

IS-95 Interval Sampler

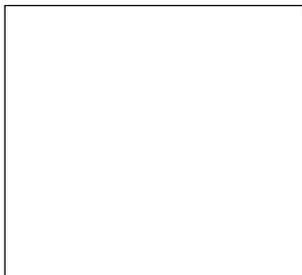
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For Software versions after 1 Jan 1996.



The IS-95 Interval Sampler has been tested
and found to comply with:

IEC 801-2:1991
IEC 801-3:1988
IEC 801-4:1990
EN 55011, Group 1, Class A:1991
EN 50082:1992

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1 INTRODUCTION

1.1 DESCRIPTION

The Spectra/Chrom® IS-95 Interval Sampler is designed to take periodic samples of flowing streams. The Interval Sampler must be used either with an electrical solenoid valve (purchased separately) or with a user supplied flow control device. It can collect up to 174 samples at intervals of up to 999 minutes and 59 seconds. The samples can be sized based on time, the number of drops or number of other pulsed events.

The maximum tube capacity is 174 tubes (12 or 13 mm diameter), 116 tubes (10 to 16 or 18 mm diameter), or 42 vials (28 mm diameter).

The Interval Sampler operates on 14 VAC supplied by a wall-mount transformer.

Special features of the IS-95 Interval Sampler include:

- Sample size based on time, number of drops, or number of volumes.
- Up to ten time windows may be programmed to control collection.
- Direct control of either a 2-Way Security Valve or a 3-Way Diverter Valve.
- On-line context-sensitive help message guide the user through programming.
- Internal heaters allow operation in cold-rooms down to 0° C.

1.2 TECHNICAL SPECIFICATIONS

Table 1-1 details the technical specifications. Tables 1-2 and 1-3 in conjunction with Figure 1-1 and 1-2 explain the controls and connectors on the front and back of the Interval Sampler.

TABLE 1-1. TECHNICAL SPECIFICATIONS

Power Requirements	115±20 VAC, 20 VA 230±40 VAC, 20 VA	Event Mark Output	Open collector outputs, 1 for tube change, 1 for rack change
Line Frequency	45 to 65 Hz	Count Input	TTL low or contact closure for 1 ms to 1 s, or drop counter. Maximum count rate is 5 per second.
Dimensions	28 cm x 12 cm x 40 cm 11" x 4.5" x 16" w x h x l	Capacity	174 • 12 or 13 mm tubes 116 • 10 to 16 mm tubes 116 • 18 mm tubes or vials 42 • 28 mm tubes or vials
Weight	5 kg (10 lb)	Operating Temperature	0° to 40° C, noncondensing
Collection Basis	6 sec to 999 min and 59 sec in 1 sec increments, 1 drop or volume to 9999 drops or volumes in 1 drop or volume increments.		
Tube Change Time	0.35 sec maximum within 12/13 mm rack		

TABLE 1-2. FRONT PANEL INDICATORS

Item in Fig. 1-1	Description	Purpose
1	LCD Display	Display prompts and results
2	Power Indicator	Lit when the Interval Sampler is on.
3	Valve Indicator	Lit when the 2-Way Security Valve is open or the 3-Way Diverter Valve is collecting.

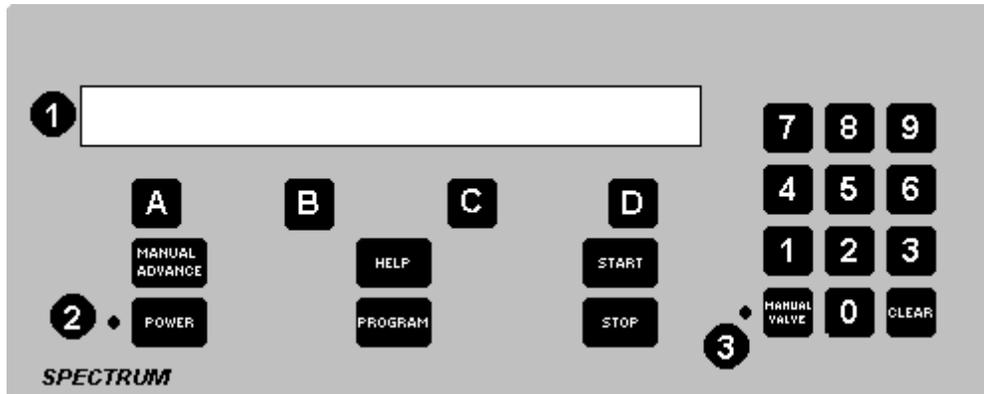


Figure 1-1. Front Panel Indicators

TABLE 1-3. REAR PANEL CONNECTORS

Item in Fig. 1-2	Name	Type	Function
1	Pump Stop	3 pin Jones	Used to shut off a pump at then end of a run.
2	Pump or Drop Count	6 pin Jones	Connection to drop counter or to pump when counting volumes. Also used to shut off pump between tubes.
3	Remote	15 pin Sub-D	Connection for remote control and event marking.
4	Connect to Ground	Thumbscrew	For grounding of the metal case of the Interval Sampler.
5	Power	5 pin DIN	14 VAC power input.
6	Valve	2 pin Jones	Connection to 2-Way Valve or 3-Way Diverter Valve.

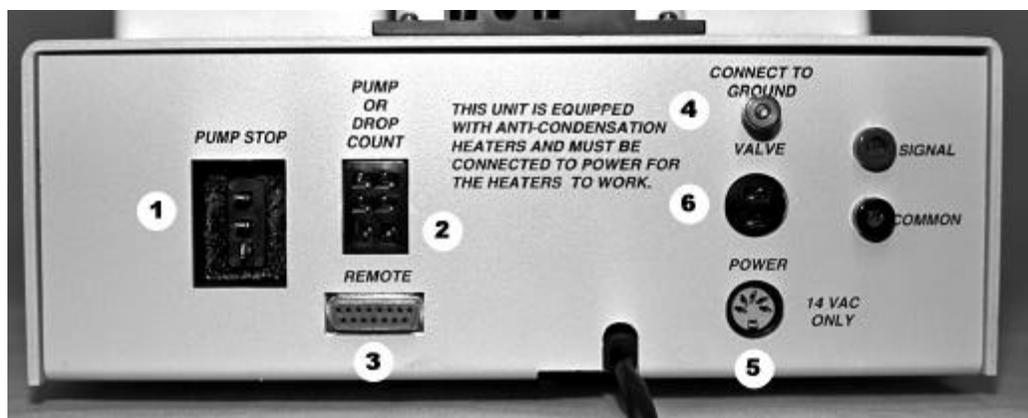


Figure 1-2. Rear Panel

2 INSTALLATION

2.1 UNPACKING

After removing the Interval Sampler and accessories from their shipping carton, examine them for signs of damage. If there is any shipping damage, file a claim with the delivering carrier immediately.

Check the contents of the shipment against the packing slip. If there are any discrepancies notify Spectrum immediately.

Save all packing materials and shipping cartons until you are sure that the instrument is working properly and all materials have been received.

2.2 SETUP

The Spectra/Chrom IS-95 is shipped without a set of tube racks. You will need to purchase these separately (see the list in Table 2-1). The first task you will need to perform is to install the racks. Simply press the racks down on the black shuttles on top of the Interval Sampler. Because the two posts on the top of the shuttles are different sized, the rack will only go on one way; the side of the racks with the small square holes goes toward the back of the Interval Sampler. Make sure the racks are completely pressed down on the shuttles. You will have an extra white rack in the set, save this in case of breakage.

Remove the plastic covering from the rack sensor and mast assembly (the assembly is permanently connected to the back of the Interval Sampler by a cable). Mount the sensor and mast assembly to its mounting block at the center rear of the case top with the knurled thumbscrew provided.

The proper position for the rack sensor assembly is shown in Figure 2-1.



Figure 2-1. Rack Sensor Position

Place the drop counter assembly on its mast. It should be placed high enough so that your tubes will be able to pass beneath it. Plug the drop counter into the six-pin PUMP or DROP COUNT socket on the back panel. A final adjustment of the drop counter will need to be made later, prior to collecting samples.

The Interval Sampler is powered by 14 VAC from a wall-mount transformer. Check the transformer supplied to be sure it is correct for your power mains. Damage to the instrument may result from connection to an inappropriate mains voltage. Connect the power cord to the POWER jack on the rear of the Interval Sampler. Do not plug the transformer into the mains at this time.

2.3 PRELIMINARY CHECKOUT

After you have completed the setup described above and before you plumb the Interval Sampler, plug the AC adapter into the mains. This should cause the Interval Sampler to immediately advance to the next tube location, the display to briefly show a copyright message, and the indicator next to the power button to light up. If this does not happen, press the **POWER** key on the front panel with power connected to the unit. If you are unable to get any response from the Interval Sampler, consult Table 5-1 for assistance or call Spectrum at (800) 459-9700 or (281) 443-2900.

If the Interval Sampler does not stop at the next tube location refer to Section 5 for help troubleshooting this problem.

After the copyright message is displayed, the Interval Sampler display should appear similar to that illustrated in Figure 2-2. Press the **POWER** key to turn the Interval Sampler off.

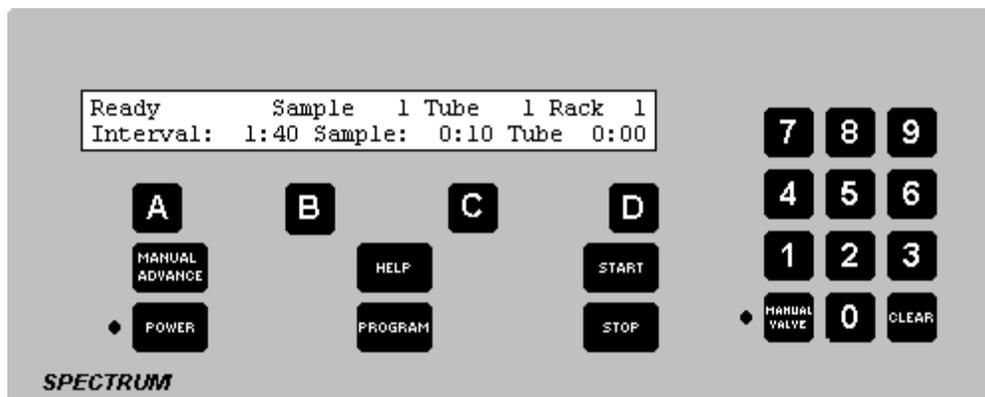


Figure 2-2. Typical Start-Up Display

2.4 PLUMBING

The interval sampler is designed to collect periodic samples from a flowing stream. These samples need to be contained within tubing at the point of connection of the sampler. In order to control the intermittent nature of the samples, an automatic solenoid valve will normally be used to control the samples although a sampling pump could be used as well.

The Interval Sampler is shipped with both a hose barb connector and a set of flangeless nuts and ferrules to accommodate size 8, 12 and 14 Spectra/Chrom tubing. The flangeless fittings will accommodate either $\frac{1}{16}$ " or $\frac{1}{8}$ " OD tubing and the hose barb will accommodate $\frac{1}{16}$ " ID tubing.

To use the Kel-F hose barb simply screw it into the drop former and push the tubing over its barbed end.

Two sets of flangeless nuts and ferrules are provided for use with the Interval Sampler. The blue nut and ferrule are for use with $\frac{1}{16}$ " OD tubing. The cream colored nut and ferrule are for use with $\frac{1}{8}$ " OD tubing.

In each case the nut is made of Delrin and the ferrule is made of Tefzel. The Tefzel ferrule has excellent resistance to most solvents, although some halogenated hydrocarbons may cause it to

The replacement Case Tops make repeated runs much easier. After one run is complete, just unsnap the Case Top, Unscrew the rack sensor, and remove an entire set of tubes at once. To start another run just snap a new Case Top into place, attach the rack sensor and begin. This eliminates the need to remove each tube or rack from the Interval Sampler separately.

2.7 RACKS

Four different rack types are available for the IS-95 Interval Sampler. These are listed in Table 2-1. All Racks come in complete sets that include a red stop rack.

2.8 REPLACEMENT FITTINGS

A kit containing a variety of replacement fittings is available as Part No. 124839. This package contains an assortment of flangeless fittings and hose barbs.

TABLE 2-1. AVAILABLE RACK SETS

Part No.	Tube Size	Tubes/Rack	Interval Sampler Capacity
124853	12 to 13 mm	6	174 tubes in 29 racks
124854	10 to 16 mm	4	116 tubes in 29 racks
124855	17 to 18 mm (minivials)	4	116 tubes in 29 racks
124856	28 to 29 mm (scintillation vials)	3	42 tubes in 14 racks

3 Operation

3.1 GENERAL INFORMATION

Many of the keys on the Interval work the same all of the time. These are:

- POWER** Alternately switches the Interval Sampler between ON and STANDBY. When ON, the indicator next to the key is illuminated.
- PROGRAM** Pressing the program key will display a menu you can use to reconfigure the Interval Sampler.
- HELP** Pressing the help key displays a context-sensitive help message and a reference for further help in Section 4 of this manual.
- MANUAL VALVE** Controls the 2-Way Safety or 3-Way Diverter Valve. The valve is set to collect when the indicator next to the key is illuminated.
- MANUAL ADVANCE** Pressing the manual advance key will advance the racks by 1 tube position. Holding the key down will cause the racks to continually advance.

Other keys have functions which are only available some of the time. These keys are:

- CLEAR** When entering a number, pressing the clear key will erase what you have entered and restore the previous value. This works only when entering a number.
- START** The start key resumes sample collection. Pressing the start key twice resets the tube and rack numbers.
- STOP** When the Interval Sampler is collecting, pressing the stop key once will pause the collection. You may resume by pressing the start key.
- A - D** The A, B, C, and D keys are "soft" keys. When a word in all capital letters is displayed above one of these keys, pressing it will select the choice associated with that word.
- 1 - 9** Used to make numeric entries. When both a greater than and a less than symbol (> <) are flashing, a numeric entry is expected. Enter the desired number and then press the **D** key.

3.2 NORMAL OPERATION

Normally the Interval Sampler is used to take periodic samples from a fluid stream. Each sample may fit in a single tube or span several tubes. Several operating parameters need to be set prior to using the sampler, these include the collection basis, the maximum sample per tube, the interval period, and the pump control.

Once these parameters have been set, operation is relatively easy. Simply hold down the **MANUAL ADVANCE** key until the last position in the red stop rack is at the filling position. Then press the **START** key to begin operation. If desired, the start signal can be supplied remotely through the remote connector on the rear of the sampler. See Table 5-2 for the pin assignments on this connector.

3.3 SAMPLER SET-UP

The sampler set-up includes such options as whether you prefer times displayed as minutes and seconds or minutes and tenths, whether to skip a tube between samples, and how the pump signal should operate. To change the sampler set-up, first press the **STOP** key twice to stop the sampler. Then press the **PROGRAM** key to display the programming menu, and then the **C** key to change the set-up.

You will then be asked to select whether you prefer to have time values displayed as minutes and second (0:00) or minutes and tenths (0.0). To have times displayed as minutes and tenths, press the **A** key. If you prefer times to be displayed as minutes and seconds, press the **B** key.

After your have selected the time units, you will be asked whether you wish to skip a tube between samples. If your samples will span more than 1 tube we recommend pressing the **A** key so that a tube will be skipped and it will be easier to identify your samples. If your samples will be small enough so that each sample will fit in a single tube, we recommend pressing the **B** key so that the maximum number of samples may be collected.

The final set-up question deals with the pump outputs from the Interval Sampler. If you will not be using the pump outputs, you may make either choice (**A** or **B**) without concern. If you are going to use one of the pump output signals to control an external pump or other device you will need to decide whether the external device should run only while sampling or continuously until the last tube is in position. If you will need the external device to operate only while the sampler is collecting a sampler press the **A** key. If you want your external device to operate continuously, stopping only when the last tube is in position, press the **B** key.

After answering the final set-up question you will return to the programming menu. You may press the **D** key to be ready to run, or one of the other “soft” keys to program some other aspect of the sampler.

3.4 SAMPLE INTERVAL

The sample interval is the time between samples. To set the sample interval, first press the **STOP** key twice to stop the sampler. Then press the **PROGRAM** key to display the programming menu, and then the **A** key to program the sample interval.

Use the numeric keys to enter the desired sampling interval. When the correct interval is displayed, press the **D** key to continue.

After the sampling interval is set, you will be asked if the sample is to be taken at the start or the end of the interval. If you select START with the **A** key, the sampler will collect a sample as soon as it is started. If you select END with the **B** key, the sampler will not collect its first sample until the interval time has expired.

After selecting either START or END you will return to the programming menu. You may press the **D** key to be ready to run, or one of the other “soft” keys to program some other aspect of the sampler.

3.5 SAMPLE

The IS-95 Interval Sampler is capable of sizing the samples based on time, number of drops, or the number of external pulses received from another instrument. It can operate under conditions where each tube holds a single sample as well as where a single sample spans several tubes. To set the sample size you will first need to select the units to use for collection (time, drop, or external pulses).

To set the sample collection units, first press the **STOP** key twice to stop the sampler. Then press the **PROGRAM** key to display the programming menu, and then the **B** key to program the sample units.

You will then be asked to select the sample units. To collect samples based on time, press the **A** key. To collect samples based on the number of drops, press the **B** key. To collect samples based on external volume pulses, press the **C** key.

When collecting by drops, the drop counter must be plugged into the PUMP OR DROP COUNT connector on the rear of the unit. The drop counter and the volume pulse input are only capable of counting at 5 drops (or pulses) per second or less. If your flow will exceed this you will need to collect based on time.

After selecting the sample collection units, you be asked to set the sample size. This is the amount which the interval sampler will collect for each sample. This will be set in the units which you previously selected, either time, drops, or volume pulses. If you are using time to size your samples, we recommend that the sample size be less than the interval time.

Use the numeric keys to enter the desired sample size and then press the **D** key to end your entry.

After you enter the sample size you will be asked to enter the maximum tube size. This is only used if your sample is to span more than 1 tube. If you enter 0 for the tube size, only 1 tube will be used for each sample. If you enter a tube amount less than the sample amount, only the tube amount will be collected in each tube and enough tubes will be used for each sample to make up the sample volume.

After the desired tube size is entered, press the **D** key to end your entry. You will then be returned to the programming menu. You may press the **D** key to be ready to run, or one of the other “soft” keys to program some other aspect of the sampler.

3.6 COLLECTING SAMPLES

After you have configured the sampler for your application, as described in Sections 3.3 - 3.5, all that remains is for you to start the sampler.

If the sampler is not already on, turn it on by pressing and releasing the **POWER** key. After the copyright message has been displayed, press and hold the **MANUAL ADVANCE** key until the last position in the red rack is in position to be filled and the racks stop advancing. Then press the **START** key to begin a run.

While a run is in progress, the following keys may be used to modify the run:

Pressing the **STOP** key once will pause the run. The interval timer will stop running and the valve will return to the non-collect position. Pressing the **START** key will resume the run where it was interrupted.

Pressing the **STOP** key a second time (while the run is paused) will stop the run. You will then only be able to restart it from the beginning.

Pressing the **START** key while running but while a sample is not being taken will cause another sample to be taken.

The **MANUAL VALVE** key may be used to pause a sample. Pressing the **MANUAL VALVE** key while the valve is collecting will close the valve and cause the sample and tube counts to pause. Pressing the **MANUAL VALVE** key a second time will restore operation.

4 HELP MESSAGES

4.1 INTRODUCTION

When the **HELP** key is pressed, the display will first show a 2 digit number and then a brief help message. The number allows you to look up the message in this section of the manual. Simply precede the number by "4." and look up the information here. More complete information is provided here than could be shown on the Interval Sampler display.

4.11

The Spectra/Chrom[®] IS-95 Interval Sampler contains an internal nickel-cadmium battery which provides power to allow the Interval Sampler to retain information while it is unplugged. This battery is continually charged while the Interval Sampler is plugged in.

When new, this battery should provide power for up to 1 month (depending storage conditions). If the Interval Sampler is left unplugged for an excessive period of time, this message will be displayed when the Interval Sampler is first turned on. You must press the **A** key to advance past this message.

4.12

The size of the collected samples may be set in terms of the number of drops to collect, the amount of time for which to collect, or the number pumped volumes to collect.

To size samples based on the number of drops, the drop counter must be plugged in to the back of the Interval Sampler. It connects to the PUMP OR DROP COUNT connector (item 2 in Figure 1-2). The drop counter pump can only count 5 drops per second or less. If you will be pumping faster than 5 drops per second you will only be able to size samples by time or volumes. Press the **A** key to size samples by drop count.

To size samples based on the amount of time for which to collect, press the **B** key.

If you are using a Spectra/Chrom[®] MP-1, or MP-2 Pump you can collect samples based on the number of pumped volumes. To do this you must use cable 123859 to connect the pump to the PUMP OR DROP COUNT connector on the back of the Interval Sampler (item 2 in Figure 1-2), and press the **C** key to select VOLUMES. The relationship between volumes and volume pumped may be found in the DIRR for your pump or in Section 6.10 of this DIRR.

4.13

There are two common conventions for working with time in the laboratory. The Spectra/Chrom[®] IS-95 Interval Sampler is capable of working with either. If you prefer to deal with time in terms of minutes and tenths of minutes press the **A** key; if you prefer to deal with time in terms of minutes and seconds press the **B** key.

4.14

The Spectra/Chrom IS-95 Interval Sampler may be set to skip 1 tube between samples. This is useful if your samples will span more than several tubes; the empty tube will provide a marker between samples. To have the sampler skip a tube between samples, press the **A** key. To have the sampler put samples in adjacent tubes (as would be most useful when each sample fits in a single tube), press the **B** key.

4.15

The Spectra/Chrom IS-95 Interval Sampler can control an external sampling pump. Depending upon your situation, you may wish this pump to run either continuously until the last sample is collected or only while a sample is being collected. To have the pump commanded to run from the time you

push the **START** key until the collection is complete, press the **B** key. To have the pump only run during the sampling interval, press the **A** key.

4.16

The Spectra/Chrom IS-95 interval sampler can collect samples at either the start or the end of the preset interval. If you press the **A** key to collect at the START of the interval, as soon as you press the **START** key to start the run the sampler will collect its first sample. If you press the **B** key to collect at the END of the interval, the sampler will wait until an interval expires before collecting its first sample.

4.17

Use the numeric keys to enter the time between samples (the interval time) and then press the **D** key. To leave the time unchanged, just press the **D** key.

4.18

The sampler is in the “command” mode. Press the **START** key to start a run, press the **PROGRAM** key to change the sampler’s settings or press the **STOP** key to stop a run in progress.

4.19

Use the numeric keys to enter the amount to collect for each sample and then press the **D** key. To leave the amount unchanged, just press the **D** key.

4.20

Use the numeric keys to enter the amount to collect in each tube and then press the **D** key. If you wish to use a single tube for each sample you may enter either 0 or a value greater than the sample size. If you wish to have a single sample span multiple tubes you should enter the amount to collect in each tube here. To leave the amount unchanged, just press the **D** key.

4.22

The Spectra/Chrom IS-95 Interval Sampler may be set to skip 1 tube between samples. This is useful if your samples will span more than several tubes; the empty tube will provide a marker between samples. To have the sampler skip a tube between samples, press the **A** key. To have the sampler put samples in adjacent tubes (as would be most useful when each sample fits in a single tube), press the **B** key.

4.23

The size of the collected samples may be set in terms of the number of drops to collect, the amount of time for which to collect, or the number pumped volumes to collect.

To size samples based on the number of drops, the drop counter must be plugged in to the back of the Interval Sampler. It connects to the PUMP OR DROP COUNT connector (item 2 in Figure 1-2). The drop counter pump can only count 5 drops per second or less. If you will be pumping faster than 5 drops per second you will only be able to size samples by time or volumes. Press the **A** key to size samples by drop count.

To size samples based on the amount of time for which to collect, press the **B** key.

If you are using a Spectra/Chrom[®] MP-1, or MP-2 Pump you can collect samples based on the number of pumped volumes. To do this you must use cable 123859 to connect the pump to the PUMP OR DROP COUNT connector on the back of the Interval Sampler (item 2 in Figure 1-2), and press the **C** key to select VOLUMES. The relationship between volumes and volume pumped may be found in the DIRR for your pump or in Section 6.10 of this DIRR.

4.24

This is the menu “page” for programming. Press the **A** key to change the interval time and the pump control. Press the **B** key to change the sample units and size. Press the **C** key to change the various setup parameters (time units and whether to skip a tube). Press the **D** key when you are done making changes,

4.25

There are two common conventions for working with time in the laboratory. The Spectra/Chrom[®] IS-95 Interval Sampler is capable of working with either. If you prefer to deal with time in terms of minutes and tenths of minutes press the **A** key; if you prefer to deal with time in terms of minutes and seconds press the **B** key.

5 MAINTENANCE

5.1 INTRODUCTION

This section describes the maintenance procedures for the IS-95 Interval Sampler. These procedures can be performed by any person with proficiency in instrument maintenance or by an electronic technician. They do not require the use of specialized equipment. Additional information can be obtained from the Spectrum Technical Service Department at (800) 459-9700.

5.2 CASE TOP REMOVAL

To remove the case top and gain access to the interior of the instrument:

1. Unplug the instrument from the power outlet and disconnect all other wiring from the instrument.
2. Detach the rack sensor from the case top by removing its thumbscrew and sliding the sensor back out of its mounting block.
3. Unlatch the draw catches by pulling outward at their upper edge, then pushing them down-and-out. Lift the case top straight up from the base.
4. If necessary, remove the drip shield by lifting the back of the pan first and then pulling it straight up until clear.

5.3 CLEANING SENSOR WINDOW

If the window for the rack sensor becomes dirty, the Interval Sampler may skip tubes or stop only intermittently. If the window becomes dirty it may be cleaned with the following procedure:

1. Remove the rack sensor drip shield by gently pulling one end of the drip shield over the "ears" on the sensor body. Do not deform the drip shield.
2. Use a clean cotton swab dampened with isopropyl alcohol and gently clean the sensor. Hardened deposits may need repeated swabbing. Do not immerse the sensor assembly.
3. Gently dry the window with another clean cotton swab.
4. Replace the rack sensor drip shield by placing one end on the appropriate ear of the sensor body and gently prying the opposite end over its ear.

5.4 SENSOR ASSEMBLY REPLACEMENT

If cleaning the sensor window does not correct a sensor problem, the entire assembly will need to be replaced. To replace the sensor assembly:

1. Remove the case top and internal drip shield as described in Section 5.2.
2. Disconnect the sensor plug (Figure 5-4) from the circuit board.
3. Cut the wire tie which secures the sensor's cable and pull the cable out the back of the cabinet. Discard the old sensor assembly.
4. Feed the cable from the new sensor assembly into the cabinet and connect the plug to the circuit board. Use a wire tie to secure the sensor cable to the cabinet.
5. Calibrate the new sensor as described in Section 5.7

5. Replace the internal drip shield and the case top.

5.5 SHUTTLE CLEANING

If the black shuttles become jammed, it is probably due to their becoming clogged with foreign material.

If the shuttles become jammed, you should remove the case top, as described in Section 5.2, and wash it in warm water and detergent while agitating the shuttles. Then rinse it with warm water. This will probably clear the jam.

If washing the case top does not rectify the problem, the shuttles will need to be removed to clean them individually and replace any which may have broken.

To remove the shuttles:

1. If possible, advance the test tube racks so that the third test tube of any rack is in position to be filled.
2. Remove the case top from the Interval Sampler, as described in Section 5.2, and place it on a flat work surface.
3. Remove all of the test tube racks.
4. Remove the 4 screws from the top of the center island cover and remove the cover.
5. Remove the necessary shuttles.
NOTE: If you were unable to get the third test tube under the fill position in step 1 or you have disturbed the position of the two end shuttles in the narrow passages at the ends of the center island you will need to perform the shuttle timing procedure described in Section 5.6 below.
6. If you have not disturbed the end shuttles, replace the shuttles and reassemble the Interval Sampler. Be sure that all 29 shuttles are present and that the small diameter posts are all oriented the same direction.

5.6 SHUTTLE TIMING PROCEDURE

If one or more shuttles becomes broken it may be necessary to reset the shuttle timing. Follow the procedure in Section 5.5 to remove all of the shuttles. Be sure the shuttles and the shuttle support pan are clean before beginning this procedure.

1. Orient the case top so that the end of the island with the timing mark cut into it is closest to you, as shown in Figure 5-1.

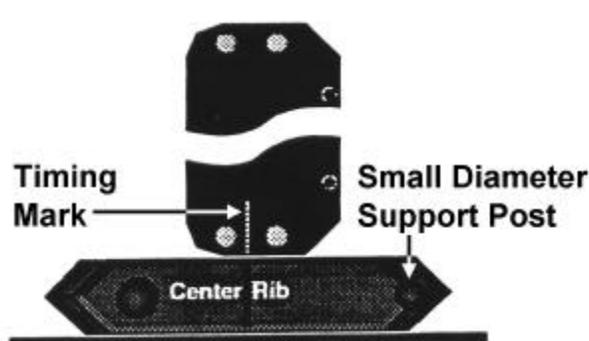


Figure 5-1. Initial Shuttle Position for Shuttle Timing Procedure

2. Place one shuttle to the left of the center island with its small diameter post to the right. Push the shuttle into the near tunnel until the center rib aligns with the timing mark
3. Place a second shuttle to the right of the center island, with its small post also to the right. Then push this shuttle into the far tunnel, large post end first, until the edge aligns with the exit angle on the center island as shown in Figure 5-2.

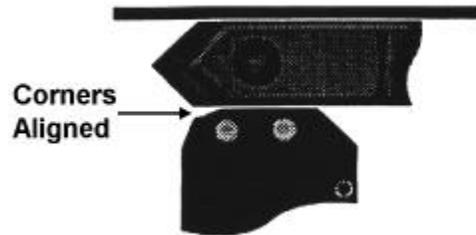


Figure 5-2. Far Tunnel Final Position for Shuttle Timing Procedure

4. Check to make sure the shuttle in the near tunnel is in its correct final position. This is shown in Figure 5-3. The two edges need only align to within 1/16".

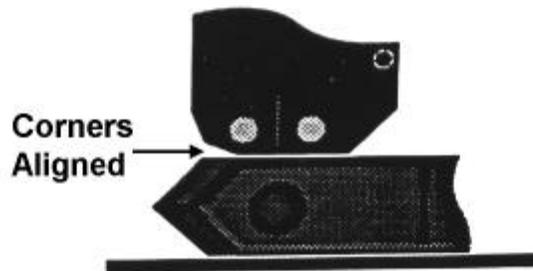


Figure 5-3. Near Tunnel Final Position for Shuttle Timing Procedure

5. If both shuttles are not aligned, repeat this procedure.
6. Without disturbing the two end shuttles, the island, 14 to the left and 13 to the right of the center island. All of the shuttles should be oriented with their small post on the right and the large post on the left.
7. Replace the center island cover and then put the case top back on the Interval Sampler.

5.7 CALIBRATING THE RACK SENSOR

If the Interval Sampler is skipping tubes, especially the final tube in each rack you may need to recalibrate the rack sensor. If you replace your rack sensor you will need to calibrate the rack sensor.

To calibrate the rack sensor:

1. Remove the case top and internal drip shield as described in Section 5.2.
2. Place the case top on the same surface as the Interval Sampler case bottom and place the rack sensor in position on the case top. You will probably have to place the case top to the rear of the case bottom.

- Use an electronic voltmeter to measure the sensor response, connect the red (+) lead to the cycle test-point on the circuit board (Figure 5-4) and the black (—) lead to the common test-point.
- Connect mains power to the Interval Sampler and turn it on. Do not drop any stray items into the Interval Sampler while power is applied.

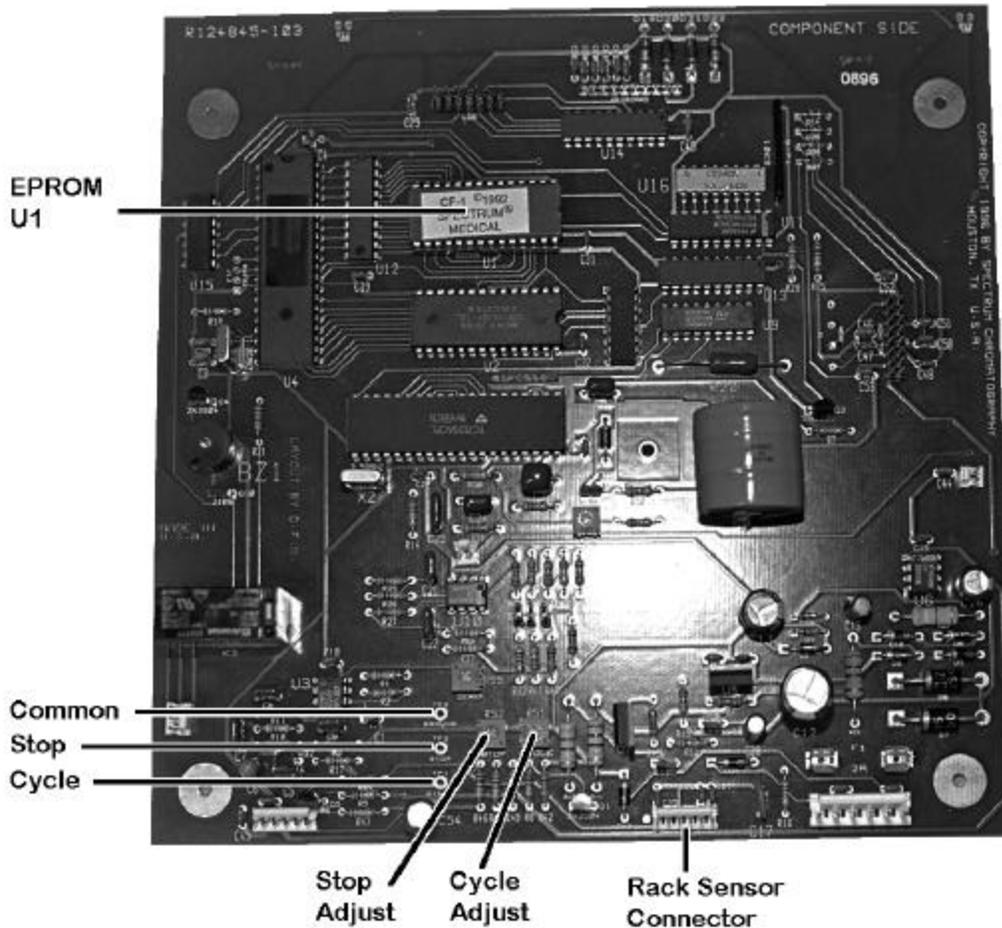


Figure 5-4. Circuit Board Layout

- Turn the drive shaft on the case top to cause the racks to move. Be careful to only move the racks in the forward (normal) direction. Attempting to move the racks backward may cause them to break. Observe the voltage at the cycle test-point as the racks move. The racks have holes in their sides which are detected by the cycle sensor. As a hole moves in front of the sensor, the voltage measured should drop to less than 1.5V; as a solid moves in front of the sensor, the voltage measured should increase to at least 3.8V. Adjust the cycle adjustment (Figure 5-4) until these levels are met. If adjustment the cycle adjustment does not allow you to meet both level requirements, you will need to either clean the sensor or replace it.

The last solid in each rack is the shortest, and thus the hardest for the sensor to see. Be sure that the sensor voltage for this solid meets the 3.8V limit.

- Turn the drive shaft on the case top until the red stop rack is in front of the sensor. Advance the rack until the final tube is in position and then further until the cycle sensor voltage begins to drop. Stop when the voltage is between 3.0V and 3.8V.
- Move the red (+) meter lead to the stop test-point.

- 8 The stop sensor should read less than 1.2. If necessary, use the stop sensor adjustment (Figure 5-4) to reduce this voltage. Advance the racks until a white rack is in position. The stop sensor voltage should now be greater than 3.8V. If the stop sensor voltage is not greater than 3.8V, use the stop sensor adjustment to make it so and repeat step 6 (be sure to reset the meter leads). If you cannot obtain both the 1.2V and 3.8V limits with a single setting you will need to either clean or replace the rack sensor.
9. Disconnect the mains power. Detach the rack sensor from the case top. Replace the drip shield (place the front end in first, with the lip protecting the display, and then press the rear into the case). Replace the case top and attach the rack sensor. When you reconnect the mains power the Interval Sampler should advance to the next tube position.

5.8 REPLACING THE EPROM

Prolonged exposure to X- or Gamma-rays may erase the EPROM in which the CF-1 program is stored. If this occurs, the EPROM will need to be replaced. Additionally, if a software upgrade becomes available it will be necessary to replace the EPROM to have access to the enhancements.

To replace the EPROM:

1. Remove the case top and internal drip shield from the Interval Sampler, as described in Section 5.2.
2. Locate U1 in Figure 5.4. Use a small screwdriver to alternately pry each end of the IC from its socket until it is free.
3. Take the new EPROM and unwrap it. Carefully remove it from its foam pad.
4. While holding the pins of the EPROM in one hand, touch the case of the Interval Sampler. This will relieve any static charge.
5. Place the new EPROM into the socket on the circuit board. Make sure all of the pins enter the socket, and that the new EPROM has the same orientation as the old one.
6. Replace the drip shield and the case top.

5.9 VOLTAGE AND FREQUENCY CHANGES

The time base used by the IS-95 Interval Sampler is derived from an internal crystal oscillator. The Interval Sampler will operate from line frequencies of 45 to 65 Hz without any internal modifications.

A variety of external transformers can be used with the IS-95 Interval Sampler. Each of these is designed to have an output voltage of 14 VAC. Use the external transformer whose input specification most nearly matches the mains power available. Please call Spectrum's Technical Service Department at (800) 459-9700 or (281) 443-2900 for assistance in selecting a replacement transformer.

5.10 SELF-TEST

When the Interval Sampler is turned on it automatically tests its internal functioning for gross errors. An additional, more comprehensive test mode is also included. To activate the test mode press and hold down the **A**, **1**, and **CLEAR** keys on the Interval Sampler immediately after turning it on.

5.11 SERVICE DEPARTMENT

If you have trouble with the Interval Sampler or need parts information contact Spectrum's Technical Service Department at (800) 459-9700, (281) 443-2900, or fax (281) 443-3100. If you write, please address your inquiry to:

Spectrum Chromatography
Service Department
PO Box 672026
Houston, TX 77267-2026 USA

Please contact the Service Department prior to returning a Interval Sampler for repair. Many problems are solved with a simple telephone or mail consultation.

5.12 SHIPPING RETURNS

Be sure that all parts and hardware are back in place before packing a return. When shipping the Interval Sampler, the mast must not be attached to the case top. Wrap the return in heavy paper or a plastic bag. Put the unit in a strong cardboard box with at least three inches of resilient packing material (shredded paper, foam, etc.) on each side of the return. Seal the package with reinforced tape. Send the return to the address given by the Technical Service Department during your consultation.

It is important that the return be well packed and shipped insured. Claims for damage during shipping must be settled between you and the carrier prior to repair.

5.13 REPLACEMENT PARTS

To minimize costs and keep prices low, Spectrum does not maintain stock of all parts used in the IS-95 Interval Sampler. Many components and assemblies are only made in sufficient quantities to satisfy a production order for Interval Samplers. Therefore, there may be some delay in providing replacement parts.

When ordering replacement parts, please first consult with a Technical Service Representative to determine exactly which items need to be replaced. The following information will be beneficial in determining the necessary part:

- Part No. of the unit
- Serial number of the unit
- Approximate date of purchase of the unit

TABLE 5-1. TECHNICAL TROUBLESHOOTING CHART

KEYBOARD	DISPLAY	MOTOR	CHECK:
No response	Blank	No movement	a. AC adapter plugged in? b. Press POWER key. c. Fuse F1. d. Regulator U11.
No response	Top line black, bottom line blank	No movement	a. EPROM U4. b. Regulator U11. c. Processor U2.
No response	Top line black bottom line blank	Runs continuously	a. EPROM U4. b. Processor U2.
Responds	Normal display	Runs continuously	a. Racks in place? b. Sensor assembly in place? c. Press the A key. d. Clean sensor assembly. e. Driver Q2. f. Replace sensor assembly.
Responds	Normal display	No movement	a. At red rack? b. External Pause input? c. Driver Q2.
Responds	Blank	Behaves Normally	a. LCD connection to circuit board.

Table 5-2 Remote Connector Pin Assignments

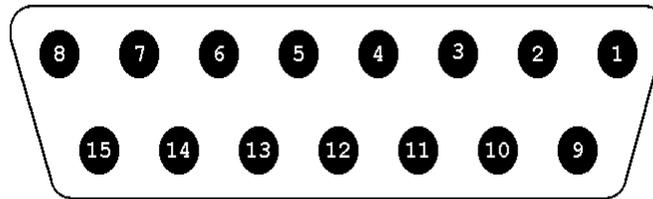


Figure 5-5. Remote Connector on Rear Panel.

Pin #	Function	Direction	Description
1	+12V	—	12V DC at 100 mA maximum. Only available when the sampler is operating.
2	Advance	Input	Open collector or contact closure to common will cause the sampler to advance 1 tube position except at the end of a run.
4	Rack Event	Output	Open collector output referenced to common. One pulse for every tube advance.
5	Tube Event	Output	Open collector output referenced to common. One pulse for every rack change.
7	Start	Input	Open collector or contact closure to common will act the same as the START key.
8	Earth	—	Connection to the sampler case and mains Earth.
9	Common	—	Signal common.
12	Valve	Output	Open collector output for switching valve. See the note following Table 5-5.
13	Pause	Input	Open collector or contact closure to common will prevent the Interval Sampler from accumulating volume or time.
14	End of Run	Output	Open collector output referenced to common. Provides a signal when collection is complete

Table 5-3 Pump or Drop Count Connector Pin Assignments

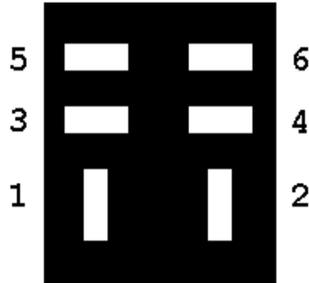


Figure 5-6. Pump or Drop Count Connector on Rear Panel.

Pin #	Function	Direction	Description
1	count	input	Drop counter input.
2	+12V supply	—	Filtered +12V supply for drop counter photocell.
3	+12V supply	—	Resistive supply for external count switch.
4	common	—	Signal common.
5	pump stop	output	Open collector output referenced to common. Active to stop a pump.
6	30mA source	—	Current source for drop counter light source.

Table 5-4 Pump Stop Connector Pin Assignments

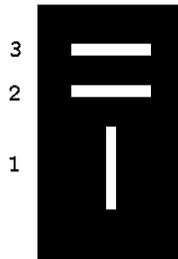


Figure 5-7. Pump Stop Connector on Rear Panel.

Pin #	Function	Direction	Description
1	N.O.	—	Normally open relay contact. Closed to stop pump.
2	N.C.	—	Normally closed relay contact. Open to stop pump.
3	Armature	—	Relay armature contact. Common to N.O. and N.C. pins.

Table 5-5 Valve Connector Pin Assignments

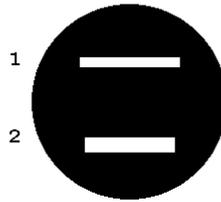


Figure 5-8. Valve Connector on Rear Panel.

Pin #	Function	Direction	Description
1	Valve	Output	Open collector output referenced to common. Active to open 2-Way security valve or to switch 3-Way valve to collect.
2	+12V DC	—	

NOTE: The valve output is specialized to drive an electric solenoid valve. The supply voltage is $12\pm 2\text{VDC}$ (250mA maximum) when the sampler is on and $1.25\pm 1\text{VDC}$ when in standby. The open collector provides full drive for about 1 second after which time a 50 ohm resistance is added. This reduces the heat generated by the valve and still provides adequate operation. The valve output may not be suitable for driving valves not provided by Spectrum and it may not be suitable for driving other apparatus.

6 ORDERING INFORMATION

Part No.	Description
142200	IS-95 Interval Sampler, 115 V (US plug) (requires either a 124848 2-Way valve or a 124849 3-Way valve purchased separately and a rack set purchased separately.)
124848	2-Way Valve
124849	3-Way Diverter Valve
124839	Replacement fittings, pkg.
124852	Replacement case top
124853	Rack Set, 12 to 13 mm tubes, 6 per rack, 174 tubes maximum
124854	Rack Set, 10 to 16 mm tubes, 4 per rack, 116 tubes maximum
124855	Rack Set, 17 to 18 mm tubes, 4 per rack, 116 tubes maximum
124856	Rack Set, 27 to 28 mm vials, 3 per rack, 42 tubes maximum
124858	Dust Cover