure Control 1 minute to 99%
12 hours to 100%

Electronic Pressure Control 1 second to 99%

Safety Shutdown (Standard): If the system is unable to reach or maintain pressure set point value after 45 seconds the following 3 things happen. The alarm relay is triggered and the alarm sounds immediately. Pressure Control Valve shuts off all but a few ml/min of flow (bypass flow still permitted). The oven and all heated zones are shut down.

This is a Fatal Error. The only way to recover is to power cycle the GC. If the leak has not been fixed, the same sequence will repeat.

The Column head pressure may be controlled by either of two systems, Manual Presure Control (MPC) or Electronic Pressure Control (EPC)

The MPC in an uncomplicated system consisting of 1) a manually adjustable forward pressure regulator which sets the pressure in the inlet and 2) a factory preset forward pressure regulator allowing 10 to 20 ml/min to escape to vent pulling septum bleed with it.

Possible failures could include pluged restrictor in the inlet to the FPR. This would prevent the inlet from reaching pressure setpoint. The FPR could be stuck open allowing the injection port to go to the same pressure as the source gas tank. It could be stuck in the closed position preventing the injection point from reaching the setpoint. Leaks in any of the tubing connections would also prevent the injection port from reaching or maintaining pressure setpoint. Leaks at the Septum, Column fitting, Septum Purge Control, Column Head Pressure gage or Purge Vent restrictor could also make injection port pressure control difficult. These leaks should be checked by capping off the injection port or suspected part to isolate it rather then using soap solution leak detection fluid.

The EPC uses a digitally controlled proportional control valve and electronic presssure transducer to perform the same functions as the MPC's manual forward pressure control and column head pressure gage. One additional feature of the EPC is a bypass flow line designed to protect the column with a small flow (.1 to 3 ml/min) in the event that the proportional control valve or electronics would fail. The same plugging or leak considerations as the MPC apply with the addition of the possiblity of electronic failures to either the proportional valve, pressure transducer or electronic control board. These will be verified by substitution.

Symptoms and possible causes

Not enough pressure.

1. Septum leaks or is missing
2. Column is broken
3. Column ferrule seal leaks
4. Gas supply is off
5. Supply pressure may not be achieveable with the column is use.

Pressure goes to 0 or max.

1. Configuration is wrong

Not Ready light flickers
(oscillating pressure)

1. Septum and/or column connection leaks.
2. Pressure set higher than the operating limit

Not Ready light flickers
(oscillating temperature)

1. Configuration is wrong
2. Inlet temperature equilibration time too short.

Pressure and Temperature are not controllable

Configuration is wrong

No flow and high zero

1. Pressure transducer probably defective.

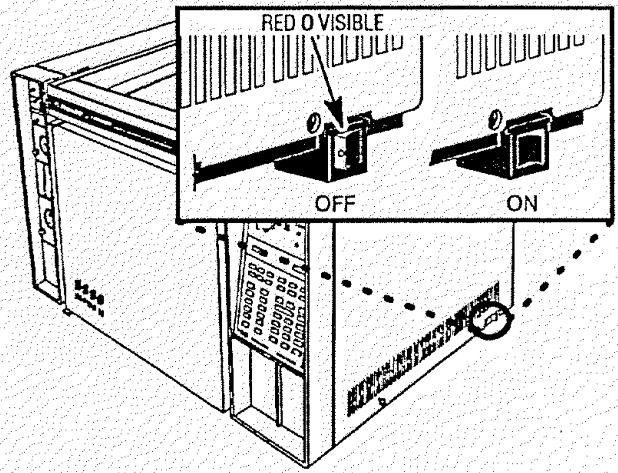
Background Zero < 6psi

1. Possible problem with either EPC pressure transducer or EPC control bd.

Remove/Replace Inlet Flow Control Components

WARNING

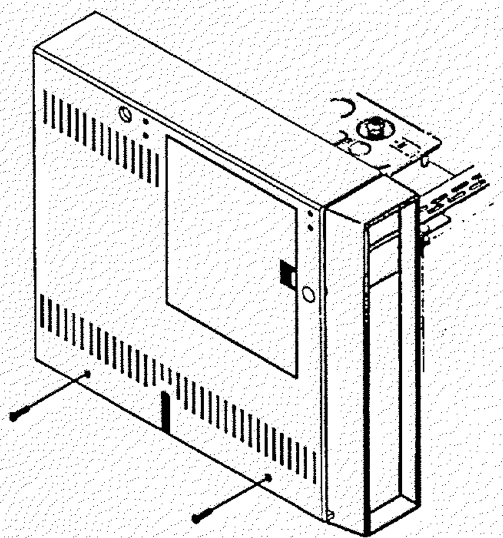
- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- FLAME IONIZATION (FID) AND NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.



NOTE

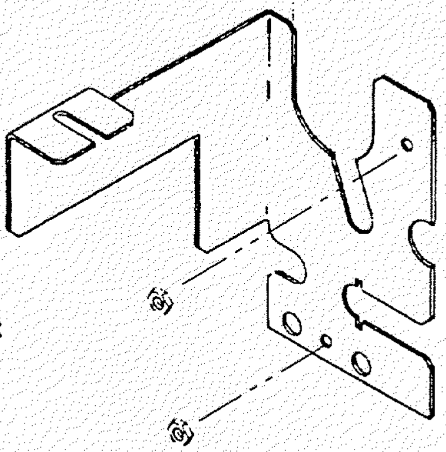
This procedure applies to the packed, purged packed, split/splitless, and split only inlets. Separate procedures exist for removal/replacement of the PCOC Electronic Pressure Control (EPC) flow module and the PCOC Manual Pressure Control (MPC) flow module. A separate procedure also exists for replacement of the split/splitless capillary inlet solenoid valve.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
6. Remove the two screws securing the left side panel along its bottom edge.
7. Slide the left side panel towards the rear of the instrument and lift.
8. Disconnect plumbing fittings as necessary to remove the flow module from the instrument. (The hydrogen lines are painted red at their ends. Remember which line is installed at each fitting; draw a diagram if necessary.)



9. Remove two nuts securing the flow module to the mainframe (one next to the pressure gauge, and one at the lower edge of the module).

10. Once the flow module is clear of the instrument, replace the flow control component desired.



FLOW MODULE BRACKET (TYPICAL)

CAUTION

When connecting lines and fittings, ensure that all o-rings are properly installed.

11. Install the flow module in the instrument.

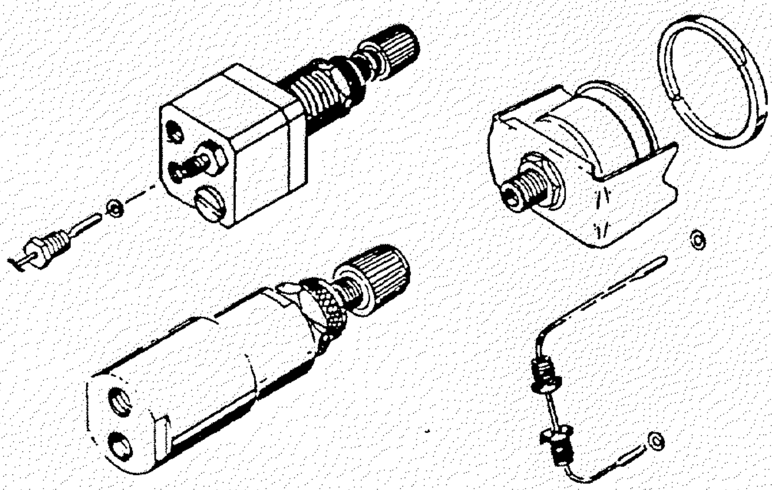
12. Connect the plumbing removed in step 8.

13. Restore all gas supplies.

14. Leak check all installed fittings.

15. If the system is leak-free, install the left side panel and secure using two screws.

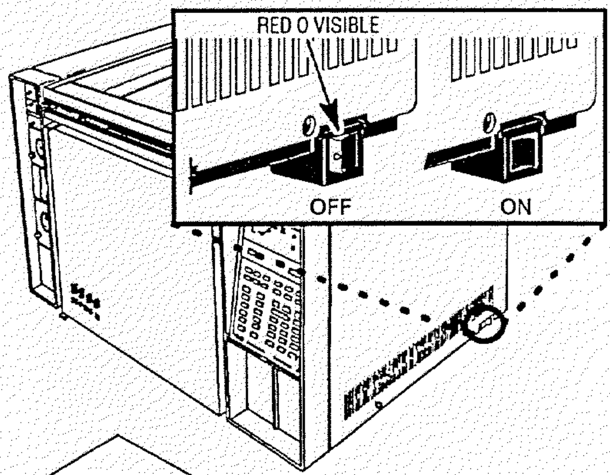
16. Restore power to the instrument.



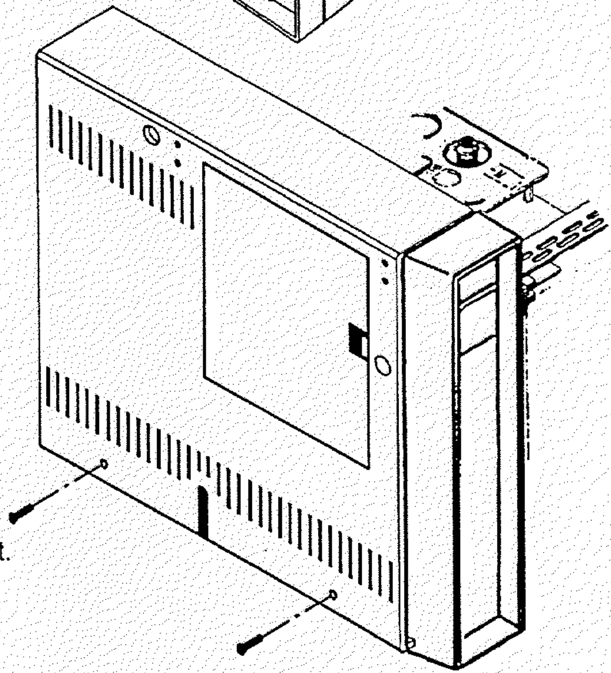
Remove/Replace Split/Splitless Capillary Inlet Solenoid Valve

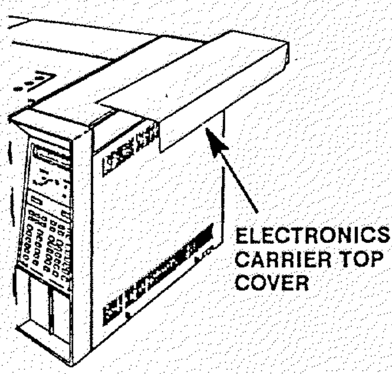
WARNING

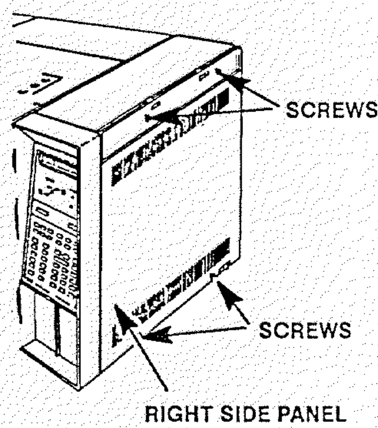
- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID) AND NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

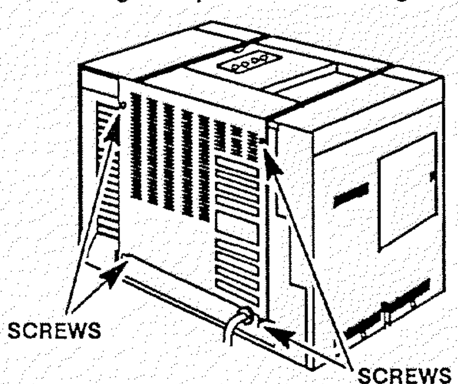


1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the two screws securing the left side panel along its bottom edge.
6. Slide the left side panel towards the rear of the instrument and lift.
7. Remove the four screws securing the rear cover to the instrument.
8. Slide the rear cover towards the rear of the instrument.
9. Remove the electronics carrier top cover (above the signal cable plugs and receptacles to expose the top edge of the TCD detector PCB).
10. Remove the right side panel by removing four screws: two each along its top and bottom edges.



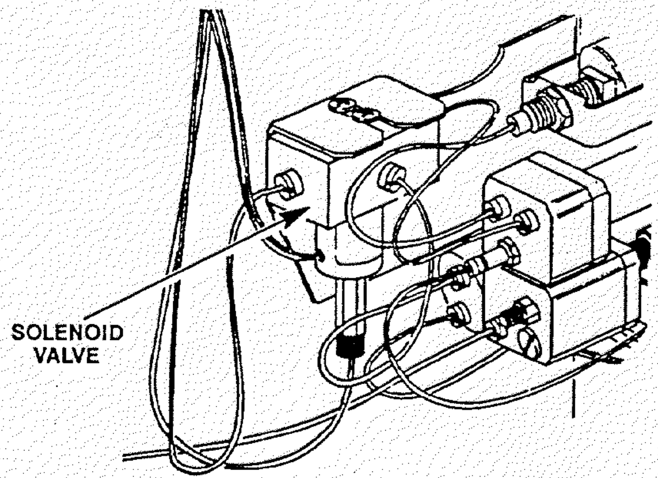






11. Locate the solenoid valve (on the flow control bracket at the lower left side of the instrument).

12. Disconnect all plumbing from the solenoid valve. (Label the tubes, noting the valve fittings to which they connect, to facilitate easy assembly.



13. Loosen the two screws securing the solenoid valve to the flow control mounting bracket

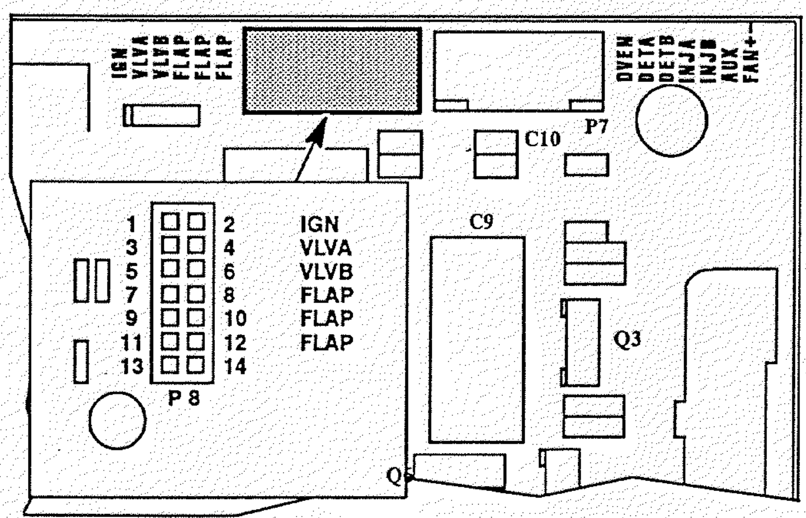
14. Remove the solenoid valve from the flow control bracket.

15. Install the replacement solenoid valve in the same location and orientation as the old one.

16. Secure the solenoid valve to the flow control bracket by tightening two screws.

17. Trace and free the solenoid valve electrical leads along their path to the P8 connector at the upper right corner of the main PCB.

18. Route the leads for the new solenoid valve along the same path, securing them with plastic wire ties.

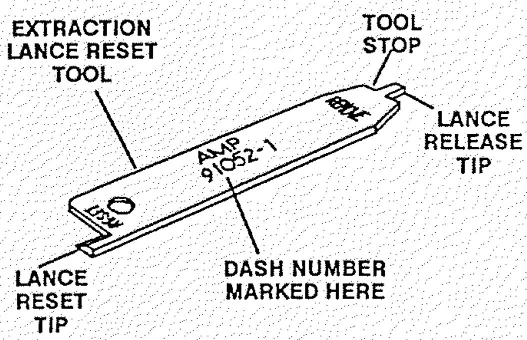


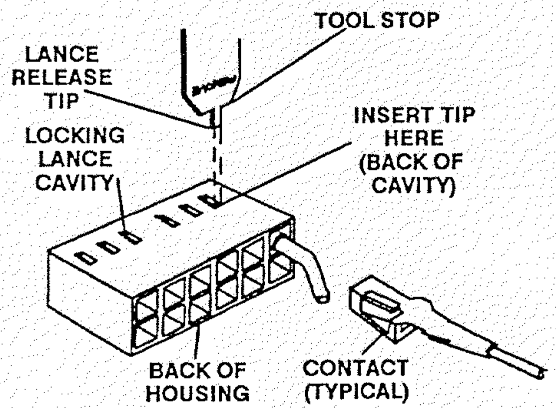
CAUTION

When removing a connector from a receptacle, pull on the connector not on its wires. Pulling on the wires may cause breakage.

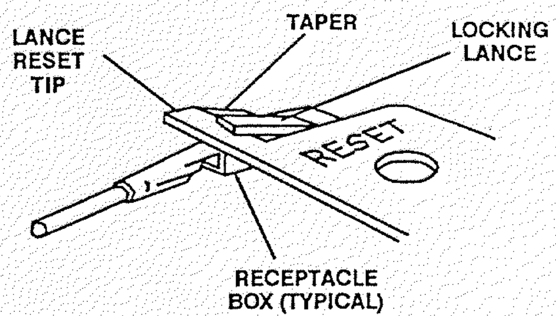
19. Disconnect connector P8 from its associated connector on the main PCB by pulling it straight out.

20. The solenoid valve leads are connected to either the VLVA or VLVB outputs of connector P8. Use the lance release tip of an AMP pin extraction/ lance reset tool (8710-1542) to remove the appropriate pins from connector P8. (The tool features a lance release tip and a lance reset tip. The lance release tip is used to depress the pin locking lance to extract the pin from a connector. The lance reset tip positions a locking lance to its proper height to ensure retention of the pin in the connector.)

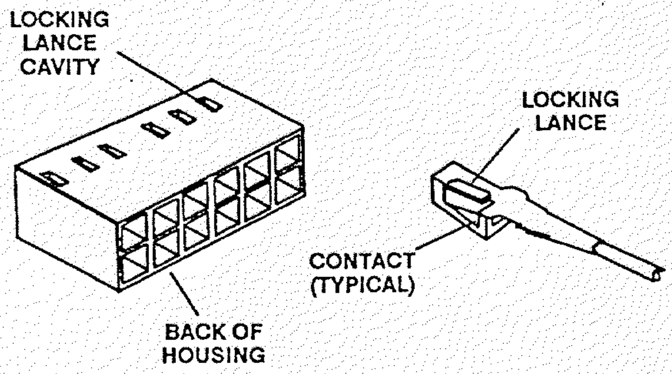




21. Prepare the pins corresponding to the replacement sensor cartridges by adjusting their locking lances using the lance reset portion of the tool.



22. Insert the pins for the replacement sensor into their appropriate locations in the plug, making sure the locking lance on each pin seats into its hole through the side of the plug.



23. Gently pull on the wire to ensure that the pin is locked in the connector.

24. Insert connector P8 into its receptacle by pressing it straight in until it bottoms.

CAUTION

When connecting lines and fittings, ensure that all o-rings are properly installed.

25. Connect the plumbing to the new valve.

26. Restore gas supplies to the instrument.

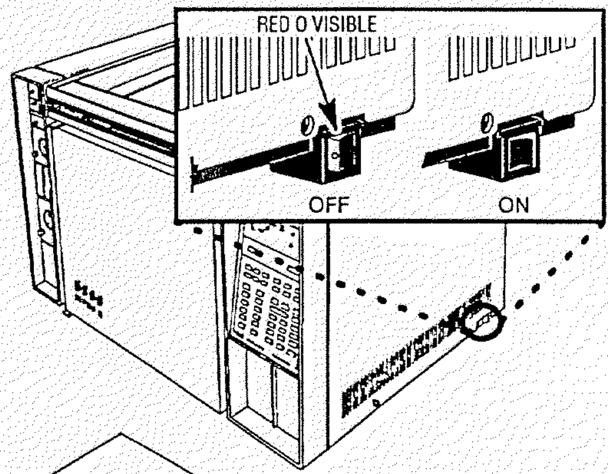
27. Check for leakage at all installed fittings.

28. If the system is leak-free, verify operation of the split/splitless system by operating the solenoid valve via the keyboard.

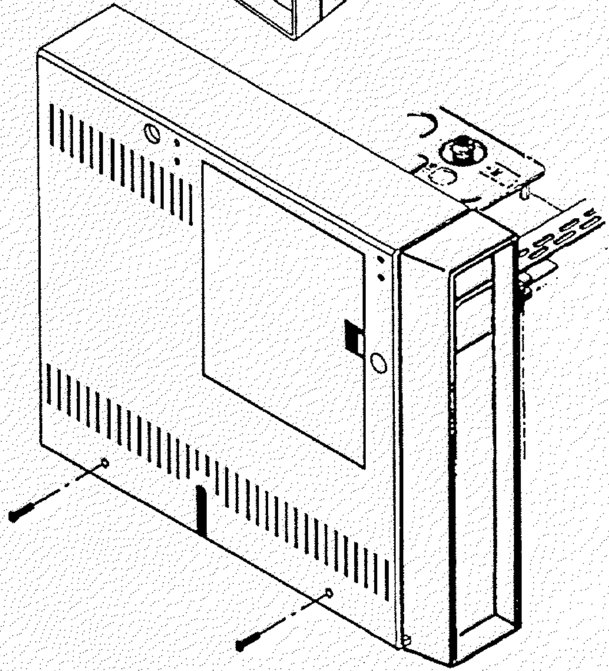
Remove/Replace Electronic Pressure Control (EPC) Components

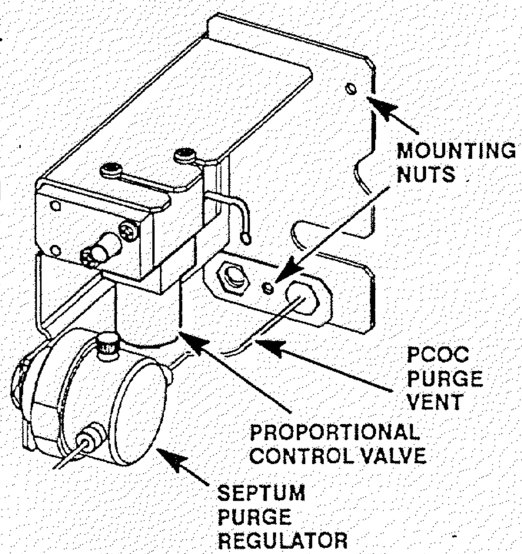
WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID) AND NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**



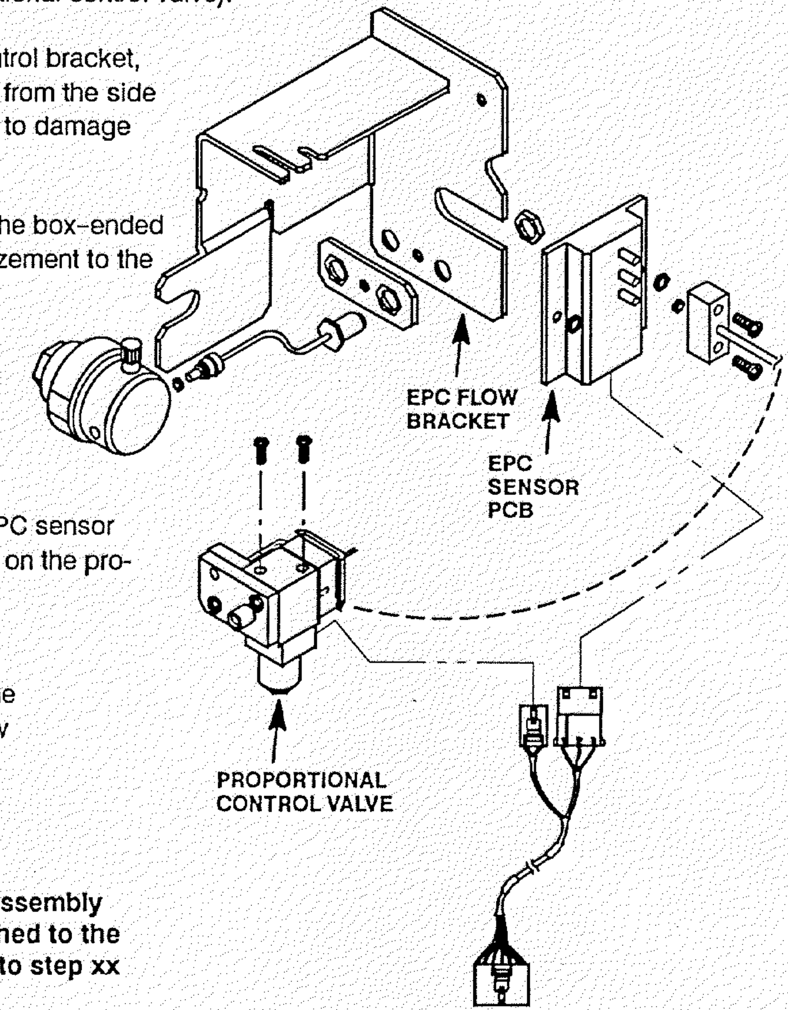
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the two screws securing the left side panel along its bottom edge.
6. Slide the left side panel towards the rear of the instrument and lift.
7. Disconnect the tubing nut from the PCOC proportional control valve.
8. Remove the plastic M8 nut securing the septum purge outlet from the inlet to the septum purge regulator.
9. Remove the two 7-mm nuts securing the EPC flow control bracket to the front of the instrument.
10. Remove any hardware attached to the PCOC purge vent.
11. Loosen the two screws securing the proportional control valve to the EPC flow control bracket.
12. Carefully slide the proportional control valve out of the EPC flow control bracket to provide access to the screw securing the bracket to the instrument flow carrier.





13. Remove the nut securing the PCOC purge regulator to the EPC flow bracket.

14. Remove the screw securing the EPC flow control bracket to the instrument flow carrier (which was previously obscured by the proportional control valve).



15. Carefully remove the EPC flow control bracket, and all components attached to it, from the side of the instrument. Use caution not to damage the tubing running to the inlet.

16. Remove the two screws securing the box-ended portion of the valve transducer brazement to the EPC sensor PCB.

17. Remove the proportional control valve and valve transducer brazement from the EPC flow control bracket.

18. Remove the EPC cable from the EPC sensor PCB and the connector receptacle on the proportional control valve.

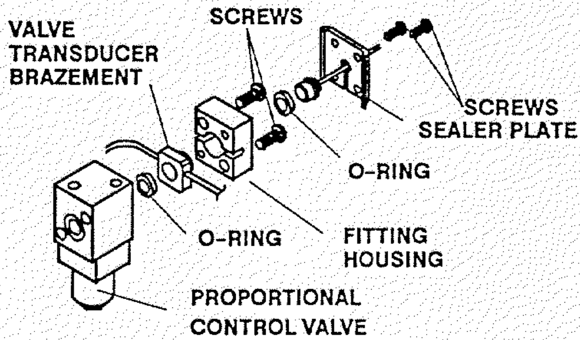
19. If the EPC sensor PCB is to be replaced, remove it by removing the two nuts securing it to the EPC flow control bracket.

NOTE

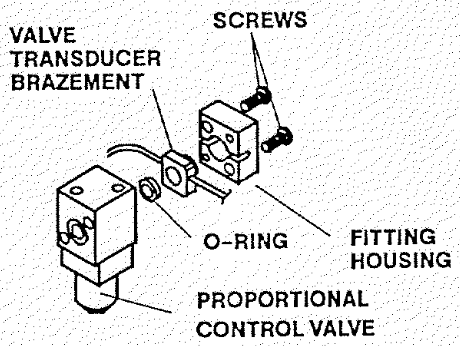
Steps 20 through xx refer to disassembly of the various components attached to the proportional control valve. Skip to step xx if you wish to skip this.

20. Remove the two screws securing the sealer plate to the proportional control valve.

21. Remove the carrier input line from the fitting housing.

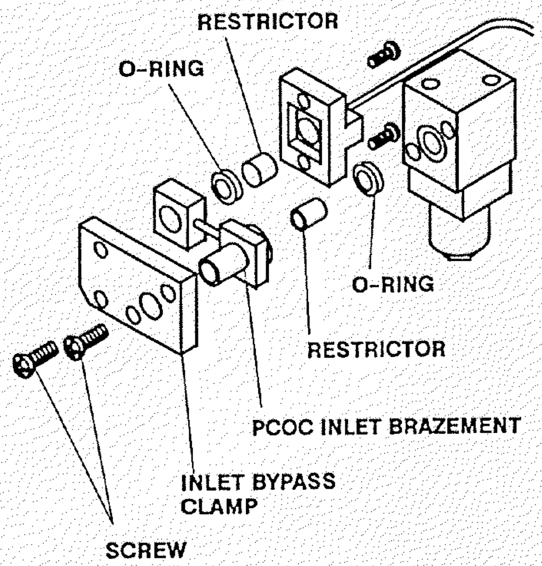


22. Remove the two screws securing the fitting housing to the proportional control. (This will free the valve transducer brazement from the proportional control valve.)



23. Remove the four screws securing the inlet bypass clamp to the proportional control valve.

24. Replace any damaged or suspect components (particularly o-rings).



CAUTION

When connecting lines and fittings, ensure that all o-rings are properly installed.

25. Assemble the EPC components in the reverse order of disassembly.

26. Restore all gas supplies.

27. Leak check all installed fittings.

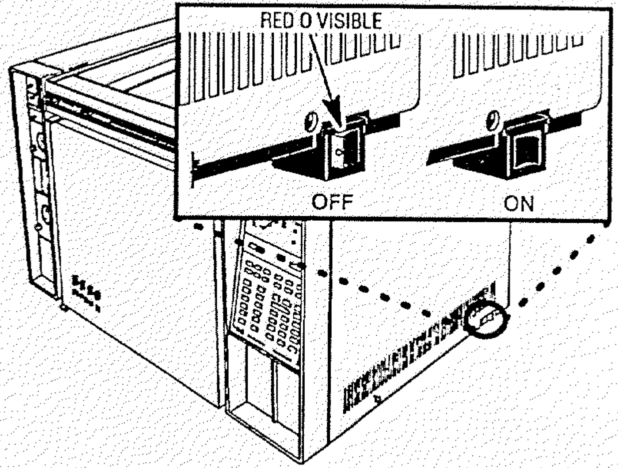
28. If the system is leak-free, install the left side panel and secure using two screws.

29. Restore power to the instrument.

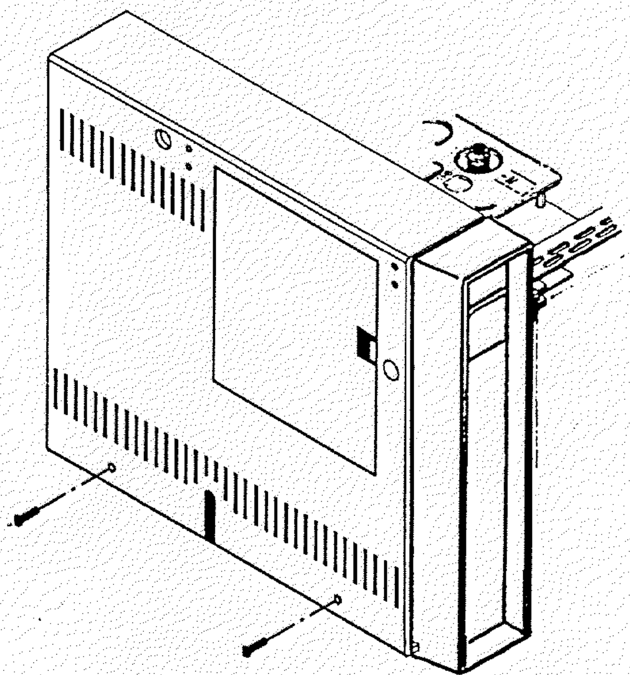
Remove/Replace Manual Pressure Control (MPC) Components

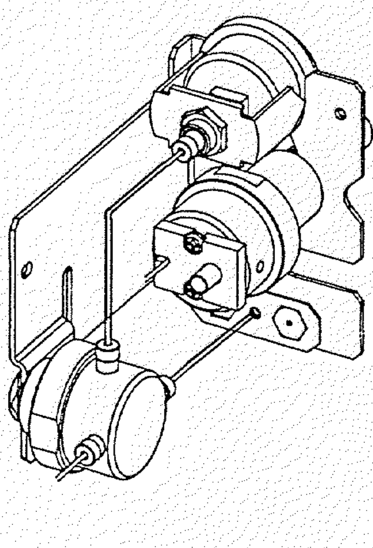
WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID) AND NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**



1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the two screws securing the left side panel along its bottom edge.
6. Slide the left side panel towards the rear of the instrument and lift.
7. Disconnect plumbing fittings as necessary to remove the flow module from the instrument. (The hydrogen lines are painted red at their ends. Remember which line is installed at each fitting; draw a diagram if necessary.)

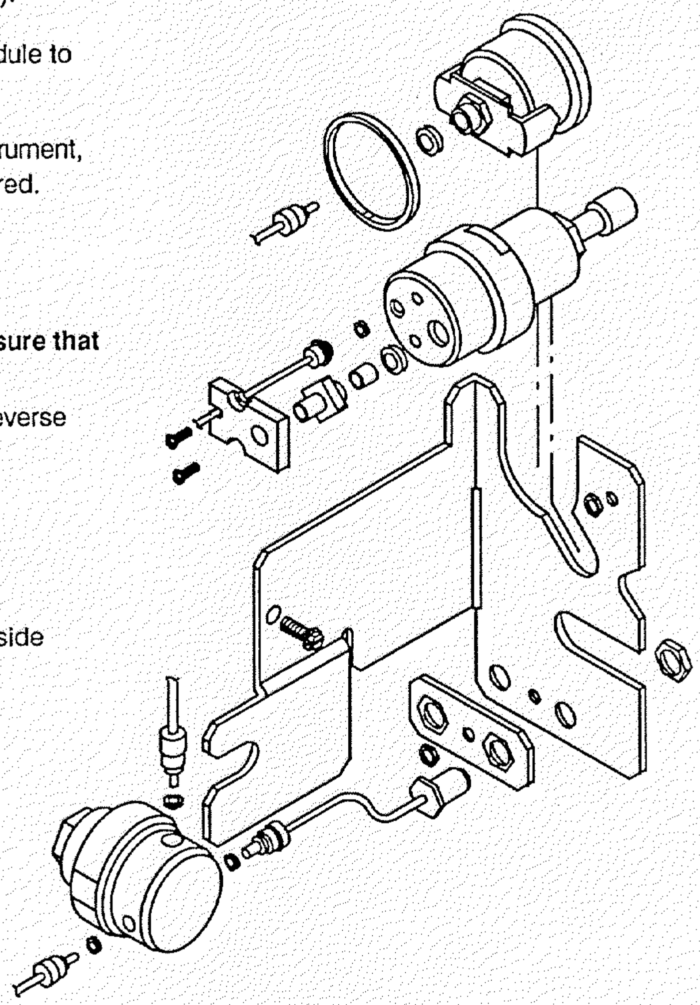




8. Remove two nuts securing the flow module to the mainframe (one next to the pressure gauge, and one at the lower edge of the module).

9. Remove the screw securing the flow module to the instrument flow carrier.

10. Once the flow module is clear of the instrument, replace the flow control component desired.



CAUTION

When connecting lines and fittings, ensure that all o-rings are properly installed.

11. Assemble the MPC components in the reverse order of disassembly.

12. Restore all gas supplies.

13. Leak check all installed fittings.

14. If the system is leak-free, install the left side panel and secure using two screws.

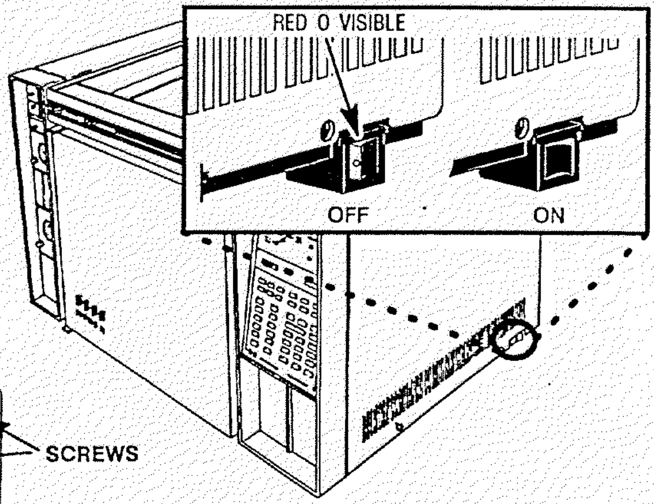
15. Restore power to the instrument.

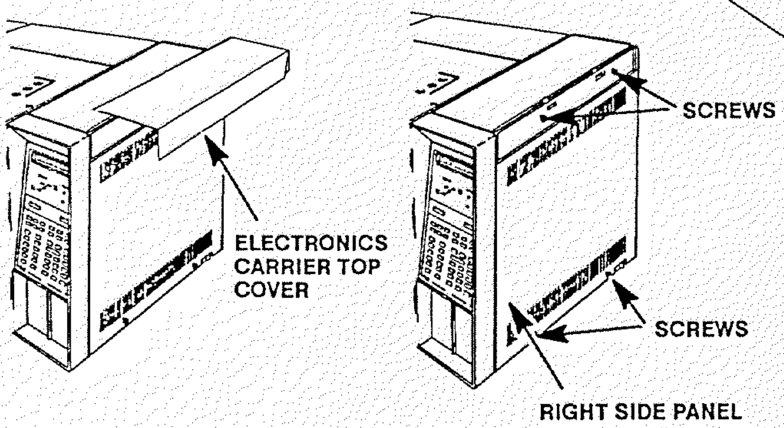
Remove/Replace EPC/MPC Pressure Control PCB

WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID), NITROGEN PHOSPHOROUS (NPD), AND FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Remove the electronics carrier top cover.
5. Remove the right side panel by removing four screws: two each along its top and bottom edges.

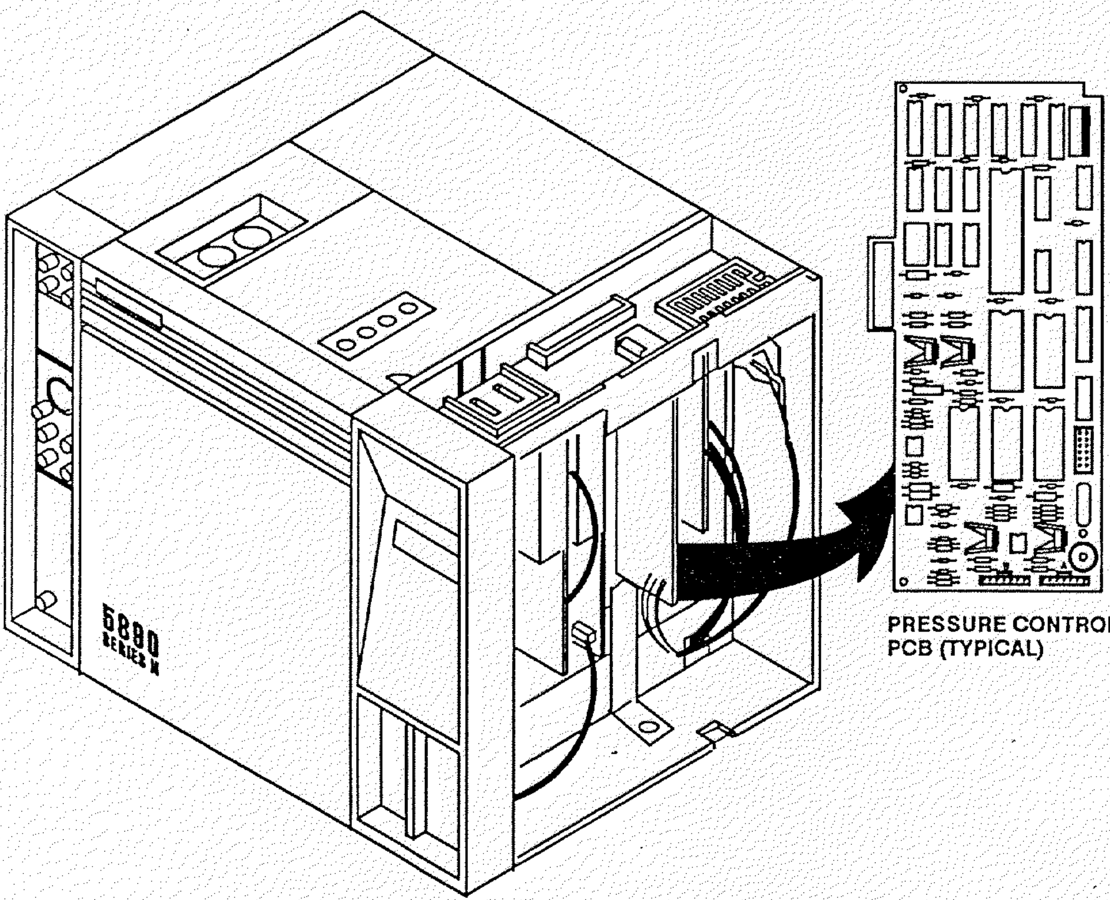




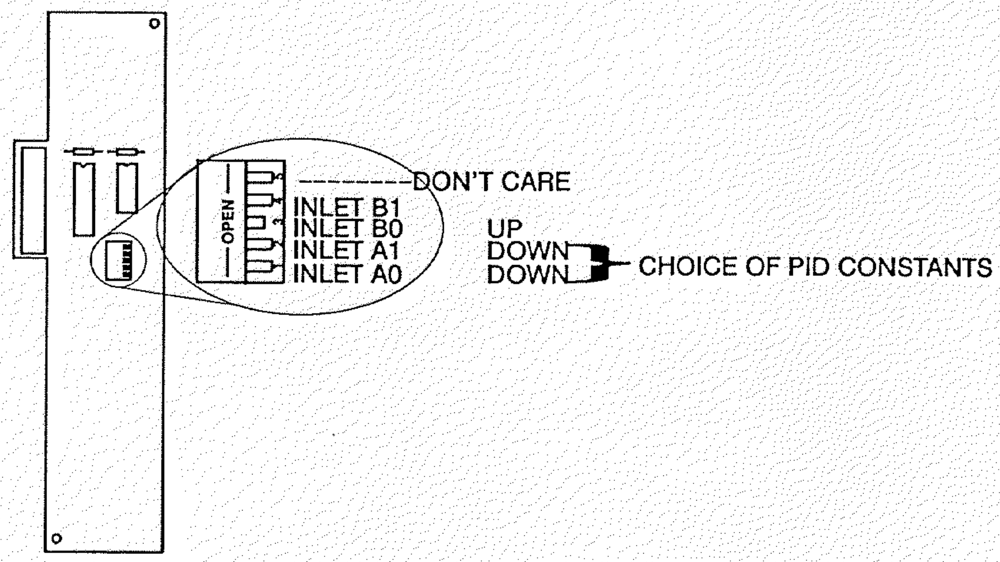
CAUTION

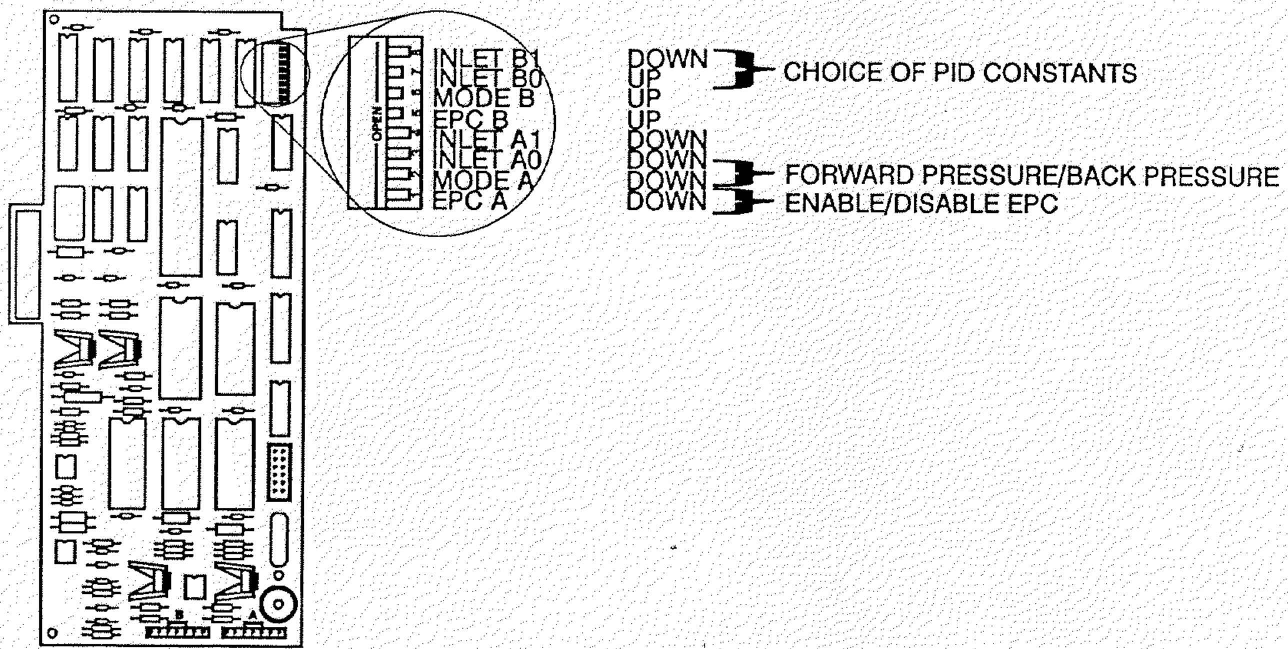
- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

6. Disconnect any cables which are connected to the pressure control PCB.
7. Remove the pressure control PCB from the right side of the instrument by grasping it in the center area along its outer edge and pulling it straight out.
8. Install the pressure control PCB by sliding it into its mounting location on the main PCB.
9. Restore all gas supplies to the instrument.
10. Install the right side panel and secure using four screws.
11. Install the electronics carrier top cover.
12. Restore power to the HP 5890 Series II.



PRESSURE CONTROL
PCB (TYPICAL)



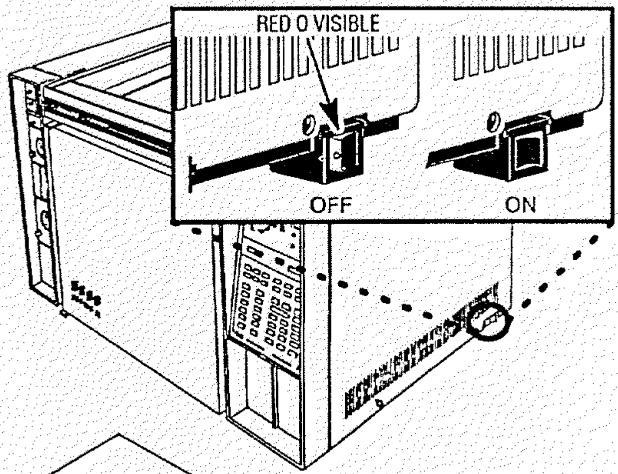


TYPICAL SWITCH SETTINGS FOR EPC/MPC PCBs

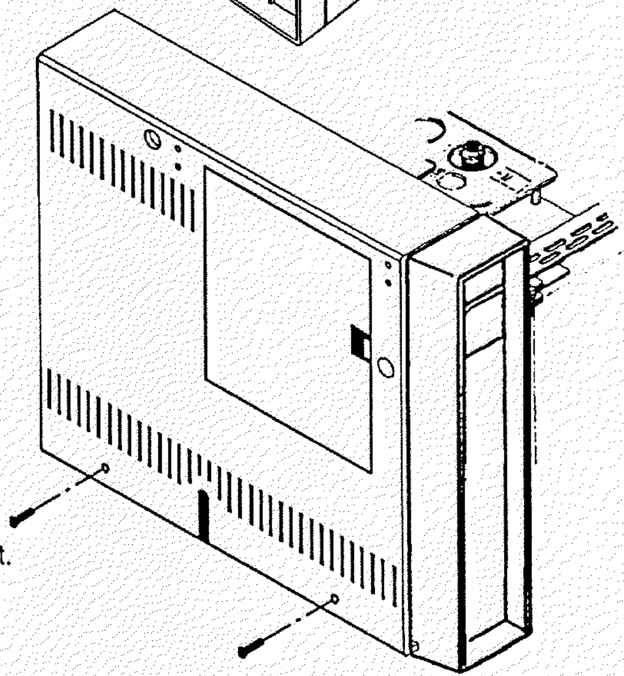
Replace Electronic Flow Sensor Module

WARNING

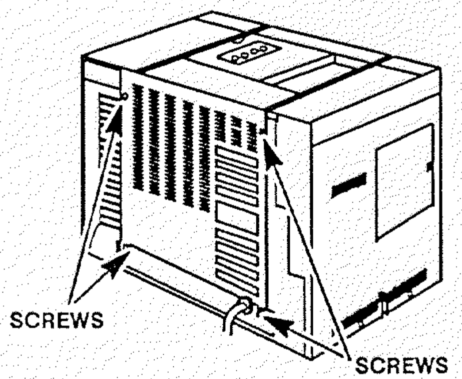
- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- FLAME IONIZATION (FID) AND NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.

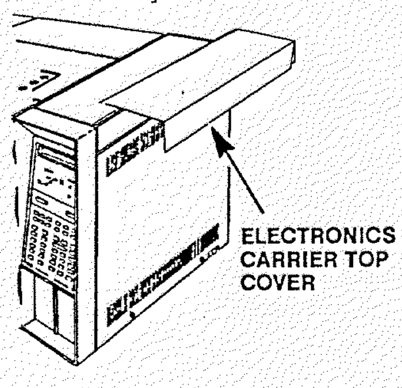


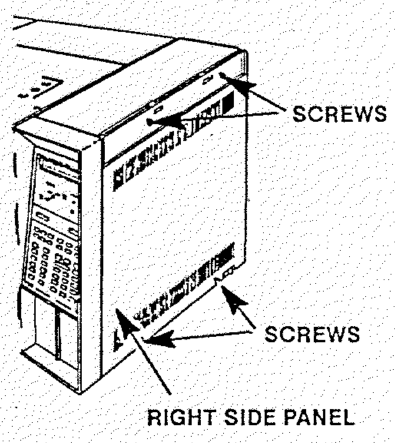
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies. .
5. Remove the two screws securing the left side panel along its bottom edge.
6. Slide the left side panel towards the rear of the instrument and lift.
7. Remove the four screws securing the rear cover to the instrument.



8. Slide the rear cover towards the rear of the instrument.
9. Remove the electronics carrier top cover (above the signal cable plugs and receptacles to expose the top edge of the TCD detector PCB).
10. Remove the right side panel by removing four screws: two each along its top and bottom edges.



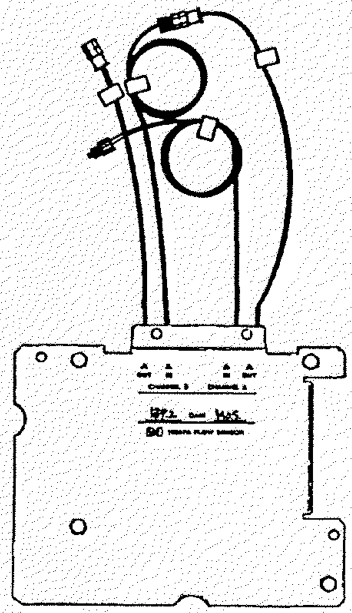


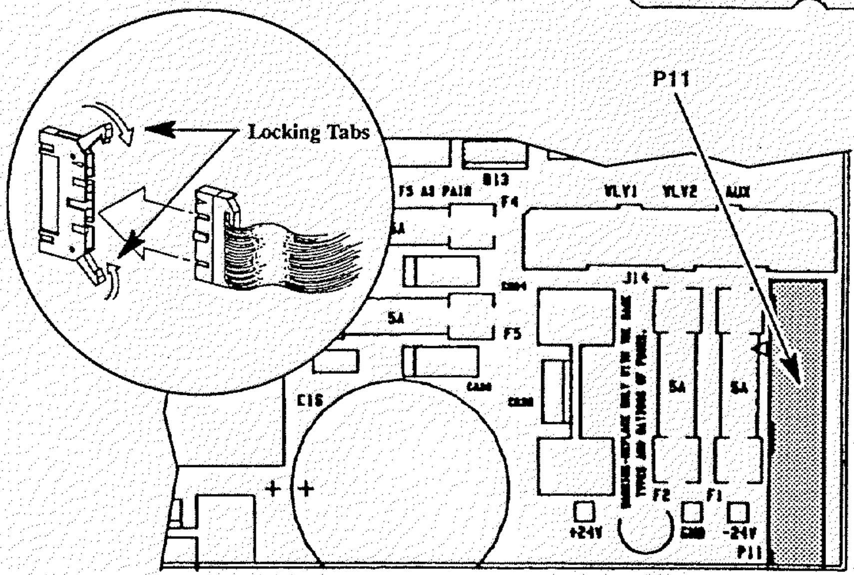


11. Disconnect the EFS tubing from their connection sites at the tubing ends. (Label the tubes as to their respective flow channel ("A" or "B") to ensure an identical connection to the replacement EFS module.)

12. Free the EFS module by removing two screws. The module can then be removed from its compartment in the side of the instrument.

13. Remove the connector from the EFS. Notice the locking tab at each end of the plug. Release the locking tabs and pull the plug straight out from its receptacle.





CAUTION

WHEN DISCONNECTING A PLUG, PULL ON THE PLUG NOT ON ITS WIRES. PULLING ON THE WIRES MAY CAUSE BREAKAGE.

14. Remove the EFS module from the instrument.

15. Install the replacement EFS module in its compartment.

16. Secure the EFS module to the instrument using two screws.

17. Connect the plumbing to the EFS module.

18. Restore the gas supply to the instrument module (both channels, "A" and "B"), and check for leaks at all installed fittings.

19. If the system is leak-free, replace the cover and panels and restore power to the instrument. Check that the EFS is operational by displaying the flow rate for each channel ("A" and "B") on the

display board and also verify the value with a bubble flow meter. It is suggested that the flow rate through each channel be different, in order to verify that the plumbing for the two channels has not been "cross-connected."

20. If a flow rate value for either channel is displayed which does not correspond to the value obtained using a bubble flow meter, leak-test the entire system. If the system is completely leak-free, the EFS may require calibration.

Electronic Flow Sensor (EFS) Calibration

Electronic flow sensor (EFS) calibration may be performed any time to ensure displayed flow rate accurately represents real gas flow rate through the sensor. The EFS is factory calibrated for four standard gases, H2, He, N2, and Ar/CH4, within the flow rate range of 0 to 100 ml/min. This covers the majority of chromatographic applications.

Two situations where it would be appropriate to perform recalibration would be where a nonstandard gas is to be used (e.g., something OTHER than H2, He, N2, or Ar/CH4), or if flow rates in excess of 100 ml/min are to be used.

EFS calibration requires setting two values for a given flow channel–first, the ZERO value (defined with NO flow through the given flow channel) and then the GAIN value (calculated, based upon a measured flow rate value).

WARNING

IF CALIBRATION IS BEING PERFORMED FOR H2, OBSERVE PROPER SAFETY PRECAUTIONS TO PREVENT A FIRE OR EXPLOSION HAZARD.

Prior to performing the calibration procedure, the following must be done:

- The instrument must be on for at least one hour for thermal equilibration of the EFS.
- Since gas flow through the channel to be calibrated will be interrupted, detectors should be turned off (particularly an NPD or TCD!), and the oven cooled to ambient temperature (to protect columns).
- A flow measuring device is required, accurate to better than 1 ml/min.
- The EFS is calibrated to measure volumetric flow at standard temperature and pressure. Flows measured at ambient temperature with a bubble flow meter will have to be converted from ambient temperature and pressure to standard temperature and pressure.

Preparation

1. Access the EFS by removing the left side panel; remove two screws along its lower edge, slide the panel toward the rear of the instrument, and then lift.
2. Through the keyboard, select CALIB AND TEST mode, function 2:

[CLEAR] [•] [2] [ENTER]

GAIN A is displayed, followed by two values: the observed flow rate through Channel A, and the current GAIN calibration value for Channel A.

Setting the ZERO Calibration Value

The ZERO calibration value MUST be set with NO gas flow through the channel being calibrated.

1. Press [ZERO] : FLOW A ZERO is displayed, followed by a value (the current ZERO calibration value for EFS Channel A). Note that Channel A is assumed by default; if channel B is to be calibrated instead, press [B] .

2. DISCONNECT the gas source to the particular flow channel being calibrated. DO NOT trust an on/off valve, pressure regulator, or mass flow controller to be an effective shutoff device; ANY gas flowing through the EFS will invalidate the ZERO calibration value. Disconnect the source at any convenient point (e.g., at the connection of the supply line into the instrument).

3. Locate the EFS module and note its labelling: CHANNEL A/CHANNEL B, IN/OUT. For the channel being calibrated, locate and disconnect its OUT fitting; use two wrenches in opposition to prevent twisting the tubes.

4. Install the EFS flow-measuring adapter (Part No. 05890-80620) into the female OUT fitting to the EFS module. Connect a bubble flow meter to the adapter.

5 Allow ample time (up to 1/2-hour) for residual gas within connected plumbing to bleed off. Verify that absolutely NO flow is observed at the connected bubble flow meter.

6. Assuming there is no gas flow through the channel being calibrated, press [ENTER] at the keyboard. This updates the ZERO calibration value.

Setting the GAIN Calibration Value

After the ZERO calibration value is set at zero flow rate through the given channel, the GAIN calibration value must be set, based upon a measured flow rate.

1. At the keyboard, press [FLOW] : GAIN A (or GAIN B) is displayed, followed by two values (the observed flow rate through the channel, and the current GAIN calibration value for the channel).

2. Connect the gas supply to the channel being calibrated.DO NOT connect the OUT fitting for the particular channel.

3. Using a suitable flow-measuring device (accurate to better than 1 ml/min) connected at the OUT fitting for the given channel, adjust flow through the channel so measured flow rate is approximately in the middle of the range to be used. For example, if the range of flow rates to be used is between 50 and 150 ml/min, measured flow rate should be adjusted to about 100 ml/min.

   - Press [TIME] to access the timer function.
   - After obtaining the desired flow rate, press [CLEAR] [•] [2] [ENTER] :to return to setting the GAIN value.
   - EFS channel A is assumed. Press [B] if Channel B is being calibrated .

4. Allow ample time for the flow rate to equilibrate (no drift should be observed).

5. Assuming no drift in measured flow rate, note the flow rate value at the connected flow-measuring device. Enter this measured value through the keyboard:

Measured Value

{ [(#)] } [ENTER]

Upon pressing [ENTER] , CALIBRATING is displayed.

6. After a short time, GAIN A (or GAIN B) is again displayed, followed by the observed flow rate and a new GAIN calibration value based upon the measured flow rate.

NOTE

The displayed flow rate value should now be quite close to the measured flow rate value. If not, drift may have occurred. If drift occurs, the process should be repeated.

7. This completes EFS calibration. Remove the flow-measuring adapter, connect the channel OUT fittings (use two wrenches in opposition to avoid twisting tubes), replace the left side panel, and restore the instrument to service.

Entering Specific ZERO and GAIN Values

Calibration values for ZERO and GAIN should be recorded when a particular channel is calibrated. They can then be reentered through the keyboard if necessary, without repeating the entire calibration procedure.

To enter specific ZERO and GAIN calibration values:

1. Select CALIB AND TEST mode, function 2:

[CLEAR] [•] [2] [ENTER]

GAIN A (or GAIN B) is displayed, followed by two values (the observed flow rate through the channel and the current GAIN calibration value for the channel).

NOTE

Note that Channel A is assumed by default. If Channel B is to be calibrated instead, press [B] .

2. Enter the desired GAIN calibration value, preceded by [-] :

[-] { [(#)] } [ENTER]

[-] is necessary to signify entry of a GAIN calibration value, rather than a measured flow rate.

3. Press [ZERO] : FLOW A ZERO is displayed, followed by a value (the current ZERO calibration value for EFS Channel A).

Note that Channel A is assumed by default. If Channel B is to be calibrated instead, press [B] .

4. Enter the desired ZERO calibration value:

{ [(#)] } [ENTER]

Note that alternately pressing [ZERO] or [FLOW] displays either the ZERO calibration value or the GAIN calibration value for the given channel (A or B).

Replacing/Repairing a Flow Manifold Block

Each detector requires a flow manifold block for gas control. There are various types of blocks, depending upon the particular detector, and upon whether or not capillary makeup gas is also to be supplied to the detector.

WARNING

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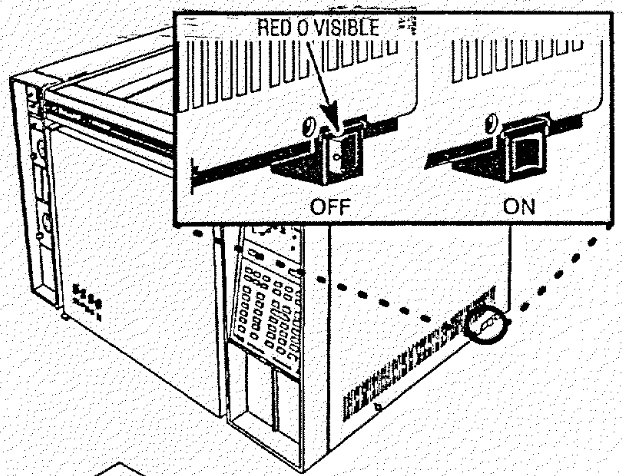
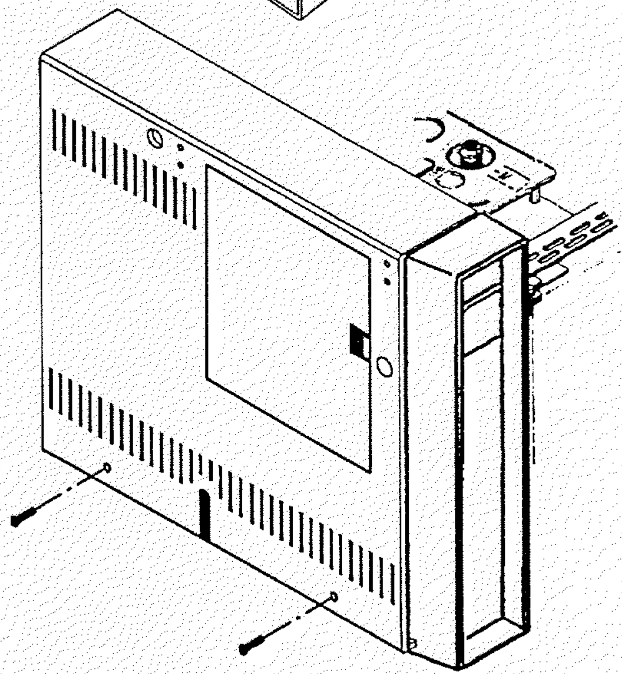
- **FLAME IONIZATION (FID) AND NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**



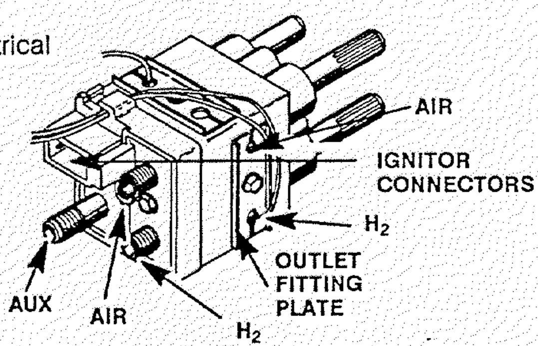
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
6. Remove the two screws securing the left side panel along its bottom edge.
7. Slide the left side panel towards the rear of the instrument and lift.
8. Disconnect all plumbing from the block.



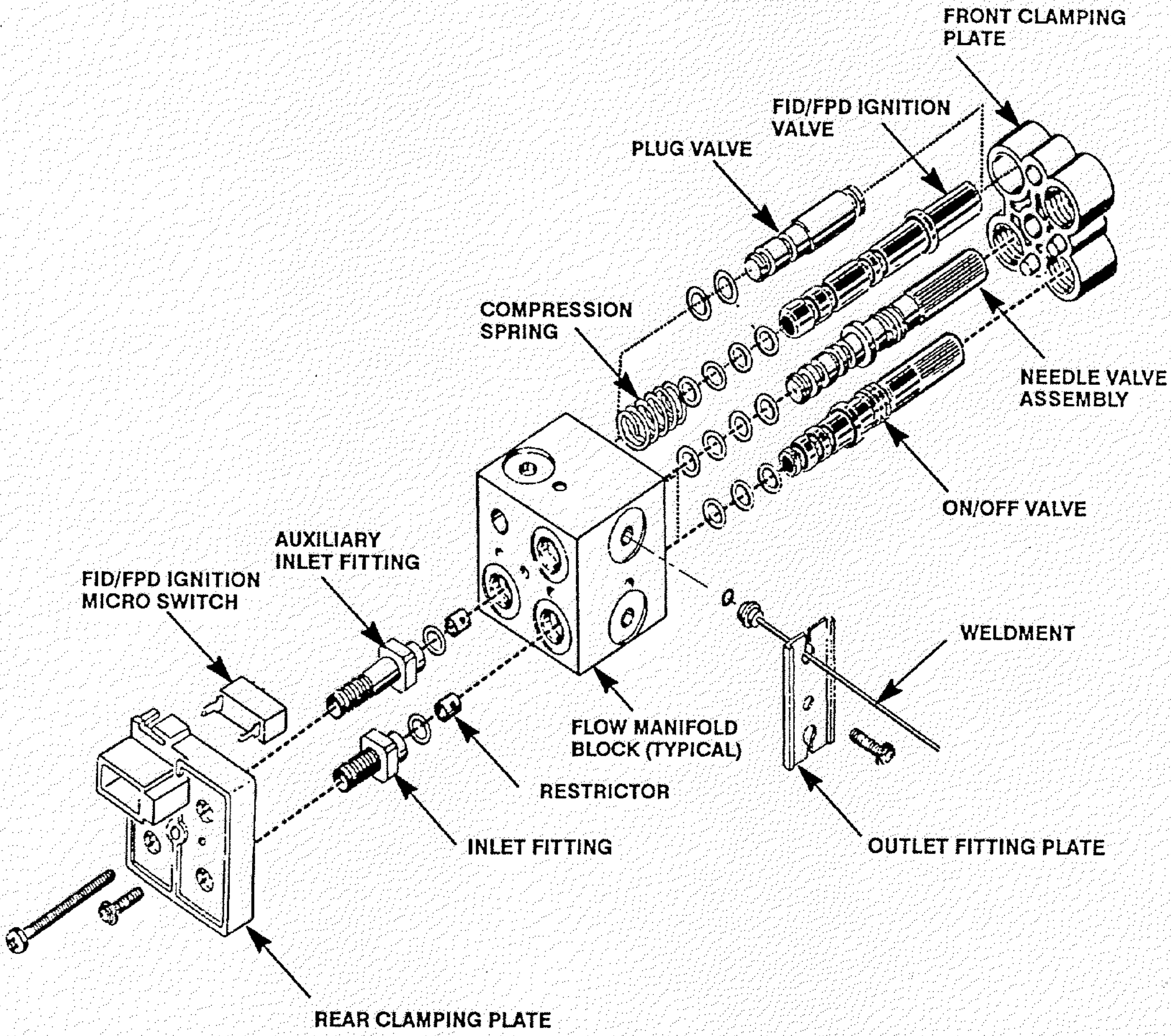
CAUTION

When removing the FID or FPD ignitor connectors, pull on the plug not on its wires. Pulling on the wires may cause damage.

9. On an FID or FPD block, disconnect the ignitor electrical connections..
10. Remove the outlet fitting plate from the side of the flow block by removing the screw securing it to the block.
11. Disconnect the detector supply gas tubes.



12. With a Pozidriv screwdriver, remove the mounting screw from the rear of the block. (The block must be removed from the rear of the instrument.)



13. Install the new block on the flow panel from the rear of the instrument. The block fits on the panel over two standoffs, in only one direction.

14. Replace the mounting screw on the block and tighten it firmly.

15. Connect the plumbing on the rear of the block. The fittings are labelled on the block. In addition:

- On an FID/NPD, replace the hydrogen and air tubes. The hydrogen tube (painted red) connects to the lower fitting. The gas tube retainer fits properly only when the hydrogen and air tubes are installed correctly.

- On an FID or FPD block, connect the ignitor leads. (The leads may be reversed without consequence.)

16. Restore the gases supplied to the system and leak check all installed fittings.

17. If the system is leak-free, reinstall panels and covers and restore power.

Section 4

DETECTORS

REPLACING DETECTOR COMPONENTS

There are five detector options available for the HP 5890 Series II Gas Chromatograph; Thermal Conductivity (TCD), Flame Ionization (FID), Nitrogen-Phosphorus (NPD), Electron Capture (ECD), and Flame Photometric (FPD). Maintenance procedures for all the detectors are given in the following pages. Procedures are supplied to remove, replace, and/or clean various subassemblies, based on the current maintenance philosophy, i. e., to allow replacement of the lowest level components applicable for a particular detector.

Specific part numbers are not given in this section. For all replacement part numbers, refer to Section 2 of the IPB portion of this document (Detector Options).

All of the detectors are heated using a heater/sensor setup which consists of at least one heater cartridge and one sensor cartridge. Heating of the detector zones is not covered in this section. For information on the zone heater/sensor systems, refer to Section 6 of the service portion of this document (Zone Temperature).

This document is not meant to provide instruction for first time installation of the detector options discussed. Add-on sheets exist for just this purpose, and should be referenced when performing a first time installation.

TABLE OF CONTENTS

Detector Troubleshooting

Problem	Probable Cause	Corrective Action
1. No signal output to external data handling device (i.e., integrator, etc.).	a. Improper keyboard or external device operation, or improper cabling.	1. Refer to operation and reference manuals as well as the manuals for the external device.
2. Strange chromatograph output. Test chromatogram is ok.	a. Faulty detector PCB.	1. Replace detector PCB. 2. If problem persists, install original detector PCB and refer to probable cause b.
	b. Faulty main PCB.	1. Replace main PCB.
3. Strange chromatograph output. Test chromatogram is not ok.	a. Faulty signal cable.	1. Disconnect signal cable and run the instrument self-test. 2. If "FAULT: DAC 1 TEST" is indicated, suspect faulty main PCB. Otherwise, suspect a faulty cable or external device.
4. Instrument has two detectors installed but only recognizes one.	a. Faulty detector PCB.	1. Swap detector PCBs. 2. If problem persists, swap back original detector PCBs to starting configuration and refer to probable cause b. 3. If problem follows the swapped PCB, replace the suspect PCB with a known good PCB.
	b. Faulty main PCB.	1. Replace main PCB.
5. FID will not ignite.	a. Improper operation.	1. Refer to operation and reference manuals to ensure that proper type, quality, and flow of gases are being used.
	b. Faulty ignitor switch on flow manifold.	1. Replace ignitor switch on flow manifold (refer to Section 3 of this document).
	c. Faulty ignitor.	1. Replace ignitor (refer to Section 4 of this document).

THERMAL CONDUCTIVITY DETECTOR (TCD)

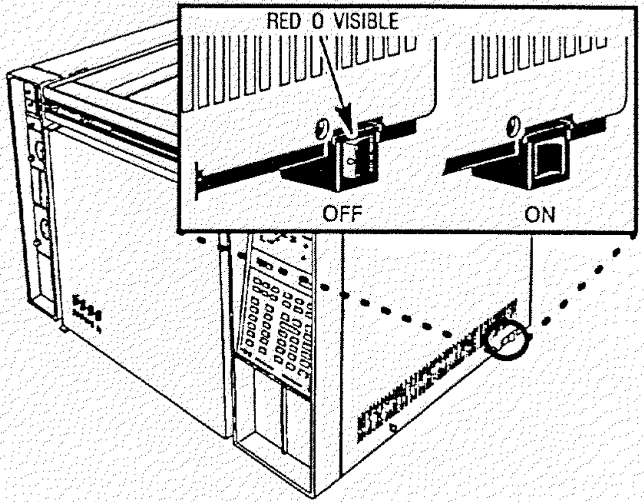
The main portion of the TCD detector is a heated block into which a heater cartridge and two sensor cartridges are installed. In addition to the standard heater and sensor cartridges, a second sensor cartridge (referred to as the delta-t cartridge) is employed which is connected to the TCD detector PCB. If the detector requires replacement, the entire assembly is replaced as a unit.

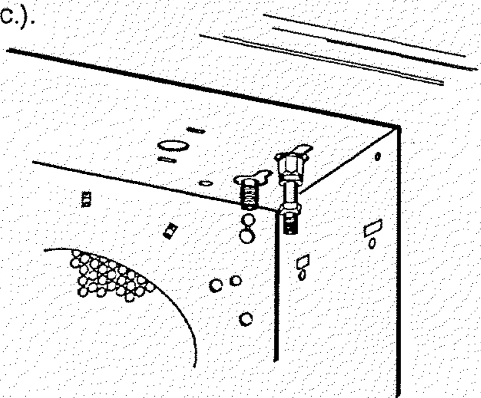
Remove/Replace TCD Detector Weldment

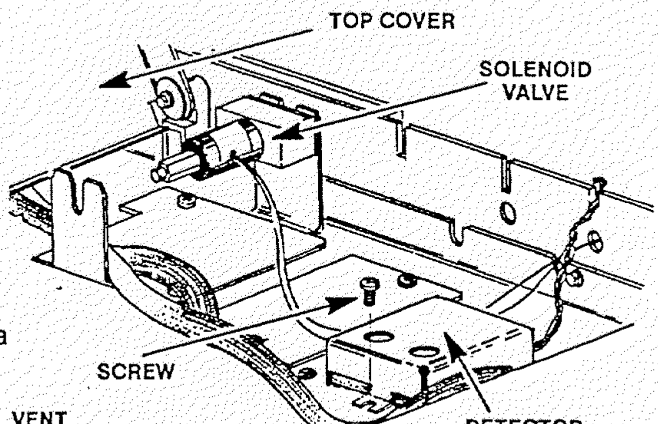
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

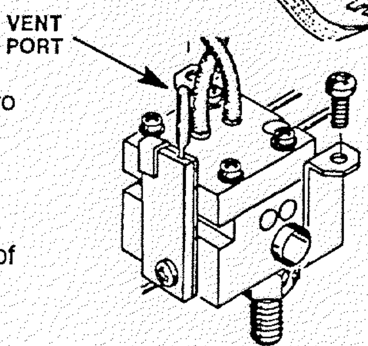
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the detector(s) to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).



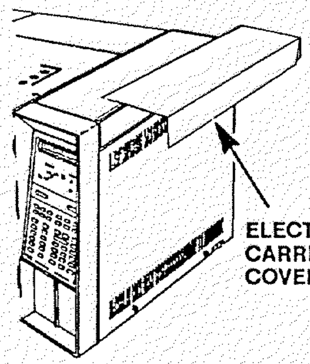




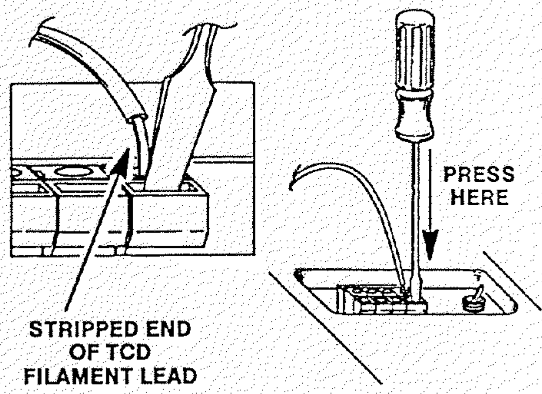
6. If the detector is not going to be replaced with a new detector, cap the detector base.
7. Lift the hinged top cover at its front edge, exposing the detector area.
8. Remove the TCD detector cover by removing two screws: one from each side of the detector cover.
9. If the detector is not going to be replaced with a new detector, cap the TCD vent port on the top of the detector. (This will not be required on a series connected TCD.)



10. Remove the electronics carrier top cover (above the signal cable plugs and receptacles to expose the top edge of the TCD detector PCB).



11. Disconnect the detector filament and delta-t temperature sensor leads at their connector block on the detector PCB. Use a small flat-blade screwdriver to press each wire lead release (located adjacent to each connection).

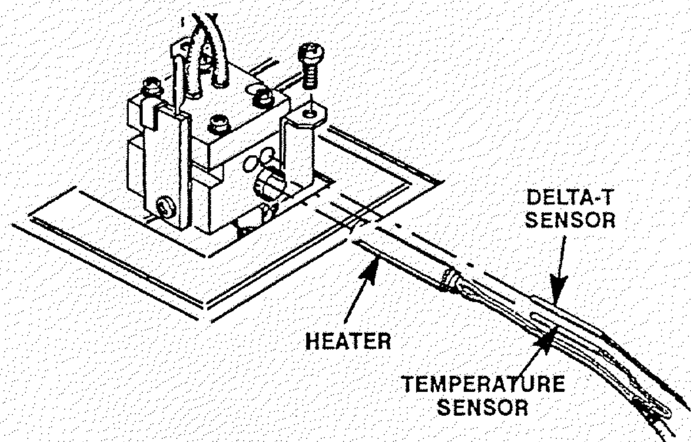


12. Remove the preformed thermal insulation from around the detector to expose the two screws securing the detector to the instrument mainframe.

13. On a series-connected TCD, disconnect the TCD to FID jumper tube from the TCD oven-return exhaust vent port.

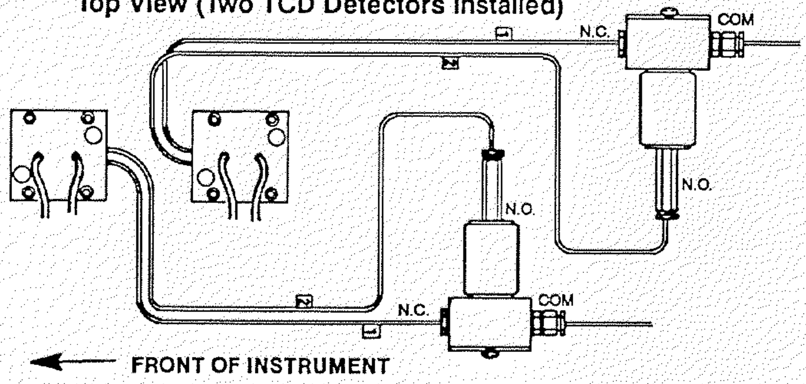
14. Remove the two screws securing the detector to the instrument and then lift the block up enough to expose the heater and sensor cartridge wires.

15. Carefully slide the three cartridges out of the block. The two smaller cartridges are the sensors and must be handled gently in order to prevent breakage.



16. Trace the reference gas inlet tubes attached to the base of the detector to their connections at the TCD solenoid valve. Observe the location on the solenoid valve where each tube is connected.

Top View (Two TCD Detectors Installed)



CAUTION

Use caution when removing and installing the plastic M8 tubing nuts. Excessive force can damage them.

17. Disconnect the tubes from the solenoid valve by loosening the plastic fittings securing them. (The fittings should only be finger-tight. If more force is required to loosen them, use a small pair of pliers to free the fittings.) Note the solenoid valve fitting where each tube is attached. (Corresponding tubes on the new detector must be connected to the same fittings.)
18. If a new detector is being installed, prepare the replacement detector block by pre-bending its tubes until they are oriented similarly to those on the detector just removed.
19. If a new detector is being installed, ensure that the base and vent port of the new detector are capped to prevent contamination.
20. Install the heater, temperature sensor, and delta-t sensor cartridges into the heated block.
21. Carefully install the detector, securing it to the instrument with two screws.

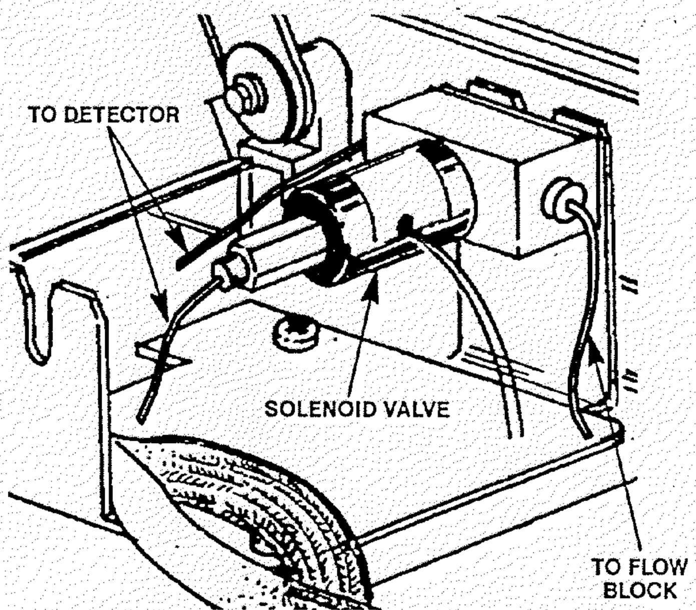
CAUTION

When installing tubing at the solenoid valve, ensure that all O-rings are positioned properly.

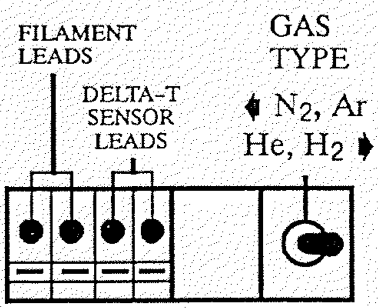
NOTE

When installing a series-connected TCD, make sure its oven-return exhaust vent tube extends into the oven.

22. Connect and tighten tubing from the detector to the solenoid switching valve, finger-tight. Ensure that the tubing is installed at their proper fittings on the TCD solenoid valve.



23. Connect the TCD filament and "delta-T" temperature sensor leads at the connector block on the detector PCB, making sure the filament leads are connected properly per the illustration at the right.



24. Restore supply pressure and check for leakage at all installed fittings.

25. If no leaks exist, turn off the supply gas.

26. Remove the caps from the detector base and the vent port.

CAUTION

When installing insulation, use care not to plug the vent port. If flow is interrupted while the TCD is on, it will shorten its life dramatically.

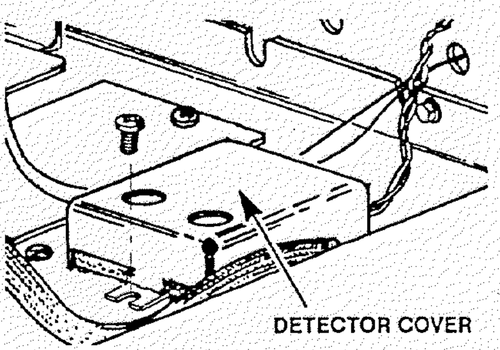
27. Taking care not to block the vent port, install insulation around the detector block.

28. Install the electronics carrier top cover.

CAUTION

Use caution not to crimp the filament and delta-t sensor leads when installing the TCD detector cover.

29. Install the TCD detector cover and secure using two screws.



30. Install column and any other hardware removed in step 5 of this procedure.

31. Restore supply pressure.

32. Restore power to the instrument.

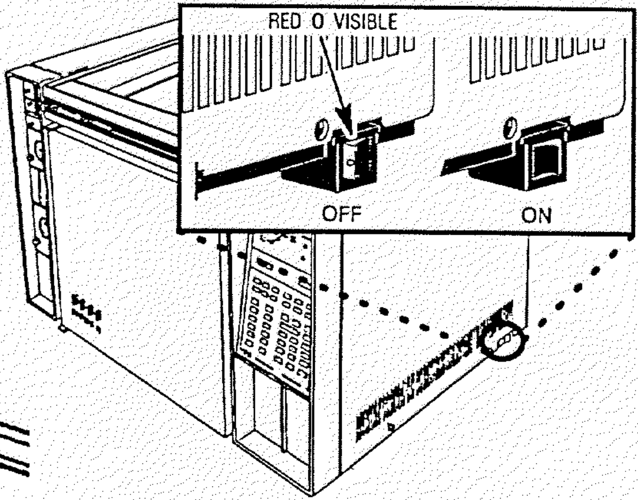
33. Run a TCD Test Sample Chromatogram (refer to HP 5890 Series II Reference Manual) to ensure that the system is operating properly. (If reversed peaks are experienced, the most likely cause is reversed gas tubes connected to the TCD solenoid valve.)

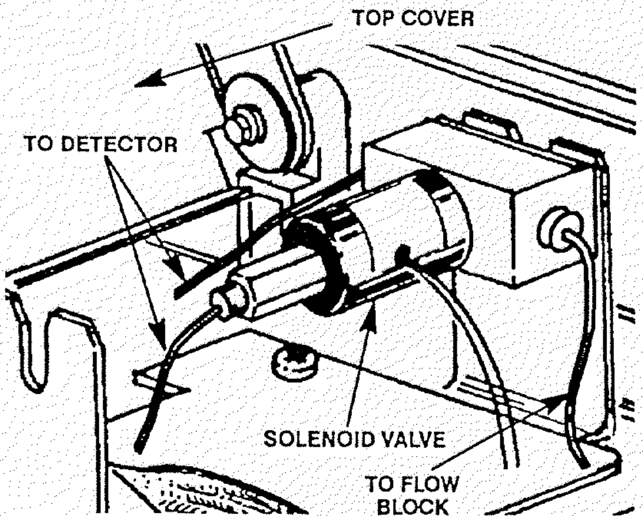
Remove/Replace TCD Solenoid Switching Valve

WARNING

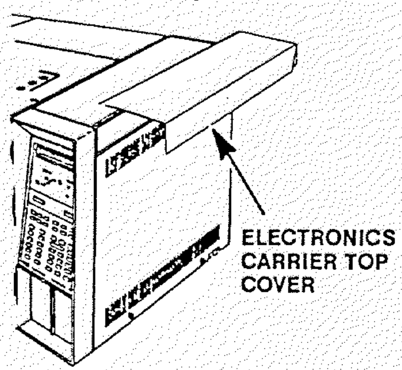
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

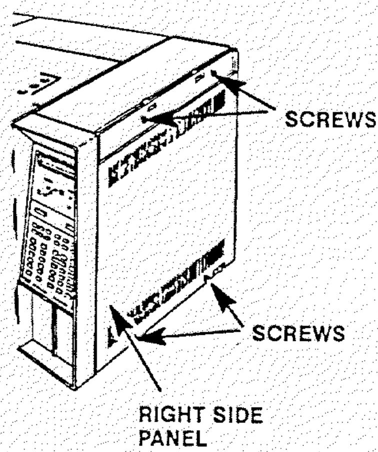
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Lift the hinged top cover at its front edge, exposing the detector area.



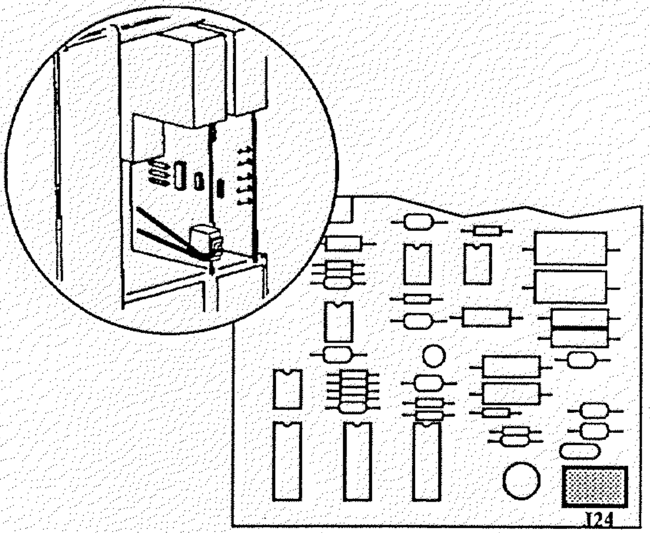


6. Remove the electronics carrier top cover (above the signal cable plugs and receptacles to expose the top edge of the TCD detector PCB).
7. Remove the right side panel by removing four screws: two each along its top and bottom edges.
8. Locate the solenoid valve to be replaced.





9. Trace the electrical leads from the solenoid valve to the "J24" connector on the TCD detector PCB (lower right edge).



10. Disconnect the lead connector from its receptacle (J24) on the detector PCB by pulling it straight out.

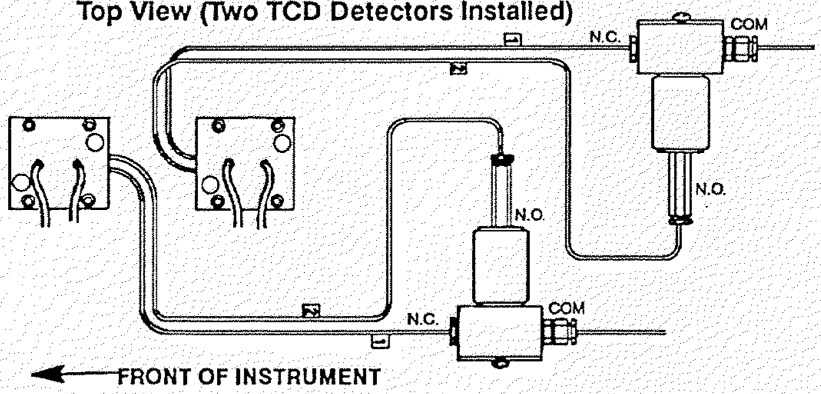
11. Note the solenoid valve fitting where each tube is attached to ensure that the new valve will be connected correctly.

CAUTION

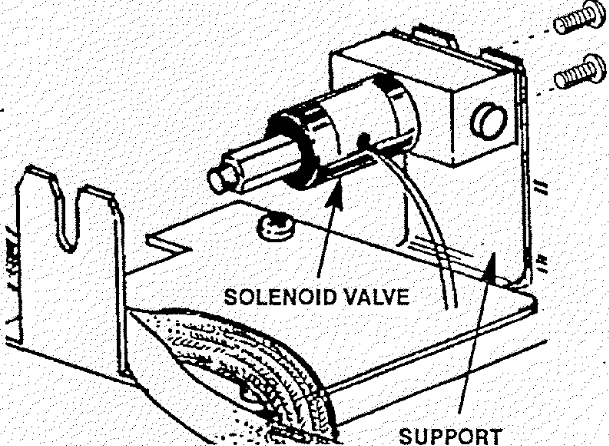
Use caution when removing and installing the plastic M8 tubing nuts. Excessive force can damage them.

12. Disconnect the tubes from the solenoid valve by loosening the plastic fittings securing them. (The fittings should only be finger–tight. If more force is required to loosen them, use a small pair of pliers to free the fittings.) Note the solenoid valve fitting where each tube is attached. (Corresponding tubes on the new detector must be connected to the same fittings.)

Top View (Two TCD Detectors Installed)



13. Remove the solenoid valve and bracket, as a unit, by removing the two screws securing the solenoid valve bracket to the instrument.



14. Remove the solenoid valve body from the bracket by removing the two screws securing it to the mounting bracket.

15. Route the leads for the new solenoid valve along the same path as the leads of the solenoid valve just removed.

16. Insert the connector for the leads of the new solenoid valve into receptacle J24 by pressing it straight in until it bottoms.

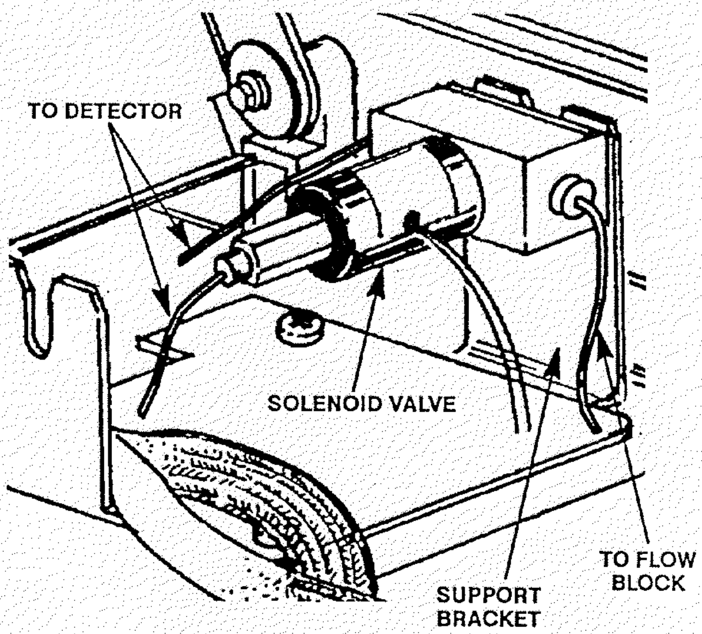
17. Install the new solenoid valve body on the mounting bracket in the same location and position as the old one.
18. Secure the solenoid valve bracket to the instrument using two screws.

CAUTION

Use caution when removing and installing the plastic M8 tubing nuts. Excessive force can damage them.

NOTE

When installing tubing at the solenoid valve, ensure that all O-rings are positioned properly.



19. Connect and tighten tubing from the detector to the solenoid switching valve, finger-tight. Ensure that the tubing is installed at their proper fittings on the TCD solenoid valve (as noted during removal).
20. Restore the gas supply to the system and check for leaks at all installed fittings.
21. If the system is leak-free, install the right side panel and secure using four screws.
22. Install the electronics carrier top cover.

CAUTION

Ensure that all gas supplies are on and all connections are made before applying power to the instrument. If flow is interrupted while the TCD is on, damage to the detector will occur.

23. Restore power to the HP 5890 Series II.
24. Verify operation of the TCD solenoid switching valve by turning on the detector via the keyboard and listening for the solenoid valve to cycle from one state to the other at a steady rate.
25. Run a TCD Test Sample Chromatogram (refer to HP 5890 Series II Reference Manual) to ensure that the system is operating properly. (If reversed peaks are experienced, the most likely cause is reversed gas tubes connected to the TCD solenoid valve.)

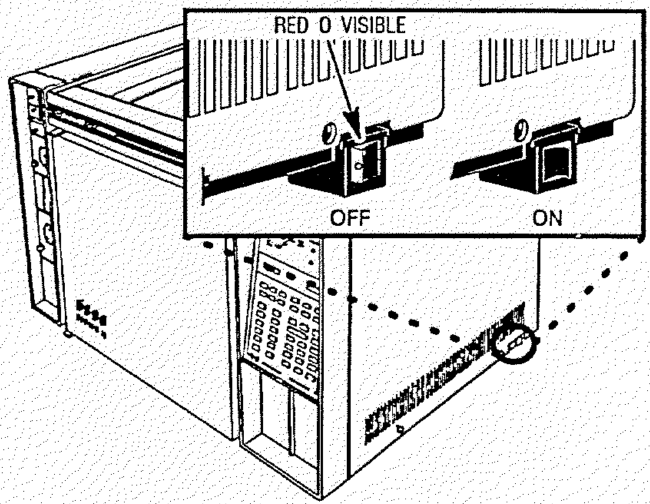
FLAME IONIZATION DETECTOR (FID)

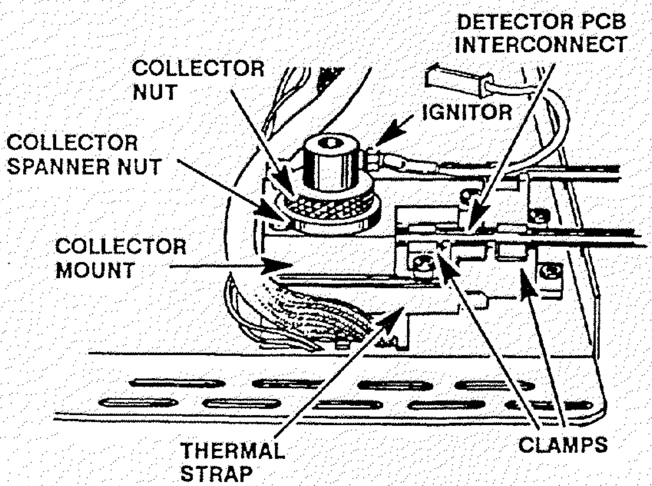
Remove/Replace FID Ignitor

WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID) AND NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Disconnect the ignitor wire lead connector at the mating connection adjacent to the ignitor.





6. Use a wrench to remove the ignitor from the FID ignitor castle.
7. Ensuring that the washer is in place, (between the ignitor castle and the threads of the ignitor) install the new ignitor; tightening it to a snug fit.
8. Connect the ignitor wire lead connector to the mating connection on the ignitor wire (which runs to the FID flow manifold).
9. Restore all gas supplies.
10. Restore power to the HP 5890 Series II.

Remove/Replace FID Diode Bridge Assembly

WARNING

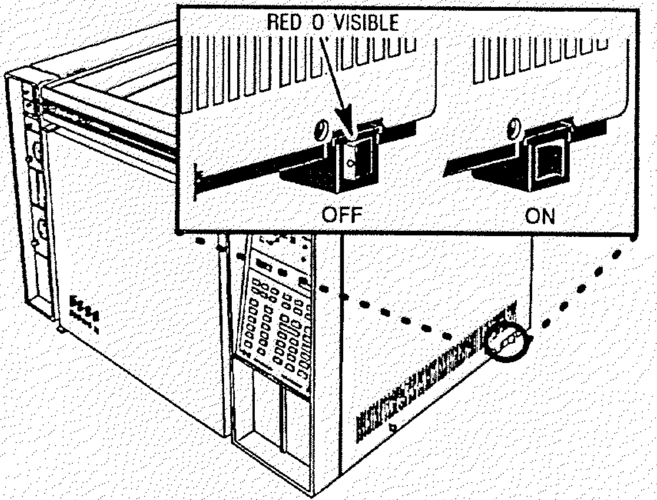
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Lift the hinged top cover at its front edge, exposing the detector area.
4. If an autosampler is installed on the instrument, it will be necessary to remove it and its mounting bracket to allow removal of the left side cover as follows:

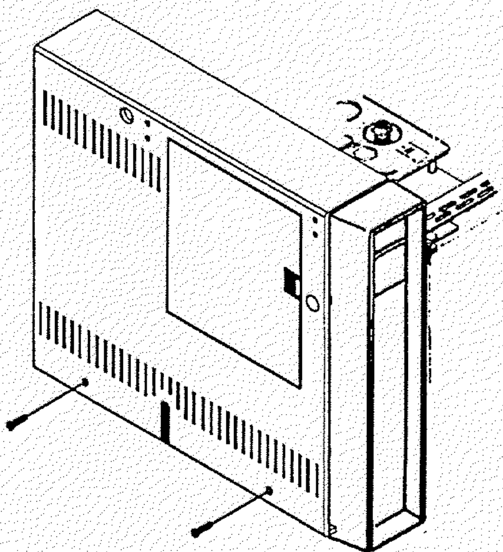
    a. Remove the autosampler tray from its mounting bracket by first simultaneously lifting and turning the two tray locks which hold it in position, then sliding the tray away from the instrument.

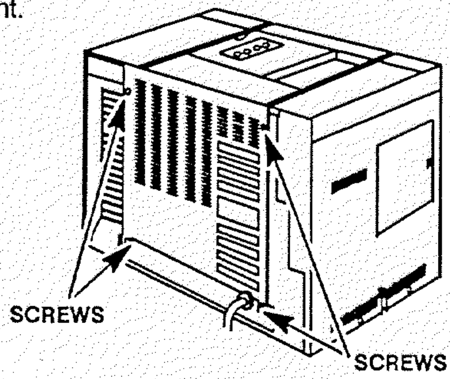
    b. Lift the autosampler tray from its mounting bracket and set it aside.

    c. Remove the autosampler bracket by removing the 6 screws securing it to the instrument.

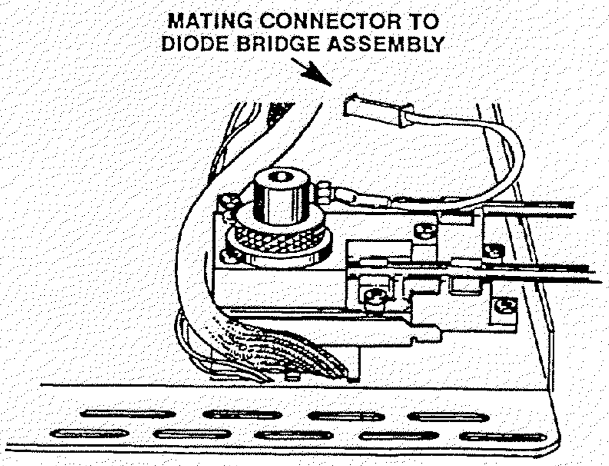


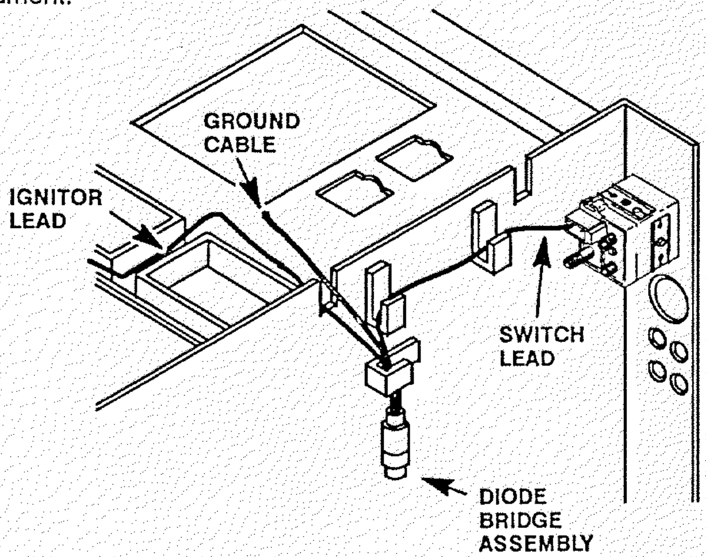
5. Remove the two screws securing the left side panel along its bottom edge.
6. Slide the left side panel towards the rear of the instrument and lift.
7. Remove the four screws securing the rear cover to the instrument.
8. Slide the rear cover towards the rear of the instrument.





9. Disconnect the ignitor wire lead connector at the mating connection of the diode bridge assembly lead (adjacent to the ignitor).
10. Trace the lead, freeing it along its path, to the diode bridge assembly.
11. Disconnect the diode bridge assembly spade lug ground cable from the instrument by loosening the screw that secures it..
12. Disconnect the diode bridge assembly from its connector at the FID flow manifold.
13. Remove the diode bridge assembly from the instrument.





14. Install the replacement diode bridge assembly into the instrument.
15. Connect the diode bridge assembly to its connector at the FID flow manifold.
16. Connect the diode bridge assembly spade lug ground cable to the instrument by placing it beneath and tightening the screw that secures it..
17. Thread the ignitor wire lead along its path from the diode bridge assembly to the detector ignitor connector.
18. Connect the ignitor wire lead connector to the mating connection of the diode bridge assembly lead (adjacent to the ignitor).
19. Install the rear panel and secure using four screws.
20. Install the left side panel and secure using two screws.
21. Restore power to the instrument.

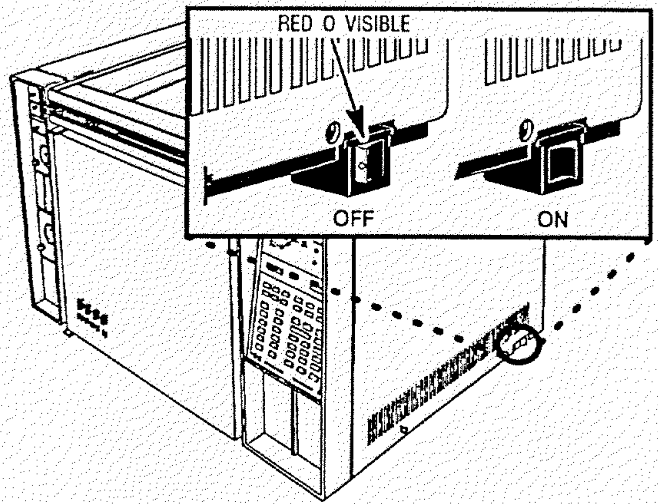
Remove/Replace FID Collector Body/Collector Assembly

The FID collector body may be replaced as a piece part, or the entire collector assembly may be replaced as a unit. Refer to section 2 of the IPB portion of this document for part number information applicable to the FID detector.

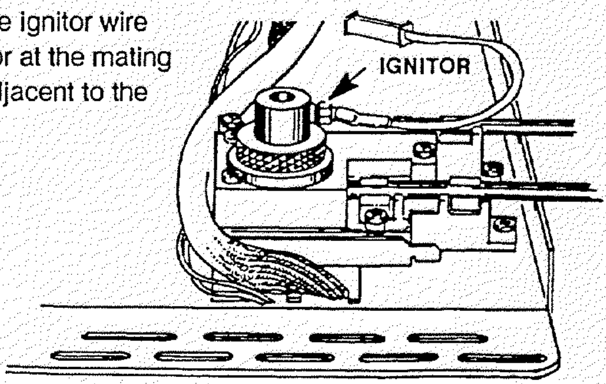
WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Lift the hinged top cover at its front edge, exposing the detector area.



6. **TO REPLACE COLLECTOR BODY:**
   a. Remove the optional PTFE chimney, if installed.
   b. Disconnect the ignitor wire lead connector at the mating connection adjacent to the ignitor.

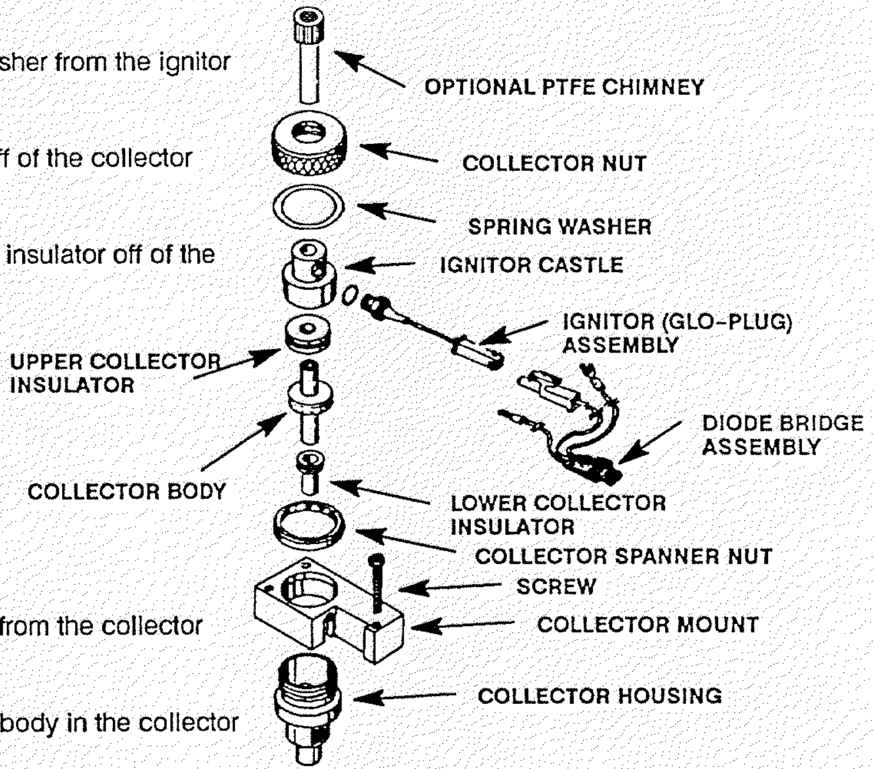


c. Remove the knurled connector nut from the collector housing.

d. Remove the spring washer from the ignitor castle

e. Lift the ignitor castle off of the collector body.

f. Lift the upper collector insulator off of the collector body.



g. Lift the collector body from the collector housing.

h. Install a new collector body in the collector housing.

i. Install the upper collector insulator on the connector body

j. Install the ignitor castle onto the collector body.

k. Install the spring washer on the ignitor castle.

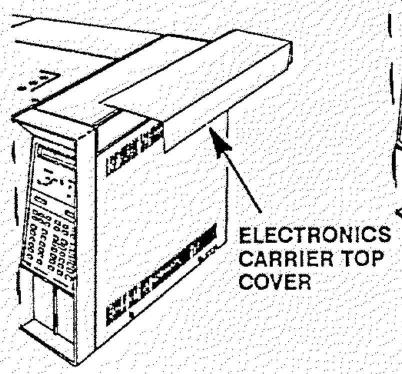
l. Install the collector nut over the ignitor castle and spring washer and onto the collector housing hand-tight.

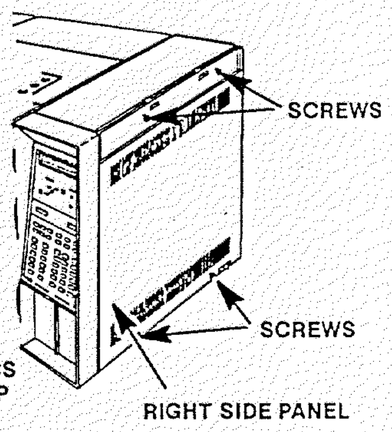
m. If employed, install the optional PTFE chimney.

7. **TO REPLACE COLLECTOR ASSEMBLY AS A UNIT:**

a. Remove the electronics carrier top cover .

b. Remove the right side panel by removing four screws: two each along its top and bottom edges.





c. Disconnect the ignitor wire lead connector at the mating connection adjacent to the ignitor.

d. Loosen the screws securing the clamps holding the detector PCB interconnect in place.

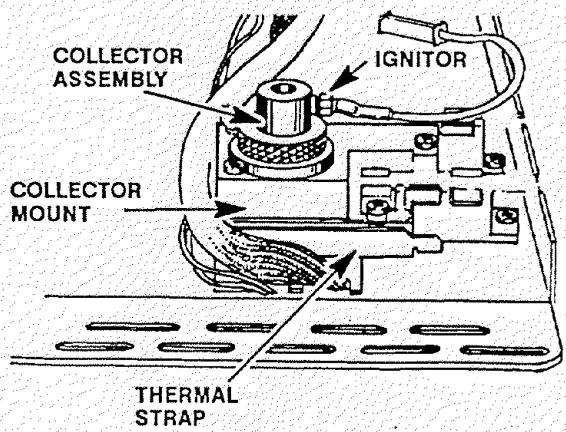
CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

e. Remove the FID detector PCB by sliding it out of the main PCB (at the right side of the instrument). Removal of the PCB will withdraw the interconnect from the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.

f. Remove the three screws securing the collector mount to the thermal strap.

g. Remove the collector mount and collector assembly as a unit.



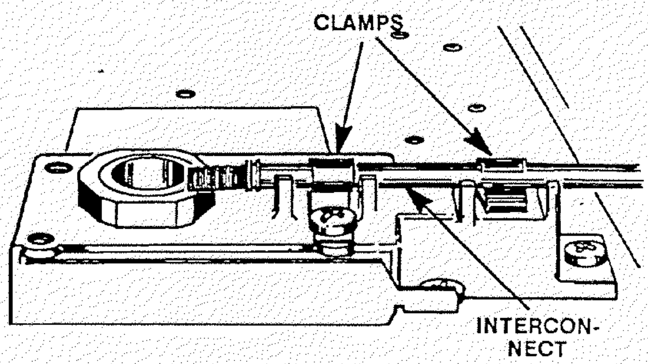
CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes.**

h. Install the FID detector PCB by sliding it into its mounting location on the main PCB (at the right side of the instrument). Installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.

i. Tighten the screws on the clamps which secure the interconnect to the thermal strap.

j. Install the collector mount and collector assembly as a unit.



k. Secure the collector mount to the thermal strap using three screws.

l. Connect the ignitor wire lead connector at the mating connection adjacent to the ignitor.

n. Install the right side panel and secure using four screws.

o. Install the electronics carrier top cover.

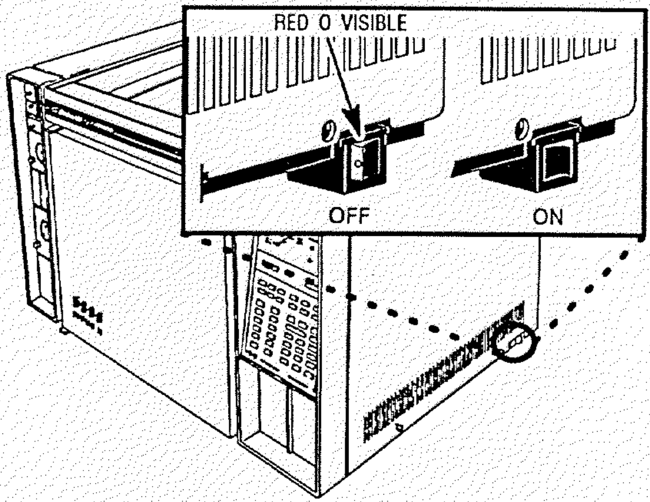
8. Restore all gas supplies.
9. Restore power to the HP 5890 Series II.

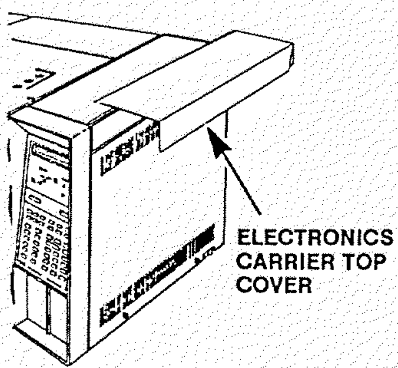
Remove/Replace FID Jet

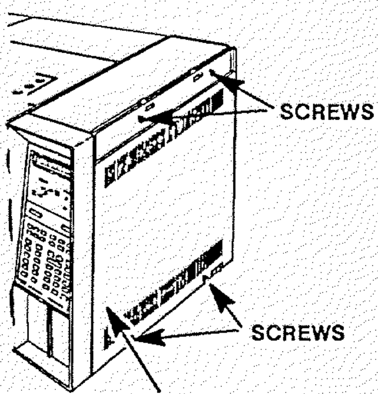
WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

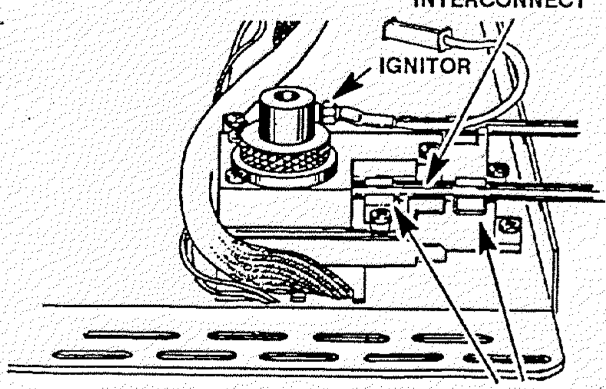
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Remove the electronics carrier top cover .
6. Remove the right side panel by removing four screws: two each along its top and bottom edges.







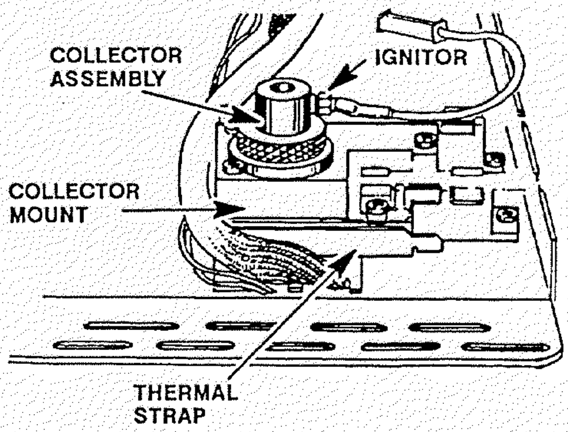
7. Disconnect the ignitor wire lead connector at the mating connection adjacent to the ignitor.
8. Loosen the screws securing the clamps holding the detector PCB interconnect in place.



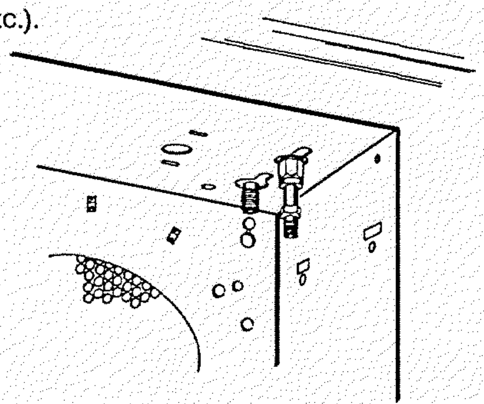
CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

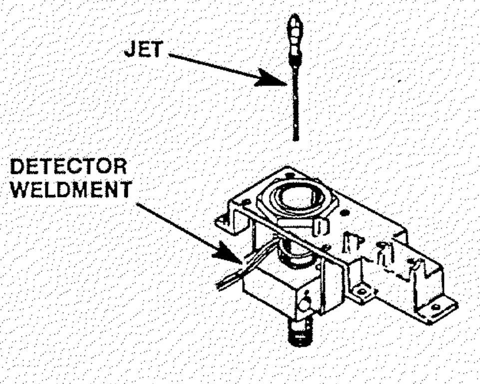
9. Remove the FID detector PCB by sliding it out of the main PCB (at the right side of the instrument). Removal of the PCB will withdraw the interconnect from the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.
10. Remove the three screws securing the collector mount to the thermal strap.



11. Remove the collector mount and collector assembly as a unit.
12. At the bottom of the detector being serviced, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).



13. Use a 1/4-inch nut driver to remove the jet from the detector weldment.
14. Use an inert gas to blow out the detector weldment, cleansing it of any debris.
15. Ensure that there is no debris in the detector weldment.
16. Replace the jet with a new jet. (Although replacement is highly recommended, the jet may be cleaned and installed at the operator's discretion. Use an approved solvent and a cleaning wire to clean jets.)



CAUTION

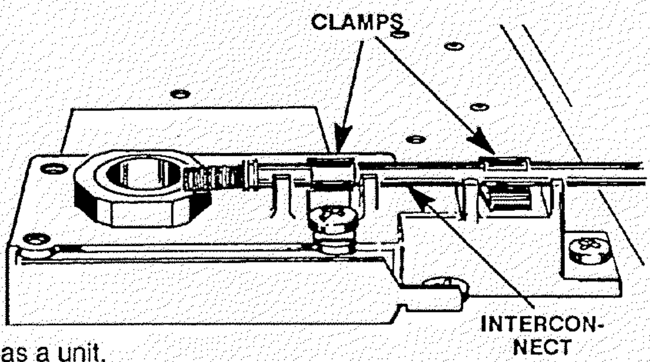
DO NOT OVER-TIGHTEN THE JET! OVER-TIGHTENING MAY PERMANENTLY DEFORM AND DAMAGE THE JET, THE DETECTOR BASE OR BOTH.

17. Install the replacement jet finger-tight. (Use two fingers on the nut driver to obtain this tightness).
18. Tighten the jet 1/8-turn past finger-tight using the nut driver.
19. At the bottom of the detector, inside the column oven, install the column and any associated hardware removed in step 12.

CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

20. Install the FID detector PCB by sliding it into its mounting location on the main PCB (at the right side of the instrument). Installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.
21. Tighten the screws on the clamps which secure the interconnect to the thermal strap.



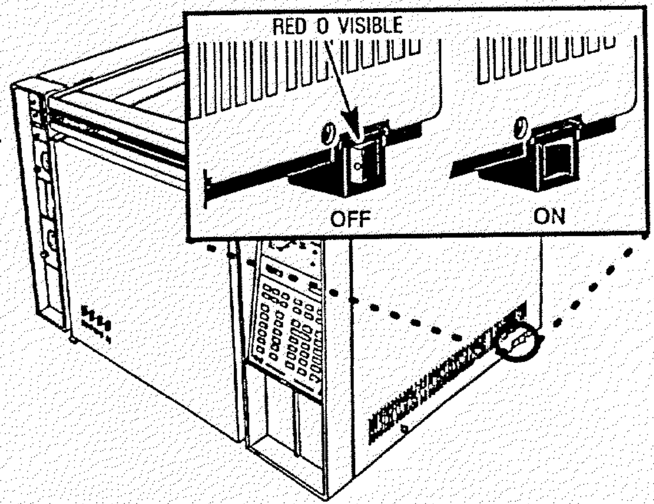
22. Install the collector mount and collector assembly as a unit.
23. Secure the collector mount to the thermal strap using three screws.
24. Connect the ignitor wire lead connector at the mating connection adjacent to the ignitor.
25. Restore all gas supplies to the instrument and check for leaks at all installed fittings.
26. If the system is leak free, install the right side panel and secure using four screws.
27. Install the electronics carrier top cover.
28. Restore power to the HP 5890 Series II.

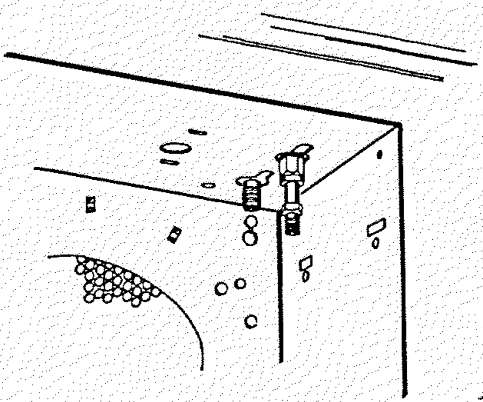
Remove/Replace FID Detector Weldment

WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME IONIZATION (FID) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the detector(s) to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).

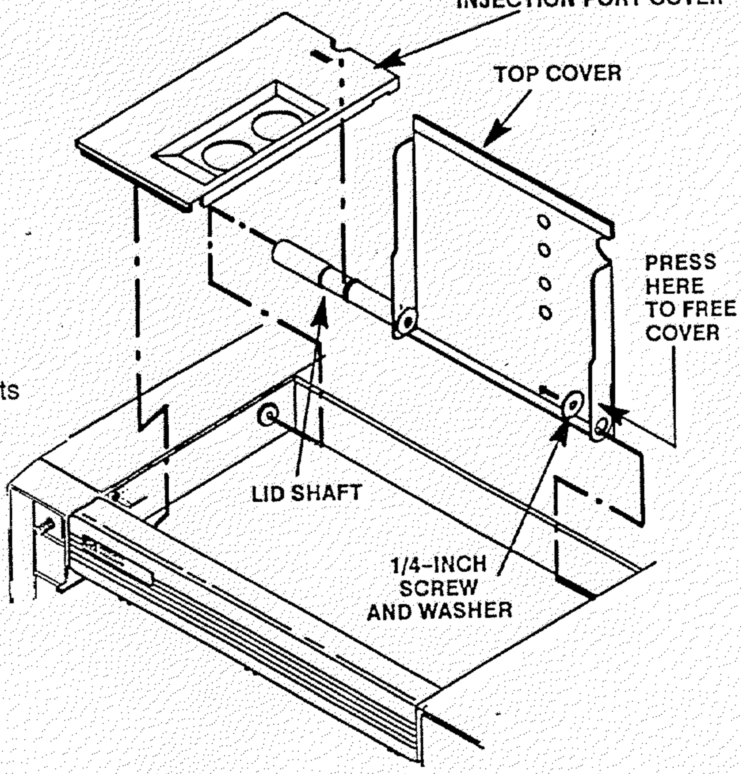




NOTE

If an autosampler is installed, the injection port cover will not be present.

6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Lift the hinged top cover at its front edge, exposing the detector area.
8. Remove the screw securing the ground strap to the hinged top cover.
9. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.

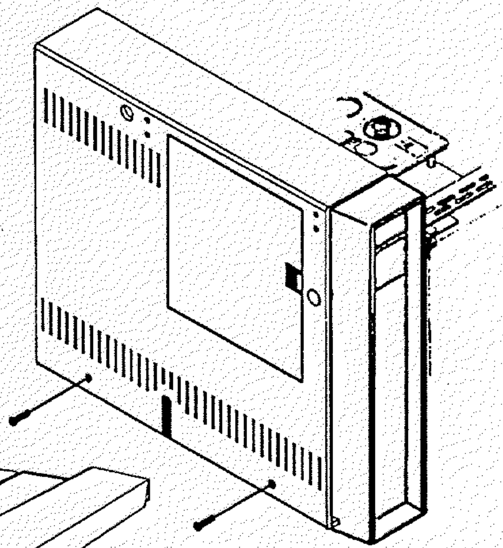


10. At the lower right edge of the cover, press from right-to-left until the right side hinge releases.
11. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.
12. If an autosampler is installed on the instrument, it will be necessary to remove it and its mounting bracket to allow removal of the left side cover as follows:

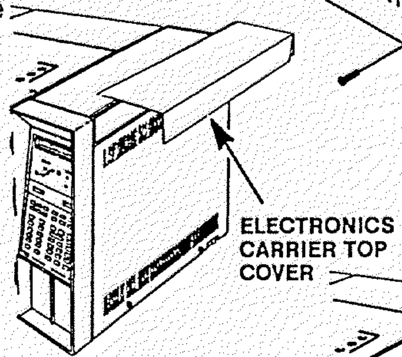
    a. Remove the autosampler tray from its mounting bracket by first simultaneously lifting and turning the two tray locks which hold it in position, then sliding the tray away from the instrument.

    b. Lift the autosampler tray from its mounting bracket and set it aside.

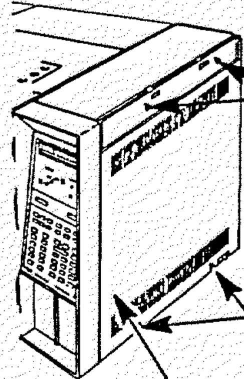
    c. Remove the autosampler bracket by removing the 6 screws securing it to the instrument.



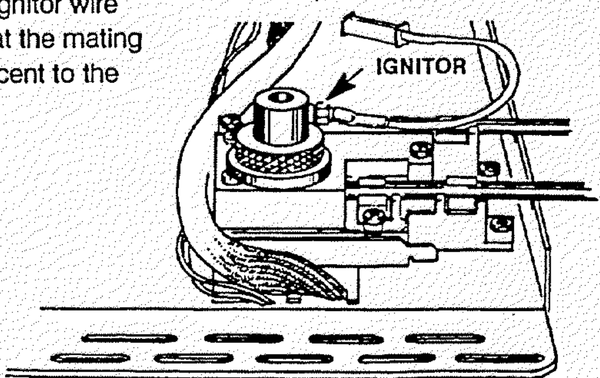
13. Remove the two screws securing the left side panel along its bottom edge.
14. Slide the left side panel towards the rear of the instrument and lift.
15. Remove the electronics carrier top cover.



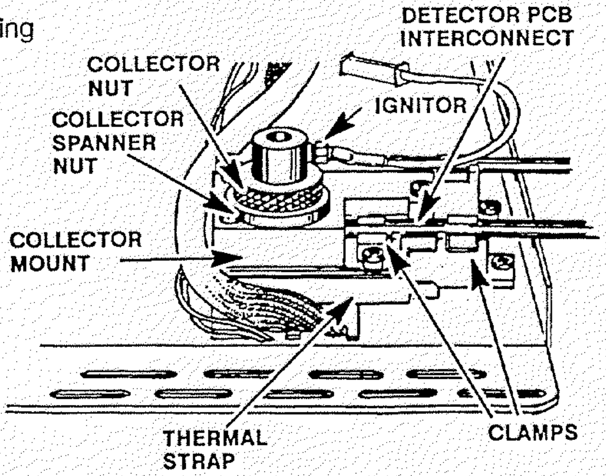
16. Remove the right side panel by removing four screws: two each along its top and bottom edges.



17. Disconnect the ignitor wire lead connector at the mating connection adjacent to the ignitor.



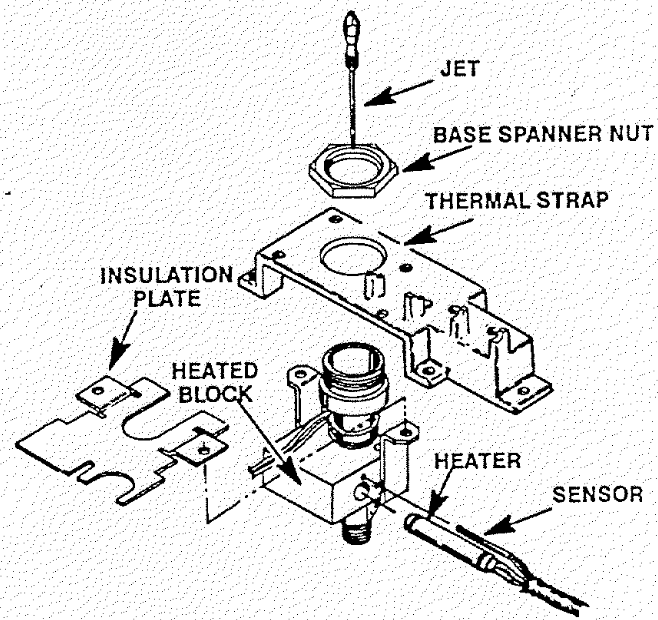
18. Loosen the screws securing the clamps holding the interconnect in place.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

19. Remove the FID detector PCB by sliding it out of the main PCB (at the right side of the instrument). Removal of the PCB will withdraw the interconnect from the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.
20. Remove the three screws securing the collector mount to the thermal strap.
21. Remove the collector mount and collector assembly as a unit.
22. Use a 1/4-inch nut driver to remove the jet from the detector weldment.
23. Use a 1 and 1/4-inch socket to remove the base spanner nut from the detector weldment.
24. Remove the thermal strap by removing the five screws securing it to the instrument.
25. Remove the two screws securing the detector weldment to the instrument.
26. Slide the insulation plate out from over the detector weldment.
27. If the detector is to be reused, cap the detector weldment at its upper opening, using a detector cap, and at its lower opening, inside the column oven.
28. Remove the insulation around the detector weldment to expose the two screws securing the weldment to the instrument.



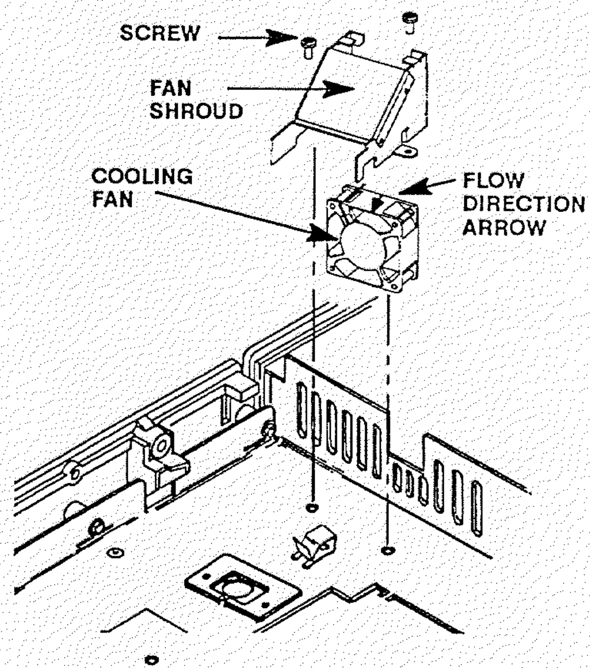
29. Lift the base up enough to expose the heated block, heater and sensor cartridge wires.

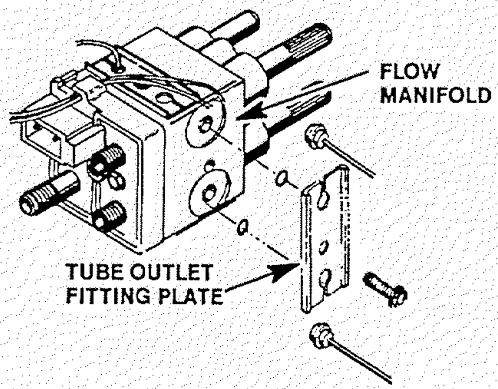
30. Carefully slide the two cartridges out of the block. (The smaller of the two cartridges is the sensor and must be handled gently in order to prevent breakage.)

31. If a PCOC fan is installed, remove the back cover of the instrument by removing four screws and sliding the cover off of the rear of the instrument.

32. If installed, remove the PCOC fan cover to allow removal of the tubing attached to the detector weldment.

33. Trace the hydrogen and air inlet tubes, attached to the detector weldment, to their appropriate connection at the flow manifold block (exposed left side of the instrument). (The specific destinations of the two tubes depends upon the function of each tube, and upon whether the detector base is located in the "A" or "B" detector position.)





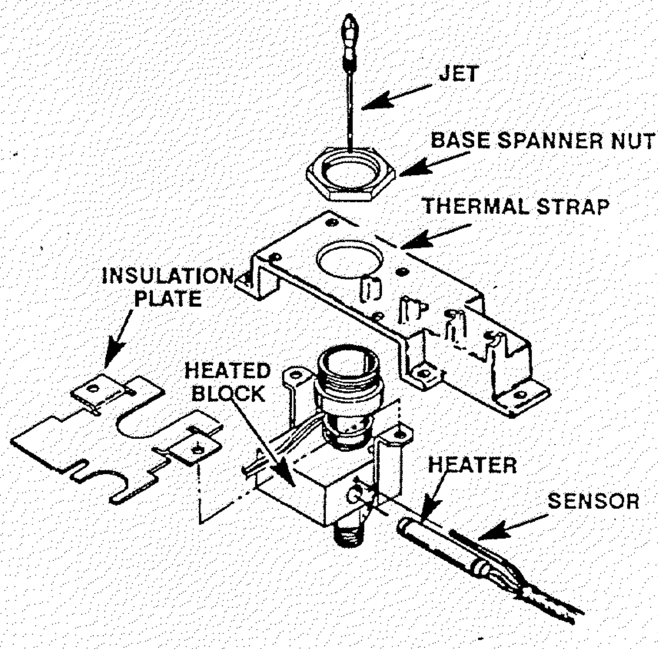
34. Disconnect the tubes by removing the tube outlet fitting plate from the manifold block.

CAUTION

When bending tubing, do not make sharp bends which may crimp the tubing.

35. Prepare the replacement detector weldment by bending its tubes until they are oriented similarly to those on the weldment just removed.

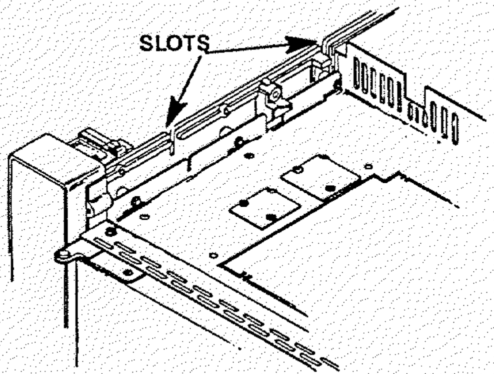
36. Position the replacement detector over the opening where it is to be installed.



37. Slide the heater and sensor cartridges into the heated block portion of the replacement detector weldment.

38. Position the replacement detector weldment in the detector opening.

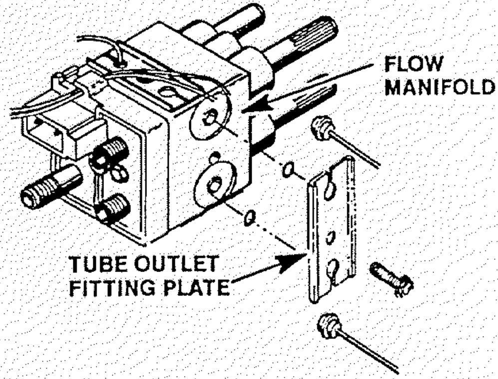
39. Install the insulation around the detector weldment.



40. Position the insulation plate over the installed insulation and align its mounting holes with those of the detector weldment.

41. Secure the detector weldment and insulation plate to the instrument with two screws.

42. Locate the "U-shaped" slots on the instrument to the left of the inlet. Bend the tubes from the new detector weldment to lay within these slots, and any installed clips, and route them to the flow manifold block on the left side of the instrument.



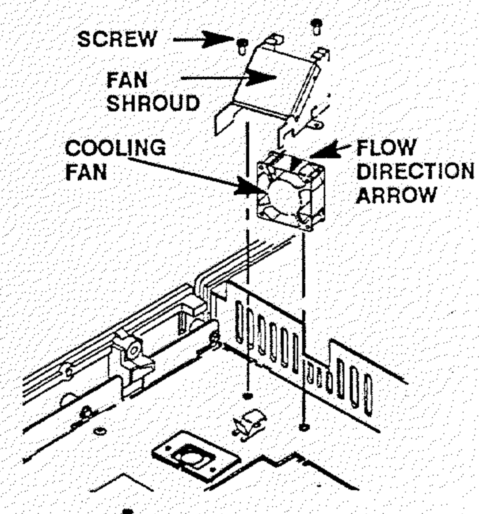
WARNING

CONNECTING THE HYDROGEN INLET TUBE AT THE WRONG LOCATION ON THE FLOW MANIFOLD BLOCK WILL RESULT IN LEAKAGE, CREATING A FIRE AND EXPLOSION HAZARD.

CAUTION

When installing tubing in the flow manifold block, ensure that all o-rings are positioned properly.

43. Connect the tubes from the new detector weldment to the flow manifold block. (The hydrogen tube is painted RED. Make sure each tube is installed at the correct location on the flow manifold block.)



44. If the PCOC fan and cover were removed, install them and secure using two screws.

45. Install the thermal strap and secure it to the instrument using five screws.

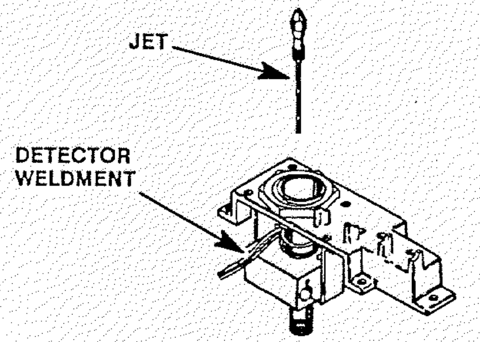
46. Install the base spanner nut on the detector weldment and tighten using an open end wrench.

47. Remove the cap from the detector weldment top opening.

48. Use an inert gas to blow out the detector weldment, cleansing it of any debris.

49. Ensure that there is no debris in the detector weldment.

50. Install a new jet in the detector weldment. (Although installation of a new jet is highly recommended, the old jet may be cleaned and installed at the operator's discretion. Use an approved solvent and a cleaning wire to clean jets.)



CAUTION

Do not over-tighten the jet! Over-tightening may permanently deform and damage the jet, the detector base, or both.

51. Install the replacement jet finger-tight. (Use two fingers on the 1/4-inch nut driver to obtain this tightness).

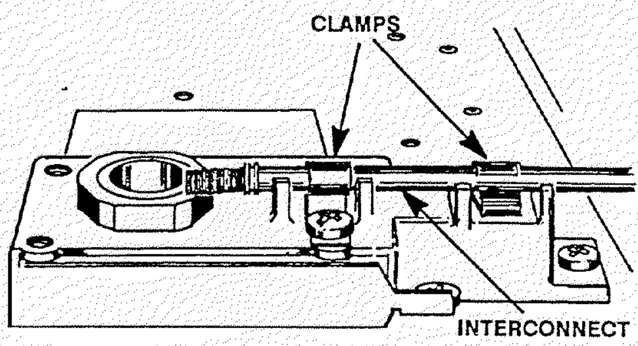
52. Tighten the jet 1/8-turn past finger-tight using the nut driver.

CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

53. Install the FID detector PCB by sliding it into its mounting location on the main PCB (at the right side of the instrument). Installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.

54. Tighten the screws on the clamps which secure the interconnect to the thermal strap.



55. Secure the collector mount to the thermal strap using three screws. (Be certain that the interconnect spring contact to the detector PCB is in contact with the groove on the collector.

56. Tighten the screws which secure the interconnect clamps to the thermal strap.

57. Remove the cap from the base of the detector weldment (inside the column oven).

58. Install the column and any other associated hardware removed in step 5 of this procedure.

59. Install the collector mount and collector assembly as a unit.

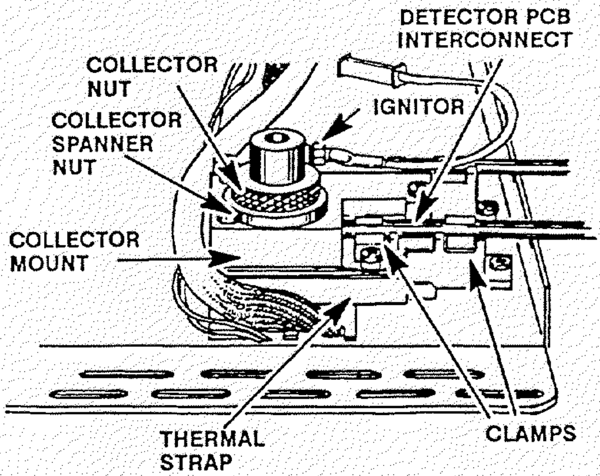
60. Secure the collector mount to the thermal strap using three screws.

61. Connect the ignitor wire lead connector at the mating connection adjacent to the ignitor.

62. If it was necessary to remove the rear panel, install it and secure using four screws.

63. Install the left side panel and secure using two screws.

64. Install the right side panel and secure using four screws.



65. Install the electronics carrier top cover.

66. Install the hinged top cover and secure using a screw and washer.

67. Connect the ground strap to the hinged top cover using a screw.

68. Restore all gas supplies.

69. Restore power to the instrument.

NITROGEN–PHOSPHORUS DETECTOR (NPD)

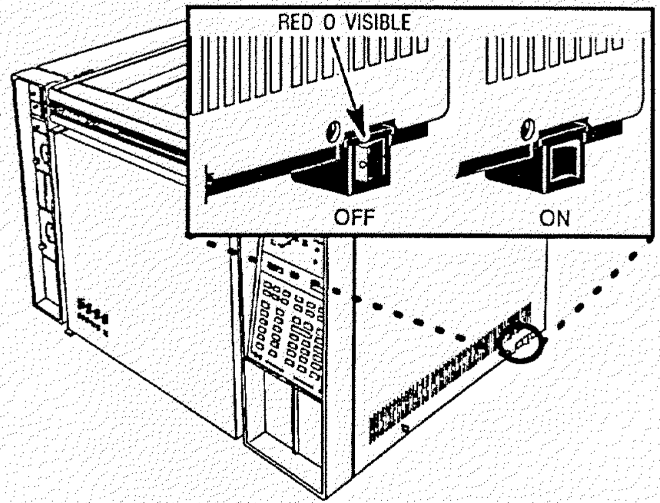
Remove/Replace NPD Active Element Power Transformer (Toroid)

WARNING

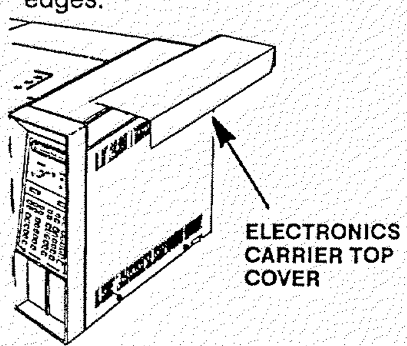
- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.

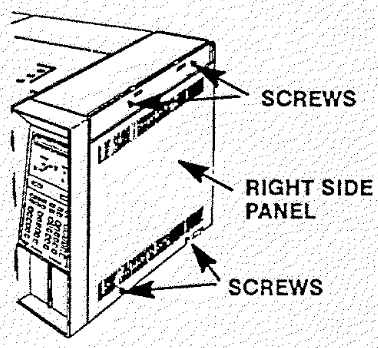
NOTE

A soldering iron is required for this procedure. Letting it heat up while performing these first few steps will save some time from the overall procedure.

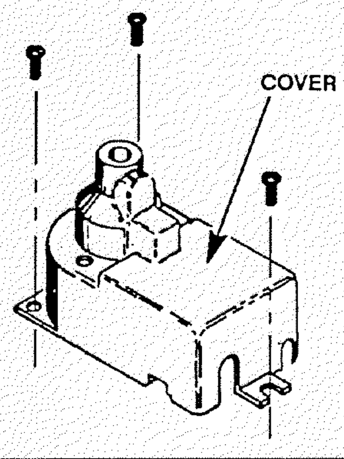


1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Lift the hinged top cover at its front edge, exposing the detector area.
6. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
7. Remove the right side panel by removing four screws: two each along its upper and lower edges.





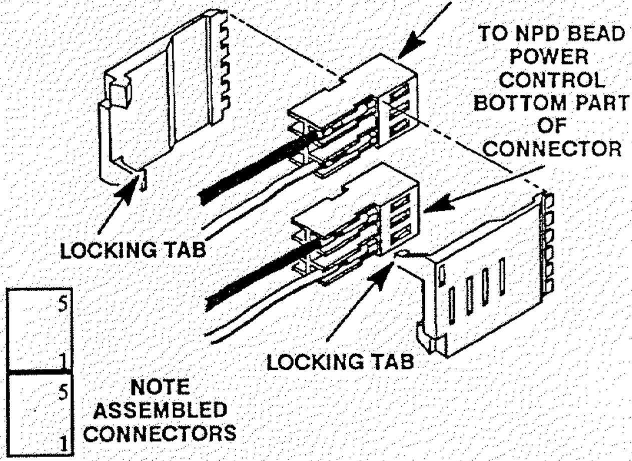
8. Use a Pozidriv screwdriver to remove the three screws securing the detector cover to the thermal strap.



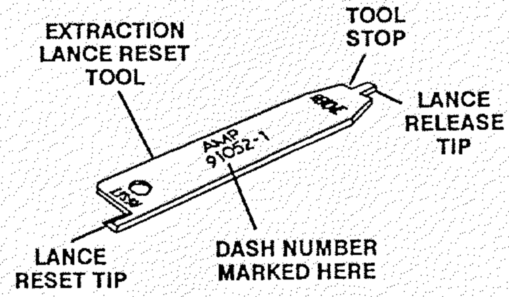
CAUTION

- When disconnecting a plug, pull on the plug not on its wires. Pulling on the wires may cause breakage.
- The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

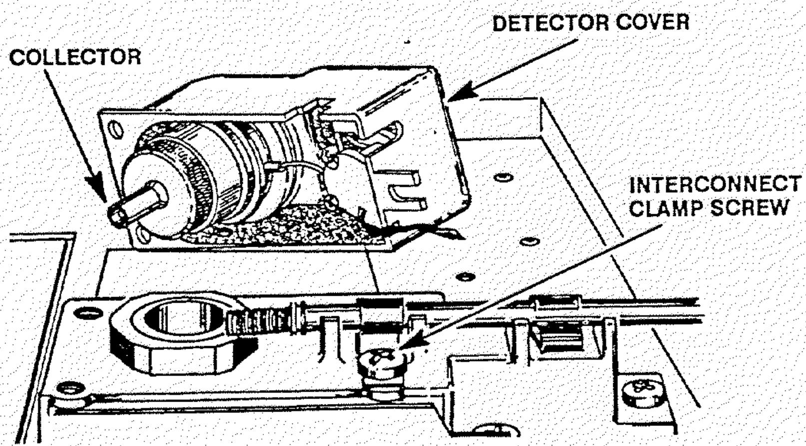
9. Disconnect the NPD bead power cable from the detector PCB by pulling it straight off.



10. Use the side edge of an AMP pin extraction/ lance tool (8710-1542) to remove the interlocking side covers from the plug. (The plug is made up of two connectors; one is for the toroid bead power, the other is for the active control element.)



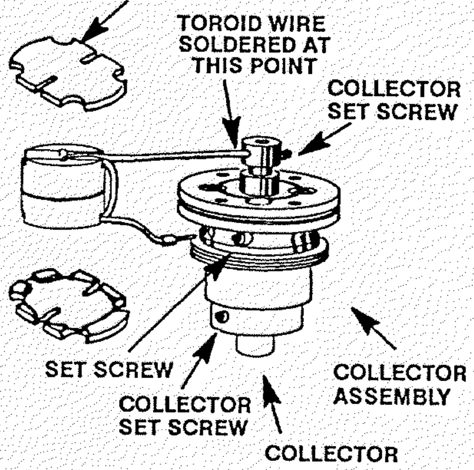
11. Loosen the screws securing the detector PCB interconnect clamps to the thermal strap.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

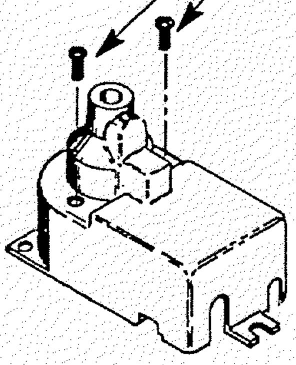
12. Remove the detector PCB from the right side of the instrument by grasping it in the center area along its outer edge and pulling it straight out. (This will draw the interconnect out of the detector.)
13. Use a 1.5-mm hex wrench to loosen the two set screws which secure the collector inside the collector assembly.

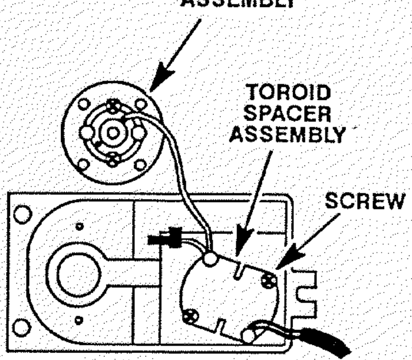


CAUTION

Do not handle the collector with bare hands. Use needle-nose pliers when handling the collector to avoid contaminating it with finger oils and/or other contaminants.

14. Use needle-nose pliers, inserted through the opening in the top of the detector cover, to remove the collector by forcing it down from inside the top of the collector assembly.
15. Remove the two Pozidriv screws securing the collector assembly to the detector cover.





16. Remove the two screws securing the toroid/spacer assembly to the inside of the detector cover.
17. Remove the collector assembly and the toroid spacer assembly from the detector cover, as a unit.

18. Using a 1.5-mm hex wrench, loosen the set screw securing the lower toroid lead to the collector assembly.

19. Remove the lower toroid lead from the collector assembly.

20. Desolder the soldered toroid lead from the upper portion of the collector assembly.

21. Remove the upper toroid lead from the collector assembly.

22. Install the new toroid leads to the collector assembly.

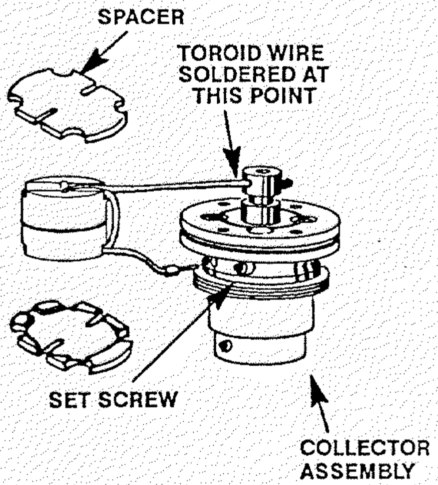
23. Tighten the setscrew securing the lower toroid wire to the collector assembly, snugly.

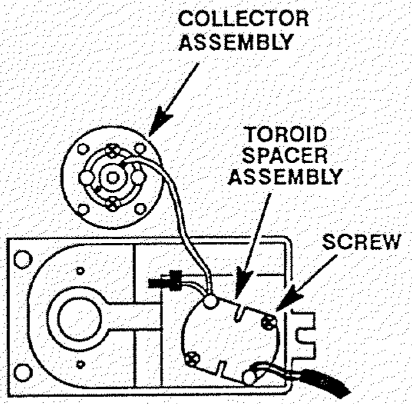
24. Solder the upper toroid lead to the collector assembly.

25. Install the new toroid/spacer assembly in the detector cover and secure with two screws.

26. Thread the bead power cable through the notch in the end of the detector cover, making sure that only the heat-shrink tubing, not the bare wire, contacts the cover.

27. Secure the collector assembly to the detector cover using two Pozidriv screws.





CAUTION

Do not handle the collector with bare hands. Use needle-nose pliers when handling the collector to avoid contaminating it with finger oils and/or other contaminants.

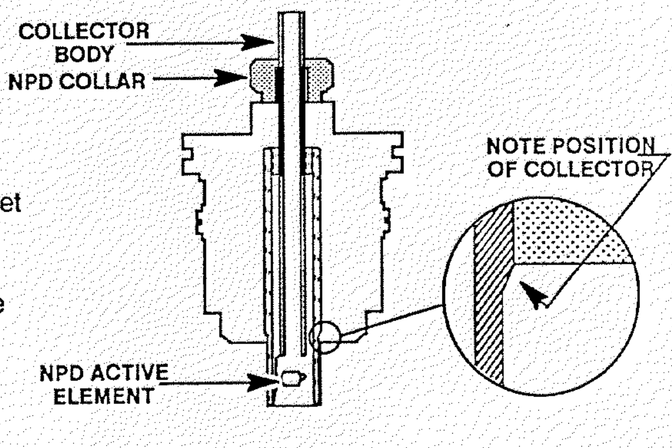
28. Use needle-node pliers to install the collector into the collector assembly, from the bottom.

29. Align the collector to the collector assembly in accordance with the illustration below.

30. When properly aligned, secure the collector inside the collector assembly by tightening two set screws.

31. Place the detector cover over the detector base and secure it with the three screws previously removed.

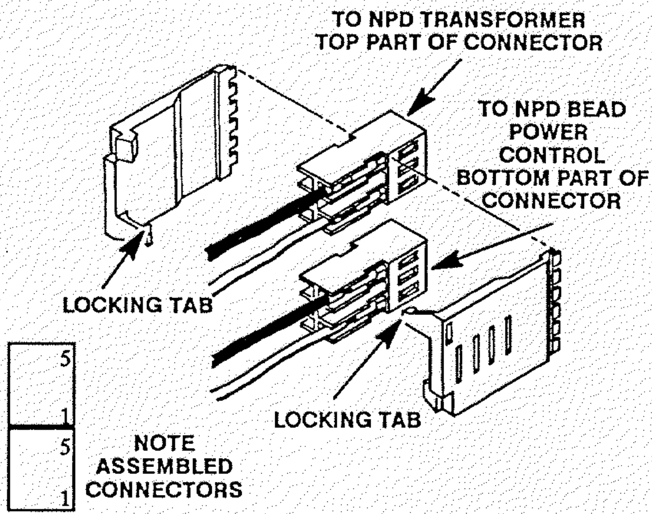
NPD COLLECTOR ASSEMBLY



32. Guide the new bead power cable through the slot on the edge of the electronics carrier and down through the rectangular opening in the carrier top marked Detector A or B, depending on which position is being used.

33. Orient the new plug in the same position as the one removed.

34. Install the interlocking side covers on the bead power and active element power control cables.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

35. Install the NPD detector PCB by aligning the PCB with the guide slots. Press the board into its connector on the circuit board.

CAUTION

NPD power control plugs installed in the wrong position will permanently damage the NPD detector PCB.

36. Insert the bead power cable and active element power control cable plug into its connector receptacle on the NPD detector PCB.

37. Tighten the interconnect clamp screws on the thermal strap.

38. Install the right side panel and secure using four screws.

39. Install the electronics carrier top cover.

40. Restore all gas supplies.

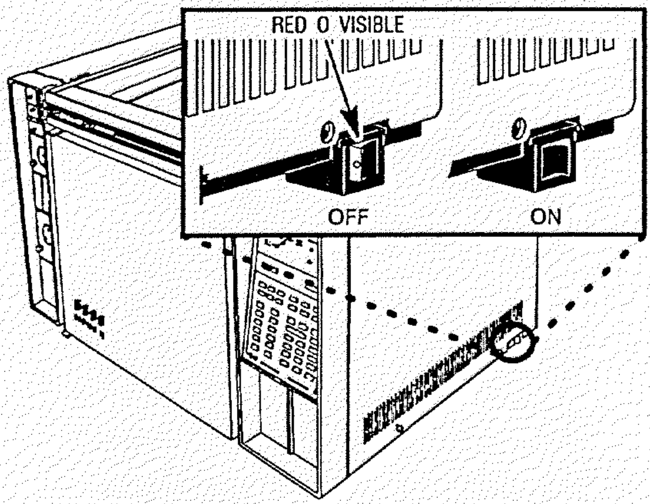
41. Restore power to the instrument.

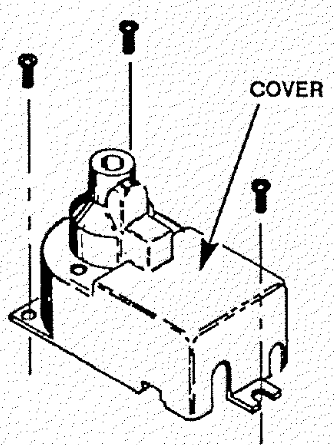
Remove/Replace NPD Collector

WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Lift the hinged top cover at its front edge, exposing the detector area.
6. Use a Pozidriv screwdriver to remove the three screws securing the detector cover to the thermal strap.

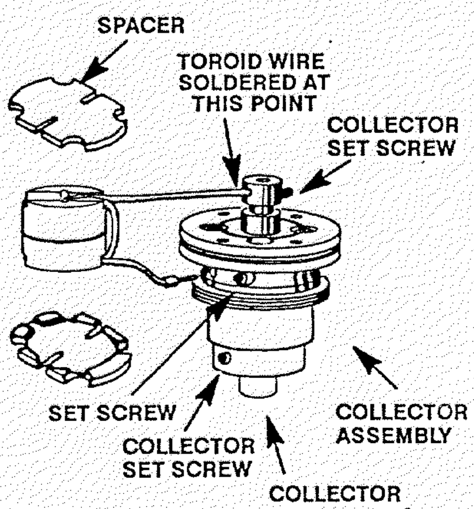




7. Use a 1.5-mm hex wrench to loosen the two set screws which secure the collector inside the collector assembly.

CAUTION

Do not handle the collector with bare hands. Use needle-nose pliers when handling the collector to avoid contaminating it with finger oils and/or other contaminants.



8. Use needle–nose pliers, inserted through the opening in the top of the detector cover, to remove the collector by forcing it down from inside the top of the collector assembly.

9. Use needle–node pliers to install the connector into the collector assembly, from the bottom.

10. Align the collector to the collector assembly in accordance with the illustration below.

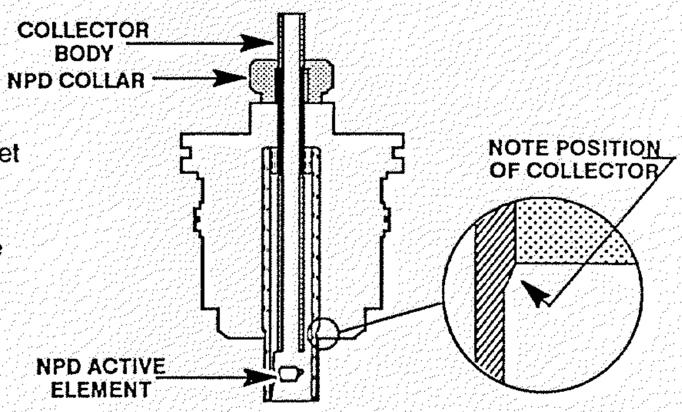
11. When properly aligned, secure the collector inside the collector assembly by tightening two set screws.

12. Place the detector cover over the detector base and secure it with the three screws previously removed.

13. Restore all gas supplies.

14. Restore power to the instrument.

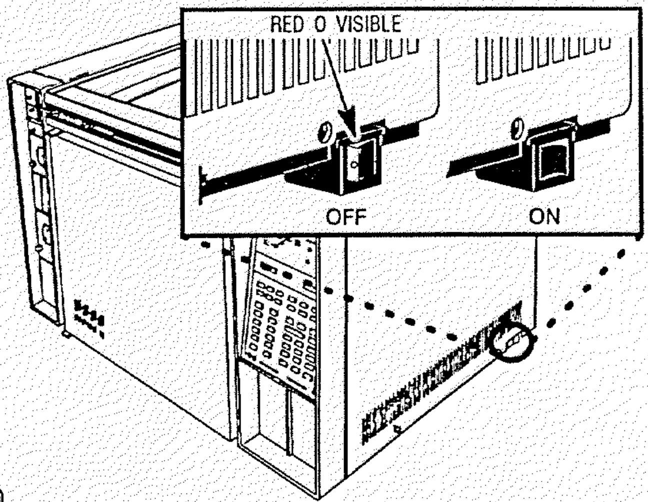
NPD COLLECTOR ASSEMBLY



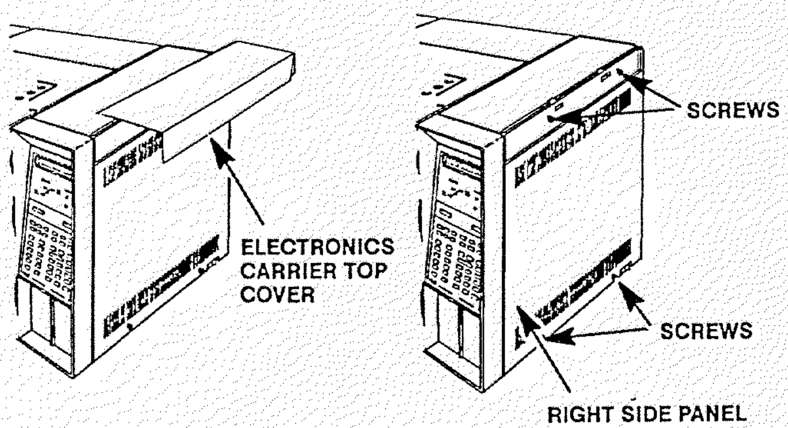
Remove/Replace NPD Jet

WARNING

- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.



1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Remove the electronics carrier top cover.
6. Remove the right side panel by removing four screws: two each along its top and bottom edges.



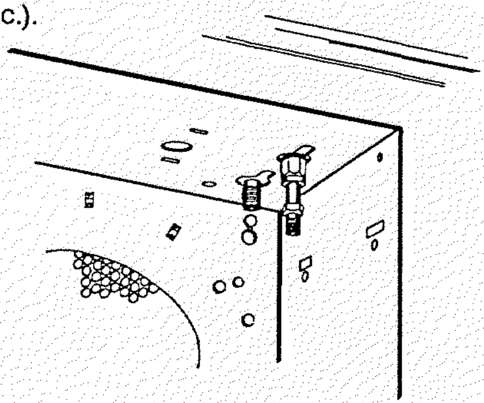
7. Loosen the screws securing the clamps holding the detector PCB interconnect in place.

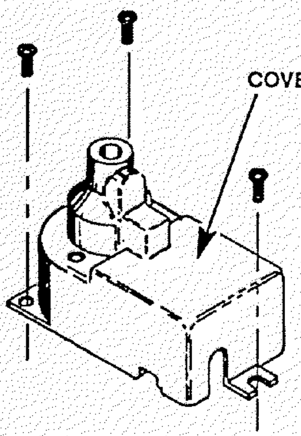
CAUTION

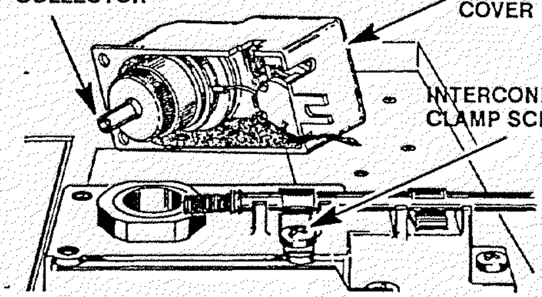
- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

8. Remove the NPD detector PCB by sliding it out of the main PCB (at the right side of the instrument). Removal of the PCB will withdraw the interconnect from the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.

9. At the bottom of the detector being serviced, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).







10. Use a Pozidriv screwdriver to remove the three screws securing the detector cover to the thermal strap.

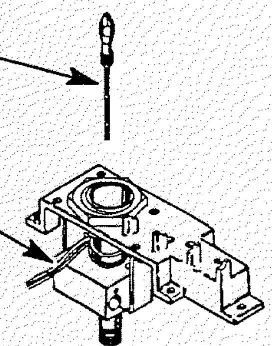
11. Remove the detector top cover, and all attached components, from the thermal strap and set aside.

12. Use a 1/4-inch nut driver to remove the jet from the detector weldment.

13. Use an inert gas to blow out the detector weldment, cleansing it of any debris.

14. Ensure that there is no debris in the detector weldment.

15. Replace the jet with a new jet. (Although replacement is highly recommended, the jet may be cleaned and installed at the operator's discretion. Use an approved solvent and a cleaning wire to clean jets.)



CAUTION

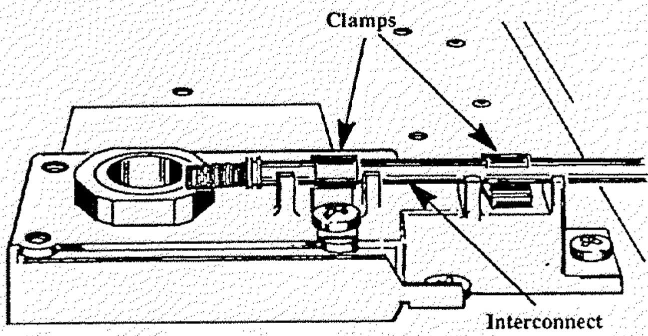
Do not over-tighten the jet! Over-tightening may permanently deform and damage the jet, the detector base or both.

16. Install the replacement jet finger-tight. (Use two fingers on the nut driver to obtain this tightness).
17. Tighten the jet 1/8-turn past finger-tight using the nut driver.
18. At the bottom of the detector, inside the column oven, install the column and any associated hardware removed in step 12.

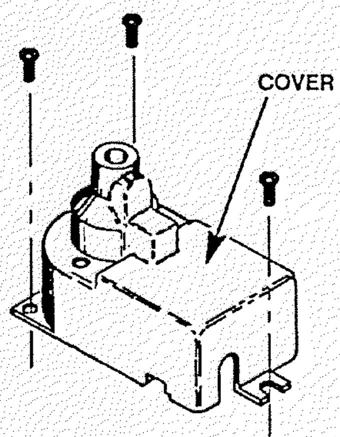
CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

19. Install the NPD detector PCB by sliding it into its mounting location on the main PCB (at the right side of the instrument). Installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.



20. Tighten the screws on the clamps which secure the interconnect to the thermal strap.
21. Install the detector top cover, and all attached components, on the thermal strap.
22. Use a Pozidriv screwdriver to secure the detector cover to the thermal strap with three screws.



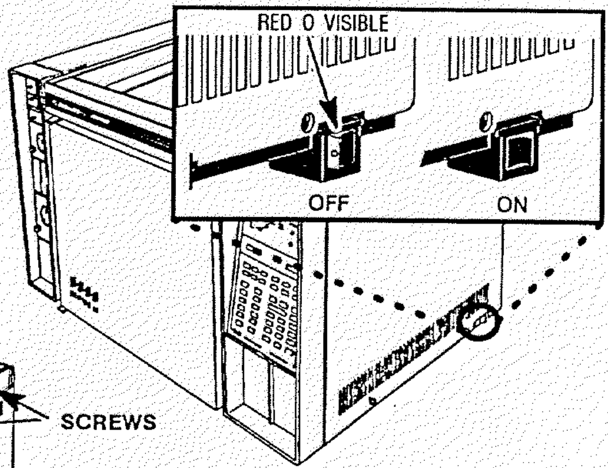
23. Restore all gas supplies to the instrument and check for leaks at all installed fittings.
24. If the system is leak free, install the right side panel and secure using four screws.
25. Install the electronics carrier top cover.
26. Restore power to the HP 5890 Series II.

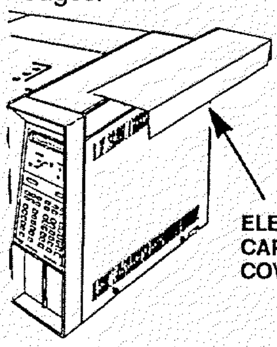
Remove/Replace NPD Active Element Power Control

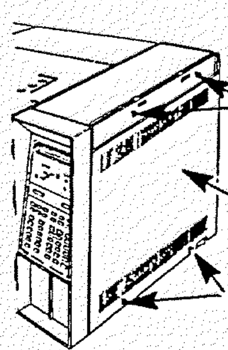
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
4. Remove the right side panel by removing four screws: two each along its upper and lower edges.



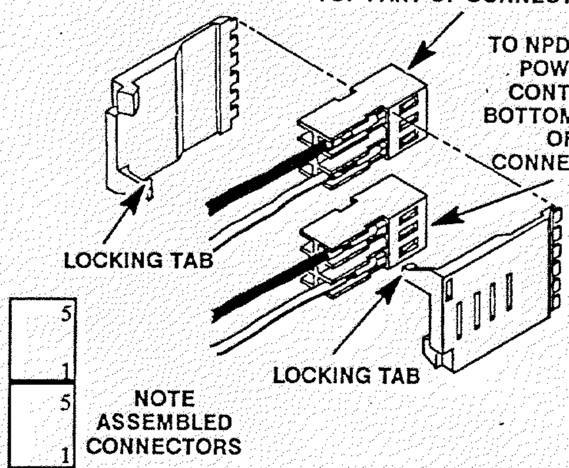


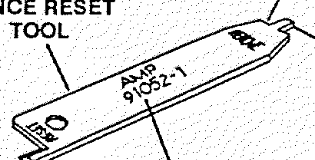


CAUTION

- **When disconnecting a plug, pull on the plug not on its wires. pulling on the wires may cause breakage.**
- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**

5. Disconnect the NPD bead power cable from the detector PCB by pulling it straight off.
6. Use the side edge of an AMP pin extraction/lance tool (8710-1542) to remove the interlocking side covers from the plug. (The plug is made up of two connectors; one is for the toroid bead power, the other is for the active control element.)





7. Remove the control knob from the potentiometer assembly by pulling it straight off.

8. Using a 1.0-mm hex wrench, loosen the two hex screws located around the outside of the brass collar.

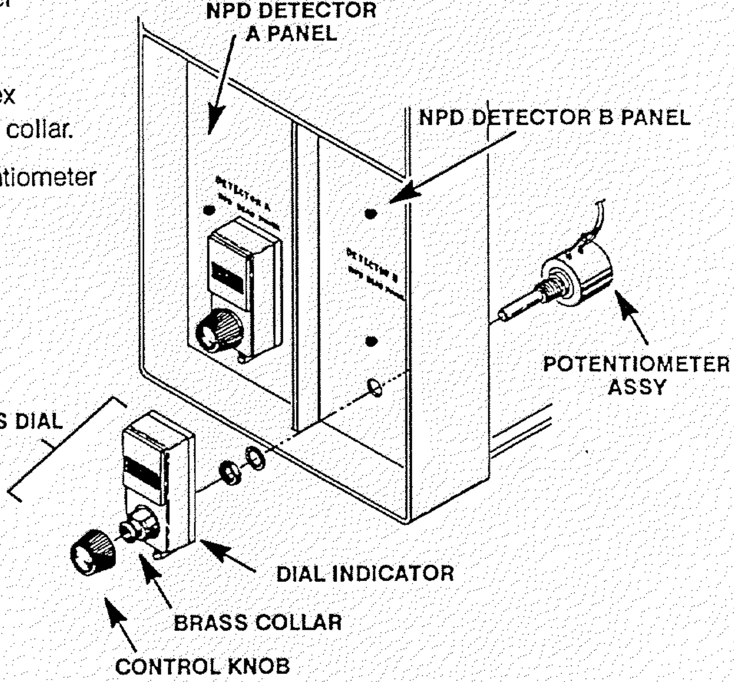
9. Slide the dial indicator off the shaft of the potentiometer assembly.

10. Remove the mounting nut securing the potentiometer assembly.

11. Remove the potentiometer assembly from the rear of the panel.

12. Remove the interlocking side covers from the plug using the side edge of an AMP pin extraction/lance tool (Part No. 8710-1542).

13. Orient the connector associated with the new potentiometer assembly in the same position as the one just removed.



CAUTION

- **NPD power control plugs installed in the wrong position will permanently damage the NPD detector PCB.**
- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**

14. Install the interlocking side covers on the two connectors which make up the connector to be installed in the NPD detector PCB.

15. Insert the plug into its connector on the NPD detector PCB.

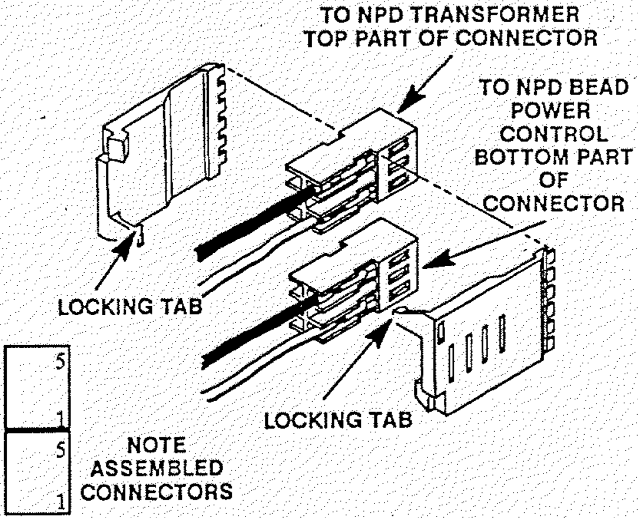
16. Remove the 1/2-inch nut from the new potentiometer assembly.

17. Install the new potentiometer assembly on the panel from the rear.

18. Install the mounting nut and tighten it firmly.

19. Turn the potentiometer shaft fully counterclockwise.

20. Slide the dial indicator onto the power control shaft.



21. While holding the potentiometer shaft fully counter clockwise with a screwdriver, adjust the dial indicator to read "000".

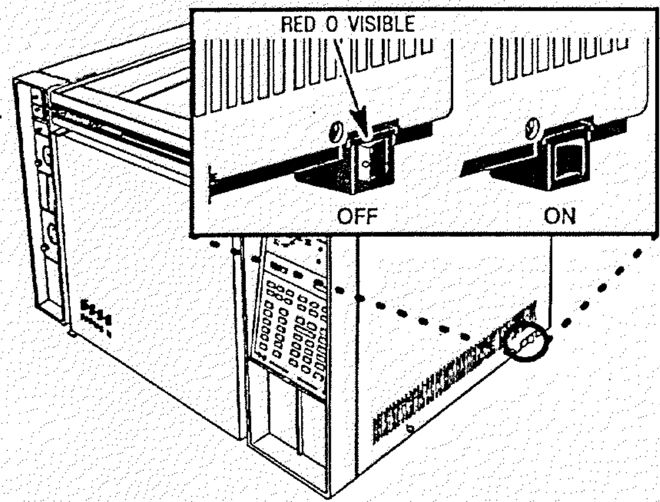
22. While still holding the potentiometer shaft fully counterclockwise with a screwdriver, use a 1.0-mm hex wrench to tighten the two hex screws around the outside of the brass collar.
23. Mount the control knob by pushing it on to the control shaft.
24. Install the right side panel and secure using four screws.
25. Install the electronics carrier top cover.
26. Restore power to the instrument.

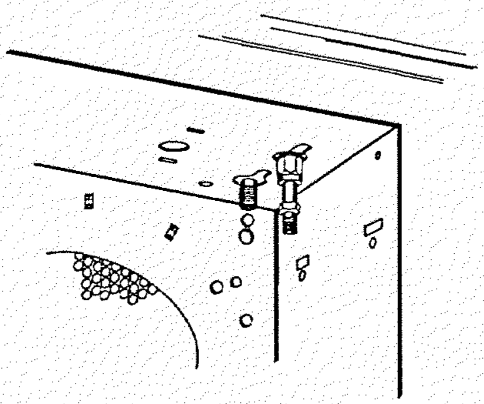
Remove/Replace NPD Detector Weldment

WARNING

- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the detector(s) to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).

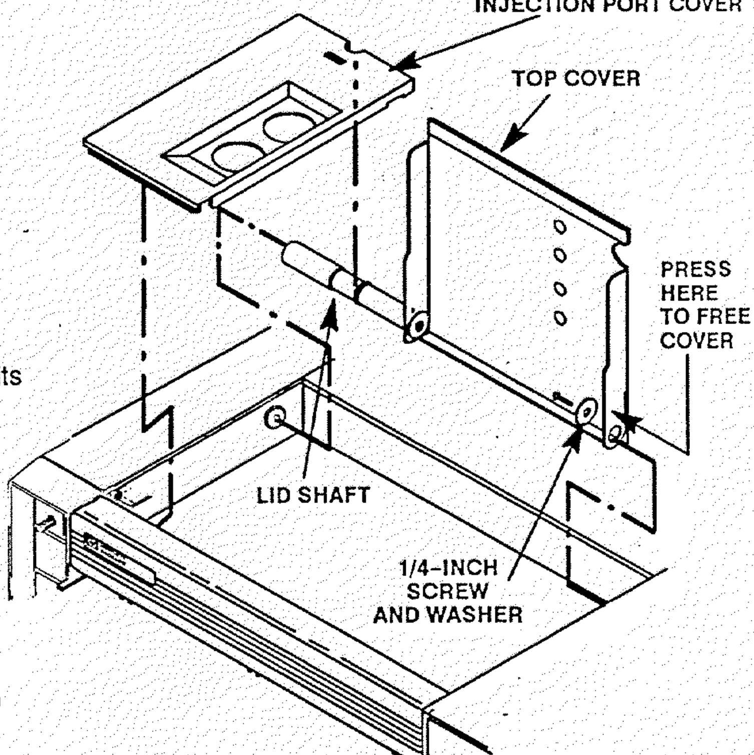




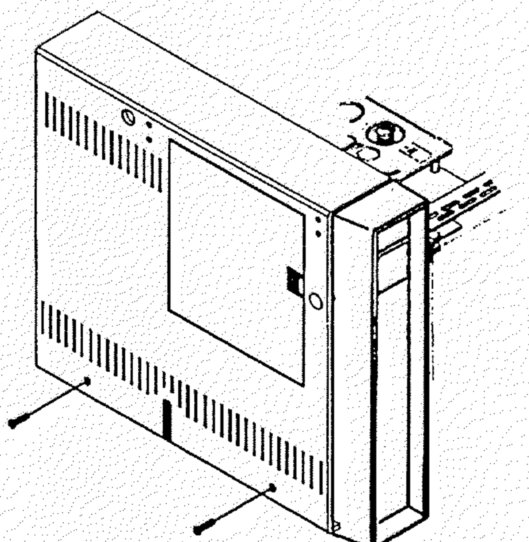
NOTE

If an autosampler is installed, the injection port cover will not be present.

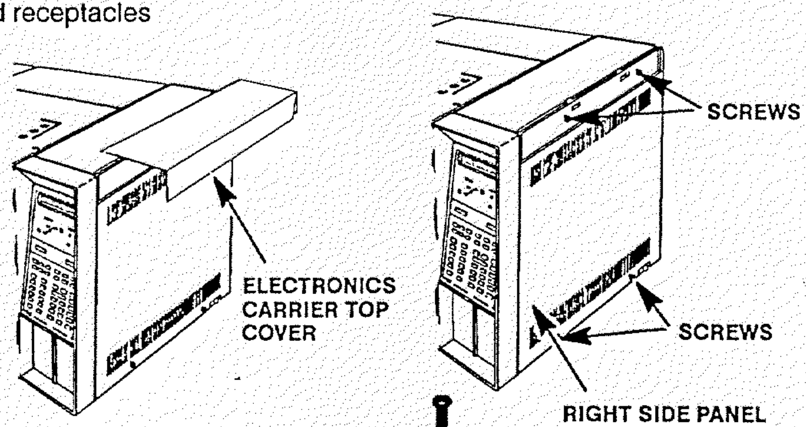
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Lift the hinged top cover at its front edge, exposing the detector area.
8. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.
9. Remove the ground strap from the hinged top cover by removing a screw.



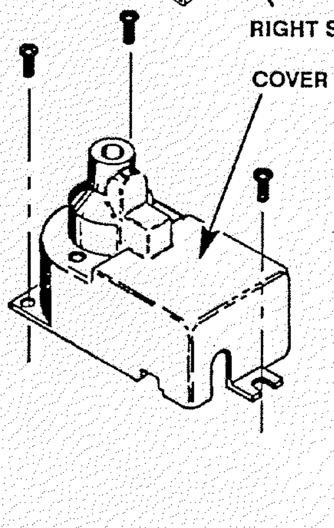
10. At the lower right edge of the cover, press from right–to–left until the right side hinge releases.
11. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.
12. If an autosampler is installed on the instrument, it will be necessary to remove it and its mounting bracket to allow removal of the left side cover as follows:
    a. Remove the autosampler tray from its mounting bracket by first simultaneously lifting and turning the two tray locks which hold it in position, then sliding the tray away from the instrument.
    b. Lift the autosampler tray from its mounting bracket and set it aside.
    c. Remove the autosampler bracket by removing the 6 screws securing it to the instrument.
13. Remove the two screws securing the left side panel along its bottom edge.
14. Slide the left side panel towards the rear of the instrument and lift.

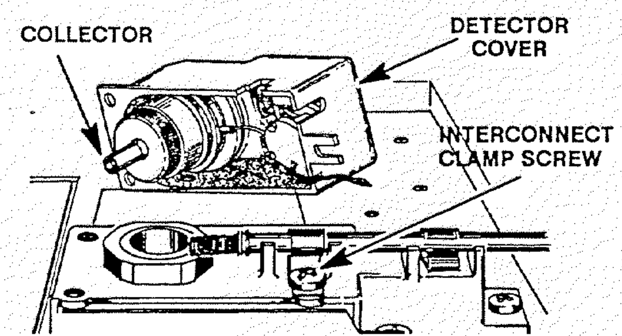


15. Remove the electronics carrier top cover (above the signal cable plugs and receptacles to expose the top edge of the TCD detector PCB).
16. Remove the right side panel by removing four screws: two each along its top and bottom edges.
17. Use a Pozidriv screwdriver to remove the three screws securing the detector cover to the thermal strap.
18. Remove the detector top cover, and all attached components, from the thermal strap and set aside.



19. Use a 1/4–inch nut driver to remove the jet from the detector weldment.

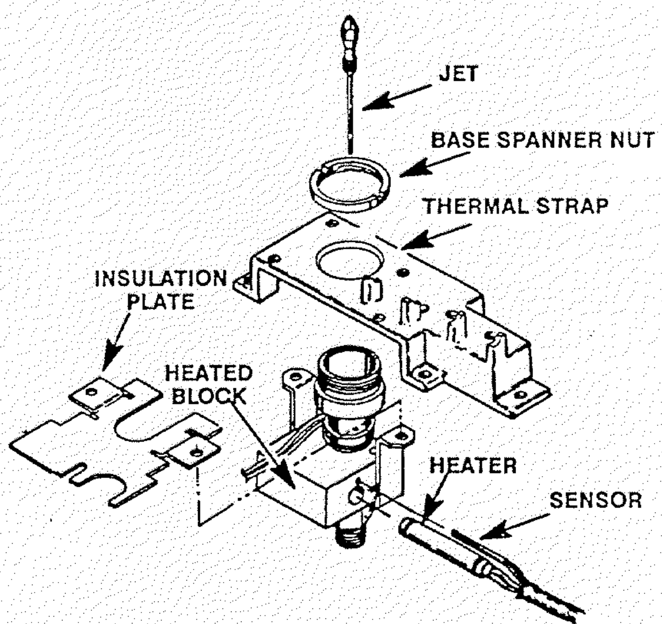




CAUTION

- The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.
- When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.

20. Disconnect the NPD bead power cable from the detector PCB by pulling it straight off.
21. Remove the NPD detector PCB by sliding it out of the main PCB (at the right side of the instrument). Removal of the PCB will withdraw the interconnect from the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.
22. Use a spanner wrench (part no. 19301-00150) to remove the base spanner nut from the detector weldment.
23. Remove the thermal strap by removing the five screws securing it to the instrument.
24. Remove the two screws securing the detector weldment to the instrument.
25. Slide the insulation plate out from over the detector weldment.
26. If the detector is to be reused, cap the detector weldment at its upper opening, using a detector cap, and at its lower opening, inside the column oven.
27. Remove the insulation around the detector weldment to expose the two screws securing the weldment to the instrument.
28. Lift the base up enough to expose the heated block, heater and sensor cartridge wires.
29. Carefully slide the two cartridges out of the block. (The smaller of the two cartridges is the sensor and must be handled gently in order to prevent breakage.)

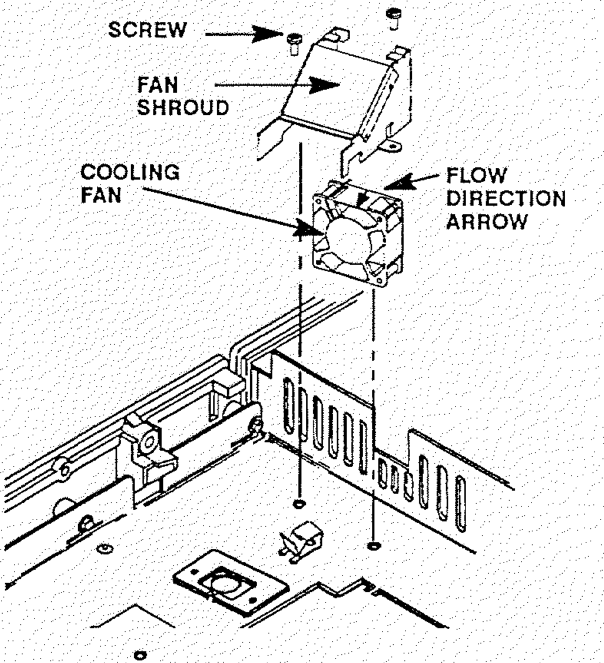


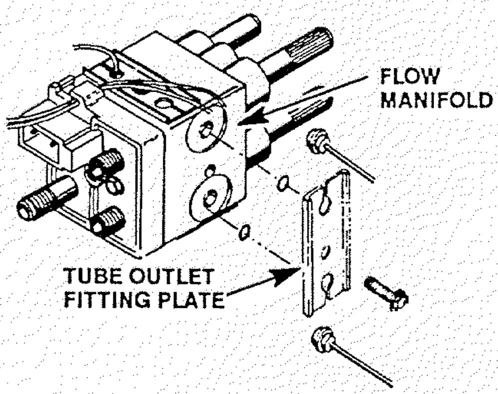
30. If a PCOC fan is installed, remove the back cover of the instrument by removing four screws and sliding the cover off of the rear of the instrument.

31. If installed, remove the PCOC fan cover to allow removal of the tubing attached to the detector weldment.

32. Trace the hydrogen and air inlet tubes, attached to the detector weldment, to their appropriate connection at the flow manifold block (exposed left side of the instrument). (The specific destinations of the two tubes depends upon the function of each tube, and upon whether the detector base is located in the "A" or "B" detector position.)

33. Disconnect the tubes by removing the tube outlet fitting plate from the manifold block.





CAUTION

When bending tubes, do not make sharp bends which may crimp the tubing.

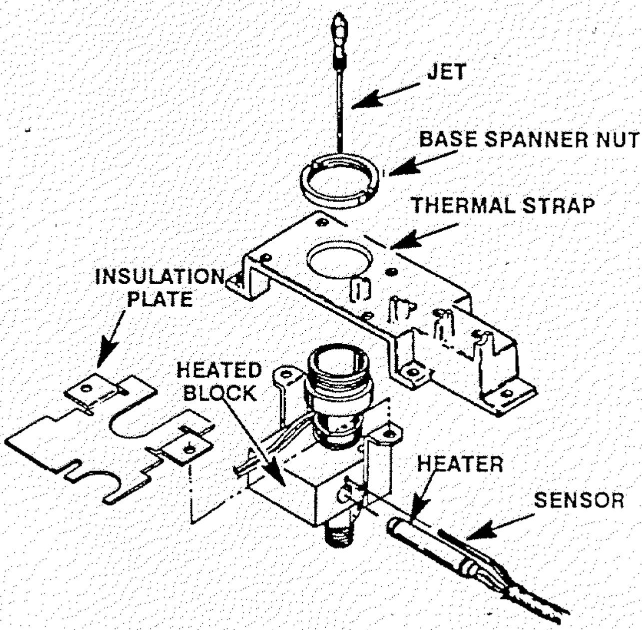
34. Prepare the replacement detector weldment by bending its tubes until they are oriented similarly to those on the weldment just removed.

35. Position the replacement detector over the opening where it is to be installed.

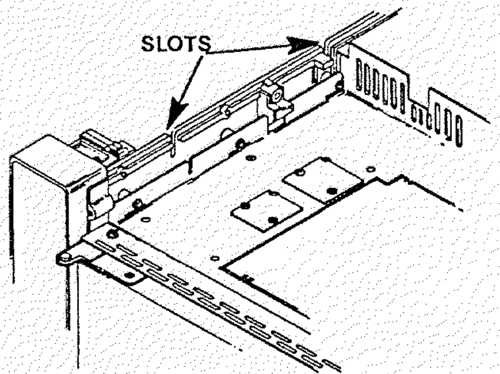
36. Slide the heater and sensor cartridges into the heated block portion of the replacement detector weldment.

37. Position the replacement detector weldment in the detector opening.

38. Install the insulation around the detector weldment.



39. Position the insulation plate over the installed insulation and align its mounting holes with those of the detector weldment.

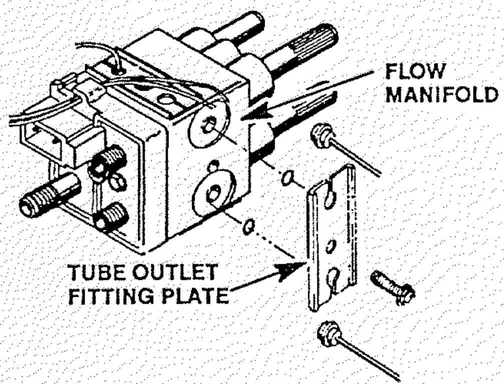


40. Secure the detector weldment and insulation plate to the instrument with two screws.

41. Locate the "U-shaped" slots on the instrument to the left of the inlet. Bend the tubes from the new detector weldment to lay within these slots, and any installed clips, and route them to the flow manifold block on the left side of the instrument.

WARNING

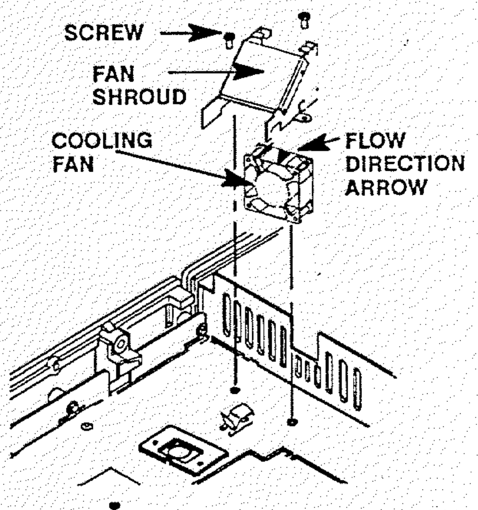
CONNECTING THE HYDROGEN INLET TUBE AT THE WRONG LOCATION ON THE FLOW MANIFOLD BLOCK WILL RESULT IN LEAKAGE, CREATING A FIRE AND EXPLOSION HAZARD.



CAUTION

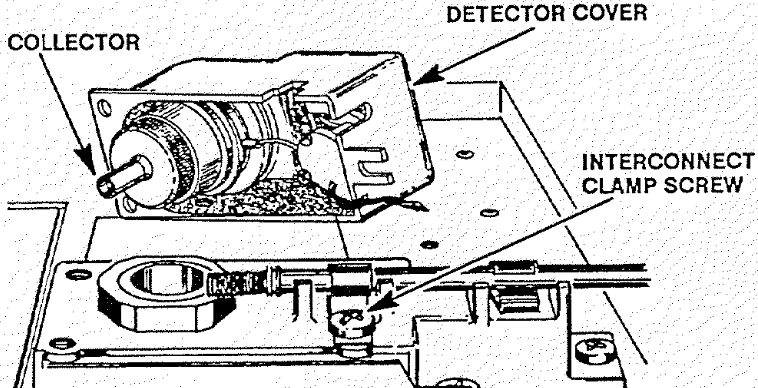
When installing tubing in the flow manifold block, ensure that all o-rings are positioned properly.

42. Connect the tubes from the new detector weldment to the flow manifold block. (The hydrogen tube fitting is painted RED. Make sure each tube is installed at the correct location on the flow manifold block.)



43. If the PCOC fan and cover were removed, install them and secure using two screws.

44. Install the thermal strap and secure it to the instrument using five screws.



WARNING

CONNECTING THE HYDROGEN INLET TUBE AT THE WRONG LOCATION ON THE FLOW MANIFOLD BLOCK WILL RESULT IN LEAKAGE, CREATING A FIRE AND EXPLOSION HAZARD.

CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

NOTE

In the next step, avoid touching the lower end of the collector (end nearest the jet). Fingerprints and/or other contamination may cause baseline drift and noise.

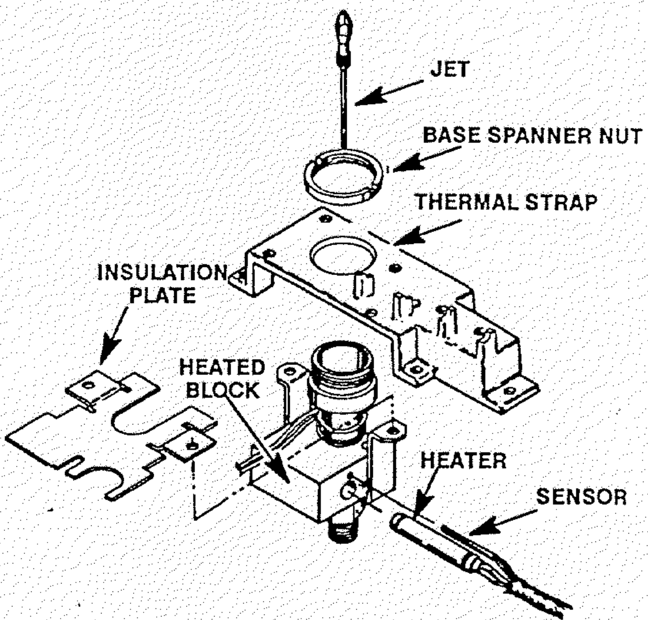
45. Install the base spanner nut on the detector weldment and tighten using a spanner wrench (part no.19301-00150).

46. Remove the cap from the detector weldment top opening.

47. Use an inert gas to blow out the detector weldment, cleansing it of any debris.

48. Ensure that there is no debris in the detector weldment.

49. Install a new jet in the detector weldment. (Although installation of a new jet is highly recommended, the old jet may be cleaned and installed at the operator's discretion. Use an approved solvent and a cleaning wire to clean jets.)



CAUTION

Do not over-tighten the jet! Over-tightening may permanently deform and damage the jet, the detector base, or both.

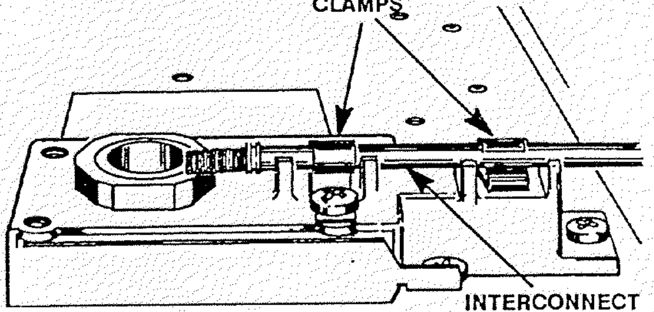
50. Install the replacement jet finger-tight. (Use two fingers on the 1/4-inch nut driver to obtain this tightness).

51. Tighten the jet 1/8-turn past finger-tight using the nut driver.

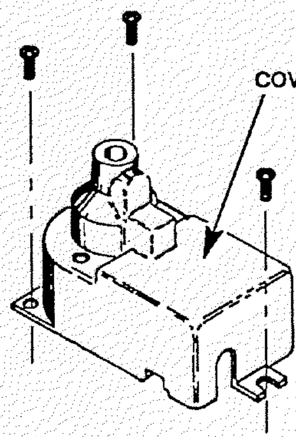
CAUTION

- The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.
- When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.

52. Install the NPD detector PCB by sliding it into its mounting location on the main PCB (at the right side of the instrument). Installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.



53. Tighten the screws on the clamps which secure the interconnect to the thermal strap.
54. Remove the cap from the base of the detector weldment (inside the column oven).
55. Install the column and any other associated hardware removed in step 5 of this procedure.
56. Install the detector top cover, and all attached components, on the thermal strap.



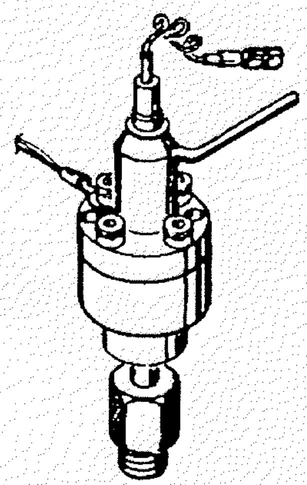
57. Use a Pozidriv screwdriver to secure the detector cover to the thermal strap with three screws.
58. Restore all gas supplies to the instrument and check for leaks at all installed fittings.
59. If the system is leak free, install the left side panel and secure using two screws.
60. If it was necessary to remove the rear panel, install it and secure using four screws.
61. Install the right side panel and secure using four screws.
62. Install the electronics carrier top cover.
63. Install the hinged top cover and secure using a screw and washer.
64. Connect the ground strap to the hinged top cover using a screw.
65. Restore all gas supplies.
66. Restore power to the instrument.

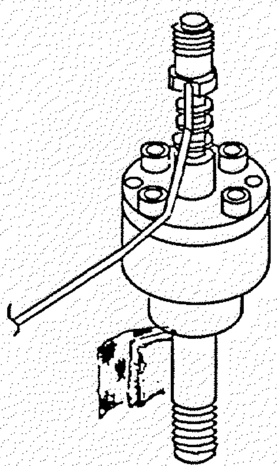
ELECTRON CAPTURE DETECTOR (ECD)

The ECD consists of two parts: the detector cell, and a heated block. **UNDER NO CONDITION IS THE ECD CELL TO BE DISASSEMBLED.** It will simply be exchanged for a new one. This does not require the detector heated block to be removed from the mainframe. There are two types of ECD detectors which may be installed in an HP 5890 Series II. The older version (shown below on the left) is referred to as the 19233A/19235A variety. The newer version (shown to the right of the 19233A/19235A version) is referred to as the G1223A/G1224A variety. Instructions for disassembly and maintenance are given for both versions of the ECD detector.

WARNING

ALL VERSIONS OF ECD DETECTOR WELDMENTS (CELLS) CONTAIN RADIOACTIVE MATERIAL. EXPOSURE TO RADIOACTIVE MATERIAL IS HAZARDOUS TO HUMAN HEALTH. UNDER NO CIRCUMSTANCES SHOULD AN ECD DETECTOR WELDMENT BE DISASSEMBLED. ECD DETECTOR WELDMENTS SHOULD BE EXCHANGED FOR NEW ONES.





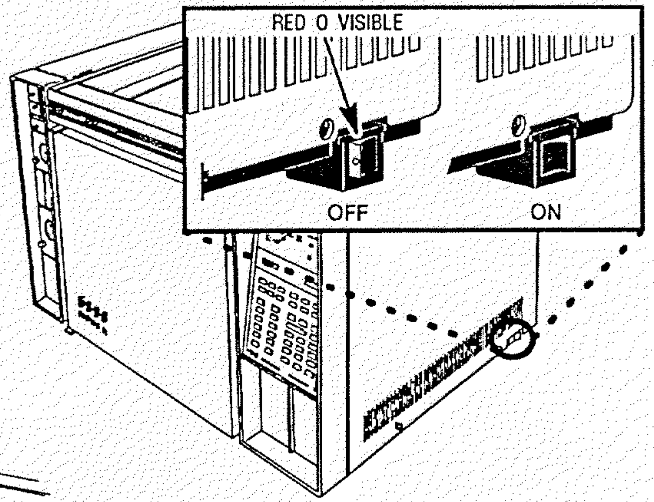
ELECTRON CAPTURE DETECTOR (ECD) (19233A/19235A VERSIONS)

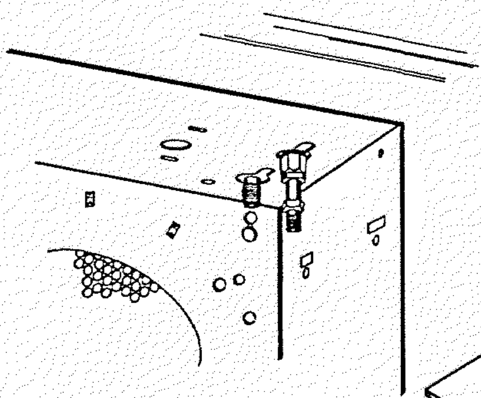
Remove/Replace ECD Cells Weldment and/or Heated Block (19233A/19235A Versions)

WARNING

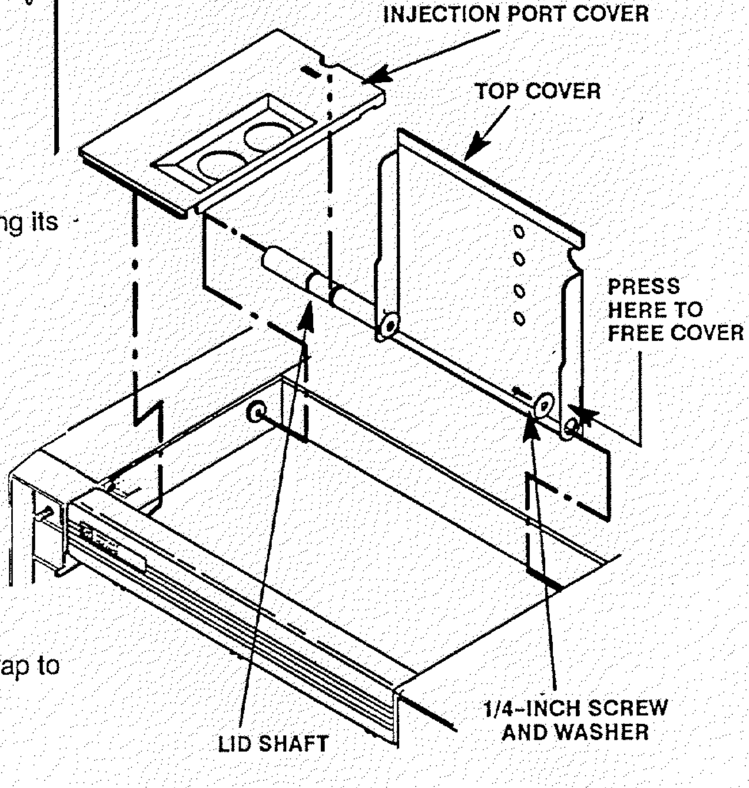
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the detector to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).

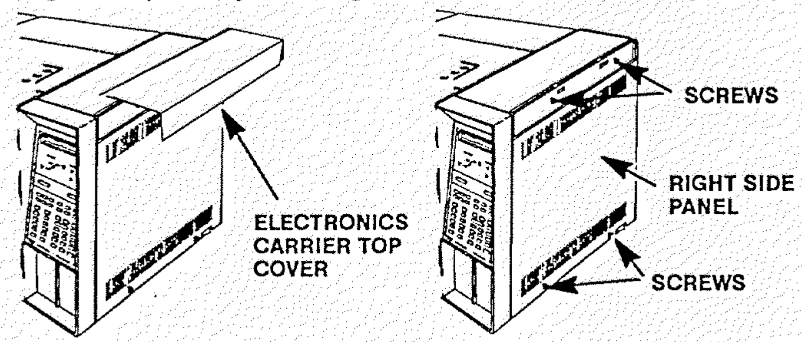




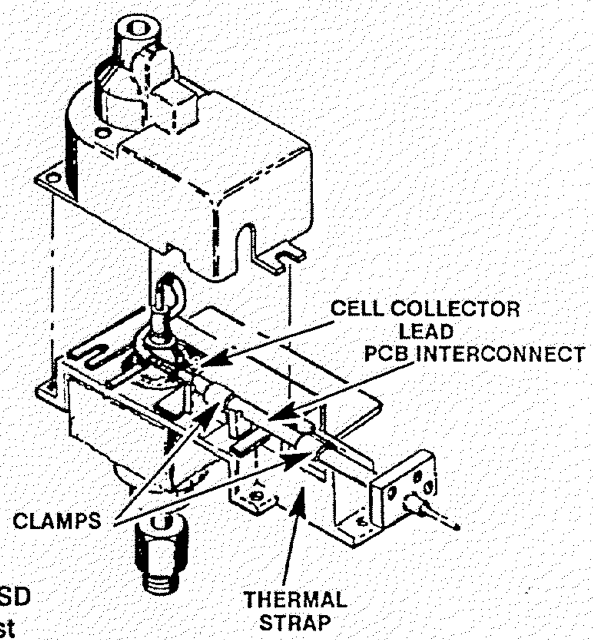
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Lift the hinged top cover at its front edge, exposing the detector area.
8. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.
9. At the lower right edge of the cover, press from right-to-left until the right side hinge releases.
10. Remove the screw securing the ground strap to the hinged top cover



11. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.
12. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
13. Remove the right side panel by removing four screws: two each along its upper and lower edges.



14. Using a Pozidriv screwdriver, remove the three screws securing the detector cover to the thermal strap.
15. Remove the detector cover.
16. Disconnect any tubing attached to the detector exhaust tube.
17. Disconnect the cell collector lead from the PCB interconnect.
18. Loosen the screws securing the clamps which hold the interconnect in place.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

19. Remove the detector PCB from the right side of the instrument by grasping it in the center area along its outer edge and pulling it straight out. (This will draw the interconnect out of the detector clamps on the thermal strap.
20. Remove the five screws securing the thermal strap and shield to the instrument.

21. Remove the shield from the thermal strap by carefully working it over the collector lead and exhaust vent tube. (Depending on the detector's location, it may be necessary to bend the shield to remove and install it. Avoid excessive bending as this will fatigue the metal shield, shortening its life.)

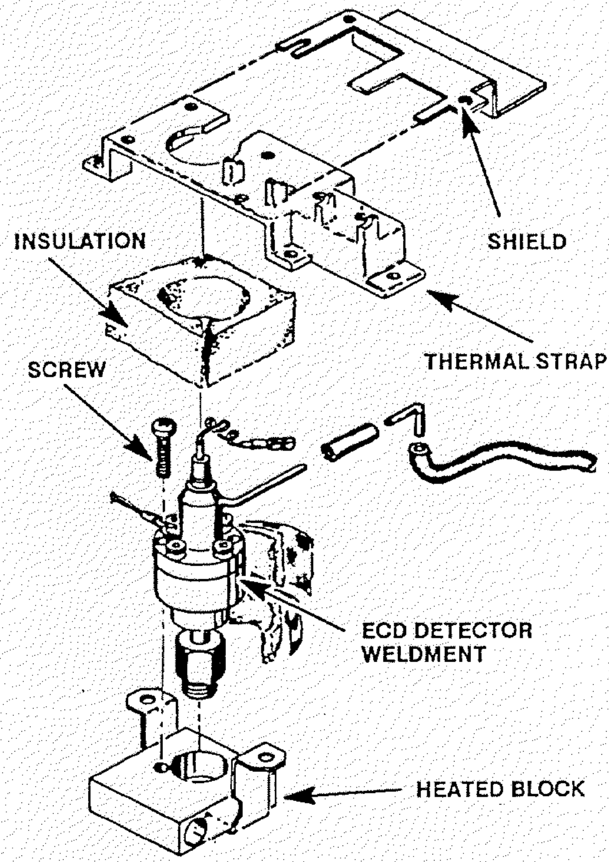
22. Remove the thermal strap, working it carefully over the collector lead and exhaust vent tube.

23. Remove the insulation around the detector base to expose the two Pozidriv screws which secure the ECD weldment to the heated block.

24. Cap the base of the detector (inside the column oven) to avoid damage or contamination of the detector.

25. Remove the two Pozidriv screws securing the detector weldment to the heated block

26. Remove the weldment from the heated block.



NOTE

Perform steps 27 through 32 only if it is desired to remove the ECD heated block. Otherwise, proceed to step 33.

27. If required, remove the two Pozidriv screws securing the heated block to the instrument.

28. Lift the heated block out of its mounting position.

29. Carefully slide the two cartridges (heater/sensor) out of the block. The smaller of the two cartridges is the sensor and must be handled gently in order to prevent breakage.

30. Remove the heated block.

31. Slide heater and sensor cartridges into the new block.

32. Install the new heated block in its mounting position.

33. Secure the heated block to the instrument using two screws.

34. Mount the new weldment, making sure its exhaust vent tube is oriented correctly. (For a cell installed in the "A" position, its exhaust tube will point towards the front of the instrument. In the "B", position the vent tube will point towards the rear of instrument.)

35. Secure the detector weldment to the heated block using two screws.

36. Install the insulation around the detector base.

37. Install the thermal strap, working it carefully over the collector lead and exhaust vent tube.

38. Install the shield over the thermal strap. (Depending on the detector's location, it may be necessary to bend the shield to remove and install it. Avoid excessive bending as this will fatigue the metal shield, shortening its life.)

CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

39. Install the detector PCB at the right side of the instrument. (This will feed the interconnect in to the detector clamps on the thermal strap.)
40. Tighten the screws securing the clamps which hold the interconnect in place.
41. Connect the cell collector lead to the PCB interconnect.
42. Position the detector cover over the detector.
43. Secure the detector cover to the thermal strap with three screws.
44. Remove the cap from the base of the detector (inside the column oven).
45. Install any hardware removed in step 5 of this procedure (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).
46. Disconnect any tubing attached to the detector exhaust vent tube.
47. Plug the detector exhaust vent tubing.
48. Restore supply pressure, and check for leakage at the column and makeup gas adapter fittings.
49. If no leaks exist, shut off the supply pressure.
50. Remove the plug from the detector exhaust vent.
51. Install the right side panel and secure using four screws.
52. Install the electronics carrier top cover.
53. Install the hinged top cover and secure using a screw and washer.
54. Connect the ground strap to the hinged top cover using a screw.
55. Restore power to the instrument.

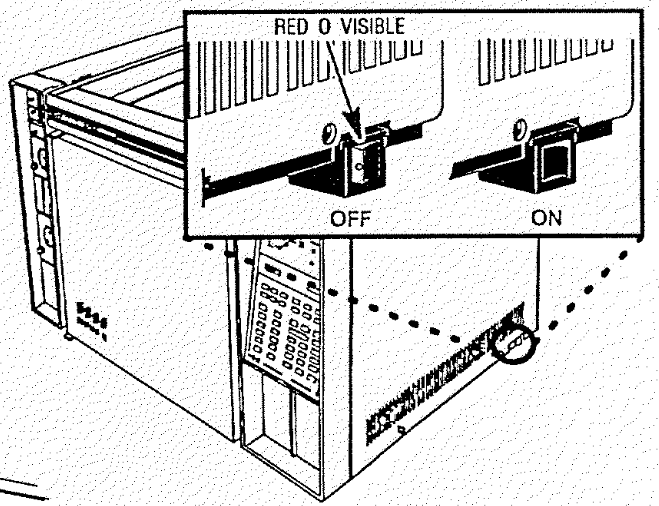
ELECTRON CAPTURE DETECTOR (G1223A/G1224A VERSIONS)

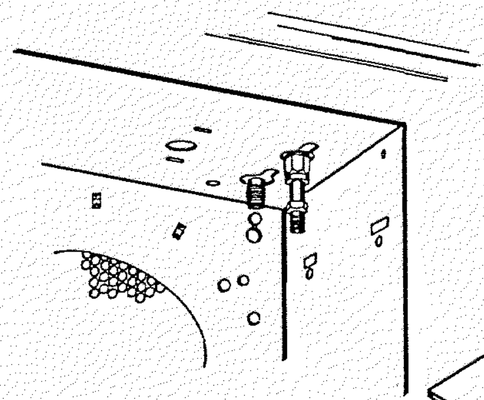
Remove/Replace ECD Cells Weldment and/or Heated Block (G1223A/G1224A Versions)

WARNING

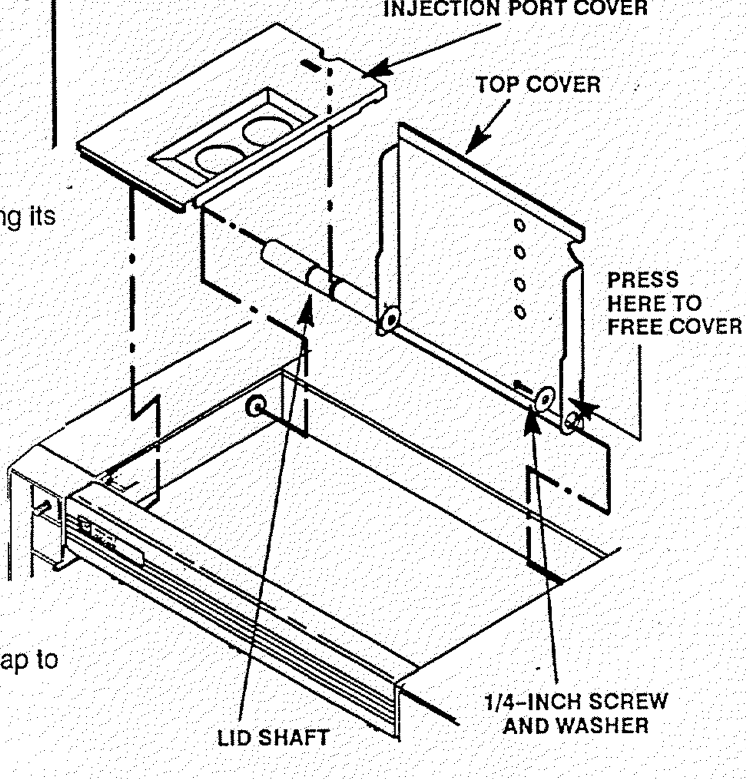
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the detector to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).

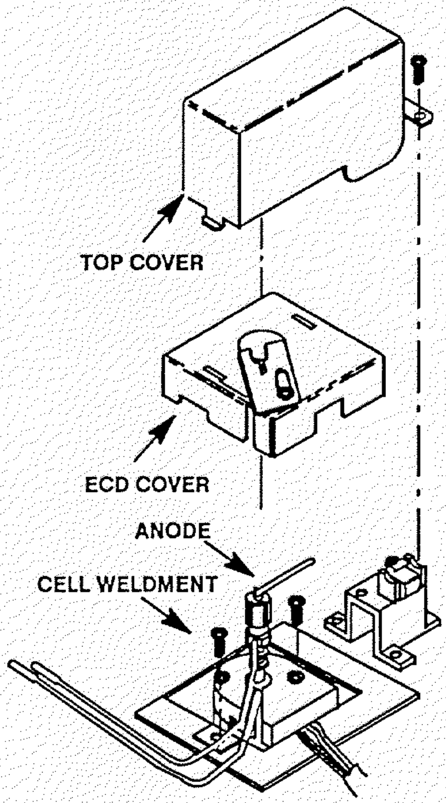




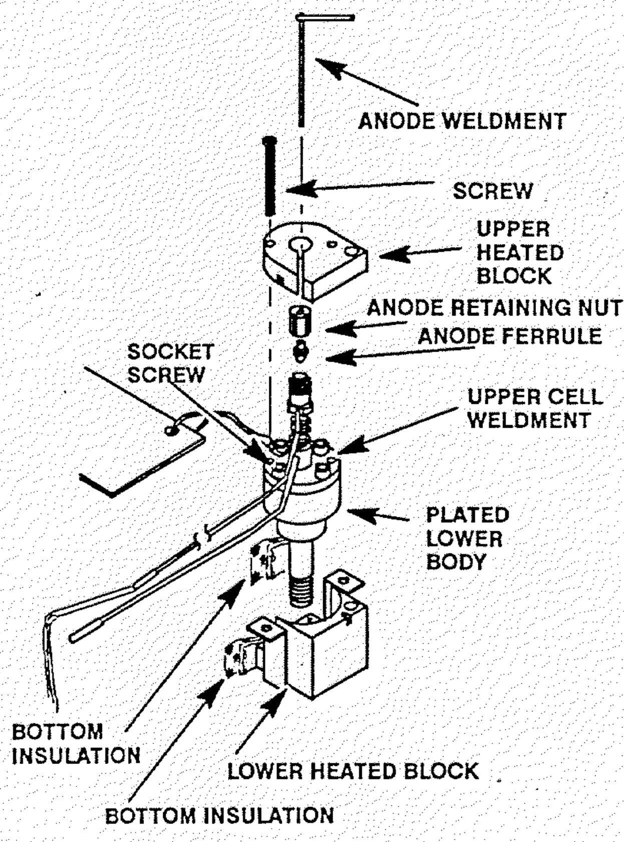
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Lift the hinged top cover at its front edge, exposing the detector area.
8. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.
9. At the lower right edge of the cover, press from right-to-left until the right side hinge releases.
10. Remove the screw securing the ground strap to the hinged top cover



11. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.



12. Using a Pozidriv screwdriver, remove the screw securing the detector top cover to the thermal strap.
13. Remove the detector top cover.
14. Disconnect any tubing attached to the detector purge and vent tubes.
15. Disconnect the cell anode lead from the PCB interconnect.
16. Loosen the locking screw on the ECD cover
17. Slide the locking tab on the ECD cover back, freeing the cover from the anode shaft of the cell weldment.
18. Carefully slide the ECD cover over the anode shaft and anode, and remove it from the detector.
19. Cap the base of the detector (inside the column oven) to avoid damage or contamination of the detector.



20. Remove the two Pozidriv screws securing the detector weldment to the upper and lower heated blocks.
21. Remove the weldment and upper heated block from the lower heated block.
22. Remove any insulation from around the base of the weldment.

NOTE

Perform steps 23 through 31 only if it is desired to remove the ECD heated block. Otherwise, proceed to step 32.

23. If required, remove the two Pozidriv screws securing the heated block to the instrument.
24. Lift the heated block out of its mounting position.
25. Carefully slide the two cartridges (heater/sensor) out of the block. The sensor enters the block from the top. The heater enters from below. The smaller of the two cartridges is the sensor and must be handled gently in order to prevent breakage.

26. Remove any insulation from around the base of the removed weldment and inside the lower heated block.
27. Remove the lower heated block.
28. Install the removed insulation in the lower heated block.
29. Slide heater and sensor cartridges into the new block.
30. Install the lower heated block in its mounting position.
31. Secure the lower heated block to the instrument using two screws.
32. Install any removed insulation in the lower heated block.
33. Place the new weldment in the lower heated block.
34. Install the upper heated block on the weldment.
35. Secure the upper heated block and detector weldment to the lower heated block using two screws.
36. Remove the cap from the base of the detector (inside the column oven).
37. Carefully slide the ECD cover over the anode shaft and anode, and install it on the detector.
38. Slide the locking tab on the ECD cover forward, capturing the cover over the anode shaft of the cell weldment.
39. Tighten the locking screw on the ECD cover
40. Connect the cell collector lead from the cell anode to the PCB interconnect.
41. Position the detector cover over the detector.
42. Secure the detector cover to the instrument with a screw.
43. Install any hardware removed in step 5 of this procedure (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).
44. Plug the detector purge and exhaust vent tubing.
45. Restore supply pressure, and check for leakage at the column and makeup gas adapter fittings.
46. If no leaks exist, shut off the supply pressure.
47. Remove the plug from the detector purge and exhaust vent tubes.
48. Connect the purge and exhaust vent tubes to the applicable tubes disconnected in step 14.
49. Install the right side panel and secure using four screws.
50. Install the electronics carrier top cover.
51. Install the hinged top cover and secure using a screw and washer.
52. Connect the ground strap to the hinged top cover using a screw.
53. Restore power to the instrument.

Clean Anode (ECD Cell Weldment) (G1223A/G1224A Versions)

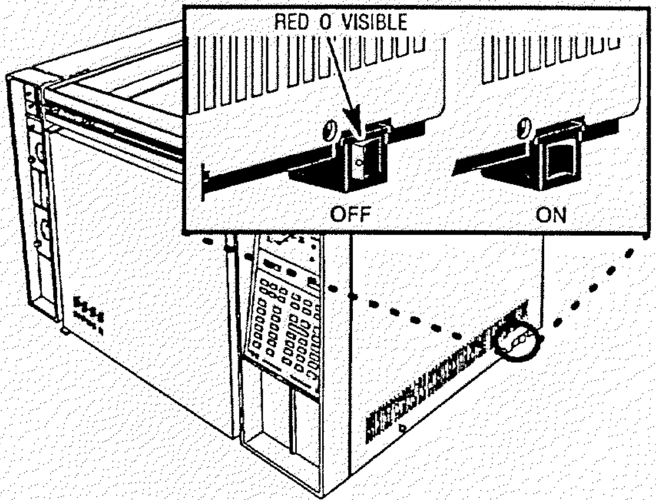
WARNING

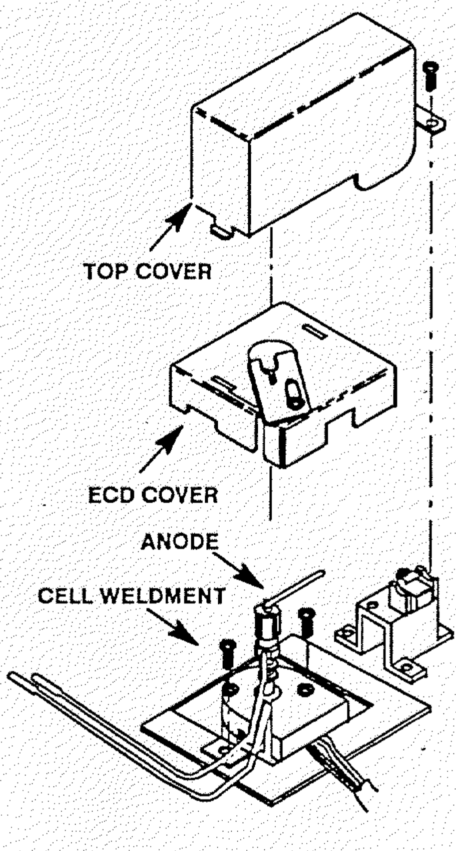
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

NOTE

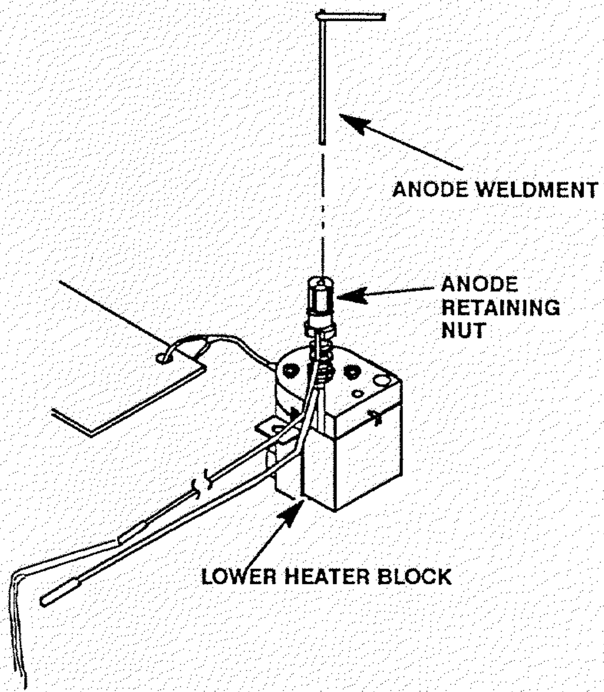
This procedure may only be performed by "Specific License" owners.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Lift the hinged top cover at its front edge, exposing the detector area.
6. Using a Pozidriv screwdriver, remove the screw securing the detector top cover to the thermal strap.
7. Remove the detector top cover.
8. Disconnect the cell anode lead from the PCB interconnect by sliding it off the end of the anode.
9. Loosen the locking screw on the ECD cover
10. Slide the locking tab on the ECD cover back, freeing the cover from the anode shaft of the cell weldment.
11. Carefully slide the ECD cover over the anode shaft and anode, and remove it from the detector.





12. Loosen the anode retaining nut on the cell weldment.
13. Remove the anode from the cell weldment.
14. Clean the anode using methanol, acetone, or methalyne chloride and/or a light sandpaper.
15. Rinse the anode with methanol.
16. Remove the anode retaining nut and associated ferrule from the cell weldment.
17. Inspect the nut and ferrule to determine if they should be replaced.
18. Install either the old nut and ferrule or their replacement on the cell weldment.
19. Insert the anode into the nut and ferrule until it bottoms.
20. Tighten the nut and ferrule to secure the anode in place.



21. Carefully slide the ECD cover over the anode shaft and anode, and install it on the detector.
22. Slide the locking tab on the ECD cover forward, capturing the cover over the anode shaft of the cell weldment.
23. Tighten the locking screw on the ECD cover
24. Connect the cell collector lead from the cell anode to the PCB interconnect.
25. Position the detector cover over the detector.
26. Secure the detector cover to the instrument with a screw.
27. Restore power to the instrument.

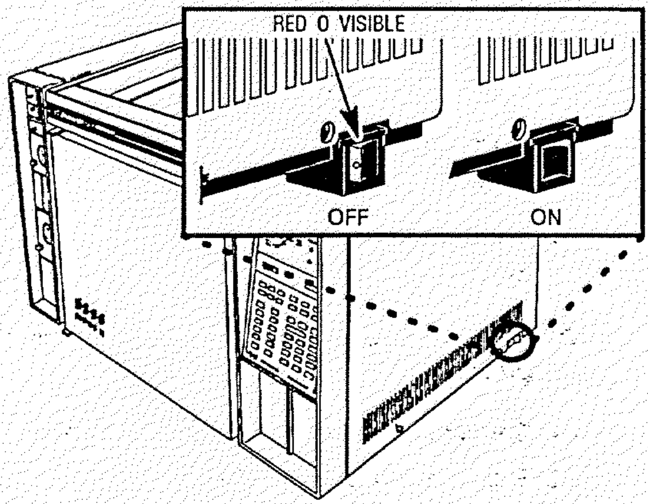
FLAME PHOTOMETRIC DETECTOR (FPD)

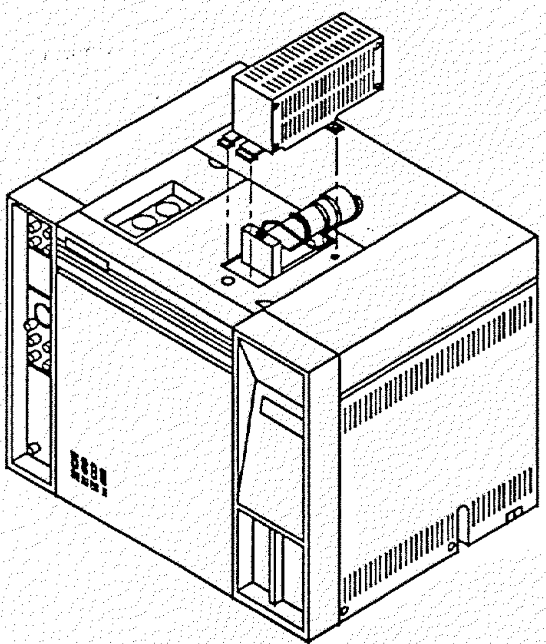
Clean/Replace Photomultiplier Tube (PMT)

WARNING

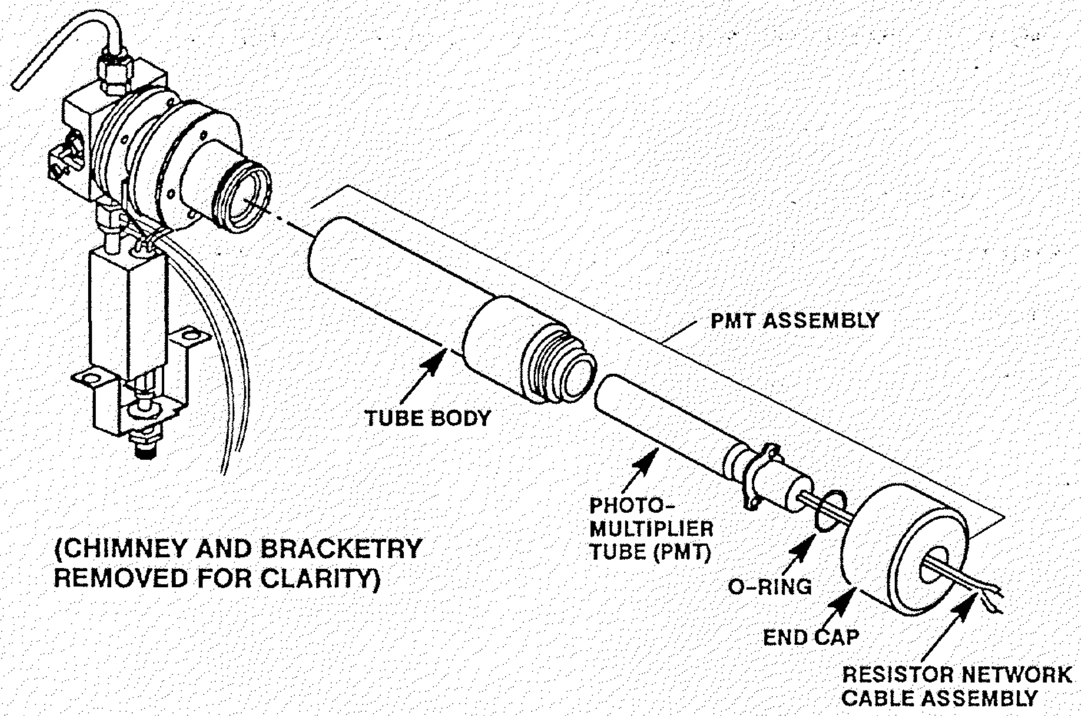
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
4. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
5. Raise the back of the cover and slide it towards the rear of the instrument.





6. Remove the spring securing the PMT assembly to its support bracket.
7. Cut the cable-tie securing the resistor network cable assembly to the PMT assembly tube body.
8. Holding the tube body, unscrew the end cap (counter-clockwise) until the threads disengage.
9. Grasp the resistor network cable assembly and pull it (along with the end cap and PMT) out of the tube body.



10. If the PMT is not to be replaced, clean the window of the tube with a lint-free lens tissue and proceed to step 15 . (If necessary clean the window with a solution of soft soap and warm water. Rinse with distilled water.)

CAUTION

Replace the PMT if there is any evidence of chips, scratches or cracks in its window surface area. A damaged tube must be replaced before continuing to operate the instrument.

11. If the PMT is to be replaced, carefully remove the PMT from the socket associated with the resistor network cable assembly, in the end cap.

12. Dispose of the old tube in a safe manner.

13. Carefully remove the new PMT from its packing case and insert the base of the tube into the socket of the resistor network cable assembly). Be very careful when inserting the tube in order to prevent damage to its contacts (observe keying).

CAUTION

Ensure that no fingerprints, dust, grease, etc. are present on the PMT window facing the detector module.

14. Remove the plastic light seal cap covering the window of the PMT.

15. Carefully insert the PMT into the tube body and engage the threads of the end cap. Seat the end cap (hand tight).

16. Slide the PMT tube assembly onto the detector assembly.

17. Secure the resistor network cable assembly to the PMT assembly using a cable–tie.

18. Secure the PMT assembly to its support bracket using the extension spring.

19. Install the FPD cover on the instrument and secure using a thumbscrew.

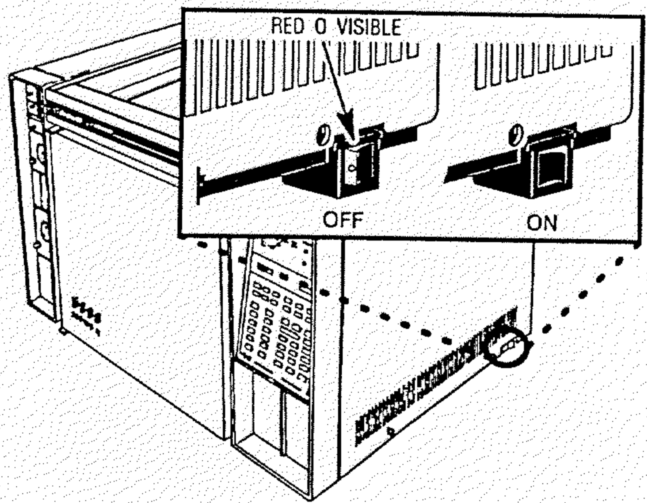
20. Restore power to the instrument.

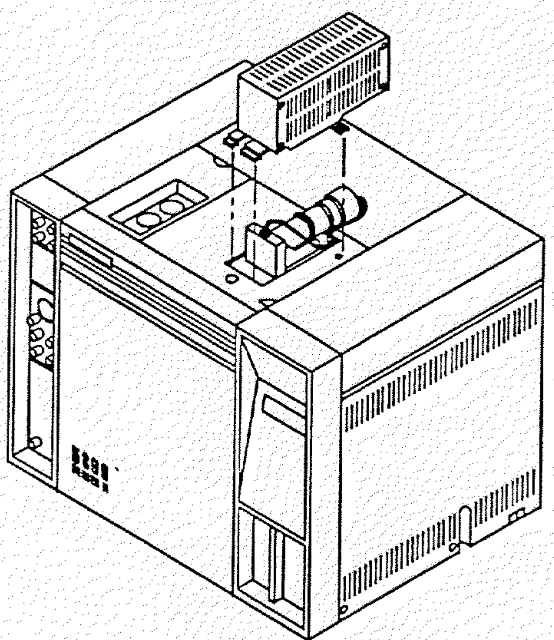
Clean/Replace FPD Filter

WARNING

- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off the hydrogen, air (or oxygen), and auxiliary gas supply to the detector by means of the manifold on/off valves.
4. Allow time for the detector module to cool.
5. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
6. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
7. Raise the back of the cover and slide it towards the rear of the instrument.



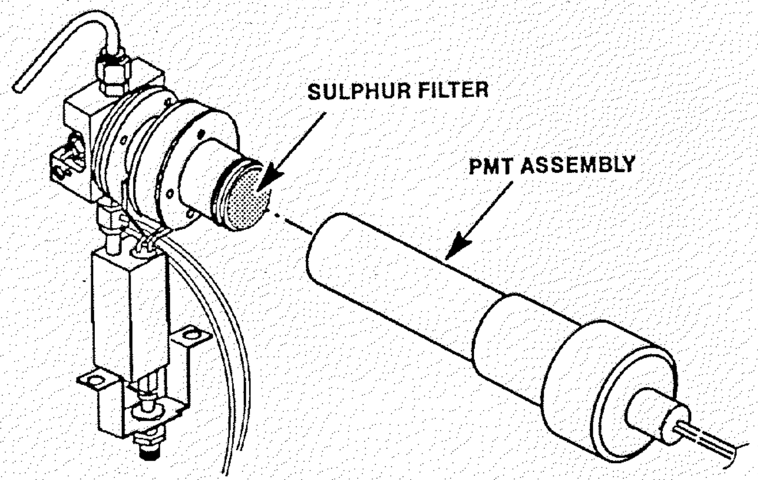


8. Remove the extension spring holding the PMT assembly to the support bracket.

9. Remove the PMT assembly by pulling it toward the rear of the instrument.

10. Remove the sulphur filter from the flange adapter.

11. If the filter is not going to be replaced, wipe it clean using a lint-free lens tissue. Be careful not to scratch the surface of the filter. (If necessary clean the filter with a solution of soft soap and warm water. Rinse with distilled water.)



(CHIMNEY AND BRACKETRY REMOVED FOR CLARITY)

12. Replace the filter if there is any evidence of chips, scratches or cracks in its surface area.

13. Install the cleaned/new filter in the flange adapter. (If the filter is silvered on one side, the silvered side must face toward the flame. If the filter has a indicator arrow on its edge (>) the arrow must point towards the PMT.)

14. Slide the PMT tube assembly onto the detector assembly.

15. Secure the PMT assembly to its support bracket using the extension spring.

16. Install the FPD cover on the instrument and secure using a thumbscrew.

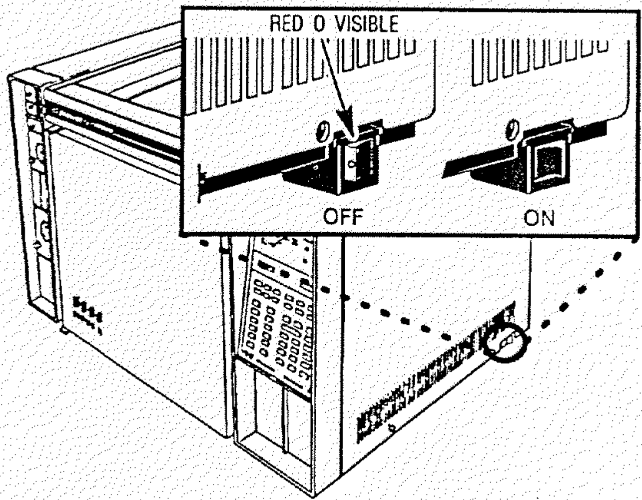
17. Restore power to the instrument.

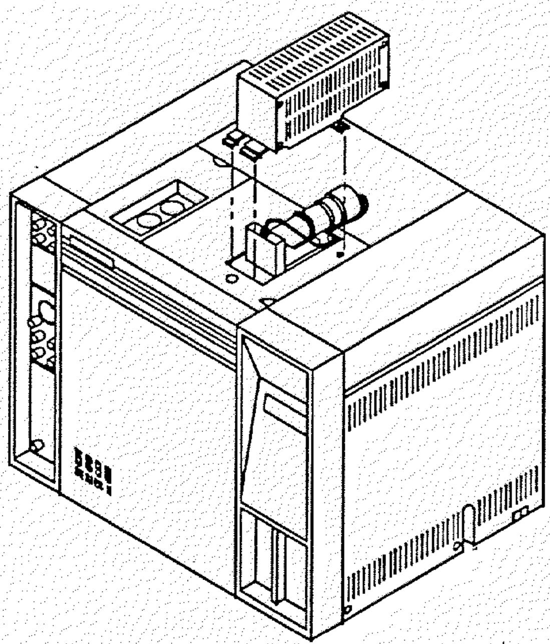
Remove/Replace FPD Diode Bridge Assembly

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
4. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
5. Raise the back of the cover and slide it towards the rear of the instrument.





6. If an autosampler is installed on the instrument, it will be necessary to remove it and its mounting bracket to allow removal of the left side cover as follows:

   a. Remove the autosampler tray from its mounting bracket by first simultaneously lifting and turning the two tray locks which hold it in position, then sliding the tray away from the instrument.

   b. Lift the autosampler tray from its mounting bracket and set it aside.

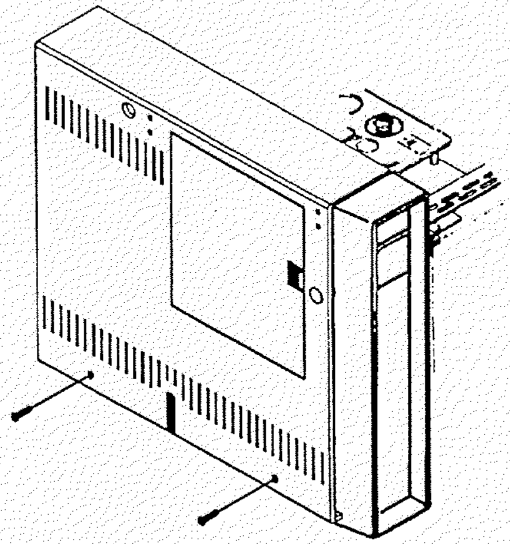
   c. Remove the autosampler bracket by removing the 6 screws securing it to the instrument.

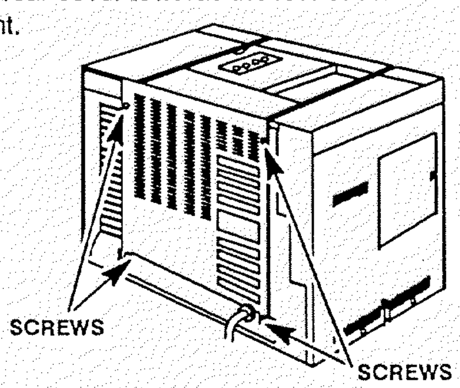
7. Remove the two screws securing the left side panel along its bottom edge.

8. Slide the left side panel towards the rear of the instrument and lift.

9. Remove the four screws securing the rear cover to the instrument.

10. Slide the rear cover towards the rear of the instrument.





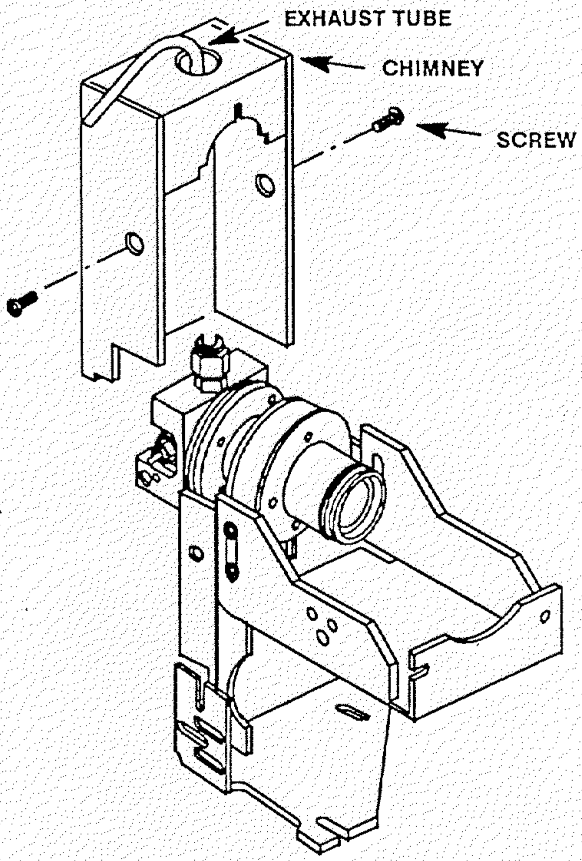
11. Lift the hinged top cover at its front edge, exposing the detector area.

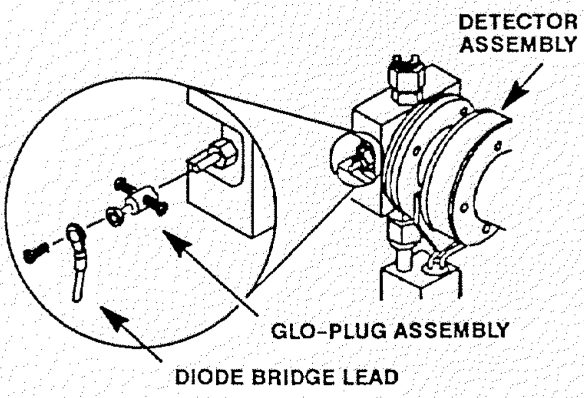
12. Remove the drip tube from the exhaust tube at the top of the detector.

13. Remove the exhaust tube from the detector using a 9/16-inch wrench.

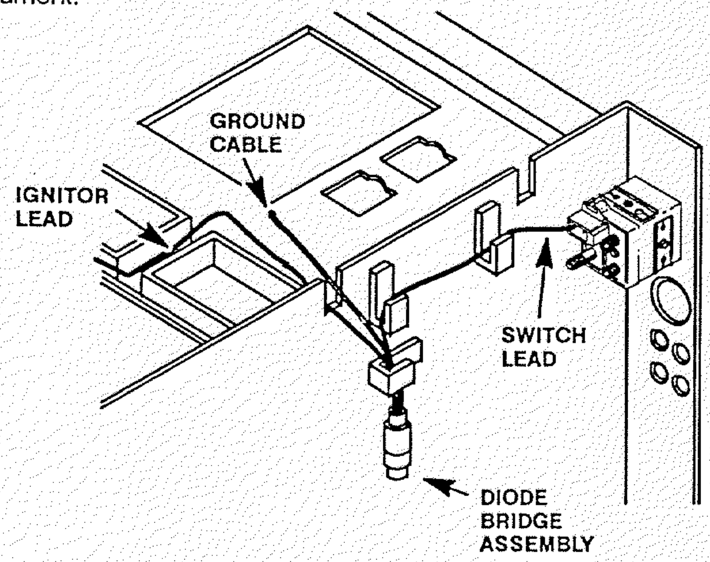
14. Remove the chimney assembly by removing the two screws securing it to the chimney back.

15. Disconnect the ignitor wire lead connector at the mating connection on the detector weldment by removing the screw which secures it to the glo-plug assembly.





16. Trace the lead, freeing it along its path, to the diode bridge assembly.
17. Disconnect the diode bridge assembly spade lug ground cable from the instrument by loosening the screw that secures it..
18. Disconnect the diode bridge assembly from its connector at the FPD flow manifold.
19. Remove the diode bridge assembly from the instrument.



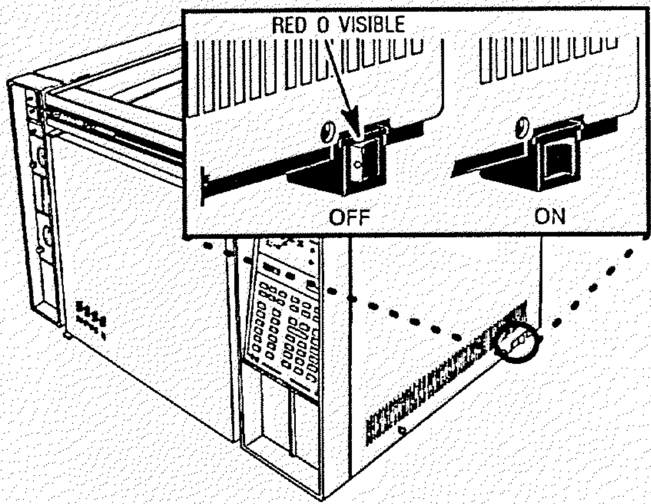
20. Install the replacement diode bridge assembly into the instrument.
21. Connect the diode bridge assembly to its connector at the FID flow manifold.
22. Connect the diode bridge assembly spade lug ground cable to the instrument by placing it beneath and tightening the screw that secures it..
23. Thread the ignitor wire lead along its path from the diode bridge assembly to the detector ignitor connector.
24. Connect the ignitor wire lead connector to the glo-plug on the detector weldment and secure using a screw.
25. Install the chimney assembly over the detector weldment and secure using two screws.
26. Install the exhaust tube on the detector weldment (through the opening in the top of the chimney) and tighten using a 9/16-inch wrench.
27. Install the drip tube on the exhaust tube.
28. Install the FPD cover on the instrument and secure using a thumbscrew.
29. Install the rear panel and secure using four screws.
30. Install the left side panel and secure using two screws.
31. Restore power to the instrument.

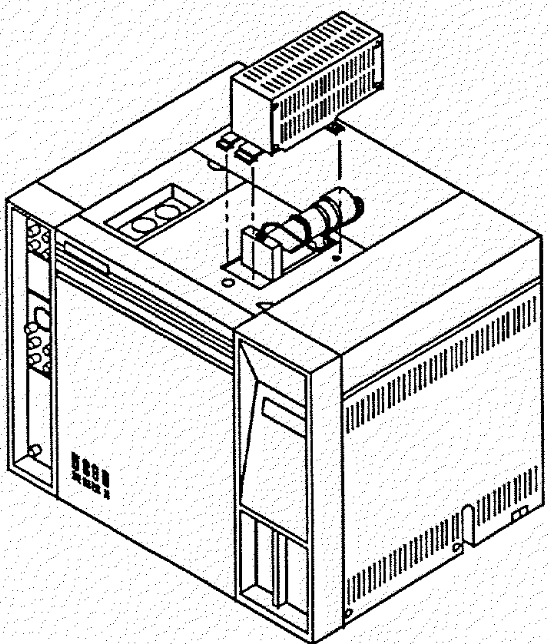
Clean/Replace FPD Heat Shield Windows

WARNING

- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off the hydrogen, air (or oxygen), and auxiliary gas supply to the detector by means of the manifold on/off valves.
4. Allow time for the detector module to cool.
5. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
6. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
7. Raise the back of the cover and slide it towards the rear of the instrument.

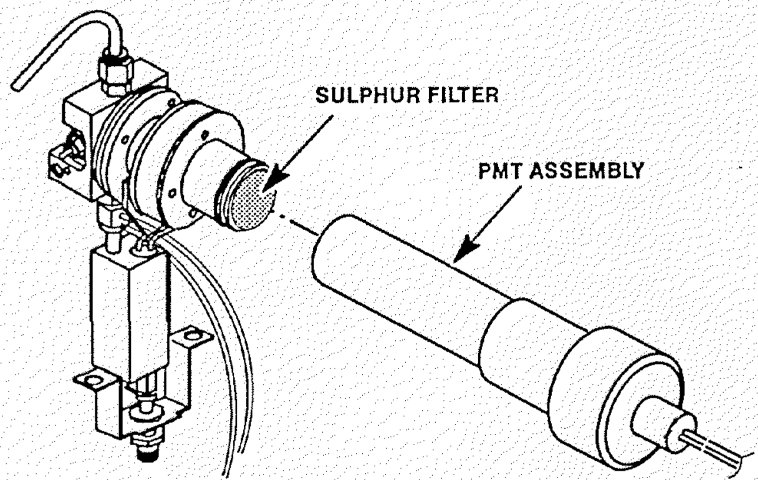




8. Remove the extension spring holding the PMT assembly to the support bracket.

9. Remove the PMT assembly by pulling it toward the rear of the instrument.

10. Remove the sulphur filter from the flange adapter.



(CHIMNEY AND BRACKETRY REMOVED FOR CLARITY)

CAUTION

Use care during disassembly of the detector block assembly in order to prevent possible damage to the quartz windows.

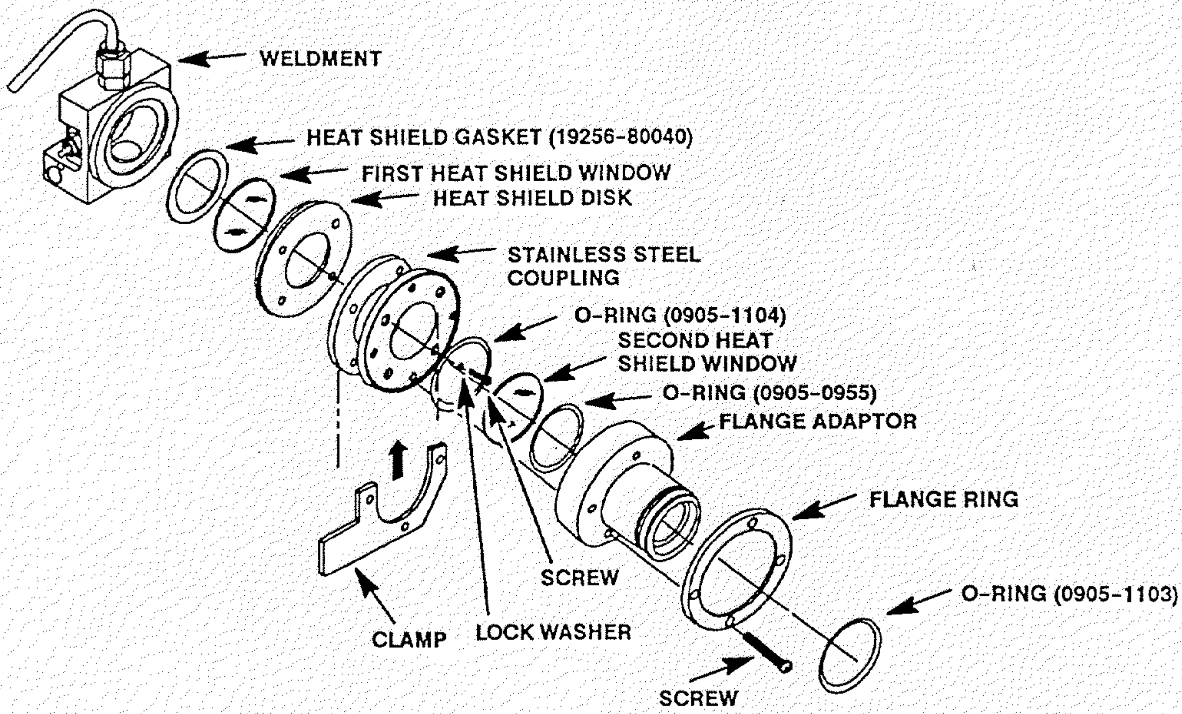
11. Remove the o-ring from the flange adapter.

12. Remove the four screws securing the flange ring and flange adapter to the stainless steel coupling. (This will free the second heat shield window and two o-rings. Use care to top the components from dropping out of the flange adapter.)

13. Tip the exposed end of the flange adapter down, to prevent loss of the second heat shield window and associated o-rings, and remove it, the heat shield window, o-rings, and the flange ring, from the detector.

14. Remove the four screws and associated lock washers securing the stainless steel coupling, clamp, heat shield disk, first heat shield window, and heat shield gasket to the detector weldment.

15. Tip the exposed end of the stainless steel coupling down, to prevent loss of the heat shield disk, first heat shield window, and heat shield gasket, and remove it, the heat shield disk, first heat shield window, and heat shield gasket, from the detector weldment.



NOTE

Due to the composition of the first heat shield gasket, it may be difficult to remove the first heat shield window from the detector weldment. If difficulties are encountered, it may be necessary to use a sharp implement to pry the first heat shield window out of the detector weldment. This may cause chipping or breakage of the window, in which case it must be replaced. Also, if chipping or breakage occurs, use an inert gas to blow any fragments out of the detector weldment, and clean the weldment with an approved solvent.

16. If the heat shield windows are not going to be replaced, wipe them clean using a lint-free lens tissue. Be careful not to scratch the surface of the windows. (If necessary clean the windows with a solution of soft soap and warm water. Rinse with distilled water.)

NOTE

During assembly of the detector, always use new seals (o-rings, gaskets) and discard the old ones.

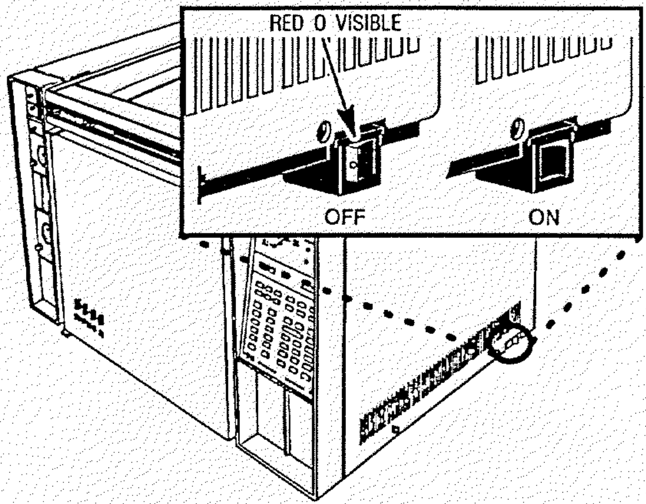
17. Assemble the heat shield gasket (new), first heat shield window, heat shield disk, stainless steel coupling and clamp to the detector weldment and secure using four screws and four lock washers. (Tighten screws evenly to ensure a gas- and light-tight seal.)
18. Assemble the second heat shield window, associated o-rings (new), flange adapter, and flange ring to the stainless steel coupling and secure using four screws. (Tighten screws evenly to ensure a gas- and light-tight seal.)
19. Install the o-ring for the sulphur filter in the flange adapter.
20. Install the sulphur filter in the flange adapter.

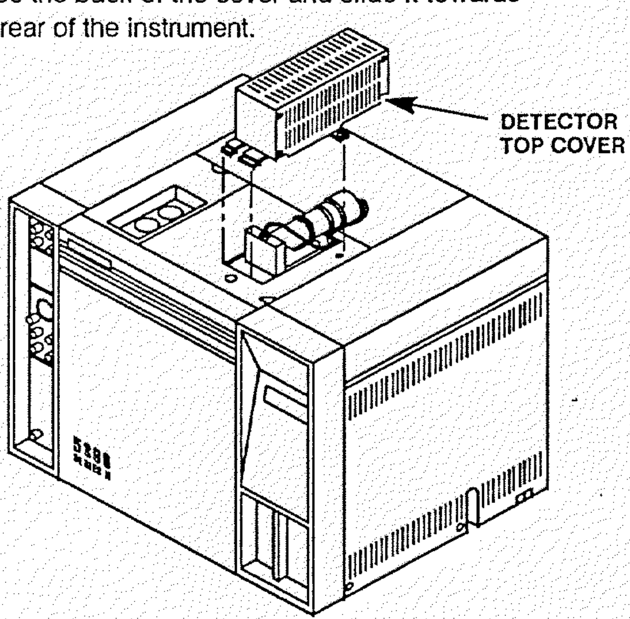
Replace FPD Jet Assembly and First Heat Shield Window

WARNING

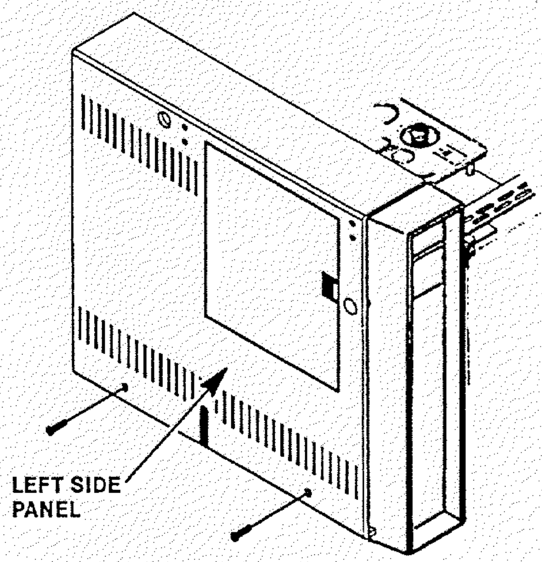
- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off the hydrogen, air (or oxygen), and auxiliary nitrogen supplies to the detector (at the flow control panel).
4. Allow time for the heated zones to cool.
5. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
6. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
7. Raise the back of the cover and slide it towards the rear of the instrument.





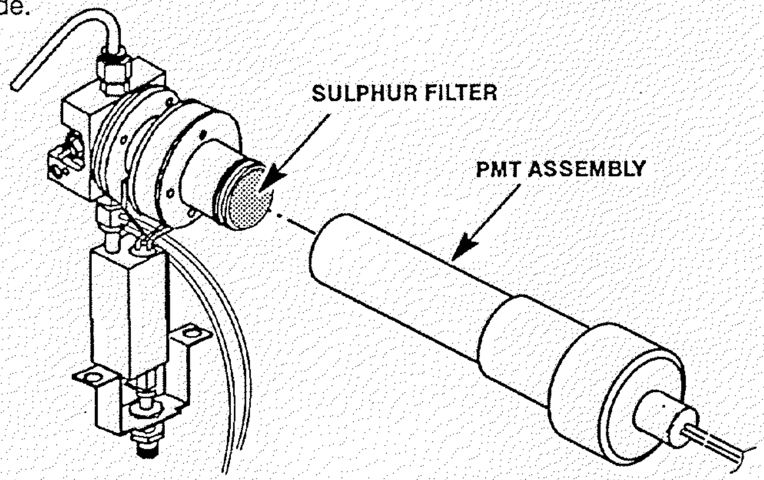
8. Lift the detector top cover to expose the FPD detector weldment.
9. Remove the two screws securing the left side panel along its bottom edge.
10. Slide the left side panel towards the rear of the instrument and lift.



21. Slide the PMT tube assembly onto the detector assembly.
22. Secure the PMT assembly to its support bracket using the extension spring.
23. Install the FPD cover on the instrument and secure using a thumbscrew.
24. Restore power to the instrument.

11. Release the extension spring securing the PMT assembly to its support bracket.

12. Remove the photomultiplier tube (PMT) assembly and sulphur filter from the detector assembly and set it aside.



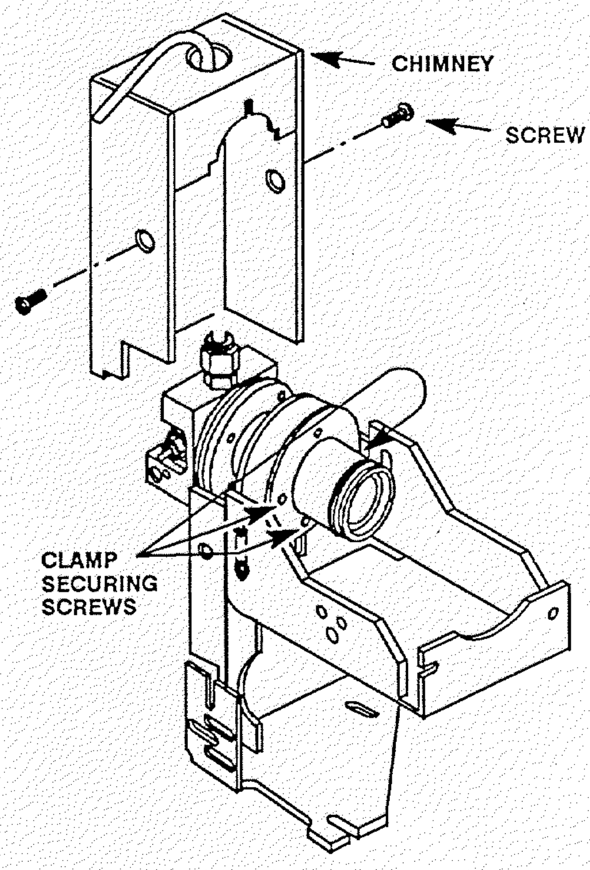
(CHIMNEY AND BRACKETRY
REMOVED FOR CLARITY)

13. Remove the drip tube from the exhaust tube at the top of the detector.

14. Remove the exhaust tube from the detector using a 9/16-inch wrench.

15. Remove the chimney assembly by removing the two screws securing it to the chimney back.

16. Loosen the three screws which secure the clamp which secure the detector to the chimney back.

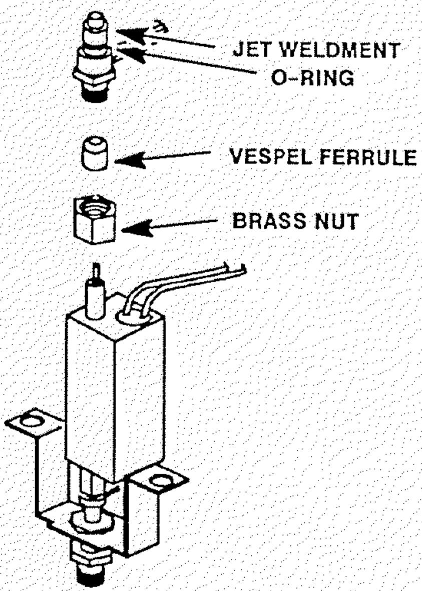


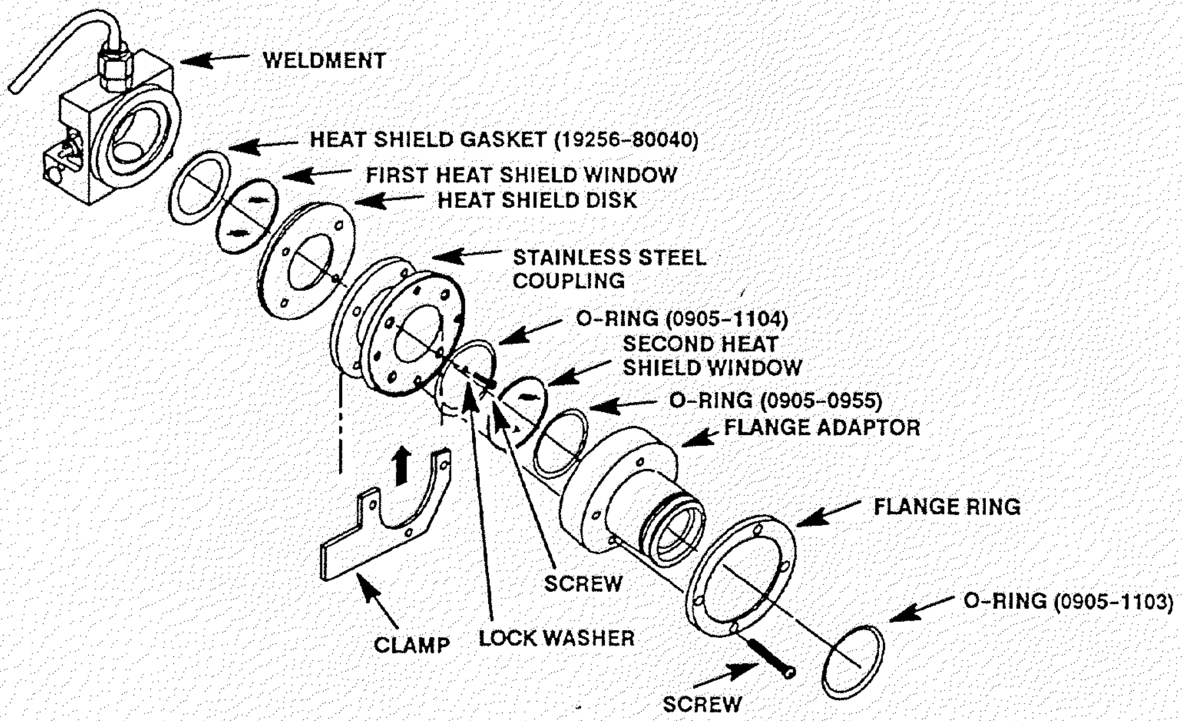
17. Use a 9/16 inch wrench to loosen the nut holding the weldment exit tube to the jet assembly. It will be necessary to hold the jet assembly with a 1/2-inch wrench to prevent rotation.

18. Pull the heater and sensor from the detector weldment assembly.

19. Carefully lift the detector, vertically, from the transfer tube, so as not to damage the fused silica liner.

20. Remove the o-ring from the flange adapter on the detector weldment.



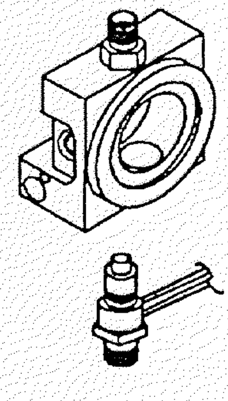


21. Remove the flange adapter and flange ring by removing the four screws securing them to the stainless steel coupling.

22. Remove the second heat shield window and two associated o-rings from the stainless steel coupling.

23. Remove the stainless steel coupling and heat shield disk from the detector weldment by removing four screws and lock washers.

24. Remove the jet weldment from the base of the weldment. (The jet weldment is not threaded; it is pressed in.)



NOTE

It may be necessary to use a suitable hex drive (or other strong shaft-like device) to drive out the jet weldment by inserting the device through the exhaust coupler (at the top of the weldment) and striking it with a hammer.

25. Insert the eraser end of a pencil (or other suitable device) through the jet opening, at the base of the detector weldment, and force the first heat shield window out of the detector weldment.

NOTE

Due to the composition of the first heat shield gasket, it may be difficult to remove the first heat shield window from the detector weldment. If difficulties are encountered, it may be necessary to use a sharp implement to pry the first heat shield window out of the detector weldment. This may cause chipping or breakage of the window, in which case it must be replaced. Also, if chipping or breakage occurs, use an inert gas to blow any fragments out of the detector weldment, and clean the weldment with an approved solvent.

26. Remove the heat shield gasket from the detector weldment.

27. Clean the detector weldment with an approved solvent.

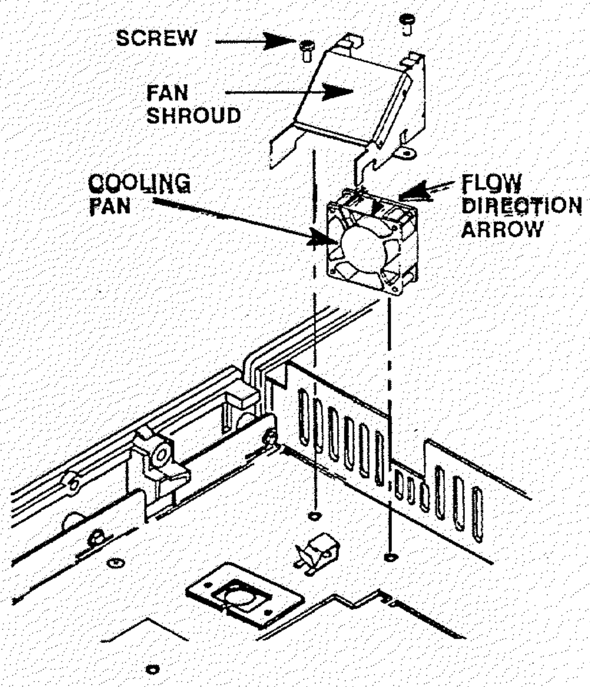
28. Blow out any particles or contaminants using an inert gas.

29. If a PCOC fan is installed, remove the back cover of the instrument by removing four screws and sliding the cover off of the rear of the instrument.

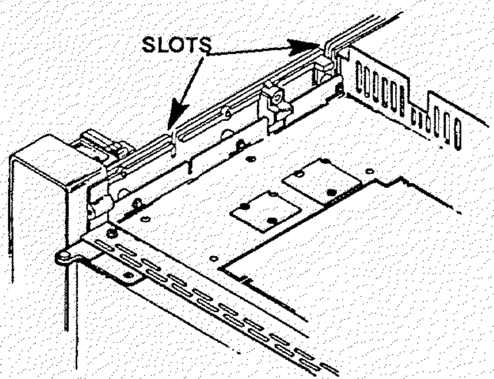
30. If installed, remove the PCOC fan cover to allow removal of the tubing attached to the detector weldment.

31. Trace the tubing from the FPD jet to the connection points at the left side of the instrument.

32. Disconnect the M8 fittings securing the tubing at their connection sites. (The tubing should only be finger-tight. If more force is required to free them, use a small pair of pliers while holding the applicable connector sites with an appropriate tool.)



33. Locate the "U-shaped" slots on the instrument to the left of the inlet. Bend the tubes from the new jet to lay within these slots, and any installed clips, and route them to their associated attachment points on the left side of the instrument.

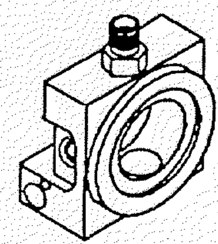


CAUTION

When installing tubing in the applicable flow control component, ensure that all o-rings are positioned properly.

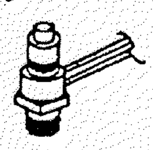
34. Connect the tubes from the new jet weldment to the flow manifold block. (The hydrogen tube fitting is painted RED. Make sure each tube is installed at the correct location on the flow manifold block.)

35. If the PCOC fan and cover were removed, install them and secure using two screws.



36. Inspect the detector weldment in which the jet weldment will be installed. If any evidence of damage or excessive contamination are observed, replace the detector weldment with a new one.

37. Press the jet weldment into the base of the detector weldment.



NOTE

During assembly of the detector, always use new seals (o-rings, gaskets) and discard the old ones.

38. Install a new heat shield gasket on the detector weldment.

39. Install a new first heat shield window.

40. Assemble the heat shield disk, stainless steel coupling and clamp to the detector weldment and secure using four screws and four lock washers. (Tighten screws evenly to ensure a gas- and light-tight seal.)

41. Assemble the second heat shield window, associated o-rings (new), flange adapter, and flange ring to the stainless steel coupling and secure using four screws. (Tighten screws evenly to ensure a gas- and light-tight seal. Then back off all screws except the top one, to allow clamping of the weldment to its support bracket.)

42. Install the assembled detector weldment assembly vertically onto the transfer tube weldment, being careful not to damage the fused silica liner.

43. Install the heater and sensor cartridges into the detector weldment.

44. Secure the weldment exit tube to the jet assembly with by holding the jet weldment with a 1/2-inch wrench, and tightening the nut which secures the weldment with a 9/16-inch wrench.

45. Install the chimney assembly and secure using two screws.
46. Install the exhaust tube on the detector weldment (through the opening in the top of the chimney) and tighten using a 9/16-inch wrench.
47. Install the drip tube on the exhaust tube.
48. Install the o-ring for the sulphur filter in the flange adapter.
49. Install the sulphur filter in the flange adapter.
50. Slide the PMT tube assembly onto the detector assembly.
51. Secure the PMT assembly to its support bracket using the extension spring.
52. Install the FPD cover on the instrument and secure using a thumbscrew.
53. Restore power to the instrument.

Replace Fused Silica Liner

WARNING

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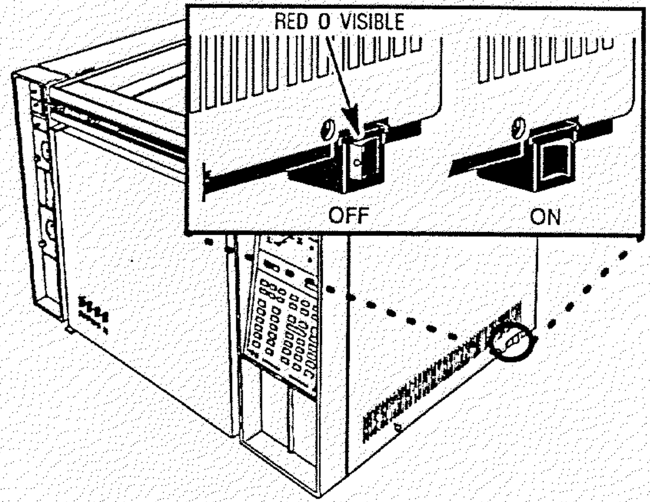
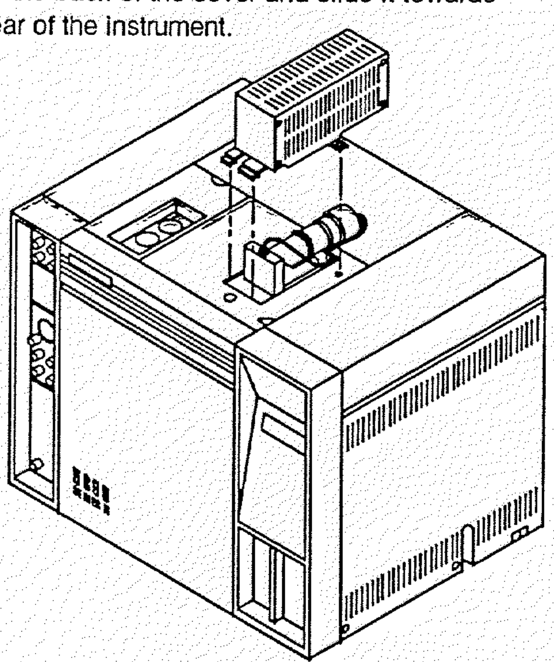
- **FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

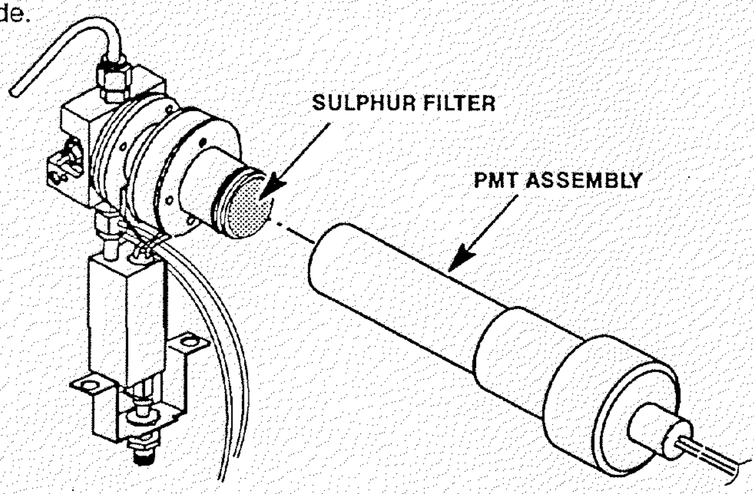
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off the hydrogen, air (or oxygen), and auxiliary nitrogen supplies to the detector (at the flow control panel).
4. Allow time for the heated zones to cool.
5. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
6. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
7. Raise the back of the cover and slide it towards the rear of the instrument.





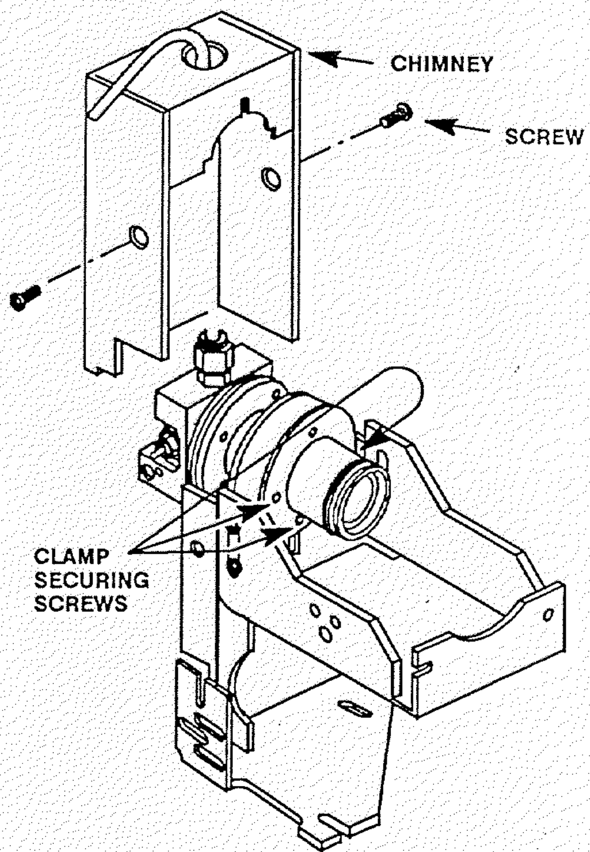
8. Lift the detector top cover to expose the FPD detector weldment.
9. Release the extension spring securing the PMT assembly to its support bracket.

10. Remove the photomultiplier tube (PMT) assembly and sulphur filter from the detector assembly and set it aside.



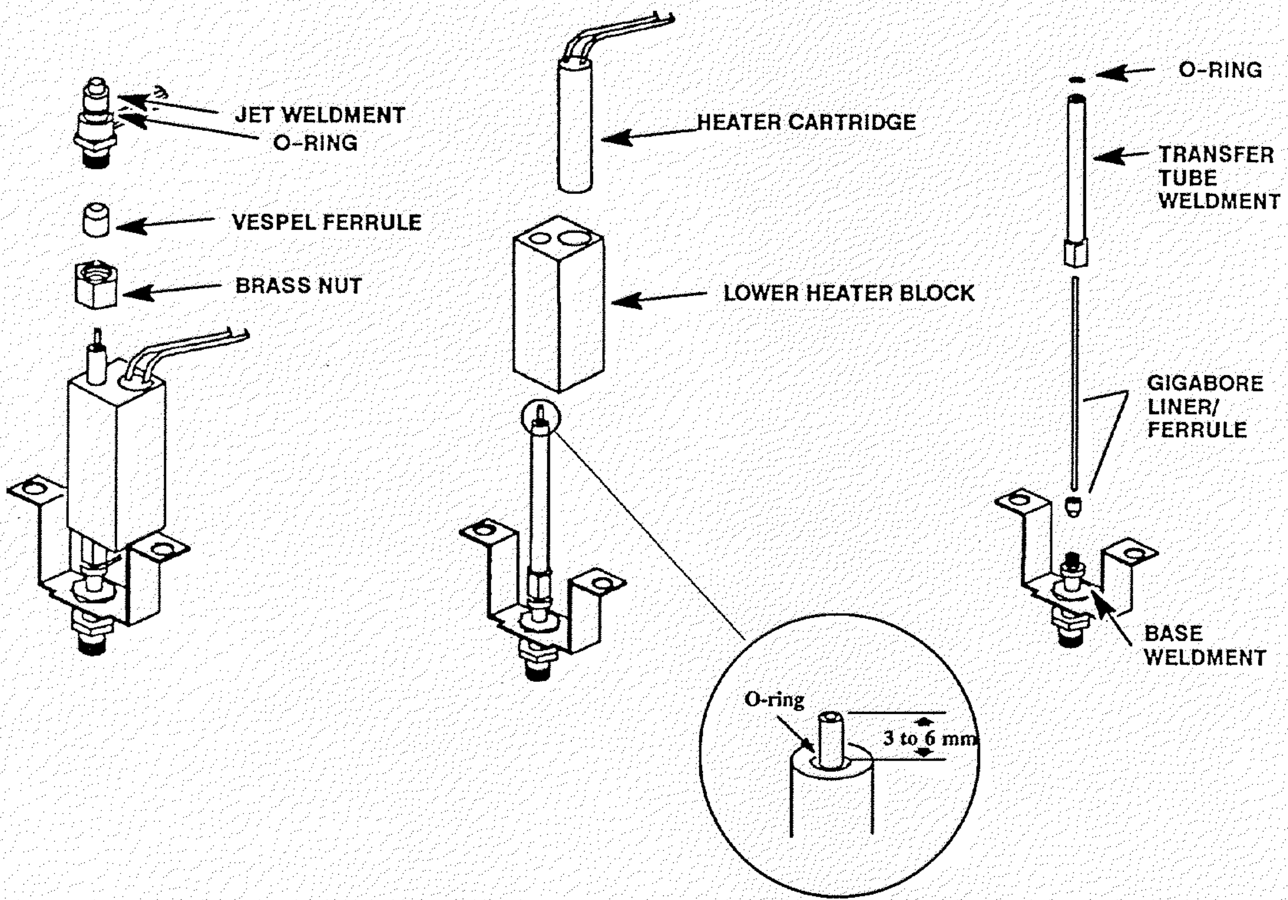
(CHIMNEY AND BRACKETRY REMOVED FOR CLARITY)

11. Remove the drip tube from the exhaust tube at the top of the detector.
12. Remove the exhaust tube from the detector using a 9/16-inch wrench.
13. Remove the chimney assembly by removing the two screws securing it to the chimney back.
14. Loosen the three screws which secure the clamp which secure the detector to the chimney back.
15. Use a 9/16 inch wrench to loosen the nut holding the weldment exit tube to the jet assembly. It will be necessary to hold the jet assembly with a 1/2-inch wrench to prevent rotation.
16. Pull the heater and sensor from the detector weldment assembly.
17. Carefully lift the detector, vertically, from the transfer tube, so as not to damage the fused silica liner.
18. Inside the oven, remove the column to the FPD.



19. Remove the nut and ferrule (Vespel) from the transfer tube weldment.

20. Remove the lower heater block from the transfer tube by lifting it vertically.



21. Unscrew the transfer tube weldment from the detector base weldment.

22. Lift the transfer tube weldment (containing the fused silica liner and ferrule) vertically off of the base weldment.

23. Remove the fused silica liner and ferrule (Vespel) by pulling them out of the bottom of the transfer tube weldment.

24. Install a new liner and ferrule by feeding the liner through the o-ring at the top of the transfer tube, being careful not to damage the o-ring. The silica liner should extend above the top of the transfer tube approximately 6-7mm

NOTE

The fused silica liner and ferrule (Vespel) are combined as Part No. 19256-80690.

25. Carefully install the fused silica liner, ferrule and transfer tube onto the detector base weldment, ensuring that the exposed end of the fused silica liner remains 3 to 6-mm above the top of the transfer tube weldment.

26. Install the heated block onto the transfer tube weldment.

27. Install the brass nut and associated ferrule on the transfer tube weldment.

28. Inside the column oven, connect the column to the detector base weldment.

29. Install the assembled detector weldment assembly vertically onto the transfer tube weldment, being careful not to damage the fused silica liner.

30. Install the heater and sensor cartridges into the detector weldment.

31. Secure the weldment exit tube to the jet assembly with by holding the jet weldment with a 1/2-inch wrench, and tightening the nut which secures the weldment with a 9/16-inch wrench.

32. Install the chimney assembly and secure using two screws.

33. Install the exhaust tube on the detector weldment (through the opening in the top of the chimney) and tighten using a 9/16-inch wrench.

34. Install the drip tube on the exhaust tube.

35. Install the sulphur filter in the flange adapter.

36. Slide the PMT tube assembly onto the detector assembly.

37. Secure the PMT assembly to its support bracket using the extension spring.

38. Install the FPD cover on the instrument and secure using a thumbscrew.

39. Restore power to the instrument.

Replace Detector Base Weldment

WARNING

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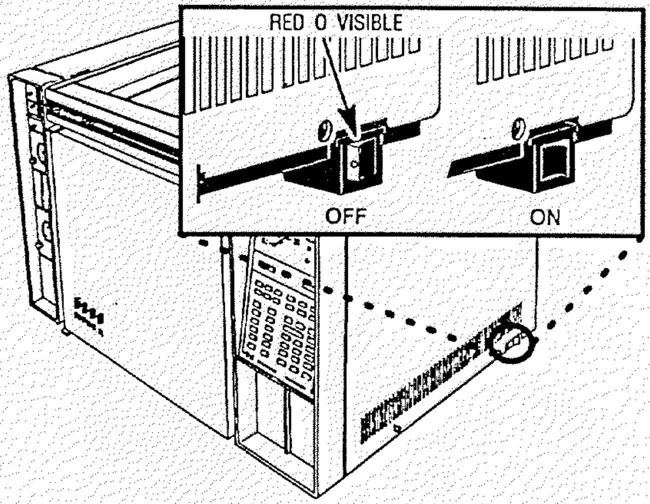
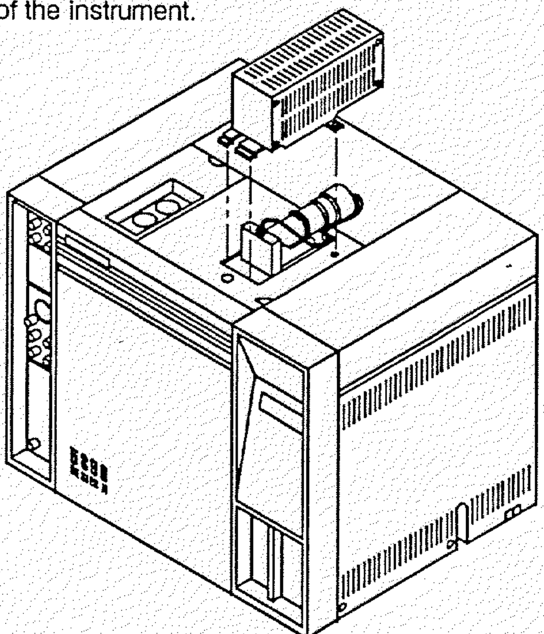
- FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.

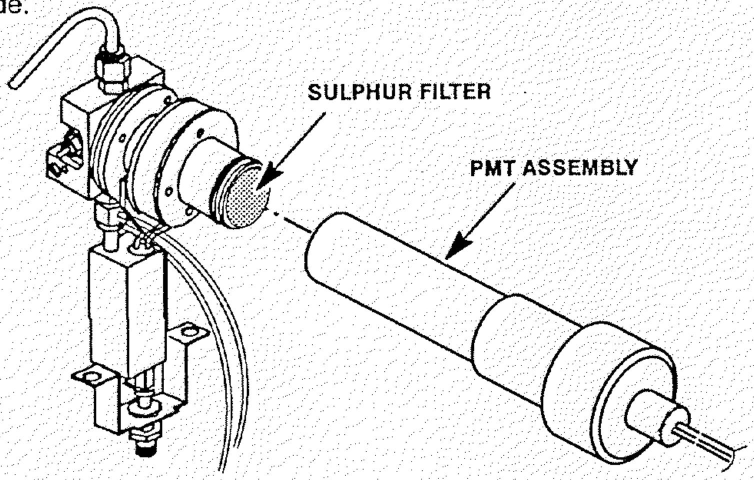
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off the hydrogen, air (or oxygen), and auxiliary nitrogen supplies to the detector (at the flow control panel).
4. Allow time for the heated zones to cool.
5. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
6. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
7. Raise the back of the cover and slide it towards the rear of the instrument.





8. Lift the detector top cover to expose the FPD detector weldment.
9. Release the extension spring securing the PMT assembly to its support bracket.

10. Remove the photomultiplier tube (PMT) assembly and sulphur filter from the detector assembly and set it aside.



(CHIMNEY AND BRACKETRY REMOVED FOR CLARITY)

11. Remove the drip tube from the exhaust tube at the top of the detector.

12. Remove the exhaust tube from the detector using a 9/16-inch wrench.

13. Remove the chimney assembly by removing the two screws securing it to the chimney back.

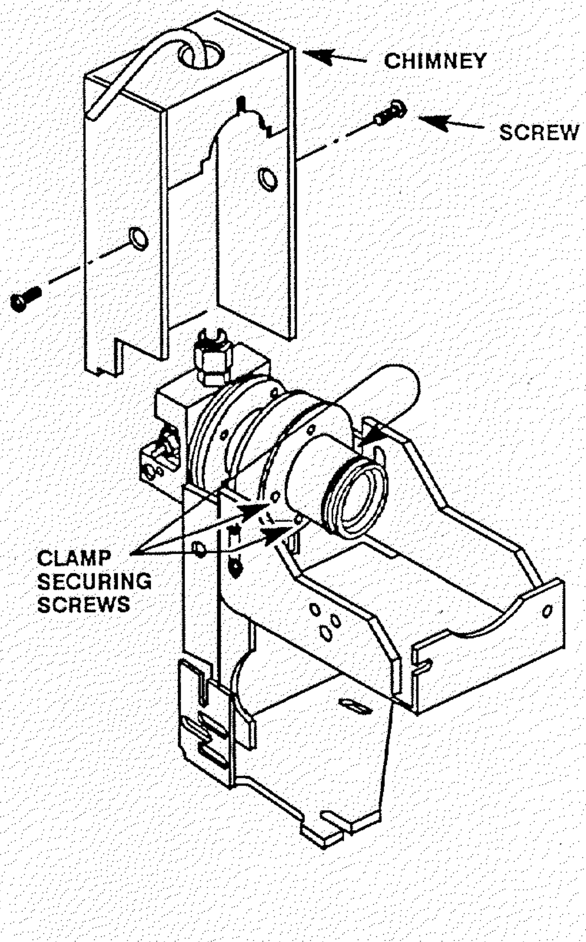
14. Loosen the three screws which secure the clamp which secure the detector to the chimney back.

15. Use a 9/16 inch wrench to loosen the nut holding the weldment exit tube to the jet assembly. It will be necessary to hold the jet assembly with a 1/2-inch wrench to prevent rotation.

16. Pull the heater and sensor from the detector weldment assembly.

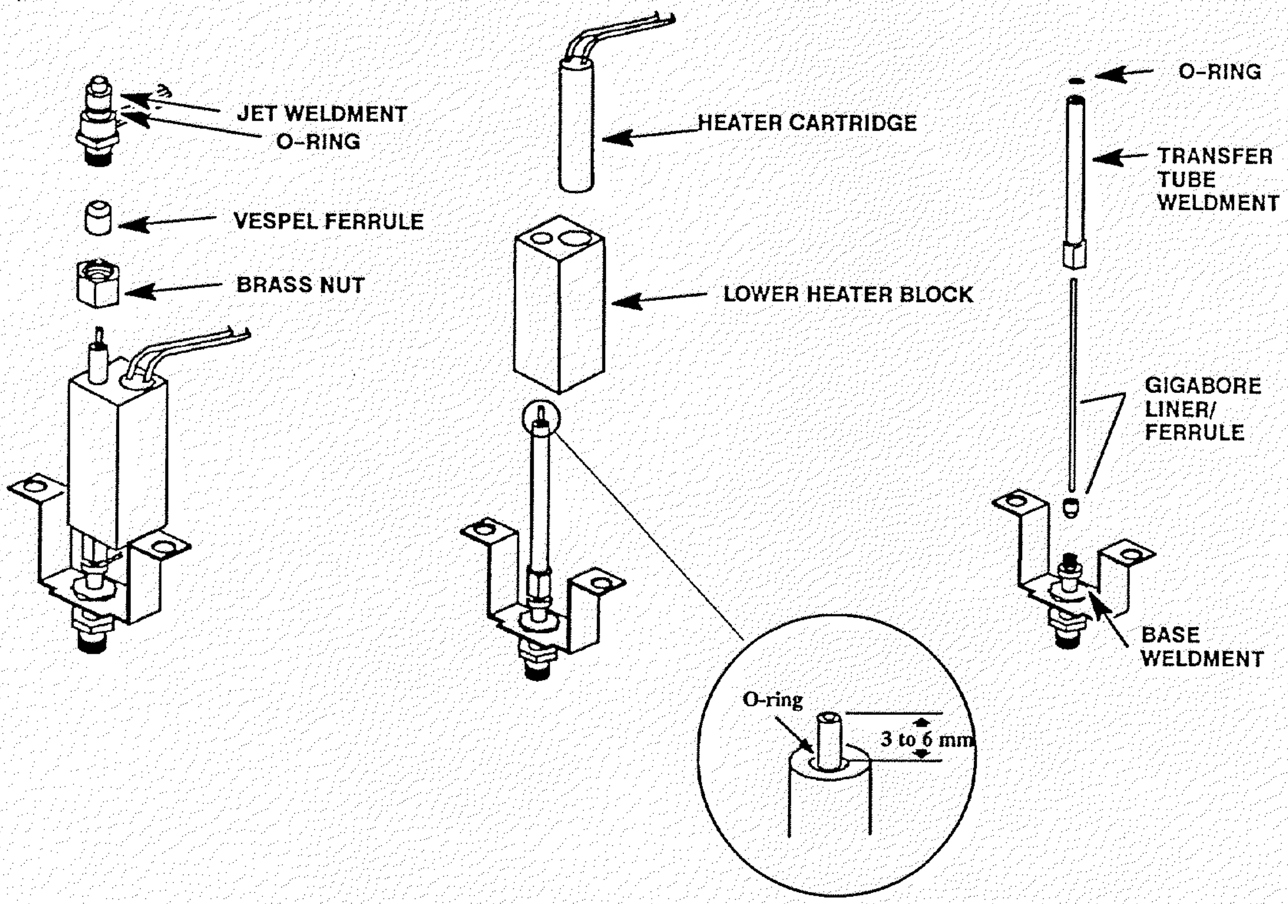
17. Carefully lift the detector, vertically, from the transfer tube, so as not to damage the fused silica liner.

18. Inside the oven, remove the column from the FPD detector base weldment.



19. Remove the nut and ferrule (Vespel) from the transfer tube weldment.

20. Remove the lower heater block from the transfer tube by lifting it vertically.



21. Unscrew the transfer tube weldment from the detector base weldment.

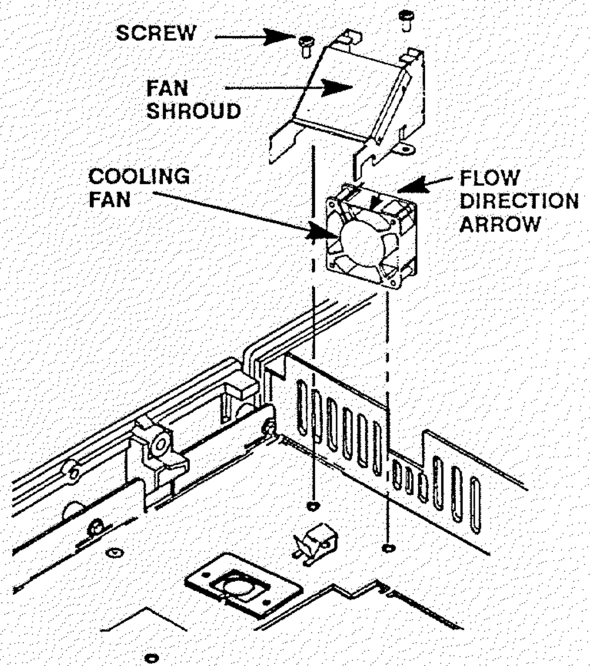
22. Lift the transfer tube weldment (containing the fused silica liner and ferrule) vertically off of the base weldment.

23. Remove the fused silica liner and ferrule (Vespel) by pulling them out of the bottom of the transfer tube weldment.

24. Remove the two screws securing the detector base weldment to the instrument.

25. Lift the detector base weldment out of the instrument.

26. If a PCOC fan is installed, remove the back cover of the instrument by removing four screws and sliding the cover off of the rear of the instrument.

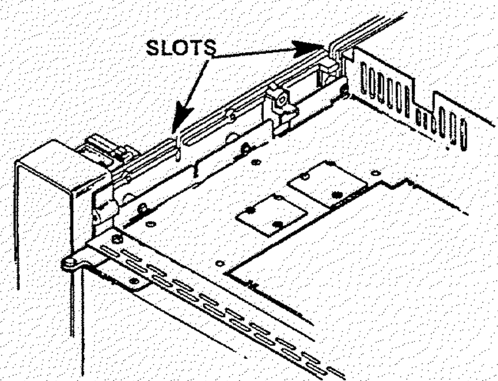


27. If installed, remove the PCOC fan cover to allow removal of the tubing attached to the detector weldment.

28. Trace the tube from the FPD base detector weldment to the connection point at the left side of the instrument.

29. Disconnect the M8 fitting securing the tube at its connection site. (The fitting should only be finger-tight. If more force is required to free it, use a small pair of pliers while holding the applicable connector site with an appropriate tool.)

30. Locate the "U-shaped" slots on the instrument to the left of the inlet. Bend the tube from the new weldment to lay within these slots, and any installed clips, and route it to its associated attachment point on the left side of the instrument.



CAUTION

When installing tubing in the applicable flow control component, ensure that all o-rings are positioned properly.

31. Connect the tube from the new detector base weldment to the flow manifold block. (The hydrogen tube fitting is painted RED. Make sure that the tube is installed at the correct location on the flow manifold block.)

32. If the PCOC fan and cover were removed, install them and secure using two screws.

33. Install the new detector base weldment and secure using two screws.

NOTE

It is advisable to install a new fused silica liner while the detector is this state of disassembly. The following step is only applicable when installing a new liner.

34. Install a new liner and ferrule by feeding the liner through the o-ring at the top of the transfer tube, being careful not to damage the o-ring. The silica liner should extend above the top of the transfer tube approximately 6-7mm

35. Carefully install the fused silica liner, ferrule and transfer tube onto the detector base weldment, ensuring that the exposed end of the fused silica liner remains 3 to 6-mm above the top of the transfer tube weldment.

36. Install the heated block onto the transfer tube weldment.

37. Install the brass nut and associated ferrule on the transfer tube weldment.

38. Inside the column oven, connect the column to the detector base weldment.

39. Install the assembled detector weldment assembly vertically onto the transfer tube weldment, being careful not to damage the fused silica liner.

40. Install the heater and sensor cartridges into the detector weldment.

41. Secure the weldment exit tube to the jet assembly with by holding the jet weldment with a 1/2-inch wrench, and tightening the nut which secures the weldment with a 9/16-inch wrench.

42. Install the chimney assembly and secure using two screws.

43. Install the exhaust tube on the detector weldment (through the opening in the top of the chimney) and tighten using a 9/16-inch wrench.

44. Install the drip tube on the exhaust tube.

45. Install the sulphur filter in the flange adapter.

46. Slide the PMT tube assembly onto the detector assembly.

47. Secure the PMT assembly to its support bracket using the extension spring.

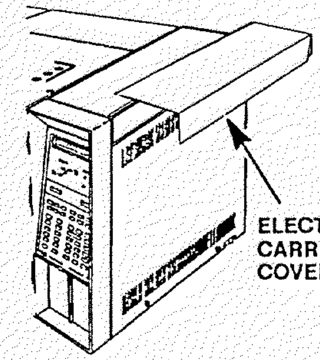
48. Install the FPD cover on the instrument and secure using a thumbscrew.

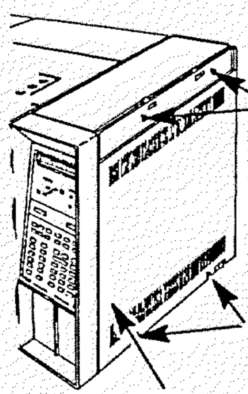
49. Restore power to the instrument.

Adjust High Voltage

After the replacement of a photomultiplier tube it may be necessary to adjust the output of the high voltage supply to the Photo Multiplier Tube (PMT) in order to attain the optimum sensitivity. After installing the PMT, the FPD check-out/performance verification must be performed. Results are compared with those of the original PMT. Assuming gas flow rates are correct, and the system leak-free, the PMT high voltage should be altered only if there is a significant change in sensitivity. The high voltage is originally set at the factory for optimum sensitivity; signal/noise ratio (0.90 =/- 0.06 Vdc), corresponding to -850 V dc =/- 50 V dc at the PMT. The PMT voltage limits are: 0.72 V dc to 1.05 Vdc corresponding to a PMT voltage of -670 Vdc to -990 Vdc.

1. Remove the electronics carrier top cover.
2. Remove the right side panel by removing four screws: two each along its top and bottom edges.





NOTE

Noise will appear only about 2/3 as large on analog signal paths than on digital, due to the high band pass filtering of signal on analog channels.

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY FOLLOWING ALL REQUIRED SAFETY PROCEDURES WHEN WORKING ON THE INSTRUMENT.

CAUTION

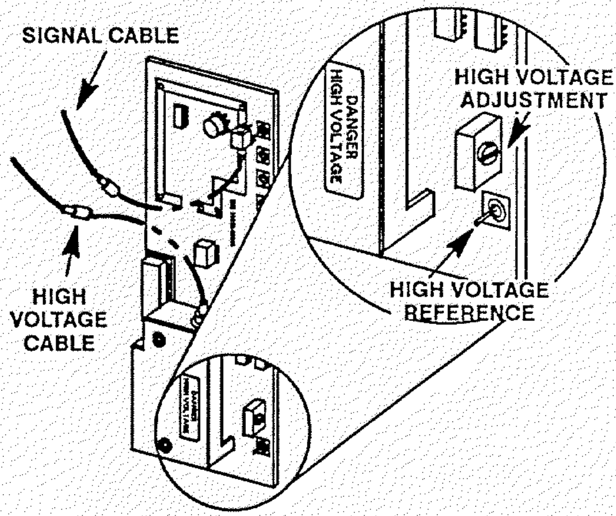
- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

3. The FPD detector board is located in the "B" detector board slot. On the board, locate the high voltage adjustment and the high voltage reference (HV REF) test point (TP7) .

4. Connect a voltmeter between ground (TP1 on the detector PCB or the aluminum oven top) and the HV reference test point (TP7).

5. Set the voltage at an optimum point. This point should be somewhere between -750 and -850 V dc. Voltage setting should never exceed -950 V dc.

6. Perform a verification analysis. Reset the voltage and perform another analysis. Continue this sequence until the maximum sensitivity is attained (greatest area counts for a given amount of sample injected, divided by noise).



7. Install the right side panel and secure using four screws.

8. Install the electronics carrier top cover.

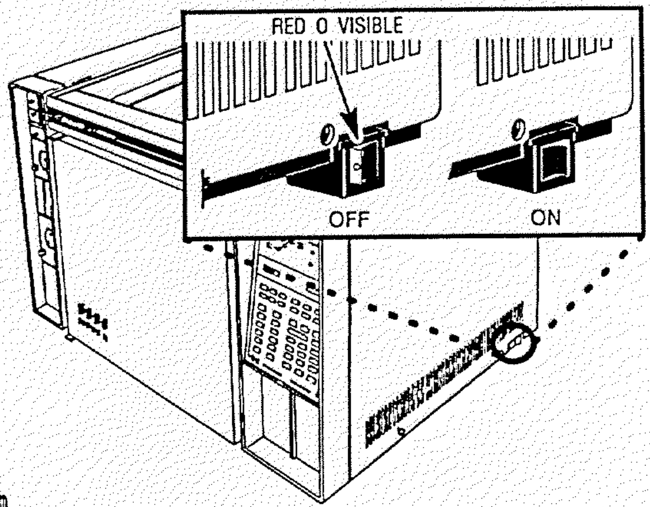
REPLACING A DETECTOR PCB

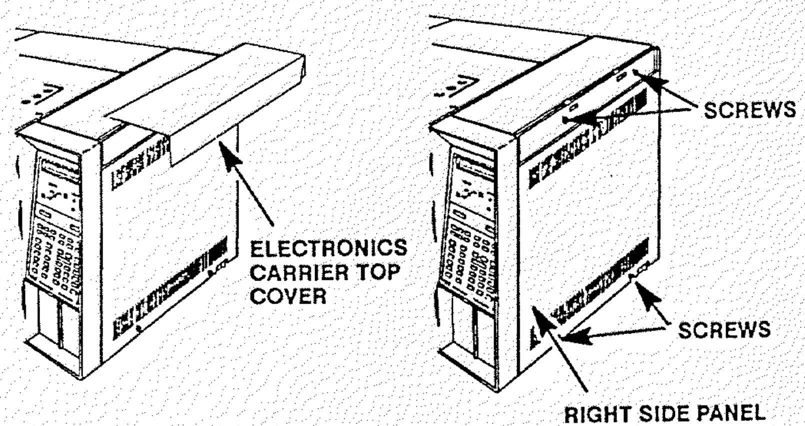
Remove/Replace Detector PCB

WARNING

- HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.
- FLAME IONIZATION (FID), NITROGEN PHOSPHOROUS (NPD), AND FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Remove the electronics carrier top cover.
6. Remove the right side panel by removing four screws: two each along its top and bottom edges.



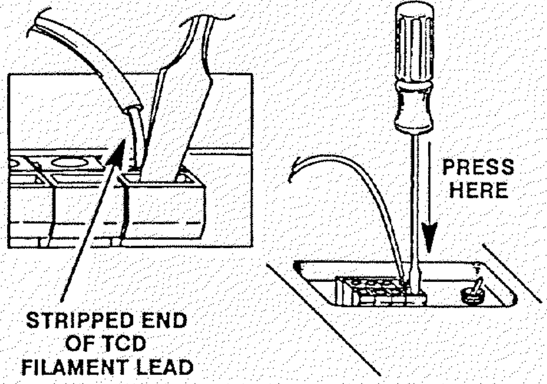


7. Lift the hinged top cover at its front edge, exposing the detector area. (If an FPD detector is installed, it will be necessary to remove the FPD cover by removing the thumbscrew securing it to the hinged top cover.)

8. With the exception of the TCD and FPD detector PCBs, all of the detector PCBs employed in the HP5890 Series II include an interconnect assembly, which connects in one fashion or another to a portion of the actual detector. In order to remove the detector PCB, the components which retain the interconnects (or other wiring) must be loosened, removed, or disconnected as applicable for a particular detector:

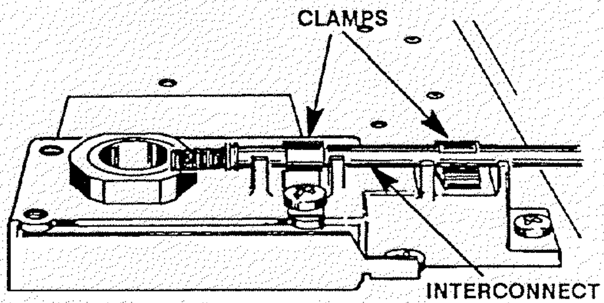
- TCD:

  Disconnect the detector filament and delta-t temperature sensor leads at their connector block on the detector PCB. Use a small flat-blade screwdriver to press each wire lead release (located adjacent to each connection).



- FID:

  Loosen the screws securing the clamps holding the detector PCB interconnect in place.

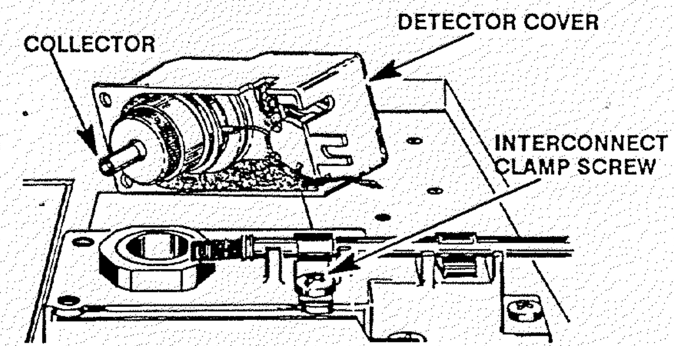


- NPD:

  a. Use a Pozidriv screwdriver to remove the three screws securing the detector cover to the thermal strap.

  b. Disconnect the NPD bead power cable from the detector PCB by pulling it straight off.

  c. Loosen the screws securing the detector PCB interconnect clamps to the thermal strap.



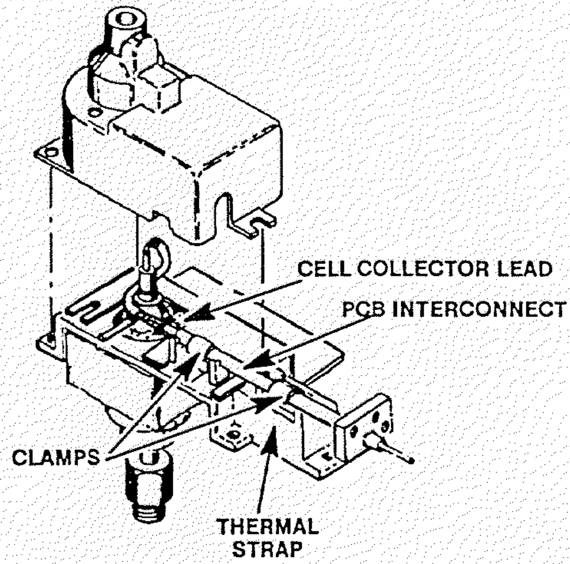
○ 19233A/19235A ECD:

a. Using a Pozidriv screwdriver, remove the three screws securing the detector cover to the thermal strap.

b. Remove the detector cover.

c. Disconnect the cell collector lead from the PCB interconnect.

d. Loosen the screws securing the clamps which hold the interconnect in place.



○ G1223A/G1224A ECD:

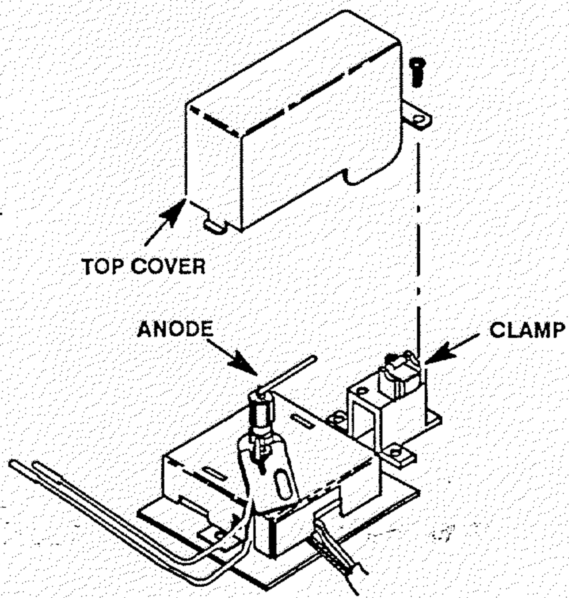
a. Using a Pozidriv screwdriver, remove the screw securing the detector top cover to the thermal strap.

b. Remove the detector top cover.

c. Disconnect any tubing attached to the detector purge and vent tubes.

d. Disconnect the cell anode lead from the PCB interconnect.

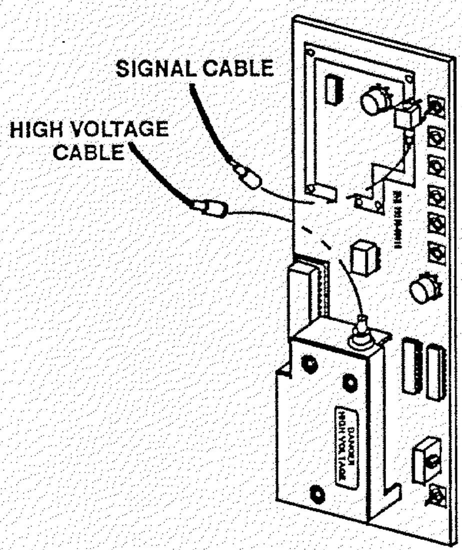
e. Loosen the screw securing the detector PCB interconnect clamp to the thermal strap.



○ FPD:

a. Disconnect the signal cable from its connector on the FPD detector PCB.

b. Disconnect the high voltage cable from its connector on the FPD detector PCB.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

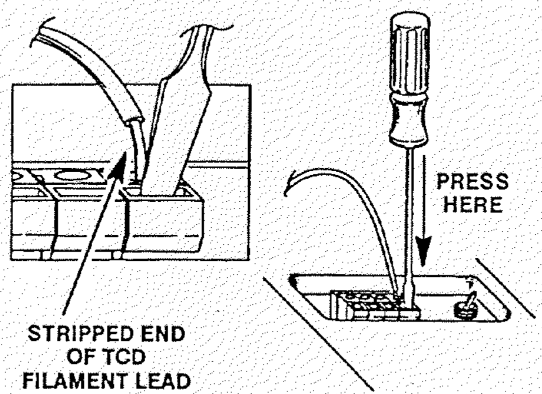
9. Remove the detector PCB from the right side of the instrument by grasping it in the center area along its outer edge and pulling it straight out. (If an interconnect is employed, this will draw it out of the detector.)

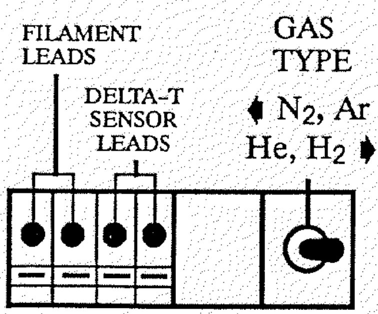
10. Install the replacement detector PCB by sliding it into its mounting location on the main PCB. (If an interconnect is employed, installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.)

11. In order to install the detector PCB, the components which retain the interconnects (or other wiring) must be tightened, installed, and/or connected as applicable for a particular detector:

- TCD:

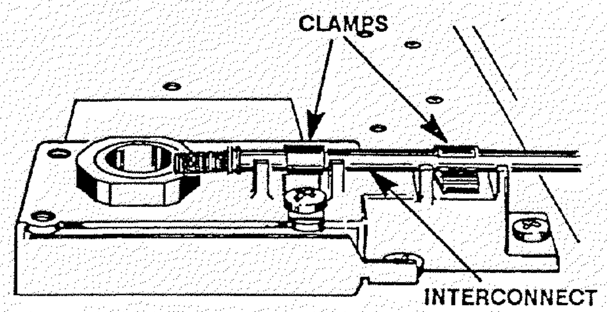
Connect the detector filament and delta-t temperature sensor leads at their connector block on the detector PCB. Use a small flat-blade screwdriver to press each wire lead release (located adjacent to each connection) while inserting the wire into the connector block.





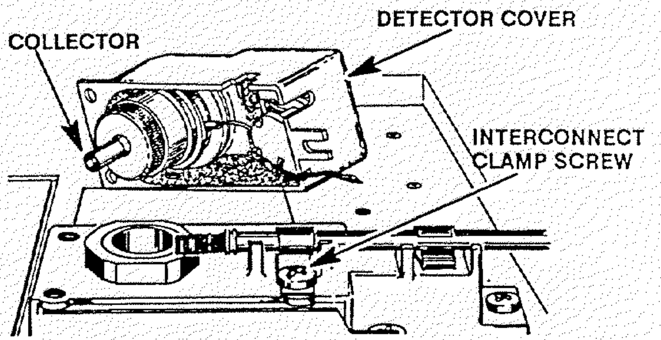
- FID:

Tighten the screws securing the clamps holding the detector PCB interconnect in place.



NPD:

a. Tighten the screws securing the detector PCB interconnect clamps to the thermal strap.

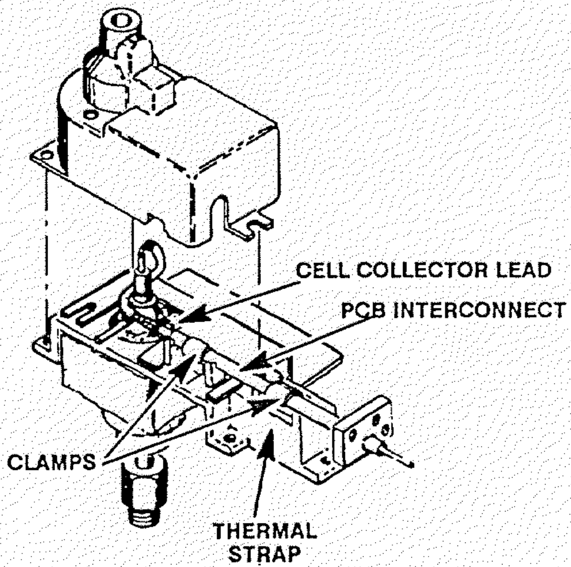


CAUTION

NPD power control plugs installed in the wrong position will permanently damage the NPD detector PCB.

b. Connect the NPD bead power cable from the detector PCB by pushing it straight in to the connector receptacle.

c. Install the detector cover and secure using three screws.



19233A/19235A ECD:

a. Tighten the screws securing the clamps which hold the interconnect in place.

b. Connect the cell collector lead from the PCB interconnect.

c. Install the detector cover and secure using three screws.

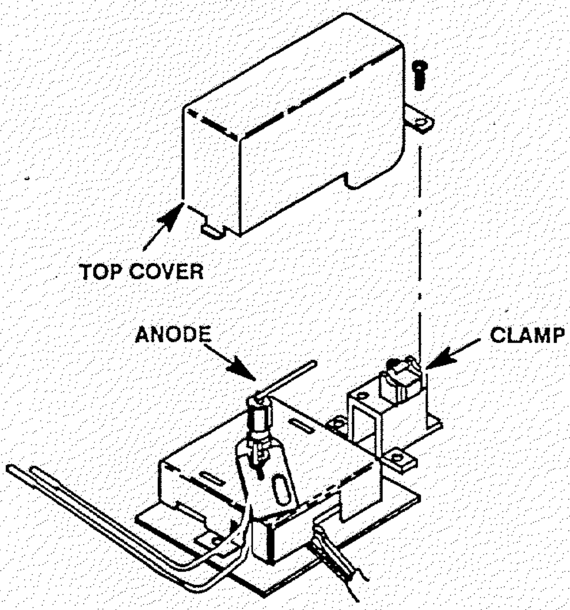
G1223A/G1224A ECD:

a. Tighten the screw securing the detector PCB interconnect clamp to the thermal strap.

s. Connect the cell anode lead from the PCB interconnect.

c. Connect any tubing that was previously attached to the detector purge and vent tubes.

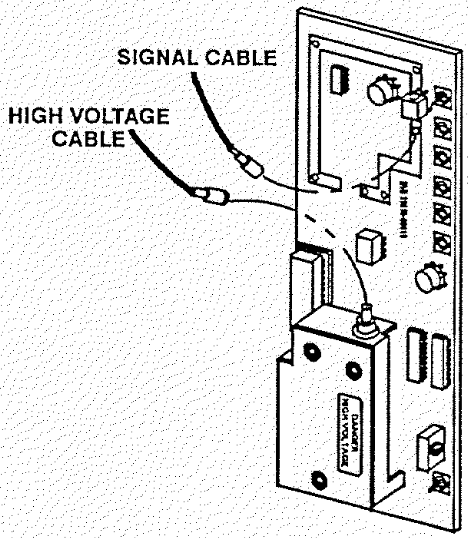
d. Install the detector top cover and secure using one screw.



○ FPD:

a. Connect the signal cable to its connector on the FPD detector PCB.

b. Connect the high voltage cable to its connector on the FPD detector PCB.



23. Restore all gas supplies to the instrument.

24. Install the right side panel and secure using four screws.

25. Install the electronics carrier top cover.

26. Restore power to the HP 5890 Series II.

Section 5

OVEN TEMPERATURE

REPLACING OVEN TEMPERATURE CONTROL COMPONENTS

Oven temperature control components include the oven, the oven fan and motor, the oven flap motor, and the cryogenic valve (if installed). Removal and installation instructions for all of these components are found on the following pages. Refer to page 20 of this section for information on troubleshooting the oven temperature control components. Refer to Section 6 of the IPB for part numbers associated with the oven temperature control components.

Current maintenance philosophy suggests that the oven shroud assembly be replaced as a unit, rather then replacing the heater element or sensor element individually. Maintenance procedures have been included for both entire shroud replacement, as well as individual part replacement, in the event that the shroud assembly is not available in a timely manner, etc.

Specific part numbers are not given in this section. For all replacement part numbers, refer to Section 6 of the IPB portion of this document (Oven Assembly).

This document is not meant to provide instruction for first time installation of the options discussed. Add–on sheets exist for just this purpose, and should be referenced when performing a first time installation.

TABLE OF CONTENTS

Oven Temperature Troubleshooting

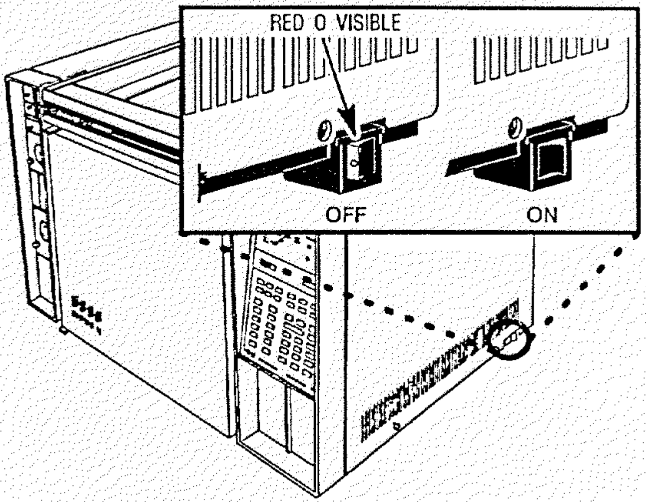
Problem	Probable Cause	Corrective Action
1. Oven does not heat. "WARN: OVEN SHUTOFF" message appears on display.	a. Faulty fuse F4 or F5 on main PCB.	1. Check both fuses. 2. If either fuse is bad, replace. If neither fuse is bad, go to probable cause b.
	b. Oven heater is open.	1. With instrument power off, check resistance of oven heater. 2. If it exhibits a dead or near short, replace the oven heater element. 3. If heater element is ok, refer to probable cause c.
	c. Faulty power supply PCB.	1. Replace power supply PCB. 2. If problem persists, reinstall original power supply PCB and go to probable cause d.
	d. Faulty main PCB PCB.	1. Check both fuses.
2. Using the same sample and conditions on this and other chromatographs, the retention times of this GC differ.	a. Oven needs calibration.	1. Calibrate oven per procedure in this section..
3. Oven does not control.	a. Faulty main PCB.	1. Replace main PCB.
4. Oven temperature runs away.	a. Oven heater partially grounded.	1. Ensure that the oven heater is not coming in contact with the oven shell or other nearby components. 2. If problem persists, go to probable cause b.
	b. Faulty main PCB	1. Replace main PCB.

Replace Oven Shroud Assembly

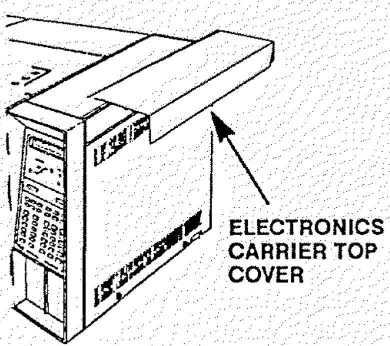
WARNING

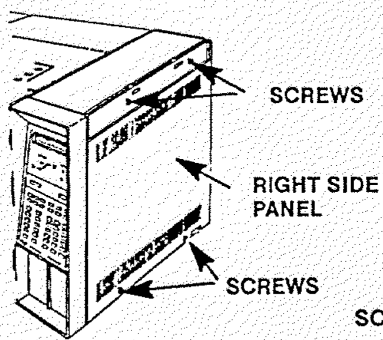
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

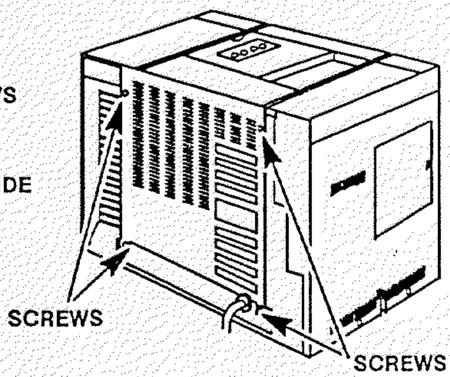
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
6. Remove the right side panel by removing four screws: two each along its upper and lower edges.



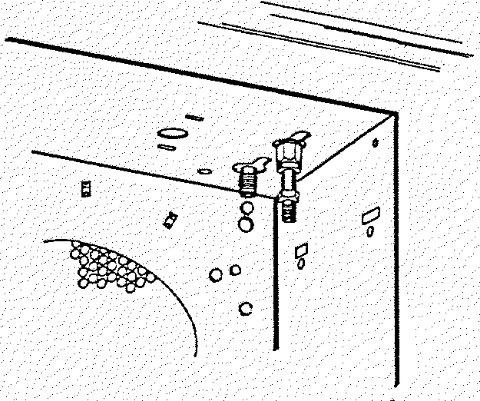
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.

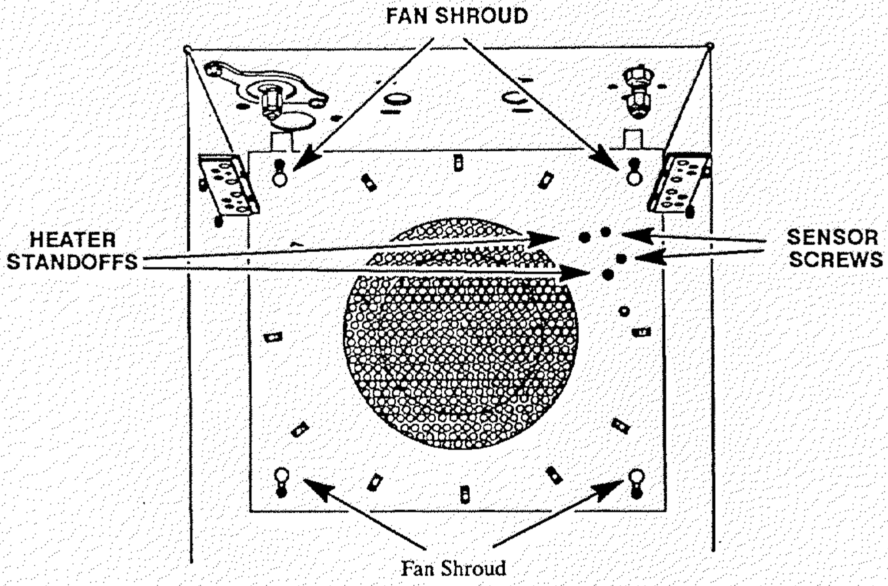






9. Remove the four screws securing the rear cover at its upper rear portion.
10. Slide the rear cover towards the rear of the instrument.
11. Remove columns and other hardware from any installed inlets and detectors, which prevents free access to the heater shroud.
12. Remove the four screws securing the oven/ heater fan shroud.
13. Carefully swing the left edge of the shroud towards the front of the instrument.



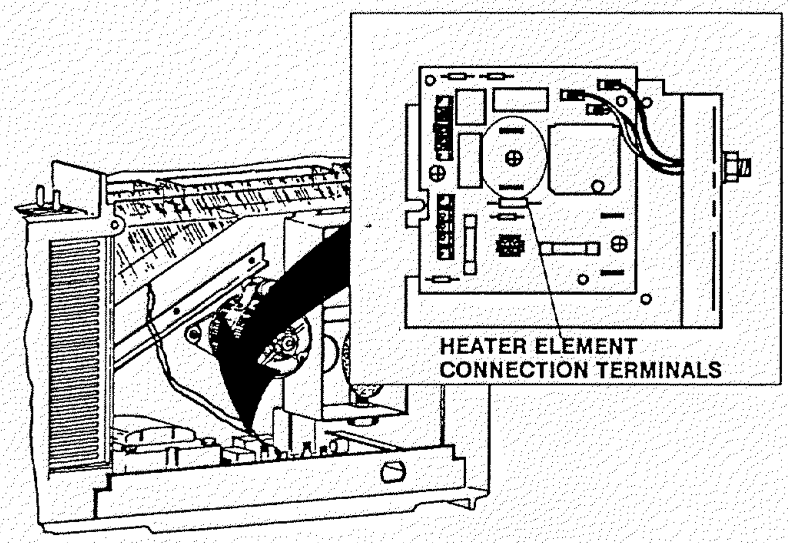


FAN SHROUD (AS VIEWED FROM INSIDE OVEN)

CAUTION

WHEN DISCONNECTING A PLUG, PULL ON THE PLUG NOT ON ITS WIRES. PULLING ON THE WIRES MAY CAUSE BREAKAGE.

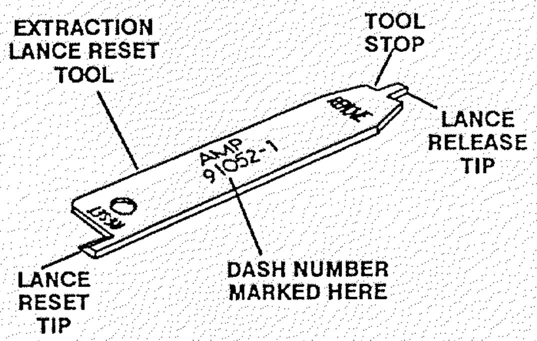
14. At the rear of the instrument, disconnect the two heater element leads at the AC power supply PCB.

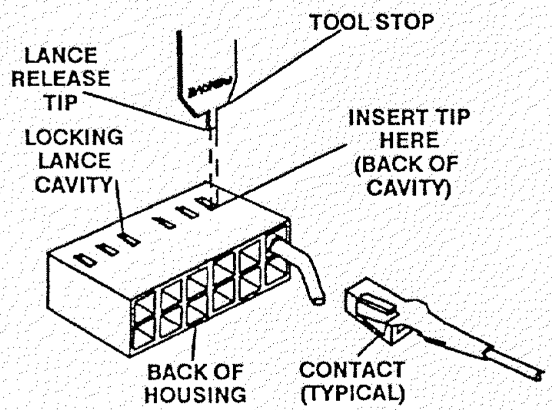


15. From inside the oven, draw the heater leads through the opening in the rear of the oven.

16. Disconnect connector P7 from its receptacle on the main PCB by pulling it straight off. (Heated zones corresponding to sensor lead locations are labeled to the right of the P7 connector receptacle on the main PCB.)

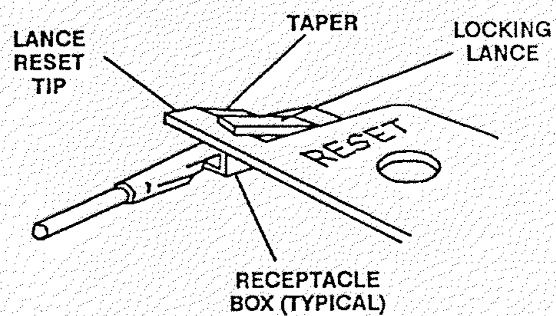
17. Use the lance release tip of an AMP pin extraction/lance reset tool (8710-1542) to remove the appropriate pins from connector P7. (The tool features a lance release tip and a lance reset tip. The lance release tip is used to depress the pin locking lance to extract the pin from a connector. The lance reset tip positions a locking lance to its proper height to ensure retention of the pin in the connector.)





18. From inside the oven, draw the sensor leads through the opening in the rear of the oven.

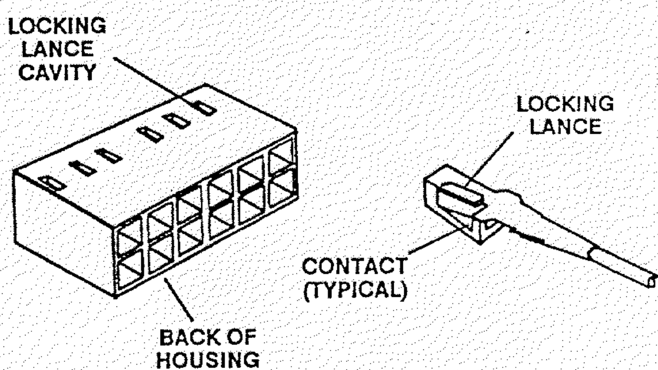
19. Prepare the pins corresponding to the sensor cartridge of the replacement shroud by adjusting their locking lances using the lance reset portion of the tool.



20. Feed the sensor cartridge pins through the opening in the oven and ready them for installation into the main board connector shell.

21. Insert the pins for the replacement sensor into their appropriate locations in the plug, making sure the locking lance on each pin seats into its hole through the side of the plug.

22. Gently pull on the wire to ensure that the pin is locked in the connector.



23. Insert connector P7 into its corresponding receptacle on the main PCB.

24. Route the heater leads from the replacement shroud through the opening in the rear of the oven so that its ends terminate at the connection locations on the power supply PCB.

25. Connect the heater leads to the corresponding blade lugs on the power supply PCB.

26. Install the oven heater/fan shroud in the instrument oven and secure using four screws.

27. Place a screwdriver through a hole in the shroud and gently spin the fan. Listen to determine if the fan touches anything while turning. If so, open the shroud and make any necessary adjustments.

28. Replace the panels removed at the beginning of this procedure.

29. Install any columns and associated hardware removed at the beginning of this procedure.

30. Connect any gas supplies disconnected in step 4 of this procedure.

CAUTION

TURN OFF THE POWER TO THE INSTRUMENT IMMEDIATELY IF THERE IS EVIDENCE OF THE FAN BLADES CONTACTING ANYTHING DURING OPERATION, AND/OR IF THERE IS UNDUE VIBRATION. VIBRATION MAY INDICATE BENT FAN BLADES AND/OR A BENT MOTOR SHAFT.

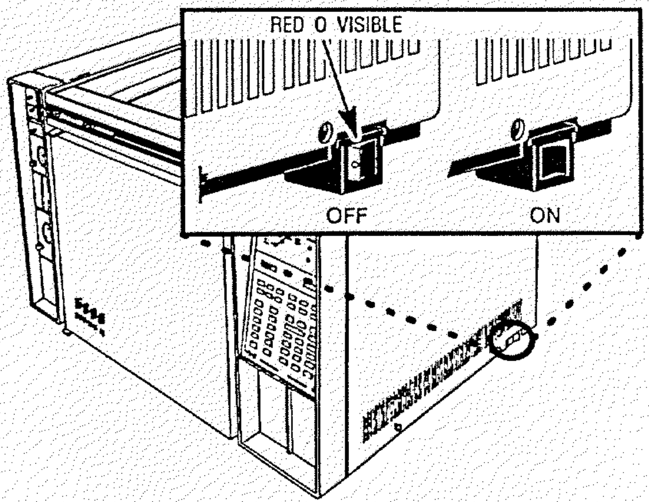
31. Restore power to the instrument.

32. Ensure that the oven operates properly at some selected temperature (e.g.,100°C).

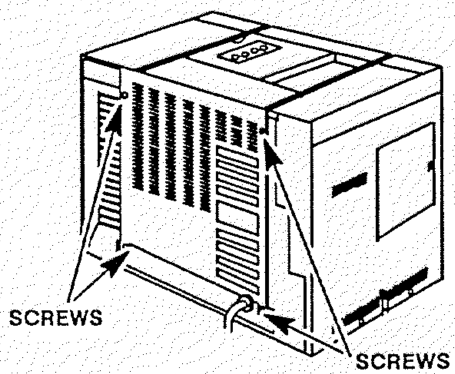
Replace Oven Heater Element

WARNING

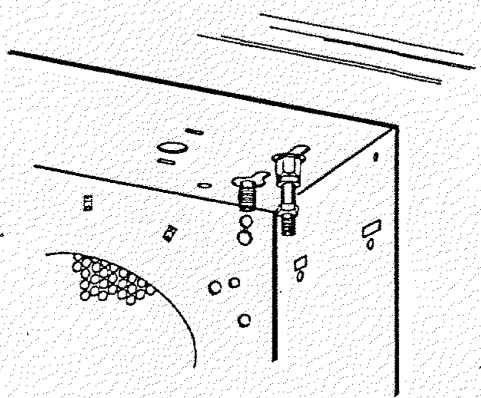
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

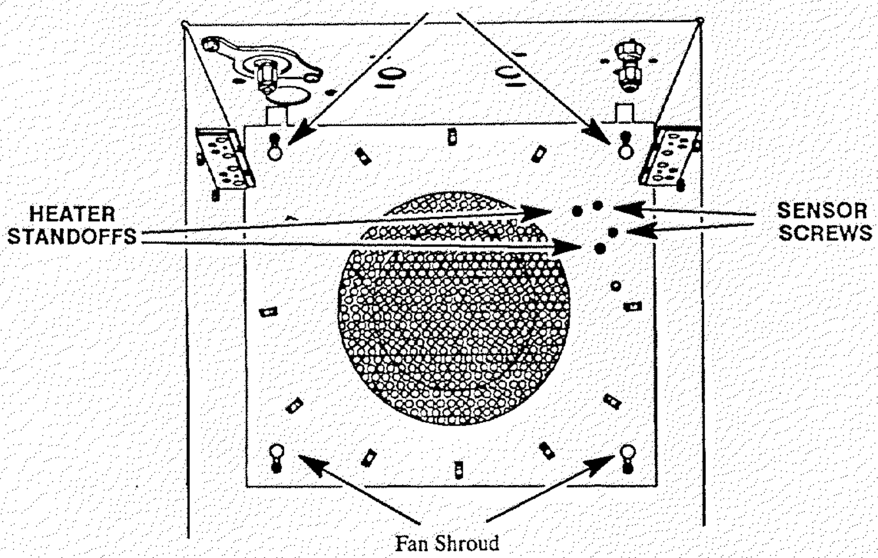


1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the four screws securing the rear cover to the instrument.



6. Slide the rear cover towards the rear of the instrument.
7. Remove columns and other hardware from any installed inlets and detectors, which prevents free access to the heater shroud.
8. Locate the four screws securing the oven/heater fan shroud, and the two screws securing the heater standoffs.
9. Remove the six screws and carefully swing the left edge of the shroud towards the front of the instrument.

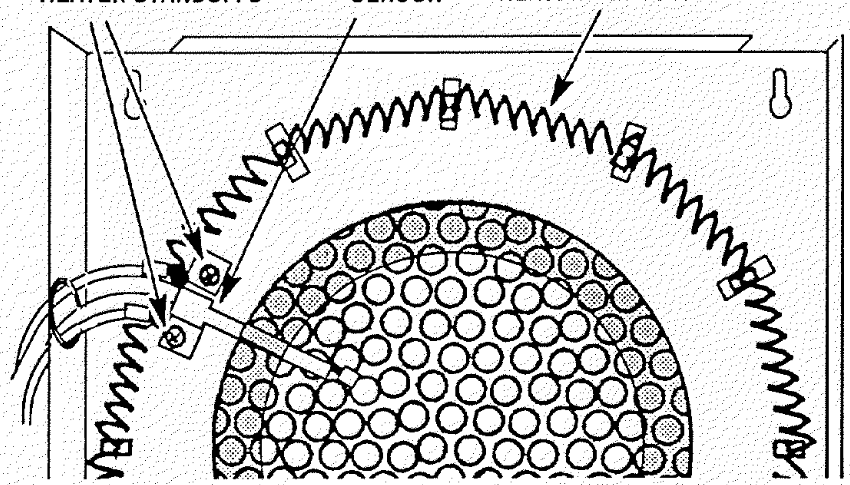




FAN SHROUD (AS VIEWED FROM INSIDE OVEN)

10. Note the position of the sensor so it may be replaced at the same location.

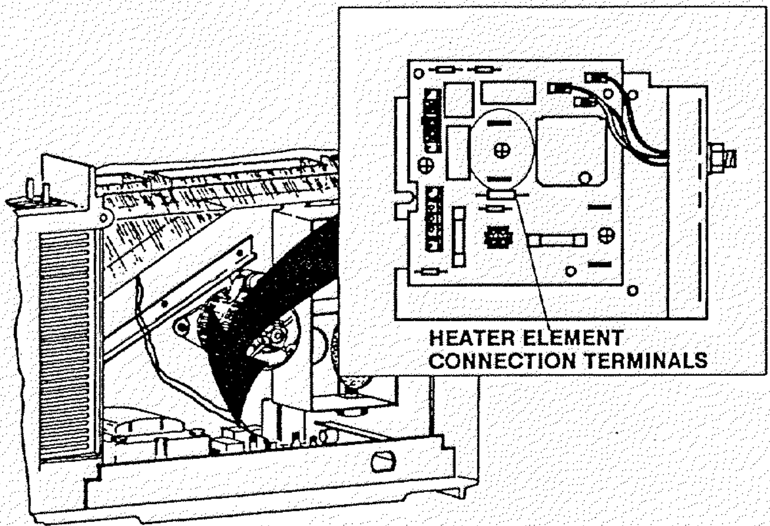
11. Loosen the retainer clamp sufficiently to free the sensor.



HEATER ELEMENT (AS VIEWED FROM REAR OF SHROUD)

12. Remove the two screws securing the heater to its standoffs.

13. At the rear of the instrument, disconnect the two heater element leads at the AC power supply PCB.



14. From inside the oven, draw the heater leads through the opening in the rear of the oven.

15. Remove the old heater element from the oven.

16. To prepare a new heater, note that it must be matched to a specific line voltage. From Table 4-1, verify the unstretched length of the replacement heater element, according to the line voltage of the instrument. Stretch the wire EVENLY to the indicated length and allow it to contract back to an approximate 720 mm length.

Table 4-1. Preparing Replacement Oven Heater Element

INSTRUMENT VOLTAGE (ohms)	RESISTANCE	UNSTRETCHED LENGTH (mm)	STRETCHED LENGTH (mm)	CONTRACTED LENGTH (mm)
120(1)	9.05(+/-0.05)	136	975	720
220(2)	30.42(+/-0.17)	180	1110	720
240(3)	36.20(+/-0.20)	214	1185	720

17. Route the new heater through insulators so that its ends terminate at the connection locations on the power supply PCB.

CAUTION

CERAMIC OVEN HEATER STANDOFFS ARE FRAGILE. OVER-TIGHTENING OF SCREWS WILL CAUSE BREAKAGE.

18. Secure the heater to its standoffs with two screws.

19. Secure the two heater standoffs to the shroud with screws.

20. Install the oven temperature sensor and secure by tightening the retaining clamp.

21. Install the oven heater/fan shroud in the instrument oven and secure using four screws.

22. Place a screwdriver through a hole in the shroud and gently spin the fan. Listen to determine if the fan touches anything while turning. If so, open the shroud and make any necessary adjustments.

23. Install any columns and associated hardware removed at the beginning of this procedure.

24. Connect any gas supplies disconnected in step 4 of this procedure.

25. Restore power to the instrument.

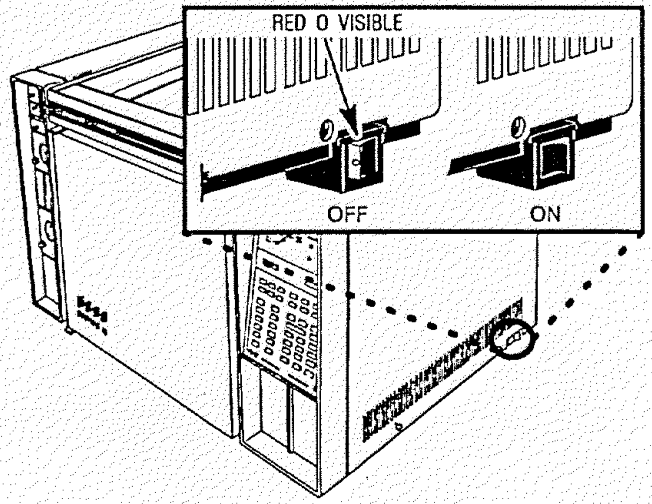
26. Ensure that the oven functions properly at a given temperature (e.g., 100°C).

Replace Oven Temperature Sensor

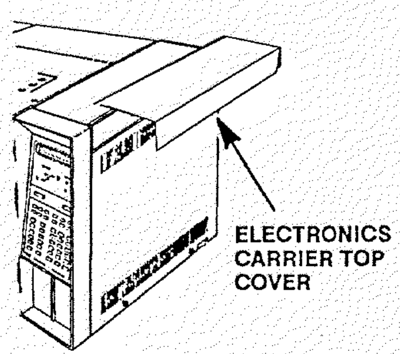
WARNING

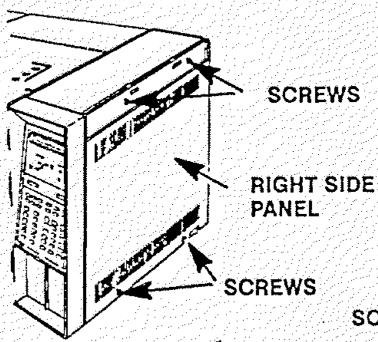
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

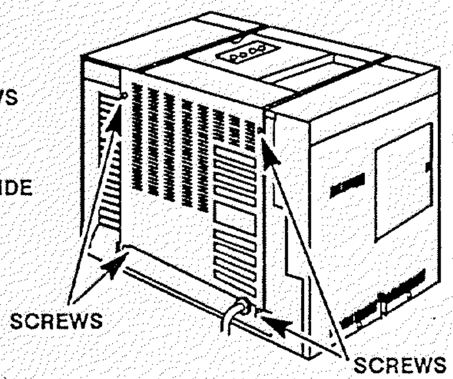
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
6. Remove the right side panel by removing four screws: two each along its upper and lower edges.



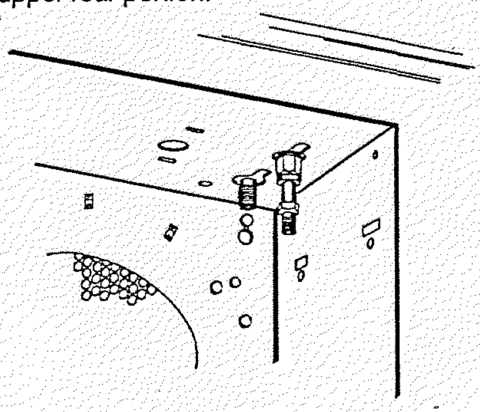
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.

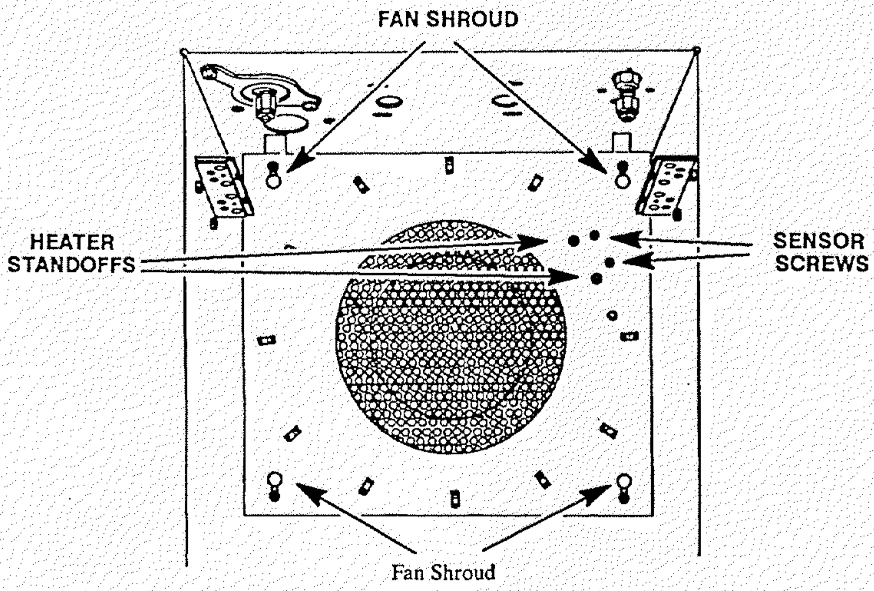






9. Remove the four screws securing the rear cover at its upper rear portion.
10. Slide the rear cover towards the rear of the instrument.
11. Remove columns and other hardware from any installed inlets and detectors, which prevents free access to the heater shroud.
12. Remove the four screws securing the oven/ heater fan shroud.
13. Carefully swing the left edge of the shroud towards the front of the instrument.

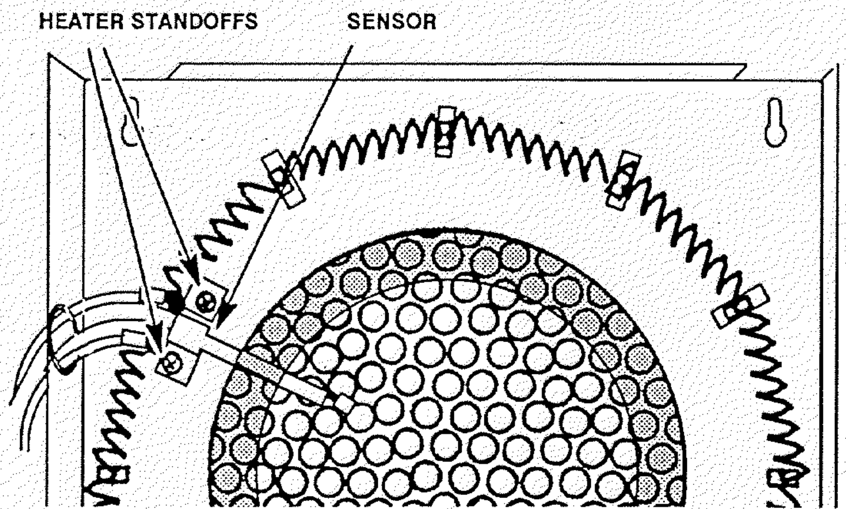




FAN SHROUD (AS VIEWED FROM INSIDE OVEN)

14. Note the position of the sensor so that the replacement may be installed at the same location.

15. Loosen the retainer clamp sufficiently to free the sensor.



HEATER SENSOR (AS VIEWED FROM REAR OF SHROUD)

16. Withdraw the faulty sensor from the retainer.

17. Remove the sensor through the opening in the rear of the oven. Some insulation will come out with the sensor.

18. Remove any insulation remaining in the sensor guide and save it for later use.

CAUTION

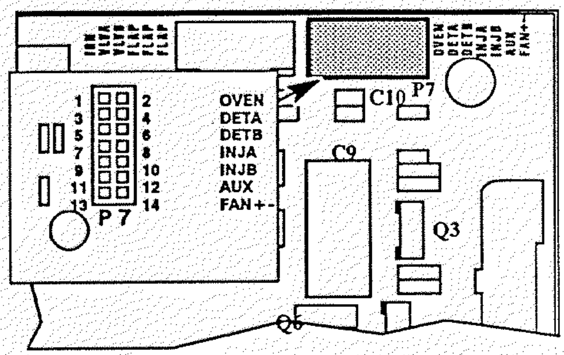
THE TEMPERATURE SENSOR (SMALL CERAMIC BEAD) IS VERY FRAGILE AND MUST BE HANDLED CAREFULLY.

19. Insert the new sensor through the opening in the rear of the oven.

20. Position the new sensor cartridge at the same location as the original and secure it by tightening the retainer clamp.

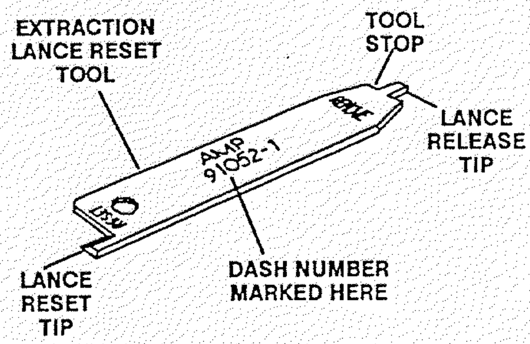
CAUTION

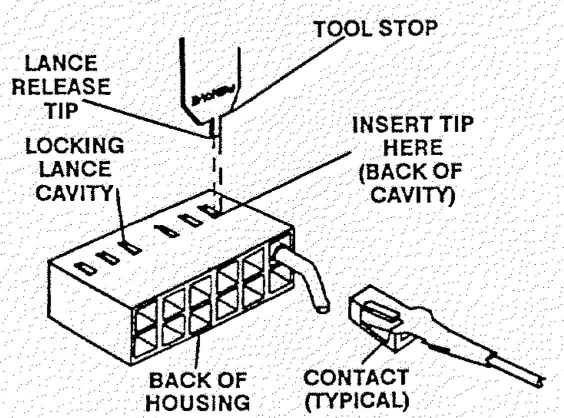
WHEN DISCONNECTING A PLUG, PULL ON THE PLUG NOT ON ITS WIRES. PULLING ON THE WIRES MAY CAUSE BREAKAGE.



21. Disconnect connector P7 from its receptacle on the main PCB by pulling it straight off. (Heated zones corresponding to sensor lead locations are labeled to the right of the P7 connector receptacle on the main PCB.)

22. Use the lance release tip of an AMP pin extraction/lance reset tool (8710-1542) to remove the appropriate pins from connector P7. (The tool features a lance release tip and a lance reset tip. The lance release tip is used to depress the pin locking lance to extract the pin from a connector. The lance reset tip positions a locking lance to its proper height to ensure retention of the pin in the connector.)



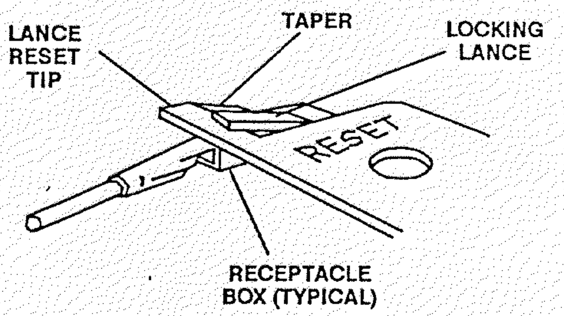


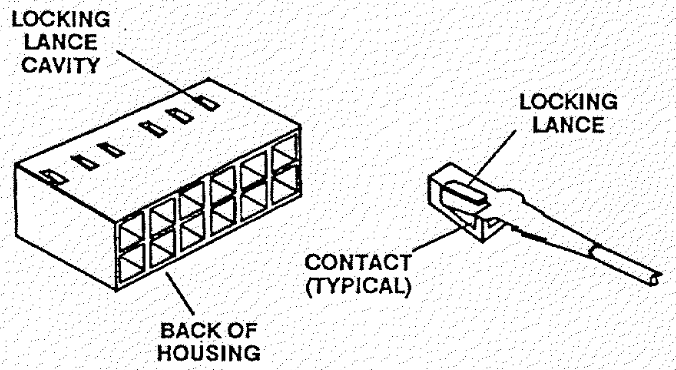
23. Prepare the pins corresponding to the replacement sensor cartridges by adjusting their locking lances using the lance reset portion of the tool.

24. Insert the pins for the replacement sensor into their appropriate locations in the plug, making sure the locking lance on each pin seats into its hole through the side of the plug.

25. Gently pull on the wire to ensure that the pin is locked in the connector.

26. Insert connector P7 into its corresponding receptacle on the main PCB.





27. Install the insulation removed earlier in the sensor guide, around the sensor wire leads.

28. Replace the panels removed at the beginning of this procedure.

29. Install any columns and associated hardware removed at the beginning of this procedure.

30. Connect any gas supplies disconnected in step 4 of this procedure.

31. Restore power to the instrument.

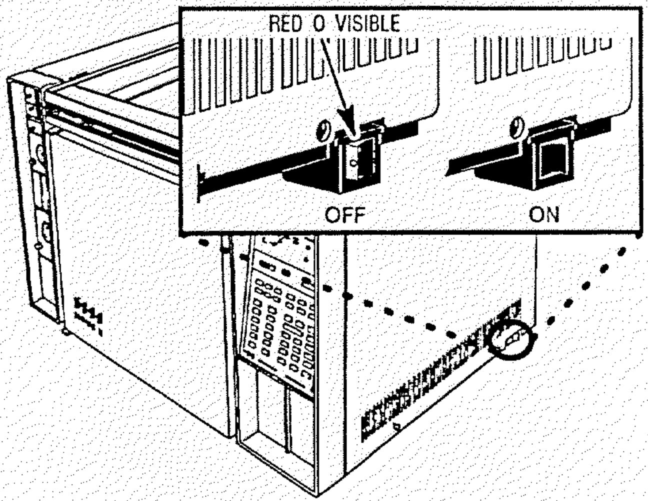
32 Ensure that the oven operates properly at some selected temperature (e.g.,100°C).

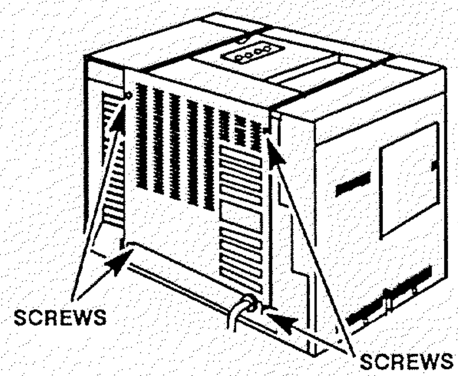
Replace Oven Fan and/or Oven Fan Motor

WARNING

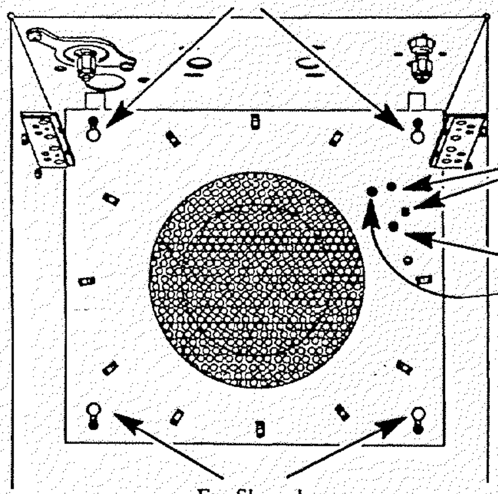
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

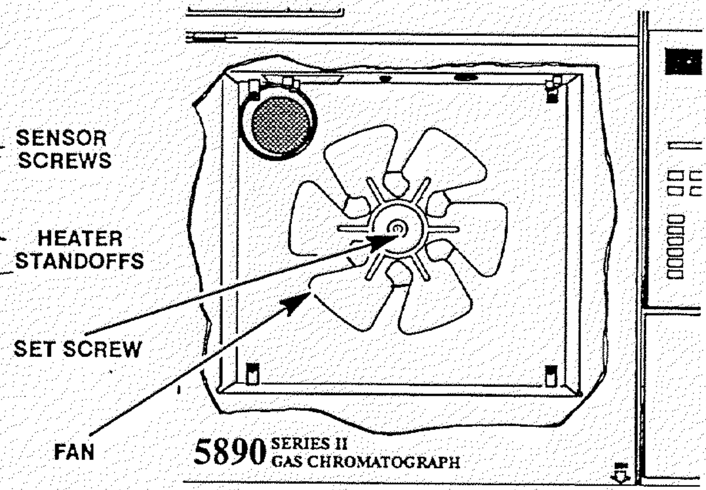
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the four screws securing the rear cover to the instrument.





6. Remove the rear cover by sliding it towards the rear of the instrument.
7. Inside the oven, remove columns and other hardware preventing free access to the heater .
8. Remove the four screws securing the oven heater/fan shroud to the instrument.
9. Carefully swing the left edge of the shroud towards the front of the instrument.
10. With a hex wrench, loosen the setscrew securing the fan to the motor shaft.
11. Carefully slide the fan off the motor shaft.





CAUTION

FAN BLADES ARE FRAGILE. BE CAREFUL NOT TO BEND THE BLADES.

12. If only the fan blade is being replaced, go to step 18.

13. At the rear of the instrument, trace the fan motor wire harness to its connector receptacle (J28) on the AC power board.

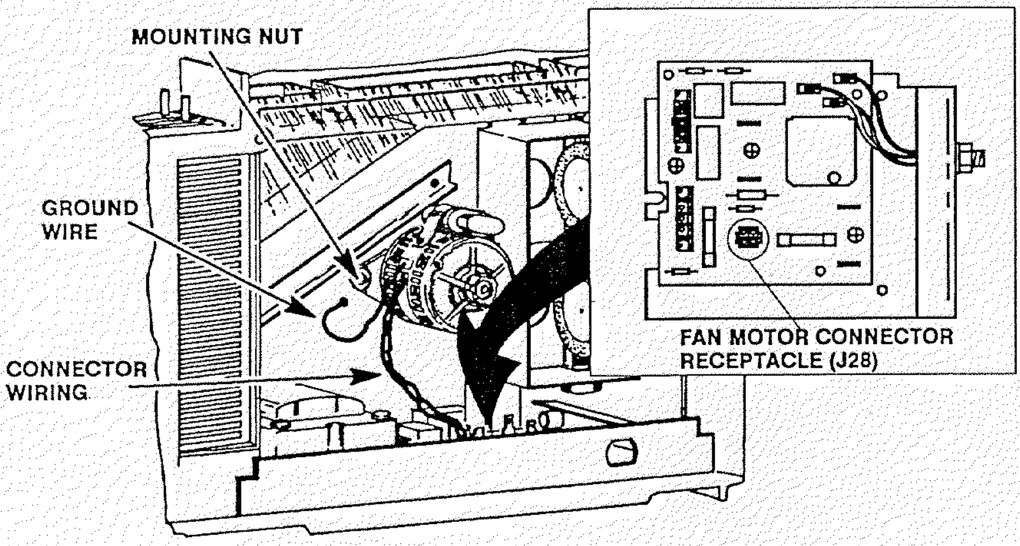
CAUTION

WHEN DISCONNECTING A PLUG, PULL ON THE PLUG NOT ON ITS WIRES. PULLING ON THE WIRES MAY CAUSE BREAKAGE.

14. Disconnect connector J28 from its receptacle by pulling it straight up while squeezing its ribbed sides.

15. Locate and remove the fan motor ground wire by removing the nut securing it to the instrument.

16. Remove the three nuts (and six associated washers) securing the motor to the oven.



17. Remove the oven fan motor from the instrument.
18. Install the new fan motor and secure using two washers and one nut at each mounting location.
19. Tighten the nuts firmly.
20. Connect the motor wire harness plug to connector receptacle J28 on the AC power board.
21. Connect the motor ground wire to the oven wall and secure using a nut.
22. Install the fan on the motor shaft and position it so its setscrew will seat against the flat portion of the shaft.
23. Tighten the setscrew.
24. Install the oven heater/fan shroud and secure with four screws.
25. Feed a screwdriver through a hole in the shroud and gently spin the fan.
26. Listen to determine if the fan touches anything while turning.
27. If any noise is heard, open the shroud and repeat steps 4 through 7 and 18 through 22, adjusting the position of the fan on the motor shaft.
28. Replace the panels removed at the beginning of this procedure.
29. Install any columns and associated hardware removed at the beginning of this procedure.
30. Connect any gas supplies disconnected in step 4 of this procedure.

CAUTION

TURN OFF THE POWER TO THE INSTRUMENT IMMEDIATELY IF THERE IS EVIDENCE OF THE FAN BLADES CONTACTING ANYTHING DURING OPERATION, AND/OR IF THERE IS UNDUE VIBRATION. VIBRATION MAY INDICATE BENT FAN BLADES AND/OR A BENT MOTOR SHAFT.

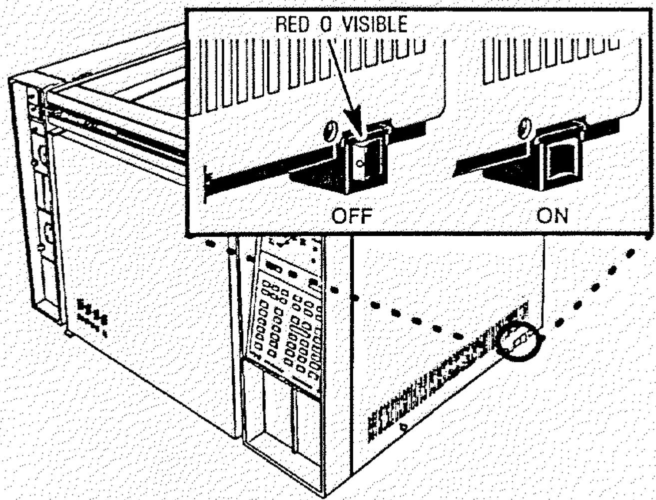
31, Restore power to the instrument.

32. Check that the oven controls properly at some selected temperature (e.g., 100°C).

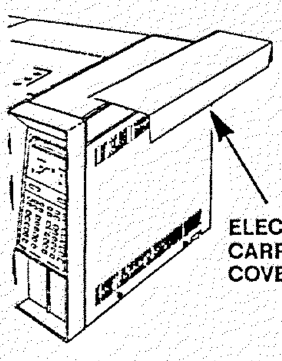
Replace Oven Flap Motor

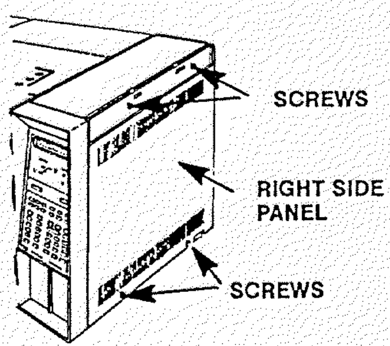
WARNING

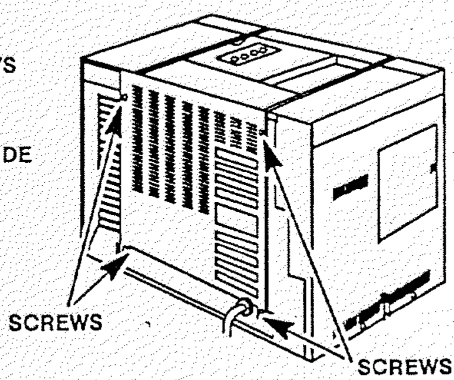
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.



1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the four screws securing the rear cover to the instrument.
6. Slide the rear cover towards the rear of the instrument.
7. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
8. Remove the right side panel by removing four screws: two each along its upper and lower edges.

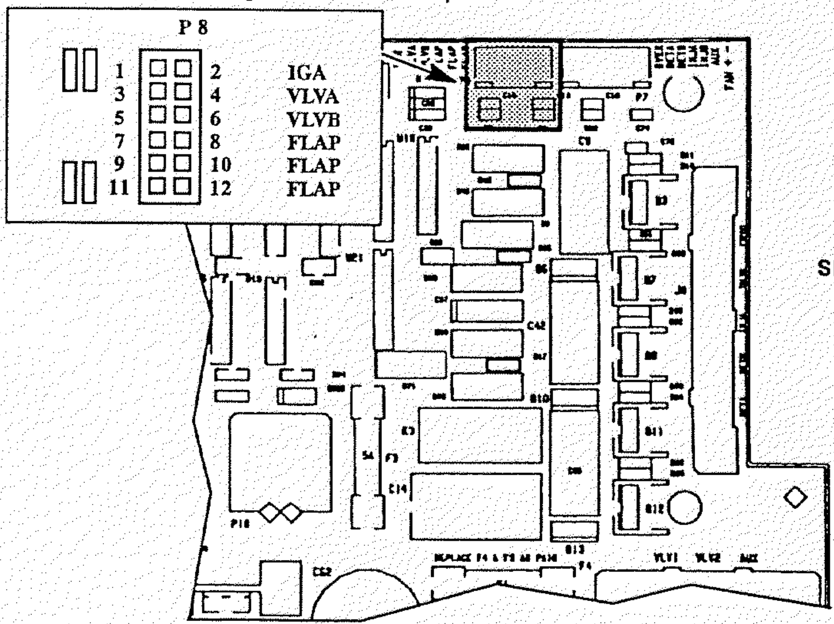


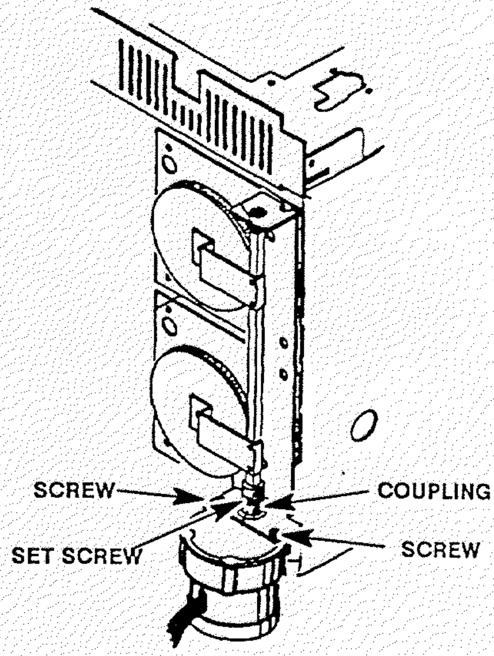




9. Facing the rear of the instrument, locate the oven flap motor (mounted on the oven at its lower right corner). Trace and free its wire harness to the P8 connector on the main PCB.

10. Disconnect connector P8 from the main PCB by pulling it straight out of its receptacle.





CAUTION

WHEN DISCONNECTING A PLUG, PULL ON THE PLUG NOT ON ITS WIRES. PULLING ON THE WIRES MAY CAUSE BREAKAGE.

11. Remove the air duct located above the upper oven flap by removing two nuts, one each along its upper and lower edges.

12. Use a Pozidriv screwdriver to remove the two screws securing the flapper bracket to the instrument.

13. Lift the flapper bracket assembly from the instrument.

14. Use a hex wrench to loosen the motor shaft setscrew on the flexible coupling closest to the flap motor.

15. Use a small Pozidriv screwdriver to remove the motor from the bracket.

16. Insert the shaft of the new stepper motor into the flexible coupling on the flapper assembly.

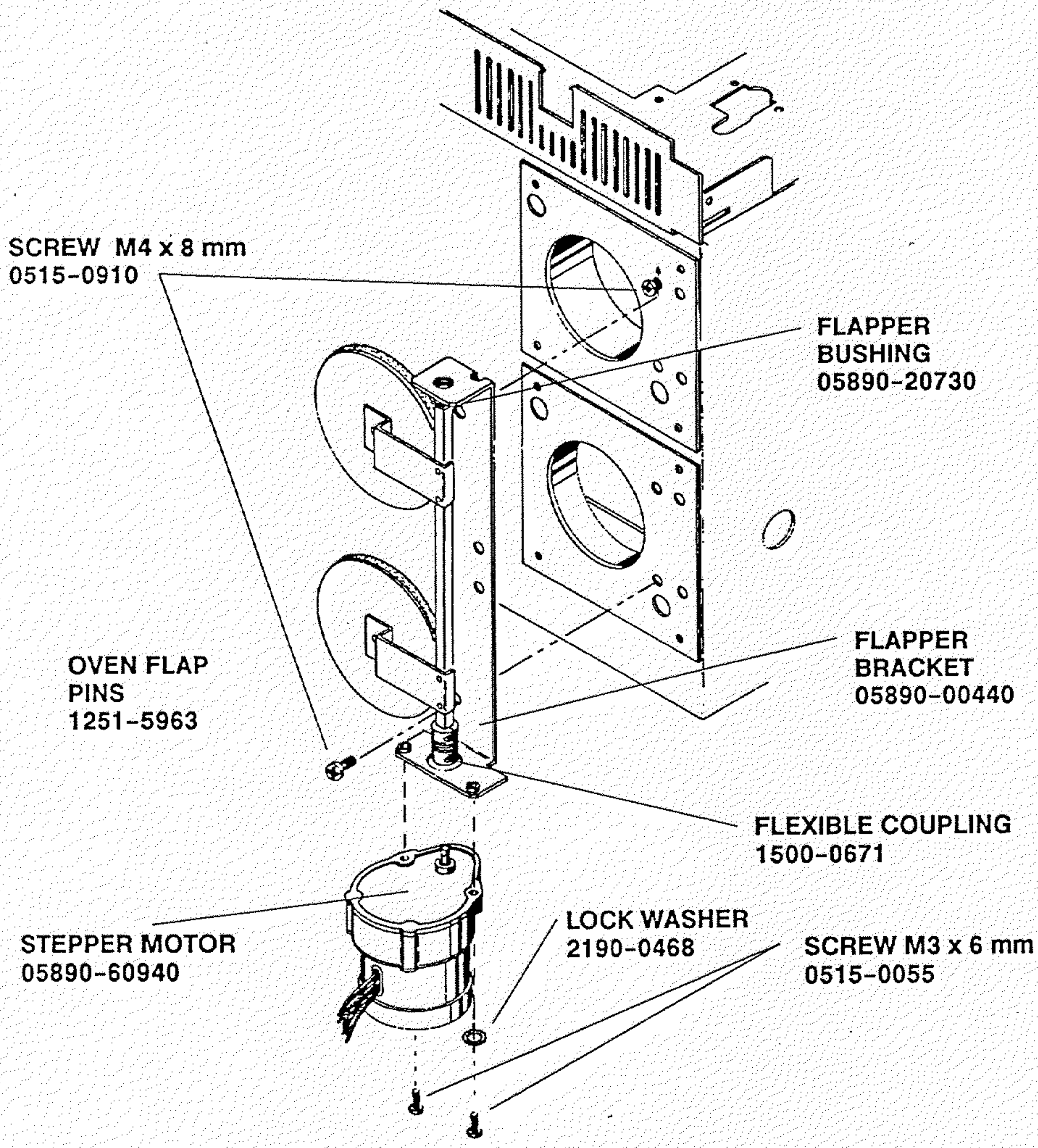
17. Secure the motor to the flapper bracket using two screws.

18. Tighten the setscrew on the coupling to a snug fit.

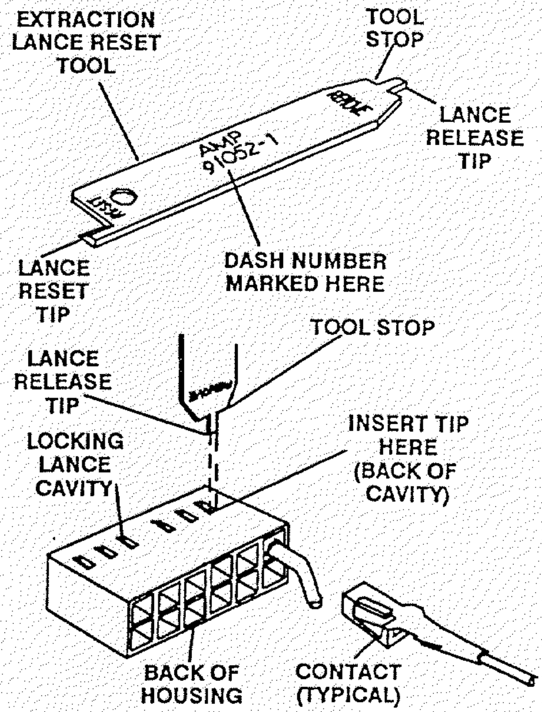
19. Mount the oven flap assembly on the instrument and secure using two screws.

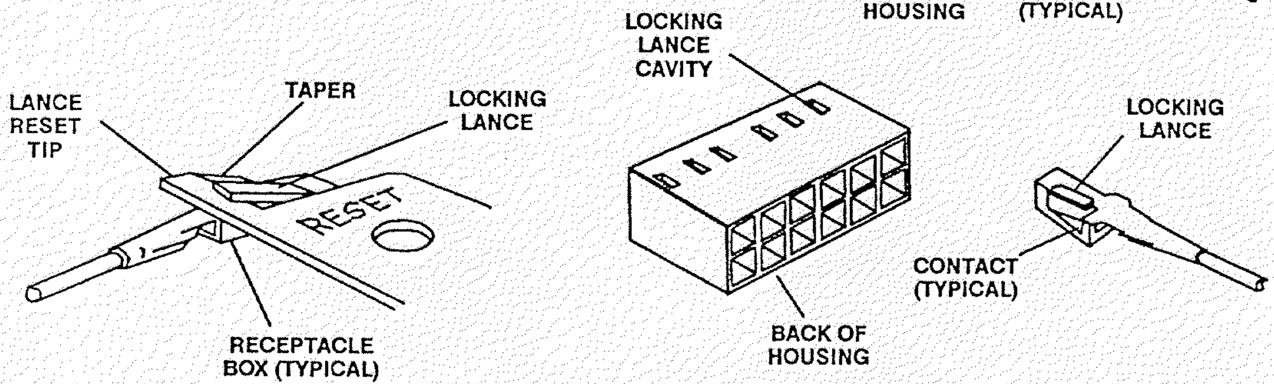
20. Mount the air duct over the upper oven flap and secure using two screws.

21. After the new motor has been installed, route its wire harness along the same path used by the old harness and secure it with plastic wire ties.



22. Use the lance release tip of an AMP pin extraction/lance reset tool (8710-1542) to remove the appropriate pins (from the old harness) from connector P8. (The tool features a lance release tip and a lance reset tip. The lance release tip is used to depress the pin locking lance to extract the pin from a connector. The lance reset tip positions a locking lance to its proper height to ensure retention of the pin in the connector.)
23. Prepare the pins corresponding to the replacement stepper motor by adjusting their locking lances using the lance reset portion of the tool.
24. Insert the pins for the replacement stepper motor into their appropriate locations in the plug, making sure the locking lance on each pin seats into its hole through the side of the plug.
25. Gently pull on the wire to ensure that the pin is locked in the connector.





26. Insert the plug in its receptacle (P8) on the main PCB. (The plug is keyed and can only be inserted one way.)
27. Replace the panels removed at the beginning of this procedure.
28. Connect any gas supplies disconnected in step 4 of this procedure.
29, Restore power to the instrument.

WARNING

- **SMALL PARTICLES OF DEBRIS MAY BE BLOWN OUT OF THE OVEN WHEN THE FLAP IS OPEN. USE PROPER EYE PROTECTION WHEN OBSERVING THE OVEN FLAPS THROUGH THE BACK PANEL.**
- **TO PREVENT POSSIBLE BURNS, AVOID COMING IN CONTACT WITH THE HOT AIR VENTED FROM THE OVEN.**

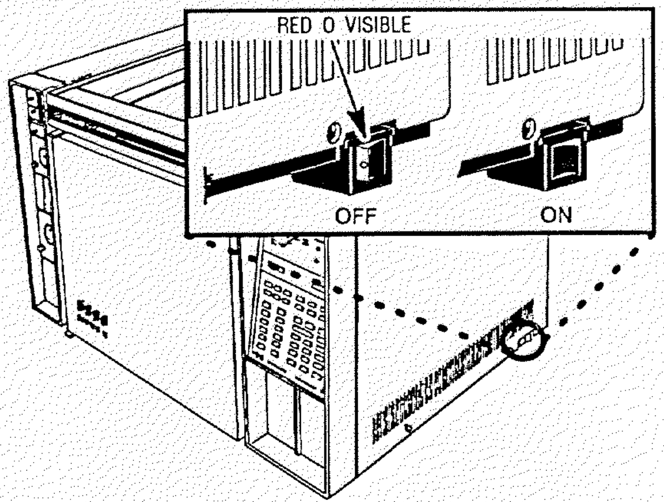
30. Observe the oven flaps through the back panel. The oven flap motor should close the flap assembly completely.
31. Enter an oven temperature setting of 20°C. The oven flap assembly should now open fully.

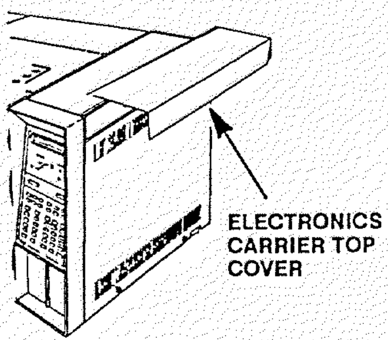
Replace Cryogenic Valve and/or Nozzle

WARNING

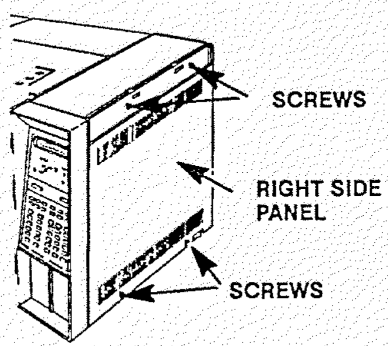
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

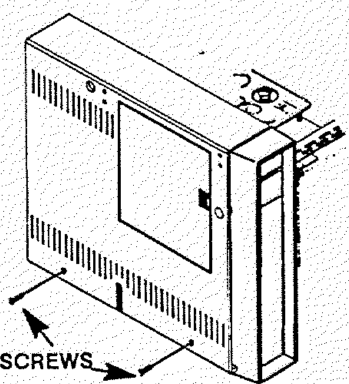
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.

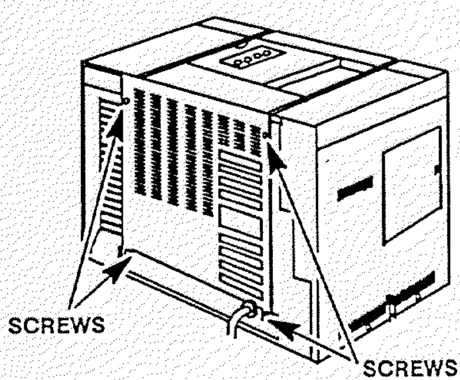




6. Remove the right side panel by removing four screws: two each along its upper and lower edges.
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.







9. Remove the four screws securing the rear cover to the instrument.
10. Slide the rear cover towards the rear of the instrument.

WARNING

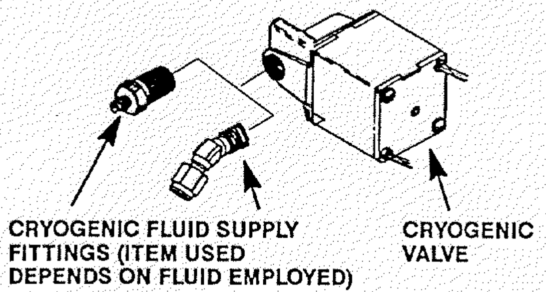
USE PROPER EYE PROTECTION WHEN WORKING WITH CRYOGENIC FLUIDS UNDER PRESSURE.

11. Shut off the cryogenic fluid supply.

12. Slowly loosen the cryogenic fluid supply, at the valve, to release any residual pressure.

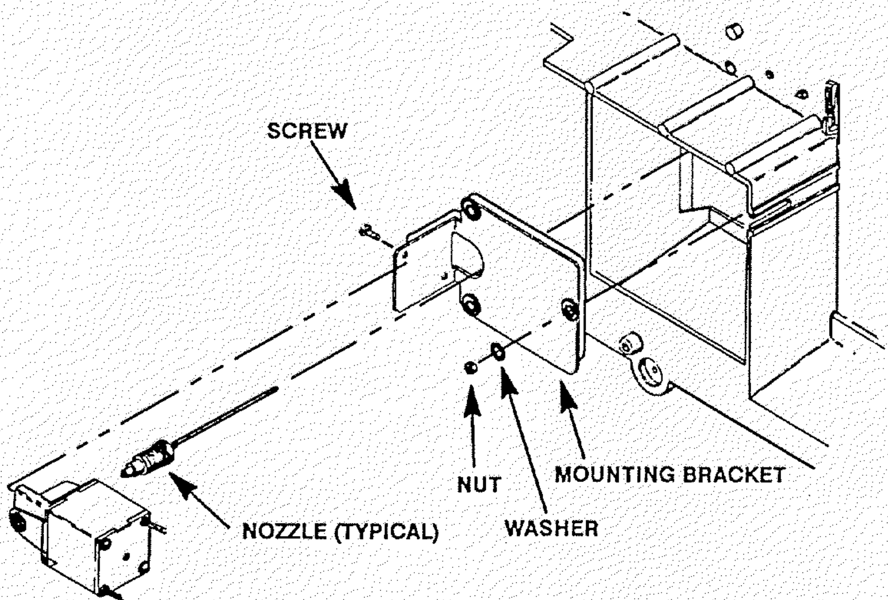
13. Disconnect the cryogenic fluid supply at its fitting to the valve.

14. Trace and free the valves wire harness to connector J9 on the main PCB.



15. Disconnect connector J9 from the main PCB by pulling it straight out of its receptacle.

16. Remove the valve assembly from the outside wall of the oven by removing three nuts (and associated washers) from around the edge of its mounting bracket.



17. Withdraw the valve assembly from the side of the instrument, being careful not to bend or damage the nozzle assembly.

18. Separate the valve body from its mounting bracket by removing two screws.

19. If only the cryogenic nozzle is being replaced, proceed as follows:

    a. Remove the nozzle (notice its position with respect to the valve assembly) from the valve body and discard.

    b. Wrap the threads of the new nozzle with Teflon pipe tape being careful not to cover the first two threads of the nozzle.

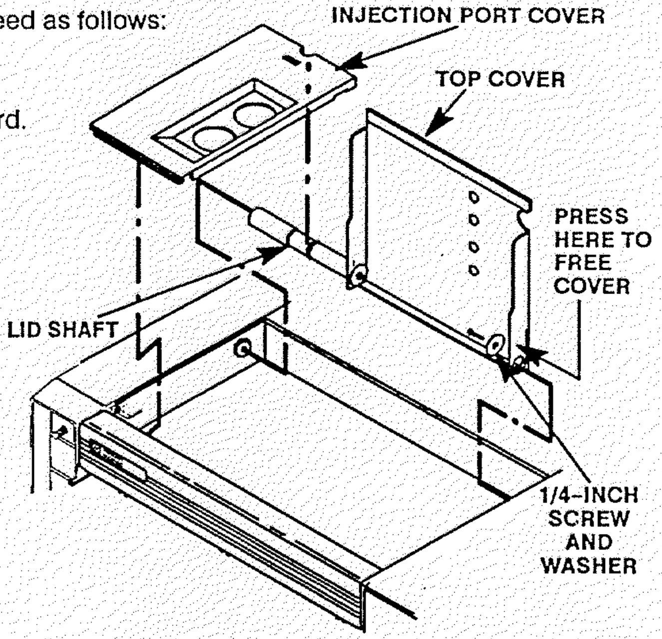
    c. Mount the cryogenic nozzle on the valve and tighten it firmly with a wrench. (Be sure to install a CO_2 nozzle (if one was present) in the same position as the old one.)

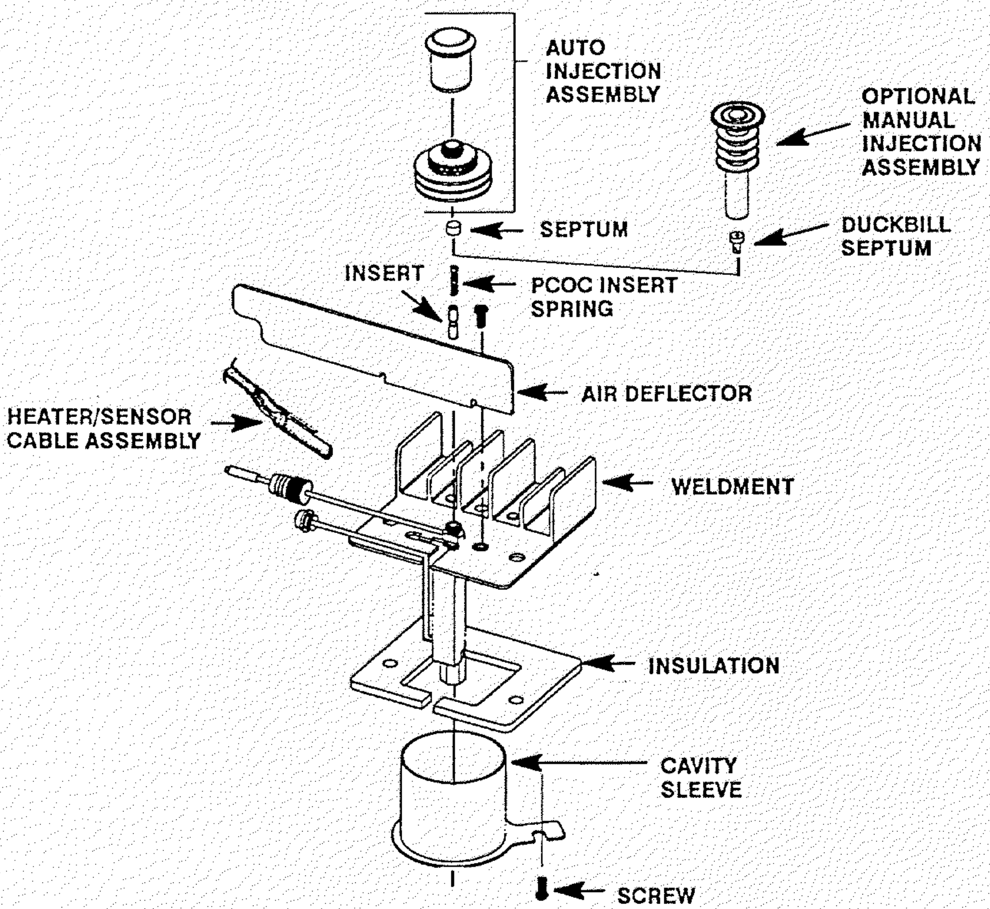
d. Go to step 22.

20. If a PCOC cryogenic nozzle is installed, proceed as follows:

    a. Remove the injection port cover by grasping its back edge and lifting it upward.

    b. Remove the auto-injection assembly (or optional manual injection assembly) by rotating it counter-clockwise). Be careful not to loose the septum, insert, or PCOC insert spring which are installed under the injection assembly.





    c. Remove the air deflector using a Pozidriv screwdriver to remove the screw securing the air deflector to the inlet weldment.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

d. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.

e. Use a Pozidriv screwdriver to remove the two screws securing the inlet to the instrument.

f. Lift the inlet enough to expose the heated block.

g. If installed, remove the cryo-blast tube from the inlet weldment.

h. Install the cryo-blast weldment onto the inlet weldment.

i. Secure the inlet to the instrument using two screws.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

j. Carefully slide the heater and sensor cartridges into the heated block portion of the inlet.

k. Install the air deflector and secure it to the weldment using one screw.

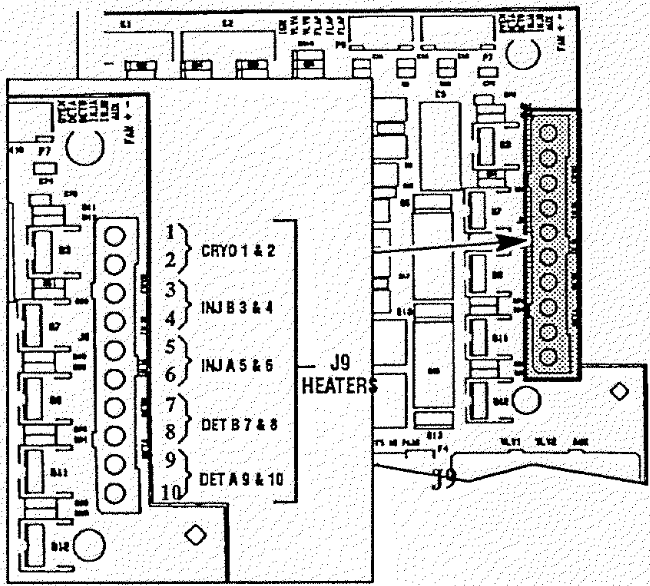
l. Install the injection assembly, septum, PCOC insert spring, and insert (the injection assembly secures the other items to the inlet weldment).

m. Install the injection port cover.

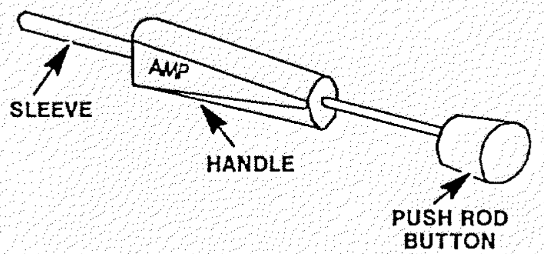
21. Mount the new valve body on the mounting bracket and secure using two screws.

22. Mount the assembly on the oven wall in the same position as the one just removed.

23. Route the wire harness along the same path used by the old harness and secure it with plastic wire ties.

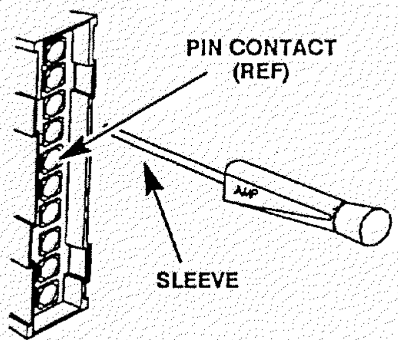


24. An AMP pin extraction tool (8710–0614) is required to properly remove pins from connector J9. The tool features a sleeve to release the pin locking lance, and a plunger to eject the pin from the plug. The following steps detail how to remove the pins from the connector.



   a. Slide the sleeve portion of the tool straight into the pin to be removed from the connector until it is fully bottomed.

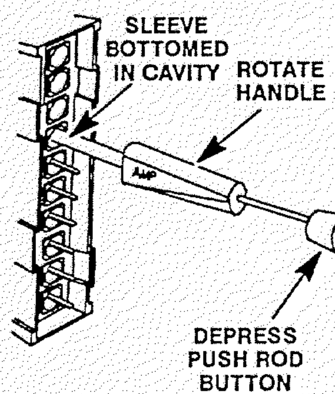
   b. At the same time, allow the plunger to be pushed back by the pin.



   c. Rotate the body of the tool to ensure it is fully bottomed, and to ensure the pin locking lance is released.

   d. Holding the body of the tool firmly in place (fully inserted into the plug), depress the plunger to eject the pin from the connector.

   e. Remove the tool from the plug.



25. Insert pins from the new valve into their appropriate locations in the plug, making sure the locking lance on each pin seats into the plug.

26. Gently pull on the wire to ensure it is locked in the plug.

27. Insert the plug in its receptacle J9 on the main circuit board. Notice that the plug is keyed and can only be inserted one way.

28. Connect the cryogenic fluid supply fittings to the valve.
29. Turn the fluid supply on.
30. Verify no leakage occurs at the fitting to the valve body.
31. If there is no evidence of leakage, replace the panels removed at the beginning of this procedure.
32. Connect any gas supplies disconnected in step 4 of this procedure.
33. Restore power to the instrument.
34. Check that the oven controls properly at some selected subambient temperature (e.g., −10°C), and that no cryogenic fluid flows into the oven at a selected temperature above ambient (e.g., 100°C).

Calibrate Oven Temperature

To maximize the precision of retention time information, particularly if retention times are to be compared to that of other chromatographs, it may be necessary to calibrate the oven temperature control circuitry using an independent temperature measuring device.

With the factory-set calibration difference value of 0 (zero), the displayed oven temperature is accurate to within 1% of the actual temperature (which is expressed in °K (Kelvin)).

The HP 5890 Series II provides the means to reset oven temperature monitoring (if necessary) so that the ACTUAL displayed temperature value accurately represents the correct temperature.

Calibration of the oven temperature control circuitry requires the operator to enter the difference **(delta)** value (in °C) between an independently measured temperature and the corresponding displayed oven temperature. For example, if the actual measured oven temperature is 148.73°C, while the corresponding displayed temperature is 150.00°C, the delta value is −1.27.

Correction Value = Measured Temperature (°C) − Displayed Temperature (°C)

Setting the Oven Calibration Value

Oven temperature calibration measurements should be made at a temperature in the mid-range of those temperatures normally attained during operation. Allow ample time (up to 1/2-hour) for thermal equilibration at the selected temperature. No drift should be observed.

1. Place the temperature sensing probe in the region of the oven which is occupied by the column(s).

2. Set the oven temperature to the desired level, allowing ample time for thermal equilibration.

3. At the keyboard select the CALIB AND TEST MODE, function 1:

   [CLEAR] [•] [1] [ENTER]

4. CALIB will be displayed, followed by two values; the observed oven temperature (to 0.01°C), and the current delta correction value. Record the current delta correction value. (If problems occur during recalibration, the value may be re-entered.)

5. Assuming no drift has occurred, the new delta correction value may be entered using the numeric keypad, followed by pressing [ENTER].

6. CALIB DELTA will be displayed until [ENTER] is pressed again. Then the oven temperature calibration occurs. Note that after oven calibration, the displayed oven temperature value should closely match the value of the installed temperature measuring device.

NOTE

- **Any delta correction value may be entered within a range of ± 10.00°C. If a value beyond these limits is entered, the message CORRECTION TOO HIGH is displayed.**
- **Assuming the battery protecting the HP 5890 Series II memory is functional, the new delta calibration value remains in effect even if the instrument is switched, disconnected from its power source, or experiences a power failure.**

Section 6

ZONE TEMPERATURE

REPLACING TEMPERATURE CONTROL COMPONENTS

The HP 5890 Series II uses heater cartridges to apply and temperature sensor cartridges to sense heat at the various heated zones (inlets, detectors, and valve box, if installed). Replacement of a heater/sensor cable assembly (which consists of the heater and sensor cartridges, as well as the wiring connecting them to the main PCB) is accomplished by partial removal of the applicable heated zone component. In addition, the heater/sensor cable assembly must be disconnected from the applicable connectors on the main PCB. Removal of the wiring from the connectors on the main PCB is covered first, followed by instructions for removal of the heater and sensor cartridges from the heated zone components.

If a TCD detector is installed, a delta-t temperature sensor is used in addition to the standard temperature sensor cartridge. Removal and replacement of the delta-t temperature sensor cartridge is discussed after the procedures for standard heater/temperature sensor cartridges.

The HP 5890 Series II also uses an optional cryogenic valve to cool the PCOC inlet. While the cryogenic valve is discussed with oven components in Section 5 of the service portion of this document, removal of the PCOC nozzle (which carries the cooling gas from the valve to the inlet) is discussed in this section.

Specific part numbers are not given in this section. For replacement part numbers, refer to the section of the IPB applicable to the heated zone component being addressed (i. e. inlets – Section 5, detectors – Section 2, valve box – Section 7, cryogenic valve – Section 6).

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Heated Zone Troubleshooting

Problem	Probable Cause	Corrective Action
1. One heated zone temperature runs away.	a. Heater partially shorted to chassis (grounded).	1. Replace heater and sensor.
	b. Faulty main PCB.	1. Replace main PCB (refer to Section 9).
2. One heated zone will not heat.	a. Heater partially shorted to chassis (grounded).	1. Replace heater and sensor.
	b. Faulty main PCB.	1. Replace main PCB (refer to Section 9).
3. None of the heated zones will heat, but the oven is ok.	a. Faulty F3 fuse on main PCB.	1. Check main PCB fuse F3; replace if required.
	b. Faulty main PCB.	1. Replace main PCB (refer to Section 9).
4. None of the heated zones will heat, and the oven will not heat.	a. Faulty main PCB.	1. Replace main PCB (refer to Section 9).

Remove/Replace Inlet, Detector, and Valve Box Heater/Sensor Cable Assemblies

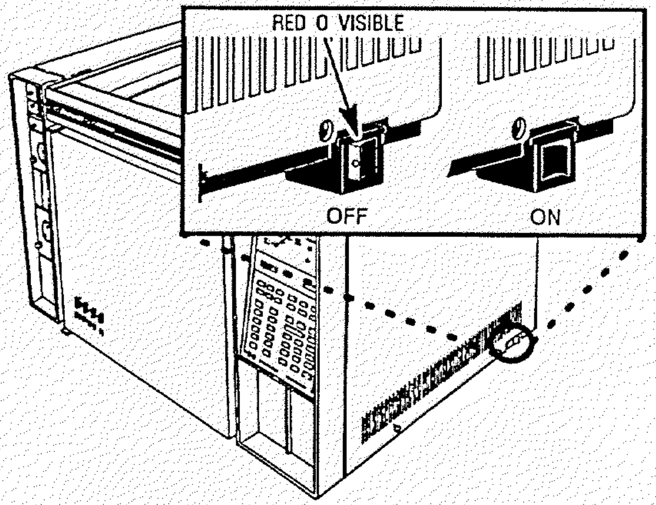
Replacement of a heater/sensor cable assembly (which consists of the heater and sensor cartridges, as well as the wiring connecting them to the main PCB) is accomplished by partial removal of the applicable heated zone component. In addition, the heater/sensor cable assembly must be disconnected from the applicable connectors on the main PCB. Removal of the wiring from the connectors on the main PCB is covered first, followed by instructions for removal of the heater and sensor cartridges from the heated zone components.

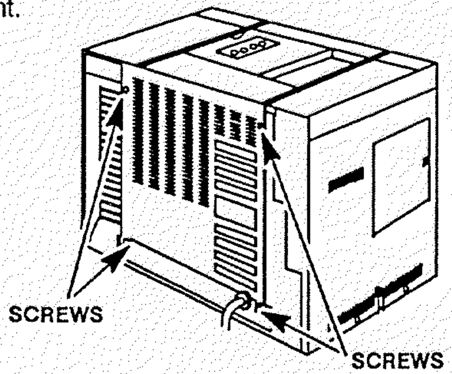
Disconnect/Connect Heater and Temperature Sensor Wiring on Main PCB

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Remove the four screws securing the rear cover to the instrument.
5. Slide the rear cover towards the rear of the instrument.



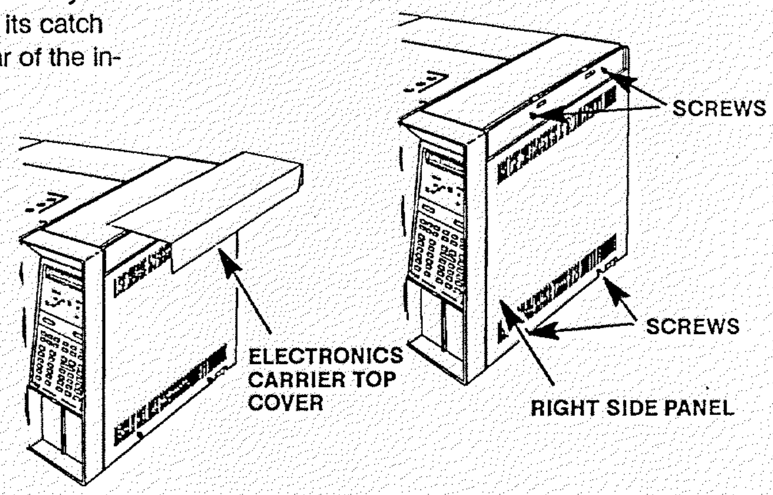


CAUTION

This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

6. Remove the electronics carrier top cover by grasping it at the rear and lifting until its catch releases, the pulling it toward the rear of the instrument .

7. Remove the right side panel by removing four screws: two each along its top and bottom edges.

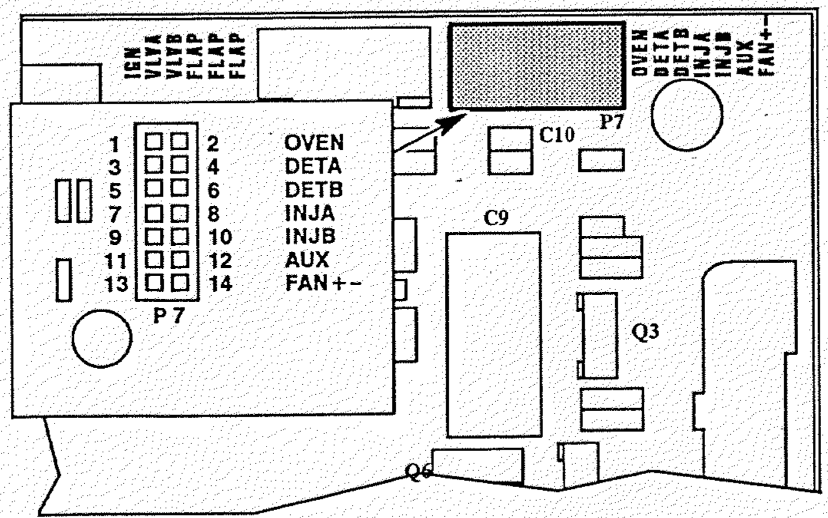


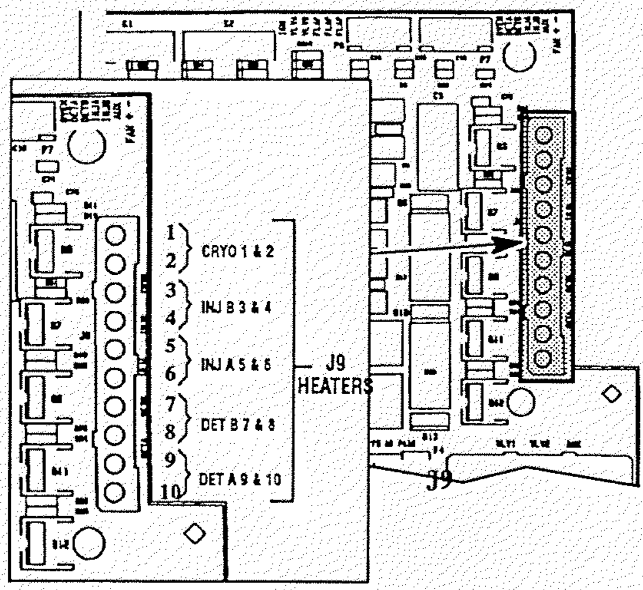
8. Trace the leads of the faulty heater and/or sensor cartridge to their terminating connectors at the upper right corner of the main PCB (located at the right side of the instrument). All temperature sensor leads terminate at connector receptacle P7 on the main PCB (at the upper right corner of the PCB). All heater cartridge leads terminate at connector receptacle J9 on the main PCB (at the right side of the PCB).

9. Route the replacement heater or sensor cartridge leads along the same path.

10. Disconnect or cut any plastic cable ties securing the old heater/sensor cable assembly along its path.

11. Secure the leads of the replacement heater/sensor cable assembly to the instrument with new plastic cable ties.

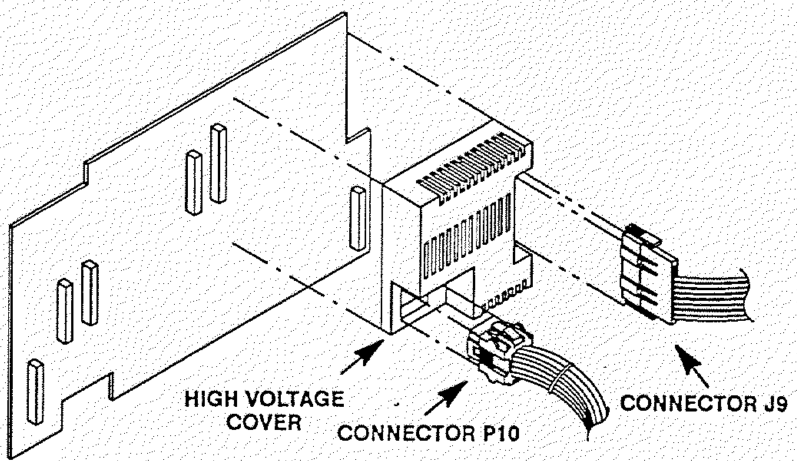




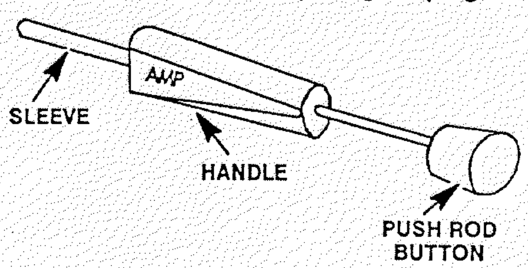
CAUTION

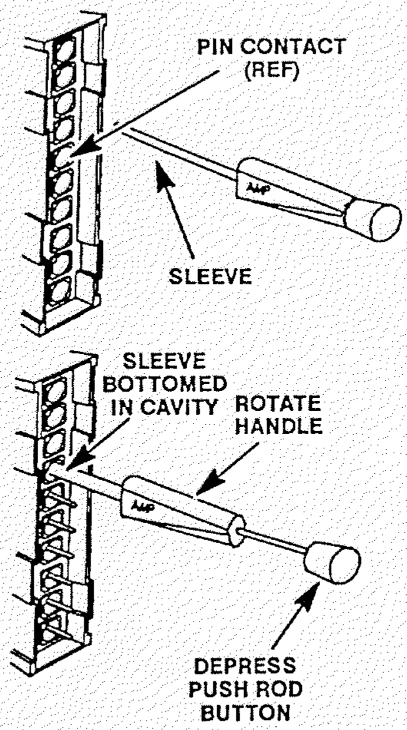
When disconnecting a plug, pull on the plug, not on its wires. Pulling on the wires may cause breakage.

12. Disconnect connector P10 from its receptacle on the main PCB by pulling the plug straight out of the receptacle.



13. Remove the high voltage cover from the upper right portion of the main PCB.
14. Disconnect connector J9 from its receptacle by squeezing its ribbed size and pulling the plug straight out of the receptacle.
15. An AMP pin extraction tool (8710–0614) is required to properly remove pins from connector J9. The tool features a sleeve to release the pin locking lance, and a plunger to eject the pin from the plug. The following steps detail how to remove the pins from the connector.





a. Slide the sleeve portion of the tool straight into the pin to be removed from the connector until it is fully bottomed.

b. At the same time, allow the plunger to be pushed back by the pin.

c. Rotate the body of the tool to ensure it is fully bottomed, and to ensure the pin locking lance is released.

d. Holding the body of the tool firmly in place (fully inserted into the plug), depress the plunger to eject the pin from the connector.

e. Remove the tool from the plug.

16. Insert pins from the new heater cartridge into their appropriate locations in the plug, making sure the locking lance on each pin seats into the plug.

17. Gently pull on the wire to ensure it is locked in the plug.

18. Insert the plug into the J9 receptacle.

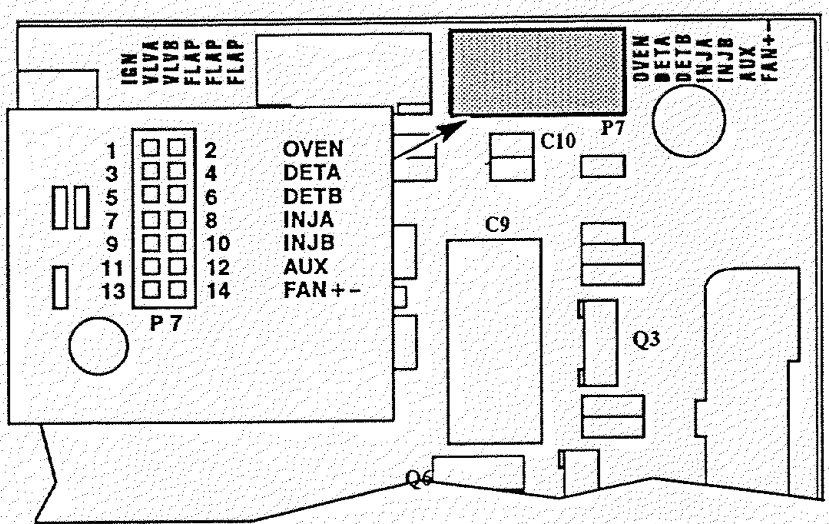
19. Replace the high voltage cover on the right side of the main PCB.

20. Insert connector P10 into its receptacle on the main PCB.

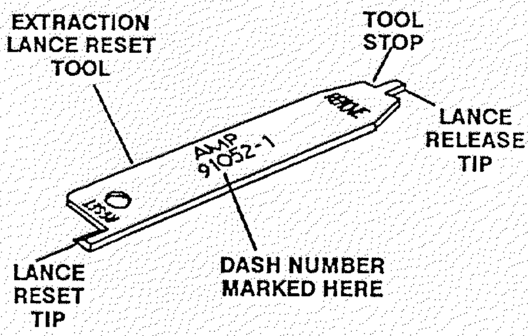
CAUTION

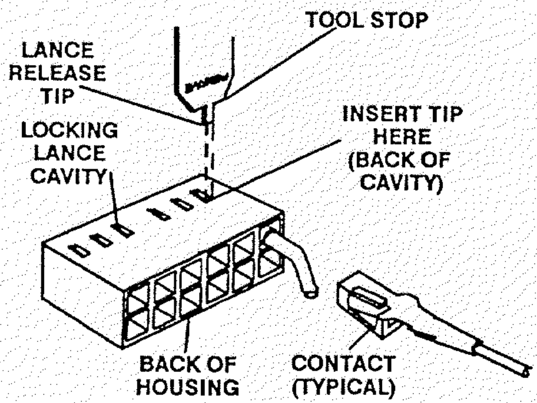
When disconnecting a plug, pull on the plug not on its wires. Pulling on the wires may cause breakage.

21. Disconnect connector P7 from its receptacle by pulling it straight off. (Heated zones corresponding to sensor lead locations are labeled to the right of the P7 connector receptacle on the main PCB.)

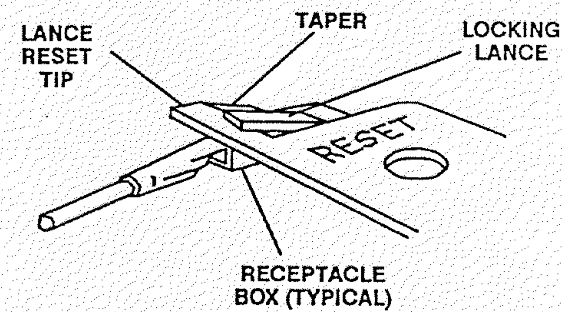


22. Use the lance release tip of an AMP pin extraction/lance reset tool (8710–1542) to remove the appropriate pins from connector P7. (The tool features a lance release tip and a lance reset tip. The lance release tip is used to depress the pin locking lance to extract the pin from a connector. The lance reset tip positions a locking lance to its proper height to ensure retention of the pin in the connector.)

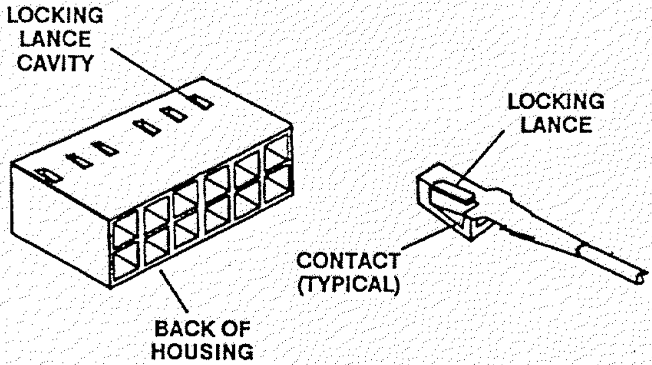




23. Prepare the pins corresponding to the replacement sensor cartridges by adjusting their locking lances using the lance reset portion of the tool.



24. Insert the pins for the replacement sensor into their appropriate locations in the plug, making sure the locking lance on each pin seats into its hole through the side of the plug.



25. Gently pull on the wire to ensure that the pin is locked in the connector.

26. Insert connector P7 into its corresponding receptacle on the main PCB.

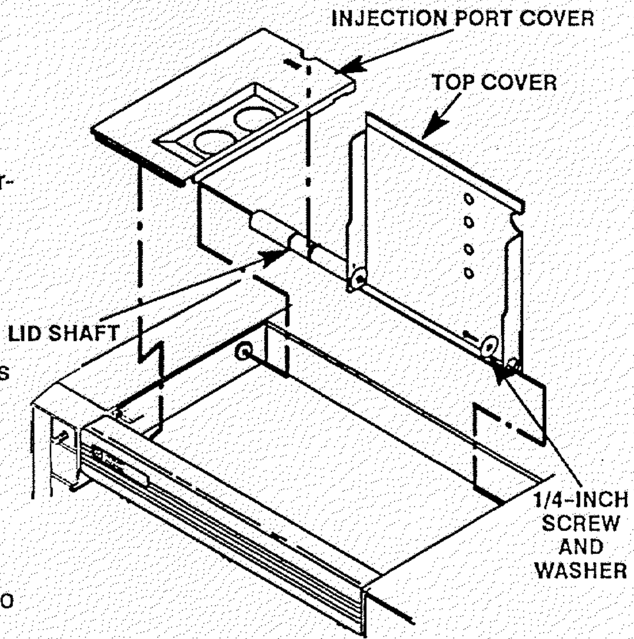
27. After the leads have been exchanged in the appropriate connectors, proceed to the heater/sensor cable assembly removal/replacement procedure applicable to the desired heated zone.

Remove/Replace Inlet Zone Heater and Sensor Cartridges

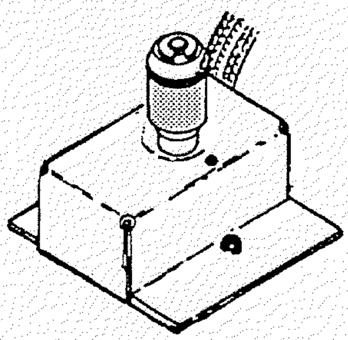
❍ Remove/Replace Packed Column Inlet Heater and Sensor Cartridges

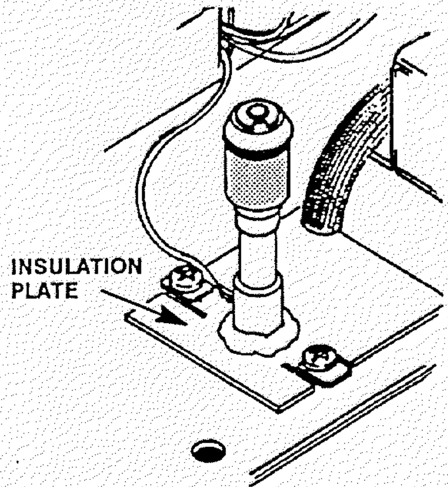
WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.



1. Allow time for the heated zones to cool.
2. At the bottom of the inlet, inside the column oven, remove the column and hardware associated with the inlet (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
3. Inside the column oven, cap the base of the inlet.
4. Remove the injection port cover by grasping its back edge and lifting it upward.
5. Remove any insulation from around the top of the inlet.
6. Use a Pozidriv screwdriver to remove the two screws securing the inlet and insulation plate to the instrument. (Depending on the age of the instrument, the insulation plate may be flat, as shown at the left, or may be a box, as shown below.



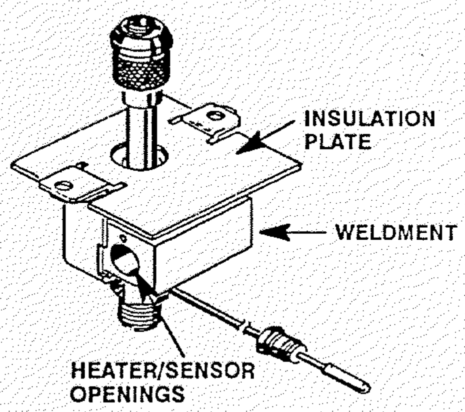


7. Lift the inlet enough to expose the heated block and heater/sensor wiring.
8. Remove any insulation from around the base of the inlet.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

9. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.
10. Slide the replacement heater and sensor cartridges into the heated block of the inlet being installed.
11. Replace any insulation that was removed from around the base of the inlet.
12. Carefully install the inlet and insulation plate, securing it to the instrument with two Pozidriv screws.
13. Replace any insulation that was removed from around the inlet.
14. Remove the cap/plug from the end of the inlet.
15. Install the liner and all other hardware removed during step 2.
16. Restore the supply gas pressure.
17. Install the injection port cover.
18. Install the right side panel and secure using two screws.
19. Install the electronics carrier top cover.
20. Slide the rear cover on to the instrument.
21. Secure the rear cover to the instrument by installing and tightening four screws.
22. Restore all gas supplies.
23. Restore power to the instrument.

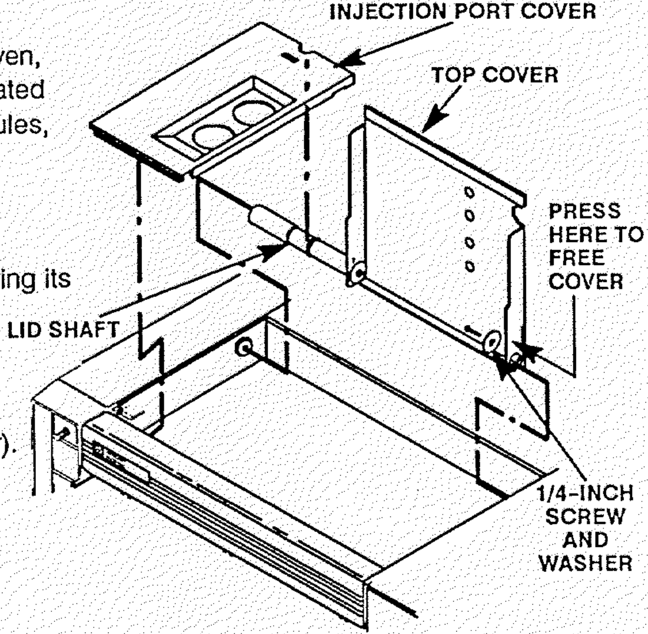


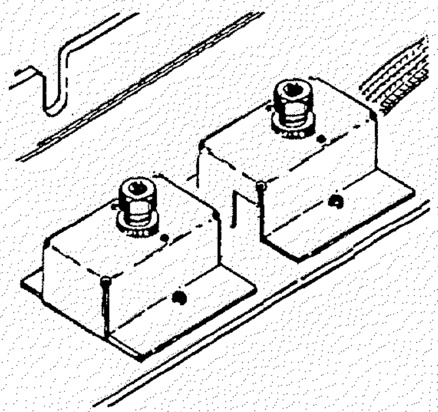
Remove/Replace Septum–Purged Packed Column Inlet Heater and Sensor Cartridges

WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.

1. Allow time for the heated zones to cool.
2. At the bottom of the, inside the column oven, remove the column and hardware associated with the inlet (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
3. Cap the base of the inlet.
4. Remove the injection port cover by grasping its back edge and lifting it upward.
5. Remove the two screws in the top of the inlet top cover (these screws secure the inlet base weldment to the inlet top cover).



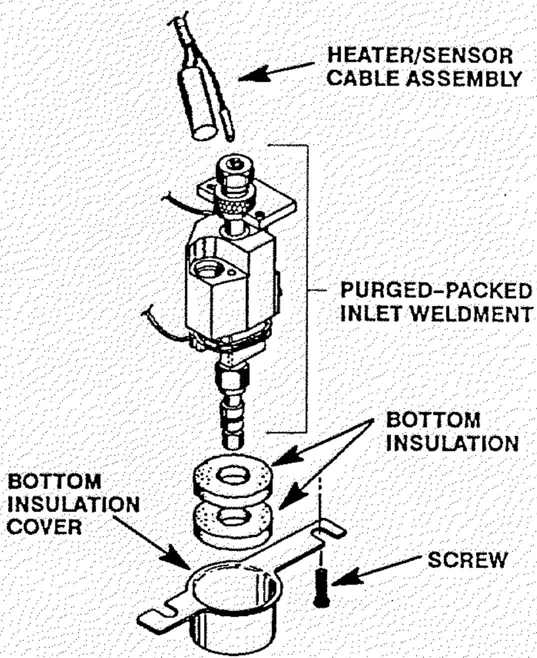


6. Use a Pozidriv screwdriver to remove the two screws securing the top cover to the instrument.
7. Lift the inlet top cover off of the inlet.
8. Remove any insulation from around the top of the inlet.
9. Lift the inlet enough to expose the heated block and heater/sensor wiring.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

10. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.
11. Slide the replacement heater and sensor cartridges into the inlet heated block of the inlet.
12. Carefully install the inlet into its inlet opening in the top of the instrument.
13. Replace any insulation that was removed from around the inlet.
14. Install the top cover over the inlet.
15. Secure the inlet to the top cover using two screws.
16. Secure the top cover and inlet to the instrument using two screws.
17. Remove the cap/plug from the end of the inlet.
18. Install the column and associated hardware removed in step 2.

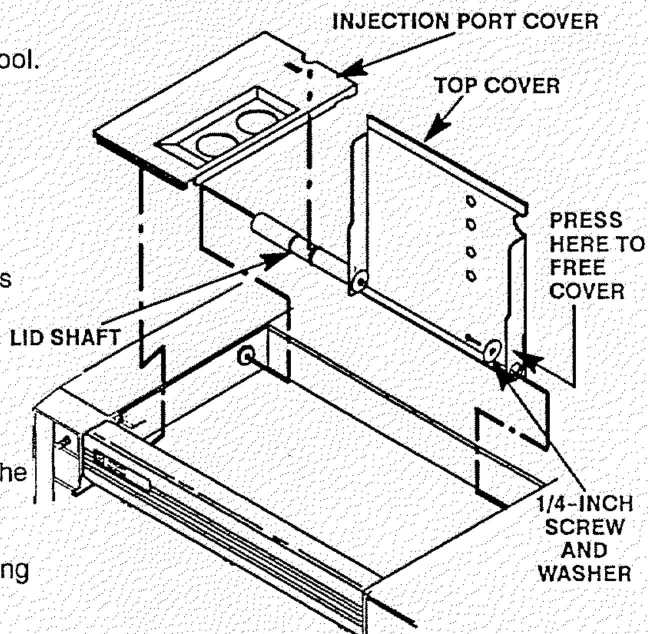


19. Install the right side panel and secure using two screws.
20. Install the electronics carrier top cover.
21. Slide the rear cover onto the instrument.
22. Secure the rear cover to the instrument by installing and tightening four screws.
23. Install the injection port cover.
24. Restore the supply gas pressure.
25. Restore power to the HP 5890 Series II.

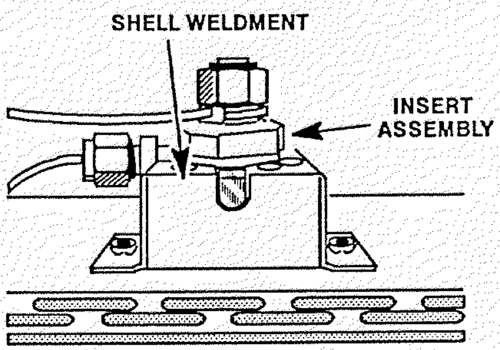
○ Remove/Replace Split-Splitless/Split-Only Capillary Inlet Heater and Sensor Cartridges

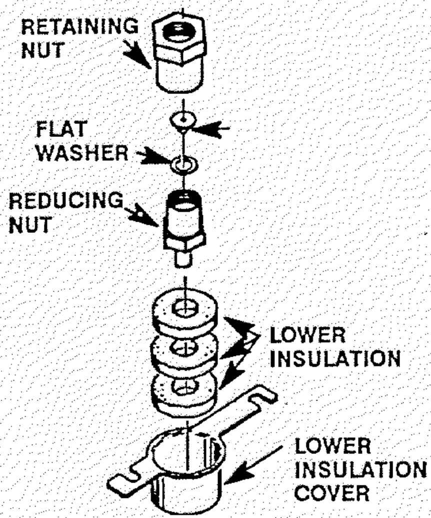
WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.



1. Allow time for the oven and heated zones to cool.
2. At the bottom of the inlet, inside the column oven, remove the column and hardware associated with the inlet (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
3. Remove the injection port cover by grasping its back edge and lifting it upward.
4. Remove any insulation from around the top of the inlet.
5. Detach and remove the insert assembly from the shell weldment using a ???-inch wrench.
6. Detach and remove the tubing nut from the fitting on the shell weldment.





7. Loosen the two screws securing the insulation cover inside the column oven.
8. Rotate the cover, freeing it from its securing hardware, and remove the cover and three pieces of lower insulation.
9. Remove the reducing nut, flat washer, and anealed seal, using a 1/2-inch wrench.
10. Use a 3/4-inch wrench to loosen (but not remove) the retaining nut below the heated block.
11. Use a Pozidriv screwdriver to remove the two screws securing the inlet to the instrument.

12. Gently pull the inlet up and out of its instrument cavity.

13. Remove the retaining nut loosened in step 10.

14. Slide the heated block off of the shell weldment.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

15. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.

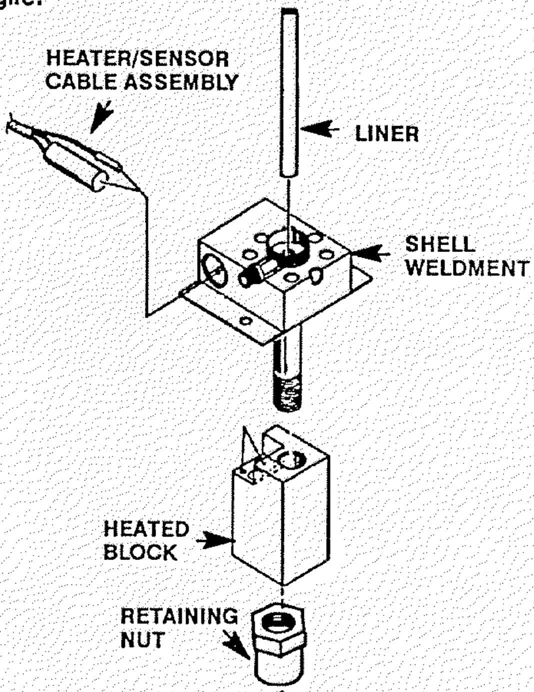
16. Slide the heater and sensor cartridges into the heated block of the inlet being installed.

17. Install the heated block onto the stem of the shell weldment.

18. Install the retaining nut on the base of the shell weldment securing the heated block to the shell weldment.

19. Install any removed insulation around the heated block (within the cavity provided in the shell weldment).

20. Carefully install the inlet, securing it to the instrument with two Pozidriv screws.



NOTE

To lessen the possibility of pressure leaks, always install a new anealed seal, when the old seal has been removed.

21. Tighten the retaining nut at the base of the shell weldment.

22. Install the reducing nut, flat washer, and anealed seal onto the base of the retaining nut.

23. Install the lower insulation cover and three pieces of lower insulation, inside the column oven.

24. Tighten the two screws which secure the lower insulation cover inside the column oven.

25. Replace any insulation that was removed from around the inlet.

26. Install the insert assembly on the shell weldment and secure using a ???-inch wrench.

27. Install the tubing nut (and associated split vent tube) on the shell weldment and secure using a 1/2-inch wrench.

28. Install the liner in the shell weldment.

29. Install a cap or plug on the end of the inlet (inside the column oven).

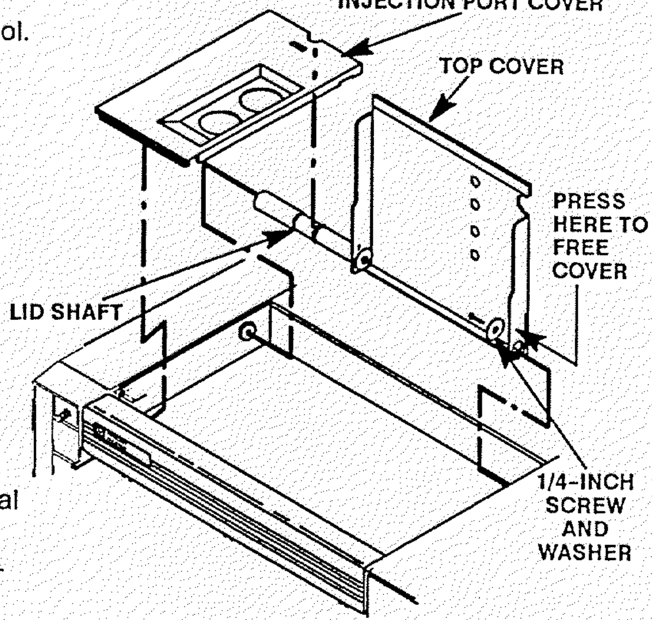
30. Restore the supply gas pressure.
31. Check for leaks at all of the newly mated fittings.
32. Turn off the supply gas.
33. Remove the cap/plug from the end of the inlet.
34. Install the column and associated hardware removed in step 2.
35. Install the right side panel and secure using two screws.
36. Install the electronics carrier top cover.
37. Slide the rear cover on to the instrument.
38. Secure the rear cover to the instrument by installing and tightening four screws.
39. Install the injection port cover.
40. Restore power to the HP 5890 Series II.

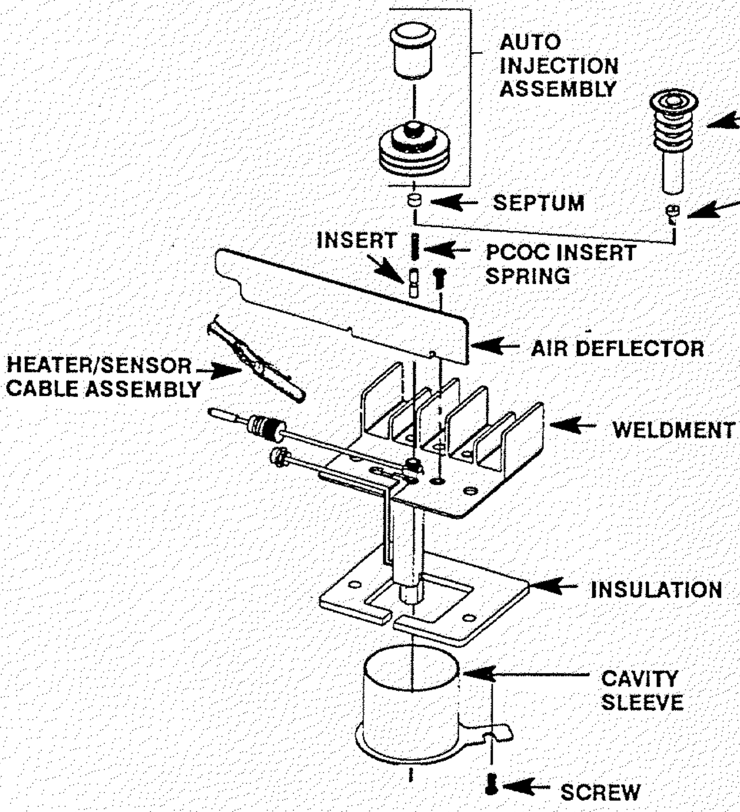
Remove/Replace PCOC Inlet Heater and Sensor Cartridges

WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.

1. Allow time for the oven and heated zones to cool.
2. At the bottom of the inlet, inside the column oven, remove the column and hardware associated with the inlet(s) (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
3. Remove the injection port cover by grasping its back edge and lifting it upward.
4. Remove the two screws securing the left side panel along its bottom edge.
5. Cap the base of the inlet, inside the column oven.
6. Remove the auto-injection assembly (or optional manual injection assembly) by rotating it counter-clockwise). Be careful not to loose the septum, insert, or PCOC insert spring which are installed under the injection assembly.





7. Remove the air deflector using a Pozidriv screwdriver to remove the screw securing the air deflector to the inlet weldment.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

8. Carefully slide the heater and sensor cartridges out of the heated block portion of the inlet.
9. Carefully slide the heater and sensor cartridges into the heated block portion of the inlet.
10. Install the air deflector and secure it to the weldment using one screw.
11. Install the injection assembly, septum, PCOC insert spring, and insert (the injection assembly secures the other items to the inlet weldment).
12. Remove the cap/plug from the end of the inlet.
13. Install the liner and all other hardware removed in step 2.
14. Restore the supply gas pressure.
15. Install the right side panel and secure using two screws.
16. Install the electronics carrier top cover.
17. Slide the rear cover on to the instrument.
18. Secure the rear cover to the instrument by installing and tightening four screws.
19. Install the injection port cover.
20. Restore all gas supplies.
21. Restore power to the instrument.

Remove/Replace Detector Zone Heater and Sensor Cartridges

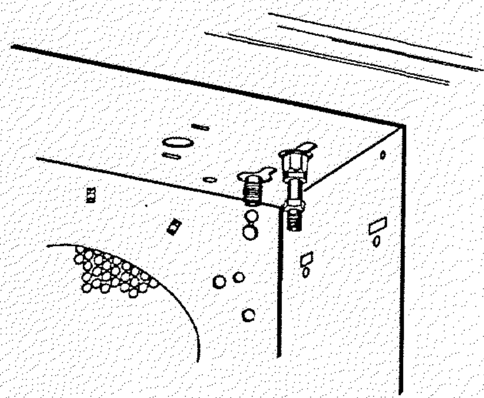
❍ Remove/Replace TCD Heater and Sensor Cartridges

WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.

1. Allow time for the oven and heated zones to cool.

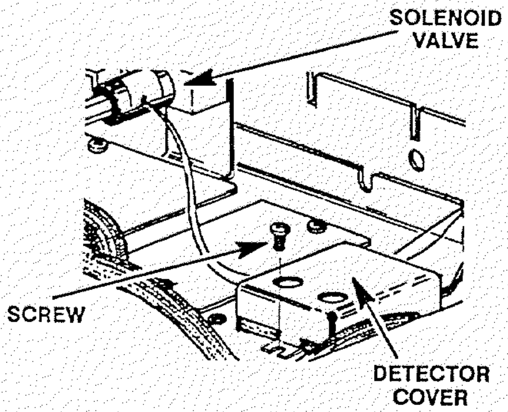
2. At the bottom of the detector, inside the column oven, remove the column and hardware associated with the detector (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).

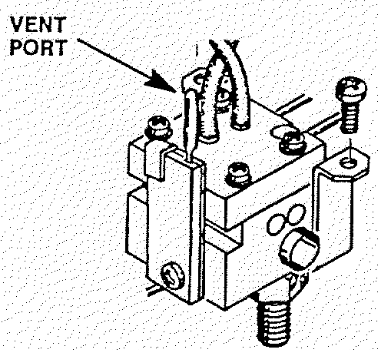


3. Cap the detector base.

4. Lift the hinged top cover at its front edge, exposing the detector area.

5. Remove the TCD detector cover by removing two screws: one from each side of the detector cover.



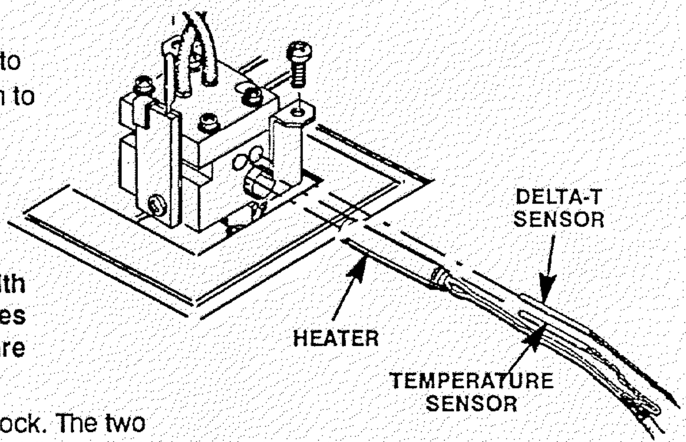


6. Cap the TCD vent port on the top of the detector. (This is not be required on a series connected TCD.)

7. Remove the preformed thermal insulation from around the detector to expose the two screws securing the detector to the instrument mainframe.

8. On a series-connected TCD, disconnect the TCD to FID jumper tube from the TCD oven-return exhaust vent port.

9. Remove the two screws securing the detector to the instrument and then lift the block up enough to expose the heater and sensor cartridge wires.



CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

10. Carefully slide the three cartridges out of the block. The two smaller cartridges are the sensors and must be handled gently in order to prevent breakage. (The delta-t temperature sensor cartridge is identified by its wiring, which is connected to the top of the TCD detector PCB)

NOTE

Replacement of the delta-t temperature sensor is covered later in this section.

11. Install the replacement heater and temperature sensor, and the old delta-t temperature sensor cartridges into the heated block.
12. Carefully install the detector, securing it to the instrument with two screws.
13. Remove the caps from the detector base and the vent port.

CAUTION

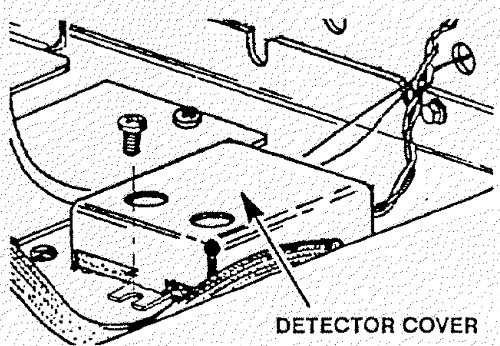
When installing insulation, use care not to plug the vent port. If flow is interrupted while the TCD is on, it will shorten its life dramatically.

14. Taking care not to block the vent port, install insulation around the detector block.

CAUTION

Use caution not to crimp the filament and delta-t sensor leads when installing the TCD detector cover.

15. Install the TCD detector cover and secure using two screws.
16. Install column and any other hardware removed in step 2 of this procedure.
17. Install the right side panel and secure using two screws.
18. Install the electronics carrier top cover.
19. Slide the rear cover on to the instrument.



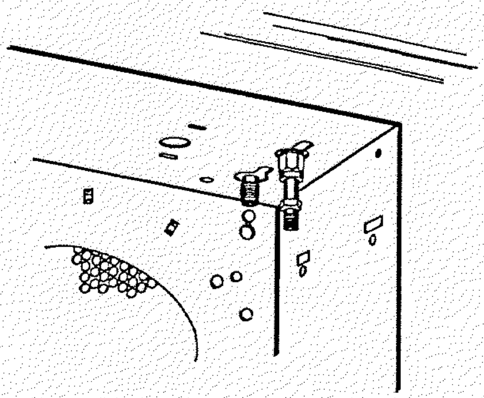
20. Secure the rear cover to the instrument by installing and tightening four screws.
21. Restore gas supply pressure.
22. Restore power to the instrument.

Remove/Replace FID Heater and Sensor Cartridges

WARNING

- **PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.**
- **FLAME IONIZATION (FID) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

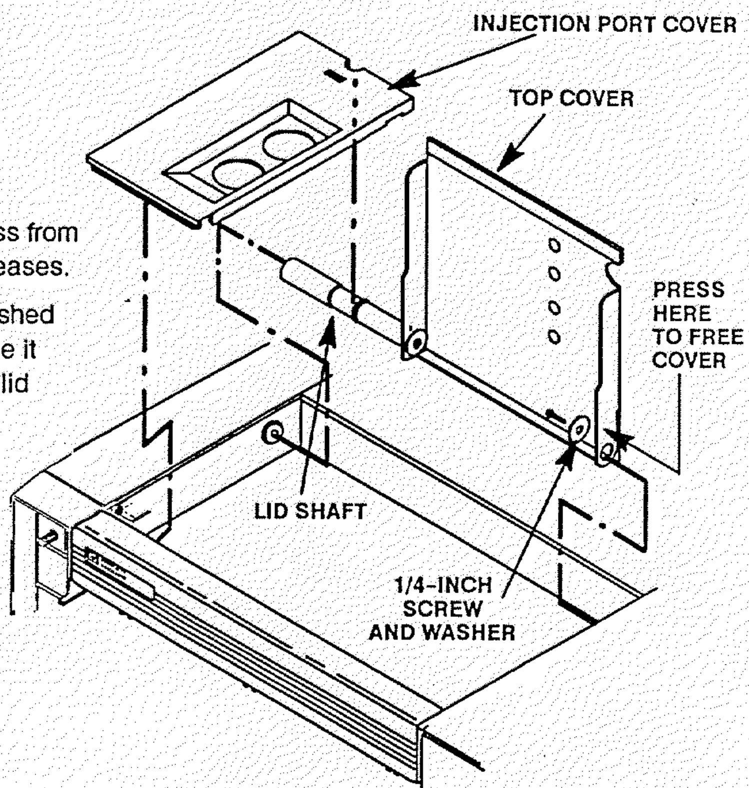
1. Allow time for the oven and heated zones to cool.
2. At the bottom of the detector(s) to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).



NOTE

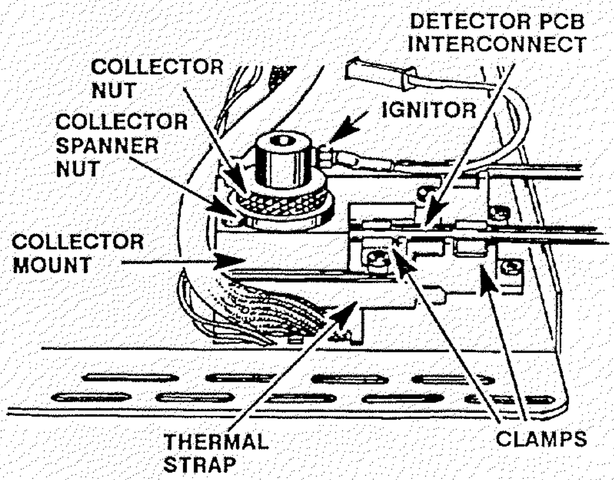
If an autosampler is installed, the injection port cover will not be present.

3. Remove the injection port cover by grasping its back edge and lifting it upward.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Remove the screw securing the ground strap to the hinged top cover.
6. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.
7. At the lower right edge of the cover, press from right-to-left until the right side hinge releases.
8. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.



9. Disconnect the ignitor wire lead connector at the mating connection adjacent to the ignitor.

10. Loosen the screws securing the clamps holding the interconnect in place.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When handling PCBs (Printed Circuit Boards), always place them in static control envelopes.**

11. Remove the FID detector PCB by sliding it out of the main PCB (at the right side of the instrument). Removal of the PCB will withdraw the interconnect from the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.

12. Remove the three screws securing the collector mount to the thermal strap.

13. Remove the collector mount and collector assembly as a unit.

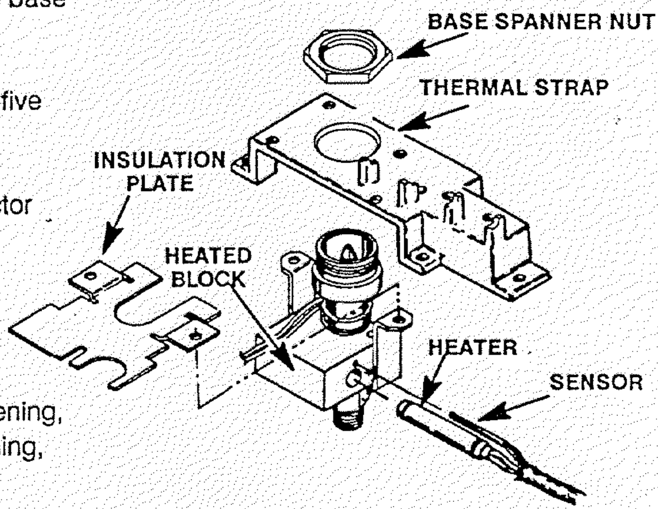
14. Use a 1 and 1/4-inch socket to remove the base spanner nut from the detector weldment.

15. Remove the thermal strap by removing the five screws securing it to the instrument.

16. Remove the two screws securing the detector weldment to the instrument.

17. Slide the insulation plate out from over the detector weldment.

18. Cap the detector weldment at its upper opening, using a detector cap, and at its lower opening, inside the column oven.



19. Remove the insulation around the detector weldment to expose the heated block.

20. Lift the base up enough to expose the heated block, heater and temperature sensor cartridge wires.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

21. Carefully slide the two cartridges out of the block.

22. Slide the replacement heater and sensor cartridges into the heated block portion of the detector weldment.

23. Position the detector weldment in the detector opening.

24. Install the insulation around the detector weldment.

25. Position the insulation plate over the installed insulation and align its mounting holes with those of the detector weldment.

26. Secure the detector weldment and insulation plate to the instrument with two screws.

27. Install the thermal strap and secure it to the instrument using five screws.

28. Install the base spanner nut on the detector weldment and tighten using an open end wrench.

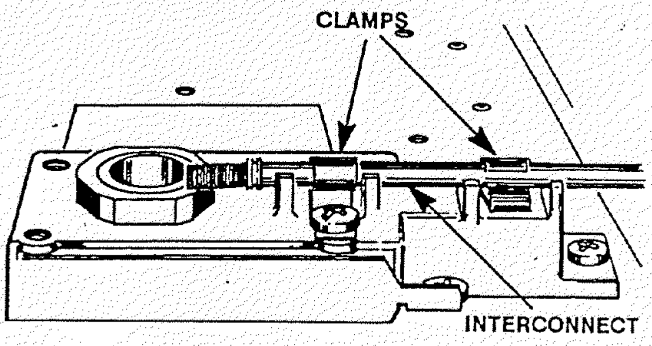
29. Remove the cap from the detector weldment top opening.

30. Ensure that there is no debris in the detector weldment.

CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When handling PCBs (Printed Circuit Boards), always place them in static control envelopes.**

31. Install the FID detector PCB by sliding it into its mounting location on the main PCB (at the right side of the instrument). Installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.



32. Tighten the screws on the clamps which secure the interconnect to the thermal strap.

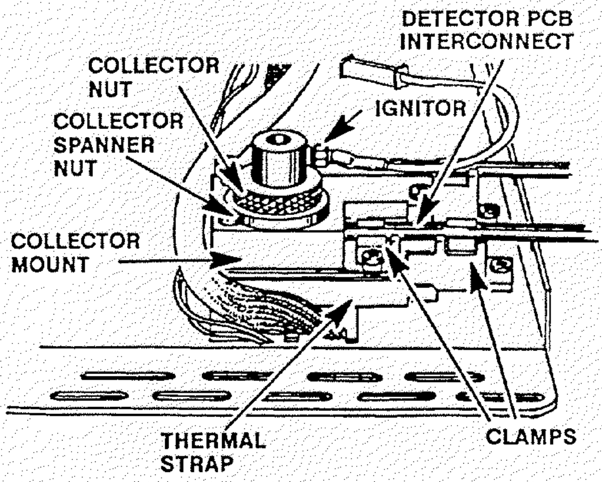
33. Secure the collector mount to the thermal strap using three screws. (Be certain that the interconnect spring contact to the detector PCB is in contact with the groove on the collector.

34. Tighten the screws which secure the interconnect clamps to the thermal strap.

35. Remove the cap from the base of the detector weldment (inside the column oven).

36. Install the column and any other associated hardware removed in step 2 of this procedure.

37. Install the collector mount and collector assembly as a unit.



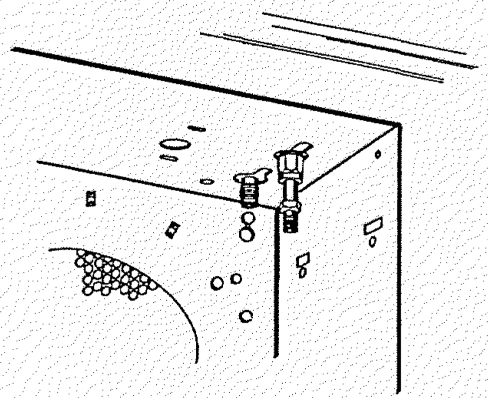
38. Secure the collector mount to the thermal strap using three screws.
39. Connect the ignitor wire lead connector at the mating connection adjacent to the ignitor.
40. Slide the rear cover on to the instrument.
41. Secure the rear cover to the instrument by installing and tightening four screws.
42. Install the right side panel and secure using four screws.
43. Install the electronics carrier top cover.
44. Install the hinged top cover and secure using a screw and washer.
45. Connect the ground strap to the hinged top cover using a screw.
46. Restore all gas supplies.
47. Restore power to the instrument.

Remove/Replace NPD Heater and Sensor Cartridges

WARNING

- **PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.**
- **NITROGEN PHOSPHOROUS (NPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

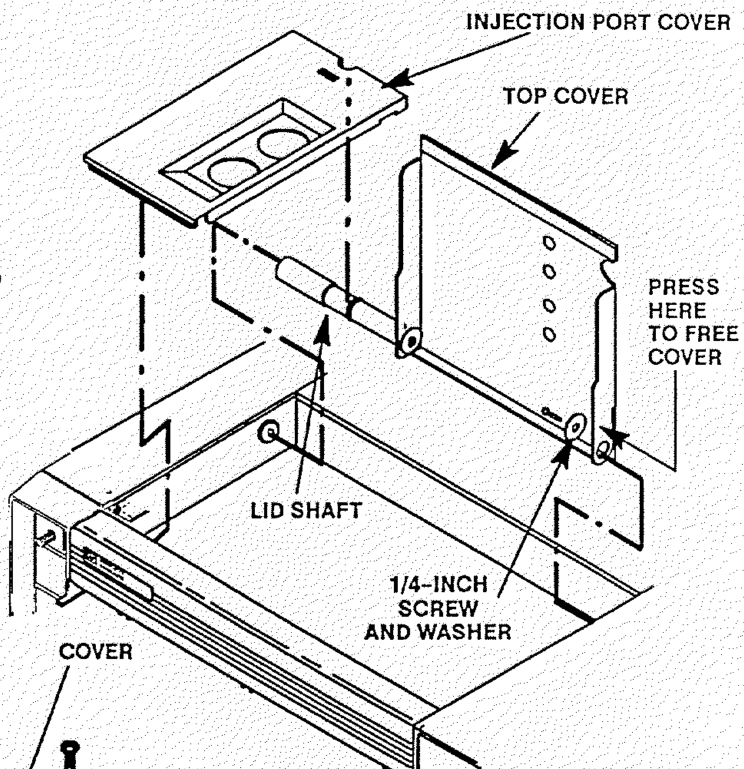
1. Allow time for the oven and heated zones to cool.
2. At the bottom of the detector, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).



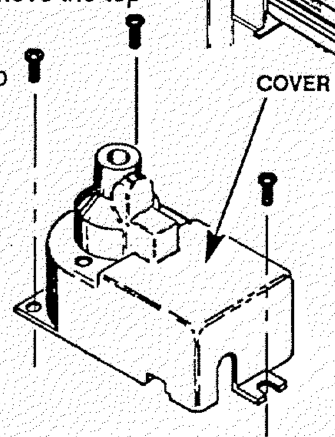
NOTE

If an autosampler Is installed, the injection port cover will not be present.

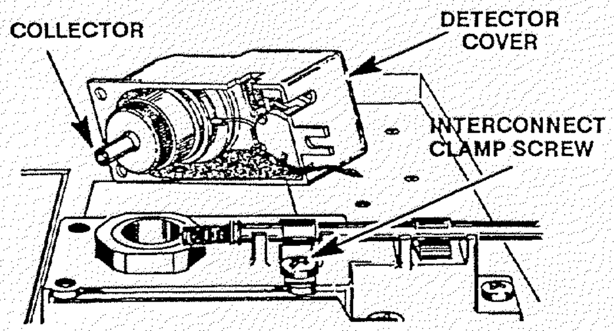
3. Remove the injection port cover by grasping its back edge and lifting it upward.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.
6. Remove the ground strap from the hinged top cover by removing a screw.
7. At the lower right edge of the cover, press from right-to-left until the right side hinge releases.
8. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.



9. Use a Pozidriv screwdriver to remove the three screws securing the detector cover to the thermal strap.



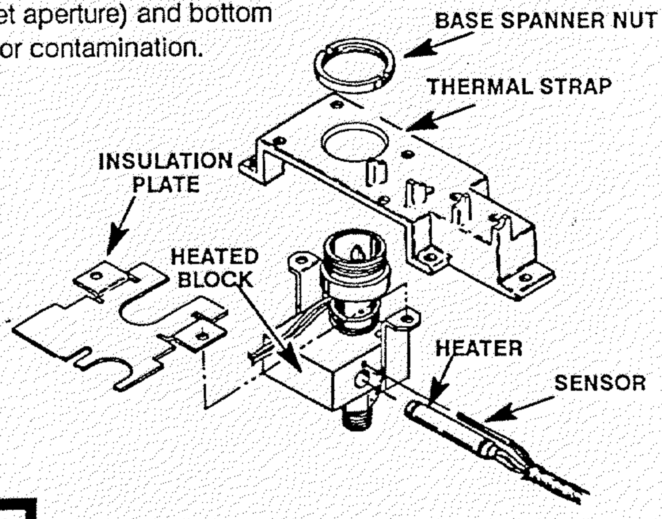
10. Remove the detector top cover, and all attached components, from the thermal strap and set aside.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When handling PCBs (Printed Circuit Boards), always place them in static control envelopes.**

11. Disconnect the NPD bead power cable from the detector PCB by pulling it straight off.
12. Remove the NPD detector PCB by sliding it out of the main PCB (at the right side of the instrument). Removal of the PCB will withdraw the interconnect from the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.
13. Use a spanner wrench (part no. 19301-00150) to remove the base spanner nut from the detector weldment.
14. Remove the thermal strap by removing the five screws securing it to the instrument.
15. Cap the weldment openings at the top (over the jet aperture) and bottom (inside the column oven) to prevent damage and/or contamination.
16. Remove the two screws securing the detector weldment to the instrument.
17. Slide the insulation plate out from over the detector weldment.
18. Remove the insulation around the detector weldment to expose the two screws securing the weldment to the instrument.
19. Lift the base up enough to expose the heated block, heater and sensor cartridge wires.



CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

20. Carefully slide the two cartridges out of the block.
21. Slide the replacement heater and temperature sensor cartridges into the heated block portion of the detector weldment.

22. Position the detector weldment in the detector opening.

23. Install the insulation around the detector weldment.

24. Position the insulation plate over the installed insulation and align its mounting holes with those of the detector weldment.

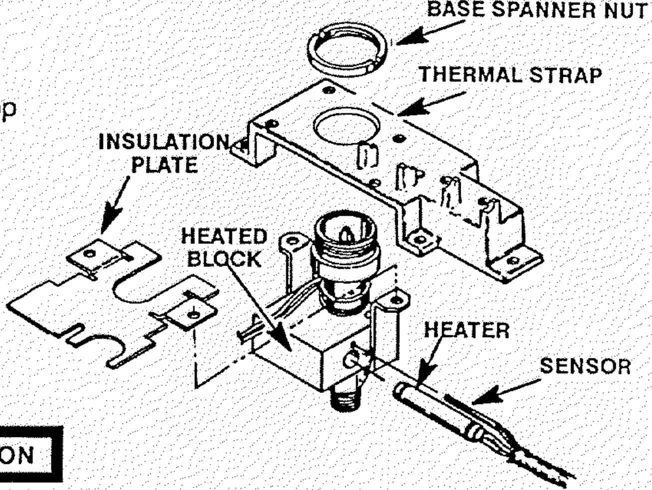
25. Secure the detector weldment and insulation plate to the instrument with two screws.

26. Install the thermal strap and secure it to the instrument using five screws.

27. Remove the cap from the detector weldment top opening.

28. Ensure that there is no debris in the detector weldment.

29. Install the base spanner nut on the detector weldment and tighten using a spanner wrench (part no.19301-00150).

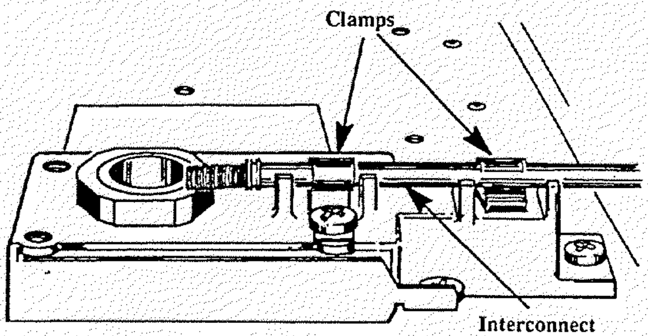


CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When handling PCBs (Printed Circuit Boards), always place them in static control envelopes.**

30. Install the NPD detector PCB by sliding it into its mounting location on the main PCB (at the right side of the instrument). Installation of the PCB will insert the interconnect into the thermal strap. Use caution to avoid damaging the spring at the end of the interconnect.

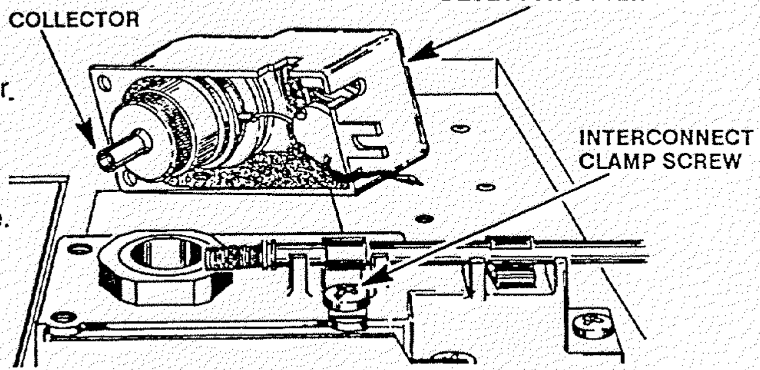
31. Tighten the screws on the clamps which secure the interconnect to the thermal strap.



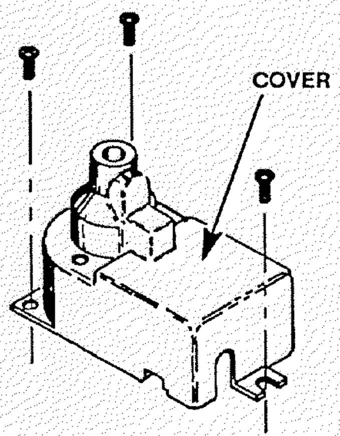
NOTE

In the next step, avoid touching the lower end of the collector (end nearest the jet). Fingerprints and/or other contamination may cause baseline drift and noise.

32. Install the detector top cover, and all attached components, on the thermal strap.



33. Remove the cap from the base of the detector weldment (inside the column oven).
34. Install the column and any other associated hardware removed in step 2 of this procedure.
36. Use a Pozidriv screwdriver to secure the detector cover to the thermal strap with three screws.
37. Install the rear panel and secure using four screws.



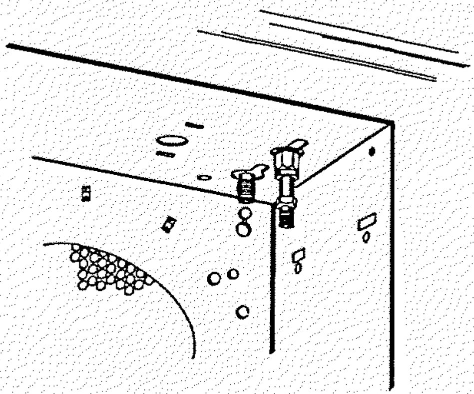
38. Install the right side panel and secure using four screws.
39. Install the electronics carrier top cover.
40. Install the hinged top cover and secure using a screw and washer.
41. Connect the ground strap to the hinged top cover using a screw.
42. Restore all gas supplies.
43. Restore power to the instrument.

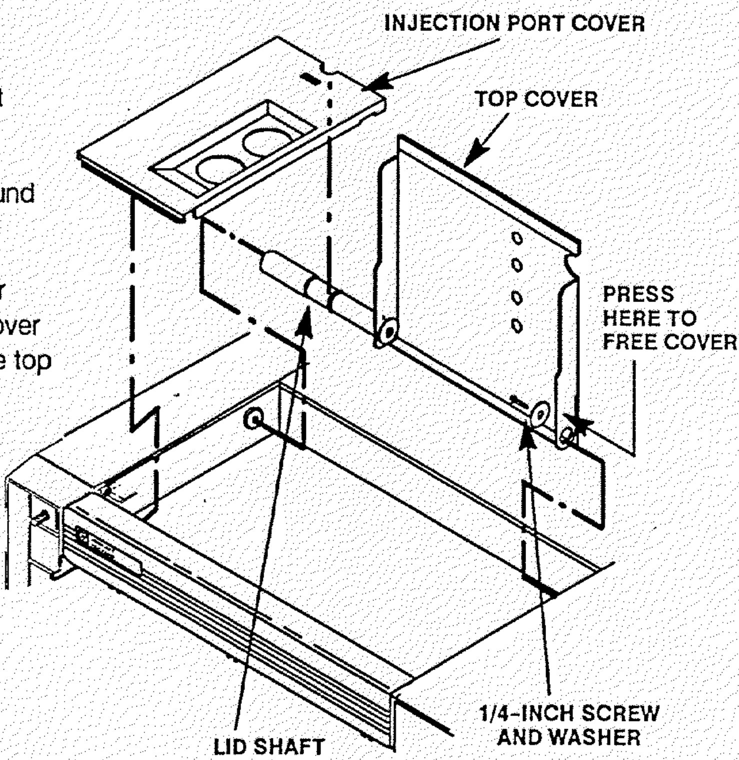
Remove/Replace ECD (19233A/19235A VERSIONS) Heater and Sensor Cartridges

WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.

1. Allow time for the oven and heated zones to cool.
2. At the bottom of the detector to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).
3. Remove the injection port cover by grasping its back edge and lifting it upward.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.
6. At the lower right edge of the cover, press from right-to-left until the right side hinge releases.
7. Remove the screw securing the ground strap to the hinged top cover
8. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.





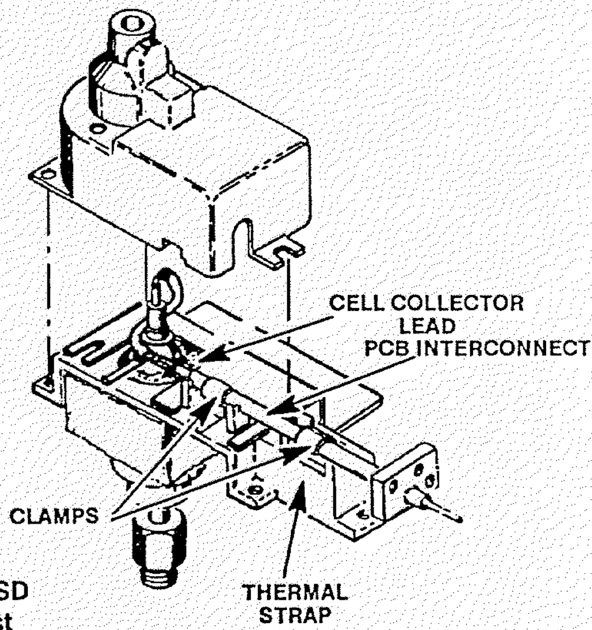
9. Using a Pozidriv screwdriver, remove the three screws securing the detector cover to the thermal strap.

10. Remove the detector cover.

11. Disconnect any tubing attached to the detector exhaust tube.

12. Disconnect the cell collector lead from the PCB interconnect.

13. Loosen the screws securing the clamps which hold the interconnect in place.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When handling PCBs (Printed Circuit Boards), always place them in static control envelopes.**

14. Remove the detector PCB from the right side of the instrument by grasping it in the center area along its outer edge and pulling it straight out. (This will draw the interconnect out of the detector clamps on the thermal strap.

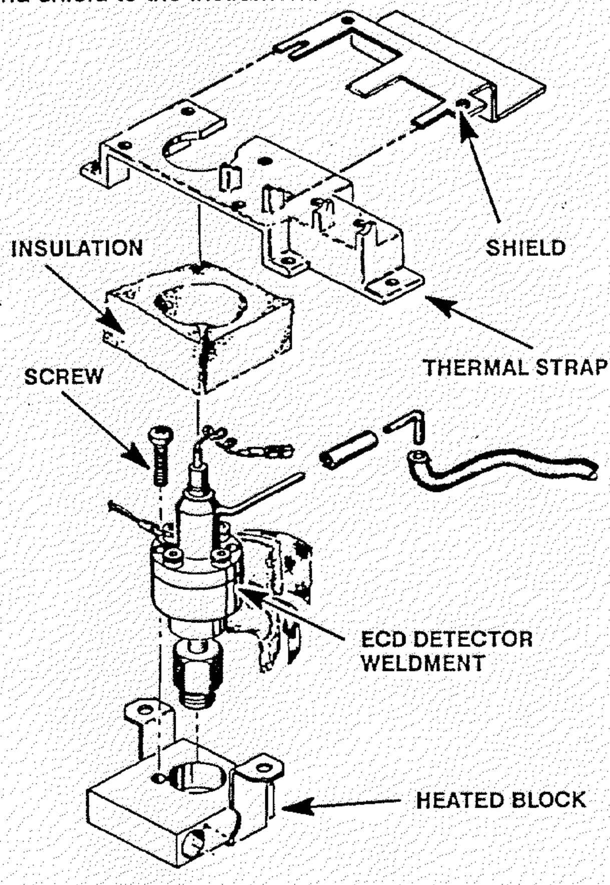
15. Remove the five screws securing the thermal strap and shield to the instrument.

16. Remove the shield from the thermal strap by carefully working it over the collector lead and exhaust vent tube. (Depending on the detector's location, it may be necessary to bend the shield to remove and install it. Avoid excessive bending as this will fatigue the metal shield, shortening its life.)

17. Remove the thermal strap, working it carefully over the collector lead and exhaust vent tube.

18. If required, remove the two Pozidriv screws securing the heated block to the instrument.

19. Lift the heated block out of its mounting position.



CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

29. Carefully slide the heater and temperature sensor cartridges out of the block.
30. Slide the replacement heater and temperature sensor cartridges into the heated block.
31. Install the heated block in its mounting position.
32. Secure the heated block to the instrument using two screws.
33. Install the insulation around the detector base.
34. Install the thermal strap, working it carefully over the collector lead and exhaust vent tube.
35. Install the shield over the thermal strap. (Depending on the detector's location, it may be necessary to bend the shield to remove and install it. Avoid excessive bending as this will fatigue the metal shield, shortening its life.)

CAUTION

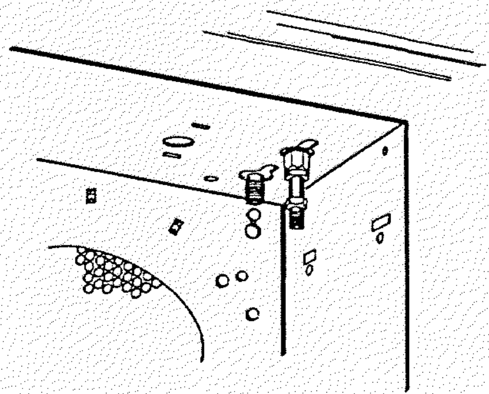
- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When handling PCBs (Printed Circuit Boards), always place them in static control envelopes.**

36. Install the detector PCB at the right side of the instrument. (This will feed the interconnect in to the detector clamps on the thermal strap.)
39. Tighten the screws securing the clamps which hold the interconnect in place.
40. Connect the cell collector lead to the PCB interconnect.
41. Position the detector cover over the detector.
42. Secure the detector cover to the thermal strap with three screws.
43. Remove the cap from the base of the detector (inside the column oven).
44. Install any hardware removed in step 2 of this procedure (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).
45. Install the rear panel and secure using four screws.
46. Install the right side panel and secure using four screws.
47. Install the electronics carrier top cover.
48. Install the hinged top cover and secure using a screw and washer.
49. Connect the ground strap to the hinged top cover using a screw.
50. Restore all gas supplies.
51. Restore power to the instrument.

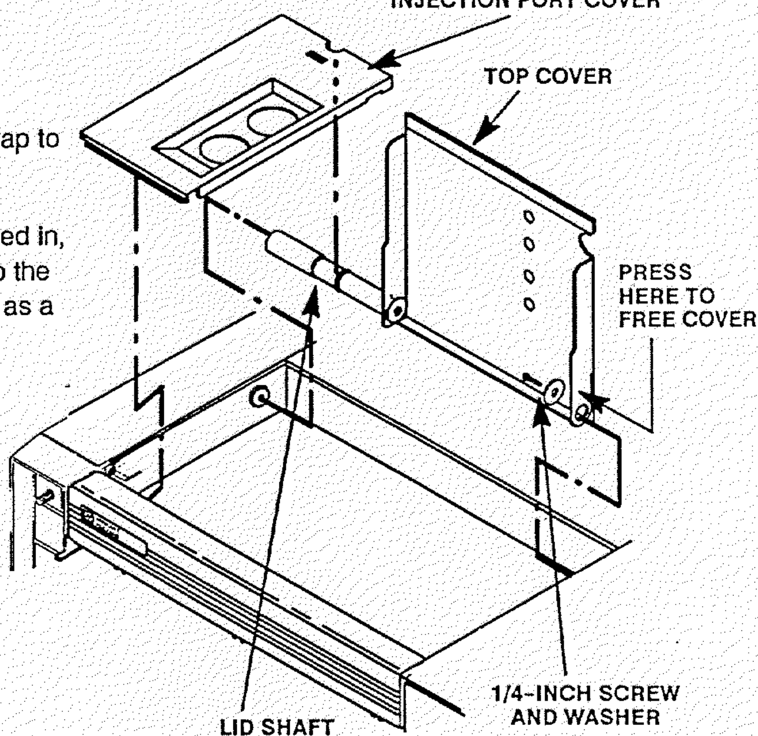
Remove/Replace ECD (G1223A/G1224A VERSIONS) Heater and Sensor Cartridges

WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.



1. Allow time for the oven and heated zones to cool.
2. At the bottom of the detector to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).
3. Remove the injection port cover by grasping its back edge and lifting it upward.
4. Lift the hinged top cover at its front edge, exposing the detector area.
5. Remove the 1/4 inch screw and washer securing the cover at its right side hinge point.
6. At the lower right edge of the cover, press from right-to-left until the right side hinge releases.
7. Remove the screw securing the ground strap to the hinged top cover
8. With the lower right side of the cover pushed in, lift the right side of the cover and slide it to the right to remove the top cover and lid shaft as a unit.



9. Using a Pozidriv screwdriver, remove the screw securing the detector top cover to the thermal strap.

10. Remove the detector top cover.

11. Disconnect any tubing attached to the detector purge and vent tubes.

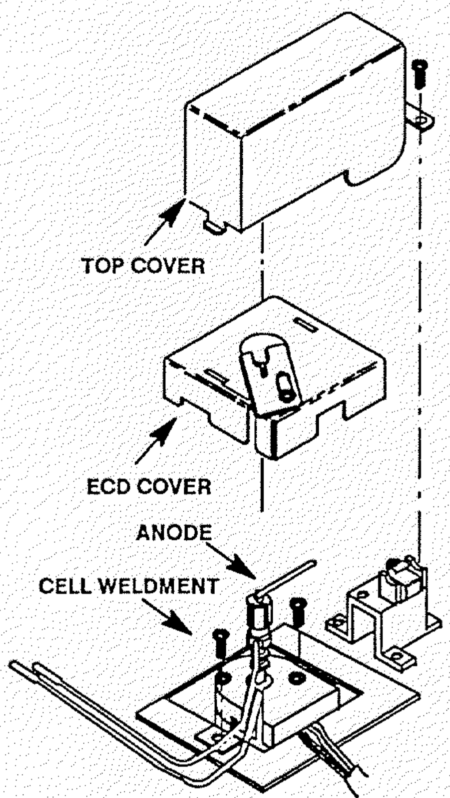
12. Disconnect the cell anode lead from the PCB interconnect.

13. Loosen the locking screw on the ECD cover

14. Slide the locking tab on the ECD cover back, freeing the cover from the anode shaft of the cell weldment.

15. Carefully slide the ECD cover over the anode shaft and anode, and remove it from the detector.

16. Cap the base of the detector (inside the column oven) to avoid damage or contamination of the detector.



17. Remove the two Pozidriv screws securing the detector weldment to the upper and lower heated blocks.

18. Remove the weldment and upper heated block from the lower heated block.

19 . Remove any insulation from around the base of the weldment.

NOTE

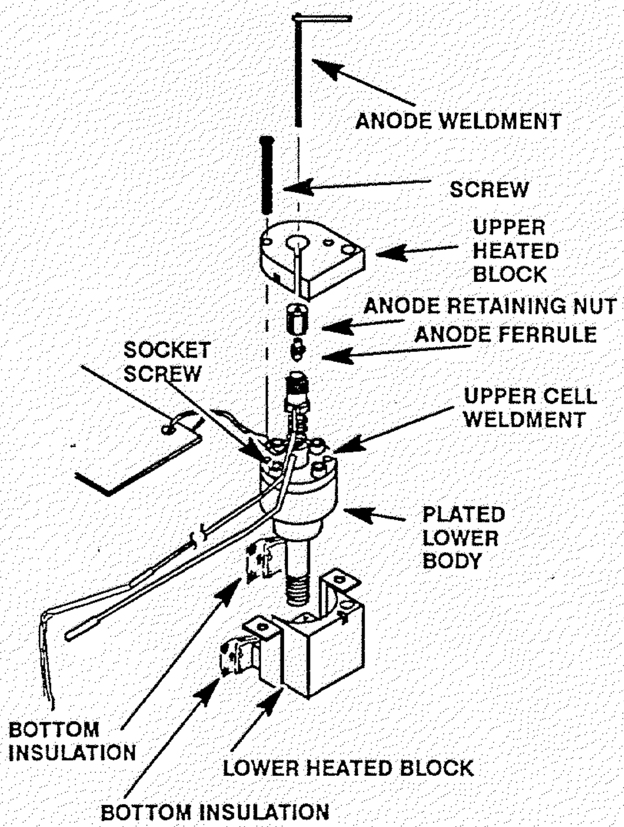
Perform steps 23 through 31 only if it is desired to remove the ECD heated block. Otherwise, proceed to step 32.

20. If required, remove the two Pozidriv screws securing the heated block to the instrument.

21. Lift the heated block out of its mounting position.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.



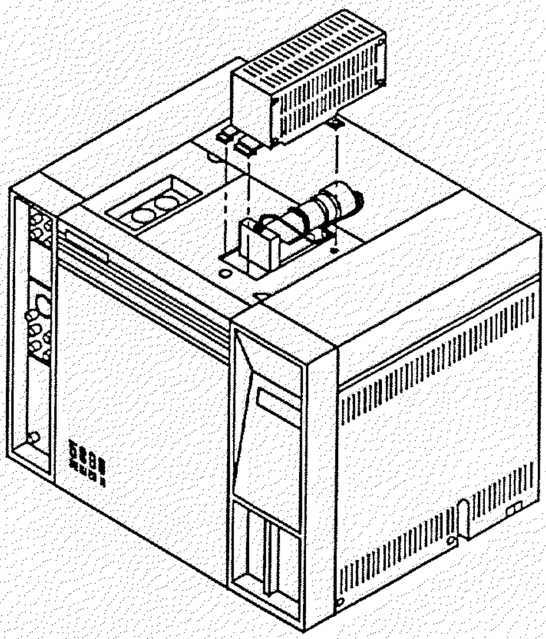
22. Carefully slide the heater and temperature sensor cartridges out of the block. The sensor enters the block from the top. The heater enters from below.

23. Slide the replacement heater and sensor cartridges into the heated block.
24. Install the lower heated block in its mounting position.
25. Secure the lower heated block to the instrument using two screws.
26. Install any removed insulation in the lower heated block.
27. Place the detector weldment in the lower heated block.
28. Install the upper heated block on the weldment.
29. Secure the upper heated block and detector weldment to the lower heated block using two screws.
30. Remove the cap from the base of the detector (inside the column oven).
31. Carefully slide the ECD cover over the anode shaft and anode, and install it on the detector.
32. Slide the locking tab on the ECD cover forward, capturing the cover over the anode shaft of the cell weldment.
33. Tighten the locking screw on the ECD cover
34. Connect the cell collector lead from the cell anode to the PCB interconnect.
35. Position the detector cover over the detector.
36. Secure the detector cover to the instrument with a screw.
37. Install any hardware removed in step 2 of this procedure (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).
38. Connect the purge and exhaust vent tubes to the applicable tubes disconnected in step 14.
39. Install the rear cover and secure using four screws.
40. Install the right side panel and secure using four screws.
41. Install the electronics carrier top cover.
42. Install the hinged top cover and secure using a screw and washer.
43. Connect the ground strap to the hinged top cover using a screw.
44. Install the injection port cover.
45. Restore all gas supplies.
46. Restore power to the instrument.

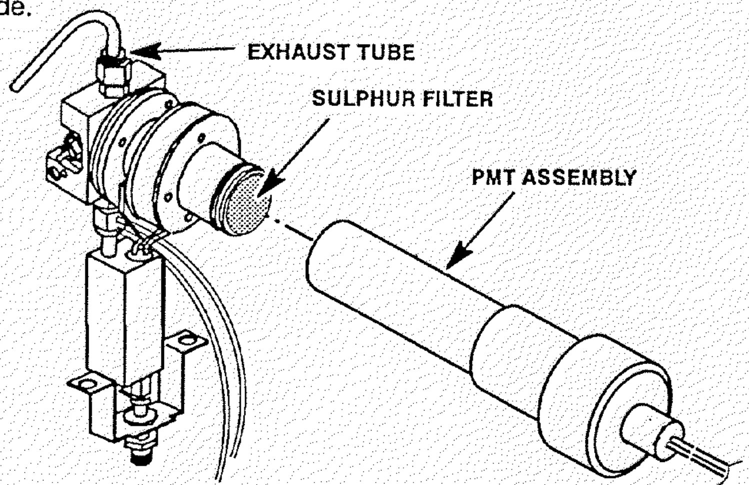
❍ Remove/Replace FPD Heater and Sensor Cartridges

WARNING

- ❍ **PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.**
- ❍ **FLAME PHOTOMETRIC (FPD) DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**



1. Allow time for the heated zones to cool.
2. Remove the thumb-screw holding the detector cover to the top of the HP 5890.
3. Facing the instrument, rotate the detector cover to your right until the tab on the bottom left edge of the cover comes free.
4. Raise the back of the cover and slide it towards the rear of the instrument.
5. Lift the detector top cover to expose the FPD detector weldment.
6. Release the extension spring securing the PMT assembly to its support bracket.
7. Remove the photomultiplier tube (PMT) assembly and sulphur filter from the detector assembly and set it aside.



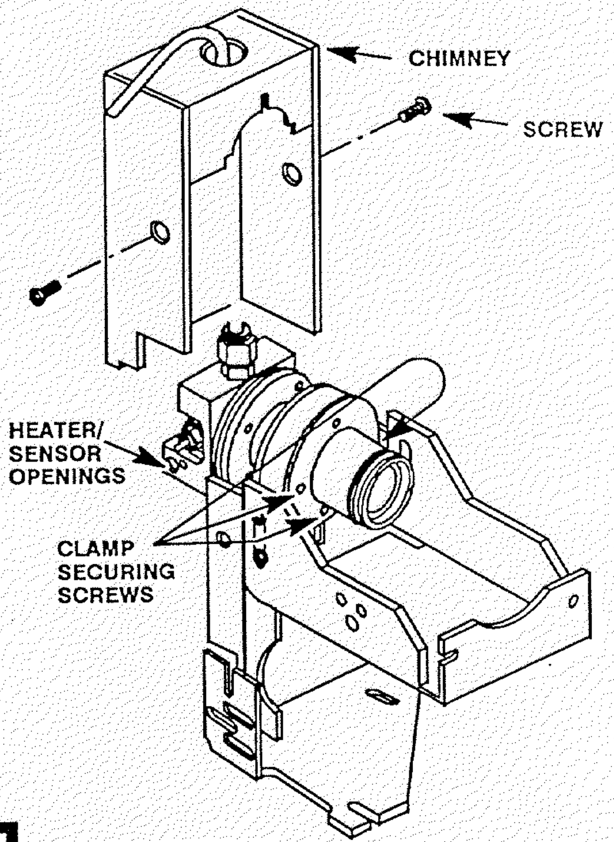
(CHIMNEY AND BRACKETRY REMOVED FOR CLARITY)

8. Remove the drip tube from the exhaust tube at the top of the detector.
9. Remove the exhaust tube from the detector using a 9/16-inch wrench.

10. Remove the chimney assembly by removing the two screws securing it to the chimney back.

11. Loosen the three screws which secure the clamp which secure the detector to the chimney back.

12. Use a 9/16 inch wrench to loosen the brass nut holding the weldment exit tube to the jet weldment. It will be necessary to hold the jet assembly with a 1/2-inch wrench to prevent rotation.



CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

13. Pull the heater and temperature sensor cartridges from the detector weldment assembly.

14. Carefully lift the detector, vertically, from the transfer tube, so as not to damage the fused silica liner.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

15. Remove the second heater cartridge from the lower heater block.

16. Install the replacement heater cartridge in the lower heater block.

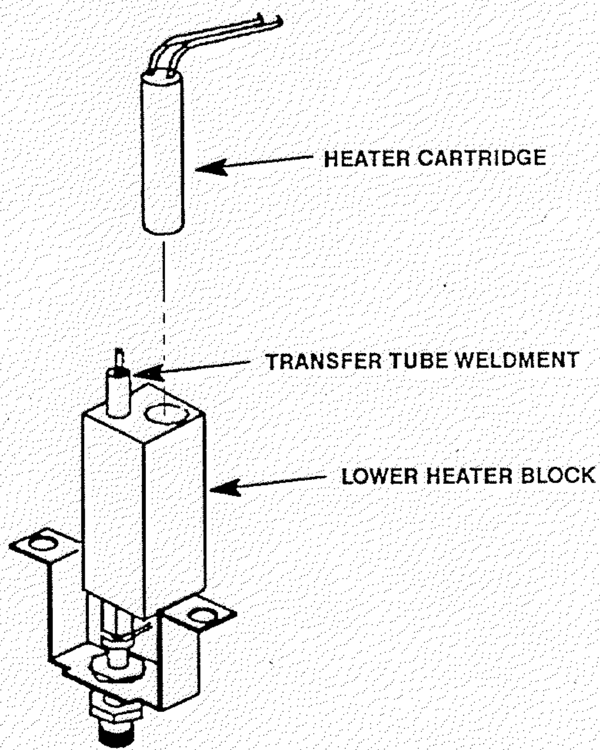
17. Install the assembled detector weldment assembly vertically onto the transfer tube weldment, being careful not to damage the fused silica liner.

18. Install the heater and temperature sensor cartridges into the detector weldment.

19. Secure the weldment exit tube to the jet assembly with by holding the jet weldment with a 1/2-inch wrench, and tightening the nut which secures the weldment with a 9/16-inch wrench.

20. Install the chimney assembly and secure using two screws.

21. Install the exhaust tube on the detector weldment (through the opening in the top of the chimney) and tighten using a 9/16-inch wrench.



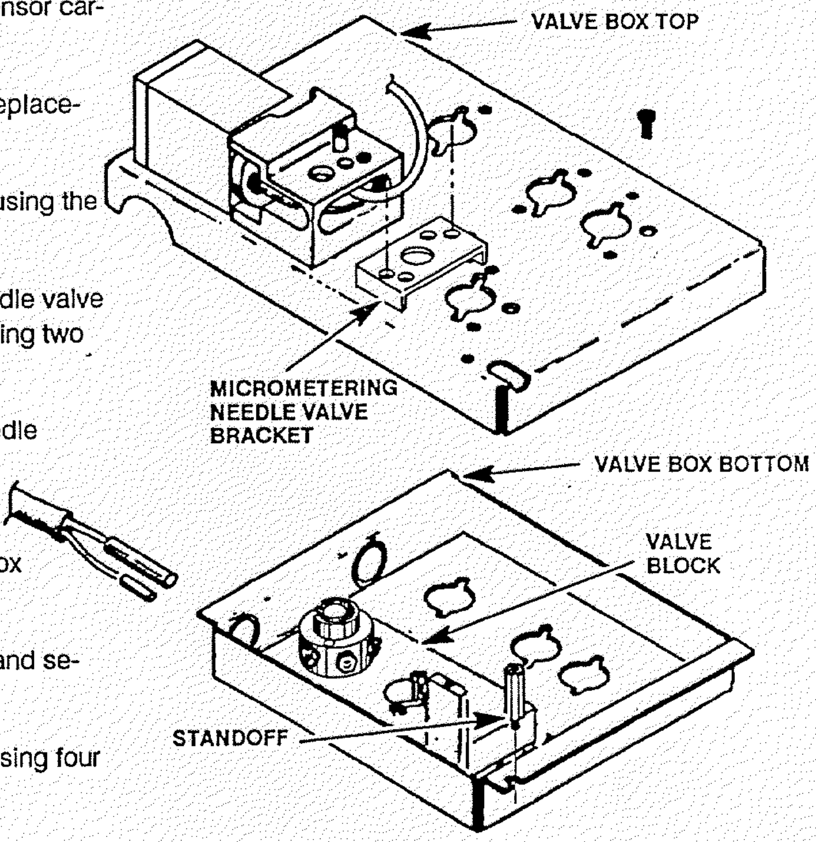
22. Install the drip tube on the exhaust tube.
23. Install the sulphur filter in the flange adapter.
24. Slide the PMT tube assembly onto the detector assembly.
25. Secure the PMT assembly to its support bracket using the extension spring.
26. Install the FPD cover on the instrument and secure using a thumbscrew.
27. Install the rear cover and secure using four screws.
28. Install the right side panel and secure using four screws.
29. Install the electronics carrier top cover.
30. Restore all gas supplies.
31. Restore power to the instrument.

Remove/Replace Valve Box Heater and Sensor Cartridges

WARNING

PERFORM THE PROCEDURE FOR DISCONNECTING/CONNECTING HEATER AND TEMPERATURE SENSOR WIRING ON MAIN PCB BEFORE PERFORMING THIS PROCEDURE.

1. Allow time for the oven and heated zones to cool.
2. Remove the two screws securing the valve box top to the valve box bottom.
3. If any micrometering needle valves are installed, remove the nut(s) securing them to their mounting bracket(s).
4. Remove the two screws securing each installed micrometering needle valve bracket to the valve box top.
5. Ensure that there is enough slack in the tubing, running from the valve box into the oven, to allow lifting of the valve box.
6. Use a 1/4-inch wrench to remove the standoffs securing the valve box to the top of the instrument.
7. Lift the valve box at the rear.
8. Pull any securing tape from around the heater and temperature sensor cables.
9. Remove the heater and sensor cartridge(s) from the valve block(s).
10. Install the replacement heater and/or sensor cartridges into the valve block(s).
11. Replace the securing tape around the replacement heater and sensor cartridges.
12. Secure the valve box to the instrument using the two standoffs, previously removed.
13. Secure the removed micrometering needle valve brackets (if any) to the valve box top using two screws for each bracket.
14. Secure any installed micrometering needle valves to their corresponding brackets using a nut.
15. Secure the valve box top to the valve box bottom using two screws.
16. Install the rear cover on the instrument and secure using four screws.
17. Install the right side panel and secure using four screws.



18. Install the electronics carrier top cover.
19. Restore all gas supplies.
20. Restore power to the instrument.

Replacing TCD Delta-T Temperature Sensor Cartridges

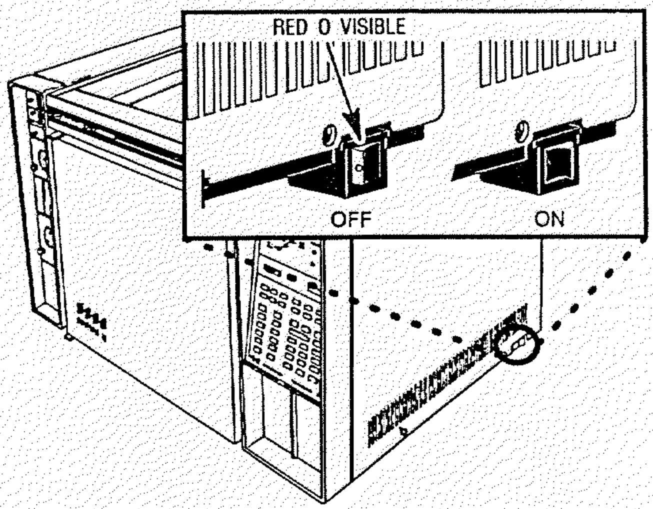
WARNING

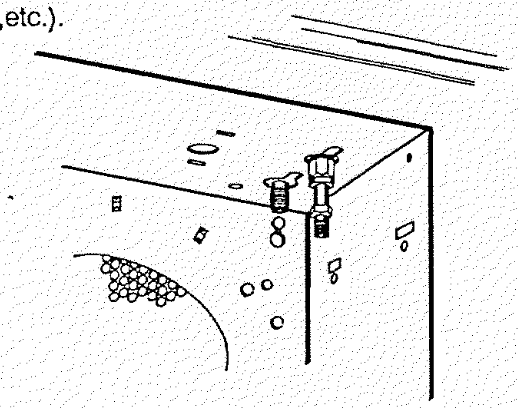
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

CAUTION

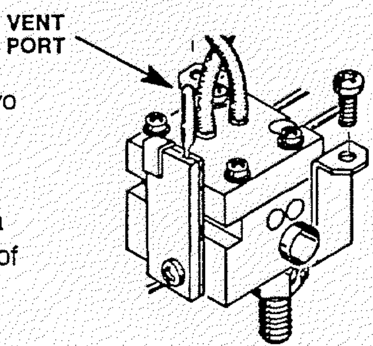
THE TCD MUST BE TURNED OFF BEFORE REPLACING ITS DELTA-T SENSOR CARTRIDGE.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the detector(s) to be removed, inside the column oven, remove the column and hardware associated with the detector(s) (liner, column/liner nuts, ferrules, makeup gas adapter,etc.).

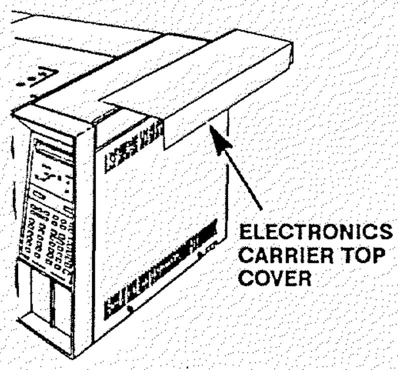


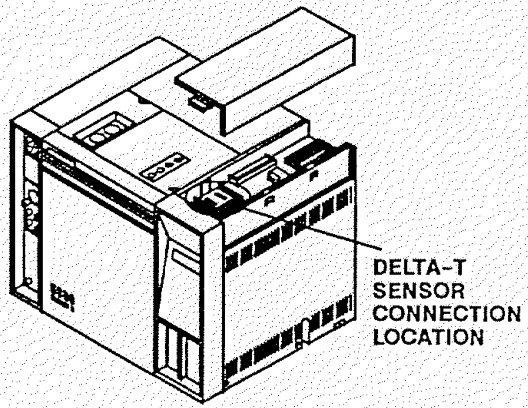


6. If the detector is not going to be replaced with a new detector, cap the detector base.
7. Lift the hinged top cover at its front edge, exposing the detector area.
8. Remove the TCD detector cover by removing two screws: one from each side of the detector cover.
9. If the detector is not going to be replaced with a new detector, cap the TCD vent port on the top of the detector. (This will not be required on a series connected TCD.)

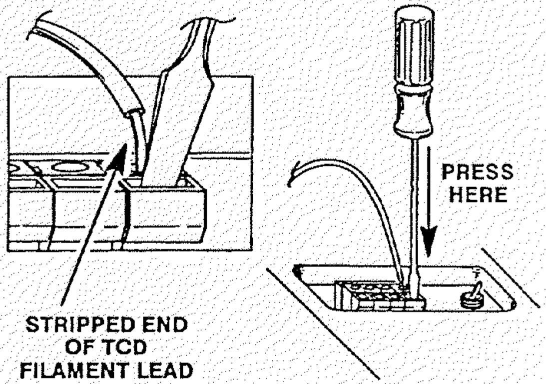


10. Remove the electronics carrier top cover (above the signal cable plugs and receptacles to expose the top edge of the TCD detector PCB).

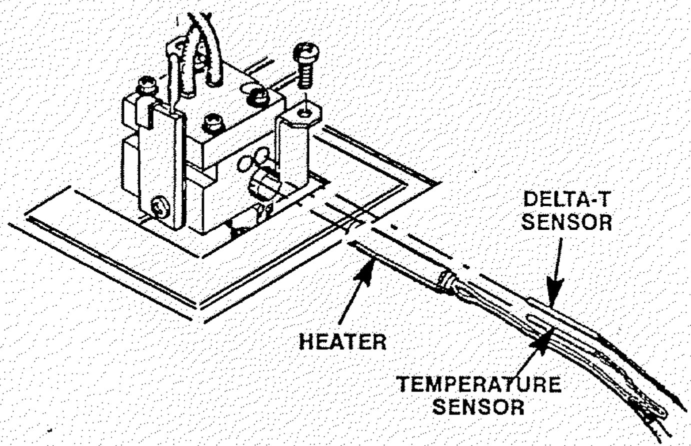




11. Disconnect the detector filament and delta-t temperature sensor leads at their connector block on the detector PCB. Use a small flat-blade screwdriver to press each wire lead release (located adjacent to each connection).



12. Remove the preformed thermal insulation from around the detector to expose the two screws securing the detector to the instrument mainframe.
13. On a series-connected TCD, disconnect the TCD to FID jumper tube from the TCD oven-return exhaust vent port.
14. Remove the two screws securing the detector to the instrument and then lift the block up enough to expose the heater and sensor cartridge wires.
15. Carefully slide the three cartridges out of the block. The two smaller cartridges are the sensors and must be handled gently in order to prevent breakage.



20. Install the heater, temperature sensor, and replacement delta-t sensor cartridges into the heated block.
21. Carefully install the detector, securing it to the instrument with two screws.

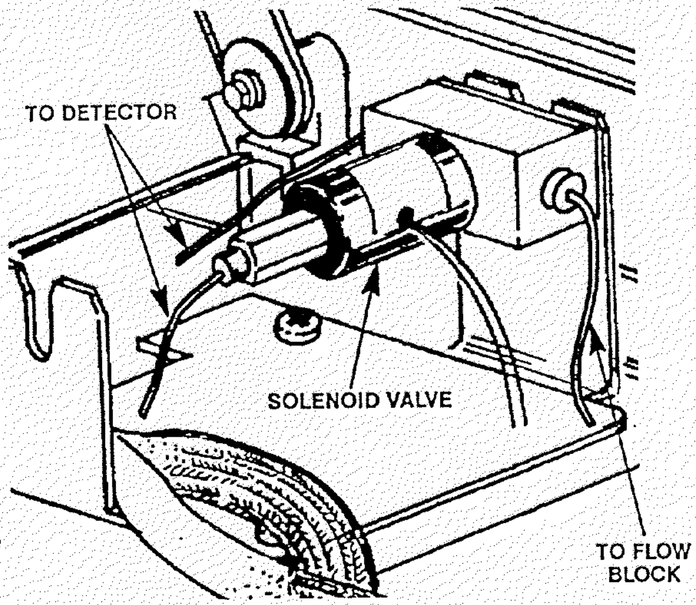
CAUTION

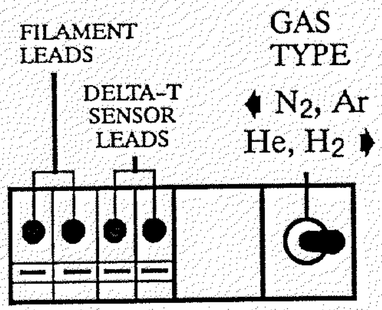
When installing tubing at the solenoid valve, ensure that all O-rings are positioned properly.

NOTE

When installing a series-connected TCD, make sure its oven-return exhaust vent tube extends into the oven.

22. Connect and tighten tubing from the detector to the solenoid switching valve, finger-tight. Ensure that the tubing is installed at their proper fittings on the TCD solenoid valve.
23. Connect the TCD filament and "delta-T" temperature sensor leads at the connector block on the detector PCB, making sure the filament leads are connected properly per the illustration at the right.
24. Restore supply pressure and check for leakage at all installed fittings.
25. If no leaks exist, turn off the supply gas.
26. Remove the caps from the detector base and the vent port.





CAUTION

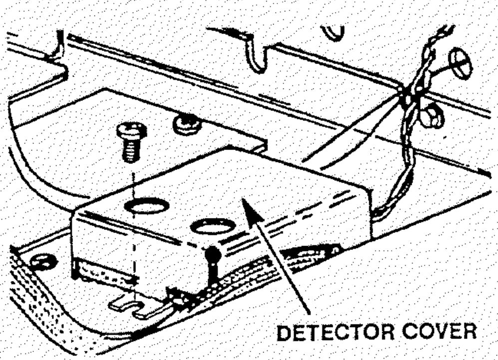
When installing insulation, use care not to plug the vent port. If flow is interrupted while the TCD is on, it will shorten its life dramatically.

27. Taking care not to block the vent port, install insulation around the detector block.
28. Install the electronics carrier top cover.

CAUTION

Use caution not to crimp the filament and delta-t sensor leads when installing the TCD detector cover.

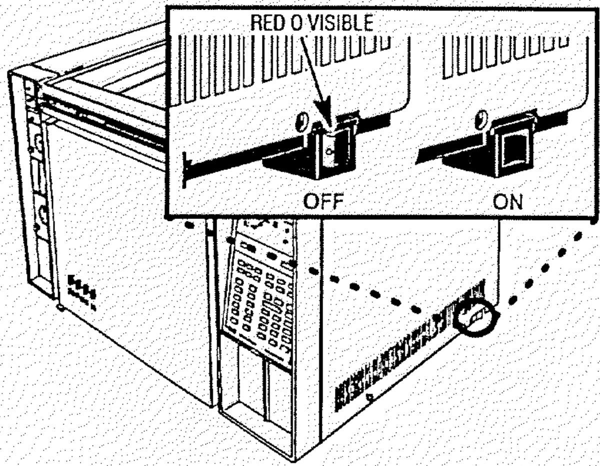
29. Install the TCD detector cover and secure using two screws.
30. Install column and any other hardware removed in step 5 of this procedure.
31. Restore supply pressure.
32. Restore power to the instrument.
33. Run a TCD Test Sample Chromatogram (refer to HP 5890 Series II Reference Manual) to ensure that the system is operating properly. (If reversed peaks are experienced, the most likely cause is reversed gas tubes connected to the TCD solenoid valve.)



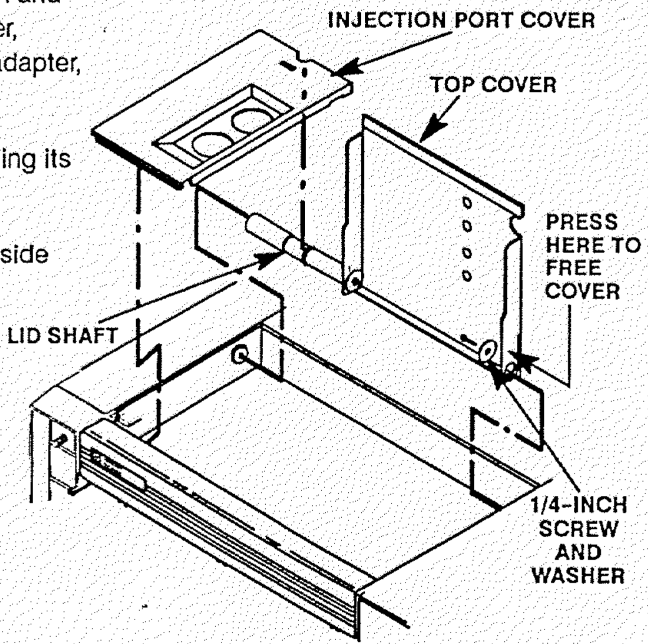
Remove/Replace PCOC Inlet Cryogenic Cooling (Cryo-Blast) Weldment

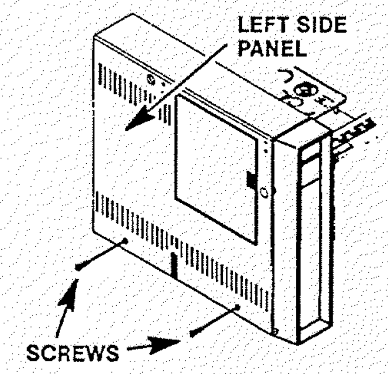
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.



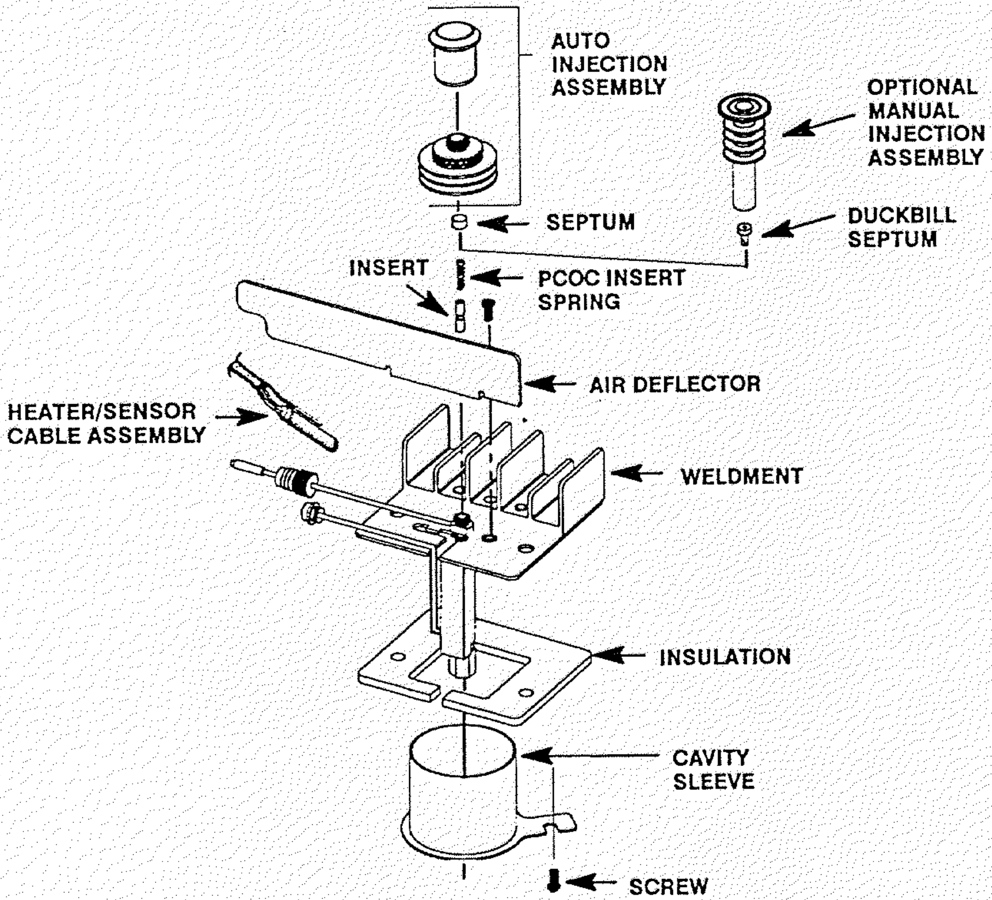
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. At the bottom of the inlet(s) to be removed, inside the column oven, remove the column and hardware associated with the inlet(s) (liner, column/liner nuts, ferrules, makeup gas adapter, etc.).
6. Remove the injection port cover by grasping its back edge and lifting it upward.
7. Remove the two screws securing the left side panel along its bottom edge.
8. Slide the left side panel towards the rear of the instrument and lift.





11. Cap the base of the inlet, inside the column oven.

12. Remove the auto-injection assembly (or optional manual injection assembly) by rotating it counter-clockwise). Be careful not to loose the septum, insert, or PCOC insert spring which are installed under the injection assembly.

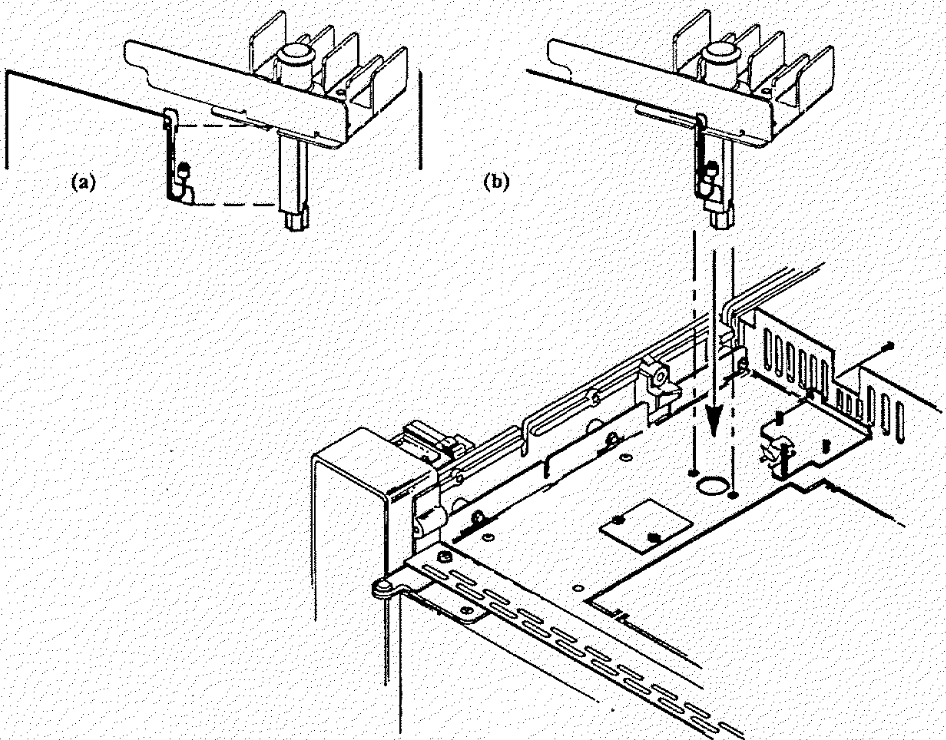


13. Remove the air deflector using a Pozidriv screwdriver to remove the screw securing the air deflector to the inlet weldment.

14. Use a Pozidriv screwdriver to remove the two screws securing the inlet to the instrument.

15. Lift the inlet enough to expose the heated block.

16. Remove the cryo-blast tube from the inlet weldment.



23. Install the replacement cryo-blast weldment onto the inlet weldment.

24. Secure the inlet to the instrument using two screws.

CAUTION

Handle the heater and sensor cartridges with care to prevent breakage. The cartridges (particularly the smaller sensor cartridge) are fragile.

25. Carefully slide the heater and sensor cartridges into the heated block portion of the inlet.

26. Install the air deflector and secure it to the weldment using one screw.

28. Install the liner and all other hardware (except the column) removed in step 5.

29. Restore the supply gas pressure.

30. Check for leaks at all of the newly mated fittings.

31. Turn off the supply gas.

32. Remove the cap/plug from the end of the inlet.

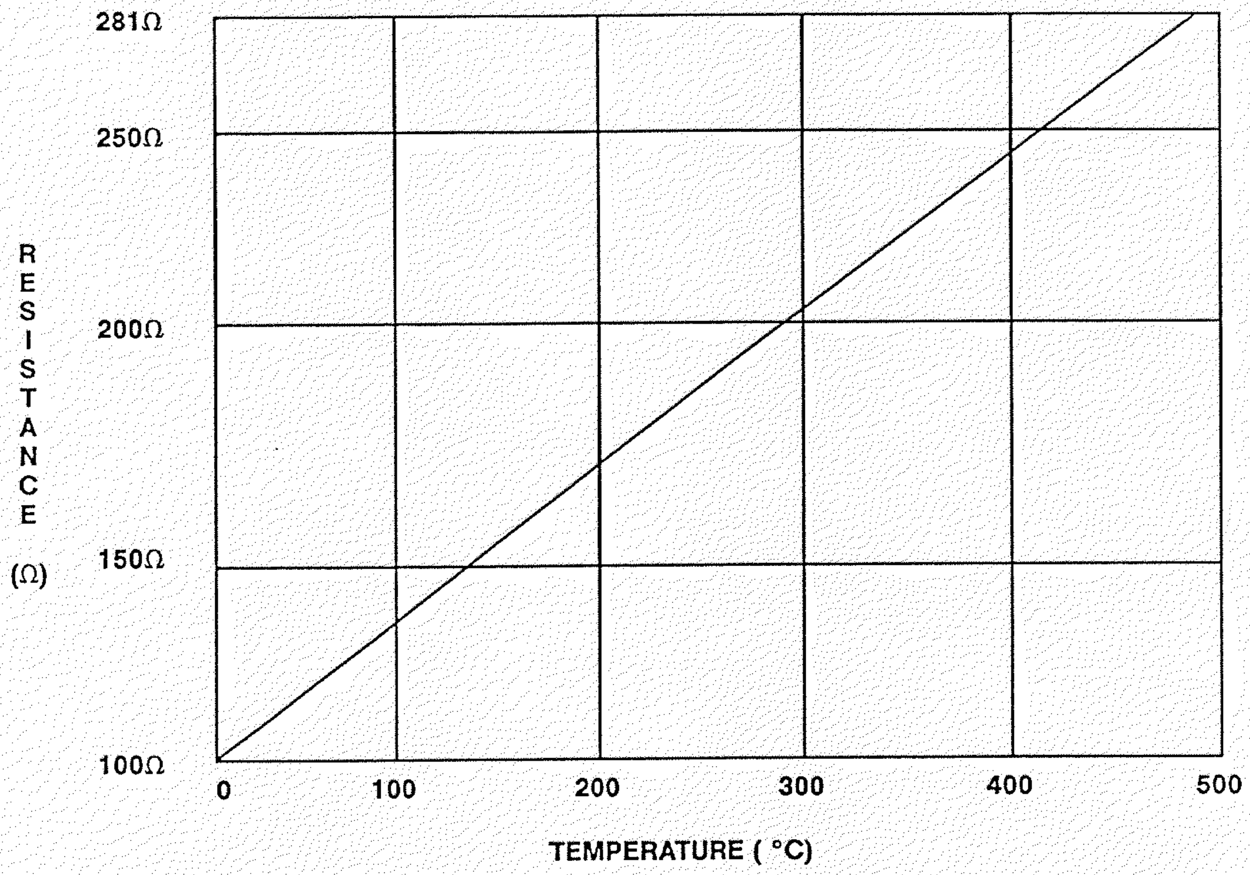
33. Install the column and associated hardware removed in step 5.

34. Install the left side panel and secure using two screws.

35. Install the injection port cover.

36. Restore power to the HP 5890 Series II.

TEMPERATURE SENSOR DATA



TEMPERATURE SENSOR RESISTANCE VS. TEMPERATURE

To figure the approximate resistance of a temperature sensor, use the following equation:

$$R = 100\Omega + (.35 \times t)$$

°C	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
0°	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50
100°	138.50	142.28	146.06	149.82	153.57	157.32	161.04	164.76	168.47	172.16	175.84
200°	175.84	179.51	183.17	186.82	190.46	194.08	197.70	201.30	204.88	208.46	212.03
300°	212.03	215.58	219.13	222.66	226.18	229.69	233.19	236.67	240.15	243.61	247.06
400°	247.06	250.50	253.34	257.34	260.75	264.14	267.52	270.89	274.25	277.60	280.93

Ω

Section 7

VALVES

This section is intended to help the technician isolate problems to a specific valve component or components. The HP 5890 Series II may be found in many different configurations, with varying component options. This complicates the process of providing detailed troubleshooting procedures for even general problems. But, by using the general troubleshooting techniques presented here, successful results should be achieved.

Specific part numbers are not given in this portion of the service manual. For all replacement part numbers, refer to the Section 7 of the IPB portion of this document.

This document is not meant to provide instruction for first time installation of any of the options discussed. The add-on sheets, which accompany the various options, exist for just this purpose, and should be referenced when performing a first time installation.

TABLE OF CONTENTS

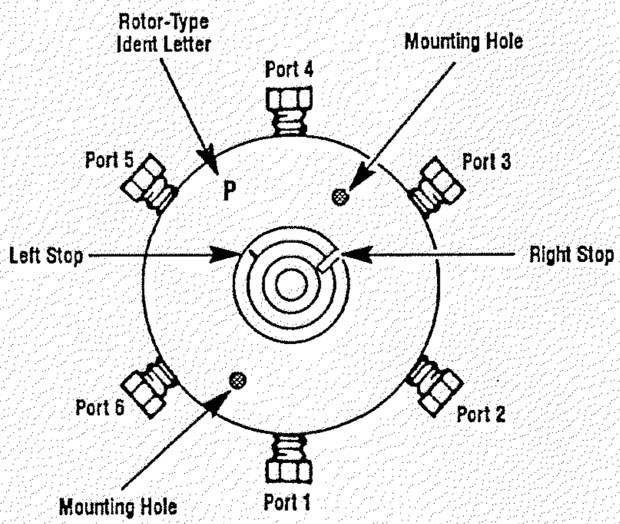
INTRODUCTION

The valves described in this manual are manufactured by VALCO Instruments Co, Houston, Texas. As members of the W-series product line, they are known as "minivalves." The valve body is made of Nitronic-60 with 1/16 inch fittings. The W-series valves are also known as the 18900F series. These valves have better leakage resistance and a longer life expectancy. An installed valve system is an integrated part of the HP 5890 Series II Gas Chromatograph. Proper instrument operation will prolong the life of the valve system. Read all the accompanying information and avoid the following operational abuses:

1) Exceeding the specified temperature and pressure ranges.
2) Plugging a valve with column packing or sample precipitation.
3) Scoring of valve surfaces with column packing or particulates in liquid or gas sample.
4) Contaminating the system with samples (noneluting materials) or poor quality support gases.

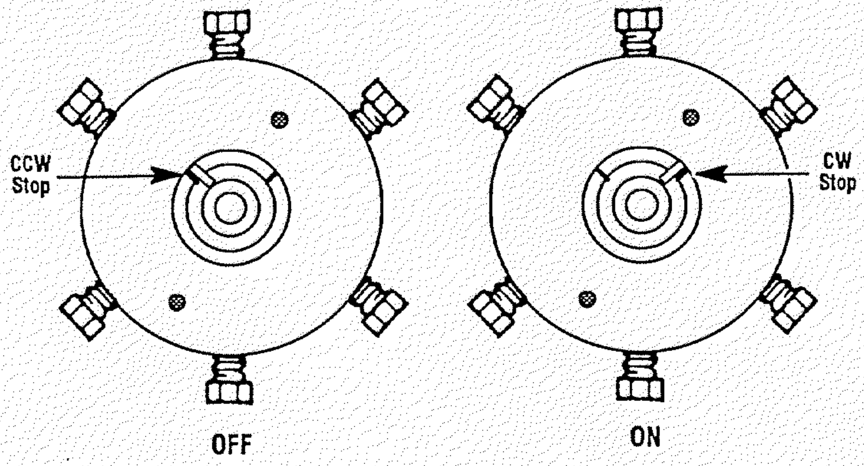
VALCO VALVES 18900F

Basically, valves are composed of four assemblies a driver,valve body, rotor, and preload assembly.



The valve body is made of Nitronic-60. This is a high chromium, high nickel content stainless steel, that has excellent chemical resistance, anti galling characteristics, and high tensile strength. External tubing (plumbing) is connected to the valve body ports by the use of provided ferrules and fittings.

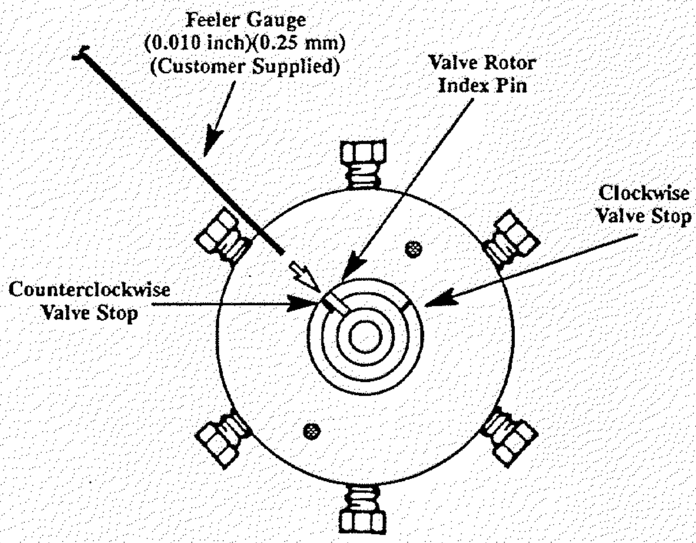
All general purpose valve bodies include mechanical stops in their index lips. The stops are predetermined to limit rotor rotation (i.e., 90 Degrees, 60 Degrees, and 36 Degrees), so the correct flow path results when the index pin is close to or against either stop of the index lip.



Also note the rotor type stamped into the valve body. The letter indicates the rotor installed in the particular body. The rotors are interchangeable. Polytetrafluorethylene (Teflon) rotors may be used from 0 to 175 degrees C (This low temperature valve may be marked with P). High Temperature (polyimide) rotors may be used from 100 to 350 degrees C (This high temperature valve may be marked with PT or just T). The rotor seat of the valve body is a highly polished conical surface. This finish precludes adsorption of most GC samples. Additionally, the polished surface with a properly seated rotor will prevent leakage around the rotor and between nonselected ports.

The rotor assembly is an integral molded and machined conical hub, necessary for proper seating. The sample will contact either Teflon (low temperature) or polyimide (high temperature) as well as the stainless steel of the valve.
The rotor fits precisely into the body and nests in the conical seat. It is held in place by a preload assembly.

The grooves in the rotor determine the paths between specific ports. The index pin prevents rotation beyond either stop of the index lip. Valve ports are connected by the grooves only when the index pin is close to or against either stop of the index lip. Any intermediate position results in shutoff of flow through the valve.

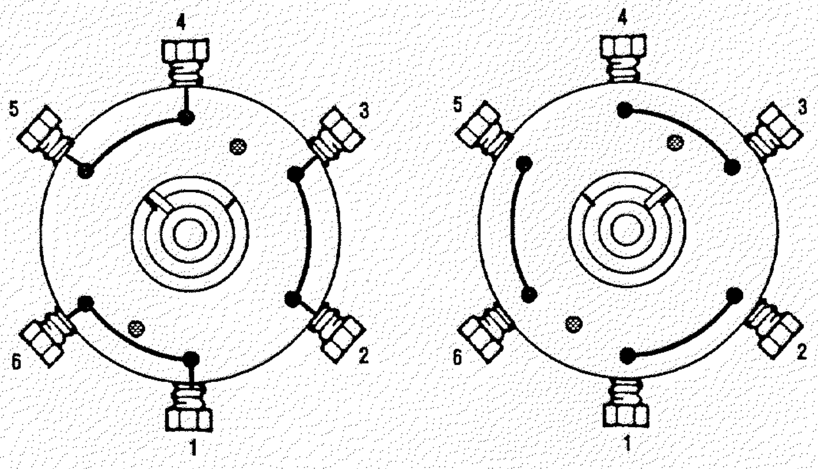


General Purpose Valves (GPVs)

The standard general purpose valves have 1/16 inch zero dead volume fittings and their internal port diameter is 0.016 inch. They may be classified by the number of ports they contain and their useful temperature range. The valves with Teflon rotors may be used in the range 0 to 175 degrees C whereas the valves with polyimide rotors function best in the range of 100 to 350 degrees C. Because of the difference in the operation temperature ranges, do not mix these two valve types in the same system. HP offers only the 6 & 10 port GSV's and the 4 port LSV.

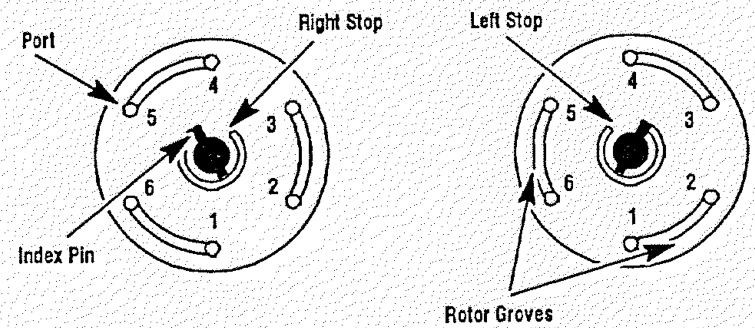
1/16 inch Teflon rotor valves: 0 to 175 degrees C
1/16 inch polyimide rotor valves: 100 to 350 degrees C
Adjustable restrictor valves: ambient to 225 degrees C
Liquid Sample Valves: (see Liquid Sample Valves, this section)

The HP 5890 Series II was designed to accept valves heated in their own compartments because valves operate best at a constant temperature. It is important to realize that when a valve is inside a gas chromatograph oven during a temperature programmed run, the valve temperature can lag behind the programmed oven temperature by as much as 20 degrees C, depending on the rate employed. The mass of the programmed valve is responsible for this lag.



OFF ON

Above is illustrated an actual 6 port valve viewed from the actuator side. A functional two dimensional diagram representing the same valve is shown.



OFF ON

Adjustable Restrictors

This restrictors are not designed for temperatures greater than 225 degrees C.

Gas Sample Loops

A 0.25cc sample loop is included with all valve systems configured for gas sampling. 10cc and 5cc loops occupy one valve position, limiting the number of valves that can be housed in a valve compartment.

LIQUID SAMPLE VALVES (LSVs)

Liquid sampling valves are designed for use with liquefied gases under pressure such as ethane, propane, butane, LNG, etc. They are not intended for nonvolatile liquids (at room conditions) where a concealed leak may allow an accumulation or pool of liquid to form that may present a significant fire hazard. All standard liquid sample valves have 1/16 inch fittings and are classified by the sample size of the installed rotor (0.2mL, 0.5mL, or 1mL capacity). The two types of valves available are standard or low pressure (1000 psig) and high pressure (5000 psig), in the four port, single purpose liquid sampling valve. Whenever a liquid sample valve is used, an adjustable restrictor is employed on the sample outlet line to maintain internal sample pressure and thereby keep a compressed gas liquefied.

TROUBLESHOOTING AND MAINTENANCE

Chromatographic Symptoms

Troubleshooting valves and their related plumbing is primarily a matter of systematic checking and verification of unimpaired mechanical operation of any moving part. This requires an understanding of how the valve functions internally and how the plumbing is configured. A plumbing diagram is essential for effective troubleshooting. The following symptom cause list gives the most commonly encountered problems and solutions found with valves.

LOSS OF SENSITIVITY OR EXCESSIVE DRIFT

Several possible causes exist for overall deterioration of the chromatogram. Contamination in the valve requires a thorough cleaning. Internal leakage necessitates a complete disassembly and inspection of the mating surfaces.

Poor temperature control may require a full check of electronic and thermal components.
Lack of proper conditioning techniques, columns, etc.
Failure or deterioration of other components (i.e., columns, detectors, etc.).

LOSS OF PEAKS IN SPECIFIC AREAS OF THE CHROMATOGRAM

Entire sections of chromatographic data can be lost due to a valve that does not rotate or one that rotates improperly. Other than obvious component failures (i.e., solenoid, actuator, etc.), generally improper adjustments and misalignments cause most problems. Check that adequate air (about 482 kPa or 70 psi) is supplied.

Check if the valve is rotating at all.
If the valve rotates, check for proper alignment of the actuator or mechanical binding or slippage of connecting parts.

Check for blocked flow paths with valve in both positions.

BASELINE UPSETS

Frequently baseline upsets may be seen on chromatograms when valves are switched. These upsets are normally caused by pressure changes within the system, injections of large volume samples, or by changing the amount of restriction in the flow path. These upsets will become more of a problem when high sensitivity is required. Addition of a fixed restriction downstream from the valve may help minimize the upset. When possible, changes in column length may also help reduce the upsets. Fixed restrictors are used immediately before flame detectors to prevent flameout and are used in some instances to prevent pressure surges from damaging TCD filaments. Needle valves (Nupro) can be used as adjustable restrictors; however, they are used typically where a matched restriction is desired and not for preventing pressure or flow surges. Often confused with baseline upsets, an offset is a shift in the baseline that does not return quickly to the original level. Baseline offsets may be caused by air leaks but more commonly are due to a change in gas purity or flow rate in the detector. Poor carrier gas or improperly conditioned filters and traps should be suspected whenever offsets occur.

EXTRANEOUS PEAKS

Air peaks are sometimes seen in a chromatogram when leakage occurs because the valve rotor does not seal properly. These leaks may not be detectable by using the soap bubble method. The Leak Test procedure is described in Section 3 of this manual. If a leak is suspected but cannot be located with soap bubbles, a pressure check will determine definitely if a leak exists. Extraneous peaks can occur sometimes due to improper conditioning of the valve or contamination. If leaks are not apparent, clean or condition the valve. Obviously other causes, totally unrelated to the valve, may exhibit similar symptoms. Impure (i.e., containing water) carrier gas can cause extraneous peaks.

LOCATING LEAKS

Leak checking the plumbing involved in a valve configured system must be done carefully and methodically. Several methods may be used, and the best choice will depend upon expediency, accessibility, and the magnitude of the leak. Refer to Initial Supply Pressures and Leak Testing in Section 3 for details.

PRESSURE CHECK

The pressure check method will indicate, but sometimes not isolate, a leak in the flow path. Since this method does not necessarily isolate the leak, one of the leak check methods may be needed to locate the leak specifically. Note that each valve in a system has two flow paths, ON and OFF. A leak sometimes occurs in only one of these two positions. Check both. To do so perform the following:

1. Disconnect the detector from the valve system.

2. Cap the valve system at its outlet and pressurize to 689 kPa (100 psi). Allow 2 to 5 minutes for pressure to equilibrate. (If a flow sensor exists, it should read zero flow.)

3. Turn the knob on the regulator counterclockwise until it turns freely. The regulator is now turned off and the gauge is indicating pressure within the valve system.

4. Commonly, the pressure will drop quickly for approximately 30–60 seconds; then stabilize. After this initial drop, the gauge should not show more than a 6.89 to 13.78 kPa (1 to 2 psi) drop during a 10 minute period.

5. If no leak is indicated, actuate all valves and repeat steps 2 through 4.

6. If a leak does show up, try to pinpoint the source with a soap bubble technique. Do not assume the leak must exist only at a valve. Often plumbing connections such as unions or bulkhead fittings are at fault. See Valve Box Top Assembly Removal in this section if exposing the valve system is necessary.

7. If the leak cannot be found easily, divide the system in half and repeat the pressure check. Continue dividing by halves, and pressure check until the leak is isolated.

Sampling Valve System

Introduction

An installed valve system is an integral part of the HP 5890 SERIES II, GAS CHROMATOGRAPH. To prolong the life of the valve system, avoid the following operational abuses:

- Exceeding the specified temperature and pressure ranges.
- Plugging a valve with column packing or sample precipitation.
- Scoring of valve surfaces with column packing or particulates in liquid or gas sample.
- Contaminating the system with samples (noneluting materials) or poor quality support gases.

Valves

Valves are composed of two basic assemblies: a body and a rotor.

Multipurpose Valve

Ports	Low Temp.	High Temp.
6	0101–0629	0101–0584
10	0101–0630	0101–0585

Liquid Sampling Valves

Ports	Volume	Pressure	Valve
4	0.2ul	1000	0101–0636
4	0.5ul	1000	0101–0637
4	1.0ul	1000	0101–0638
4	0.5ul	5000	0101–0639

The body assembly and its component parts are made from Nitronics 60, nickel steel. If required the valve may also be produced from Hastelloy C. External tubing (plumbing) is connected to the valve body ports by ferrules and fittings provided with the instrument.

All general purpose valve bodies include mechanical stops in their index lips. The stops limit rotor rotation (i.e., 60 degrees,90 degrees), so the correct flow path results when the index pin is close to or against either stop of the index lip.

CAUTION

Any intermediate position of the rotor may result in an interrupted flow path which could cause damage to the valve or other components in the chromatograph.

The letter of the rotor type stamped into the valve body indicates the rotor installed in the particular body.

P Polytetrafluorethylene (Teflon rotor) may be used from 0 to 175 degrees C. (This low temperature valve may be unmarked -no"P").

PT High Temperature (polyimide rotor) may be used from 100 to 300 degrees C. (This "high temperature" valve may be marked with "PT", or just "T").

The rotor seat of the valve body is a highly polished conical surface. This finish precludes adsorption of most GC samples. Additionally, with a properly seated rotor the polished surface will prevent leakage around the rotor and between non-selected ports.

The rotor assembly is essentially a one-piece stainless steel part with an integral molded and machined conical hub and several parts necessary for proper seating. The sample will contact either Teflon (low temperature) or polyimide (high temperature) as well as the stainless steel of the valve.

The rotor fits precisely into the body and nests in the conical seat. It is held in place by a preloaded assembly.

The grooves in the rotor determine the paths between specific ports and run in a transverse fashion across the rotor. The index pin prevents rotation beyond either stop of the index lip. Valve ports are connected by the grooves only when the index pin is close to or against either stop of the index lip. Any intermediate position results in shutoff of flow through the valve and possible valve damage if left in this position.

General Purpose Valves (GPVs)

The standard general purpose valves have 1/16-inch zero dead-volume fittings. They may be classified by the number of ports they contain and their useful temperature range. The valves with Teflon rotors may be used in the range 0 to 175 degrees C; whereas, the valves with polyimide rotors function best in the range of 100 to 300 degrees C. Both types of valves are available with 6 or 10 ports, depending on the desired application.

Teflon rotors are not interchangeable with polyimide rotors in the same valve body. Because of the difference in the operating temperature ranges, do not mix these two valve types in the same system.

CAUTION

The life of any valve is shortened, if not used within its specified temperature range

Temperature Ranges for Liquid Sample Valves

1/16inch Teflon rotor valves..............0 to 175 degrees C
1/16inch polyimide rotor valves..........100 to 300 degrees C
Adjustable restrictor valves.........ambient to 175 degrees C

The HP 5890 was designed to accept valves heated in their own compartments because valves operate best at a constant temperature. It is important to realize that, when a valve is inside a gas chromatograph oven during a temperature-programmed run, the valve temperature can lag behind the programmed oven temperature by as much as 20 degrees depending on the rate employed. The mass of the programmed valve is responsible for this lag. For this and other reasons, gas chromatograph oven-mounted valves are not offered on the HP 5890.

An actual 6-port valve viewed from the actuator side is illustrated in Figure 2-4. A functional two-dimensional diagram representing the same valve is shown in Figure 2-5.

Note that with this type of diagram, not only the external ports are drawn, but rotor grooves are easy to see. The transverse grooves appear as curved lines. Note the change in the port-to-port connections by the grooves when the valve rotor is moved from the left stop to the right stop. Also note that the rotor grooves move, but the ports do not. Figure 2-6 Illustrates a Simplified Valve Diagram.

Note that the essential valve features are not lost; namely the index pin, stops, ports, and grooves. This is the type of diagram that will be used throughout this section. The 6-port, and 10-port valves and the LSVs function in the same basic manner but with different port locations and rotor grooves.

Some other symbols used in the plumbing configuration diagrams are shown in Figure 2-7.

Adjustable Restrictor

This restrictor is not designed for temperatures greater than 175 degrees C; for this reason this adjustable restrictor is NOT compatible with high-temperature valves.

Gas Sample Loops

A 1.0cc sample loop is included with all valve systems configured for gas sampling. 10.0cc and 5.0cc loops occupy one valve position, limiting the number of valves that can be housed in a valve compartment.

Six-port General Purpose Configurations

Liquid sampling valves are designed for use with liquefied gases under pressure such as ethane, propane, butane, LNG, etc. They are not intended for use with nonvolatile liquids (at room conditions) where a concealed leak may allow an accumulation or pool of liquid to form that may present a significant fire hazard.

WARNING

TO REDUCE THE POSSIBILITY OF FIRE HAZARD WHEN SAMPLING FLAMMABLE GASES OR LIQUID UNDER PRESSURE, THE OPERATOR SHOULD ROUTINELY MAKE A CAREFUL PRESSURE-LEAK TEST OF THE PLUMBING, FITTING AND VALVES COMPRISING THE SAMPLING SYSTEM IN OPERATION. BOTH VALVE POSITIONS SHOULD BE CHECKED. THEREFORE DEPENDING UPON THE NATURE AND PRESSURE OF THE SAMPLING STREAM, PERIODIC PRESSURE LEAK TEST AND VISUAL INSPECTION SHOULD BE MADE AS WEAR OR USE COULD CAUSE LEAKS TO DEVELOP. THESE LEAKS MAY OCCUR IN THE INTERIOR OF THE VALVE BOX AND BE CONCEALED FROM THE OPERATORS VIEW.

All standard liquid sample valves have 1/16inch fittings and are classified by the sample size of the installed rotor (0.2μl, 0.5μl or 1.0μl capacity). The two types of valves available are standard or low pressure (1000 psig) and high pressure (5000 psig), in the four-port, single-purpose liquid sampling valve.

Whenever a liquid sample valve is used, an adjustable restrictor is employed on the sample outlet line to maintain internal sample pressure and thereby keep a compressed gas liquefied.

WARNING

THE LIFE OF AN LSV IS SHORTENED IF NOT USED WITHIN ITS SPECIFIED PRESSURE AND TEMPERATURE RANGES. HIGHLY DANGEROUS LEAKS CAN OCCUR IF THE VALVE BOX TEMPERATURE EVER EXCEEDS THE LIMITS LISTED IN TABLES 2-4 AND 2-5.

LSV Temperature Range

High Pressure Standard Pressure

Temperature Range

From To From To

Ambient 80_C Ambient 100_C

Ambient 150_C

Ambient 175_C

LSV Pressure Range

High Pressure Standard Pressure

Pressure Limit

PSIG PSIG

5000 1000

400

300

Troubleshooting and Maintenance

Chromatographic Symptoms

Troubleshooting valves and their related plumbing is primarily a matter of systematic checking and verification of unimpaired mechanical operation of any moving part. This requires an understanding of how the valve functions internally and how the plumbing is configured. A plumbing diagram is essential for effective troubleshooting.

The following "symptom–cause" list gives the most commonly encountered problems found with valves and their solution.

Loss of Sensitivity or Excessive Drift

Several possible causes exist for overall deterioration of the chromatogram.

- Contamination in the valve requires a thorough cleaning.
- Internal leakage necessitates a complete disassembly and inspection of the mating surfaces.
- Poor temperature control may require a full check of electronic and thermal components.
- Lack of proper conditioning techniques, columns, etc.
- Failure or deterioration of other components (i.e., columns, detectors, etc.).

Loss of Peaks in Specific Areas of the Chromatogram

Entire sections of chromatographic data can be lost due to a valve that does not rotate or one that rotates improperly. Other than obvious component failures (i.e., solenoid, actuator, etc.), generally improper adjustments and misalignments cause most problems.

- Check that adequate air (about 482 kPa or 70 psi) is supplied.
- Check the valve. Is it rotating?
- If the valve rotates, check for proper alignment of the actuator, mechanical binding or slippage of connecting parts.
- Check for blocked flow paths with valve in both positions.

Baseline Upsets

Frequently baseline upsets may be seen on chromatograms when valves are switched. These upsets are normally caused by pressure changes within the system, injections of large volume samples, or by changing the amount of restriction in the flow path. These upsets will become more of a problem when high sensitivity is required. Addition of a fixed restriction downstream from the valve may help minimize the upset. Changes in column length may also help reduce the upsets.

Fixed restrictors are used immediately before flame detectors to prevent flameout and are used in some instances to prevent pressure surges from damaging TCD filaments. An adjustable restrictor (needle valve) can also be used where a matched restriction is desired but not for preventing pressure or flow surges.

Often confused with baseline upsets, an offset is a shift in the baseline that does not return quickly to the original level. Baseline offsets may be caused by air leaks but more commonly are due to a change in gas purity or flow rate in the detector. Poor carrier gas or improperly conditioned filters and traps should be suspected whenever offsets occur.

Extraneous Peaks

Air peaks are sometimes seen in a chromatogram when leakage occurs because the valve rotor does not seal properly. These leaks may not be detectable by using the soap-bubble method.

If a leak is suspected but cannot be located with soap bubbles, a pressure check will determine definitely if a leak exists. Extraneous peaks can occur sometimes due to contamination or improper conditioning of the valve. If leaks are not apparent, clean or condition the valve.

Obviously other causes, totally unrelated to the valve, may exhibit similar symptoms. Impure carrier gas (i.e., containing water) can cause extraneous peaks.

Locating Leaks

Leak-checking the plumbing involved in a valve configured system must be done carefully and methodically. Several methods may be used, and the best choice will depend upon expediency, accessibility, and the magnitude of the leak.

Pressure Check

The pressure check method will indicate, but sometimes not isolate, a leak in the flow path. Since this method does not necessarily isolate the leak, other leak check methods may be needed to locate the leak specifically.

Note

Each valve in a system has two flow paths, ON and OFF. A leak sometimes occurs in only one of these two positions. Check both.

1. Disconnect the detector from the valve system.

2. Cap the valve system at its outlet and pressurize to 689 kPa (100 psi). Allow 2 to 5 minutes for pressure to equilibrate. If a flow sensor exists, it should read zero flow.

3. Turn the knob on the regulator counterclockwise until it turns freely. The regulator is now turned off and the gauge is indicating pressure within the valve system.

4. Generally, the pressure will drop quickly for approximately 30-60 seconds; then stabilize. After this initial drop, the gauge should not indicate more than a 6.89 to 13.78 kPa (1 to 2 psi) drop during a 10 minute period

5. If no leak is indicated, actuate all valves and repeat steps 2 through 4.

6. If a leak does show up, try to pinpoint the source using a soap bubble meter. Do not assume that the leak exists only at the valve. Often plumbing connections such as unions or bulkhead fittings are at fault. See "Valve Box Top Assembly Removal" in this section should it become necessary to expose the valve system.

7. If the leak cannot be found easily, divide the system in half and repeat the pressure check. Continue dividing by halves, and pressure check until the leak is isolated.

Valve Box Assembly Removal

1. Place the main power switch in the off position.

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

2. Unplug the line power cord from its receptacle.

3. Allow some time for the oven and heated zones to cool.

4. When the oven has cooled, turn off all gas supplies.

5. Switch the solenoid valve off so the actuator is in its fully extended position (Figure 2–29). Place the main power switch in its "OFF" position. Disconnect the line power cord from its receptacle.

6. Remove the back panel and allow sufficient time for the oven and heated zones to cool; then turn off supply gases and the air supply to the solenoids at their sources.

7. If variable restrictors are present, remove their mounting hardware in the following order: two M4 screws, hex nut, and mounting bracket for each restrictor valve.

8. Remove two, valve box top assembly, mounting screws, one located near the left front corner and one along the right side edge near the middle. Lift the valve box top assembly straight off the valve box. Be careful not to move the valve rotor index pin from its "at rest" position.

NOTE

If valve/actuator alignment is to be made, see "Valve/Actuator Alignment" in this section, but do not perform steps 9 through 11.

9. To reassemble: Align the two mounting holes in the valve box top assembly with the standoffs in the valve box. Lower the box top assembly until it rests on the standoffs.

10. Secure the valve box top assembly with two M4 mounting screws. Tighten these screws firmly. Reinstall hardware for variable restrictors if present.

11. Exercise the valve(s) on and off a few times to verify operation.

Valve Actuator Alignment

1. Remove the valve box top assembly. See steps 1 through 3 "Valve Box Top Assembly Removal."

2. Loosen the actuator link arm lock screw at each actuator (Figure 2–29) with a 3mm hex key wrench so that the coupling/shaft assembly is free to rotate. Push the coupling shaft fully into the actuator.

3. Turn the valve rotor index pin of each valve counterclockwise (CCW) until it is 0.010 inch (0.25 mm) from the counterclockwise (left–hand) valve stop (Figure 2–31).

4. Set the valve box top assembly on the lower assembly and secure it with the two screws removed in step 1 above. To do this, simply place the valve box top assembly on the two diagonally opposite rectangular standoffs in the lower valve box assembly and install the screws. (The quick release pin should be installed in the 90 degree position for the 6 port valves and in the 60 degree position for the 10–port valves.)

5. Gently rotate and push the coupling/shaft assembly with a blade–type screwdriver until the slot on the coupling fully engages the valve rotor index pin . Repeat this procedure for each valve installed.

6. Make sure that all solenoid valves are turned "off" by the appropriate valve controller. Turn on the air supply to the solenoid valve(s). The piston rod of each actuator will move all the way out to the extended (OFF) position. Very firmly tighten the link arm lock screw for each actuator.

CAUTION

Use care in performing the above operation so as not to accidentally turn the valve rotor away from its preset (step 2) position.

7. Install the hardware for any variable restrictors present.

Valve Actuation of GC-Controlled Valves

(Operation of one or two 120-volt solenoid valves)

Activation of up to two valve solenoids (designated as Purge A or Purge B) may occur in either of two ways. The operator may switch the valves manually whenever it is desirable via keyboard entry, or more conveniently, the valves can be switched ON once and OFF once during a run via the HP 5890's timed events table.

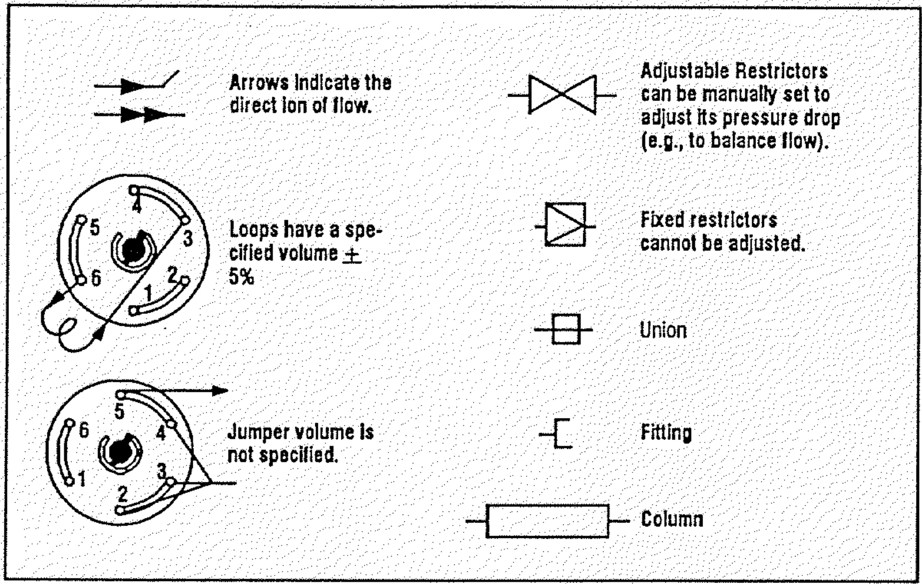
NOTE

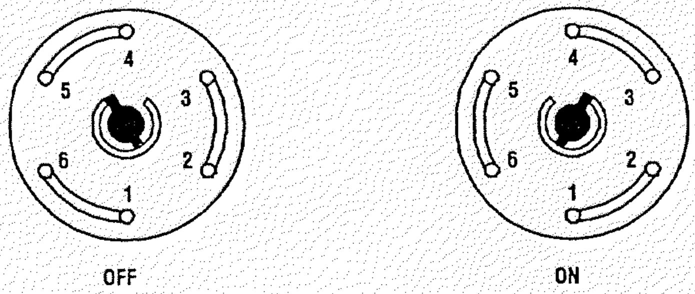
If the valve is already in the position where a command instructs it to switch, no action will occur.

The designated channels (A or B) are determined solely by the wiring connections to the valve box.

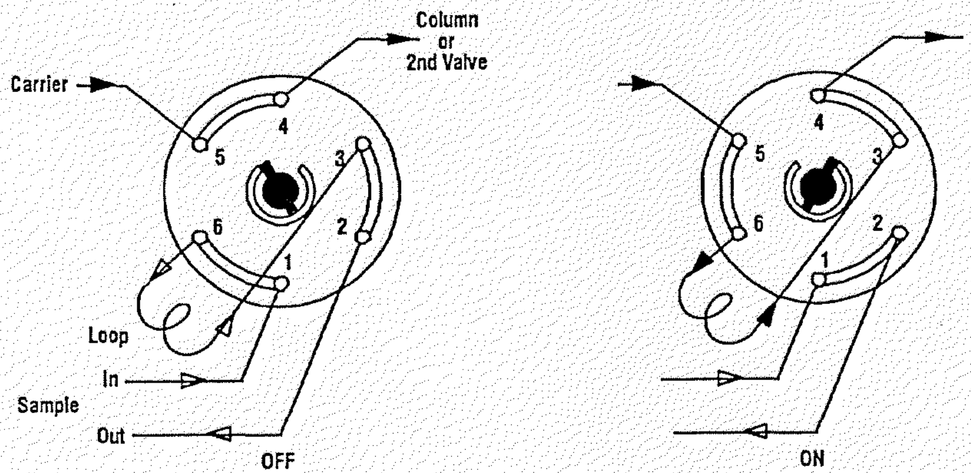
Valve Configuration Diagrams

Legend

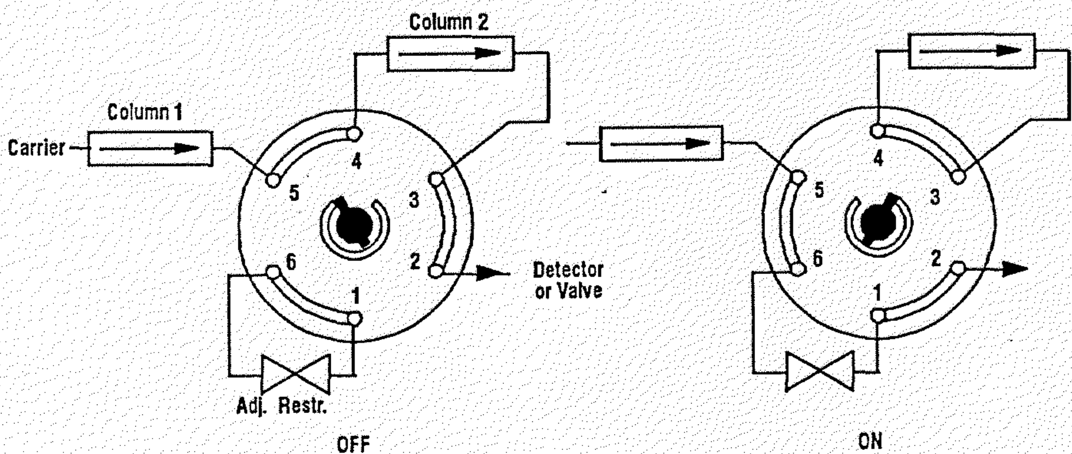




Custom Plumbing (Diagram Required), Option 200 or 230

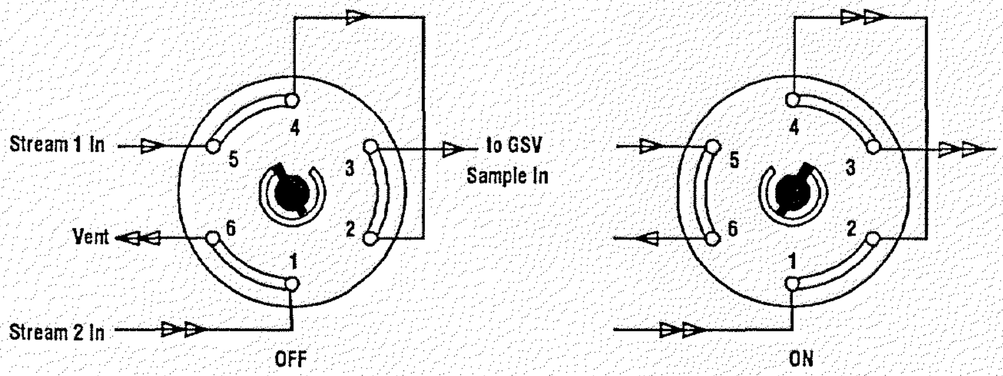


Gas Sampling Option, Option 201 or 231

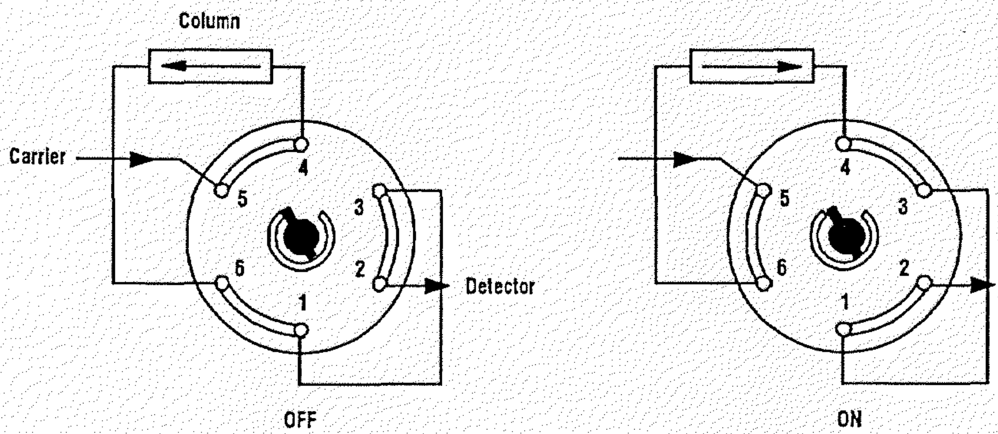


Column Isolation, Option 202 or 232*

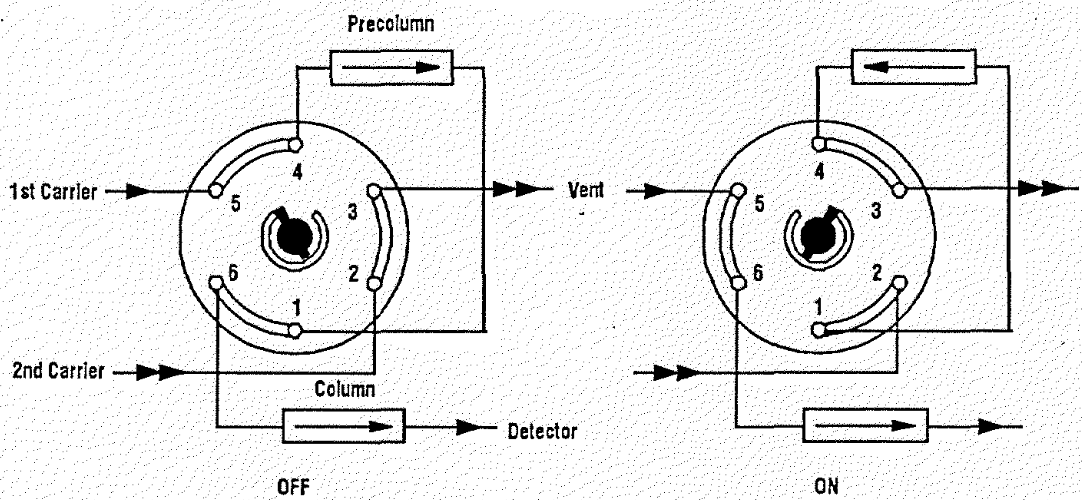
*Temperature limited to 235°C by micrometering needle valve.



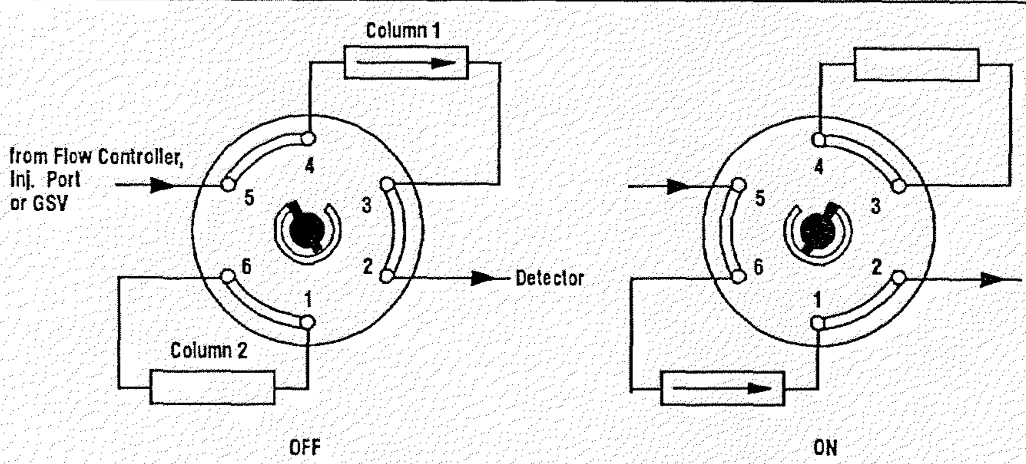
Two Stream Selection (Requires Gas Sampling), Option 203 or 233



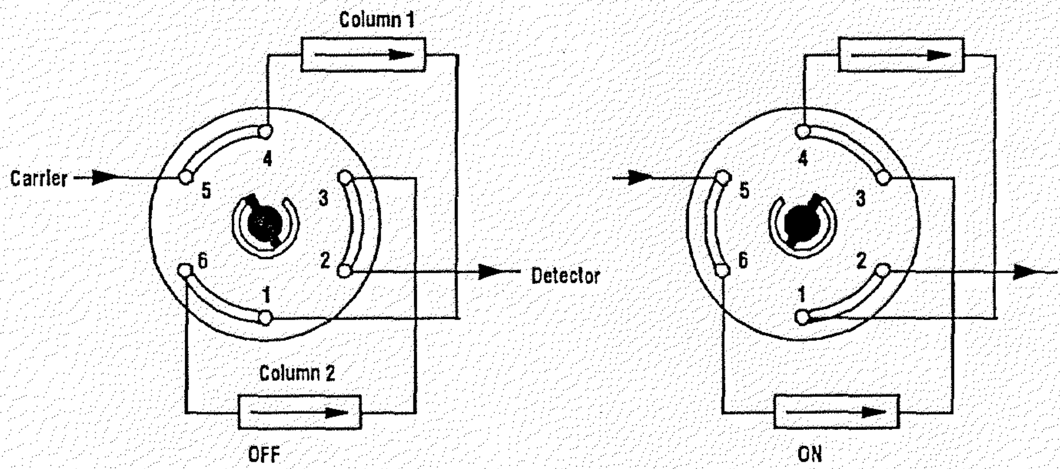
Backflush to Detector, Option 204 or 234



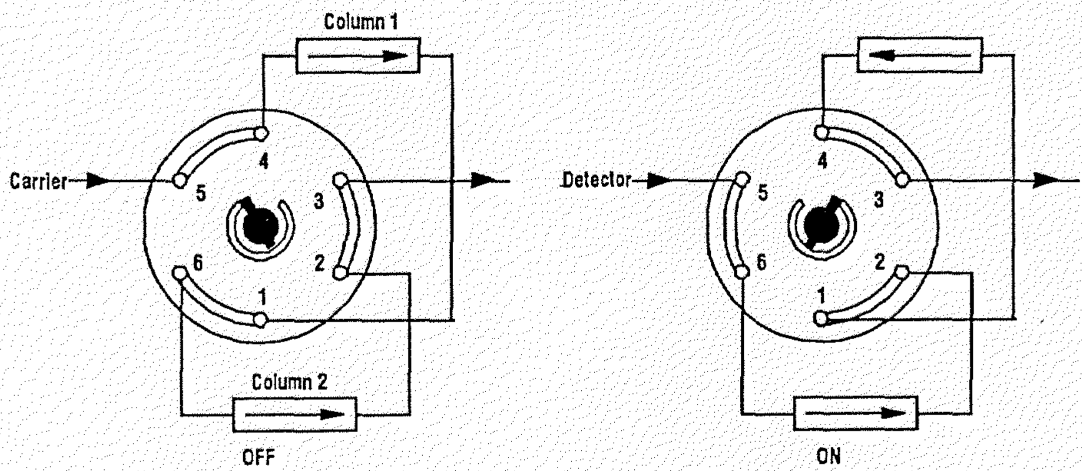
Backflush a Precolumn to Vent, Option 205 or 235



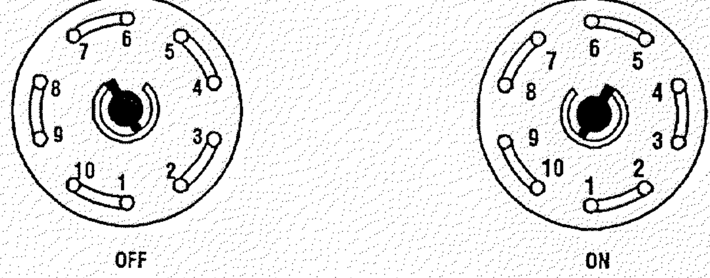
Column Selection (Unused Column Isolated), Option 206 or 236



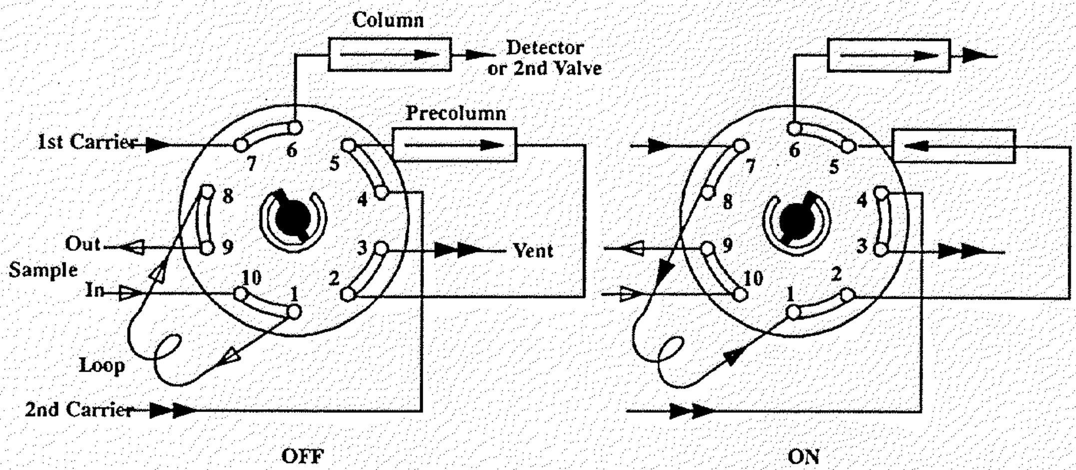
Sequence Reverse, Option 207 or 237



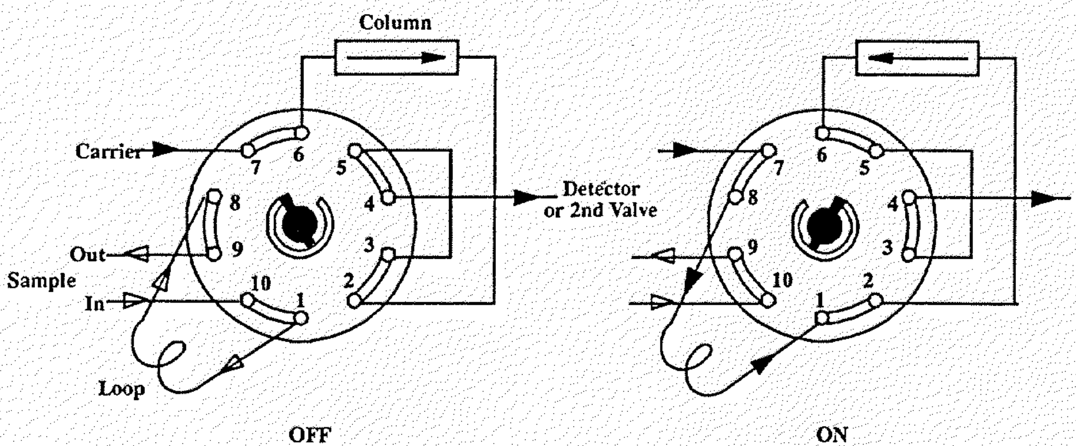
Sequence Reverse with Backflush of Column 1, Option 208 or 238



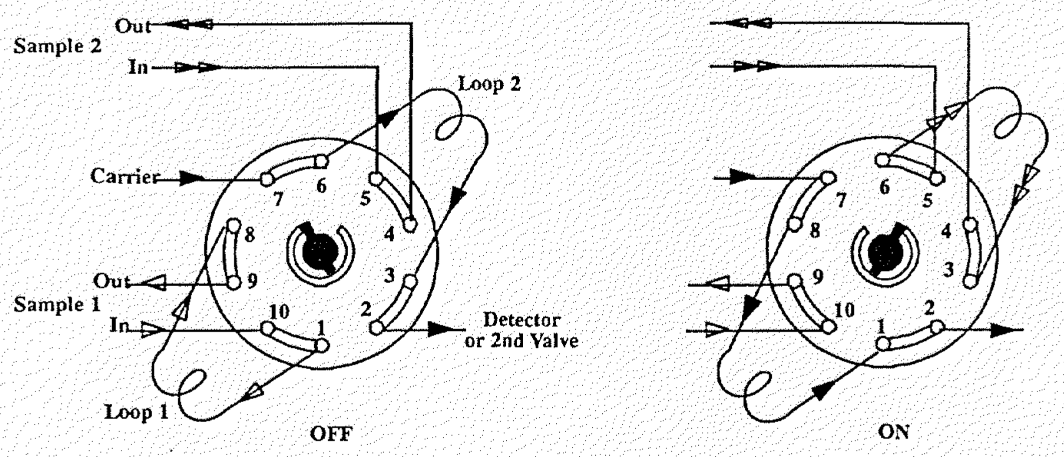
Custom Plumbing (Diagram Required), Option 400 or 430



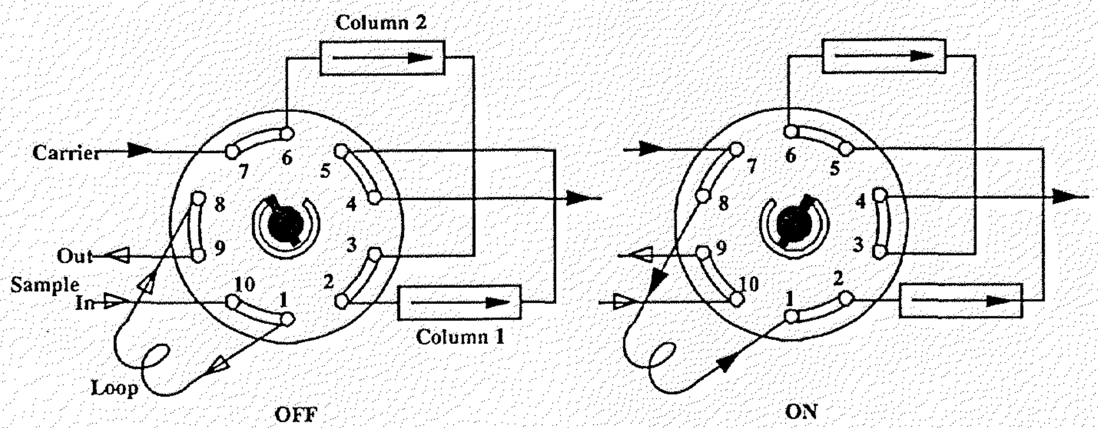
Gas Sampling with Backflush of Precolumn to Vent, Option 401 or 431



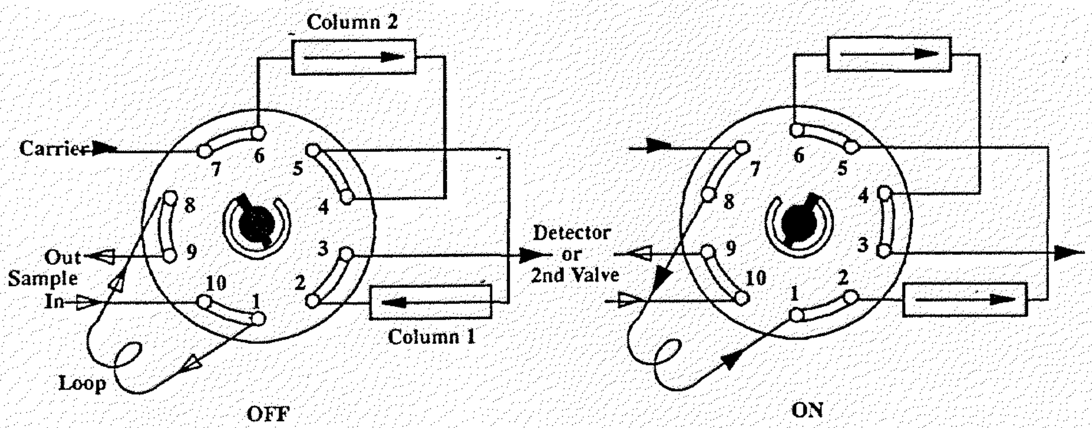
Gas Sampling with Backflush to Detector, Option 402 or 432



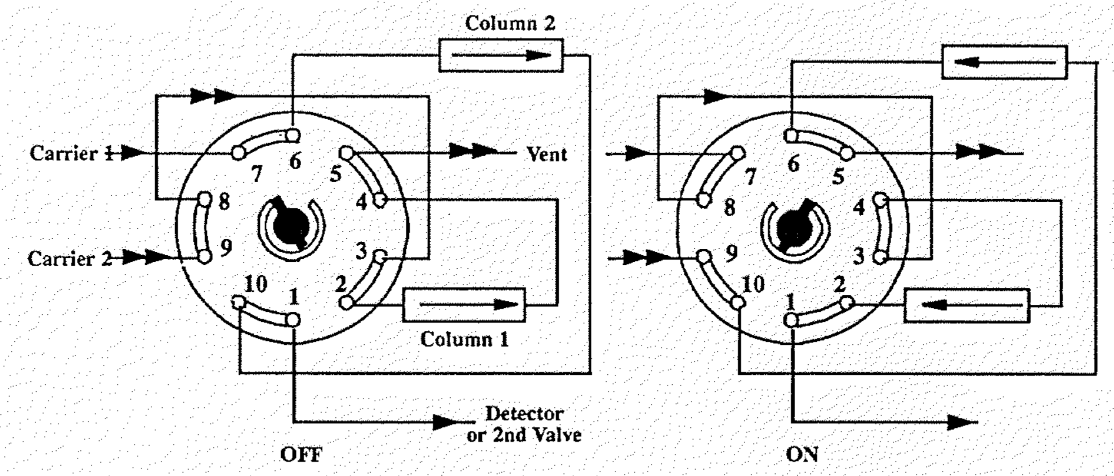
Gas Sampling of Alternate Streams, Option 403 or 433



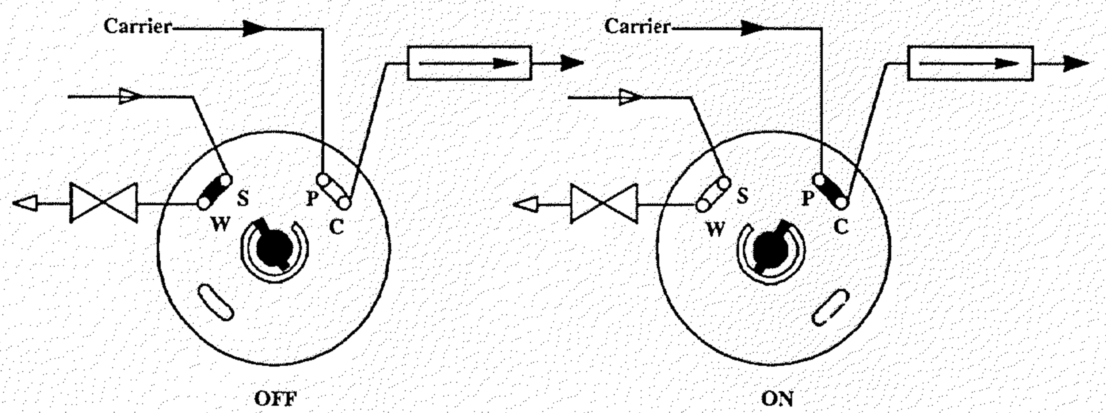
Gas Sampling with Sequence Reverse, Option 404 or 434



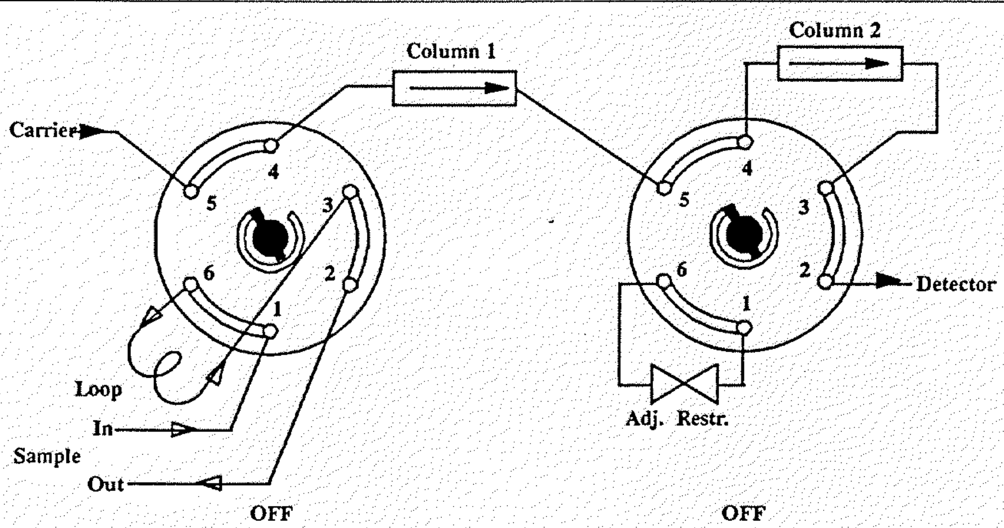
Gas Sampling with Sequence Reverse and Backflush of Column 1, Option 405 or 435



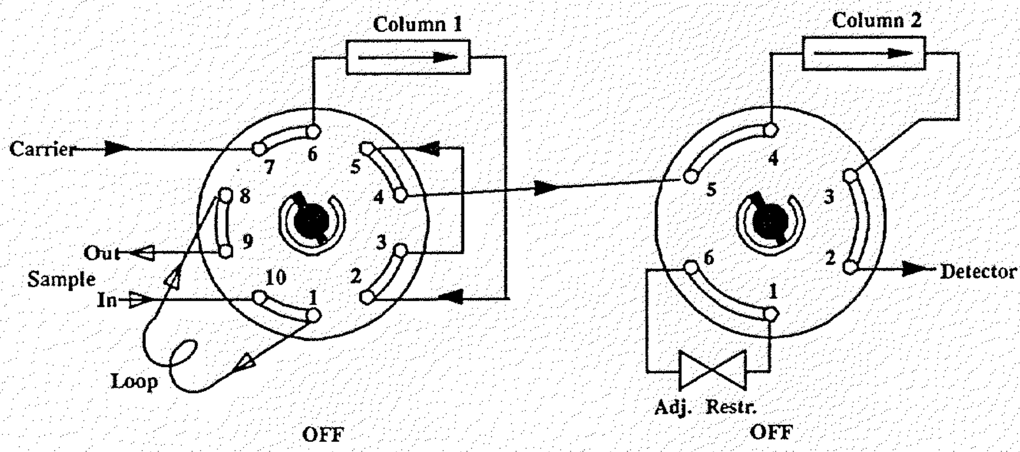
Column Selection with Backflush to Vent, Option 406 or 436



Liquid Sampling, Options 151, 152, 153, and 162



Gas Sample and Column Isolation, Option 601



Gas Sample/Backflush and Column Isolation, Option 602

Section 8

KEYBOARD AND DISPLAY

KEYBOARD AND DISPLAY REPLACEMENT

The keyboard and display components of the HP 5890 Series II are housed in a single display PCB assembly. Removal, disassembly. and installation instructions for the display PCB assembly are found on the following pages. Refer to page XX of this section for information on troubleshooting the keyboard and display components. Refer to Section 9 of the IPB for part numbers associated with the keyboard and display components.

Current maintenance philosophy suggests that the display PCB assembly be replaced as a unit, rather then replacing the display PCB, keyboard connector element, etc. individually. Maintenance procedures have been included to allow for the disassembly of the display PCB assembly in the event that the shroud assembly is not available in a timely manner, etc.

TABLE OF CONTENTS

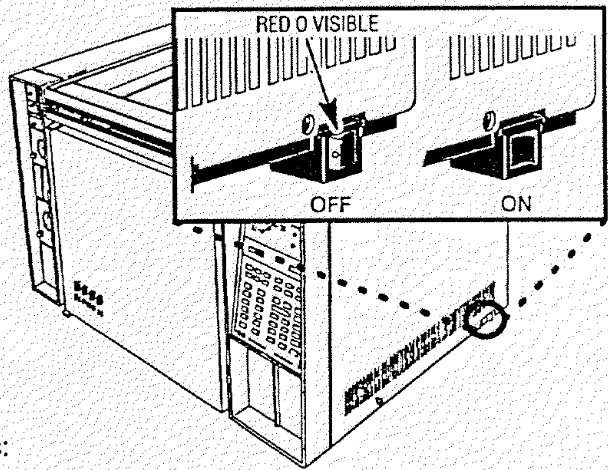
Keyboard and Display Troubleshooting

Problem	Probable Cause	Corrective Action
1. No visual indications of any kind on display.	a. Faulty display PCB assembly.	1. Replace display PCB assembly. 2. If problem persists, remove replaced display PCB 3. Install original display PCB assembly. 4. Go to probable cause b.
	b. Faulty display PCB ribbon cable.	1. Replace display PCB ribbon cable.. 2. If problem persists, go to probable cause c.
	c. Faulty main PCB.	1. Replace main PCB.
2. Some portion of the display is blank. (Bad LED, etc.)	a. Faulty display PCB assembly.	1. Shut off instrument and restart. 2. All indicators should light during start-up self test. Observe suspect portion of display. 3. If any indicators are out, replace display PCB. 4. If problem persists, remove replaced display PCB 5. Install original display PCB assembly. 6. Go to probable cause b.
	b. Faulty display PCB ribbon cable.	1. Replace display PCB ribbon cable.. 2. If problem persists, go to probable cause c.
	c. Faulty main PCB.	1. Replace main PCB.
3. No keyboard control of instrument.	a. Keyboard locked.	1. Press clear dot minus enter and set the lock status to OFF. 2. If problem persists, go to probable cause b.
	b. Faulty display PCB assembly.	1. Replace display PCB assembly. 2. If problem persists, remove replaced display PCB 3. Install original display PCB assembly. 4. Go to probable cause c.
	c. Faulty display PCB ribbon cable.	1. Replace display PCB ribbon cable.. 2. If problem persists, go to probable cause d.
	d. Faulty main PCB.	1. Replace main PCB.

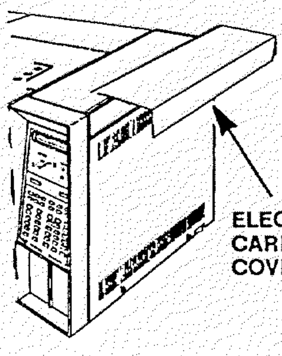
Replace Display PCB Assembly

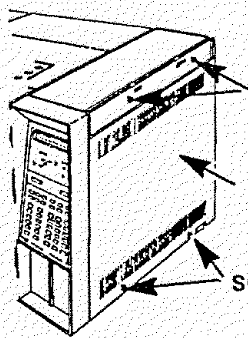
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.



1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
4. Remove the right side panel by removing four screws: two each along its upper and lower edges.





CAUTION

This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

5. Free the keyboard connector (J1) from connector receptacle P1 on the main PCB by releasing the locking tabs (one on either side of the connector receptacle).

CAUTION

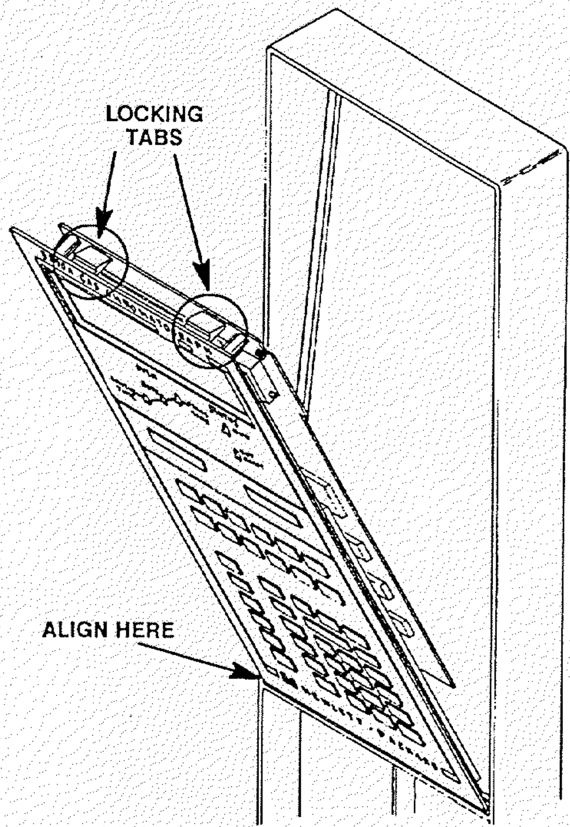
When disconnecting a plug, pull on the plug not on its wires. Pulling on the wires may cause breakage.

6. Remove connector J1 from connector receptacle P1 by carefully pulling it straight out.

NOTE

It may be necessary to remove the detector PCB from the "a" position on the main PCB in order to access the locking tabs at the top of the display PCB assembly. Refer to Section 4 of this document for information on the removal of detector PCBs.

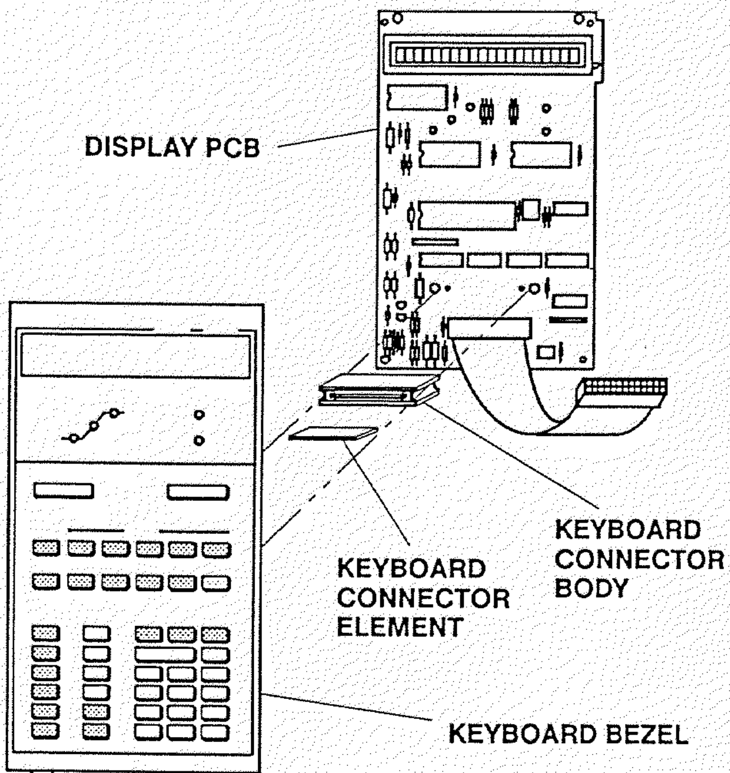
7. Reach behind the display PCB assembly and depress the two locking tabs which secure the assembly (at the top) to the electronics bezel.
8. While depressing the locking tabs on the display PCB assembly, tilt the top of the display PCB assembly forward (away from the front of the instrument).
9. Remove the display PCB assembly from the instrument.



NOTE

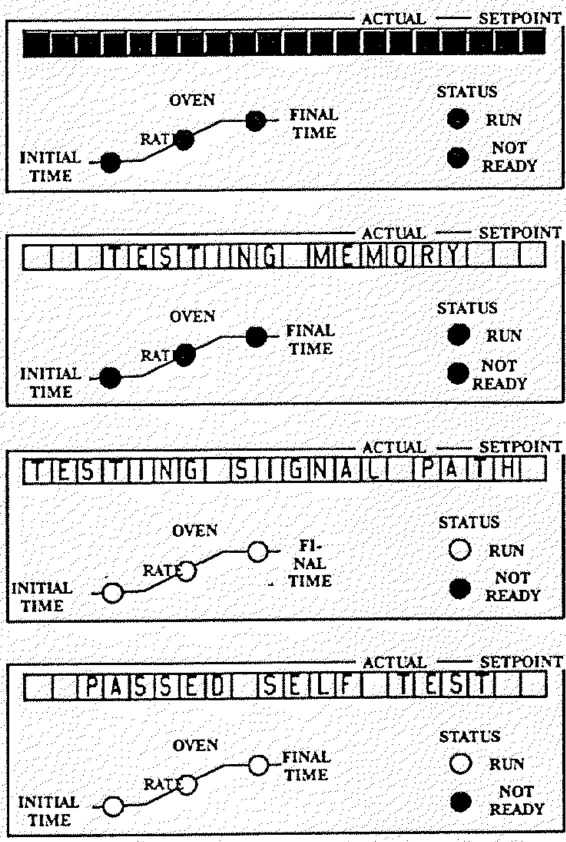
The display PCB assembly may be replaced as a unit, or the individual pieces which make it up may be ordered. If the entire display PCB assembly is to be replaced, go to step 15.

10. Remove the four screws securing the display PCB to the keyboard bezel.
11. Remove the display PCB from the keyboard bezel.
12. Remove the suspect component.
13. Install desired replacement component.



14. Install the display PCB onto the keyboard bezel (making sure that the keyboard connector element and keyboard connector body are properly installed) and secure using four screws.
15. Align the locating tabs on the bottom edge of the replacement display PCB assembly with the locating slots on the bottom of the opening in the electronics bezel.
16. Tilt the top of the display PCB assembly (toward the rear of the instrument) and gently press on the display board near the top until the locking tabs "click" into place.
17. If removed, install the detector PCB removed from position "A" on the main PCB.
18. Install connector J1 into connector receptacle P1 on the main PCB. (When connector J1 is properly seated, the locking tabs on connector receptacle P1 will wrap around the edge of the connector, locking it in place.)
19. Install the right side panel and secure using four screws.
20. Install the electronics carrier top cover.
21. Restore all gas supplies.
22. Restore power to the instrument.
23. Observe the alphanumeric display, as the instrument performs an internal self-diagnostic integrity check. to ensure that the instrument shows the expected normal displays.

NORMAL"INTEGRITY CHECK" AT POWER-ON



Test of display elements: all alphanumeric and LED elements are lit.

5890 Series II memory test in progress.

5890A Self-testing in progress.
LEDs off, except possibly "NOT READY."

Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.
LEDs off, except possibly "NOT READY."

Section 9

MAIN PCB

Specific part numbers are not given in this section. For replacement part numbers, refer to the Section 9 of the IPB (Electronics).

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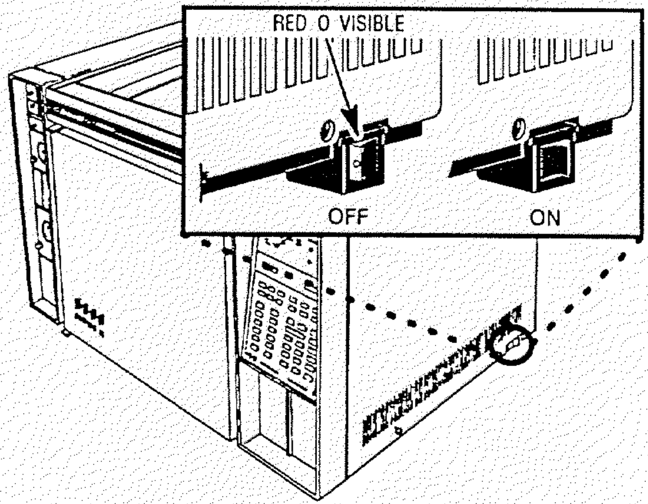
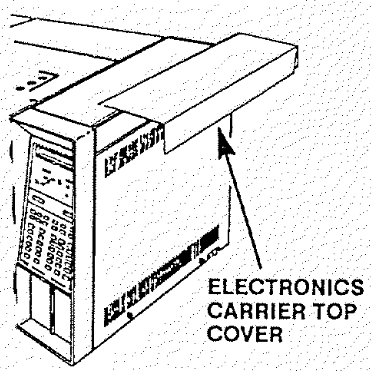
Replace Main PCB

WARNING

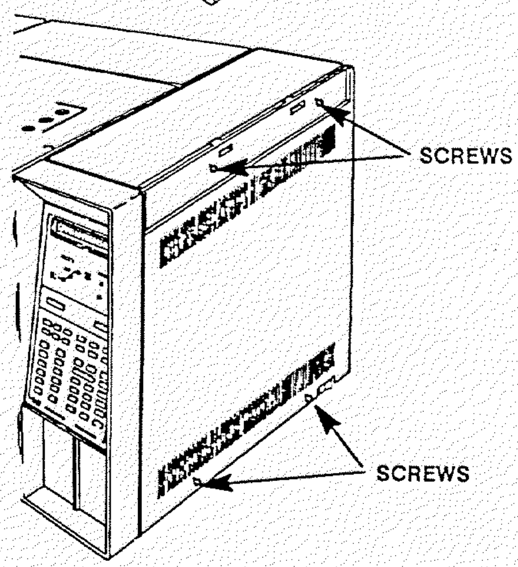
- **HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.**
- **NPD AND FID DETECTORS USE HYDROGEN GAS AS FUEL. BE SURE ALL HYDROGEN GAS IS TURNED OFF AT ITS SOURCE BEFORE REPLACING ANY FLOW COMPONENTS.**

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the electronics carrier top cover.

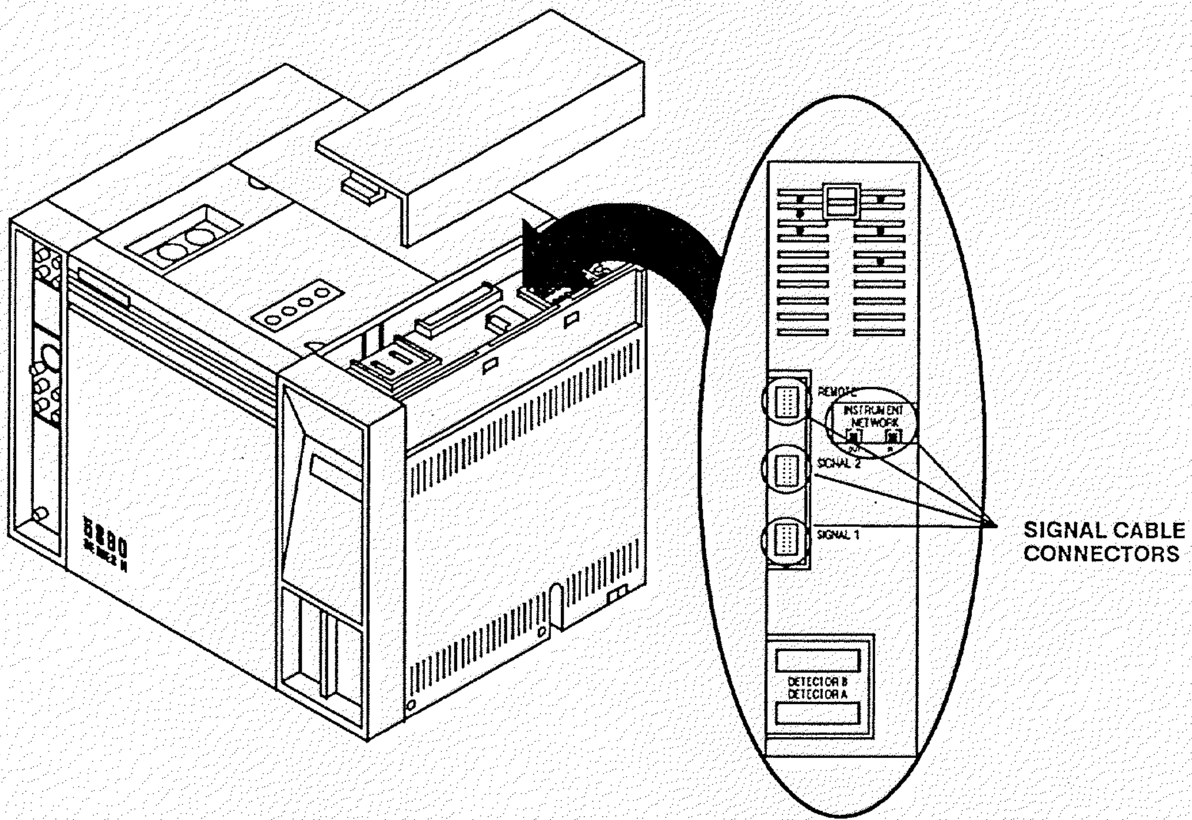




6. Remove the right side panel by removing four screws: two each along its top and bottom edges.



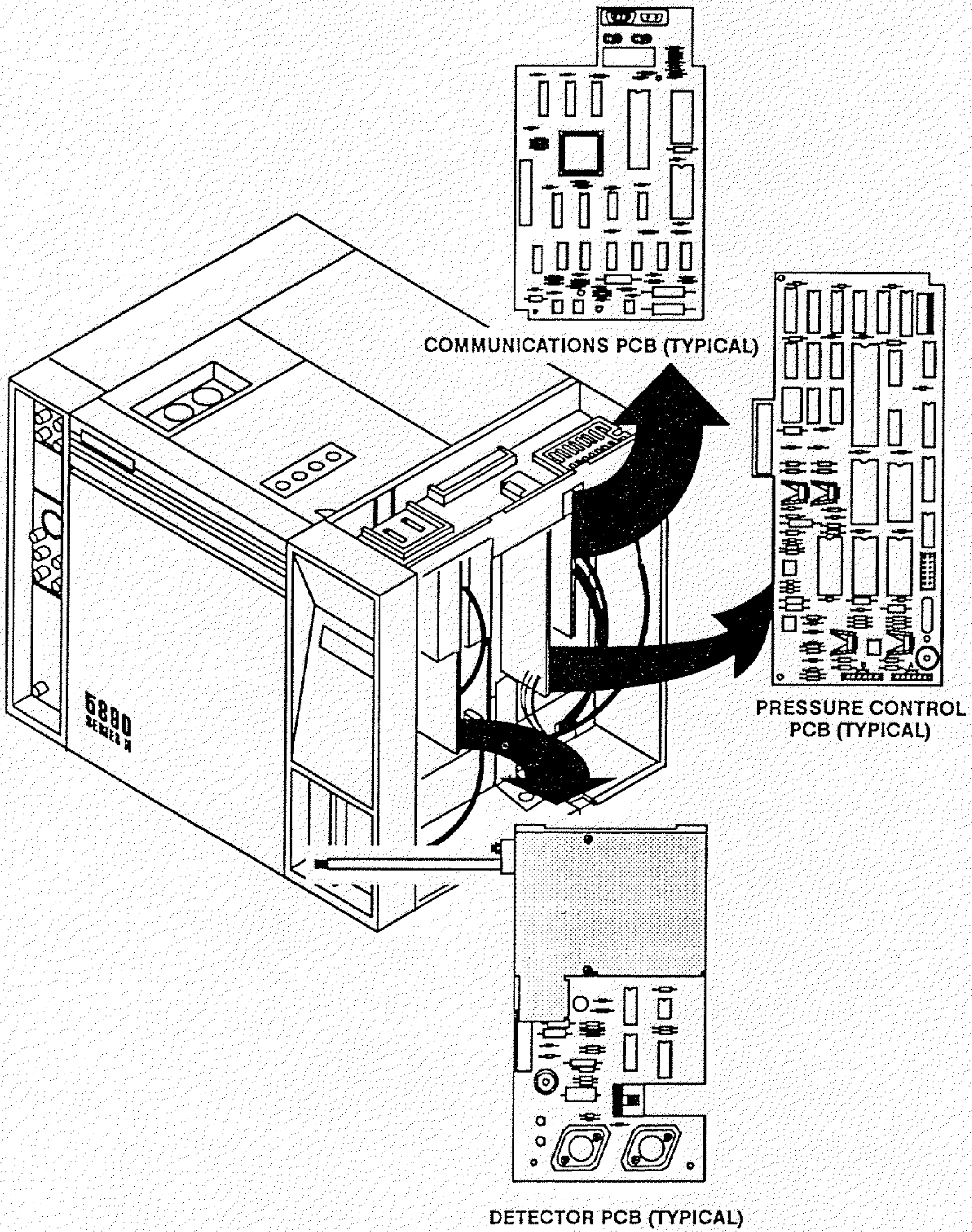
7. Disconnect any signal cables installed at the connectors on the top of the main PCB.



CAUTION

- **The following steps require protection against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.**
- **When storing or in between handling of PCBs (Printed Circuit Boards), always place them in static control envelopes or enclosures.**

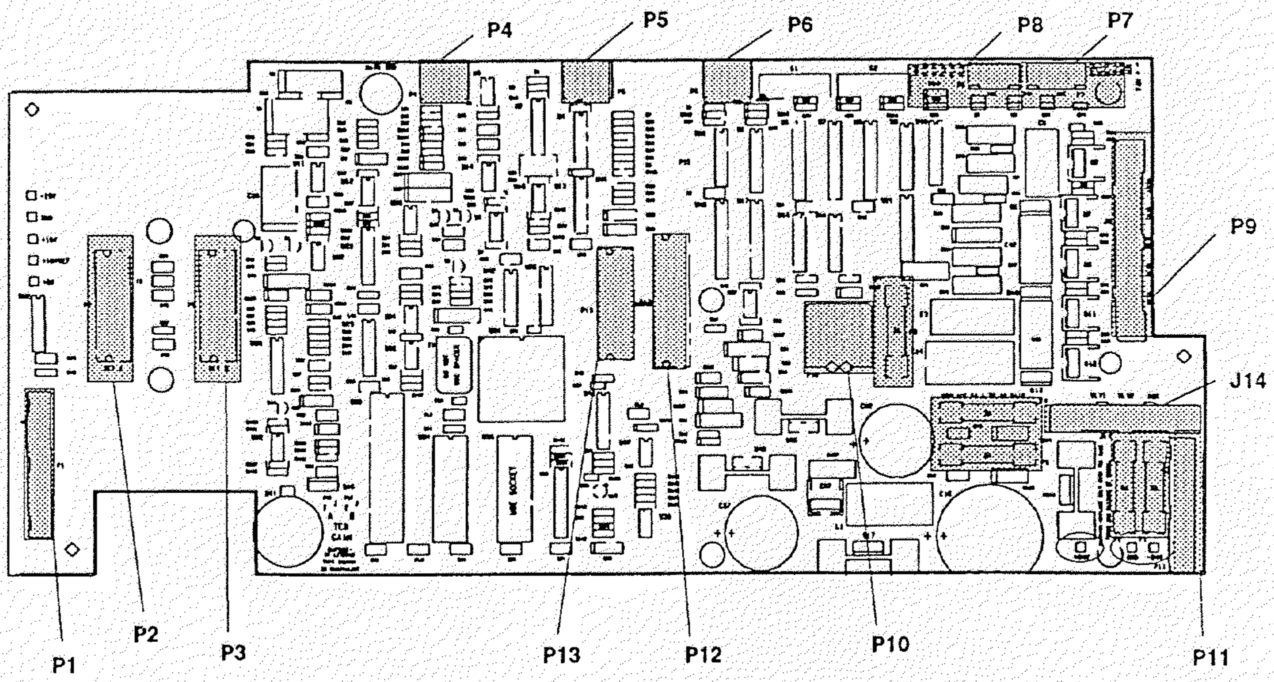
8. Remove detector PCB(s), optional communications interface PCB, and optional EPC (Electronic Pressure Control) or MPC (Manual Pressure Control) interfcae PCB if installed. (Refer to section 4 of this manual for information on removal and installation of detector PCBs. Refer to section 10 of this manual for information on removal and installation of Communications interface PCBs. Refer to section 3 of this manual for information on removal and installation of the EPC/MPC interface PCB.



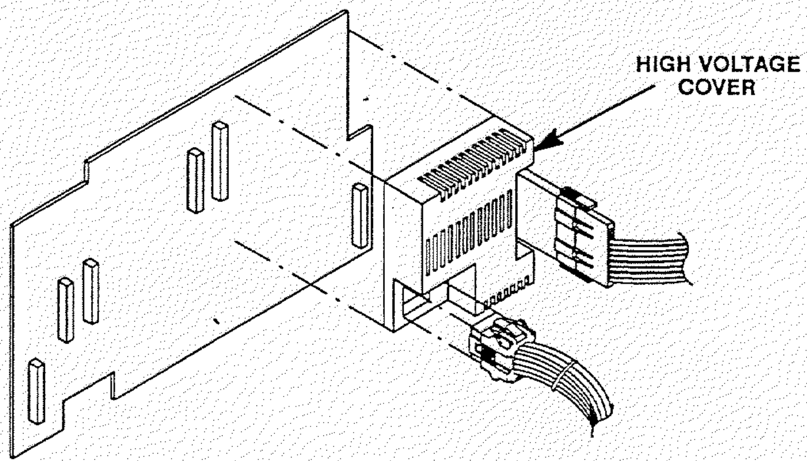
CAUTION

WHEN DISCONNECTING A PLUG, PULL ON THE PLUG NOT ON ITS WIRES. PULLING ON THE WIRES MAY CAUSE BREAKAGE.

9. Disconnect connectors (if present) from their respective receptacles ("J1," "J7," "J8," "J10," and "J11") by carefully pulling them straight out. (For "J1" and "J11," note the locking tab at each end of the plug: these must be released to free the plug for removal.) (Also, note that "J10" plug is released by squeezing its ribbed sides while pulling.)

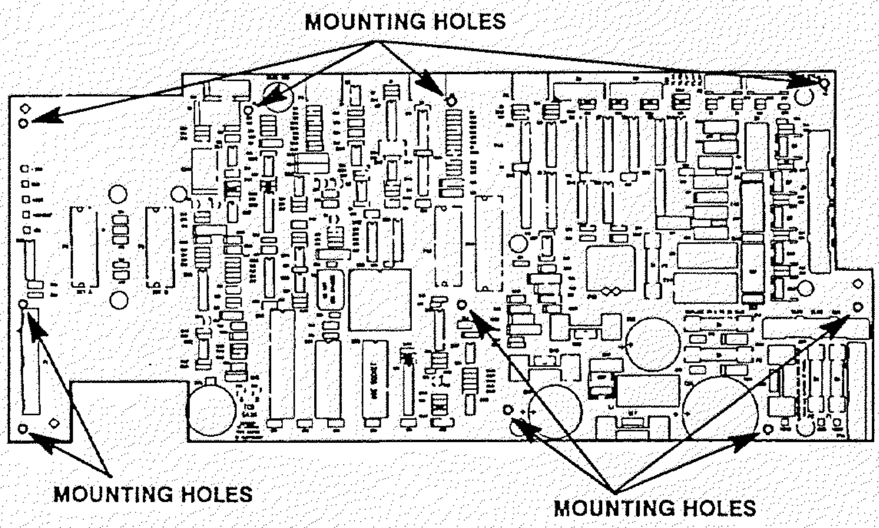


10. Remove the high voltage cover covering the triac components.



11. Disconnect connector from receptacle J9 by squeezing its ribbed sides while pulling it straight out.

12. Verify all interconnecting plugs are now disconnected.



13. Remove seven screws securing the main PCB to the electronics flow carrier.

14. Remove the main PCB from the instrument by carefully tipping it towards the right side of the instrument, and then lifting it from its support brackets.

15. Position the replacement main PCB so its lower edge is within the support brackets; then slide the board to its left or right as needed to align it with locater posts and holes for mounting screws.

16. Secure the board in place with the seven mounting screws. Make sure the longest screw is installed in the hole marked "MAIN GND" at the top of the board.

17. Install all connectors, detector PCBs, communications interface PCB (if present), EPC/MPC interface PCB (if present), and signal cables.

18. Restore all gas supplies to the instrument.

19. Install the right side panel and secure using four screws.

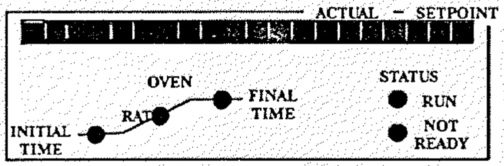
20. Install the electronics carrier top cover.

21. Restore power to the HP 5890 Series II.

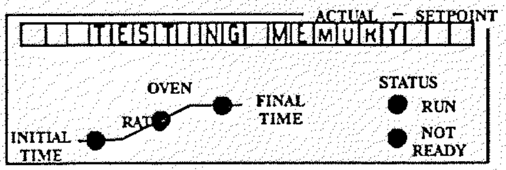
22. Observe the alphanumeric display as the instrument performs an internal self-diagnostic integrity-check.

23. If the self-testing process does not complete successfully, and/or if a message other than "PASSED SELF TEST" eventually appears, see "Electronic Troubleshooting," for diagnostic and troubleshooting information.

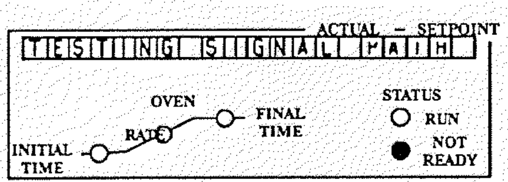
NORMAL "INTEGRITY CHECK" AT POWER-ON



Test of display elements: all alphanumeric and LED elements are lit.

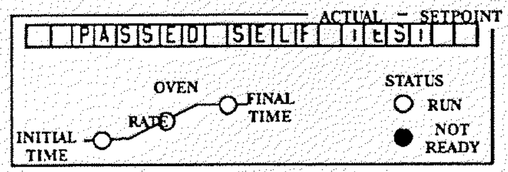


5890A memory test in progress.



5890A Self-testing in progress.

LEDs off, except possibly "NOT READY."



Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.

LEDs off, except possibly "NOT READY."

Section 10

DATA COMMUNICATIONS

COMMUNICATION INTERFACE COMPONENTS

There are five possible data communication options which may be encountered in instruments found in the field. The five options are Non-Buffered INET, Buffered INET, RS-232-C, HPIB/RS-232-C (DICE), and analog input. Communications Interface PCBs are optional and may not be installed in all instruments.

Specific part numbers are not given in this section. For replacement part numbers, refer to the Section 9 of the IPB (Electronics).

This document is not meant to provide instruction for first time installation of any of the options discussed. The add-on sheets, which accompany the various options, exist for just this purpose, and should be referenced when performing a first time installation.

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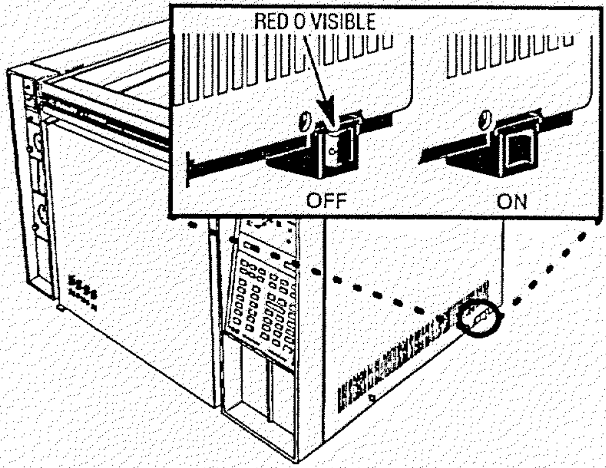
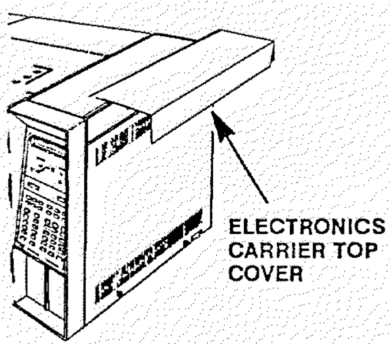
Replace Communications Interface PCB

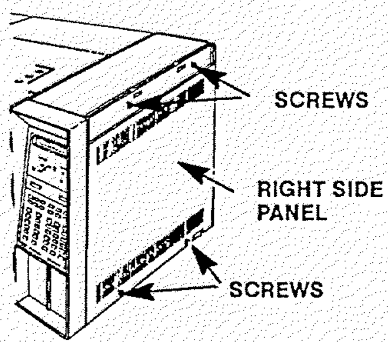
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.



1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
6. Remove the right side panel by removing four screws: two each along its upper and lower edges.





CAUTION

This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

NOTE

Depending upon the type of communications PCB installed, there may be one or more connecting cables installed which must be disconnected before PCB removal.

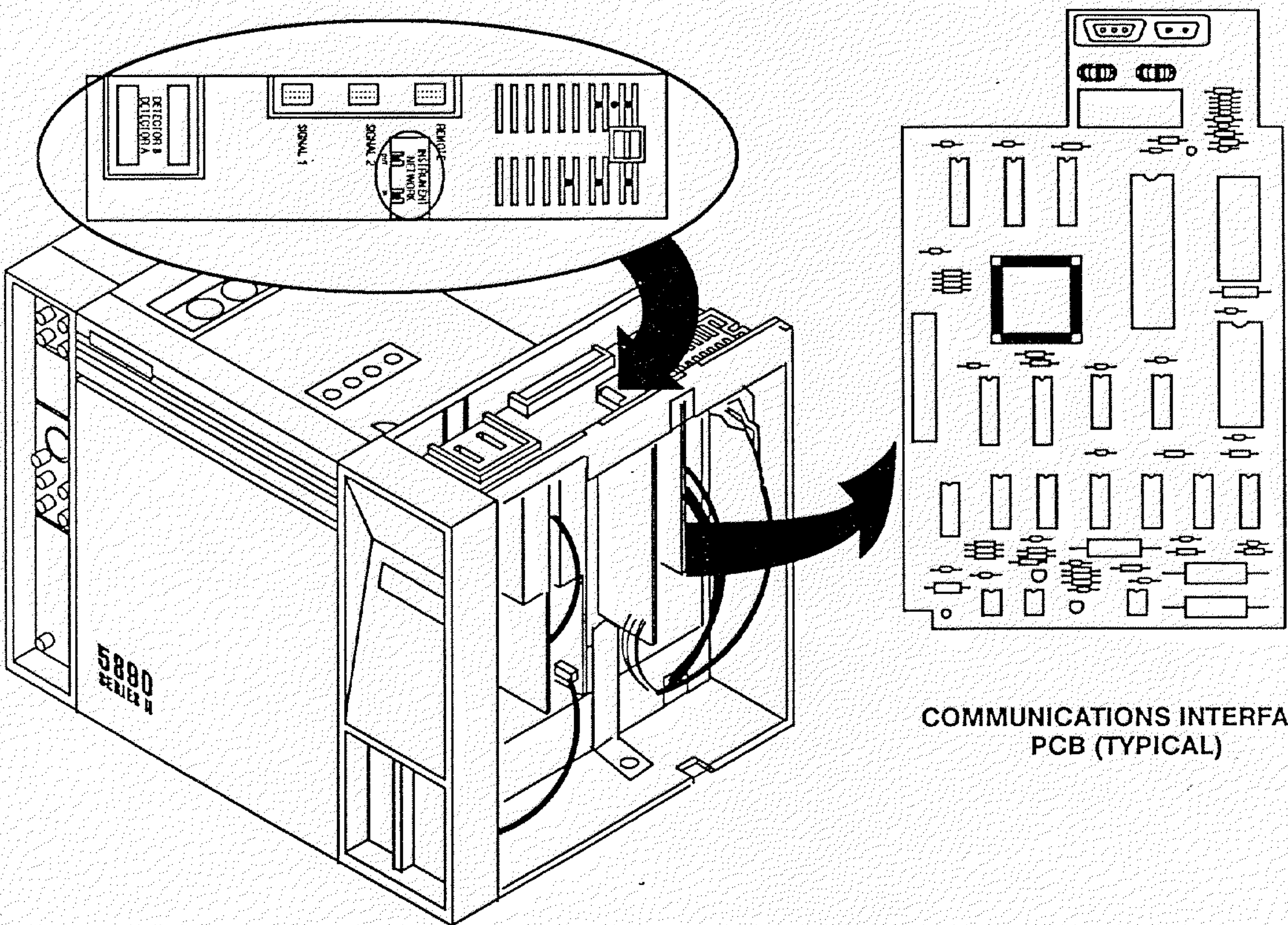
7. If a non-buffered INET PCB, buffered INET PCB, or HPIB/RS-232-C PCB is installed, disconnect the INSTRUMENT NETWORK (INET) IN and OUT cables from their connectors on the communications PCB.

8. If an HPIB/RS-232-C communications PCB is installed, free and remove the rear panel PCB cable from the connector on the communications PCB by releasing the locking tabs (one on either side of the connector receptacle) and pulling the cable straight out.

9. If an RS-232-C communications PCB is installed, a different cable is used to connect the PCB to the RS-232-C port of the connected device. Remove the 12-pin connector from the communications PCB. (The cable is installed through the opening where the INET cables are usually connected.)

10. If an analog input communications PCB in installed, remove the cable connected to at the top of the PCB.

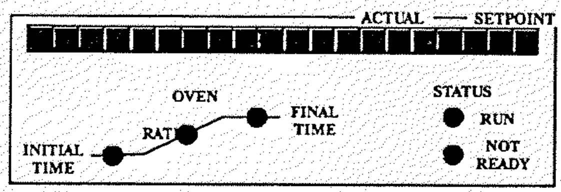
11. Remove the communications PCB by grasping it in the center area along its right edge and pulling it from its connector on the main PCB.



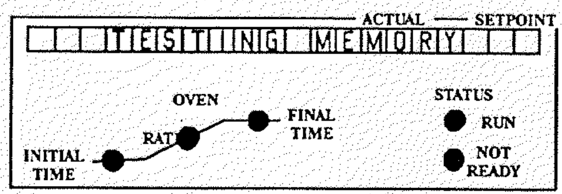
COMMUNICATIONS INTERFACE PCB (TYPICAL)

12. Install the replacement PCB by inserting it straight into its connector on the main PCB.
13. Connect the cable(s) removed during steps 7 through 10.
14. Install the right side panel and secure using four screws.
15. Install the electronics carrier top cover.
16. Restore all gas supplies.
17. Restore power to the instrument.
18. Observe the alphanumeric display, as the instrument performs an internal self-diagnostic integrity check. to ensure that the instrument shows the expected normal displays.

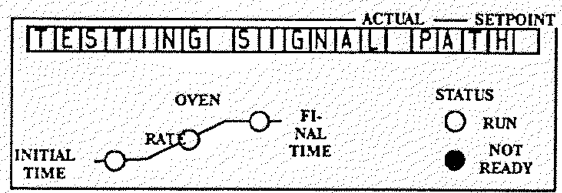
NORMAL "INTEGRITY CHECK" AT POWER-ON



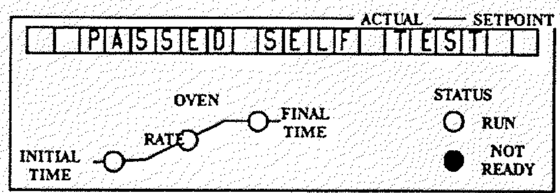
Test of display elements: all alphanumeric and LED elements are lit.



5890 Series II memory test in progress.



5890A Self-testing in progress.
LEDs off, except possibly "NOT READY."

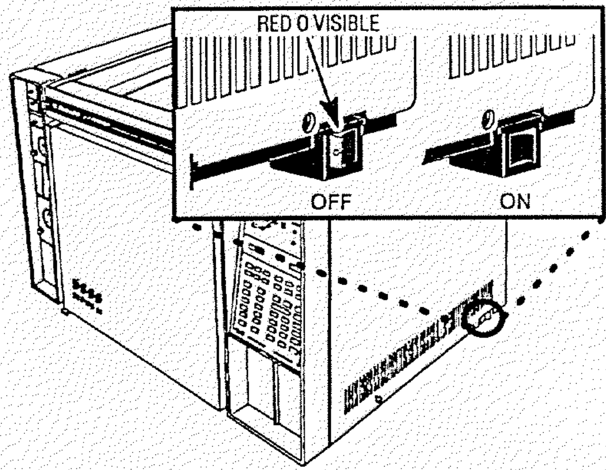


Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.
LEDs off, except possibly "NOT READY."

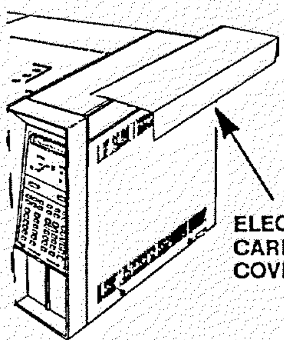
Replace Rear Panel Connector PCB and/or Cable for DICE PCB

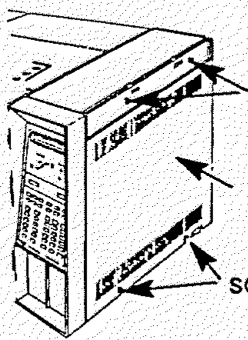
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

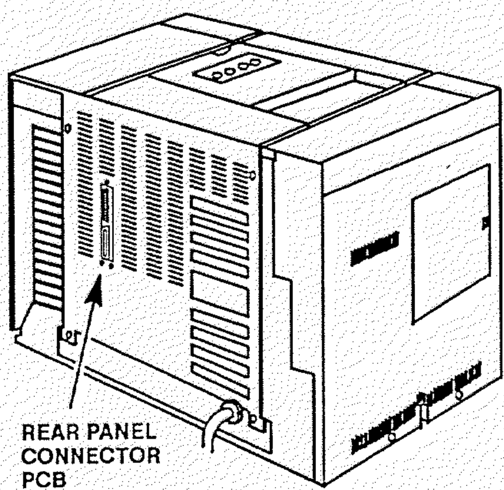


1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Allow time for the oven and heated zones to cool.
4. When the heated zones are cool, turn off all gas supplies.
5. If the rear panel connector PCB ribbon cable is to be replaced, remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it towards the rear of the instrument.
6. If the rear panel connector PCB ribbon cable is to be replaced, remove the right side panel by removing four screws: two each along its upper and lower edges.





7. Remove the four screws securing the rear panel to the instrument.
8. If the rear panel connector PCB is to be replaced, remove the three screws securing the rear panel connector PCB to the rear panel.

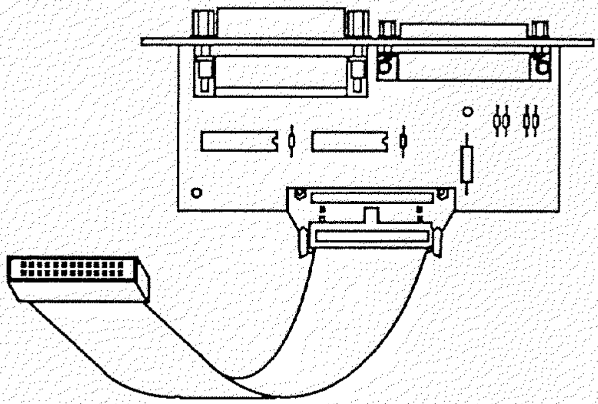


CAUTION

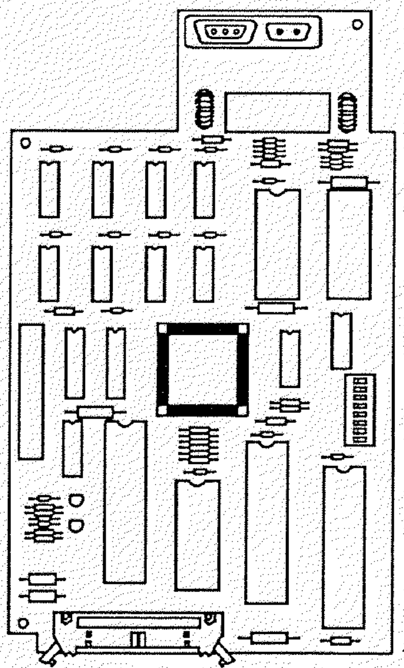
This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

9. Slide the rear panel away from the back of the instrument, taking care not to damage the rear panel connector PCB ribbon cable.

10. If the rear panel connector PCB is to be replaced, remove it from the rear panel.



11. Free and remove the ribbon cable from the rear panel connector PCB by releasing the locking tabs (one on either side of the connector receptacle) and pulling the cable straight out.



12. If the rear panel connector PCB ribbon cable is to be replaced, free and remove the cable from the connector on the communications PCB by releasing the locking tabs (one on either side of the connector receptacle) and pulling the cable straight out.

13. If the ribbon cable is to be replaced, slide the old ribbon cable out of the opening in the electronics carrier.

14. If the ribbon cable is being replaced, slide the new ribbon cable into the opening in the electronics carrier.

15. If the ribbon cable is being replaced, install the new ribbon cable into the connector receptacle on the communications PCB. (When the connector is properly seated, the locking tabs on the connector receptacle will wrap around the edge of the connector, locking it in place.)

16. Install the ribbon cable into the connector receptacle on the rear panel connector PCB. (When the connector is properly seated, the locking tabs on the connector receptacle will wrap around the edge of the connector, locking it in place.)

17. If a new rear panel connector PCB is being installed, secure it to the rear panel using three screws.

18. Install the rear panel and secure using four screws.

19. If it was necessary to remove the right side panel, install it and secure using four screws.

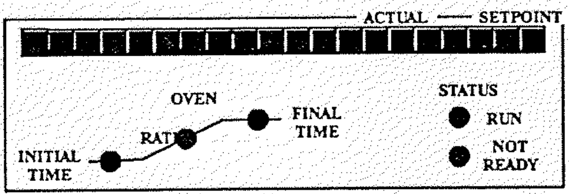
20. If it was necessary to remove the electronics carrier top cover, install it now.

21. Restore all gas supplies.

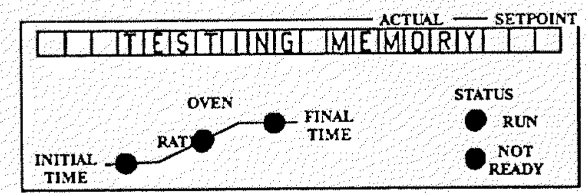
22. Restore power to the instrument.

23. Observe the alphanumeric display, as the instrument performs an internal self-diagnostic integrity check. to ensure that the instrument shows the expected normal displays.

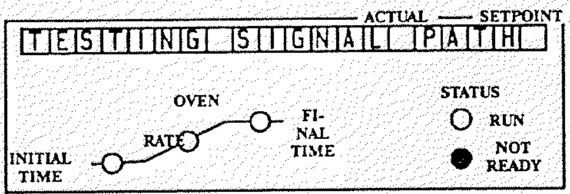
NORMAL "INTEGRITY CHECK" AT POWER-ON



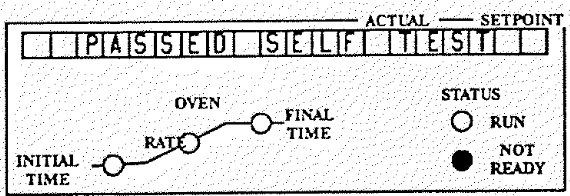
Test of display elements: all alphanumeric and LED elements are lit.



5890 Series II memory test in progress.



5890A Self-testing in progress.
LEDs off, except possibly "NOT READY."



Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.
LEDs off, except possibly "NOT READY."

INET CONFIGURATION

("CALIB AND TEST" function 3)

The CONFIGURE NETWORK function provides four features: verifying the INET address for the HP 5890A (as determined through automatic loop configuration), setting the default HP-IL address to be used when the HP 5890A is connected to some device where addresses must be set manually (i.e., no automatic loop configuration), switching the INET function at the HP 5890A between "global" or "local," and verifying INET signal definitions. Each feature is discussed separately.

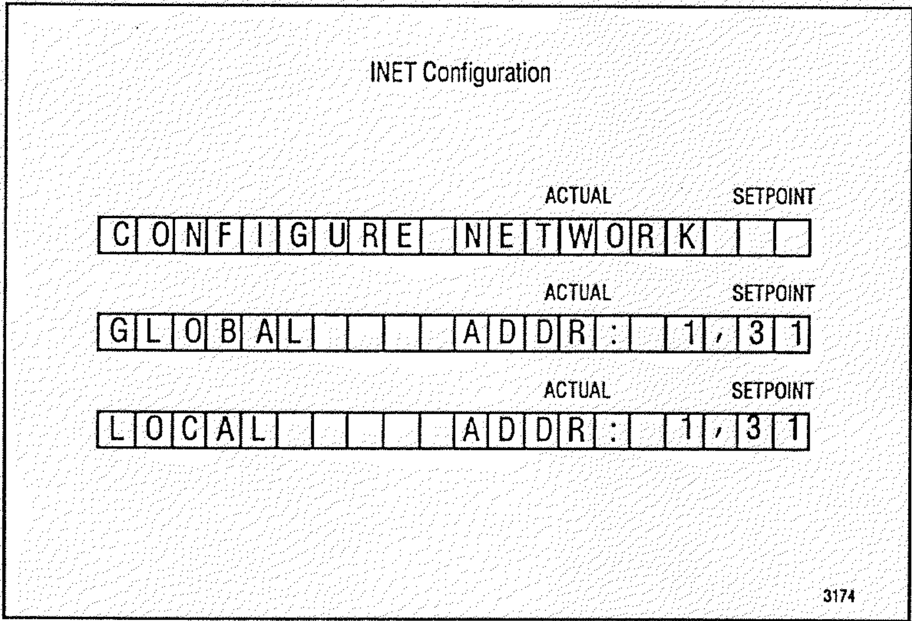


Figure 13-4. "CONFIGURE NETWORK" Displays

Figure 13-4 shows displays resulting from the key sequence:

[CLEAR] [•] [3] [ENTER]

Switching Between "Global" and "Local"

With regard to the INET function at the HP 5890A, there are two operating modes: "global" or "local." In "global" mode (default mode), HP 5890A [START] and [STOP] keys, when pressed, affect other devices on the INET loop. In "local" mode, however, pressing [START] or [STOP] at the HP 5890A affects only the HP 5890A. A run may be started or stopped at the HP 5890A without affecting other devices on the INET loop.

In "local" mode, note that the HP 5890A remains part of the INET system; it reports its "readiness" to the system and pressing "START" and "STOP" keys on other devices on the INET loop (e.g., the controller) will affect HP 5890A operation.

Once in "CONFIGURE NETWORK," pressing [ON] or [OFF] switches, respectively, between "global" or "local" mode shows resulting displays as in Figure 13-5.

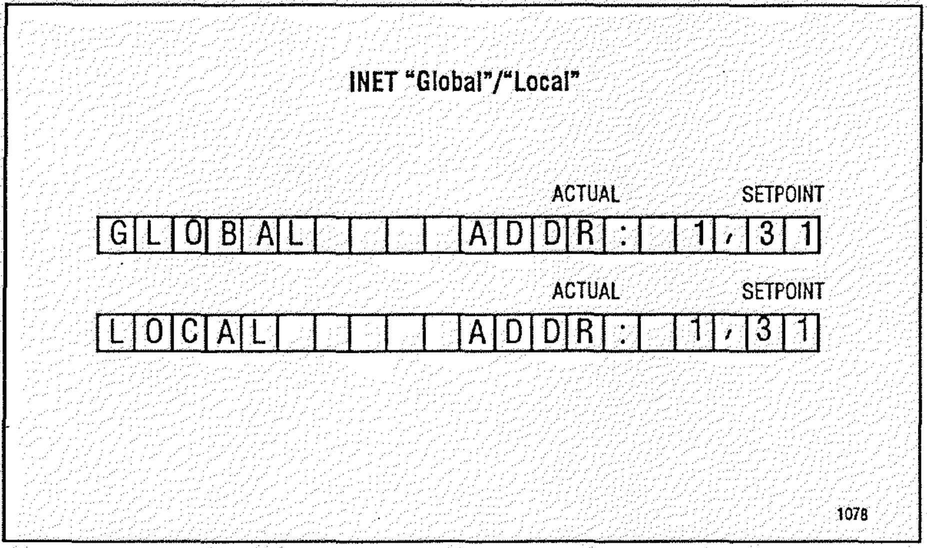


Figure 13-5. INET "GLOBAL/LOCAL" Displays

An example of where having the HP 5890A in "local" mode might be useful is in the case of conditioning a column: the HP 5890A may be started or stopped as desired without affecting other devices on the INET loop.

Note that "global" mode has two states: if GLOBAL flashes (default mode) when displayed, the HP 5890A is in "global" mode, but NOT configured into the INET system. When the HP 5890A is properly configured into the INET system, GLOBAL is displayed continuously. This feature provides a convenient diagnostic to determine if system configuration has occurred (at least as far as the HP 5890A is concerned).

INET/HP-IL Addresses

Figure 13-6 shows displays occurring either in verifying an INET address set through automatic loop configuration or in entering a specific HP-IL default address used when the HP 5890A is included in an HP-IL loop without automatic configuration. The address is maintained in battery-protected memory along with other instrument setpoints.

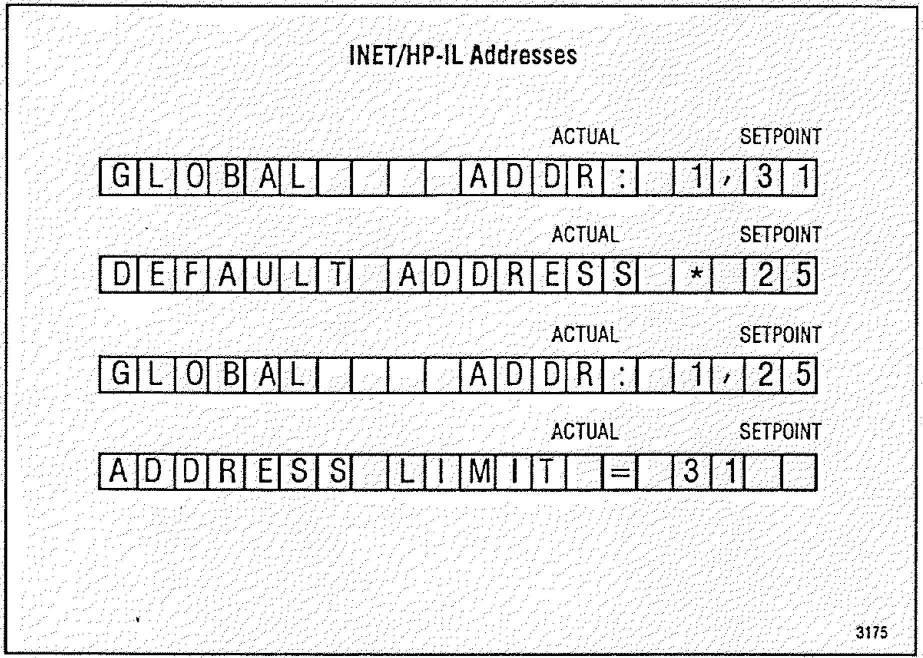


Figure 13-6. INET/HP-IL "ADDR:" Displays

VERIFYING THE HP 5890 Series II INET ADDRESS

In Figure 13-6, note the two numeric values following "ADDR:". The first of these numbers is the INET address for the HP 5890A, determined via automatic loop configuration.

The SPECIFIC number shown depends upon how INET cables are connected among devices included in the loop. The value shown in the example ("1") implies the HP 5890A is the first instrument on the loop, starting from the "OUT" receptacle on the controller device (the controller is always defined as "0"). A "2" indicates the HP 5890A is the second device on the loop, etc., to a maximum value of "31".

If cabling is altered, or if one or more devices are powered off and then on again, automatic loop configuration, initiated by the controller, updates the displayed value accordingly.

SETTING THE DEFAULT HP-IL ADDRESS

Remaining displays in Figure 13-6 show the process of defining a specific HP-IL address for the HP 5890A. Entry of any value from "0" through "31" is permitted. An attempt to enter an invalid value results in the "ADDRESS LIMIT" message shown.

INET-HP 5890A SIGNAL DEFINITION

INET signal definition (defined AT THE CONTROLLER) may be verified at the HP 5890A. To display the definitions, enter:

[CLEAR] [•] [3] [ENTER]
{[SIG 1] or [SIG 2]}

Figure 13-7 shows resulting displays.

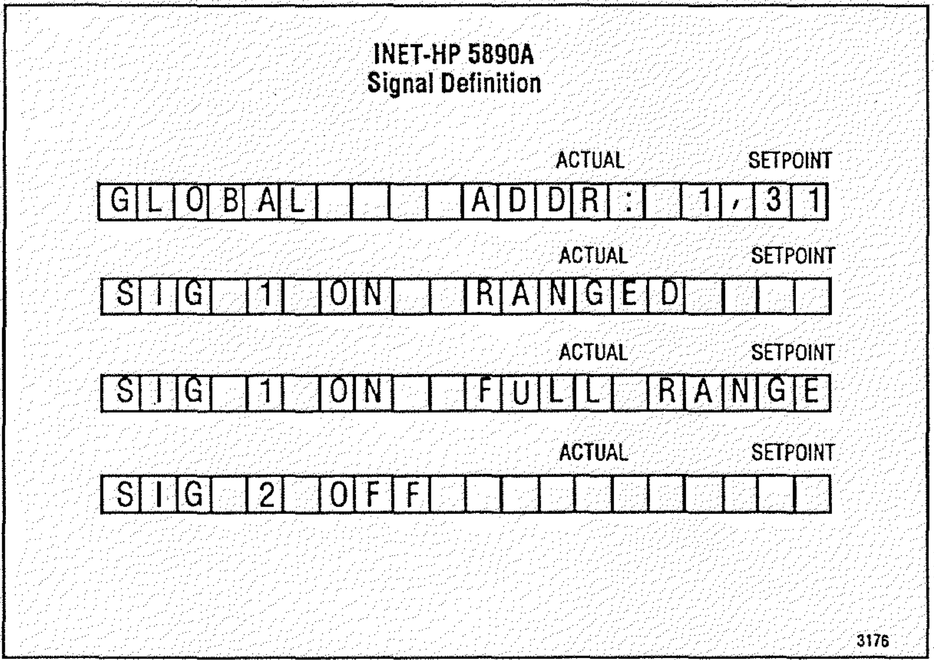


Figure 13-7. INET Signal Definition Displays

From the displays, the following may be noted:

- HP 5890A signal channels are designated `SIG 1` or `SIG 2`.

- ON indicates the given signal channel is considered active by the controller; data from this signal channel is transmitted to other devices on the INET loop. Note that ON in this context has the same meaning as " + " shown in the HP 5890A portion of the INET configuration table in the HP 3392A work file listing.

  Similarly, `OFF` indicates the channel is considered inactive; no data from this signal channel is transmitted to other devices on the loop. `OFF` has the same meaning here as "–" shown in the HP 5890A portion of the INET configuration table in the HP 3392A work file listing.

  It is important to note that ON or `OFF` in this context are strictly INET definitions, defined at the system controller. They do not, for example, bear any relationship to whether or not a given detector assigned to the signal channel is turned on or off.

- "RANGED" versus "`FULL RANGE`" indicates the dynamic range for the data to be transmitted to other devices on the loop; dynamic range for "RANGED" data is set at the HP 5890A according to the setpoint for [RANGE 2↑()]. Dynamic range for "`FULL RANGE`" data is limited only by the detector itself. The choice of the type of data to be transmitted is set at the controller.

HP-IL LOOPBACK TEST

("CALIB AND TEST" function 7)

The "HPIL LOOPBACK TEST" may be performed any time to verify that HP 5890A INET communication is performing satisfactorily. Testing involves setting up the HP 5890A to send an INET message directly to itself by connecting its INET output to its INET input. The following procedure is used:

1. Disconnect INET cables at their respective INSTRUMENT NETWORK IN and OUT receptacles on the HP 5890A (located beneath the top right cover panel).

2. Choose either one of the cables and disconnect it at the next device on the INET loop.

3. Connect this free cable to both IN and OUT INSTRUMENT NETWORK receptacles on the HP 5890A.

4. Enter the following key sequence:

[CLEAR] [•] [7] [ENTER]

Upon pressing [ENTER], the test is performed: the HP 5890A both sends and verifies a diagnostic message to itself through the connected cable. Each press of [ENTER] repeats the test. Each test requires about one second. Figure 13-8 shows displays to be expected.

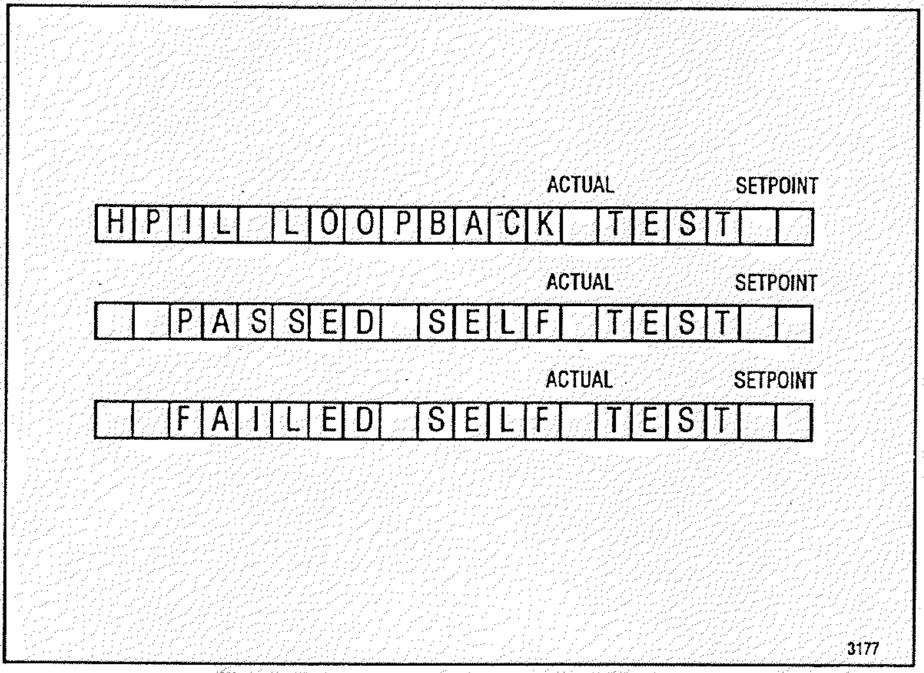


Figure 13-8. "HPIL LOOPBACK TEST" Displays

The message "PASSED SELF TEST" indicates INET, at least with respect to the HP 5890A, is performing satisfactorily. If FAILED SELF-TEST is displayed, a bad cable may be indicated; install a different INET cable and repeat the test. If FAILED SELF-TEST is displayed again for a second cable, electronic problems within the HP 5890A are indicated; see Section 19, "Electronic Troubleshooting," for more information.

NOTE

The LOOPBACK TEST may be used to check for continuity in an INET cable; an open cable causes test failure. Verify that the cable is at fault (rather than the HP 5890A) by testing a second cable.

If an intermittent cable problem is suspected, the test may be repeated as necessary while flexing the cable (particularly at its plugs). An ohmmeter should also be used to test for problems; it is a reliable method for testing continuity.

Section 11

POWER SUPPLY

REPLACING POWER SUPPLY COMPONENTS

Power supply components include the power supply PCB, the power supply transformer, the power switch, and the power cable. Removal and installation instructions for all of these components are found on the following pages.

Specific part numbers are not given in this section. For all replacement part numbers, refer to Section 8 of the IPB portion of this document (Oven Assembly).

This document is not meant to provide instruction for first time installation of the different power supply options discussed. Add-on sheets exist for just this purpose, and should be referenced when performing a first time installation.

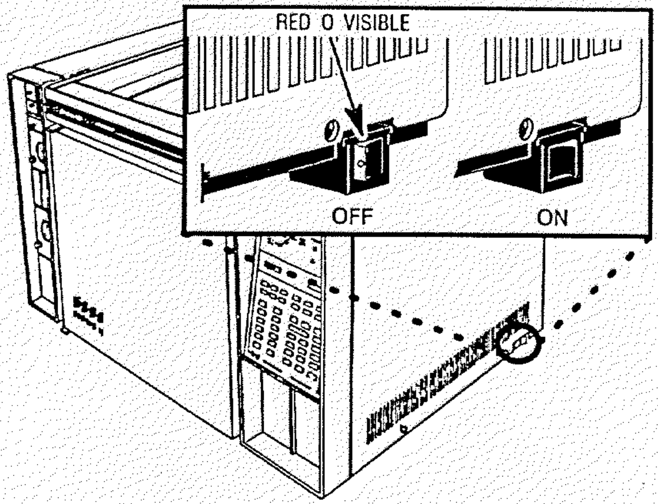
TABLE OF CONTENTS

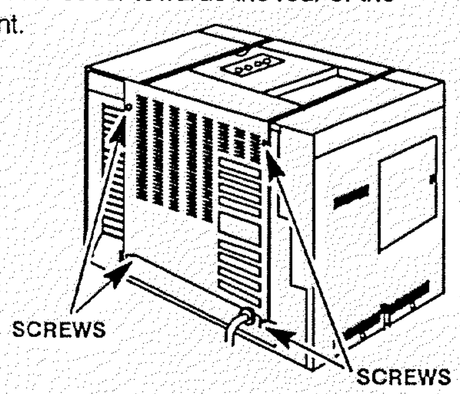
Remove/Replace Power Supply PCB

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Remove the four screws securing the rear cover to the instrument.
5. Slide the rear cover towards the rear of the instrument.

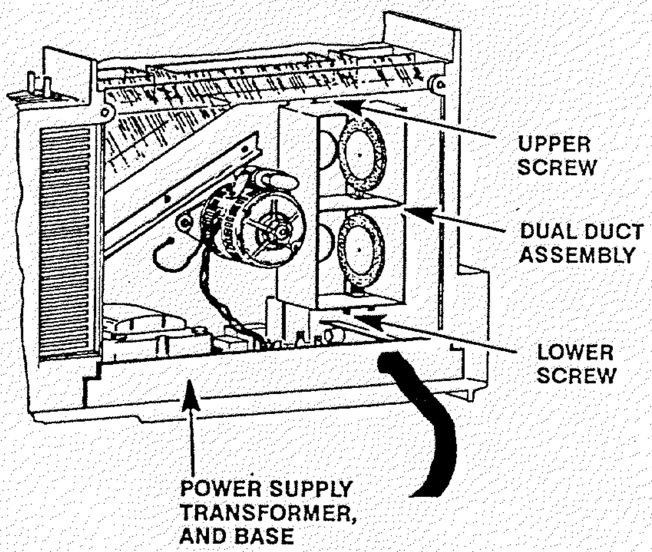




CAUTION

This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

6. Use a 7-mm nut driver to remove the screw securing the upper portion of the dual duct assembly to the outer oven shell.
7. Use a Pozidriv screwdriver to loosen (but not remove, the screw securing the lower portion of the dual duct assembly to the outer oven shell.
8. Tilt the upper portion of the dual duct assembly out of the rear of the instrument while lifting it off of the loosened lower screw.



CAUTION

When disconnecting a plug, pull on the plug not on its wires. Pulling on the wires may cause breakage.

9. Disconnect push-on type connectors J1, J2, J3, and J4 (from blade connectors P1, P2, P3, and P4, respectively) by grasping each one and pulling it straight off of its terminal.

10. Disconnect connectors J26, J27, and J28 from their respective receptacles. (Remove each one by squeezing its ribbed sides while simultaneously pulling it out of the receptacle.)

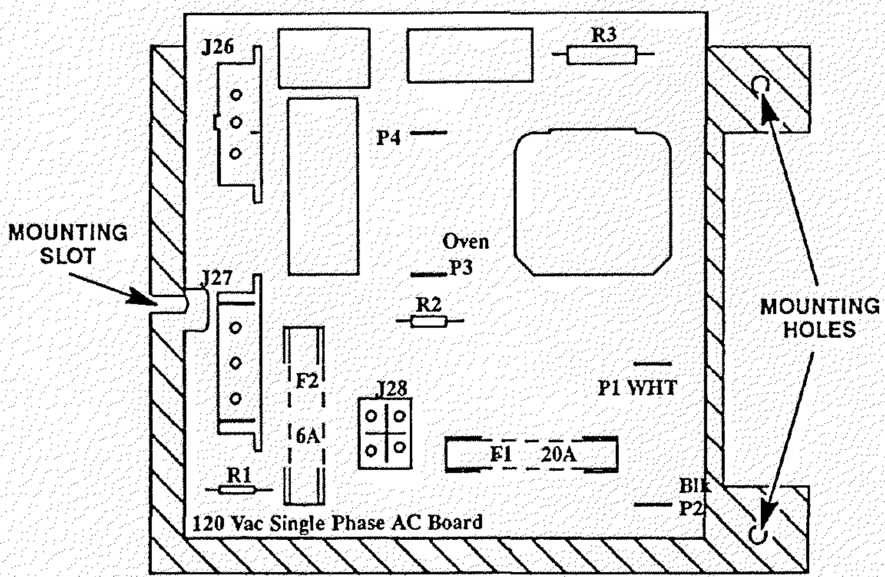
11. Use a 7mm nut driver to loosen, but not remove, the mounting nut corresponding to the mounting slot at the left edge of the AC power supply PCB mounting bracket, alongside the power transformer.

12. Use the nut driver to remove the two mounting nuts at the right edge of the AC power supply PCB mounting bracket.

NOTE

The AC power supply PCB, and its associated mounting bracket, are removed and replaced as a unit.

13. Lift the PCB bracket at its right edge while sliding it to the right to remove it from the instrument.



14. Install the replacement AC power supply PCB in the reverse manner by sliding the mounting slot on the left side of the PCB mounting bracket under the loosened mounting screw adjacent to the transformer.

15. Install the two mounting nuts at the right edge of the AC power supply PCB mounting bracket.

16. Tighten the two mounting nuts and the mounting screw firmly.

17. Install connectors J26, J27, and J28 into their respective receptacles, pushing each straight down until fully bottomed.

18. Install push-on-type connectors for oven heater leads (J3 and J4). (Either lead may be connected to either terminal.)

19. Connect power cord lead push-on-type connectors J1 (WHITE lead) and J2 (BLACK lead).

20. Install the dual duct assembly on the installed mounting screw.

21. Install the upper mounting nut to secure the dual duct assembly to the outer oven shell.

22. Tighten the upper mounting nut using a 7-mm nut driver.

23. Tighten the lower mounting screw using a Pozidriv screwdriver.

24. Slide the rear cover on to the instrument.

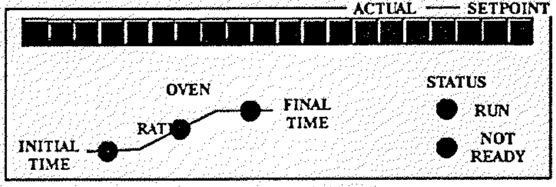
25. Secure the rear cover to the instrument by installing and tightening four screws.

26. Restore all gas supplies.

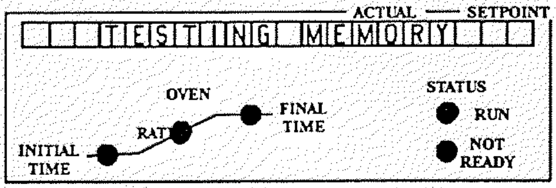
27. Restore power to the instrument.

28. Observe the alphanumeric display, as the instrument performs an internal self-diagnostic integrity check. to ensure that the instrument shows the expected normal displays.

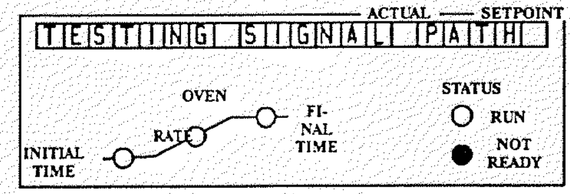
NORMAL "INTEGRITY CHECK" AT POWER-ON



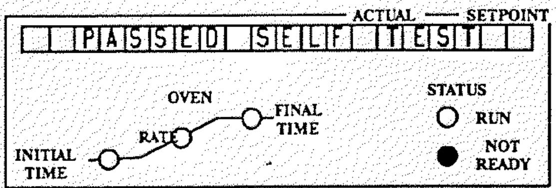
Test of display elements: all alphanumeric and LED elements are lit.



5890 Series II memory test in progress.



5890A Self-testing in progress.
LEDs off, except possibly "NOT READY."



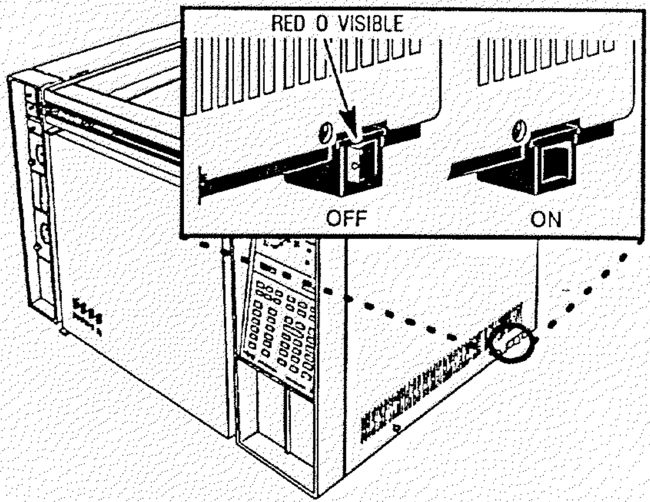
Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.
LEDs off, except possibly "NOT READY."

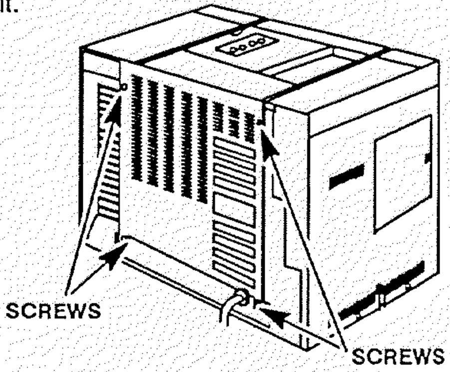
Remove/Replace Power Supply Transformer

WARNING

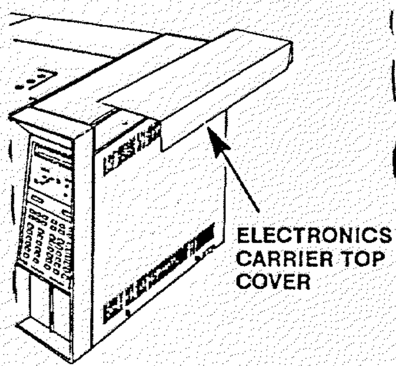
HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

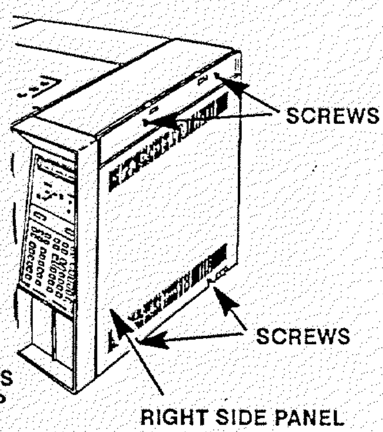
1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Remove the four screws securing the rear cover to the instrument.
5. Slide the rear cover towards the rear of the instrument.





6. Remove the electronics carrier top cover by grasping it at the rear and lifting until its catch releases, the pulling it toward the rear of the instrument .
7. Remove the right side panel by removing four screws: two each along its top and bottom edges.





CAUTION

This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

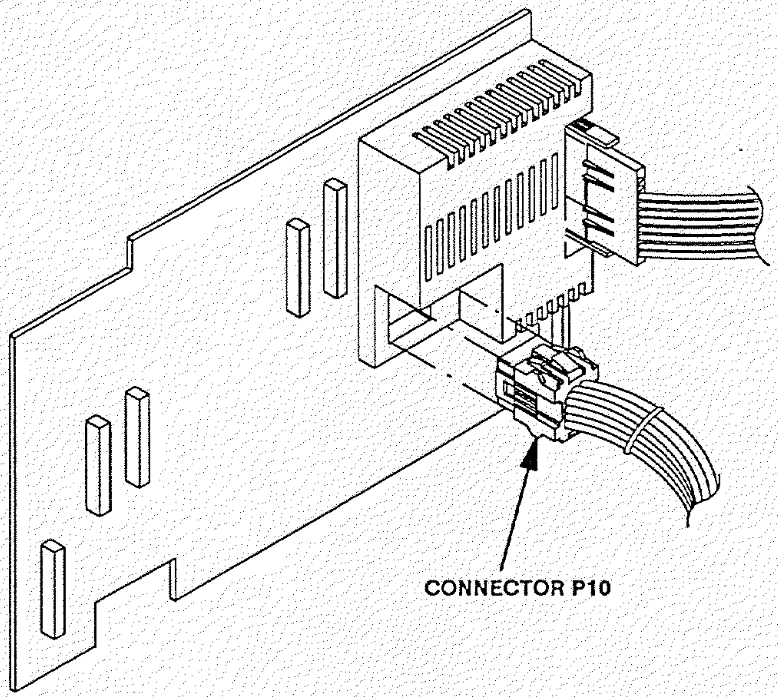
CAUTION

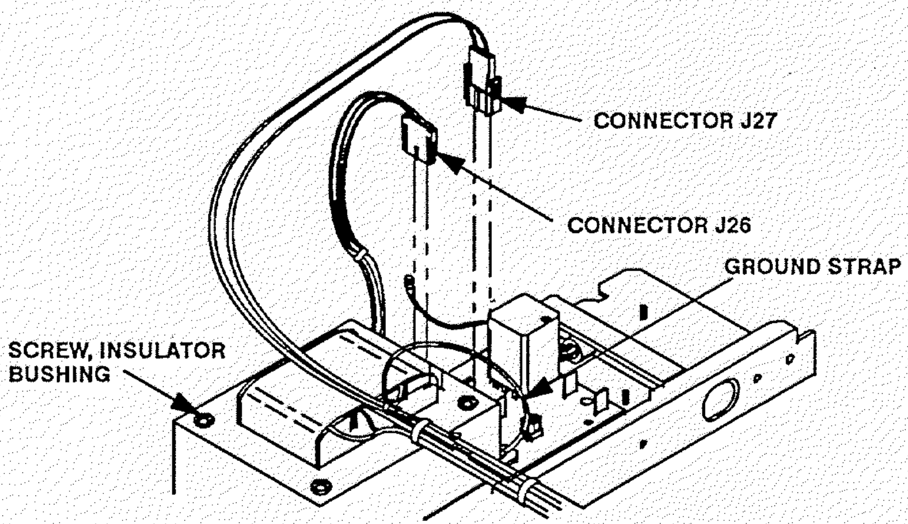
When disconnecting a plug, pull on the plug not on its wires. Pulling on the wires may cause breakage.

8. Disconnect connector P10 from its receptacle on the main PCB by squeezing its ribbed sides while pulling the plug straight out of the receptacle.

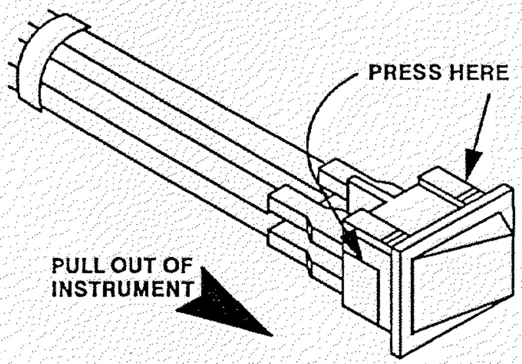
9. Disconnect connectors J26 and J27 from their respective receptacles on the AC power supply PCB. (Remove each one by squeezing its ribbed sides while simultaneously pulling it out of the receptacle.)

10. Remove the screw and lock washer securing the ground strap to the transformer bracket.

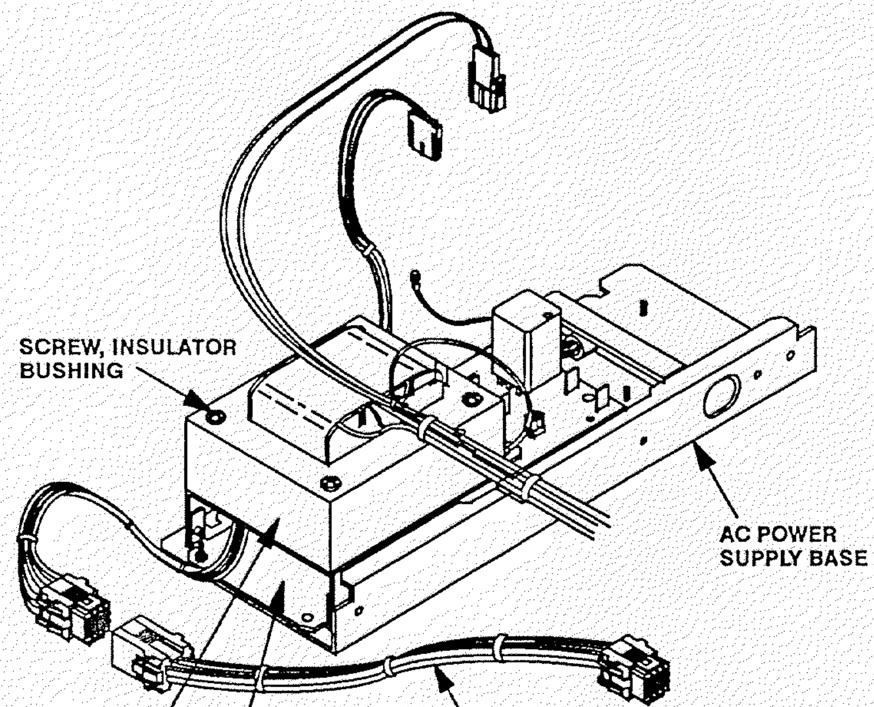




11. At the right side of the instrument, below the main PCB, remove the power switch from its slot by prying the plastic locking tabs on each side of the switch in toward the switch body.



12. Remove the four push-on-type connectors from the rear of the switch.
13. Remove the three nuts and one screw securing the transformer bracket to the AC power supply base.
14. Slowly lift the transformer and transformer bracket off of the AC power supply base as a unit, being careful not to strain the wiring from connector P10 and the power switch.



POWER SUPPLY ASSEMBLY SHOWN REMOVED FROM INSTRUMENT FOR CLARITY

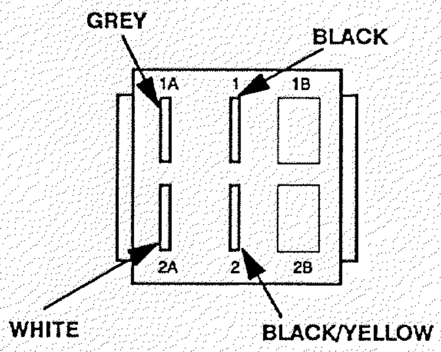
15. Free the wiring from connector P10 and the power switch from their associated paths in the electronics carrier.
16. Remove the transformer and transformer bracket from the rear of the instrument, as a unit.
17. Remove the four screws and four insulator bushing which secure the transformer to the transformer bracket.

18. Install the replacement transformer onto the transformer bracket and secure using four screws and four insulator bushings.

19. Position the transformer and transformer bracket to allow threading of the P10 connector cable and power switch wiring through their applicable paths in the electronics carrier.

20. Secure the transformer and transformer bracket to the AC power supply base using three nuts and one screw.

21. Connect wiring to power switch as shown in illustration.



22. Install the power switch in its mounting slot (below the main PCB.

23. Install connector P10 in its receptacle on the main PCB by pushing it straight in until fully bottomed.

24. Secure the ground strap to the transformer bracket using a screw and lock washer.

25. Install connectors J26 and J27 into their respective receptacles on the AC power supply PCB, pushing each straight down until fully bottomed.

26. Install the right side panel and secure using two screws.

27. Install the electronics carrier top cover.

28. Slide the rear cover on to the instrument.

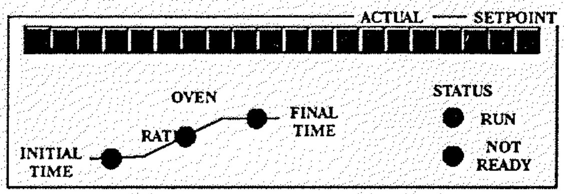
29. Secure the rear cover to the instrument by installing and tightening four screws.

30. Restore all gas supplies.

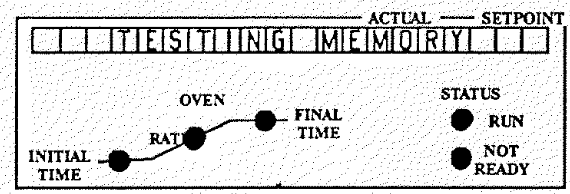
31. Restore power to the instrument.

32. Observe the alphanumeric display as the instrument performs an internal self–diagnostic integrity check. to ensure that the instrument shows expected normal displays.

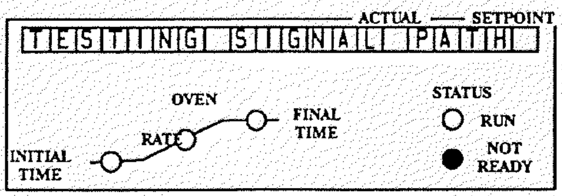
NORMAL "INTEGRITY CHECK" AT POWER-ON



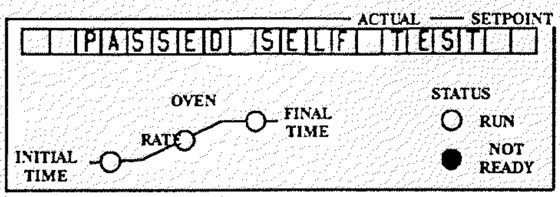
Test of display elements: all alphanumeric and LED elements are lit.



5890 Series II memory test in progress.



5890A Self-testing in progress.
LEDs off, except possibly "NOT READY."



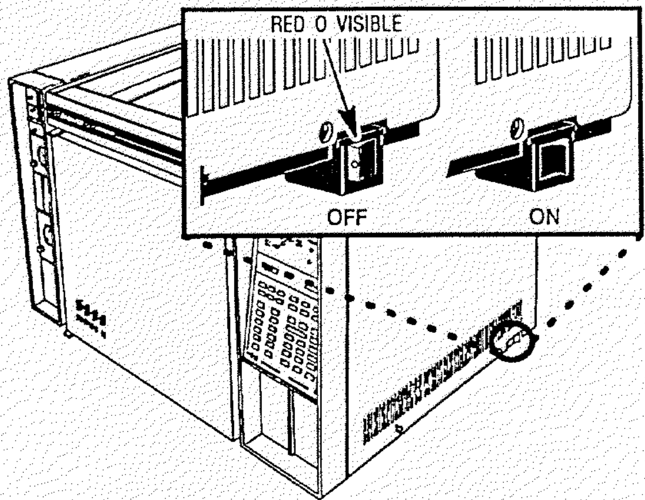
Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.
LEDs off, except possibly "NOT READY."

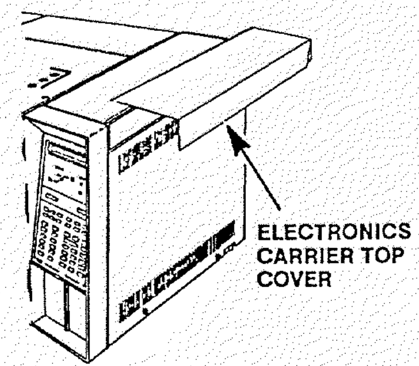
Remove/Replace Power Switch

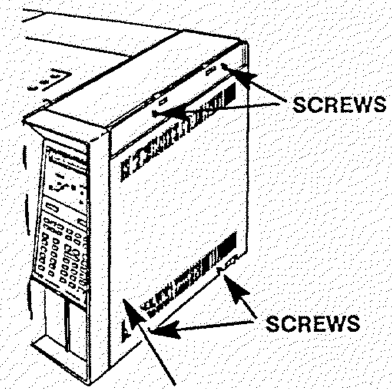
WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Remove the electronics carrier top cover by grasping it at the rear and lifting upwards until its catch releases, then pulling it toward the rear of the instrument.
5. Remove the right side panel by removing four screws: two each along its top and bottom edges.



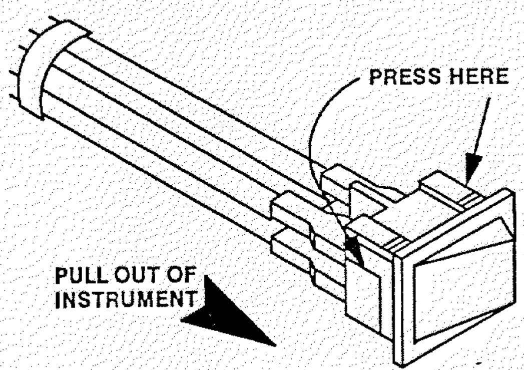




CAUTION

This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

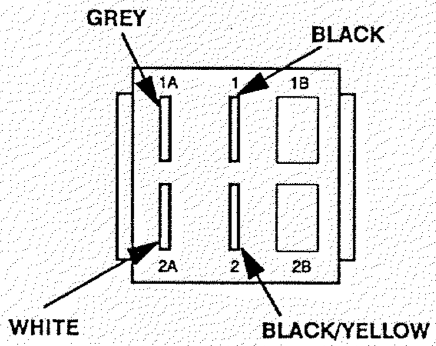
6. At the right side of the instrument, below the main PCB, remove the power switch from its slot by prying the plastic locking tabs on each side of the switch in toward the switch body.



CAUTION

When disconnecting a plug, pull on the plug not on its wires. Pulling on the wires may cause breakage.

7. Remove the four push-on-type connectors from the rear of the switch.



8. Connect wiring to power switch as shown in illustration.

9. Install the power switch in its mounting slot (below the main PCB.

10. Install the right side panel and secure using two screws.

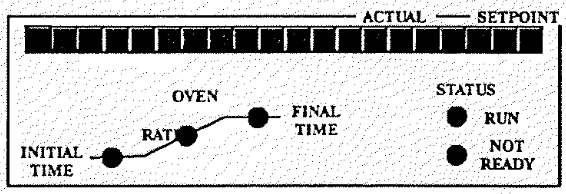
11. Install the electronics carrier top cover.

12. Restore all gas supplies.

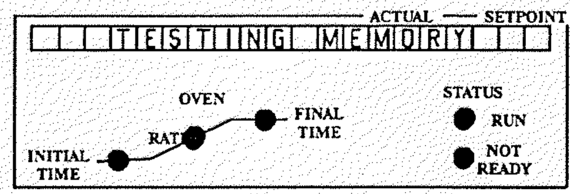
13. Restore power to the instrument.

14. Observe the alphanumeric display as the instrument performs an internal self-diagnostic integrity check. to ensure that the instrument shows expected normal displays.

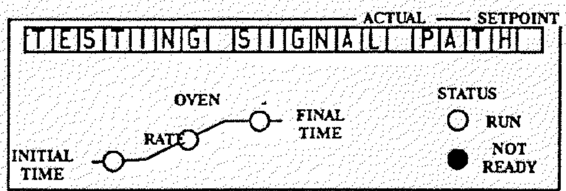
NORMAL"INTEGRITY CHECK" AT POWER-ON



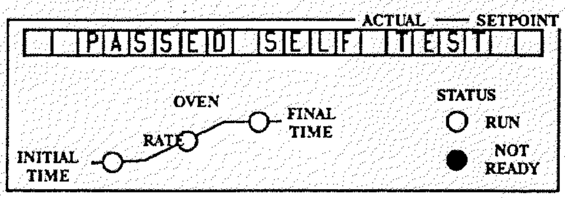
Test of display elements: all alphanumeric and LED elements are lit.



5890 Series II memory test in progress.



5890A Self-testing in progress.
LEDs off, except possibly "NOT READY."



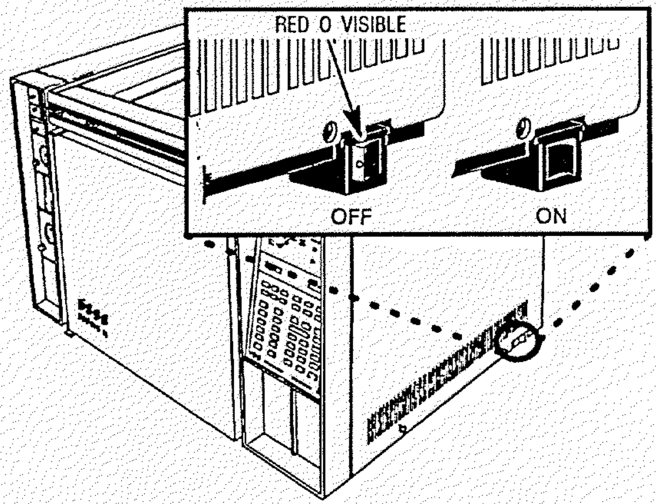
Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.
LEDs off, except possibly "NOT READY."

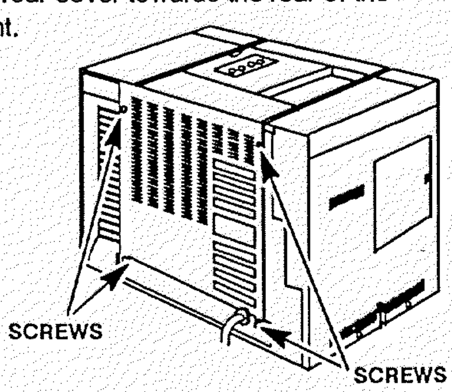
Remove/Replace Power Cable

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE INSTRUMENT WHEN THE POWER CORD IS CONNECTED. AVOID A POTENTIALLY DANGEROUS SHOCK HAZARD BY DISCONNECTING THE POWER CORD BEFORE WORKING ON THE INSTRUMENT.

1. Set the main power line switch to the off position.
2. Disconnect the power cable from its receptacle.
3. Turn off all gas supplies.
4. Remove the four screws securing the rear cover to the instrument.
5. Slide the rear cover towards the rear of the instrument.

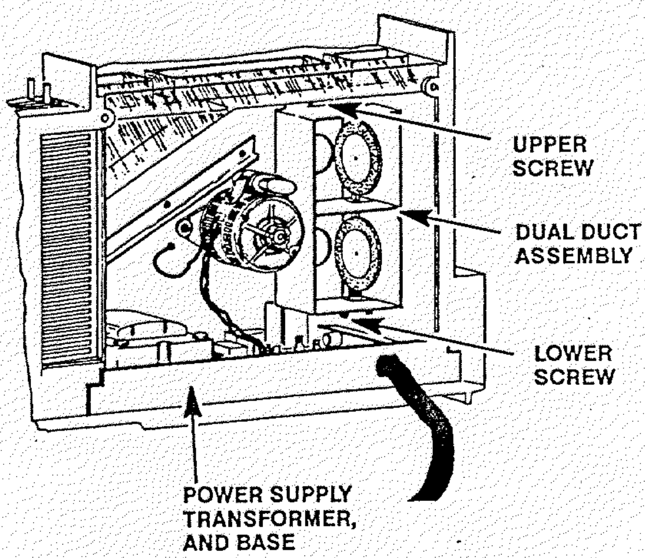




CAUTION

This procedure requires precautions against ESD (Electro-Static Discharge). Use a grounded wrist strap (part no. 9300-0969 - large, or 9300-0970 - small) connected to a suitable ground. Failure to heed this caution may result in damage to the instrument.

6. Use a 7-mm nut driver to remove the screw securing the upper portion of the dual duct assembly to the outer oven shell.
7. Use a Pozidriv screwdriver to loosen (but not remove, the screw securing the lower portion of the dual duct assembly to the outer oven shell.
8. Tilt the upper portion of the dual duct assembly out of the rear of the instrument while lifting it off of the loosened lower screw.

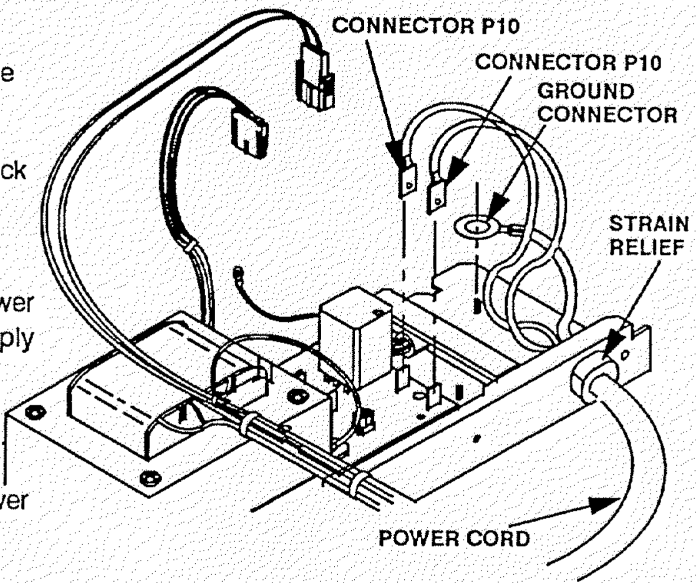


CAUTION

When disconnecting a plug, pull on the plug not on its wires. Pulling on the wires may cause breakage.

9. Disconnect push-on type connectors J1 and J2 (from blade connectors P1 and P2, respectively) by grasping each one and pulling it straight off of its terminal.

10. Use a 7-mm nut driver to remove the nut securing the power cable ground lead to the AC power supply base.



11. Remove the power cable ground lead from the stud on the AC power supply base.

12. Use a large pair of pliers to compress the black plastic strain relief which secures the power cable to the AC power supply base.

13. With the strain relief compressed, pull the power cable out of the opening in the AC power supply base.

14. Remove the strain relief from the power cable.

15. Install the strain relief on the replacement power cable.

16. Compress the strain relief with a large pair of pliers.

17. With the strain relief compressed, insert the power cable through the opening in the power supply base and seat the strain relief in the opening.

18. Install the power cable ground lead on the stud on the AC power supply base and secure with a locking nut.

19. Connect power cord lead push-on-type connectors J1 (WHITE lead) and J2 (BLACK lead) to their appropriate connectors on the AC power supply PCB.

20. Install the dual duct assembly on the installed mounting screw.

21. Install the upper mounting nut to secure the dual duct assembly to the outer oven shell.

22. Tighten the upper mounting nut using a 7-mm nut driver.

23. Tighten the lower mounting screw using a Pozidriv screwdriver.

24. Slide the rear cover on to the instrument.

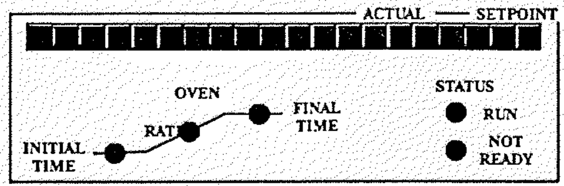
25. Secure the rear cover to the instrument by installing and tightening four screws.

26. Restore all gas supplies.

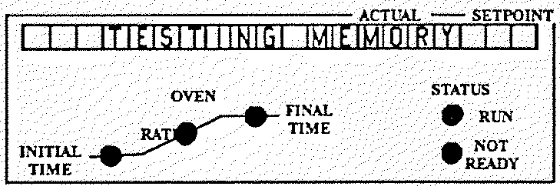
27. Restore power to the instrument.

28. Observe the alphanumeric display, as the instrument performs an internal self-diagnostic integrity check. to ensure that the instrument shows the expected normal displays.

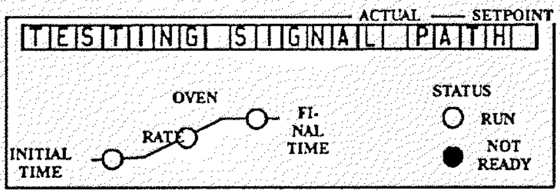
NORMAL "INTEGRITY CHECK" AT POWER-ON



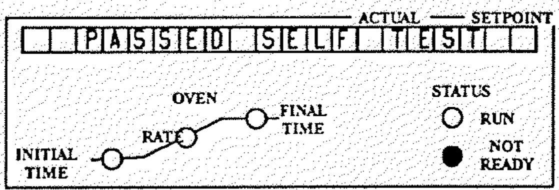
Test of display elements: all alphanumeric and LED elements are lit.



5890 Series II memory test in progress.



5890A Self-testing in progress.
LEDs off, except possibly "NOT READY."



Message indicating normal termination of diagnostic tests after power restoration. User setpoints remain in force.
LEDs off, except possibly "NOT READY."