HP 7673A
Automatic Sampler
Operating Manual

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HEWLETT PACKARD

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Note

The information contained in this document may be revised without notice.

Hewlett-Packard makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental, or consequential damages in connection with the furnishing, performance, or use of this material.

Important User Information For In Vitro Diagnostic Applications

This is a multipurpose instrument that may be used for qualitative or quantitative analyses in many applications. If used in conjunction with proven procedures (methodology) by a qualified operator, one of these applications may be for In Vitro Diagnostic use; however, use of this instrument is neither limited to nor committed to In Vitro Diagnostic procedures.

Generalized instrument performance characteristics and instructions are included in this manual. Specific In Vitro Diagnostic procedures and methodology remain the choice and responsibility of the user, and are not included.

Safety Information

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked).

Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

SYSTEM PERFORMANCE SPECIFICATIONS

Typical Values

HP 7673A Automatic Injector with an HP 5880A Gas Chromatograph or an HP 5890A Gas Chromatograph and HP 3392A Integrator.

INLET	PRECISION*
Cool On-Column	<0.3%
Heated Packed	<0.5%
Capillary	
a. Split (50:1→400:1)	<1.5%
b. Splitless	<1.0%

RETENTION.TIME REPRODUCIBILITY	<0.03%
CARRYOVER	$<10^{-4}$ WITH 4-6 WASHES
SEPTUM LIFE (11mm Diameter)	>200 INJECTIONS

Sample: 500ng/µl ea C_{10} - C_{40} n-hydrocarbons in hexane

Split: Insert 19251-60540 required

Splitless: Insert 18740-80220 with 2-3mm long glass wool plug centered in insert required

*Precision is expressed as the relative standard deviation of the absolute peak area.

SECTION 1. GENERAL INFORMATION

SECTION 2. INSTALLATION AND SETUP

SECTION 3. OPERATION

SECTION 4. IN CASE OF DIFFICULTY

SECTION 1

General Information

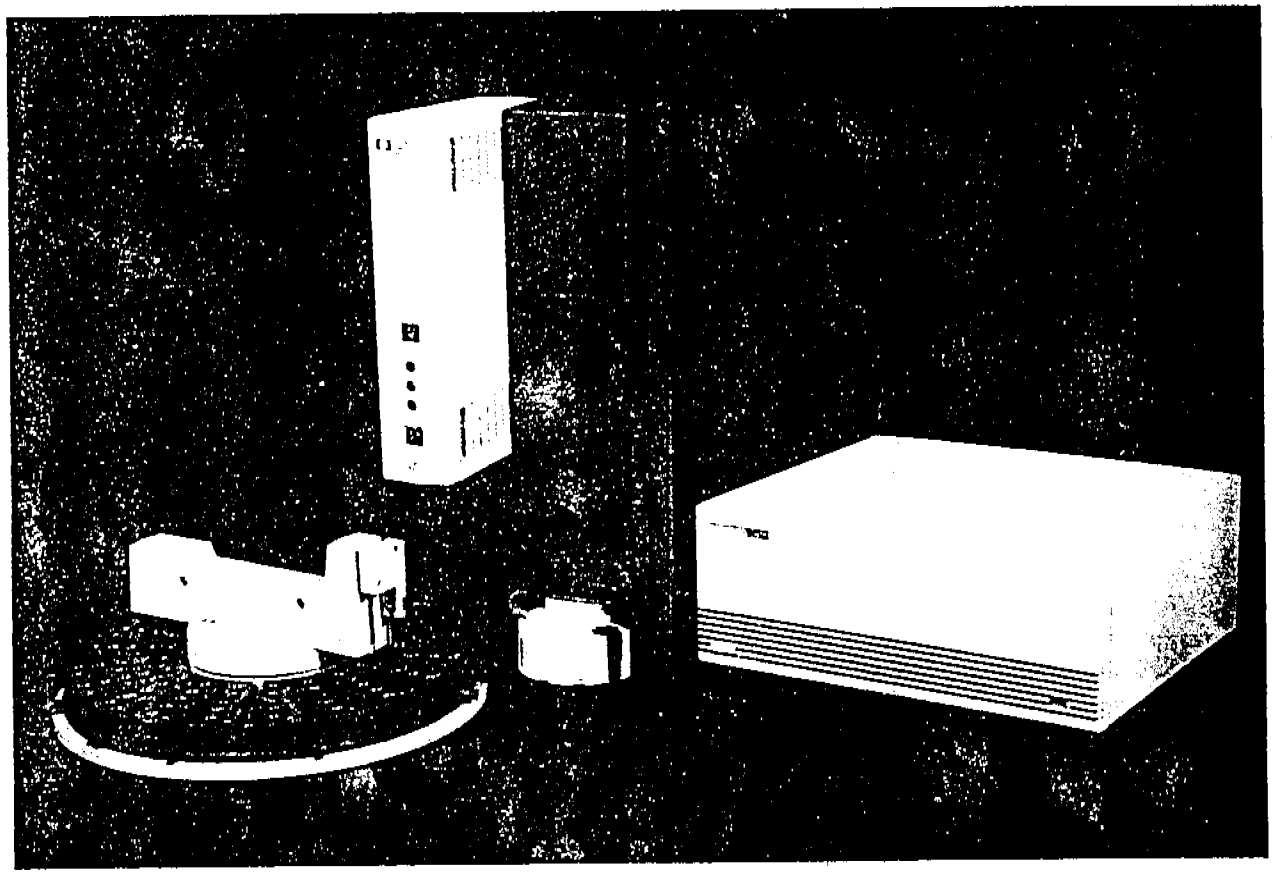


Figure 1-1. HP 7673A Automatic Sampler

INTRODUCTION

The HP 7673A Automatic Sampler is a combination of three separate modules: the injector (18593A), controller (18594A), and tray (18596A).

INJECTOR

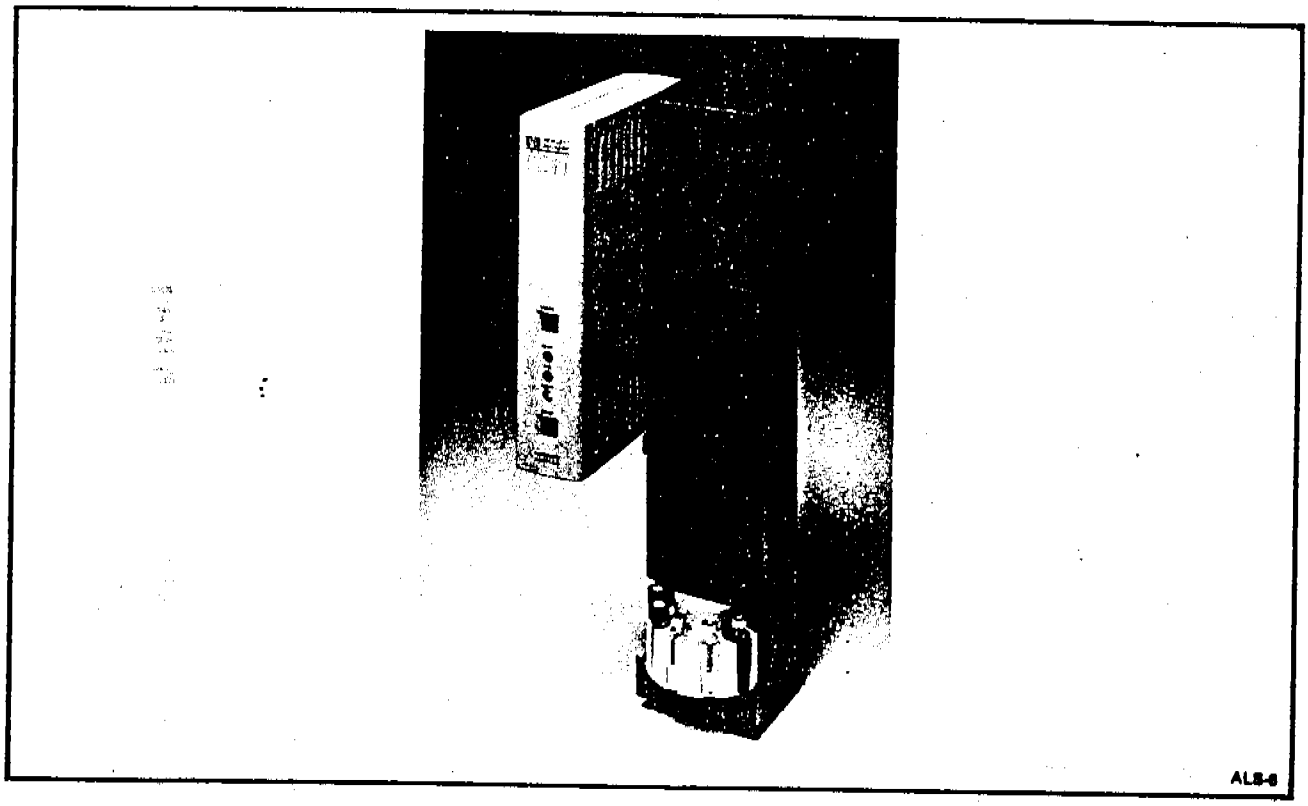


Figure 1-2. HP 7673A Injector

The HP 7673A Injector is a device for automatic liquid injections into the injection port of a gas chromatograph. It contains the syringe, syringe transport, a "turret" type sample tray, and sample parameter switches (used for stand-alone control only) in a compact, lightweight housing.

The injector mounts to the GC on a plate which is unique to the GC. Mounting is performed by lowering the injector over the septum nut and giving it a turn to lock it in position. All syringe alignment is automatic.

The turret has space for five vials (bottles). Arrangement of vials depends upon the operator and the controlling device used. The turret rotates the sample vial(s), and bottles used for solvent and waste, into position directly below the syringe. With exception of the power supply and control boards, everything required to execute an injection cycle is included with the injector module. Electric motors are used to operate the turret, syringe transport, and syringe plunger as directed by operator selected commands.

CONTROLLER

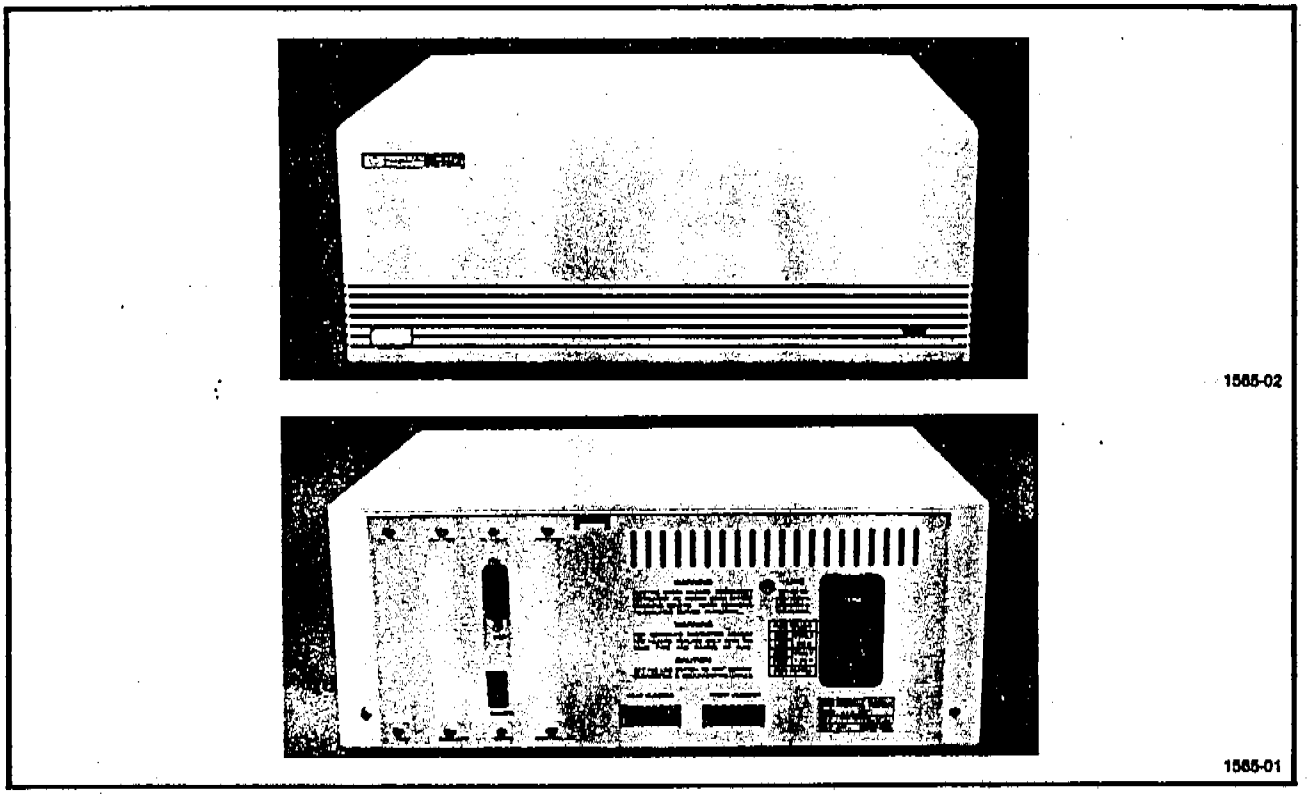


Figure 1-3. HP 7673A Controller

The HP 7673A Controller contains various control boards plus power supply to power up to two injectors and a tray. The appropriate combination of control boards will permit the HP 7673A Automatic Sampler to be controlled three ways; stand-alone, INET (via HP 3392A integrator), or HP 5880A control. Each method of control is discussed in detail later in this manual. The HP 7673A Injector and Tray hardware remain the same regardless of the control being used.

TRAY

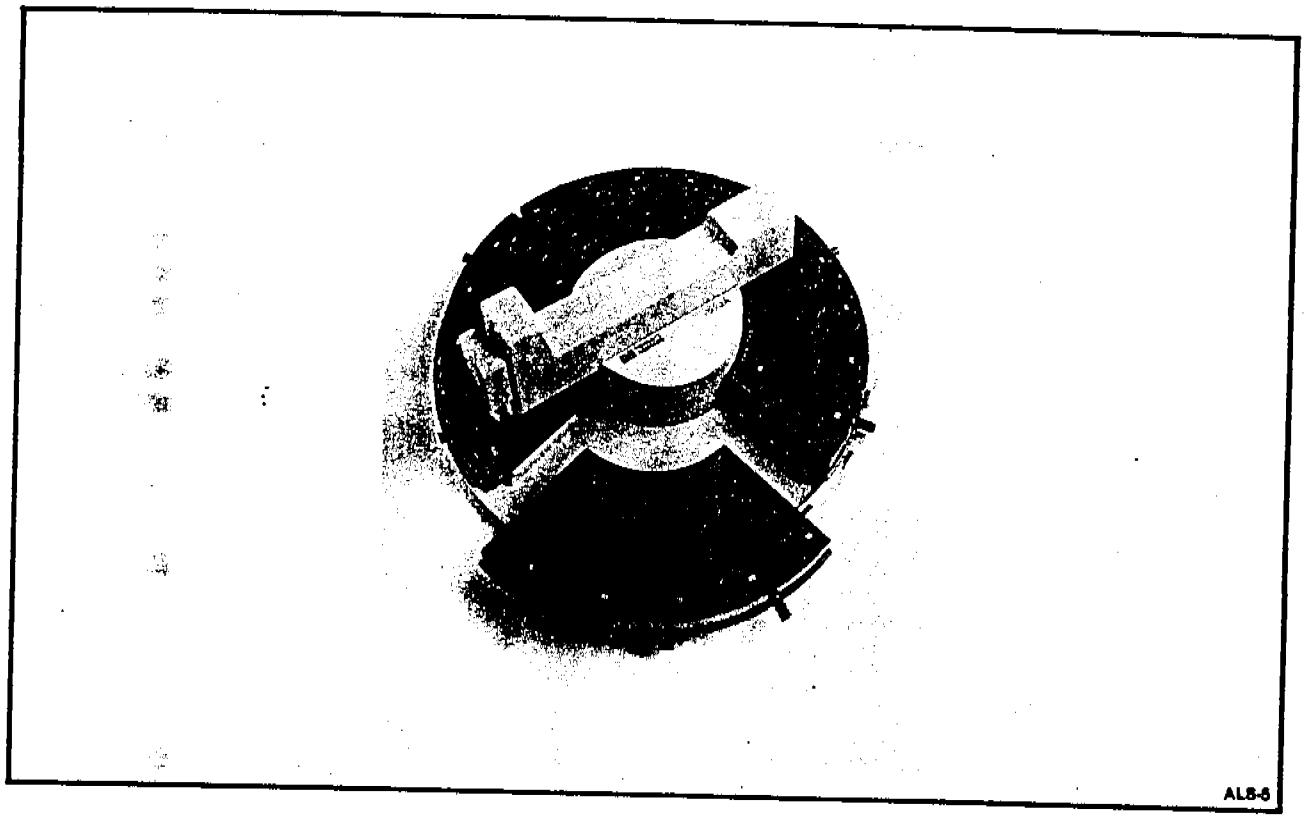


Figure 1-4. HP 7673A Tray

The HP 7673A Tray mounts to the left side of the gas chromatograph, adjacent to the injector, and is capable of accessing one or two injectors.

The circular tray functions as the storage and transportation vehicle for up to 100 sample vials in the HP 7673A Automatic Sampler.

The tray consists of a fixed base containing four removable trays called quadrants around a transport mechanism. The quadrants incorporate a passage for circulation of fluid for moderate temperature control of the sample vials. Fill and drain lines are accessible when quadrants are installed in the tray. If desired, a circulating temperature controlled liquid bath (user supplied), can be attached for temperature control applications. Sample vials, arranged in the quadrants of 25 each, are identified by the storage coordinate (1 to 100).

The transport mechanism consists of an arm and gripper mounted to the top of the drive mechanism located in the center of the tray base. The transport mechanism is capable of movement in three dimensions (radially, about its axis, and vertically). The arm can move in the radial and axial dimensions; the gripper can move in the vertical dimension. To pick up a vial, the arm positions the gripper beside the vial, then rotates to snap the claw on the neck of the vial. Individual sample vials are moved from the tray to the injector and back by the transport mechanism.

Required control to operate the tray is contained in an interface board installed in the 18594A Controller.

SUMMARY OF FEATURES

Fast Injection Technique	The syringe needle is in and out of the injection port before the needle has time to get hot. Sample boiloff in the needle is virtually eliminated giving improved performance through accurate and precise results.
INET Capability	When the HP 7673A is controlled by an HP 3392A Integrator, it starts both the GC and the integrator. Automatic Sampler parameters are controlled from the HP 3392A.
Self-aligning Quick Connect Mounting	Within seconds the injector can be mounted for operation or dismounted for easy access to the injection port area. Once installed, the injector is automatically aligned, ready to make an injection.
Automated On-Column Capillary Injection	The HP 7673A is combined with the Series 530u capillary column and the HP Dedicated On- Column Inlet for automation of this technique.
Stand-Alone Injector	Automatic sample injection is not limited to those who primarily have a high sample throughput.
Sample Tray	With addition of the HP 7673A Tray, 1 to 100 samples may be run automatically.

UNIT IDENTIFICATION

A warranty/identification label on the injector, tray, and controller lists the instrument model and serial number. Include these numbers in any correspondence with Hewlett-Packard regarding this instrument.

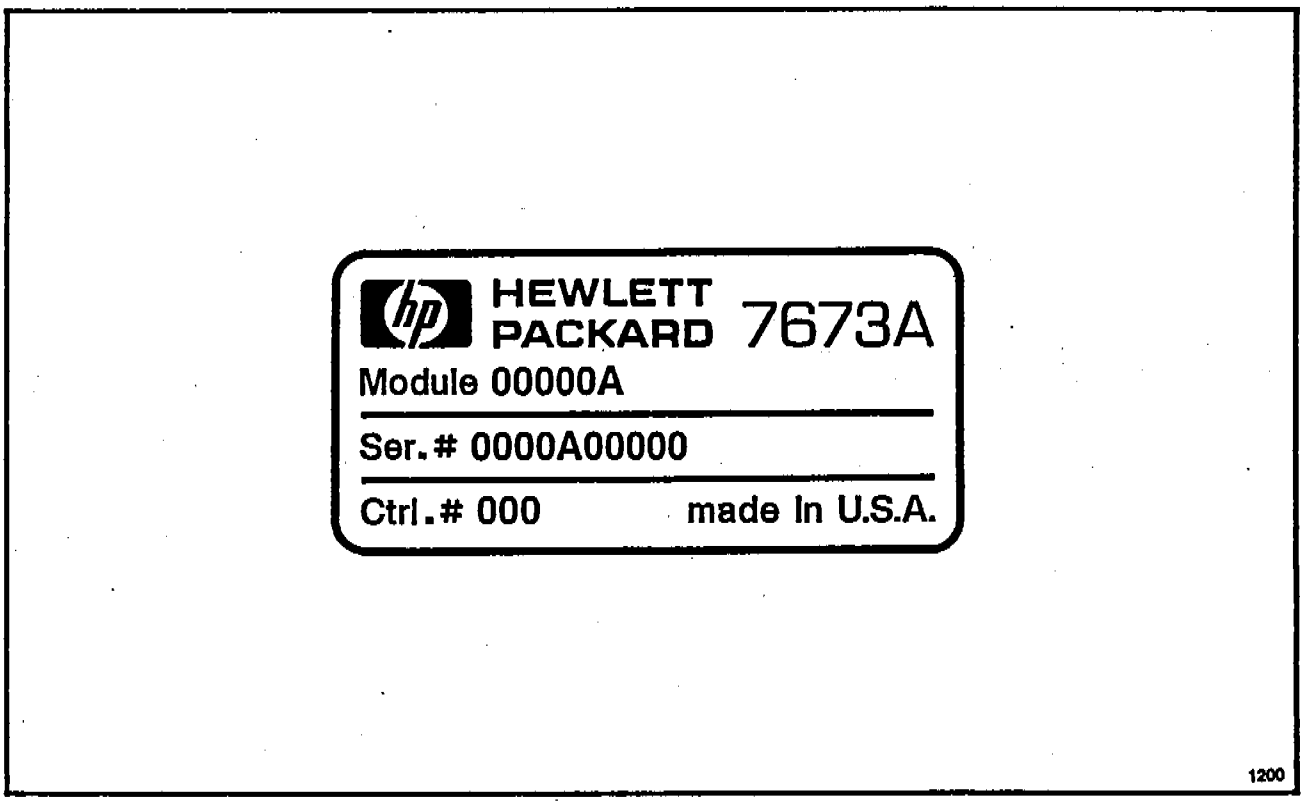


Figure 1-5. Warranty Identification Label

PHYSICAL SPECIFICATIONS

INJECTOR

Dimensions	44.4 cm high	(17.5 inches)
	15.2 cm wide	(6.0 inches)
	17.8 cm deep	(7.0 inches)
Weight	3.6 kg	(8.0 pounds)

TRAY

Dimensions	14.0 cm high	(5.5 inches)
	31.8 cm diameter	(12.5 inches)
Weight	1.8 kg	(4.0 pounds)

CONTROLLER

Dimensions	12.7 cm high	(5.0 inches)
	33.0 cm wide	(13.0 inches)
	29.2 cm deep	(11.5 inches)
Weight	7.3 kg	(16.0 pounds)

ENVIRONMENT

The instrument will operate within temperature and relative humidity conditions of 0 to 55°C and 5 to 95% respectively; however an environment comfortable for human habitation (reasonably constant temperature and humidity conditions) is recommended for optimum performance and instrument lifetime.

Exposure to corrosive substances (whether gas, liquid, or solid) may affect materials and components used in the HP 7673A and should be avoided.

EQUIPMENT POWER CONNECTIONS

The power cables and plugs for all Hewlett-Packard instruments are selected according to the country of origin at time of sale. If a power cable or plug is not correct, contact your local Hewlett-Packard Sales and Service Office.

POWER REQUIREMENTS

The HP 7673A Automatic Sampler is configured to operate from one of the following line sources:

120 VAC single phase (+5%,-10%), 48 to 66 Hz, 150 VA max.

220 VAC single phase (+5%,-10%), 48 to 66 Hz, 150 VA max.

230/240 VAC single phase (+5%,-10%), 48 to 66 Hz, 150 VA max.

100 VAC single phase (+5%,-10%), 48 to 66 Hz, 150 VA max.

The Power Line Module provides an AC power receptacle, a fuse holder, and line voltage selector. Operating voltage is configured according to the original power option ordered. A line of sufficient power capacity (Volt Amps or Watts) should be provided.

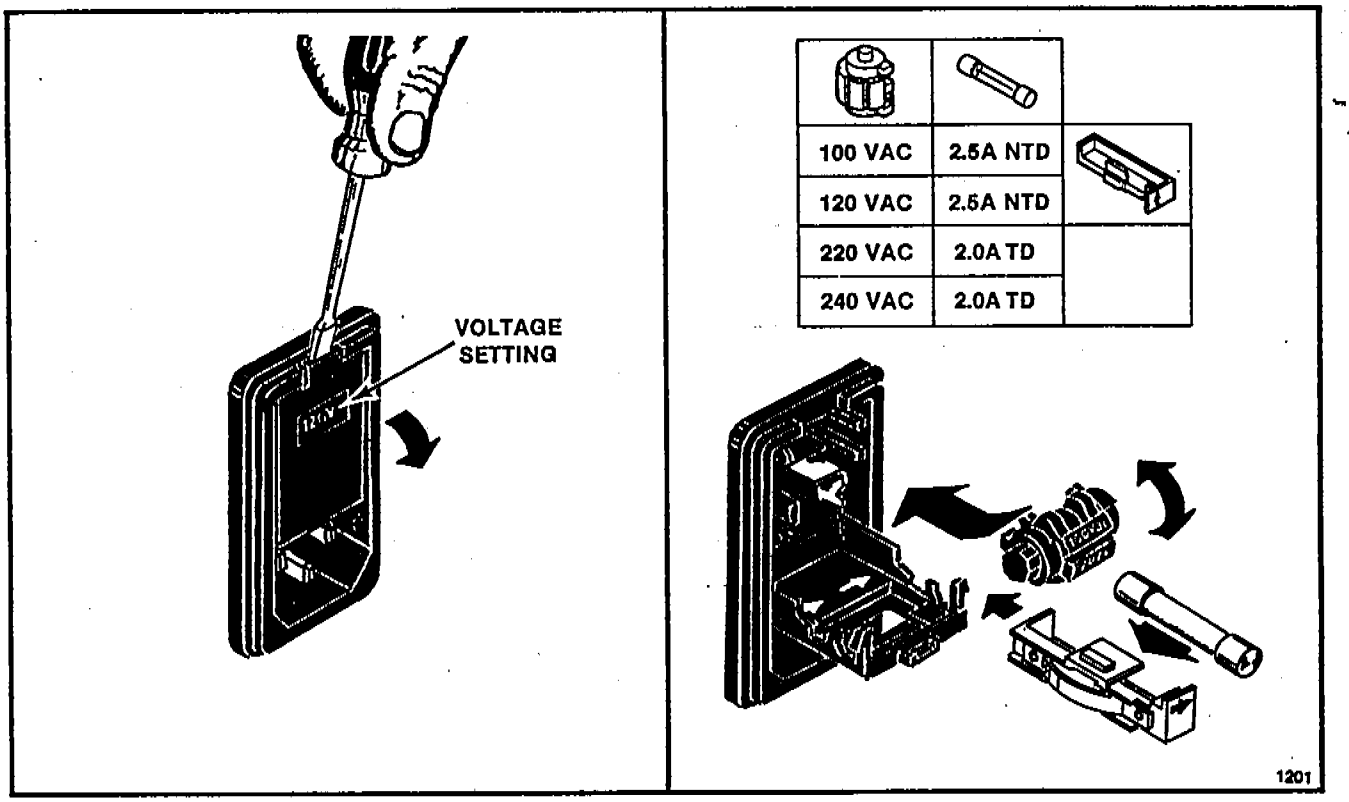


Figure 1-6. Power Line Module

WARNING

CHECK THE VOLTAGE SETTING BEFORE CONNECTING TO THE MAINS SUPPLY.

To protect personnel, the HP 7673A Automatic Sampler panels and cabinets are grounded through the three-conductor power line cord, in accordance with International Electrotechnical Commission (IEC) requirements.

The HP 7673A Controller power line cord, when plugged into its receptacle, provides power and ground to the instrument. To preserve protection, the instrument must be operated from a receptacle having its ground contact connected to a suitable earth ground. Proper receptacle grounding should be verified.

Refer to the specification sheet in the front of this manual for other than physical specifications.

SECTION 2. INSTALLATION AND SETUP

SECTION 2

Installation and Setup

INTRODUCTION

This section includes information regarding installing the HP 7673A. The following topics are included:

- Informational Symbols
- Safety Considerations
- Initial Receipt
- Installing Syringes
- HP 5890A Mounting & Cabling
- HP 5880A Mounting & Cabling

INFORMATIONAL SYMBOLS

This unit has been designed and tested in accordance with recognized safety standards. The present instruction manual contains safety information which should be followed by the user to insure safe operation of the instrument.

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

WARNING

THE WARNING SIGN CALLS ATTENTION TO A PROCEDURE, WHICH, IF INCORRECTLY DONE, COULD RESULT IN PERSONAL INJURY OR DEATH.

CAUTION

THE CAUTION SIGN CALLS ATTENTION TO A PROCEDURE, WHICH, IF INCORRECTLY DONE, COULD RESULT IN DAMAGE TO THE INSTRUMENT.

NOTE

Used in this manual, this symbol emphasizes important additional information provided with various procedures.

SAFETY CONSIDERATIONS

This is a Safety Class 1 instrument and has been manufactured and tested according to international safety standards.

Power Line Cord

To protect personnel, the HP 7673A is grounded through a three-conductor power line cord, in accordance with International Electrotechnical Commission (IEC) requirements.

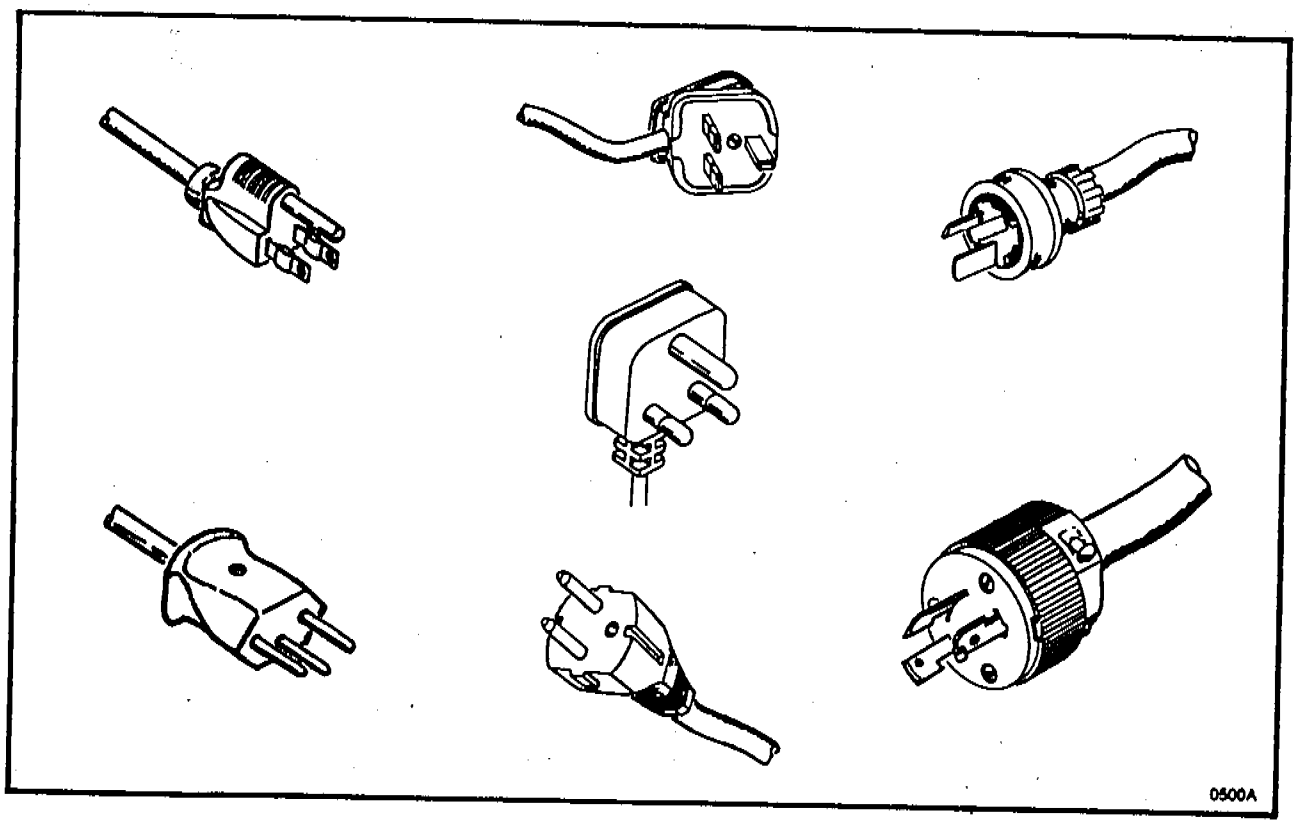


Figure 2-1. Available HP 7673A Power Cord Options

The HP 7673A three-conductor power line cord, when plugged into its receptacle, provides power and grounds the instrument. To preserve protection, the mains plug must be connected to a mains outlet with a protective earth contact to minimize any shock hazard. Proper receptacle grounding should be verified.

IN VITRO DIAGNOSTIC APPLICATIONS

This is a multipurpose instrument that may be used for qualitative or quantitative analyses in many applications. If used in conjunction with proven procedures (methodology) by a qualified operator, one of these applications may be In Vitro Diagnostic procedures.

Generalized instrument performance characteristics and instructions are in this manual. Specific In Vitro Diagnostic procedures and methodology remain the choice and responsibility of the user, and are not included.

INITIAL RECEIPT

Shipping Container

Inspect the outside of the shipping container for damage. If you find something wrong, immediately contact both the carrier and your local Hewlett-Packard office.

Container Contents

Compare the contents of the container with the shipping list and the original order. Check the items for damage. Should you have questions concerning damage or missing parts, immediately contact your local Hewlett-Packard office.

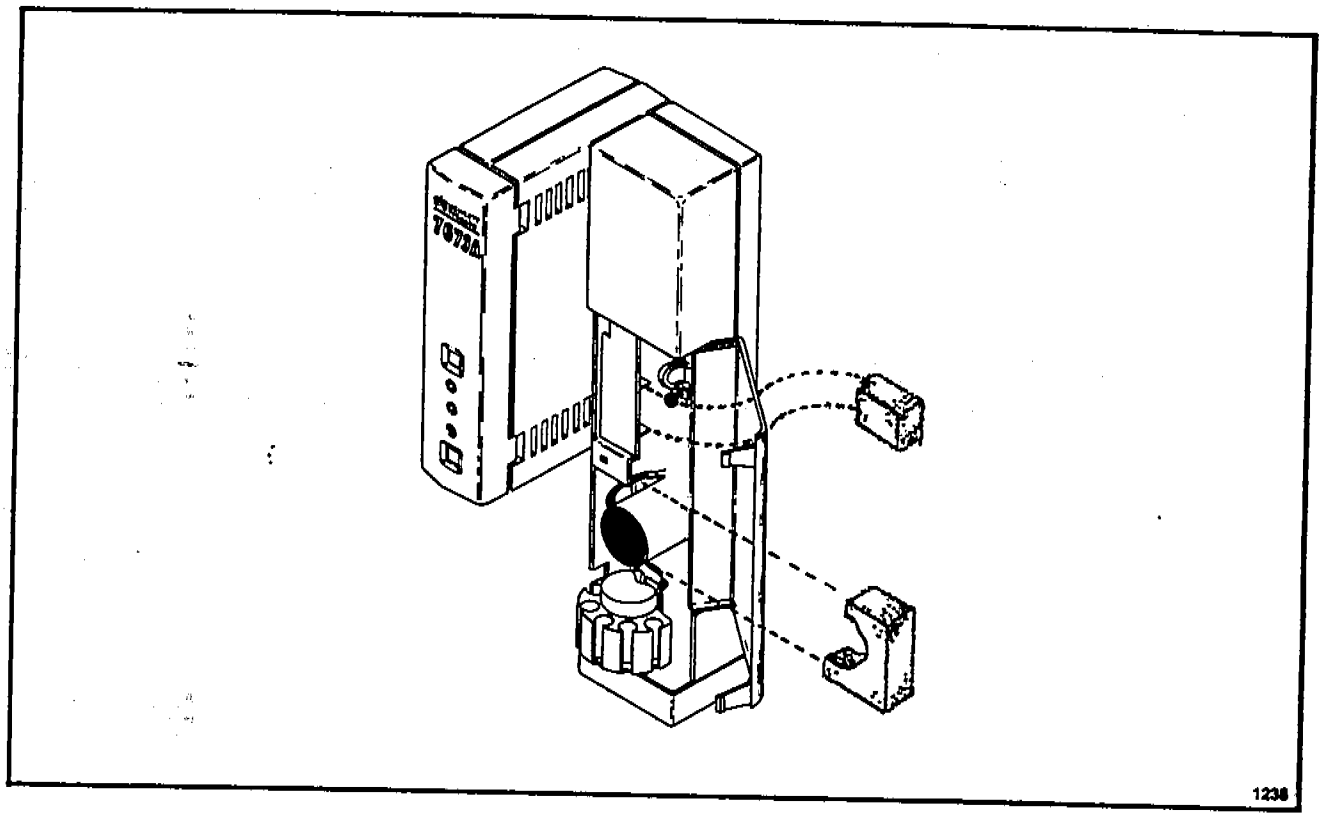


Figure 2-2. Shipping Block(s)

Remove the internal shipping block(s) from inside the injector.

Accessories Check

SHIPPING KIT CONTENTS

Compare the contents of the shipping carton to the option list inside each carton. Should you have questions concerning damage or missing parts, immediately contact your local Hewlett-Packard office.

INSTALLING SYRINGES

Two syringes are available for use with the HP 7673A. The standard HP 7673A syringe (23 gauge needle) with a volume of 10µL is for use with a packed column inlet or a split/splitless capillary inlet. The on-column HP 7673A syringe (26 gauge needle) also with a volume of 10µL is for use with the dedicated on-column capillary inlet.

CAUTION

FAILURE TO USE THE ON-COLUMN SYRINGE WHEN INJECTING INTO AN ON-COLUMN INLET COULD CAUSE DAMAGE TO THE INJECTOR, SYRINGE, COLUMN OR ALL THE ABOVE.

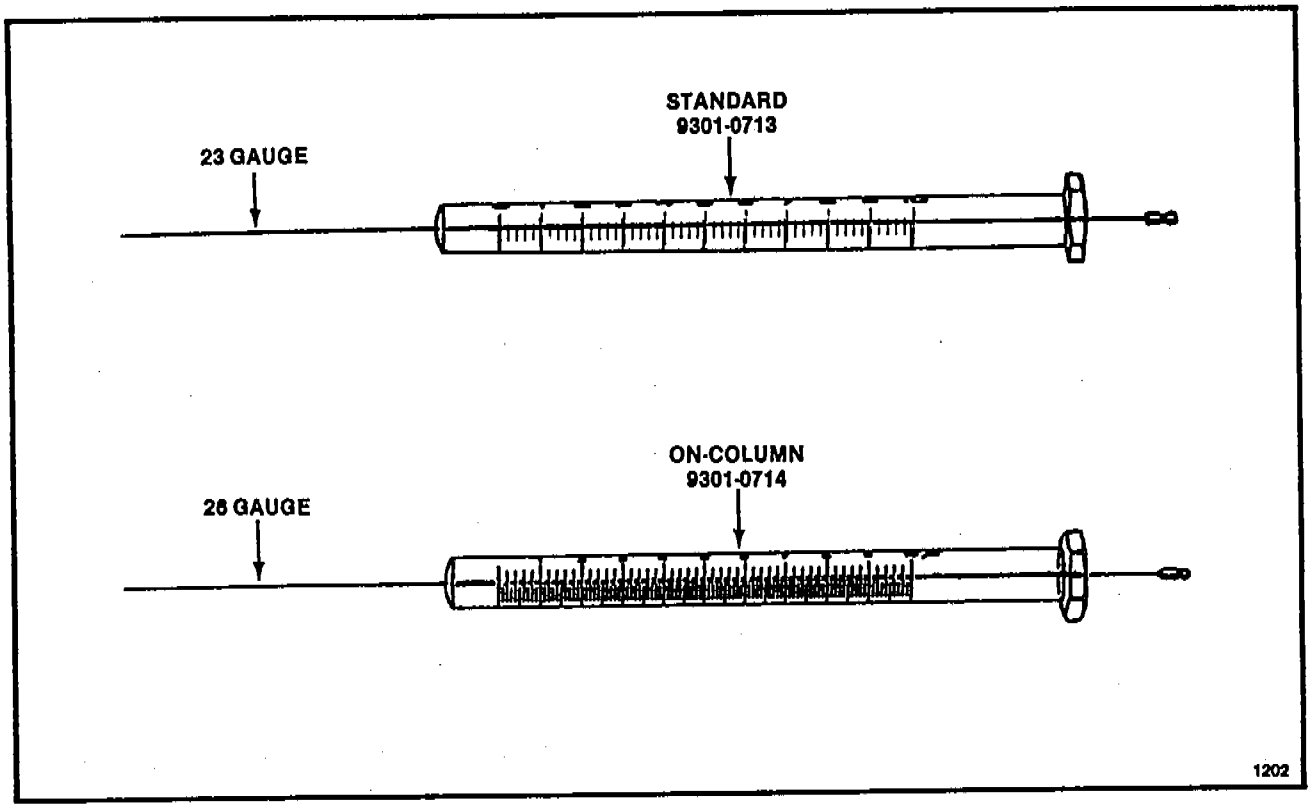


Figure 2-3. Syringes

Syringe Installation Procedure

NOTE

For ease of installation, it is recommended to install the syringe after the injector has been mounted onto the GC.

1. Open the syringe carrier access door.

2. Slide the plunger carrier up approximately 1 inch.

3. Install the plunger screw provided in the ship kit if not already present. Loosen the plunger screw enough to guide the syringe button into the plunger carrier.

4. Align the syringe with the syringe carrier (see Figure 2-4).

5. Push the syringe against the carrier until it snaps in place at the top and bottom of the syringe.

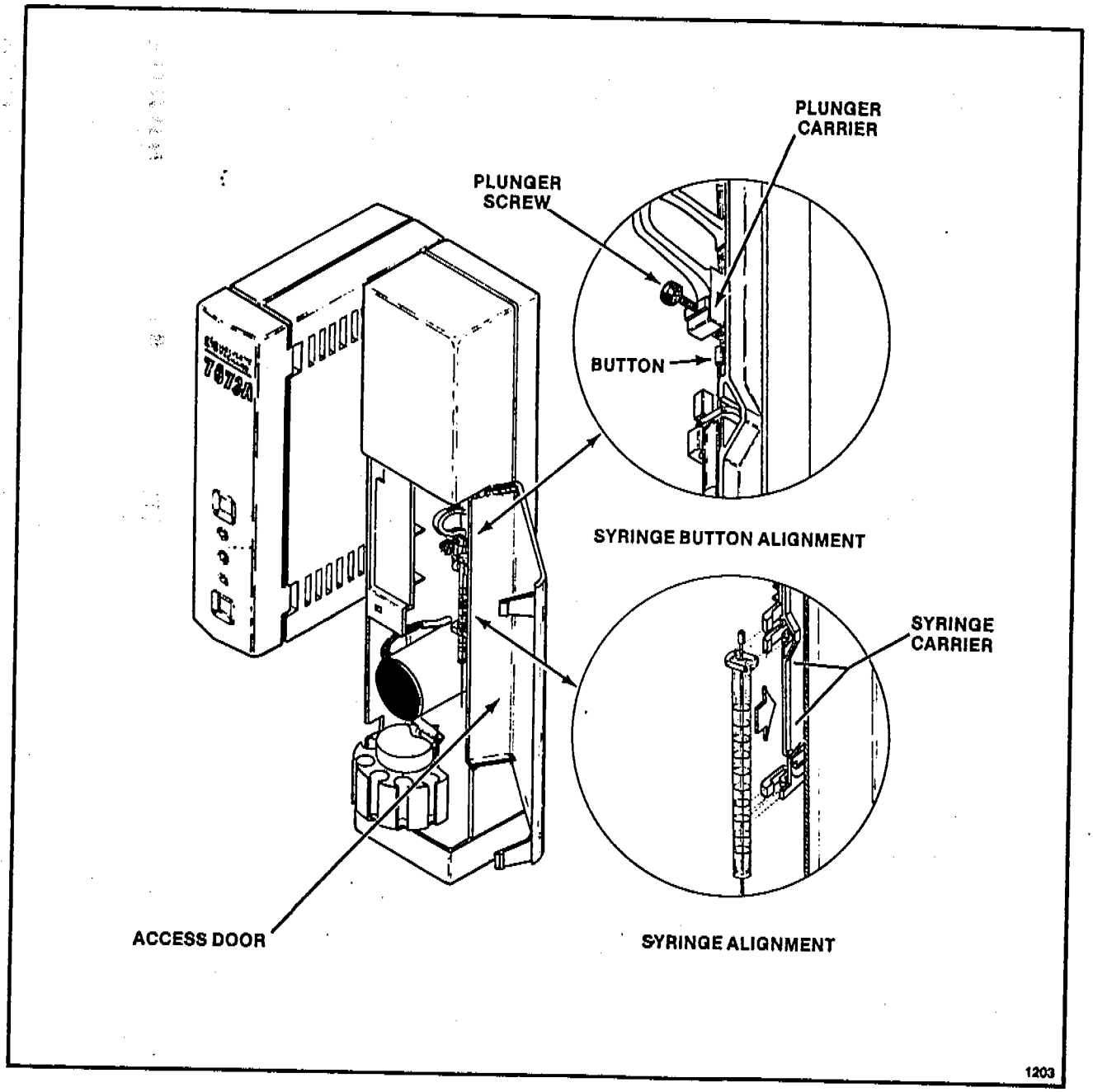


Figure 2-4. Syringe Installation

6. Slide the plunger carrier down over the button of the syringe plunger, guiding the button into the hole.

7. Tighten the plunger carrier screw.

CAUTION

WHEN INSTALLING THE SYRINGE FOR ON-COLUMN USE, MOVE THE INJECTION MODE SWITCH TO THE ON-COLUMN POSITION (SEE SECTION 3, "DEDICATED ON-COLUMN OPERATION") OR SET ON-COLUMN PARAMETER TO "YES" ON THE CONTROLLING DEVICE.

NOTE

When controlling the HP 7673A via "other instruments" the on-column parameter "YES" or "NO" setting will override the on-column switch inside the injector.

CAUTION

DO NOT ATTEMPT TO MOVE THE SYRINGE CARRIAGE BY THE PLASTIC TABS USED TO HOLD THE SYRINGE AS THESE TABS WILL BREAK.

HP 5890A MOUNTING

Injector Only Bracket

HP 5890A (OPTs #101, 102, 151)

DESCRIPTION	PART NO.
1. Bracket	18597-00010
2. Standoff	18597-20520
3. Screw-self tap	0624-0546
4. Screw-M4 x 6mm	0515-0916

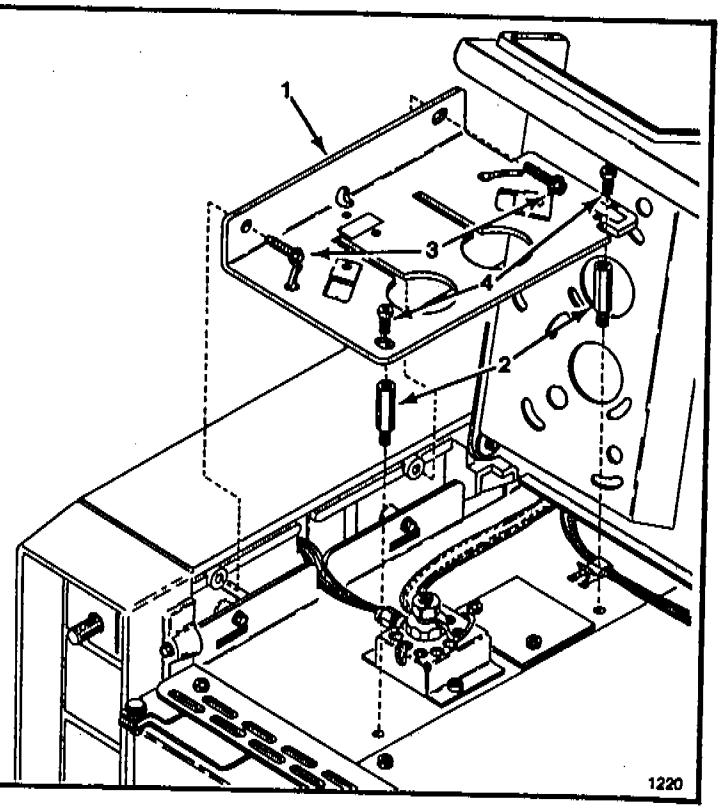


Figure 2-5. Injector Only Mounting

1. Lift the hinged top cover of the chromatograph at its front edge, exposing the inlet area.

2. Install two standoffs "2", one to the right just before the front position inlet and one to the right just after the rear position inlet.

3. Position the mounting bracket over the inlet(s).

NOTE

When the sampler is used with a capillary inlet, the inlet tubing ("Carrier In" and "Septum Purge Out") should be relocated above the mounting bracket. The brackets are labeled for proper tube routing.

Loosely install two "4" screws through the mounting bracket into the standoffs.

4. Install two "3" screws horizontally through the left side of the bracket into the body of the chromatograph.

5. Firmly tighten all four screws. Lower the GC hinged top cover.

After installation, the septum nut should be centered in the bracket opening. If not, the inlet screws must be loosened and the inlet repositioned in the center of the opening. See "Controller Position Recommendation" this section.

Injector/Tray Bracket

NOTE

The left side panel must be installed on the Gas Chromatograph before the injector/tray bracket can be installed correctly.

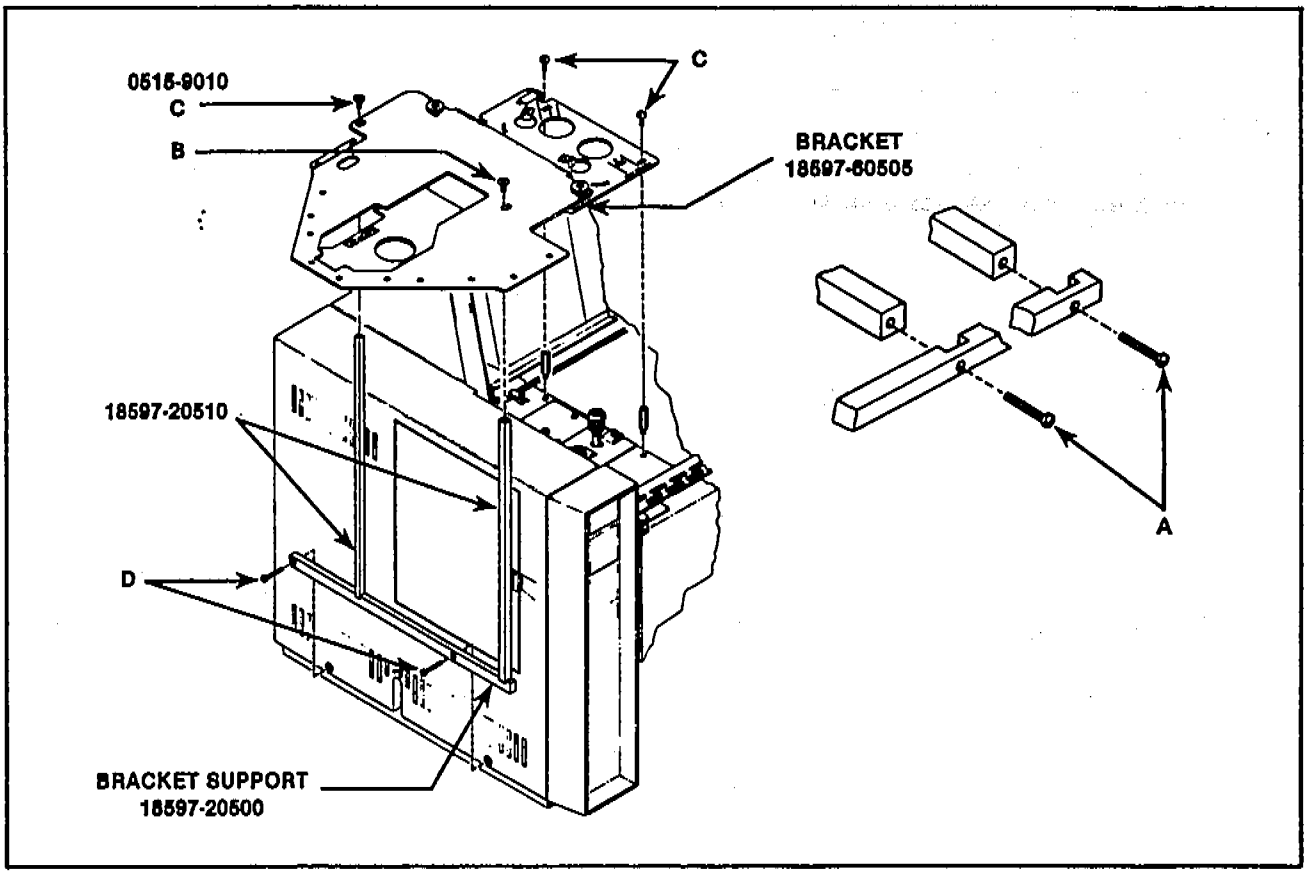


Figure 2-6. Injector/Tray Bracket

1. Assemble the two supports and support rail to match the bracket support in Figure 2-6 (detail "A".) When assembled, the supports should fit flush with the support rail.

2. Perform steps one through three ("Injector Only Bracket").

3. Remove two screws located along the bottom edge of the left side panel (do not remove the side panel).

4. Position the bracket support next to the instrument and loosely install one "B" and one "C" screw through the bracket (see detail "B,C", Figure 2-6).

5. Install two "D" screws along the bottom edge of the left side panel through the tray support and tighten firmly (see detail "D", Figure 2-6).

6. Center the bracket with the injecton ports. Firmly tighten two "C" screws to the right of the injection ports.

7. Hold the support bracket firmly against the side panel and tighten screws "B" and "C". Installation of the injector/tray bracket is complete. Lower the GC hinged top cover.

After installation, the septum nut should be centered in the bracket opening. If not, the inlet screws must be loosened and the inlet repositioned in the center of the opening. See "Controller Position Recommendation" this section.

Controller Location Recommendation

The recommended location for the HP 7673A Controller is to the right of the HP 5890A on the bench.

CAUTION

DO NOT LOCATE THE HP 7673A CONTROLLER ON TOP OF ANY GAS CHROMATOGRAPH, DUE TO THE EXCESSIVE AMOUNT OF HEAT PRESENT.

DO NOT LOCATE AN HP 3392/93A ON TOP OF THE CONTROLLER, DUE TO THE AMOUNT OF HEAT PRESENT IN BOTH INTRUMENTS.

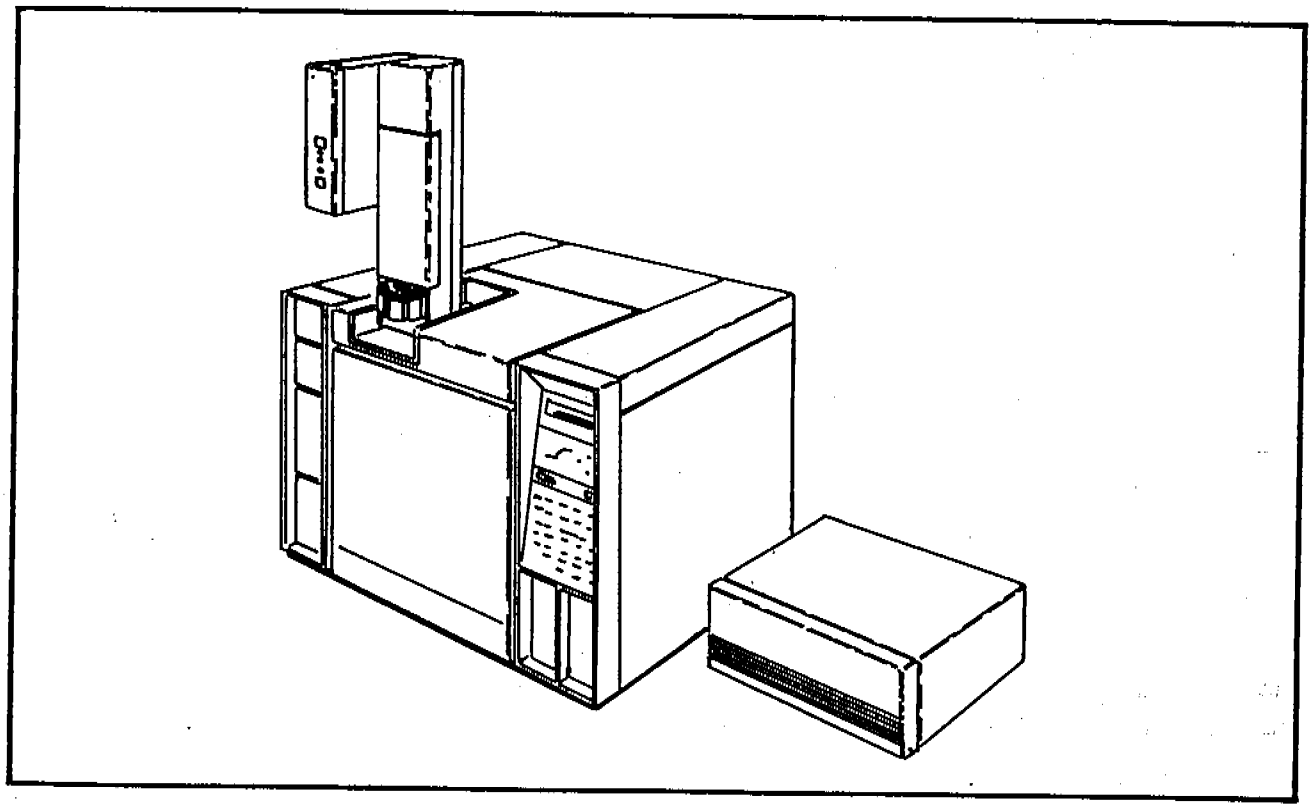


Figure 2-7. Controller Location

Proceed with injector installation instructions in this section.

Injector Installation

The HP 7673A injector mounts to a mounting plate directly over the injection port of the instrument. The septum nut mates with an opening in the base of the injector to provide precise alignment. A spring (bayonet) clip on the bottom of the injector engages the injector mounting plate already installed on the instrument.

NOTE

When installing two injectors, the rear injector must be installed first and the front last.

1. Using Figure 2-8 or 2-9 as a guide, position the injector over the injection port. Align the opening in the base of the injector (detail "A") over the septum nut. At the same time align the bayonet type spring clip (detail "B") and the alignment pin (detail "C") with their locating holes in the mounting plate.

2. Allow the base of the injector to rest flat on the top cover of the chromatograph. Turn the injector one-eigth turn clockwise until it locks the injector in place.

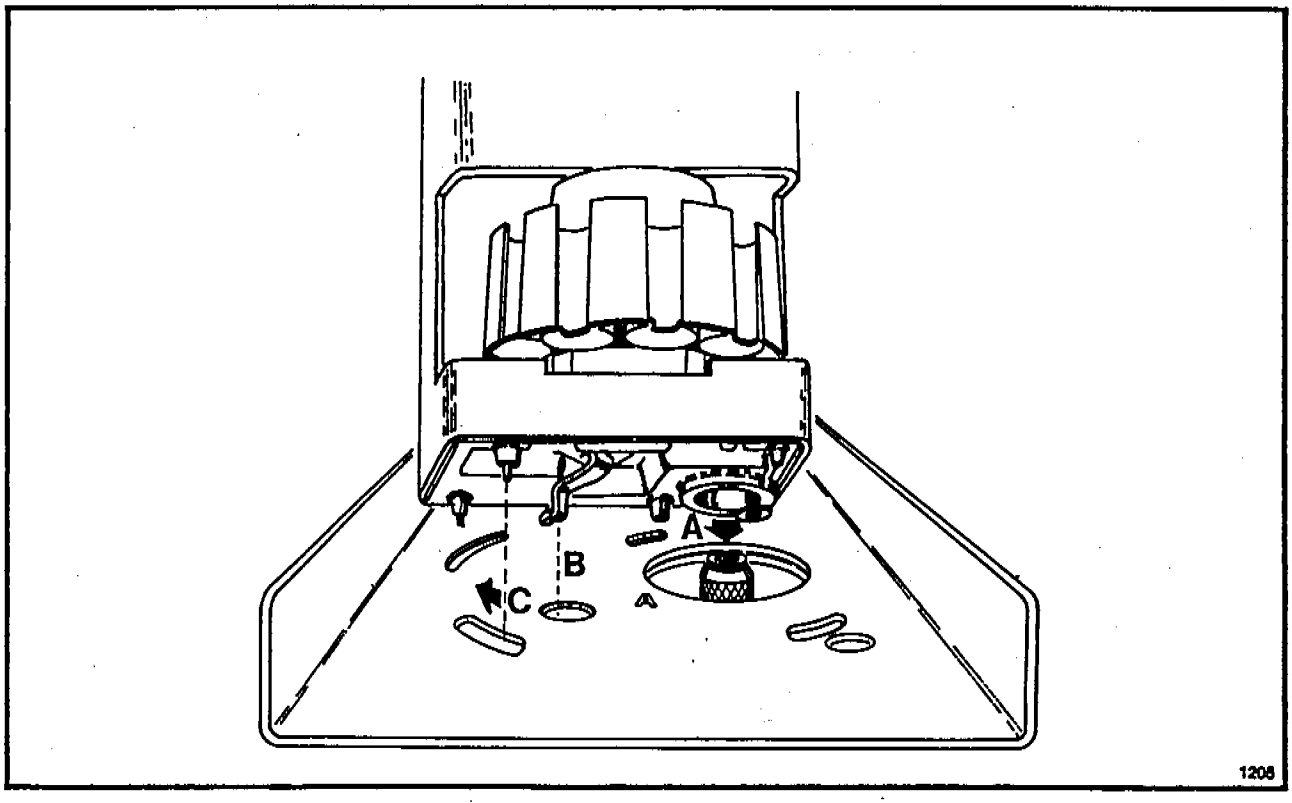


Figure 2-8. Injector Mounting Details, Front Position

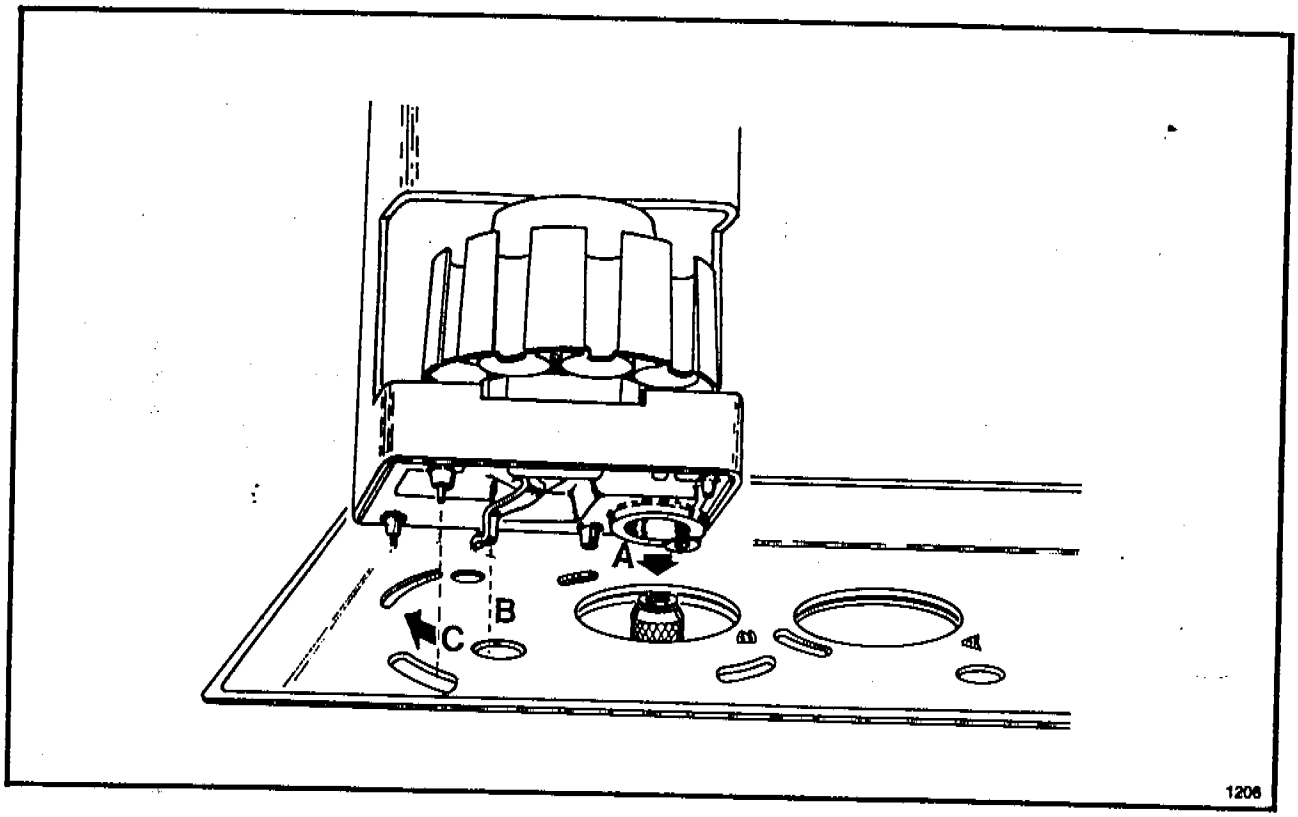


Figure 2-9. Injector Mounting Details, Rear Position

To remove, turn the injector one-eigth turn counter-clockwise and lift off. When two injectors are installed, the front injector must be removed first to allow room for the rear injector to be removed.

Locate the connections labeled "Front Injector" and/or "Rear Injector" on the back panel of the controller.

CAUTION

TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES. FAILURE TO DO SO WILL DAMAGE THE INJECTOR.

CAUTION

THE WIDER SIDE OF THE INJECTOR CABLE CONNECTOR MUST BE FACING UP WHEN CONNECTED TO THE CONTROLLER. FAILURE TO DO SO WILL DAMAGE THE INSTRUMENT.

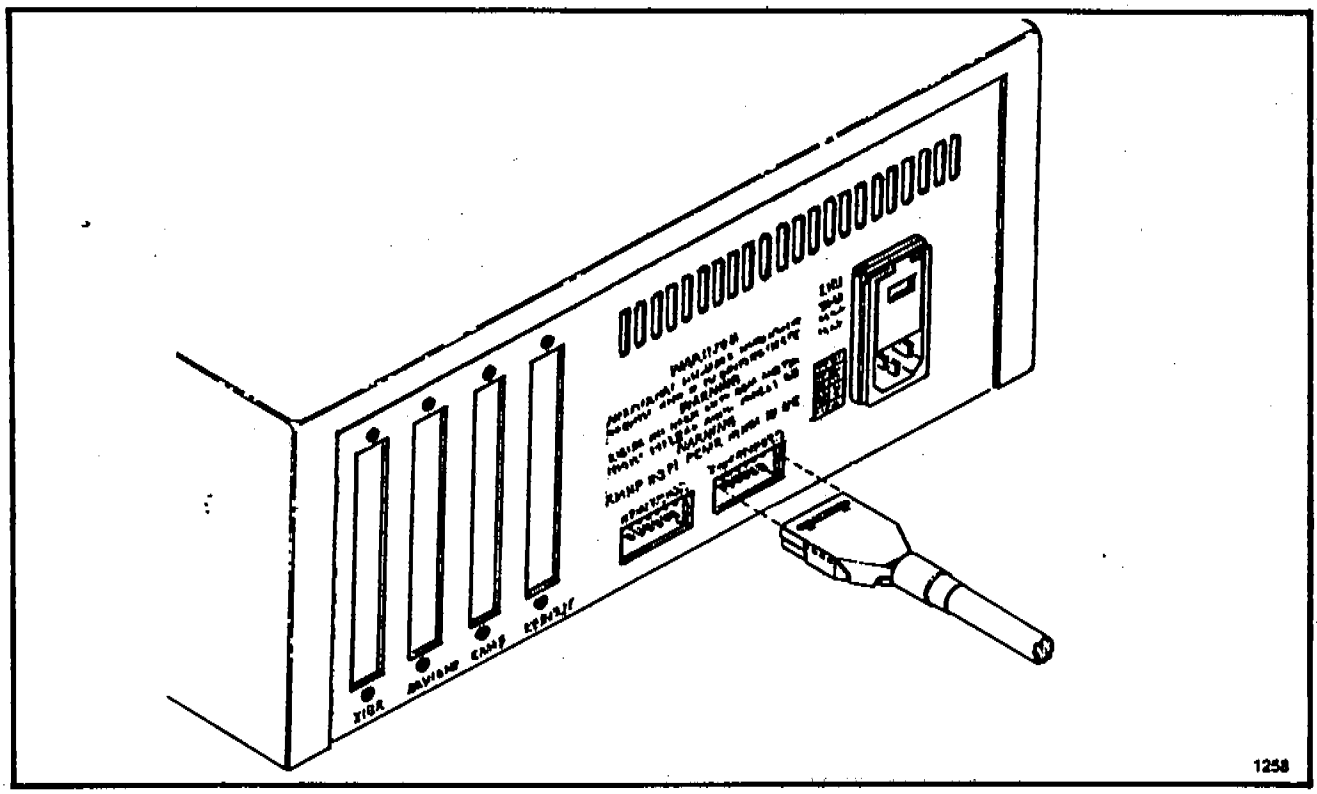


Figure 2-10. Injector Cable Connection

Using Figure 2-10 as a guide, plug the injector cable into the appropriate connection. The wider outside of the connector must be facing up.

Proceed with tray installation instructions in this section. If no tray is to be installed and the HP 7673A is to be self-controlled (stand-alone control), refer to the operation section of this manual. If no tray is to be installed and HP 3392A INET Control is being used, see "Cabling HP 5890A" this section.

Tray Installation

The HP 7673A Tray mounts to a mounting plate directly to the left of the injection port of the instrument. The bottom of the tray slides into the opening in the mounting plate to provide precise alignment.

1. Route the tray cable through the slot indicated on the tray bracket.

2. Using Figure 2-11 as a guide, align the base of the tray with the opening in the mounting plate. Rest the tray flat on the bracket. An arrow on the tray is provided to show the direction the tray is installed.

3. Locate the tray locking tabs on the mounting bracket. Rotate the locking tabs away from the tray. Slide the tray into the bracket until the alignment pin stops the tray. The trays edge should rest under the locking tabs on the bracket when positioned properly.

4. Lift and rotate the locking tabs toward the tray. Release the tabs to lock them into the slots in the tray.

5. Connect the output cable from the tray to the connector labeled "TRAY" at the rear of the HP 7673A Controller.

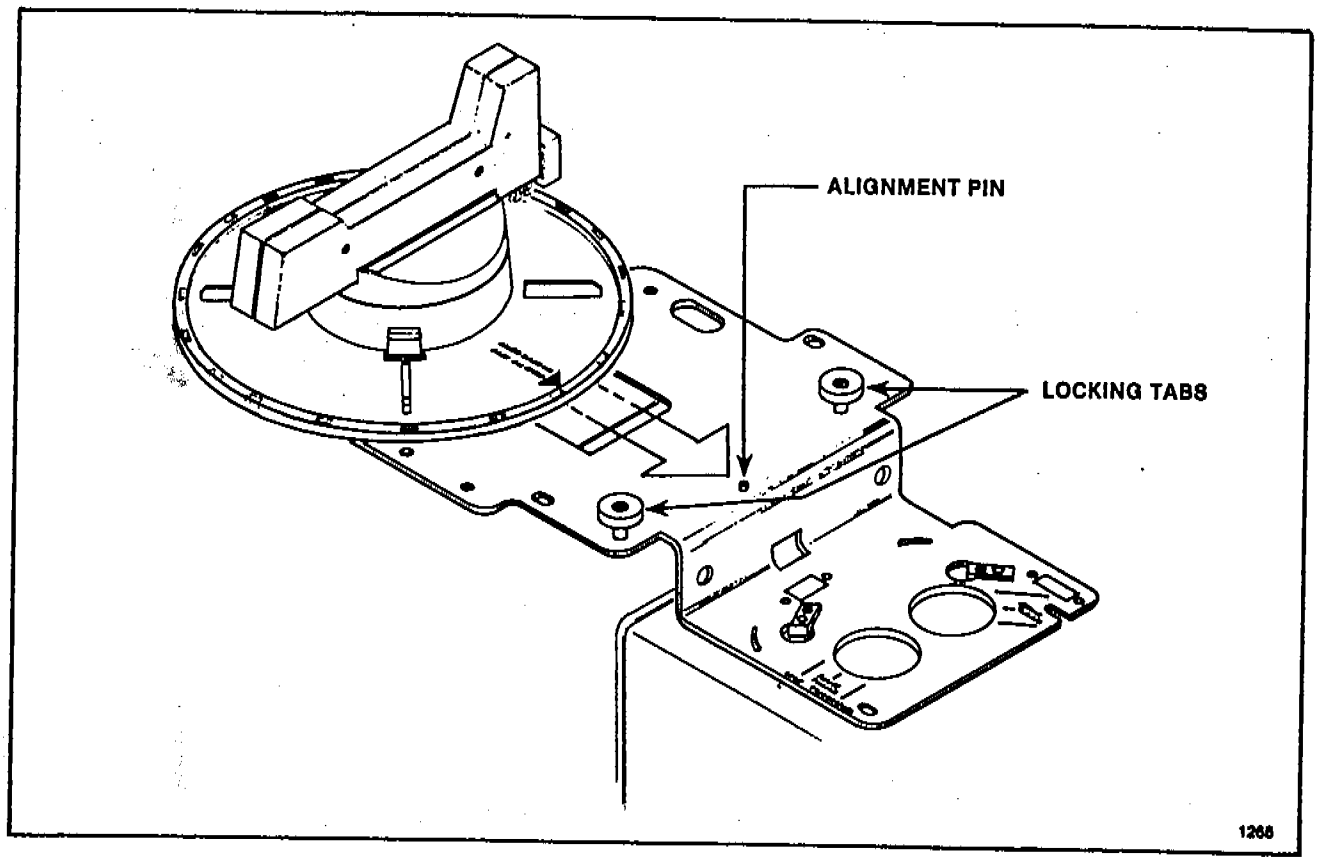


Figure 2-11. Tray Installation

6. Vial positions are arranged in quadrants of 25 each. Each quadrant contains five rows of five samples and can be removed from the tray for remote loading or storage. Install the quadrants by matching the bottle location numbers on the quadrants with those on the tray base. Insert the locating tab on the backside of the quadrant into the slot in the tray. Align the tab along the front edge of the quadrant and press downward until the tab snaps into place.

If stand-alone control is to be used, see HP 5890A Cabling in this section for remote start/stop cabling instructions.

If an HP 3392A is to be used for control, see HP 5890A Cabling in this section for INET cable hookup.

CAUTION

THE HP 7673A TRAY MUST BE UNLATCHED AND MOVED 1-INCH TO THE LEFT BEFORE THE HP 7673A INJECTORS CAN BE REMOVED. FAILURE TO DO SO MAY TRSULT IN MISALIGNMENT OF THE INJECTOR AND TRAY.

CABLING HP 5890A

HP 3392A INET Control

WARNING

FOR SAFETY, TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES.

Figure 2-12 shows the HP 3392A connections needed to operate the Instrument Network (INET) to an HP 5890A and the HP 7673A Controller.

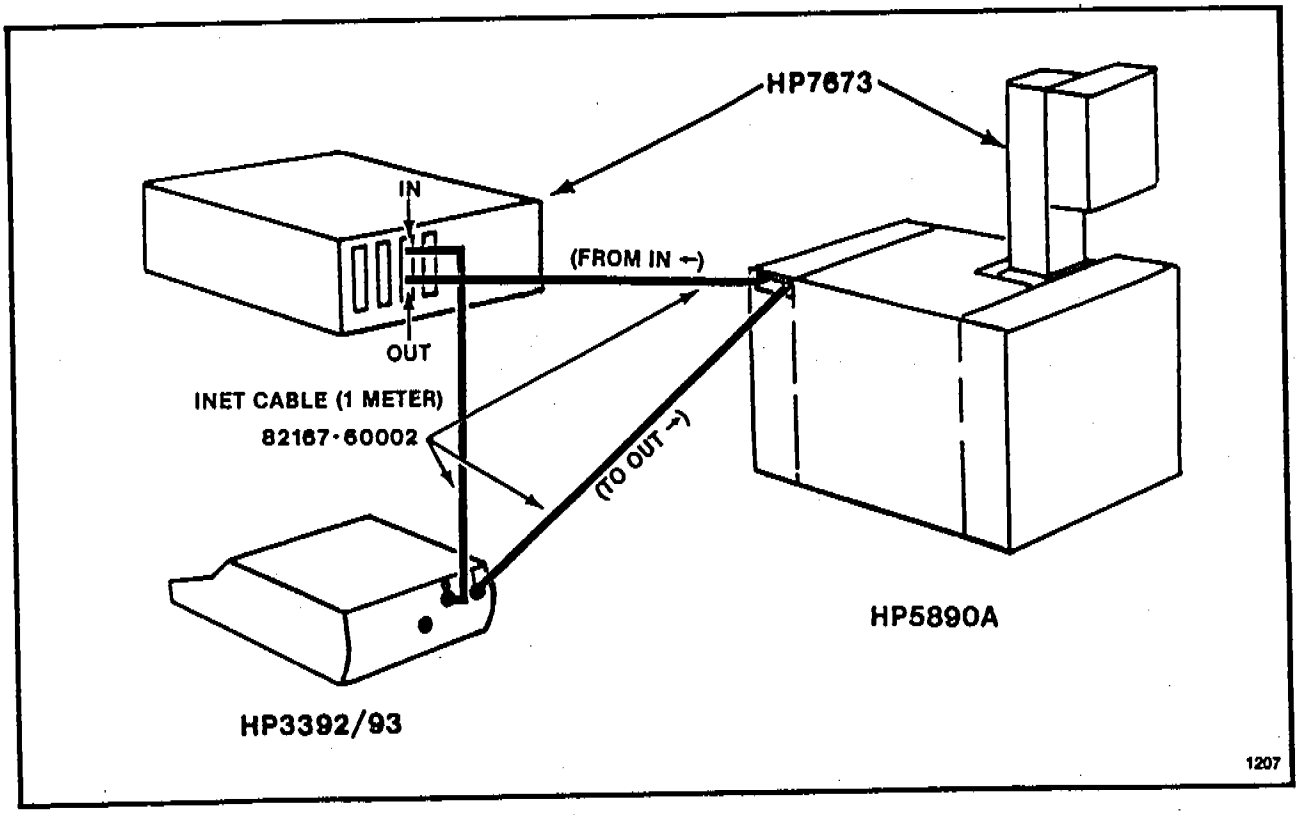


Figure 2-12. HP 7673A, INET Controlled

Referring to the figure above, install the INET interconnecting cables in a loop type fashion (e.g. controller to the chromatograph to the integrator).

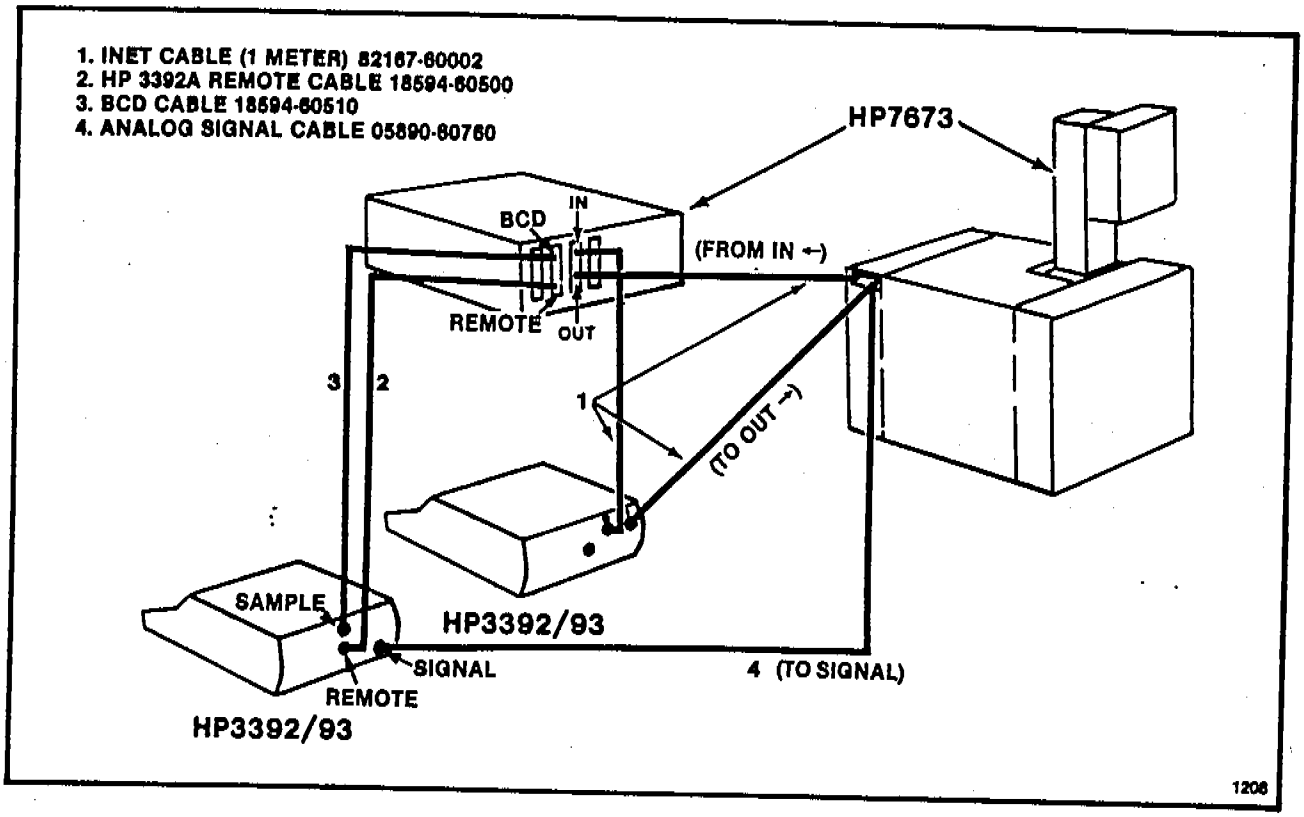


Figure 2-13. HP 7673A, Two Injectors INET Controlled

Referring to the figure above, install the INET interconnecting cables in a loop type fashion (e.g. controller to the chromatograph to the integrator). Also install the remote start/stop, BCD output, and signal cables for the second injector.

If not already done, install the syringe (see INSTALLING SYRINGES, this section). After installing the syringe, refer to the operation section of this manual for operating instructions.

Stand-Alone Control

Figure 2-14 shows the connections needed for a remote start/stop signal between an HP 5890A and the HP 7673A Controller.

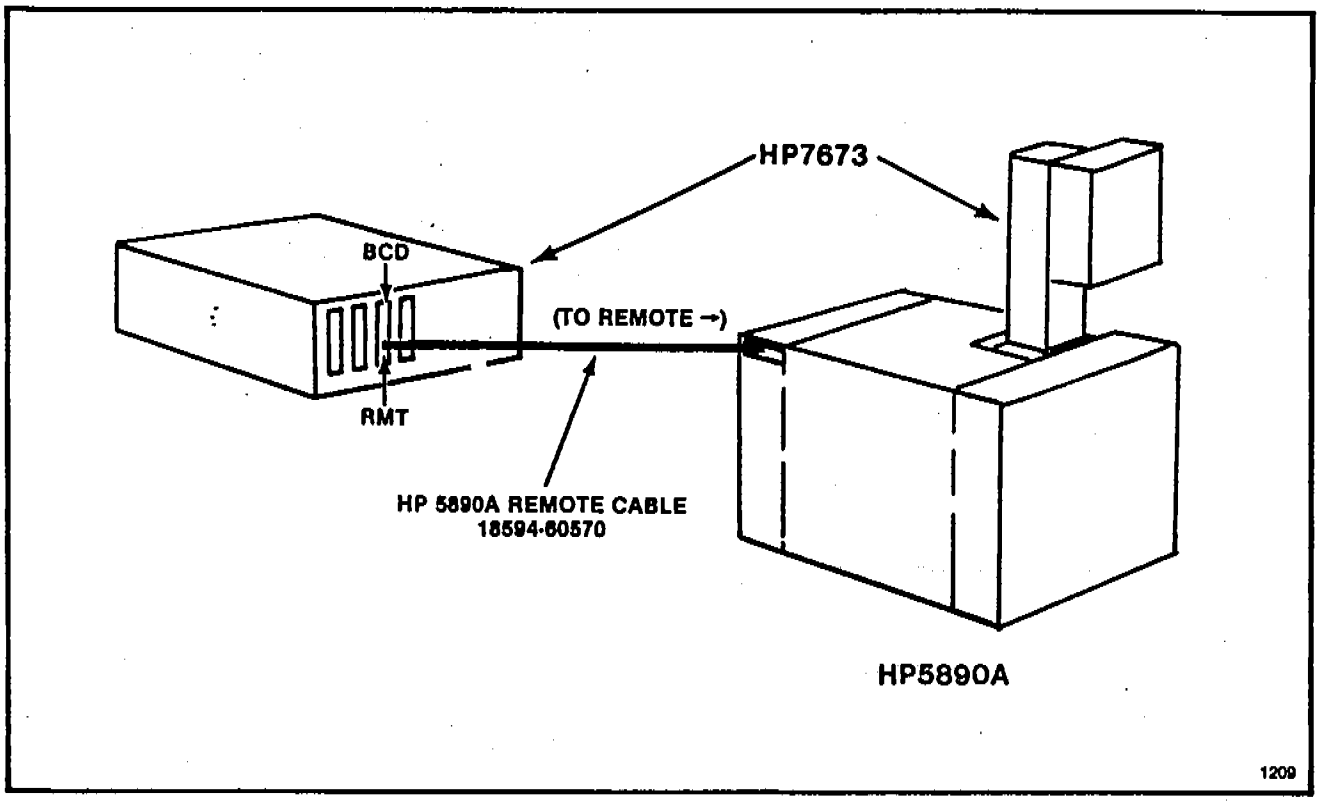


Figure 2-14. HP 7673A, Stand-Alone Control

Referring to the figure above, install remote start/stop cable between the HP 5890A and the 18594A controller.

HP 5880A MOUNTING

Injector Only Bracket

NOTE

When mounting two injectors, they must be in non-adjacent positions of the injection ports, (i.e. A/C position or B/D position). For a single injector, the bracket can be located to access the desired injection port.

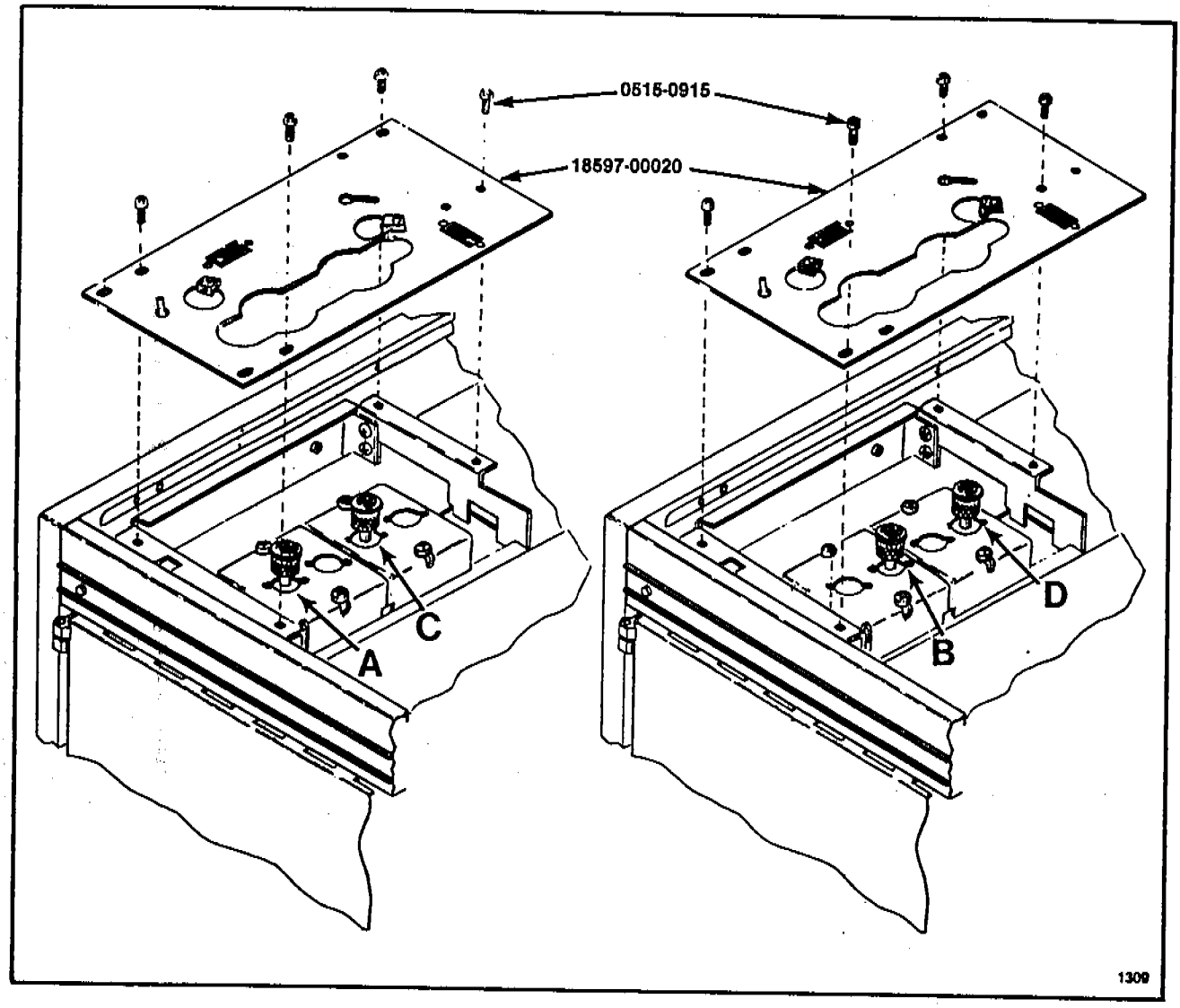


Figure 2-15. Injector Only Mounting

1. Remove the left portion of the top panel.

2. If using a packed port, replace the HP 5880A septum nut with the septum nut provided with the HP 7673A. The septum nut on the split/splitless capillary inlet is OK for use with the sampler. However, when using a split/splitless capillary inlet, the inlet tubing should be relocated above the mounting bracket, in the positions indicated on the bracket.

3. Install the injector mounting bracket to the support using four M4X6mm screws.

   There are two sets of holes for attaching the bracket to the support. One set of holes positions the bracket to permit the injector to be used with injection ports "A" and "C". The second set is for injection ports "B" and "D". Use the mounting holes that will permit the injector to be installed over the intended injection port.

4. Firmly tighten all screws. Re-install the left portion of the top panel.

See Controller Position Recommendation this section.

Injector/Tray Bracket

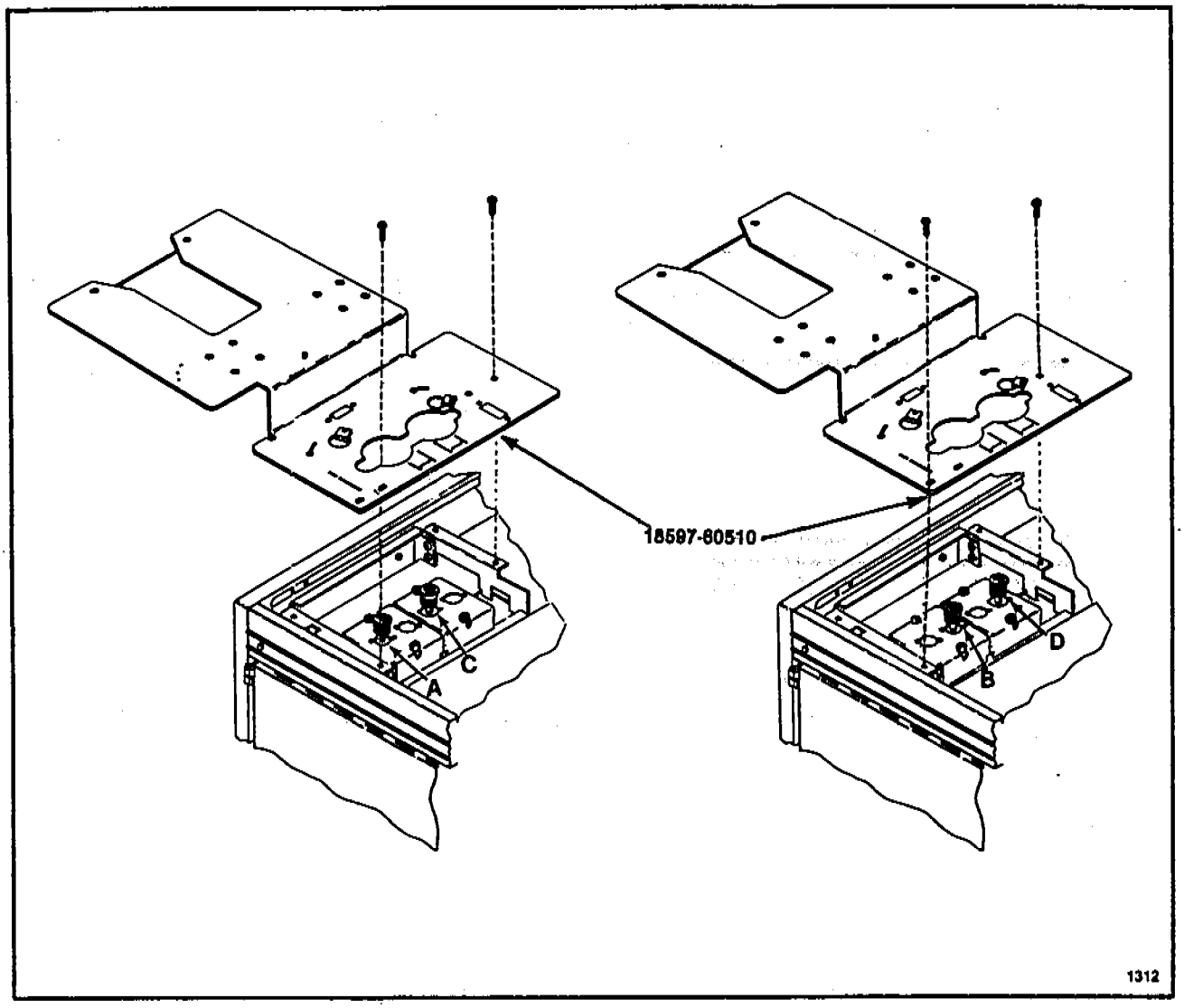


Figure 2-16. Injector/Tray Bracket

1. Perform steps one and two from the previous page (Injector Only Bracket).

2. Install the injector/tray mounting bracket to the support using two M4X6mm screws.

   There are two sets of holes for attaching the bracket to the support. One set of holes positions the bracket to permit the injector to be used with injection ports "A" and "C". The second set is for injection ports "B" and "D". Use the mounting holes that will permit the injector to be installed over the intended injection port.

3. Install two tray mounting bracket supports:

   a. Position the supports under the mounting bracket to the left side of the instrument. Loosely install two M3X16mm screws through the support into the left side of the instrument for each support.

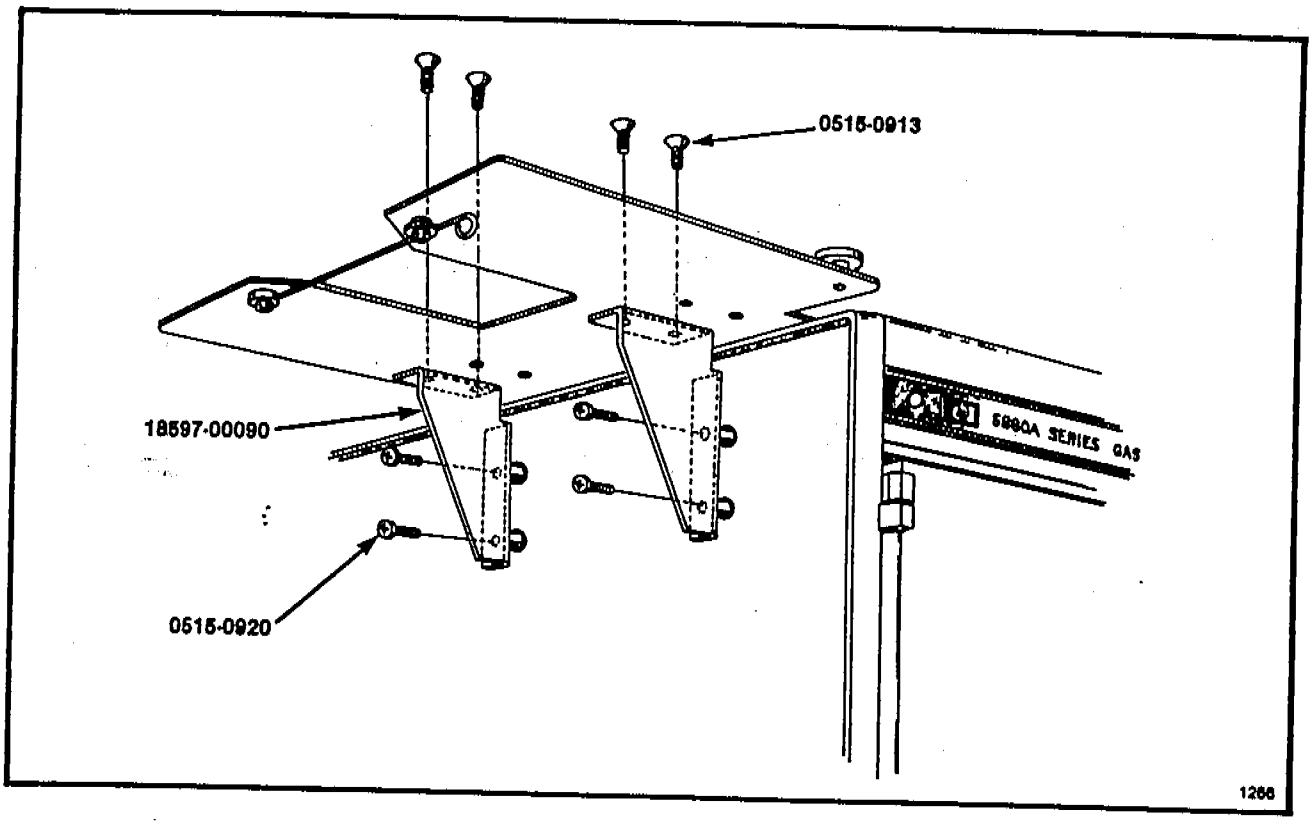


Figure 2-17. Tray Support Positions

b. Install two M4X6mm screws from the top of the bracket for each support and tighten firmly.

c. Tighten the two screws loosely installed in step "3,a".

d. Re-install the left portion of the top panel.

See Controller Position Recommendation this section.

Controller Position Recommendation

The recommended location for the HP 7673A Controller is to the right of the HP 5880A on the bench. It can be safely placed under the HP 5880A terminal.

WARNING

DO NOT LOCATE THE HP 7673A CONTROLLER ON TOP OF ANY GAS CHROMATOGRAPH, DUE TO THE EXCESSIVE AMOUNT OF HEAT PRESENT.

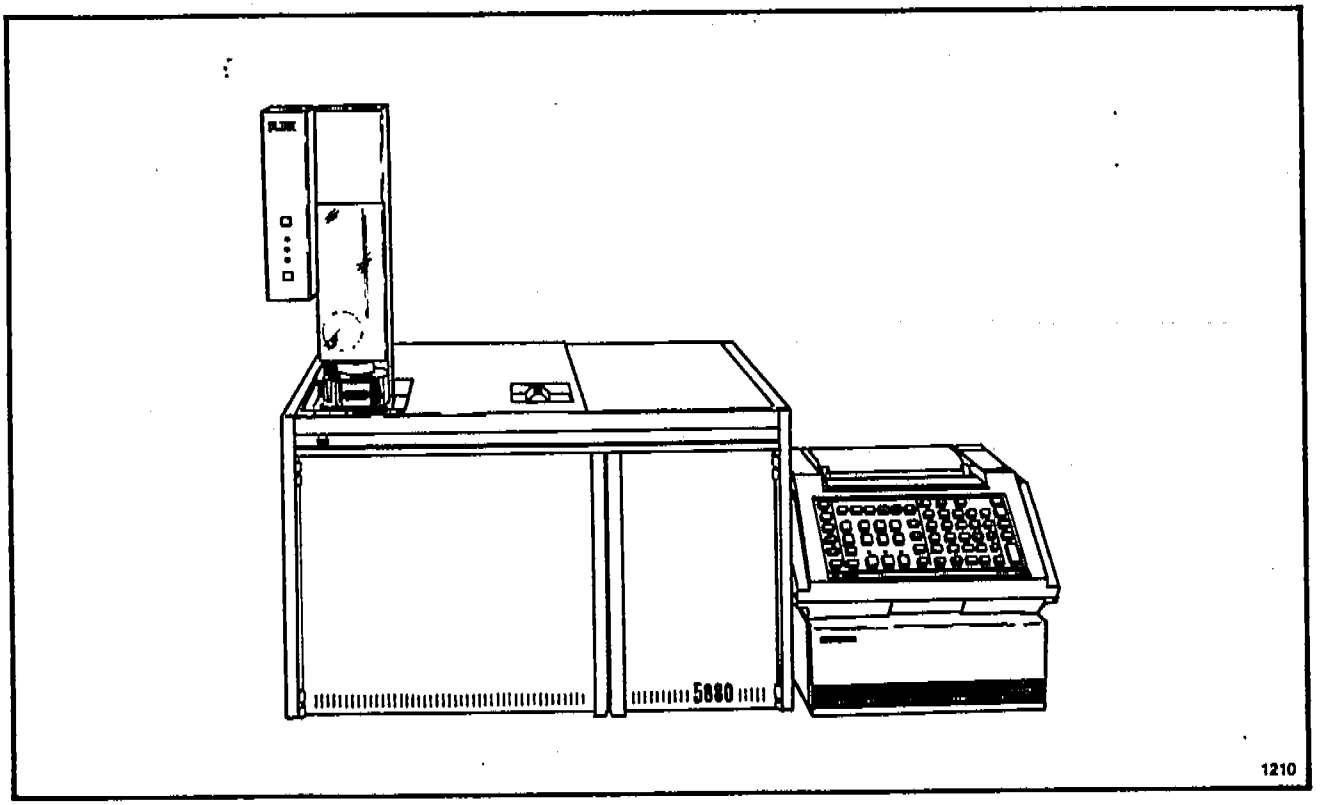


Figure 2-18. Controller Location

Proceed with injector mounting instructions in this section.

Injector Installation

The HP 7673A injector mounts directly on the injection port of the instrument. A special septum nut mates with an opening in the base of the injector to provide precise alignment. A spring (bayonet) clip on the bottom of the injector engages the injector mounting plate on the instrument.

NOTE

When installing two injectors, the rear injector must be installed first and the front last. Two injectors must be mounted in non-adjacent positions (i.e., A/C or B/D).

When inlets are located together (i.e. A/B, B/C, or C/D positions), a flat septum plug must be installed on the inlet not being used.

1. Using Figure 2-19 or 2-20 as a guide, position the injector over the injection port. Align the opening in the base of the injector (detail "A") over the septum nut. At the same time align the bayonet type spring clip (detail "B") and the alignment pin (detail "C") with their locating holes in the mounting plate.

2. Allow the base of the injector to rest flat on the top cover of the chromatograph. Turn the injector one-eigth turn clockwise to lock the injector in place.

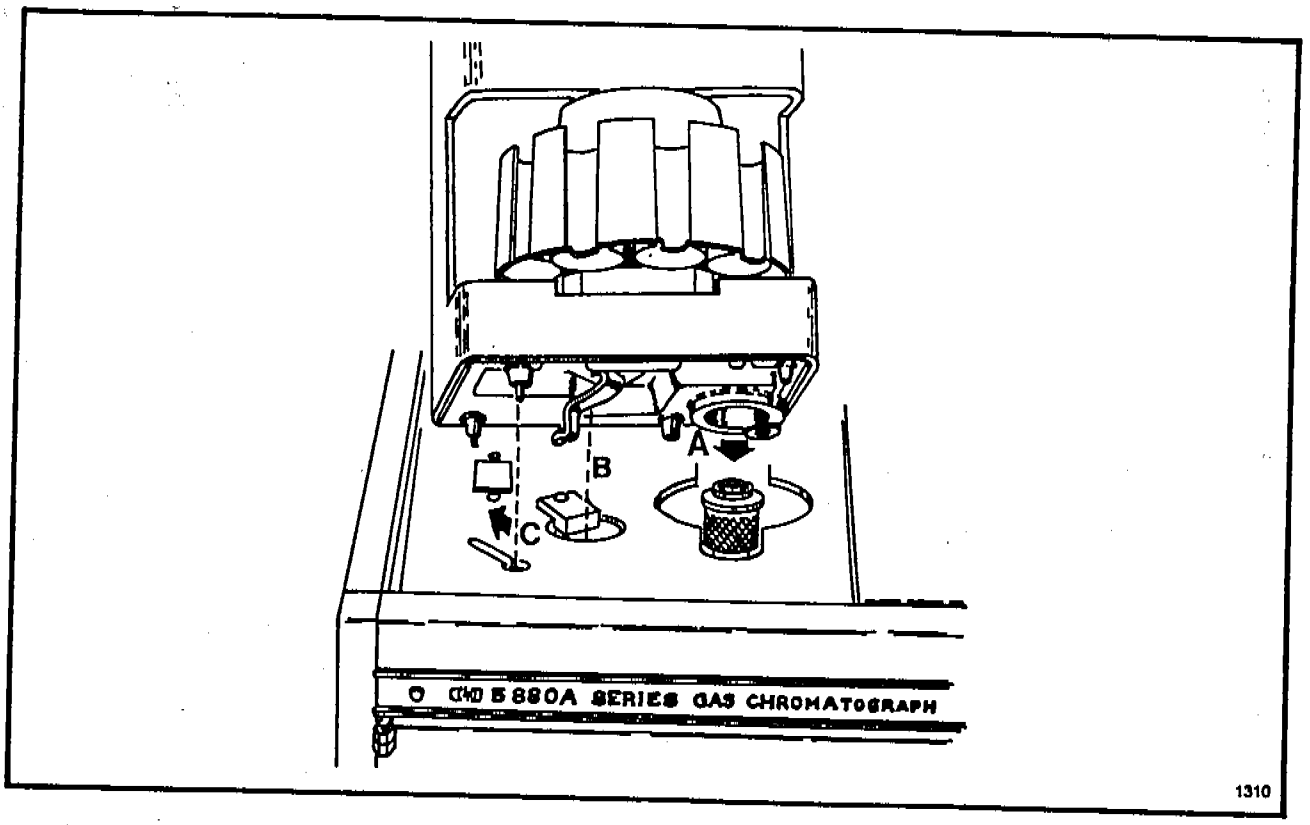


Figure 2-19. Injector Mounting Details, Front Position

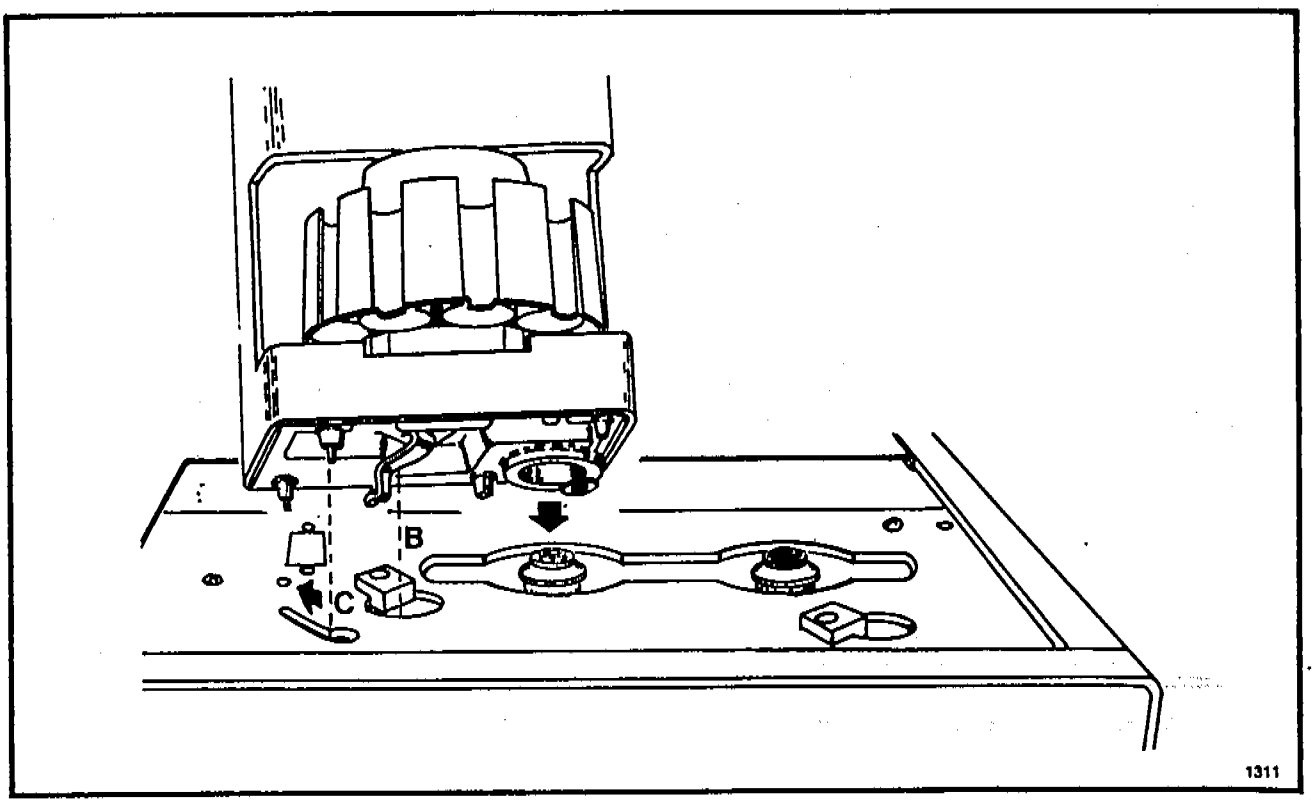


Figure 2-20. Injector Mounting Details, Rear Position

To remove, turn the injector one-eighth turn counter-clockwise and lift off. When two injectors are installed, the front injector must be removed first to allow room for the rear injector to be removed. Locate the connections labeled "Front Injector" and/or "Rear Injector" on the back panel of the controller.

CAUTION

TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES. FAILURE TO DO SO WILL DAMAGE THE INJECTOR.

CAUTION

THE WIDER SIDE OF THE INJECTOR CABLE CONNECTOR MUST BE FACING UP WHEN CONNECTED TO THE CONTROLLER. FAILURE TO DO SO WILL DAMAGE THE INSTRUMENT.

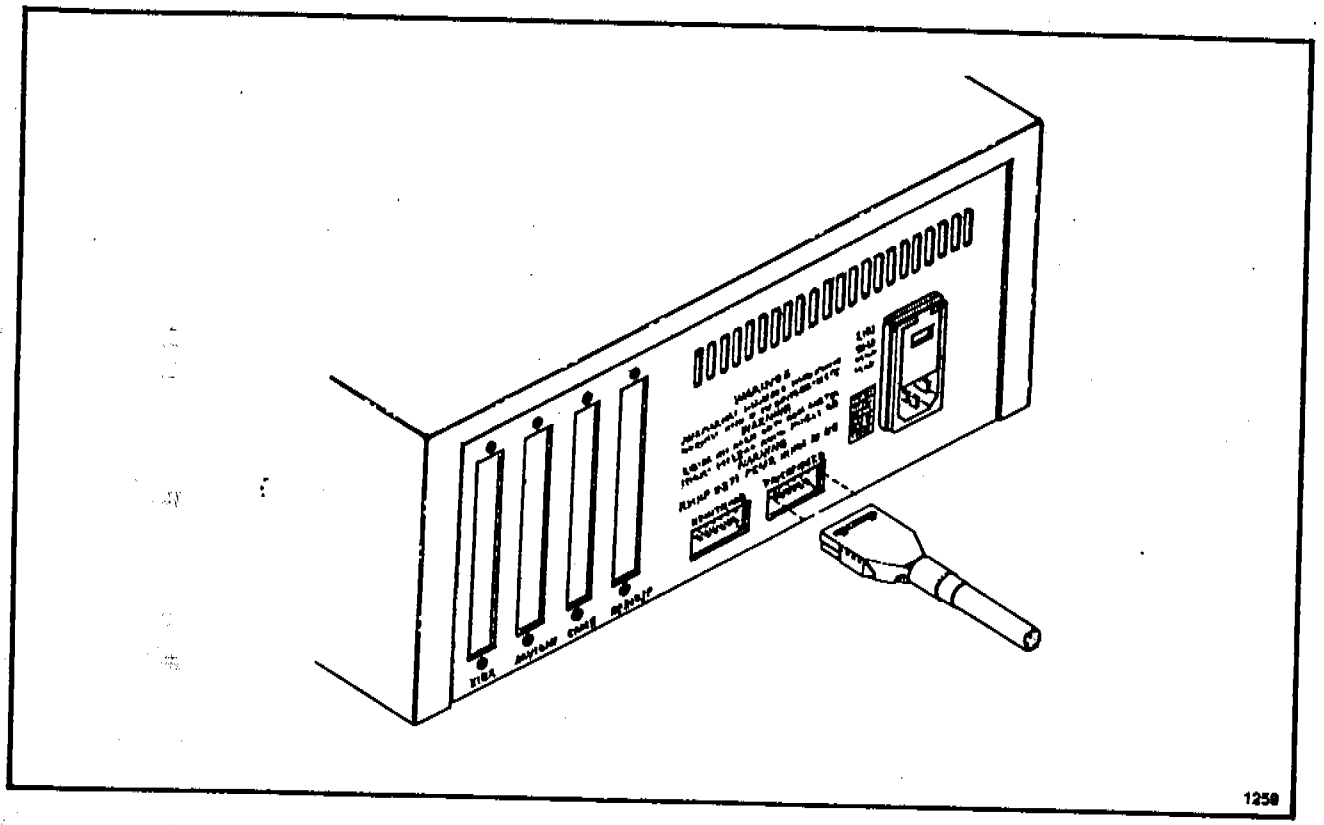


Figure 2-21. Injector Cable Connection

Using Figure 2-21 as a guide, plug the injector cable into the appropriate connection (FRONT or REAR INJECTOR) at the rear of the controller. The wider outside of the connector must be facing up.

Proceed with tray installation instructions in this section. If no tray is to be installed, see "Cabling HP 5880A" this section.

Tray Installation

The HP 7673A tray mounts to a mounting plate directly to the left of the injection port of the instrument. The bottom of the tray slides into the opening in the mounting plate to provide precise alignment.

WARNING

TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES.

1. Using Figure 2-22 as a guide, position the tray to the left of the mounting bracket. Align the base of the tray with the opening in the mounting plate. An arrow on the tray is provided to show the direction the tray is installed.

2. Locate the tray alignment pin on the mounting bracket. Slide the tray into the bracket until the pin stops the tray. The trays edge should rest under the circular stops on the bracket when installed properly.

3. Close the tray retaining latch to secure the tray.

4. Connect the output cable from the tray to the connector labeled "TRAY" at the rear of the HP 7673A Controller.

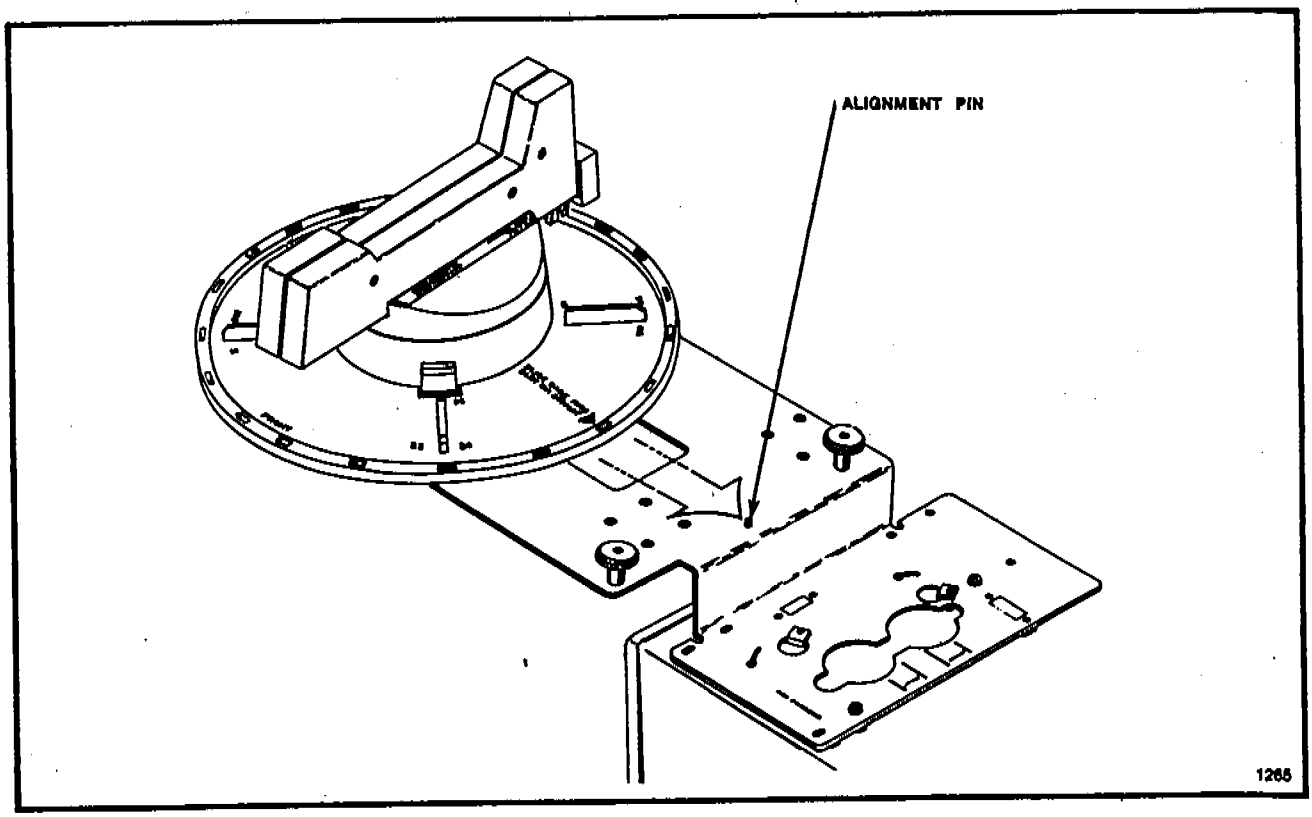


Figure 2-22. Tray Installation

5. Vial positions are arranged in quadrants of 25 each. Each quadrant contains five rows of five samples and can be removed from the tray for remote loading or storage. Install the quandrants by matching the bottle location numbers on the quadrants with those on the tray base. Insert the locating tab on the backside of the quadrant into the slot in the tray. Align the tab along the front edge of the quadrant and press downward until the tab snaps into place.

CAUTION

THE HP 7673A TRAY MUST BE UNLATCHED AND MOVED 1-INCH TO THE LEFT BEFORE THE HP 7673A INJECTORS CAN BE REMOVED. FAILURE TO DO SO MAY RESULT IN MISALIGNMENT OF THE INJECTOR AND TRAY.

CABLING HP 5880A

HP 5880A Control

WARNING

FOR SAFETY, TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES.

Figure 2-23 shows an HP 5880A and HP 7673A connected by the control cable.

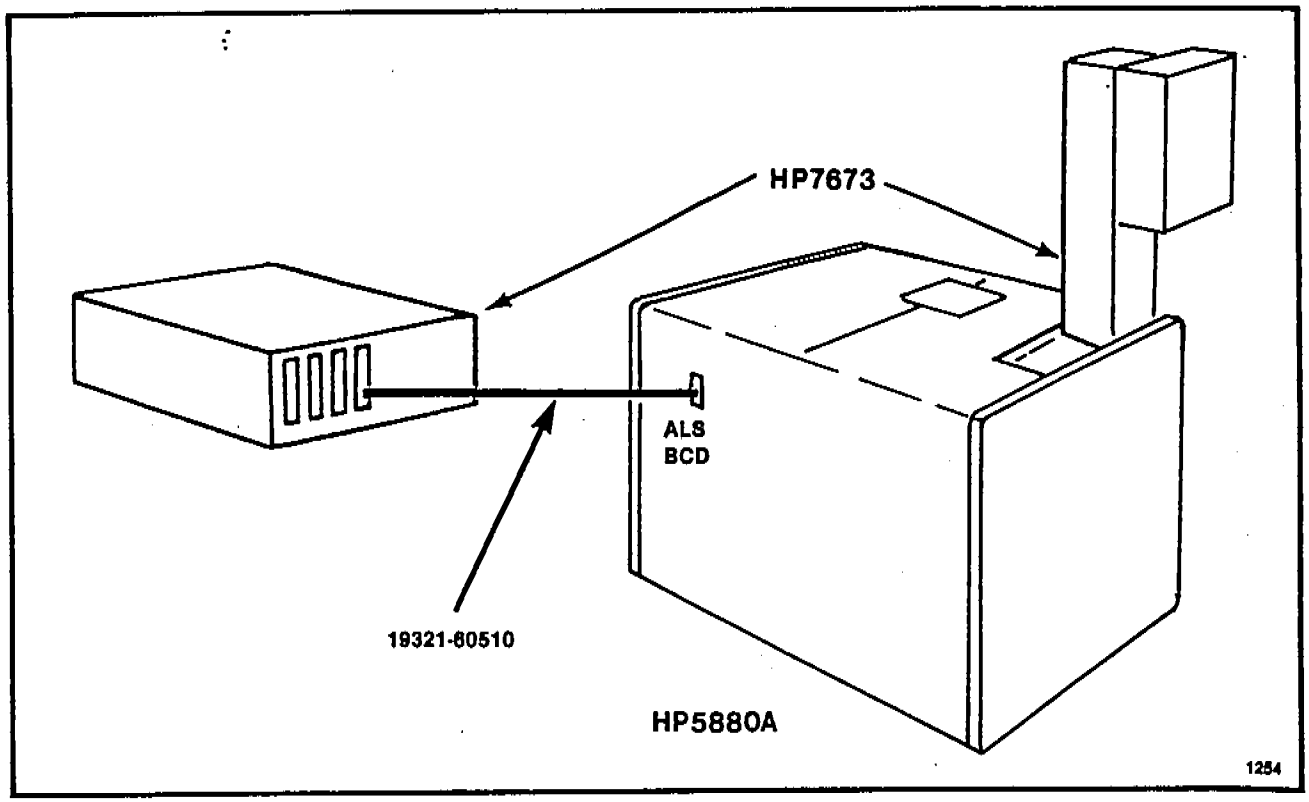


Figure 2-23. HP 7673A, HP5880A Controlled

Referring to the figure above, connect the HP 5880A control cable to the rear of the HP 5880A and the rear of the controller. This control cable is the only controlling cable needed whether one or two injectors are installed.

If not already done, install the syringe (see Syringe Installation, this section). After installing the syringe refer to the operation section of this manual for operating instructions.

HP 5700A SERIES MOUNTING (5710/30/90)

These instructions describe how to install sampler mounting hardware designed specifically for the HP 5700A series gas chromatographs.

Injector Only Bracket

If an on-column capillary inlet is installed (HP 5790A GC only), remove the appropriate hole plug (A or B) in the position occupied by the inlet. Also, the inlet's control module (on the back edge of the top panel) must be removed before the modified sampler panel can be installed.

PACKED COLUMN INLET

1. Remove the top panel of the GC over the oven and replace it with the modified panel supplied. Use new 8-32X0.250 inch screws to secure the panel to the instrument.

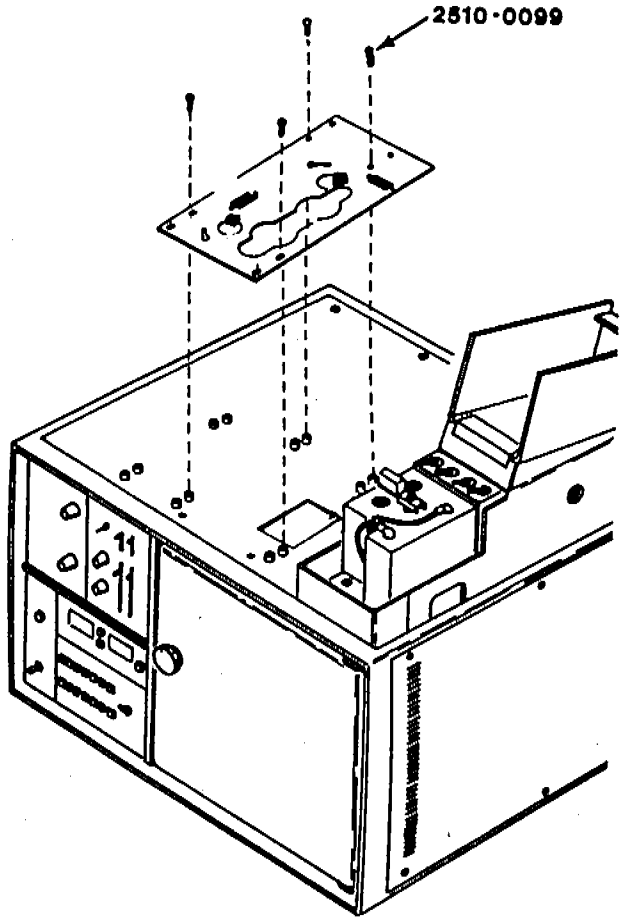


Figure 2-24. Injector Only Mounting (Packed Column Inlet)

2. Replace the HP 5700A septum nut with the septum nut provided with the HP 7673A.

3. Install the injector mounting bracket to the top panel using four 8-32X0.250 inch screws.

   The chromatograph's top panel has fittings so arranged that the injector can be positioned over the A or B inlet. However, when the injector is used with a packed port, it must be installed in the "B" position. Use the fittings that will permit the injector to be installed over the "B" position (packed column inlet use).

4. Firmly tighten all screws.

See Controller Position Recommendation this section.

CAPILLARY COLUMN INLET

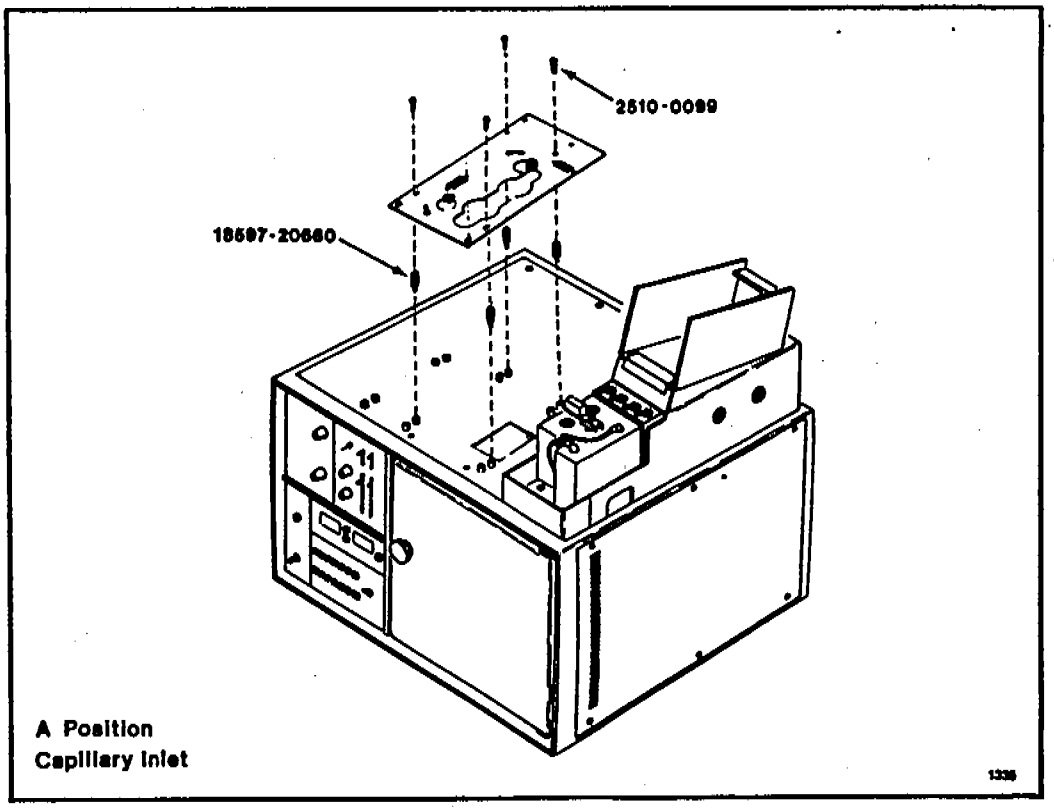


Figure 2-25. Injector Only Mounting (Capillary Inlet)

1. Remove the top panel of the GC over the oven and replace it with the modified panel supplied. Use new 8-32X0.250 inch screws to secure the panel to the instrument.

2. The septum nut on the capillary inlet is correct for use with the HP 7673A Injector.

3. The supplied instrument top panel has fittings so arranged that the injector can be positioned over the A or B inlet. Use the fittings that will permit the injector to be installed over the "A" position (capillary column inlet use).

   Install four 15.5mm long standoffs into the "A" position fittings on the top panel.

4. Install the injector mounting bracket to the standoffs using four 8-32X0.250 inch screws.

5. Firmly tighten all four screws.

See "Controller Position Recommendation" this section.

Injector/Tray Bracket

If an on-column capillary inlet is installed (HP 5790A GC only), install the appropriate hole plug (A or B) in the position not occupied by the inlet. Also, the inlets' control module (on the back edge of the top panel) must be removed before the modified sampler panel can be installed.

PACKED COLUMN INLET

1. Remove the top panel of the GC over the oven and replace it with the modified panel supplied. Use new 8-32X0.250 inch screws to secure the panel to the instrument.

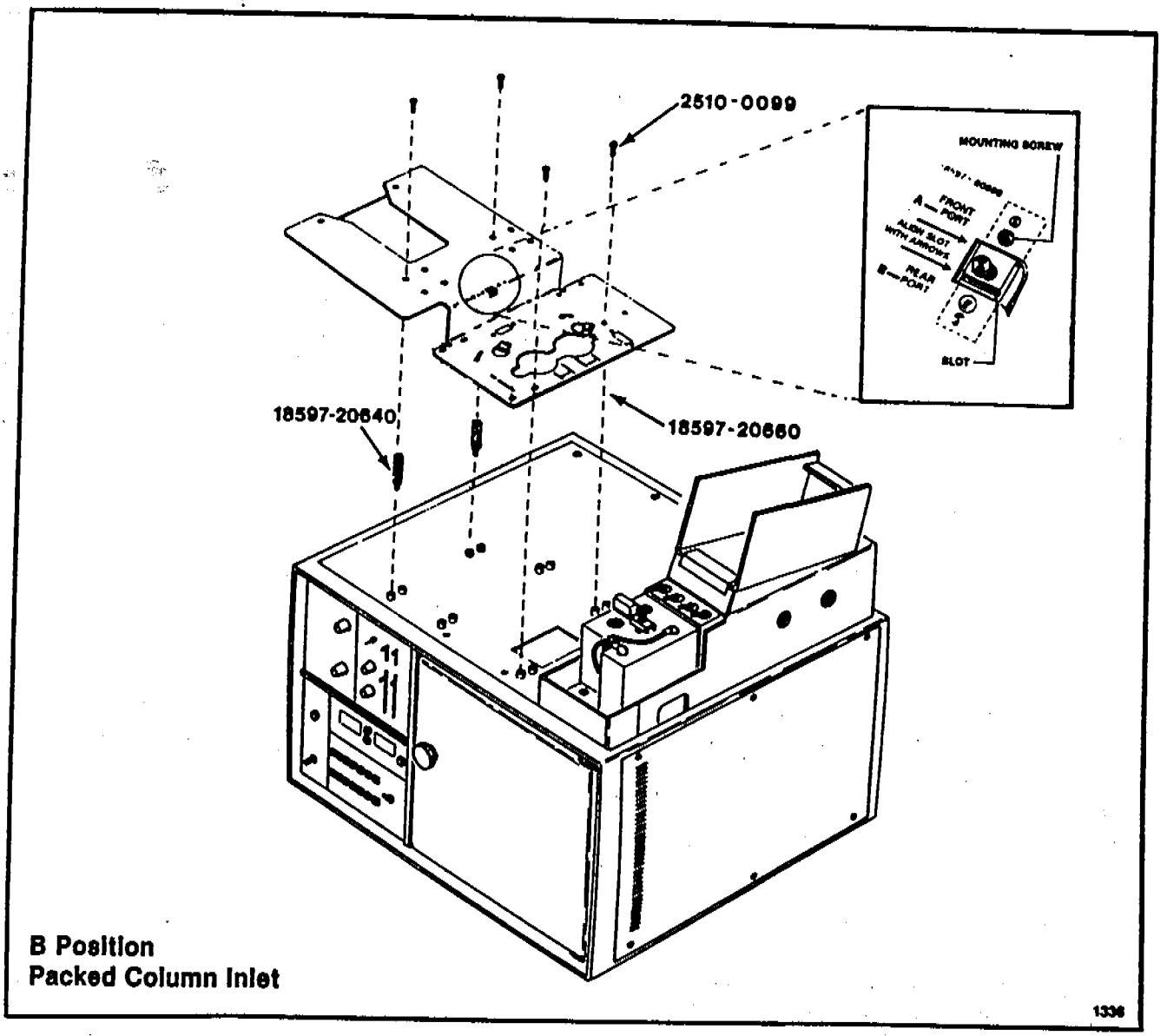


Figure 2-26. Injector/Tray Bracket (Packed Column Inlet)

2. Replace the HP 5700 septum nut with the septum nut provided with the HP 7673A.

   The chromatograph's top panel has fittings so arranged that the injector can be positioned over the A or B inlet. However, when the injector is used with a packed port, it must be installed over the "B" position (packed column inlet use).

   Using figure 2-26 as a guide, install two 48.3mm long standoffs on the top panel.

3. The injector/tray bracket contains a location pin plate to align the tray. The location pin plate should be in the rear port position (the slot in the plate should line up with the rear port arrow). If not, remove the plate mounting screw and turn the plate around. Re-install the plate.

4. Install the injector mounting bracket to the top panel using four 8-32X0.250 inch screws.

5. Firmtly tighten all screws.

See Controller Position Recommendation this section.

CAPILLARY COLUMN INLET

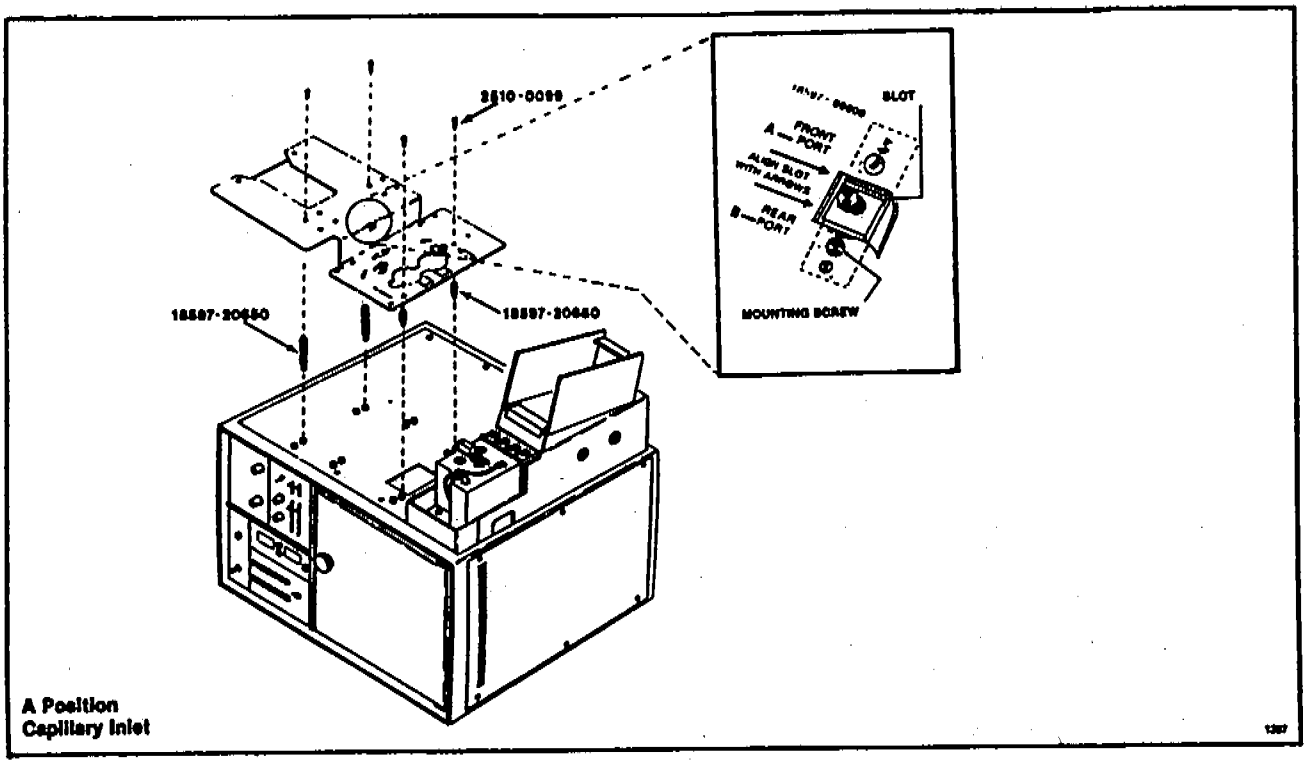


Figure 2-27. Injector/Tray Bracket (Capillary Inlet)

1. Remove the top panel of the GC over the oven and replace it with the modified panel supplied. Use new 8-32X0.250 inch screws to secure the panel to the instrument.

2. The septum nut on the capillary inlet is correct for use with the HP 7673A Injector.

3. The supplied instrument top panel has fittings so arranged that the injector can be positioned over the A or B inlet. Use the fittings that will permit the injector to be installed over the "A" position (capillary column inlet use).

Using figure 2-27 as a guide, install two 15.5mm and two 58.3mm standoffs to the top panel.

4. The injector/tray bracket contains a location pin plate to align the tray. Remove the location pin plate mounting screw and turn the plate around 180° so the slot in the plate lines up with the front port arrow. Re-install the plate.

5. Install the injector mounting bracket to the standoffs using four 8-32X0.250 inch screws.

6. Firmly tighten all four screws.

See "Controller Position Recommendation" this section.

Controller Location Recommendation

The recommended location for the HP 7673A Controller is to the right of the HP 5700A on the bench.

CAUTION

DO NOT LOCATE THE HP 7673A CONTROLLER ON TOP OF ANY GAS CHROMATOGRAPH, DUE TO THE EXCESSIVE AMOUNT OF HEAT PRESENT.

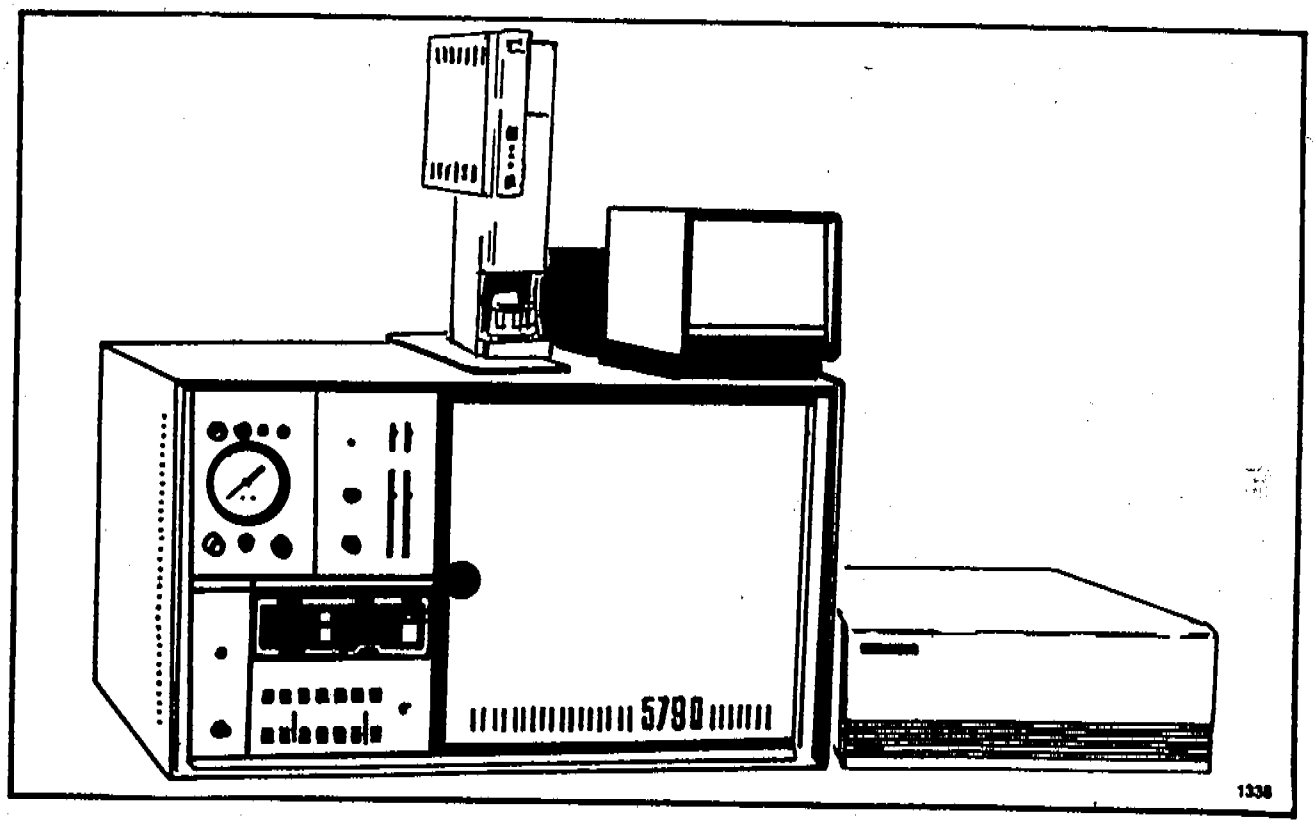


Figure 2-28. Controller Location

Proceed with injector installation instructions in this section.

Injector Installation

The HP 7673A injector mounts directly on the injection port of the instrument. A special septum nut mates with an opening in the base of the injector to provide precise alignment. A spring (bayonet) clip on the bottom of the injector engages the injector mounting plate on the instrument.

1. Using Figure 2-29 or 2-30 as a guide, position the injector over the injection port. Align the opening in the base of the injector (detail "A") over the septum nut. At the same time align the bayonet type spring clip (detail "B") and the alignment pin (detail "C") with their locating holes in the mounting plate.

2. Allow the base of the injector to rest flat on the top of the mounting bracket. Turn the injector one quarter turn clockwise to lock the injector in place.

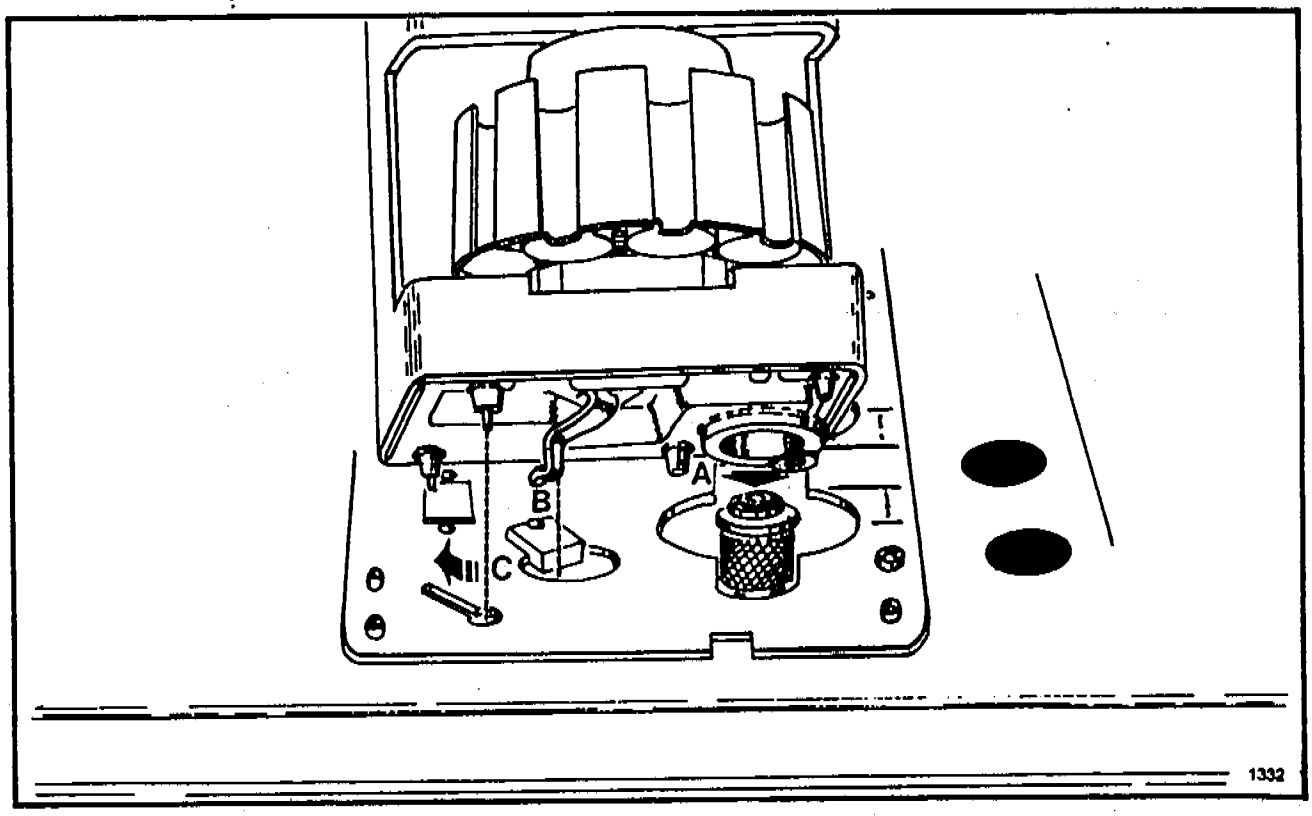


Figure 2-29. Injector Mounting Details, "A" Position

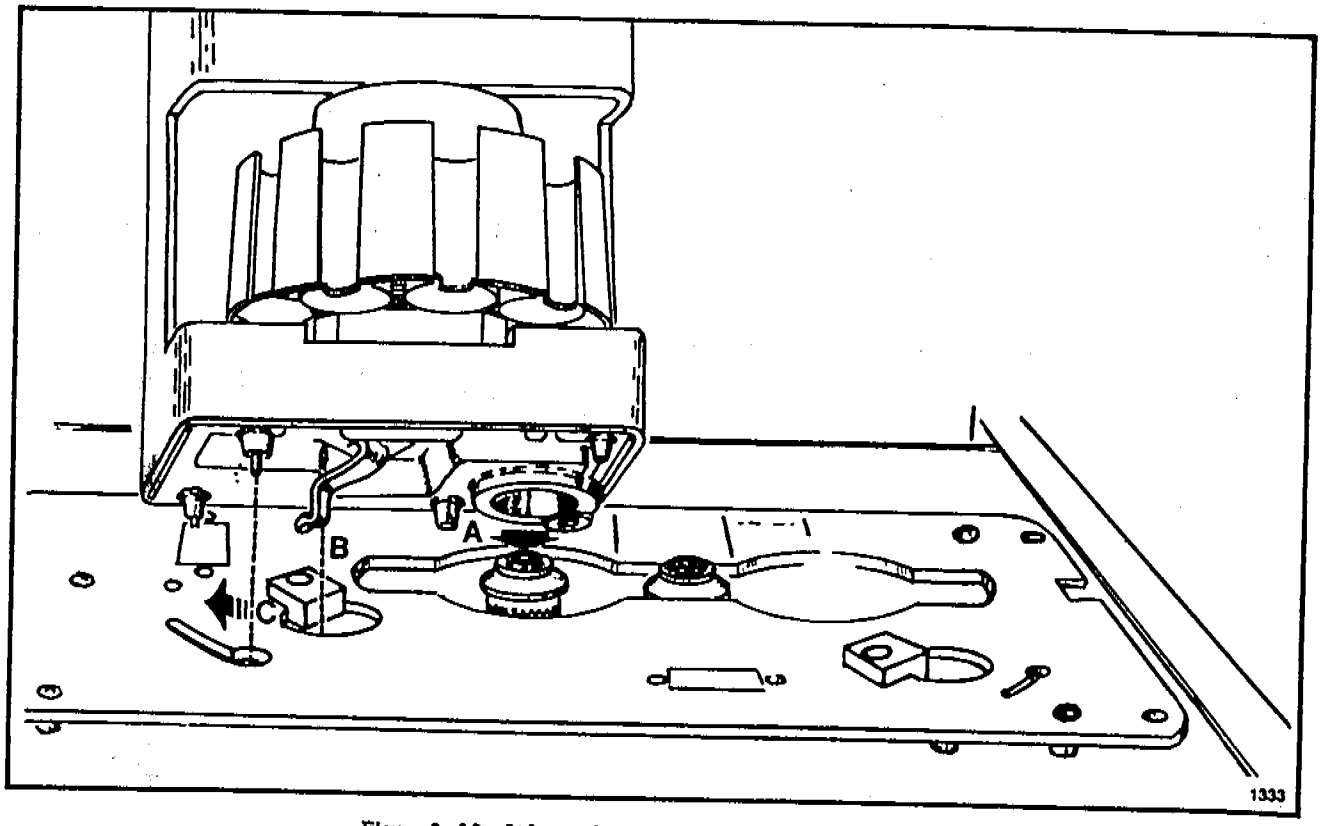


Figure 2-30. Injector Mounting Details, "B" Position

To remove, turn the injector one quarter turn counter-clockwise and lift off.

Locate the connections labeled "Front Injector" and/or "Rear Injector" on the back panel of the controller.

CAUTION

TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES. FAILURE TO DO SO WILL DAMAGE THE INJECTOR.

CAUTION

THE WIDER SIDE OF THE INJECTOR CABLE CONNECTOR MUST BE FACING UP WHEN CONNECTED TO THE CONTROLLER. FAILURE TO DO SO WILL DAMAGE THE INSTRUMENT.

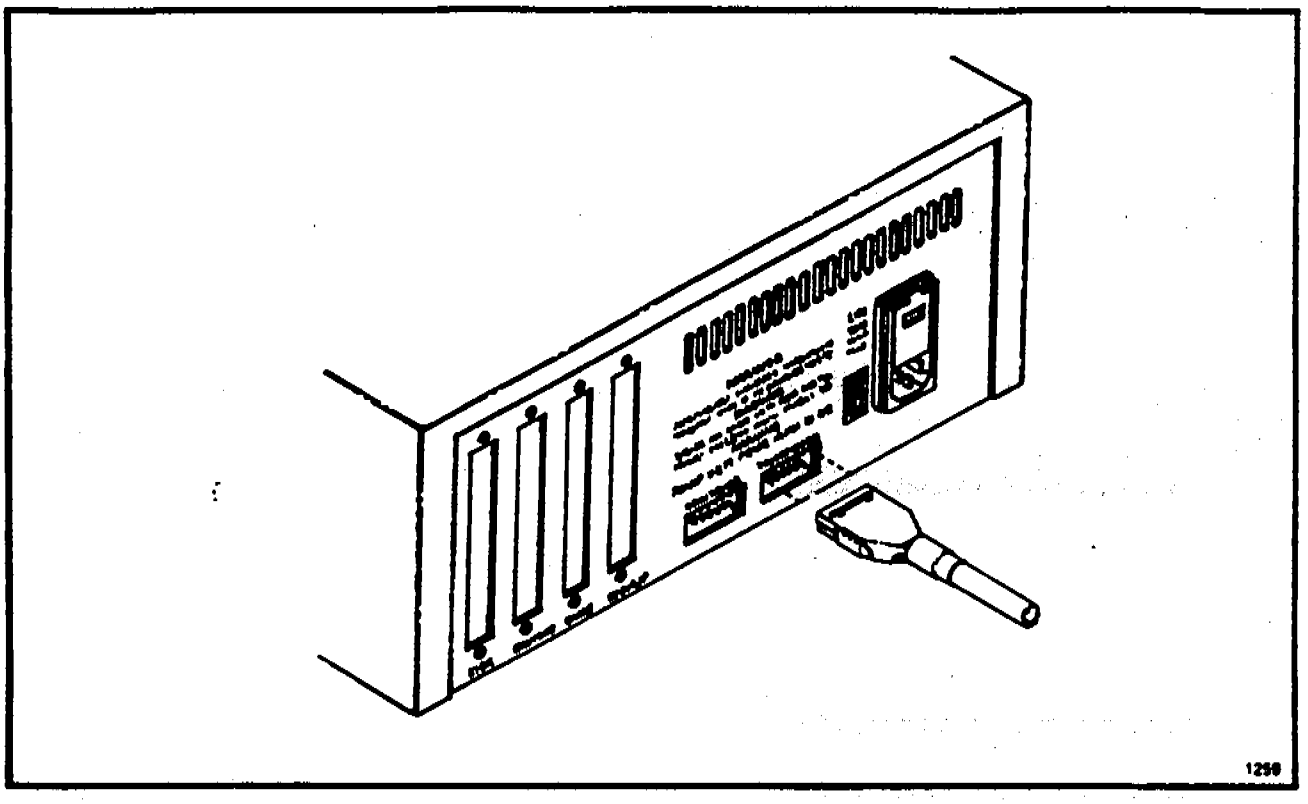


Figure 2-31. Injector Cable Connection

Using Figure 2-31 as a guide, plug the injector cable into the appropriate connection (FRONT or REAR INJECTOR) at the rear of the controller. The wider outside of the connector must be facing up.

Proceed with tray installation instructions in this section. If no tray is to be installed, see "Cabling HP 5700A Series (5710/30/90) GCs" this section.

Tray Installation

The HP 7673A tray mounts to a mounting plate directly to the left of the injection port of the instrument. The bottom of the tray slides into the opening in the mounting plate to provide precise alignment.

WARNING

TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES.

1. Using Figure 2-32 as a guide, position the tray to the left of the mounting bracket. Align the base of the tray with the opening in the mounting plate. An arrow on the tray is provided to show the direction the tray is installed.

2. Locate the tray alignment pin on the mounting bracket. Slide the tray into the bracket until the pin stops the tray. The tray's edge should rest under the circular stops on the bracket when installed properly.

3. Close the tray retaining latch to secure the tray.

4. Connect the output cable from the tray to the connector labeled "TRAY" at the rear of the HP 7673A Controller.

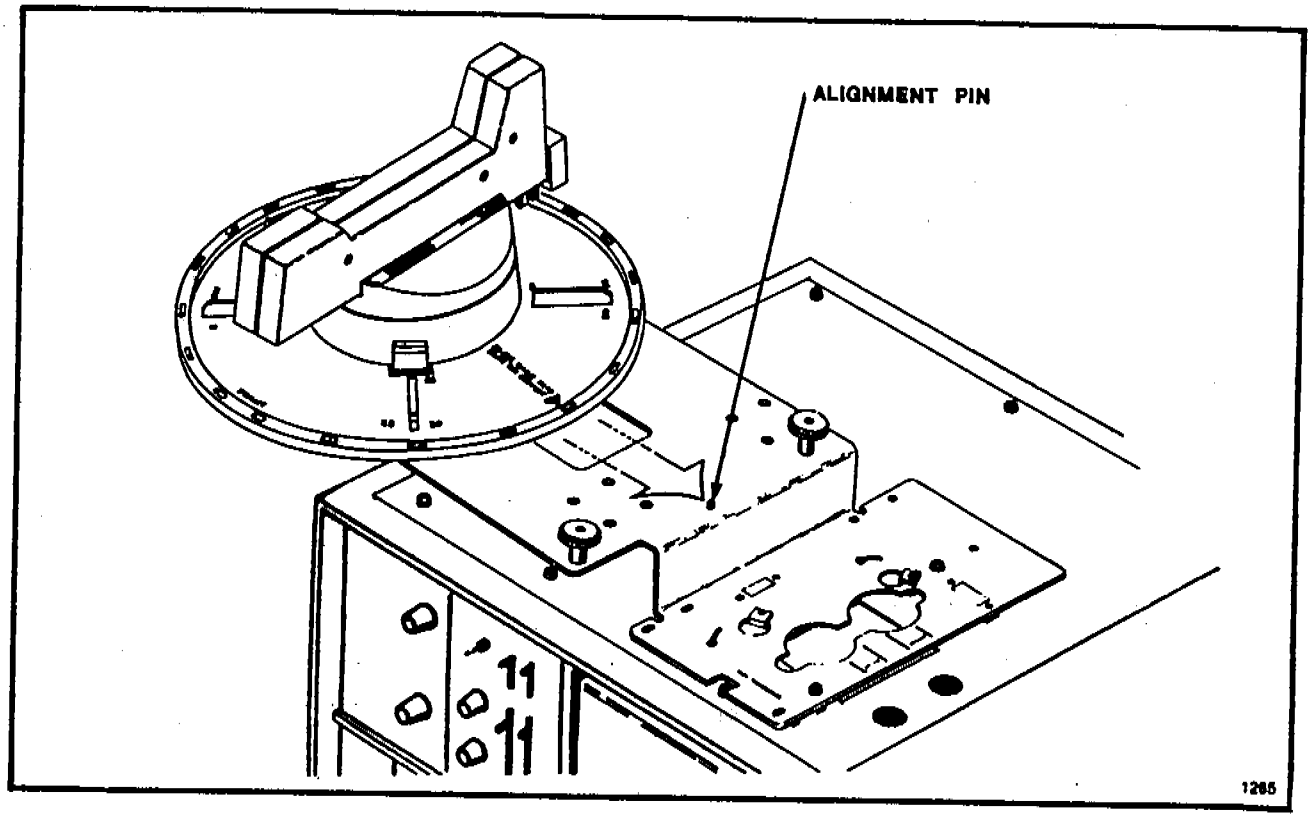


Figure 2-32. Tray Installation

5. Vial positions are arranged in quadrants of 25 each. Each quadrant contains five rows of five samples and can be removed from the tray for remote loading or storage. Install the quandrants by matching the bottle location numbers on the quadrants with those on the tray base. Insert the locating tab on the backside of the quadrant into the slot in the tray. Align the tab along the front edge of the quadrant and press downward until the tab snaps into place.

CAUTION

THE HP 7673A TRAY MUST BE UNLATCHED AND MOVED 1-INCH TO THE LEFT BEFORE THE HP 7673A INJECTORS CAN BE REMOVED. FAILURE TO DO SO MAY RESULT IN MISALIGNMENT OF THE INJECTOR AND TRAY.

CABLING HP 5700A SERIES (5710/30/90) GCs

HP 3392/93A INET Control

WARNING

FOR SAFETY, TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES.

Figure 2-33 shows the HP 3392/93A connections needed to operate the Instrument Network (INET) to the HP 7673A Controller. The remote start/stop cable is needed for temperature programmed analysis.

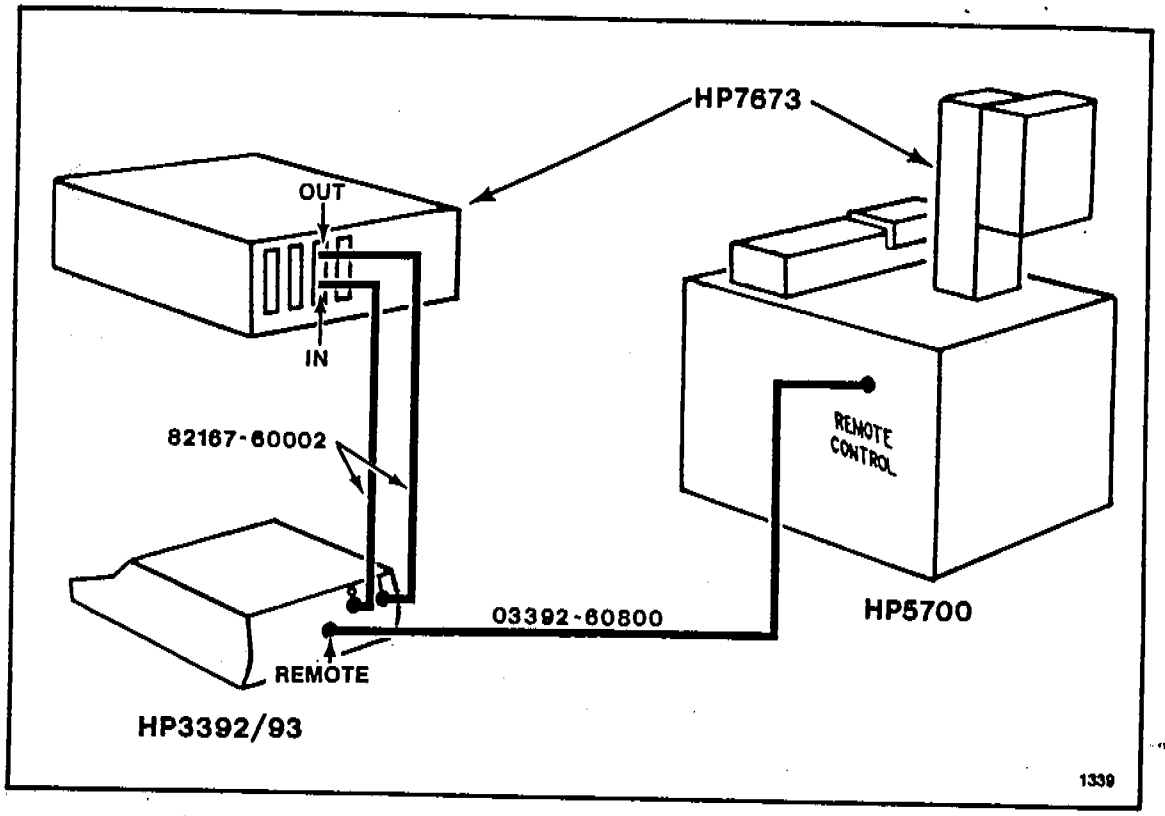


Figure 2-33. HP 7673A, INET Controlled

Referring to the figure above, install the INET interconnecting cables in a loop type fashion (e.g. controller to the integrator).

If not already done, install the syringe (see Syringe Installation, this section). After installing the syringe refer to the operation section of this manual for operating instructions.

WARNING

FOR SAFETY, TURN OFF POWER TO ALL INSTRUMENTS TO BE CONNECTED, AND DISCONNECT POWER CORDS AT THEIR SOURCES.

Figure 2-34 shows the connections needed for a remote start/stop signal beteen an HP 5700A Series GC, HP 3390A, and HP 7673A Controller.

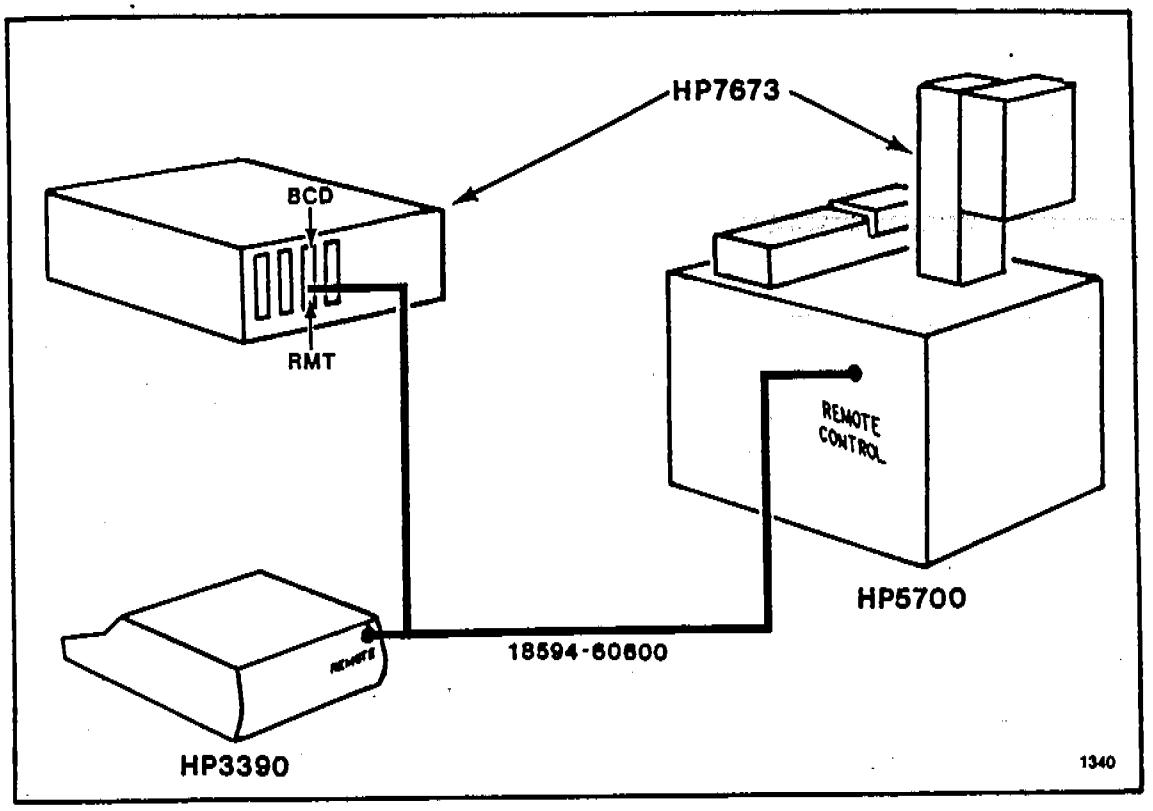


Figure 2-34. HP 7673A, HP 3390A, and HP 5700A Series GC

Referring to the figure above, install the remote start/stop "Y" cable between the HP 3390A, HP 5700A, and the 18594A Controller.

Figure 2-35 shows the connections needed for a remote start/stop signal between an HP 5700A Series GC and the HP 7673A Controller.

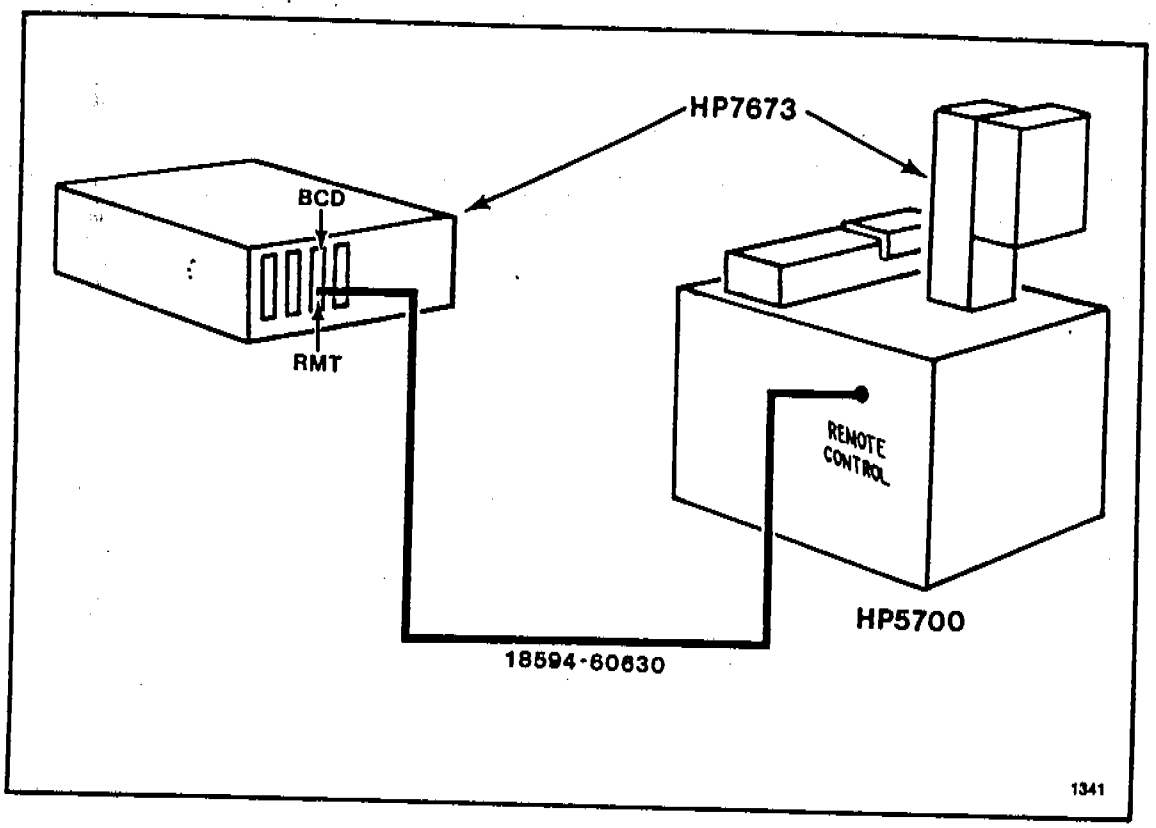


Figure 2-35. HP 7673A and HP 5700A Series GC

Referring to the figure above, install the remote start/stop cable between the HP 5700A and the 18594A Controller.

Figure 2-36 shows the connections needed for a remote start/stop signal between an HP 5700A Series GC, HP 18652A A/D Module, and the HP 7673A Controller

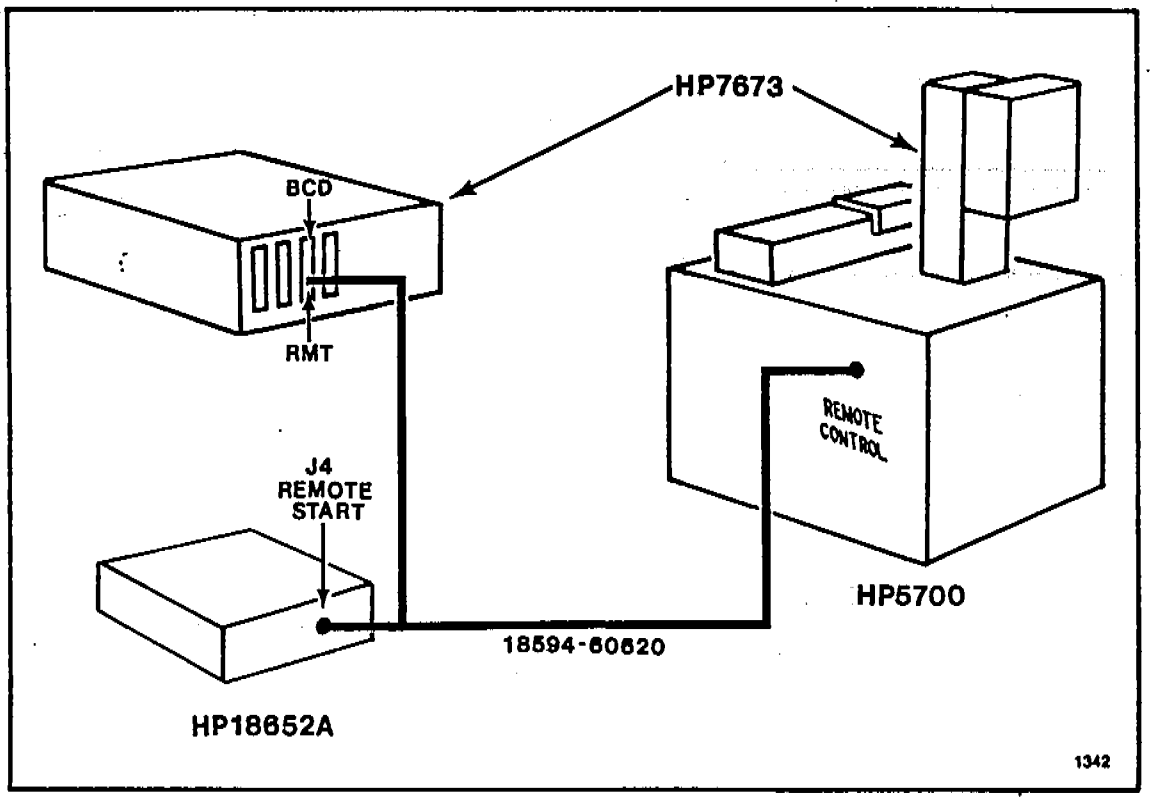


Figure 2-36. HP 7673A, HP 18652A, and HP 5700A Series GC

Referring to the figure above, install the remote start/stop "Y" cable between the HP 5700A, HP 18652A, and the 18594A Controller.

If not already done, install the syringe (see Syringe Installation, this section). After installing the syringe refer to the operation section of this manual for operating instructions.

SECTION 3. OPERATION

SECTION 3

OPERATION

INTRODUCTION

This section includes general operating information and also covers information regarding controlling the HP 7673A through the injector operating controls ("Stand-Alone Control"). These controls are located behind the front panel door. Under "Stand-Alone Control" the injector will control itself.

This section also presents operating information for controlling the HP 7673A via external instruments (e.g. HP 3392A/93A, HP 5880A), and includes application examples that may be used as a general guide to instrument performance.

HP 7673A operating information included:

- Solvent Pre-Wash Cycle
- Sample, Wash/Waste Bottles
- Sample Handling
- Dedicated On-Column Capillary Operation
- Injection Sequence
- Sample Tray Operation
- Solvent and Waste Bottle Usage Stand-Alone Control
- HP 3392A (INET) Control
- HP 5880A Control
- HP 3393A (INET) Control

SAMPLE, WASH/WASTE BOTTLES

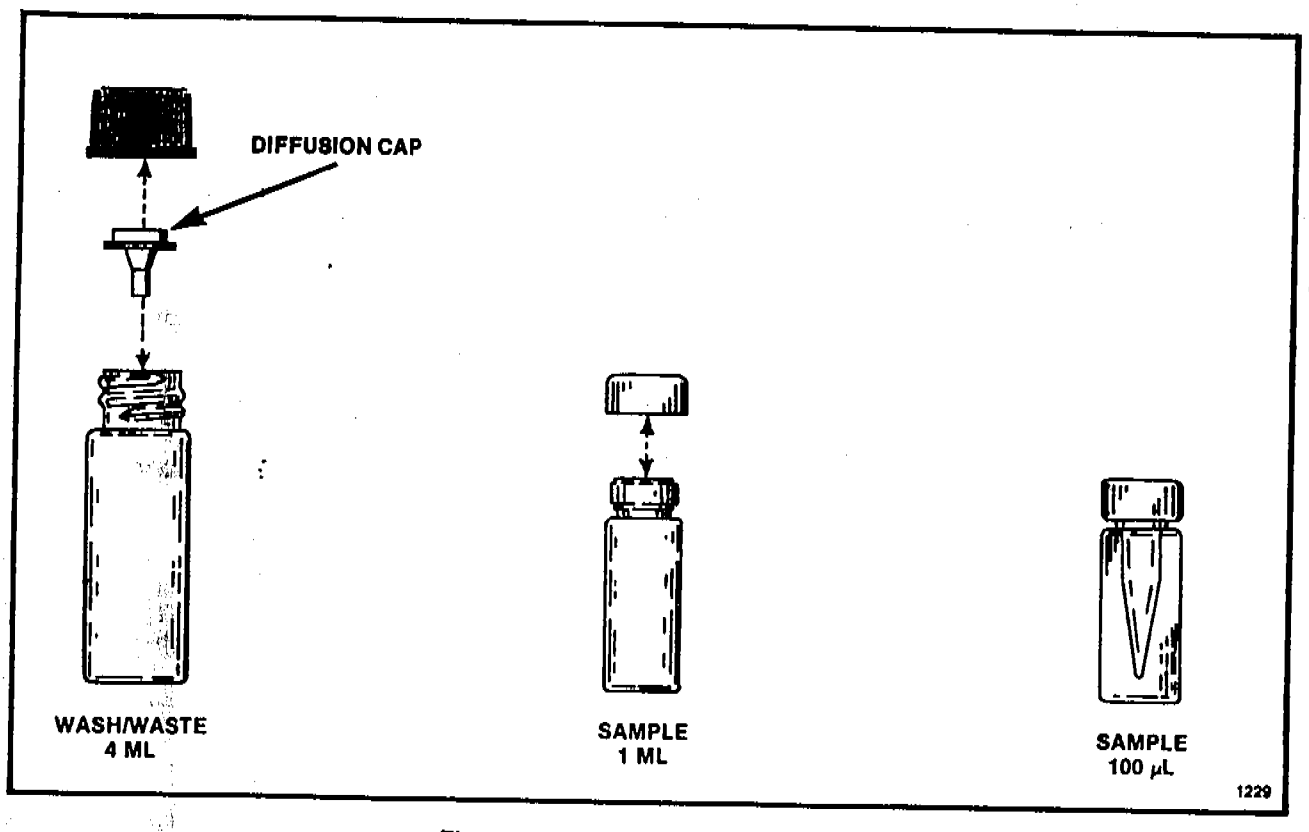


Figure 3-1. Sample, Wash/Waste Bottles

Snap-on cap sample vials may be used when the injector only (no tray) is installed. The snap-on cap eliminates the need for the crimper tool needed with the crimp-on cap sample vials.

Crimp-on cap sample vials MUST ALWAYS be used with the tray installed. The tray is designed to handle only the crimp-on cap vials. Using snap-on cap or any other type sample vial may result in a fault condition and the sampler will shut down.

Solvent wash/waste bottles (Part No. 9301-0723) are intended for use in solvent wash/waste positions only. They are of the correct dimensions to fit properly in the injector turret. Other bottles may be used for solvent wash/waste providing they are of the same width, height, and depth.

Before using the solvent wash/waste bottles, place a white diffusion cap in the bottle. The white diffusion cap eliminates the possibility of septa interaction with solvent being used.

The diffusion cap allows multiple entrances into a bottle without contaminating the liquid inside the bottle with small pieces of septum material. The rate of diffusion for many common solvents out of a vial with a diffusion cap is less than the rate out of a vial whose septum has been pierced with a standard syringe needle. For these reasons, HP recommends using diffusion caps for use in all solvent and waste bottles.

NOTE

The solvent wash/waste bottle usage information provided in this manual is based on using solvent wash/waste bottles (Part No. 9301-0723)

SAMPLE HANDLING

This section covers the preparation and loading of samples into the injector's turret and the tray module.

1. 1 ml Crimp Vials (144)
   5080-8712
2. 100 µl Vials (12)
   5080-8779
3. Vial Crimp Caps (144)
   5080-8713
4. Hand Crimping Tool - 11 mm
   8710-0979
5. Syringe 10 µl-Standard
   9301-0713
6. Syringe 10 µl-On-Column
   9301-0714
7. 4 ml Wash-Waste Bottles (144)
   9301-0723
8. Diffusion Caps (12)
   07673-40180
9. Septa 11 mm (24)
   5080-8896

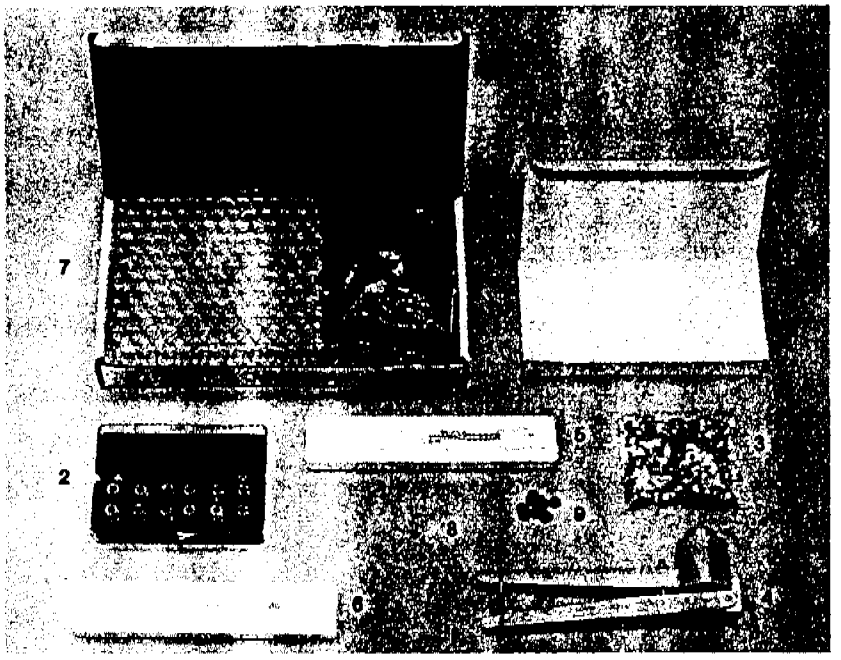


Figure 3-2. Sample Handling Supplies

Two types of sample vials are available for use with the HP 7673A.

Standard 1ml vials are for use when at least one milliliter of sample is available.

Microvolume 100µL vials have a tapered inside bore to permit operation when a limited quantity of sample is available.

Both vials are available in snap-on or crimp-on cap styles. However, the screw-on cap vials are not compatible with the HP 7673A. Snap-on cap vials may be used when loading samples directly into the injector turret (no tray installed).

NOTE

Sample vial size is critical for proper HP 7673A operation. Sample vials other than those specified may result in sampler errors.

NOTE

Use of small volume inserts in the standard sample vials may result in bending of the syringe needle or may cause sampler errors.

NOTE

Because of the need for clearance between the end of the needle and the bottom of the bottle, there is a certain sample volume that cannot be accessed by the syringe needle. This is termed the "unreachable" volume, and amounts to approximately 0.2ml for the standard 1 ml bottles and approximately 15µL for the 100µL bottles.

Sample Quality

Samples must be free of insoluble material to prevent freezing of the syringe and subsequent bending of the plunger. If insolubles are unavoidable the post-wash feature should be used to minimize the possibility of syringe damage.

CAPS FOR SAMPLE VIALS

Two types of crimp-on/snap-on vial caps are available and can be installed on the sample bottle.

Although black/tan septa are intended for ECD and high sensitivity FID applications, they are not recommended for use with the HP 7673A.

Orange septa are made of silicon rubber with a Teflon® coating on the inside surface and are recommended for HP 7673A use.

NOTE

Syringe needles may be damaged when caps other than those recommended by HP are used. The HP caps contain septa that are 0.94 +/- 0.13mm (0.037 +/- 0.005 inches) thick. Thicker septa may cause needle bending.

FILLING THE SAMPLE VIALS

1. Fill the sample vial with approximately 1 ml of sample. (Vials that are more than half full develop a partial vacuum as sample is withdrawn. This prevents the syringe from filling properly and can result in inconsistent or non-repeatable injection volumes; see note below.)

2. Cap vials and seal with a hand cap-crimping tool.

3. Test for tightness by twisting the cap. Crimp the cap again if the vial can be twisted inside the cap.

NOTE

When properly capped, the vial is vapor-tight and problems associated with "low boilers" vaporizing are eliminated. However, the vapor-tight cap may cause a vacuum problem when large volumes are injected. There are several ways to overcome this problem:

a. Do not use the cap to seal the vial unless it is necessary for sample protection.

b. If the cap is necessary, create a positive pressure in the vial by injecting air (use a 1-3 cc syringe) into the vial after the vial has been sealed. The positive pressure will decrease as the sample is withdrawn from the vial, and the partial vacuum problem should not occur.

c. Divide the sample among three consecutive vials and make a single injection from each vial.

d. Reduce the number of sample wash cycles from the maximum to the minimum.

REUSING SAMPLE VIALS

By using a simple technique to remove the caps from the sample vials, the vials can be emptied, cleaned and used again. This is particularly desirable when using the "microvolume" sample vials which have a fairly high unit cost.

To remove the caps, grip the edge of the cap with the jaws of the cap-crimping tool and twist the vial to pull it free from the cap.

WASH AND WASTE BOTTLE USAGE

With the tray installed, care must be used when specifying number of washes to be done for each injection. **It is possible to exhaust a supply of solvent OR overflow a waste bottle if too many washes are done during a sequence.**

Stand-Alone Control (With Tray)

The following graph (see Figure 3-3), can be used as an aid in determining how long a sequence can be with a specified number of washes. This graph assumes the use of a 10µl syringe. On the graph there is a line showing the TOTAL number of injections which can be done before the solvent bottles are emptied for a given number of solvent washes. The other line shows the TOTAL number of injections which can be done before the waste bottles overflow for a given number of sample and solvent washes (ALL washes, sample+solvent, are emptied into the waste bottles).

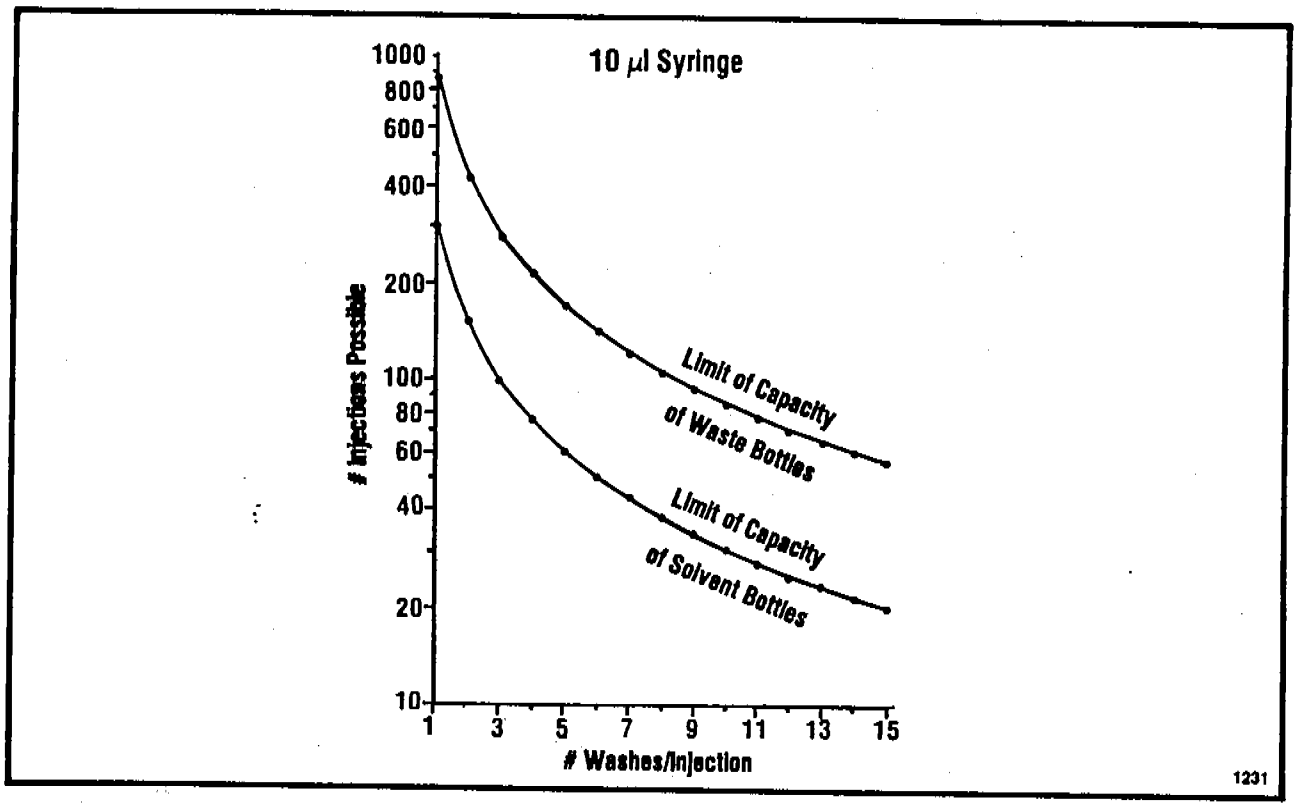


Figure 3-3. 10µL Syringe Calculation

Example Calculation

This is an example of calculation to determine sufficient solvent and waste bottle space available to run a proposed sequence. It assumes the solvent post-wash bottles are full and the waste bottles are empty. The syringe in the injector is 10µL, and the settings of the auto sequence on the injector are:

Injections #/Vial = 2

Sample Pre-Wash = 2

Solvent Post-Wash = 2 (produces 1 from solvent A and 1 from solvent B)

During operation the number of solvent post-washes selected on the injector front panel will be split between solvent "A" and solvent "B". For example, when two solvent post-washes are selected, the syringe is washed once from solvent bottle "A" and once from solvent bottle "B". When six solvent post-washes are selected, the syringe is washed three times from solvent bottle "A" and solvent bottle "B". During a sequence, the injector will alternate solvent and sample waste between waste "A" and waste "B" bottles.

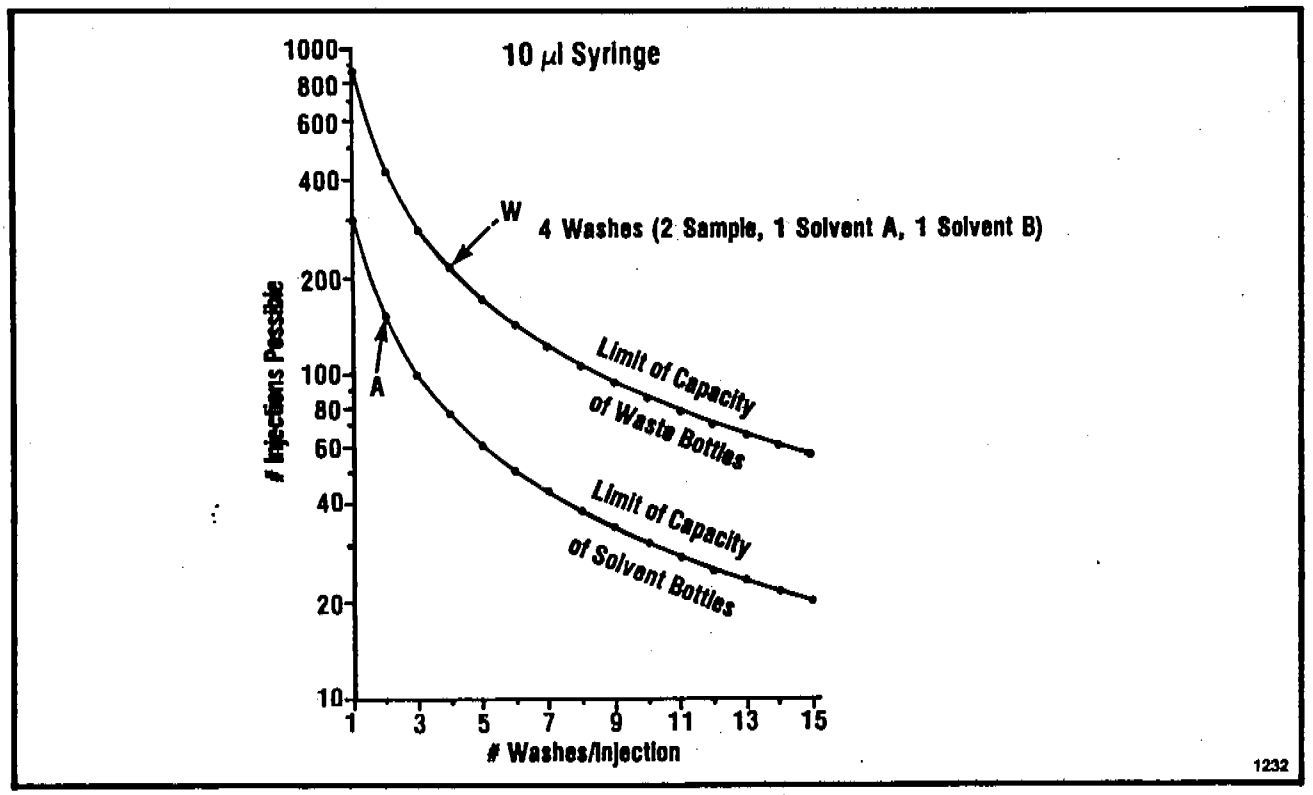


Figure 3-4. Example Calculation

For solvent post-wash at 2 washes per injection, the limitation is 156 injections (point A on the graph).

For the waste bottles there are 4 washes per injection (2 sample pre-washes and 2 solvent post-washes) and the limitation is 244 (point W on the graph).

The limiting factor in the sequence is the solvent usage. The sequence can run up to 156 injections without refilling the bottles. The injections #/Vial set at 2 limits the total number of samples to be run at 78.

HP 3392A, HP 5880A Control (With Tray)

Care must be used when specifying the number of washes to be done for each injection. It is possible to exhaust a supply of solvent or overflow a waste bottle if too many washes are done during a sequence. The following graph (see Figures 3-5) can be used as an aid in determining how long a sequence can be with a specified number of washes. On the graph there is a line showing the number of injections possible before the solvent bottles are emptied for a given number of solvent washes. The other line shows the number of injections possible before the waste bottles overflow for a given number of sample and solvent washes (all washes are emptied into the waste bottles).

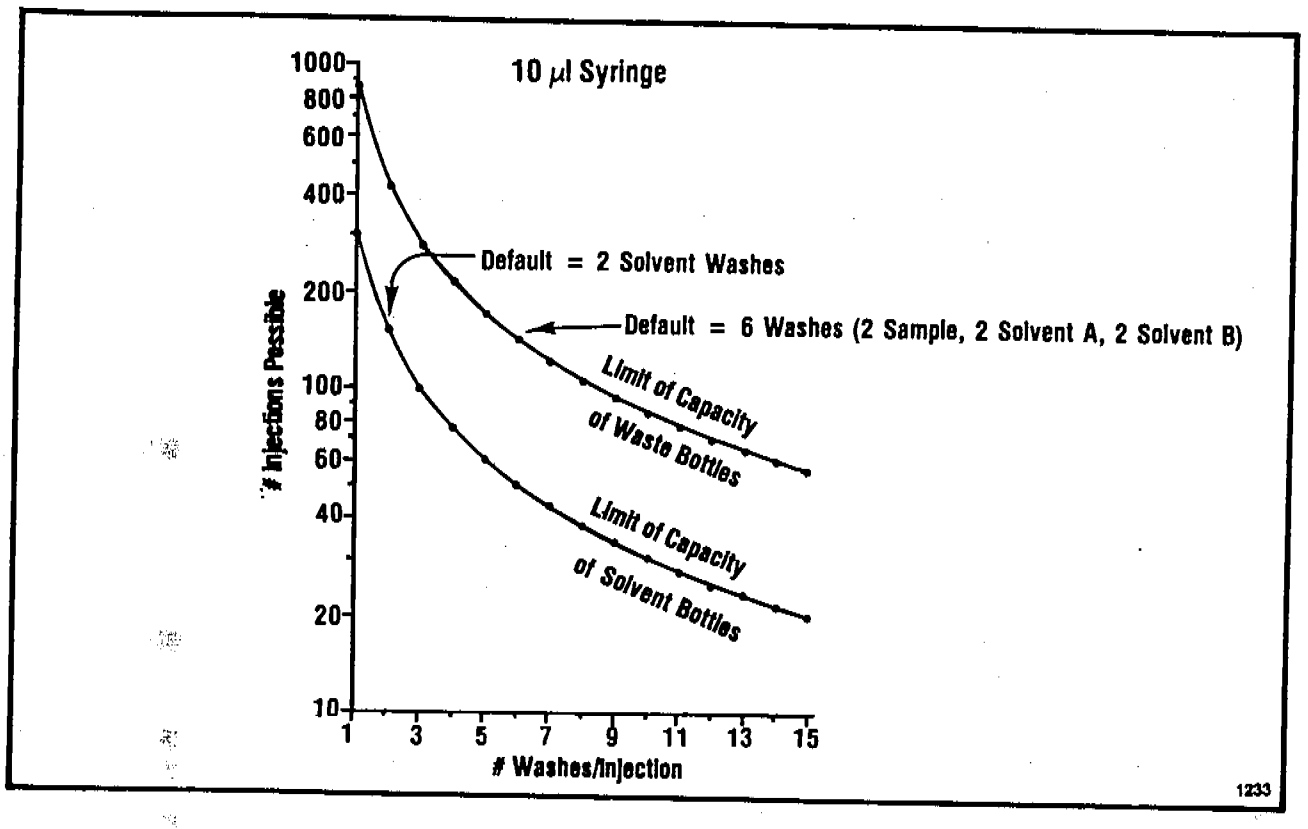


Figure 3-5. 10µL Syringe Calculation

Example Calculation

This is an example of the calculation to determine sufficient solvent and waste bottle space available to run a proposed sequence. The syringe in the injector is 10µL, and the listing of the auto sequence is as follows:

HP 3392A (INET)

```
FRONT INJECTOR
 INJ/BOTTLE = 2
 FIRST BOTTLE =  1
 LAST BOTTLE = 35
 # OF SAMPLE WASHES = 1
 # OF PUMPS = 6
 VISCOSITY = 0
 VOLUME = 1
 # OF SOLVENT A WASHES = 1
 # OF SOLVENT B WASHES = 3
 ON COLUMN (1=YES) =  0
```

```
0. MODE (0=NORMAL, 1=ON COLUMN) =0
1. PRE-INJECTION SAMPLE WASHES = 1
2. VISCOSITY = 0
3. SAMPLE PUMPS = 6
4. SAMPLE VOLUME = 1
5. POST-INJECTION SOLVENT A WASHES = 1
6. POST-INJECTION SOLVENT B WASHES = 3
7. INJECTIONS PER BOTTLE = 2
8. FIRST BOTTLE = 1
9. LAST BOTTLE = 35
```

1. The limitations of the capacities of each solvent bottle and the combined waste bottles are calculated:

   a. For solvent "A", at 1 wash per injection, the limitation is 307 injections (point "A" on the graph).

   b. For solvent "B", at 3 washes per injection, the limitation is 102 injections (point "B" on the graph).

   c. The waste bottles together total 5 washes per injection; 1 sample wash, 1 solvent "A" wash, and 3 solvent "B" washes. The limit is 172 injections (point "W" on the graph).

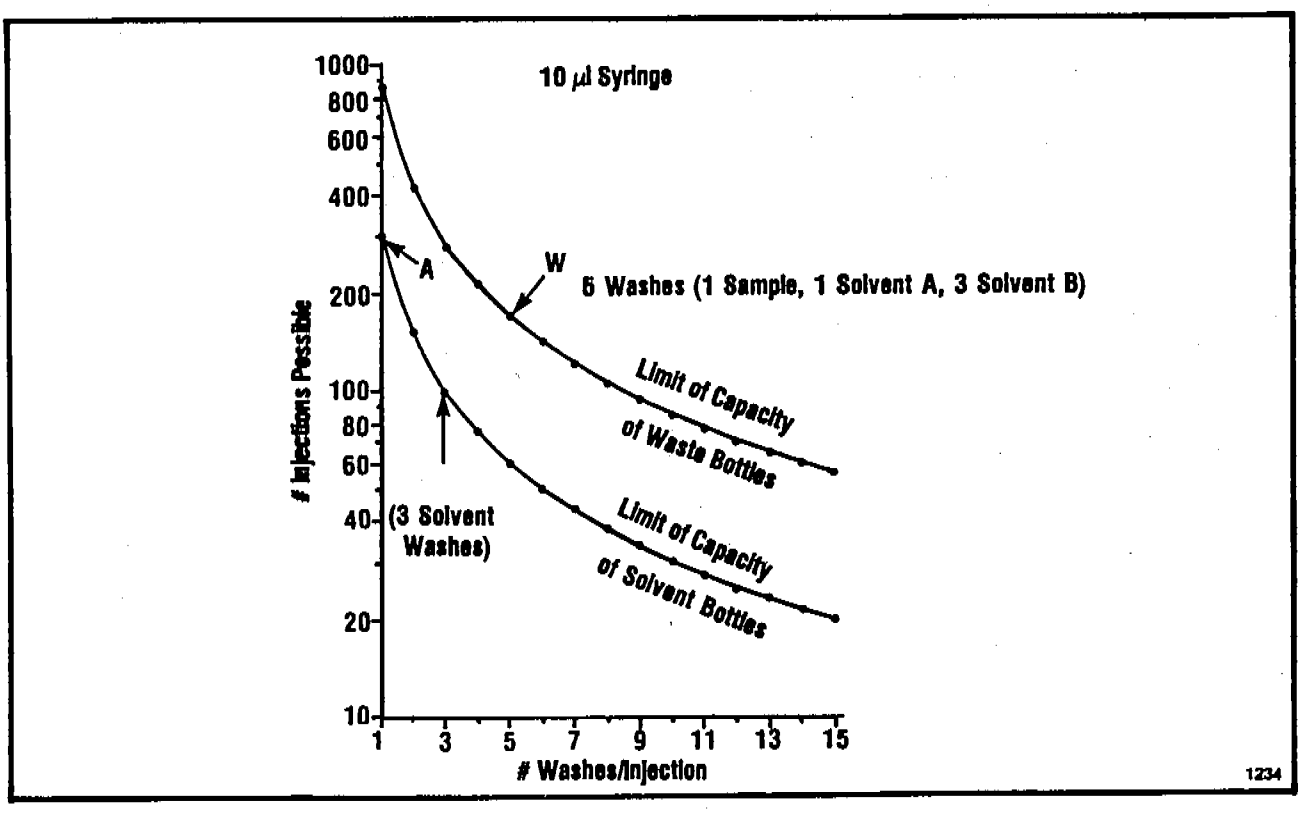


Figure 3-6. Solvent and Waste Usage Graph

The limiting factor in the sequence is solvent "B" usage. Up to 102 injections can be made without refilling the bottles.

The sequence listed previously will make 70 injections (35 bottles at 2 injections per bottle). It is assumed the solvent bottles are filled prior to starting the sequence.

SOLVENT PRE-WASH CYCLE

The solvent pre-wash cycle insures the syringe will always be emptied of any contents and will be washed so that it's ready for use. When the START button is pressed the FIRST TIME after power on, a power fail, an operator induced fail, or after recovery from a fault, the following (solvent pre-wash cycle) will take place before the first sample is injected:

1. Syringe carriage and turret will move to their home positions.

2. The turret will index the waste vial under the syringe.

3. The syringe carriage moves to the waste position. The plunger moves down expelling any material in the syringe before the syringe carriage returns to its home position.

4. The turret indexes the wash vial under the syringe.

5. The syringe carriage moves down to the "wash" position. The plunger moves up fully and the syringe carriage moves back to its home position with the plunger remaining up.

6. The turret indexes the waste vial under the syringe.

7. The syringe carriage moves to the waste position. The plunger moves down expelling the solvent from the syringe before the syringe carriage returns to its home position.

DEDICATED ON-COLUMN CAPILLARY OPERATION

NOTE

The correct needle guide and disc-type septum (see Figure 3-7), must be installed on the inlet for dedicated on-column capillary operation using the HP 7673A.

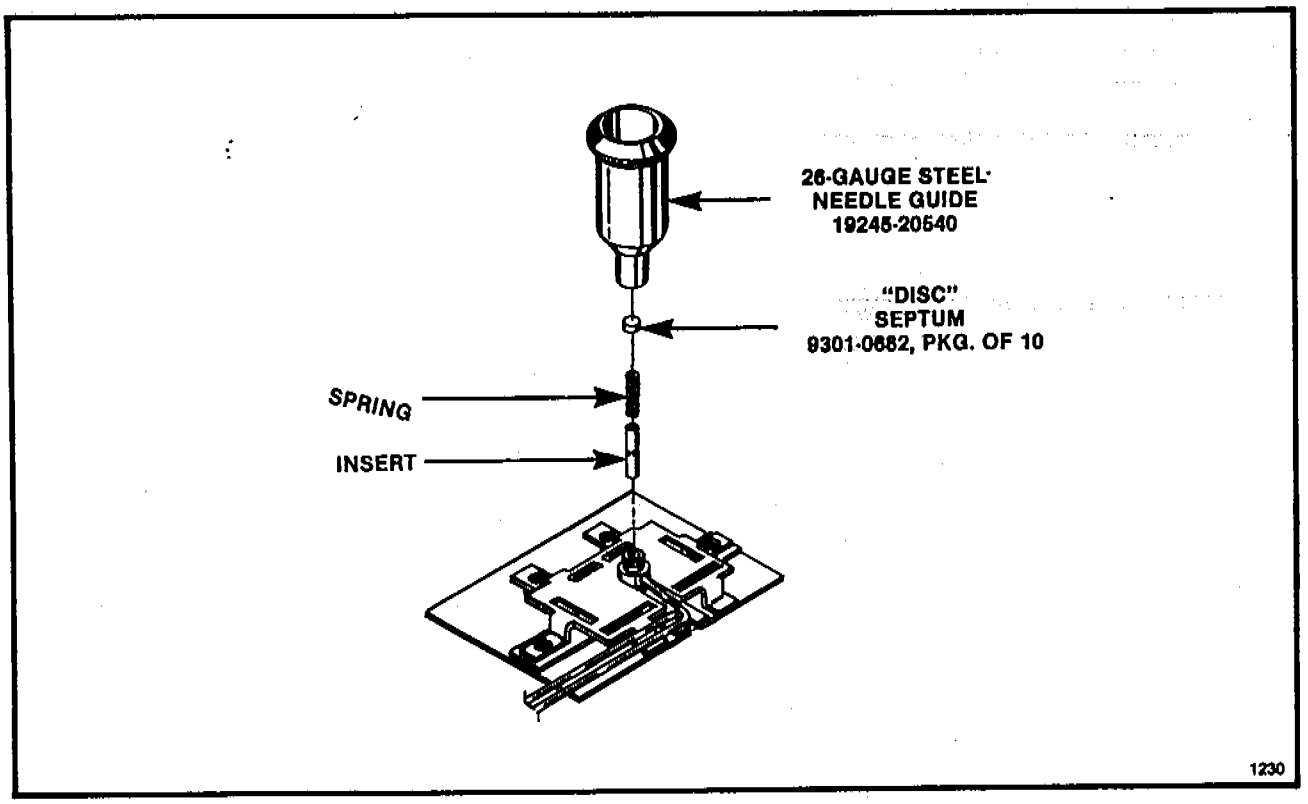


Figure 3-7. On-Column Needle Guide and Septum

In addition to the correct needle guide and septum being installed, dedicated on-column capillary operation requires two changes from normal HP 7673A operation.

a. An on-column syringe must be installed.

b. The injection mode switch must be in the on-column position or the on-column parameter on the controlling device set to the "yes" position.

NOTE

A 530µ column must be used as a pre-column with the HP 7673A. A smaller i.d. column can then be connected to the 530µ pre-column.

When controlling the injector via an external device, perform steps one, two, three,

and seven. When using stand-alone control, perform all steps except three.

1. Place the controller's power switch in its off position. Disconnect the line power cord from its receptacle.

2. Install the on-column syringe (see Figure 3-8). For first time syringe installation see Section 2, "Installing Syringes" for instructions. For syringe replacement, follow instructions inside the syringe access door.

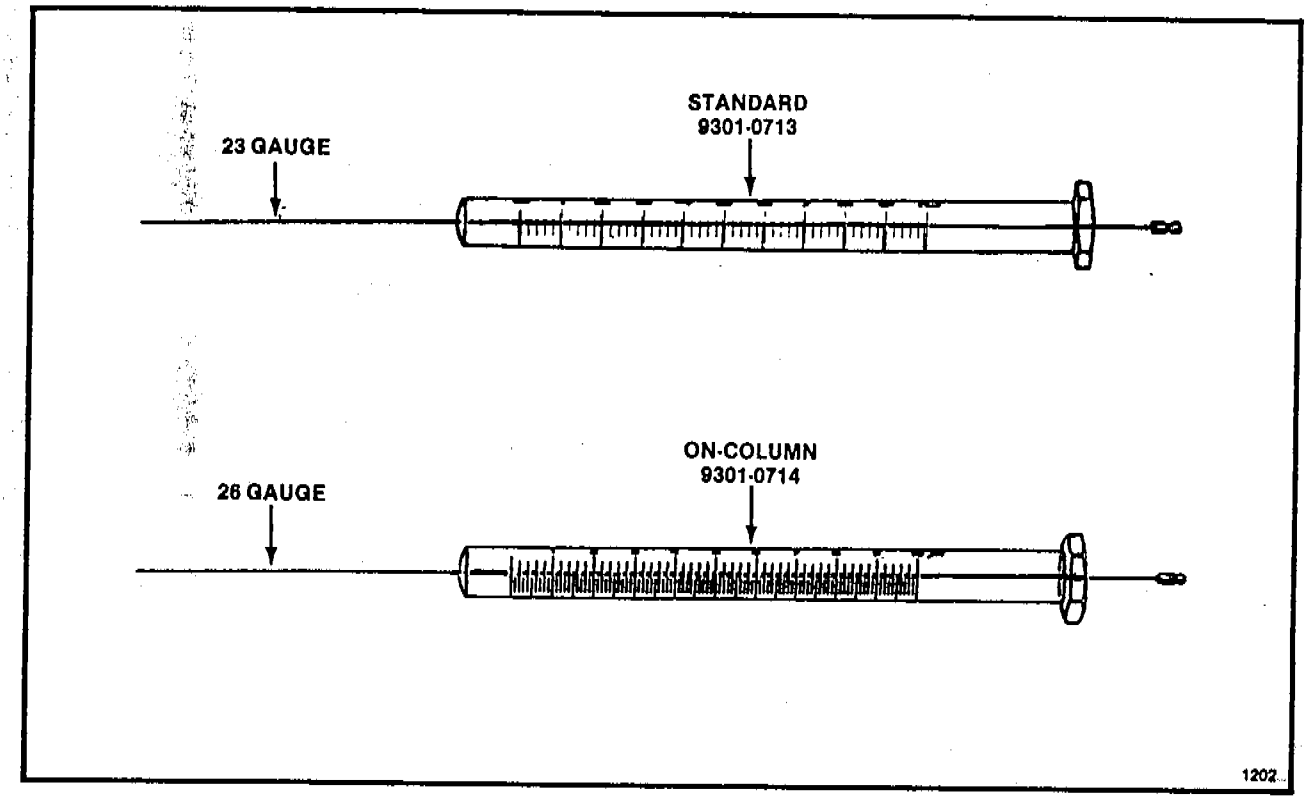


Figure 3-8. Syringes

3. If the injector is being controlled by an external device, set the on-column parameter to "ON" (HP 3392A/93A = YES, HP 5880A = ON COLUMN).

4. Open the injector front panel door. Remove three screws located along the left edge of the switch plate.

5. Swing the panel to the left to expose the injector electronics board (see Figure 3-9).

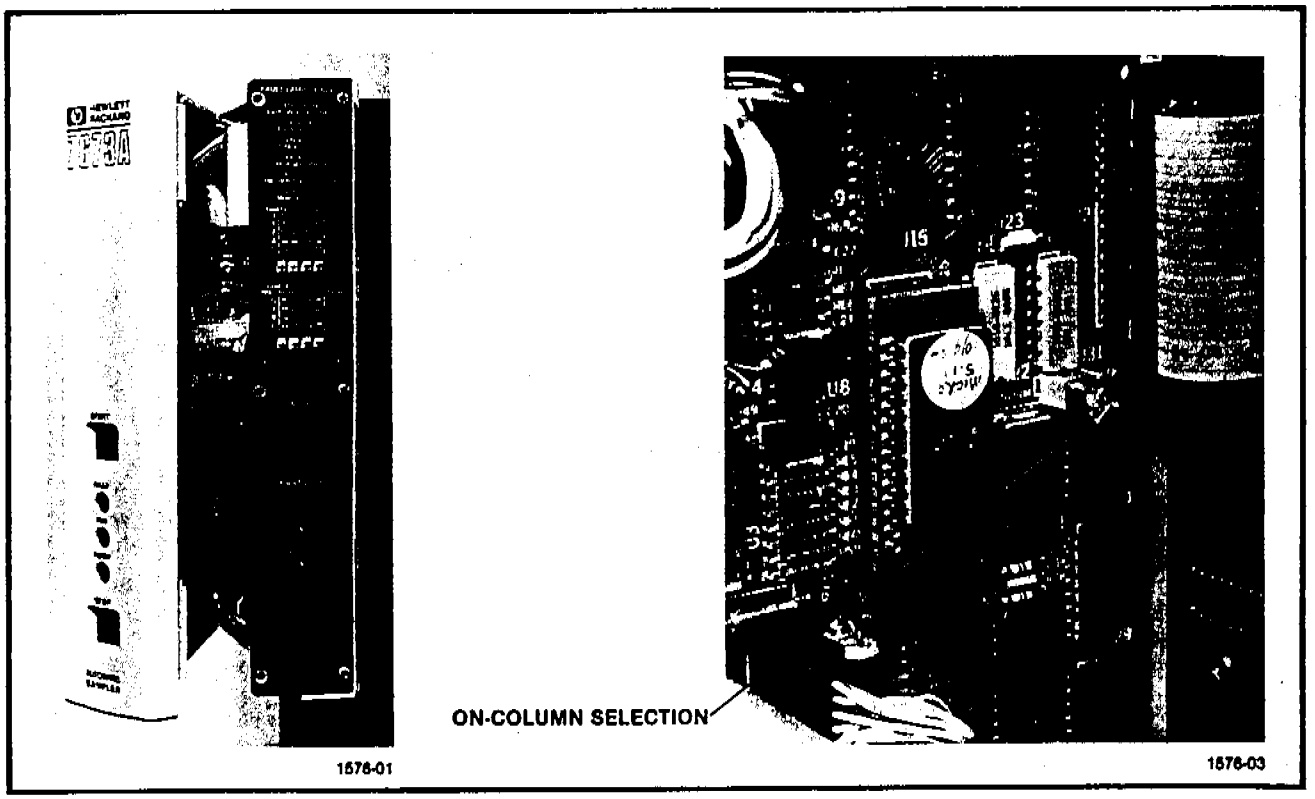


Figure 3-9. Accessing Injector Electronics

CAUTION

DO NOT TOUCH ELECTRONIC COMPONENTS OTHER THAN THE INJECTION SELECTION SWITCH INSIDE THE INJECTOR HOUSING. DAMAGE THROUGH STATIC DISCHARGE MAY RESULT.

6. Locate the injection selection switch and move it to the on-column position. Close the panels and reinstall screws.

7. Restore power.

During an injection in the On-Column Mode the syringe carriage will:

a. Have a much slower injection stroke than in the normal injection mode.

b. Travel approximately 19 mm (3/4-inch) deeper during the injection stroke allowing the needle to enter the column.

All other parameters set for the injection sequence (washes, sample size, etc.) will operate identical to normal injection mode.

HOME POSITIONS

When starting a sequence after turn on, recovery from a power failure, operator or instrument induced safety fault, and at many points in the injection sequence,the HP 7673A will check its position. The position check is accomplished by returning all moving components to their HOME position. The home position for HP 7673A components are:

1. Syringe Carriage.....Full up position

2. Syringe Plunger.....Full down position

3. Turret.....Injection opening under syringe

4. Tray.....(see "Tray Home Position", this section)

If the home position for any of these components is not recognized in sequence that required a return to home, one additional attempt will be made to move that component home. If home is still not recognized, a fault is registered and the fault light will blink and the injector will be rendered inoperable. As soon as the fault is corrected, the fault is cleared by pressing the STOP button on the injector. The injector can then be restarted.

INTERRUPTIONS

A power failure, safety (device unmounted) or operator induced fault, syringe access door open, and stop signal will interrupt any injection sequence. All interruptions are treated the same way. The injector is inoperable and any sequence in process is aborted. The fault must be eliminated and the injector restarted to place it back in service.

An interruption in the middle of a sequence of more than one bottle will (upon being restarted) result in all of the specified bottles being run again (i.e. if interrupted at bottle 35 during a sequence of one through 60 samples, one through 35 will be run again when the system is restarted unless the first bottle parameter is changed).

Power Failure

A power failure stops all operations of the system and the entire sequence is aborted. When power is restored the ready light will glow steady. When the injector is restarted it will automatically go through a solvent pre-wash cycle before it starts the first sample.

STAND-ALONE CONTROL

Operating Principles

The HP 7673A can control itself ("stand-alone control"), or it can be controlled by an external device. This section contains information about the HP 7673A operated under stand-alone control.

All user selected parameters under stand-alone control are selected using the controls on the injector front panel.

Using the injector alone, one to three samples and up to four injections per sample can be done. The injector sends a start run signal to the GC at injection. It also monitors the ready signal from the GC: when the GC becomes ready, the injector proceeds to the next injection. If no ready signal from the GC is available, only a single injection occurs.

Using the injector with its tray allows 1 to 100 samples, with up to 4 injections per sample.

NOTE

In this configuration, a ready signal from the GC is required.

When the start button on the injector is pressed, the tray sends the sample from position one to the injector. After injection, the sample is returned to the tray in position one. The next sample (if there is one) is sent from the tray to the injector. The HP 7673A monitors the GC ready line until the system is again ready. The next sample is then injected in the same manner. This sequence continues until the tray runs out of samples or reaches sample 100.

When operating under stand-alone control with an integrator, the stop time on the integrator has no effect on the gas chromatograph's oven run time. To halt the integrator before the next injection by the sampler, the stop time on the integrator must be set to allow enough time for integration. It is important that the total oven run time be set for an interval longer than that set for the stop time on the integrator. Thus the integrator will have finished its data collection and report before the next injection begins.

NOTE

When using an HP 5710 or HP 5730 WITHOUT an integrator, the injection sequence starts automatically the first time the ready light on the gas chromatograph blinks. This may degrade chromatographic performance due to premature injection.

Injector Operating Controls

Stand-Alone Control is the term used to describe controlling the injector through the injector front panel controls. Access to parameters in this mode is limited to four areas. The following settings are possible:

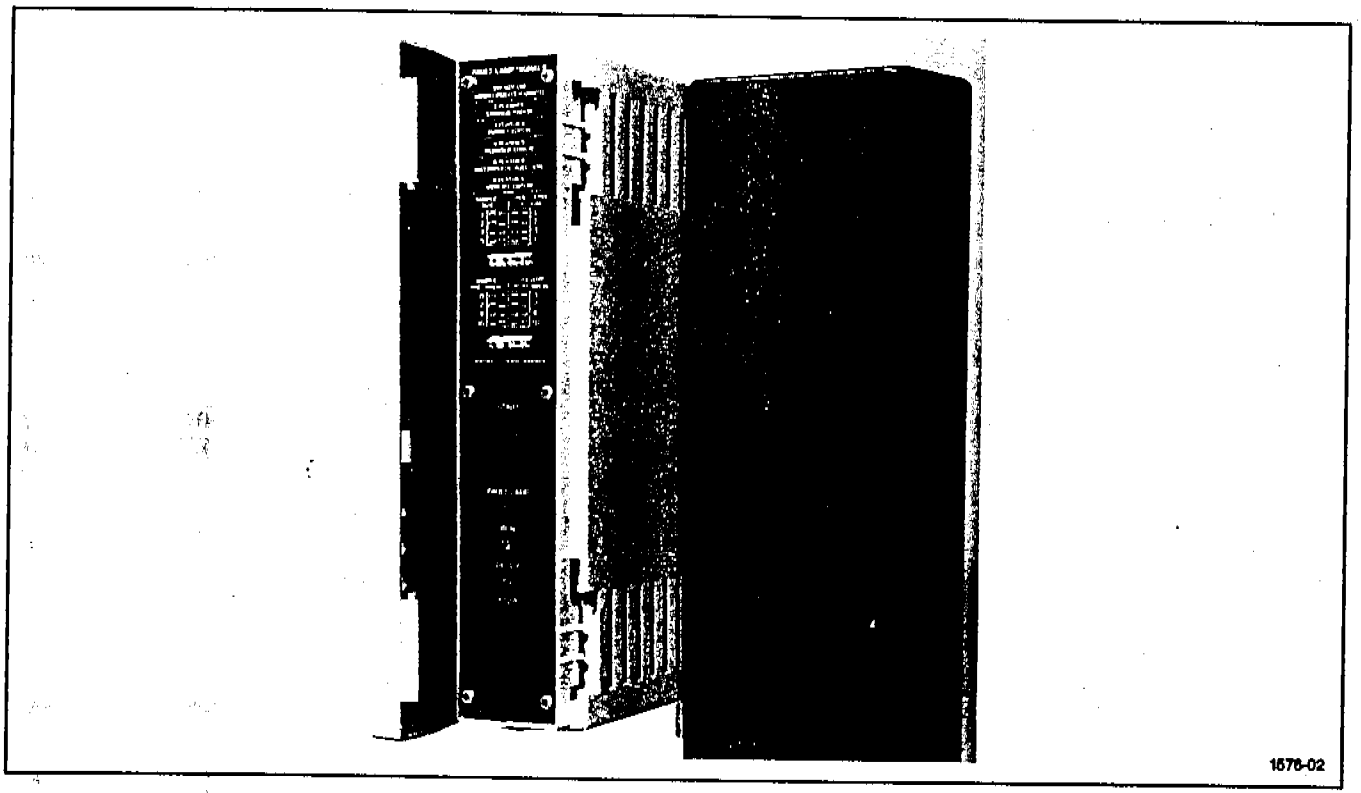


Figure 3-10. Front Panel Controls

1. # injections per vial	1, 2, 3, 4
2. # sample washes	0, 2, 6, 10
3. # solvent post-washes	0, 2, 6, 10
4. sample volume setting	1, 2, 3, 5

Two other injection parameters are set by default at turn on. Sample pumps are set at six and number of solvent pre-washes to three. No access to them exists under stand-alone control.

Sample volume is set by the user from the front panel and is determined by an internal mechanism. There are four volume stops in the mechanism that determine the stroke of the plunger.

START BUTTON CHARACTERISTICS

The start button is an instant action switch. The moment it's pressed, a checking sequence is begun to read all the injector parameter settings and verify all moving parts are in the HOME position. It simultaneously reads the injection mode setting. If there is no sequence-in-progress and no faults are found, the injection sequence starts.

NOTE

When there is a sequence-in-progress, the start button, if pressed, will be ignored.

If the injection is interrupted before the sequence is completed (green light on), the system automatically is reinitialized to assure the contents of the syringe will be expelled into the waste vial rather than in some other location in the injector. This is called the Solvent Pre-Wash Cycle and is defined later in this section (see Solvent Pre-Wash Cycle).

STOP BUTTON CHARACTERISTICS

The stop button is an instant action switch. It's used to stop a sequence in progress or clear the injector and/or tray after a fault condition has occured.

Stopping a Sequence

At any time during an injection sequence when the stop button is pressed, the injector and tray will stop instantly. It will leave the syringe, turret and tray in any position they were in when the button was pressed.

To home the syringe carriage in the event the injector was stopped with the syringe needle inside a bottle (wash, waste, or sample):

a. Press the start button

b. When the injector returns the syringe carriage home, press the stop button.

Once the stop button has been pressed, the sequence is aborted. When the injector is restarted, the sequence starts over again with the first bottle, first injection. The system automatically is reinitialized to assure the contents of the syringe will be expelled into the waste vial rather than in some other location in the injector. This is called the Solvent Pre-Wash Cycle and is defined later in this section (see Solvent Pre-Wash Cycle).

INJECTION VOLUME SELECTION

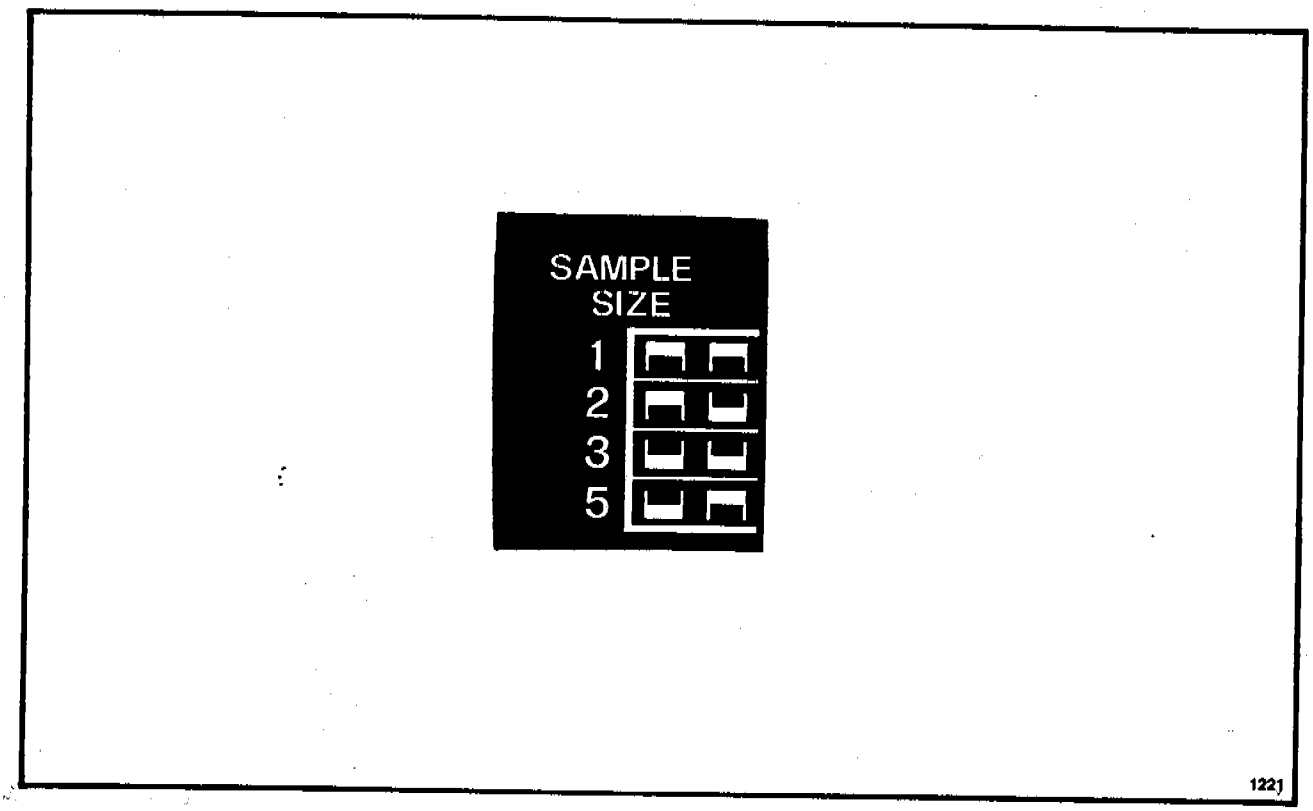


Figure 3-11. Sample Size

Sample volume is selected by positioning the sample size switches located behind the hinged HP 7673A nameplate. Four settings are available, allowing volumes of approximately 1, 2, 3, and 5 microliters when using a 10µL syringe.

REPEAT INJECTION SELECTION (Injections #/vial)

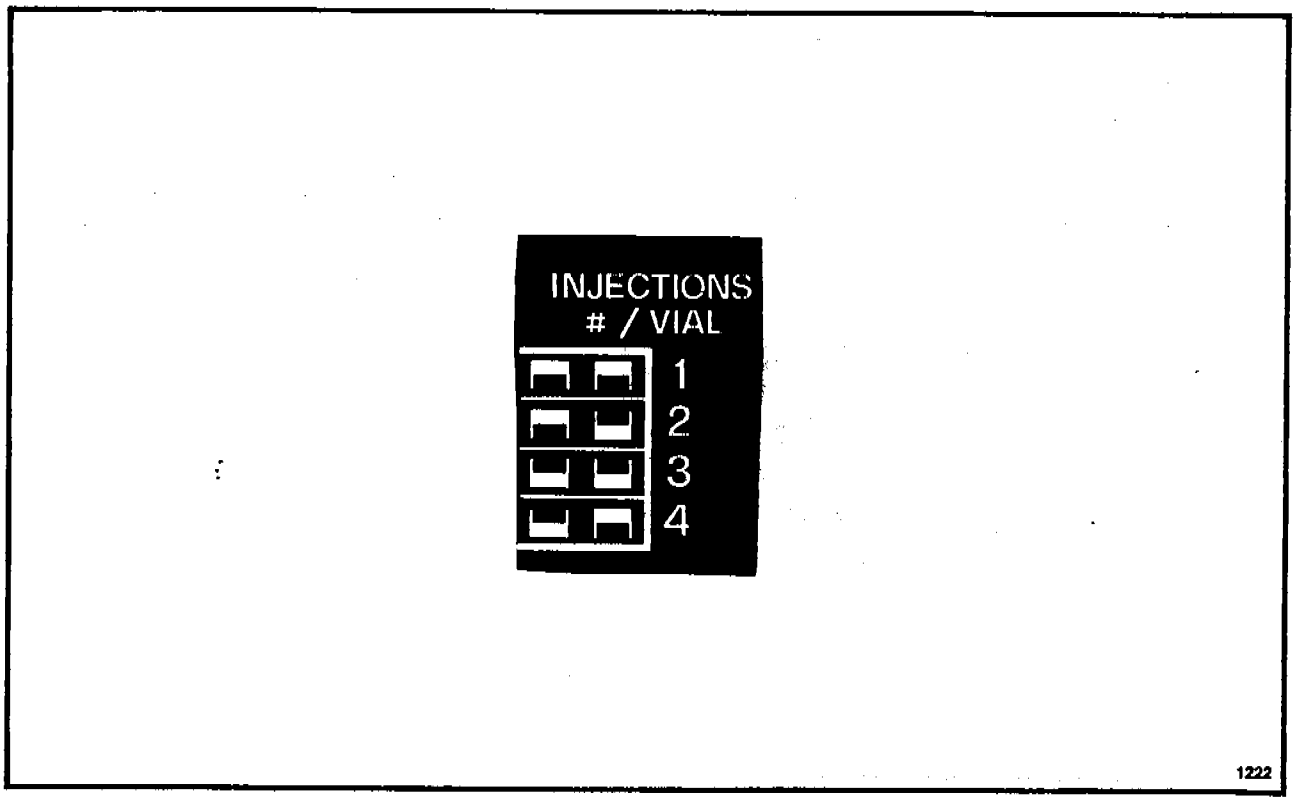


Figure 3-12. Multiple Injections Per Vial Selection

The number of injections per sample is selected by positioning the "INJECTIONS #/VIAL" switches located behind the HP 7673A nameplate. Four settings are available providing 1, 2, 3, or 4 injections per sample vial.

When making sequential runs where one to 100 samples may be used, the user must be careful in specifying the number of injections per vial. It is possible to exhaust the supply of solvent in the solvent bottles or overflow the waste bottles if too many injections are done on too long of sequence. As an aid in determining the number of injections that can be done given the number of washes taking place, see Section 3, "Wash and Waste Bottle Usage".

SAMPLE PRE-WASH SELECTION

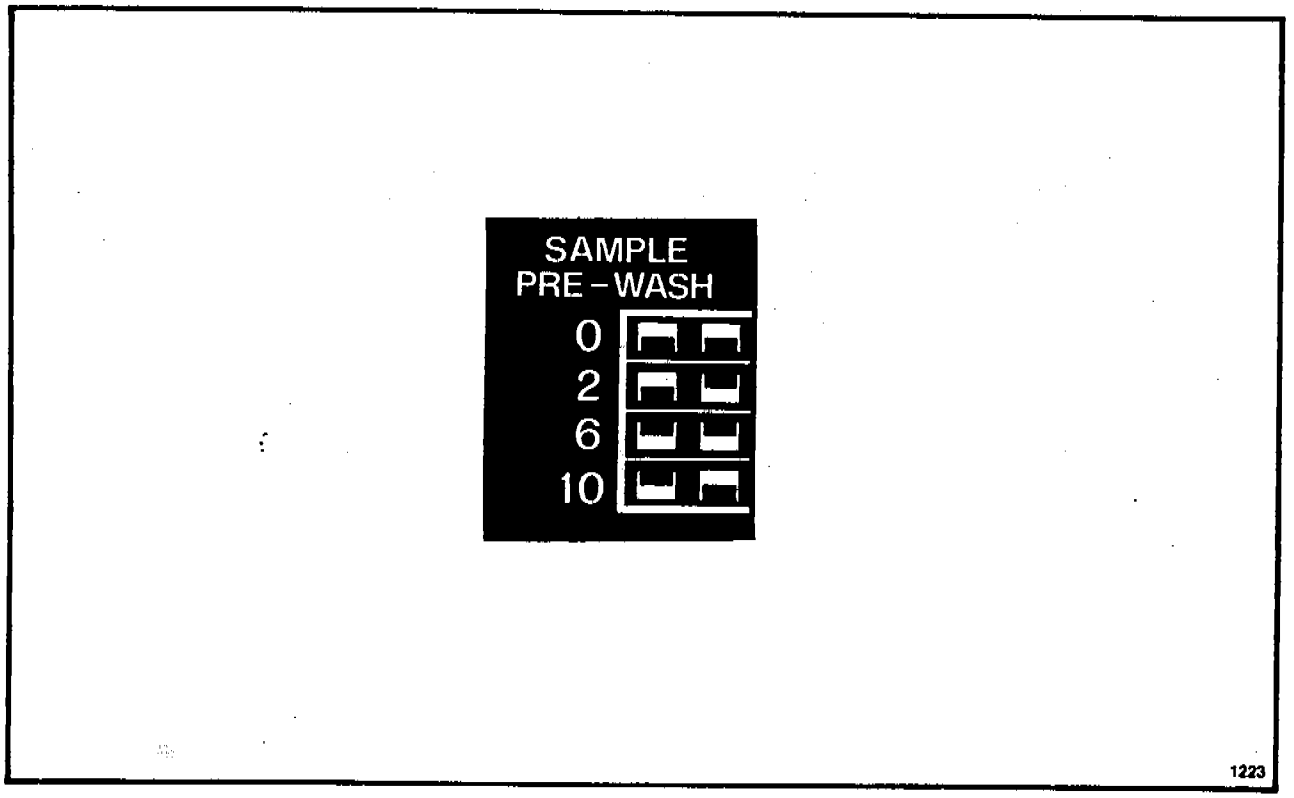


Figure 3-13. Sample Pre-Wash Selection

The number of sample pre-washes is selected by positioning the switches labeled "SAMPLE PRE-WASH" located behind the HP 7673A nameplate. Four settings are available providing 0, 2, 6, or 10 sample washes before each injection.

When selecting the number of sample pre-washes, make certain the amount of sample in the vial will be sufficient to handle the number of sample pre-washes, injections per vial and the amount of each injection.

SOLVENT POST-WASH SELECTION

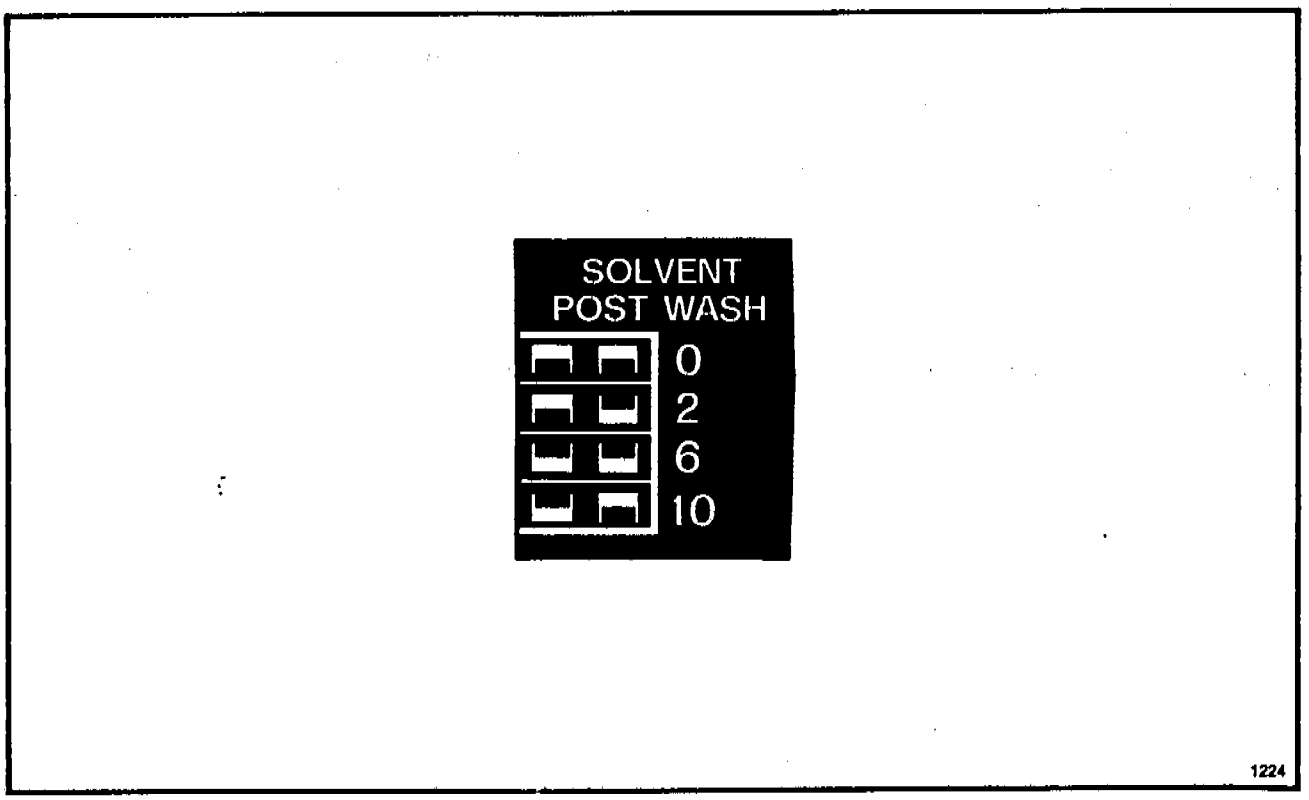


Figure 3-14. Solvent Post-Wash Selection

The number of solvent post-washes is selected by positioning the switches labeled "SOLVENT POST-WASH" located behind the HP 7673A nameplate. Four settings are available providing 0, 2, 6, or 10 solvent washes after each injection.

When making runs where 1-100 samples may be used, the user must be careful in specifying the number of solvent post-washes. It is possible to exhaust the supply of solvent in the solvent bottles or overflow the waste bottles if too many washes are done on too long of sequence. As an aid in determining the number of washes that can be done given the number of injections taking place, see Section 3, "Wash and Waste Bottle Usage".

Loading The Injector Turret

The injector turret is loaded in two different ways under stand-alone control. When the injector is being operated by itself, the samples are loaded directly into the turret (see "Single Injector"). During single injector operation, the turret holds one to three samples, one wash and one waste bottle. When the tray is installed the samples are loaded into the tray and the injector turret receives them one at a time until the sequence is done (see "Single Injector, Tray Installed" this section). The addition of the tray allows the turret to accommodate one sample, a wash "A" and waste "A", wash "B" and waste "B" position.

CAUTION

USE RECOMMENDED WASH/WASTE BOTTLES (PART NO. 9301-0723) IN WASH AND WASTE POSITIONS DESCRIBED IN THIS MANUAL. OTHER WASH/WASTE BOTTLES MAY BE USED PROVIDING THEY ARE THE SAME WIDTH, HEIGHT, AND DEPTH. SEE "SAMPLE, WASH/WASTE BOTTLES" THIS SECTION.

SINGLE INJECTOR(s)

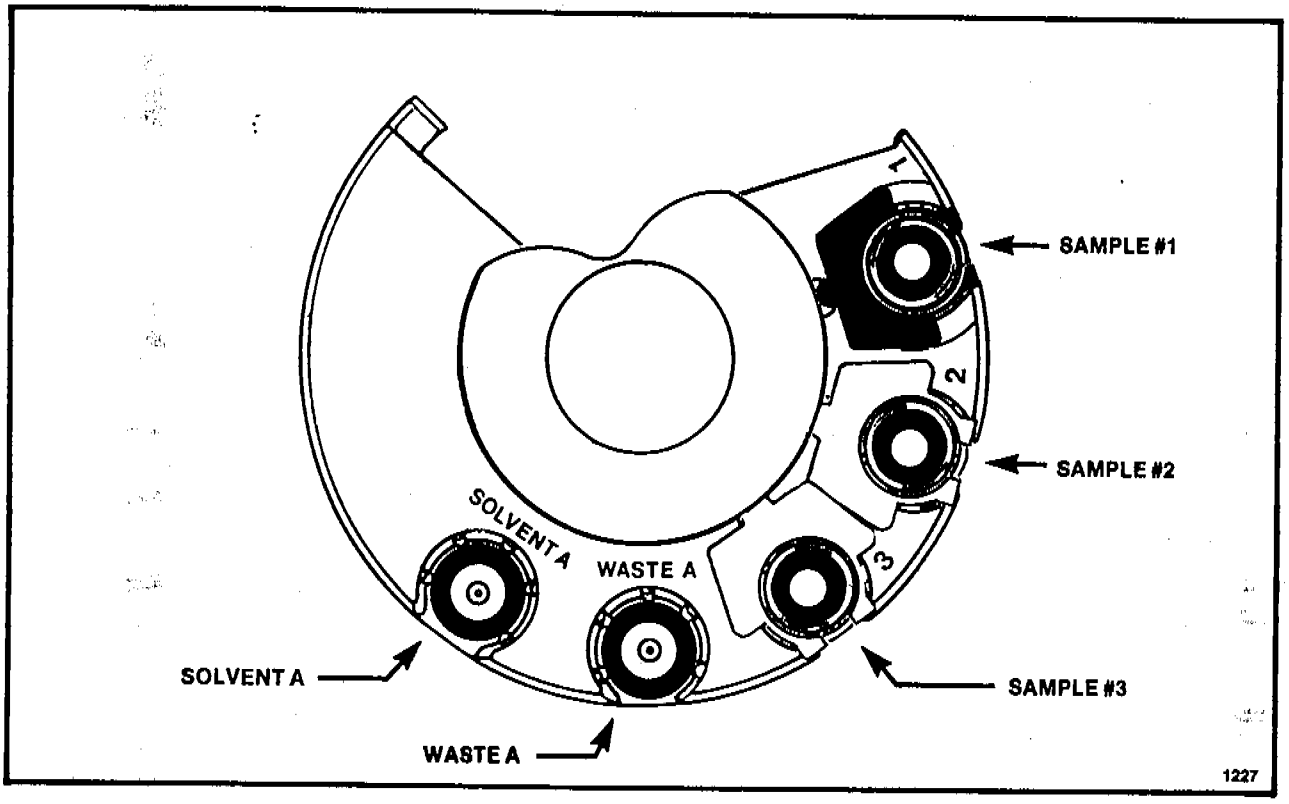


Figure 3-15. Turret Vial Locations (Injector use without tray)

The turret is designed to hold five vials. Using the injector alone (no tray installed), sequences of one to three samples are possible. Two positions of the turret are used as wash and waste positions while the remaining three are sample positions. Sample inserts must be installed in the injector turret for proper operation. See "Sample Inserts" this section for information on the use of sample inserts.

SINGLE INJECTOR(s) TRAY INSTALLED

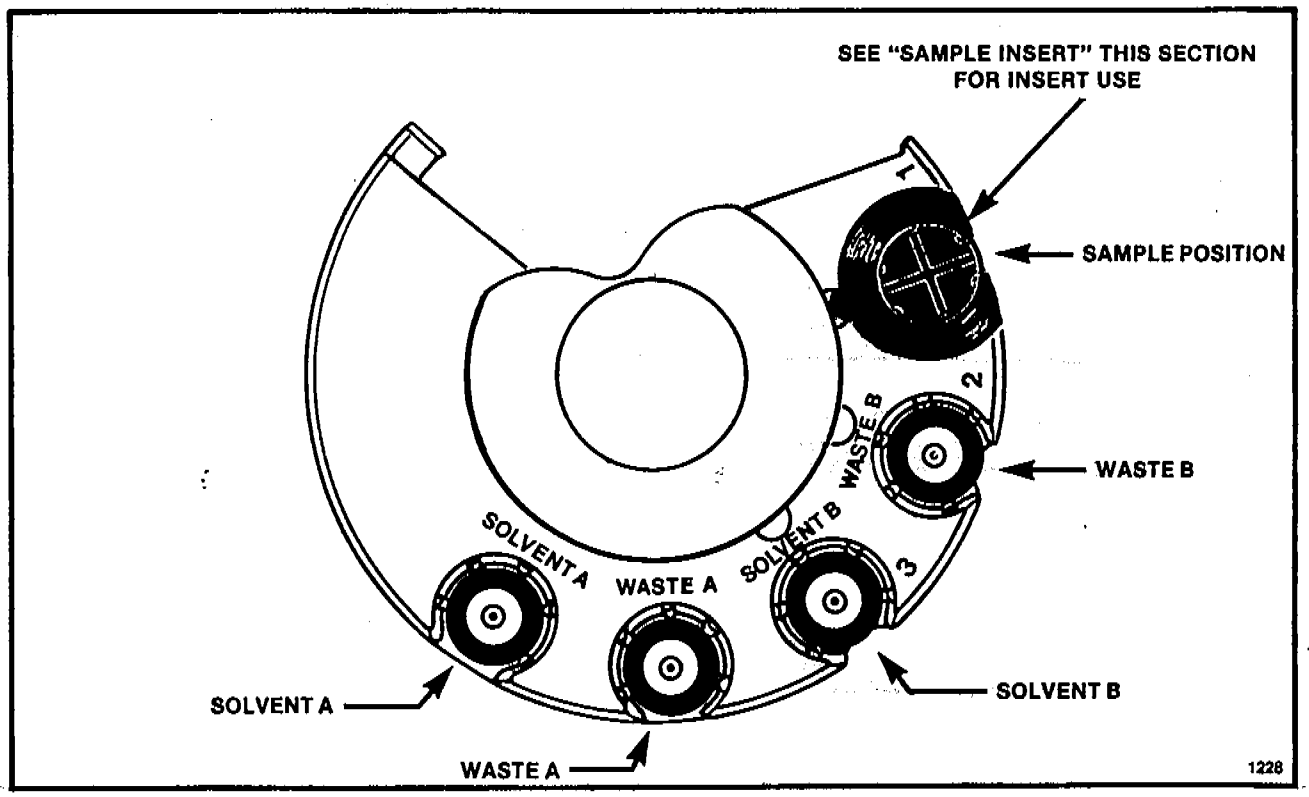


Figure 3-16. Turret Vial Locations, Tray Installed

Using the injector with the tray installed, sequences of 1 to 100 samples are possible. With the tray installed, the turret accommodates two wash, two waste, and one sample position.

During operation the number of solvent post-washes selected on the injector front panel will be split between solvent "A" and solvent "B". For example, when two solvent post-washes are selected, the syringe is washed once from solvent bottle "A" and once from solvent bottle "B". When six solvent post-washes are selected, the syringe is washed three times from solvent bottle "A" and solvent bottle "B". During a sequence, the injector will alternate solvent and sample waste between waste "A" and waste "B" bottles.

SAMPLE INSERTS

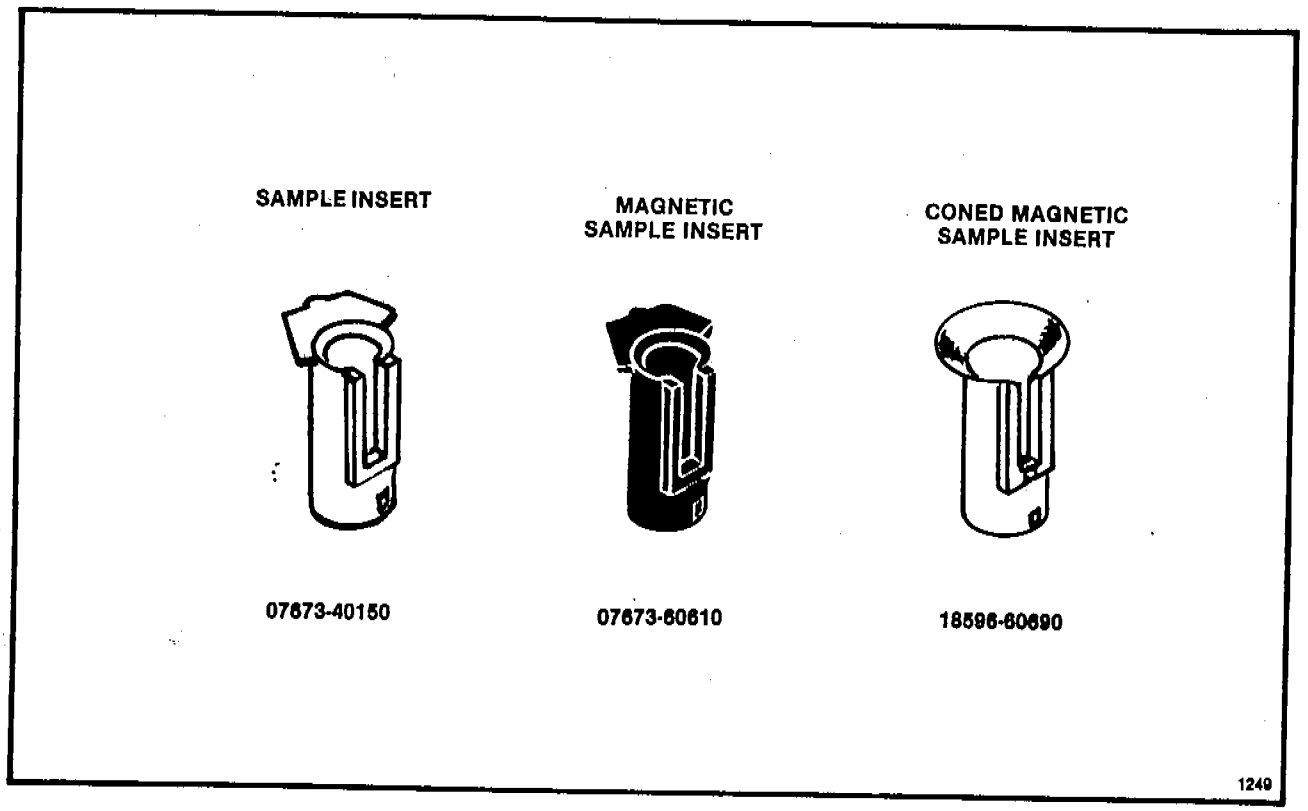


Figure 3-17. Sample Inserts

Sample inserts are used to hold sample vials in position in the injector turret. There are two types of sample inserts used when the injector alone is being used:

SAMPLE INSERT (WHITE)	- Used only in sample positions one, two, or both.
MAGNETIC SAMPLE INSERT (BLACK)	- Used to identify the LAST sample in a sequence without a tray installed. The injector will stop after sampling from this insert.
CONED MAGNETIC SAMPLE INSERT (NEUTRAL)	- Used only when the tray is present and is always installed in sample position one.

Examples: Injector Only Operation (Tray Not Installed)

1. Three samples in a sequence:

   Position 1 = white insert
   Position 2 = white insert
   Position 3 = black insert

2. Two samples in a sequence:

   Position 1 = white insert
   Position 2 = black insert
   Position 3 = empty

3. One sample in a sequence:

   Position 1 = black insert
   Position 2 = empty
   Position 3 = empty

NOTE

The magnetic (black) sample insert must ALWAYS be installed in the injector turret (in sample position 1, 2, or 3) BEFORE starting a sequence. If not installed, the injector will not home the turret and a fault condition will occur. For more information on fault conditions, see Section 4, "In Case Of Difficulty".

Tray Use

When the tray is installed, a coned magnetic sample insert is installed in the injector turret.

SAMPLE INSERT (WHITE)	- Not used with the tray installed.
MAGNETIC SAMPLE INSERT (BLACK)	- Not used with the tray installed.
CONED MAGNETIC SAMPLE INSERT (NEUTRAL)	- Always installed in the SAMPLE 1 position in the injector turret when the tray is installed.

When using the injector with the tray installed, install the coned insert in sample position one. In this application, no white inserts are used in the injector turret (see Figure 3-16).

NOTE

If the coned insert is not installed, or if more than one is installed, the injector will stop and the FAULT light will flash a code to identify the problem (see Section 5, "In Case of Difficulty").

Sample Tray Operation

To transport the vials, the arm rotates to the proper angular location next to the vial to be transported. The gripper moves down to the segment between the vials; a slight angular movement of the arm, counter-clockwise, engages the neck of the vial. The vial is then moved in a vertical direction until it clears the top of the other vials. The arm moves to the radial home location before rotating to the specified deliver angle. The arm then moves to the delivery location in the injector turret. The gripper is lowered placing the sample vial in the specified port. The arm again makes a slight angular movement disengaging the vial from the gripper. The gripper is raised to the vertical home position. The arm then returns to the home position.

TRAY HOME POSITION

Home positions for the tray/transport mechanism are defined as follows:

1. Angular arm home position is perpendicular to a line drawn through the injection ports from front to back of the gas chromatograph.

2. Radial arm home is above the third sample vial in the row defined by the angular home.

3. Gripper home is the full up position on the arm.

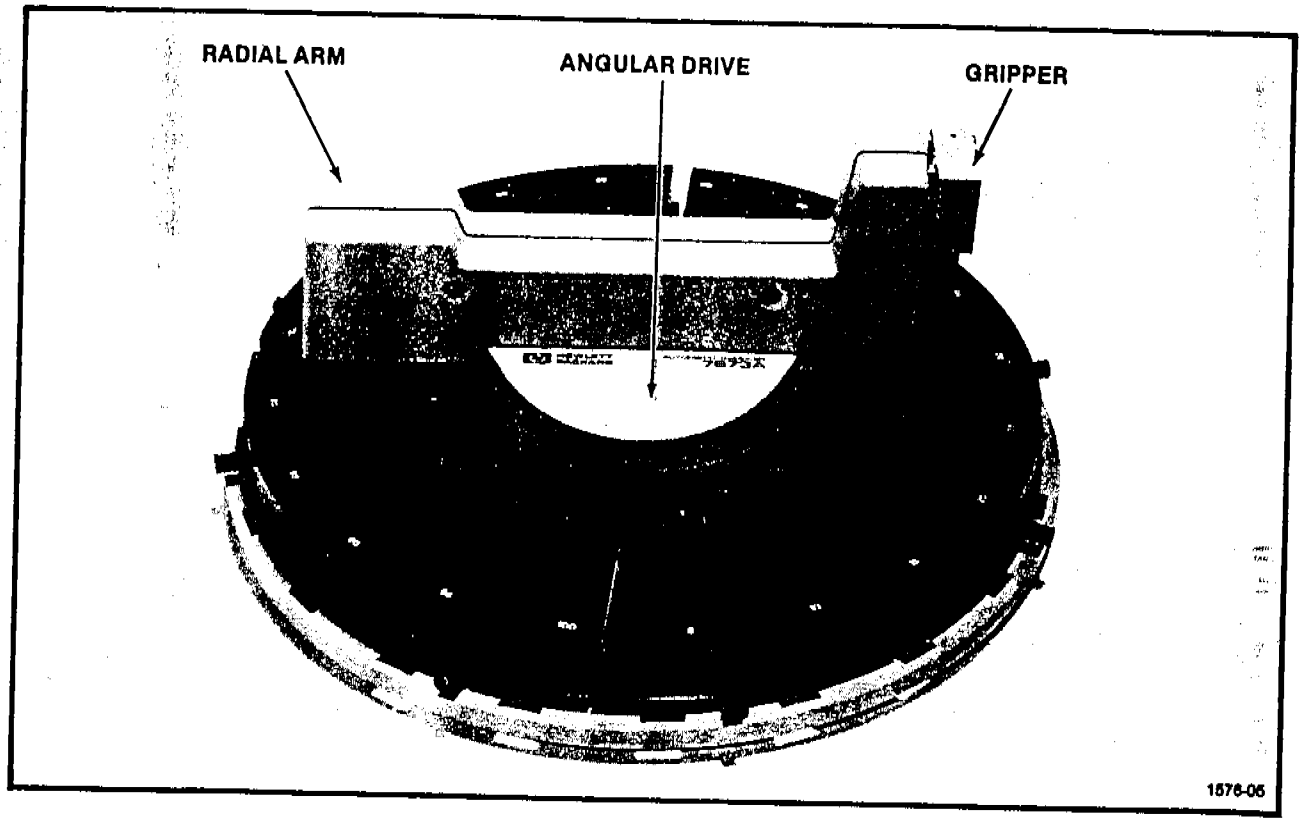


Figure 3-18. Tray Home Positions

BOTTLE SENSOR

In addition to checking for the home positions, there is also a check to see if there is a vial in the gripper. When a vial is expected to be in the gripper and is not found, a fault signal is generated, shutting down the injector.

If a vial is found, when none was expected, the arm returns to the last location and attempts to deliver the vial. If a vial is found, a fault signal is generated, shutting down the injector.

LOADING THE SAMPLE TRAY

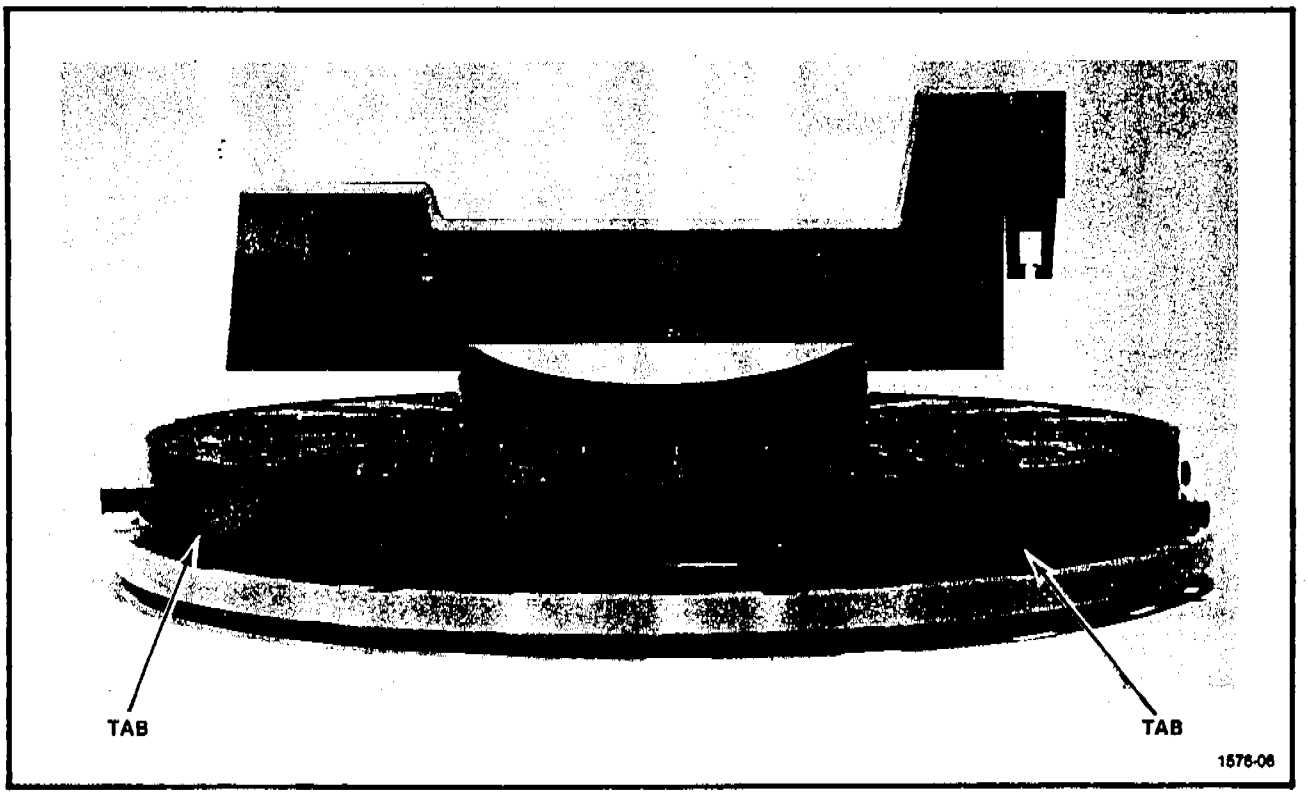


Figure 3-19. Sample Tray

Vial positions are arranged in quadrants of 25 each. Each quadrant contains five rows of five samples and can be removed from the tray for remote loading or storage.

The quadrants themselves are hollow plastic molded parts that can be filled with a fluid to aid in temperature control of the samples while in the tray. The fill and drain lines will be accessible when installed in the tray. A circulating temperature controlled bath (user supplied) can be attached for temperature control applications.

CAUTION

BATH TEMPERATURE RANGE MUST BE BETWEEN 0 °C TO 60 °C. PERMANENT DAMAGE MAY RESULT OUTSIDE THIS RANGE.

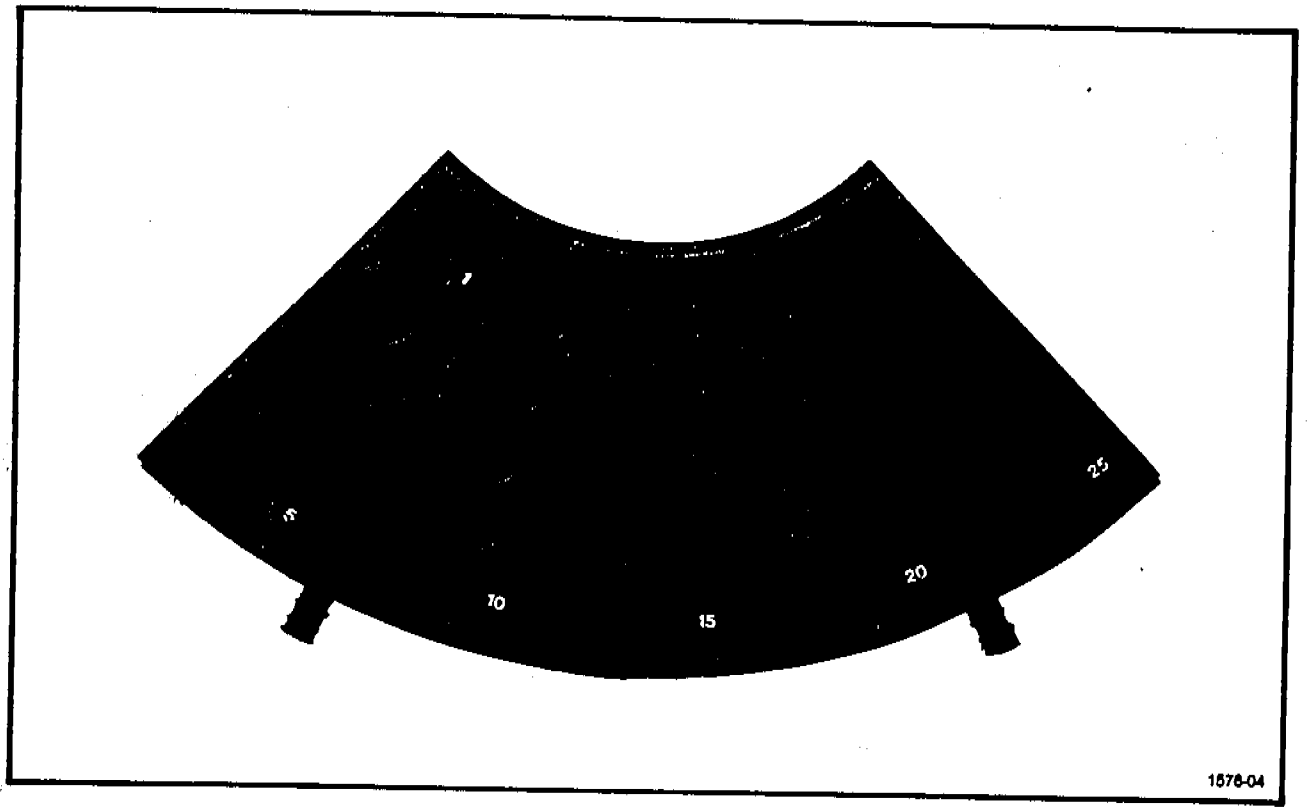


Figure 3-20. Sample Tray Quadrant

To remove a quadrant from the tray, lift at the tab along its front edge. Once the tab is free from the tray, remove the quadrant.

To reinstall the quadrant, insert the locating tab on the backside of the quadrant into the slot in the tray. Align the tab along the front edge of the quadrant and press downward until the tab snaps into place.

Samples are loaded in consecutive order using the outside set of numbers as a reference. Under stand-alone control, the tray will always start with sample in position one. This feature necessitates that the first sample in the series must always occupy position one.

In cases when the sampler is controlled through other instruments (e.g., HP 3392A,HP 5880A, etc.), the entries programmed into the "sample table" (first bottle number and last bottle number) will indicate to the tray at which sample position to begin the auto sequence and at which position to stop it.

Injection Sequence

Under stand-alone control the sampler's injection sequence has four parameters the user is able to access; sample size, injections per vial, sample pre-wash, and solvent post-wash. Keeping these accessible areas in mind, the following sequence of events will take place using the parameters shown in Figure 3-21.

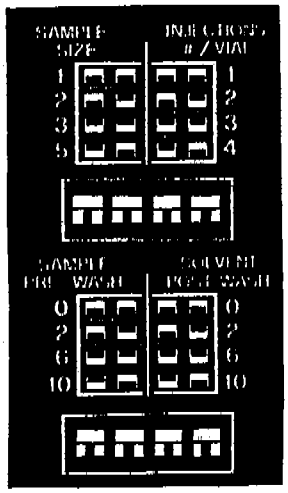


Figure 3-21. Injection Sequence Control Switches

Before any sequence begins, the syringe is moved into a waste bottle. The plunger moves to the bottom of the stroke to expel anything that may be in the syringe.

1. The turret indexes the sample vial into position under the syringe. The syringe carriage moves down into sample-load position causing the syringe needle to penetrate the vial septum. The plunger will move to full up position and the syringe carriage will move up to its home position.

2. The turret indexes the waste vial under the syringe and the syringe carriage moves down until the needle enters the waste vial. The syringe plunger moves down, fully emptying syringe contents into the waste vial. The syringe carriage moves to home position.

3. The turret indexes the sample vial under the syringe. The syringe carriage moves down causing the syringe needle to pierce the sample vial septum and enter the sample. The syringe plunger is moved up and down (pumped) six times before the sample is drawn into the syringe for the last time by moving the plunger up against the mechanical stop (preset by the operator). The syringe carriage moves up to the home position.

4. The turret indexes to the inject (home) position. The syringe carriage moves down to the inject position, penetrating the septum and entering the injection port. The syringe plunger moves down to its home position. When bottoming of the plunger is sensed, the syringe transport removes the syringe needle from the injection port and returns to the "home" position. If the plunger does not bottom in 170 msec, the syringe carriage will return to home position and a fault will be registered causing the red fault light to flash.

NOTE

Just before the syringe is moved down into the injection port , a start signal is sent through the remote start cable. The injector proceeds with the solvent post-wash cycle while the GC performs the analysis.

5. The syringe carriage moves from the inject position returning to home. Once the syringe carriage is home, the turret indexes the wash solvent under the syringe. The carriage moves down allowing the syringe needle to enter the solvent bottle. The syringe plunger is pulled to full up position, filling the syringe with solvent. The plunger remains up while the syringe carriage moves to home position.

6. The turret indexes the waste vial over the injection port. The syringe carriage moves down and the syringe needle enters the waste vial. The syringe plunger is pushed down, expelling the syringe contents (solvent) into the vial.

7. After the wash cycle has been completed, the turret indexes to the home position (the syringe cutout in the turret is under the syringe). The injector waits for the next start command.

NOTE

While waiting for the next start command, all home positions are checked. If any sensor detects a loss of home during this period, the injector will try to re-home the affected assembly during the next injection cycle. If the re-homing is unsuccessful, the injection will be aborted with an error condition (red light blinking).

Application Examples

It is assumed that the injector, controller and proper cables are installed, that general front panel control is understood (number of washes, pumps, etc.), and that specific operating information for sample, wash/waste bottles and sample inserts is also understood. Consult this manual as necessary before proceeding with application examples.

SINGLE INJECTOR

Number of samples to be run: 2

Sample size: 3µL

Number of injections per sample: 2

Sample Pre-Wash: 2

Solvent Post-Wash: 6

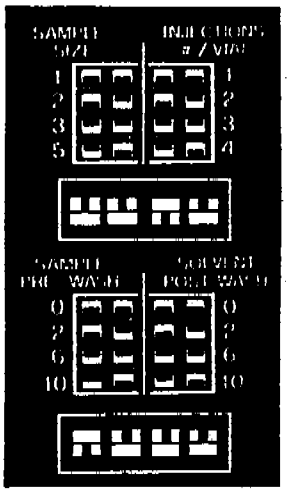


Figure 3-22. Example, Injector Conditions

1. Set the injector front panel switches to match the settings in Figure 3-22 above.

2. Install a sample insert (white) in position 1, and the magnetic sample insert (black) in position 2 of the injector turret.

3. Place the first sample vial in the white sample insert and the second (and last sample in this sequence) sample in the magnetic (black) sample insert.

4. Install wash "A" and waste "A" bottles in their appropriate places in the injector turret.

5. Press START on the injector. The HP 7673A will run the two samples according to the conditions set on the injector front panel. After the last injection of the last sample is run, the injector will stop.

In this example, a sequence of two samples with two injections per sample was used. By changing the positions of the sample inserts, sequences of one to three samples (injections per sample 1 to 4) are possible.

TWO INJECTORS

When a second injector is installed, the operation of the second injector is identical to the first. However, they will operate independently.

SINGLE INJECTOR WITH TRAY

Number of samples in the run: 10

Sample size: 3µL

Number of injections per sample: 2

Sample Pre-Wash: 2

Solvent Post-Wash: 6

1. Set the injector front panel switches to match the settings in Figure 3-22.
2. Install the coned magnetic sample insert (black) in position 1 of the injector turret.
3. Place the samples in the tray in positions one through ten.
4. Install "A" and "B" wash and waste bottles in their appropriate places in the injector turret.
5. When the system is ready, the START key (on the GC or injector) is pressed to start the injection sequence. The HP 7673A will run the ten samples according to the conditions set on the injector front panel. If the START key is pressed before a ready signal is given, the system will wait until all devices are ready and then start the sequence. The tray will deliver vials 1 to 10 in sequential order. If only 5 vials are loaded, the tray will attempt to find number 6 and, when the vial is not sensed, the sampler will stop.

HP 3392A CONTROL (INET)

NOTE

This section presents operating information for the HP 7673A via the HP 3392A Integrator, and also includes application examples that may be used as a general guide to instrument performance. Refer to the HP 3392A Owner's Manual for operating instructions for the integrator itself.

The "Instrument Network" (INET) is a path for various devices to communicate with each other (data and/or commands). INET permits a group of devices, consisting of a "controller", a number of data "Producers" and data "Consumers", to function as a single unified system.

NOTE

Section 7, HP 3392A Owner's Manual, provides an overview of the Instrument Network (INET).

Figure 2-12 shows an HP 3392A connected by INET to an HP 5890A Chromatograph and HP 7673A Controller, which in turn controls the sampler. Setpoints can be passed to and received from the chromatograph and the sampler, giving the HP 3392A control of the instruments. The HP 3392A can send, receive, and list the current sampler conditions. Bottle numbers can be transmitted over the network. The instruments' setpoints (the HP 3392A's, the chromatograph's, and the HP 7673A's) can also be changed between runs as part of a sequence of workfiles.

The active sample producer on INET is the device responsible for delivering sample-data to the active sample-data consumer(s). In general, it is the part of the instrument which actually injects or introduces the sample into the analyzing instrument. The HP 7673A Controller is a sample-data producer, that is, it sends a sample# to the HP 3392A after each run.

The HP 3392A accepts the sample# the HP 7673A controller delivers. It prints the sample number it receives as part of the report heading, and uses it as an index into the Sample Table (see Section 5, HP 3392A Integrator Owner's Manual).

Turret Bottle Locations

The turret is designed to hold five bottles and may be loaded in two different ways when controlling the HP 7673A via other instruments. When the injector is being operated by itself, the turret holds one to three samples, one wash and one waste bottle (see Figure 3-23).

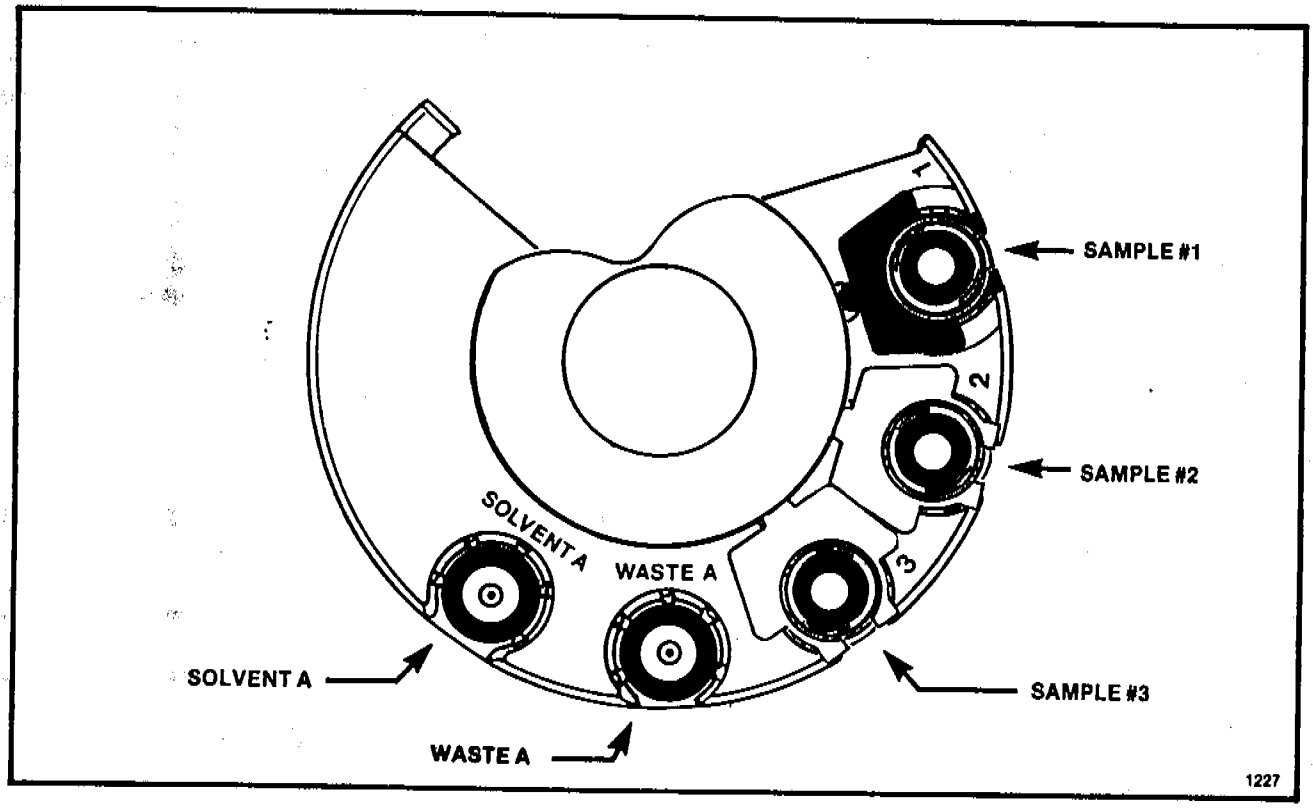


Figure 3-23. Turret Bottle Locations (Injector Only)

When the tray is installed, all samples are loaded into the tray. The injector turret then holds:

One Solvent Wash "A" Bottle

One Empty Waste "A" Bottle

One Solvent Wash "B" Bottle

One Empty Waste "B" Bottle

One Sample Location (coned magnetic insert installed)

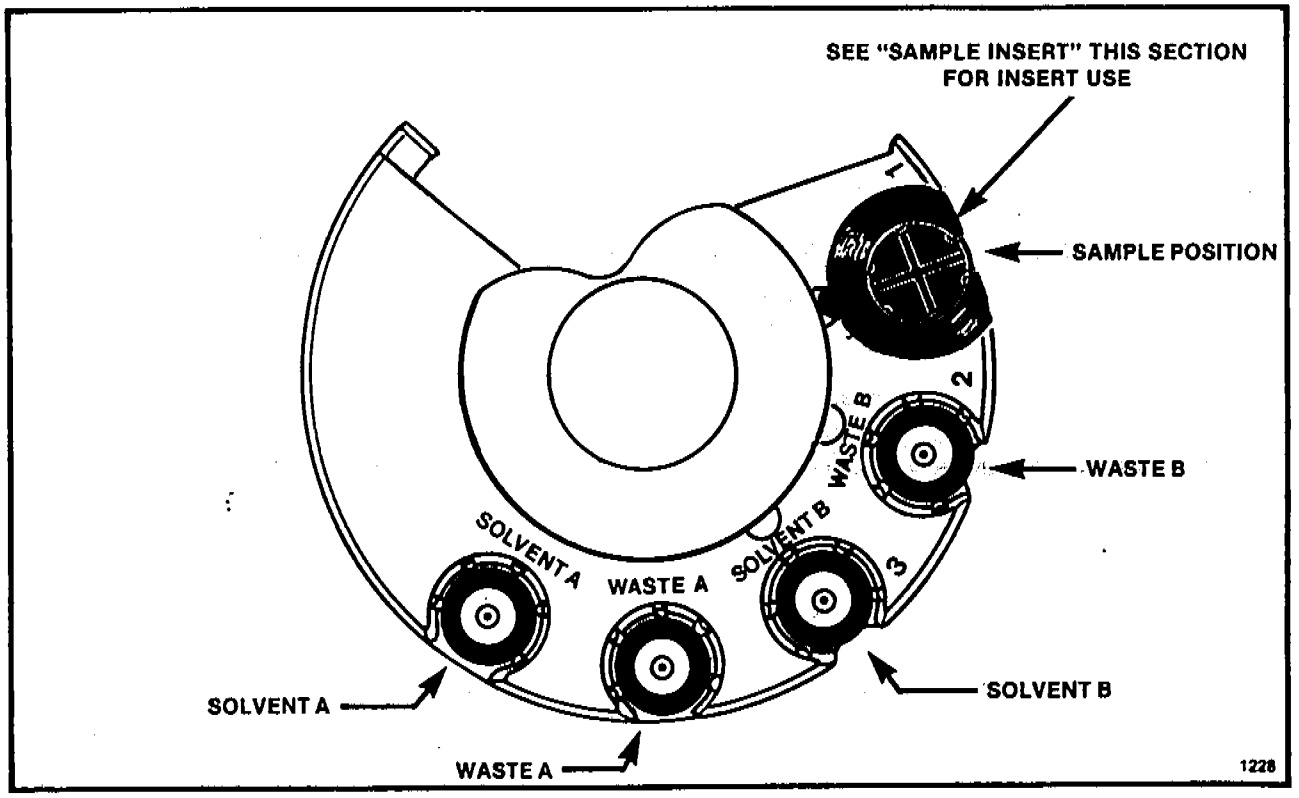


Figure 3-24. Turret Bottle Locations (Tray Installed)

Sample Inserts

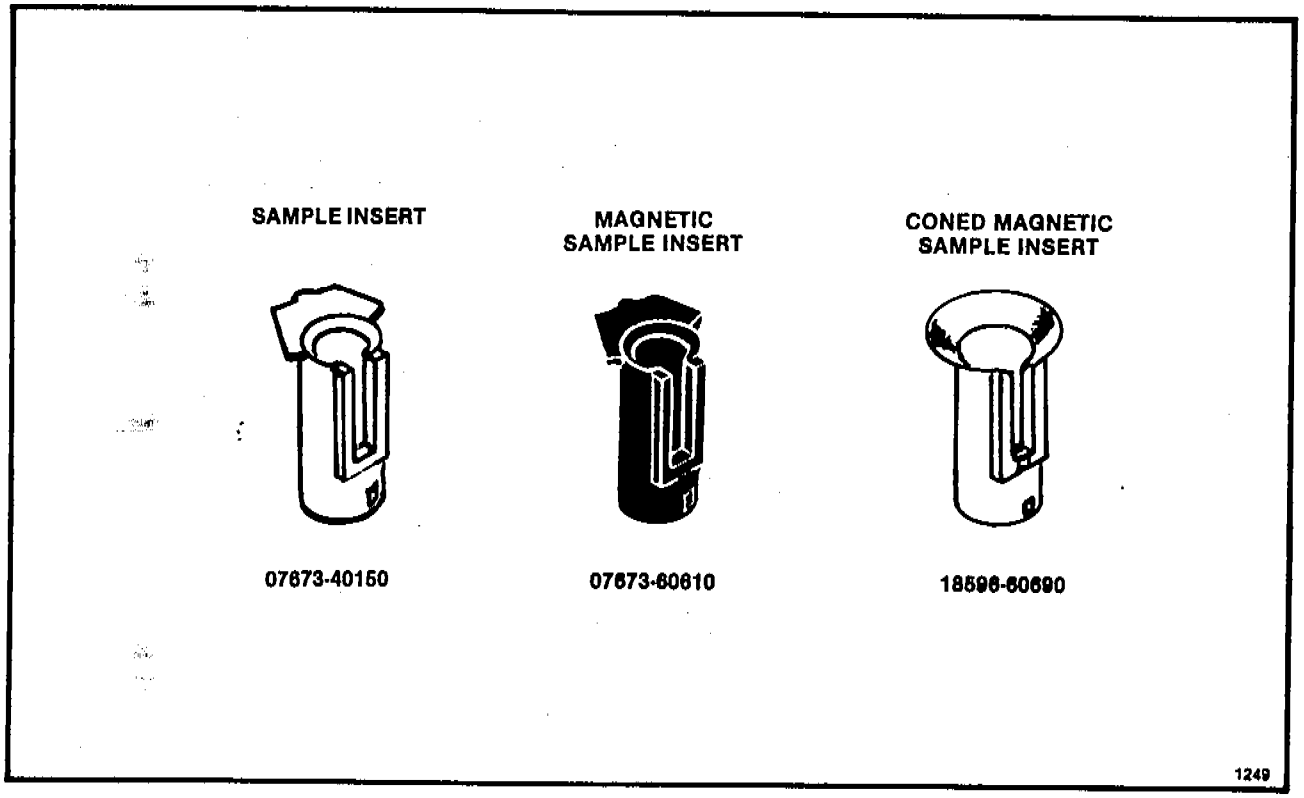


Figure 3-25. Sample Inserts

Three types of sample inserts are used in the injector turret. Two are used when the injector only is installed while a third type is for use only when the tray is installed.

Sample inserts are used to hold sample vials in position in the injector turret.

Injector Use (Tray Not Installed)

There are two types of sample inserts used when the injector alone is being used:

SAMPLE INSERT (WHITE)	- Used only in sample positions two and three to hold sample at correct height.
MAGNETIC SAMPLE INSERT (BLACK)	- Used as a guide to position the turret for requested sequence operations (e.g., washes, sample injections, etc.). This insert must always be installed in sample position one.

When using the injector by itself, install the black insert in sample position one and the white insert(s) in sample positions two and three (see Figure 3-23).

Tray Use

When the tray is installed, a coned sample insert is installed in the injector turret.

SAMPLE INSERT (WHITE)	- Not used with the tray installed.
MAGNETIC SAMPLE INSERT (BLACK)	- Not used with the tray installed.
CONED MAGNETIC SAMPLE INSERT (NEUTRAL)	- Always installed in the SAMPLE position in the injector turret when the tray is installed. See "Turret Bottle Locations" this section, for locating the Coned Sample Insert.

When using the injector with the tray installed, install the coned insert in sample position one. In this application, no white inserts are used in the injector turret (see Figure 3-24).

NOTE

If the coned insert is not installed, the injector will stop and the FAULT light will flash a code to identify the problem (see Section 4, "In Case of Difficulty").

Sampler Control Parameters

When controlling the HP 7673A via an HP 3392A, the entries programmed through option 11 (first bottle number and last bottle number) indicate to the HP 7673A at which sample position to begin automated operation and at which position to stop it.

The HP 7673A automatically starts with the sample that matches the first bottle number value entered. From that point it automatically begins sampling bottles consecutively until the last sample bottle number specified has been reached.

The HP 3392A uses two functions of the [OP()] key for automatic sampler control. Option 10 is used to enable or disable automatic sampler operation. Option 11 opens a dialog with the HP 7673A for keyboard entry of its sampler parameters.

[OP( )] [1] [0] [ENTER] enables continuous sampler operation. All of the injections defined in the sampler parameters in the active workfile will be made sequentially. Automatic loading of another workfile in the Active Work Space from storage is also enabled. If a "NEXT WORKFILE" has been entered through Option 18, it will be loaded when all of the injections defined by the active workfile have been made and the results generated. See Section 6 of the HP 3392A Integrator Owner's Manual for instructions for workfile chaining.

[OP( )] [-] [1] [0] [ENTER] disables continuous operation and disables workfile chaining. The injection function of the sampler is disabled. Manual injections can be made if the sampler is dismounted from the injection port(s).

The sampler controller operates with parameters entered from the HP 3392A keyboard.

[LIST] [OP( )] [1] [1] [ENTER] lists the parameter's current values for the HP 7673A.

The sequence:

[OP( )] [1] [1] [ENTER]

starts a dialog for entering the parameters. All parameters are entered as unsigned integers. Just pressing the [ENTER] key in response to the arrow-prompt skips to the next parameter without changing the current value.

NOTE

An answer of 0 to the INJ/BOTTLE prompt terminates the remaining dialog prompts for that injector.

When entries for the parameters to be changed have been made, the dialog ends and the new parameters become the current setpoints for the HP 7673A.

At any time during the dialog associated with Option 11, pressing the [ESC] key exits the dialog. All of the entries which have been completed at that time will be passed to the HP 7673A controller. As with other numeric entries, pressing [CLEAR] before the [ENTER] key is pressed clears the current number; the HP 3392A waits for the correct entry.

```
7673A SAMPLER
 LOOP ADDRESS:   1
 FRONT INJECTOR
  INJ/BOTTLE                    1
  FIRST BOTTLE                  1
  LAST BOTTLE                   1
  # OF SAMPLE WASHES             2
  # OF PUMPS                     6
  VISCOSITY                     0
  VOLUME                        1
  # OF SOLVENT A WASHES          2
  CAPILLARY ON-COLUMN (1=YES)   0
```

Figure 3-26. Sampler Parameter Listing, One Injector Installed

```
7673A SAMPLER
 LOOP ADDRESS:   1

 FRONT INJECTOR
  INJ/BOTTLE                    1
  FIRST BOTTLE                  1
  LAST BOTTLE                   1
  # OF SAMPLE WASHES            2
  # OF PUMPS                    6
  VISCOSITY                     0
  VOLUME                        1
  # OF SOLVENT A WASHES         2
  # OF SOLVENT B WASHES         2
  PRIORITY SAMPLE (1=YES)       0
  CAPILLARY ON-COLUMN (1=YES)   0
```

Figure 3-27. Sampler Parameter Listing, One Injector and Tray Installed

```
7673A SAMPLER
 LOOP ADDRESS:   1

 FRONT INJECTOR
  INJ/BOTTLE                    1
  FIRST BOTTLE                  1
  LAST BOTTLE                   1
  # OF SAMPLE WASHES            2
  # OF PUMPS                    6
  VISCOSITY                     0
  VOLUME                        1
  # OF SOLVENT A WASHES         2
  CAPILLARY ON-COLUMN (1=YES)   0

 REAR INJECTOR
  INJ/BOTTLE                    1
  FIRST BOTTLE                  1
  LAST BOTTLE                   1
  # OF SAMPLE WASHES            2
  # OF PUMPS                    6
  VISCOSITY                     0
  VOLUME                        1
  # OF SOLVENT A WASHES         2
  CAPILLARY ON-COLUMN (1=YES)   0
 POSITION (1=FRONT, 2=REAR)
  INET CHANNEL 1                1
  AUXILIARY CHANNEL             2
```

Figure 3-28. Sampler Parameter Listing, Two Injectors Installed

```
7673A SAMPLER
 LOOP ADDRESS:   1

 FRONT INJECTOR
  INJ/BOTTLE                    1
  FIRST BOTTLE                  1
  LAST BOTTLE                   1
  # OF SAMPLE WASHES            2
  # OF PUMPS                    6
  VISCOSITY                     0
  VOLUME                        1
  # OF SOLVENT A WASHES         2
  # OF SOLVENT B WASHES         2
  PRIORITY SAMPLE (1=YES)       0
  CAPILLARY ON-COLUMN (1=YES)   0

 REAR INJECTOR
  INJ/BOTTLE                    1
  FIRST BOTTLE                  1
  LAST BOTTLE                   1
  # OF SAMPLE WASHES            2
  # OF PUMPS                    6
  VISCOSITY                     0
  VOLUME                        1
  # OF SOLVENT A WASHES         2
  # OF SOLVENT B WASHES         2
  PRIORITY SAMPLE (1=YES)       0
  CAPILLARY ON-COLUMN (1=YES)   0
 POSITION (1=FRONT, 2=REAR)
  INET CHANNEL 1                1
  AUXILIARY CHANNEL             2
```

Figure 3-29. Sampler Parameter Listing, Two Injectors and Tray

The parameters, their allowed ranges, and their default values are defined below.

1. INJ/BOTTLE (0 to 15 permitted).

Specifies number of times the analytical run is repeated for each sample bottle in the sequence. Thus, if the value is two, each bottle is analyzed twice.

An entry of 0 turns the injector off and all dialog associated with the injector is ignored.

NOTE

An excessive number of injections per bottle (in conjunction with sample pre-washes) can create a vacuum in the sample bottle, or cause pieces of septum to get into the sample. This may affect the reproducibility of sample being analyzed. See "Sample Handling" in this section.

2. FIRST BOTTLE (1 to 100 permitted with tray installed).
(1 to 3 permitted without tray).

Specifies the position containing the first bottle in the sequence. When using the injector/tray system, entries of 1 to 100 are permitted and samples are loaded into the tray. When using the injector alone (no tray), entries of 1 to 3 are permitted and samples are loaded directly into the injector turret.

3. LAST BOTTLE (1 to 100 permitted with tray installed).
(1 to 3 permitted without tray).

Specifies tray position containing the last bottle in the sequence. However, with the tray installed, an empty bottle position between the FIRST BOTTLE and the LAST BOTTLE parameters will be interpreted as a last bottle position.

Under control of the HP 3392A, the sampler always works from a defined first bottle number through a defined last bottle number. The sampler cannot run continuously around the sample tray.

However, the active workfile can be stored locally or by a remote computer, and its workfile# or workfile i.d. (see HP 3392A Owner's Manual, Section 6) entered as the NEXT WORKFILE for chaining using Option 18. When processing for the LAST BOTTLE is finished, the entire workfile is reloaded, and the sequence starts again at the FIRST BOTTLE.

Where the last bottle value is less than the first bottle value:

Injector Only- the injector turret will continue the sequence with bottle one after reaching bottle three.

Tray Installed- the tray will continue the sequence with bottle one after reaching bottle 100. During this type of sequence where priority sampling is on, bottle positions 99 and 100 will not be sampled (see auto sequence parameter #10).

4. # of SAMPLE WASHES (0 to 15 permitted).

Specifies number of pre-injection syringe washings with sample. For the specified number of times, the syringe is filled with sample, then emptied into a waste bottle.

NOTE

An excessive number of injections per bottle (in conjunction with sample pre-washes) can create a vacuum in the sample bottle, or cause pieces of septum to get into the sample.. This may affect the reproducibility of sample being analyzed. See "Sample Handling" in this section.

5. # OF PUMPS (0 to 15 permitted)..

Specifies number of times the syringe plunger is moved up and down (pumped) prior to drawing the actual sample volume to be injected. This expels air bubbles, giving improved reproducibility.

6. VISCOSITY (0 to 7 permitted).

Specifies the number of seconds the plunger pauses at the top of the pump and injection stroke(s) (parameter 5) to allow the sample to be drawn into the syringe.

7. VOLUME (1 to 5 permitted).

Specifies volume of sample to be injected. Each volume unit corresponds to approximately 1/10th of the syringe capacity. Thus, for a 10-µL syringe, each unit is approximately 1 µL.

8. # OF SOLVENT "A" WASHES (0 to 15 permitted).

Specifies number of post-injection washings of the syringe with solvent from the "A" solvent bottle. For the specified number of times, the syringe is filled with solvent and emptied into a waste "A" or "B" bottle.

NOTE

When a tray is installed and parameters 8 and 9 are both non-zero, the waste bottles are used alternately (i.e. waste "A" used exclusively during one injection and "B" during the next. If one is zero, the other's waste is used for all injections. If both are zero, then waste "A" is always used. If no tray is installed, "A" is used.) See "Wash and Waste Bottle Usage" in this section.

9. # OF SOLVENT "B" WASHES (0 to 15 permitted).

Specifies number of post-injection washings of the syringe with solvent from the "B" solvent bottle. For the specified number of times, the syringe is filled with solvent and emptied into a waste "A" or "B" bottle. This parameter only appears when the HP 7673A Tray is installed.

10. PRIORITY SAMPLE (1=YES, 0=NO).

Specifies priority sample feature on or off.

The priority sample function is used to handle rush samples without interrupting a sequence in progress. This parameter only appears when the HP 7673A Tray is installed.

When priority sample is on, positions 99, 100 are no longer regular bottle locations. Position 100 becomes the priority sample location and 99 stores the priority sample after the run. With priority sample on, position 100 is checked before each regular bottle in the sequence. If a bottle is located there, it is run next, and then returned to position 99. If priority sample is used on either injector, then both injectors can only run regular bottles up to position 98.

Priority samples are run under exactly the same conditions set for the sequence in progress.

Example:

```
FIRST BOTTLE:  1
LAST BOTTLE:   25
```

Priority Sample On- Bottle position 100 becomes the priority sample position and 99 becomes the priority sample return position.

NOTE

Position 99 must be empty when the priority sample function is used to allow the tray a position to return priority samples. If there is already a bottle in position 99, the system halts and gives an error message.

A rush sample is placed in position 100. Assume the next bottle to be run is bottle #15. Before bottle 15 is transferred to the injector turret, the tray will look for a bottle in position 100. Upon finding it, the tray transfers bottle 100 to the injector turret where it is run next. After the run, the tray returns bottle 100 to position 99 and resumes the sequence with bottle 15.

If both priority samples are turned on, a bottle in location 100 is first run on the front injector (while the rear injector continues its regular sequence). Then the priority sample is transferred directly to the rear injector (while the front injector runs the next regular sample in the sequence). After being run on the rear injector, the priority sample (bottle 100) is returned to position 99 in the tray. The sequence continues normally.

11. ON-COLUMN (1=YES, 0=NO).

Specifies on-column or normal injection mode. When doing on-column injections, the on-column syringe (Part No. 9301-0714) must be installed. When operating in this mode, the travel of the syringe carriage is longer and slower than in the normal injection mode. For more information about on-column operation, see Section 3, "Dedicated On-Column Capillary Operation".

12. POSITION (1=FRONT, 2=REAR)

```
    INET CHANNEL              1  (1=FRONT, 2=REAR).
    AUXILIARY CHANNEL         2  (1=FRONT, 2=REAR).
```

The position parameter determines where the sample bottle numbers will be printed when more than one injector is installed.

The INET CHANNEL setting determines the bottle number sent to the INET controlling device (e.g. HP 3392A). The AUXILIARY CHANNEL setting determines the bottle number sent to the auxiliary device being used. The settings correspond to the injector position; 1 equals the injector connected into the controller position labeled "FRONT INJECTOR", and 2 equals the injector connected into the controller position labeled "REAR INJECTOR".

If the POSITION parameter for a device is set to 1 (FRONT), then the bottle number of the sample injected from the front injector will be reported to that device.

If the POSITION parameter for a device is set to 2 (REAR), then the bottle number of the sample injected from the rear injector will be reported to that device.

If in any run either injector does not make an injection, no sample number will be reported (for INET CHANNEL 1 or 2) or a sample number of "0" will be reported (for the AUXILIARY CHANNEL). More than one device may receive the sample number from the same injector if desired. If there is only one injector installed, then all devices receive its sample number.

Application Examples

It is assumed that general control of the HP 7673A is understood and that specific operating information for HP 3392A type of control is also understood. If not, consult the appropriate manual as necessary.

EXAMPLE 1. SINGLE INJECTOR (TRAY NOT INSTALLED)

This example demonstrates how to run a single sample placed in the injector turret (sample position #1) with commands entered from the HP 3392A's keyboard.

First enable automated sequences by turning Option 10 on:

```
OP # 10 [ENTER]
```

Next enter commands to select injection parameters (washes, pumps, volume, and injections per bottle). For example:

```
OP # 11 [ENTER]

7673A SAMPLER
 LOOP ADDRESS:   1


FRONT INJECTOR
  INJ/BOTTLE     1-->     1 [ENTER]
  FIRST BOTTLE     1-->     1 [ENTER]
  LAST BOTTLE     1-->     1 [ENTER]
  # OF SAMPLE WASHES     2-->     2 [ENTER]
  # OF PUMPS     6-->     6  [ENTER]
  VISCOSITY     0-->     0  [ENTER]
  VOLUME     1-->     1 [ENTER]
  # OF SOLVENT A WASHES     2-->     2 [ENTER]
  ON-COLUMN (1=YES)     0-->     0 [ENTER]
```

Press START on either the HP 3392A, HP 5890A, or the HP 7673A.

In this example, a single injection is made, and control of the HP 7673A Sampler is done through the HP 3392A. The sampler will seek the "FIRST BOTTLE" as specified, and make an injection from it. The sequence will end after the post-run processing finishes.

EXAMPLE 2. SINGLE INJECTOR (WITH TRAY INSTALLED)

This example demonstrates how to run 1 to 30 samples placed in the tray (positions 1 through 30). All commands are entered through the HP 3392A's keyboard.

First enable automated sequences by turning Option 10 on:

```
OP # 10 [ENTER]
```

Next enter commands to select injection parameters (washes, pumps, volume, etc.). Example:

```
OP # 11 [ENTER]

7673A SAMPLER
 LOOP ADDRESS:   1

FRONT INJECTOR
  INJ/BOTTLE    1-->    1 [ENTER]
  FIRST BOTTLE    1-->    1 [ENTER]
  LAST BOTTLE    1-->   30 [ENTER]
  # OF SAMPLE WASHES    2-->    2 [ENTER]
  # OF PUMPS    6-->    6  [ENTER]
  VISCOSITY    0-->    0 [ENTER]
  VOLUME   1-->    1 [ENTER]
  # OF SOLVENT A WASHES    2-->    2 [ENTER]
  # OF SOLVENT B WASHES    2-->    2 [ENTER]
  PRIORITY SAMPLE (1=YES)  0-->    0 [ENTER]
  CAPILLARY ON-COLUMN (1=YES)    0-->  0 [ENTER]
```

The ready signal from INET devices is monitored. When the system is ready, the START key (on any INET device) is pressed to start the injection sequence. If the START is pressed before a ready signal is given, the system will wait until all devices are ready and then start the sequence. The tray will deliver vials 1 to 30 in sequential order. If only 10 vials are loaded, the tray will attempt to find number 11 and, when the vial is not sensed, the sampler will stop.

EXAMPLE 3. TWO SINGLE INJECTORS (NO TRAY)

The HP 7673A can operate only in a synchronous mode. That is, when two injectors are installed both injectors will inject at the same time. When one injector finishes its pre-injection sequence ahead of the other, that injector will wait. When both injectors are finished, they will inject at the same time.

There are two separate sample injections involved in this system, and a set of sampler parameters are assigned for each injector. The two injectors share the same GC oven. They also share the same input and output signals. Only one INJECTOR READY signal is sent to the GC system. This signal is sent only when both injectors are ready for an injection to take place. There is one Start signal and two BCD code signals sent, one for each data channel.

EXAMPLE 4. TWO INJECTORS WITH TRAY

The HP 7673A can operate only in a synchronous mode. That is, when two injectors are installed both injectors will inject at the same time. When one injector finishes its assigned washes and pumps ahead of the other, that injector will wait. When both injectors are finished, they will inject at the same time. One tray supplies the sample vials to the turrets of both injectors.

There are two separate sample injections involved in this system, and a set of sampler parameters are assigned for each injector. The two injectors share the sample tray and the same GC oven. They also share the same input and output signals. Only one INJECTOR READY signal is sent to the GC system. This signal is sent only when both injectors are ready for an injection to take place. There is one start signal and two BCD code signals sent, one for each data channel.

The sample vials are transported to injector #1 first; and injector #2 last. Once both injectors have samples, the injection cycle will start. After the injection, both of the injectors proceed with the post-wash cycle at the same time. The sample vials are transported back to the tray before the post-wash cycle begins. The sample vial in injector #1 is transported before the sample vial in injector #2.

HP 3393A CONTROL (INET)

NOTE

This section presents operating information for the HP 7673A via the HP 3393A Integrator, and also includes application examples that may be used as a general guide to instrument performance. Refer to Section 14 of the HP 3393A Owner's Manual for operating instructions for the integrator itself.

Turret bottle location and sample insert use are exactly as described for HP 3392A. Refer to "HP 3392A CONTROL (INET)" for turret bottle and sample insert use.

The "Instrument Network" (INET) is a path for various devices to communicate with each other (data and/or commands). INET permits a group of devices, consisting of a "controller", a number of data "Producers" and data "Consumers", to function as a single unified system.

NOTE

Section 12, HP 3393A Owner's Manual, provides more information about Instrument Network (INET).

Setpoints can be passed to and received from the chromatograph and the sampler, giving the HP 3393A control of the instruments. The HP 3393A can send, receive, and list the current sampler conditions. Bottle numbers can be transmitted over the network. The instruments' setpoints (the HP 3393A's, the chromatograph's, and the HP 7673A's) can also be changed between runs as part of sequences and methods.

The active sample producer on INET is the device responsible for delivering sample-data to the active sample-data consumer(s). In general, it is the part of the instrument which actually injects or introduces the sample into the analyzing instrument. The HP 7673A Controller is a sample-data producer, that is, it sends a sample# to the HP 3393A after each run.

The HP 3393A accepts the sample# the HP 7673A controller delivers. The HP 3393A prints the sample number it receives as part of the report heading, and can use it as an index into the Sample Table (see Section 14, HP 3393A Integrator Owner's Manual).

Sampler Control Parameters

When controlling the HP 7673A via an HP 3393A, the entries programmed through the ALS INFORMATION (first bottle number and last bottle number) indicate to the HP 7673A at which sample position to begin automated operation and at which position to stop it.

The HP 7673A automatically starts with the sample that matches the first bottle number value entered. From that point it automatically begins sampling bottles consecutively until the last sample bottle number specified has been reached.

The sampler controller operates with parameters entered from the HP 3393A keyboard.

[LIST] [SEQ] [ENTER] lists the parameter's current values for the HP 7673A.

The command:

[EDIT] [SEQ]

responds by asking which section of the file to be edited.

Entering a [1] [ENTER] (ALS INFORMATION)and then a [Y] [ENTER] (INET SAMPLER CONTROL) opens a dialog for entering the parameters. All parameters are entered as unsigned integers. Just pressing the [ENTER] key in response to the arrow-prompt skips to the next parameter without changing the current value.

NOTE

An answer of 0 to the INJ/BOTTLE prompt terminates the remaining dialog prompts for that injector.

When entries for the parameters to be changed have been made, the dialog ends and the new parameters become the current setpoints for the HP 7673A.

Starting a Sequence: [SEQ] [START] entered from the HP 3393A keyboard is the correct way to start the system. Pressing start at the Chromatograph or on the HP 7673A injector will not start the system correctly.

Through BASIC programming if you wish, you can enable the start keys on the GC and HP 7673A injector to start the system correctly. For example:

```
10 START SEQ_LATER
```

This one line basic program allows any start key to be used to start the system correctly

For more information about BASIC programming, see the HP 3393A BASIC User's Manual (Part No. 03393-90140).

At any time during the dialog associated with [EDIT] [SEQ], pressing the [BREAK] key exits the dialog. All of the entries which have been completed at that time will be passed to the HP 7673A controller. As with other numeric entries, pressing [BACKSPACE] before the [ENTER] key is pressed clears the current number; the HP 3393A waits for the correct entry.

NOTE

When using the HP 3393A, sampler parameters and their definitions are exactly as described for the HP 3392A. Refer to "HP 3392A CONTROL (INET)" in this manual for the sampler parameters and their definitions.

Application Examples

It is assumed that general control of the HP 7673A is understood and that specific operating information for HP 3393A type of control is also understood. If not, consult the appropriate manual as necessary.

EXAMPLE 1. SINGLE INJECTOR (TRAY NOT INSTALLED)

This example demonstrates how to run a single sample placed in the injector turret (sample position #1) with commands entered from the HP 3393A's keyboard.

First press:

[EDIT] [SEQ]

Next answer 1 for SECTION TO BE EDITED and Y for INET SAMPLER CONTROL.

Enter commands to select injection parameters (washes, pumps, volume, and injections per bottle). For example:

```
7673A SAMPLER
 LOOP ADDRESS:   1

FRONT INJECTOR
  INJ/BOTTLE    1-->    1 [ENTER]
  FIRST BOTTLE    1-->    1 [ENTER]
  LAST BOTTLE    1-->    1 [ENTER]
  # OF SAMPLE WASHES    2-->    2 [ENTER]
  # OF PUMPS    6-->    6  [ENTER]
  VISCOSITY    0-->    0  [ENTER]
  VOLUME    1-->    1 [ENTER]
  # OF SOLVENT A WASHES    2-->    2 [ENTER]
  ON-COLUMN (1=YES)    0-->    0 [ENTER]
```

Press [SEQ] [START] on the HP 3393A.

In this example, a single injection is made, and control of the HP 7673A Sampler is done through the HP 3393A. The sampler will seek the "FIRST BOTTLE" as specified, and make an injection from it. The sequence will end after the post-run processing finishes.

EXAMPLE 2. SINGLE INJECTOR (WITH TRAY INSTALLED)

This example demonstrates how to run 1 to 30 samples placed in the tray (positions 1 through 30). All commands are entered through the HP 3393A's keyboard.

First press:

[EDIT] [SEQ]

Next answer 1 for SECTION TO BE EDITED and Y for INET SAMPLER CONTROL.

Enter commands to select injection parameters (washes, pumps, volume, and injections per bottle). For example:

```
7673A SAMPLER
 LOOP ADDRESS:   1

FRONT INJECTOR
  INJ/BOTTLE    1-->    1 [ENTER]
  FIRST BOTTLE    1-->    1 [ENTER]
  LAST BOTTLE    1-->   30 [ENTER]
  # OF SAMPLE WASHES    2-->    2 [ENTER]
  # OF PUMPS    6-->    6  [ENTER]
  VISCOSITY    0-->    0 [ENTER]
  VOLUME   1-->    1 [ENTER]
  # OF SOLVENT A WASHES    2-->    2 [ENTER]
  # OF SOLVENT B WASHES    2-->    2 [ENTER]
  PRIORITY SAMPLE (1=YES)  0-->    0 [ENTER]
  ON-COLUMN (1=YES)    0-->  0 [ENTER]
```

The ready signal from INET devices is monitored. When the system is ready, press [SEQ] [START] to start the injection sequence. If the [SEQ] [START] is pressed before a ready signal is given, the system will wait until all devices are ready and then start the sequence. The tray will deliver vials 1 to 30 in sequential order. If only 10 vials are loaded, the tray will attempt to find number 11 and, when the vial is not sensed, the sampler will stop.

EXAMPLE 3. TWO SINGLE INJECTORS (NO TRAY)

The HP 7673A can operate only in a synchronous mode. That is, when two injectors are installed both injectors will inject at the same time. When one injector finishes its pre-injection sequence ahead of the other, that injector will wait. When both injectors are ready, they will inject at the same time.

There are two separate sample injections involved in this system, and a set of sampler parameters are assigned for each injector. The two injectors share the same GC oven. They also share the same input and output signals. Only one INJECTOR READY signal is sent to the GC system. This signal is sent only when both injectors are ready for an injection to take place. There is one Start signal and two BCD code signals sent, one for each data channel.

EXAMPLE 4. TWO INJECTORS WITH TRAY

The HP 7673A operates in a synchronous mode. That is, when two injectors are installed both injectors will inject at the same time. When one injector finishes its assigned washes and pumps ahead of the other, that injector will wait. When both injectors are finished, they will inject at the same time. One tray supplies the sample vials to the turrets of both injectors.

There are two separate sample injections involved in this system, and a set of sampler parameters are assigned for each injector. The two injectors share the sample tray and the same GC oven. They also share the same input and output signals. Only one INJECTOR READY signal is sent to the GC system. This signal is sent only when both injectors are ready for an injection to take place. There is one start signal and two BCD code signals sent, one for each data channel.

The sample vials are transported to injector #1 first; and injector #2 last. Once both injectors have sample vials, the injection cycle will start. After the injection, both of the injectors proceed with the post-wash cycle at the same time. The sample vials are transported back to the tray before the post-wash cycle begins. The sample vial in injector #1 is transported before the sample vial in injector #2.

NOTE

When using two injectors, simultaneous injections from the same sample vial are not possible. HP recommends filling two sample vials with the same sample to obtain virtually the same result.

NOTE

This section presents operating information for the HP 7673A via the HP 5880A Gas Chromatograph, and also includes application examples that may be used as a general guide to instrument performance. Refer to the HP 5880A Instrument Manual for operating instructions for the Gas Chromatograph itself.

Injector and sequence parameters are maintained in an "Auto Sequence Table" within the HP 5880A. There is a separate table for each injector. The HP 5880A executes instructions provided in the auto sequence table and ignores front panel switches on the injector itself.

Turret Bottle Locations

The turret is designed to hold five bottles; two wash, two waste and one sample when being controlled by the HP 5880A. When the injector is being operated by itself, the turret holds one sample at a time, hand loaded by the operator.

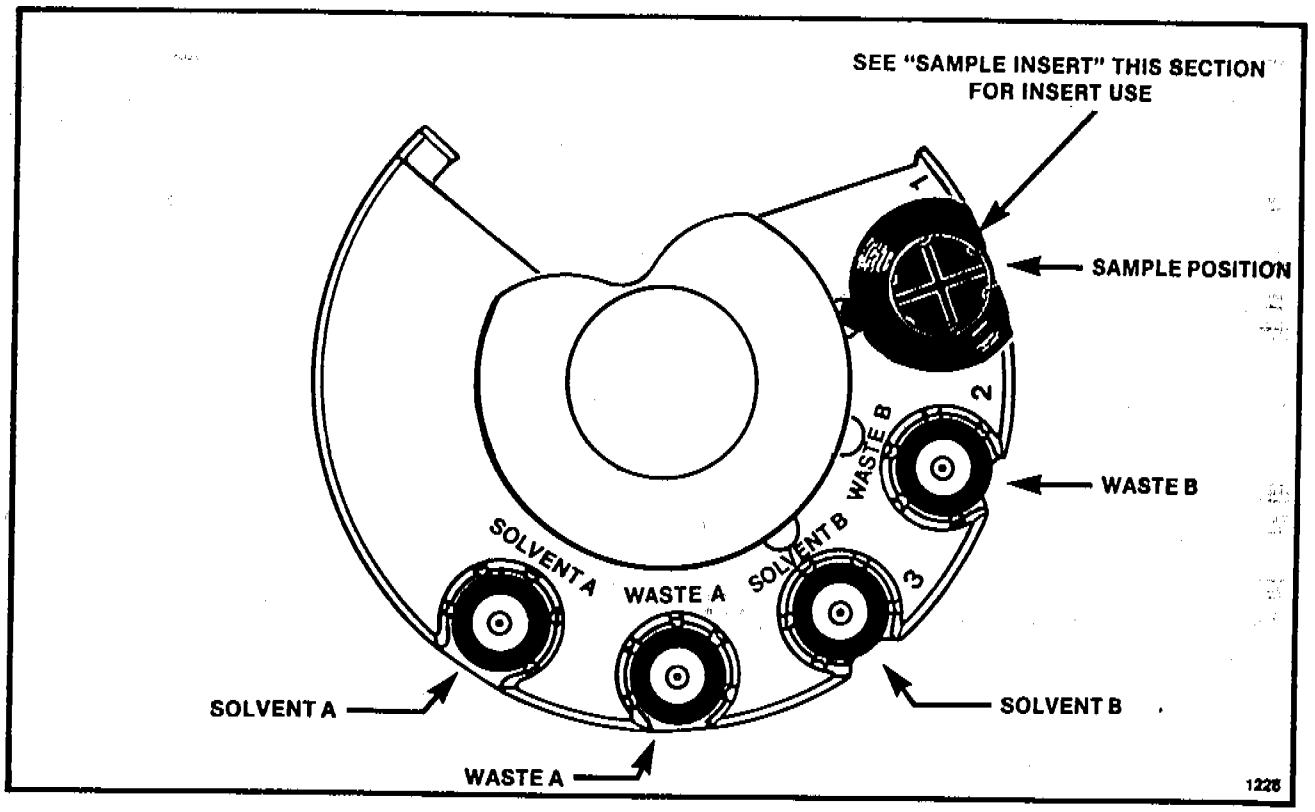


Figure 3-30. Turret Bottle Locations

When the tray is installed, all samples are loaded into the tray and the sample position in the injector turret is left empty.

Sample Insert

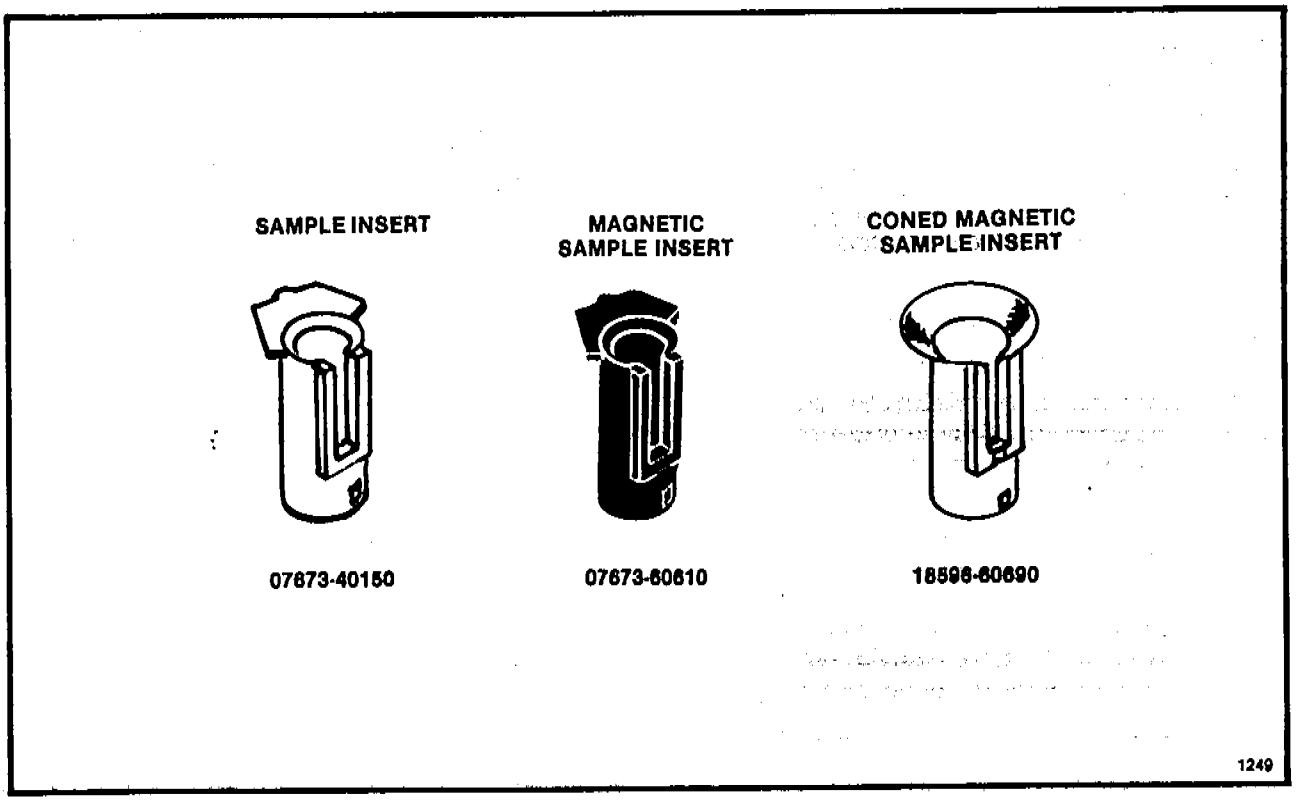


Figure 3-31. Sample Insert

Sample inserts are used to hold sample vials in position in the injector turret.

When controlling the injector via HP 5880A, one of two magnetic inserts will always be used. The Magnetic Sample Insert is used when the injector alone is installed and the Coned Magnetic Sample Insert is used whenever the tray module is installed.

SAMPLE INSERT (WHITE)	- Not used with HP 5880A Control.
MAGNETIC SAMPLE INSERT (BLACK)	- Used in sample position one in the injector turret when no tray module is installed.
CONED MAGNETIC SAMPLE INSERT (NEUTRAL)	- Used in sample position one in the injector turret when the tray module is installed.

Auto Sequence

A complete auto sequence table requires ten parameters. A default value is used if no value is entered for a given parameter.

The ten parameters have the following meanings:

0. INJECTION MODE (0 = normal, 1 = on-column; default=0).

A setting of "0" specifies a normal injection where a standard syringe is used. A setting of "1" specifies an on-column injection and requires an on-column syringe to be installed.

1. PRE-INJECTION SAMPLE WASHES (0 to 15 permitted; default = 2).

Specifies number of pre-injection washings of the syringe with sample from the sample bottle. For the specified number of times, the syringe is filled with sample, then emptied into one of the waste bottles.

NOTE

An excessive number of pre-washes (in conjunction with multiple injections per bottle) can create a vacuum in the sample bottle. This may affect reproducibility in sample volume injected.

2. VISCOSITY (0 to 7 permitted; default = 0).

Specifies the number of seconds the plunger pauses at the top of the pump and injection stroke(s) (parameter 3) to allow the sample to be drawn into the syringe.

3. SAMPLE PUMPS (0 to 15 permitted; default = 6).

Specifies number of times the syringe plunger is moved up and down prior to drawing the actual sample volume to be injected. This expels air bubbles, giving improved reproducibility.

4. SAMPLE VOLUME (1 to 5 permitted; default = 1).

Specifies volume of sample to be injected. Each volume unit corresponds to approximately 1/10th of the syringe capacity. Thus, for a 10-µL syringe, each unit is approximately 1 µL.

5. POST-INJECTION SOLVENT "A" WASHES (0 to 15 permitted; default = 2).

Specifies number of post-injection washings of the syringe with solvent from the "A" solvent bottle. For the specified number of times, the syringe is filled with solvent and emptied into one of the waste bottles.

6. POST-INJECTION SOLVENT "B" WASHES (0 to 15 permitted; default = 2).

Specifies number of post-injection washings of the syringe with solvent from the "B" solvent bottle. For the specified number of times, the syringe is filled with solvent and emptied into one of the waste bottles.

7. INJECTIONS PER BOTTLE (1 to 5 permitted; default = 1).

Specifies number of times the analytical run is repeated for each sample bottle in the sequence. Thus, if the value is two, each bottle is analyzed twice.

NOTE

An excessive number of injections per bottle (in conjunction with sample pre-washes) can create a vacuum in the sample bottle and/or pieces of septum to be deposited into the sample vial. This may affect reproducibility of the sample injected. See "Sample Handling" in this section.

8. FIRST BOTTLE (1 to 100 permitted; default = 1).

Specifies tray position containing the first bottle in the sequence. The parameter is used only when running a sequence using an HP 7673A injector/tray system. It is ignored for single injections where the [START] [AUTO SEQ] [-] command is used.

9. LAST BOTTLE (1 to 100 permitted; default = 1).

Specifies tray position containing the last bottle in the sequence. The parameter is used only when running a sequence using an HP 7673A injector/tray system. It is ignored for single injections where the [START] [AUTO SEQ] [-] command is used.

An empty bottle position between the FIRST BOTTLE and the LAST BOTTLE parameters will be interpreted as an error and the sequence will abort.

Parameters are entered into the table(s) using the following command:

[EDIT] [*inj#*] [AUTO SEQ] [*parm#*], [*value*] [ENTER]

The injector number [*inj#*] specifies the injector auto sequence table to be used. If not specified, the default is:

INJECTOR 1 if the command is entered on channel 1.

INJECTOR 2 if the command is entered on channel 2.

```
LIST AUTO SEQ

INJECTOR 1:
0. MODE (0=NORMAL, 1=ON-COLUMN) = 0
1. PRE-INJECTION SAMPLE WASHES = 2
2. VISCOSITY = 0
3. SAMPLE PUMPS = 6
4. SAMPLE VOLUME = 1
5. POST-INJECTION SOLVENT A WASHES = 2
6. POST-INJECTION SOLVENT B WASHES = 2
7. INJECTIONS PER BOTTLE = 1
8. FIRST BOTTLE = 1
9. LAST BOTTLE = 1
```

Figure 3-32. Auto Sequence

Entries can be made or altered at any time, even while the auto sequence is operating. New or changed entries will be executed provided the sequence has not yet reached that entry. Any of the ten parameters can be entered or changed manually or automatically using keystroke or BASIC programs. If an incorrect entry is made for any parameter, the HP 5880A will refuse the entry and indicate the cause of the error. The first and last bottle parameters may be BASIC variables. All others must be simple numbers.

The injector is operated by itself without using the tray by loading a sample bottle into the injector turret (in sample position one) and starting the injector by entering the following command:

[START] [*inj#*] [AUTO SEQ] [-] [ENTER]

The [*INJ#*] may be 1, 2, or 3. The front-most injector is #1, and the rear-most is #2. Either channel may control either injector for automation purposes. By default, channel 1 controls injector #1, and channel 2 controls injector #2; "3" indicates simultaneous injections are to be performed by both injectors. If no injector number is entered, the injector numbered the same as the channel on which the command is entered will be used. The "-" indicates the HP 7673A is being used as a stand-alone injector (tray not used).

It is possible to stop a sequence and (using the [START] [*inj#*] [AUTO SEQ] [-] [ENTER] command) run a *rush* sample by placing the sample directly in the injector turret. Then, editing the first sample parameter would allow the sequence to be restarted and continue from where it was stopped.

The injector uses parameters in its associated auto sequence table and makes an injection.

GC readiness is required before injection. Conditions required include oven readiness and no other conflicting operations in progress in the instrument (e.g. already running an analysis, auto sequences, or programs).

When a tray module is installed, it is possible to do sequences of runs. After all entries to the auto sequence table have been made, the solvent bottles filled and the waste bottles emptied, a sequence of runs is started by the command:

[START] [*inj#*] [AUTO SEQ] [*first btl#*], [*second btl#*] [ENTER]

The [*inj#*] may be 1, 2, or 3. "3" indicates simultaneous injections will be performed by both injectors. If no [*inj#*] is entered, the injector numbered the same as the channel on which the command is entered will be used.

The FIRST BTL# and LAST BTL# parameters, if specified, override the equivalent entries in the auto sequence for the sequence. If the injector number is 1, the entries from injector 1's auto sequence are overridden. If the injector number is 2, the entries from injector 2's auto sequence are overridden. If the injector number is 3, the entries from the auto sequence with the same number as the channel on which the command was entered are overridden. These parameters may be BASIC variables.

With the chromatograph in the ready state, the sample analyses will begin. For each bottle, (per the auto sequence), an injection will be made, a START RUN command issued, and a run performed.

If simultaneous injection [*inj# = 3*] is requested, the [START] [AUTO SEQ] command starts parallel sequences on both channels using both injectors.

In the simultaneous injection mode, an error will result if the two auto sequences call for the same bottle for the same injection. In this case the error message

*** ERROR *** AUTO SEQ BOTTLE CONFLICT

will be printed, and the auto sequence aborted.

The command [STOP] [AUTO SEQ] [ENTER] can be used any time to stop an auto sequence. A run in progress will be completed and no further injections will be made. The command must be entered on the same channel as the [START] [AUTO SEQ] command.

Application Examples

EXAMPLE 1. SINGLE INJECTOR (TRAY NOT USED)

This example demonstrates how to do a single injection of a sample placed in injector #1 turret and with commands entered from the channel 1's keyboard.

First enter commands to select injection parameters (washes, pumps, volume, and injections per bottle). For example:

```
EDIT AUTO SEQ 0, 0 ENTER = Normal injection mode (default)
EDIT AUTO SEQ 1, 2 ENTER = Two pre-injection sample washes (default)
EDIT AUTO SEQ 2, 0 ENTER = No viscosity delay (default)
EDIT AUTO SEQ 3, 6 ENTER = Six sample pumps (default)
EDIT AUTO SEQ 4, 1 ENTER = One volume unit (default)
EDIT AUTO SEQ 5, 2 ENTER = Two post-injection solvent A washes (default)
EDIT AUTO SEQ 6, 2 ENTER = Two post-injection solvent B washes (default)
EDIT AUTO SEQ 7, 1 ENTER = One injection per bottle (default)
```

These parameter values are the default values, automatically entered when the HP 5880A is turned on. Parameters 8 and 9 (first bottle, last bottle) need not be entered, as they are ignored in the single injection mode.

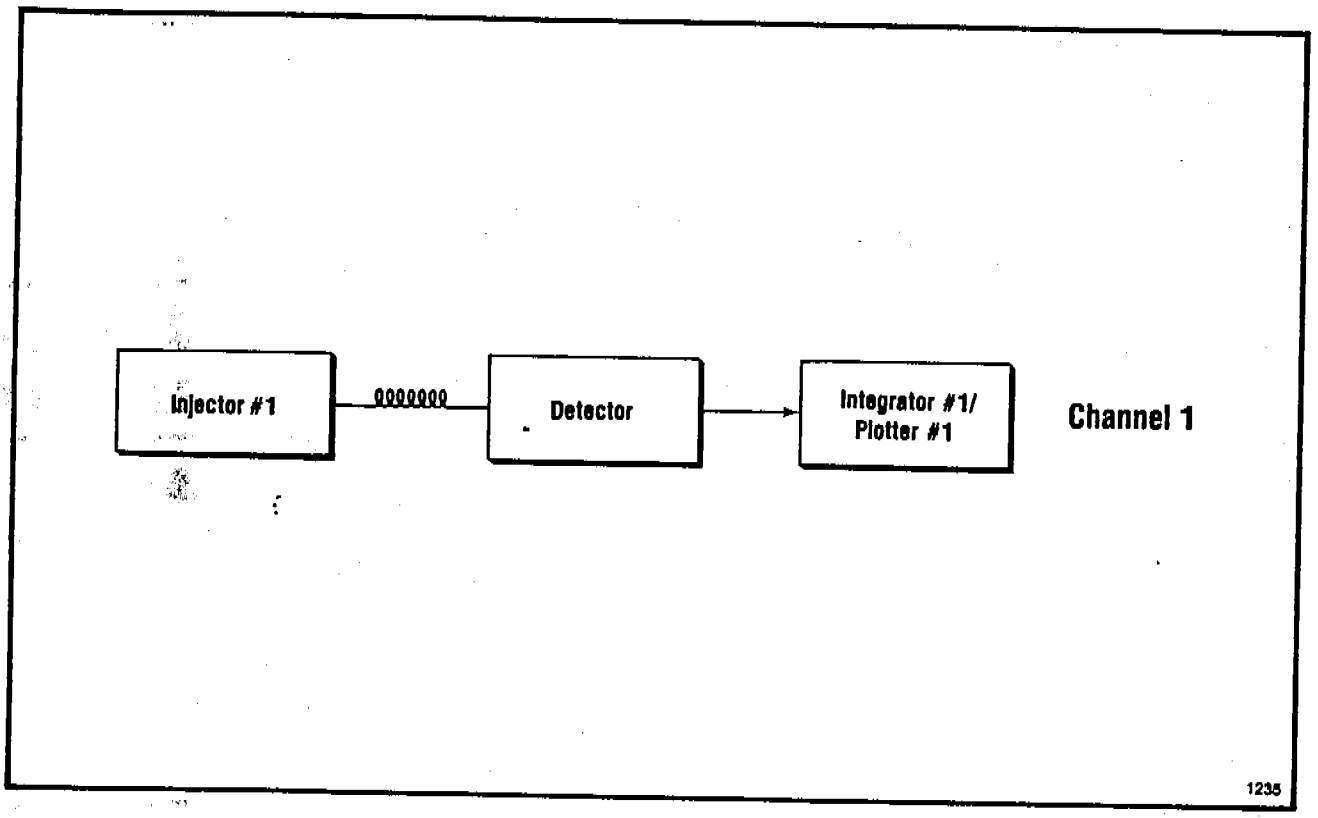


Figure 3-33. Single Injection

Place the sample bottle in the sample position of the injector turret.

The injector is operated by itself without using the tray by entering the following command:

[START] [*inj# 1*] [AUTO SEQ] [-] [ENTER]

In this example a single injection is made on injector 1, and control of the instrument is done through channel 1.

Setting of SYNC mode is determined by the application. If only one channel is installed, the SYNC setpoint is meaningless. If two channels are installed, SYNC is needed only if two channels of integration (or two plots) are required from one injection.

For example, if the sample is split at the injection port and fed to two different detectors, and output of each detector is to be plotted or integrated during the run, then SYNC mode should be ON. Otherwise, (in most cases) it should be OFF. For more information regarding the use of SYNC, consult the "HP 5880A Instrument Manual".

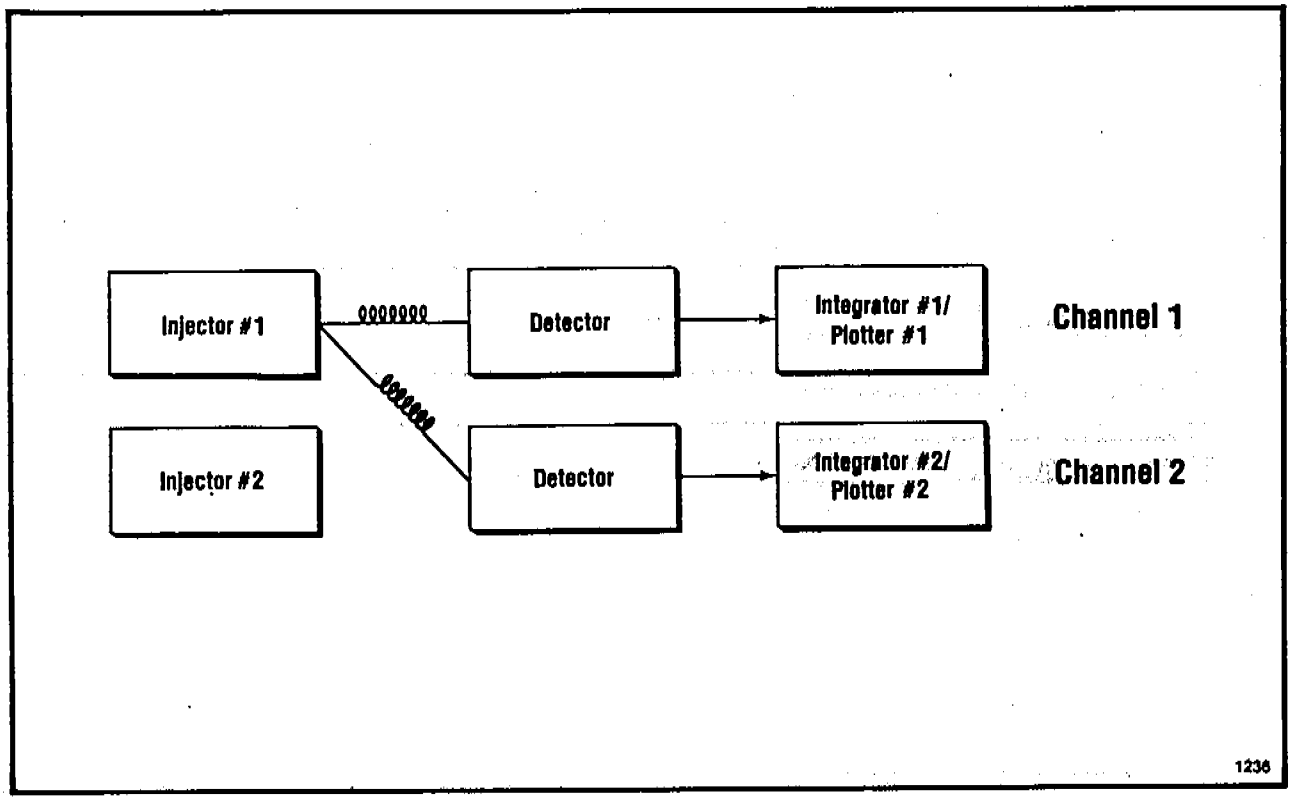


Figure 3-34. SYNC ON, Single Injection

In this example, the sample is split after the injection port and fed into two different detectors. Each detector feeds a different integrator. SYNC is ON to get the two integrator/plotters to start together. A single injection is made on injector 1, and control of the instrument is done through channel 1. The second injector need not be installed for this application.

EXAMPLE 2. SINGLE INJECTOR WITH TRAY

This example shows how to do a sequence of runs using the tray and one injector. The injector parameters are set up as before (see Application Example #1). Now enter sequence parameters:

```
EDIT AUTO SEQ 7, 3  [ENTER] = Analyze each bottle three times
EDIT AUTO SEQ 8, 20 [ENTER] = First bottle
EDIT AUTO SEQ 9, 25 [ENTER] = Last bottle
```

Load the six sample bottles into the tray positions 20 through 25 and enter [START] [AUTO SEQ] on the keyboard. The instrument will make 18 runs (three runs for each of the six bottles).

EXAMPLE 3. TWO INJECTORS WITH TRAY

In this example both channels of a dual channel instrument are used to analyze samples asynchronously (i.e. both channels have different start times and durations). This mode of operation is only practical if the oven is run isothermally.

In this mode, SYNC should be OFF.

From channel 1's keyboard the parameters for injector #1 are entered and the [START] [AUTO SEQ] command entered.

From channel 2's keyboard the parameters for injector #2 are entered and the [START] [AUTO SEQ] command entered.

Each channel will process its sequence of samples without interference from the other channel.

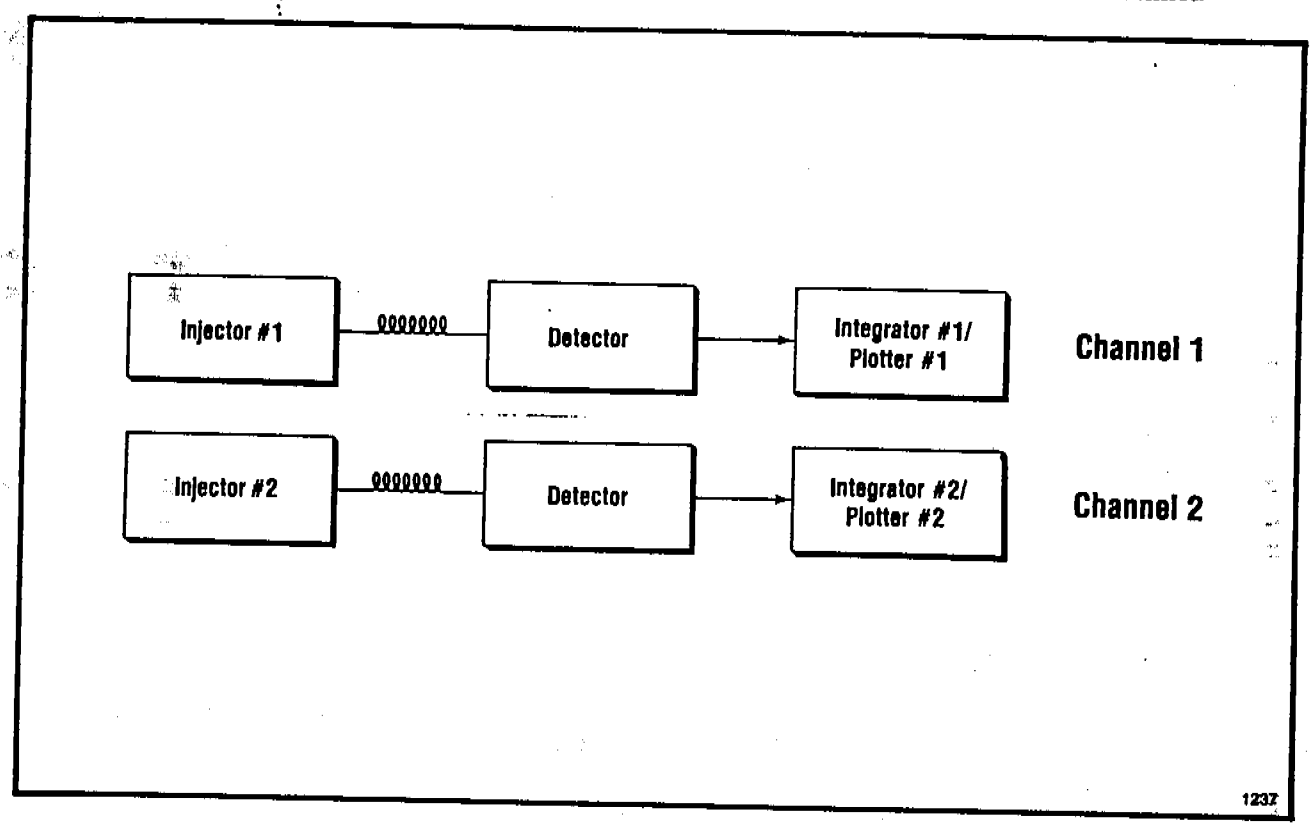


Figure 3-35. SYNC OFF, Single Injection

In Figure 3-35 the instrument is used as two isothermal GC's. Analyses are isothermal, the two channels and injectors need not be synchronized. The two channels run completely independent sequences. On each channel SYNC is OFF, and non-simultaneous injections are requested.

EXAMPLE 4. SIMULTANEOUS INJECTION SEQUENCES

(Tray Not Used)

This example shows how to simultaneously inject two samples, one placed in each of the two injector's turrets. This allows the two samples to be run under identical temperature programs.

The first injector is set up in the same manner as the previous example (example 1, this section).

The other injector may be set up either of two ways. The first case is where all parameters are entered from the channel #1 keyboard:

```
EDIT "2" AUTO SEQ 1, 2
EDIT "2" AUTO SEQ 2, 0
...etc...
```

The "2" between EDIT and AUTO SEQ indicates parameters are for injector #2. The second way is where parameters are entered from the channel #2 keyboard:

```
EDIT AUTO SEQ 1, 2
EDIT AUTO SEQ 2, 0
...etc...
```

For this type of operation, SYNC mode is usually ON. The only exception is if the extra sample is not going to be integrated locally, and is instead sent out an I/O port owned by the controlling channel.

Put the sample bottles in the injector turrets and enter the command:

[START] [3] [AUTO SEQ] [-] [ENTER] (at either keyboard)

Both injectors perform the requested sample washes and pumps, simultaneously inject the samples, start the run on both channels (if SYNC mode is ON; the controlling channel only if the SYNC mode is OFF), and then perform the requested number of solvent post-washes.

Tray Installed

In this example the injections of each injector are synchronized. This allows the samples on the two channels to be analyzed with a temperature program, for example:

The parameters for channel 1's sequence are entered on channel 1.

The parameters for channel 2's sequence are entered on channel 2.

SYNC should be ON.

The auto sequence table for each channel gives the total number of runs scheduled for the respective channel. The [START] [3] [AUTO SEQ] command should be entered on the channel with the longest run sequence. If the auto sequence table for the other channel specifies a greater number of runs, the excess runs will not be performed.

If the auto sequence table for the other channel specifies fewer runs, dummy runs will be done on that channel. No injection will be made for these dummy runs, and the report will show bottle #0. The purpose of the dummy run is to allow the oven program (if the oven is owned by the other channel) to execute, as well as all run table events in the other channel's run table.

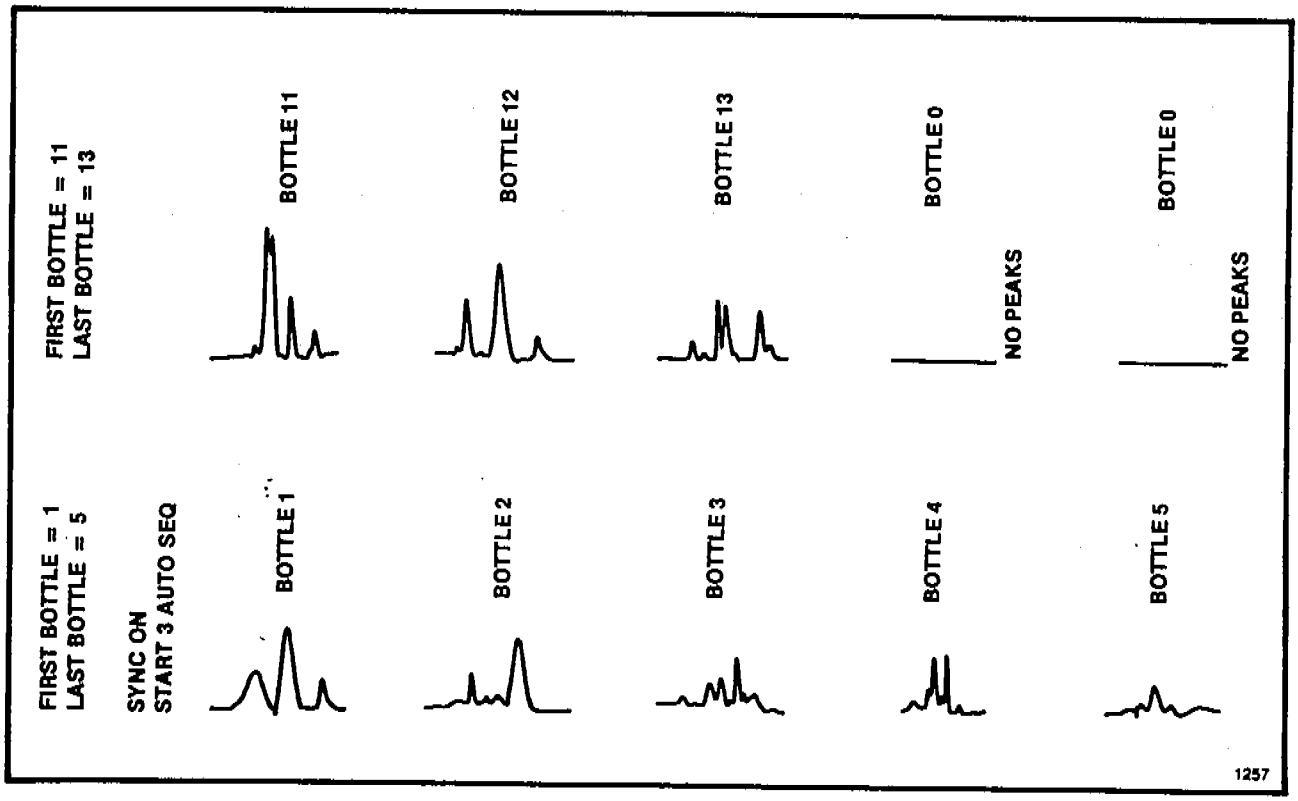


Figure 3-36. Simultaneous Injection Sequences

The sample vials are transported to injector #1 first; and injector #2 last. Once both injectors have samples, the injection cycle will start. After the injection, both of the injectors proceed with the wash cycle at the same time. The sample vials are transported back to the tray after the wash cycle has completed. The sample vial in injector #1 is transported before the sample vial in injector #2.

SECTION 4. IN CASE OF DIFFICULTY

SECTION 4

In Case of Difficulty

INTRODUCTION

This section contains information useful in identifying problems that may arise with the operation of the HP 7673A. The information presented includes:

- Chromatographic Troubleshooting
- Definitions of Fault Codes
- Definitions of System Codes via HP 3392A
- Definitions of System Codes via HP 5880A

An alphabetically arranged list of Hewlett-Packard Sales and Support offices appears in the back of this manual. To contact your local Sales and Support Offices, see "Contacting HP" in this section.

The HP 7673A Service Manual provides more detailed troubleshooting information for technically qualified service personnel.

CHROMATOGRAPHIC SYMPTOMS

Often operators suspect a problem in the injection system based on chromatographic results. These symptoms typically can be classified into one of five chromatographic symptoms:

A. Peak Area/Retention Time Variability (poor precision)

B. "No" Signal/Peaks

C. Sample Carryover (bottle-to-bottle)

D. Contamination/"Ghost" Peaks

E. Peak Area Discrimination

A. Peak Area/Retention Time Variability (poor precision)

POSSIBLE CAUSE	POSSIBLE SOLUTION
1. Injection port septa leakage	1. Replace septa. The 11-mm diameter septa P/N 5080-8896 (gray), or 5080-8897 (white) are recommended on Hewlett-Packard packed column and capillary inlets.
2. Leaks at injector or detector fittings	2. Locate by pressure testing or leak detection fluid and eliminate.
3. Improper detector flow rates	3. Refer to appropriate instrument manual to obtain recommended settings.
4. Column problems or injector insert problem	4. Absorption or adsorption problems due to active sites. Replace column and insert or deactivate as necessary.
5. Improper integration of areas	5. Review integrator settings being used and integration codes given run-to-run. Consult integrator manuals for proper operation.
6. Syringe cleanliness or condition	6. Syringe is dirty and requires cleaning. Plunger could be sticking at some intermediate position between fixed stops. Clean with appropriate solvent or syringe manufacturer's cleaning recommendation if residues are present. Syringes wear with use and may require replacement.
7. Sample volume too low or too high	7. The sample level should be approximately 1 mL for a 2 mL bottle and 0.05 mL for a 0.10 mL bottle. If the level is too low the syringe needle may not retrieve sample properly. If the level is too high, a vacuum may be created, depending on the number of washes and injections/bottle (maximum of five recommended) being used.

8. Loose sample bottle caps	8. Loose caps may cause volatile sample to be lost with time. The caps should not rotate easily if installed properly. Tighten as necessary.
9. Sample stability problem	9. Certain compounds may change with time. Reactions can be catalyzed by light, temperature or bottle/cap material.
10. Sample size	10. Small injection volumes will suffer somewhat in precision due to the volumetric precision of the syringe in use. This should be very small with standard HP syringes recommended.
11. Type of syringe in use	11. The fixed needle HP syringe is recommended. Area variations can be due to syringes with removable type needles due to dead volumes or needle-to-needle variations.
12. Air bubbles in needle	12. Increase number of pumps by the plunger prior to drawing sample volume into the syringe.

B. "NO" Signal/Peaks

POSSIBLE CAUSE	POSSIBLE SOLUTION
1. Detector output or cabling not correct	1. Verify detector zero and signal being used. Adjust as necessary. Verify if proper signal cables are correct from signal output to integrator/recording device being used.
2. Syringe plunger malfunction	2. Verify if syringe plunger is properly fastened by the thumb-screw on HP 7673A. Check cleanliness of syringe barrel.
3. Sample level too low in bottles	3. The sample level should be at least half the bottle volume to allow for bottle wash and the number of injections/bottle (five injections/bottle maximum recommended).
4. Syringe needle is plugged	4. Verify if syringe can draw liquid. This is best accomplished by removing from HP 7673A and performing manual verifications. Remove needle obstruction with needle cleaning wire or replace syringe.
5. Sample viscosity	5. The sample viscosity is greater than can be accommodated by normal syringe injection. Dilute sample in appropriate solvent or increase sample temperature to decrease its viscosity. May require use of the viscous mode of operation of the HP 7673A.

C. Sample Carryover (bottle-to-bottle)

POSSIBLE CAUSE	POSSIBLE SOLUTION
1. Number of washes too low	1. A minimum of five syringe washes should be performed from the sample bottle itself. Where possible, the use of a solvent post-wash in between sample bottles is recommended.
2. Samples (bottle-to-bottle) are of immiscible types	2. The syringe is not being wetted and cleaned properly. Either increase the number of wash cycles or use a solvent wash which would properly clean syringe in between bottles.
3. Solvent wash level too low	3. Verify if solvent wash level is adequate. Refill if necessary.
4. Syringe cleanliness	4. Syringe barrel/plunger may have developed a residue. Remove syringe and attempt rigorous solvent cleaning or the manufacturer's recommended cleaning. Replace the syringe if residue cannot be removed.
5. GC system adsorption problems	5. Sample may be adsorbed/absorbed run-to-run. Verify if column in use is not causing problems. Other areas of problem could be injector insert or septa. Clean insert, try higher injector temperature or a different type septa in order to eliminate symptoms.

D. Contamination/"Ghost" Peaks

POSSIBLE CAUSE	POSSIBLE SOLUTION
1. From vial cap material	1. Contaminates due to solvent extraction of material in use or due to small pieces of cap material in sample. Check syringe needle for burrs to eliminate pieces of cap material from getting into sample.
2. From vials in use	2. New vials should always be stored in a location free of possible contamination due to working environment. Try new vials or try cleaning thermally by storage in an oven for some period of time prior to use.
3. From septa/column bleed	3. Make several "blank" runs to determine presence or absence of the observed peaks. If due to septa or column in use, try to eliminate by replacing with different type septa and/or column.

4. From injector or column front	4. Heavy use of the GC with high molecular weight samples that contain residues may cause the injector system or the first few inches of column to become contaminated. Eventually some of these residue materials can degrade giving "ghost peaks". Remove injector liner and clean or replace it. Examine column front for appearance of foreign material. Replace first few inches of column packing and plug as necessary.
5. From sample stability	5. Some chemicals undergo change due to temperature or U.V. light forming new products. Verify your sample stability and, if necessary, store in dark or keep vials covered with aluminum foil or tape to minimize exposure to light. Vials can be stored in cool environment prior to use and can be cooled during sampling period.

E. Peak Area Discrimination

POSSIBLE CAUSE	POSSIBLE SOLUTION
1. Due to comparison of manual to auto injection or comparison between two different type auto injectors	1. The Model 7673A was designed to deliver a representative amount of the sample into the GC with minimal sample change occurring due to the needle dwell time in a heated injector. This is accomplished with a fast injection (in normal mode) technique. It may be virtually impossible to accurately determine the amount of fractionation actually occurring unless a quantitative blend of two similar compounds is compared to the areas received. Prior determination of other discrimination possible such as the type injector in use, the detector/flowrates and the column characteristics must also be considered. As a rule, manual or slower auto injection devices will transfer higher levels of low molecular weight versus higher molecular materials from the syringe needle due to more rapid vaporization of the lower boiling point components present.
2. From injector in use	2. Capillary column split mode or splitless mode injectors do have some inherent sample discrimination characteristics. The specifications and/or limitations with a particular sample blend should be considered and determined.

3. With packed column injector	3. The injector temperature may not be proper for sample being analyzed. Increase temperature if necessary. The injector liner or insert may not be compatible with certain compounds present in the sample causing selective absorption of one or more of the compounds. This phenomena can also be due to column or detector fittings, jet, etc. as well. Prepare samples of varying concentrations to evaluate the area/response characteristics of each material present in the sample.
4. Due to small leaks in GC systems	4. Small leaks present either at the septa or at the injector fittings can cause sample discrimination. Replace septa as necessary and/or leak test injector system.
5. Due to sample stability	5. Certain compounds may change with time due to temperature or U.V. light reactions. Determine physical properties of samples being analyzed. Prepare fresh samples and compare data.
6. Due to loose vial caps or defective vial caps	6. Loose vial caps can cause selective loss of lighter materials from a sample. Determine if the caps are being crimped properly by attempting to rotate the cap. Prepare new samples and assure the caps are tight. The same losses can occur when the vial cap is "cork bored" due to a burr present on the syringe. Determine if the needle is satisfactory and replace syringe if necessary.
7. Due to change in detector calibration	7. Prepare new samples and determine new response factors. Absolute response factors can change several percent during the day depending on the type of detector in use.

DEFINITIONS OF FAULT CODES

There are five status LEDs (Light Emitting Diodes) on the HP 7673A: three on the injector module and two on the controller module. These LEDs, using fault codes built into the HP 7673A, will flash in a variety of patterns to help define problems if they should occur. When controlling the HP 7673A via an HP 3392A or HP 5880A, an error message will also be printed on these instruments.

The stop button on the injector is an instant action switch. In addition to stopping a sequence, the stop button is also used to clear the injector and/or tray from a fault condition. Pressing the stop button while in a fault condition will clear the HP7673A system. Once the stop button has been pressed, the sequence is aborted. When the injector is restarted, the sequence starts over again with the first bottle, first injection.

The following is a list of fault codes and their meanings according to the type of control being used:

	INJECTOR LEDs	CONTROLLER LEDs	CONDITION
1.	Red = ON Yellow = OFF Green = OFF	Red = OFF Green = ON	Injector door open or the injector unmounted from the chromatograph.
2.	Red = 2 FLASHES Yellow = OFF Green = OFF	Red = OFF Green = ON	Syringe carriage out of position. Syringe carriage sensor inoperable.
3.	Red = 3 FLASHES Yellow = OFF Green = OFF	Red = OFF Green = ON	Injector turret out of position. The turret sensor inoperable.
4.	Red = 4 FLASHES Yellow = OFF Green = OFF	Red = OFF Green = ON	Plunger carrier out of position. The plunger carrier sensor(s) inoperable. Plunger carrier operating incorrectly.
5.	Red = 5 FLASHES Yellow = OFF Green = OFF	Red = OFF Green = ON	Incomplete injection. The plunger carrier operating incorrectly during injection. Syring carrier operating incorrectly.
6.	Red = 6 FLASHES Yellow = OFF Green = OFF	Red = OFF Green = ON	Injector memory error. The processor on the injector main board is malfunctioning.
7.	Red = ON Yellow = ON Green = ON	Red = OFF Green = ON	Injector Processor failure.
8.	Red = ON Yellow = ON Green = ON	Red = OFF Green = OFF	The processor on the injector logic board is blown or the +18 Volts or -18 Volts is not being supplied to the injector logic board. The injector logic board processor is not functioning.

	INJECTOR LEDs	CONTROLLER LEDs	CONDITION
9.	Red = OFF Yellow = OFF Green = OFF	Red = OFF Green = OFF	No line voltage available or the +5 Volt supply is down on the power supply main board.
10.	Red = OFF Yellow = OFF Green = ON	Red = ON Green = ON	No tray installed. Tray board inoperable. Controller board inoperable.
11.	Red = OFF Yellow = OFF Green = ON	Red = 2 SINGLE FLASHES Green = ON	Bottle left in gripper after delivery attempt. Bottle switch on when the gripper is empty.
12.	Red = OFF Yellow = OFF Green = ON	Red = 3 SINGLE FLASHES Green = ON	Tray not able to home its angular axis. Tray arm not able to rotate. Theta axis sensor inoperable.
13.	Red = OFF Yellow = OFF Green = ON	Red = 4 SINGLE FLASHES Green = ON	Tray not able to home its radial axis. Tray not moving in radial axis. Radial axis sensor inoperable
14.	Red = OFF Yellow = OFF Green = ON	Red = 5 SINGLE FLASHES Green = ON	Tray not able to home the gripper. Gripper not moving. Gripper axis sensor inoperable.
15.	Red = OFF Yellow = OFF Green = ON	Red = 2 DOUBLE FLASHES Green = ON	Processor error on the controller board.
16.	Red = OFF Yellow = OFF Green = ON	Red = 3 DOUBLE FLASHES Green = ON	RAM error on the controller board.
17.	Red = OFF Yellow = OFF Green = ON	Red = 4 DOUBLE FLASHES Green = ON	ROM error on the controller board.

DEFINITIONS OF SYSTEM ERROR CODES

Summary of HP 3392A (INET) Error Warning Messages

Depending on circumstances, the HP 3392A may print an error message on its printer/plotter to indicate a fault condition or certain occurrences in communications. The following is a list of these messages and a brief definition of their meaning:

DOWNLOAD NOT COMPLETE FILE TOO LONG
Method file is too long.

DOWLOAD NOT COMPLETE INVALID PARAMETER
Value of a parameter is not within the legal limit.

DOWNLOAD NOT COMPLETE CONFIGURATION ERROR
Method parameters do not match software or hardware installed.

FRONT INJECTOR COMMUNICATIONS ERROR
Communication error between front injector module and controller.

FRONT INJECTOR SYRINGE ERROR
Syringe carriage is out of position. Syringe carriage sensor inoperable.

FRONT INJECTOR TURRET ERROR
The injector turret is out of position. Turret sensor inoperable.

FRONT INJECTOR PLUNGER ERROR
The plunger carrier is out of position. Plunger carrier sensor(s) inoperable. Plunger carrier operating incorrectly.

FRONT INJECTOR INCOMPLETE INJECTION
Incomplete injection. Plunger carrier operating incorrectly during injections. Syringe carriage operating incorrectly.

FRONT INJECTOR MEMORY ERROR
Electronic hardware (memory) problem.

FRONT INJECTOR RESET
The +18 volts from the power supply was interrupted.

FRONT INJECTOR DOOR OPEN/NOT MOUNTED
The injector door is open or the injector is not mounted to the GC. The door switch or mount switch is inoperable.

REAR INJECTOR COMMUNICATIONS ERROR
Communications error.

REAR INJECTOR SYRINGE ERROR
Syringe carriage is out of position. Syringe carriage sensor inoperable.

REAR INJECTOR TURRET ERROR
The injector turret is out of position. Turret sensor inoperable.

REAR INJECTOR PLUNGER ERROR
The plunger carrier is out of position. Plunger carrier sensor(s) inoperable. Plunger carrier operating incorrectly.

REAR INJECTOR INCOMPLETE INJECTION
Incomplete injection. Plunger carrier operating incorrectly during injections. Syringe carriage operating incorrectly.

REAR INJECTOR MEMORY ERROR
Electrical hardware (memory) problem.

REAR INJECTOR RESET
The +18 volts from the power supply was interrupted.

REAR INJECTOR DOOR OPEN/NOT MOUNTED
The injector door is open or the injector is not mounted to the GC. The door switch or mount switch is inoperable.

TRAY COMMUNICATIONS ERROR
Communications problem between the controller module and the tray.

TRAY ERROR - BOTTLE LEFT IN GRIPPER
Bottle left in gripper after delivery attempt. Bottle switch on when gripper is empty.

TRAY ANGULAR AXIS ERROR
Tray arm not able to home it's angular axis. Tray arm not able to rotate. Theta sensor inoperable.

TRAY RADIAL AXIS ERROR
Tray not able to home it's radial axis. Tray not moving in radial axis. Radial axis sensor inoperable.

TRAY GRIPPER AXIS ERROR
Tray not able to home the gripper axis. Gripper not moving. Z axis sensor inoperable.

TRAY MEMORY ERROR
Electronic hardware (memory) error on the tray board.

TRAY RESET
The +18 volts from the power supply was interrupted.

TRAY NOT CONNECTED
Tray cable unplugged or defective.

BOTTLE NOT FOUND
Sample bottle was not found in the injector turret during removal attempt.

Summary of HP 5880A Error Warning Messages

Depending on circumstances, the HP 5880A may print an error message on its terminal to indicate a fault condition or certain occurrences in communications. The following is a list of these messages and a brief definition of their meaning:

ERRORCHANNEL 2 (or 1) NOT INSTALLED
The START or STOP button on injector #2 (or 1) has been pushed, but no channel 2 (or 1) has been configured in the instrument (no integrator/plotter #2 or#1).

ERRORAUTO SEQ BOTTLE CONFLICT
The instrument is running two sequences in simultaneous injection mode, and the two sequences have called for the same bottle.

ERRORTRAY NOT INSTALLED
The START AUTO SEQ command cannot be used without the tray module installed. If no tray is installed, single samples may be run by using the [START [inj#] AUTO SEQ -] command.

ERRORINJECTOR 1 (or 2)NOT INSTALLED

A START 1 (or 3) AUTO SEQ command has been attempted either with no injector on channel 1, or with the power controller turned off.

ERROR TRAY MISSING BOTTLE (#)
The auto sequence calls for a bottle (#) in the tray, but there is none in the requested position.

ERROR INVALID BOTTLE IN INJECTOR 1
The tray arm is attempting to deliver a bottle to an injector which currently contains a bottle.

ERROR TRAY FAILURE
See "Definition of Fault Codes" this section for further information.

ERROR INVALID BOTTLE IN TRAY POSITION (#)
The tray arm is attempting to move a bottle from the injector back to a tray position which currently contains a bottle.

ERROR INJECTOR 1 (or 2) FAILURE
See "Definition of Fault Codes" this section for further information.

CONTACTING HP

Each instrument module is identified by an individual serial number (see "Unit Identification" Section 1).

Include COMPLETE serial number(s), model number (HP 7673A), maintenance agreement number (if any), ship date, and name ("INJECTOR, CONTROLLER, SAMPLE TRAY") in any correspondence with Hewlett-Packard, either by mail or telephone. Also include your complete return address, telephone number, and full description of the problem and symptoms.

Shipment or Storage

Original factory or authorized Hewlett-Packard containers and packing material should be used for either shipping or storage. If other packaging materials are used, they must meet the following requirements:

1. Use a double-wall carton of at least 275 pound test.

2. The tray MUST be foam packed and the injector's syringe carriage MUST be locked from movement. Use enough shock-absorbing material on all sides to provide a firm cushion and to prevent movement within the container.

3. Mark the outside "FRAGILE, DELICATE INSTRUMENTS" to ensure careful handling.

If the instrument is to be stored, choose a clean environment not exceeding:

- 95% relative humidity • 25,000 feet in altitude
- Below -40°C, or above +75°C

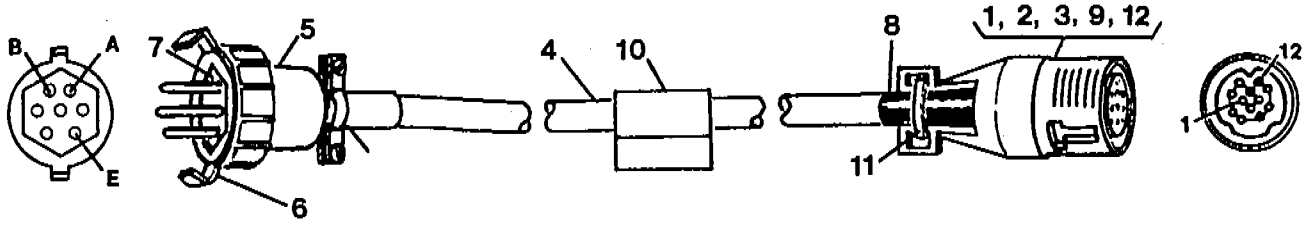
Appendix A

HP 7673A Cables

Pin#	Signal Name	Wire Color
A	Ready In	Red
B	Start HP 3392A	Green
B	Start Oven 1	Black
E	Ground	Brown
E	Drain	Shield
N.C.	Not Connected	Orange

Pin #	Signal Name	Wire Color
10	Ready In	Red
11	Start HP 3392A	Green
8	Start Oven 1	Black
3	Ground	Brown
N.C.	Drain	Shield
2	Start Oven 2	Orange
5	Ground	Orange

HP5700 END **HP3392A END**



Item	Description	Part No.
1	Plastic Rod (0.5 inches)	4135-0265
2	Conn	1251-8475
3	Cont. Conn F	1251-4060
4	Cable 7-Cond Shielded (83 inches)	8120-3125
5	Hood Conn	1251-1202
6	Spring Lock	1251-1040
7	Conn 7-Pin M	1251-6750
8	Sleeving Flexible (1 inch)	0890-0015
9	Wire AWG 24 Orange (0.75 inches)	8150-0450
10	Label	9320-5210
11	TBG HS .093 (0.8 inches)	0890-0706
12	Tie Wrap	1400-1226

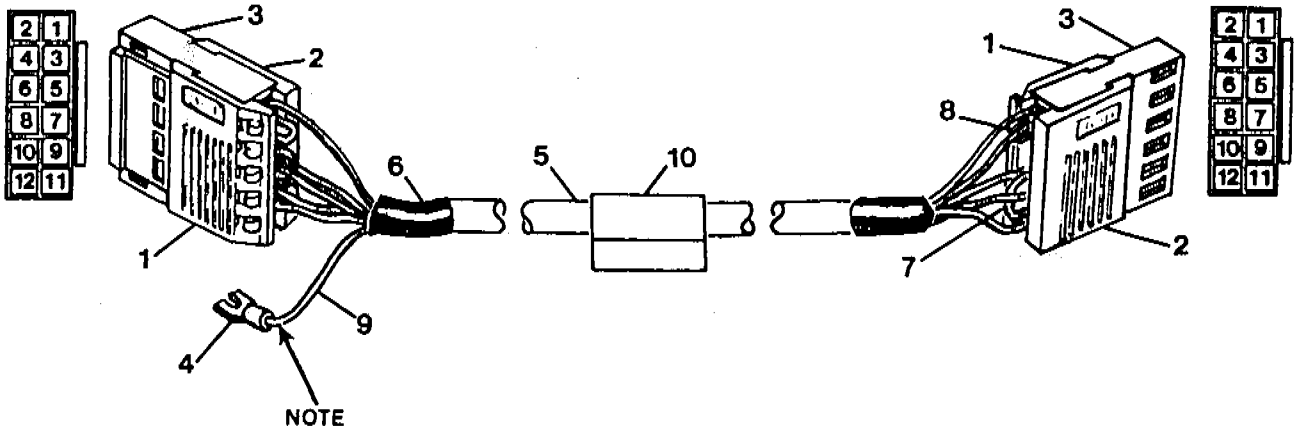
Figure A-1. Remote Control Cable: 03392-60800

Pin#	Signal Name	Wire Color
1	Start In	Orange
2	Gnd	Black
3	Jmpr to #4	Blue
4	Jmpr to #3	Blue
5	Ready Out 1	
6	Jmpr to #10	Brown
7	Start Out 1	Green
8	Start Out 0	Brown
9	Ready Out 1	
10	Jmpr to #6	Brown
11	Gnd	
12	Ready In	White

Pin#	Signal Name	Wire Color
1	Start In	Green
2	Gnd	Brown
3	Jmpr to #4	Blue
4	Jmpr to #3	Blue
5	Ready Out 1	White
6	Ready Out 0	Brown
7	Start Out 1	Orange
8	Start Out 0	Black
9	Ready Out 1	
10	Start Out 0	Brown
11	Gnd	
12	Ready In	

HP7673A END

HP5890A END



Spade lug connector must be attached to ground at the HP 7673A for proper operation.

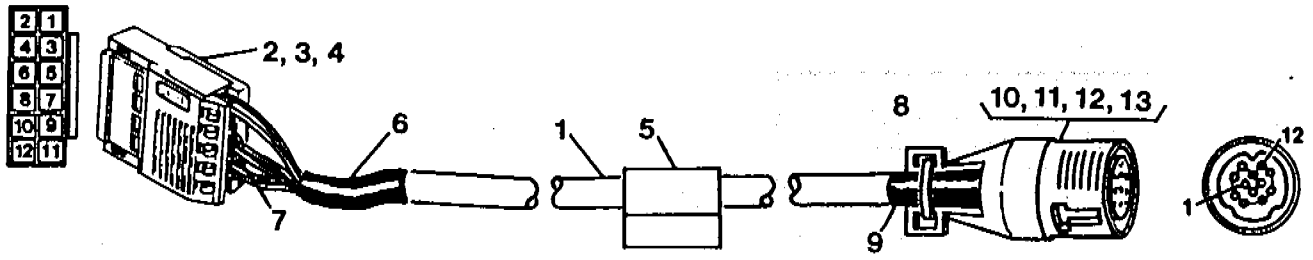
Item	Description	Part No.
1	Cover Polarizing	1251-8326
2	Cover Back	1251-8325
3	Connector	1251-8751
4	Terminal - Crimp (Amp Part No. 51874)	0362-0700
5	Cable 7-Cond. 2M ± .1M	8120-3125
6	Heat Shrink Tubing - 25 MM	0890-0759
7	Wire Brown 45 MM	8150-0448
8	Wire Blue 45 MM	8150-0453
9	Clear Tubing 50 MM	0890-0340
10	Label	9320-4995
11	Tie Wrap (Note 13)	1400-0249

Figure A-2. Remote Start/Stop Cable HP 5890A: 18594-60570

Pin#	Signal Name	Wire Color
1	Start In 2	Orange
2	Start In 1	Black
3	Unused	Blue
4	Gnd.	Blue
5	Ready Out	Red
6	Ready Out 0	Red
7	Start Out	Green
8	Start Out 0	Brown
9		
10	Jmpr to #6	Brown
11		
12	Ready In	White

Pin#	Signal Name	Wire Color
5	Ground	Drain
8	Start Out 1	Black
3	Ground	Brown
10	Ready In	Red
2	Start Out 2	Orange
11	Start In	Green
9	Ready Out	White

HP7673A END **HP3392/93 END**



Item	Description	Part No.
1	Cable 7-Cond. 2M ± .1M	8120-3125
2	Connector 12-Pin	1251-8751
3	Connector Cover - Polarizing	1251-8326
4	Connector Cover - Back	1251-8325
5	Label	9320-4995
6	Heat Shrink Tubing 25 mm	0890-0759
7	Wire - Brown 45 mm	8150-0448
8	Tie Wrap	1400-1226
9	Sleeving 25 mm	0890-0015
10	Clear Tubing 25 mm	0890-0340
11	Socket	1251-4060
12	Connector - Viking	1251-8475
13	Plastic Rod 12 mm	4135-0265
14	Wire - Blue 45 mm	8150-0453
15	Tie Wrap	1400-0249

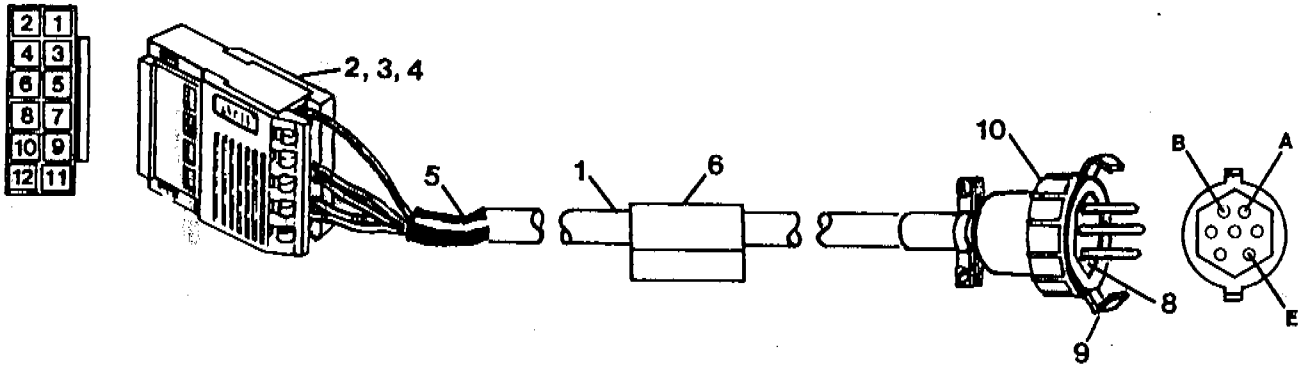
Figure A-3. Remote Start/Stop Cable HP 3392/93A: 18594-60500

Pin#	Signal Name	Wire Color
2	Gnd	Brown
7	Start Out 1	Orange
8	Start Out 0	Black
11	Ground	Drain
12	Ready In	Red

Pin#	Signal Name	Wire Color
A	Ready Out	Red
E	Start Out	Brown
E	Start In 0	Black
B	Start In	Orange

HP7673A END

HP57XX END



Item	Description	Part No.
1	Cable 10 Cond. 2.35M ± .1M	8120-4279
2	Connector 12-Pin	1251-8751
3	Connector Cover - Polarizing	1251-8326
4	Connector Cover - Back	1251-8325
5	Heat Shrink Tubing 25 mm	0890-0782
6	Label	9320-5210
7	Tie Wrap	1400-0249
8	Winchester Conn 7-Pin	1251-6750
9	Lock Spring	1251-1040
10	Hood	1251-1202

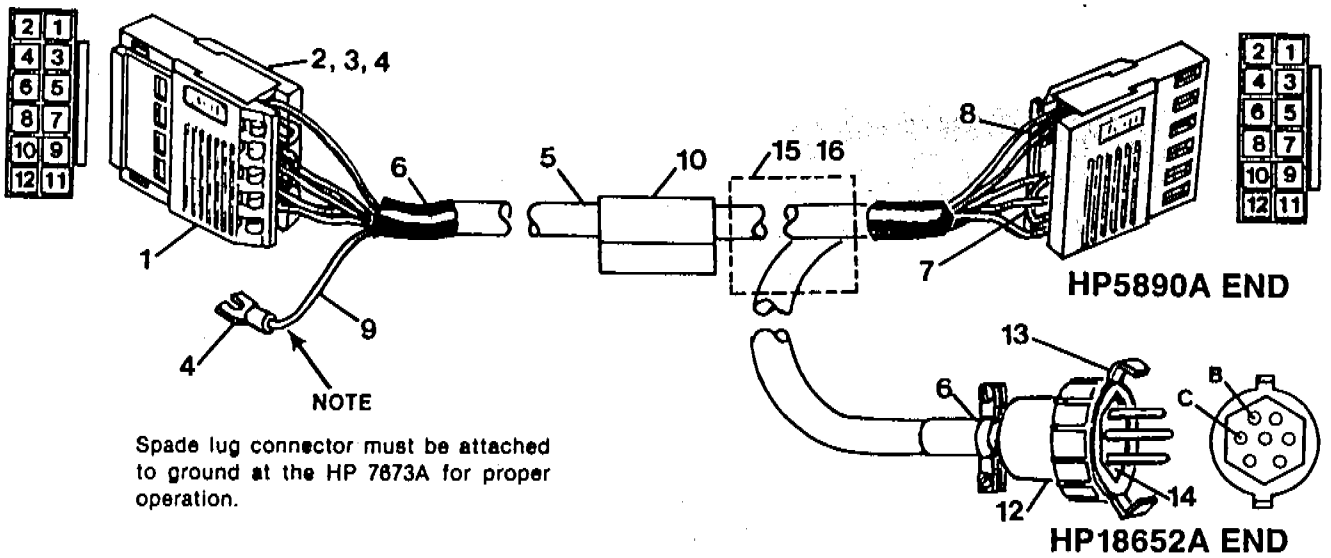
Figure A-4. Remote Start/Stop Cable HP 5700A Series: 18594-60630

Pin#	Signal Name	Wire Color
1	Start In	Orange
2	Ground	Black
3	Jmpr to #4	Blue
4	Jmpr to #3	Blue
5	Ready Out 1	
6	Jmpr to #10	Brown
7	Start Out 1	Green
8	Start Out 0	Brown
9	Ready Out 1	
10	Jmpr to #6	Brown
11	Ground	
12	Ready In	White

HP7673A END

Pin #	Signal Name	Wire Color
1	Start In	Blue
2	Ground	Red
3	Jmpr to #4	Blue
4	Jmpr to #3	Blue
5	Ready Out 1	White
6	Jmpr to #10	Brown
7	Start Out 1	Orange
8	Start Out 0	Black
9	Ready Out 1	
10	Jmpr to #6	Brown
11	Ground	
12	Ready In	

Pin #	Signal Name	Wire Color
B	Start Out 1	Green
B	Start In	Blue
C	Start Out 0	Brown
C	Ground	Red



Spade lug connector must be attached to ground at the HP 7673A for proper operation.

Item	Description	Part No.
1	Cover - Polarizing	1251-8326
2	Cover - Back	1251-8325
3	Connector 12-Pin	1251-8751
4	Terminal - Crimp	0362-0700
5	Cable 7-Cond. 2.3M ± 1M Lg	8120-3125
6	Heat Shrink Tubing - 25 MM Lg	0890-0759
7	Wire - Brown 45 MM Lg	8150-0448
8	Wire - Blue 45 MM Lg	8150-0453
9	Clear Tubing 50 MM Lg	0890-0340
10	Label	9320-4995
11	Tie Wrap	1400-0249
12	Winchester Hood	1251-1202
13	Winchester Lock Spring	1251-1040
14	7-Pin Winchester Conn	1251-6750
15	Heat Shrink Tubing 50 MM Lg	0890-0782
16	Heat Shrink Tubing 10 MM Lg	0890-0706

Figure A-5. "Y" Remote Start/Stop Cable HP 5890A-18652A: 18594-60610

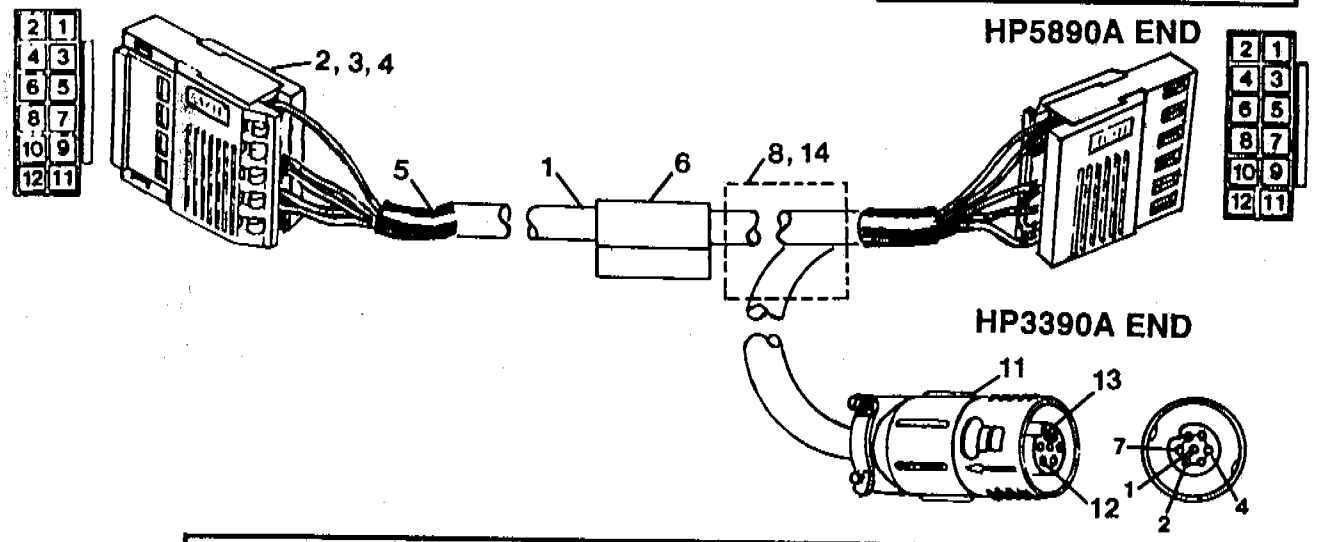
Pin#	Signal Name	Wire Color
1	Start In	Orange
2	Gnd	Black
3	Jmpr to #4	Blue
4	Jmpr to #3	Blue
5	Ready Out 1	
6	Jmpr to #10	Brown
7	Start Out 1	Green
8	Start Out 0	Brown
9	Ready Out 1	
10	Jmpr to #6	Brown
11	Gnd	
12	Ready In	White

Pin#	Signal Name	Wire Color
1	Start In	Violet
2	Ground	Black
3	Jmpr to #4	Blue
4	Jmpr to #3	Blue
5	Ready Out 1	White
6	Jmpr to #10	Brown
7	Start Out 1	Orange
8	Start Out 0	Black
9	Ready Out 1	
10	Jmpr to #6	Brown
11	Ground	
12	Ready In	

Pin#	Signal Name	Wire Color
1	Start Out	Violet
2	Start In 1	Green
4	Ground	Red
7	Start In 0	Brown

HP7673A END

HP5890A END



HP3390A END

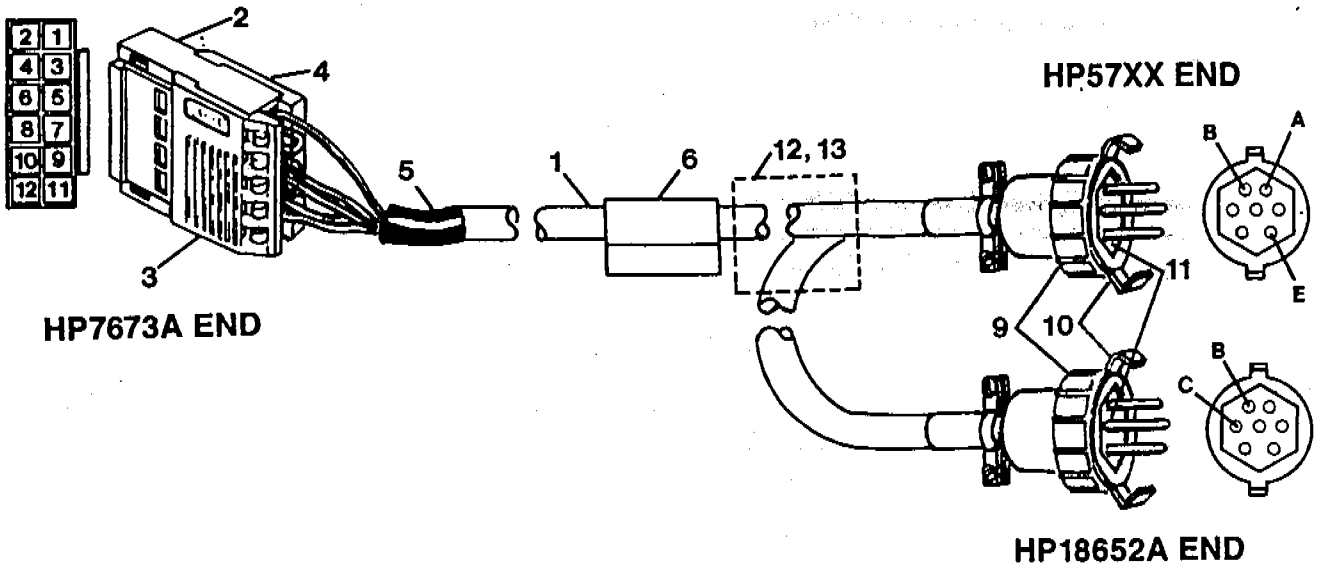
Item	Description	Part No.
1	Cover-Polarizing	1251-8326
2	Cover - Back	1251-8325
3	Connector HSG 12-Pin	1251-8751
4	Terminal - Crimp	0362-0700
5	Cable 7-Cond 2.3M +.05 – .01M	8120-3125
6	Heat Shrink Tubing - 25 MM	0890-0759
7	Wire - Brown 45 MM Lg	8150-0448
8	Wire - Blue 45 MM Lg	8150-0453
9	Clear Tubing 50 MM Lg	0890-0340
10	Label	9320-4995
11	Tie Wrap	1400-0249
12	Viking Connector	1251-6045
13	Socket	1251-4060
14	Plastic Rod 12.7 MM Lg	4135-0265
15	Heat Shrink Tubing 50 MM Lg	0890-0782
16	Heat Shrink Tubing 10 MM Lg	0890-0706

Figure A-6. "Y" Remote Start/Stop Cable HP 5890A-HP3390A: 18594-60590

Pin#	Signal Name	Wire Color
1	Start In 1	Violet
2	Gnd	Red
3	Jmpr to #4	Blue
4	Jmpr to #3	Blue
5	Ready Out 1	White
6	Jmpr to #10	Brown
7	Start Out 1	Orange
8	Start Out 0	Black
9	$\overline{\text{Ready Out 1}}$	
10	Jmpr to #6	Brown
11	Gnd	
12	Ready In	

Pin #	Signal Name	Wire Color
B	Start In 1	Orange
A	Ready Out	Red
E	Gnd	Brown
E	Start In 1	Black

Pin #	Signal Name	Wire Color
C	Gnd	Brown
B	Start In	Orange



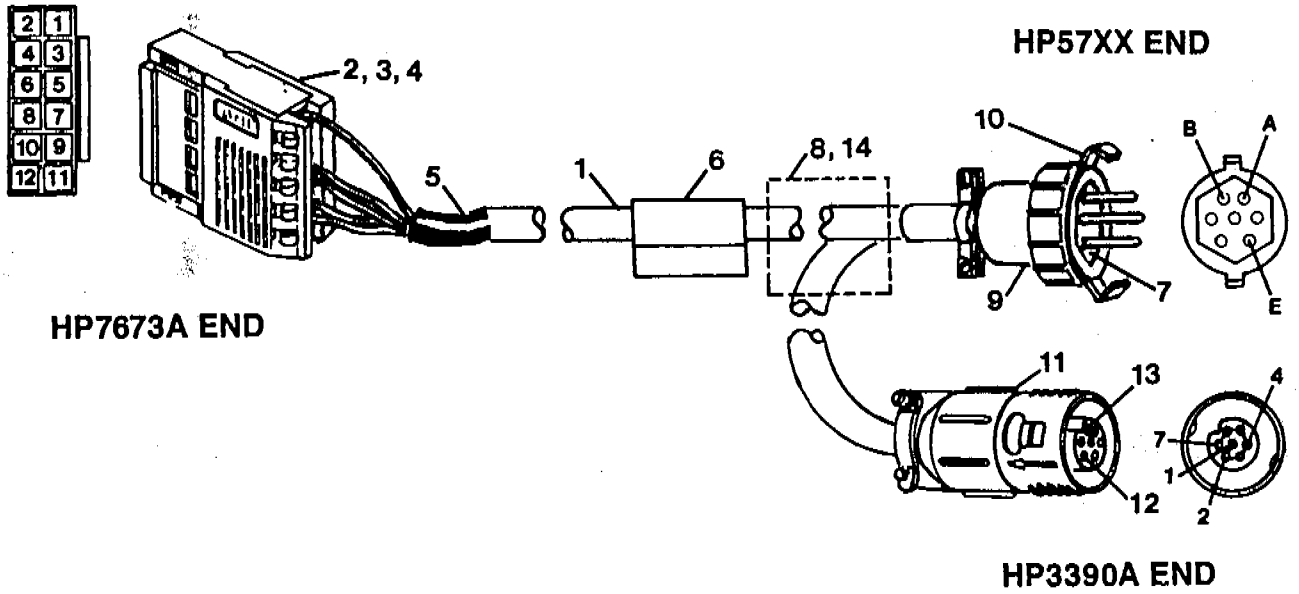
Item	Description	Part No.
1	Cable 10 Cond 2.35M ± .1M	8120-4279
2	Connector 12-Pin	1251-8751
3	Connector Cover - Polarizing	1251-8326
4	Cover - Back	1251-8325
5	Heat Shrink Tubing - 25 MM Lg	0890-0782
6	Label	9320-5210
7	Tie Wrap	1400-0249
8	Heat Shrink Tubing 25 MM	0890-0759
9	Hood	1251-1202
10	Lock Spring	1251-1040
11	Winchester Conn 7-Pin	1251-6750
12	Tubing 65 MM	0890-0782
13	Tie Wrap	1400-0493

Figure A-7. "Y" Remote Start/Stop Cable HP 5700A-18652A: 18594-60620

Pin#	Signal Name	Wire Color
1	Start In 2	
2	Gnd	Brown
3	Unused	
4	Ground	
5	Ready Out 1	
6	Ready Out 0	
7	Start Out 1	Orange
8	Start Out 0	Black
9	Ready Out 1	
10	Start Out 0	
11	Ground	Drain
12	Ready In	Red

Pin#	Signal Name	Wire Color
A	Ready Out 1	Red
E	Ready Out 0	Brown
E	Start In 0	Brown
E	Start In 1	Green

Pin #	Signal Name	Wire Color
1	Start Out 0	Brown
2	Start In 0	Black
4	Start Out 1	Green
7	Start In 1	Orange



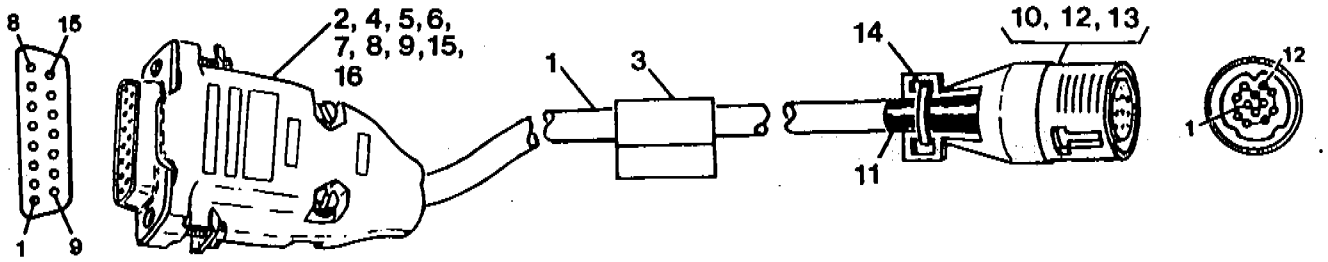
Item	Description	Part No.
1	Cable 10-Cond. 2.35 + .05 – .01M	8120-4279
2	Connector 12-Pin	1251-8751
3	Connector Cover - Polarizing	1251-8326
4	Connector Cover - Back	1251-8325
5	Heat Shrink Tubing - 25 MM Lg	0890-0782
6	Label	9320-5210
7	Winchester Conn 7-Pin	1251-6750
8	Tie Wrap	1400-0249
9	Hood	1251-1202
10	Spring	1251-1040
11	Viking Connector	1251-6045
12	Socket	1251-4060
13	Plastic Rod 12.7 MM Lg.	4135-0265
14	Heat Shrink Tubing 50 MM	0890-0782

Figure A-8. "Y" Remote Start/Stop Cable HP 5700A-HP 3390A: 18594-60600

Pin#	Signal Name	Wire Color
5	BCD 0	Black
8	BCD 1	Brown
7	BCD 2	Red
6	BCD 3	Orange
4	BCD 4	Yellow
1	BCD 5	Green
3	BCD 6	Blue
2	BCD 7	Violet
9	GND	Gray

Pin#	Signal Name	Wire Color
7	SL1	Black
4	SL2	Brown
12	SL4	Red
5	SL8	Orange
9	SM1	Yellow
10	SM2	Green
3	SM4	Blue
11	SM8	Violet
1	GND	Gray

HP7673A END **HP3392/3393A END**

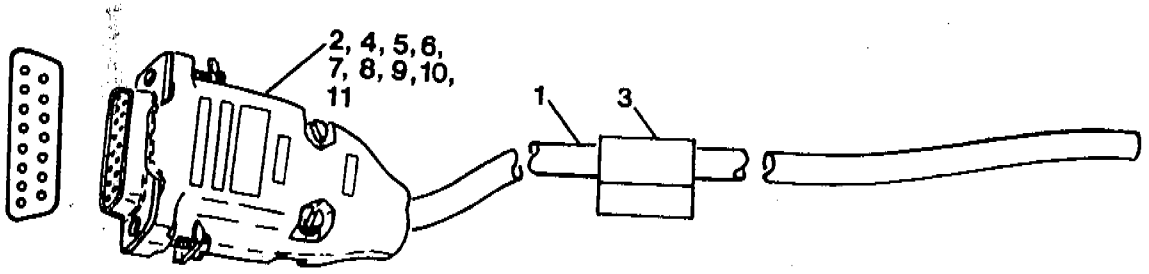


Item	Description	Part No.
1	Cable 10-Cond. 1.5M ± .1M	8120-4279
2	Ferrule Amp # 745508-4	1252-0573
3	Label	9320-4995
4	Contact - Crimp Amp # 205201-3	1252-0653
5	4-40 Saddle Screw	1252-0572
6	Saddle Washer	1252-0572
7	4-40 Fillister Head Screw With Nut	1252-0572
8	Met, Plastic Shield Amp # 747099-5	1252-0572
9	Receptacle, 15 Pos Amp # 205205-2	1252-0485
10	Connector - Viking	1251-8475
11	Sleeving 25 mm	0890-0759
12	Socket	1251-4060
13	Plastic Rod 12 mm	4135-0265
14	Tie Wrap	1400-1226
15	Tie Wrap	1400-0249
16	Shrink Tube 25 mm Lg	0890-0759

Figure A-9. BCD-HP 3392/93A Cable: 18594-60510

Pin#	Signal Name	Wire Color
1	BCD 5	Green
2	BCD 7	Violet
3	BCD 6	Blue
4	BCD 4	Yellow
5	BCD 0	Black
6	BCD 3	Orange
7	BCD 2	Red
8	BCD 1	Brown
9	Gnd	Gray
15	+5 VDC	White

HP7673A END



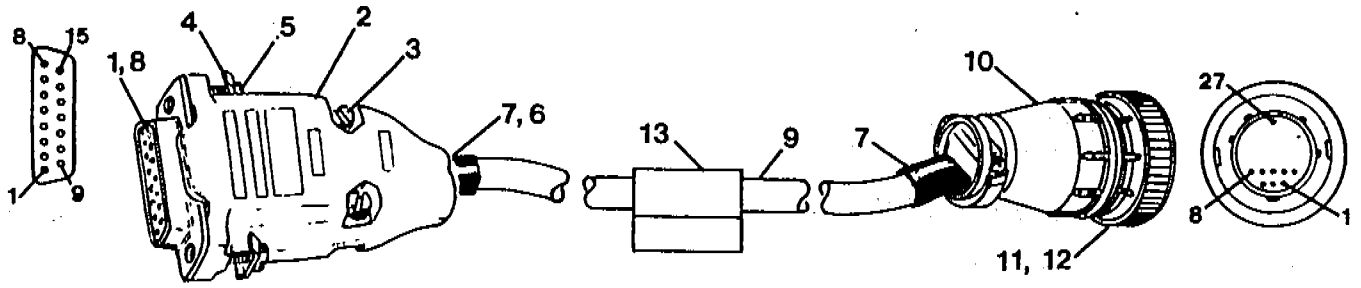
Item	Description	Part No.
1	Cable 10 Cond. 1.5M ± .1M	8120-4279
2	Ferrule Amp #745508-4	1252-0573
3	Label	9320-4995
4	Contact - Crimp Amp #205201-3	1252-0653
5	4-40 Saddle Screw	1252-0572
6	Saddle Washer	1252-0572
7	4-40 Fillister Head Screw W/Nut	1252-0572
8	Met. Plastic Shield, Amp #747099-5	1252-0572
9	Recepticle 15-Pos. Amp #205205-2	1252-0485
10	Tie Wrap	1400-0249
11	Shrink Tube 25 MM Lg	0890-0759

Figure A-10. BCD-General Purpose: 18594-60520

Pin#	Signal Name	Wire Color
5	BCD 0	Black
8	BCD 1	Brown
7	BCD 2	Red
6	BCD 3	Orange
4	BCD 4	Yellow
1	BCD 5	Green
3	BCD 6	Blue
2	BCD 7	Violet
9	Gnd	Gray

Pin#	Signal Name	Wire Color
1	BCD 0	Black
2	BCD 1	Brown
3	BCD 2	Red
4	BCD 3	Orange
5	BCD 4	Yellow
6	BCD 5	Green
7	BCD 6	Blue
8	BCD 7	Violet
27	Gnd	Gray

HP7673A END **NELSON END**

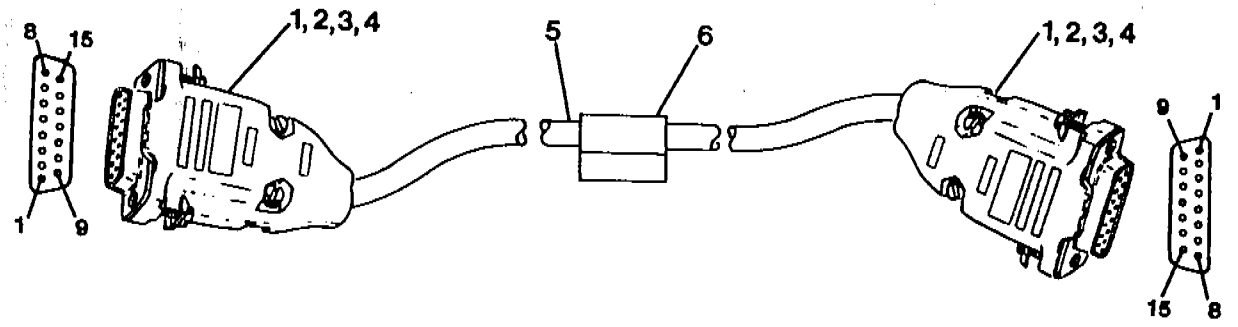


Item	Description	Part No.
1	Recepticle 15-Pos.	1252-0485
2	Met. Plastic Shield	1252-0572
3	4-40 Fillister Head Screw W/Nut	1252-0572
4	Saddle Washer	1252-0572
5	4-40 Saddle Screw	1252-0572
6	Ferrule - Split	1252-0573
7	Heat Shrink Tube 25 MM	0890-0759
8	Contact Connector	1252-0653
9	Cable 10-Cond. 1.5 M	8120-4279
10	Hood Assembly	1251-3938
11	Contact Connector	1251-5283
12	Plug 28-Pin	1252-1310
13	Label	9320-4995
14	Tie Wrap	1400-0249

Figure A-11. BCD-Nelson Cable: 19164-60550

Pin#	Wire Color	Pin #
1	Brown	1
2	Red	2
3	Orange	3
4	Yellow	4
5	Green	5
6	Blue	6
7	Violet	7
8	Gray	8
9	White	9
10	Black	10
11	White/Brown	11
12	White/Red	12
13	White/Orange	13
14	White/Yellow	14
15	White/Black	15

Pin#	Wire Color	Pin #
1	Brown	1
2	Red	2
3	Orange	3
4	Yellow	4
5	Green	5
6	Blue	6
7	Violet	7
8	Gray	8
9	White	9
10	Black	10
11	White/Brown	11
12	White/Red	12
13	White/Orange	13
14	White/Yellow	14
15	White/Black	15



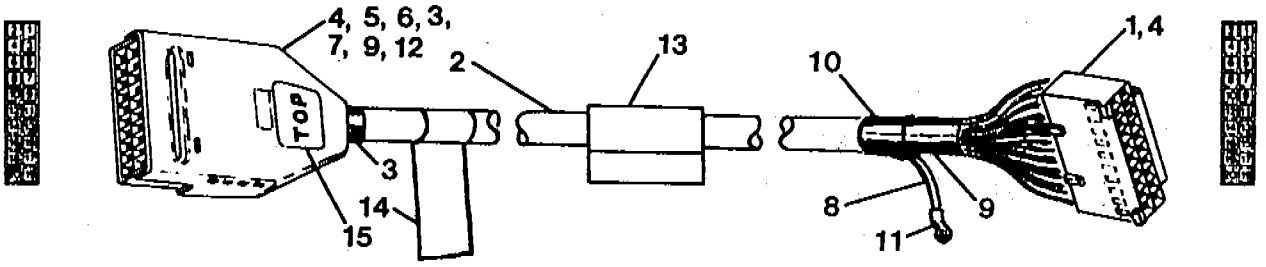
Item	Description	Part No.
1&1A	Amp 15-Pin Connector	1252-0485
2	Socket Contacts	1251-6328
3	AMP Shield (Clamp)	1252-0572
4	Split-Ring Ferrule	1252-0573
5	Cable, 15 Conductor	8120-3071
6	Label (See Note 1)	9320-4995

Figure A-12. HP 5880A Control Cable: 19321-60510

Pin#	Signal Name	Wire Color
1	5V Supply	Black
2	± 5V Supply	White
3	± 18V Supply	Brown
4	± 18V Supply	White
5	18V Ground	Red
6	18V Ground	White
7	– 18V Supply	Orange
8	– 18V Supply	White
9	POP	Yellow
10	POP	White
11	Serial Comm. Out	Green
12	Serial Comm. In	White
13	5V Ground	Blue
14	Start In	White
15	5V Ground	Violet
16	Start Out	White
17	5V Ground	Gray
18	Ready In	White
19	5V Ground	White/Black
20	Ready Out	White

Pin#	Signal Name	Wire Color
1	± 5V Supply	Black
2	± 5V Supply	White
3	± 18V Supply	Brown
4	± 18V Supply	White
5	18V Ground	Red
6	18V Ground	White
7	– 18V Supply	Orange
8	– 18V Supply	White
9	POP	Yellow
10	POP	White
11	Serial Comm. Out	Green
12	Serial Comm. In	White
13	5V Ground	Blue
14	Start In	White
15	5V Ground	Violet
16	Start Out	White
17	5V Ground	Gray
18	Ready In	White
19	5V Ground	White/Black
20	Ready Out	White

CONTROLLER END **INJECTOR MAIN BOARD END**

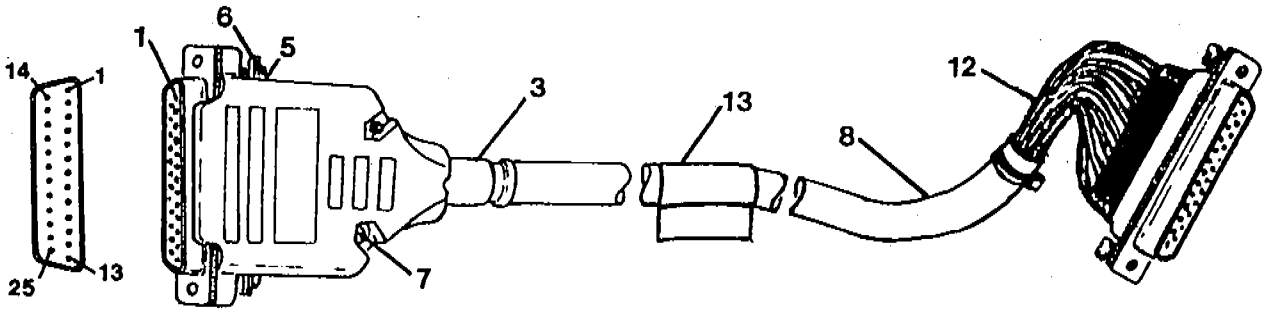


Item	Description	Part No.
1	Polarized 20-Pos HSG (Amp #3-87977-5)	1252-0663
2	Shielded Cable, 20 Cond, 24AWG	8120-1494
3	Ferrule (Amp #102789-3)	1252-0662
4	Crimp Contacts (Amp # 87046-3)	1252-0625
5	20-Pos Housing (Amp #102394-8)	1252-0682
6	Front Cover (Amp #102541-8)	1252-0652
7	Shielding Kit (Amp #103125-6)	1252-0664
8	Shrink Tubing	0890-0029
9	Shrink Tubing	0890-0273
10	Shrink Tubing	0890-0273
11	Terminal Crimp-Ring Tongue	0362-0428
12	Back Cover (Amp #102823-4)	1252-0665
13	Label	9320-4995
14	Label-Cable Warning	07673-90730
15	Label-Connector	07673-90740

Figure A-13. Injector Cable Assembly: 07673-60640

Pin#	Signal Name	Wire Color
1	Ground	Brown
2	+ 12V Supply	Red
3	Radial Home	Orange
4	Angular Home	Yellow
5	Angular Sense	Green
6	Gripper Motor Common	Blue
7	Gripper Motor 03	Violet
8	Gripper Motor 01	Gray
9	Radial Motor 02	White
10	Radial Motor 04	Black
11	Angular Motor Common	White/Brown
12	Angular Motor 02	White/Red
13	Angular Motor 04	White/Orange
14	Ground	White/Yellow
15	+ 12V Supply	White/Green
16	Interlock	White/Blue
17	Gripper Home	White/Violet
18	Bottle Switch	White/Gray
19	Gripper Motor 04	Wht/Blk/Blue
20	Gripper Motor 02	White/Black
21	Radial Motor Common	Wht/Blk/Brown
22	Radial Motor 01	White/Black/Red
23	Radial Motor 03	Wht/Blk/Orange
24	Angular Motor 01	Wht/Blk/Yellow
25	Angular Motor 03	Wht/Blk/Yellow

Pin#	Signal Name	Wire Color
1	Ground	Brown
2	+ 12V Supply	Red
3	Radial Home	Orange
4	Angular Home	Yellow
5	Angular Sense	Green
6	Gripper Motor Common	Blue
7	Gripper Motor 03	Violet
8	Gripper Motor 01	Gray
9	Radial Motor 02	White
10	Radial Motor 04	Black
11	Angular Motor Common	White/Brown
12	Angular Motor 02	White/Red
13	Angular Motor 04	White/Orange
14	Ground	White/Yellow
15	+ 12V Supply	White/Green
16	Interlock	White/Blue
17	Gripper Home	White/Violet
18	Bottle Switch	White/Gray
19	Gripper Motor 04	Wht/Blk/Blue
20	Gripper Motor 02	White/Black
21	Radial Motor Common	Wht/Blk/Brown
22	Radial Motor 01	White/Black/Red
23	Radial Motor 03	Wht/Blk/Orange
24	Angular Motor 01	Wht/Blk/Yellow
25	Angular Motor 03	Wht/Blk/Yellow



Item	Description	Part No.
1	Amp HDP-20 Plug 25-Pos	SNR 19212
2	Inner Ferrule, Amp	1252-0308
3	Outer Ferrule, Amp	1252-0307
4	Metalized Plastic Shield	1252-0503
5	4-40 Saddle Screw	1252-0503
6	Saddle Washer	1252-0503
7	4-40 Fillister Head Screws/Nuts	1252-0503
8	25 Conductor 22AWG Shielded Cable	8120-2947
9	MOD V Receptacle Pin	1251-4223
10	Crimp Contact Pin	1251-5283
11	26 Pin Amp Housing W/Strain Relief	1252-1233
12	Tie Wrap	1400-0249
13	Label	9320-4995

Figure A-14. Tray Cable: 18596-60550