

AS120 Manual

Original Operating Instructions

Rev. 2.0

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PN: I07-00CE-DOC

Declaration of Conformity

Manufacturer: EST Analytical, Inc.
503 Commercial Drive
Fairfield, OH 45014
USA

We hereby declare under sole responsibility that the following product as originally delivered

Product Name: AS120/Cobra
Product Options: Including all options, accessories and OEM branded products based on the above model.

complies with the requirements of the following applicable European Directives and carries the CE marking accordingly:

- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- Machinery Directive 2006/42/EC-Annex 1
- RoHS Directive 2011/65/EU

This product is designed and manufactured in accordance with the following standards:

IEC 61010-1:2014
IEC 61326-1:2012
CISPR 11:2009+A1:2010
EN 50581:2012

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12/14/17

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12-14-17

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NOTICES

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Document Number

A07-000-UMAN

Rev. 2.0

Printed in USA

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WARRANTY

The material contained in this document is provided “as is”, and is subject to being changed without notice, in future editions. EST Analytical warrants the products it manufactures and distributes, except those specially exempted, to be free from defects for one full year from the date of shipment. This warranty is limited to the original purchaser of the product and is not transferable. This limited warranty does not extend to any products that have been damaged as a result of accident, misuse, abuse, service or modification by anyone.

Except as expressly set forth above, no other warranties are expressed or implied including, but not limited to, any implied warranties merchantability and fitness for a particular purpose, and EST expressly disclaims all warranties not stated herein. In the event the product is not free from defect as warranted above, the purchaser's sole remedy shall be provided above. Under no circumstances will EST Analytical be liable to the purchaser or any user for any damages, including the incidental or consequential damages, expenses, lost profits, lost savings or other damages arising out of the use or inability to use the product. This warranty shall not be applicable to the extent that any provision of this warranty is prohibited by any federal, state, or municipal law that cannot be preempted.

FEDERAL COMMUNICATIONS COMMISSION'S ADVISORY

This equipment has not been tested or found to comply with the limits of Class A computing device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.








SAFETY INFORMATION

English

- Warnings in the manual or on the AS120 to be observed during installation, operation, service and/or repair of the instrument. EST Analytical will assume no responsibility for customers failing to comply with the safety precautions stated.
- Use of the AS120 for something other than the intended use of the instrument is prohibited.
- The use of the AS120 is for trained personnel only.
- Personnel operating the AS120 should wear safety glasses, safety shoes and gloves where appropriate.
- The AS120 is not intended for use in a hazardous environment.
- Installation of the AS120 requires that there is nothing blocking the vents of the system.
- Installation of the AS120 requires that the instrument be placed on a non-flammable surface capable of handling the weight of the instrument.

Français

- Les avertissements dans le manuel ou sur le AS120 à observer lors de l'installation, le fonctionnement, le service et / ou la réparation de l'instrument. EST analytique n'assume aucune responsabilité pour les clients qui ne respectent pas les consignes de sécurité indiquées.
- Utilisation de le AS120 pour autre chose que l'utilisation prévue de l'instrument est interdite.
- L'utilisation de le AS120 est de personnel qualifié seulement.
- Le personnel d'exploitation le AS120 doivent porter des lunettes de protection, chaussures de sécurité et gants le cas échéant.
- Le AS120 n'est pas destiné à être utilisé dans un environnement dangereux.
- Installation de le AS120 exige que rien ne bloque les orifices de ventilation du système.
- l'installation de le AS120 exige que l' instrument est placé sur une surface non inflammable capable de supporter le poids de l'instrument.

Symbol	English	French
	See Accompanying Instructions for more Information	Voir les instructions d'accompagnement pour plus d'informations
	Indicates Hot Surface	Indique surface chaude
	Indicates an Electrical Hazard	Indique un danger électrique
	Indicates a Risk of Hand Entanglement	Indique un risque d'étranglement pour les mains
	Indicates a Sharp Point	Indique une pointe acérée
	Indicates Bulky/Heavy Item, Use Two Person Lift	Indique objet volumineux / lourds, utilisez deux personnes ascenseur
	Indicates Risk of Explosion	Indique un risque d'explosion

Safety Symbols

ELECTRICAL HAZARDS



The power cord supplied with the AS120 system must be connected to a power outlet with a protective ground contact. If using an extension cord or a power strip, make sure that it also has a protective ground contact.



Le cordon d'alimentation fourni avec le système AS120 doit être connecté à une prise de courant avec un contact de terre. Si vous utilisez une rallonge ou une multiprise, assurez-vous qu'il dispose également d'un contact de terre.



Do not change the internal or external ground connections. Tampering with the grounding connections will result in a voided warranty and could damage the AS120 system.



Ne pas modifier les connexions de terre internes ou externes. Ingérence dans les connexions de mise à la terre se traduira par une annulation de la garantie et pourrait endommager le système AS120.



If there is suspected electrical damage to the AS120, contact EST Analytical in order to have a service representative evaluate the system. Do NOT try to address the problem until a service representative has looked at the AS120.



Si on soupçonne des dégâts électriques à la AS120, contactez EST analytique afin d'avoir un représentant du service à évaluer le système. Ne pas essayer de résoudre le problème jusqu'à ce qu'un représentant de service a examiné la AS120.



Disconnect power cords from the AS120 before performing instrument maintenance.



Débranchez les cordons d'alimentation du AS120 avant d'effectuer l'entretien de l'instrument.



Do not disconnect any of the electrical assemblies while the power is on. Turn the power off and unplug the power cord before disconnecting any electrical assembly.



Ne débranchez pas l'un des ensembles électriques tandis que l'appareil est sous tension. Coupez l'alimentation et débranchez le cordon d'alimentation avant de déconnecter toute l'installation électrique.

ADDITIONAL HAZARDS



Never try to repair any components of the AS120 without the aid of Technical support **(800)283-3510** (USA and Canada) or **513-642-0100** (International), email: support@estanalytical.com, the manual, or a service representative. If the AS120 is damaged during unauthorized repairs, the warranty may be voided.



Ne jamais essayer de réparer les composants pour le AS120 sans l'aide d'un soutien technique **(800) 283-3510** (États-Unis et Canada) ou **513-642-0100** (International), email: support@estanalytical.com, le manuel, ou un représentant de service. Si le AS120 est endommagé lors de réparations non autorisées, la garantie peut être annulée.



The power switch for the AS120 is on the back of the instrument with the symbol(s) “—” meaning ON and “O” meaning OFF. The power supply for the AS120 should be located where it is possible to unplug the AC power cord from the power supply/wall outlet in case of an emergency.



L'interrupteur d'alimentation pour le AS120 est sur le dos de l'instrument avec le symbole (s) "—" signifie ON et "O" signifie OFF. L'alimentation de la AS120 devrait être situé là où il est possible de débrancher le cordon d'alimentation de la prise d'alimentation / mur en cas d'urgence.



Use safe laboratory practices when using solvents, changing syringes or operating the AS120. See the MSDS sheets from the manufacturer for all solvents in use.



Utilisez pratiques de laboratoire lors de l'utilisation de solvants, seringues ou changer le fonctionnement du AS120. Voir les fiches signalétiques du fabricant pour tous les solvants utilisés.



A lithium battery is used to buffer the electronic memory when the AS120 is not in use. Replace it only with an equivalent battery. The battery recommended is a CR1225. NOTE: Dispose of all Lithium batteries properly



Une batterie au lithium est utilisé pour tamponner la mémoire électronique lorsque le AS120 n'est pas en cours d'utilisation. Remplacer uniquement avec une batterie équivalente. La batterie recommandée est une CR1225. REMARQUE: Eliminer toutes les batteries au lithium correctement.



If one of the printed circuit boards fails, contact EST Analytical Technical Support for a replacement board. Technical support **(800)283-3510** (USA and Canada) or **513-642-0100** (International)



Si l'une des cartes de circuits imprimés échoue, contactez le support technique EST analytique pour une carte de remplacement. Support technique **(800) 283-3510** (États-Unis et Canada) ou **513-642-0100** (International)



To avoid injury during the operation of the AS120, keep hands away from the syringe.



Pour éviter les blessures lors de l'opération de l'AS120, éloigner les mains de la seringue.

DISPOSAL AND RECYCLING INFORMATION



United States:

This symbol indicates that your product must be disposed of properly according to local laws and regulations. When your product reaches its end of life, contact your local authorities to learn about recycling options.

European Union:

This symbol above means that according to local laws and regulations your product should be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities. Some collection points accept products for free. The separate collection and recycling of your product at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

1. INTRODUCTION

1.1 PRODUCT DESCRIPTION

The AS120 Auto Sampler combines state-of-the-art component technology with easy-to-use Operating features that meet routine as well as research level autosampling requirements.

The AS120 is an all-electric, stepper motor driven autosampler providing rugged reliability and pinpoint injection accuracy. The syringe mechanism moves back-and-forth and in-and-out across the sample tray to access sample vials, multiple solvent vials, standards, etc.

Variable inject volumes, injection speed, needle dwell times, number of samples per vial, multiple methods per run, solvent flush, air gapping, dual column operation and a host of other auto sampling options are all standard and easily programmed on the AS120's PC user interface.

The unit uses screw-cap or crimp-top septum vials and easily interfaces with your GC system with all the remote inputs/outputs—ready signal, injection mark, etc.—with RS 232 for direct communication with an IBM or compatible personal computer. Mounting is easy and allows for quick changes between GC's if desired. Syringe/injector alignment is PC user interface.

1.2 KEY FEATURES

- Direct Syringe Injection: Uses 5µl - 100µl syringes for minimum sample volume and maximum flexibility.
- All Electric: No additional cost for gases.
- Priority Manual Sample feature allows the current analysis to be interrupted for RUSH samples.
- Variable Sample Fill Rate for viscous samples.
- Variable Injection Rate to optimize chromatography based on injector type and analyses of interest.
- Dual Injector Operation allows maximum productivity from GC with dual injectors and columns.
- Programmable Injector Alignment: No manual adjustments to align injection ports.
- Variable Dwell Time for hot needle injection techniques.
- Post Solvent Rinse user definable with two separate rinse solutions.
- Internal Standard Injection
- Two Solvent Rinse capabilities minimizes cross contamination.
- Easy To Operate Menu-driven system simplifies method setup and allows for multiple method linking. Up to 10 different methods available.
- A sample may be run from any position in the sample tray in Manual or Auto mode.
- Large 120 or 200 position sample tray for overnight operation that lifts off for easy loading.

- The syringe may be programmed for simple or complex injection sequences through a simple PC user interface allowing for any type of sample handling with one system.
- Totally controlled sequences of syringe purging and rinsing allowing improved peak resolution and minimum compound carry over.
- Compact size, requires less space than other autosampler systems.
- Easy hook up and installation.

1.3 SPECIFICATIONS

- Tray Capacity: 120 sample vials — 2 ml, 12 mm x 32 mm vials; 2 Solvent, 1 or 2 Waste, 10 ml vials
- Sample Size Reproducibility Typically 1% or better.
- Minimum Sample Size: 1% of Syringe Volume
- Sample Injections per Vial: 1 to 100; or sample vial capacity.
- Standard Injection: 1% to 100% of syringe capacity (standard volume plus sample volume cannot exceed the syringe volume.)
- Operating Temperature: 15° to 35°C Storage Temperature: 0°C to 85°C
- Relative Humidity: 10 to 90%
- Line Voltage: 100-240 VAC; 50-60 Hz, 115-160 VA
- Weight: Auto Sampler Unit - 17 lbs 3 oz.: 7.8 Kilograms
- Size: Auto Sampler Unit - 25 x 10 x 17 inches : 63.5 cm x 35.5 cm x 43.2 cm
- Host PC requirements: 2G RAM, Windows 7 or greater

2.0 INSTALLATION

2.1 INSTALLATION PROTOCOL

The complete installation of the AS120 includes the following steps:

1. Unpack the Auto Sampler and make certain all parts and supplies are available.
2. Install the mounting bracket to the GC per separate instructions.
3. Install the Auto Sampler onto the mounting bracket.
4. Install the cable from the PC to the rear of the AS120, see Figure 2.0.

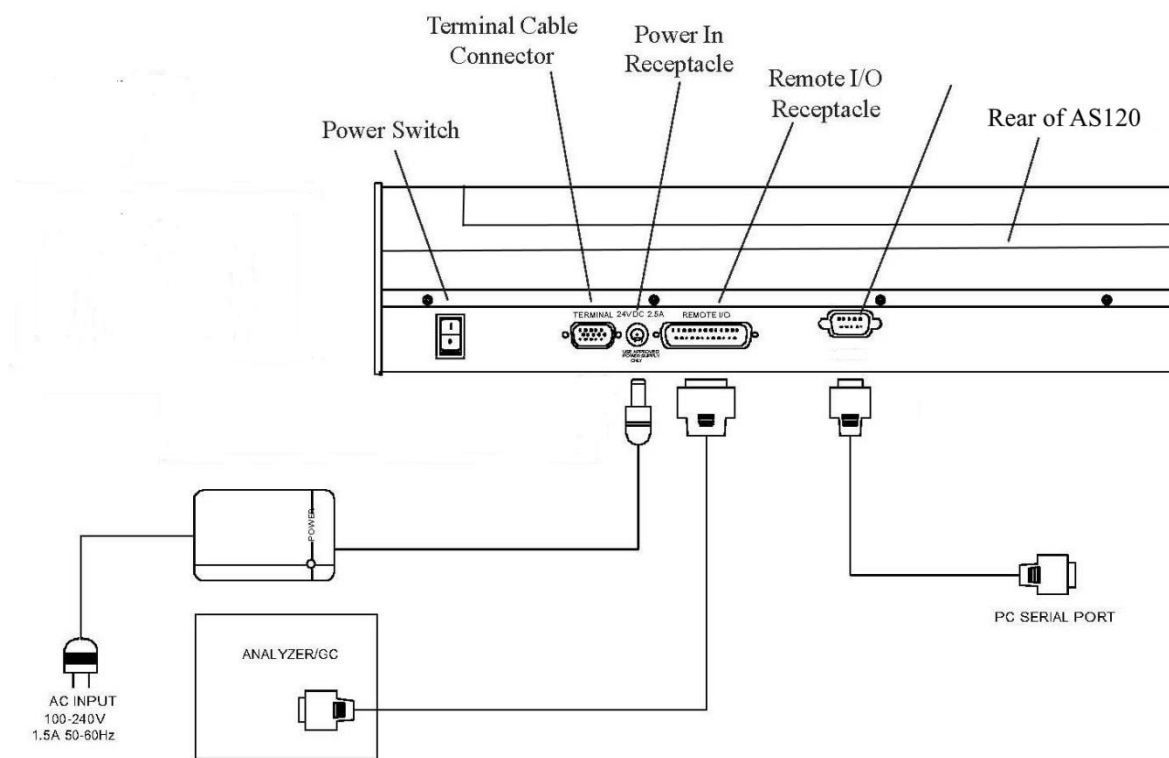


Figure 2.0: Rear of AS120

5. Connect the Remote I/O cable between the Auto Sampler and the GC or data system. See Section 6.0.
6. Connect the power supply power cord to the rear of the Auto Sampler and then plug the main power cord into a grounded AC power source.
7. Install the syringe assembly. See Section 3.1.
8. Perform the Setup and Target Setup procedures (some of these may require removal of the syringe.) Verify the initial mounting bracket alignment to the injection port on the chromatograph. See Section 3.2.

2.2 UNPACKING THE AUTO SAMPLER

Carefully unpack and inspect the Auto Sampler. Inspect the instrument for possible shipping damage. If damage is discovered, immediately notify the shipping carrier and then EST Analytical.

NOTE: Do not return the instrument without first notifying EST Analytical and obtaining a Return Goods (RG) authorization number. If possible, please store the shipping cartons and all packing material for possible future use.

2.3 PARTS AND MATERIALS

The following parts list is included in the accessory kit:

- Sample Tray
- I/O Cable (comes with bracket)
- Power Cord w/ Power supply
- 4 Solvent / Waste Vials (10 ml)
- Sample Syringe
- 4 Solvent / Waste Caps with Septa
- 4 extra Waste/Solvent Septa
- Operators Manual
- Optional Mount Bracket (This must be purchased separately)
- Mount Bracket Installation instructions (with purchased Optional Mounting Bracket)
- USB to RS-232 Adapter Cable
- USB drive with Application Software

2.4 POWER REQUIREMENTS

The Auto Sampler is an all-electric system with only a maximum of 24 VDC present in the cabinet. No gases or other energy sources are required. The power requirement for the system is an input to the power supply of 100-224 volts and a line frequency of 50 to 60 Hz. Make certain the electrical voltage is a constant source with no severe drops or spikes in the voltage. If the power source is not certain, install a power conditioner on the electrical line.

2.5 INTERFACING TO AN ANALYZER

To properly interface the Auto Sampler to the GC, the GC ready (or Analyzer Ready) signal and the remote start signal must be located on the GC and or Data Collection Device. Each GC is different and it may be necessary to refer to the instrument's manual, or contact a representative for the correct location of the ready and start signals. Connection points on gas

chromatographs are unique to each system; therefore, a specially wired cable is required. To insure correct operation of the system follow the wiring schematic supplied with each cable. If a problem exists please consult the factory.

The Auto Sampler may also be operated in the Local mode if a GC ready signal is not available. The Local mode allows the Auto Sampler to inject a sample based on a cycle time setting without receiving a ready signal. See Method Parameters Section for more details.

The connections will be from the Auto Sampler's Remote I/O connector (25 Pin D), located on the rear of AS120, to the chromatograph's I/O "D" connector or appropriate terminal block connector(s).

Figure 2.0 shows the complete installation of cables to the GC and for RS 232 remote control. Be certain all cable connections are made before the power to the AS120 is turned on.

2.6 SAMPLE TRAY INSTALLATION

1. Loosen the front clamp(s) on the leg bracket(s) in order to clear the mounting rail on the AS120 by loosening the M4 X 10mm screw(s).
2. Place the leg bracket(s) on the mounting rail where needed.
3. Tighten the leg bracket(s) onto the mounting rail by tightening the M4 X 10mm screw(s).
 - **NOTE:** See Figure 2.6a below for leg bracket, clamp and screw mounting.

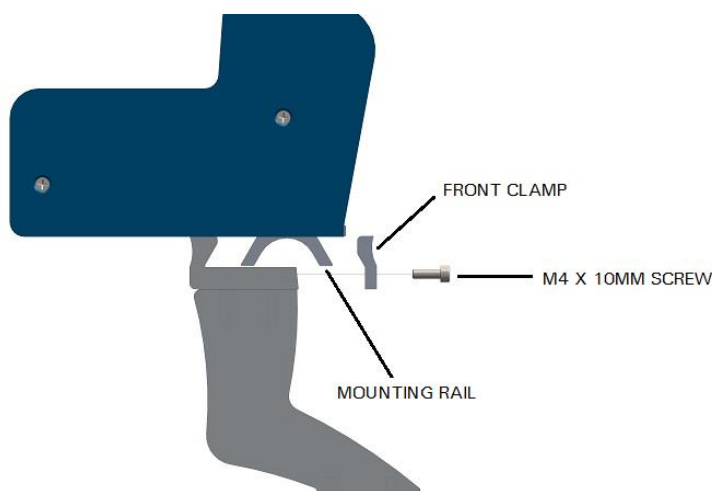


Figure 2.6a: AS120 Mounting Rail, Front Clamp and M4 X 10mm Screw

Unwrap the sample tray and place it onto the sample tray brackets. The tray will mount in either direction; there are alignment pegs in the tray. Once installed, place an empty vial with cap and septa in vial position #1 and the waste /solvent locations to be used. Be certain the waste/solvent tray is located on the correct side of the sample tray for your GC. Note, the waste/solvent tray may be located on either side of the sample tray, see Figures 2.6a & 2.6b.

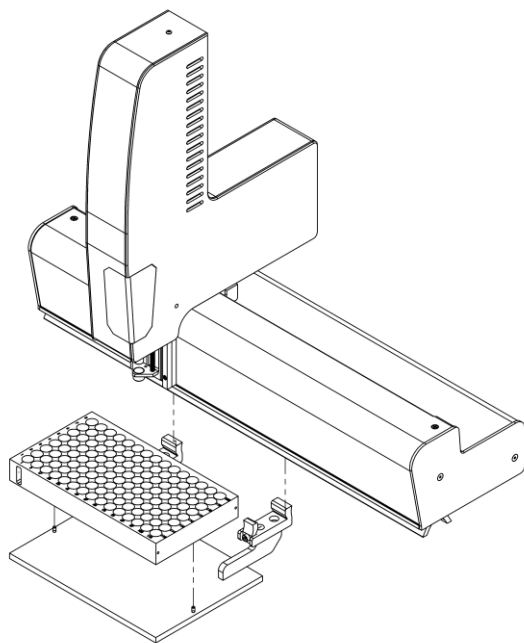


Figure 2.6a: AS120 sample tray Installation

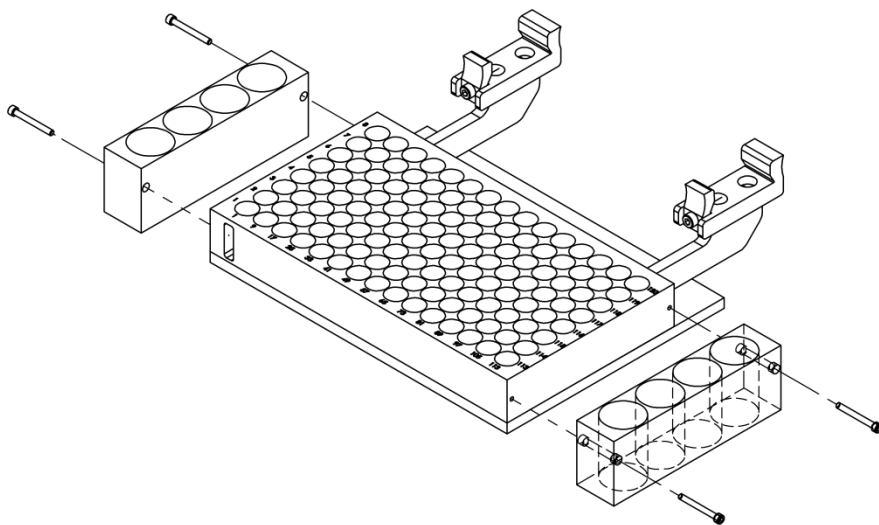


Figure 2.6b: AS120 Waste/Rinse Station Installation

2.7 PC USER INTERFACE OVERVIEW

The PC user interface, see figure 2.7, provides for a complete entry of all Status, Method, Configuration, and Diagnostics as well as motor operations. The menus perform the following operations.

- Status Menu: Shows the current state of the instrument.
- Method Menu: Provides access to Method parameters and execution.
- Configuration Menu: Only visible to users with the appropriate role assignment, configuration, calibration, and direct motor commands are available from this menu.
- User Menu: Only visible to users with the appropriate role assignment, users can be managed from this menu.

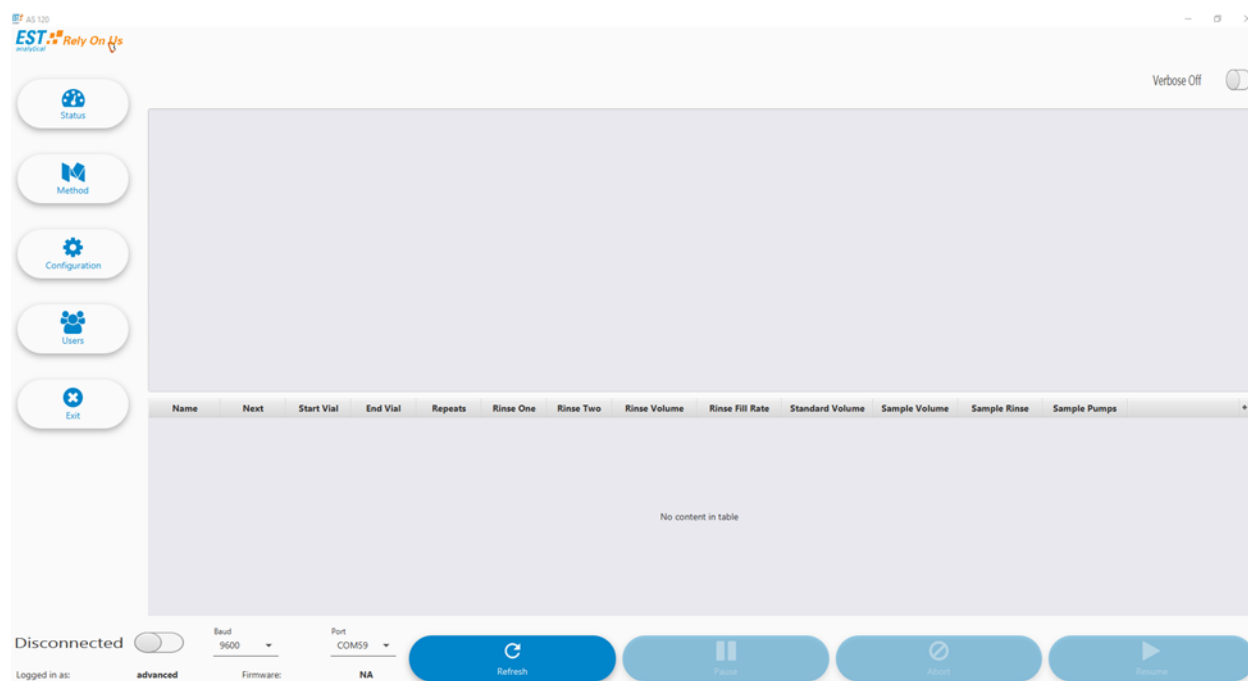


Figure 2.7: PC User Interface

NOTES

If at any point the PC User Interface is not visible, it may be required to change the Windows Display settings Resolution or Scaling settings. The PC User interface must be restarted after adjusting the Windows Display settings.

After starting the PC User Interface, a connection must be made with the instrument (after the instrument is powered on and the serial cable is connected). Before connecting, the correct baud rate and port in the lower left hand corner of the window must be set. The baud rate is 9600 for all users except select OEM customers. The Port setting is automatically populated but may need to be adjusted manually. To make the connection to the instrument, press the toggle button next to the text that says “Disconnected”. Once connected, this button will change to green and the text will say “Connected”.

3.0 CONFIGURATION

3.1 Syringe Setup

The AS120 will accept most manufacturer's syringes, an 10µl syringe (non-gas tight) is shipped as standard.

NOTE: When changing syringe brands, there may be some adjustment required to the lower needle guide.

From the PC User Interface, go to the "Configure" menu and select the desired syringe volume from the "Syringes" tab. Then select "SYRINGE" from the Calibrations drop down selector and press Calibrate. Follow the instructions for 3.1.2 Syringe Calibration after 3.1.1 Syringe Installation.

3.1.1 Syringe Installation



1. Power off the instrument.
2. Loosen the syringe plunger thumbscrew (1) and the two 4-40 socket head screws (4) securing the holder.
3. Insert the syringe needle (10) into the mid needle guide (9) and then down into the lower guide (11).
4. Insert the syringe flange (3) into the notch (4) in the upper section of the syringe holder (8).
5. Raise the plunger thumbscrew (1), holding it up, insert the syringe plunger thumb piece (3) into the T-slot in the plunger retainer. Lower the plunger retainer thumbscrew and tighten securely. Rotate the syringe clamp (6), 90 degrees, to hold the syringe (7) in place.
6. Set the plunger to its zero position by sliding the holder (8) up until it touches the needle, then back it down about 1/64" and tightening the two 4-40 socket head screws (4).
7. Verify that the needle (10) does not extend beyond the lower needle guide (11). Place your finger under the lower needle guide and check. The needle tip should not be felt. If the needle tip can be felt, the needle guide requires adjustment, consult factory.

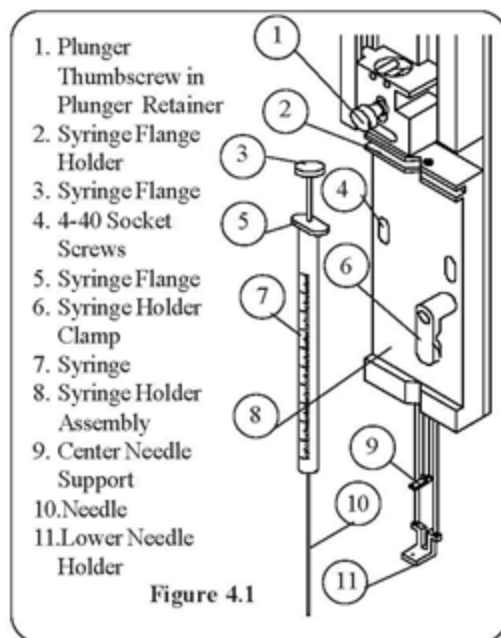


Figure 3.1.1

3.1.2 Syringe Calibration

The syringe plunger must be properly calibrated to insure injection accuracy. The procedure is performed in the Configuration menu of the PC User Interface. Go to the "Configure" menu and select the desired syringe volume from the "Syringes" tab. Then select "SYRINGE" from the Calibrations drop down selector and press Calibrate. Follow the on-screen prompts to calibrate the syringe.

NOTE: Record the value show on the line "Volume" for future use). Press the Enter key. Next, using the Left/Right arrow keys, adjust the plunger stroke to the maximum position allowed on the syringe barrel. This is generally about 10% above the syringe volume. Press the Enter key.

NOTE: If the plunger motor "chatters", the syringe holder is set too high not allowing the plunger sensor to be reached. Loosen the two 4-40 socket head screws and slowly lower the holder until the motor stops chattering. The plunger sensor has now been homed. Look at the plunger to be sure it is at the "0" mark.

The plunger has now been set to the maximum graduation (100%) mark on the syringe scale. This will allow the software to properly calculate the sample and rinse volume parameters.

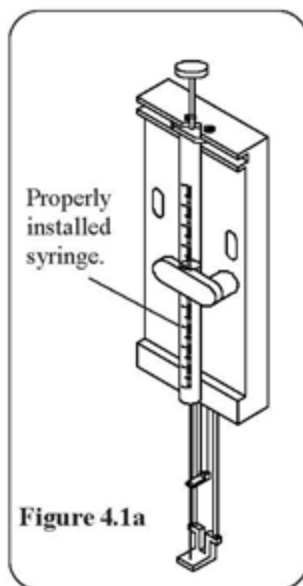


Figure 3.1.2

3.2 TARGET SETUP

CAUTION: Severe damage can occur to the Syringe, Sample Vials, and/or Chromatography Instrumentation if incorrect parameters are set. Remove the syringe from the holder.

CAUTION: The mounting bracket must be correctly installed before attempting Target Setup.

3.2.1 Target Setup

The Auto Sampler is designed to inject from up to 220 samples using 0.8 ml sample vials, however, the 120 position 2 ml vial tray is standard, into most types of GC injection ports. Two injection ports may be established anywhere along the travel length of the syringe arm.

Target Setup involves completing the following steps.

1. Installing the Mount Bracket and Auto Sampler to the analyzer.
2. Installing the Syringe Holder and Sample Tray with the Waste / Solvent installed on the correct side for you GC inlet configuration.
3. Syringe Installation and Calibration (be certain the syringe is removed before beginning Target Setup).
4. Selecting the Sample Tray Size (PC User Interface Configuration menu, Accessories Tab. Note, the waste and rinse vials can be on either side of the tray).

5. Calibrating the sample vial #1 position (PC User Interface Configuration menu, select "SAMPLE 1" from the Calibrations drop down selector, press Calibrate, and follow on screen prompts).
Caution: Never allow the needle to pierce the septum of an empty vial. Always have liquid in the vial. This will help lubricate the needle in the septum.
6. Setting Waste or Rinse position(s) (PC User Interface Configuration menu, select "WASTE 1" from the Calibrations drop down selector, press Calibrate, and follow on screen prompts).
7. Calibrating the syringe to the injection port(s) location(s) (PC User Interface Configuration menu, select "INJECTION A" from the Calibrations drop down selector, press Calibrate, and follow on screen prompts).

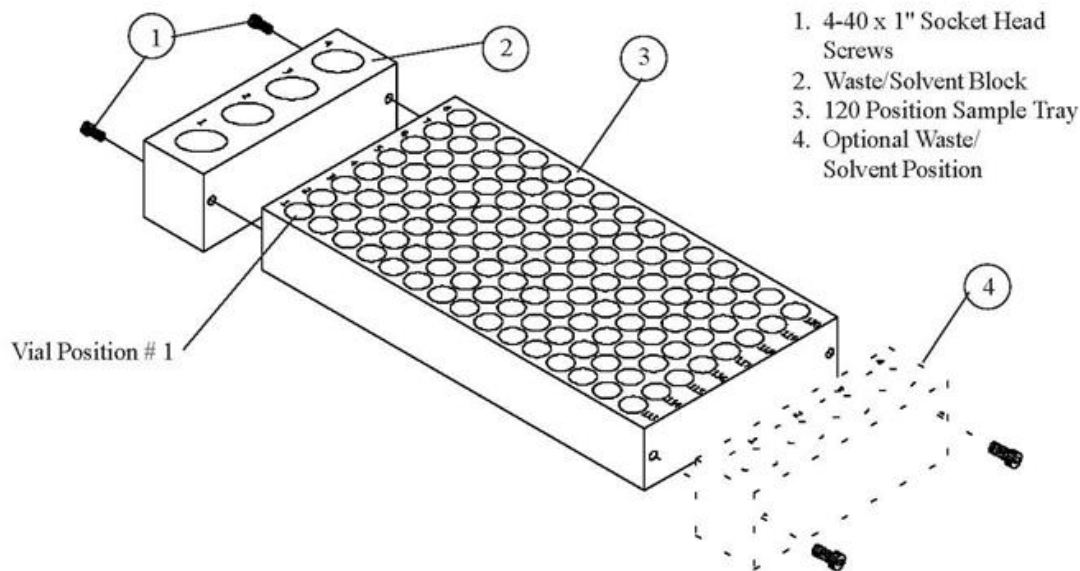


Figure 3.2.1

3.2.2 Motor Positioning Guidelines

When setting up the Sample Tray and Injection Inlet positions the gold arrow keys on the PC User Interface act as a directional input for axis movement (Left/Right, head Up/Down, head Forward/Back, and plunger up/down. The small arrows next to the plunger window are for the plunger). This movement is achieved when the operator "presses" or clicks a directional arrow key momentarily. If the movement for a single click is too large, the step rate may be changed

by changing the value in the Steps drop down selector. A smaller number indicates a smaller number of steps per arrow click. The default step rate is factory set at 50. Larger movements can be also selected (up to 250 steps per click).

3.2.3 Target Coordinate Setup Verification

After completing the Target Setup in Section 3.2.1 the positions for each target can be verified. The Configuration menu of the PC User Interface provides a Quick Move drop down selector. Select each of the target configurations to ensure that the calibration is satisfactory:

- INJECTION A
- INJECTION B (optional)
- RINSE 1
- RINSE 2
- WASTE 1
- WASTE 2
- 1 (for tray vial 1 position)

NOTE: the head will start to move as soon as the target position is clicked in the drop down selector.

4.0 OPERATION

4.1 METHOD EDITING

The AS120 allows 10 methods to be saved into memory. To edit a method, press the "Method" button in the UI. To see the methods currently stored in the unit, press the "Retrieve" button. The method to be edited can be selected by pressing the "Current Method" drop down on the right side of the screen. **The "Save" button must be pressed to save the method parameters to the instrument prior to running the method.** Refer to the following parameter list for values for each parameter.

4.2 METHOD PARAMETERS

Parameter	Range	Description
Start Vial	1-120	The first sample vial to be injected
End Vial	1-120	The last sample vial to be injected.
Inject Sample	1-100	The number of injections to be performed on each individual sample.
Rinses Solvent #1	0-20	After a sample is injected, the syringe will be rinsed this number of times using Solvent #1.
Rinses Solvent #2	0-20	After a sample is injected, the syringe will be rinsed this number of times using Solvent #2.
Rinse Volume uL	0-100	The volume of the syringe in uL to be used in rinsing.
Rinse Fill Rate	0-100	The plunger stepper motor speed will be adjusted to a speed rating per the input value (% per second). Use a lower number if more viscous solvents are being used to avoid air bubbles.
Standard Volume uL	0-100	The total syringe volume used when adding a standard to a sample. If this parameter is used, each sample injection will have standard added to the syringe along with the sample. Note, the standard is always drawn into the syringe first and the sum of the standard volume and sample cannot exceed 100% of the available volume.
Sample Volume uL	0-100	The total syringe volume used for the sample.
Sample Rinses	0-10	The number of times the syringe is filled with sample and "emptied" to the waste vial. The volume of sample loaded into the syringe will be according to the Sample Volume uL Parameter.

Sample Pumps	0-10	The syringe will be flushed this number of times with standard/sample solution before the final standard/sample solution is drawn into the syringe prior to injection. The syringe will remain in the sample vial for this process. This helps to purge air bubbles from the syringe before drawing in the final sample to be injected.
Sample Fill Rate	0-100	The plunger motor fill rate speed will may be controlled with this value. Use 100 for the fastest plunger operation. Use a lower number if more viscous samples are being used to avoid bubble formation.
Sample Inj. Rate	0-100	The plunger injection speed is controlled with this parameter. Use a lower number if more viscous samples are being used to increase reproducibility. Use 100 for the fastest injection speed.
Syringe Offset	0-20	The syringe offset determines what volume of sample remains in the syringe at the completion of an injection. A value of 10% to 20% may be useful in avoiding volume errors due to bubbles caused by certain sample types. The offset is ignored during the rinse cycle. This parameter MUST be set to if the Pre-Fill air parameter is being used.
PreFill Air uL	0-100	The amount of air to be drawn into the syringe before drawing in the standard/sample. This provides a head space of air to help purge the syringe of the entire sample during injection. See "Syringe Offset Parameter". Note, the sum of the standard volume, sample volume, and Prefill Air cannot exceed of the syringe Capacity.
MidFill Air uL	0-100	The amount of air to be drawn into the syringe after drawing the standard volume. This air space will be utilized as a buffer between the two different solutions in the syringe. This parameter is not used if the Standard Volume is set to "0"
PostFill Air uL	0-100	The amount of air to be drawn into the syringe after the sample is drawn into the syringe. This air volume can reduce "needle burn off" of sample in the injection port.
Start Delay	0-999	This parameter allows the autosampler to begin its sampling sequence at a future time, up to 999 seconds from the GC start output.
Pre Inject Delay	0-600	The number of seconds to pause after the syringe needle has entered the sample injection port. In systems where "needle burn" occurs this value can help separate the initial solvent injection from the main sample injection.

Post Inectj Delay	0-600	The number of seconds to pause (Dwell) after the sample has been injected. This feature allows the sample, time to completely leave the needle, before the needle is withdrawn from the injection port. GC Start and Data Start signals have been activated.
Inject Target	[A, B, a_and_B]	There are two injection targets possible, "A" and "B". The sample will be injected into the assigned target(s). The position of the inlets does not matter; they can be left/right or front/rear. Multiple targets may be selected by entering one of the A, B combination values.
PostFill Delay	0-60	This parameter allows a pause after the plunger has pulled the programmed sample volume into the syringe barrel. This delay, in seconds, allows viscous samples to completely fill the syringe barrel before the syringe needle is removed from the sample vial.
Operate Mode	Remote/Local	Remote or Local operating modes are selectable by using the Left/Right arrow keys. In the Local mode, the AS120 operates according to the Cycle Time Parameter. In the Remote mode, a GC Ready or Start signal must be received, and the Cycle Timer must be at "0" before the injection can begin.
Cycle Time Minutes	0-999	Begins counting time from when the injection is made, (plunger is depressed). The next sample injection process will not start until this amount of time has elapsed. The syringe will however be rinsed, after the injection, according to the number of Rinses programmed. If the duration of post-rinse sequences requires a longer time period than the Cycle time, this parameter is not the determining time between injection cycles. This parameter is only required when running in the Local mode.
Aux Time Minutes	0-999	The auxiliary timer begins marking time when the sampling sequence begins. At the end of the programmed time, the Auxiliary Output switch is pulsed.
Link To Method	0-10	Methods may be linked together allowing the AS120 to run multiple methods in a continuous process. Note: Circular linkage of a single method is allowed providing for continuous sample operations. When the method parameter is set to "0", the AS120 will only run the one selected method.

See Section 4.4 for an example of Method Parameter Setup values. The Method example may be used for most sample situations.

4.3 UTILIZING STANDARD SOLUTIONS

The AS120 allows standard solutions to be automatically added to the sample injection. The syringe will first fill with standard solution and then move to the sample vial and pull up the sample into the syringe. Both sample and standard will then be injected as one “sample”.

Standards are loaded into the tray in the far right vial column, vial positions 113 to 120. When a Standard Volume is programmed, the syringe will move to the standard vial position along each row of sample. As an example, all samples processed in vial row #1 will use position # 113 as the standard location. All samples in row # 2 will use position # 114 as the standard location. This pattern is used all the way to row # 8 Standard position # 120. What this means is samples **CANNOT** be loaded in locations 113 -120, this is reserved for Standards ONLY!

This method works well for injection methods into single injectors and in the dual inject mode [A+B] (see Inject Target parameter in Section 4.2). It does not work in the dual inject mode [A&B] because the sample and standard are not sufficiently mixed in the syringe.

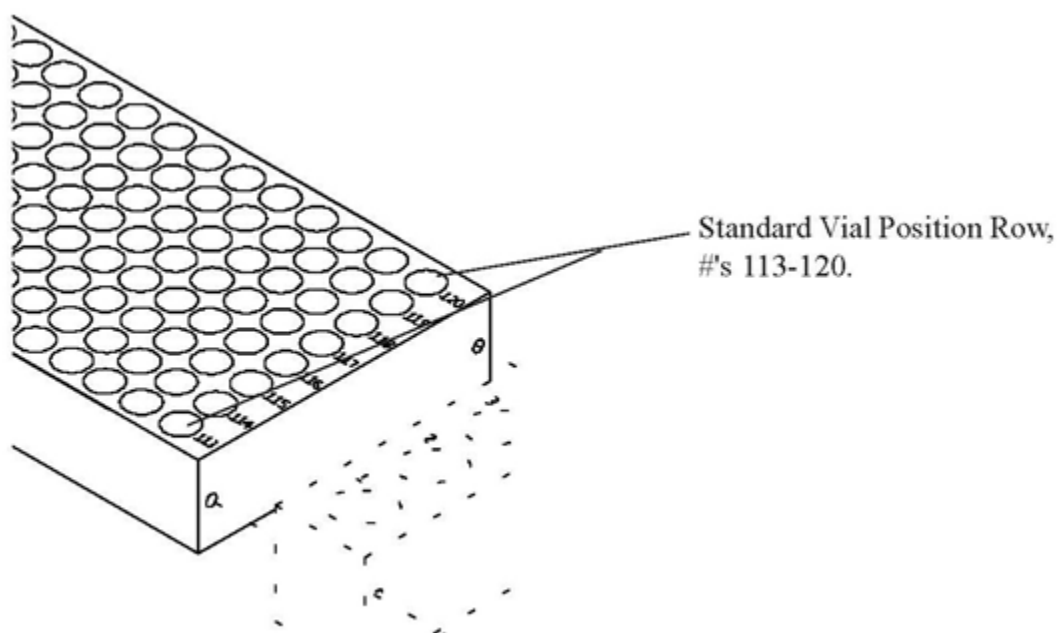


Figure 4.3

4.4 SUGGESTED METHOD PARAMETER VALUES UTILIZING HEXANE AND METHYLENE CHLORIDE

Use the following as an example to setup Method Parameter Values. These values are suggested for solvents such as Hexane and Methylene Chloride. This Method is with a 5µl syringe installed. The sample is 1 µl, with a 0.25 µl offset injecting into inlet A. The syringe will be rinsed with 5µl of rinse #1 twice and #2 once. Prior to injection, it will dump the rinse twice, into waste, and then flush in the vial 5 times. This should eliminate any bubble problems with any solvent.

Method Parameter	Initial Value
# Inject/Sample	1
# Rinse/Solvent #1	2
# Rinse/Solvent #2	1
Rinse Volume %	100
Rinse Fill Rate %	10
Sample Volume %	20
# Pumps/Inject	2
# Flushes/Inject	5
Sample Fill Rate	10
Sample Inject Rate	100
Syringe Offset	5
Operating Mode	Remote

5.0 EXTERNAL I/O CONNECTIONS

The AS120 has a 25 pin "D" connector on the rear of the cabinet for External I/O connections, i.e. GC Ready, GC Start, Data Start, etc. The following is a list and pin locations for the signals. Note: The AS120 is supplied with an External I/O cable that will be specific to your GC system however, not all functions shown will be wired in your cable. Be certain the cable you received is correct for your system.

Pin #	Signal
1	Signal Ground
2	In 1 Ground
3	In 2 Ground
4	In 3 Ground
5	GC Start N/O
6	GC Start N/C
7	Data Start Com
8	Auxiliary N/O
9	Auxiliary N/C
14	GC Ready Input
18	GC Start Com
19	Data Start N/O
20	Data Start N/C
21	Auxiliary Com
22	Spare Out N/O
23	Spare Out N/C
24	Ground
25	5VDC Out

6.0 REMOTE CONTROL (RS 232 SERIAL LINK)

The AS120 can be Remote Controlled through its Serial Interface Link, labeled "RS 232." This may be accomplished in either the "Remote or Local" Mode (this is programmed in the Methods). Commands may be received from either the Host PC. The AS120 is started by a signal generated by either the GC Ready signal or the Host PC.

The AS120 requires a 9 conductor cable to Receive, Transmit and Ground, fed straight through. If you do not have a cable, consult the factory. Plug the cable into the 9 position "D" connector on the rear of the AS120 labeled "RS 232" and then into the 9 pin serial connector on the rear of your PC.

6.1 DATA FORMAT

The Data Transmission from the host to the AS120 and from the AS120 to the host use the same data format. Communications are RS 232 as follows: 9600 baud, no parity, 8 bits, 1 stop bit and no handshaking.

6.2 COMMAND SUMMARY FROM HOST TO AS120

All Commands require 3 bytes, followed by a CR. Shorter commands should be padded with a CR to make them 4 bytes long, total.

"Q" command gets the AS120's attention (AS120 will stop running, and echo ok). Note that parameters updated with the MWn command will not take effect until the batch is started the next time.

Attempts to communicate with the AS120 while it is performing a manually initiated rinse will be ignored.

After the AS120 has responded to the Q command, the following commands are available:

NOTE: For commands with a method parameter, the examples use method 1. In the Mode After column, remote indicates the PC Host stays in control after the command is executed. Local means control has transferred back to the AS120.

<u>Command</u>	<u>Example</u>	<u>Mode After</u>	<u>Description</u>
MWn	77 87 01 13	Remote	Program method parameters (requires parameter string to follow)
SW	83 87 13 13	Remote	Program system parameters (requires parameter string to follow)
Rn	82 01 13 13	Remote	Start running method n
V0	86 48 13 13	Local	Turn off Verbose mode, no status message will be sent while AS120 is running
V1	86 49 13 13	Local	Turn on verbose mode, "PC Host active" LCD message changes to "Linked to Host"
MRn	77 82 01 13	Remote	Request Method parameters for method n
SR	87 82 13 13	Remote	Request System parameters
ST	87 84 13 13	Local	Request current status. One of the following series of two binary bytes, followed by CR will be sent: 1-10, 1-12 0-Running method, sample 0, 101- Manual mode, 0 102- Idle
GO	71 79 13 13	Local	Resume running is a method was interrupted, or return to local control if AS120 was not running.
GN	71 78 13 13	Local	Resume running at beginning of current cycle, after dumping syringe contents into waste, or return to local control
AB	65 66 13 13	Local	Abort current method, dump syringe and return to local control
Q	81 13 13 13	Remote	Echo "ok", useful for synchronizing with AS120, works to establish communications initially, and does no harm if communication are already working
<Esc>	27 13 13 13	Remote	Return AS120 to local keypad control, and continue method if one was interrupted (Same effect as GO)

For both Rn and Gn, the AS120 will transmit "Run Complete" CR when the method is complete. The system will wait for a keypad press, or any character over the serial link, and then return control to the AS120. A remote program will have to re-send Q to get back to control. All commands should be terminated with a Carriage Return (binary 13). All method #'s (n) should be binary, not ASCII value, i.e. 77 82 49 01 for MR1, except the Rn command, in which the n can be either the ASCII equivalent, or the binary value, i.e. 82 01 13 13 and 82 49 13 13 will both start Run 1.

6.3 AS120 COMMAND DETAILS

To program a method remotely from a host PC:

1. PC sends a Q to get sampler's attention
2. PC waits for ok, indicating AS120 is ready
3. PC sends "MWn" CR, to indicate method is to be programmed.
4. PC waits for ok CR, indicating the AS120 is ready
5. PC sends the following binary string, all word (2 byte) values:

Byte#	#Bytes	Content	Allowed Range (PC code must enforce these limits)
0	2	First Vial	1-120
2	2	Last Vial	1-120
4	2	Number of repeats/sample	1-100
6	2	# of rinse ones	0-20
8	2	# of rinse twos	0-20
10	2	rinse volume	0-100%
12	2	Rinse fill rate	0-100%
14	2	Standard Volume	0-100%
16	2	Sample Volume	0-100%
18	2	Num of solvent dumps/inject	0-10
20	2	Num of solv. flushes/inject	0-100
22	2	Sample Fill Rate	0-100%
24	2	Sample dispense rate	0-100%
26	2	Syringe Offset	0-20%
28	2	Prefill Air	0-100%
30	2	MidFill Air	0-100%
32	2	Postfill Air	0-100%
34	2	Start delay (seconds)	0-999
36	2	Pause before sample dispense	0-600
38	2	Pause after sample dispense	0-600
40	2	Target	0-3 (0-A, 1-B, 2A& B3- A+B)
42	2	Pause after sample fill	0-60
44	2	Operation mode	0-1 (0-continuous 1- GC trigger)
46	2	Cycle time (secs) when Opmode=0	0-999
48	2	Seconds till auxiliary relay closure	0-999(Clock starts at cycle start)
50	2	Link to method # on method completion	0-10 0 for no link
52	1	CR	

6. AS120 will respond with ok
7. Host sends Rn to start method n. AS120 will respond by starting method. For example, sending R1 (binary 82 49 13 13) starts method 1, whether or not it was just programmed. To start AS120 in Verbose mode, where status reports are sent while running, send the V (86 49 13 13) command first.

6.4 PROGRAM SYSTEM PARAMETERS

1. PC sends a Q to get sampler's attention
2. PC waits for ok, indicating AS120 is ready
3. PC sends "SW" (binary 83 87) to indicate system parameters are to be programmed.
4. PC sends the following binary string:

Byte#	#Bytes	Content	Allowed Range (PC code must enforce these limits)
0	2	Right/Left Final Speed	0-999
2	2	Forward/Back Speed	0-999
4	2	Vertical Final Speed	0-999
6	2	Plunger Final Speed	0-999
8	2	Plunger Initial Rate	0-999
10	1	Plunger Acceleration	0-255
11	1	Normal Acceleration	0-255
12	1	Vertical Acceleration	0-255
13	1	Tray Size	0-3 (only 0 currently supported)

6.5 SYSTEM ERRORS

Undefined commands will get a response "Undefined command"

All parameters must be in their allowed range, AS120 will not edit incoming values.

AS120 will wait for an enter key press (ASCII 13) to continue after an error.

6.6 ERROR CODES

1 undefined command

2 Invalid value

3 not yet supported

4 Current run must be aborted first

7.0 AS120 INSTALLATION OF CABLES

The following section details the AS120 I/O cable installation. Refer to the drawing for detail.

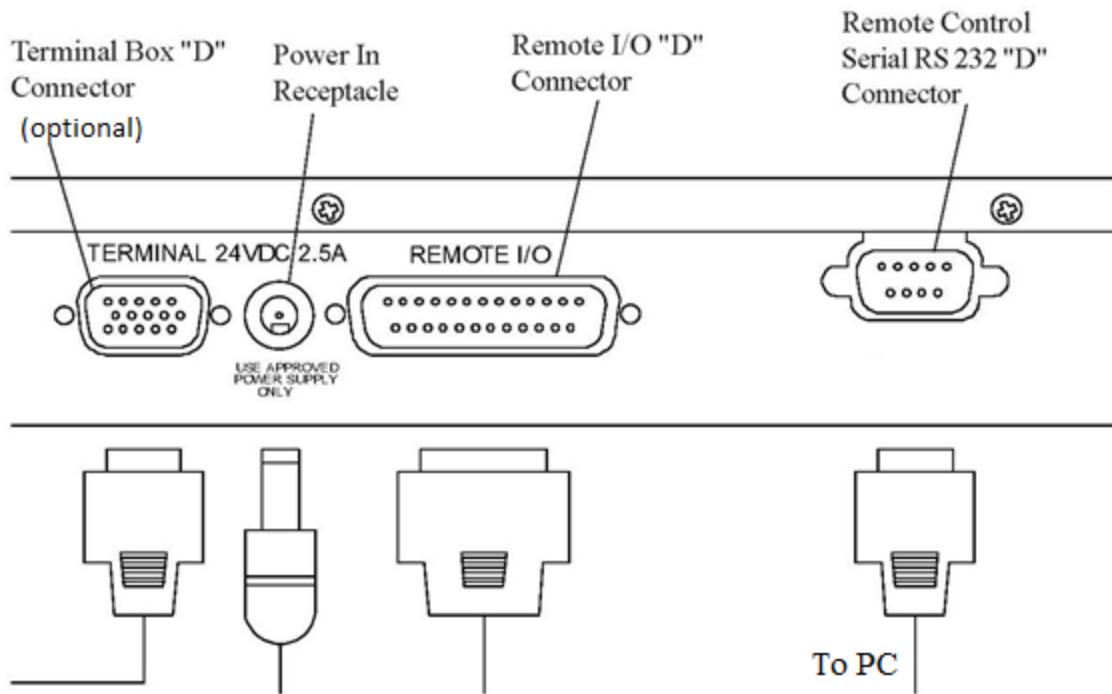
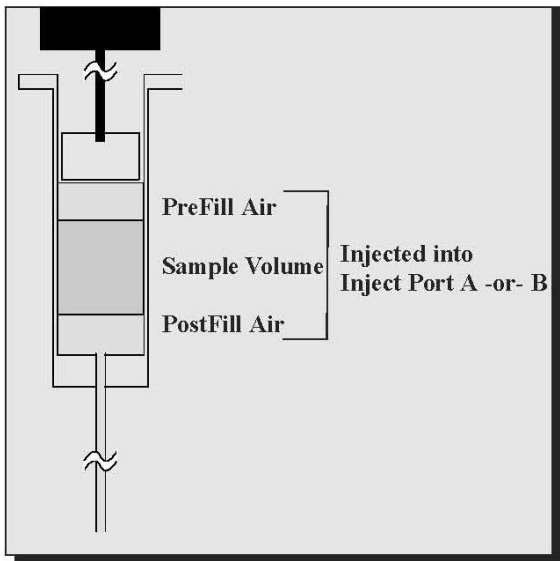
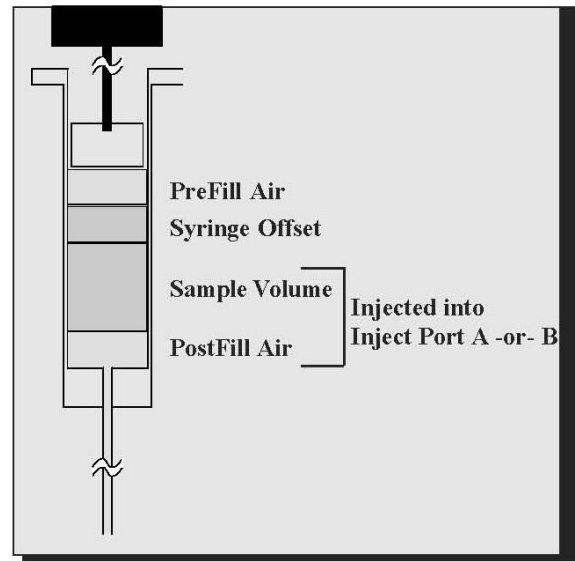


Figure 7.0

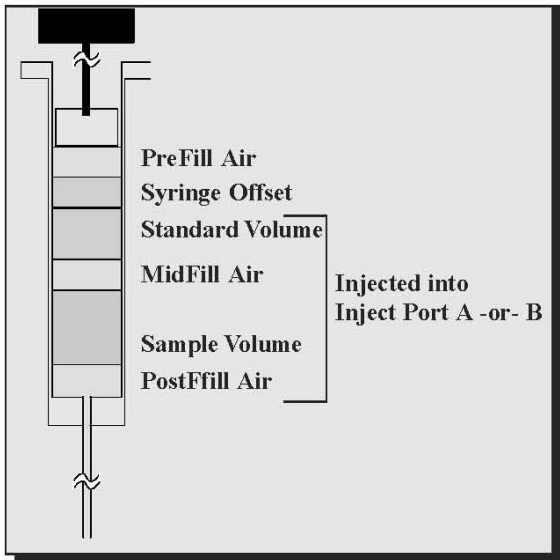
APPENDIX 1: SYRINGE OPERATION DRAWINGS



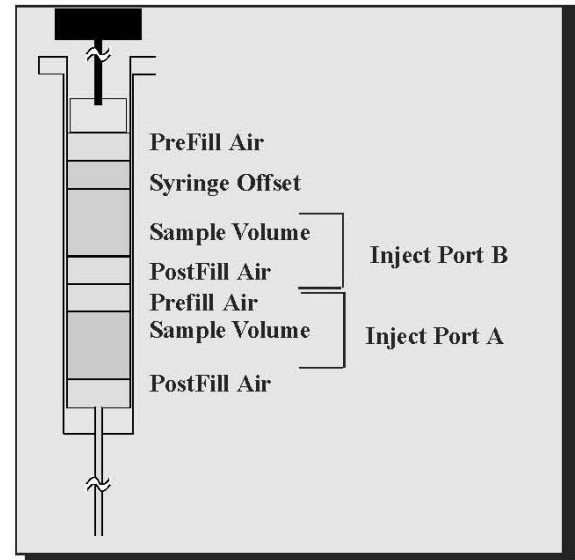
Example 1 - Standard Injection Setup



Example 2 - Syringe Offset Used



Example 3 - Using Syringe Offset and Standard Offset



Example 4 - Using Syringe Offset and Inject Mode = A&B

APPENDIX 2 TERMINAL BOX OPTION

A terminal box may be optionally purchased to control the AS120. The terminal box is connected to the rear of the AS120 as in Figure 9.0.

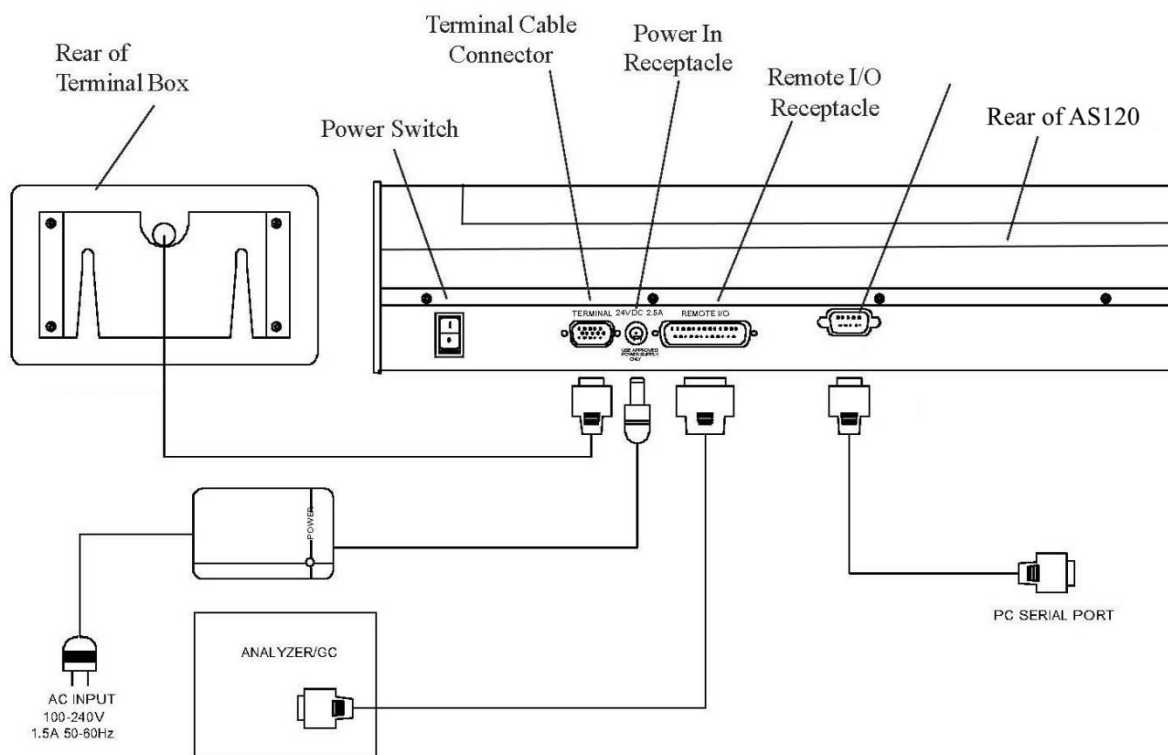


Figure A2.1 AS120 Connections with Optional Terminal Box

The keyboard, see figure A2.2, provides for a complete entry of all Setup, Method, Configuration, and Diagnostics as well as motor operations. The keys perform the following operations:

- Program (Prog) Key: Provides access to: Methods, Configure and Diagnostics menus.
- Mode Key: Selects the desired Mode of operation Automatic, Manual or Flush.
- Hold/Stop Key: Provides both a "Hold" in the current operation and/or a complete abort of the current operation and allows for an exit out of a menu.
- Enter Key: Accepts the numeric value entry and/or menu item selection. It also scrolls to the next data entry item in applicable situations.
- Arrow Keys: Allows for selection of all data, the L/R keys allow for increasing or decreasing numerical values and the U/D for scrolling within a menu or parameter.

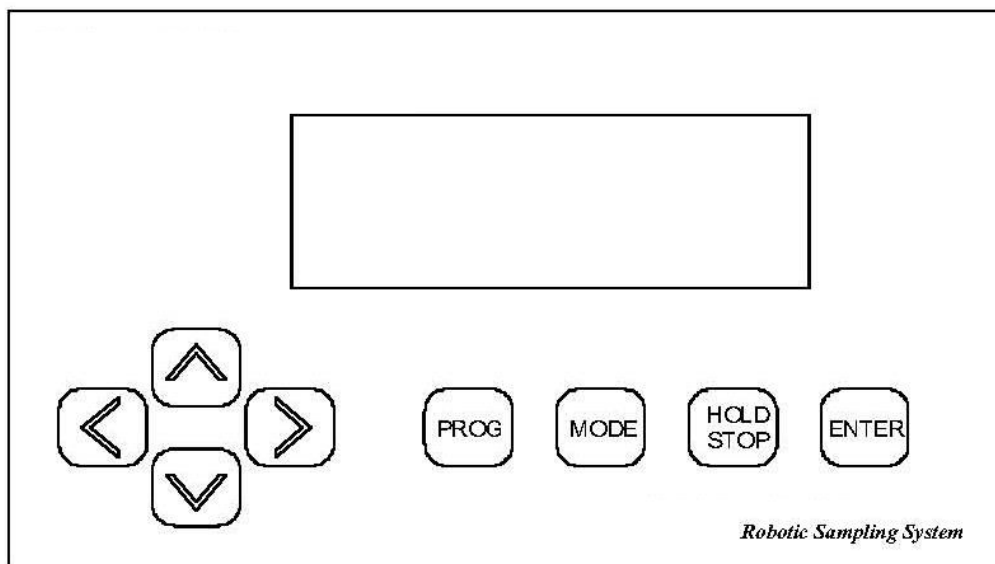


Figure A2.2: Keyboard

Prog (Program) Key

The Prog Key is used to access the AS120 Method Edit and Setup menus. The user must select either the Method Edit or Setup screen with the Up/Down arrow keys and press Enter. If Method Edit is selected, enter with the Left/Right keys, a method number from #1-10 and press the Enter Key. The display will change to the method number entered allowing for editing or review.

If the Setup menu line is selected, the next screen allows access to the "Configuration, Maintenance, Diagnostics and Motor Speeds" menus. These menus will be discussed in detail in Section 8.

To exit the "Prog" key selection, press the Hold/Stop key.

Mode Key

The mode key allows the user to begin running samples. Press the "Mode" key and the next screen will display the selection of "Auto Run" or "Manual Run." The user can select either mode with the Up/Down arrow keys. If the Auto Run is desired enter the method number, with the Left/Right arrow keys, and then press Enter. This will immediately begin the sampling sequence per the Method selected.

If the Manual mode is selected, the next screen allows the user to run a single sample or rinse the syringe. If a sample is to be run the user must enter the Method number and the sample vial number to run. The Left/Right arrow keys are used to enter this data. Press the Enter key and the sequence begins.

If Sample Rinse is selected, the next screen allows the user to enter the Method number to run the rinse syringe sequence. Press the Enter key to begin the sequence.

NOTE: The Auto Sampler will rinse the syringe according to the parameters in the Method number selected. It is advised that a Method be dedicated to the desired syringe flushing cycle and stored for future use.

Hold/Stop Key

The Pause/Stop Key performs two (2) functions:

1. Pause the current Auto Sampler operation at its completion. The sampling continues until a complete sample injection cycle is completed. The method parameters and/or the system parameters may then be edited or a priority Manual Injection may be performed. The system may then resume the AutoRun (where it paused) and complete the method.
2. Abort the current AutoRun or other function. The Syringe contents may be dumped to waste and/or immediately returned to its "Home" position and the AutoRun may not be resumed from the point it was stopped.

NOTE: The EndPause can be turned off at any point before it is actually executed by pressing the Enter Key.

Press Hold/Stop Key - One Time.

During any operation of the Auto Sampler the "Hold/Stop" Key may be pressed. Hold the key down until the "End Pause" message appears. For an operation pause, the screen will display the prompt "End Pause". The Auto Sampler will continue until the current injection cycle is completed.

At this point practically any aspect of the Auto Sampler may be updated. Methods may be edited, a Priority Manual Sample may be performed or any of the System parameters may be changed. To resume the AutoRun from the point it was paused, press the "Enter" Key.

Press Hold/Stop Key - Two Times.

Pressing the "Hold/Stop" Key the second time will immediately stop the motors. A prompt will appear on the screen to allow the syringe contents to be dumped to the waste vial before returning the syringe to its home position and reset. The method or AutoRun cannot be resumed from the position it was stopped without editing the method and changing the "First Vial Position". If the syringe contains any solution at this point, press the "Enter" Key to allow it to be dumped into the waste vial before returning the syringe to its home position.

CAUTION: Syringe contents will be emptied where the syringe is currently positioned if the "Hold/Stop" key is pressed instead of the "Enter" Key. This could cause hazardous and/or corrosive chemicals to be dispensed into the atmosphere and/or onto the Auto Sampler and Analyzer.

METHOD EDITING

The AS120 allows 10 methods to be saved into memory. To edit a method, press the "Prog" key, select "Method Edit", enter the method number and press Enter. The next menu will allow entry into the selected Method. Press the Enter key and the parameters will be displayed. The Method parameters will then cycle through with each touch of the Enter key or Up\Down arrow, allowing changes to be made. The method editing may be exited at any time by pressing "Prog" or the Hold\Stop key. If the Enter key has been pressed changes will automatically be saved. If an invalid entry is made, the system will not save the entry. Refer to Section 4.2 for the parameter list definitions.

APPENDIX 3: CHART TO LOG METHOD PARAMETERS
