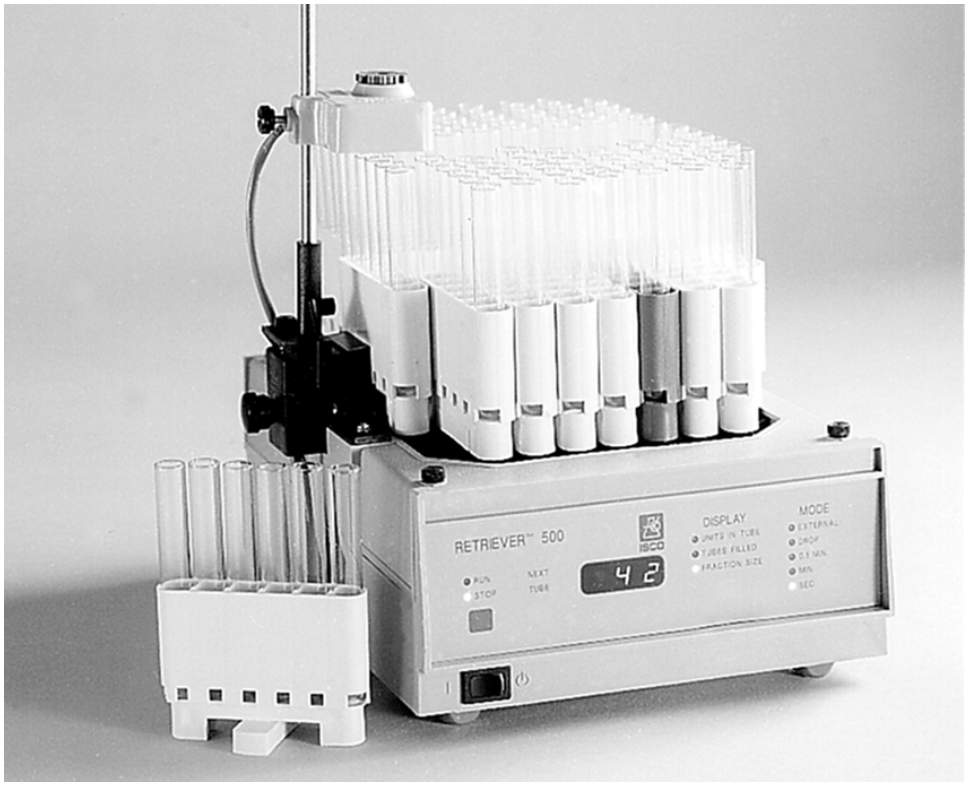
Retriever 500 Fraction Collector

Installation and Operation Guide



For Retriever 500 Series 3880-001

TELEDYNE ISCO
A Teledyne Technologies Company

Part #69-3883-031 of Assembly #60-3883-021

Revision H, April 23, 2007

Foreword

This instruction manual is designed to help you gain a thorough understanding of the operation of the equipment. Teledyne Isco recommends that you read this manual completely before placing the equipment in service.

Although Teledyne Isco designs reliability into all equipment, there is always the possibility of a malfunction. This manual may help in diagnosing and repairing the malfunction.

If the problem persists, call or e-mail the Teledyne Isco Technical Service Department for assistance. Simple difficulties can often be diagnosed over the phone.

If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by the Customer Service Department, including the use of the **Return Authorization Number** specified. **Be sure to include a note describing the malfunction.** This will aid in the prompt repair and return of the equipment.

Teledyne Isco welcomes suggestions that would improve the information presented in this manual or enhance the operation of the equipment itself.

Teledyne Isco is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.

Contact Information

Customer Service

Phone:	(800) 228-4373	(USA, Canada, Mexico)
	(402) 464-0231	(Outside North America)
Fax:	(402) 465-3022	
Email:	IscoCSR@teledyne.com	

Technical Service

Phone:	(800) 775-2965	(Analytical)
	(800) 228-4373	(Samplers and Flow Meters)
Email:	IscoService@teledyne.com	
Return equipment to:	4700 Superior Street, Lincoln, NE 68504-1398	

Other Correspondence

Mail to:	P.O. Box 82531, Lincoln, NE 68501-2531
Email:	IscoInfo@teledyne.com
Web site:	www.isco.com

Revised September 15, 2005

General Warnings

Before installing, operating, or maintaining this equipment, it is imperative that all hazards and preventive measures are fully understood. While specific hazards may vary according to location and application, take heed of the following general warnings:

⚠ WARNING

Liquids associated with this instrument may be classified as carcinogenic, biohazard, flammable, or radioactive. Should these liquids be used, it is highly recommended that this application be accomplished in an isolated environment designed for these types of materials in accordance with federal, state, and local regulatory laws, and in compliance with your company's chemical/hygiene plan in the event of a spill.

⚠ AVERTISSEMENT

Eviter de répandre des liquides dangereux. Les liquides qui sont analysés dans cet instrument peuvent être cancérigènes, hasards biologiques, inflammables, ou radioactifs. Si vous devez utiliser tels liquides, il est très recommandé que vous le faites à l'intérieur d'un environnement isolé conçu pour tels liquides. Cet environnement isolé devrait être construit selon les règlements fédéraux, provinciaux, et locaux, aussi que le plan de votre compagnie qui concerne l'évènement d'un accident avec les matières hasardeuses.

⚠ WARNING

Avoid hazardous practices! If you use this instrument in any way not specified in this manual, the protection provided by the instrument may be impaired.

⚠ AVERTISSEMENT

Éviter les usages périlleux! Si vous utilisez cet instrument d'une manière autre que celles qui sont specifiées dans ce manuel, la protection fournie de l'instrument peut être affaiblie; cela augmentera votre risque de blessure.

⚠ WARNING

If this system uses flammable organic solvents, Teledyne Isco recommends that you place this system in a well-ventilated environment, designed for these types of materials. This environment should be constructed in accordance with federal, state, and local regulations. It should also comply with your organization's plan

concerning chemical and hygiene mishaps. In all cases use good laboratory practices and standard safety procedures.

⚠ AVERTISSEMENT

Ce système peut utiliser des dissolvants organiques inflammables. Pour réduire le péril qui peut être causé par l'accumulation des vapeurs explosives, Teledyne Isco recommande que vous installez ce système dans un environnement bien-aéré qui est conçu pour les matières hasardeuses. Cet environnement devrait être construit selon les règlements fédéraux, provinciaux, et locaux. Aussi, il devrait se conformer au plan de votre organisation qui concerne les mésaventures de l'hygiène ou de chimique. En tout cas, utilisez toujours de pratiques bonnes de la laboratoire et des procédures standardes de la sûreté.

Hazard Severity Levels

This manual applies *Hazard Severity Levels* to the safety alerts, These three levels are described in the sample alerts below.

⚠ CAUTION

Cautions identify a potential hazard, which if not avoided, may result in minor or moderate injury. This category can also warn you of unsafe practices, or conditions that may cause property damage.

⚠ WARNING

Warnings identify a potentially hazardous condition, which if not avoided, could result in death or serious injury.

⚠ DANGER

DANGER – limited to the most extreme situations to identify an imminent hazard, which if not avoided, will result in death or serious injury.

Hazard Symbols

The equipment and this manual use symbols used to warn of hazards. The symbols are explained below.

Hazard Symbols	
Warnings and Cautions	
	The exclamation point within the triangle is a warning sign alerting you of important instructions in the instrument's technical reference manual.
	The lightning flash and arrowhead within the triangle is a warning sign alerting you of "dangerous voltage" inside the product.
Symboles de sécurité	
	Ce symbole signale l'existence d'instructions importantes relatives au produit dans ce manuel.
	Ce symbole signale la présence d'un danger d'électocution.
Warnungen und Vorsichtshinweise	
	Das Ausrufezeichen in Dreieck ist ein Warnzeichen, das Sie darauf aufmerksam macht, daß wichtige Anleitungen zu diesem Handbuch gehören.
	Der gepfeilte Blitz im Dreieck ist ein Warnzeichen, das Sei vor "gefährlichen Spannungen" im Inneren des Produkts warnt.
Advertencias y Precauciones	
	Esta señal le advierte sobre la importancia de las instrucciones del manual que acompañan a este producto.
	Esta señal alerta sobre la presencia de alto voltaje en el interior del producto.

FREQUENTLY ORDERED REPLACEMENT PARTS FOR THE TELEDYNE ISCO TRIS PUMP

These replacement parts are often ordered by Tris owners. All parts are pictured and identified by number and description in the replacement parts section of the rear of this manual. The part number prefix for catalog items is 68-, but the manual part number prefix is 60-. If you come across a number that is identical, except for the prefix, then it delineates the same part.

Description	Part Number
Cassette assembly (each)	**60-1614-072**
Silicone tubing, 1/8" ID, 20 foot length (6 meters)	**68-1617-017**
Silicone tubing, 1/16" ID, 20 foot length (6 meters)	**68-1617-018**
Viton tubing, 1/8" ID, 10 foot length (3 meters)	**68-1617-025**
Connectors for tubing (package of 10 with nuts and ferrules)	**68-1617-023**

Retriever 500 Fraction Collector

Table of Contents

Section 1 Introduction

Section 2 Installation

Section 3 Operating Procedures

Section 4 Maintenance and Repair

Appendix A Replacement Parts List

List of Figures

List of Tables

Retriever 500 Fraction Collector

Section 1 Introduction

1.1 Introduction

The Retriever 500 is a fraction collector designed for column liquid chromatography, HPLC, and other applications involving measured collections of fractions. Fractions can be collected on the basis of time (5 seconds to 999 minutes), counted drops (1 to 999 drops) or other counted events (1 to 999) such as pump pulses.

The maximum tube capacity is:

- 02 - 12 or 13 mm tubes
- 68 - 10-18 mm tubes or 17 mm vials
- 24 - 28 mm vials

The Retriever 500 operates on 14 Vac supplied by a transformer built into the mains outlet end of the power cord.

1.2 Technical Specifications

Table 1-1 details the instrument's technical specifications. Tables 1-2 and 1-3 and Figures 1-2 and 1-3 explain the controls and connectors on the front and rear panels of the instrument.

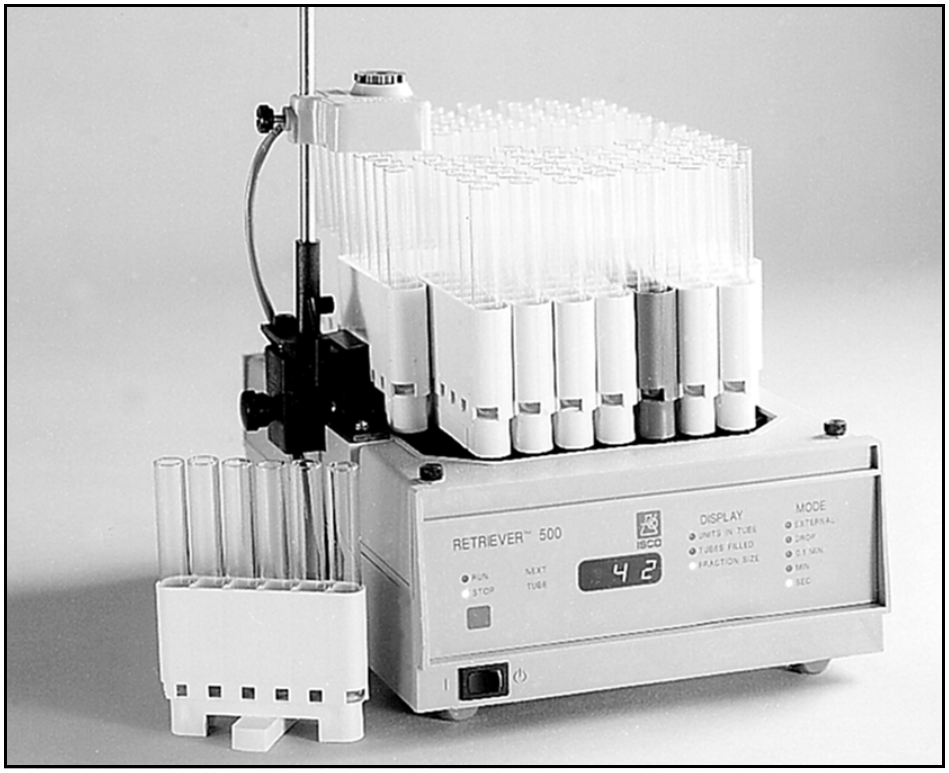


Figure 1-1 The Retriever 500

Table 1-1 Technical Specifications	
Dimensions	Height: 9.5 cm (3.7”) Width: 21.0 cm (8.3”) Depth: 29.0 cm (11.4”)
Weight	3.0 kg (6.6 lbs)
⚠ Power Mains Requirements (Use only Teledyne Isco supplied power packs)	100 ± 10 V P/N 60-1614-092 117 ± 12 V P/N 60-1614-091 234 ± 23 V P/N 60-3874-053
Power Consumption	22 VA
Line Noise	± 1.7 x nominal line voltage, 10 µsec pulses, at any phase angle (random or repetitive).
Line Frequency	50 or 60 Hz ***Note:*** *117 Vac/50Hz is not available.*
Ambient Temperature	5° - 40°C
Collection Basis	• 5 seconds to 999 seconds in 1 second increments • 0.1 minute to 99.9 minutes in 0.1 minute increments • 1 minute to 999 minutes in 1 minute increments • 1 to 999 drops in 1 drop increments • 1 to 999 volumes in 1 volume increments
Drop Counter	Maximum drop rate 7 drops/sec.
Count Input	CMOS or TTL logic “0” for 7.7 msec minimum. Maximum repetition rate 60 counts/sec. (Maximum input voltage: 18 volts)
Tube Change Input	Open collector TTL logic “0”, or contact closure. (Maximum input voltage: 18 volts)
Pause Input	Selectable; inactive, active TTL logic “1”, or active TTL logic “0”. (Maximum input voltage: 18 volts)
Event Mark Outputs	Open collector which turns on to indicate a tube change. Open collector which turns on to indicate a rack change.
Tube Capacity	102 (12 or 13 mm tubes) 68 (10-18 mm tubes or 17 mm vials) 24 (28 mm vials)
Tube Change Time	0.35 seconds with 12/13 mm rack tube-to-tube within rack; 0.57 seconds between racks
Humidity	95% relative humidity maximum
Pollution Degree	2
Installation Category	II
Maximum Altitude	2,000 meters

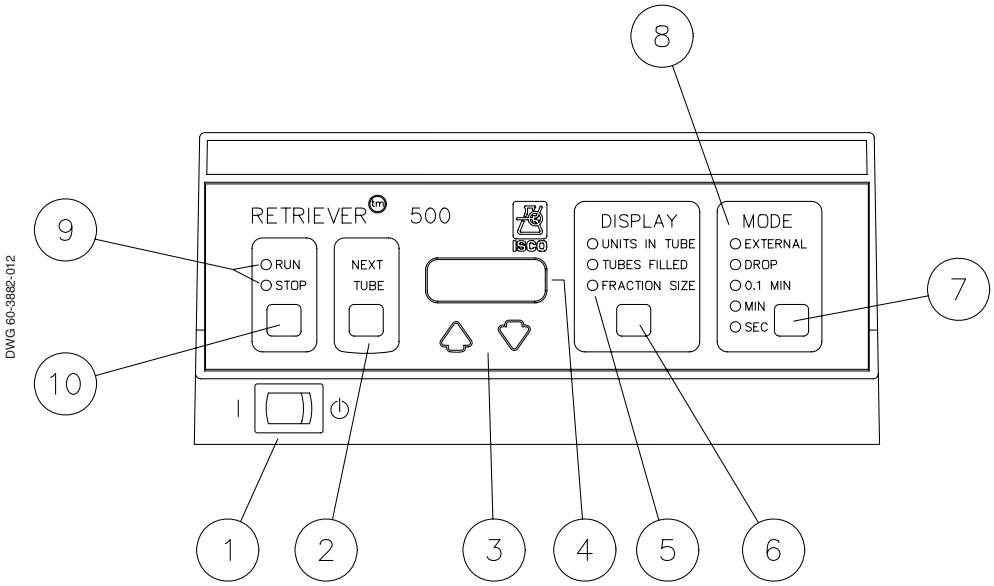


Figure 1-2 Front Panel

Table 1-2 Front Panel Controls and Indicators

Item in Figure 1-2	Control or Indicator	Description	Function
1	OPERATE/STANDBY	Rocker Switch	In the STANDBY position, power is applied to the anti-condensation heater. In the OPERATE position, power is applied to the circuitry.
2	NEXT TUBE key	Membrane Key	Advances the fraction collector and resets the fraction and tube counts.
3	UP/DOWN keys	Membrane Keys	These up and down arrow shaped keys increment and decrement the fraction size.
4	DIGITAL DISPLAY	3 Digit LED Readout	Displays one of the following: • the total number of units collected in the tube at the collection station • the total number of tubes that have completed collection • the fraction size setting
5	DISPLAY LEDs	3 LEDs	These red LEDs show which units (see item 4) are currently displayed on the 3 digit display. The display units are changed by pressing the display key (see item 6).
6	DISPLAY key	Membrane Key	While the fraction collector is running, this key designates which units will be displayed on the 3 digit LED: • units in tube • tubes filled, or • fraction size When the unit is not running, only the fraction size is displayed.

Table 1-2 Front Panel Controls and Indicators (Continued)

Item in Figure 1-2	Control or Indicator	Description	Function
7	MODE key	Membrane Key	This key selects the collection basis: • external event pulses • drop count • 0.1 minute time • minute time • second time
8	MODE LEDs	5 LEDs	These LEDs indicate the collection basis (see item 7)
9	LEDs	2 LEDs	These LEDs indicate whether the Retriever 500 is stopped or running.
10	RUN/STOP key	Membrane Key	This key alternately starts and stops the fraction collector.

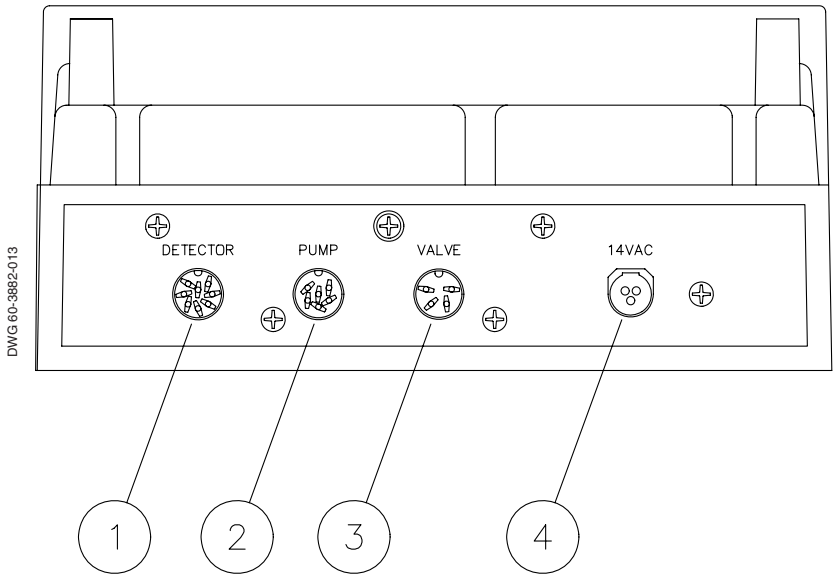


Figure 1-3 Rear Panel

Table 1-3 Rear Panel Connectors

Item in Figure 1-3	Connector	Description	Mating	Function
1	DETECTOR	8-pin circular DIN socket	Preh #76597-680	Interface connector to Teledyne Isco detector for automatic peak separation and event marking.
2	PUMP	6-pin circular DIN socket	Preh #76597-660	Interface connector to Teledyne Isco pump. Allows fraction collector to count deliveries or shut off a pump while tubes are changing and at the end of a run.
3	VALVE	4-pin circular DIN socket	Preh #76597-640	Connection to activate an (optional) valve while changing tubes, at the end of a run or if power fails.
4	14 VAC	3-pin jack	Hypertronics #D01PB306MST	14 Vac power input to fraction collector from the line voltage wall plug transformer.

Retriever 500 Fraction Collector

Section 2 Installation

2.1 Unpacking

After removing the unit and accessories from the shipping carton, examine them for signs of shipping damage. Be sure no internal parts have shaken loose in transit. 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 shortages, notify Teledyne Isco immediately. Save the packing materials and shipping carton until you are sure that all parts have been accounted for and the instrument is working satisfactorily.

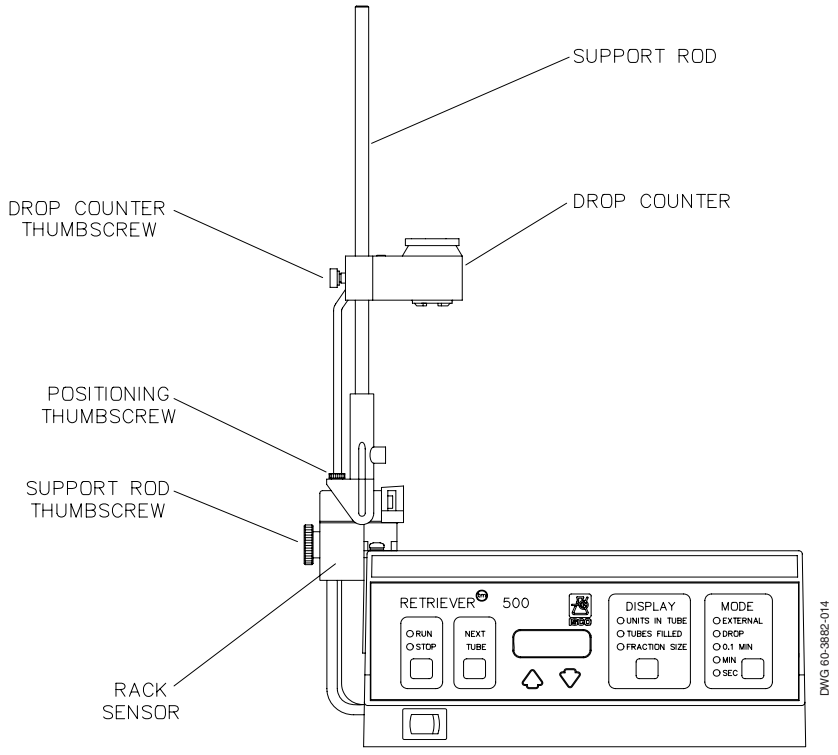


Figure 2-1 Drop Counter/Sensor Support Rod

2.2 Set Up

The Retriever 500 is shipped with the test tube racks installed. Because the test tube racks may have become loose during shipment, each rack should be pressed down firmly to secure it to its shuttle.

2.2.1 Automatic Stop

If the automatic stop feature of the Retriever is not going to be used, the red stop test tube rack should be replaced with a white test tube rack. (An extra white rack is supplied with each rack set.)

2.2.2 Support and Installation

The drop counter assembly is located on the support rod. A bracket at the base of the support rod fits into pivot holes on the rack sensor. The rack sensor has two tabs which fit into slots on the mounting block. Once the rack sensor has been placed on the mounting block, it is secured to the instrument using the support rod thumbscrew. This support rod/sensor assembly is shipped detached from the mounting block, but with the drop counter and sensor wires connected to the instrument. The support rod thumbscrew is shipped screwed in place in the mounting block.

To assemble the sensor:

1. Remove the plastic which covers the sensor, support rod, and drop counter assembly.
2. Remove the black thumbscrew from the mounting block.
3. Align the tabs on the base of the support rod with the slots in the mounting block, Figure 2-2.

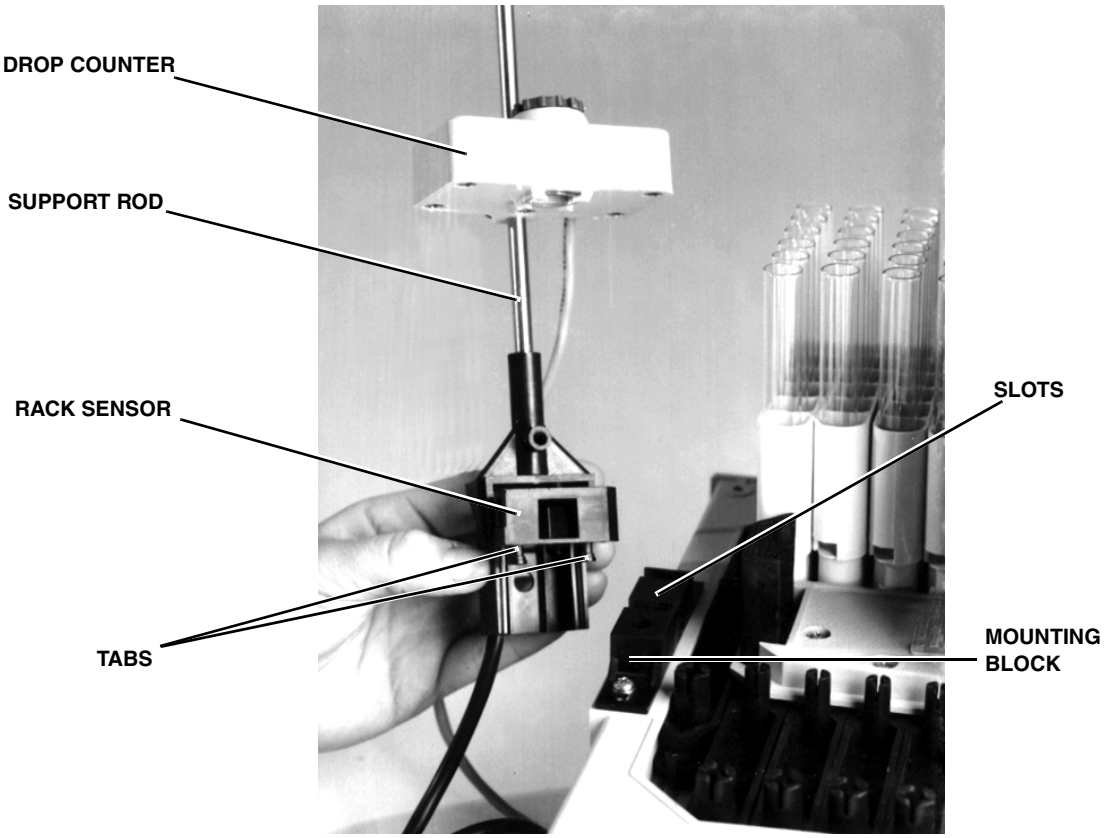


Figure 2-2 Mounting the Support Rod

4. Use the black thumbscrew to attach the support rod to the mounting block, Figure 2-3.

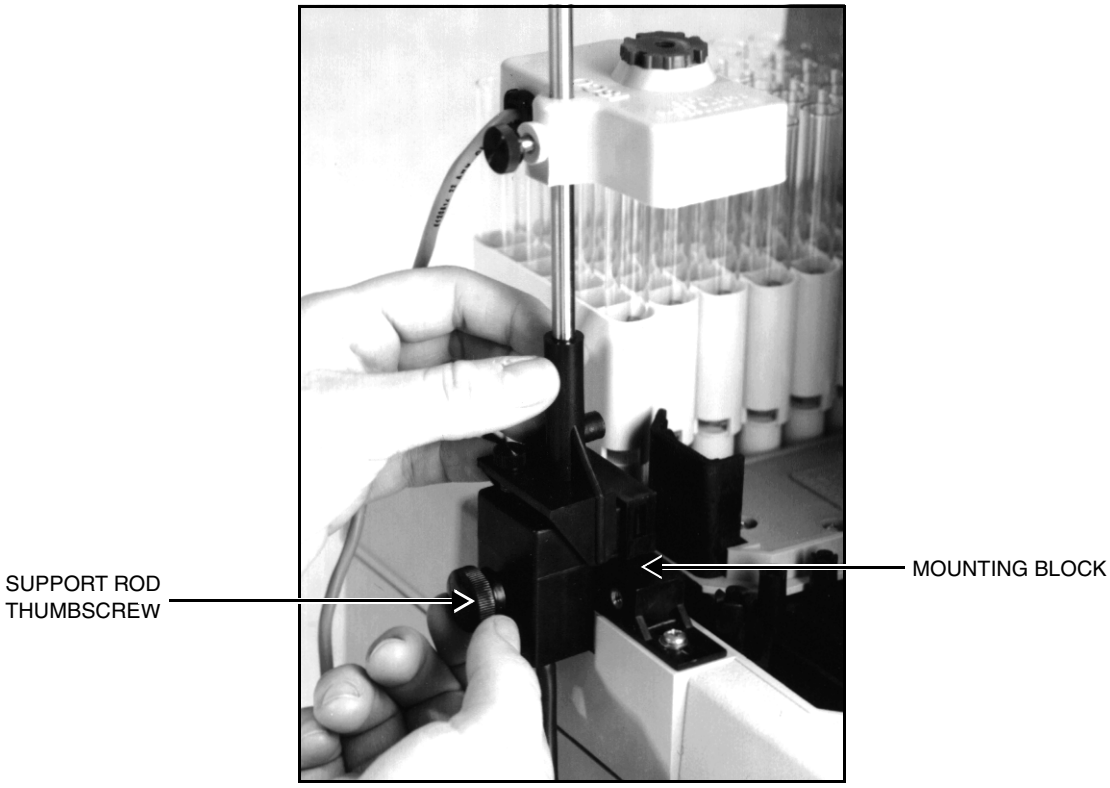


Figure 2-3 Securing the Support Rod

2.2.3 Drop Counter Adjustment

Once the support rod has been secured, the height of the drop counter should be adjusted. Use the following procedure.

To adjust the height of the drop counter:

1. Loosen the drop counter thumbscrew, Figure 2-4 on the following page.
2. Adjust the drop counter height so that appropriately sized tubes can pass under it.
3. Retighten the thumbscrew.

Note

Final adjustment of the drop counting assembly will be necessary immediately prior to initiating fraction collection, refer to section 3-7.

To connect the transformer:

1. Connect the power cord to the Retriever 500 rear panel 14 Vac jack.
2. Plug the transformer into the mains.

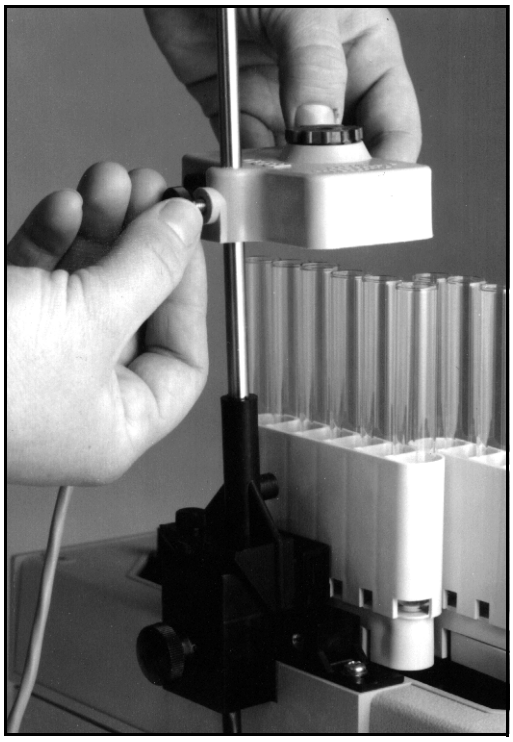


Figure 2-4 Adjusting the Drop Counter Height

2.3 Preliminary Checkout

Once the drop former has been correctly positioned and the instrument has been connected to the power mains, use the following procedure to run an initial check on the instrument.

To run an initial check:

1. Depress the left side of the rocker switch to set the Retriever 500 to ON (|). The display should come on and the STOP light should be lit. If the RUN light is lit instead, then press the RUN/STOP key once.
2. Press the MODE key until the SEC (seconds) indicator is lit (each time the MODE key is pressed the Retriever 500 will step to the next collection mode).
3. Press the UP/DOWN arrow keys until “6” is displayed on the 7-segment LED display. Your display panel should look like Figure 2-5.

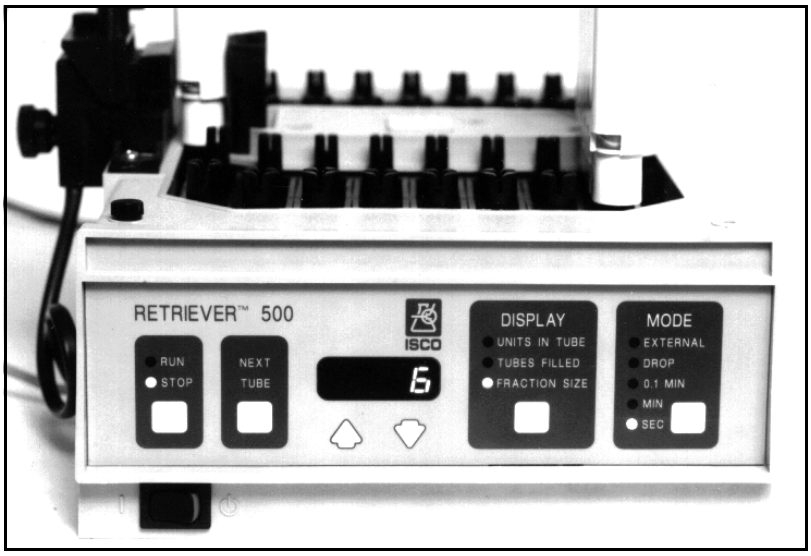


Figure 2-5 Retriever 500 Front Panel: Preliminary Checkout

4. Press the RUN/STOP key, the green RUN LED will come on and the 7-segment LED display will begin counting from 0.

The Retriever 500 should begin indexing through its tube positions at six second intervals. Check to be sure it stops automatically after the last tube position in the red rack.

If this preliminary test was unsuccessful in any way, contact the Teledyne Isco Service Department.

This page intentionally left blank.

Retriever 500 Fraction Collector

Section 3 Operating Procedures

3.1 Introduction

The Retriever 500 is extremely easy to use. The mode, display, and increments are all set using well-defined, push button keys. LEDs light to indicate the current mode and display units, and the 7 segment LED displays the selected display units.

3.2 Operation Modes

The Retriever 500 has three operating modes: external, drop, and time. The time mode is subdivided into increments of 0.1 min, min, and sec.

3.2.1 Time

The time modes use an internal electronic timer to determine collection duration. This is the preferred method for fraction collection when the effluent stream has a constant flow rate. Three time interval bases are possible with the Retriever 500:

Seconds – In this mode, the Retriever 500 will advance to the next tube when the preset seconds have elapsed. The green LED next to SEC will be lit, and no decimal point will show in the display. The possible count range is from 5 seconds to 999 seconds (16 minutes, 39 seconds) per tube.

0.1 Minutes – In this mode, the Retriever 500 will advance to the next tube in tenths of minutes increments, from 0.1 minutes to 99.9 minutes per interval. The green LED next to 0.1 MIN will be lit, and a decimal point will appear just before the last digit on the display in this mode.

Minutes – In this mode, the Retriever 500 will advance to the next tube in whole minute intervals, ranging from 1 minute to 999 minutes(16 hours, 39 minutes). The green LED next to MIN will be lit, and there will be no decimal point on the display.

3.2.2 Drop

If accurate volumes are to be collected, and the flow rate is not uniform (due to bed swelling, etc.), drop counting or other volumetric collecting is the optimal collection method. Drop counting is also recommended when collecting very small volumes, as it allows fractions to be cut to the nearest drop. When operating in a time mode the fraction sizes may vary slightly depending on whether or not the last drop falls.

> ☑ ***Note***
>
> Since drops sometimes vary in size (due to changing surface tension and other factors during elution) drop counting may not be the most accurate method for collecting larger volumes.

The drop counter will count at a maximum of 7 drops/second in the DROP mode. The maximum recommended drop rate (to ensure that no drops will fall between the collection tubes) is **2 drops/second**.

3.2.3 External

The EXTERNAL mode is used for volumetric collection in association with instruments such as a Teledyne Isco Wiz or Tris pump. Refer to sections 3.13.1 and 3.13.2.

3.2.4 Setting the Operating Mode

The Retriever 500 can advance from tube to tube based on elapsed time, accumulated drops, or by counting external signal pulses. The selected collection basis is referred to as the operating mode.

> ☑ ***Note***
>
> To select the operating mode, the unit must be stopped.

To set an operating mode:

1. If the RUN indicator is lit, press the RUN/STOP key once to stop the unit.
2. Press the MODE key on the front panel. The operating mode will change each time the MODE key is pressed. An LED will light to indicate which mode is selected.
3. Keep pressing the MODE key until the LED indicating the desired mode is lit.

You may now set the fraction size.

3.3 Setting The Fraction Size

The fraction size associated with each collection mode is stored separately. When a mode is selected, the last fraction size set for that mode will be displayed.

The fraction size is incremented by 1 when the up arrow key is pressed briefly. Pressing the up arrow key and holding it down for more than 0.5 seconds will cause the fraction size to increment by 1 (four times per second) until the units digit rolls over to 0. Then it will increment by 10 until the tens digit rolls over to 0. Then it will increment by 100 until 900 is reached, then by 10 until 990 and then by 1 until 999.

The fraction size can be decremented by 1 by pressing the down arrow key briefly. Pressing the down arrow key and holding it down for more than 0.5 seconds will cause the fraction size to decrement by 1 (four times per second) until the units digit rolls over to 0. It will then decrement by 10 until the tens digit rolls over to 0. Then it will decrement by 100 until 100 is reached, then by 10 until 10 then by 1.

3.4 To Begin and End the Collection

With the transformer plugged in and the operate standby switch ON (|), press the RUN/STOP key to start the collection. Press the RUN/STOP key again to stop the collection. Use the red stop rack as described in section 3.6 to automatically stop collection when the last tube is reached.

3.5 Setting the Display Mode

While the Retriever 500 is collecting fractions, the three digit display may be used to display the UNITS IN TUBE, TUBES FILLED or FRACTION SIZE. The default setting is UNITS IN TUBE. Every time the unit is set to run, the display will be set to UNITS IN TUBE. When the power switch is set to operate but the unit is not running (the stop LED is lit), the fraction size is displayed.

To change the display mode:

1. Press the RUN key. The display will show UNITS IN TUBE.
2. Press the DISPLAY key once and the display will show the TUBES FILLED. **NOTE**: TUBES FILLED is reset each time the Retriever 500 is set to run or the NEXT TUBE key is pressed.
3. If the DISPLAY key is pressed a second time while the unit is running, the FRACTION SIZE setting will be displayed for about 13 seconds. The display will then revert to UNITS IN TUBE. **NOTE**: This allows you to review the fraction size setting without interrupting the collection.

3.6 Stop Rack

The red stop rack is used to program the automatic shutoff feature of the Retriever 500. The last test tube position of this rack has special coding molded into the side. When this special coding is encountered, the Retriever 500 stops.

The final position of the stop rack also provides a signal to the rear panel connectors which will stop a pump or fractionator, close a valve or prevent the Retriever 500 from responding to tube advance signals from a peak separator.

To use the stop rack:

1. Determine the number of fractions desired.
2. Count back in a clockwise direction to that number.
3. Replace the white rack at that position with the red stop rack.

3.7 Drop Counter

The drop counter can be adjusted left and right by using the positioning thumbscrew shown in Figure 3-1.

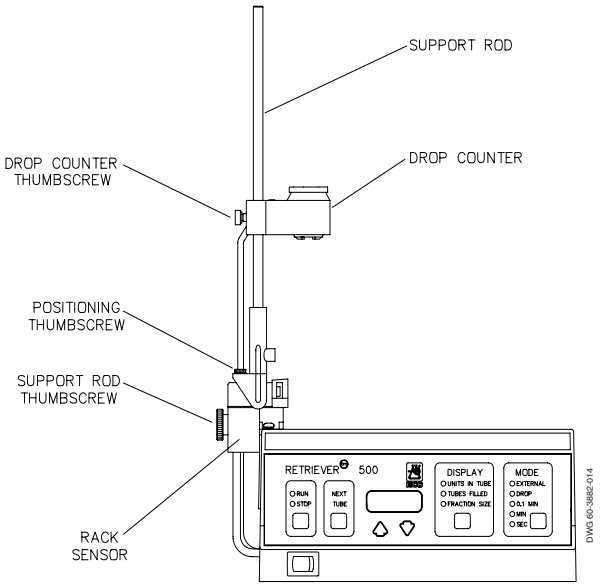


Figure 3-1 Drop Counter / Sensor Support Rod

When using 18 mm tubes in the 4-position 18 mm racks (P/N 68-3887-003), we recommend you use the tube positioner (included with the racks) to improve tube alignment and drop collection.

To install the 18 mm tube positioner:

1. Remove the drop counter from the support rod by loosening the support rod thumbscrew, Figure 3-1.
2. Install the test tube positioner on the support rod, Figure 3-2.

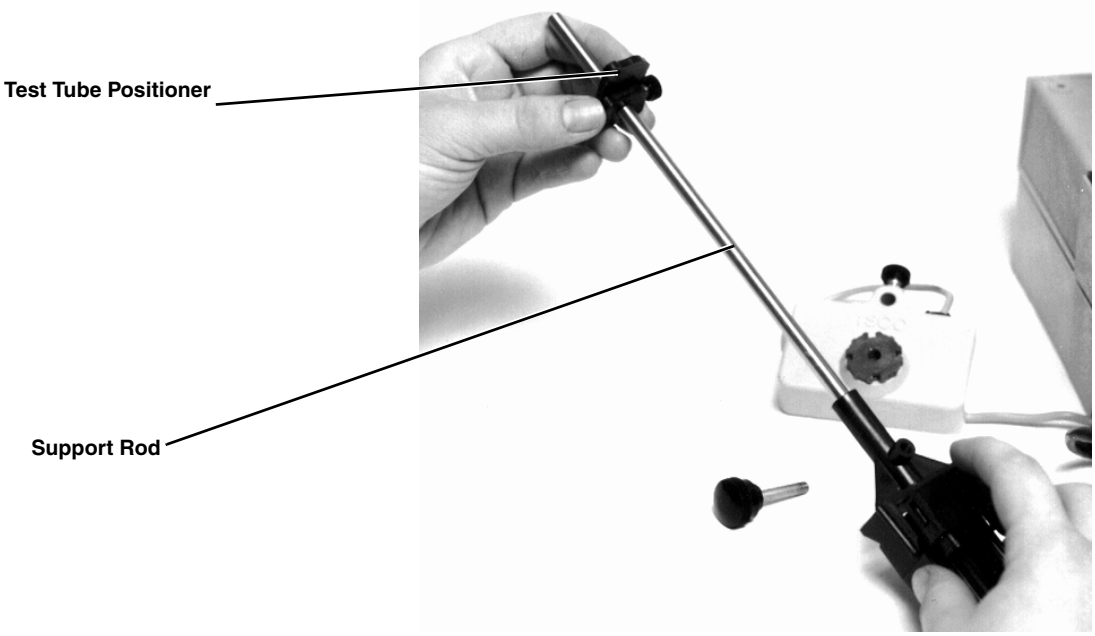


Figure 3-2 Installing the Test Tube Positioner

3. Mount the drop counter onto the support rod, and secure it approximately 2 cm (0.8 in) above the top of the test tube positioner, Figure 3-3.

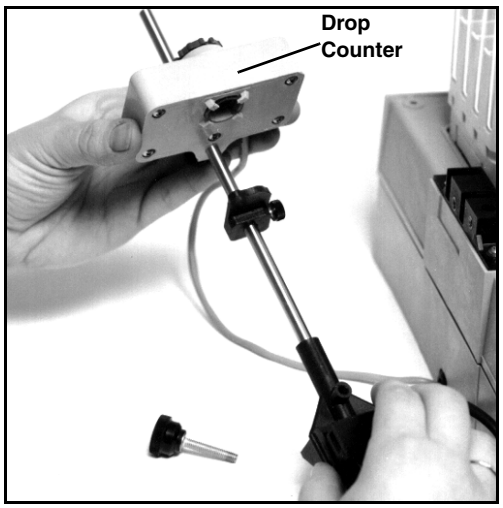


Figure 3-3 Securing the Drop Counter

4. Secure the test tube positioner approximately 1.5 cm (0.6 in) below the top of the test tube, Figure 3-4.

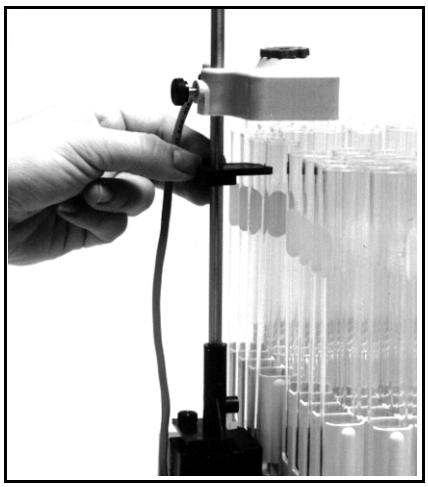


Figure 3-4 Placing the Test Tube Positioner

5. With effluent dripping into the tube, center the drop by moving the drop counter forward or backward as required.

To center the drop in the left to right axis:

1. Loosen the support rod thumbscrew to allow the test tube positioner to rest against the tube.
2. To move the drop toward the left side of the tube, slide the test tube positioner down the support rod.

To move the drop toward the right side of the tube, slide the test tube positioner up the support rod.

3. Press the NEXT TUBE key to advance the Retriever 500 through several tubes to check the alignment.
4. Adjust the positioning screw such that, when the test tube positioner is between racks (not in contact with a tube), the support rod moves a slight amount to the right.

3.8 Flow Diverter Funnel

The accessory flow diverter funnel is normally used in conjunction with the stop rack. When the last position of the stop rack has been encountered, the funnel diverts the effluent from the collection point.

To install the diverter funnel:

1. Attach the diverter funnel to the drop counter support rod (Figure 3-5) and position it so that it is to the rear of the collection point, and not disrupting the movement of the test tubes advancing underneath it.
2. Place a rubber stopper in the test tube in the last position of the red stop rack (Figure 3-6). Adjust the diverter funnel so that the rubber stopper will contact it as the stopper advances toward the collection point.
3. As the tube containing the rubber stopper moves underneath the collection point, it will position the diverter funnel under the effluent stream. The stream will then be diverted through the diverter drain hose. Some provisions should be made for collecting or disposing of the diverted waste.

> ☑ ***Note***
>
> When using 10, 12, and 13 mm test tubes it is necessary to use a wedge between the test tube stop rack and the last tube. This ensures that the flow diverter will not push the test tube to one side when the diverter is engaged.

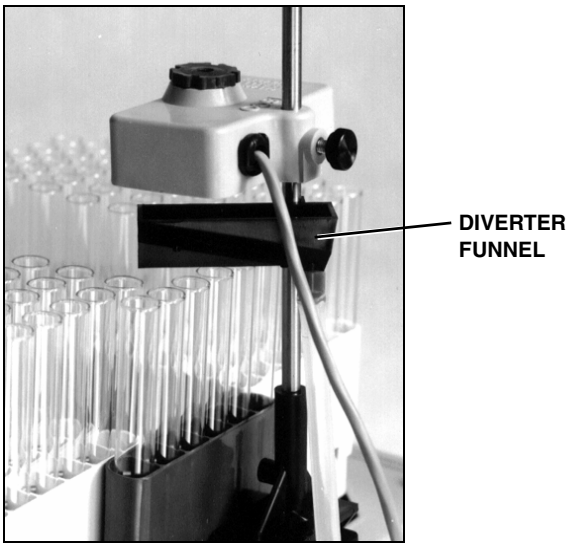


Figure 3-5 Installing the Diverter Funnel

Figure 3-6 The Rubber Stopper in the Stop Rack

3.9 Valves

Two optional solenoid-operated valves (which stop flow during tube changes and at the end of the run) are available from Teledyne Isco. These valves are made of Kel-F™ Teflon™, and are essentially inert.

Both valves stop or divert effluent flow approximately 0.8 seconds before each tube change. They will always stop or divert effluent flow at the end of a run and during a power failure. Because they help to prevent drops falling between tubes, they are particularly useful for applications in which radioactive or otherwise hazardous effluents are used. Compression fittings accept either 1/16" (1.5 mm) or 1/8" (3 mm) OD plastic tubing.

3.9.1 Security Valve

(P/N 68-3887-005) This on-off valve is recommended for operation at pressures below 30 psi. Use it in gravity flow and peristaltic pump systems.

3.9.2 Diverter Valve

(P/N 68-3887-006) Instead of shutting off flow, this three-way valve diverts it to a drain or receptacle. It is therefore suitable for higher pressure systems or applications where the flow from the column should not be terminated for some reason.

The valve connection labeled "IN" is the inlet. The connection labeled "WASTE" (normally open) goes to the drain. The connection marked "COLLECT" (normally closed) goes to the fraction collector drop counter. Effluent flowing during tube changes is diverted so that it can be collected elsewhere.

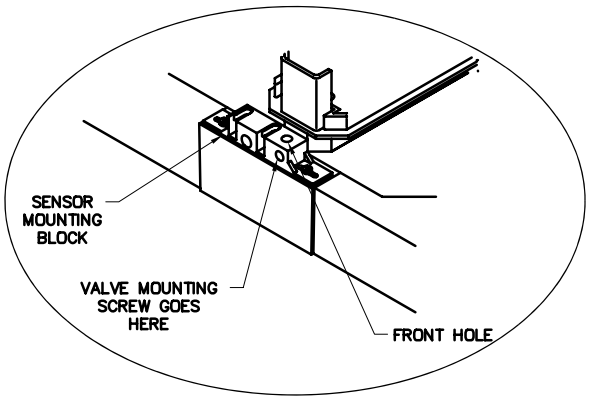
> **☑ Note**
>
> Similar valves (with different plugs and different operating voltages) are used on other Teledyne Isco fraction collectors, so it is important to be sure you have the correct valve part number when ordering or talking to a service technician.

In order to use the pause function of the diverter valve, you need to reset the jumper (selector S301). Refer to Section 4.5.2 for details. The Pause input is on pin 2 of the detector connector located at the back panel of the Retriever 500. When a Pause input signal is applied across pins 2 and 8 (circuit common) of the detector connector, the collector will pause its collection and the 3-way valve will divert to waste.

3.9.3 Installation of Valves

To connect the valves, follow the instructions on the following page.

> **☑ Note**
>
> Some people find it easier to install the valve with the support rod removed. To do this, remove the support rod thumbscrew holding the rack sensor assembly to the Retriever 500. Then remove the rack sensor/drop counter as an assembly.



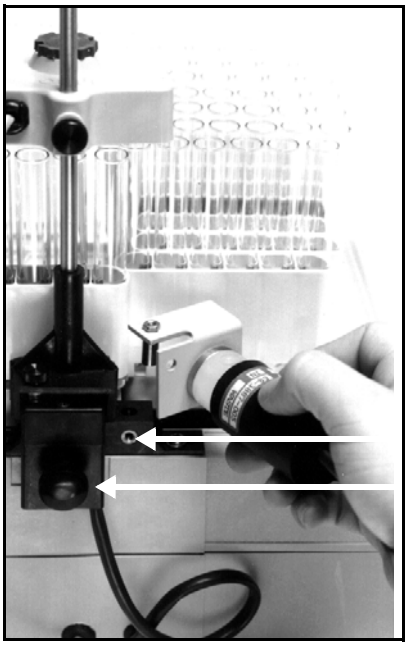


Figure 3-7 Installing the valve bracket
(Security Valve Shown)

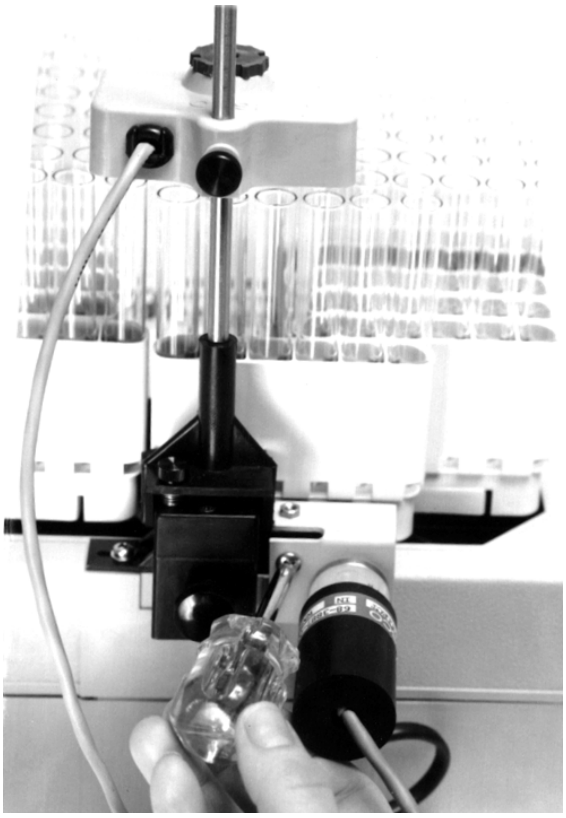


Figure 3-8 Tightening the Valve Bracket Screw
(The screw that comes with your valve may be a thumbscrew.)

1. Insert the pin of the valve bracket into the front hole on the sensor mounting block (Figure 3-7) so that the valve hangs on the left side of the Retriever 500.
2. Install the valve mounting (thumb) screw (provided with the valve) through the hole in the bracket, and tighten fully (Figure 3-8).

3. If you removed the support rod, reposition it on the sensor mounting block, and tighten the support rod thumbscrew.
4. Plug the valve cable into the 4-pin VALVE socket on the rear panel of the Retriever 500.

3.10 Connection to a Teledyne Isco Absorbance Detector

The information transmitted between the Retriever 500 and a Teledyne Isco detector consists of tube change and rack change event marks, and a tube advance signal from an optional peak separator. The tube change event marks appear as short negative blips, while the rack change event marks appear as short positive blips. No separate pen is needed to generate these marks.

The peak separator, which may be built into the detector, locates peaks by change of slope in the detector signal. At the beginning and end of each peak, the peak separator signals the Retriever 500 to change tubes; thus each peak is put into its own tubes with no dilution from preceding or succeeding baseline effluent.

> ☑ ***Note***
>
> When superimposing the event mark on the absorbance curve, set the recorder baseline a little above zero. The event mark blip hangs below the curve and cannot be made if the pen is already at zero.

3.10.1 Absorbance Detector Cable Connections

The cable required for connection between your absorbance detector and the Retriever 500 will depend on the model and series of your detector.

Detector	Cable
UA-5 (serial number of 120,000 or higher)	68-1020-216
UA-6	68-1020-217

3.11 Connection to Non-Teledyne Isco Detector or Recorder

The Teledyne Isco Retriever 500 can be connected to various non-Teledyne Isco detectors or recorders via the rear panel DETECTOR connector using an optional interface cable (P/N 68-1010-119). Table 3-1 lists the function, wire color, and pin number of the DETECTOR connector input-output signals available with the optional interface cable.

Table 3-1 Optional Interface Cable
(P/N 68-1010-119)

Pin #	Wire Color	Use
1	Yellow	Common
2	Red	Programmable PAUSE Input
3	Green	Rack Change Event Mark Output
4	Black	No Connection
5	Brown	Tube Advance Input
6	Orange	No Connection
7	Blue	Tube Change Event Mark Output
8	White	Common
Case	Bare	Chassis

The most basic signal exchange between the collector and detector is the tube advance signal. Whenever the collector advances, an open collector output signal is present on pin 7 (blue wire) relative to the circuit common (white wire). The transistor which supplies this signal is capable of switching up to 50 vdc and sinking 50 mAdc. The method of using this signal for non-Teledyne Isco instruments will vary depending on the capabilities of the detector or recorder.

For example, if the recorder used to record the analog output of the detector has a separate event mark pen, then the recorder's instruction manual should indicate what type of signal is needed from the fraction collector. The manual should also describe how this signal can be electrically connected to the recorder, e.g. the recorder has a separate event mark pen and its manual indicates that a contact closure is required. The manual will also indicate the polarity of the connections as well as its electrical characteristics. If the values for the volts being switched (e.g. 24 volts) and the current being drawn (e.g. 2.4 milliAmps) are lower than the maximum values listed for the collector, then the recorder and collector are directly compatible.

If the recorder does not have an event mark pen, the connection must be made via the detector (which in turn will superimpose a signal onto the recorder trace). The instruction manual for the detector will list the type of signal needed and the method of connection.

As a rule of thumb, if you measure 5 to 50 volts DC across the two points on the recorder or detector where the connection is to be made, then the event mark circuit of the Retriever 500 will be compatible.

3.12 Connection to a Computer or Other External Controller

The Retriever 500 can be externally controlled via the 8-pin DETECTOR connector. The detector cable (P/N 68-1010-119) has an 8-pin connector on one end which connects to the DETECTOR socket of the Retriever 500 and the other end has 9 wires (one wire is the shield to "earth"). The most common application involves remote control of fraction changes, but this cable also provides connections for sending tube and rack change event marks to the recording instrument being used. See Table 3-1.

3.13 Connection to Teledyne Isco Instruments

The Retriever 500 may be easily integrated into a pumping-fraction collection system via the rear panel connections. Various cables are available from Teledyne Isco to connect the Retriever 500 to other Teledyne Isco (and non-Teledyne Isco Instruments). Table 3-2 details the available cables.

Table 3-2 Connection Cables

Instrument	Purpose	Part Number
UA-5, V[4]	Tube change signal to Retriever 500 and event marking	60-1020-216
UA-6	Tube change signal to Retriever 500 and event marking	60-1020-217
Wiz	Volume count and pump stop	60-1020-203
Tris	Volume count and pump stop	60-1020-204
185	Volume count	60-1020-218
Computer	Remote tube advance and pause	60-1010-119

3.13.1 Connection to a Teledyne Isco Wiz Peristaltic Pump

The Retriever 500 can count pulses from a Wiz pump to determine fraction size. This microprocessor-based pump can be very accurately calibrated with a pipet or graduated cylinder. The calibrated volume is referred to as the scaled reference volume and is entered into the pump's memory. The pump transmits 100 pulses for each scaled reference volume delivered, regardless of pumping speed. Once a scaled reference volume of 100 ml or 10 ml is established, the Retriever 500 fraction size may be set directly in ml or tenths of a ml.

Example:

The desired collection volume is 13 ml per tube. Set the Retriever 500 EXTERNAL fraction size to 130. If the scaled reference volume of the Wiz is 10 ml, each pump pulse will be 1/100 of 10 ml, or 0.1 ml.

The Retriever 500 will also shut the Wiz off during tube changes and at the end of the run. To reliably stop the flow in time for the tube movement, the pump must be placed between the column and the drop former. Use a 68-1020-203 connect cable between the Retriever 500 PUMP connector and the Wiz's EXTERNAL CONTROL connector.

3.13.2 Connection to a Teledyne Isco Tris Peristaltic Pump

For volumetric counting and stopping the Tris pump during fraction collector tube changing, use a 68-1020-204 cable.

3.13.3 Connection to a Teledyne Isco Peak Separator

Connection is the same as for the UA-5 detector (section 3.10). Event marks will be superimposed on the absorbance signal.

3.14 Racks

Four rack types (Figure 3-9 and Table 3-3) are available for the Retriever 500. All racks have a stand which can be rotated to support the rack when it is removed from the Retriever 500.

Table 3-3 Available Rack Sets for the Retriever 500

Catalog No.	Tubes Accommodated	Tubes per Rack	Retriever 500 Capacity
68-3887-001	12, 13, mm OD	6	102 tubes in 17 racks
68-3887-002	10, 112, 13, 16 mm OD	4	68 tubes in 17 racks
68-3887-003	18 mm OD, 17 mm OD vials	4	68 tubes in 17 racks
68-3887-004	28 mm scintillation vials 29 mm centrifuge tubes	3	24 tubes in 8 racks

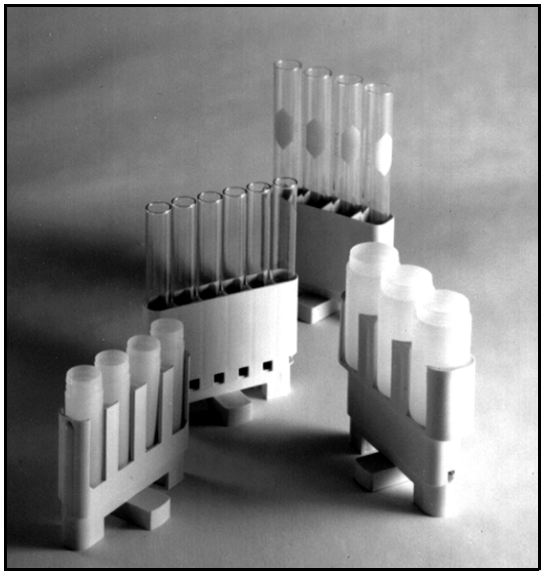


Figure 3-9 Collection Racks

Retriever 500 Fraction Collector

Section 4 Maintenance and Repair

4.1 Introduction

This section describes the maintenance procedures for the Retriever 500. Most of these procedures can be performed without the use of specialized equipment, by an electronic technician or person with some proficiency in instrument maintenance.

The procedures described here are limited to routine operating maintenance, replacement of specific parts, and troubleshooting of the Retriever 500. Should additional information be required, it can be obtained from the Teledyne Isco Service Department as described in section 4.10.

4.2 Case Top Cleaning

The Retriever 500 case top is made of polypropylene and stainless steel (except for the bearings which are sintered bronze) and contains no electronics. It is designed to be easily removed and can be immersed or soaked in water. It should be removed and washed with mild soap and warm water (max. 150°F) to remove any spilled effluent on a regular basis.

> ☑ ***Note***
>
> Some mild organic and inorganic solvents (e.g. isopropyl alcohol) can also be used to clean the Retriever. However, some aggressive solvents may attack the plastic parts and should be avoided.

Spills

When effluent is spilled onto the Retriever 500, the case top should be removed and washed, especially if the effluent is sticky or crystallizes when it dries. Contaminants in the shuttle mechanism will cause poor performance of the shuttle motion. Spills into the shuttle mechanism will NOT enter the electronics in the case bottom, so you may wait until your collection is complete before cleaning the unit. The Retriever 500 should, however, be cleaned as soon as the run is completed.

> ☑ ***Note***
>
> Spillage of solvents or buffers known to attack plastics or stainless steel should be cleaned as soon as possible.

4.2.1 Removing the case top

⚠ CAUTION

Disconnect power before removing the case top. This prevents the shuttles from advancing continuously when the rack sensor head is removed and the unit is ON and in the RUN mode.

1. Remove the support rod thumbscrew (Figure 4-1) from the left side of the unit.

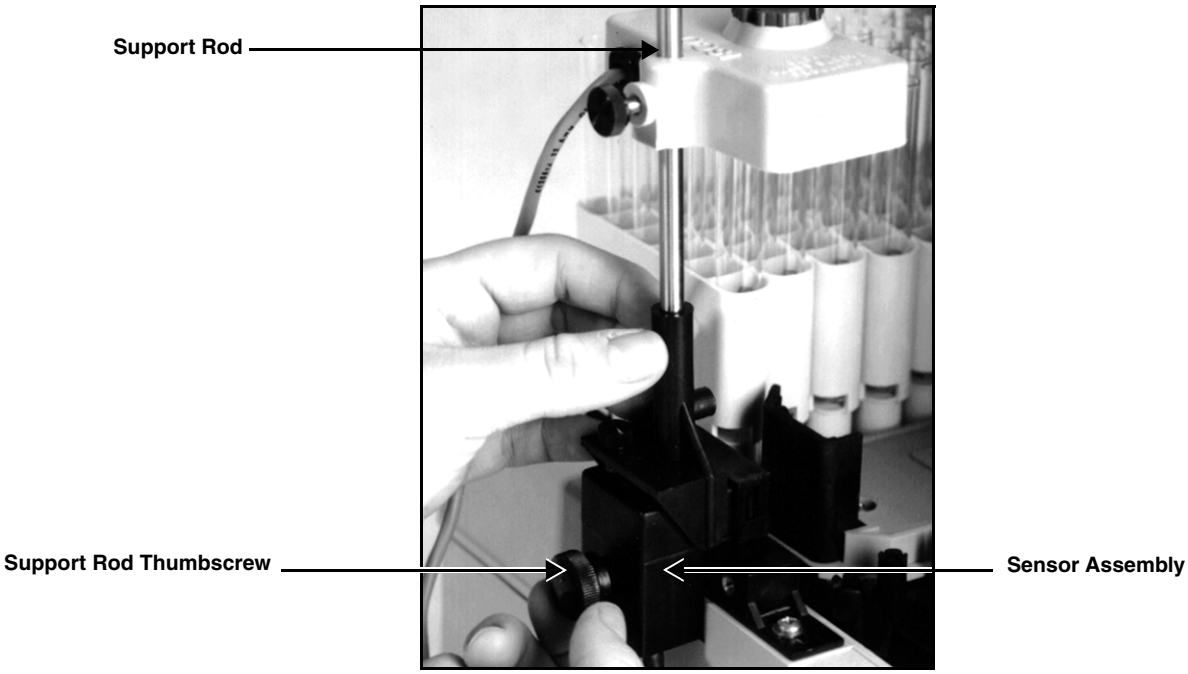


Figure 4-1 Removing the Support Rod Thumbscrew

2. The sensor assembly, which retains the support rod, is now removed by sliding the sensor towards the left (Figure 4-2).

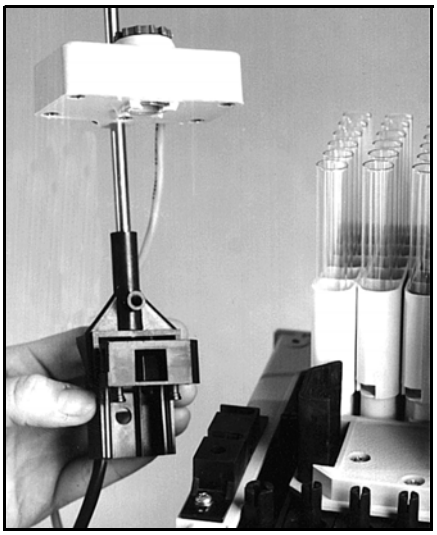


Figure 4-2 Removing the Support Rod and Assemblies

3. Lay these parts beside the unit with their wires remaining attached. If a valve is attached, remove the screw holding it to the mounting block and slide it upwards as described in section 3.9. Its cable can remain attached, if desired.
4. Remove the four case top thumbscrews (Figure 4-3) and place them out of the way.

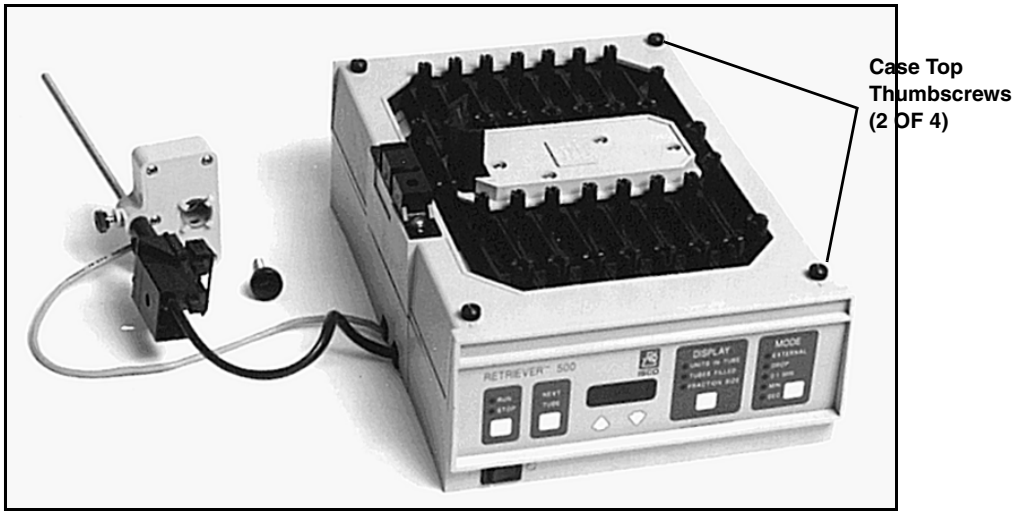


Figure 4-3 Case Top Thumbscrews

5. Lift the case top assembly upwards and off of the unit, as shown in Figure 4-4.

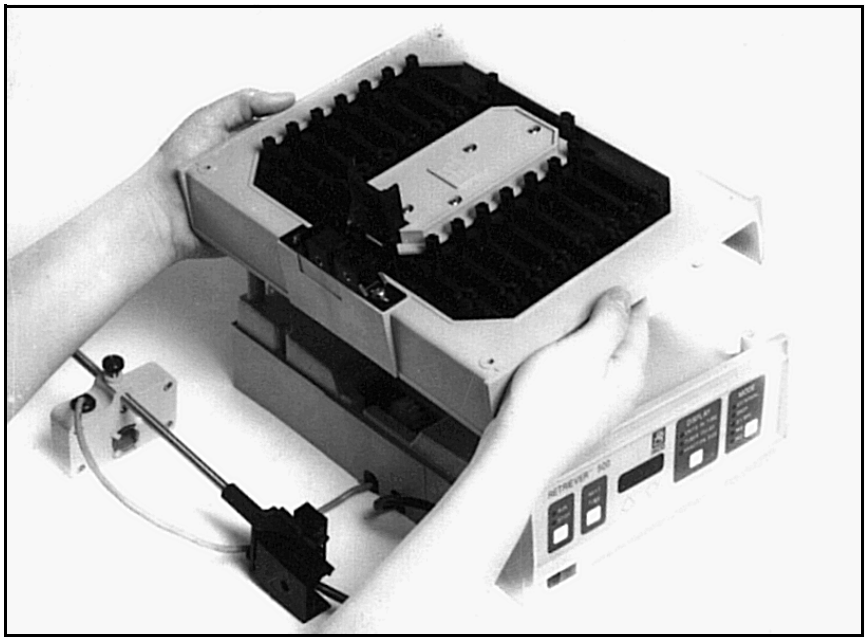


Figure 4-4 Case Top Removal

4.2.2 Installing the case top

1. To reinstall the case top, position the case bottom assembly with the front panel towards you.
2. Position the case top with the mounting block to your left with the open end towards you and the shuttles up.
3. Align the lip of the case top with the channel in the case bottom (Figure 4-5) and lower it into place. **NOTE:** The top will go on only one way.

Figure 4-5 Case Top Installation

4. Tighten the four case top thumbscrews.
5. If a valve was removed, slide the round pin on its bracket into the hole on the top of the mounting block. Install the

valve bracket screw through the bracket and into the front threaded hole in the mounting block.

6. Position the rack sensor so that the tabs are aligned with the slots in the mounting block, Figure 4-6.

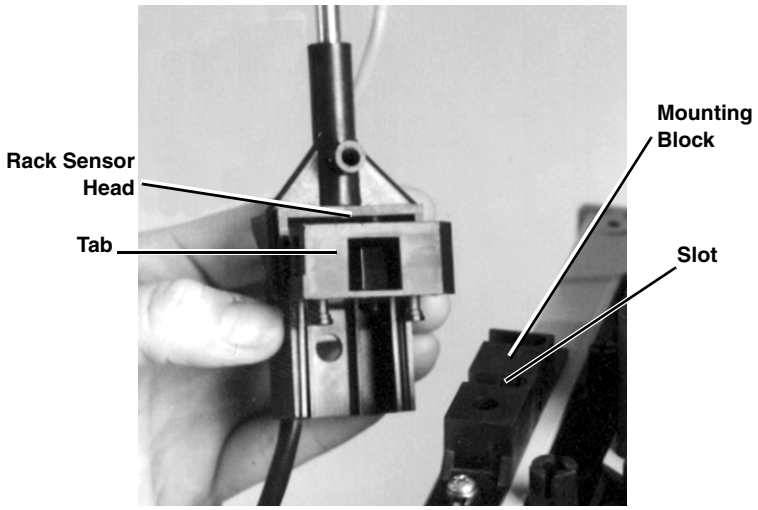


Figure 4-6 Positioning the Rack Sensor and Support Rod

7. Slide the rack sensor to the right, onto the mounting block. Install the support rod thumbscrew and tighten.

4.3 Rack Sensors

The Retriever 500 is provided with infrared sensors to detect the presence of a rack and to detect the stop rack. If the sensor backup plate is improperly adjusted or the rack sensor head becomes dirty around the sensors, erratic operation, tube skipping or inability to detect the stop rack will result. These symptoms may also occur if the sensors are defective.

4.3.1 Sensor Backup Plate Adjustment

In order for the Retriever 500 to sense the racks, they must be held firmly against the rack sensor. Pressure from the sensor backup plate (Figure 4-7) holds the racks firmly against the read head assembly. The rack should compress the drip shield spring approximately 50%. If this needs adjusting, see the following procedure.

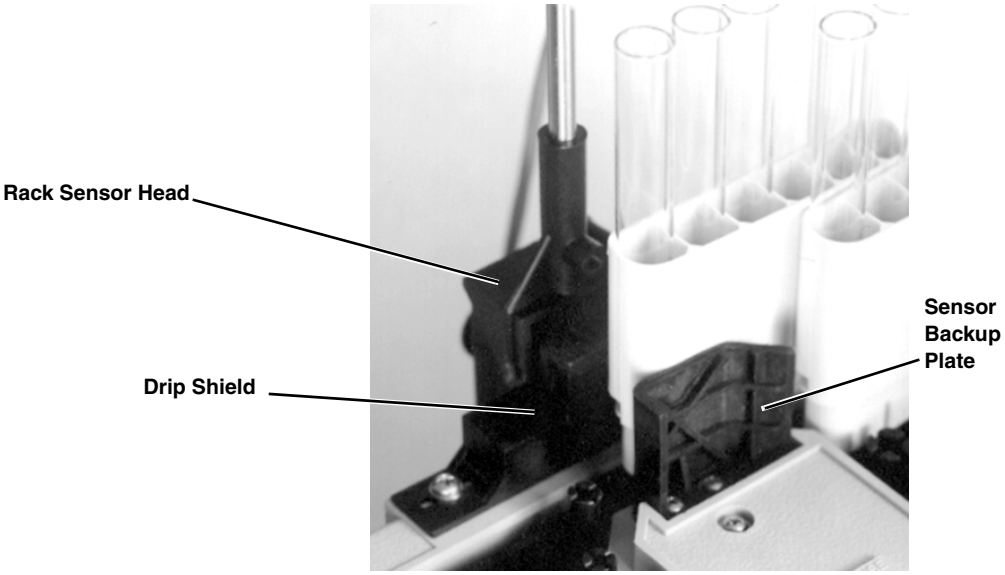


Figure 4-7 Sensor Backup Plate

To adjust the sensor backup plate:

1. Position a rack in the shuttle in front of the rack sensor head (Figure 4-7).

   It may be easier to put the rack in the shuttle just before the rack sensor head and advance the Retriever 500 using the "NEXT TUBE" button.

2. Loosen the two screws behind the backup plate, Figure 4-8.

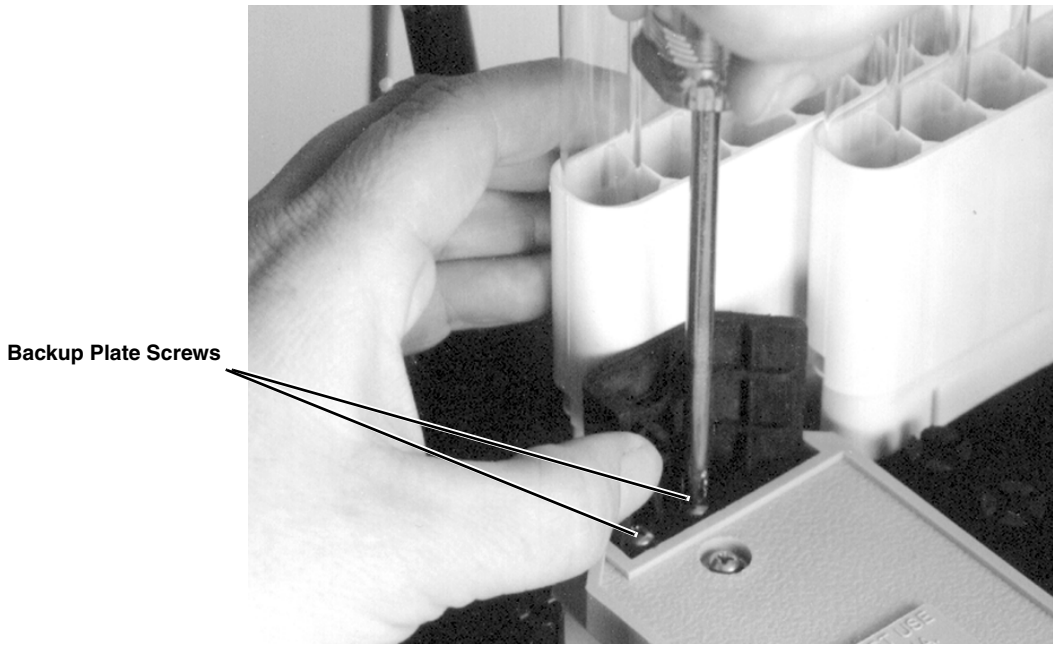


Figure 4-8 Loosening the Sensor Backup Plate Screws

3. Move the backup plate towards or away from the read head. Observe the drip shield from the side and position the backup plate so the nibs holding the drip shield to the rack sensor head are approximately centered in their mounting holes, as shown in Figure 4-9.

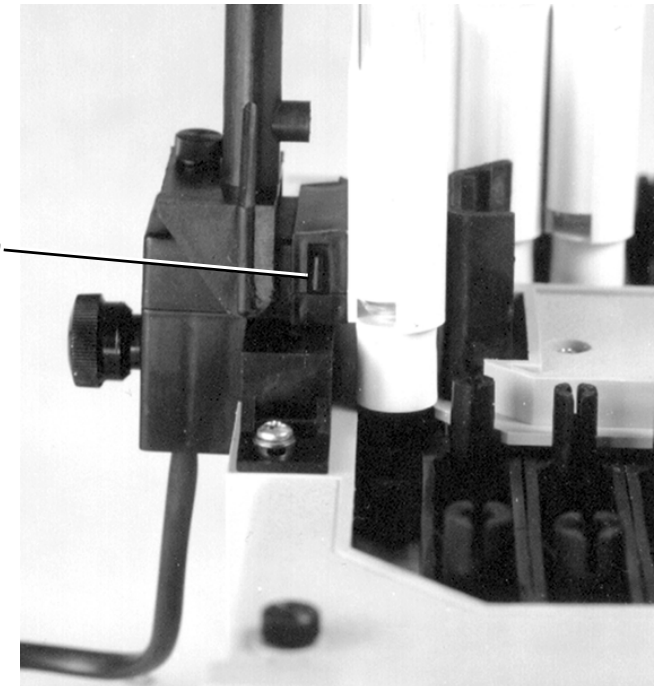


Figure 4-9 Centering the Drip Shield Nibs

4. Tighten the two screws holding the backup plate.
5. Advance the rack, making sure the racks move properly without binding and that the Retriever 500 stops when the rack is in its correct position.

⚠ CAUTION

If the spring is not sufficiently compressed, the Retriever 500 may not reliably sense the rack and missed tubes can result. Adjusting the spring too tightly will cause the unit to wear quickly and may cause premature failure. Adjust the drip shield spring so that it is about 50% compressed.

4.3.2 Sensor Window Cleaning

The Retriever 500 rack sensor head incorporates a one piece cover to encase the optical sensors. This portion of the rack sensor head is made of a transparent plastic impregnated with a light selective dye.

Although this area appears nearly black, infrared light from the sensors is able to pass through it. The light sensitive area is the notched portion of the rack sensor immediately behind the drip shield, Figure 4-10.

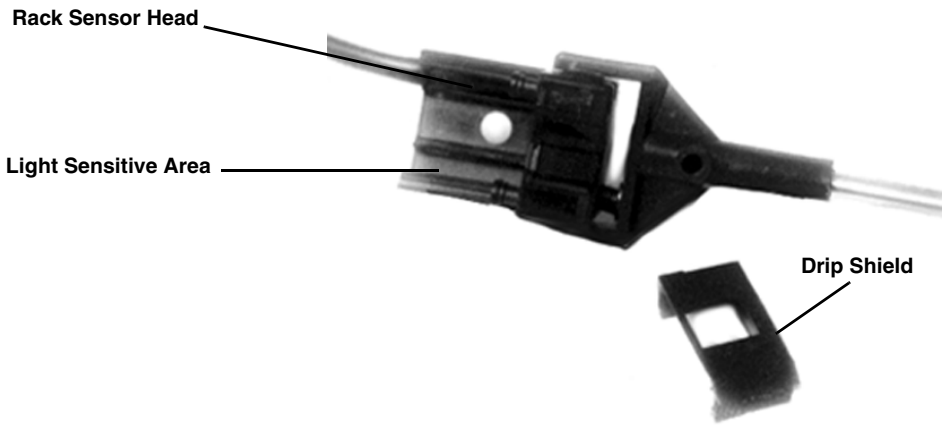


Figure 4-10 The Light Sensitive Portion of the Rack Sensor

If the light sensitive area of the rack sensor becomes dirty or contaminated, use the cleaning procedure detailed below:

To clean the sensor window:

1. Remove the support rod thumbscrew and slide the rack sensor to the left and off the mounting block.
2. Remove the drip shield, Figure 4-11, by carefully prying one end of the shield over the drip shield nib.

⚠ WARNING

Be careful not to scratch the light sensitive area of the rack sensor head! Do not insert any prying tool through the large opening in the center of the drip shield!

⚠ CAUTION

Hardened deposits may need additional swabbing. However, DO NOT IMMERSE THE RACK SENSOR HEAD IN WATER OR ANY OTHER SOLVENT!

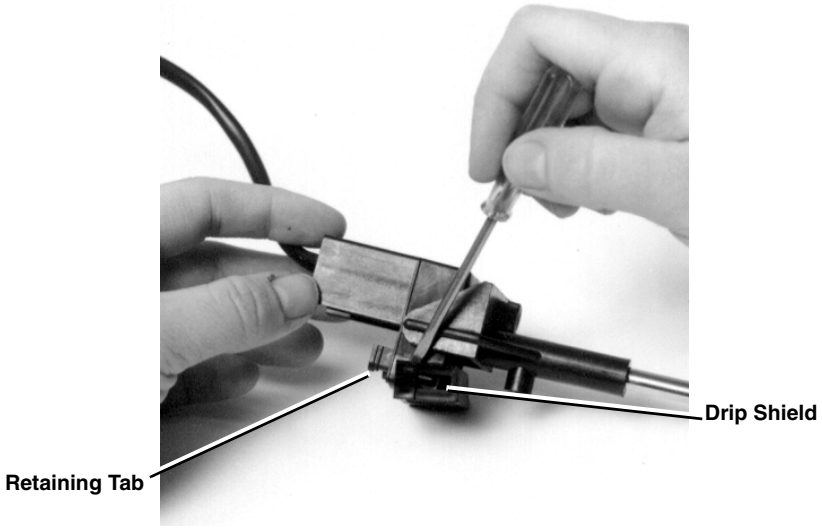


Figure 4-11 Removing the Drip Shield

3. Use a CLEAN cotton swab or soft tissue dampened with isopropyl alcohol to GENTLY clean the notched area behind the drip shield. BE CAREFUL NOT TO SCRATCH THE LIGHT SENSITIVE AREA!

☑ Note

The plastic used to make the rack sensor head is chemically resistant, but is quite soft. Scratches in the light sensitive area will reduce the ability of the sensor to detect racks and may cause the sensor to stop working. (Scratches are of less concern elsewhere on the rack sensor head.)

4. Gently dry the light sensitive area with a CLEAN soft tissue or swab.
5. Inspect the light sensitive area for dirt, contaminants or scratches.
6. Replace the drip shield by aligning the open side of the shield downward and the angled edge towards the rear, Figure 4-12.

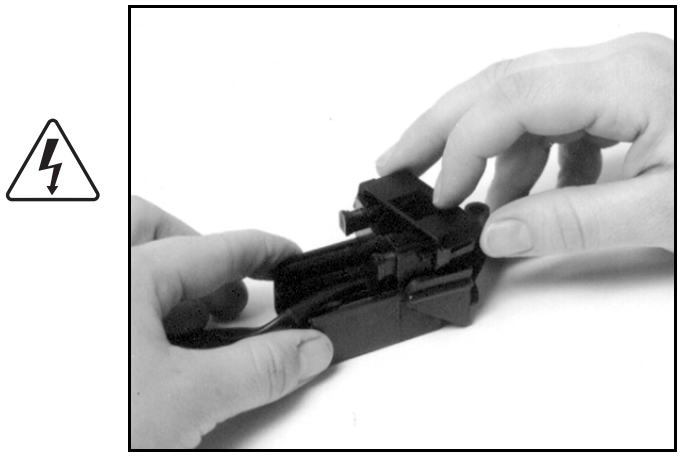


Figure 4-12 Replacing the Drip Shield

7. Place one end of the shield on its drip shield nib and press the other end over the drip shield nib, Figure 4-13. When correctly installed, the notch for the light sensitive area should not be visible from the support rod side.

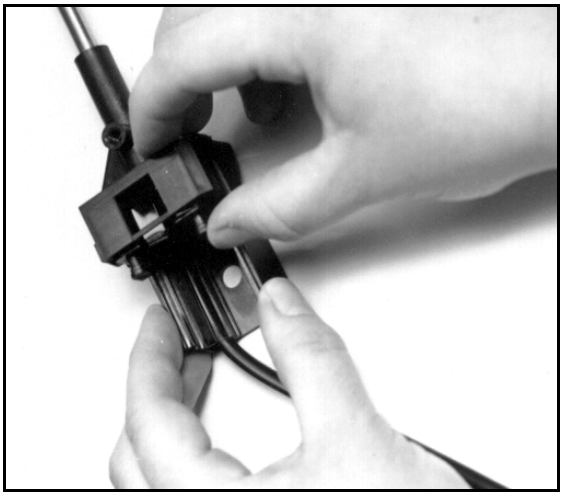


Figure 4-13 Snapping on the Drip Shield

8. Align the tabs on the rack sensor with the slots on the mounting block, Figure 4-14.

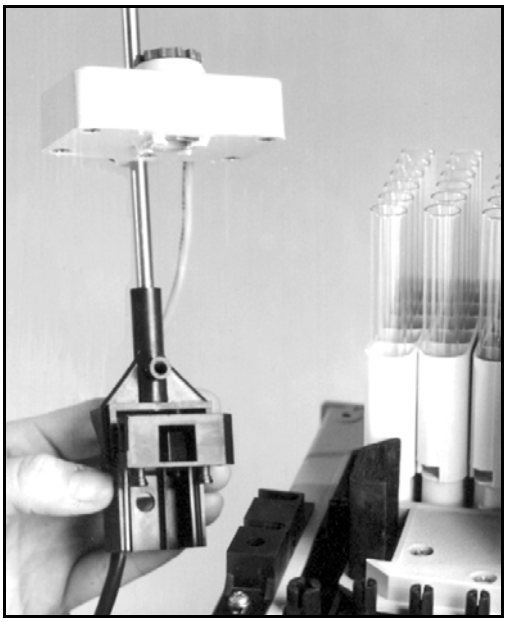


Figure 4-14 Aligning the Rack Sensor Tabs

9. Slide the rack sensor onto the mounting block from the left. Reinstall the support rod thumbscrew and tighten.

4.3.3 Electrical Adjustment Of Sensor

⚠ WARNING

The power cord must be attached to the unit for this adjustment. Although no high voltage is used by this unit, accessories may contain lethal voltage. REMOVE ALL ACCESSORY CABLES ATTACHED TO THE BACK PANEL BEFORE PROCEEDING. Also, careless probing of test points can result in short circuits which may damage the unit. Touch the test points precisely to avoid short circuits.

To adjust the sensors electrically:

1. Remove all accessory cables from the back panel, except the power connector. Remove the case top as detailed in section 4.2.
2. If the racks are installed, remove them.
3. Install the red stop rack on the shuttle just entering the rack sensor and move the rack into position by rotating one of the gears on the underside of the case top (Figure 4-15A).

   The easiest way to do this is to lift the case top slightly and use your middle fingers to rotate the gears, as shown in Figure 4-15B. Rotate the gears so the shuttles move the same direction as during operation, i.e. back to front on the side that the read head is mounted.

Note

The shuttle mechanism will jam if it is run backwards. Be sure the shuttles are moving from the rear towards the front on the left side of the unit; and from the front towards the rear on the right side. DO NOT FORCE THE MECHANISM! If it doesn't run smoothly, disassemble and perform the timing procedure detailed in section 4.4.

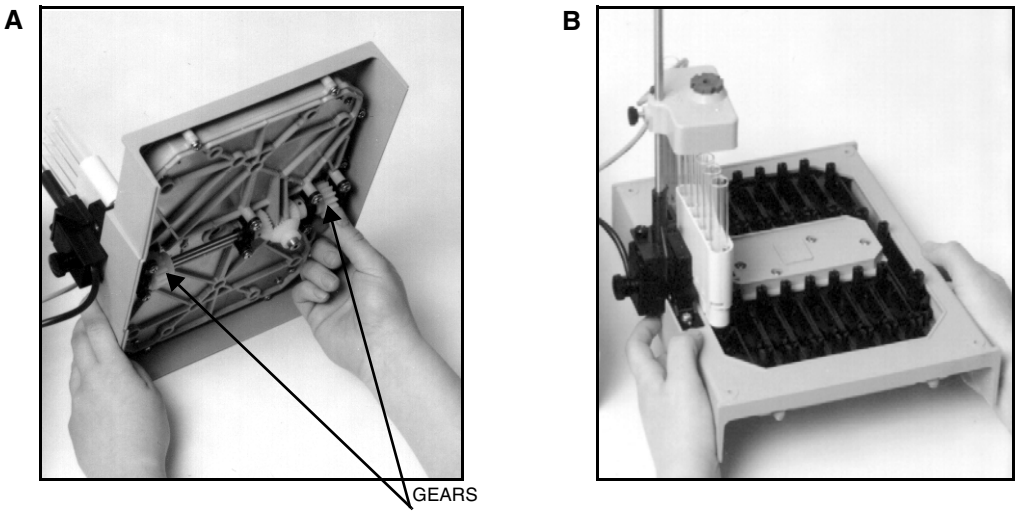


Figure 4-15 Rotating the Gears

4. Set the case top beside the case bottom and turn the case bottom over.
5. Remove the nine screws holding the metal plate onto the case bottom and remove the metal plate, Figure 4-16.

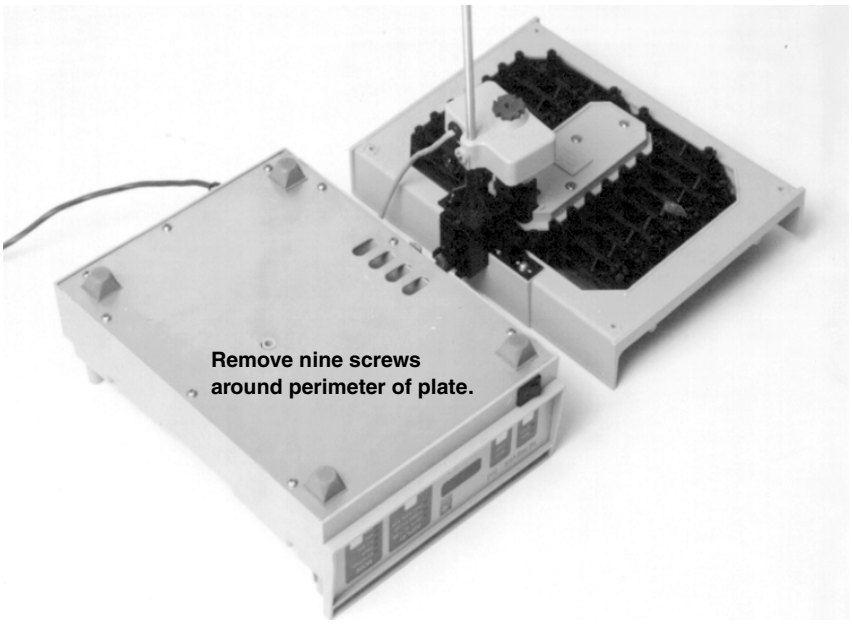


Figure 4-16 Case Bottom Screws and Metal Plate

6. Switch the Retriever 500 first to STANDBY and then, while depressing the NEXT TUBE key, switch it back to OPERATE. All of the MODE LEDs will be lit except for SEC.

   NOTE: If SEC is lit, and only one of the other LEDs is out, press the MODE key until all mode LEDs are lit except for SEC. If only one mode LED is lit, retry this step.

The display will now read the cycle sensor voltage.

To adjust the lower (or cycle) sensor:

> ***Note***
> This sensor views the rack along the lower edge.

1. Install the red stop rack and rotate the gears to position the rack in front of the rack sensor, Figure 4-15B. Move the rack until the plastic area between any two windows is in front of the sensor. This will correspond to the largest value on the display. Turn the potentiometer R23, as shown in Figure 4-17, to display a reading of 2.60 VDC.

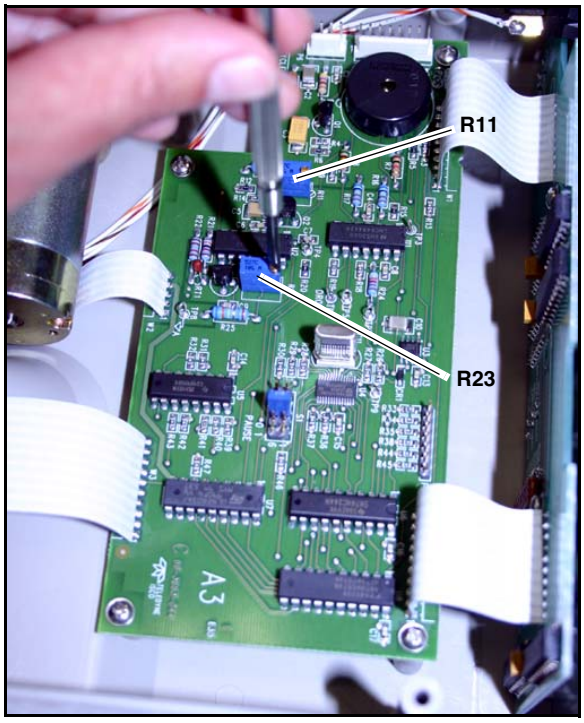


Figure 4-17 Adjusting the Cycle Sensor (R23)

2. Move the rack so that a window is centered in front of the sensor head. This will correspond to the lowest value on the display. The displayed value should be 0.5 Vdc or less.

3. Press the MODE key so that all the MODE LEDs are lit except for 1 MIN. The display will then show the stop sensor voltage.

To adjust the upper (or stop) optical sensor:

> ☑ ***Note***
>
> This sensor views the rack along the surface above the windows that are sensed by the cycle sensor (described in the previous steps).

1. The only window that the stop sensor detects is the one relative to the last tube position on the red rack. Note that it is located higher on the side surface of the rack than the previous tube position windows.
2. Move the rack so that a tube position other than the last is in front of the sensor. Adjust potentiometer R11 as shown in Figure 4-17, for a displayed reading of 2.60 volts.
3. Move the rack so the stop window (mentioned in step 10 as being located higher on the side surface) is centered in front of the sensor. This will correspond to the lowest displayed value. Ensure that the reading is 0.5 volts or less.
4. Reinstall the metal plate in the case bottom. Be sure to align the round hole in the metal plate with the drainage funnel in the case bottom.
5. Install the screws holding the plate in place. Turn the case bottom upright.
6. Reinstall the case top and secure the thumbscrews.
7. Switch the Retriever 500 to "STANDBY", then back to "OPERATE" and test the operation of the unit.

4.3.4 Rack Sensor Head Replacement

When the rack sensor head assembly must be replaced, use the procedure detailed below.

To replace the rack sensor head assembly:

1. Disconnect the power and all accessory connections to the back panel. Remove all racks from the unit.
2. Loosen the positioning screw (Figure 4-18).

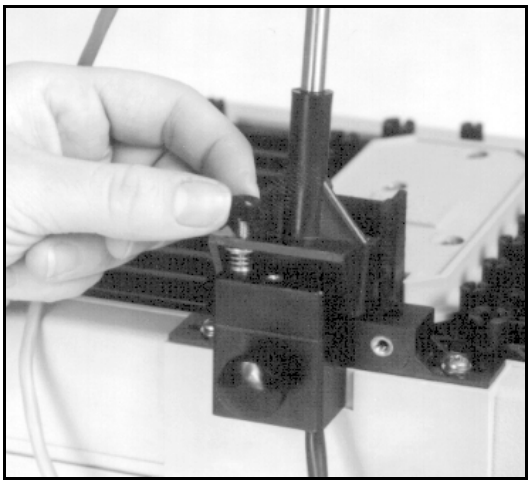


Figure 4-18 Loosening the Positioning Screw

3. Remove the spring and washer from the rack sensor head assembly (Figure 4-19). Store these in a safe place, as they will be reused.

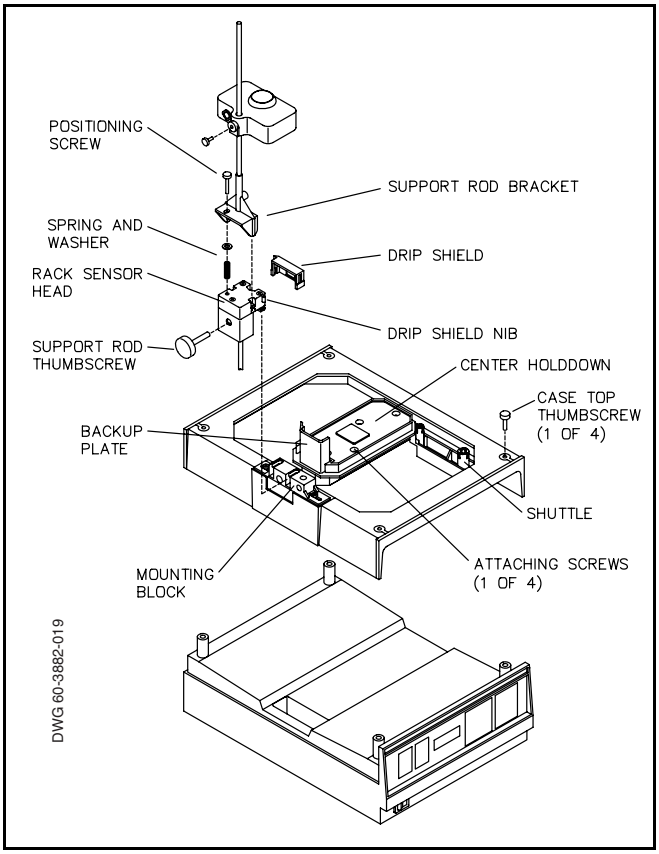


Figure 4-19 Rack Sensor Spring and Washer

4. Using a flat tool, pry one leg of the support rod bracket out of its pivot hole in the rack sensor head, Figure 4-20. Once

it is clear of the hole, remove the drop counter assembly and lay it aside. Do not remove the drop counter cable.

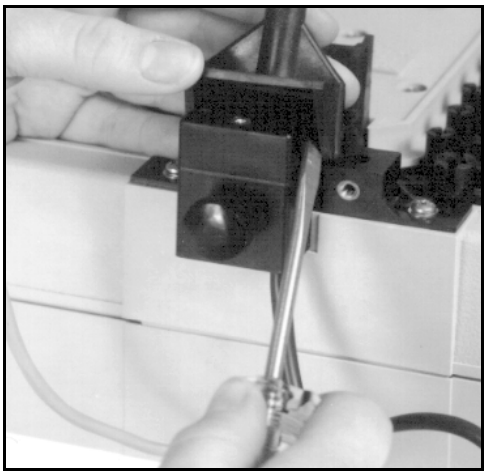


Figure 4-20 Prying the Support Rod Bracket Leg Out of Its Pivot Hole

5. Remove the support rod thumbscrew and slide the sensor assembly off the mounting block to the left.
6. Remove the case top and set it beside the case bottom. Turn the case bottom upside down and remove the screws holding the metal plate to the bottom. Remove the metal bottom as described in section 4.3.3.
7. Disconnect the sensor connector from the printed circuit board (A3, P302), Figure 4-21A.
8. Pull the sensor cable and grommet out of the case bottom and remove the sensor assembly.
9. Connect the new sensor electrical plug to the circuit board P302. Position the grommet from the new cable assembly over the 'U'-shaped hole in the case bottom and push the grommet into position, Figure 4-21B.

A. DISCONNECTING THE SENSOR CONNECTOR

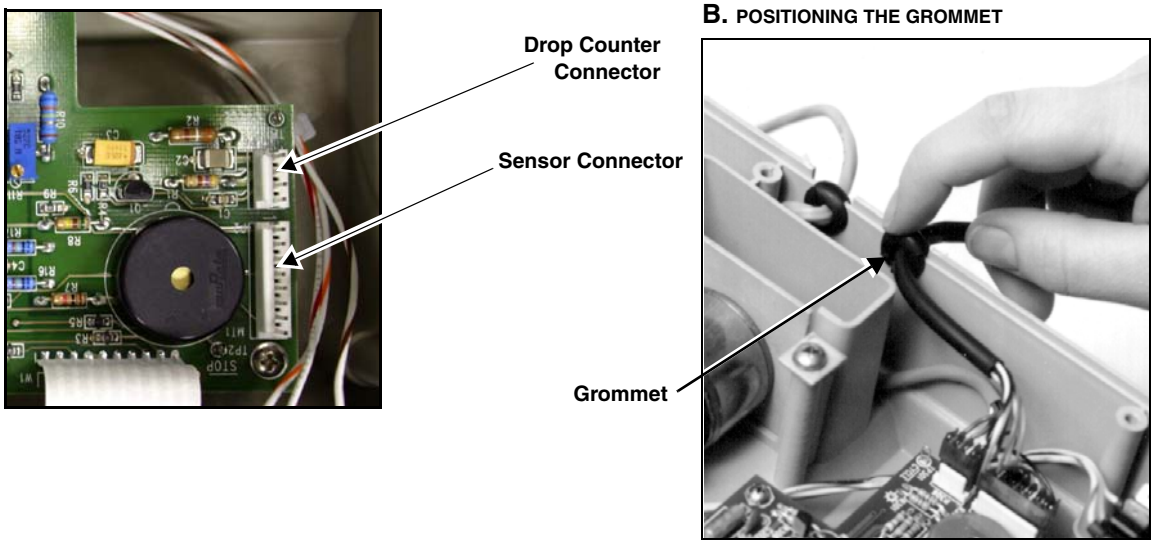


Figure 4-21 Sensor Replacement

10. Slide the new sensor assembly into the mounting block and install the support rod thumbscrew.
11. Electrically adjust the sensors as described in section 4.3.3.
12. Reinstall the metal plate and screws in the case bottom, aligning the round hole in the metal plate with the drainage funnel in the case bottom.
13. Turn the case bottom upright and install the case top.
14. Orient the support rod bracket so the tabs are facing the slots in the rack sensor head.
15. Reinstall the support rod bracket by inserting one pin into a hole on the rack sensor head, then gently pry the opposite leg of the bracket outwards to insert the other pin.
16. Insert the positioning screw through the hole in the rack sensor head. Place the washer over the end of the screw, Figure 4-22A.
17. Place the spring over the screw and compress it using your fingers as in Figure 4-22B, or using a flat tool. With the spring compressed, tilt the support rod forward and guide the end of the positioning screw into the hole in the rack sensor head.
18. Push the support rod towards you to maintain the spring compression and tighten the positioning screw, Figure 4-22C.
19. Adjust the drop counter position and test operation.

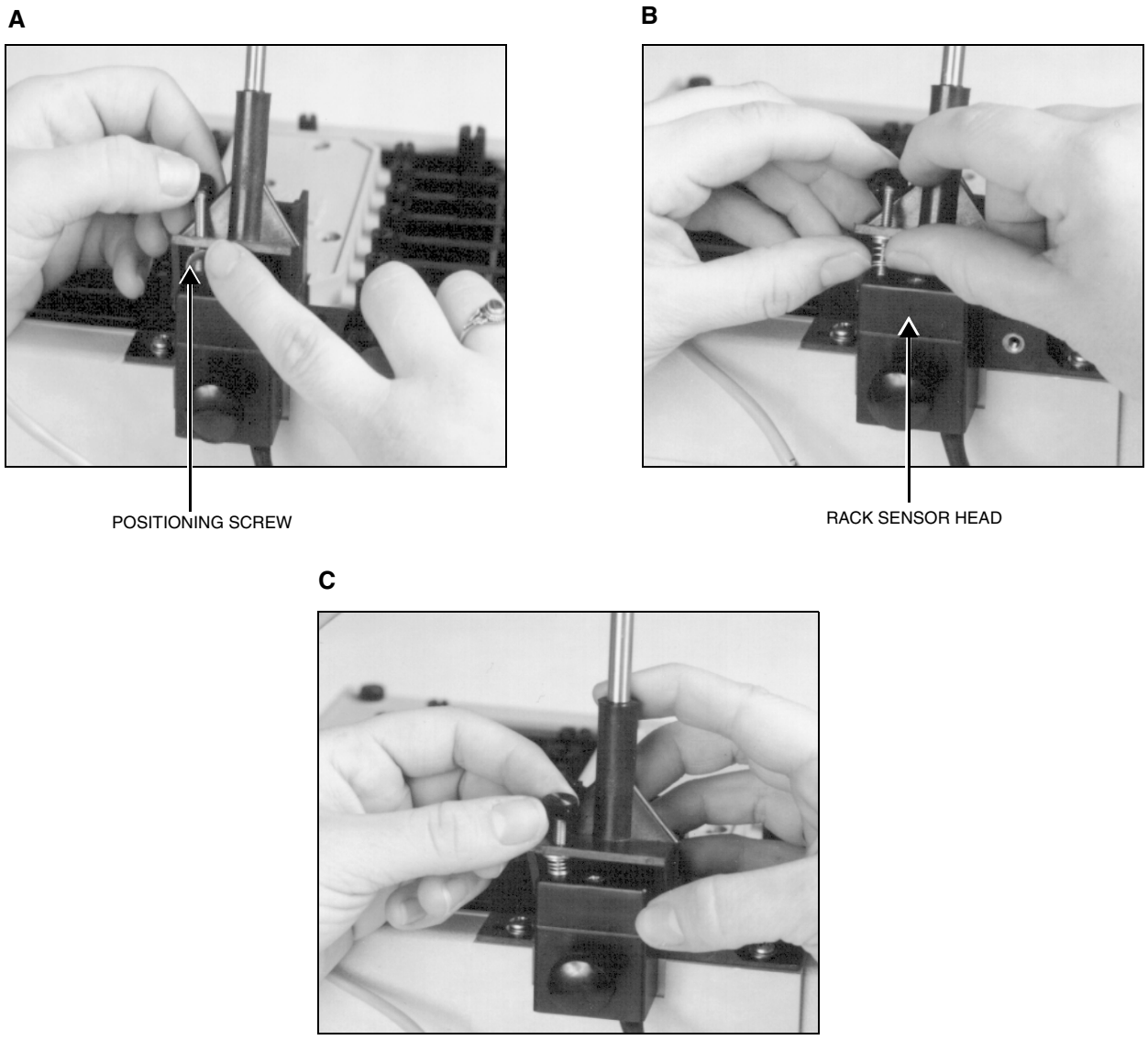


Figure 4-22 Replacing the Positioning Screw

4.4 Shuttle Adjustment

The Retriever 500 shuttles must be accurately positioned (timed) to allow the drive gears to correctly change from one shuttle to the next as the motion proceeds.

If the Retriever 500 shuttles drag or jam, the case top has probably become clogged with foreign materials or dried effluent. Remove the case top and wash it with soap and water as described in section 4.2.

If this does not correct the problem, the shuttles will have to be removed for cleaning, replacement of broken parts, and/or retiming of the mechanism. If it becomes necessary to remove the shuttles, see the procedure detailed below.

To remove the shuttles:

1. If possible, advance the test tube racks until the third tube of any rack is in position to be filled under the drop counter. If a shuttle is being replaced because it is broken, position a good shuttle under the drop counter.
2. Remove all the test tube racks.

Assembly Tip:
Note which end of the shuttle has the larger post. Noticing now which way the shuttles are oriented will help make assembly easier later. (Note the orientation of the shuttle in Figure 4-24).

3. Remove the case top and position it with the shuttles upward beside the case bottom. **NOTE:** Leave the rack sensor installed.
4. Remove the two screws holding the backup plate (Figure 4-23) and remove the backup plate.

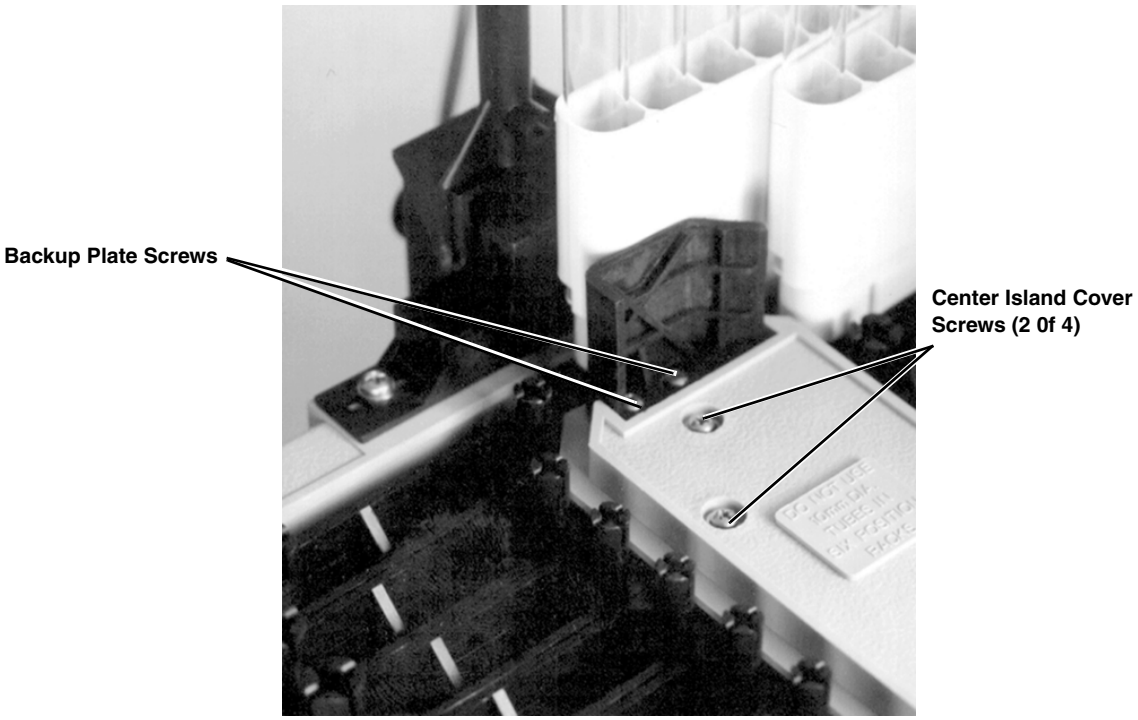


Figure 4-23 Backup Plate Screws

5. Loosen the four center hold-down plate screws and remove the plate.

> **Note**
>
> Do not remove the shuttles from the narrow passages at the ends of the center island unless absolutely necessary. Removal of these shuttles will require retiming of the mechanism (see section 4.5).

6. Clean and reassemble the unit, being careful not to disturb the position of the end shuttles. Install the shuttles so that the large post on ALL shuttles is towards the front.

4.5 Shuttle Timing Procedure

Shuttle timing is required whenever the end shuttles are removed or if it is determined the mechanism binds because of timing between the two drive gears.

To time the shuttles:

1. Remove the case top, backup plate, center island cover, and shuttles as described in section 4.4.
2. Remove the shuttles on the ends of the center island by rotating the gears from below. Make sure all shuttles are clean and inspect for breakage. Examine the drive gears for breakage and rotate the gears to make sure they move freely. Replace any broken or binding parts.
3. Place a shuttle near the gear closest to the rack sensor with the large post towards the front (Figure 4-24) and rotate the gear until the small dot near the center of the shuttle is aligned with the line molded into the center island, Figure 4-25. This is shuttle “C”.

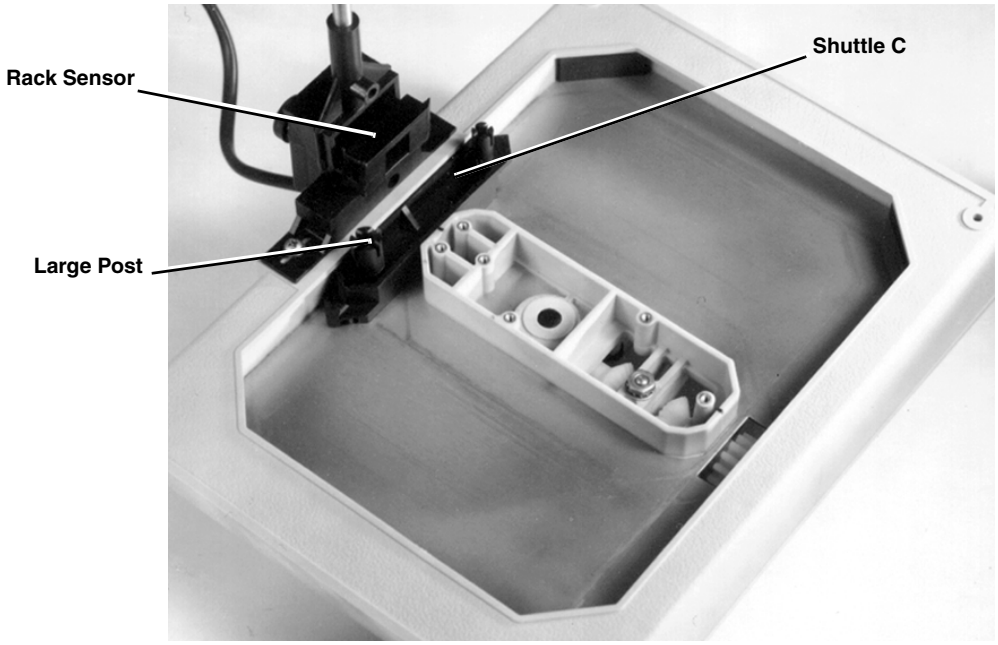


Figure 4-24 Retiming the Shuttles: Situating the Shuttle

Figure 4-25 Retiming the Shuttle: The Alignment Dot

4. Place another shuttle on the rear side of the center island with its largest post towards the front and touching the side of the shuttle installed in step 3. This is shuttle “D” (Figure 4-26).

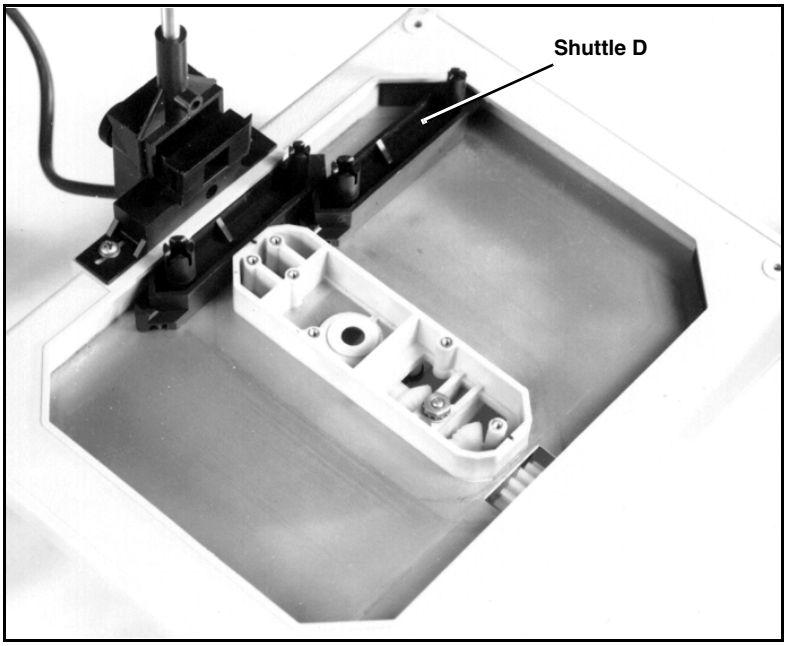


Figure 4-26 Retiming the Shuttle: Installing Shuttle D

5. Position another shuttle on the front side of the center island with its larger post towards the front and move the shuttle so that its leading corner is aligned with the line molded into the center island near the opposite gear (Figure 4-27). This is shuttle "E".

Note

The alignment marks need only align within 1/16" of their intended position.

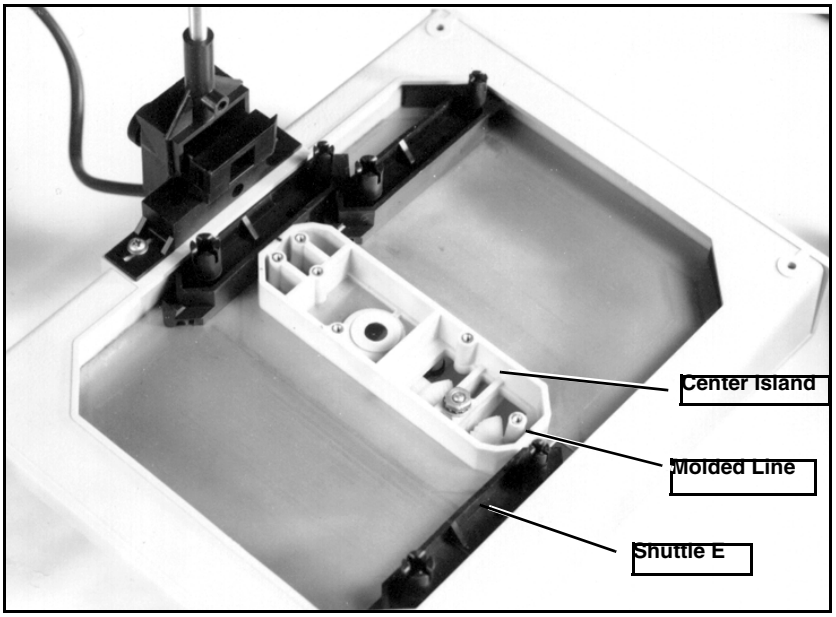


Figure 4-27 Retiming the Shuttle: Installing Shuttle E

6. Gently holding the shuttle "D" against shuttle "C", move shuttle "E" towards the rear (Figure 4-28A). Shuttle "C" will move towards the front at the same time. Stop moving the shuttles as soon as the tine on the front of shuttle "D" engages the tine on the rear of shuttle "C", and shuttle "D" is in line with shuttle "C" (Figure 4-28B).

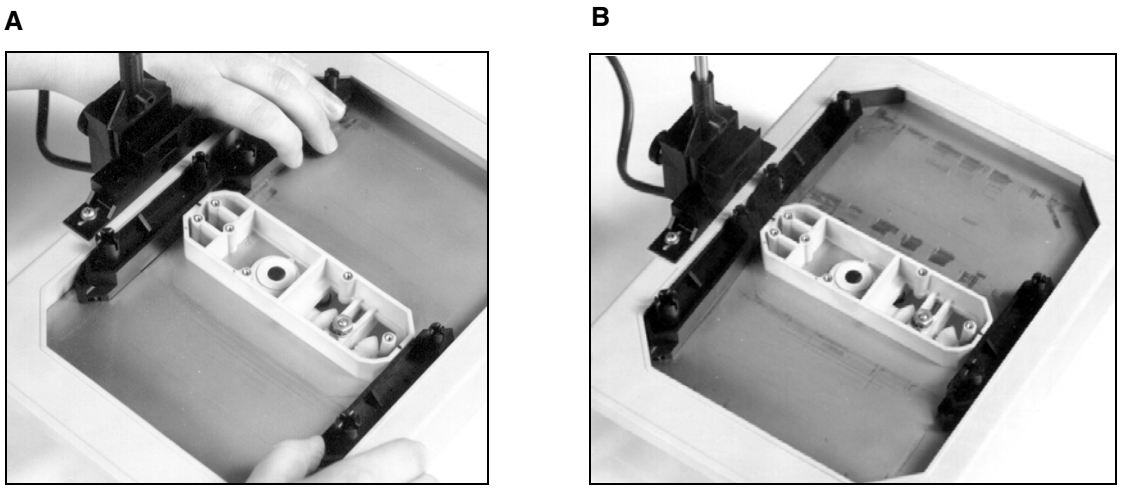


Figure 4-28 Retiming the Shuttle: Engaging Shuttle D

7. Without disturbing the shuttles already installed, insert the remaining 14 shuttles with the larger post towards the front. Seven will go in front of the center island; seven in back of the center island, Figure 4-29.

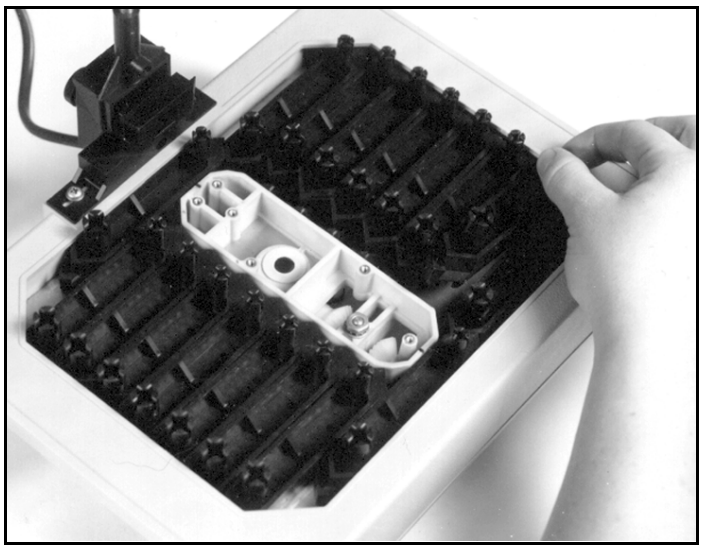


Figure 4-29 Retiming the Shuttle: Installing the Remaining Shuttles

8. Visually examine the shuttle placement. Be sure that the larger post of each shuttle is towards the front. The shuttles must be resting on the metal portion of the tray and not on the center island or the side of the case top.
9. Install the center hold-down with the large molded notch towards the rack sensor. Secure the center hold-down plate with four screws.
10. Manually rotate the gear below the rack sensor so that the shuttle nearest to the rack sensor MOVES FROM THE

REAR TOWARDS THE FRONT. During engagement of the shuttle, there should be about 0.8 mm to 1.5 mm clearance between the angled ends of the shuttles.

☑ Note

The shuttle mechanism will jam if it is run backwards. Be sure the shuttles are moving from the rear towards the front on the left side of the unit; and from the front towards the rear on the right side. DO NOT FORCE THE MECHANISM! If it doesn't run smoothly, disassemble and perform the timing procedure again.

11. Reinstall the backup plate and move one shuttle so that it is centered on the gear opposite the rack sensor (Figure 4-30). Adjust the backup plate as described in section 4.3.1.
12. Reinstall the case top using the four thumbscrews.
13. Reconnect the power cord and test the operation of the mechanism.
14. If the motion is satisfactory reinstall the racks and any accessories.

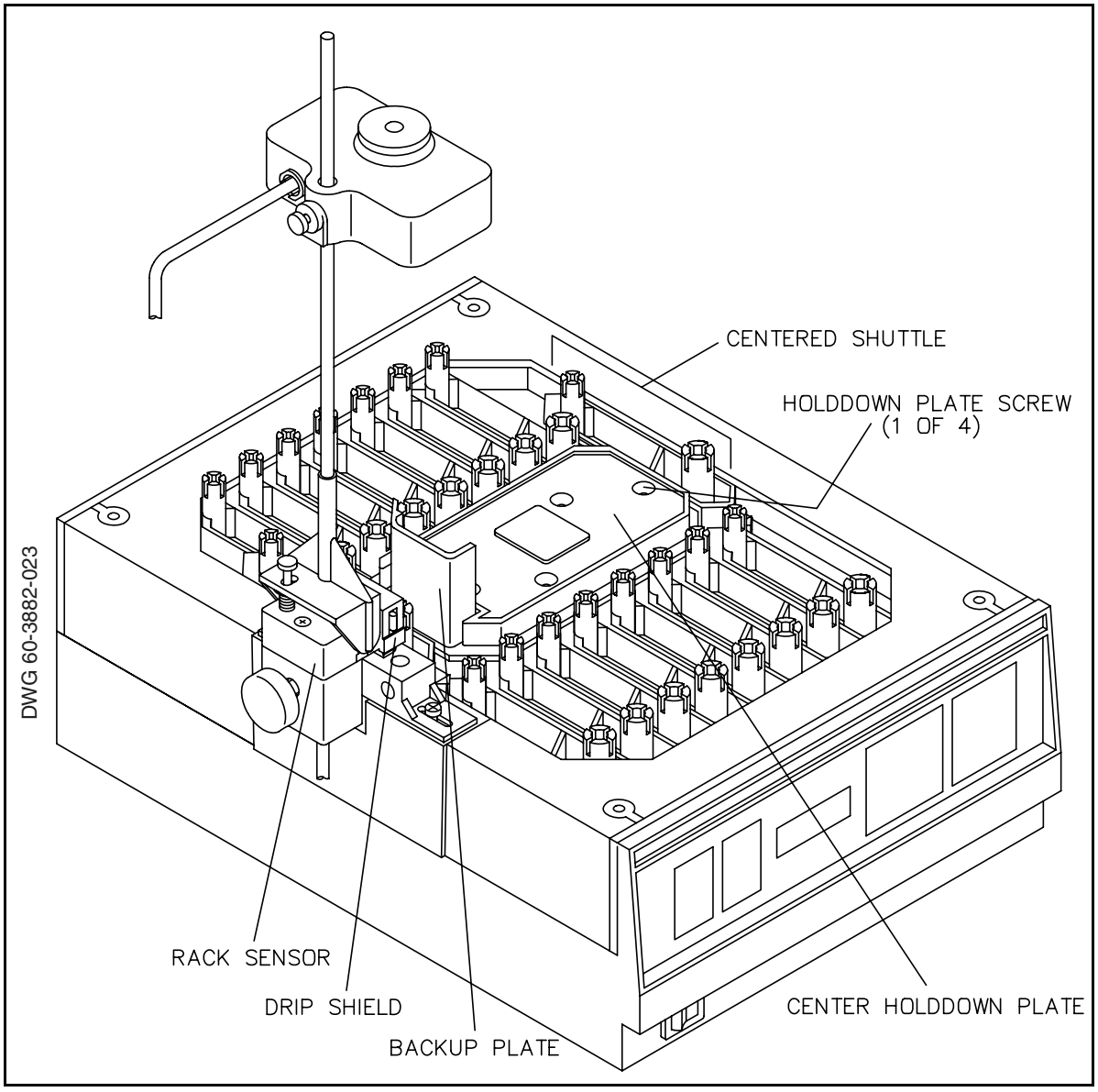


Figure 4-30 Centering a Shuttle Opposite the Rack Sensor

4.6 Converting to a Different Line Voltage

The Retriever 500 uses 14 Vac input power. Three power modules can be used with this unit; all provide 14 Vac output. Changing to a different line voltage involves selecting the module that most nearly matches your available line voltage. The voltage requirement of each module is molded into the prong side of the module's case.

In remote applications, it is possible to run the Retriever 500 from a 12 VDC battery capable of providing 2 amps continuously, but this practice is not recommended. The motor may run slightly slower, increasing the tube to tube transit time. When running from a battery, however, the voltage will not be high enough to reliably actuate the valve, so the use of a valve on battery power is not advised. No cable is available to make the electrical connection to a battery, so the user must provide the cable. Polarity of the wires from the battery is not important.

4.7 Replacing the Motor

The Retriever 500 uses a single DC servomotor to move the shuttles. Its replacement is not difficult, but requires tools to drive the spring pin out of the gear. An assembly consisting of a new motor, new bracket, new drive gear, and spring pin is available from Teledyne Isco. This assembly makes the replacement of the motor much simpler.

⚠ WARNING

The Retriever 500 does not use high voltage for its operation, however, some accessories may have lethal voltage present on their pins. BEFORE OPENING THE CASE BOTTOM, DISCONNECT ALL FLEXIBLE CORDS FROM THE BACK PANEL OF THE RETRIEVER 500!

To replace the motor:

1. Remove the racks and the support rod so the Retriever 500 is more stable when it is turned upside down.
2. Remove the support rod thumbscrew and slide the rack sensor assembly off the mounting block towards the left.
3. Turn the Retriever 500 upside down and remove the screws holding the metal plate to the case bottom. Remove the metal plate.
4. Two wires are attached to the motor (Figure 4-31). For your convenience, the terminals are marked 1 and 2. Using a 40W or less soldering iron, unsolder the leads from the motor. Note the wire colors relative to terminals 1 & 2.
5. Unplug motor assembly from P107 on power circuit board.

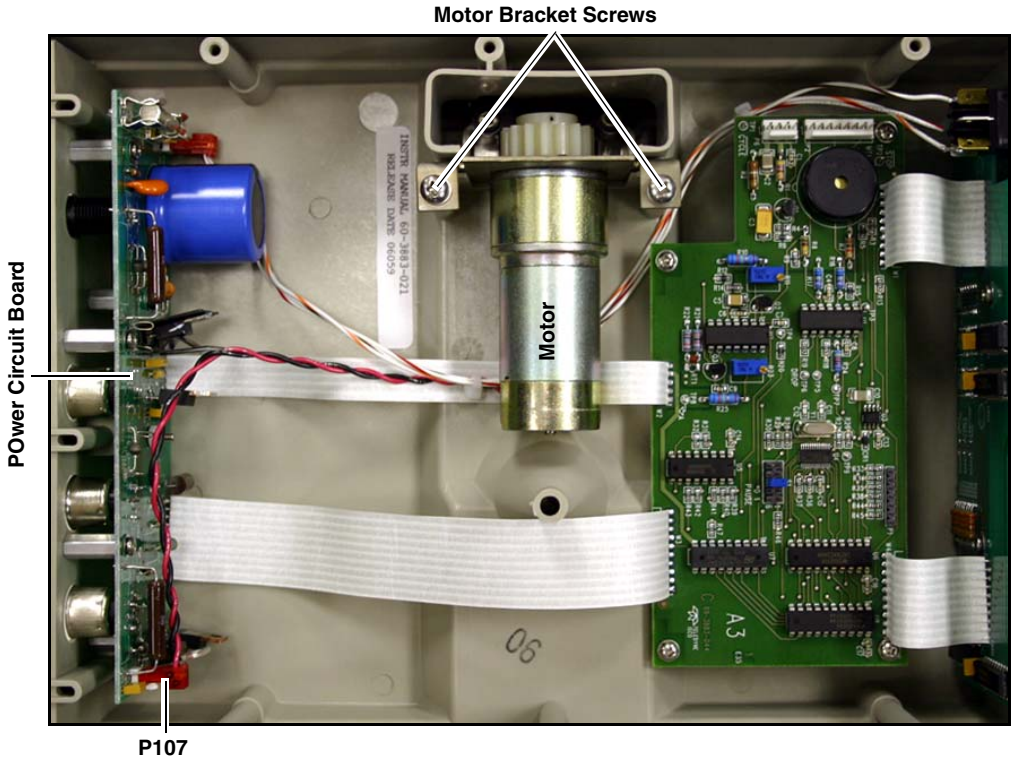


Figure 4-31 Retriever 500 Motor

6. Remove the two screws holding the motor bracket to the case bottom. Save these screws to remount the new motor. Pull the motor up and out of the grooves in the case bottom. Inspect the grooves for debris and damage; clean or replace as needed.

7. If the motor assembly has been purchased, skip to step 14.
8. If only a motor is being replaced, position the motor assembly so that the gear is supported on a suitable support. Then drive the spring pin out of the gear and discard.

⚠ CAUTION

Use care not to bend the motor shaft while driving the spring pin into the gear!

9. Slide the gear off the shaft and save it for re-use. Remove the three phillips screws which secure the motor to the bracket and remove the bracket.
10. Position the bracket on the new motor. Ensure that the two mounting tabs on the bracket are on the side closest to the motor. Reinstall the three screws to secure the bracket to the motor.
11. Slide the gear onto the motor shaft with the hub **AWAY** from the bracket. Align the pin holes in the gear with the hole in the motor shaft. Using a new spring pin, secure the

gear to the motor shaft. The pin must be driven flush with the gear.

☑ Note

Support the gear before driving the pin into place!

☑ Note

Reuse of the old spring pin increases the probability of an early gear failure.

12. Remove the inductors, capacitor, and wires from the old motor. Slip shrink tubing over the wires and solder them to the new motor.

☑ Note

Connect the inductor with the orange wire to motor terminal 1 and the inductor with the orange on white to motor terminal 2.

13. Blow hot air over the shrink tubing to shrink it over each terminal.
14. Slide the new motor assembly into the grooves provided in the case bottom. It should slide into place easily; no excessive pressure is needed to install it. The motor should be secure and not loose or canted when installed correctly.
15. Push the motor bracket down to insure it is fully engaged in all the grooves in the case bottom. Install the two securing screws into the motor bracket.
16. Connect the plug on the motor assembly to P107.
17. Reinstall the metal cover on the case bottom and securely fasten it with screws.
18. Turn the unit over, connect the power cord, and test the motor function.

4.8 Technical Troubleshooting

Table 4-1 is a symptom/remedy chart to help you diagnose technical problems. Table 4-2 details the rear panel connector pins.

It is a good idea to begin troubleshooting by verifying the transformer's output and the +16V, +12V and +3.3V outputs of the power supply. These values (and their acceptable limits) can be measured at the following test points, respectively:

14 Vac - 12.2 to 14.8 Vac, across C107 (if F101 is ok)

+16 V - +14.4 to +19.2 V, at TP101

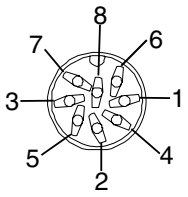
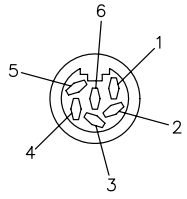
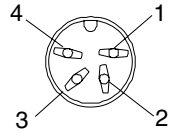
+12 V - +11.4 to +12.6 V, at TP103

+3.3 V - +3.1 to +3.5 V, at TP104

Table 4-1 Symptom/Remedy Chart

Symptom	Possible Cause	Remedy
NOTE: This chart provides basic information. For a more full explanation, contact Technical Service.		
1. Motor runs continuously.	a. The sensor/drop detector assembly is not attached to the case top. b. Test tube racks are not installed. c. Q102, U6, U8, U01 failed. d. Backup plate improperly adjusted.	a. Install sensor. b. Install racks. c.Isolate and replace. d. Adjust backup plate. See Section 4.3.
2. Motor does not run.	a. F101, Q102, U6, U8 failed. b. If audio transducer is sounding, it is a clogged tray or jammed mechanism.	a. Isolate and replace. b. Use test mode to check motor current. Clean tray or adjust shuttle timing.
3. Occasionally skips tube.	a. Dirty racks. b. Backup plate improperly adjusted. c. Rack sensors need adjustment or cleaning.	a. Clean the racks. b. Adjust backup plate. See Section 4.3. c. Clean and adjust sensors. See Section 4.3.
4. Works on TIME and EXTERNAL, but not on DROP.	a. Drop detector defective. b. Q1, U1-c failed.	a. Replace drop detector. b. Isolate and replace.
5. Works on TIME and DROP, but not on EXTERNAL.	U5d and U5f failed.	Replace.
6. Pump and/or valve does not operate during tube change.	U6, U8.	Isolate and replace.
7. Unit advances, but no event mark is output.	U6, U8.	Isolate and replace.
8. Unit will not advance when an external signal is input.	U5a and U5b failed.	Replace.
9. Unit does not remember fraction size, mode, or run/stop condition.	U4 failed.	Replace.
10. Motor runs but shuttle does not advance.	a. Uncoupled rack. b. Broken shuttle. c. Broken motor gear or shuttle gears.	a. Retime shuttle mechanism. See Section 4.4. b. Replace. See Section 4.4. c. Replace. See Section 4.4.
11. Shuttles jam, grind, or do not move freely.	a. Dirt or eluent in tray. b. Shuttle timing wrong.	a. Clean tray. See Section 4.2. b. Retime shuttles. See Section 4.2.

Table 4-2 Rear Panel Connector Pin Descriptions

Detector **8 pin circular DIN socket**	**PIN #**	**Function**	**Direction of Signal**	**Description**
Female as viewed from rear panel  	1	common	-	Signal Common.
	2	pause	input	Selectable input: default is no function, or contact closure/open collector referenced to common to pause, or contact closure/open collector referenced to common to collect.
	3	rack event output	open collector	Provides an event mark between racks.
	4	N.C.	-	-
	5	advance	input	Contact closure/open (tube change) collector referenced to common to change tube.
	6	N.C.	-	-
	7	tube event mark	output	Open collector provides an event mark between tubes.
	8	common	-	Signal Common.
	case	earth	-	Chassis.
Pump **6 pin circular DIN socket**	**PIN #**	**Function**	**Direction of Signal**	**Description**
FEMALE AS VIEWED FROM REAR PANEL  DWG 60-2132-125	1	external	input	CMOS or TTL logic “0”, or count contact closure.
	2	pump stop output	-	Open collector provides a pump stop signal between tubes and at end of run.
	3	N.C.	-	-
	4	common	-	Signal Common.
	5	N.C.	-	-
	6	N.C.	-	-
	case	earth	-	Chassis.
Valve **4pin circular DIN socket**	**PIN #**	**Function**	**Direction of Signal**	**Description**
 	1	valve	output	Open collector to switch valve.
	2	+12 Vdc	-	Regulated supply power.
	case	earth	-	Chassis.

14Vac: 14Vac power input to the fraction collector from the line voltage wall plug transformer.

The Retriever 500 has a special test mode (refer to Table 4-3) which can be used to check the operation of the rack sensors, drop detector and motor.

To enter the test mode:

1. Switch the Retriever 500 to STANDBY and then, with the NEXT TUBE key depressed, switch it back to OPERATE. All the MODE LEDs will be lit except for the SEC LED. This indicates that the display is reading the cycle sensor input.
2. Press the MODE key to change the parameter to be displayed. The Retriever 500 will remain in the test mode until it is switched to STANDBY or power is removed.

Table 4-3 Test Mode

Parameter	Display	Mode (LED not lit)	Notes
Motor Current	x.xx Adc	EXTERNAL	0.25 Adc (typ.) If the motor current is more than 0.50 Adc than the case top probably needs cleaning.
Drop Detector	x.xx Vdc	DROP	2.75 Vdc (typ.) The input will drop briefly when the optical path of the drop detector is blocked.
Stop Sensor	x.xx Vdc	MIN	0.00-3.3 vdc See Section 4.3.
Cycle Sensor	x.xx Vdc	SEC	0.00-3.3 Vdc See Section 4.3.

4.9 Replacing the Front Panel Label

If the front panel switches are no longer working, then the entire front panel label (which is attached to the case with adhesive) must be replaced. A new front panel label can be ordered from Teledyne Isco, P/N 69-3883-006. Use the procedure detailed below to remove and replace the label.

To replace the front panel label:

1. Remove the case top as detailed in section 4.2.
2. Remove the case bottom cover as detailed in section 4.3.3.
3. Disconnect the keyboard connector from the main CBA (circuit board assembly), Figure 4-32.

> ☑ ***Note***
>
> Removing the display CBA makes it easier to remove the front panel label and to thread the new keyboard connector through the slot on the front panel.

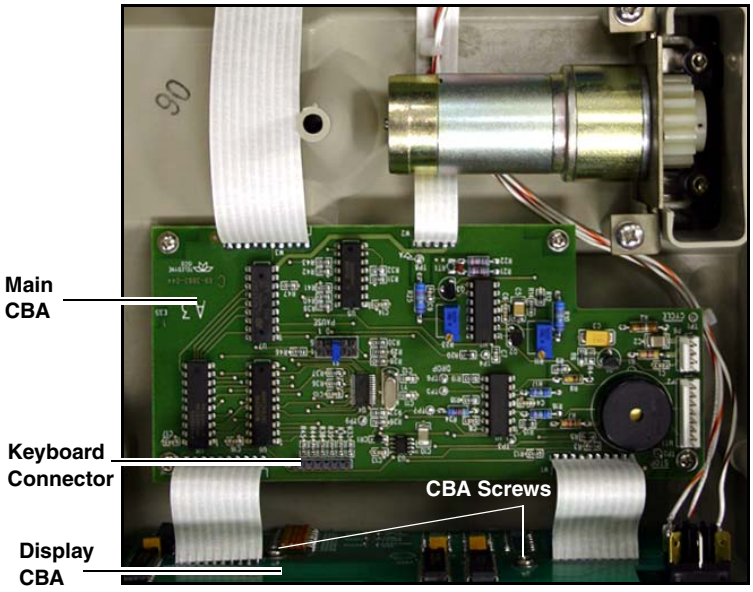


Figure 4-32 Display CBA and Keyboard Connector

To remove the display CBA:

a. Remove the two phillips CBA screws.

b. Pull the board away from the case front and lay it back against the main CBA.

⚠ CAUTION

The cables between the display CBA and the main CBA remain attached. Be careful not to break them.

☑ *Note*

Once the label has been removed it cannot be reused.

4. Use a sharp, flat object to pry the edge of the front panel label away from the case front. Be careful not to scratch or gouge the plastic case.
5. Peel one corner of the label away and push against the back of the label through the rectangular LED opening on the case front with your fingers to help lift the label. Then peel the label completely away. Discard the old label.
6. Thread the “pigtail” from the new label through the slot in the case front.
7. Remove the backing from the label, position the label over the opening, and then press it into place.
8. Replace the display CBA and reconnect the keyboard connector. Reinstall the two phillips CBA screws.

9. Reinstall the case bottom cover and the case top.
10. Test the unit's operation. If you have any problems, call the Teledyne Isco Service Department.

4.10 Service Department

If you have a problem with the instrument or need parts information, contact the Teledyne Isco Service Department. The toll-free number is: (800) 775-2965.

Before calling, please have the unit at hand, pencil and paper readily available, and have simple tools to disassemble the unit as needed. Month and year indicators are molded into the case parts to more accurately identify your unit and help with servicing.

If you write, please include all information that may be helpful in solving your problem. Address your letter to: Teledyne Isco, Inc. Service Department, P.O. Box 82531 Lincoln, NE 68501.

4.11 How to Ship Returns

If it is necessary to return the Retriever 500 to Teledyne Isco, please be sure to wash any effluent spills off the case top. If the unit is returned with debris or contaminants on it, please include a note identifying what the contaminants are, particularly if they are poisonous or harmful.

Be sure all parts and hardware are back in place before packing. Wrap the unit in heavy paper or put it in a plastic bag. If the original carton is not available, put the wrapped unit in a strong cardboard box at least six inches longer in each basic dimension than the unit. Fill the box equally around the unit with resilient packing material (shredded paper, bubble pack, expanded foam chunks, etc.). Seal it with strapping tape or gummed cloth tape and ship it to the address given previously.

It is very important that the shipment be well-packaged and fully insured. Damage claims must be settled between you and the carrier. This can delay repair and return of the unit to you.

4.12 Purchasing Parts

Only the replacement parts listed in Appendix A of this manual are stocked for immediate delivery by Teledyne Isco. Virtually all other parts are also available, but there may be some delay in shipping them because they are not normally stocked.

When ordering replacement parts, please supply the following information:

- series number of the unit
- item number
- part number

Retriever 500 Fraction Collector

Appendix A Replacement Parts List

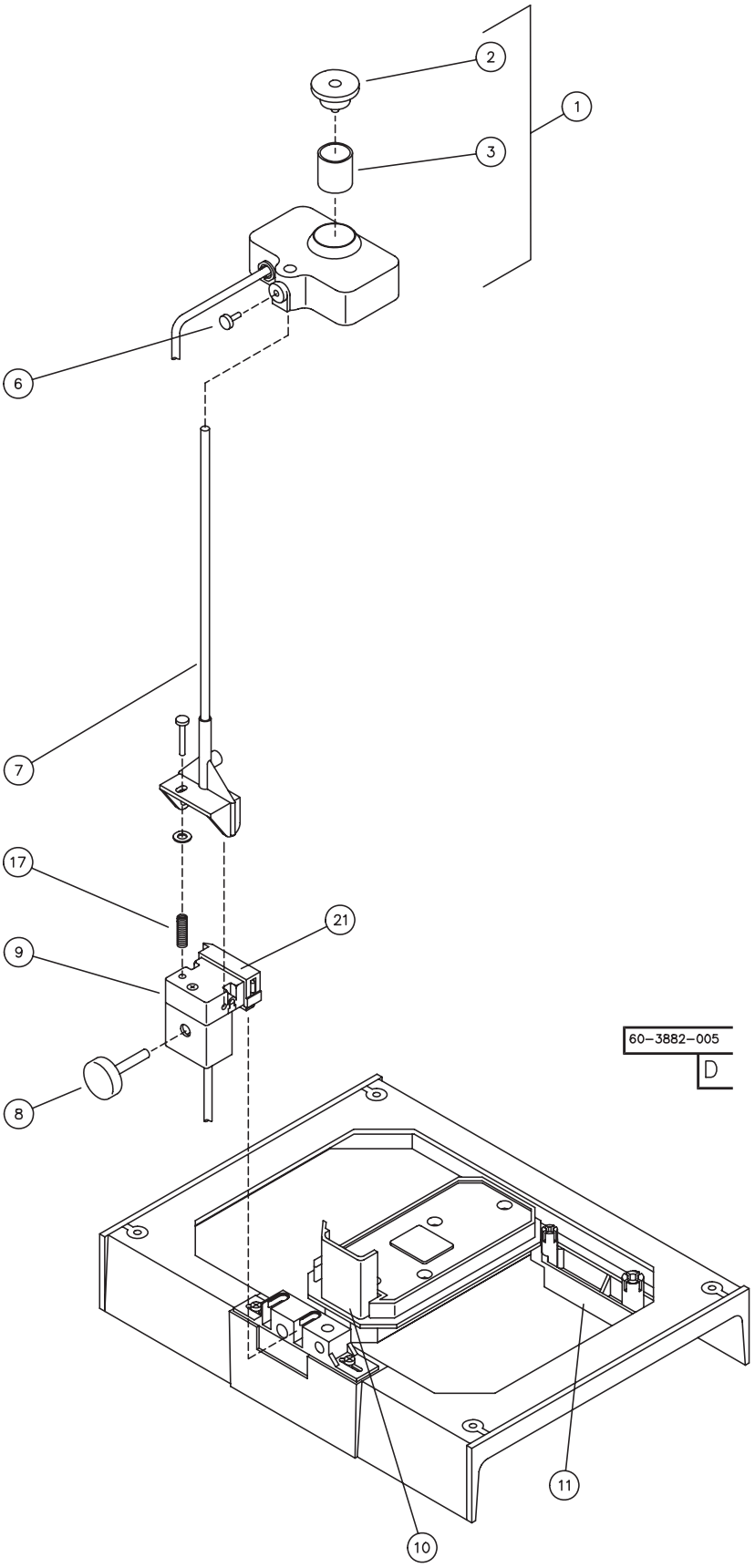
A.1 Overview

Only the parts listed in the this section of the manual are stocked for immediate delivery by Teledyne Isco. Virtually all other parts are also available, but there may be some delay in shipping them because they are not normally stocked.

The following figures illustrate the immediate delivery items. Each replacement part is given an item number which is shown in the callout “balloons” in the illustration. Use the item number to reference the appropriate part number in the list.

When ordering replacement parts, please supply the following information:

1. series number of the unit
2. item number
3. part number

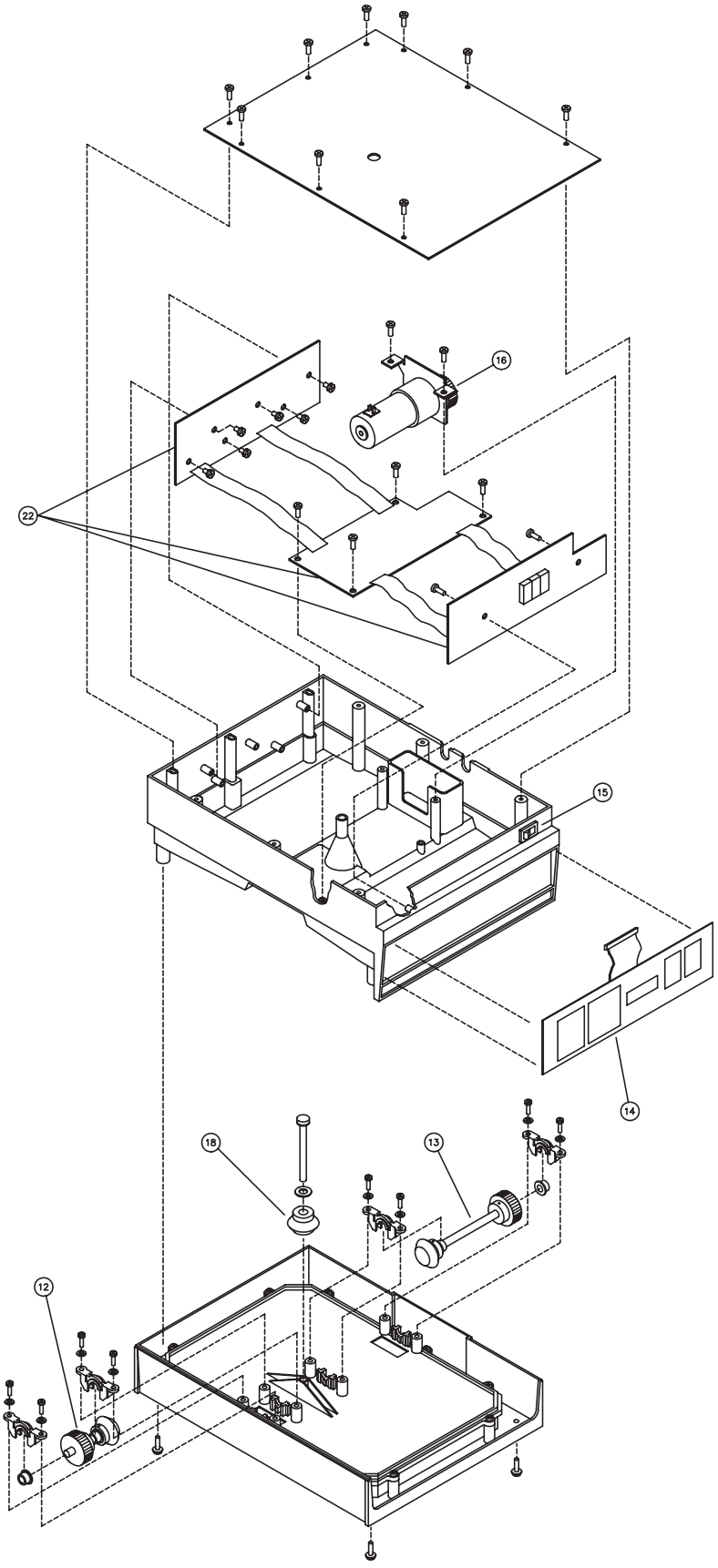

2
1
3
6
7
17
21
9
8
60-3882-005
D
11
10

REPLACEMENT PARTS LIST

DWG. NO.: 60–3882–005
SHEET: 2 OF 4
REV.: D DATE: 05345

ITEM NO.	PART NUMBER	DESCRIPTION
1	60–3884–004	DROP DETECTOR ELECTRICAL ASSY
2	60–1103–105	DROP FORMER
3	69–1103–106	DROP COUNTER SLEEVE
6	60–1854–034	SCREW
7	60–1574–070	COLUMN BRACKET ASSY
8	231–9097–20	HAND SCREW
9	60–3884–016	SENSOR ASSY
10	60–2183–022	BACKUP PLATE
11	60–1853–009	SHUTTLE
17	203–0112–05	SPRING
21	60–2183–056	SENSOR DRIP SHIELD
22	60–3884–020	TESTED CIRCUIT BOARD ASSEMBLY (ALL 3 CIRCUIT BOARDS)

NOTE: 1. This list is subject to change without notice.


16
22
15
14
18
13
12

REPLACEMENT PARTS LIST

DWG. NO.: 60–3882–005
SHEET: 4 OF 4
REV.: D DATE: 05345

ITEM NO.	PART NUMBER	DESCRIPTION
12	60–3884–008	RIGHT SHAFT DRIVE ASSY
13	60–3884–009	LEFT SHAFT DRIVE ASSY
14	69–3883–006	FRONT PANEL LABEL
15	60–3884–007	SWITCH ASSY
16	60–3884–006	MOTOR ASSY
18	200–0634–02	GEAR
20	60–1614–091	TRANSFORMER ASSY (117 VOLT) (NOT SHOWN)
20	60–1614–092	TRANSFORMER ASSY (100 VOLT) (NOT SHOWN)
20	60–3874–053	TRANSFORMER ASSY (234 VOLT) (NOT SHOWN)

NOTE: 1. This list is subject to change without notice.

NOTICE

Disregard the following “Declaration of Conformity” and Radio Interference Statement” if your instrument does not have a CE label on its rear panel

Radio Interference Statement

FCC

This equipment has been tested and found to comply with the limits for a class A digital 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 the user will be required to correct the interference at his own expense.

Canada

This ISM apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Ce générateur de fréquence radio ISM respecte toutes les exigences du Règlement sur le materiel brouilleur du Canada.

产品中有毒有害物质或元素的名称及含量

Name and amount of Hazardous Substances or Elements in the product

部件名称 Component Name	有毒有害物质或元素 Hazardous Substances or Elements					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二联苯 (PBDE)
线路板 Circuit Board	X	O	O	O	O	O
接线 Wiring	O	O	O	O	X	O
内部电缆 Internal Cables	O	O	O	O	X	O
主电源线 Line Cord	O	O	O	O	X	O
变压器 Transformer	X	O	O	O	X	O
直流电机 DC Motor	X	O	O	O	X	O
小键盘 Keypad	X	O	O	O	X	O

产品中有毒有害物质或元素的名称及含量：Name and amount of Hazardous Substances or Elements in the product

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在ST/ 标准规定的限量要求以下。

O: Represent the concentration of the hazardous substance in this component's any homogeneous pieces is lower than the ST/ standard limitation.

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出ST/ 标准规定的限量要求。

(企业可在此处，根据实际情况对上表中打"X" 的技术原因进行进一步说明。)

X: Represent the concentration of the hazardous substance in this component's at least one homogeneous piece is higher than the ST/ standard limitation.

(Manufacturer may give technical reasons to the "X"marks)

环保使用期由经验确定。

The Environmentally Friendly Use Period (EFUP) was determined through experience.

生产日期被编码在系列号码中。前三位数字为生产年(207 代表2007年) 。随后的一个字母代表月份：A为一月，B为二月，等等。

The date of Manufacture is in code within the serial number. The first three numbers are the year of manufacture (207 is year 2007) followed by a letter for the month. "A" is January, "B" is February and so on.

DECLARATION OF CONFORMITY

CE
ISM1-A

Application of Council Directive:	89/336/EEC – The EMC Directive 73/23/EEC – The Low Voltage Directive
Manufacturer's Name:	Teledyne Isco, Inc.
Manufacturer's Address:	4700 Superior, Lincoln, Nebraska 68504 USA Mailing Address: P.O. Box 82531, Lincoln, NE 68501
Equipment Type/Environment:	Laboratory Equipment for Light Industrial/Commercial Environments
Trade Name/Model No:	Retriever 500/RTRV 500
Year of Issue:	2000
Standards to which Conformity is Declared:	EN 61326-1998 EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use EN 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Standard	Description	Severity Applied	Performance Criteria
EN61000-4-2	Electrostatic Discharge	Level 2 - 4kV contact discharge Level 3 - 4kV air discharge	B B
EN61000-4-3	Radiated RF Immunity	80 MHz to 1000MHz 80% AM at 1kHz Level 1 - 3V/m	A
EN61000-4-4	Electrical Fast Transient	Level 2 - 1kV on ac lines	B
EN61000-4-5	Surge on AC Lines	1kV common mode, 500V differential mode	B
EN61000-4-6	Conducted RF on AC lines	150 kHz to 80 MHz, 3V rms, 80% modulated	B
EN61000-4-11	Voltage Dips/Short Interruptions	0.5 cycle, each polarity/100%	B
CISPR11/ EN 55011	RF Emissions	Group 1, Class A Industrial, Scientific, and Medical Equipment	
EN61000-3-2, 3-3	Harmonic Flicker	Group 1, Class A	

We, the undersigned, hereby declare that the design of the equipment specified above conforms to the above Directive(s) and Standards as of August 15, 2000.

William Foster

William Foster
USA Representative

TELEDYNE ISCO
A Teledyne Technologies Company

William Foster
Director of Engineering
Teledyne Isco, Inc.
4700 Superior Street
Lincoln, Nebraska 68504

Phone: (402) 464-0231
Fax: (402) 464-4543

60-3882-031
Rev D

*Teledyne Isco One Year Limited Factory Service Warranty **

Teledyne Isco warrants covered products against failure due to faulty parts or workmanship for a period of one year (365 days) from their shipping date, or from the date of installation by an authorized Teledyne Isco Service Engineer, as may be appropriate.

During the warranty period, repairs, replacements, and labor shall be provided at no charge. Teledyne Isco's liability is strictly limited to repair and/or replacement, at Teledyne Isco's sole discretion.

Failure of expendable items (e.g., charts, ribbon, tubing, lamps, glassware, seals, filters, fittings, and wetted parts of valves), or from normal wear, accident, misuse, corrosion, or lack of proper maintenance, is not covered. Teledyne Isco assumes no liability for any consequential damages.

This warranty does not cover loss, damage, or defects resulting from transportation between the customer's facility and the repair facility.

Teledyne Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose.

This warranty applies only to products sold under the Teledyne Isco trademark and is made in lieu of any other warranty, written or expressed.

No items may be returned for warranty service without a return authorization number issued from Teledyne Isco.

The warrantor is Teledyne Isco, Inc.
4700 Superior, Lincoln, NE 68504, U.S.A.

*** This warranty applies to the USA and countries where Teledyne Isco Inc. does not have an authorized dealer. Customers in countries outside the USA, where Teledyne Isco has an authorized dealer, should contact their Teledyne Isco dealer for warranty service.**

In the event of instrument problems, always contact the Teledyne Isco Service Department, as problems can often be diagnosed and corrected without requiring an on-site visit. In the U.S.A., contact Teledyne Isco Service at the numbers listed below. International customers should contact their local Teledyne Isco agent or Teledyne Isco International Customer Service.

Return Authorization

A return authorization number must be issued prior to shipping. Following authorization, Teledyne Isco will pay for surface transportation (excluding packing/crating) both ways for 30 days from the beginning of the warranty period. After 30 days, expense for warranty shipments will be the responsibility of the customer.

Shipping Address: Teledyne Isco, Inc. - Attention Repair Service
4700 Superior Street
Lincoln NE 68504 USA

Mailing address: Teledyne Isco, Inc.
PO Box 82531
Lincoln NE 68501 USA

Phone: Repair service: (800)775-2965 (lab instruments)
(800)228-4373 (samplers & flow meters)
Sales & General Information (800)228-4373 (USA & Canada)

Fax: (402) 465-3001

Email: iscoservice@teledyne.com **Web site:** www.isco.com

February 1, 2006 P/N 60-1002-040 Rev C

TELEDYNE ISCO
A Teledyne Technologies Company