Foxy Jr.®
Fraction Collector

Installation and Operation Guide

TELEDYNE ISCO
A Teledyne Technologies Company

Part #69-3873-169 of Assembly #60-3873-152

Revision N, May 1, 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.

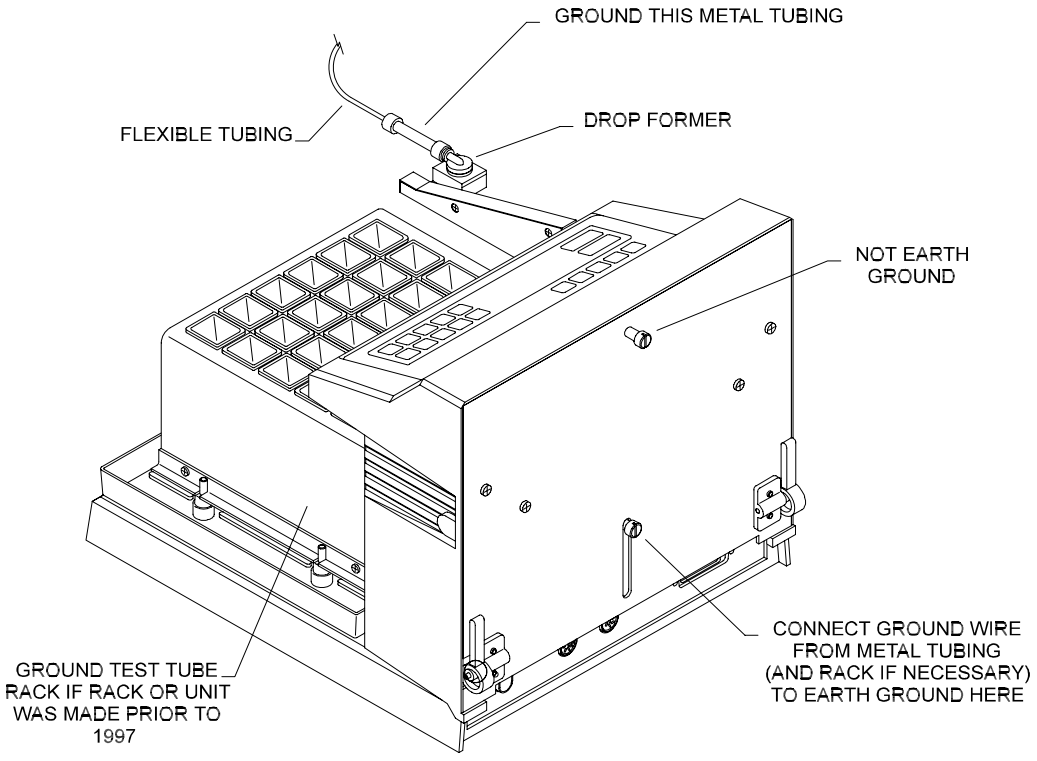
WARNING:

HAZARD of EXPLOSION or FIRE from electrostatic charge buildup in high-velocity nonconductive liquids.

Nonconductive, nonpolar liquids (such as hexane) flowing at linear velocities greater than 40 cm/sec., will develop a static charge. If the liquid is flammable or explosive, this charge can create a serious fire/explosion hazard. If you must use high flow rates in your application, and the liquids are flammable, use **metal tubing** (not supplied by Isco) between the flexible tubing and the drop former and **ground** the metal tubing (and rack, if necessary) as shown in below.

Isco also recommends that the system and fraction collector be placed inside a **fume hood**. Not only will the moving air prevent the accumulation of explosive fumes, but the moving air also appears to assist in bleeding away the static charge, as well.

On the back of this page is a chart based on tubing size for determining whether these safety considerations apply to your application.



(DWG NO. 60-3872-068, REV B)

EXAMPLE: USING 1/8" INTERNAL DIAMETER TUBING–

INTERNAL DIAMETER INCHES X 2.540 = INTERNAL DIAMETER CENTIMETERS

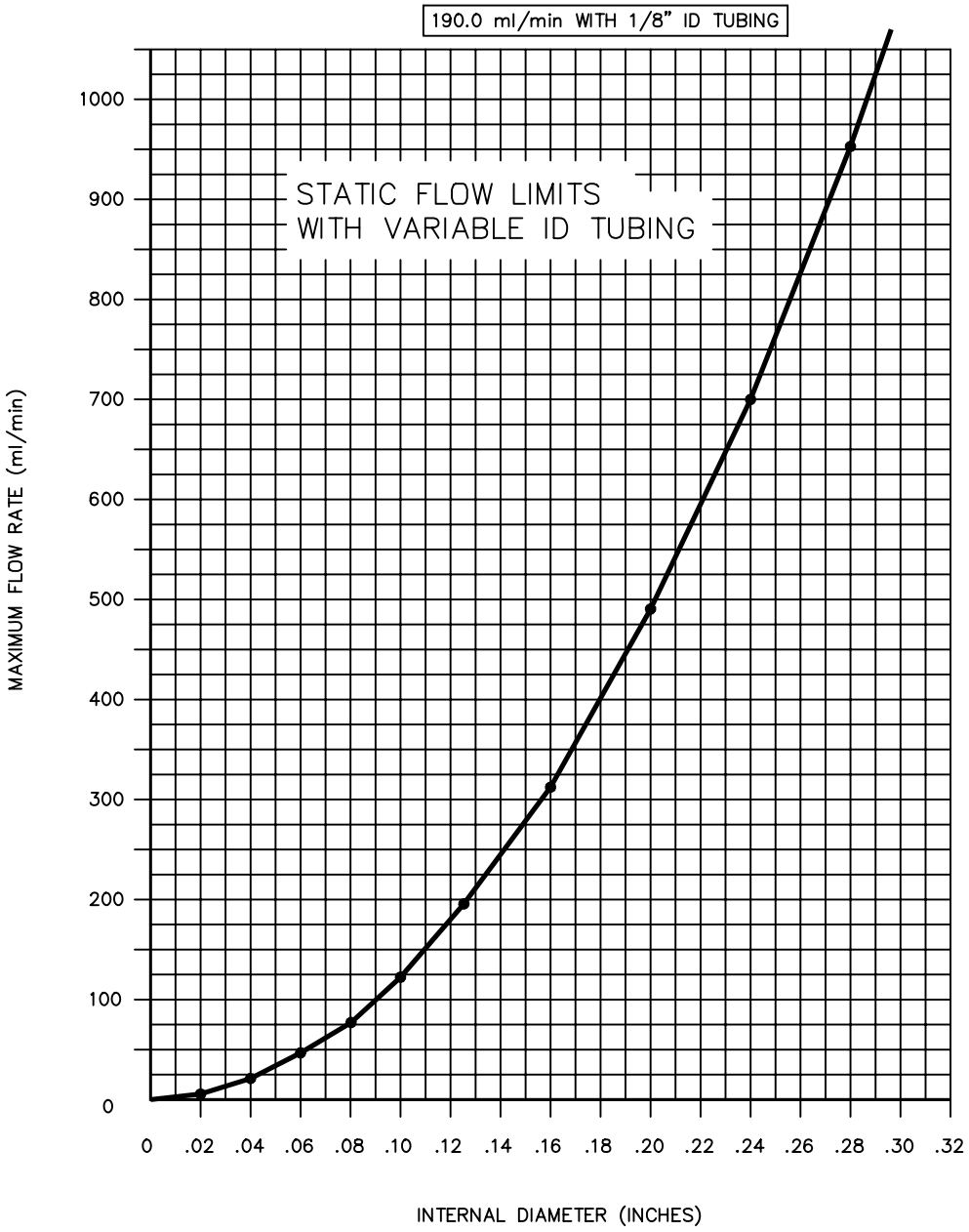
.125 X 2.540 = .3175 cm

R = .3175/2

R = .15875 cm

$ml/min = (40\ cm)(\pi)(60)R^2$

190.0 ml/min WITH 1/8" ID TUBING



(DWG NO. 60–2132–161)

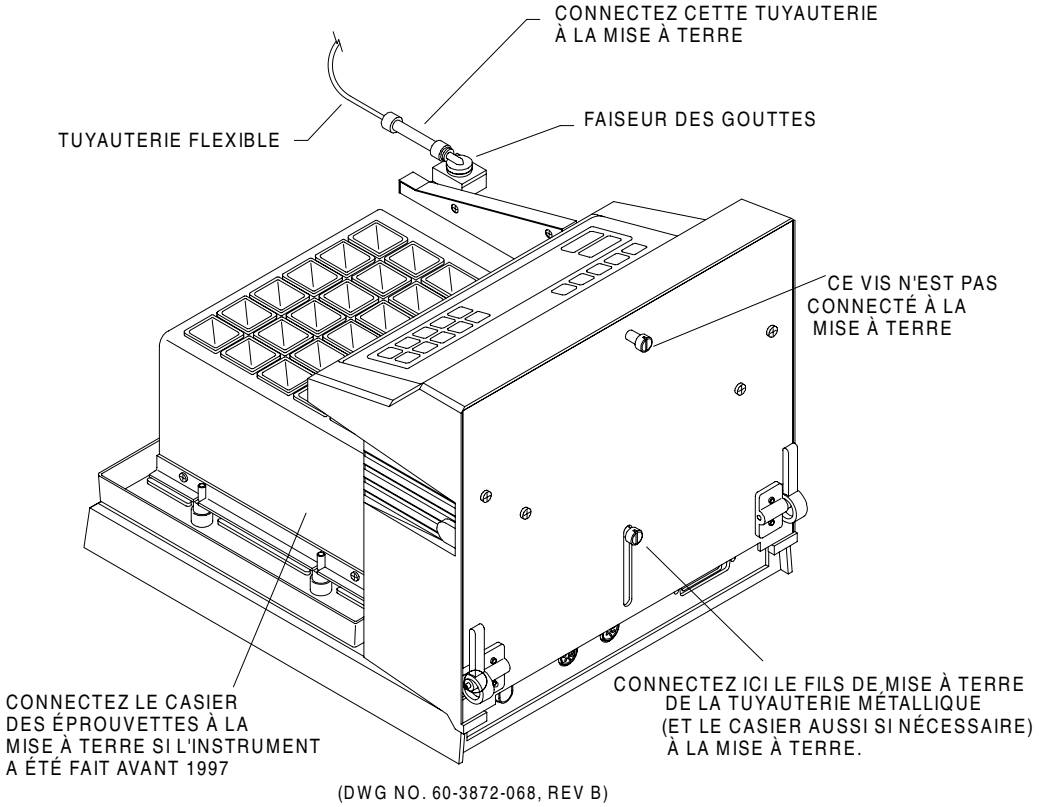
AVERTISSEMENT:

Hasard d'explosion ou d'incendie de l'accumulation de charge électrostatique dans les liquides non-conducteurs quand ils coulent à vélocité haute.

Les liquides qui sont non-conducteurs et non-polaires (tel qu'hexane), en coulant à vélocités linéaires plus vite que 40 cm/sec., développeront une charge électrostatique. Si ce liquide est inflammable ou explosif aussi, cette charge peut créer un hasard sérieux de feu ou d'explosion. Si vous devez utiliser tels liquides inflammables à vélocité haute dans votre application, utilisez la tuyauterie métallique (pas fournie par Isco) entre la tuyauterie flexible et le faiseur des gouttes, et connectez une mise à terre entre la tuyauterie (et le casier, s'il est nécessaire) comme montré dans le dessin 1.

Isco recommande aussi que vous installez le système entier (y compris le collecteur des fractions) à l'intérieur d'une hotte chimique. L'air en mouvement prévient l'accumulation des vapeurs explosives. L'air en mouvement semble aussi d'aider à dissiper la charge électrostatique.

Sur l'autre côté de cette page il ya un graphique de courant de liquide et dimension de tuyauterie. Utilisez ce graphique pour déterminer si votre application est sans danger.



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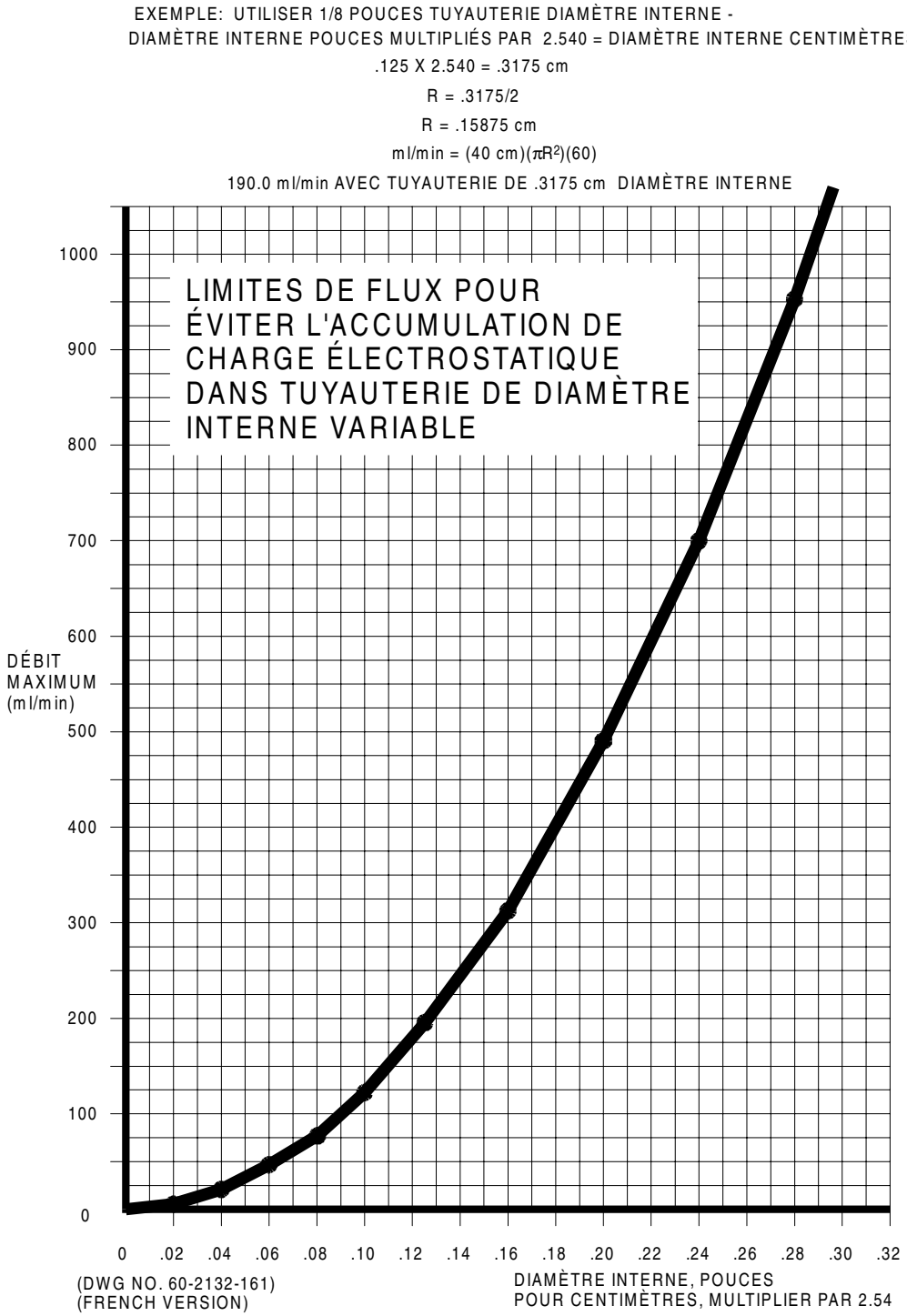

Limites du flux des liquides non-conducteurs pour éviter l'accumulation de charge électrostatique dans la tuyauterie du diamètre interne variable

Foxy Jr. Fraction Collector

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Foxy Jr. Fraction Collector

Section 1 Introduction

The Foxy Jr. Fraction Collector has easy-to-use, interactive programming. Microprocessor control and advanced software allow you to program the Foxy Jr. quickly and easily for almost any collection routine.

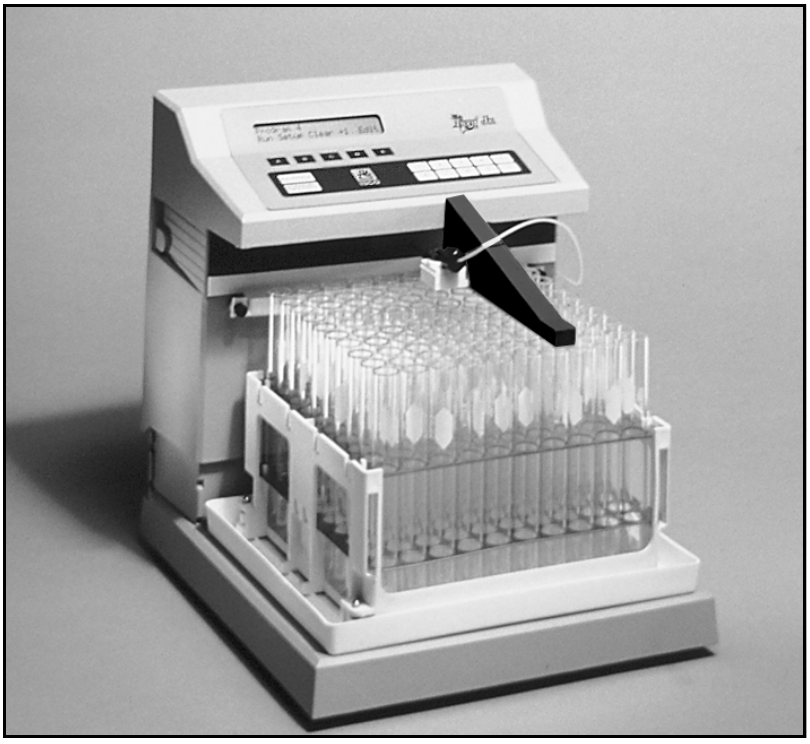


Figure 1-1 Foxy Jr. Fraction Collector

1.1 Foxy Jr. Features

Some common collection schemes and features you can easily program include:

- Basic collection of uniform fractions with fraction sizes set by time, drop count, or external signal count.
- A variety of peak separation schemes including:
  - slope (rate of change in detector output)
  - threshold level sensing
  - time windows
  - time windows and slope
  - time windows and level sensing
  - slope and level sensing
  - time windows, slope, and level sensing

- A delay time may be programmed to synchronize the Foxy Jr. with the detector.
- Diversion of waste using either the built-in waste drain or optional 3-way diverter valve.
- The Foxy Jr. can be controlled serially.
- An optional security or diverter valve is available for use with the Foxy Jr.

The Foxy Jr.'s user-friendly software makes programming easy. You can set all collection parameters to customize your collection routines. Fraction collection can be controlled on the basis of time, counted drops, or external signals. This programming flexibility enables you to quickly tailor a run to any application .

Up to nine collection programs can be saved and recalled by pressing a number key. Different operators can create and save their own programs, making multi-user operation simple. Any saved program can also be recalled and edited to meet new requirements. All changes are automatically saved as you edit. All nine programs remain in memory as long as the instrument is plugged in or the internal NiCad battery remains charged.

The Foxy Jr. is programmed through a spill-resistant membrane keyboard consisting of function-specific softkeys. The Foxy Jr.'s LCD display prompts you for program options and operating conditions. Simple messages guide you through the programming steps. During a run, the display provides continually updated information on operating conditions.

1.2 Racks and Vessels

The Foxy Jr. is supplied with a chemical-resistant stainless steel and polypropylene tube rack designed for 13 mm diameter test tubes, unless otherwise requested. Other racks are available for 12, 16, 18, and 25 mm diameter test tubes, MiniVials®, 96 well microplates, 28 mm scintillation vials, 1.5 ml micro centrifuge tubes, standard 50 ml centrifuge tubes, and prep funnel racks. The Foxy Jr.'s polypropylene drip pan has tabs which accurately locate up to nine 150 ml bottles or a single, larger container. TheFoxy Jr.'s case is designed to allow you to adjust the height of the instrument to accommodate 100mm, 125mm, and 150mm tall collection vessels. Disposable collection racks are also available for the Foxy Jr.

During collection, tubes remain stationary while the moving collection arm positions the drop former over the appropriate tube. When a run is complete, the drop former returns to the waste drain where unwanted effluent is diverted to waste.

1.3 Peak Detection

The Foxy Jr.'s built-in peak detector allows collection based on signals from a separate UV, florescence, or other detector. Up to 10 time windows defining important areas may be programmed for collection. Unwanted peaks may be diverted to waste through the waste drain or optional diverter valve.

The Foxy Jr. automatically controls a security (on/off) valve to prevent loss of sample when changing tubes, or actuates a 3-way diverter valve to prevent pressure buildup between tubes. It can also interrupt pump operation when indexing tubes, at the end of a run, or manually.

1.4 Control Panel

The Foxy Jr.'s control panel consists of a 17-key membrane keypad and a 48-character LCD. The keys have a tactile click as well as an audible tone to indicate that you have activated a key. The alphanumeric display provides programming flexibility and allows the Foxy Jr. to communicate a wide range of information. The contrast can be adjusted for comfortable viewing.

Table 1-1 describes the Foxy Jr.'s front panel controls, according to the call-out numbers in Figure 1-2.

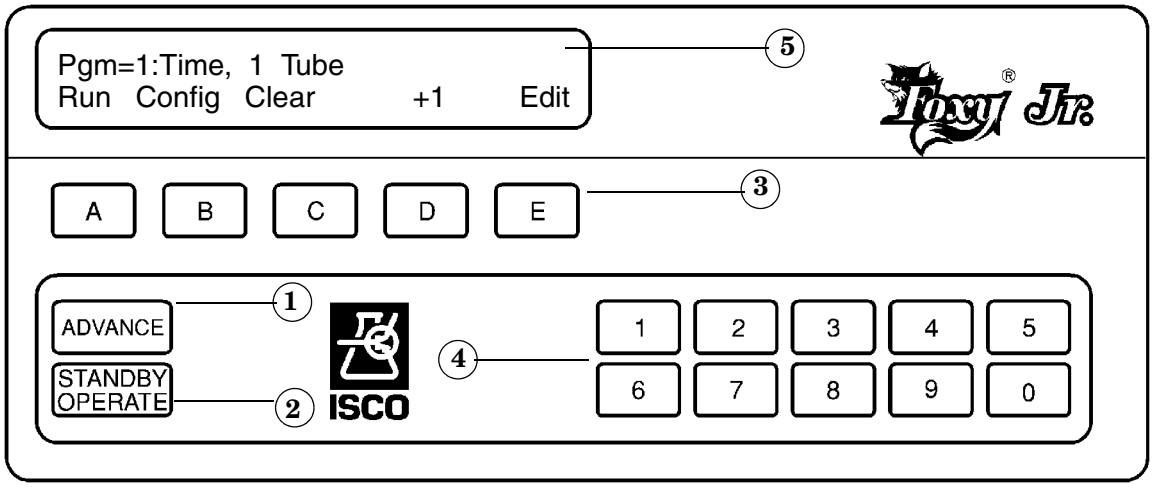


Figure 1-2 Foxy Jr. Control Panel

Table 1-1 Foxy Jr. Control Panel

Item No. in Fig. 1-2	Control	Description
1	Advance Key	Provides manual control of drop former position, valve and pump operation.
2	Standby/Operate Key	Switches the instrument between operate and standby modes, without disconnecting power.
3	Softkeys	Labeled A, B, C, D and E; used to select menu items displayed on the liquid crystal display.
4	Numeric Keypad	Used to enter numeric data.
5	Liquid Crystal Display (LCD)	2 lines x 24 characters display area.

1.5 Rear Panel Connectors

The rear panel of the Foxy Jr. has connectors allowing external detector input, pump control, and serial connection to a computer and/or other instruments. The rear panel connectors are described in Table 1-2.

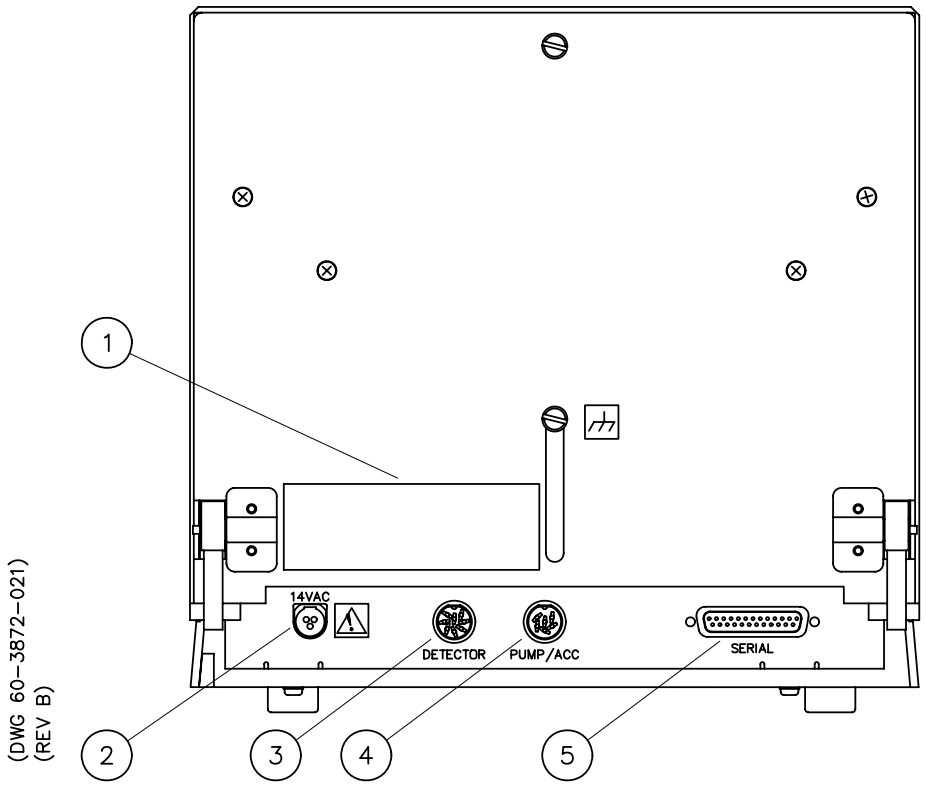


Figure 1-3 Foxy Jr. Rear Panel

Table 1-2 Foxy Jr. Rear Panel

Item in Fig. 1-3	Item/connector	Description
1	Serial tag	Indicates the serial number and series number of the instrument.
2	Power connector	Input from wall power adapter.
3	Detector (8-pin DIN)	Interface connection to the detector for automatic peak separation, event marking, inject action, and external advance.
4	Pump/Acc. (6-pin DIN)	Provides stop signal to pump at the end of the run and optionally between tubes. Also provides a count input for the valve controller.
5	RS-232-(25-pin D-Sub)	Serial interface to computer or other instruments for monitoring , control, and printing.

1.6 Technical Specifications

Foxy Jr. technical specifications are detailed in Table 1-3.

Table 1-3 Foxy Jr. Fraction Collector Technical Specifications

Collection Vessels	(144) 12 or 12 mm tubes (72) 1.5 ml micro centrifuge tubes (100) 16 mm tubes (72) 18 mm tubes (72) MiniVials (2) 96 well Microplates (36) 28 mm scintillation vials (36) 25 mm tubes (36) 50 ml centrifuge tubes (9) 150 ml bottles (36) Prep funnels
Collection Basis	Time: 1 second to 99 hours: 59 minutes: 59 seconds Drop: 1 to 999,999 drops Volume: 1 to 999,999 volume units
Program Storage/Restart after Power Failure	7 days
Anti-Drip Delay	0.8 second with valve installed or pump stop between tubes is enables
Advancement Speed (Default setting: acceleration=5)	0.2 to 15 seconds tube center to tube center depending on rack type and acceleration setting
Maximum Drop Speed	5.5 drops/second
Serial Communication Baud Rates Supported (for external computer)	300, 1200, 2400, 4800, 9600, 19200
Dimensions	Depth: 12.3 inches (31 cm) Width: 10.9 inches (28 cm) Height: 10.5 to 12.5 inches (27 to 32 cm)
Weight	10.35 lbs. (4.7 kg)
Power Requirements (Use only Teledyne Isco made power packs)	100 VAC ±10 V part #60-1614-092 117 VAC ±12 V part #60-1614-091 234 VAC ±23 V part #60-3874-053
Line Frequency	50 to 60Hz (Note: 117 VAC @ 50Hz is not available)
Power Consumption	22 VA
Line Voltage Noise Tolerance	±170% of nominal line voltage, 10 microseconds at any phase angle
Ambient Temperature Range	0° to 40°C
Humidity (Connected to power mains)	95% RH 0-20°C; 90% RH 21-40°C
Pollution Degree	2
Installation Category	II
Maximum Altitude	2,000 meters

1.7 Glossary

Default

A parameter which is pre-programmed at the factory. Defaults are provided as a convenience and represent typical selections for some fields. The default parameter is displayed on the screen. Simply press the **Enter** softkey to accept the displayed parameter.

Display

The Foxy Jr. Liquid Crystal Display (LCD).

Field

The space designated on the screen for the entry of parameters.

Park

The drop former is positioned at the right rear of the instrument, over the waste drain.

Keys

The raised buttons on the Foxy Jr. keyboard.

Parameter

Any value that must be entered or selected while programming the Foxy Jr.

Screen

The program and run information appearing on the LCD display. Some screens are referred to by name. All screens are described in Section 3.

Softkeys

The keys labeled A through E are softkeys. The function of these keys changes depending on the current status of the Foxy Jr. The function of each softkey is indicated by the display above the softkeys.

Foxy Jr. Fraction Collector

Section 2 Preparation For Use

This section describes the setup procedures for the Foxy Jr. and its optional accessories. Tools required to install accessories are listed at the beginning of each procedure.

Before attempting to assemble or operate the Foxy Jr., ensure that all parts listed on the packing slip are in the shipping carton(s). All items ordered, including test tube racks and optional valves, are listed on the packing slip.

> ☑ ***Note***
>
> Optional accessories ordered with the Foxy Jr. may be shipped in a separate carton.

Inspect the Foxy Jr. for damage that may have occurred during shipping. Notify the shipping carrier immediately if you find any damage.

2.1 Preliminary Checkout

Before using the Foxy Jr., you may perform a preliminary checkout sequence to ensure your unit functions properly. This includes testing electrical, mechanical, and programming functions. To do this, you need to enter a simple program.

> ⚠ **CAUTION**
>
> Do not install any accessories until preliminary checkout has been completed.

1. Set the Foxy Jr. upright on a level surface.

> ⚠ **WARNING**
>
> **The powerpack and your instrument have been thoroughly tested together by Underwriters Laboratories (UL®). Use only the Teledyne Isco powerpack provided: 100 VAC, #60-1614-092; 117 VAC, #60-1614-091 234 VAC #60-1614-093**

2. Connect the Foxy Jr. to power using the supplied powerpack. The display should be off.
3. Press the STANDBY/OPERATE key on the keyboard. The Foxy Jr. will perform a self-test, then the drop former should move to the right rear of the drip pan, over the waste drain. The display momentarily displays the software version, then shows the main screen

The Foxy Jr. prompts you through its programming steps with a series of simple menus. After you make your programming selection and press the **Enter** softkey, the next menu prompts you for another program step.

Preliminary Test Entries

4. After the initial version and copyright screen, the following screen appears:

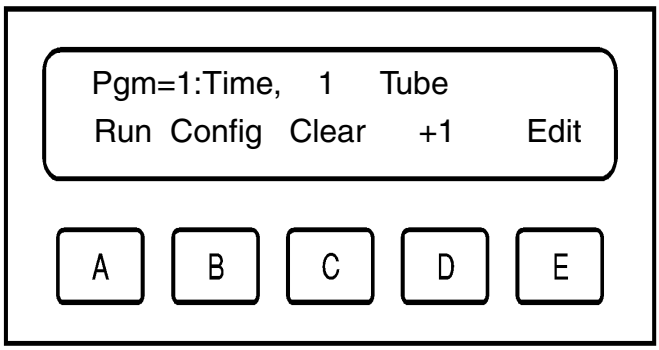
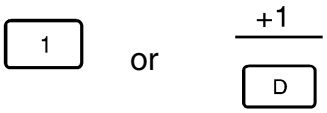
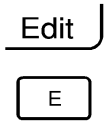


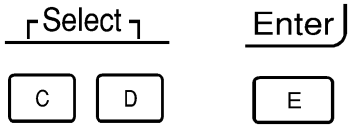
Figure 2-1 Foxy Jr. Main Menu



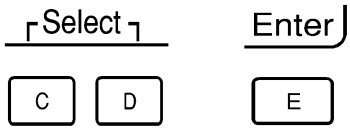
5. If Pgm=1 is not displayed, press **1** on the numeric keypad or press the **+1** softkey until Pgm=1 is displayed.



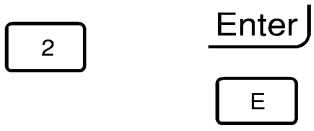
6. Press the **Edit** softkey to edit Program 1.



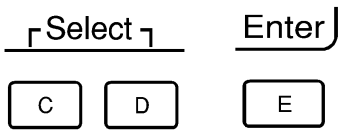
7. The next screen prompts you to select a collection mode. Press either **Select** softkey (C or D) until Simple is displayed; press **Enter**.



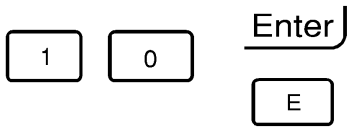
8. The next screen prompts you to select the rack type. Press either Select softkey (C or D) until 12/13 mm tubes or the appropriate rack installed into the Foxy Jr. Press **Enter**.



9. The next screen prompts you to enter the last tube in the run. Press **2** on the numeric keypad and press **Enter**.

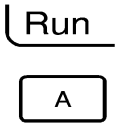


10. Press either Select softkey until **Fraction by time** is displayed. Press **Enter**.

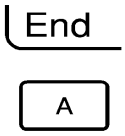


Operational Test

11. Enter 0:10 for fraction time then press the **Enter** softkey to store it and return to the main screen.



12. Press the **Run** softkey. The drop former should advance to front left of the drip pan. The screen should display Tube = 1 and the fraction time. After 10 seconds, the drop former should move to tube 2. After 10 seconds over tube 2, the drop former should return to the park position over the waste drain.



13. Press the **End** softkey when the program is done. This completes the preliminary checkout sequence.

If the preliminary checkout ran satisfactorily, complete the preparatory steps in this section and then refer to Section 3 for operating instructions and Section 4 for connection of accessories.

If the Foxy Jr. failed, contact Teledyne Isco's Technical Service Department.

2.2 Drop Former Installation

To connect the inlet tubing to the Foxy Jr., remove the drop former and install the tubing while holding the drop former in your hand.

2.2.1 Removing Drop Former

To remove the drop former:

1. Access the drop former by connecting the instrument to power using the supplied wall power pack. Press the STANDBY/OPERATE key to turn on the Foxy Jr. and press the ADVANCE key. Then press 1 on the numeric keypad, press **Enter**, and press the **Tube** softkey. This moves the drop former to a more accessible location.
2. Hold the drop counter assembly with one hand and grasp the drop former with the other, as shown in Figure 2-2.
3. Pull straight up on the drop former to remove it from the drop counter assembly. Rotating the drop former while pulling upward may ease removal.

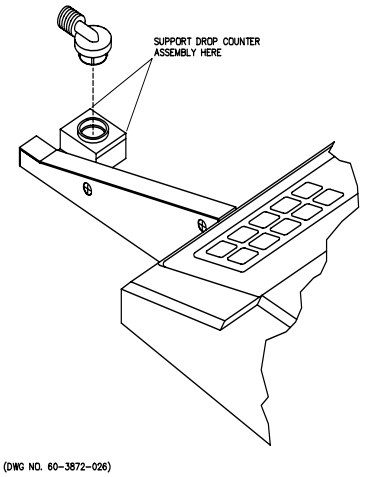


Figure 2-2 Removing the Drop Former

2.2.2 Installing Inlet Tubing To install the inlet tubing:

1. Unscrew the lead connector nut from the lead connector.
2. Guide the tubing through the nut and an appropriately sized ferrule into the lead connector, as shown in Figure 2-3.

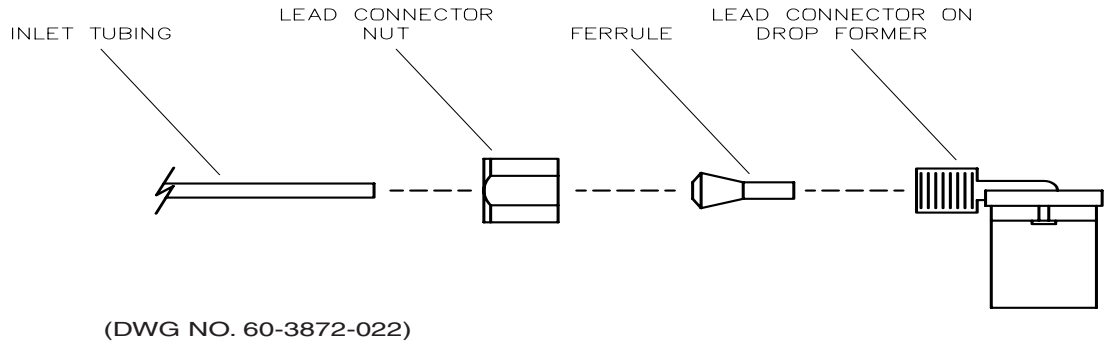


Figure 2-3 Installing the Inlet Tubing

3. Push the tubing into the lead connector and tighten the lead connector nut on the drop former.

2.2.3 Installing the Drop Former

To install the drop former, support the underside of the drop counter assembly and press the drop former firmly into place. A slight rotation of the drop former while pressing into place will make assembly easier. The tubing connector should point toward the front.

See Section 4 for possible tubing routing.

2.3 Rack Installation

The Foxy Jr. accommodates one rack. All racks are designed to prevent improper installation, however, you should ensure that the rack rests flat on the drip pan. The rack is properly oriented if the test tube numbers appear upright when viewing the instrument from the front. Make sure the drop former is in the park (right rear) position. Set the rack on the drip pan at a slight angle as shown in Figure 2-4, align the index pins, and press the rack into place on the pins. When properly seated, both sides of the rack will sit on the ridges in the drip tray.

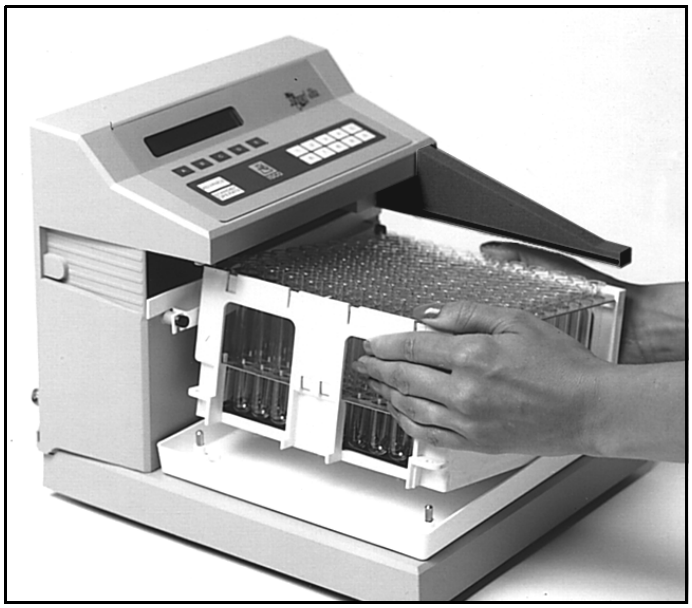


Figure 2-4 Installing the Test Tube Rack

2.4 Micro Collection Tray

These chemically resistant polypropylene trays are ideal for collecting small (0.5 ml or less) fractions. Each tray has 72 conical sample wells arranged in a matrix which conforms to the tube spacing of both 12 mm and 13 mm racks. Up to two trays per rack can be used. They may be placed directly on the rack or on top of test tubes. These trays have a special drop disperser feature which breaks the drop as it falls in the tray, preventing your sample material from splashing out of the shallow collection well. Micro collection trays may be ordered in packages of ten.

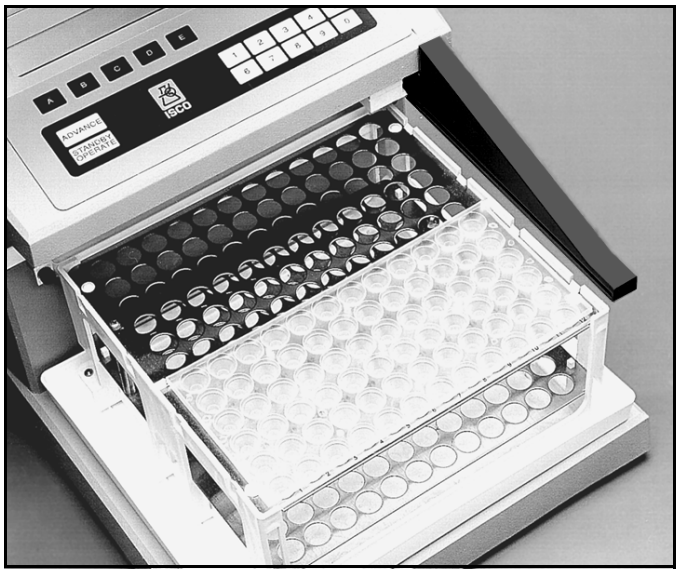


Figure 2-5 Micro Collection Tray

2.5 Funnel Tray

Each 12 and 13 mm test tube rack is shipped with two chemically resistant polypropylene funnel trays. The molded tray consists of a matrix of 72 funnels which, when inserted into the test tubes in the racks, ensure that no effluent drops between the tubes. These trays are ideal for collecting radioactive materials because they protect against contamination of the test tube racks. Two trays can be used per rack.

Because the diameter of 12 mm tubes is so small, a minor variation in the evenness of the surface on which the Foxy Jr. is sitting may increase the risk of drops not hitting the tubes. Therefore, the funnel trays are recommended for use when collecting in 12 mm tubes.

Additional funnel trays may be ordered in packages of ten (part number 68-2137-013).

2.6 Prep Rack (Funnel Rack)

A matrix of 36 funnels on this rack connected to tubing will allow you to distribute effluent to 36 remote vessels of unlimited volume. This rack handles flow rates up to 100 ml/min with valving between fractions, or 1 liter/min of non-foaming liquids without valving.

⚠ WARNING

High flow rates with linear velocities greater than 40 cm/sec. of non-conducting liquids (e.g. hexane) generate electrostatic charges on the instrument and associated tubing. If the liquids are flammable, this constitutes a fire hazard. Use grounded metal connecting tubing to the drop former as shown in Figure 2-6 and connect a ground wire to the metal portion of the rack.

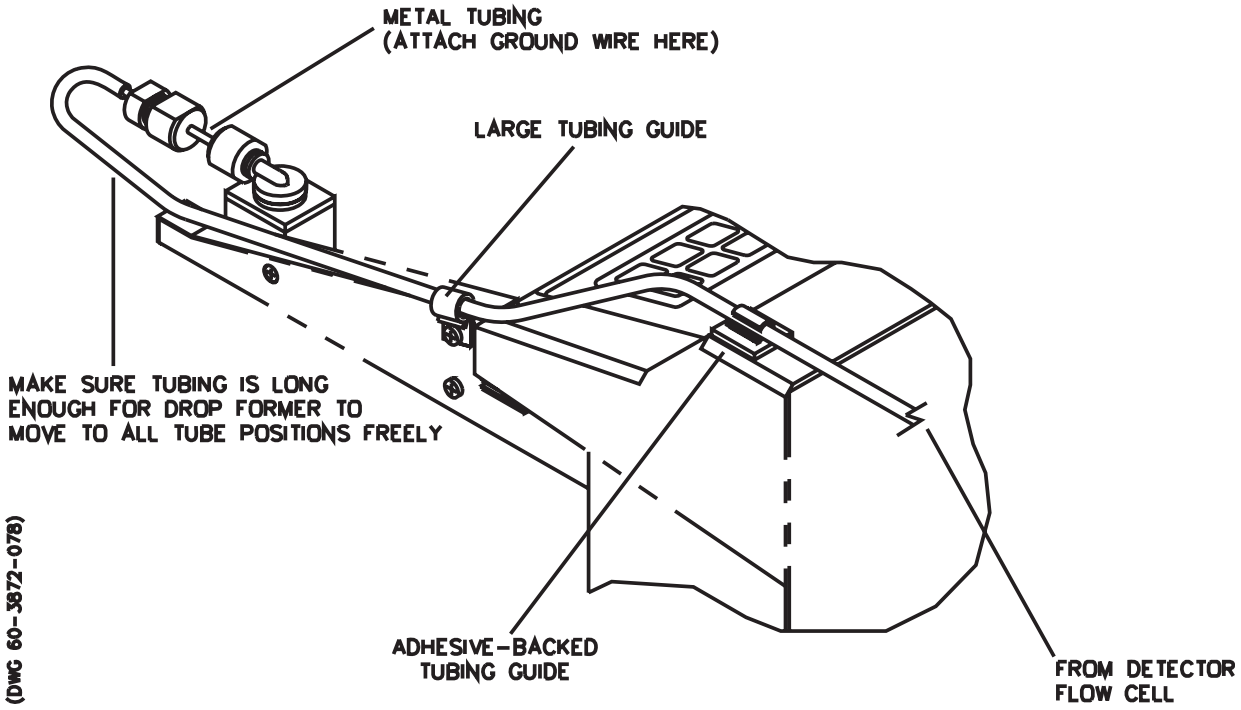


Figure 2-6 Connecting Grounded Metal Tubing to the Drop Former

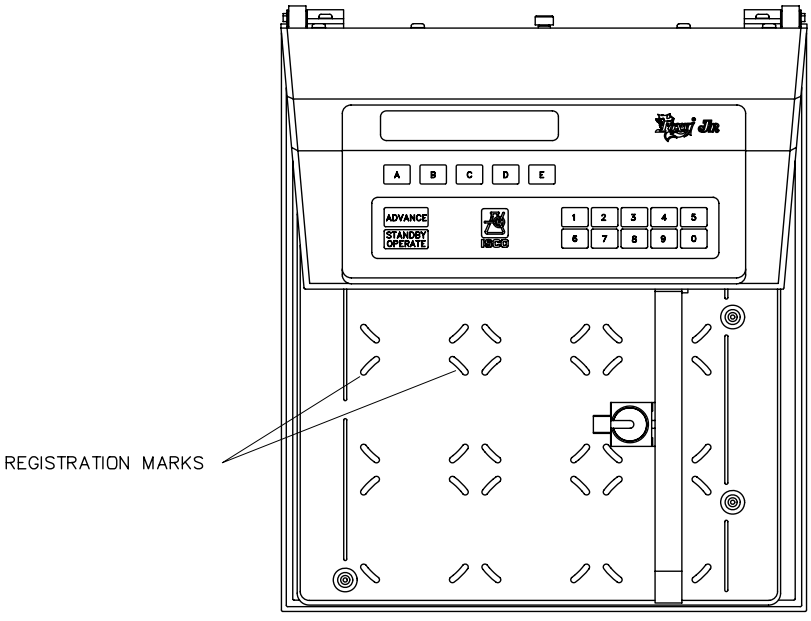


Figure 2-7 Registration Marks on Drip Pan

2.7 Container Collection

No racks are required for container collection. The Foxy Jr. accommodates up to nine 150 ml bottles. The proper position of these containers is indicated by raised registration marks on the drip pan. Alternatively, a single, large container may be placed at the center of the drip pan.

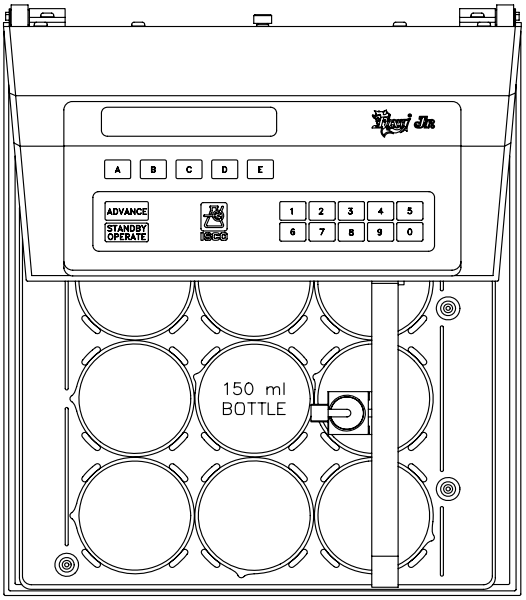


Figure 2-8 150 ml Bottles Positioned on Drip Pan

2.8 Height Adjustment

To accommodate collection vessels of different sizes, the Foxy Jr. has a three-position height adjustment. The height can be set for 100mm, 125mm, and 150mm collection vessels.

The telescoping mechanism is incorporated into both the upper and lower case halves. The upper case half has protrusions that engage a set of mating locating features molded into the lower case half. The two parts are held together by a pair of locking cams that are attached to the rear of the Foxy Jr. and press against the lower case half. Three sets of reliefs are molded into the lower case half, one for each height setting. A shoulder screw that slides into a slot in the upper case back panel and is attached to the lower case prevents the instrument from accidentally coming apart.

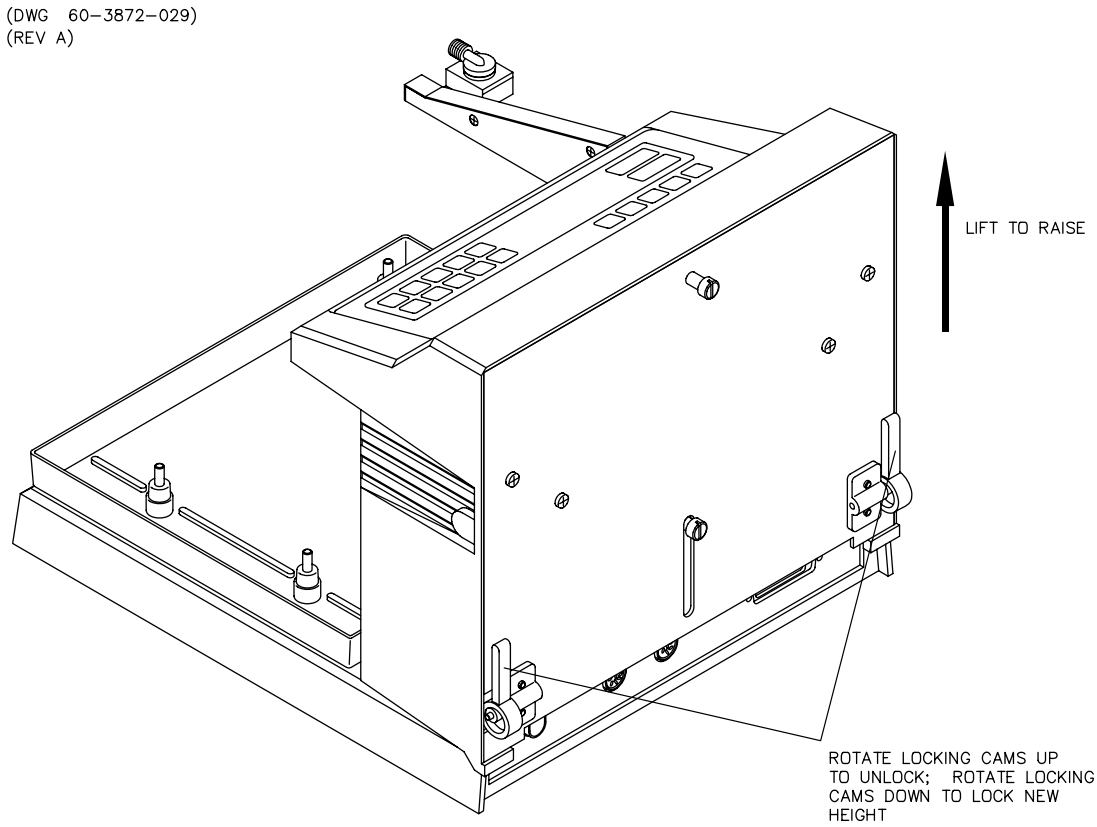


Figure 2-9 Height Adjustment

Adjust the height by loosening the locking cams, sliding the upper case half forward, lifting the upper case half up to the desired position and tightening the locking cams. Locate the three height settings by pushing the upper case half of the instrument back while moving it slowly up and down. You will feel a slight catch as the upper case half locating features align with those in the lower case half.

☑ Note

Remove the test tube rack when adjusting to or from the lowest (100 mg) height position.

2.9 External System Connection Recommendations

An extra-long length of .020 ID Teflon® (PTFE) tubing is shipped with all Teledyne Isco absorbance monitors. This allows connection between the flow cell of the monitor and other devices. To minimize transit delay times, the smallest bore tubing compatible with your system's pressure and flow should be used. The tubing should be cut as short as is convenient to reach your column or flow cell location. For in formation about interfacing a fraction collector with your absorbance detector interface, consult your absorbance detector manual.

See Section 3 for complete information on using peak detection based on absorbance detector signal.

2.10 Drip Tray Drain and Drain Trough

The drip tray provided with the Foxy Jr. has a drain located at its right rear corner that protrudes through the lower enclosure. The drip tray drain is designed to be fitted with .313-inch ID tubing. The waste tube may be routed through a channel and out the back of the Foxy Jr., or it may be routed under the edge of the instrument.

There is a similar outlet on the drain trough for use with the same size tubing for discarding waste or solvent recovery.

2.11 96 Well Microplate Rack

Install the 96 well microplate rack into the Foxy Jr. Note the orientation of the 96 well microplate with respect to the rack. The microplate text will be upside down. Collection in this rack will begin at the front right position of the rack.

⚠ WARNING

High flow rates with linear velocities greater than 40 cm/sec. of non-conducting liquids (e.g. hexane) generate electrostatic charges on the instrument and associated tubing. If the liquids are flammable, this constitutes a fire hazard. Use grounded metal connecting tubing to the drop former as shown in Figure 2-6 and connect a ground wire to the metal portion of the rack.

Foxy Jr. Fraction Collector

Section 3 Operation

This section will familiarize you with the Foxy Jr. and explain how to enter and run programs.

For a step by step example of how to program and run a simple collection see Section 3.2.1.

The Foxy Jr. Simplified Flowchart, Figure 3-2, shows how the various screens are arranged.

3.1 The Basics

The following paragraphs describe the basic control panel functions, error messages, and main screen display.

3.1.1 The Keyboard

The Foxy Jr. keyboard consists of four groups of keys.

STANDBY/OPERATE - Turns the Foxy Jr. on and off. When first turned on, the unit will display the software version, do a self-test of all components, and move the drop former to the back right corner (the Park position). If a 3-way diverter valve is installed it will be set to divert. If a 2-way security valve is installed it is opened to the waste trough. If a pump is connected it is stopped.

> ☑ ***Note***
>
> Power is maintained throughout the unit at all times for cold room compatibility.

Softkeys A through E – Function as indicated in the display line above each key. The software changes these to provide the functions needed for each screen. Some common softkeys are:

- **Back** Go back one screen. Any entry in progress is discarded. This is useful if you inadvertently skip a program step or decide to change a setting after you enter it.
- **End** Go back one menu level. If you only want to change a few program settings, you do not need to go through the entire list of program steps. After changing the desired parameters, press the **End** softkey to return to the Main Screen.
- **Select** Two keys are used to select from a list of allowable entries. Pushing either **Select** softkey scrolls through the list of choices in either direction.

> ☑ ***Note***
>
> You can also select your choice directly using keys **0** through **9**. For example, if the one you want is the fifth on the list, press **5**.

- **-1/+1** These keys are used to decrement/increment a numeric entry.
- **Enter**- Store the setting (if changed) and go to the next screen.
- **Next** - Go to the next screen.
- **Stop** - Pause or halt the operation in progress.

Numeric keys 0 through 9 - Used whenever a numeric entry is required. If you make an error, press the **-1** or **+1** softkey, then enter the correct value.

> ☑ ***Note***
>
> Softkeys labeled **-1** and **+1** can be used to change numbers easily without reentering them. If these softkeys are held down, they repeatedly decrement and increment the number.

> ☑ ***Note***
>
> If you try to store a value outside the limits, the instrument will correct it to nearest limit and signal you with a tone.

ADVANCE - Moves the drop former to the next tube if pressed for a half second and brings up a screen allowing manual control of drop former, pump, valve, and accessories. See Section 3.4 for details.

3.1.2 The Display

The display is a two line, 48 character LCD (Liquid Crystal Display). The top line is generally used to show the program settings and operation progress. The bottom line usually displays the labels for the five softkeys below it.

3.1.3 Error Messages

If the Foxy Jr. detects hardware problems, it displays a message about the problem and sounds a tone. This message will go away after a few seconds and the unit will attempt to continue operation. See Table 7-1 for troubleshooting assistance. If you missed the message, you can recall the last one by pressing the **D** key and the **2** key simultaneously. See Section 7 for more information on viewing past messages.

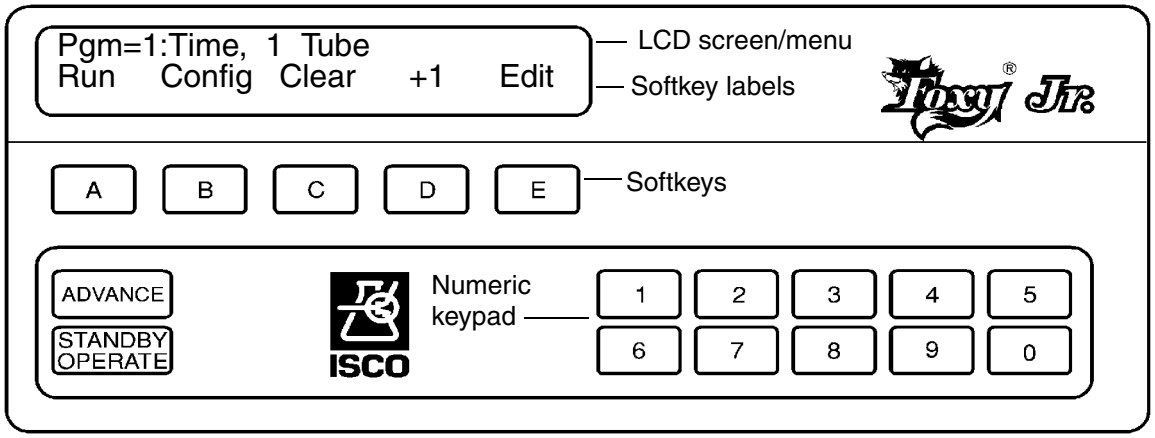
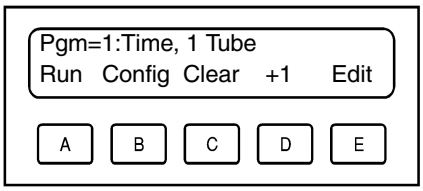


Figure 3-1 Keyboard, Display, and Main Screen.

3.1.4 The Main Screen

This screen is the starting point for every operation. It is where you select which program to use, start editing of the program, and run the program. Also available from this screen are editing of the configuration, clearing/copying of programs, and the Service Menu.



The top line of this screen indicates the current program number and a summary of the program, including fraction type, last tube, and program type.

Press **1** through **9** to select a program, or step through the programs with the **+1** softkey.

To clear a program, copy a program, or clear all programs press the **Clear** softkey and see Section 3.10.

Press **Edit** to enter or change program parameters. See Section 3.2.

To start the program, press **Run**.

To alter the instrument's configuration parameters, press **Config**. These are the settings that apply to all programs and include pump control, pre-setting some program parameters, serial control, motor acceleration, and display contrast. See Section 3.9.

The Service Menu for calibrating, testing, and troubleshooting is also accessed from this screen by pressing **0**. See Section 7.

3.2 Programming

Collection programs are a list of answers to questions asked by the Foxy Jr. The answers customize the collection operation to your application. The answers also affect the questions that follow, thereby skipping unnecessary questions. This allows the flexibility to do complex collections, as well as simple collections. Also, some settings can be pre-set to save the user from having to enter them each time.

There can be up to nine different collection programs. Programs can also be edited to meet new requirements. All programs remain in memory as long as the instrument is connected to power or the internal battery remains charged.

Fraction collector applications are divided in this section into simple and advanced.

3.2.1 Simple Program

A simple program is used to collect uniform fractions by time, drops, or external volume count signal (usually from a pump).

3.2.2 Advanced

There are four program types that allow the use of the advanced features of peak separation, selectable rack filling pattern, flow delay, restarts, and timed events. The four types select the peak separation method. They are:

- **Type=Time windows** - The Foxy Jr.'s time windows programming allows you to select the portions of the program, based on running time, during which samples are collected.
- **Type=Peak detection** - This program type is used with a detection instrument to control the collection of sample peaks. The peak detector in the Foxy Jr. responds to the level and slope change characteristics of sample peaks and uses that information to control where the flow is sent.
- **Type=Windowed peaks** - This program type combines time windows with peak detection.
- **Type=Simple + Delay etc.** - This program type is used to collect uniform fractions, like the Simple type, but allows using advanced features.

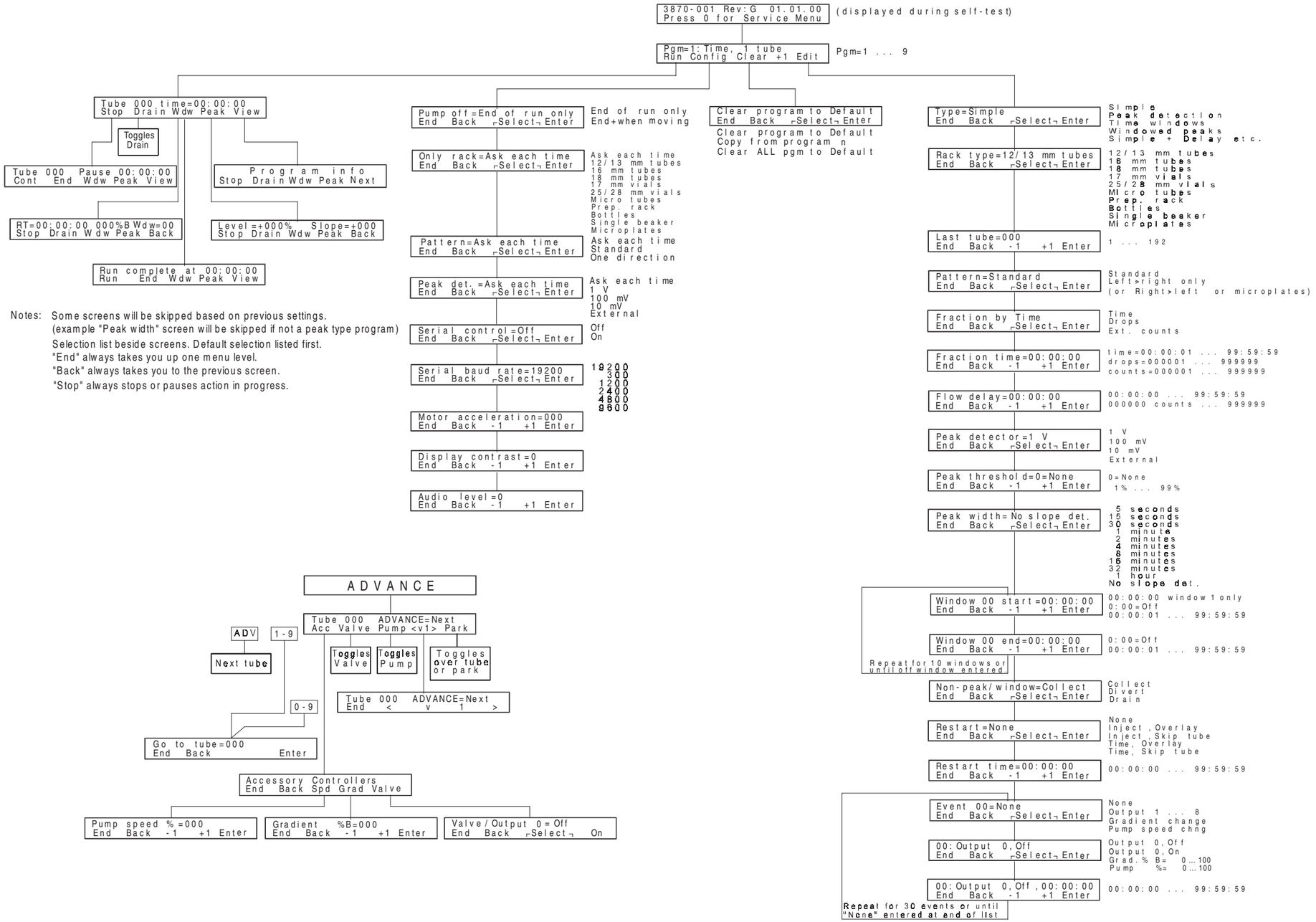


Figure 3-2 Foxy Jr. Simplified Flowchart

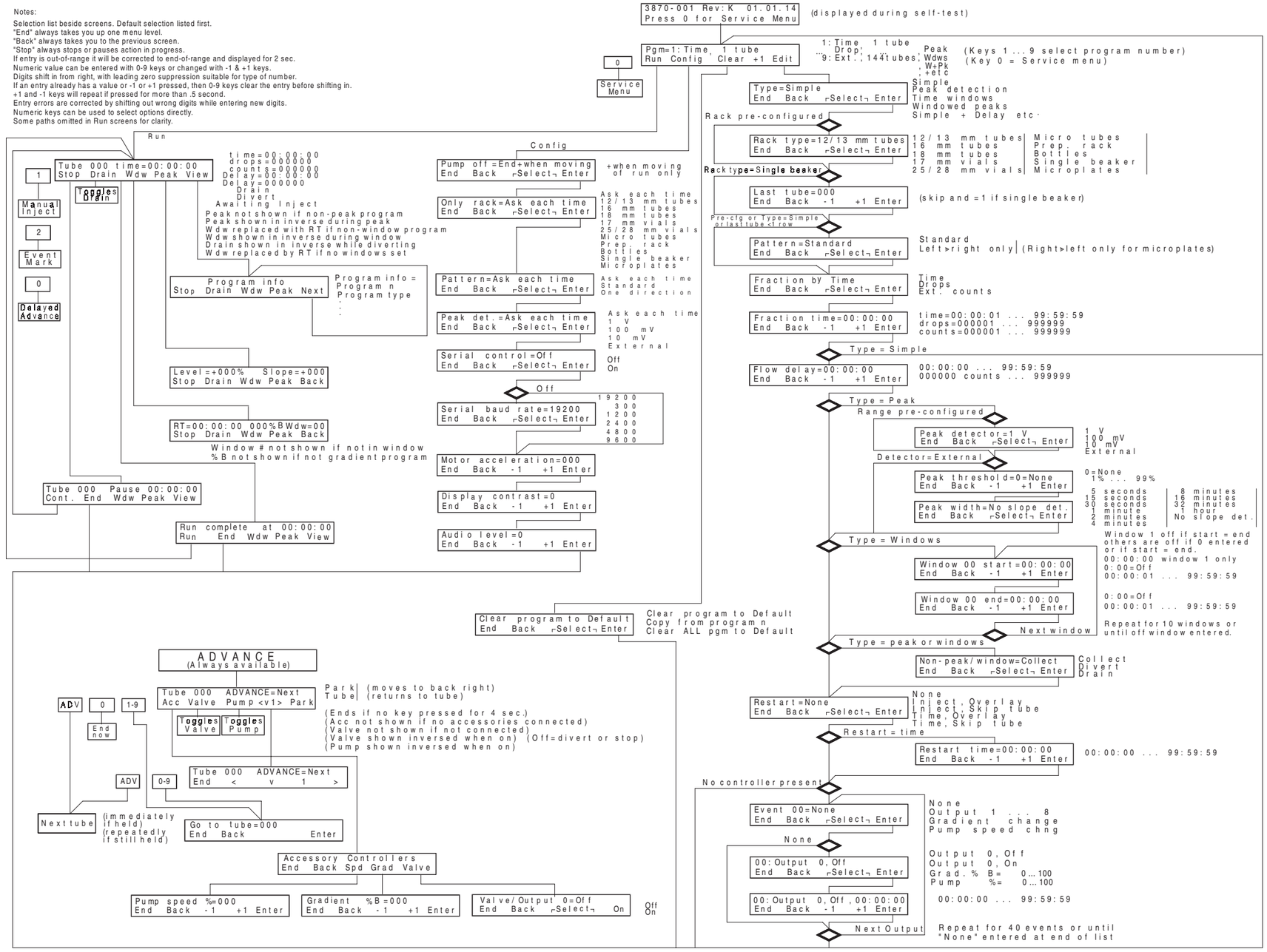


Figure 3-3 Foxy Jr. Detailed Flowchart

3.3 Creating and Running a Simple Collection Program

1. If the display is blank, press the **Standby/Operate** key to turn the unit on. The screen momentarily displays the software version and then displays the Main Screen. A summary of the main features of this program including fraction type, last tube, and program type are displayed.
2. Press the number key corresponding to the desired program number. The program number is displayed on the upper lefthand corner of the main screen.
3. Press the **Edit** softkey to enter the program editing mode.
4. Press either **Select** softkey to scroll through the program types. When Simple is displayed, press **Enter** to select this method.
5. Press either **Select** softkey until the desired rack/collection vessel type is displayed. The available choices are:

12/13 mm tubes	Micro tubes
16 mm tubes	Prep. rack
18 mm tubes	Bottles
17 mm vials	Single beaker
25/28 mm vials	Microplates

Press **Enter** when your selection is displayed. If the collection vessel is a single beaker, the Foxy Jr. will skip step 6.

> ☑ ***Note***
>
> Step 5 can be skipped if pre-configured. (See Section 3.9)

6. Enter the last tube number to be filled using the numeric keypad or **-1** and **+1** softkeys. If you enter a number larger than the maximum number of tubes for the selected rack, the Foxy Jr. will beep and reset this parameter to the maximum number allowed for that tube rack. Press **Enter** to store last tube number.

> ☑ ***Note***
>
> **-1** and **+1** softkeys will wrap around to the other end of the allowed range, so pressing -1 with 1 displayed will set the Foxy Jr. to use the entire rack.

7. Press either **Select** softkey to display the desired fraction type. The choices are:
   - Time
   - Drops
   - Ext. counts.

   Press **Enter** to store your choice.

8. Use the numeric keys or the **-1** and **+1** softkeys to set the desired fraction size. If Time was selected in step 7, the size is show in hours, minutes and seconds from 00:00:01 to 99:59:59. If Drops or Ext. counts were selected, it is shown as 1 to 999999 drops or counts.
   Press **Enter** to store the size.
9. You should now be back at the Main Screen and ready to run the collection program.
10. Press the **Run** softkey to start. The drop former will move to the first tube and start collecting. Section 3.6 contains more information on functions available while running. After the last tube has been filled, the drop former will move back over the right end of the drain trough and the screen will indicate Run complete. Press the **End** softkey to return to the Main Screen, or press **Run** to repeat the collection.

3.4 Advanced Collection Features

The following paragraphs discuss advanced collection features, including rack filling patterns, flow delay, peak detection, time windows, restarts, timed events utilizing optional external accessories, and possible combinations of some of these features.

3.4.1 Rack Filling Pattern

The standard pattern is a serpentine motion to minimize the tube to tube time. When a row of tubes is filled, the drop former moves to the tube directly behind the current tube and starts filling that row.

The alternate pattern always fills the rows from the same end. This is left to right for all racks except 96 well Microplates. To avoid drops while in motion using the alternate pattern, you should use a valve, stop the pump while moving, or collect fractions by drops with a low flow rate.

3.4.2 Flow Delay

Flow Delay is used to synchronize tube changes with sample flow to make precise peak cutting possible. The flow delay time is the time required for a fraction to travel from your detector to the Foxy Jr. The delay depends on the flow rate and the size of the tubing between the Foxy Jr. and the detector.

If fractioning by time or drops, the flow delay is in hours, minutes, and seconds. To calculate the flow delay time, use this formula:

V / Q = T

V is the internal volume of the tubing, Q is the flow rate, (in the same units as V) per second, and T yields the desired flow delay time in seconds. The volume of the tubing can be calculated by:

Π/4 D2 L = 0.7854 L D2 = V

L is the tubing length and D is the inside diameter.

But the easiest way to find the delay is to introduce a bubble ahead of the detector and measure the delay to the drop former.

If the Foxy Jr. is set for fraction by external counts, then the flow delay is also in counts. This allows the flow rate (pump speed) to be changed without resetting the fraction size or flow delay.

3.4.3 Peak Detection

The Foxy Jr.'s built-in peak detector is used with a detection instrument to control the collection of sample peaks. The detection instrument can be a UV absorbance detector, a fluorometer, or any instrument that produces analog voltage output signals. Through the voltage signal, the Foxy Jr. can differentiate between each peak. These peaks are then collected in the separate collection vessels. Non-peak effluent can be placed in separate collection vessels, diverted to an external container, or drained to waste.

The peak detector can be set to react to the signal crossing a set threshold level, changes in slope of the signal, or changes of slope only when above the set threshold level.

Level detection allows collecting only the most concentrated portion of peaks and not collecting smaller peaks. The threshold is set as a percentage of the maximum input signal. When the input signal rises above this threshold value, it is collected by the Foxy Jr. An example of this type of collection is shown in Figure 3-4.

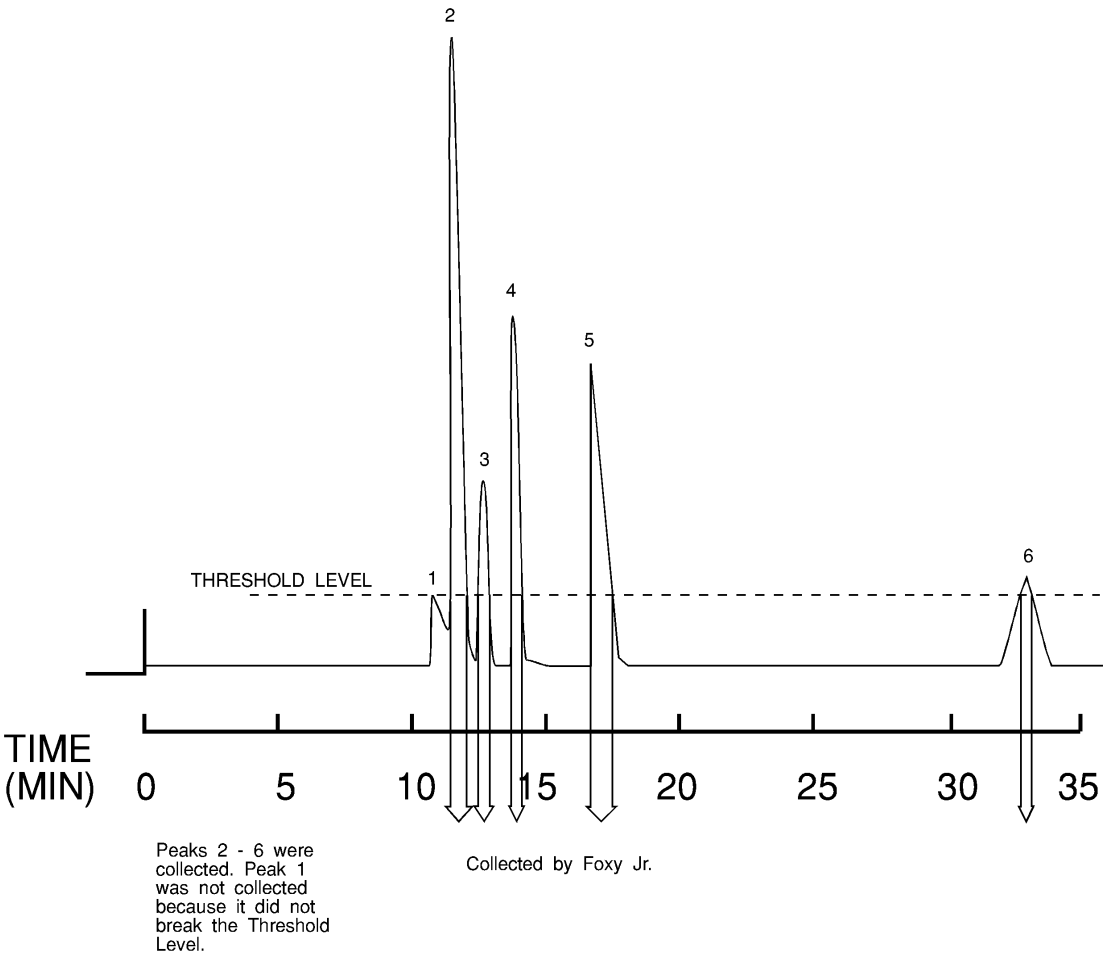


Figure 3-4 Level Sensing Collection

Slope detection allows collection of large or small magnitude peaks. Changes in the base line will not affect the collection. Reacting to slope change also allows the unit to collect even partially resolved peaks. Slope detection is set as a function of average peak width measured at the baseline. The Foxy Jr.'s slope detector can detect peaks with widths ranging from .2 to 2 times the programmed setting. For best results, choose the next larger peak width than the expected peaks to be separated. For example, if the average peak width is 45 seconds, select the 1 minute peak width when programming the fraction collection. This will ensure that peaks lasting more than 9 seconds but less than two minutes will be collected. An example of this type of collection is shown in Figure 3-5.

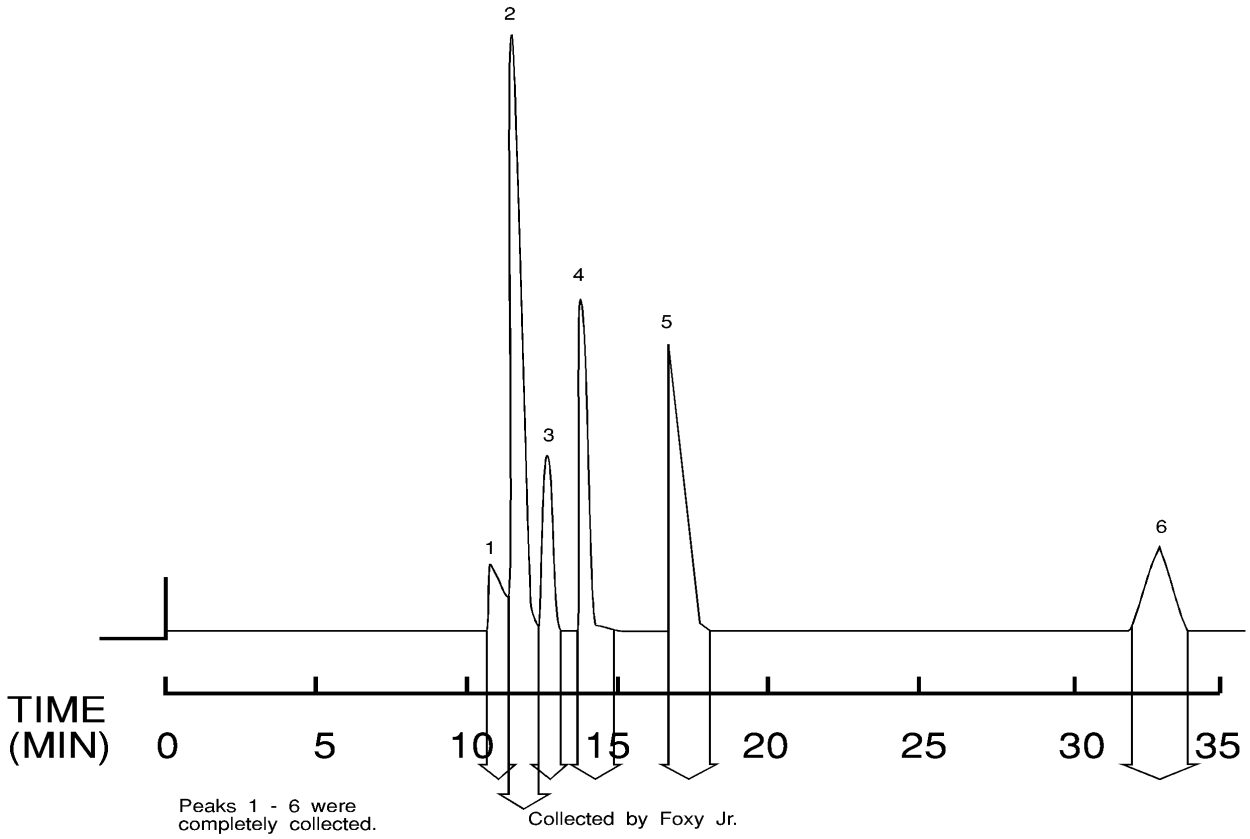


Figure 3-5 Slope Sensing

Slope sensing can be combined with level sensing. When both of these parameters are set in a collection program, a peak will be collected only when it rises above the peak threshold **and** when its slope is within the average peak width range. Combining these two parameters allows collection of only the most concentrated segment of each peak and separating partially resolved peaks. An example of this type of collection is shown in Figure 3-6.

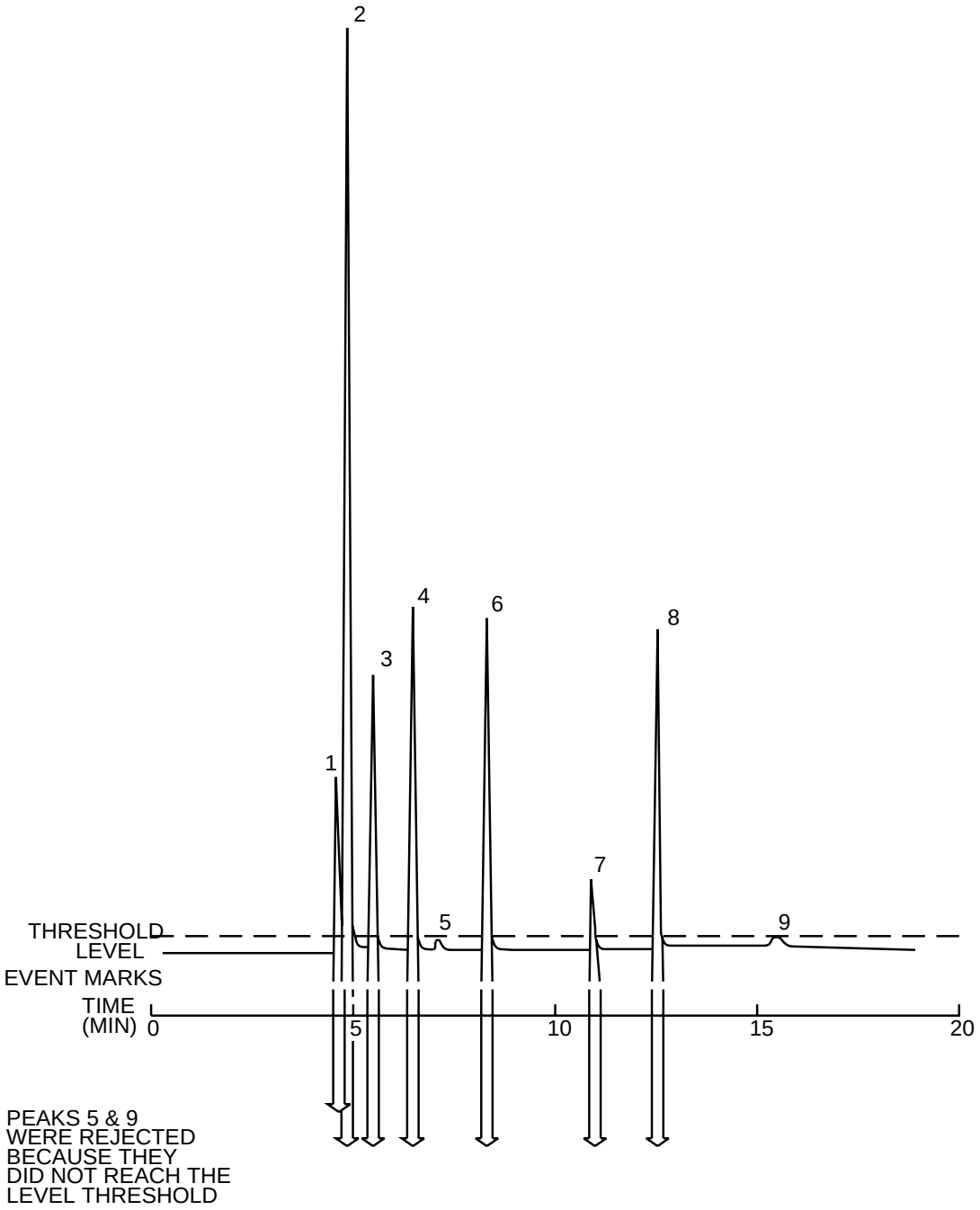


Figure 3-6 Slope and Level Sensing Collection

The Foxy Jr. can operate with any one of three input voltage ranges or with an external peak detector. Choose the voltage, either 1V, 100mV, or 10 mV, to correspond to your detection device's 100% signal output. If your detector does not scale its output to 100% of its set range, choose the voltage just above your highest expected peak. An active low TTL external peak detector signal, usually from a detector, can be sensed through ADVANCE-/PEAK- input. Note that the external advance function is not available while using external peak detection.

3.4.4 Time Windows

Time windows programming allows the selection of portions of running time during which the Foxy Jr. should collect. Time windows are used for several applications: they can be used to reject peaks of no interest to you, to cut peaks to increase the concentration of the sample, to divert initial waste volume, or to allow you to set up non-continuous collection periods for specific collection vessels. Up to 10 windows may be programmed. An example of this type of collection is shown in Figure 3-7.

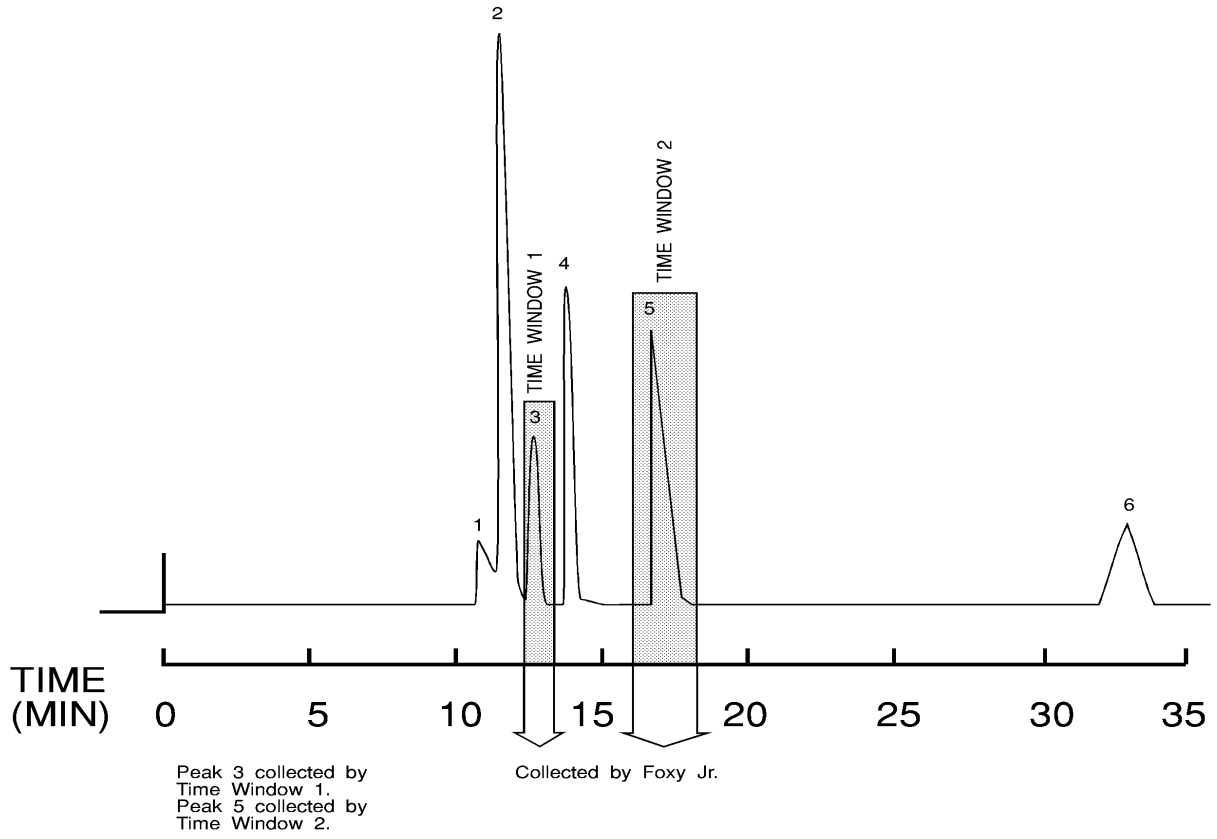


Figure 3-7 Time Windows Collection

3.4.5 Windowed Peaks

Time windows can be combined with slope detection or level sensing, or all three can be combined to create very specific collection routines. This can be used to exclude timed volumes while still collecting concentrated peaks. All the programmed criteria must be met before the Foxy Jr. collects a sample. For example, if all three are set then the peak must rise above the peak threshold, its slope change must be within the peak width time programmed range, **and** it must be within a programmed time window.

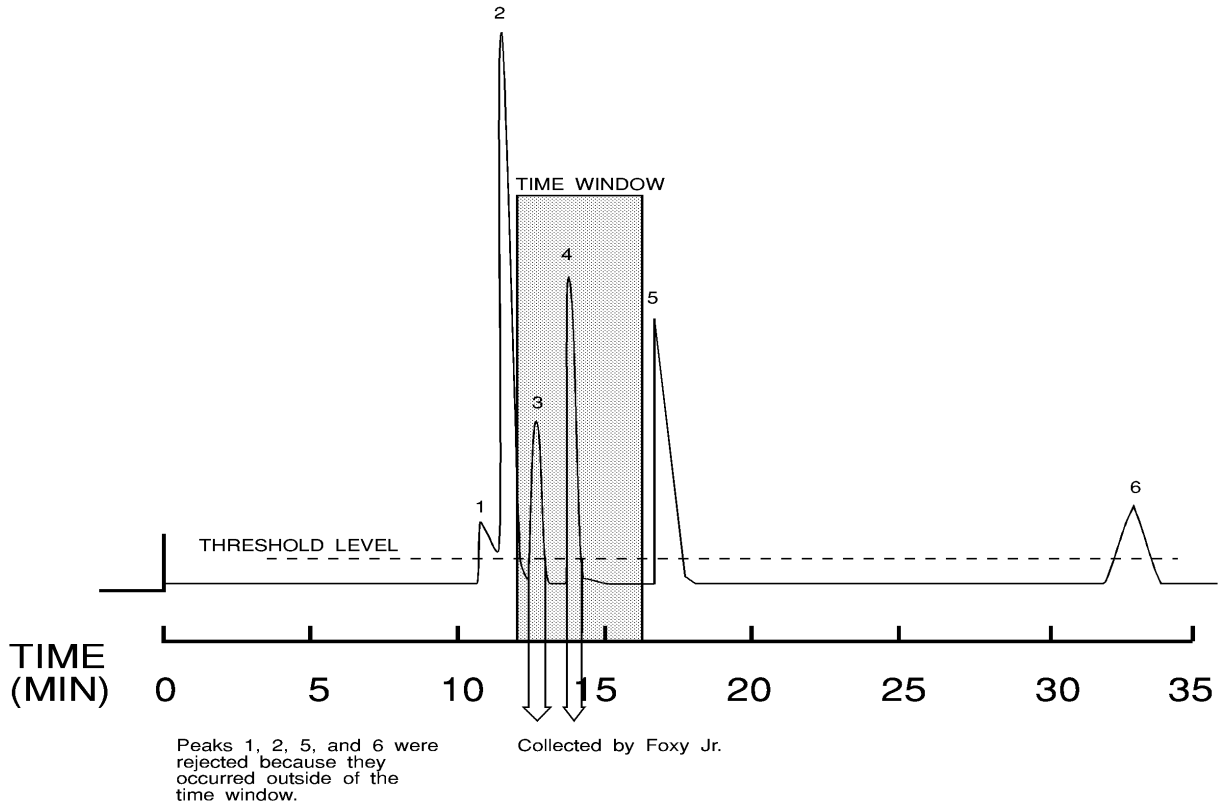


Figure 3-8 Time Windows/Level Sensing

3.4.6 Non-Peak/Window

The effluent not containing peaks or within time windows can be directed to the collection vessels, an external container (if a 3-way diverter valve is installed), or the drain trough.

3.4.7 Restarts

This feature allows you to collect fractions of multiple samples. It starts the collection run over at a set time, or when an external TTL signal INJECT- goes low, or manual inject key is pressed. The run can be restarted at the tube where the run was originally started to overlay repeats of the same sample, or it can be restarted at fresh tubes to apply the same run parameters to different samples, marking the fresh sample set by leaving one tube empty at the beginning. When running a program that uses an

Inject Restart, the Foxy Jr. waits for an external signal before starting the programmed run sequence. After that, anytime another inject signal occurs, the run sequence starts over.

3.4.8 Timed Events

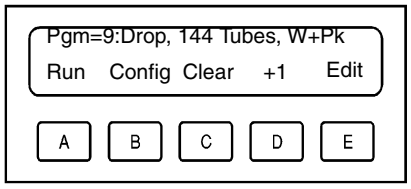
The Foxy Jr. can operate several optional external accessories. The collection program can be set to alter the operation of these accessories based on run time. Up to 40 such events can be entered.

The Foxy Valve Controller has 8 general purpose outputs, (6 open collector power transistor outputs, 2 relay outputs), that can be turned on or off at the programmed time by the Foxy Jr. These outputs can be used to operate valves, pumps, etc. to automate the separation process.

The Foxy Gradient Controller allows the creation of binary gradients and control of the speed of a TRIS pump. The gradient changes linearly to reach the set percentage at the set time. The following events, 60%B at 1:00, 60%B at 2:00, 80%B at 2:30, 20%B at 2:30, would create a gradient that ramps from 0%B to 60%B in the first minute of the run, then holds 60%B for one minute, then ramps to 80%B over 30 seconds, then immediately drops to 20%B and holds it till the end of the run. Pump speed events change the pump to the programmed speed at the programmed time.

At the start and end of a collection run, all outputs are turned off, the gradient is set to 0%B, and pump speed is set to 0%.

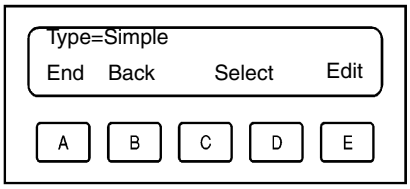
3.4.9 Creating Advanced Collection Programs



1. If the display is blank, press the **Standby/Operate** key to turn the unit on. The screen momentarily displays the software version and then displays the Main Screen. A summary of the main features of this program including fraction type, last tube, and program type are displayed. Program type is shown as follows (upper right corner of main screen):

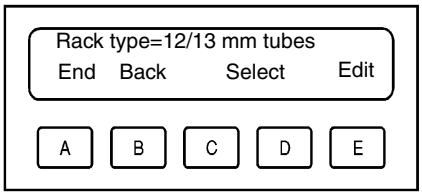
	=	Simple
Peak	=	Peak detection
Wdws	=	Time windows
W+Pk	=	Windowed peaks
+etc	=	Simple + Delay etc.

2. Press the number key corresponding to the desired program number or select the program using the **+1** softkey.
3. Press the **Edit** softkey to enter the program editing mode.
4. Press either **Select** softkey to scroll through the program types. The choices are:
   - Simple
   - Peak detection
   - Time windows
   - Windowed Peaks



- Simple + Delay etc.

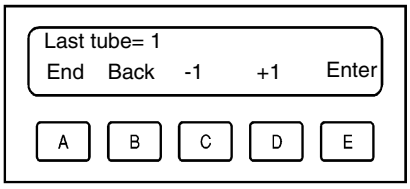
When the desired program type is displayed, press **Enter** to store it.



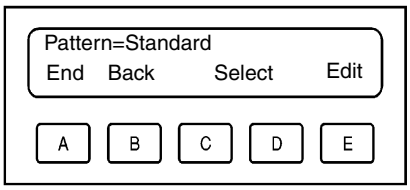
5. Press either **Select** softkey until the desired rack/collection vessel type is displayed. The available options are:

12/13 mm tubes	Microtubes
16 mm tubes	Prep. rack
18 mm tubes	Bottles
17 mm vials	Single beaker
25/28 mm vials	Microplates

Press **Enter** when your selection is displayed.
Step 5 can be skipped if pre-configured (see Section 3.9). If the collection vessel is a single beaker, step 6 will be skipped.



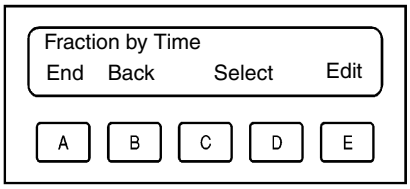
6. Enter the last tube number to be filled using the numeric keypad or **-1** and **+1** softkeys. If you enter a number larger than the maximum number of tubes for the selected rack, the Foxy Jr. will beep and reset this parameter to the maximum number allowed for that tube rack.
Press **Enter** to store the last tube number.
-1 and +1 softkeys will wrap around to the other end of the allowed range, so pressing -1 with 1 displayed will set the Foxy Jr. to use the entire rack. If the last tube selected is in the first row, step 7 will be skipped. Step 7 can be skipped if pre-configured. (See section 3.9)



7. Press either **Select** softkey to set the rack filling pattern of the Foxy Jr. The choices are:
   - Standard
   - Left → right only
   (or Right → left for 96 well Microplates)

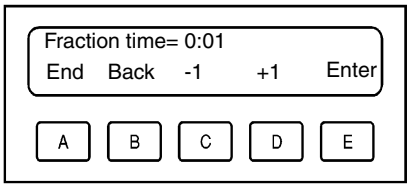
The Standard pattern is a serpentine motion where the front row of tubes is filled left to right, the second row is filled right to left. The alternative fills all rows left to right (right to left for 96 well Microplates).

Press **Enter** to store your choice.



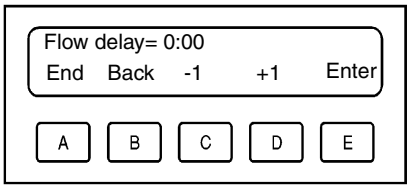
8. Press either **Select** softkey to display the desired fraction type. The choices are:
   - Time
   - Drops
   - Ext. counts

Press **Enter** to store your choice.

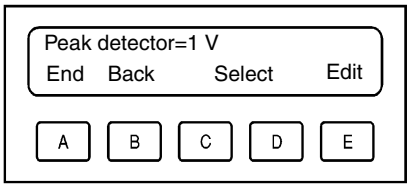


9. Use the numeric keys or the **-1** and **+1** softkeys to set the desired fraction size. If Time was selected in step 8, the size is in hours, minutes and seconds from 00:00:01 to 99:59:59. If Drops or Ext. counts was selected, it is 1 to 999999 drops or counts.

   Press **Enter** to store the size.

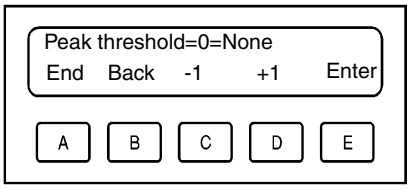


10. The screen prompts you for the desired flow delay time or counts.
    Type a number for flow delay time or flow delay counts.
    Press **Enter**.
    If the program type selected in step 4 was not Peak detection or Windowed peaks, steps 11 through 13 will be skipped.

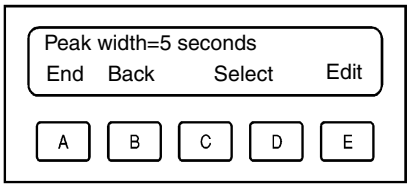


11. This screen will ask for the input type of the peak detector. Pressing either **Select** softkey will scroll through the choices:
    - 1 V
    - 100 mV
    - 10 mV
    - External

Select the range that matches the 100% output of your detection instrument, or external peak detector, and press **Enter**.
Step 11 can be skipped if pre-configured. If External peak detector was selected, steps 12 and 13 will skipped.



12. The next screen asks for the peak threshold, or the percentage of full-scale input signal at which peak collection is to begin. Use the numeric keypad or **-1** and **+1** to set the peak threshold. Setting the threshold to 0 disables threshold sensing, (slope sensing only).
    When the desired threshold is displayed, press **Enter.**



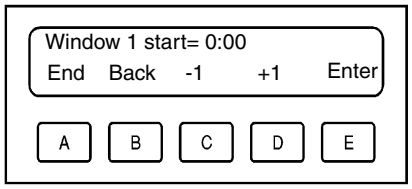
13. The next screen prompts for the average width of peaks to be collected. This information is used to detect peaks based on the slope of the detector signal. Press either Select softkey to scroll through the choices until the desired peak width is displayed. To use threshold sensing only, select No slope det. The available choices are:

5 seconds	8 minutes
15 seconds	16 minutes
30 seconds	32 minutes
1 minute	1 hour

2 minutes No slope det.

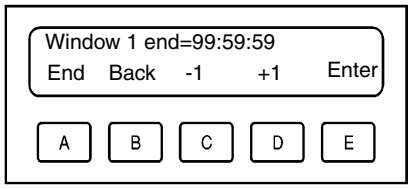
4 minutes

When the desired peak width is displayed, press **Enter**. If the program type in step 4 was not Time Windows or Windowed peaks, steps 14 and 15 will be skipped.



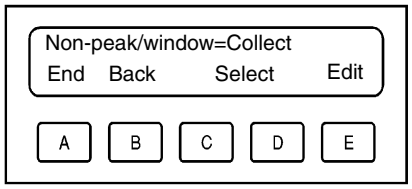
14. Set the window start time using the numerical keypad or **-1** and **+1** softkeys. Entering a start time of 0:00 at windows after the first window, turns off that window and all following windows. If you enter a start time that overlaps another window, the Foxy Jr. will correct it and beep. Time windows must entered in chronological order.

    Press **Enter** to store.



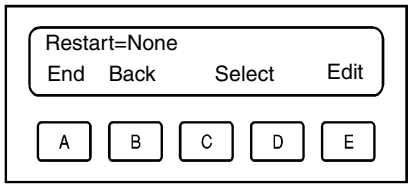
15. The screen will prompt you for the window end time. Set the end time using the numerical keypad or **-1** and **+1** softkeys. Entering an end time of 0:00, or an end time equal to the start time, turns off that window and all following windows. If you enter an end time that overlaps another window, the Foxy Jr. will correct it and beep.

    Press **Enter** to store.
    Steps 14 and 15 will repeat for up to ten windows.



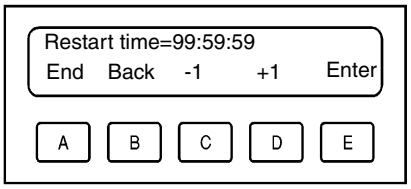
16. The next screen allows you to choose what to do with non-peak effluent. Press either Select softkey until the desired option is displayed. The available options are:
    - Collect
    - Divert
    - Drain

Press **Enter** to store.

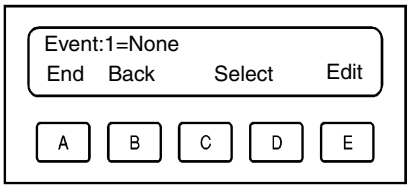


17. The next screen allows you to choose what the Foxy Jr. should do after if you are collecting fractions of multiple samples. It can be based on external signal, or run time. Press **Select** until the desired action is displayed. The options are:
    - None
    - Inject, Overlay
    - Inject, Skip tube
    - Time, OverlayTime, Skip tube

    Press **Enter** to store.
    Unless restart by time is selected, step 18 will be skipped.

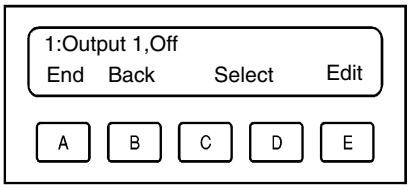


18. Set the restart time using the numerical keypad or **-1** and **+1** softkeys.
Press **Enter** to store.
Steps 19 through 21 will be skipped unless an external accessory controller is connected to the Foxy Jr.

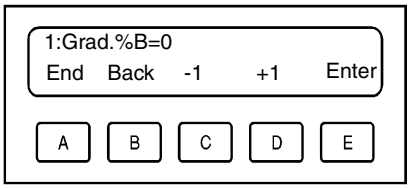


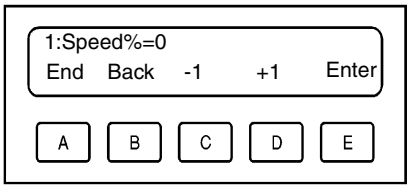
19. This step allows you to select the event type for the first of up to 40 events. Press either Select softkey until the desired type is displayed. Options are:
    - None
    - Output 1 to 8
    - Gradient change
    - Pump speed change

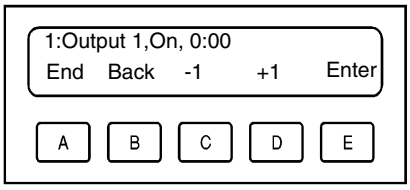
Refer to Timed Events in Section 3.2.2 for a complete description of this feature.
Make your selection and press **Enter**.
If None is selected, steps 20 and 21 will be skipped. If there are no more programmed events when None is entered, the Foxy Jr. will return to the Main Screen.



20. If an Output was set in step 19 then press either Select softkey to set whether to turn the output on or off. If Gradient change or pump change was chosen, use the numeric keypad or **-1** and **+1** softkeys to set the percentage.
Press **Enter** to store.







21. Set the desired event time using the numeric keypad or **-1** and **+1** softkeys. Events are sorted by time for running so they do not need to be entered in order.
Press **Enter** to store.
Step 19 through 21 will be repeated for up to 40 accessory events.

22. You should now be back at the Main Screen and ready to run the collection program. See Section 3.6 for details of running programs.

3.5 Sample Programs

3.5.1 Peak Detection

Program Parameters:

- Fraction size 4 minutes
- 25 fractions
- Collected in 17 mm vials
- Flow delay 30 seconds
- Peak threshold 35%
- Average peak width 1 minute
- 100% detector output = 1 Volt
- Non-peak to drain
- Program number 3

Notice that the fraction size is set to four minutes while the average peak width is only 1 minute. This is a normal situation. The four minute parameter sets the maximum amount of time that the drop former stays over an individual tube. If two adjoining fractions are only one minute wide and are separated by 15 seconds, they will be collected in separate tubes.

The average peak width of one minute is a value used by the Foxy Jr.'s peak separator to set the slope sensitivity used in the slope-based detection method. This method collects peaks that have both enough slope to activate the slope-based peak detector and exceed 35% of full-scale detector signal threshold. For example, setting the threshold at 35% and the detector signal at 1 volt will require a minimum signal of 0.35 V for collection.

Programming Steps:

1. From the Main Screen, press **3**. Press the **Clear** softkey and then **Enter** to reset the program to default values.
2. Press **Edit**.
3. Press either **Select** softkey to display **Type = Peak detection.** Press **Enter**.
4. Press either **Select** softkey to display **Rack type=17 mm vials;** press **Enter**.
5. To set **Last Tube= 25**; press 2, 5, **Enter**.
6. To leave **Pattern = Standard**; press **Enter**.
7. Press either **Select** softkey to display **Fraction by Time**; press **Enter**.
8. To set **Fraction time= 4:00**; press **4**, **0**, **0**, **Enter**.

9. To set **Flow delay= 0:30**; press **3**, **0**, **Enter**.
10. To leave **Peak detector=1 V**; press **Enter**.
11. To set **Peak threshold=35%**; press **3**, **5**, **Enter**
12. Press either **Select** softkey until **Peak width= 1 minute** is displayed; press **Enter**.
13. Press either **Select** softkey to display **Non-peak/window = Drain**; press **Enter**.
14. Press **Enter** to leave **Restart = None.**

3.5.2 Time Windows

Program Parameters:

- Fraction size 6 minutes 30 seconds
- 10 fractions
- Collected in 28 mm vials
- Flow delay 1 minute
- 3 time windows: the first starts at 4 minutes and ends at 6 minutes, the second starts at 10 minutes and ends at 14 minutes; the third starts at 30 minutes and ends at 42 minutes.
- Non-peak is collected in the rack
- Program number 4

Programming Steps:

1. From the Main Screen, press **4**. Press **Clear**, then **Enter** to reset the program to default values.
2. Press **Edit**.
3. Press either **Select** softkey to display **Type = Time Windows**. Press **Enter**.
4. Press either **Select** softkey to display **Rack type=25/28 mm vials**; press **Enter**.
5. To set **Last Tube= 10**; press **1**, **0**, **Enter**.
6. To leave **Pattern = Standard**; press **Enter**.
7. Press either **Select** softkey to display **Fraction by Time**; press **Enter**.
8. To set **Fraction time= 6:30**; press **6, 3, 0, Enter.**
9. To set **Flow delay= 1:00**; press **1, 0, 0, Enter**.
10. To set **Window 1 start= 4:00**; press **4, 0, 0, Enter**.
11. To set **Window 1 end= 6:00**; press **6, 0, 0, Enter**.
12. To set **Window 2 start= 10:00**; press **1, 0, 0, 0, Enter**.
13. To set **Window 2 end= 14:00**; press *1,* **4, 0, 0, Enter**.
14. To set **Window 3 start= 30:00**; press **3, 0, 0, 0, Enter**.
15. To set **Window 3 end= 42:00**; press **4, 2, 0, 0, Enter**.

16. Now that the three desired windows have been programmed, press **Enter** to leave **Window 4 start=0:00=Off**. This will jump you to the next step.
17. To leave **Non-peak/ window = Collect**; press **Enter**.
18. To leave **Restart = None**; press **Enter**.

3.5.3 Timed Restart with Valve Controller Events

Program Parameters:

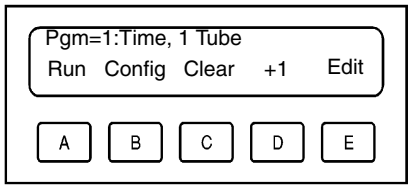
- Fraction size 4 drops
- 150 fractions
- Collected in 96 well Microplates
- No flow delay
- Restart run at 90 seconds in empty tubes
- Valve controller output 1 on for 30 seconds
- Gradient control from 0 to 40%B in 30 seconds starting at 20 seconds.
- Program number 2

Programming Steps:

1. From the Main Screen, press **2**. Press the **Clear** softkey and then **Enter** to reset the program to default values.
2. Press the **Edit** softkey.
3. To set **Type = Simple + Delay etc**.; press **5, Enter**.
4. To set **Rack type = Microplates**; press **0, Enter**.
5. To set **Last Tube=150**; press **1, 5, 0, Enter**.
6. To leave **Pattern = Standard**; press **Enter**.
7. To set **Fraction by Drops**; press *2,* **Enter**.
8. To set **Fraction drops= 4**; press *4,* **Enter**.
9. To leave **Flow delay= 0:00**; press **Enter**.
10. To set **Restart = Time, Skip tube**; press **5, Enter**.
11. To set **Restart time= 1:30**; press **9, 0, Enter**.
12. To set event **1:Output 1,On , 0:00**; press **1, Enter, 1, Enter, Enter**.
13. To set event **2:Output 1,Off, 0:30**; press **1, Enter, Enter, 3, 0, Enter**.
14. To set event **3:Grad. %B= 0, 0:20**; press **9, Enter, Enter, 2, 0, Enter**.
15. To set event **4:Grad. %B= 40, 0:50**; press **9, Enter, 4, 0, Enter, 5, 0, Enter**.
16. To leave **Event: 5=None** and end event input; press **Enter**.

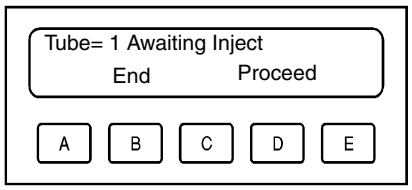
3.6 Running Collection Programs

3.6.1 Starting a Run



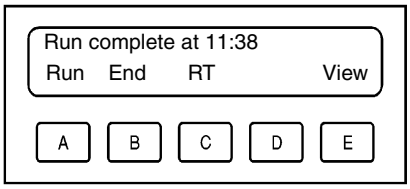
To run a program, at the Main Screen select the program using the numeric keys **1** through **9** or press **+1** or **-1** softkeys until the desired program number is displayed, and press the **Run** softkey. When a run is started, the pump is enabled and the valve, if present, is opened.

If the drop former is at the waste trough when the run is started, the program will begin at tube 1. However, the run can be started at any tube by moving to that tube before pressing **Run**. Press **ADVANCE**, the tube number, **Enter, Tube**.



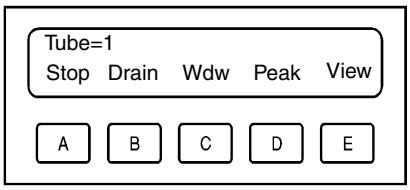
If inject restart is programmed, the screen will display **Awaiting Inject** while the Foxy Jr. waits for the first inject signal. If you wish to go ahead without waiting, press the **Proceed** softkey.

If a flow delay is set, one will occur before the first tube is filled. If a 3-way diverter valve is installed, the drop former will move to the tube with flow diverted till the delay is done. Otherwise, the drop former will stay at the drain until the delay is done.



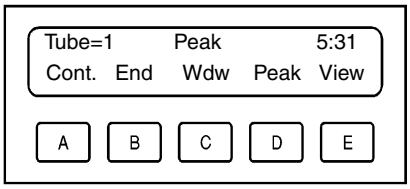
When the last tube or last window is finished, the screen displays the run completion time. Press the **Run** softkey to run the program again. Press the **End** softkey to end the program and return to the Main Screen.

> ☑ ***Note***
>
> The run time continues to count after the run has completed, so timed events can still occur.



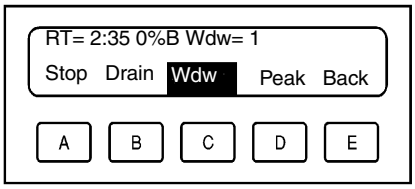
While the program is running, the screen keeps you informed of the status of the run. The softkeys allow you to pause, then end the program, direct the flow, monitor specific program functions and view the program settings being run.

3.6.2 Stopping



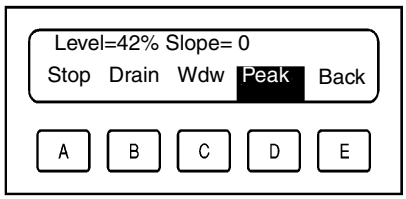
The **Stop** softkey pauses the program, stopping both the run time and the pump, if connected. Press the **Cont.** softkey to continue the program from the point at which you stopped it. Press the **End** softkey to terminate the program immediately and return to the Main Screen.

3.6.3 Time/Window Status



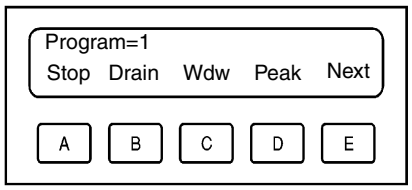
The **RT** or **Wdw** softkey is used to display run time and window information. If the program doesn't use time windows, *RT* is displayed instead of *Wdw*. Press **RT/Wdw** to see the elapsed run time and current window number. During a window, *Wdw* is displayed in reverse text. If gradient controller accessory events are programmed, the current gradient percentage is displayed here also. Press the softkey again, or the **Back** softkey, to return to the normal run screen.

3.6.4 Peak Information



The **Peak** softkey is used to display peak detector information. If program doesn't use peak detection, *Peak* is not shown. Press **Peak** to see the current level and slope values. When a peak is detected, *Peak* is displayed in reverse text. Press the softkey again, or the **Back** softkey, to return to the normal run screen.

3.6.5 Program Viewing



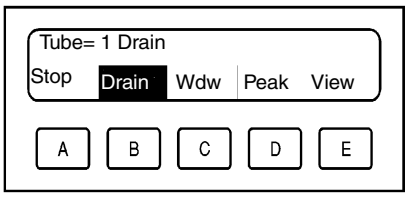
While a program is running, you can look at all program settings being used. Press the **View** softkey at any time during a run. Press the **Next** softkey to view the next program setting in sequence. When the last program setting is reached, pressing the **Next** softkey returns the Foxy Jr. to the normal run screen. To return to the normal run screen without stepping through all settings, press the **RT/Wdw** softkey twice.

3.7 Manual Collection Control

3.7.1 Next tube

To move to the next tube immediately, press the **ADVANCE** key for a half second. For a flow delayed move to the next tube, press the **0** key. This is useful for manually separating peaks without connecting your detector or using the Foxy Jr's. peak sensing, or if the settings you programmed did not detect some peak.

3.7.2 Drain



To redirect flow to waste immediately, press the **Drain** softkey. If a diverter valve is installed the effluent is diverted to waste. If a security valve or no valve is installed, the drop former moves to the waste trough. The word *Drain* is displayed in reverse text while effluent is being redirected. Press the **Drain** softkey again to return the program to normal operation.

> ☑ ***Note***
>
> Run time counting continues while at drain.

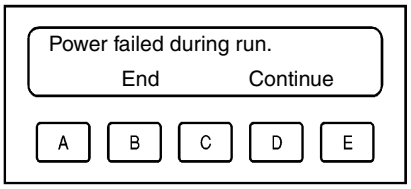
3.7.3 Event Marks

Each time a move to a new tube is initiated, (before flow delay), a short event mark pulse is output. This occurs when the run starts, whenever a tube is filled, at the start and end of peaks and time windows, and at the end of the run. This is typically used to annotate the chart recording of the detector output. You can manually add marks by pressing the **2** key during run. Since events may occur faster than event marks are output, they are queued and may briefly fall behind the actual events.

3.7.4 Inject

If inject restart is programmed, the restart can be triggered manually by pressing the **1** key. Using this you can collect from multiple samples without an automated injector.

3.7.5 Power Fail Recovery

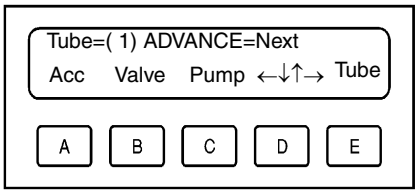


If power fails during a run, the Foxy Jr. can continue the run if power is restored before its battery is discharged. When power is restored, the unit will go through its usual start-up self-tests, then it will display **Power failed during run**. You can either press the **End** softkey to cancel the run, or press the **Continue** softkey to go on with the run at the tube after the one where power failed.

3.8 Advance and Manual Control

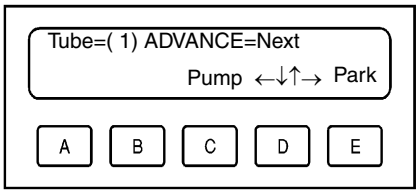
Pressing the **ADVANCE** key brings up a screen that allows manual control of the drop former position, valve, pump, and accessories. If no key is pressed for 4 seconds, the screen will return to the screen displayed before **ADVANCE** was pressed. The operations that can be performed from this screen are explained below.

3.8.1 Next Tube



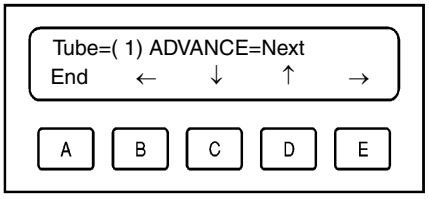
Pressing the **ADVANCE** key for more than a half second will move the drop former to the next tube. Holding the key down will continuously advance the drop former. If the drop former is currently over the waste trough, only the tube number will advance.

3.8.2 Parking/Unparking



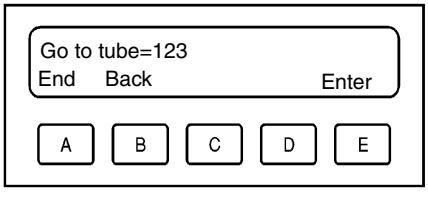
Press the **Park** softkey to move the drop former to the park position (back right corner), allowing access to the test tube rack. When at the park position, the softkey changes to **Tube** and the tube number is shown in parenthesis. Pressing the **Tube** softkey returns the drop former to the indicated tube. During a collection run pressing the **Drain** softkey will also return to the tube.

3.8.3 Directional Moving



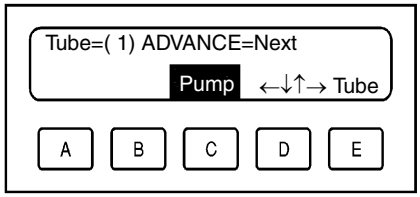
The directional arrows softkey brings up a screen which allows you to move the drop former left, forward, back, or right to any tube. Press the softkey labeled with the direction you want the drop former to move. Press and hold a softkey for repeated movement. The display indicates the current tube number. If the drop former is currently over the waste trough, only the tube number will change.

3.8.4 Go to Tube



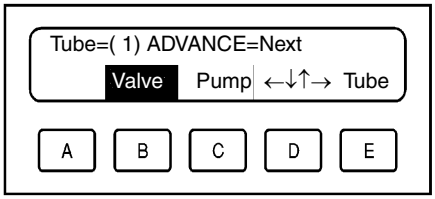
To move the drop former directly to any tube, type the tube number using the numeric keypad and press **Enter**. If the drop former is currently over the waste trough, only the tube number will change.

3.8.5 Pump



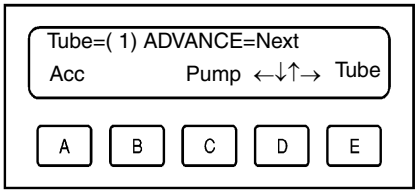
The pump connected to the Foxy Jr. is controlled manually with the **Pump** softkey. When *Pump* is displayed in reverse text, the pump is allowed to run. The **Pump** softkey toggles the current state. Turning off the pump during a run overrides the normal operation of the pump.

3.8.6 Valve

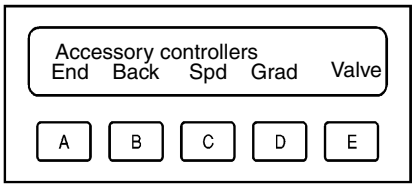


If a valve is installed, the **Valve** softkey will be shown. It toggles flow from the valve to the tube on or off. When *Valve* is displayed in reverse text, the valve is directing flow to the tube. Turning the valve on or off during a run overrides the normal operation of the valve.

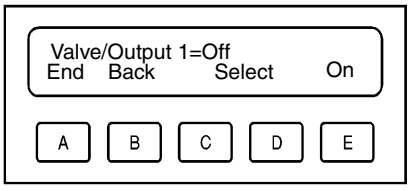
3.8.7 Accessories



If any external accessory controllers are present, the **Acc** softkey will be shown. Pressing it brings up a screen to select which accessory function to manually change. The **Valve** softkey selects the Foxy Valve Controller. The **Grad** softkey selects the gradient function of the Foxy Gradient Controller. The **Spd** softkey selects the pump speed function of the Foxy Gradient Controller.

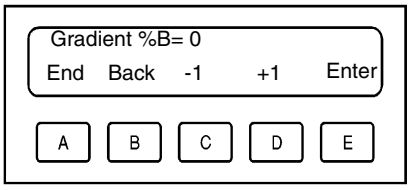


3.8.8 Valve Controller



Use the **Select** softkeys to choose which **Valve/Output**, 1 through 8, you want to change, then use the **On/Off** softkey to toggle its state.

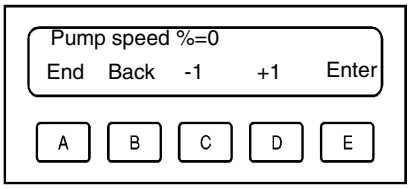
3.8.9 Gradient Control



Use the numeric keys or the **-1** and **+1** softkeys to select the percentage of the B component, then press **Enter**.

3.8.10 Pump Speed Control

Use the numeric keys or the **-1** and **+1** softkeys to select the percentage of full speed, then press **Enter**.



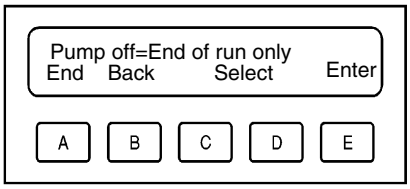
3.9 Configuration

To alter the instrument's configuration parameters, press the **Config** softkey on the Main Screen. These are the settings that apply to all programs and include pump control, pre-setting some program parameters, serial control, motor acceleration, and display contrast.

3.9.1 Pump Pausing

The first screen asks you when you want the pump off. Use the **Select** softkeys to choose either **End of run only** or **End + when moving**. If you are using a pump that can react quickly to the pump pause output, you may want program the Foxy Jr. to stop the pump whenever the drop former is moving to reduce the chance of drops missing a tube. This is also useful with a security valve to reduce the pressure on the valve between tubes.

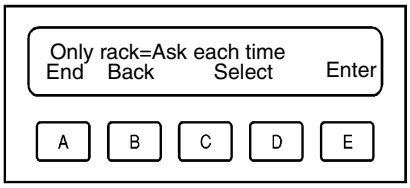
When your choice is displayed, press **Enter**.



3.9.2 Pre-configuring Rack Type

The next screen lets you pre-set the rack type if you will always be using the same type. Press either **Select** softkey until the desired rack/collection vessel type is displayed. If you are using more than one type of rack, choose the "**Ask each time**" option - the software will ask you each time you edit a program what size rack will be used.

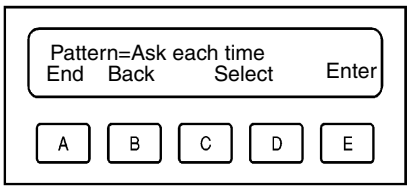
Press **Enter** when your selection is displayed.



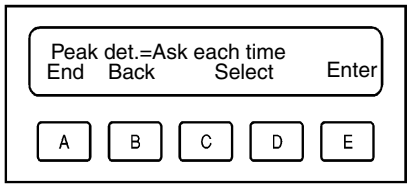
3.9.3 Pre-configuring Rack Filling Pattern

This screen lets you pre-set the rack filling pattern you wish the Foxy Jr. to use. Select **Ask each time** if you want the choose in each program. Select **Standard** if you want to always use the serpentine pattern, which provides the shorter time between all tubes. Or select **One direction** if you want to always fill the rack left to right (right to left on Microplates).

Press **Enter** to store your choice.



3.9.4 Pre-configuring Peak Input

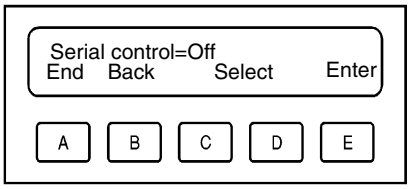


The type of input for peak sensing can be pre-set at this screen. Pressing either **Select** softkey will scroll through the choices:

- Ask each time
- 1 V
- 100 mV
- 10 mV
- External

Select the range that matches the 100% output of your detection instrument, or external if using an external peak detector, and press **Enter** to store.

3.9.5 Serial Control

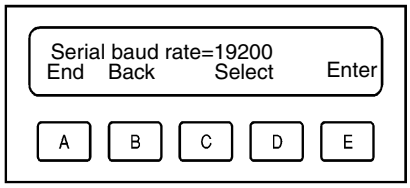


The next screen allows you to enable serial operation. Pressing the either **Select** softkey toggles this on or off.

> ☑ ***Note***
>
> This must be set to On to enable serial printer use, remote serial control, or up/downloading programs with a computer.

Press **Enter** to continue. See Section 5 for more on serial control.

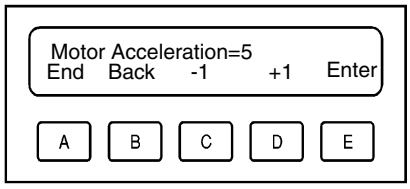
If the serial control above is set On, the next screen will ask you to select a serial baud rate. The choices are:



- 19200
- 300
- 1200
- 2400
- 4800
- 9600

Using the **Select** softkeys, scroll through the choices until yours is displayed and press **Enter**.

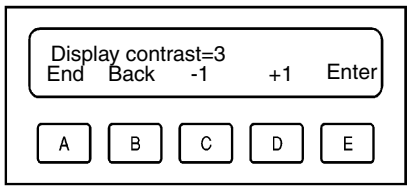
3.9.6 Motor Acceleration



The next screen will prompt you for motor acceleration. The default is set at the factory to a conservative 5 to prevent flinging drops. If you are using drop counting at low rates, drop counting with a valve, using large collection vessels, or errant drops are not a concern, you may increase this setting to significantly decrease the tube-to-tube time. The value can range from 0 to 255. However, high settings may result in position error warnings, depending upon the tubing load, etc. If so, reduce this value until you don't get the warnings.

Press **Enter** to store.

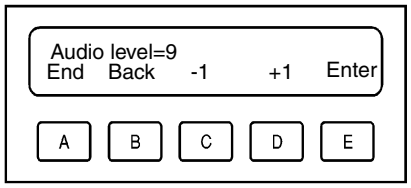
3.9.7 Display Contrast



The next screen allows you to change the contrast of the LCD display. Set a value from 0 to 9 with the numeric keypad or **-1** and **+1** softkeys. The display changes immediately so that you can select the contrast you prefer.

Press **Enter** to store.

3.9.8 Audio Level



The next screen allows you to change the audio level of sounds made by the Foxy Jr. (except Warning and Failure sounds). Enter a value with the numeric keypad.

Press **Enter**.

The Foxy Jr. will return to the Main Screen.

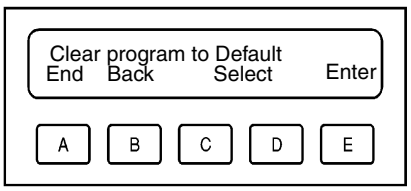
3.10 Clearing and Copying Programs

Pressing the **Clear** softkey on the Main Screen allows you to clear the current program from memory by resetting all program parameters to their default values. It also allows you to copy another program to the current program number. This is useful if you want to use a variation of an existing program.

⚠ CAUTION

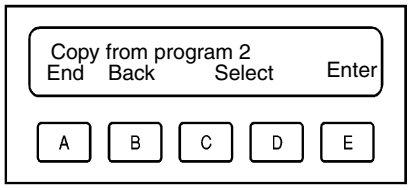
Clearing a program or copying another program to the current program number overwrites the current program. Once a program is cleared or overwritten, it cannot be restored and must be reprogrammed from the beginning.

3.10.1 Clearing a Program



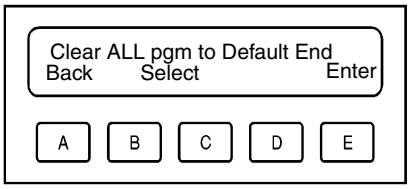
To clear a program to the default values, select the program you want to clear on the Main Screen, press the **Clear** softkey (*Clear Program to Default* will be displayed), and press **Enter**.

3.10.2 Copying a Program



To copy a program, use the numeric keypad or the **+1** softkey to select the program number to be overwritten on the Main Screen Press the **Clear** softkey. Press either **Select** softkey or the numeric key until the desired program number to copy from is displayed. Press **Enter** to copy the selected program.

3.10.3 Clearing all Programs



To clear ALL programs and return them to factory default settings, press the **Clear** softkey on the Main Screen, then press the left **Select** softkey to display *Clear all pgm to Default*, then press **Enter** to clear all 9 programs.

Foxy Jr. Fraction Collector

Section 4 Accessories

The Foxy Jr. comes with one standard 13 mm test tube rack, unless another size was specified at the time of purchase.

4.1 Optional Accessories

The Foxy Jr. has a wide range of available accessories that adapt it to virtually every application. Table 4-1 lists the available accessories and part numbers for easy ordering.

Table 4-1 Foxy Jr. Optional Accessories

Accessory	Part Number
Teledyne Isco Lab Stacker	68-2137-007
Medium LC Organizer Shelf	68-2187-012
Valve Controller	68-2137-069
Diverter Valve	68-3877-071
Security Valve	68-3877-072
Printer	68-3930-004

4.2 Available Test Tube Racks

The Foxy Jr. can accommodate a wide variety of tubes and other types of liquid containers. In order to maximize the number of each size of collection vessel, many different racks are available. All racks are constructed with a polypropylene base and stainless steel plates. The polypropylene base has indexing slots that secure the rack to the stainless steel pins molded into the Foxy Jr.'s base. This feature ensures precise positioning of the racks on the instrument. Table 4-2 lists the available racks with part numbers for easy ordering.

Table 4-2 Foxy Jr. Available Test Tube Racks

Rack Size/Type	Number of Positions	Part Number
12 mm/standard	144	68-2137-041
13 mm/standard	144	68-2137-042
16 mm/standard	100	68-2137-043
1.5 ml micro centrifuge tubes	60	68-2137-048
18 mm/standard	72	68-2137-044
MiniVials	72	68-2137-047
25 mm/standard	36	68-2137-045
28 mm/standard	36	68-2137-046
50 ml centrifuge tubes	36	68-2137-064
Funnel tray for 12 or 13 mm racks	72	68-2137-013

Table 4-2 Foxy Jr. Available Test Tube Racks (Continued)		
Micro collection tray with (72) 0.6 ml conical wells.	72	68-2137-014
Prep funnel rack	36	68-3877-003
96 well microplate rack	2 x 96	68-3877-006

A disposable collection rack is available for the Foxy Jr. This single-use rack is half of the size of a 12/13 mm test tube rack. A pair of disposable racks use the same collection pattern as the 12/13 mm rack. Although the rack can hold 12/13 mm test tubes, tubes are not required. The rack holds about 7.5 ml in each of its 72 wells. The disposable rack is made of polypropylene, which is compatible with aqueous solutions. The rack can also be used with organic solvents such as hexane. However, the exposure to organic solvents should be limited to less than 24 hours.

To accommodate different collection vessels, the Foxy Jr. has a three-position height adjustment. The height can be set for 100mm, 125mm, and 150mm collection vessels.

Adjust the height by loosening the locking cams, sliding the upper enclosure forward, lifting the upper enclosure up to the desired position, and tightening the locking cams. More detailed instructions for setting the height of the Foxy Jr. can be found in Section 2.8.

4.3 Available Valves

Two valves are available to use with the Foxy Jr. These valves can divert flow to waste or stop flow momentarily while the drop former moves to the next tube.

Figure 4-1 Foxy Jr. with Valve Installed

4.3.1 Security Valve

This valve stops the effluent flow 0.8 seconds before the drop former begins to move. This ensures that no drops fall between tubes - an especially useful feature when working with radioactive effluents. Made of a chemically inert fluoroplastic with compression fittings for $^{1}/_{16}$" (1.5 mm) and $^{1}/_{8}$" (3 mm) diameter tubing, the security valve enhances your separation by stopping effluent flow as programmed, on a manual command, or during a power outage. This valve can be used for systems with low flow rates that do not build up excessive pressure (> 25 psi) during tube changes, or at low pressures.

4.3.2 Three-Port Diverter Valve

When high flow rates are necessary, pressures which exceed the pressure rating of the security valve can build up during tube changes. The three-port diverter valve solves this problem by diverting effluent flow to waste between tubes. This prevents pressure build up.

4.3.3 Installing a Valve

The optional Security or Diverter valve can be installed directly on the Foxy Jr. The valve mounts on the arm assembly. This procedure requires a medium Phillips screwdriver.

1. Disconnect power from the Foxy Jr.
2. Gently move the arm assembly to the far left (as viewed from the front). Lay the instrument on its left side on a non-scratch surface such as a smooth table top or towel.
3. Remove the valve mounting screws on the arm.
4. Bend the valve cable so you can position the valve connector part way into the connector on the arm assembly, as shown in Figure 4-2.

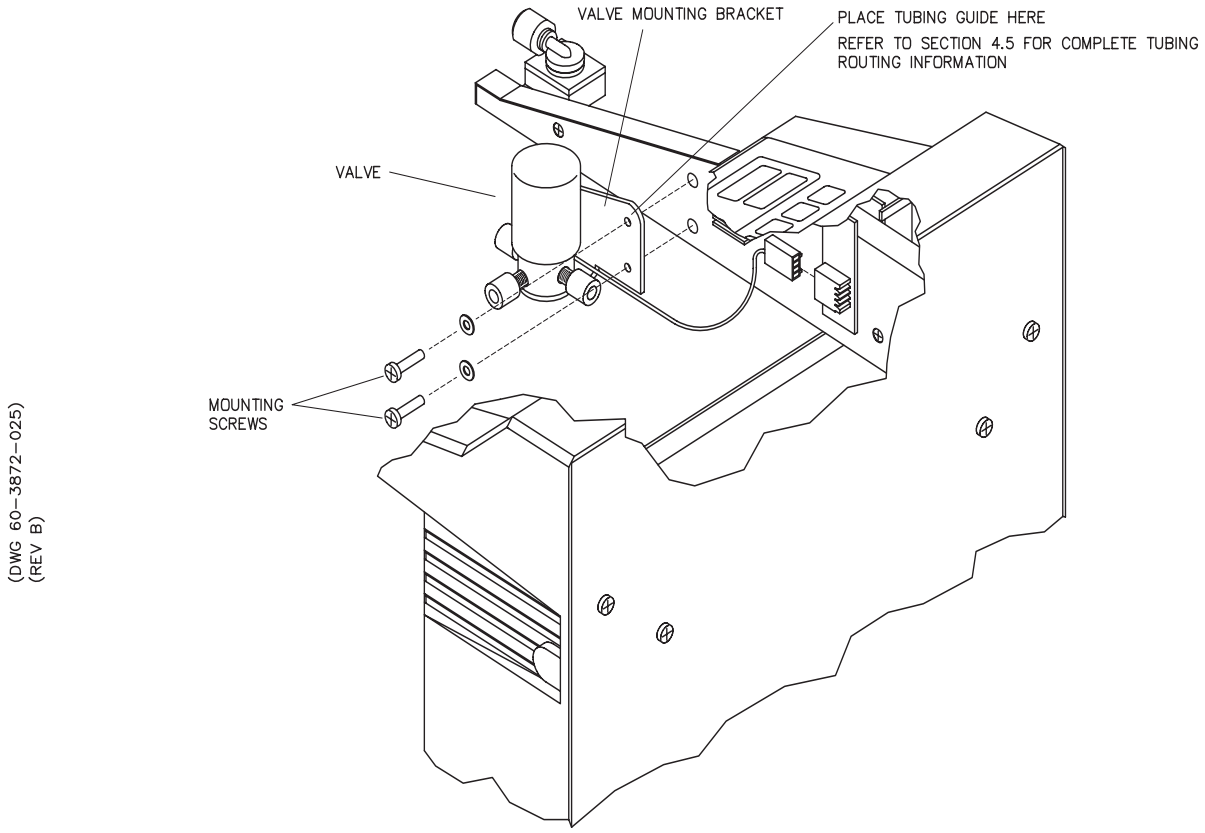
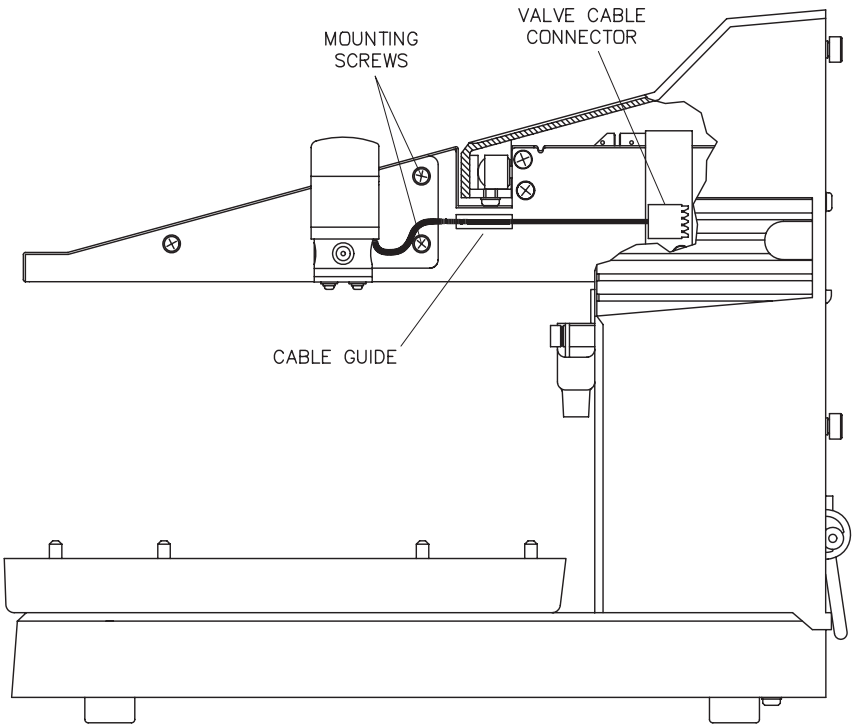


Figure 4-2 Installing the Valve on the Arm Assembly

5. Push the valve cable connector into the connector on the arm assembly with your finger.
6. Mount the valve on the arm assembly using the two 4-40 x $^1/_2$" screws (Item 6 in the Valve Accessory Package), making sure that the valve does not hang below the arm. Tighten the screws to secure the valve in place.



(DWG 60-3872-024)
(REV A)

Figure 4-3 Attaching the Valve Cable

7. Press the valve cable into the cable guide on the side of the arm assembly.

> ☑ ***Note***
>
> The wire can be flattened slightly with a pair of pliers to make insertion into the cable guide easier.

8. Set the instrument upright and reconnect power.

4.3.4 Connecting Tubing to a Valve

When installing a security valve, ensure that the *Out* port of the valve points toward the front of the Foxy Jr. When installing a diverter valve, the waste port points toward the rear.

> ☑ ***Note***
>
> For the Three-Port Diverter Valve only: Attach the tubing from the waste collection vessel to the Waste port.

1. Attach the tubing from the drop former to the port marked *Collect*. Refer to Figure 4-6 to determine the length of tubing required.
2. Attach the tubing from the detector to the port marked *In*.

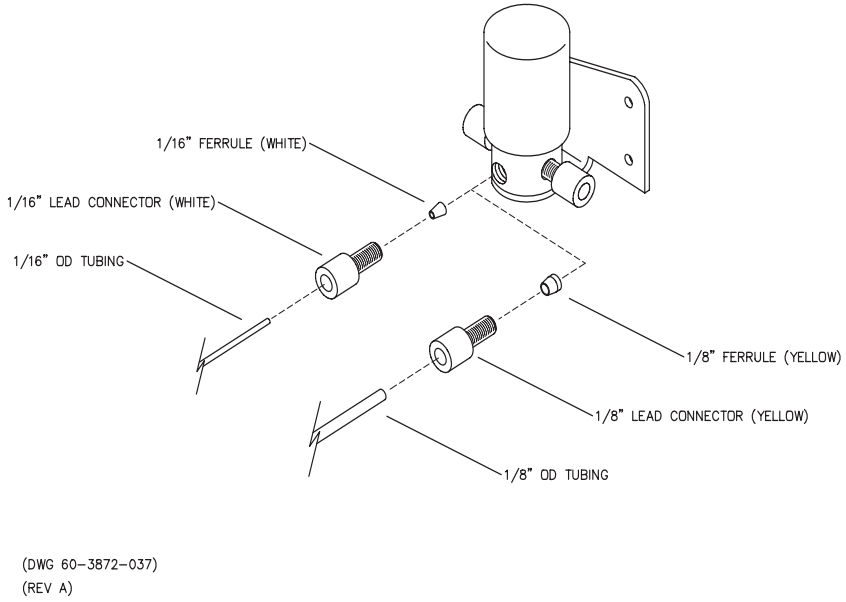


Figure 4-4 Attaching Tubing to the Valve

4.4 Inlet Tubing Routing

The Foxy Jr. is supplied with tubing guides to help you route the inlet tubing to the drop former and/or accessory valve. The routing guides accommodate a variety of tubing sizes. Which guide you use and how you position them depend on your installation. If your optical unit mounts in such a way that the tubing does not catch on a test tube, you may not need to use any additional tubing guides.

> ☑ ***Note***
>
> The instructions provided here are recommendations only. Your installation may require different tubing routing arrangements.

4.4.1 Small Diameter Tubing

To route small diameter tubing to the drop former, remove the left-most screw on the upper case. Use the existing screw to secure the mounting plate as shown in Figure 4-5. Route the tubing through either of the guides on the mounting plate as shown.

> ☑ ***Note***
>
> Move the drop former to tube position #1 before installing the inlet tubing. This makes the drop former accessible and allows you to gauge the length of tubing required to make the connection. See Section 2.2 for instructions on moving the drop former.

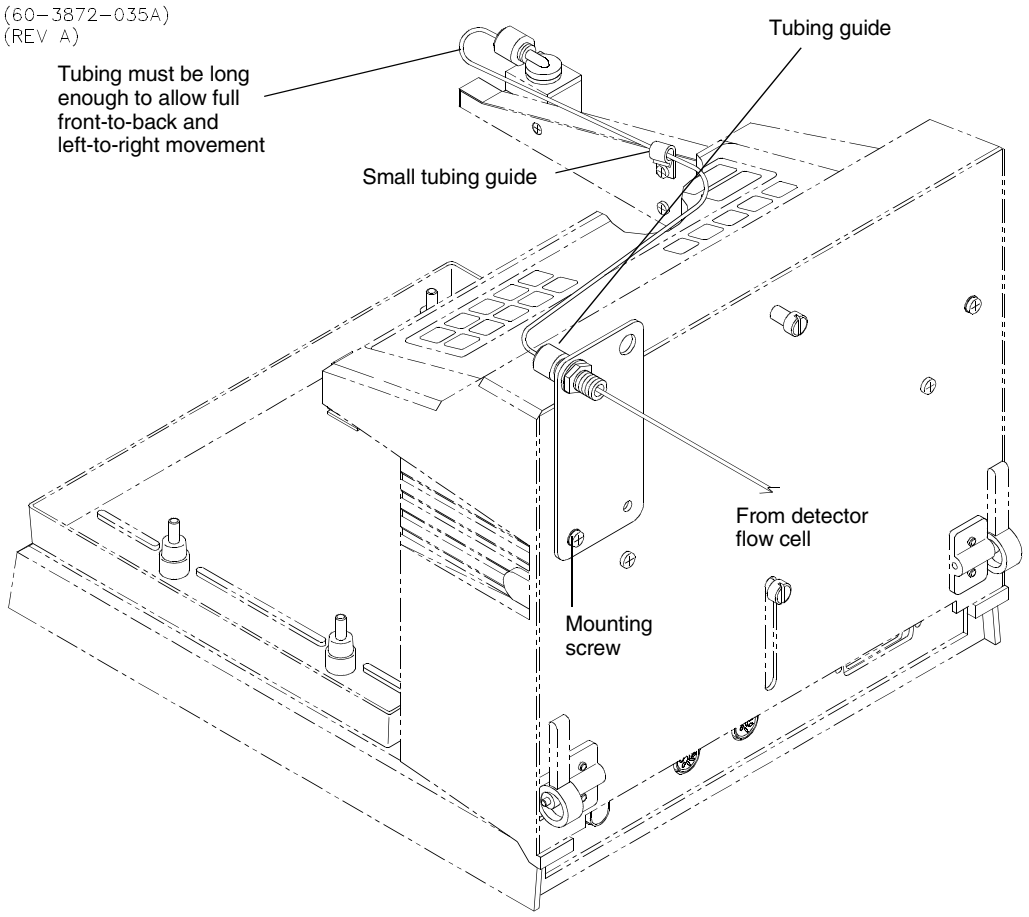


Figure 4-5 Small Diameter Tubing Routing

Next, remove the mounting screw on the arm indicated in Figure 4-5. Use the screw to secure the small plastic tubing guide to the arm in the position indicated. Route the tubing through the guides and attach it to the drop former.

> ☑ ***Note***
>
> To ensure that the tubing is properly routed, move the drop former to tube position #1 and back to the Park position.

4.4.2 Routing to an Accessory Valve

With an accessory valve installed, the process is only slightly different. Install the mounting plate as described above. Mount the small plastic tubing guide so that it routes the tubing from the valve vertically as shown in Figure 4-6.

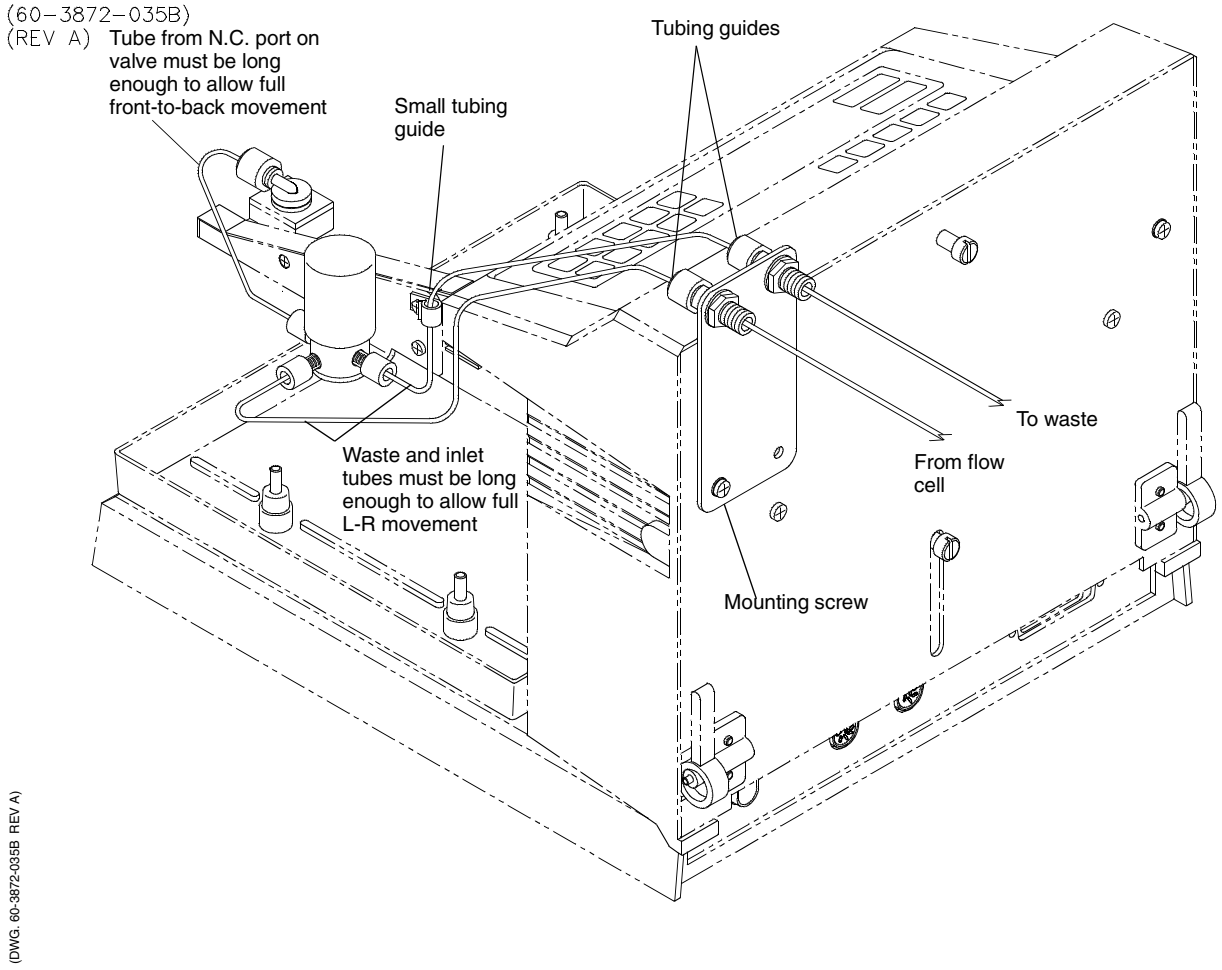


Figure 4-6 Routing Tubing with Accessory Valve

4.4.3 Large Diameter Tubing

To route large diameter tubing to the drop former, peel the protective cover off the adhesive tape on the bottom of the large plastic tubing guide. Attach the guide to the top of the Foxy Jr. as shown in Figure 4-7.

> **Note**
>
> The accessory valves are not rated for use with 1/8 -inch ID tubing.

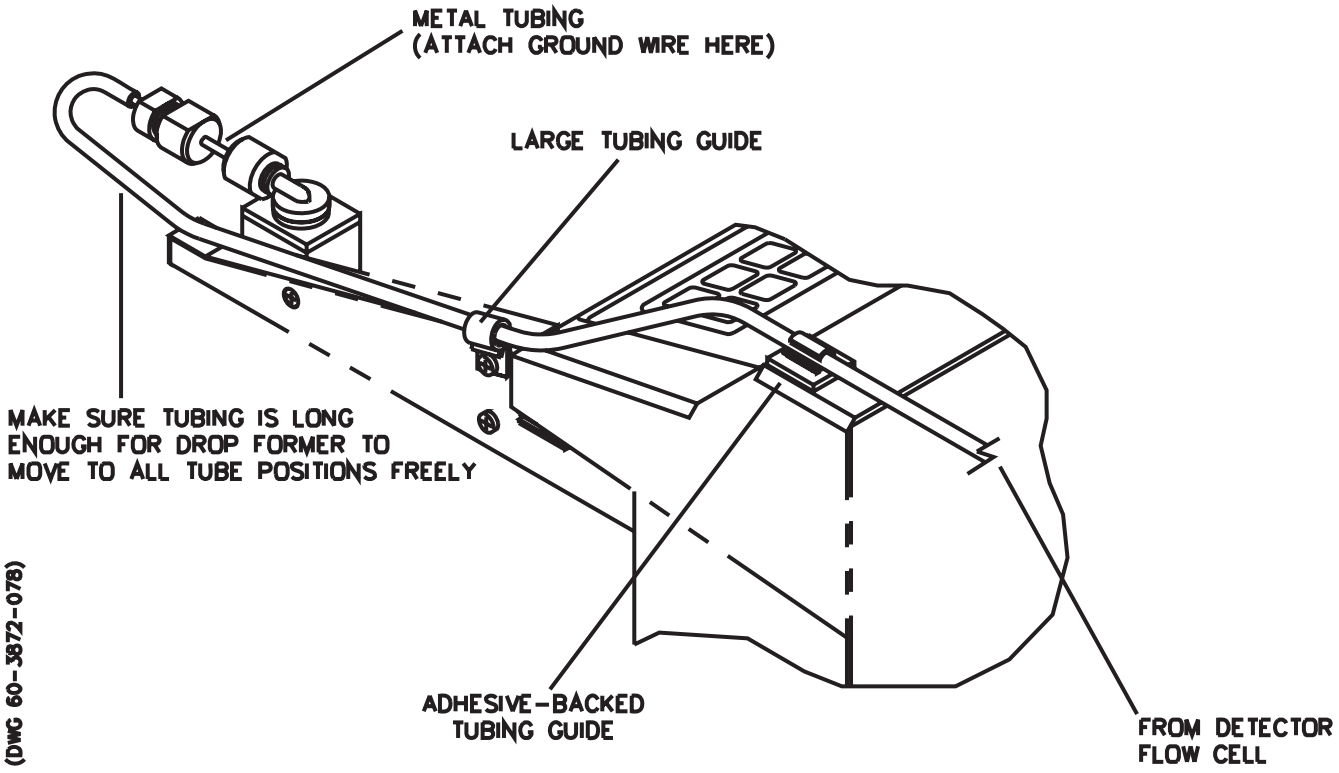


Figure 4-7 Routing Large Diameter Tubing

Next, remove the mounting screw on the arm indicated in Figure 4-7 and use the screw to secure the larger plastic tubing guide to the arm in the position indicated. Route the tubing through the guides and attach it to the drop former.

4.5 Connection to Other Instruments

Cables are available to connect the Foxy Jr. to other Teledyne Isco and non-Teledyne Isco equipment. Table 4-3 lists the available connection cables and part numbers. For combinations of equipment not listed here, use the external signal connections on the Foxy Jr.'s back panel.

Table 4-3 Optional Interconnect Cables

Instrument	Purpose	Part Number
Wiz	Volume count and pump stop	68-1020-203
Tris	Volume count and pump stop	68-1020-204
185	Volume count	68-1020-218
UA-6, V4 (Series 1840-017, 1840-018)	Detector signal and event marking	68-1020-211
Foxy Jr. to non Teledyne Isco detector, injector, or ChemResearch Interface	Detector signal, event marking, inject, peak, and advance	68-1010-119
Foxy Jr. to non Teledyne Isco pumps	Volume count and pump stop (if compatible)	68-1010-114
Serial printer	Print out programs	68-1020-503

4.5.1 Connection to a Teledyne Isco Absorbance Detector

The cable required for connection between your absorbance detector and the Foxy Jr. depends on the model and series of your detector. Refer to Table 4-3 to select the proper cable for your detector.

The information transmitted between the Foxy Jr. and the detector consists of tube change event marks, inject cycle start, tube advance signal, and analog detector signal. The tube event mark appears as a short negative blip on the chart recorder trace. No separate pen is necessary to generate these marks.

The Foxy Jr. has an internal peak separator, so the analog output signal from the detector may be used directly by the Foxy Jr. The peak separator locates peaks by a change of slope in the detector signal, or by the signal crossing a user-programmed threshold. At the beginning and end of each peak, the peak separator causes the Foxy Jr. to change tubes. Therefore, each peak is put into its own tube with no dilution from preceding or succeeding baseline effluent. The Foxy Jr. may also use the peak separator in the detector. Be sure that you use only one peak separator at a time; either in the Foxy Jr. *or* the detector. Using both at the same time results in inaccuracies.

4.5.2 Connection to Non-Teledyne Isco Detectors or Recorders

The Foxy Jr. may be connected to various non-Teledyne Isco detectors or recorders via the rear panel *Detector* connector using an optional interface cable. Table 4-6 lists the function, wire color, and pin number of the Detector connector input/output signals available with the optional interface cable.

The most basic signal exchanges between the Foxy Jr. and the detector are the tube advance/event mark signals. The Foxy Jr. tube advance requires a TTL level logic “0” (or contact closure) to initiate a tube change. The minimum pulse width is 50 milliseconds and the maximum allowable voltage is +5 Volts. Whenever the Foxy Jr. advances, the Event output is active: this is an open collector output signal on pin 7 (blue wire) relative to the circuit common (white wire) on pin 8. This input is capable of

switching up to +12 VDC at 100 mA. The use of this signal for non-Teledyne Isco instruments varies, depending on the capabilities of the detector or recorder.

4.5.3 Connection to a Teledyne Isco Wiz Peristaltic Pump

The Foxy Jr. can count pulses from a Wiz pump to determine fraction size. This microprocessor-based pump can be calibrated with a pipette 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 the pumping speed. Once a scaled reference volume of 100 ml or 10 ml is established, the Foxy Jr. fraction size may be set directly in ml or tenths of a ml.

For example, the desired collection volume is 13 ml per tube. Set the Foxy Jr. External Counts size to 130. If the scaled reference volume of the Wiz pump is 10 ml, each pump pulse will be $^{1}/_{100}$th of 10 ml, or 0.1 ml.

The Foxy Jr. will also turn the Wiz pump off during tube changes and at the end of the run. To reliably stop the flow in time for tube movement, the pump must be placed between the column and the Foxy Jr. drop former. Use the connection cable #68-1020-203 between the Foxy Jr. Pump connector and the Wiz pump's External Control connector.

4.5.4 Connection to and Teledyne Isco Tris Peristaltic Pump

For Tris pump control, use cable #68-1020-204. The Tris pump can be used for uncalibrated volumetric counting and pump stopping.

4.5.5 Connection to Non-Teledyne Isco Pumps

The Foxy Jr. may be connected to various non-Teledyne Isco pumps using the rear panel *Pump* connector and the optional connect cable # 68-1010-114. Table 4-5 lists the function, wire color, and pin number of the Pump connector signals available with the cable.

Two signals are used to interface with the pump. The first is the volumetric count input on pin 1 (orange wire). The count input requires a TTL level logic “0” (or contact closure). The minimum pulse width of the signal is 50 milliseconds. No more than the maximum of +5 VDC should be applied to this input. The Foxy Jr. program needs to be set to External Counts collection mode.

The pump pause output on pin 2 (yellow wire), which can switch a load of +12 VDC at 100 mA, is used to stop the pump at the end of a run and optionally between tubes.

4.5.6 Connection to a Teledyne Isco ChemResearch External Interface

When using the Foxy Jr. with Teledyne Isco's ChemResearch providing the peak detection, use connect cable #68-1010-119 to connect the ChemResearch interface to the Detector connector on the rear panel of the Foxy Jr. The Peak detector parameter should be set to External in the Foxy Jr.’s program.

The ChemResearch program must be properly set up to work with the Foxy Jr. Consult your ChemResearch manual for instructions on setting External Peak Detection to the following parameters: Control Bit 0, Low, Continuous. On the ChemRe-

search External Interface, connect the brown wire to Digital Output 0 and the white wire to Ground. Insulate the unused wires from each other.

4.6 Foxy Jr. Input/Output Connectors

The Foxy Jr.'s rear panel is equipped with four different connectors, as shown in Figure 4-8. Table 4-4 provides a brief description of the purpose of each connector. Tables 4-5, 4-6, and 4-7 provide detailed, pin-by-pin information on each connector.

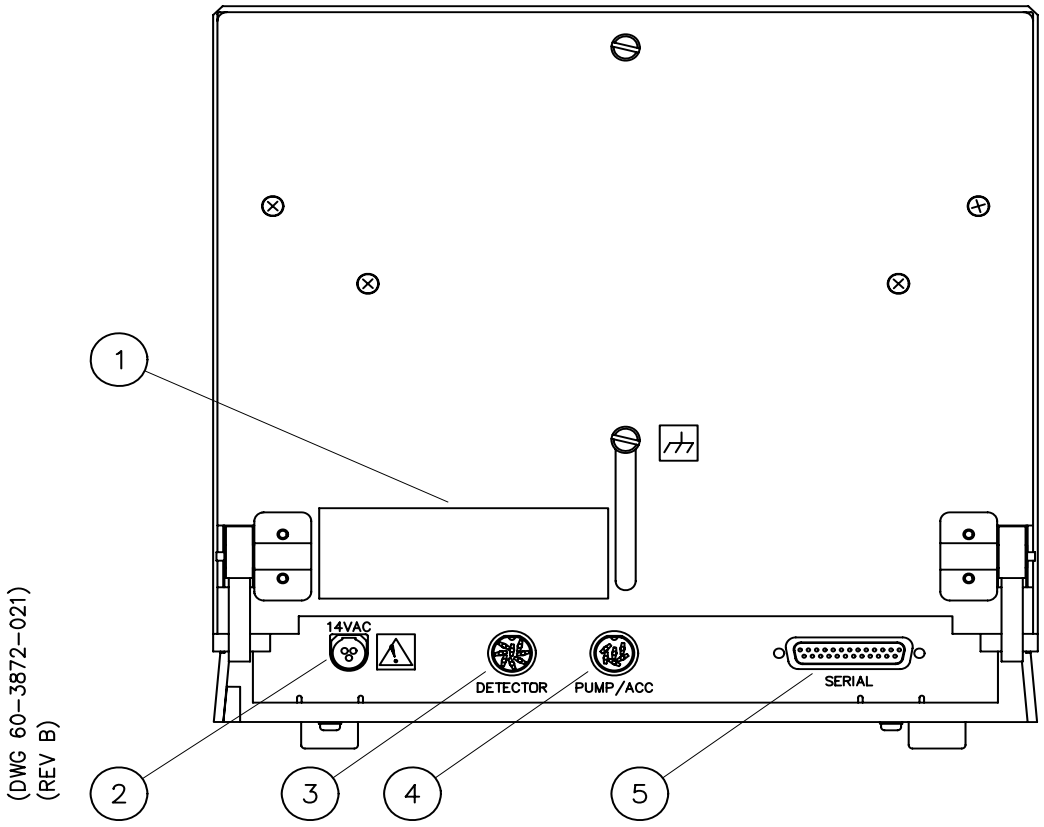


Figure 4-8 Foxy Jr. Rear Panel

Table 4-4 Foxy Jr. Rear Panel Connectors

Connector	Description	Purpose
14 VAC	3-pin locking socket	Input for supplied power adapter only.
Detector	8-pin circular DIN socket	Interface connection to a Teledyne Isco detector for automatic peak separation and event marking.
Pump/Acc.	6-pin circular DIN socket	Provides stop signal to pump at the start of the 0.8 second delay between tubes and at the end of the run in both Time and Drops collection modes, or under manual control.
Serial	RS-232-C (25-pin D-Sub)	Serial interface to computer for monitoring and control.

Table 4-5 Foxy Jr. Pump Connector Pin-Outs

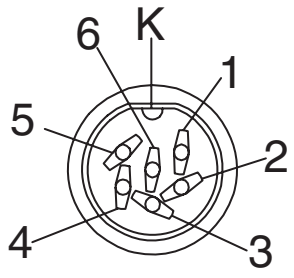
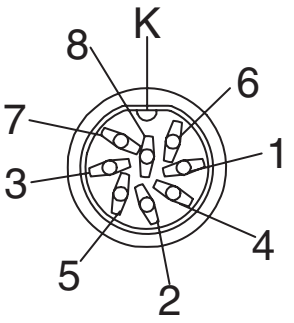
Pump (Cable 60-1010-114)	Pin	Color	Type	Description
	1	Orange	Input	Count: pump volumes signal*
	2	Yellow	Output	Pump pause: stops pump between tubes and /or at end of run**
	3	Brown	Not Used	-
	4	Red	Common	Circuit common
	5	Black	Not Used	-
	6	Green	Reserved	Valve controller: Do Not Connect
	K	Bare	Shield	Earth ground

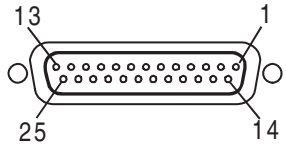
Table 4-6 Foxy Jr. Detector Connector Pin-Outs

Detector (Cable 60-1010-119)	Pin	Color	Type	Description
	1	Yellow	Common	Analog common (for use with pin 6)
	2	Red	Not Used	-
	3	Green	Not Used	-
	4	Black	Input	Inject: starts and inject cycle*
	5	Brown	Input	Advance: moves to next tube& also External Peak
	6	Orange	Input	Analog detector signal: 0-10 mV, 0-100 mV, or 0-1 Volt (-1.2 to +1.2 usable, -5 to +5 maximum)
	7	Blue	Output	Event: sends a 300 ms pulse when tube is changed**
	8	White	Common	Circuit common
	K	Bare	Shield	Earth ground

* Inputs are TTL levels or contact closures, active low, 50 ms minimum, +5 VDC maximum.

** Outputs are open collector, active low, +12 VDC maximum, 100 mA maximum.

Table 4-7 Foxy Jr. Serial Connector Pin-Outs

Serial (RS-232-C)	Pin	Type	Description
	1	Shield	Earth ground
	2	Input	RXD RS-232 Serial data in
	3	Output	TXD RS-232 Serial data out
	4	-	CTS Connected to pin 21
	5	-	RTS Connected to pin 25
	6	Output	DCD Connected to positive RS-232 supply
	7	-	Circuit common
	8	Output	DSR Connected to positive RS-232 supply
	9	Output	PTV Positive RS-232 Test Voltage
	10	Output	NTV Negative RS-232Test Voltage
	11	Output	+5 VREF Internal reference voltage test point
	12	-	Analog common (for use with pin11)
	14	Input	RS-232 Serial data chain in
	16	Output	RS-232 Serial data chain out
	20	Input	DTR Connected to positive RS-232 supply
	21	-	CTS chain. Connected to pin 4
	24	Output	+5 VDC supply
	25	-	RTS chain. Connected to pin 5
	13, 15, 17, 18, 19, 22, 23	-	No connection

4.7 Teledyne Isco LC Organizer Shelf/Lab Stacker

To conserve lab space, we recommend adding a Teledyne Isco Medium LC Organizer Shelf or Lab Stacker to help organize all your Teledyne Isco column/chromatography equipment. Depending on the number of instruments in use, the Medium LC Organizer Shelf or Lab Stacker helps you keep your equipment organized.

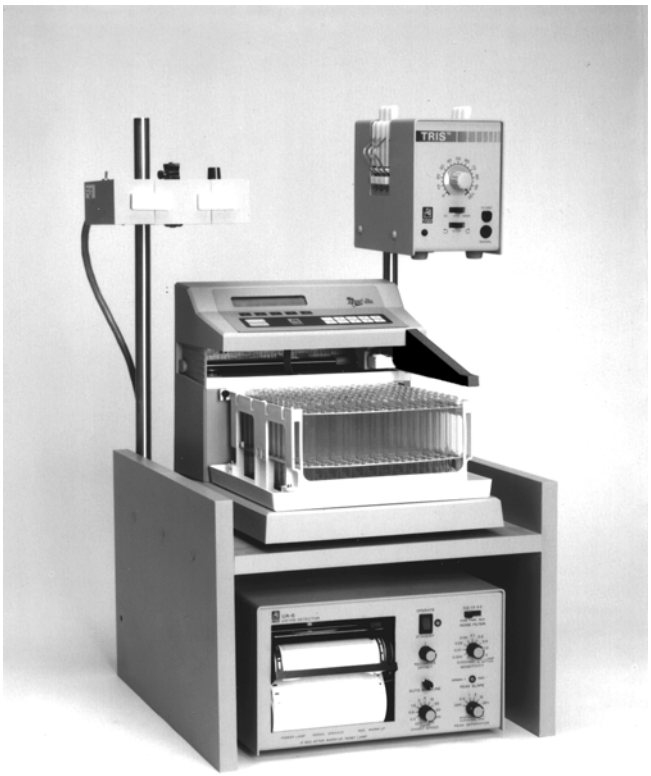


Figure 4-9 Teledyne Isco Medium LC Organizer Shelf

4.8 Valve Controller

When a liquid chromatography application requires the use of valves, pumps, or other external devices and signals, the Foxy Valve Controller is used with the Foxy Jr. Fraction Collector to provide timed control of these devices. The valve controller is fully dependent on the Foxy Jr. for its logic timing. It has an array of internal power transistors and relays that operate at programmed time intervals selected by the Foxy Jr. Each relay or transistor is simultaneously activated or deactivated by the Foxy Jr.'s program. Access to the relay contacts or transistor outputs is through the terminal block on the rear of the valve controller.

4.8.1 Connectors and Indicators

Figure 4-11 shows the location of the items described in Table 4-9.

4.8.2 Unpacking

After removing the unit from the shipping carton, examine it for signs of shipping damage. Be sure no hardware has shaken loose in transit, and inspect it closely for signs of internal damage. If there are any signs of shipping damage, notify the delivery carrier and file a claim immediately.

Check the contents of your shipment against the packing slip that was sent with it. If there are any shortages, notify Teledyne Isco immediately. Save the packing material and shipping carton. You may need them later for shipment or storage of the unit.

4.8.3 Preparation For Use

1. First, connect the desired valves and accessories to the output terminals on the back of the Foxy Jr.
2. Connect the valve controller's interface cable to the 10 pin connector of the "Y" cable supplied, then connect the 6 pin plug of the "Y[a] cable to the PUMP/ACC. jack on the Foxy Jr. The other functions of the PUMP/ACC. connector are still available through the second connector of the "Y[a] cable.
3. Next, connect the valve controller to power.

⚠ CAUTION

Do not connect to the power until all connections to the terminals of the valve controller have been completed.

4.8.4 Valves For Valve Controller

The following is a list of 2-port (security) and 3-port (diverter) valves available for use with the valve controller.

Standard Flow Rate Valves (for flow rates up to 10 ml/min):

- Security Valve 68-2137-053
- Diverter Valve 68-2137-050

These valves draw 140 mA at 12 VDC.

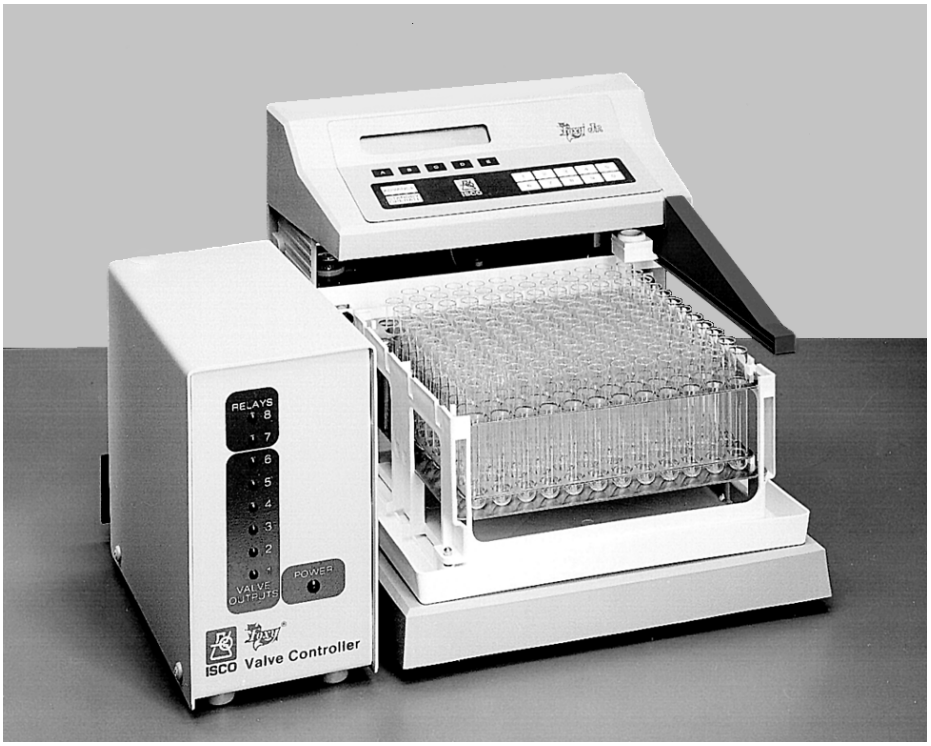


Figure 4-10 Foxy Valve Controller with Foxy Jr.

Table 4-8 Valve Controller Technical Specifications	
Physical Size	7.8 H x 3.4 W x 9.8 D (19.9 cm x 8.6 x 24.8 cm)
Weight	6 lbs. 9 oz. (2.976 kg)
Temperature Range	5 to 40°C
Humidity Range	0-95% (non-condensing environment)
Power Requirements (Voltage line cord is a disconnect device)	100 ± 10 VAC, 1.0 A 117 ± 12 VAC, 1.0 A Factory Set 234 ± 23 VAC, 0.5 A
Line Frequency	50 to 60 Hz
Relay Contact Rating	3 Amperes at 30 VDC/VAC RMS
Transistor Switch Rating	12 VDC at 1.0 amp max.
Maximum Continuous Current from Internal Power Supply	With total combined load of Valves and/or Power Supply outputs, maximum is 2.5 amp dc at 12 VDC at 25°C Derate to 1.9 amp dc at 25°C, 50 Hz and 10% high line voltage.

High Flow Rate Valves (for flow rates of 10 ml/min to 4.5 l/min):

- Security Valve 68-2137-055
- Diverter Valve 68-2137-054

These valves draw 725 mA at 12 VDC.

Figure 4-11 Foxy Valve Controller Front Panel Controls and Indicators

Table 4-9 Valve Controller Front Panel Controls and Indicators

Item No.	Control or Indicator	Description
1	POWER	An LED that lights up to show ±12 VDC power is available to the outputs.
2	RELAY Indicators	Each LED lights up when its relay is activated.
3	VALVE OUTPUTS Indicator	Each LED lights up when its transistor is activated.

4.8.5 Foxy Valve Controller Operation

⚠ WARNING

Do not switch voltages higher than 30 Volts AC or DC with the Valve Controller. Improper wiring techniques can result in hazardous conditions that may cause lethal shocks and/or fire.

Any device that can be controlled electrically by the closing of an isolated contact closure (within the rated values in Table 4-8) or by open-drain transistor switching, can be turned on and off by the valve controller. Before connecting the leads of a particular device to the SWITCHED VALVE OUTPUT or RELAY terminals, you must know the device's specifications (voltage, load and effect of switching) and you must decide when you want it switched on and off. The terminal block is designed to accept bare (tinned) wire ends, eliminating the need for any special connectors. There is a terminal for each of the eight outputs. The

outputs can be programmed to operate either sequentially, simultaneously, or a combination thereof. **Care must be taken when operating loads simultaneously using the VALVE OUTPUTS so as not to overload the valve controller power supply.** An external power supply may be used with the relay outputs. Care must be taken not to exceed the relay contact ratings. See Table 4-8.

Connection to the power transistors is made through the SWITCHED VALVE OUTPUT terminals. The (+) terminal is at +12 VDC and the (-) is an open drain connection to the power transistor that is switched to 0 VDC common.

Connection to a relay through the RELAY output terminals are made to the common (COM) terminal and either the normally open (N/O) or the normally closed (N/C) terminals. If the external device is to be energized during the time interval, the connection will be to the COM and N/O terminals. If the device is to be de-energized during the time interval, the connection will be to the COM and N/C terminals.

⚠ WARNING

When the line cord is connected, power is applied to the internal circuitry, even though the "POWER" LED may be off. To totally remove power from the Valve Controller, disconnect the line cord.

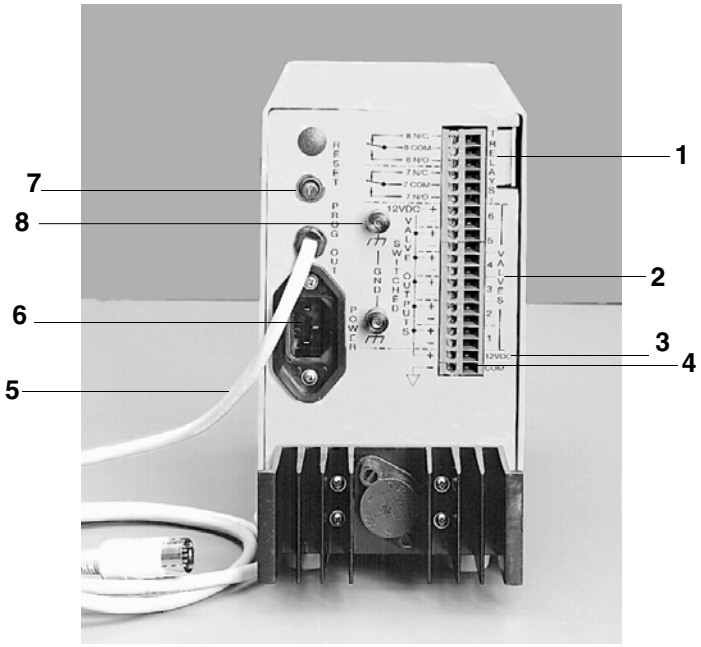


Figure 4-12 Foxy Valve Controller Rear Panel Connectors and Indicators.

Table 4-10 Valve Connector Rear Panel Connectors and Indicators

Item No.	Connector or Indicator	Description
1	RELAY outputs	Connection point for the relays. The N/O contacts switches to the COM (common) contact in the active state.
2	VALVE outputs	Connection points for the valve controller transistors. These are activated when the negative (-) valve output is brought to “common” potential by the transistor being turned on by the Foxy Jr.
3	12 VDC	12 volt regulated output available whenever power indicator is on.
4	COM	Common connection for 12 VDC output.
5	PROG OUT	Connects to the Foxy Jr.’s PUMP/ACC. jack via the “Y” cable controller to function.
6	Mains	Provides the connection of the valve controller to 100/117/234/ VAC 50/60 Hz.
7	RESET	Circuit breaker(s) Push to Reset. **Internal fuse (F101, 3A, “T”) is not accessible to the user**.
8	GND	Chassis

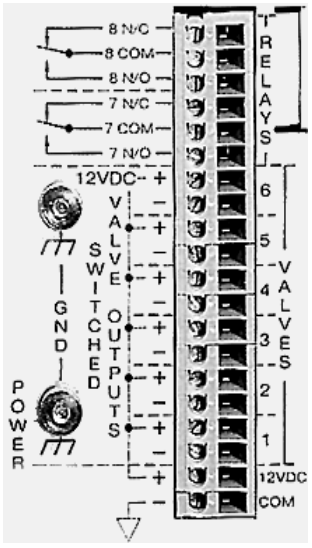


Figure 4-13 Rear Panel Showing Location of +12 VDC and Unswitched Com Source

4.8.6 External Device Connection

External devices may be connected to either the RELAY output connections or the SWITCHED VALVE output connections. Devices may be mixed, i.e., a 12 VDC valve may be connected to one of the valve output sets, while a 117 VAC pump may be connected to one of the relay sets.

A regulated +12 VDC and an unswitched COM source are available at the bottom of the terminal strip. These can be patched into the relay connections if the user wishes to use the internal power supply of the valve controller to drive the external device connected to the relay.

4.8.7 Connection to Valve and Relay Outputs

Assume you have a device that can be turned on and off by a simple contact closure. If you want the device to turn on when the output is activated, connect one of the device's control leads to the common (COM) terminal of the RELAY output and the other lead to the normally open (N/O) terminal of the same relay output.

If, instead, you want the device to turn off when the relay output is activated, connect one control lead to the common (COM) terminal, and the second lead to the normally closed (N/C) terminal of that relay output.

The relay can be activated by a program in the Foxy Jr. and the indicator on the controller front will show when the relay is activated.

If you need to switch valves, low voltages from the internal power supply (+12 VDC) can be used to drive them, using the SWITCHED VALVE OUTPUTS. The positive (+) terminal is a regulated +12 VDC supply and the negative (-) is an open drain that ties to circuit common when activated. A valve will be turned on when the output is activated.

Two chassis ground terminals are provided on the rear. These allow the user to connect the chassis (safety) grounds of all equipment connected to the valve controller to the controller's chassis ground.

4.8.8 Programming the Foxy Valve Controller

See Sections 3.2.1 and 3.2.2.

4.8.9 Cleaning the Enclosure

To clean the Valve Controller enclosure, use a mild detergent in water. For stains of an organic nature, use isopropyl alcohol in a sponge that has been mostly squeezed dry.

Foxy Jr. Fraction Collector

Section 5 Serial Interface

5.1 Introduction

The Foxy Jr. Fraction Collector has a built-in RS-232 serial interface that allows it to be remotely controlled, or to print out its programs.

Remote control is typically done using a computer running a terminal program to upload or download programs. Alternately, programs can be printed by connecting a serial printer, such as the 40 column printers available from Teledyne Isco (250-100-002 for 117 VAC, 250-100-003 for 234 VAC), using cable 68-1020-503. See Section 5.5 for more information on printing.

See Section 3.9 to turn on the serial interface and set the baud rate.

5.2 General Information

5.2.1 Connector pins

The minimum connections required for serial control are:

Pin 2	RECEIVE	Serial data input from computer, (not required for printer.)
Pin 3	TRANSMIT	Serial data output to computer or printer
Pin 7	COMMON	Signal common for all signals.

See Table 4-7 for further information on this connector.

5.2.2 Baud Rates

Available baud rates are:

300	1200	2400	4800	9600	19200

See Section 3.9 to set the Foxy Jr. baud rate.

5.2.3 Character Format

8 data bits, no parity bit, 1 stop bit.

All characters will be printable ASCII characters.

5.2.4 Command Syntax

Commands consist of single keywords, possibly followed by an operand, separated by a "=[a], for example: DISPLAY or TUBE=42. Commands may be abbreviated to as few as three characters. Spaces are ignored. Backspace, (ASCII character 8), may be used to correct mistakes.

5.2.5 Line syntax

Commands are processed when a carriage return is received. Multiple commands may be sent on a line, separated by semicolons (;), for example: NEXT;NEXT;RSVP. Total line length must not exceed 80 characters. Errors occurring from any command do not stop the execution of the remaining commands on line.

5.2.6 Modes

The Foxy Jr. must be in remote mode to do anything other than read values. See REMOTE command in Section 5.3.1. Program parameters cannot be changed while a run is in progress. Also, changes to any parameter currently being edited on the Foxy Jr. display will not be effective.

5.2.7 Errors

Errors relating to syntax, etc., of commands result in problem message responses. See Section 5.4. Hardware related errors (Warnings and Failures) are indicated by the display and audio of the unit, and can be detected serially using the STATUS command.

5.3 Serial Commands

The following is a list of all Foxy Jr. serial commands, with a brief description and example of the use for each command. For some commands, no response is required or expected from the unit. The examples show this as Response: (None).

5.3.1 Miscellaneous commands

CLEAR

This command resets the unit. It is equivalent to switching the unit to standby and then back to operate.

Example:	Command:	CLEAR
	Response:	(none)

CUE=n

This command enables or disables the sending of a ">.[a] prompt character when the unit is finished processing a command line and is ready for another. This "line pacing" can be used by many terminal programs to avoid downloading commands faster than the unit can execute them. CUE=1 will enable the prompt, CUE=0 will disable it. CUE=0 is set when unit is switched to OPERATE.

Example:	Command:	CUE=1
Response:	>	

CUE without an operand returns the current setting.

Example:	Command:	>CUE
	Response:	CUE=1

DISPLAY

This command asks the unit for the current characters displayed on the unit. Characters having no ASCII equivalent are translated to the nearest similar character. For example, the left arrow becomes a "<[a]. Inverse characters, (light characters on a dark background), are translated to upper case. For example, inverse Peak becomes PEAK.

Example:	Command:	DISPLAY
	Response:	Fraction Time= 0:03
		End Back -1 +1 Enter

ECHO=n

This command enables or disables echoing of characters received. Echoing can be used to verify correct reception of characters. ECHO=1 will enable the echoing, ECHO=0 will disable it. ECHO=0 is set when unit is switched to OPERATE.

Example:	Command:	ECHO=1
	Response:	(None)

ECHO without an operand returns the current setting.

Example:	Command:	ECHO
	Response:	ECHO=1

HELP

The unit will respond to this command with a list of valid command names.

Example:	Command:	HELP
	Response:	CLEAR COLLECT...

IDENTIFY

This command returns information identifying the unit.

Example:	Command:	IDENTIFY
	Response:	SERIES=3870, Foxy Jr. Frac. Col.,
		REV A, 01.00.00

KEY=keys

This command enables you to enter keys as if they were pressed on the unit's keypad. "F[a] is used for the ADVANCE key, others are as labeled. For example, from the "Fraction by[a] screen, sending KEY=1E23E selects the Fraction by Time option and inputs a fraction time of 0:23. Characters other than 0-9 and A-F are ignored (including spaces).

Example:	Command:	KEY=1 E 23 E
	Response:	(None)

> **Note**
>
> On screens displaying the “Select” soft-keys, options may be directly selected using the numeric keys: “1” will select the first option, “2” will select the second option, etc.

LINEFEED=n

This command enables (LINEFEED=1) or disables (LINEFEED=0) the sending of a linefeed character each time a carriage return is sent. LINEFEED=0 is set when unit is switched to OPERATE.

Example:	Command:	LINEFEED=1
	Response:	(None)

LINEFEED without an operand returns the current setting.

Example:	Command:	LINEFEED
	Response:	LINEFEED=0

LOCAL

This command sets the unit to local mode. In local mode, serial commands cannot affect the unit's operation; they can only *obtain* information. Local mode is set when the unit is switched to OPERATE. See REMOTE command.

Example:	Command:	LOCAL
	Response:	(None)

NOTE=text or NOTE

This command and any following text are ignored by the unit. This allows annotating program files for user reference. NOTE without a operand can provide spacing for readability.

Example:	Command:	NOTE=Use with column 3 at 3 ml/min.
	Response:	(None)

REMOTE

This command sets the unit to remote mode. The unit must be put into remote mode before any commands are sent that affect the unit. Local mode is set when the unit is switched to OPERATE. See LOCAL command.

> ☑ ***Note***
>
> The keypad on the unit is still fully operational in remote mode.

Example:	Command:	REMOTE
	Response:	(None)

RSVP

This command instructs the unit to indicate completion of the preceding commands that take some time to perform. The response from the unit will be READY when the task is complete. For example, if you have sent RACK=1;RSVP, the unit moves the drop former over the rack and then responds: READY.

Example:	Command:	RSVP
	Response:	READY

STATUS

The unit will respond to this command with the last warning or failure code that occurred. If an action is in progress, the unit will wait to respond, so a response of STATUS=0 means the preceding commands are complete and no errors occurred. For example, the command string **STATUS=0;RACK=1;TUBE=1;STATUS** will cause the unit to respond with STATUS=0 after the unit has successfully moved to tube 1.

Example:	Command:	STATUS
	Response:	STATUS=0

The STATUS=0 command clears the last warning or failure code from memory so that future errors can be noted.

Example:	Command:	STATUS=0
	Response:	(None)

5.3.2 Immediate Control Commands

COLLECT

The unit resumes collecting fractions after a DRAIN command if this command is given during a run. Otherwise, this command will instruct the Foxy Jr. to move the drop former over the tubes and open the valve. See DRAIN command.

Example:	Command:	COLLECT
	Response:	(None)

DETECTOR

The unit responds to this command with the current peak detector input value. If the value is below -120%, then "- - - -%" will be returned. If over +120%, then "++++%" will be returned.

Example:	Command:	DETECTOR
	Response:	DETECTOR=12.3%

DETECTOR=n

This command sets the peak detector input voltage range for the above. 'n' can be set to 10, 100, or 1000 millivolts.

Example:	Command:	DETECTOR=100
	Response:	(None)

DRAIN

This command halts collecting. If executed during a run, it is the same as pressing the **Drain** softkey. If a three-way valve is connected, the flow is diverted. If there is no three-way valve, the drop former is moved to the drain. See Collect command.

Example:	Command:	DRAIN
	Response:	(None)

GRADIENT=n

This command sets the percentage of the B component for the Gradient Controller attached t tho Foxy Jr. 'n' can equal 0 to 100.

Example:	Command:	GRADIENT=34
	Response:	(None)

GRADIENT without an operand returns the current setting.

Example:	Command:	GRADIENT
	Response:	GRADIENT=25

HOME

The unit will re-home itself to verify position, even if it is already at home position.

Example:	Command:	HOME
	Response:	(None)

NEXTTUBE

The unit will advance the current tube number one tube. If the drop former is over the drain, the drop former will not go to the new tube position until it returns from the drain.

Example:	Command:	NEXTTUBE
	Response:	(None)

OUTPUT=n

This command sets which Valve Controller output will be used for OSTATE commands that follow. 'n' =1 to 8.

Example:	Command:	OUTPUT=4
	Response:	(None)

OUTPUT without an operand returns the current setting.

Example:	Command:	OUTPUT
	Response:	OUTPUT=2

OSTATE=n

This command turns on (OSTATE=1) or off (OSTATE=0) the Valve Controller output previously selected with the OUTPUT command.

Example:	Command:	OSTATE=0
	Response:	(None)

OSTATE without an operand requests the current state of the previously selected output.

Example:	Command:	OSTATE
	Response:	OSTATE=1

PSPEED=n

This command sets the speed of the pump controlled by the Gradient controller, as a percentage of full speed. n=1 to 100.

Example:	Command:	PSPEED=78
	Response:	(None)

PSPEED without an operand returns the current setting.

Example:	Command:	PSPEED
	Response:	PSPEED=56

PUMP=n

This command sets the pump controlled by the Foxy Jr. on (PUMP=1) or off (PUMP=0).

Example:	Command:	PUMP=1
	Response:	(None)

PUMP without an operand returns the current setting.

Example:	Command:	PUMP
	Response:	PUMP=1

RACK=n

This command instructs the unit to move the drop former over the drain (RACK=0) or the rack (RACK=1).

Example:	Command:	RACK=1
	Response:	(None)

RACK without an operand returns the current position.

Example:	Command:	RACK
	Response:	RACK=1

RUN

The Foxy Jr. starts, continues, or restarts a run. For this command to be executed, the unit cannot be on a manual control screen (i.e.,the ADVANCE menu)

Example:	Command:	RUN
	Response:	(None)

STOP

This command pauses or stops a run. Enter the command once to pause a run in progress. Enter the command twice to completely stop the run. This command is ignored if the unit is not in a collection run. The command cannot be executed if the unit is on a manual control screen (i.e., the ADVANCE menu).

Example:	Command:	STOP
	Response:	(None)

TUBE=n

This command sets the current tube number to 'n,' then moves the drop former to it if the drop former is not at drain. 'n' can be from 1 up to the maximum for the currently programmed rack type.

Example:	Command:	TUBE=78
	Response:	(None)

TUBE without an operand requests the tube number the drop former is currently over. If the drop former is at the drain position, the tube number will be 0.

Example:	Command:	TUBE
	Response:	TUBE=45

VALVE=n

This command turns the valve on or off. Setting VALVE=0 will cause the flow to the drop former to stop with a two-way valve, or to be diverted with a three-way valve. Setting VALVE=1 will allow flow to the drop former.

Example:	Command:	VALVE=1
	Response:	(None)

VALVE without an operand returns the current valve state.

Example:	Command:	VALVE
	Response:	VALVE=1

5.3.3 Programming Commands

DEFAULT=1

This command clears the current program to defaults.

> ☑ ***Note***
>
> To minimize accidental clearing, the characters "=1" are required.

Example: Command: DEFAULT=1
Response: (None)

DELAY=n

This command sets the flow delay of the current program. If FTYPE=1 or 2 (fraction by time or drops), then n = 0 to 359999 seconds. If FTYPE=3 (fraction by ext. counts), then n=0 to 999999 counts. For example, FTYPE=1;DELAY=102 sets a flow delay of 1 minute 42 seconds.

Example: Command: DELAY=120
Response: (None)

DELAY without an operand returns the current setting.

Example: Command: DELAY
Response: DELAY=120

EVENT=n

This command selects which event will be used for the **ETYPE**, **ESTATE**, and **ETIME** commands below. 'n' = 1 to 40.

Example: Command: EVENT=2
Response: (None)

EVENT without an operand returns the current setting.

Example: Command: EVENT
Response: EVENT=2

ETYPE=n

This command sets the event type of the currently selected event. Choices are: none (n=0), valve controller output 1 to 8 (n=1 to 8), gradient change (n=9) or pump speed change (n=10).

Example:	Command:	ETYPE=4
	Response:	(None)

ETYPE without an operand requests the current setting.

Example:	Command:	ETYPE
	Response:	ETYPE=4

ESTATE=n

This command sets the new state for the event. For ETYPE=1 to 8 (valve controller outputs), 'n' can be 0 (off) or 1 (on); for ETYPE=9 or 10 (gradient or pump speed), 'n' can be 0 to 100.

Example:	Command:	ESTATE=0
	Response:	(None)

ESTATE without an operand returns the current setting.

Example:	Command:	ESTATE
	Response:	ESTATE=1

ETIME=n

This command sets the time at which the currently selected event will occur. Set n=0 to 359999 seconds.

Example:	Command:	ETIME=120
	Response:	(None)

ETIME without an operand returns the current setting.

Example:	Command:	ETIME
	Response:	ETIME=120

FSIZE=n

This command sets the fraction size for the current program. If FTYPE=1 (fraction by time), n=0 to 359999; if FTYPE=2 or 3 (fraction by drops or ext. counts), n=0 to 999999.

Example:	Command:	FSIZE=23
	Response:	(None)

FSIZE without an operand returns the current setting.

Example:	Command:	FSIZE
	Response:	FSIZE=23

FTYPE=n

This command sets the fraction type of the current program. Choices are Fraction by Time (FTYPE=1), Fraction by Drops (FTYPE=2), or Fraction by Ext. counts (FTYPE=3).

Example:	Command:	FTYPE=3
	Response:	(None)

FTYPE without an operand returns the current setting.

Example:	Command:	FTYPE
	Response:	FTYPE=3

LAST=n

This command sets the last tube of the current program. Choices are n=1 to n=maximum number of tubes for programmed rack type.

Example:	Command:	LAST=10
	Response:	(None)

LAST without an operand returns the current setting.

Example:	Command:	LAST
	Response:	LAST=10

LIST

The unit responds with the current program settings as they appear on the Foxy Jr.'s display. This can be used to document procedures or to manually restore a program at a later time. Settings not relevant to the program are not sent. For example, there would be no peak settings sent for a Time Windows-only program. The listing ends with a blank line.

EXAMPLE	Command:	LIST
	Response:	Pgm=1
		Type=Peak detection
		Rack Type=12/13 mm tubes

Last tube=144
Pattern=Standard
Fraction by Time
Fraction time= 1:00
Peak Detector=1V
Peak threshold=5%
Peak width=30 seconds
Non-peak/window=Collect
Restart=None
Pump off=End of run only
Motor Acceleration=5

NONPEAK=n

This command sets the non-peak/window action of the current program. Choices are Collect (n=1), Divert (n=2), or Drain (n=3)

Example:	Command:	NONPEAK=3
	Response:	(None)

NONPEAK without an operand returns the current setting.

Example:	Command:	NONPEAK
	Response:	NONPEAK=3

PATTERN=n

This command sets the rack filling pattern of the current program. Choices are Standard (n=1), Left-to-right only, or Right-to-left only (n=2).

Example:	Command:	PATTERN=1
	Response:	(None)

PATTERN without an operand returns the current setting.

Example:	Command:	PATTERN
	Response:	PATTERN=1

PROGRAM=n

This command sets the current program number. Choices are n=1 to 9.

Example:	Command:	PROGRAM=9
	Response:	(None)

PROGRAM without an operand returns the current setting.

Example:	Command:	PROGRAM
	Response:	PROGRAM=9

PTYPE=n

This command sets the program type. Choices are:

n=1	Simple
n=2	Peak Detection
n=3	Time Windows
n=4	Windowed Peaks
n=5	Simple + Delay etc.

Example:	Command:	PTYPE=2
	Response:	(None)

PTYPE without an operand returns the current setting.

Example:	Command:	PTYPE
	Response:	PTYPE=2

RANGE=n

This command sets the detector signal voltage range of the current program. Choices are 1 Volt (n=1), 100mV (n=2), 10 mV (n=3), or External detector (n=4).

Example:	Command:	RANGE=2
	Response:	(None)

RANGE without an operand returns the current setting.

Example:	Command:	RANGE
	Response:	RANGE=2

RESTART=n

This command sets the restart action of the current program. Choices are:

n=1	None
n=2	Inject, Overlay
n=3	Inject, Skip Tube
n=4	Time, Overlay
n=5	Time, Skip Tube

Example:	Command:	RESTART=5
	Response:	(None)

RESTART without an operand returns the current setting.

Example:	Command:	RESTART
	Response:	RESTART=5

RSTIME=n

This command sets the restart time (n=0 to 359999 seconds) of the current program.

Example:	Command:	RSTIME=600
	Response:	(None)

RSTIME without an operand returns the current setting.

Example:	Command:	RSTIME
	Response:	RSTIME=5000

TYPE=n

This command sets the rack type of the current program. Choices are:

n=1	12/13 mm tubes
n=2	16 mm tubes
n=3	18 mm tubes
n=4	17 mm vials
n=5	25/28 mm vials
n=6	Micro tubes
n=7	Prep. rack
n=8	Bottles
n=9	Single Beaker
n=10	Microplates

Example:	Command:	RTYPE=5
	Response:	(None)

RTYPE without an operand returns the current setting.

Example:	Command:	RTYPE
	Response:	RTYPE=5

THRESHOLD=n

This command sets the peak threshold (n=0[none] to 100)% of the current program.

Example:	Command:	THRESHOLD=10
	Response:	(None)

THRESHOLD without an operand returns the current setting.

Example:	Command:	THRESHOLD
	Response:	THRESHOLD=10

WIDTH=n

This command sets the peak detection width of the current program. Choices are:

n=1	5 seconds
n=2	15 seconds
n=3	30 seconds
n=4	1 minute
n=5	2 minutes
n=6	4 minutes
n=7	8 minutes
n=8	16 minutes
n=9	32 minutes
n=10	1 hour
n=11	No slop detection

Example:	Command:	WIDTH=2
	Response:	(None)

WIDTH without an operand returns the current setting.

Example:	Command:	WIDTH
	Response:	WIDTH=2

WINDOW=n

This command sets which window number (n = 1 to 10) will be used for the **WSTART** and **WEND** commands that follow.

Example:	Command:	WINDOW=5
	Response:	(None)

WINDOW without an operand returns the current setting.

Example:	Command:	WINDOW
	Response:	WINDOW=1

WSTART=n

This command sets the window start time (n = 0 to 359999 seconds) of the currently selected window.

Example:	Command:	WSTART=36000
	Response:	(None)

WSTART without an operand returns the current setting.

Example:	Command:	WSTART
	Response:	WSTART=240

WEND=n

This command sets the window end time (n=0 to 359999 seconds) of the currently selected window.

Example:	Command:	WEND=60
	Response:	(None)

WEND without an operand returns the current setting.

Example:	Command:	WEND
	Response:	WEND=240

UPLOAD

The unit responds to this command with the current program settings, one line at a time. The UPLOAD command must be sent for each line in the program until NOTE=END is received from the unit. Settings are in the form of commands allowing them to be sent back to the unit to restore a program. All settings are sent, even if they are not relevant to the way the program is currently set. For example, the setting for peaks will be sent even if the program is a time windows type.

Example:	Command:	UPLOAD
	Response:	WINDOW=3; WSTART=6000; WEND=6600
	Command:	UPLOAD
	Response:	Window=4; wstart=7000; WEND=7320

UPLOAD=n

This command chooses which program line (n = 0 to 71) is to be sent next.

Example:	Command:	UPLOAD=0
	Response:	(None)

UPLOAD=-1

This command responds with the command strings for the entire current program immediately.

EXAMPLE	Command:	UPLOAD=-1
	Response:	NOTE=PROGRAM 3
		PTYPE=4
		LAST=144
		PATTERN=1
		FTYPE=1
		FSIZE=1
		DELAY=0
		RANGE=1
		THRESHOLD=0
		WIDTH=11

```
NONPEAK=3
RESTART=2
WINDOW=1; WSTART=0; WEND=60
WINDOW2; WSTART=180; WEND=240
WINDOW=10; WSTART=0; WEND=0
EVENT=1; ETYPE=0; ESTATE=0; ETIME=0
EVENT=2; ETYPE=0; ESTATE=0; ETIME=0
....
EVENT=40; ETYPE=0; ESTATE=0; ETIME=0
NOTE=Config: Pump off=0, Only rack=11
NOTE=Pattern=3, Peak det. =5, Motor=5
NOTE=Cal: 0mV=32768, 1V=58982,
NOTE=100mV=58982, 10mV=35389,
NOTE=Time=749, VREF=500, Bklash=0
NOTE=FLLR=128, FLFB=128, FRLR=128
NOTE=FRFB=128, BLLR=128, BLFB=128
      NOTE=END
```

5.4 Problem Responses

PROBLEM=LOCAL MODE

The unit must be in the remote mode to do anything other than read values.

PROBLEM=INVALID OPERAND

The number is too high or too low for the command.

PROBLEM=IMPROPER MODE

The program values cannot be changed while a run is in progress. Also, **RUN** and **STOP** cannot be executed while in manual control (ADVANCE menu).

PROBLEM=INVALID COMMAND

One of three situations could cause this response:

- An unknown command has been entered, usually a typographical error.
- An operand has been sent for a command that does not require one.
- An operand is missing for a command that requires one.

5.5 Program Printing

To print the program:

1. Connect a serial printer, or a parallel printer with a serial to parallel convertor, to the RS-232 output.
2. If the printer has less than a 4k buffer, set it to a low baud rate so the data will not be sent faster than the printer can print it.

3. Set the serial control screen under the Config Menu to On. (See Section 3.9 for more information on pre-configuring settings.)
4. Set the Serial baud rate screen to match the printer. At baud rates below 9600, the unit adds a half second delay between lines to allow the printer to keep up.
5. Press the D and 6 keys simultaneously to start a printout of the current program in the same format as the UPLOAD command described in 5.3.3. Or press the D and 7 keys simultaneously for a print out in the same format as the LIST command described in Section 5.3.3.

Setup for 40 column Citizen 3530 printers available from Teledyne Isco:

- Dip Switch DS-2: all off except 2
- Dip Switch DS-1: all off except 1
- Foxy Jr. baud rate = 1200
- Cable 68-1020-503

Foxy Jr. Fraction Collector

Section 6 Theory of Operation

The Foxy Jr. is a microprocessor-based X-Y fraction collector designed to provide both simple and sophisticated collection along with ease of programming and operation. Microprocessor control and advanced software allow you to program the Foxy Jr. quickly for a variety of collection schemes. The Foxy Jr. includes a sophisticated peak separator, which greatly increases its versatility and scope.

This section provides a detailed description of the mechanical and electrical operation of the Foxy Jr.

6.1 Mechanical Description

The Foxy Jr. has a molded telescoping case enclosing the electronics and the mechanism that moves the drop former from left to right. The front-to-back mechanism is contained entirely within the arm assembly. The telescoping case consists of an upper section and a lower section held together by a cam-actuated locking mechanism. The upper and lower enclosures are tethered to prevent them from coming completely apart.

The upper enclosure is composed of polypropylene (PP). It contains features to mount the left-to-right mechanism, the Liquid Crystal Display (LCD), the keyboard panel, the interior shield, the upper case rear panel, and the left-to-right home flag.

The left-to-right mechanism consists of an arm assembly sliding on a hardened stainless steel (SST) rod. The arm assembly has a molded bushing that rides on the SST guide rod. There is also a small roller on the arm that rides on an aluminum rail. The arm is attached to a timing belt driven by a stepper motor. The idler pulley is adjustable to allow the timing belt tension to be set. The stepper motor is mounted with rubber isolators to control noise.

The arm assembly contains the front-to-back mechanism. The front-to-back mechanism is an integral part of the arm assembly. The front-to-back mechanism is a push/pull design. The drop counter housing is attached to a perforated ribbon cable. This cable is held in a molded track in the two halves of the arm, which are made of polyphtalamide (PPA). The cable is driven by an acetal (POM) ring gear with special teeth around its circumference that engage the perforations in the ribbon cable. The ring gear rotates in bearing surfaces molded into the arm. The ring gear is also the output of an epicyclic gear reduction consisting of the ring gear, a planet gear, a sliding block, and a cam. The planet gear is molded PPA and has two integral pins molded into it. These pins engage two slots in the sliding block to prevent the planet gear from rotating. The acetal sliding block moves in a slot molded into the arm. The planet gear has a ball bearing pressed into its center. The SST cam, which is pressed on the front-to-back stepper motor shaft, is located inside the inner race

of the ball bearing in the planet gear. As the cam is rotated by the stepper motor, the planet gear is forced to move in a circular pattern without rotating. The ring gear, which is engaged with the planet gear, rotates in its bearing at a much slower speed than the cam.

The Liquid Crystal Display (LCD) assembly is attached to the upper enclosure by four screws. The screws are threaded into two grooves located on either side of the display window. The display cable is routed over the top of the interior shield, down between the upper case back panel and the back of the interior shield and is plugged into the main circuit board assembly.

The polyester keyboard is adhered to the upper enclosure from the outside with its cable entering the case through a clearance slot. The cable is routed over the top of the interior shield, between the upper case rear panel and the back of the interior shield, and is plugged into the main circuit board assembly (CBA).

The lower enclosure contains most of the electronics and has molded-in features to retain the lower case rear panel and to locate the drip tray, test tube rack, and the rubber feet. The lower enclosure is also molded out of PP. Four pressed-in pins are used to retain the drip tray and position the test tube rack. A groove located in the back of the case is used to position and retain the lower enclosure rear panel. Two screws engage the lower case rear panel from the underside of the instrument to secure it in place. Circuit board guides are molded into the bottom front of the enclosure. These features are used to mount the bottom of the main CBA. The top of the main CBA is held by two circuit board standoffs positioned in two grooves in the top of the enclosure area. The power CBA is attached to the inside of the lower case rear panel.

The telescoping mechanism is incorporated into both the upper and lower enclosures. The upper enclosure has protrusions that engage a set of mating detents molded into the lower enclosure. The two parts are held together by a pair of locking cams attached to the upper case back panel. The locking cams press against the lower enclosure and pull the upper enclosure protrusions into the matching lower enclosure detents. Several sets of detents are molded into the lower enclosure so that the height can be adjusted to handle 100, 125, and 150mm height test tubes. A shoulder screw, which slides into a slot in the upper case back panel and is attached to the lower case back panel, prevents the unit from accidentally coming apart. The height is adjusted by loosening the locking cams, sliding the upper enclosure forward, lifting the upper enclosure up to the desired position, and tightening the locking cams.

The test tube racks fit in a removable polypropylene (PP) drip tray. The Foxy Jr. accommodates standard Foxy 200 racks for 12, 13, 16, 18, 25, and 28mm tubes, MicroVials, micro centrifuge vials, microplates, and disposable racks. Without a rack in position, the drip tray will hold 9 bottles or a single large beaker. A 36-position prep funnel rack is also available. The drip tray

drain is located at the right rear corner of the tray and protrudes through the lower enclosure. The waste tube may be routed through a channel and out the back of the Foxy Jr., or it may be routed under the edge of the instrument.

A polypropylene (PP) waste trough is provided for waste diversion. The waste trough is located behind the test tube rack and is attached to the upper enclosure by two thumb screws. The drain is on the right end of the trough.

6.2 Electrical Description

To view schematic drawings of the circuit boards discussed in this section, first find the serial number on your equipment, then go to our web site, **www.isco.com**. Go to Training and Support and select Product Support. Click Liquid Chromatography Products. In the left margin, click Schematics. Enter the serial number of your instrument, then click Get Schematics to view a list of PDF files that contain the available schematics. Refer to block diagram Figure 6-1 and schematic diagram on the web site as needed when following the circuit description.

6.2.1 Power Supply

The AC input voltage is converted to about 14 Volts by the external transformer (T1), and passes through a line noise filter (C103, C141, C142) and a fuse (F101) to the dual full-wave rectifier (CR101). The rectifier supplies approximately 18 Volts DC unregulated for the motors and two voltage regulators. It also supplies signal PF, which is used to detect power failures. The +5V regulator (VR102) is a switching regulator that supplies pulses to a filtering inductor (L101) to provide the main logic supply (+5V) and positive analog circuit supply (+5VA). Regulator VR103 limits the unregulated 18 Volts to 15 Volts (+VL) for valve, audio indicator, and U109. U109 inverts the +VL to about -13 Volts, which is then regulated by VR101 to provide the negative analog circuit supply (-5V). A rechargeable nickel-cadmium battery (BT201) provides power during power failures to retain programs in memory. The battery is continuously trickle-charged through R209 whenever the unit is connected to power. Block diagram Figure 6-1 shows which sections of the unit use which power supplies.

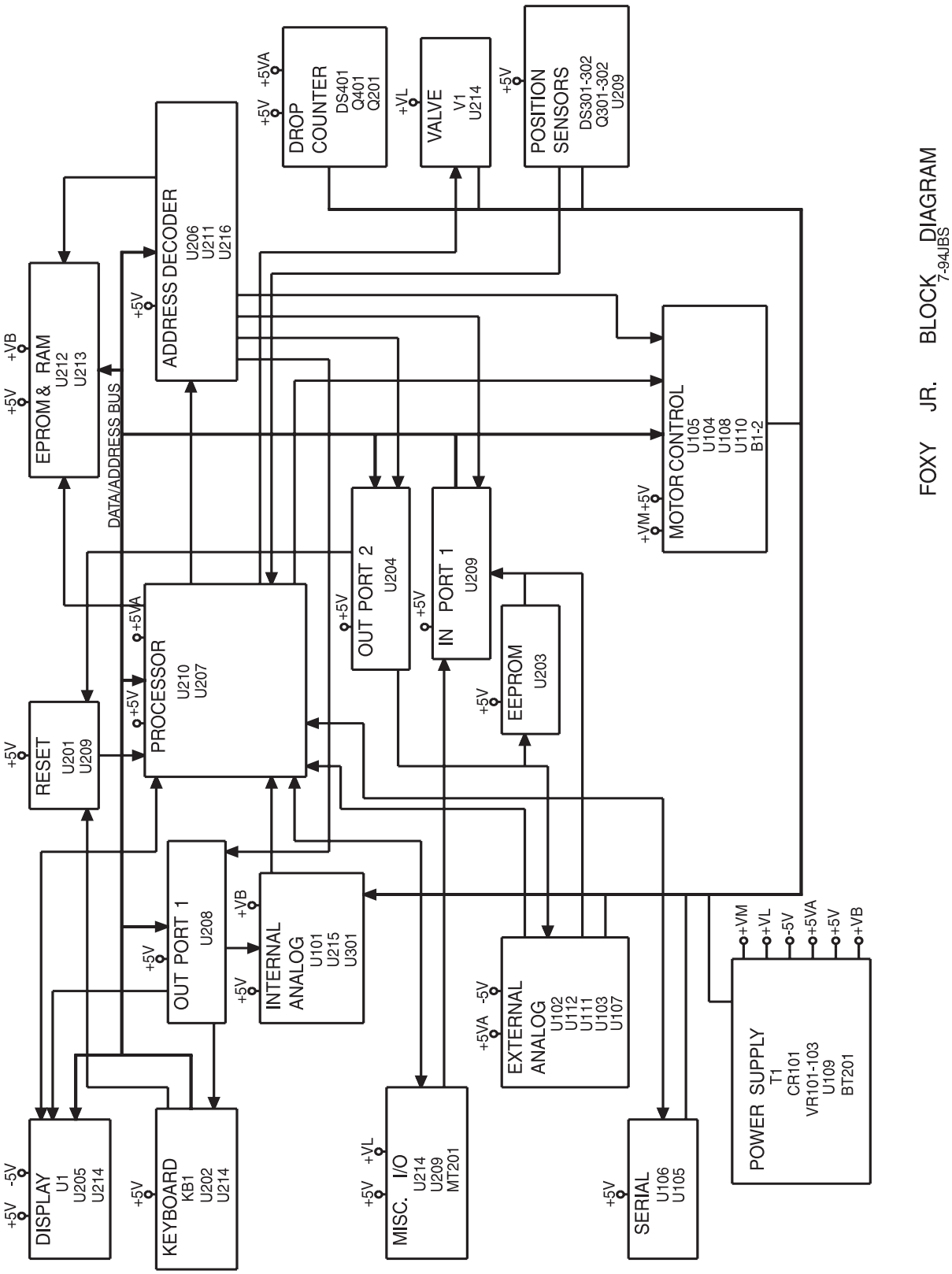


Figure 6-1 Foxy Jr. Block Diagram

6.2.2 Processor and Clocks

U210 is a 16-bit internal, 8-bit external, 80C198 microprocessor. It executes the software stored in the EPROM to perform the functions required by the user's programs. It also incorporates several additional support functions such as timers, serial UART, and input/output ports. It operates a 12 MHz using crystal Y101. This 12 MHz signal is also divided by U207 to provide 375 KHz to the processor and 94 KHz to the motor drive circuitry. The processor uses a multiplexed data and address bus to communicate with the EPROM, RAM, address decoder, input and output ports, and motor control circuits.

6.2.3 Address Decoding

This portion of the unit determines which circuits are selected for each processor address. U206 latches the lower 8 bits of the 16-bit address from the processor. U211 is a programmable logic device that uses the upper 9 bits of address plus the read (RD-) and write (WR-) signals to determine whether to activate the EPROM, RAM, one of the motor control IC's, or one of the input or output ports. U211 also slows down the processor, using the READY signal, when accessing a slower device. U216 is a programmable logic device that remaps a portion of the EPROM's address range to allow access to more than the normal 64 kilobytes of software, using a page switch scheme. U204 supplies signal HIROM- allowing access to the EPROM area normally used by the RAM.

6.2.4 EPROM and RAM (Memory)

The software that controls the unit’s operation is permanently stored in a 128-kilobyte EPROM (Erasable Programmable Read Only Memory), U213. The user's programs and other information are stored in an 8-kilobyte alterable RAM (Random Access Memory), U212. Its contents are retained by a rechargeable battery (BT201) that provides power during power failures if the battery voltage stays greater than 1.7 volts. The unit may need to be plugged into power for 17 hours to fully recharge the battery.

6.2.5 EEPROM

Calibration and configuration settings are stored in a small EEPROM (Electrically Erased Programmable Read Only Memory), U203. This information will remain intact, even if main power and battery power are lost. It is accessed serially using a chip select, shift clock, and data out through output port 2 (U204), and data in through input port 1 (U209).

6.2.6 Display

The unit uses a 2-line by 24-character liquid crystal display (LCD) module. Data to the module is carried by the processor data bus, and control signals are sent through output port 1 (U205) and received through input port 1 (U209). The viewing angle (contrast) is set by the duty cycle of pulses from the PWM output of the processor via driver U214. A divider/filter (R210-2, C214) changes the pulses to a constant DC voltage for the LCD.

6.2.7 Keyboard

The keyboard consists of 17 normally-open sealed keys arranged as an 8 by 2 matrix, plus a separate key for STANDBY-OPERATE. When waiting for a keypress, signals KEY1 and KEY2 from output port 1 are both low, which selects both rows through open collector driver U214. R203 pulls the 8 inputs from the keyboard to the input port (U202) high until a key is pressed. When a key press is detected, first KEY1, then KEY2, is turned off to determine which row the key is in. The column is determined by which input to U202 is low. The STANDBY-OPERATE key is monitored separately by the processor through input P2.4. The keyboard is shielded to minimize ESD and EMI problems.

6.2.8 Drop Counter

Drops falling from the drop former partially block the light from infrared-emitting diode DS401 to phototransistor Q401. This decreases the current through Q401 and results in a momentary drop in the voltage on the collector of Q201. Q201 amplifies and stretches the pulse, and sends it to one of the analog-to-digital convertor inputs (ACH4) on the processor for detection.

6.2.9 Position Reference Sensors

The unit uses two optical interrupter sensors on the arm circuit board to determine the initial position of the arm and drop counter. The unit then counts the distances moved, relative to this position, to determine its current positions. The interrupters consist of infrared-emitting diodes DS301-2 and phototransistors Q301-2. When the light path is blocked by a flag, the phototransistor turns off, allowing resistor R217 to pull the input to Schmitt trigger buffer U209 high. The buffer cleans up the signals and sends them to processor inputs HSI.0 and 1. The unbuffered signals are also sent to the processor's analog input system for diagnostic purposes.

6.2.10 Motor Control

The arm and drop former are moved by bipolar stepper motors B1-2, using a microstepping, current-limiting chopper drive. The current limit for each phase winding of each motor is set by the processor via the data bus to the quad-programmable comparator U104. U105 is a programmable logic device that determines which phases are active, and in what polarity. It is also set by the processor via the data bus. U105 limits the current by shutting off the phase whenever the comparator indicates the phase has reached its set current. The 94 kHz clock periodically attempts to turn the phase back on if it has fallen below its set current. The eight outputs of U105 go to dual H-bridge drivers U108 and U110. The current in each phase is sensed by the voltage developed across resistors R122-5. This voltage is filtered and compared to the programmed level, relative to the voltage reference formed by R112-113. The outputs of the drivers are filtered slightly and fed to stepper motors B1 and B2. Diode arrays CR103 and CR104 suppress voltages generated when the phases are turned off.

6.2.11 External Analog

The external analog interface is used for slope and level peak detection. It consists of a selectable gain differential input amplifier (U102, U112, U111), a 2.50 volt reference (U107), and an analog-to-digital convertor (U103, Y101). When a conversion is complete (every 50 ms), the processor is signaled through input P2.2. The results of the conversion are read serially, using a chip select, shift clock, and data out through output port 2 (U204), and data in through input port 1 (U209). Output port 2 is also used to start the self-calibration and start conversion.

6.2.12 Serial Interface

For external serial communications, the unit uses the UART (Universal Asynchronous Receiver/Transmitter) contained in the processor. Commands are received via pin RXD and responses returned via pin TXD. These 5-volt logic level signals are then converted to and from the positive and negative voltage levels required by the RS-232 standard by U106. U106 also generates its own positive and negative supplies.

6.2.13 Valve

The valve is controlled by the processor output HSO.3 through open collector driver U214. Power for the valve (+VL) is supplied by voltage regulator VR103. The presence and type of valve is sensed at switching to Operate by turning off the valve and then measuring the voltage of the valve output, using the processor's internal analog-to-digital convertor. If the output is at +VL then a 2-way valve is connected. If it is one diode drop lower than +VL then a 3-way valve is connected. Otherwise, no valve is connected.

6.2.14 Valve/Gradient Controllers Interface

The Foxy Jr. communicates with these external accessories using bidirectional serial signals through processor input/output pin HSI.3/HSO.5. Commands include error detection information and are acknowledged by the accessory equipment to provide error-free operation, accessory presence, and functionality confirmation.

6.2.15 Misc. Input/Output

The ADVANCE- and INJECT- external inputs are read by the processor through input port 1 (U209). The COUNT- external input is buffered by U209 and fed to processor input HSI.2. External outputs EVENT- and PUMP PAUSE- come from processor outputs HSO.1 and HSO.2 through open collector driver U214. The sound for acknowledging key presses and signalling warnings and failures comes from processor output HSO.0 via the open collector driver U214 to audio transducer MT201. The duty cycle and frequency of this output create the different levels and pitches of the sounds.

6.2.16 Internal Analog

The unit uses the analog-to-digital converter of the processor to measure various voltages, currents, and temperature (U301) within the unit for self-testing, calibration, and operation. Resistive dividers convert the signals to the 0-5 volt range of the converter, then analog multiplexers U215 and U101 select which signal will be measured as set by TMUX0-2 from output port 1 (U208). Diode array CR204 and various resistors and capacitors protect the processor from out-of-range voltages.

6.2.17 Foxy Valve Controller

The reference designators below are for the Foxy Valve Controller. See the schematic diagram.

When the Foxy Jr. adaptor cable is attached to the Foxy Valve controller, it pulls the STROBE- signal low with the OUT/ENABLE line high. This tells it to use the Foxy Jr. asynchronous bidirectional serial protocol to receive commands from the Foxy Jr. Commands include error detection information, providing error-free operation.

The signals from the Foxy Jr. are buffered and inverted by U101 and then fed to a microprocessor (U105), which acts as a serial-to-parallel convertor. The valve controller acknowledges valid commands by pulsing the DATA line low immediately after reception. The eight parallel outputs of U105 are inverted by U102, then connected to an eight-channel source driver (U103), which provides the necessary voltage and current to operate the indicating LEDs (DS201-8), the output relays K101-2, and the gates of the six output FETs (Q102-7).

When the Foxy Jr. is set to operate, it sends a command to the valve controller to turn on. The processor then causes the three-terminal regulator (VR1) to switch from +1.25 volt output to +12 volt output (via U105 and Q101). Then, once every second, the Foxy Jr. updates the valve controller outputs (except when the drop former is moving).

U104 is used to reset the microprocessor whenever the +5V supply (from VR101) falls below 4.6 volts, or the microprocessor stops pulsing its P0.4 output, indicating that it has stopped operating correctly. Status LED DS102 lights to indicate that data has been received from the Foxy Jr., so it should blink whenever the Foxy Jr. is on.

Foxy Jr. Fraction Collector

Section 7 Maintenance and Repair

The Foxy Jr. has been designed to be simple to maintain and repairable by the customer. This section provides detailed instructions for maintenance, troubleshooting, and repair of the Foxy Jr. Fraction Collector. If you are unsure how to proceed with a repair procedure, call the Teledyne Isco Tecnical Service Department. Our technicians can help you with any procedure.

If you have a problem with the instrument or need replacement parts information, contact Teledyne Isco's Service Department. If you write, please include all relevant information regarding the difficulty you are experiencing with the instrument.

Please contact the Service Department before returning the instrument to the factory for repair. Problems can frequently be solved in the field with help from our experienced service technicians. Contact information and return instructions can be found on the Foreword and Warranty pages at the front and back of this manual.

7.1 How to Ship Returns

Before packing the instrument, make sure all parts and hardware are in their proper places. Wrap the instrument in heavy paper or put it in a plastic bag for extra protection. If at all possible, pack the instrument in its original shipping container with the original packing material. If the original shipping container is not available, place the instrument in a strong cardboard box at least six inches larger in all three dimensions than the instrument itself. Fill the box equally around the instrument with a resilient packing material, such as shredded paper, bubble pack, expanded foam, etc. Seal the box with strapping tape or other suitable shipping tape and ship it to the return address listed on the warranty page. The warranty page describes the conditions under which Teledyne Isco will pay surface shipping costs for returns.

It is very important that the instrument be well-packaged for shipment and fully insured. Damage claims must be conducted between you and the carrier. Damage in shipment due to inadequate packing can delay the repair and return of the instrument to you.

7.2 Disassembly and Repair

Follow the instructions contained in this section for normal maintenance.

7.2.1 Cleaning the Drip Tray

The drip tray can be removed from the instrument for thorough cleaning. It is held in place by pins at its four corners. First remove the test tube rack, turn the instrument on its side, and remove the waste tube from the drip tray. Set the instrument back on its feet and pry the corners of the drip tray loose with

your fingers. After loosening all four corners, lift the drip tray up and off of the instrument case. Clean the drip tray with mild detergent.

To replace the drip tray, place the tray on the instrument, aligning the drain with its hole. Press down on the tray firmly to seat it onto the retaining pins.

7.2.2 Cleaning the Drop Counter Sleeve

The drop counter sleeve is a glass cylinder lining the inside of the drop counter assembly to protect the photosensors from effluent. The drop counter sleeve is attached to the drop former. In order for the Foxy Jr. to operate reliably in the drop counting mode, this sleeve should be removed and cleaned periodically. No special tools are required for this procedure.

To remove the drop former :

1. Using the Advance key, position the drop counter at the front end of the arm. Placing the drop counter over tube position 1 is recommended.
2. Carefully remove the drop former by pulling it straight up and out of the drop counter assembly while holding the arm and drop counter in place with your other hand. Twisting the drop former slightly makes removal easier.

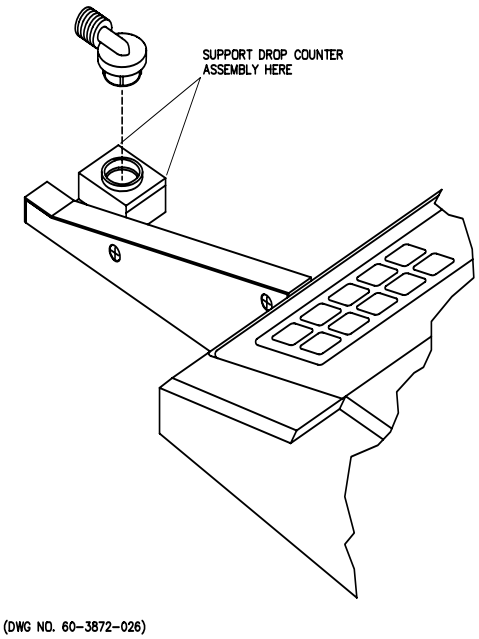


Figure 7-1 Removing the Drop Former

☑ Note

To prevent damage to the arm assembly or drop counter, you must support the drop counter while removing the drop former assembly. Support the drop counter at the points indicated in Figure 7-1.

3. Wash the sleeve with a suitable detergent or solvent to remove all traces of effluent or other contamination. Dry the sleeve completely. After cleaning, avoid touching the sleeve.

To Install the drop former:

To install the drop former, align the drop former in the drop counter assembly and gently press the drop former into the drop counter assembly. Support the underside of drop counter assembly while pressing the drop former into place. Twisting the drop former slightly makes it easier to install.

7.2.3 Removing the Upper Case Back Panel

1. Unlock the locking cams by rotating them up and remove the four screws and interlocking bolt located on the back of the upper case back panel as shown in Figure 7-2.

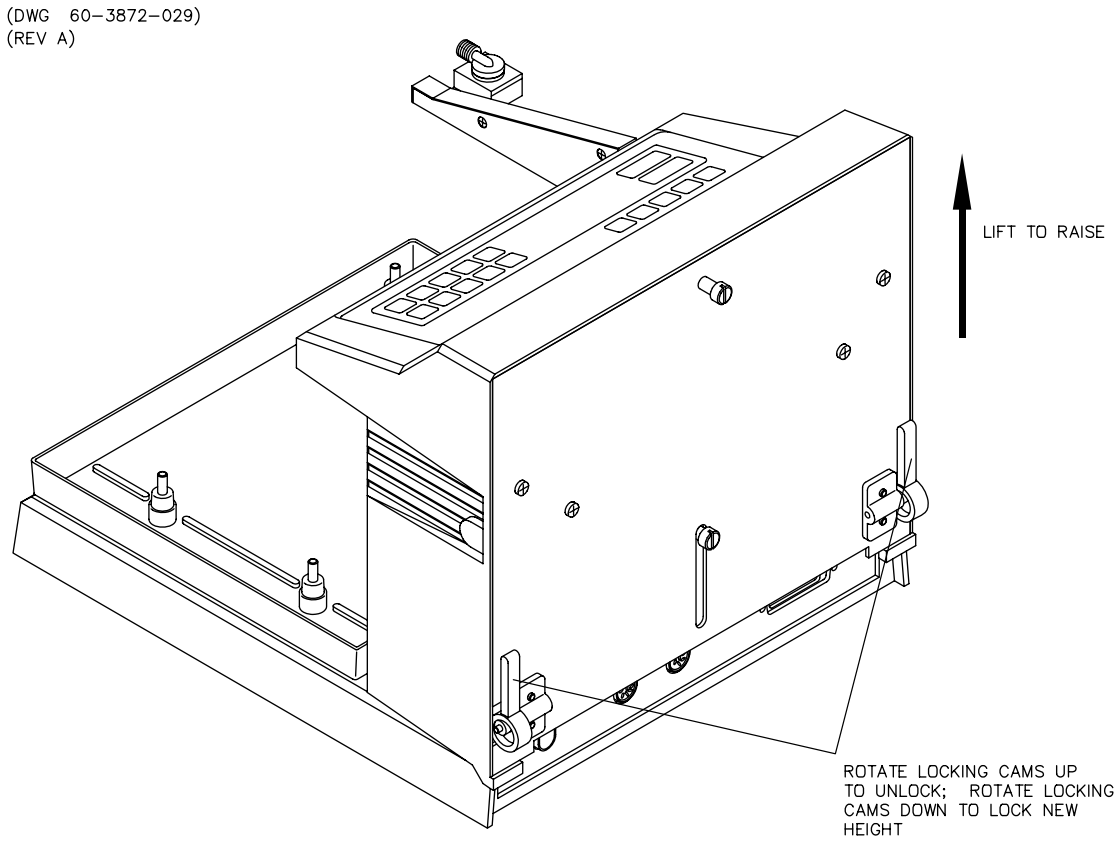


Figure 7-2 Upper Case Back Screws, Interlock Bolt

2. Tilt the upper case back panel rearward until the top edge of the upper case back panel clears the upper case, then lift the back panel off of the upper case half.
3. To reinstall the upper case back panel, follow these steps in reverse order. Be sure the "ears[a] on the back panel bottom edge are located in front of the "ears[a] on the case top.

7.2.4 Opening the Case and Removing the Back Panel

To access the Foxy Jr.'s internal parts, it is necessary to remove the back panels from the upper and/or lower case halves. Follow these instructions carefully.

1. Lay the instrument on its side and remove the two case screws on the bottom of the instrument as shown in Figure 7-3.

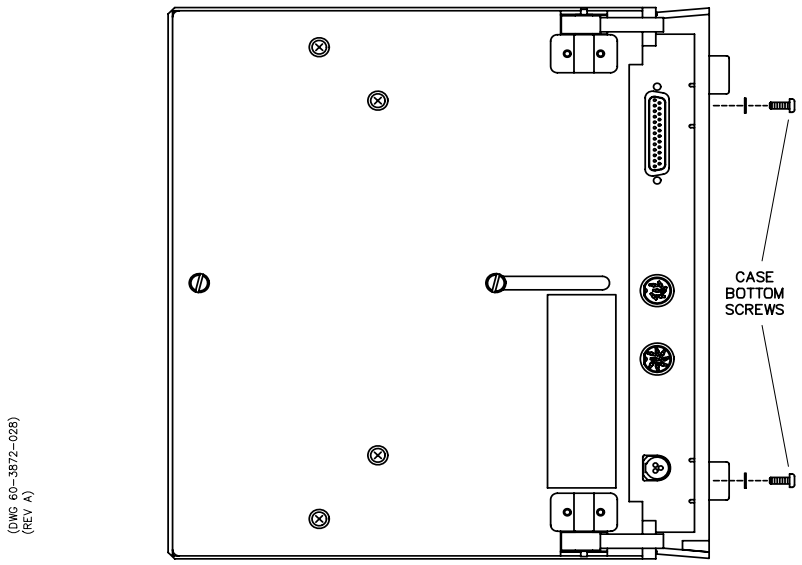


Figure 7-3 Removing the Case Bottom Screws

2. Set the instrument back on its feet. Remove the upper case back panel as described in Section 7.2.3.
3. Lift the upper case off of the lower case. Tip the upper case forward, allowing it to rest on the lower case and test tube rack.
4. To access the circuit boards, lift the lower case back panel up about one-half inch to release it from its retainers and tip it back, allowing it to rest on the bench top.

> **☑ Note**
>
> If you want to leave all the cables attached for troubleshooting purposes, stop here. Replace the upper case half in its normal position, without the upper case back panel. The instrument should now appear as shown in the right-hand drawing in Figure 7-4.

5. Disconnect the four cables linking the upper and lower case halves. Refer to Section 7.2.5 for complete instructions.
6. You can now set the upper case half aside.

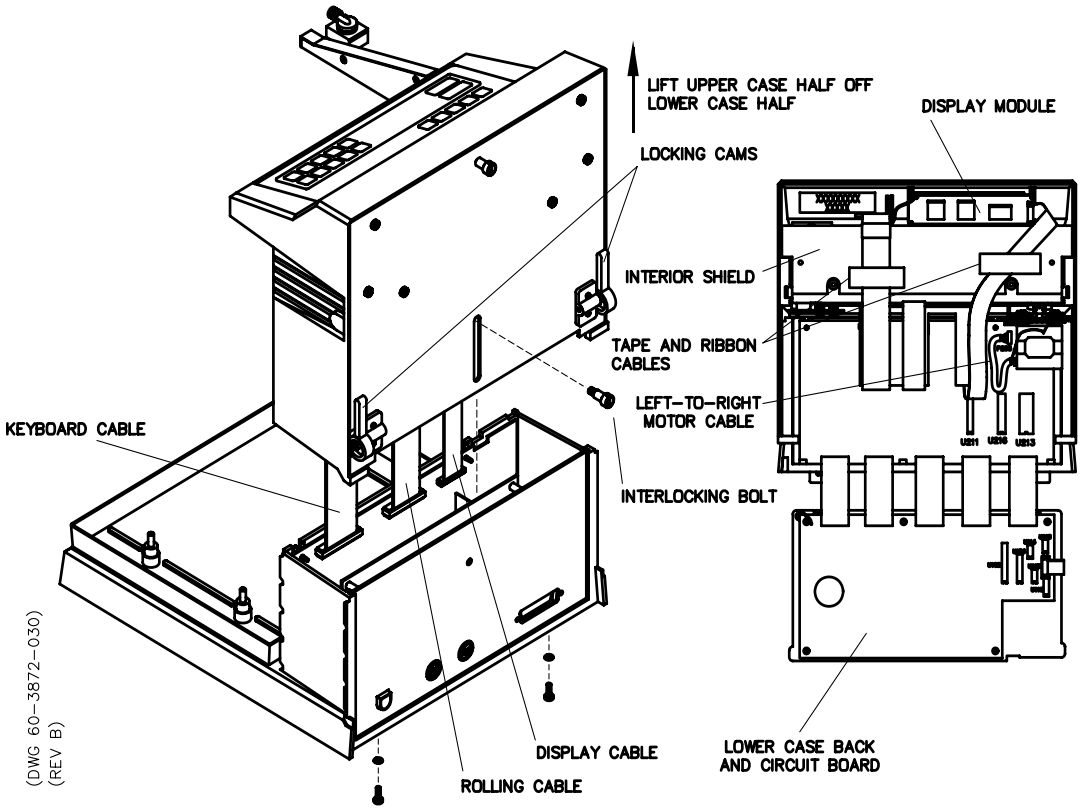


Figure 7-4 Cable Locations on Circuit Boards, Case Disassembly

7. To remove the front circuit board, depress the retainers on the standoffs at the top of the circuit board and tip the circuit board slightly toward the back until it just clears the standoffs. Lift the front circuit board and lower case back panel assembly out of the lower case. Both circuit boards are now detached.

⚠ WARNING

Do not force the top of the front circuit board too far back or you will damage the circuit board holders that retain the bottom of the circuit board.

8. To reassemble the case halves, follow these steps in reverse order.

☑ *Note*

The ribbon cable connectors have an indexing mark - a small, raised triangle or other mark - molded into the connector housing. Align this mark with pin 1 of the pin connector as indicated on the circuit board assembly.

7.2.5 Interconnect Cable Connections

Several cables link the upper and lower case halves. All cables are equipped with connectors to allow disassembly. When performing any servicing that requires separating the case halves, disconnect only those cables necessary and use masking tape and a marker to mark each cable and its associated connector in the lower case half. Marking the cables and connectors can save you time and trouble when reassembling the instrument.

1. Remove the upper case half as described in Section 7.2.4
2. Remove the lower case back panel as described in Section 7.2.4.
3. Disconnect the keyboard, rolling, and motor cables indicated in Figure 7-4.
4. To disconnect the display cable, you must unlock the snaps at either side of the cable connector. As you press the snaps outward, the cable is freed from its connector.
5. To reattach the cables, follow these steps in reverse order.

7.2.6 Removing the Arm

> ☑ ***Note***
>
> Refer to Figure 7-5 when removing the arm.

1. Remove the upper case back panel as described in Section 7.2.3.
2. Disconnect the ribbon cable connectors from the main circuit board in the lower case half as described in Section 7.2.5.
3. The ribbon cables from the LCD and keyboard are taped to the interior shield as shown in Figure 7-4. Remove this tape.
4. Remove the interior shield by sliding it out the back of the instrument. Remove the waste trough on the front of the instrument.
5. Move the arm to middle of the instrument by grasping it near the motor and pushing it to the middle. Loosen the timing belt idler screws and move the idler toward the left-to-right motor. Remove the timing belt from the idler and left-to-right motor pulleys as shown in Figure 7-6.

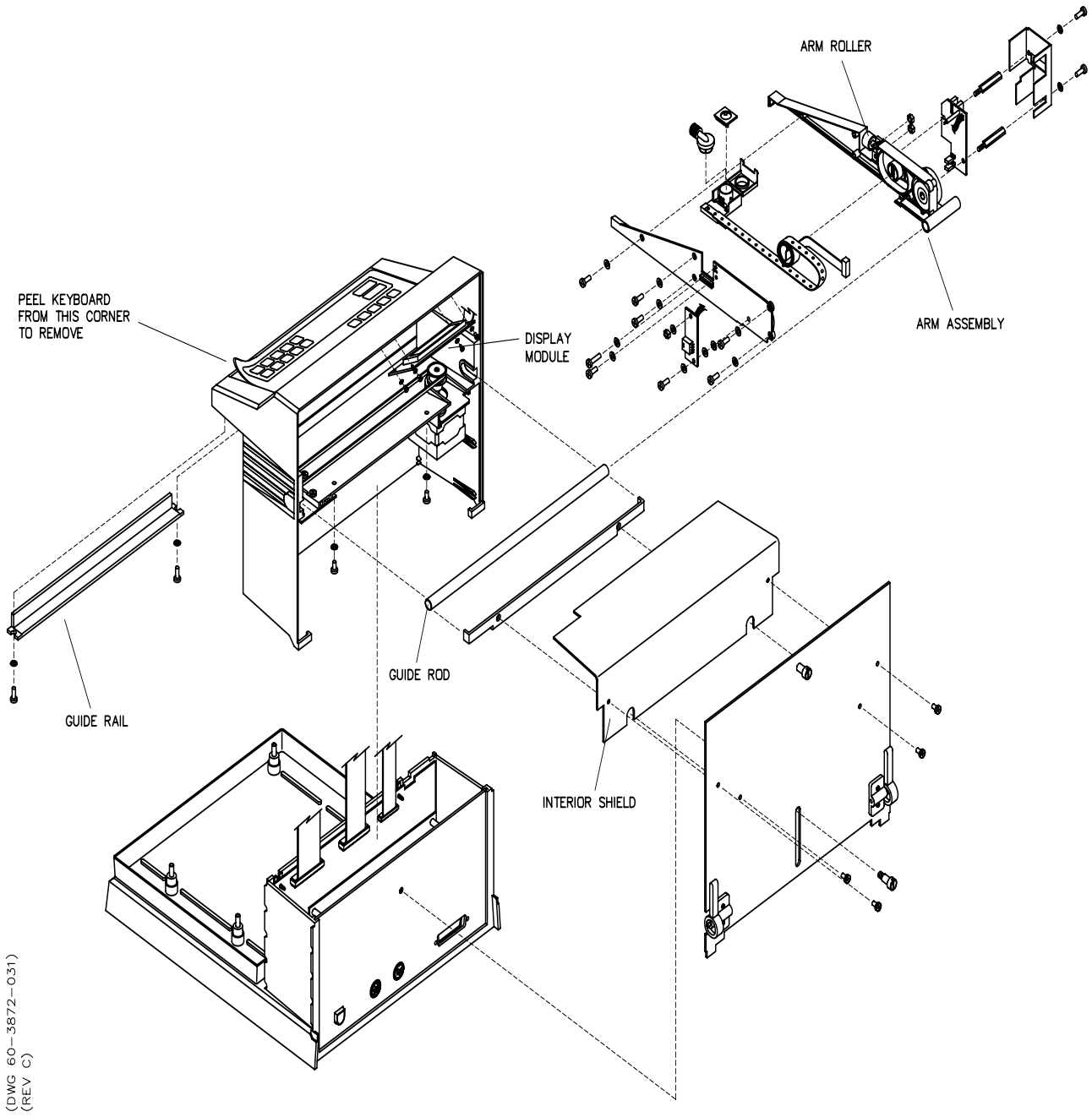


Figure 7-5 Foxy Jr. Exploded View

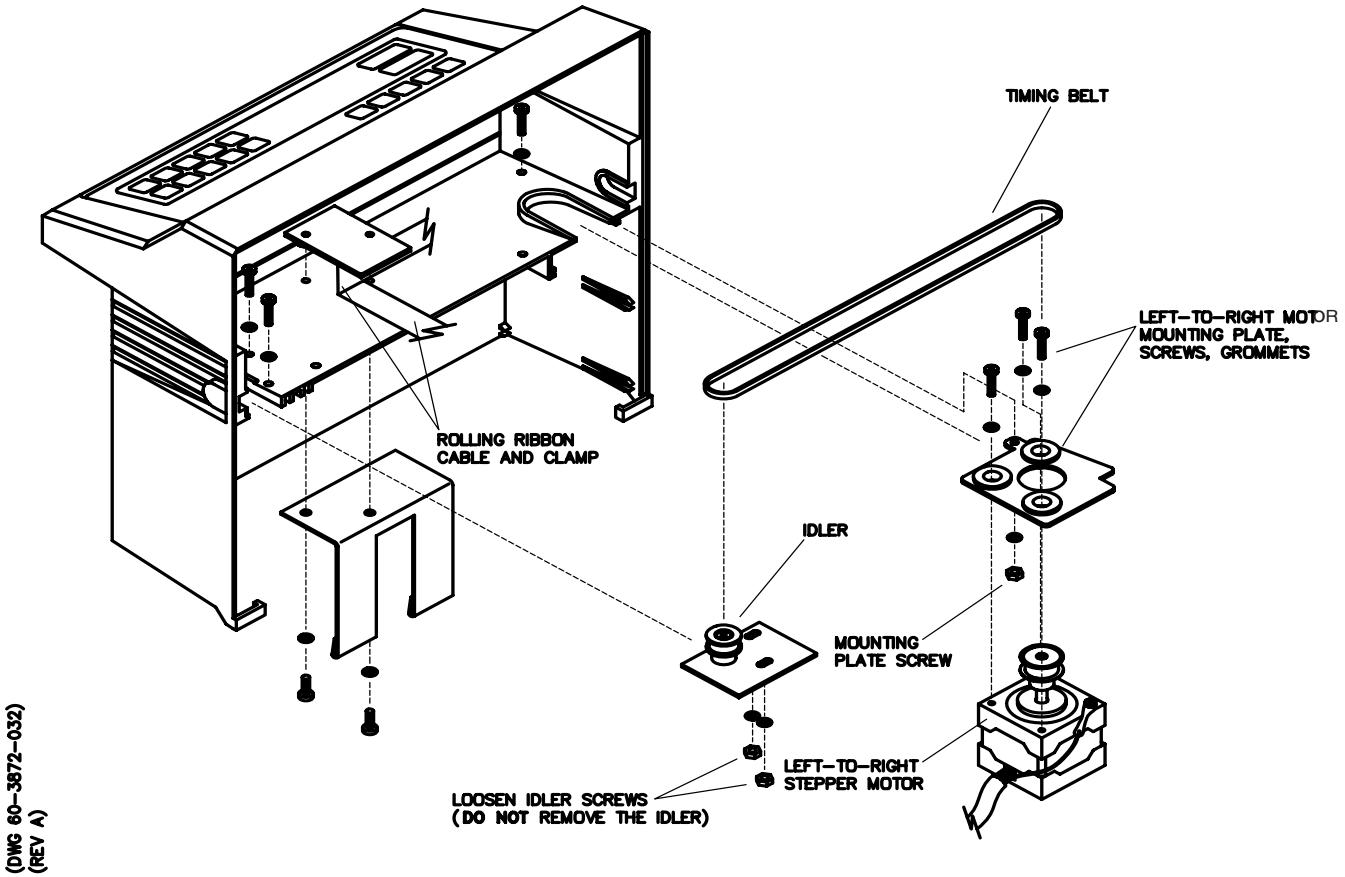


Figure 7-6 Removing the Timing Belt (exploded view)

6. Gently move the arm to the park side of the upper case (opposite the left-to-right motor). Remove the arm circuit board shield and disconnect the rolling cable from the arm circuit board.
7. Remove the arm guide rail retaining screws and remove the guide rail.
8. Remove the brace.
9. Remove the end of the guide rod furthest from the arm by carefully pulling it out of the case. Slide the guide rod out of the arm assembly and set it aside.

☑ Note

The roller on the arm assembly may fall off as you remove the guide rod. Be careful not to lose the roller.

10. The arm assembly is now free. Remove it by carefully pulling it out the back of the upper case half.

☑ Note

The left-to-right stop plate in the upper case half may catch on the home position sensor on the arm circuit board. Be very careful when removing the arm assembly to avoid damaging the home position sensor.

7.2.7 Installing the Arm

☑ Note

Refer to Figure 7-5 when installing the arm.

1. Slide the guide rod through the arm assembly and center it on the arm.

☑ Note

Be sure the timing belt is attached to the arm assembly prior to installing the arm.

2. Carefully slide the arm assembly through the slot in the upper case half and position the guide rod in its retaining slots. Be sure the timing belt is in place and is not folded.
3. Place the guide rail through the arm assembly. Be sure the roller is properly positioned and able to move freely.
4. Place the guide rail in the upper case half and install its retaining screws.

☑ Note

The guide rail should be as far forward as possible before installing the retaining screws.

5. Install the brace, placing it on top of the rolling ribbon cable. The ends of the brace will be in contact with the guide rod. You will need to apply pressure to the brace to line it up with mounting holes in the case.
6. Connect the rolling cable to the arm circuit board and install the arm circuit board shield and retaining screws.
7. Route the timing belt around the motor pulley and idler. Slide the idler assembly away from the motor to apply tension to the timing belt. Tighten the idler assembly retaining screws.

☑ Note

The timing belt should be tight enough that it does not slip when moving the arm by hand, but not so tight that the timing belt pulls the left-to-right motor assembly out of position. If the timing belt is not properly tensioned, the arm will chatter as it moves left to right and may miss test tubes.

8. Install the brace.
9. Install the interior shield. The front edge of the shield slides into slots molded into the upper case half.
10. Install the waste trough.
11. Lay the ribbon cables from the display and keyboard smoothly along the back of the interior shield. Secure the cables in place with the tape removed earlier.
12. Reattach the upper and lower case halves and upper case back panel as described in Sections 7.2.3 and 7.2.4.

7.2.8 Replacing the Keyboard

The keyboard is an integral part of the front panel label, which is secured to the upper case half with an adhesive. Refer to Figure 7-5 when performing this procedure.

To remove the keyboard:

1. Remove the upper case as described in Section 7.2.4.
2. Remove the interior shield as described in Section 7.2.6.
3. Set the upper case half on its back.
4. Gently lift the label at its lower right corner and slowly peel it toward the top until it is free from the case, as shown in Figure 7-5. Gently pull the keyboard ribbon cable through the slot in the case. The cable connector may become caught on the slot. Setting the upper case on its side allows you to guide the connector through the slot more easily.
5. Remove any excess adhesive from the case.

To install a new keyboard:

> ☑ ***Note***
>
> The clear display window on the keyboard has a thin protective layer of clear plastic covering its back. Remove this protective plastic before installing the keyboard by firmly pressing a piece of tape on one end of the window and pulling it off. The protective plastic film will stick to the tape when you pull it off.

1. Remove the backing from the keyboard to expose the adhesive.
2. Insert the keyboard ribbon cable connector through the slot in the upper case front panel.

> ☑ ***Note***
>
> Hold the upper portion of the keyboard panel, with the window, over the top of the keyboard panel while positioning the lower panel.

3. Align the keyboard with the top edge of the keyboard area on the front panel of the upper case. Gently lower the keyboard into place from top to bottom.

☑ Note

Use care to prevent air pockets from forming under the keyboard label. This is best accomplished by rolling the keyboard label into position from one edge.

4. Check the alignment and position of the keyboard label and then firmly press it into place.
5. Reinstall the interior shield as described in Section 7.2.6. Tape the ribbon cables into place on the interior shield.
6. Reattach the upper and lower case halves as described in Section 7.2.4.
7. Reinstall the upper case back panel as described in Section 7.2.3.

☑ Note

The ribbon cable connectors have an indexing mark - a small raised triangle - molded into the connector housing. Align this mark with pin 1 of the pin connector as indicated on the circuit board.

7.2.9 Replacing the Liquid Crystal Display

To remove the display:

1. Remove the upper case half as described in Section 7.2.4.
2. Disconnect all interconnect cables as described in Section 7.2.5.
3. Lay the upper case on its side. Remove the interior shield as described in Section 7.2.6.
4. Remove the four mounting screws from the corners of the display module. Remove the display module from the upper case as shown in Figure 7-5.

☑ Note

Before removing the display, notice that adhesive from the keyboard panel may be holding the display in place. Gently pry the display loose so you do not damage the keyboard and label.

To install the display:

1. Remove the protective plastic film from the face of the new display module.
2. Position the new display module in the upper case, ensuring that it is right side up. Check the ribbon cable orientation against Figure 7-4.
3. Install the mounting screw at each corner of the display module. Be sure that the fiber washers are installed between the display module and the case.
4. Reinstall the interior shield and position the two ribbon cables properly over it. Tape the ribbon cables into place on the interior shield.

5. Reattach all cables as described in Section 7.2.4.
6. Reattach the case halves as described in Section 7.2.4.

7.2.10 Replacing the Left-to-Right Motor

1. Remove the upper case half as described in Section 7.2.4. Set the lower case half aside.
2. Remove the interior shield as described in Section 7.2.6 and lay it aside. Lay the ribbon cables from the display and keyboard over the top of the upper case to keep them clear of the work area.
3. Loosen the two screws retaining the timing belt idler assembly. Slide the idler assembly toward the left-to-right motor to loosen the timing belt. Remove the timing belt from the pulley attached to the left-to-right motor. Slide the arm assembly to the side away from the motor. Refer to Figure 7-7.
4. Remove the brace (Figure 7-5).

> ☑ ***Note***
>
> Do not remove the arm from the upper case. You will need to remove the end of the guide rod above the left-to-right motor from its slot in order for the top of the timing belt pulley to pass under the guide rod.

5. Remove the left-to-right motor assembly retaining screw as shown in Figure 7-7.
6. Slide the left-to-right motor assembly out of the slots in the upper case.
7. Remove the screws securing the left-to-right motor to the mounting plate and remove the mounting plate from the motor.

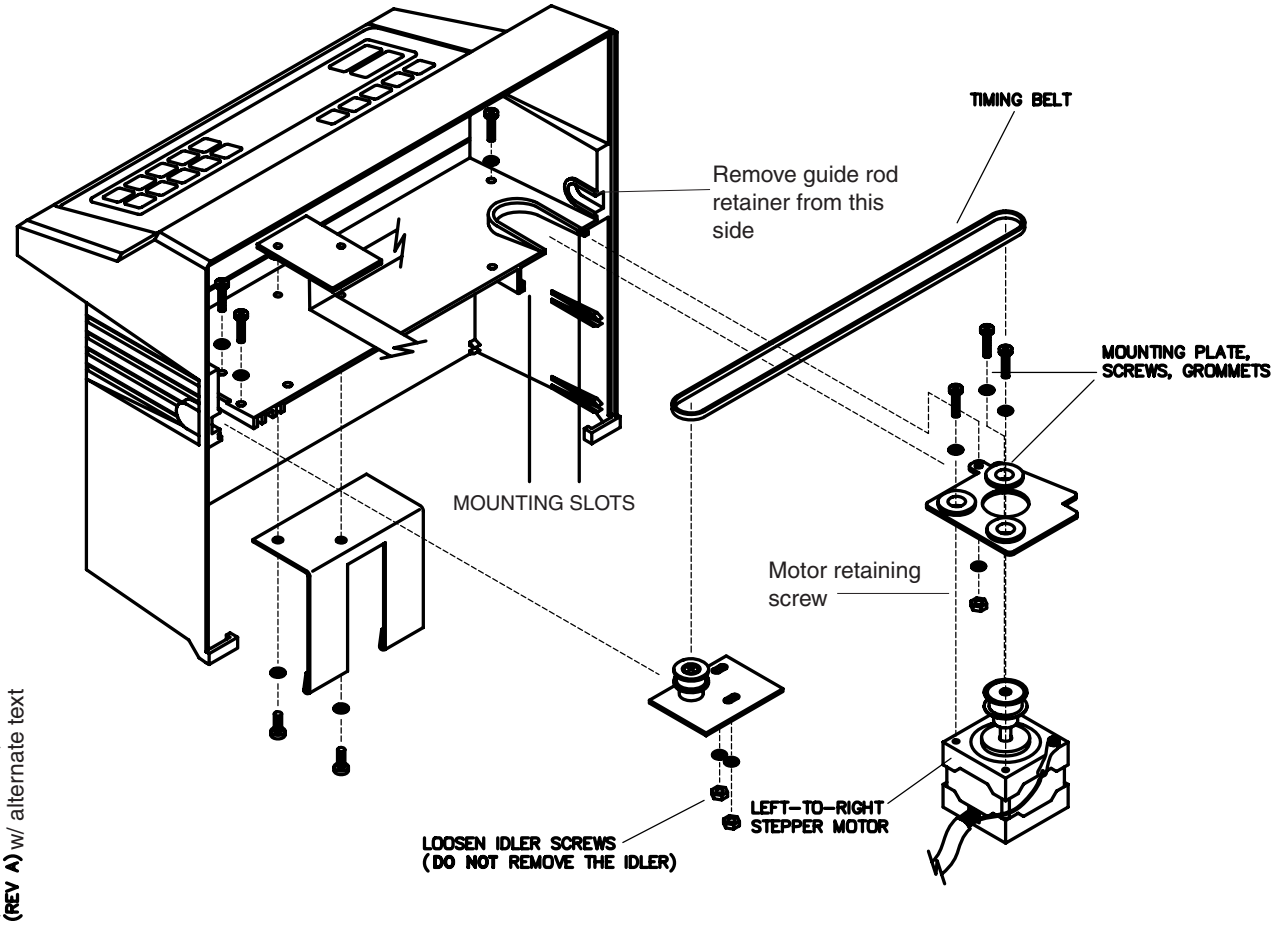


Figure 7-7 Replacing the L-R Motor

Installing the left-to-right motor:

1. Position the mounting plate assembly on the left-to-right motor, ensuring that the motor is properly oriented on the mounting plate assembly (not upside down) and the grommets are in place in the mounting holes. Attach the retaining screws to secure the mounting plate assembly to the left-to-right motor.
2. Slide the left-to-right motor-mounting plate assembly into the slots in the upper case until it reaches the mounting stop molded into the case.
3. Install the retaining screw in the left-to-right motor-mounting plate assembly.
4. Reinstall the arm guide rod.
5. Install the brace placing it on top of the rolling ribbon cable. The ends of the brace will be in contact with the guide rod. You will need to apply pressure to the brace to line it up with mounting holes in the case.

6. Route the timing belt around the motor pulley and idler. Slide the idler assembly away from the motor to apply proper tension to the timing belt. Tighten the idler assembly retaining screws.

> ☑ ***Note***
>
> The timing belt should be tight enough that it does not slip when moving the arm by hand, but not so tight that the timing belt pulls the left-to-right motor assembly out of position. If the timing belt is not properly tensioned, the arm will chatter as it moves left to right and may miss test tubes.

7. Reinstall the interior shield as described in Section 7.2.6.
8. Reattach the upper and lower case halves as described in Section 7.2.4.

7.2.11 Replacing the Arm Circuit Board

The arm circuit board contains both the left-to-right and front-to-back home position sensors, as well as all connectors for the arm assembly.

1. Move the arm to the park position to provide clear access to the arm circuit board.
2. Remove the upper case half as described in Section 7.2.4.
3. Lay the upper case on its side, park position down.
4. Remove the interior shield as described in Section 7.2.6 and lay it aside.
5. Remove the two retaining screws that hold the arm circuit board shield in place. Slide the arm circuit board shield back along the rolling ribbon cable to expose the arm circuit board.
6. Using masking tape and a marker, mark the location of all connectors on the arm circuit board. Detach all cables from the arm circuit board.
7. Unscrew the two hexagonal standoffs that hold the arm circuit board in place.
8. Slide the arm circuit board out of the arm.
9. Carefully install the new arm circuit board on the arm, ensuring that you do not damage any of the components on the underside of the circuit board.

> ☑ ***Note***
>
> Ensure that the arm circuit board is properly oriented so it will clear the left-to-right stop.

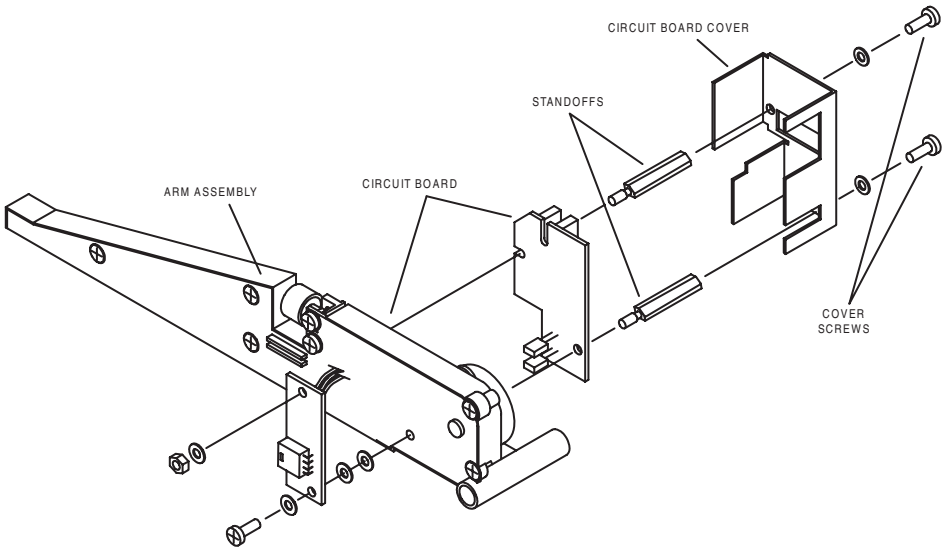


Figure 7-8 Removing the Arm Circuit Board Hardware

10. Secure the arm circuit board in place with the two hexagonal standoffs. Attach all cables to the new arm circuit board and reinstall the arm circuit board shield.
11. Reinstall the interior shield as described in Section 7.2.6.
12. Reattach the upper and lower case halves as described in Section 7.2.4.

7.2.12 Replacing the Drop Counter Circuit Board

1. Using the **Advance** key, position the drop counter at the front end of the arm. Carefully remove the drop former as described in Section 7.2.2.
2. Remove the test tube rack and lay the instrument on its back.
3. There are two snap catches on the underside of the drop counter housing. Use a small flat-blade screwdriver to push the catches away from the arm while gently lifting the top of the drop former housing.
4. Open the top of the drop former housing all the way.
5. Gently remove the circuit board from its connectors and take it out of the housing.
6. Position the new drop counter circuit board, making sure that the connector pins are properly aligned, and press it into place.
7. Close the drop counter housing over the circuit board and press firmly until the cover snaps lock it into place.

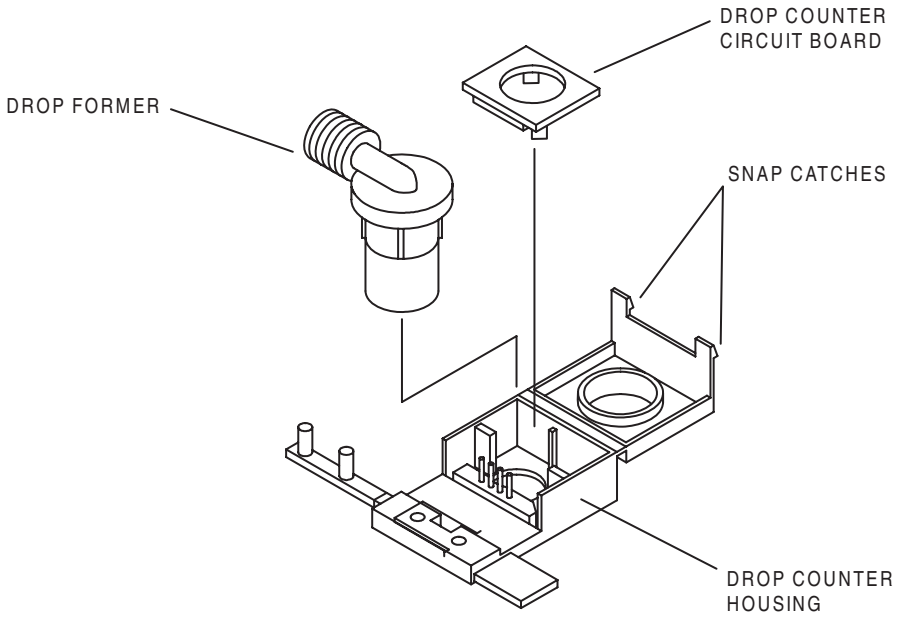


Figure 7-9 Replacing the Drop Counter Circuit Board

☑ Note

When closing the drop counter housing, be sure the "snaps" are started into their slot before pressing the housing closed. Support the underside of the arm to prevent damage to the arm mechanism.

8. Place the instrument on its feet and install the drop former as described in Section 7.2.2.

7.2.13 Replacing the Front-to-Back Axis Drive Components

1. Move the arm to the park position to provide clear access to the front-to-back motor.
2. Remove the upper case as described in Section 7.2.4.
3. Remove the interior shield as described in Section 7.2.6.
4. Lay the upper case on its side with the park position down.
5. Remove the retaining screws securing the arm circuit board shield. Slide the shield back along the rolling ribbon cable.
6. Detach the front-to-back motor cable from the arm circuit board.
7. Remove the front-to-back motor retaining screws and carefully remove the front-to-back motor from the arm assembly. Several small parts may come out when you remove the motor. Ensure that none of these parts are lost.

Note

The front-to-back motor cam may not slide out of the planet gear bearing easily, especially if the instrument is warm. Allow the instrument to cool to room temperature, then gently lift the motor out.

8. Remove the slider, spacer, and planet gear from the arm assembly. Inspect the slider, planet gear bearing, and planet gear for wear.

Note

The planet gear bearing can stay in the planet gear.

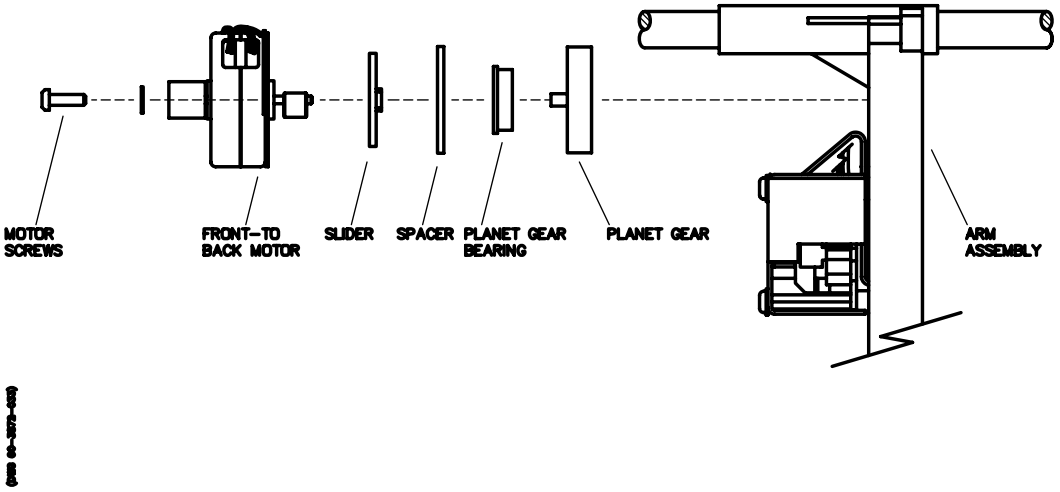


Figure 7-10 Front-to-back Drive Assembly

9. Reinstall the planet gear and planet gear bearing in the arm assembly. The planet gear slides through the slot in the arm and must be positioned at the bottom of the ring gear, with its pins facing the front-to-back motor and oriented at a 45-degree angle.
10. Install the spacer in the arm.

Note

The straight edges on the spacer slide through the slot on the arm. Slide the spacer through the slot until it is pressed against the planet gear with the planet gear pins protruding through the slot in the spacer. Rotate the spacer counter-clockwise 45 degrees until it reaches a stop. Reposition the planet gear to sit on the bottom of the ring gear with its pins oriented vertically-centered in the large slot in the spacer.

11. Lubricate the sliding surfaces of the slider with a light, synthetic grease. Install the slider in the arm.

> **☑ Note**
>
> The slider fits loosely in the slot in the arm with the planet gear pins in the slots in the slider. The protrusions on the slider fit into the large slot in the spacer. If the planet gear pins are not aligned with the slots in the slider, adjust the position of the planet gear to achieve proper alignment.

12. Carefully install the front-to-back motor assembly in the arm assembly by inserting the cam on the motor into the bearing in the planet gear. Make sure the spacer and slider stay in place. Over the last sixteenth of an inch of travel, the motor shaft slides into a bearing on the arm cover and positions the motor. Check the motor for proper alignment. When properly aligned, the motor turns, but will not move in any direction.
13. Install the front-to-back motor retaining screws.

> **☑ Note**
>
> The front-to-back motor must turn freely when installed. If it does not, loosen the retaining screws slightly and/or check the gear assembly for proper arrangement. Rotate the motor shaft by hand to ensure that it does not tighten up when the motor retaining screws are tightened.

14. Attach the connector from the front-to-back motor to the arm circuit board and install the arm circuit board shield.
15. Reinstall the interior shield as described in Section 7.2.6.
16. Reattach upper and lower case halves as described in Section 7.2.4.

7.2.14 Replacing the Left-to Right Motor Timing Belt

1. Remove the upper case as described in Section 7.2.4.
2. Remove the interior shield as described in Section 7.2.6.
3. Remove the arm assembly as described in Section 7.2.7.
4. Remove the timing belt from the arm assembly by grasping it on both sides of the attachment point and pulling it off, as shown in Figure 7-11.

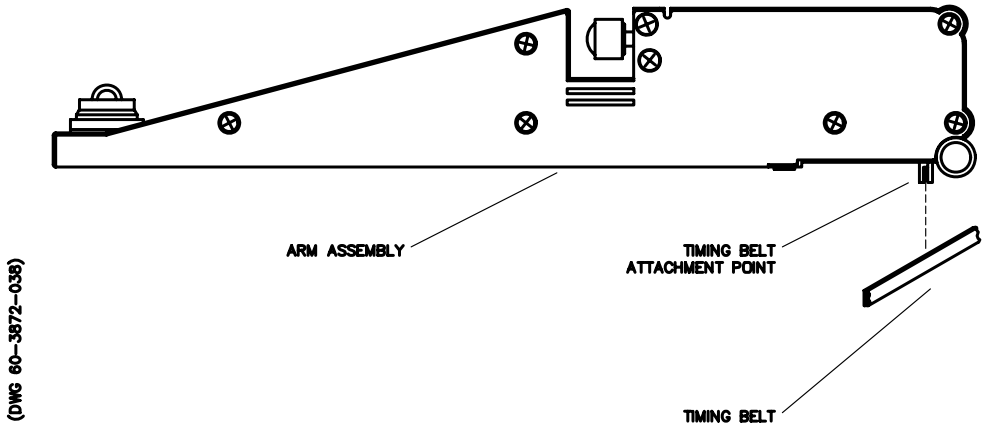


Figure 7-11 Removing the Timing Belt from Arm

5. Install the new timing belt on the arm by holding the belt on both sides of the attachment point, aligning the timing belt grooves with the arm features, and sliding the belt onto the arm.

> ☑ ***Note***
>
> The timing belt fits snugly and requires firm pressure to slide it into position.

6. Reinstall the arm as described in Section 7.2.7.
7. Route the timing belt around the motor pulley and idler. Slide the idler assembly away from the motor to apply proper tension to the timing belt. Tighten the idler assembly retaining screws.

> ☑ ***Note***
>
> The timing belt should be tight enough that it does not slip when moving the arm by hand, but not so tight that the timing belt pulls the left-to-right motor assembly out of position. If the timing belt is not properly tensioned, the arm will chatter as it moves left to right and may miss test tubes.

8. Reinstall the brace and interior shield as described in Section 7.2.6.
9. Reattach the upper and lower case halves as described in Section 7.2.4.

7.2.15 Replacing the Rolling Cable

The rolling cable carries all electronic signals to the arm assembly.

1. Remove the upper case half as described in Section 7.2.4.
2. Remove the interior shield as described in Section 7.2.6.
3. Remove the brace.

4. Lay the upper case half on its side, remove the arm circuit board shield, and slide the shield back to expose the rolling cable.
5. Disconnect the rolling cable from the arm circuit board.
6. Remove the retaining screw closest to the front of the instrument from the clamp assembly, then loosen the second retaining screw to free the cable. Remove the rolling cable by sliding it from under the clamp toward the front of the instrument. Depress the center of the plastic ledge to allow the connector to pass under the guide rod. Remove the arm circuit board shield from the rolling cable.
7. Place the required 90-degree bend in the new rolling cable as shown in Figure 7-13.

☑ Note

Use the old rolling cable as a guide to properly position and orient the 90-degree bend in the new cable.

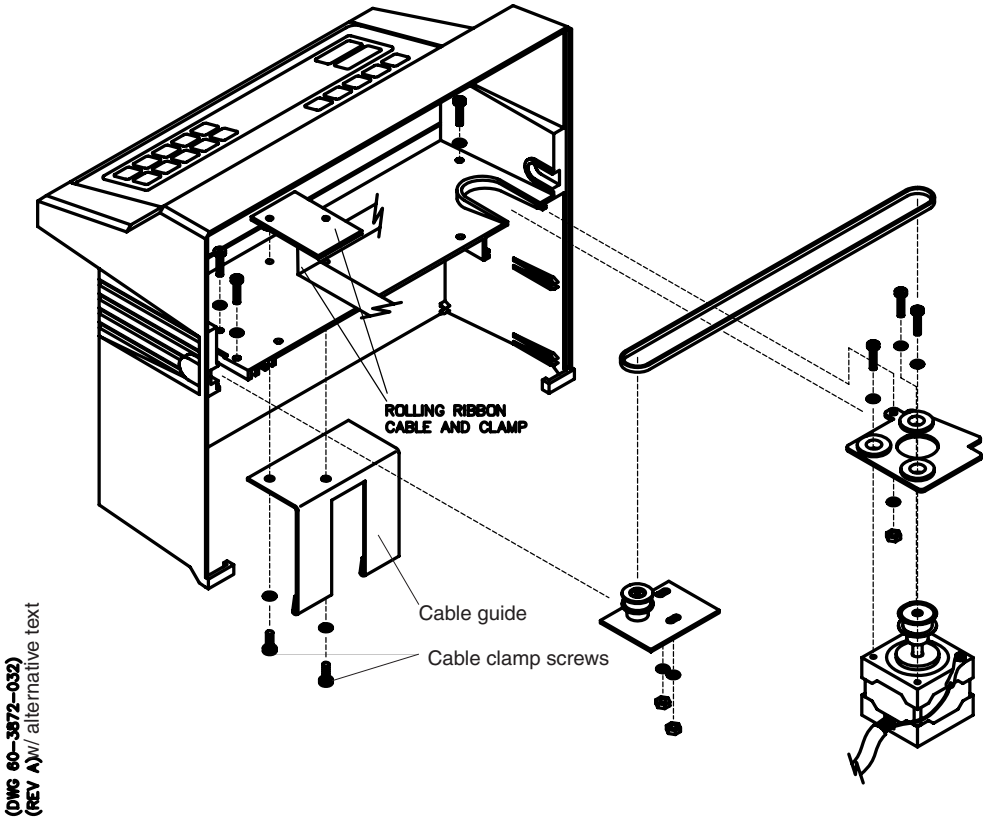


Figure 7-12 Rolling the Cable Mounting Hardware

8. Position the new rolling cable properly in the instrument and loosely install it under the clamp.

Note

The rolling cable must lie flat against the upper case half. Remove all slack from the rolling cable before tightening the clamp.

9. Properly orient the new rolling cable and tighten the clamp as shown in Figures 7-12 and 7-13. Ensure that the cable guide on the underside of the cable clamp is properly oriented as shown in Figure 7-12.

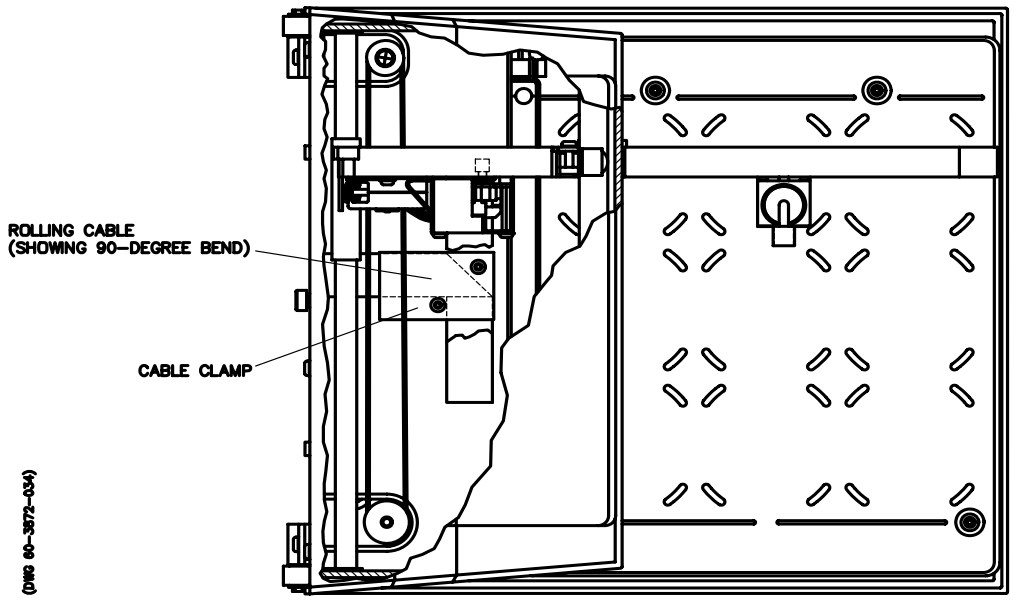


Figure 7-13 Rolling the Cable and Clamp, Top View

10. Slide the arm circuit board shield over the upper portion of the rolling cable, ensuring that the shield is properly oriented.
11. Attach the rolling cable connector to the arm circuit board and reinstall the arm circuit board shield.
12. Reinstall the brace and interior shield as described in Section 7.2.6.
13. Attach the upper and lower case halves as described in Section 7.2.4.

Table 7-1 Foxy Jr. Troubleshooting Guide

Symptoms	Check
Display: Blank Keyboard: No response Motion: None	1. Power module 2. Fuse 3. CR101 4. +5V power supply circuit (VR102) 5. Intense static discharge (unplug power, then reconnect)
Display: Top row solid blocks (may be dim or blinking) Keyboard: No response Motion: None	1. Reset circuit (U201) 2. +5V power supply circuit (VR102) 3. STANDBY key circuit (KB1, U209C) 4. Microprocessor clock (Y201, U210) 5. Microprocessor bus (U210, U216, U204-6, U208-9,U211-3, U202, U104-5) 6. Address decoding (U206, U211, U216) 7. Intense static discharge (unplug power, then reconnect)
Display: Blank Keyboard: Responds Motion: OK or repeated re-homing	1. Display (U1) 2. Display interface (U206, U205, U208, U209H, U211)
Display: Contrast too light or dark	1. Config - Display contrast setting 2. View angle circuit (R210-2, C214, U214, U210)
Display: Does not count all drops	1. Drop counter glass sleeve dirty 2. Flow too fast 3. Arm cable (P207) 4. Drop counter push-pull cable 5. Drop counter CBA connector (J415) 6. Drop counter circuit (Q401, R206, R202, R205, C205, Q201, R221D, U210)
Motion: Drops missing tubes (but no error messages)	1. Rack not seated correctly 2. Program or Config - Rack type 3. Config - Motor acceleration set too high for tubing, etc. load on arm 4. Rack calibration - See Section 7.4
Display: Peak detector values do not match detector	1. Program or Config - Peak detector range 2. Cabling to detector 3. Analog input circuit (U102, U112, U111, U107, U103, U209E, U204, U210) 4. Calibration - See Section 7.4
Serial: Does not work or erratic operation	1. Cabling 2. Config - Serial on and baud rates match 3. Datat formats match (8 data bits, no parity, 1 stop bit) 4. Serial interface circuit (U106, C108, C111, C126, C122, U105, U210)

Table 7-1 Foxy Jr. Troubleshooting Guide (Continued)

Symptoms (Continued)	Check (Continued)
Valve: Does not work or erratic operation	1. Not plugged in (see Section 4.4.3) 2. Fittings over-tightened 3. Valve dirty 4. Intense static dishcharge (press STANDBY, then OPERATE) 5. Valve circuit (U214, V1, CR 201, CR 301) 6. VL power supply circuit (VR103) 7. Self test circuit (R221B, R220C, U215, U208, U210)
Display: Failures 2, 1, 29, 30, 37, and 41 when OPERATE is pressed	Arm cable (P207)
Display: “Failure #01 Cannot leave right sensor”	1. Drop former/valve tubing caught 2. Drive belt 3. Guide rod, guide rail, arm binding 4 L-R motor cable (P105) 5. L-R motor drive circuit (B2, U110, U105, U104, U207) 6. Right park sensor circuit (DS301, Q301, U209B, R217B)
Display: “Failure #02 Cannot leave back sensor”	1. Drop former/valve tubing caught 2. Drop former push-pull cable 3. Arm cable (P207) 4. F-B motor, gear, slider alignment 5. F-B motor drive circuit (B1, U108, U105, U104, U207) 6. Back park sensor circuit (DS302, Q302, U209A, R217C)
Display: Failure #03 Cannot find right sensor”	1. Drop former/valve tubing caught 2. Drive belt 3. Guide rod, guide rail, arm binding 4. L-R motor cable)P105) 5. L-R motor drive circuit (B2, U110, U105, U104, U207) 6. Right park sensor circuit (DS301, Q301, U209B, R217B)
Display: Failure #04 Cannot find back sensor”	1. Drop former/valve tubing caught 2. Drop former push-pull cable 3. Arm cable (P207) 4. F-B motor, gear, slider alignment 5. F-B motor drive circuit (B1, U108, U105, U104, U207) 6. Back park sensor circuit (DS302, Q302, U209A, R217C)
Display: “Warning #06: Front-back position error”	1. Config - Motor acceleration set too high for tubing, etc. load on drop former 2. Drop former/valve tubing caught 3. Drop former push-pull cable 4. F-B motor, gear, slider alignment 5. F-B motor drive circuit (B1, U108, U105, U104, U207) 6. Back park sensor circuit (DS302, Q302, U209A, R217C)

Table 7-1 Foxy Jr. Troubleshooting Guide (Continued)

Symptoms (Continued)	Check (Continued)
Display: “Warning #07 No response from valve controller”	1. Valve controller not connected 2. Valve/gradient controller interface circuit (R224-5, U210) 3. Circuitry in valve controller
Display: “Failure #08 Valve or gradient controller”	1. Valve controller power cord 2. Gradient controller power module 3. Valve/gradient controller interface circuit (R224-5, U210) 4. Circuitry in valve/gradient controllers
Display: “Failure #09 EEPROM verify error”	EEPROM circuit (U203, U204, U209E, U211)
Display: “Remark #10 Entering standby mode”	No problem. Marks point in error trace where unit went to Standby.
Display: “Remark #11 Entering operate mode”	No problem. Marks point in error trace where unit went to Operate.
Display: “Remark #12 Power drop out occurred”	No problem. Marks point in error trace where unit detected a power failure.
Display: “Failure #13 ROM bank switching”	1. Bank switching circuit (U216) 2. Microprocessor bus (U210, U216, U204-6, U208-9, U211-3, U202, U104-5) 3. Address decoding (U206, U211)
Display: “Failure #14 ROM check-sum”	1. EPROM (U213) 2. Microprocessor bus (U210, U216, U204-6, U208-9, U211-3, U202, U104-5) 3. Address decoding (U206,U211)
Display: “Failure # 15 External RAM”	1. RAM (U212) 2. Microprocessor bus (U210, U216, U204-6, U208-9, U211-3, U202, U104-5) 3. Address decoding (U206, U211)
Display: “Failure #16 Internal RAM	Microprocessor (U210)
Display: “Warning #17 Cal. data in EEPROM invalid”	1. EEPROM circuit (U203, U204, U209E, U211) 2. EEPROM cleared via key D-5 screen (Unit will need to be completely recalibrated)
Display: “Remark #18 Cal. data in RAM invalid”	No problem. Indicates that cal. data had to be read from EEPROM.
Display: “Remark #19 Run data is invalid”	1. Battery discharged (BT201) 2. RAM cleared via key D-9 screen 3. Intense static discharge 4. Charging circuit (CR203, R209) 5. RAM (U212) 6. Reset circuit (U201)

Table 7-1 Foxy Jr. Troubleshooting Guide (Continued)	
Symptoms (Continued)	**Check (Continued)**
Display: “Remark #20 Program data is invalid”	1. Battery discharged (BT201) 2. RAM cleared via key D-9 screen 3. Intense static discharge 4. Charging circuit (CR203, R209) 5. RAM (U212) 6. Reset circuit (U201)
Display: Warning #21 Stack out of range reset occurred”	1. Intense static discharge 2. Microprocessor (U210)
Display: “Failure #22 Display not responding”	1. Display (U1) 2. Display interface (J206, U205, U208, U209H, U211)
Display: “Failure #23 Peak det. ADC not responding”	Peak detector analog to digital converter (U103, U204, U209E)
Display: “Failure #24 PF sensing”	PF < 10 VDC or > 24 VDC Power failure circuit (CR 101, C106, R221C, R220H, U210)
Display: “Failure #25 VL supply”	VL < 10 VDC or > 15.5 VDC 1. VL power supply circuit (VR103) 2. Self-test circuit (R221A, R220A, U215, U208, U210)
Display: “Failure #26 -5V supply”	-5V < -5.3 VDC or > -4.7 VDC 1. -5V power supply circuit (VR 103, U109, C136, VR 101) 2. Self-test circuit (R131-2, U101, U208, U210)
Display: “Failure #27 Valve sensing”	VALVE > 16 VDC 1. Valve circuit (U214, V1, CR 201, CR 301) 2. VL power supply circuit (VR103) 3. Self-test circuit (R221B, R220C, U215, U208, U210)
Display: “Warning #28 Battery low”	BT < 2.0 VDC or > 3.2 VDC 1. Battery discharged (BT201) 2. Battery failed (BT201) 3. Charging circuit (CR203, R209) 4. Self-test circuit (U215, U208, U210)
Display: “Failure #29 Drop counter LED”	LED current < 38 mA or > 53 mA 1. Arm cable (P207) 2. Drop counter push-pull cable 3. Drop counter CBA connector (J415) 4. Self-test circuit (U215, U208, U210)
Display: “Failure #30 Park sensors LEDs”	LED current < 18 mA or > 30 mA 1. Arm cable 2. Park LEDs circuit (DS 301-2, R204) Self-test circuit (U215, U208, U210)
Display: “Failure #31 Right park sensor”	1. Right park sensor circuit (DS301, Q301,U209B, R217B) 2. Self-test circuit (U215, U208, U210)

Table 7-1 Foxy Jr. Troubleshooting Guide (Continued)

Symptoms (Continued)	Check (Continued)
Display: “Failure #32 Back park sensor”	1. Back park sensor circuit (DS302, Q302, U209A, R217C) 2. Self-test circuit (U215, U208, U210)
Display: “Failure #33 MC0 limit”	1. L-R motor phase AB drive circuit (B2, U110A, U105, U104, U207) 2. Self-test circuit (U101, U208, U210)
Display: “Failure #34 MC1 limit”	1. L-R motor phase CD drive circuit (B2, U110B, U105, U104, U207) 2. Self-test circuit (U101, U208, U210)
Display: “Failure #35 MC2 limit”	1. F-B motor phase AB drive circuit (B1, U108B, U105, U104, U207) 2. Self-test circuit (U101, U208, U210)
Display: “Failure #36 MC3 limit”	1. F-B motor phase CD drive circuit (B1, U108B, U105, U104, U207) 2. Self-test circuit (U101, U208, U210)
Display: “Failure #37 Temperature reference”	1. Unit too cold (below -5 °C) 2. Temperature sensing circuit (U301, R220B, R222, U215, U208, U210)
Display: “Failure #38 Peak det. reference”	AD_REF < 2.3 VDC or > 2.7 VDC 1. Reference circuit (U107, R 108) 2. Self-test circuit (U101, U208, U210)
Display: “Failure #39 RS232 pos. supply”	+10V < 6 VDC or > 12 VDC 1. Pos. RS 232 supply circuit (U106, C111, C126) 2. Self-test circuit (R115, R117, U101, U208, U210)
Display: “Failure # 40 R232 neg. supply”	-10V < -12VDC or > -5VDC 1. Neg. RS 232 supply circuit (U106, C108, C122) 2. Self-test circuit (R114, R116, U101, U208, U210)
Display: “Failure #41 Drop counter sensor”	DROP < 0.5 VDC or > 5.3 VDC 1. Arm cable 2. Drop counter push-pull cable 3. Drop counter CBA connector (J415) 4. Drop counter circuit (Q401, R206, R202, R205, C205, Q201, R221D, U210)
Display: “Remark #42 Leaving run mode”	No problem. Marks point in error trace where run ended.
Display: “Remark #43 Entering run mode”	No problem. Marks point in error trace where run started.

Table 7-1 Foxy Jr. Troubleshooting Guide (Continued)

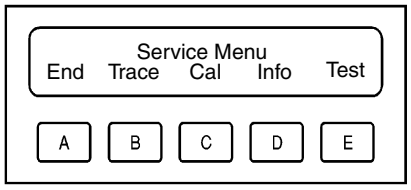
Symptoms (Continued)	Check (Continued)
Display: Warning #44 No response from gradient controller	1. Gradient controller not connected 2. Valve/gradient controller interface circuit (R224-5, U210) 3. Circuitry in gradient controller
Display: "Warning #45 Unexpected interrupt"	1. Intense static discharge 2. Microprocessor (U210) 3. EPROM (U213) 4. Microprocessor bus (U210, U216, U204-6, U208-9, U211-3, U202, U104-5) 5. Address decoding (U206, U211, U216)

7.3 Service Features

The Foxy Jr. has many features to detect and diagnose problems. When the unit is switched to Operate, it runs self-tests of all systems. While operating, it continues to monitor system performance for errors. If any problems are found, a brief message is displayed and a tone is sounded to call attention to it. All problem messages are also stored for later examination. Information and definitions of these messages are found above in the Troubleshooting Guide (Table 7-1).

7.3.1 Service Menu

To access the service features, press **0** at the Main Screen (Pgm=). This brings you the Service Menu.



Trace - This softkey lets you examine the last 50 warnings, failures, and remarks that occurred. See Section 7.3.2.

Cal - Allows recalibration of the peak detector input, drop former positioning over the rack, etc. See Section 7.3.5.

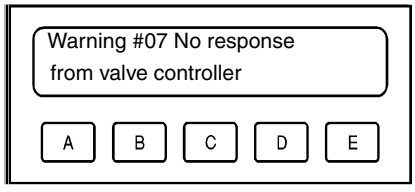
Info - Displays 12 screens of information about voltages, currents, states, etc. for diagnosing problems. See Section 7.3.4.

Test - For running active tests of all parts of the machine. See Section 7.3.3.

End - Returns you to the Main Screen.

Service Keys

There are a number of service functions available at all times by pressing special key combinations. These allow displaying and clearing recent error codes and messages, and brute force clearing of calibration EEPROM or program RAM. See Section 7.4.5.



The Foxy Jr. keeps a record of the last 50 failures, warnings, and remarks that occurred. To view or clear this buffer, press the **Trace** softkey on the Service Menu screen.

The **Clear** softkey clears the buffer. Press **View** to look at the contents of the buffer, if any. The other softkeys return to the Service Menu screen.

The most recent error codes in the buffer are shown first. The number on the far left shows how far back in the buffer the condition occurred. The number on the right is the error code for use in the Troubleshooting Chart (Table 7-1).

Press the **Older** softkey to look at the any earlier occurring error code. Press **Back** to back up to later error codes. For either key, if there are no more error codes, it will return to the Error Trace-back Buffer screen.

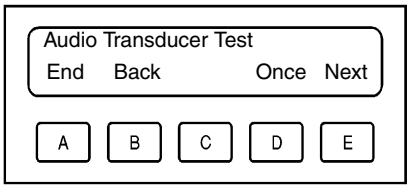
To display the message description of the error code, press the **Text** softkey.

7.3.3 Test Screens

These allow the testing of all parts of the Foxy Jr. To reach the first test, press the **Test** softkey on the Service Menu. Each of the tests can be skipped by pressing the **Next** softkey. To run any test one time, press the **Once** softkey. Most of the tests can be halted at any time by pressing the **Stop** softkey (key **A**), even if it is not being displayed.

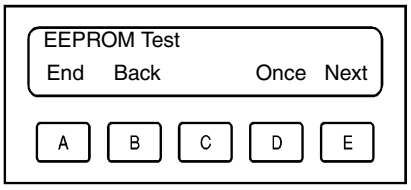
Some tests can be run repeatedly by pressing the **Many** softkey. These tests are ended by pressing the **Stop** softkey.

Audio Transducer Test



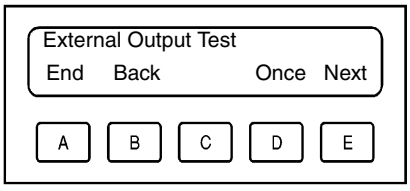
This tests the circuitry used for error beeps and key clicks by running the audio transducer through each of the loudness levels for four different frequencies.

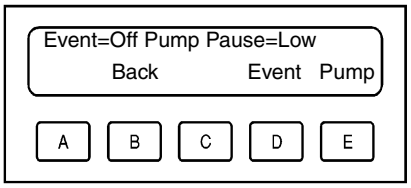
EEPROM Test



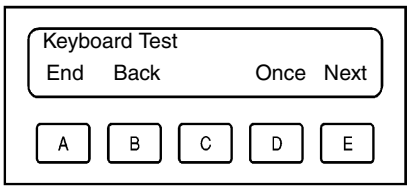
This does a non-destructive read-write test of each location of the EEPROM used to hold the calibration and configuration information. After a few seconds, the display should show “Passes: 1,” indicating success.

External Output Test



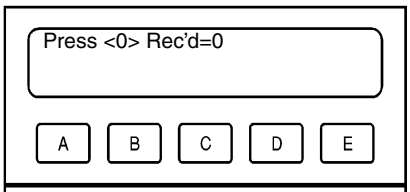


This allows the user to manually toggle the event mark and pump pause output on and off to test their operation externally. Press the **Event** softkey with some external indicator, such as a recorder or ohmmeter, connected from pin 7 to 8 (common) of the DETECTOR connector (J103). Press the **Pump** softkey with some external indicator, such as a pump or ohmmeter, connected from pin 2 to 4 (common) of the PUMP/ACC connector (J102).



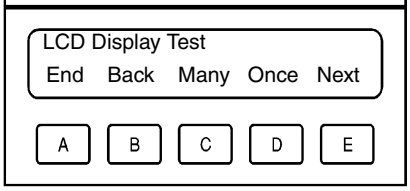
Keyboard Test

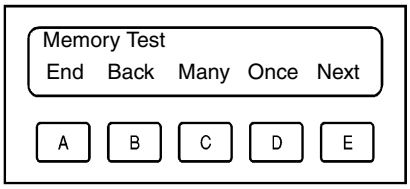
This test confirms the correct operation of all keys except the STANDBY/OPERATE key, which is tested by use. Press each key as prompted. The keypress received is displayed. If it doesn't match the key requested, the unit will beep.



LCD Display Test

This test allows the user to visually test all functions of the display. The test will run cursor motion tests, contrast tests, then display each possible character at every location. Observe the display for cursor errors, contrast problems, bad dots, bad locations, missing characters, and erratic operation.

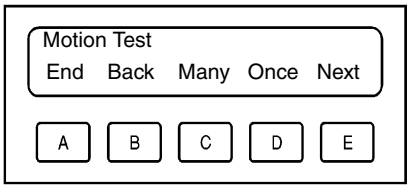




Memory Test

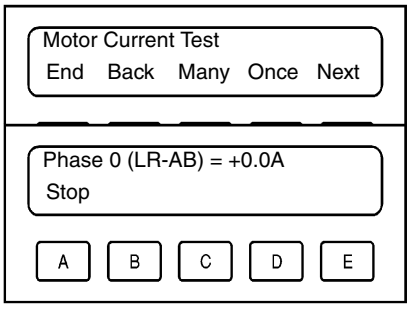
This tests all the memory in the unit, except the EEPROM tested above. This includes the RAM inside the processor, the external RAM, and the external program ROM. After a few seconds, the display should show "Passes: 1," indicating success. If it fails, the type of memory that failed will be displayed.

This test can be run continuously, if marginal operation is suspected, by using the **Many** key. The display will show the number of passes completed.



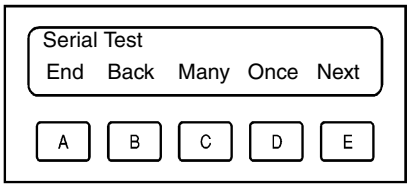
Motion Test

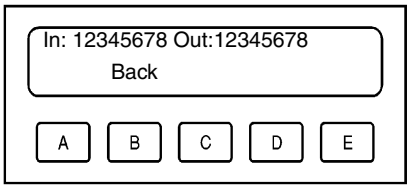
The motion test runs the unit through a series of drop former moves to allow checking for problems. When started, the unit will park, then move to each of the corners of the current program's rack type, then move to each tube of the rack. Observe the unit for any error messages or clear the error trace-back and check it after for errors. This test can be run continuously, to check for intermittent problems, by using the **Many** softkey. Pressing the **Delay** softkey while the test is running toggles the unit from 1 second per advance to 1 minute per advance.



Motor Current Test

This test slowly runs each of the two phases of the two stepper motors through each possible current level for both polarities. It is useful for diagnosing problems with the motors, motor drivers, motor control PLD, and motor current threshold IC. The motors may make a slight squealing sound during this test.

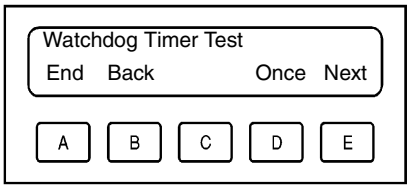




Serial Test

This test checks the unit's serial output and input simultaneously. It can also be used to test the connections and operation of the external serial device. When run, the unit sends "Serial test - 12345678<carriage return><linefeed>" at the current configured serial rate (default is 19200).

To test only the Foxy Jr., connect the serial output (J101-3) back to the serial input (J101-2) and press the **Once** softkey. Verify that the displayed "In" characters match the "Out" characters ("12345678"). To test the external device, connect it to the Foxy Jr. and press the **Many** softkey. The external device should receive the above test message repeatedly, and anything sent by it should appear after [a]In:" on the display.

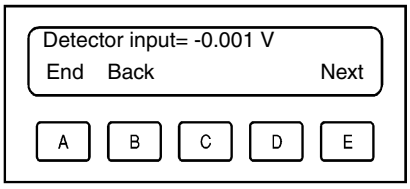


Watchdog Timer Test

The Foxy Jr. has a timer that resets the unit if the processor stops telling it that everything is OK. This allows the unit to recover from things like static discharge. When this test is run, the unit should reset and end up at the "Pgm=" screen. If the test fails, an error message will appear on the display after a few seconds.

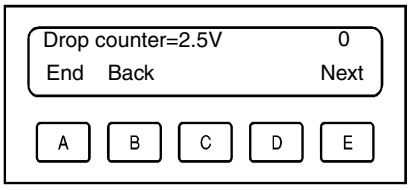
7.3.4 Info screens

These screens display many pieces of information about the internal and external state of the unit. Press the Info softkey on the Service Menu to reach the first screen. Step through each of the screens by pressing the Next softkey.



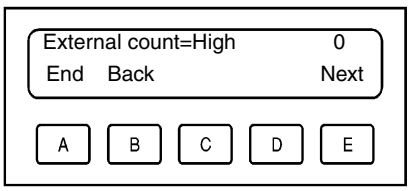
Detector input

This screen displays the voltage of the peak detector input. If the input is over approximately 1.2 Volts, then "+++++" will be displayed. If below -1.2 Volts, "- - - - -" will be displayed.



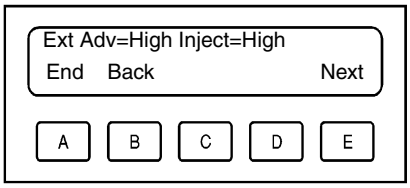
Drop counter

This screen shows the voltage of the drop counter circuit in the center. It should be 2.4 V +0.4 V. The number on the right side is the number of drops detected since the screen was entered. Also, each time a drop is detected the unit will emit a short beep.



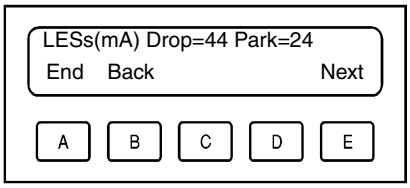
External count

This screen shows the logic state of the external count input (J102-1). The display will show "High" with the input unconnected or above 2 Volts and "Low" with the input connected to common (J102-4) or below 0.8 Volts. The number on the right side shows the number of counts since the screen was entered. Also, each time a count is detected, the unit will emit a short beep.



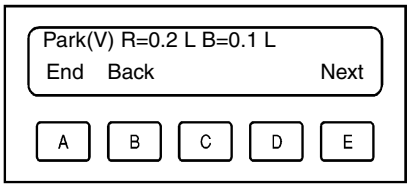
External Advance and Inject

This screen shows the logic states of the external advance (J103-5) and inject (J103-4) inputs. The display will show "High" with the input unconnected or above 2 Volts and "Low" with the input connected to common (J103-8) or below 0.8 Volts.



LED currents

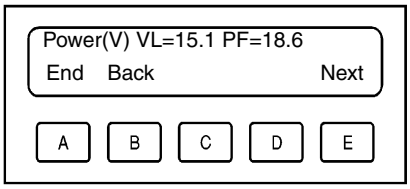
This screen shows the currents flowing through the light emitting diodes used for sensing drops and sensing when the drop former is at its park position. The "Drop" LED should be 44 mA ±4 mA. The "Park" LEDs, (two LEDs in series), should be 24 mA ±3 mA.



Park sensors

This screen shows the voltages and logic states of the Right ("R") and Back ("B") park position sensors. The logic states are displayed after the voltages as "L" for low and "H" for high. When the flag is in the sensor, (all the way right or back), the sensor should show greater than 3.5 Volts and "H." When the flag is out of the sensor, (left or forward), the sensor should be less than 0.4 Volts and "L."

> ☑ ***Note***
>
> Pushing the drop former or arm out of position may cause warnings later unless the unit is switched to Standby before the next time the drop former is parked.

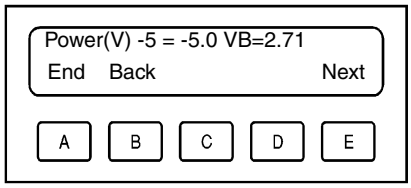


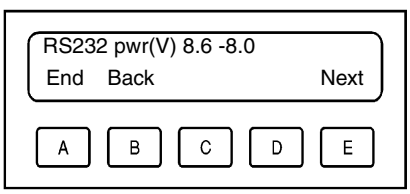
Power

There are two screens that show various voltages of the internal power supplies. On the first screen is the "VL" (voltage limited) supply, which should be 10.0 to 15.3 Volts, and the "PF" (powerfail) sensing, which should be 14 to 24 Volts.

On the second screen is the "-5" volt supply, which should be -5.0 Volts +0.3 Volts, and the "VB" battery charging voltage, which should be 2.7 Volts +0.3 Volts when the battery is charged.

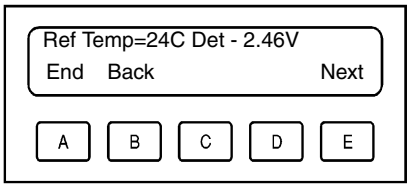
Note that the +5 Volt supply is not shown because it is used as the reference for measuring voltages and would always show as +5.00 Volts. The +5 Volt supply can be checked with an external voltmeter connected from pin 11 to pin 12 (common) of the SERIAL connector (J101).





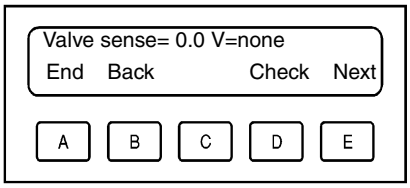
RS232 Power

This screen shows the voltages used for the RS232 serial interface. The positive supply, (left number), should be 9 Volts +3 Volts and the negative supply, (right number) should be -9 Volts +3 Volts.



References

This screen shows the Temperature ("Temp") reference and the peak Detector ("Det") voltage reference. The temperature will be several degrees over ambient room temperature due to heat from the holding current on the motors and is accurate only to +3° C. The detector voltage reference should be 2.5 Volts +0.1 Volts.



Valve sensing

This screen shows the voltage used to sense the presence and type of valve attached to the unit. The right side of the display shows the type of valve (none, 2-way, or 3-way), that the unit determined to be connected to when switched to Operate. The type can only be sensed while the valve is off, so the **Check** softkey is provided to turn the valve off, update the type, and restore the valve state.

> ☑ ***Note***
>
> The next screen after the Valve screen is the Error Trace-back Buffer screen, which allows viewing, clearing, and displaying of the last 50 errors, warnings, and remarks that occurred. See Section 7.3.2.

7.3.5 Calibration

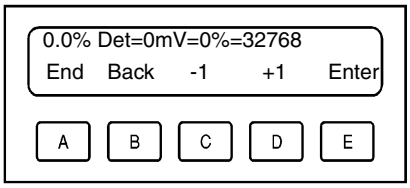
Pressing the **Cal** softkey on the Service Menu allows the recalibration of the peak detector input, drop former positioning over the rack, internal voltage reference, and internal time reference. This overwrites the existing factory calibration, so write down the existing value before changing it. The user should normally not need to recalibrate any part of the unit.

Do not alter Cal values unless necessary.

Peak Detector Input

Calibration of the detector input consists of matching the displayed value to the external source at 0% and 100%.

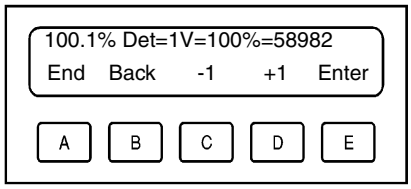
> ☑ ***Note***
>
> In the following, if display shows "+++++%," the input is above approximately 120%. Likewise, if it shows "- - - - - %," the input is below approximately -120%.



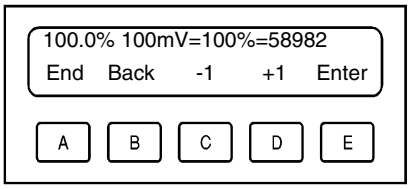
The first screen is the 0% calibration for all three input ranges. It is performed in the 10 mV input range. Connect the external source (precision power supply or detector) from the detector analog input (J103-6) to analog common (J103-1). Set the external source as close to 0.0 millivolts, or 0%, as possible. Write down the five-digit number on the right side of the screen so the factory setting can be restored if necessary. Use the **-1** and **+1** softkeys to adjust the number until the percentage on the left side of the screen matches the value of the external source.

Remember to compensate if using a detector with a 100 mV or 1 V output, (i.e. 0.1% on a 1 V output detector = 10% on the display, 0.1% on a 100 mV output detector = 1% on the display).

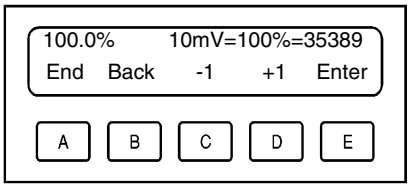
Press **Enter** to store it and move to the next screen, or press **Back** to return to the original value.



The second screen adjusts the 100% value for the 1 Volt input range. If you never use this range, press **Enter** to skip to the next screen. Otherwise, set the external source as close as possible to 1.00 Volts, or 100%, on a 1 V detector output. Write down the five digit number on the right side of the screen so the factory setting can be restored if necessary. Use the **-1** and **+1** softkeys to adjust the number until the percentage on the left side of the screen matches the value of the external source. Press **Enter** to store it and move to the next screen. Or press **Back** to return to the original value.

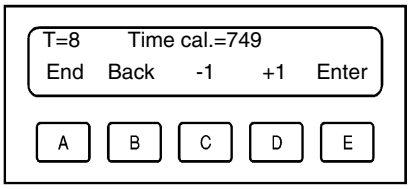


The third screen adjusts the 100% value for the 100 millivolt input range. If you never use this range, press Enter to skip to the next screen. Otherwise, set the external source as close as possible to 100 millivolts or 100% on a 100 mV detector output. Write down the five digit number on the right side of the screen so the factory setting can be restored if necessary. Use the -1 and +1 softkeys to adjust the number until the percentage on the left side of the screen matches the value of the external source. Press Enter to store it and move to the next screen or press Back to return to the original value.



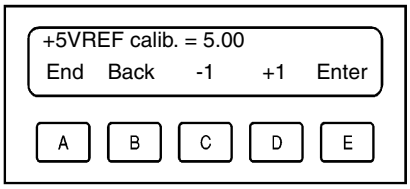
The fourth screen adjusts the 100% value for the 10 millivolt input range. If you never use this range, press **Enter** to skip to the next screen. Otherwise, set the external source as close as possible to 10 millivolts or 100% on a 10 mV detector output. Write down the five digit number on the right side of the screen so the factory setting can be restored if necessary. Use the **-1** and **+1** softkeys to adjust the number until the percentage on the left side of the screen matches the value of the external source. Press **Enter** to store it and move to the next screen. Or press **Back** to return to the original value.

Time calibration



The fifth calibration screen adjusts the internal time base. It almost never needs adjustment, and should show approximately 749 on the right side of the screen. Press **Enter** to skip this screen if it does not need adjusting. While at this screen, the unit will beep and send an event mark output once every 60 seconds. The number on the left side counts down the seconds until the next beep. To check the time base, measure the time between beeps with a stopwatch, (time multiple cycles for more accuracy), or with an external electronic timer or recorder connected to the event mark output (pin 7 of the DETECTOR connector J103). If necessary, adjust the value with the **-1** and **+1** softkeys until time

gets as close as possible to 60 seconds. Press **Enter** to store it and move to the next screen. Or press **Back** to return to the original value.



Voltage Reference

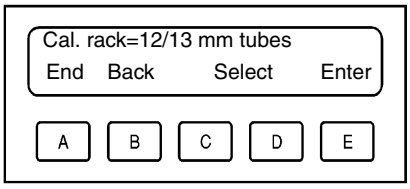
The sixth screen tells the unit the actual value of the +5 Volt supply used as a reference for measuring other voltages in the unit. Press **Enter** to skip this screen if it does not need adjustment. To check it, measure the voltage from pin 11 (+5VREF) to pin 12 (analog common) of the SERIAL connector (J101) with a high quality digital voltmeter. If the voltage does not match the number displayed, then write down the value shown so the factory setting can be restored if necessary, and adjust the displayed number with the **-1** and **+1** softkeys to match the measured voltage. Press **Enter** to store it and move to the next screen. Or press **Back** to return to the original value.

Drop Former Positioning

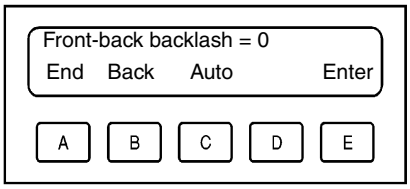
The remaining screens calibrate the positioning of the drop former relative to the rack. If drops are missing the tubes when the drop former is not moving, this may need adjustment.

Before adjustment, verify the following:

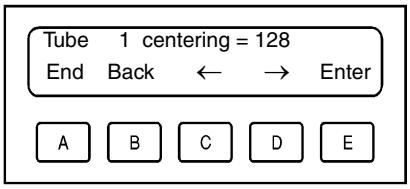
1. The case top height should be properly set with the same distance between the bottom of the case top and the surface of the case bottom on each side of the unit.
2. Both latches on the back should be in the full down position.
3. All back and bottom screws should be installed and tightened.
4. The drop former should be seated fully down in the drop counter housing.
5. The drain trough should not be hitting the bottom of the arm across the left to right travel.
6. The tubing attached to the drop former, valve, or arm should not be pulling anything out of position anywhere in the travel. Press **End** to skip these screens if adjustment is not needed. At each screen below, write down the numbers on the right side of the screen so the factory settings can be restored if necessary.



The seventh screen selects which rack type will be used for calibration. Calibrating with one rack calibrates the unit for all larger vessel diameter racks, so use the smallest diameter vessel rack you have. Use the **Select** softkeys to display that rack type then press **Enter** to store it.

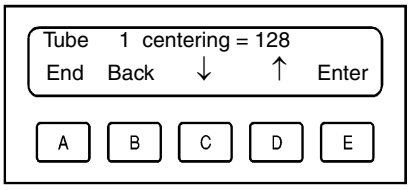


The eighth screen sets the backlash compensation of the front-to-back axis. If drops land in a different place when a tube is arrived at from the front versus from the back, or drops land in a different place in alternating rows, then this may need adjustment. Otherwise, press **Enter** to skip this screen. Write down the current value so the factory setting can be restored if necessary. A new backlash value can be manually entered using the numeric keys, or it can be automatically measured by the unit by pressing the **Auto** softkey. After a few seconds of very small movements, the number displayed will be updated. Repeat the Auto function several times. If the number returned is consistent, press **Enter** to store it, or press **Back** to return to the original value.

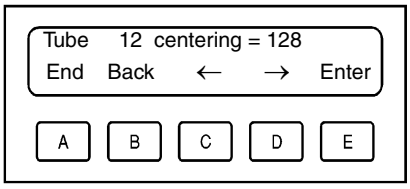


The ninth screen sets the left-right offset of the rack by adjusting the left-right centering over the front left corner tube. Write down the current value so the factory setting can be restored if necessary. Pump fluid slowly into the tube and observe where the drops fall. The pump may have to be enabled by pressing the **ADVANCE** key then the **Pump** softkey. If the drops are not centered left to right, use the arrow softkeys to adjust the centering.

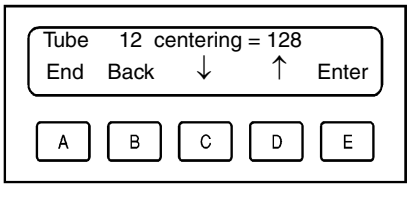
> ☑ ***Note***
>
> For the ninth through thirteenth screens, the offset wraps around at 0 and 255. When satisfied with the centering, press **Enter** to store it and move to the next screen. Or press **Back** to return to the original value.



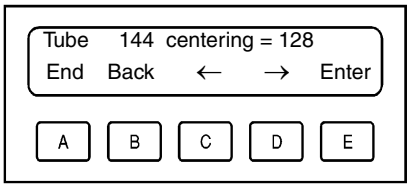
The tenth screen sets the front-back offset of the rack by adjusting the front-back centering over the front left corner tube. Write down the current value so the factory setting can be restored if necessary. Pump fluid slowly into the tube and observe where the drops fall. If the drops are not centered front to back, use the arrow softkeys to adjust the centering.



The eleventh screen sets the left-right scaling of the rack by adjusting the left-right centering over the front right corner tube. Write down the current value so the factory setting can be restored if necessary. Pump fluid slowly into the tube and observe where the drops fall. If the drops are not centered left to right, use the arrow softkeys to adjust the centering.



The twelfth screen sets the rotation offset of the rack by adjusting the front-back centering over the front right corner tube. Write down the current value so the factory setting can be restored if necessary. Pump fluid slowly into the tube and observe where the drops fall. If the drops are not centered front to back, use the arrow softkeys to adjust the centering.



The thirteenth screen sets the arm skew offset of the rack by adjusting the left-right centering over the back left corner tube. Write down the current value so the factory setting can be restored if necessary. Pump fluid slowly into the tube and observe where the drops fall. If the drops are not centered left to right, use the arrow softkeys to adjust the centering.

The fourteenth screen sets the front-back scaling of the rack by adjusting the front-back centering over the back left corner tube. Write down the current value so the factory setting can be restored if necessary. Pump fluid slowly into the tube and observe where the drops fall. If the drops are not centered front to back, use the arrow softkeys to adjust the centering.

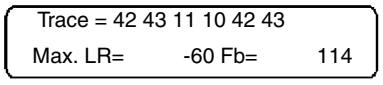
> ☑ ***Note***
>
> The offset wraps around at 0 and 255. When satisfied with the centering, press **Enter** to store it and return to the Service Menu. Or press **Back** to return to the original value.

The pump may be stopped by pressing the **ADVANCE** key, then the **Pump** softkey.

7.3.6 Service Keys

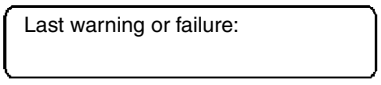
These service functions are available any time the unit is accepting keypresses. Each is activated by pressing two keys simultaneously, requiring the use of two hands. This allows displaying and clearing of recent error codes and messages, and hard-reset clearing of calibration EEPROM or program RAM.

Short trace back

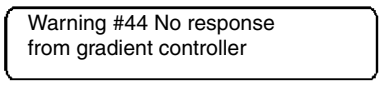


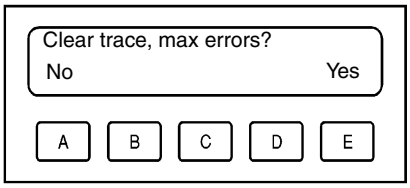
Press the **D** and **1** keys at the same time to activate this screen. It displays the last six error codes that occurred and the maximum left-right and front-back position rehoming errors since clearing. See the Troubleshooting Guide (Table 7-1) for more information on the error codes. After four seconds, the screen will return to the screen displayed before the keys were pressed.

Last problem



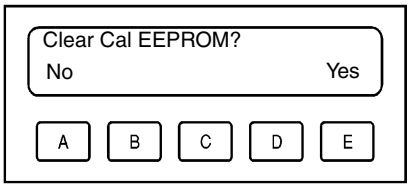
Press the **D** and **2** keys at the same time to activate this screen. PIt displays the text of the last warning or failure that occurred since clearing. See the Troubleshooting Guide (Table 7-1) for more information on the error codes. After four seconds, the screen will return to the screen displayed before the keys were pressed.





Clear Trace

Press the **D** and **3** keys at the same time to activate this screen. It allows clearing the error code trace back buffer and the maximum left-right and front-back position rehoming errors. Press the **Yes** softkey to clear the buffer. Press any other key to return to the screen displayed before the keys were pressed without clearing the buffer.



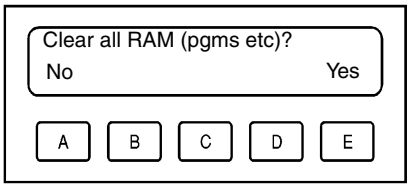
Clear EEPROM

Press the **D** and **5** keys at the same time to activate this screen. It allows clearing of the memory that stores the unit's calibration and configuration.

⚠ CAUTION

Clearing the EEPROM erases vital calibration information necessary for proper operation of the instrument. Do not do this without consulting Teledyne Isco's Service Department (See warranty page). Also, write down or print out all calibration and configuration values before clearing. The unit will have to be completely recalibrated and reconfigured after clearing.

Press the **Yes** softkey to clear the EEPROM and reset the unit. Press any other key to return to the screen displayed before the keys were pressed without clearing the EEPROM.



Clear RAM

Press the **D** and **9** keys at the same time to activate this screen. It allows clearing of the memory that stores the user programs, run information etc.

⚠ CAUTION

Clearing the RAM erases all user programs and other ingormation. It cannot be restored after erasing, but programs can be re-entered if written down or printed out before clearing.

Press the **Yes** softkey to clear the RAM and reset the unit. Press any other key to return to the screen displayed before the keys were pressed without clearing the RAM.

7.4 Rarely Used Features

The Foxy Jr. has a number of features for special applications, such as those listed below. If you need any of these features, contact Teledyne Isco for information on how to activate and use them.

- INJECT input can start a run (External run start) at the Main Screen.
- ADVANCE/PEAK input ends a run (External run end).
- External enabling of valve through pin 6 of J102.
- No 0.8 second drip delay before moving drop former.
- Never continue after power failure instead of asking.
- Always continue after power failure instead of asking.
- No position rechecking at right and back edge of rack.
- Pre-set serial echo and linefeed commands.
- Allow editing accessory events without accessory attached.
- No position holding current on motors when not moving.

FOXY Jr. Service Features Flowchart

3-96 JBS

Notes: Some test execution screens not shown.

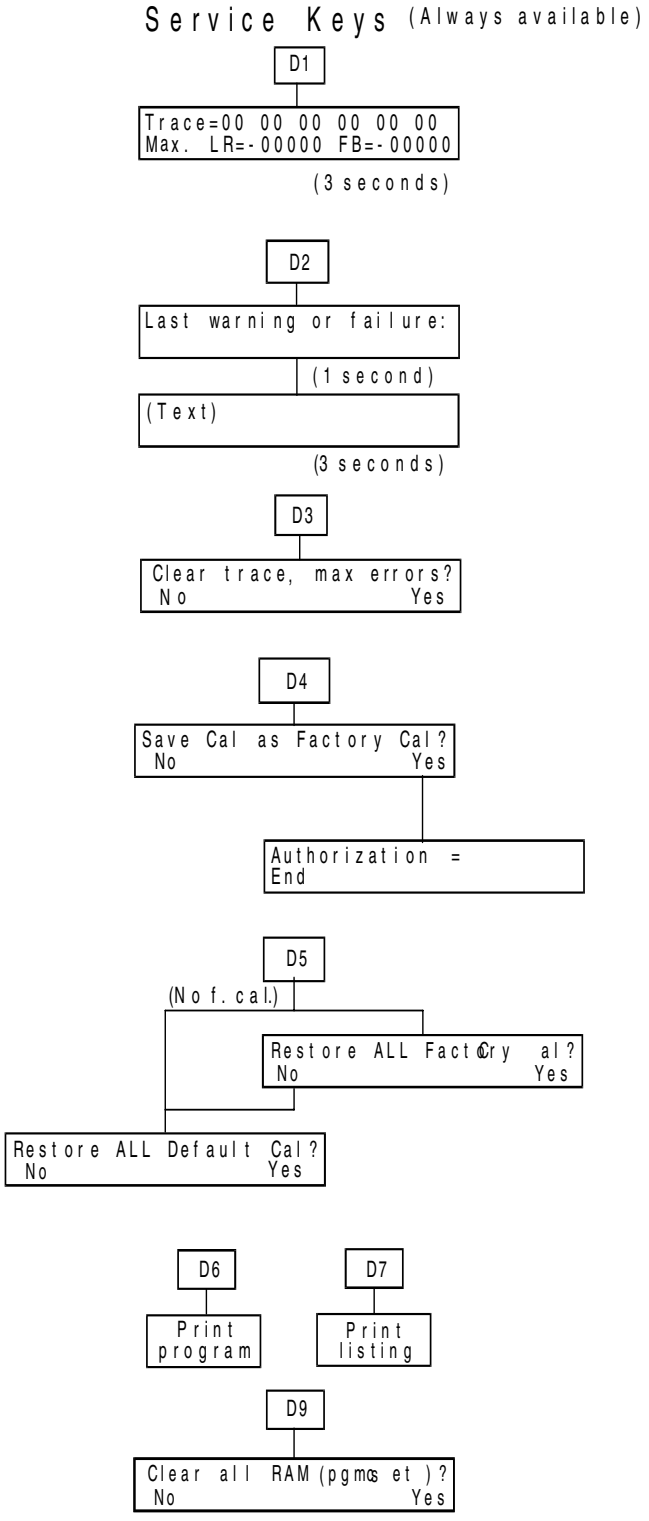


Figure 7-14 Service Features Flowchart, Part 1

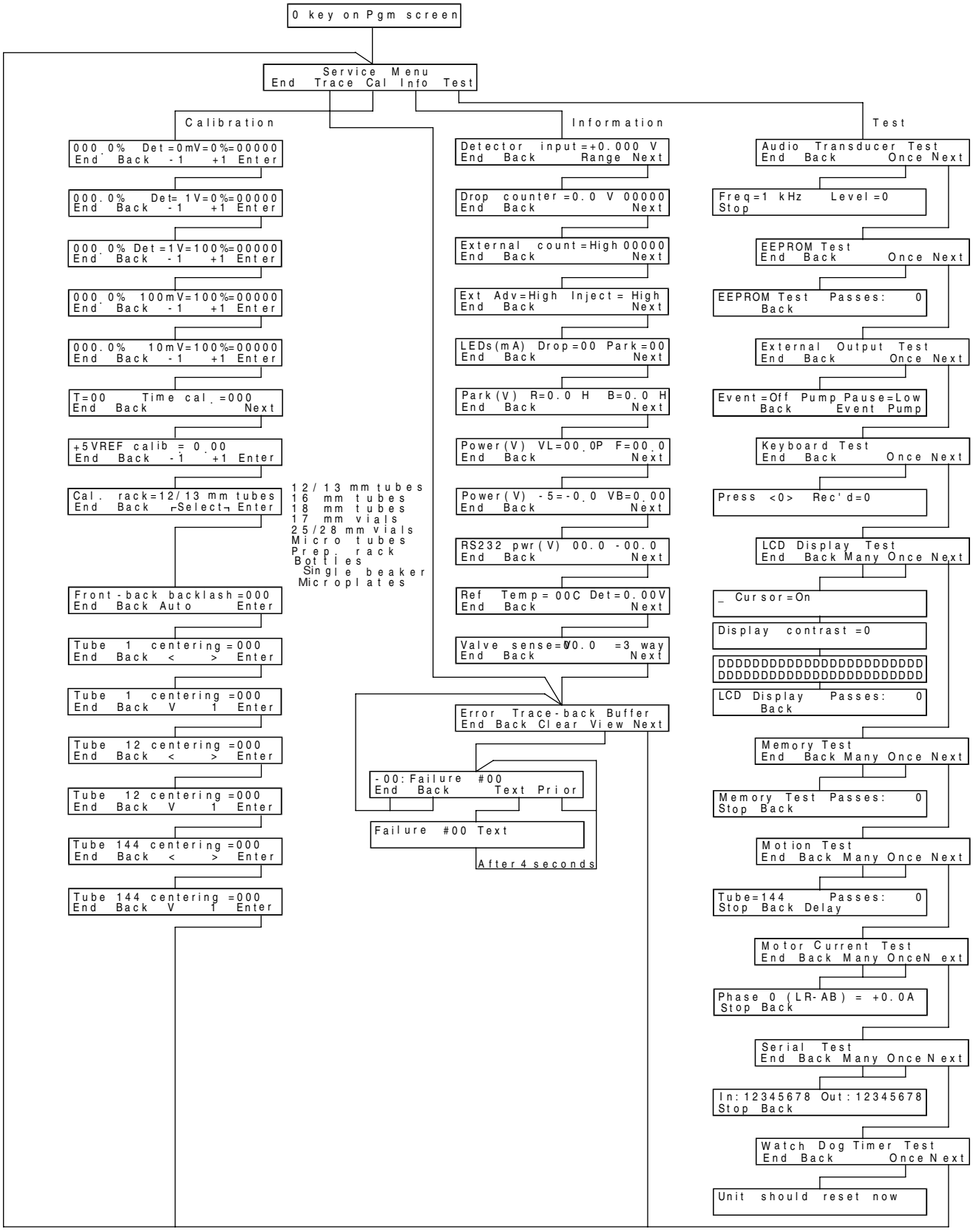


Figure 7-15 Service Features Flowchart, Part 2

Foxy Jr. Fraction Collector

Appendix A Replacement Parts List

A.1 Replacement Parts

Replacement parts are called out in the following pages. Refer to the call-out in the adjacent table to determine the part number for the item.

Replacement parts can be purchased by contacting Teledyne Isco's Customer Service Department.

Teledyne Isco, Inc.
Customer Service Department
P.O. Box 82531
Lincoln, NE 68501 USA

Phone: (800) 228-4373
(402) 464-0231
FAX: (402) 465-3022

E-mail: IscoInfo@teledyne.com

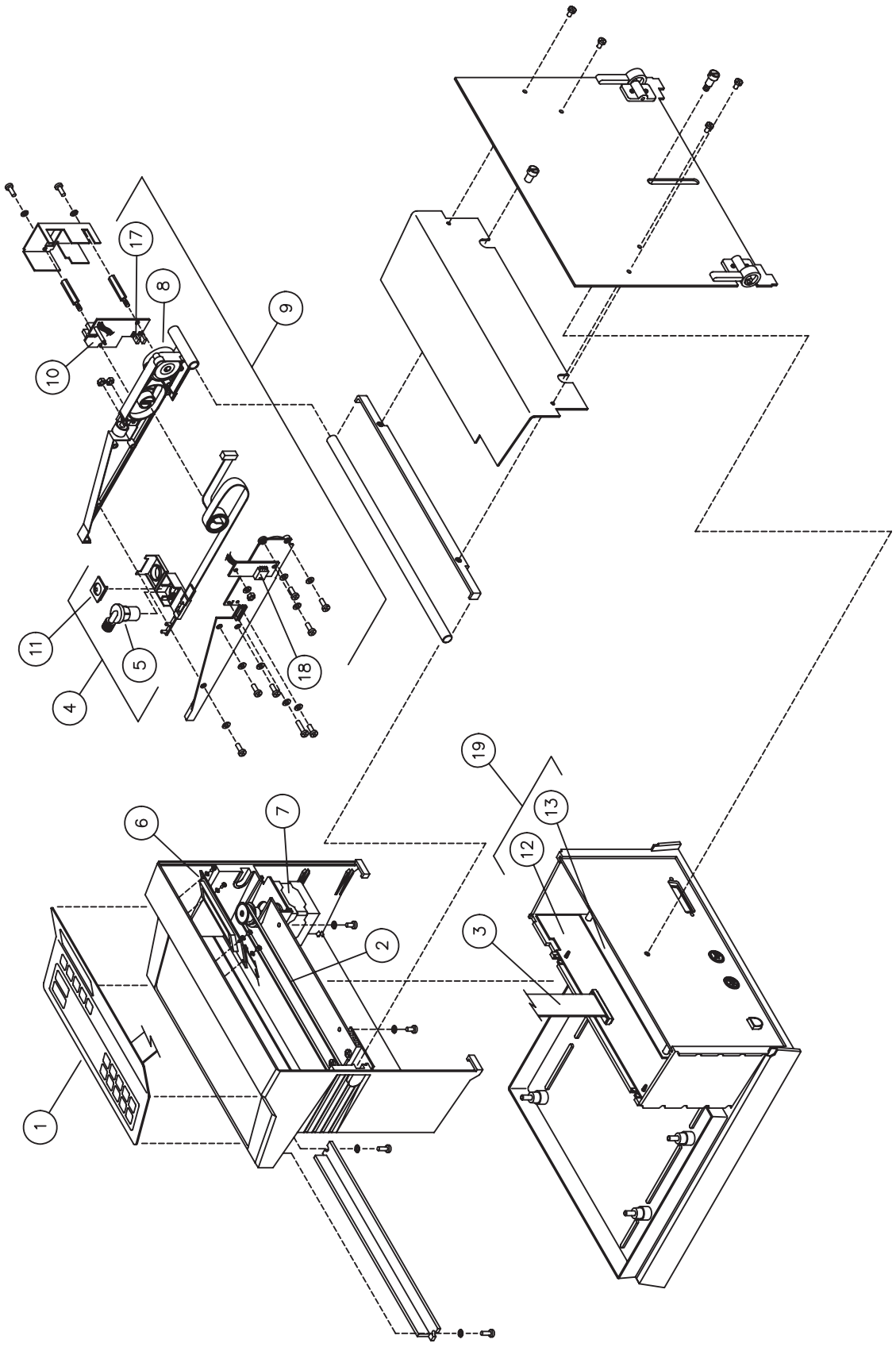
A.2 Purchasing Replacement Parts

Only the parts specified in Appendix A Replacement Parts List are stocked for immediate delivery by Teledyne Isco. Virtually all other parts are also available, but there may be a delay in shipping them because they are not normally kept in stock.

The following illustrations show the parts available for immediate delivery. Each replacement part is assigned an item number on the drawings. Use this item number to match the description and order number in Appendix A.

When ordering replacement parts, please supply the following information:

1. Series number of the instrument
2. Item number from the Replacement Parts List
3. Part number from the Replacement Parts List


17
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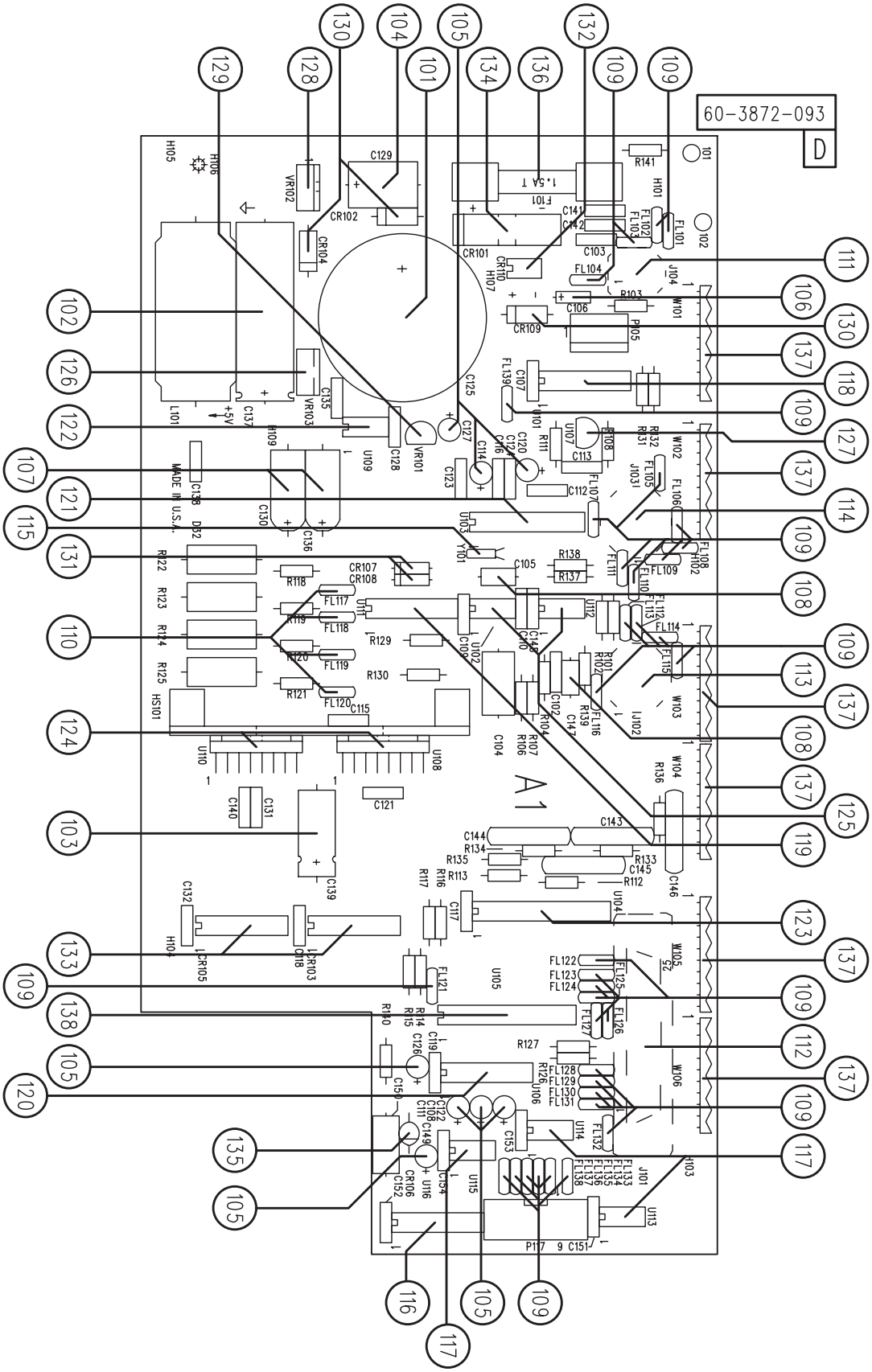
1

REPLACEMENT PARTS LIST
Teledyne Isco, Inc.

DWG. NO.: 60-3872-002
SHEET: 2 OF 2
REV.: G DATE: 05213

ITEM NO.	PART NUMBER	DESCRIPTION
1	69-3873-024	LABEL
2	209-0030-14	TIMING BELT
3	60-3874-014	ARM RIBBON CABLE ASSEMBLY
4	60-3874-089	DROP COUNTER ASSEMBLY
5	60-3878-009	DROP FORMER ASSEMBLY
6	60-3874-046	DISPLAY ASSEMBLY
7	60-3874-044	LEFT/RIGHT MOTOR ASSEMBLY
8	60-3874-006	FRONT/BACK MOTOR ASSEMBLY
9	60-3874-087	ARM ASSEMBLY
10	60-3874-075	FOXY JR. ARM CBA
11	60-3874-019	DROP COUNTER CIRCUIT BOARD ASSEMBLY
12	60-3874-048	MAIN CBA
13	60-3874-049	POWER CBA
14	60-1614-091	117V TRANSFORMER ASSEMBLY
15	60-1614-092	100V TRANSFORMER ASSEMBLY
16	60-3874-053	234V TRANSFORMER ASSEMBLY
17	319-0003-91	SENSOR EE-SX1103
18	140-9005-04	SOCKET 4 PIN RIGHT ANGLE
19	60-3874-052	TESTED CIRCUIT BOARD SET

Note: 1. For current prices and quotations on parts, contact Teledyne Isco Service Department, (800) 228-4373
2. This list is subject to change without notice.


60-3872-093
D
A1

REPLACEMENT PART LIST

POWER CIRCUIT BOARD

DWG NO: 60-3872-093
SHEET: 2 OF 3
REV: D DATE: 03069

ITEM NO	PART NUMBER	REFERENCE DESIGNATION	DESCRIPTION
101	110-5612-00	C125	CAP 12000uF 35VDC
102	110-6305-00	C137	CAP 500uF 50VDC
103	110-6310-00	C139	CAP 100uF 50VDC
104	110-6342-00	C129	CAP 30uF 50VDC
105	112-6010-00	C108 C111 C114 C120 C122	CAP 10uF 25VDC
		C126 C127 C149	
106	112-7510-00	C106	CAP 1.0uF 35VDC
107	112-7580-00	C130 C136	CAP 15uF 35VDC
108	119-0306-00	C105 C147	CAP 100pF 600VDC
109	120-0015-00	FL101 FL102 FL103 FL104 FL105	FILTER EMI 10000 pFD
		FL106 FL107 FL108 FL109 FL110	
		FL111 FL112 FL113 FL114 FL115	
		FL116 FL121 FL122 FL123 FL124	
		FL125 FL126 FL127 FL128 FL129	
		FL130 FL131 FL132 FL133 FL134	
		FL135 FL136 FL137 FL138 FL139	
110	120-0015-01	FL117 FL118 FL119 FL120	FILTER EMI 1000 pFD
111	141-1001-01	J104	SKT 3 PIN
112	141-9002-25	J101	SKT 25 PIN D-SUB
113	141-9018-06	J102	SKT 6 PIN DIN
114	141-9018-08	J103	SKT 8 PIN DIN
115	170-1000-12	Y101	XTAL 32.768 KHZ
116	270-1105-02	U116	IC 74HC4040
117	270-1300-45	U113 U114 U115	IC LTC485CN8
118	270-1400-02	U101	IC 4051B
119	270-1400-05	U111	IC 4053B
120	270-1500-08	U106	IC RT MAX232
121	270-1600-28	U103	IC ADC CS5507
122	270-1600-29	U109	IC CONV 7662
123	270-1900-11	U104	IC CMPTR MAX516

NOTE: This list subject to change without notice.

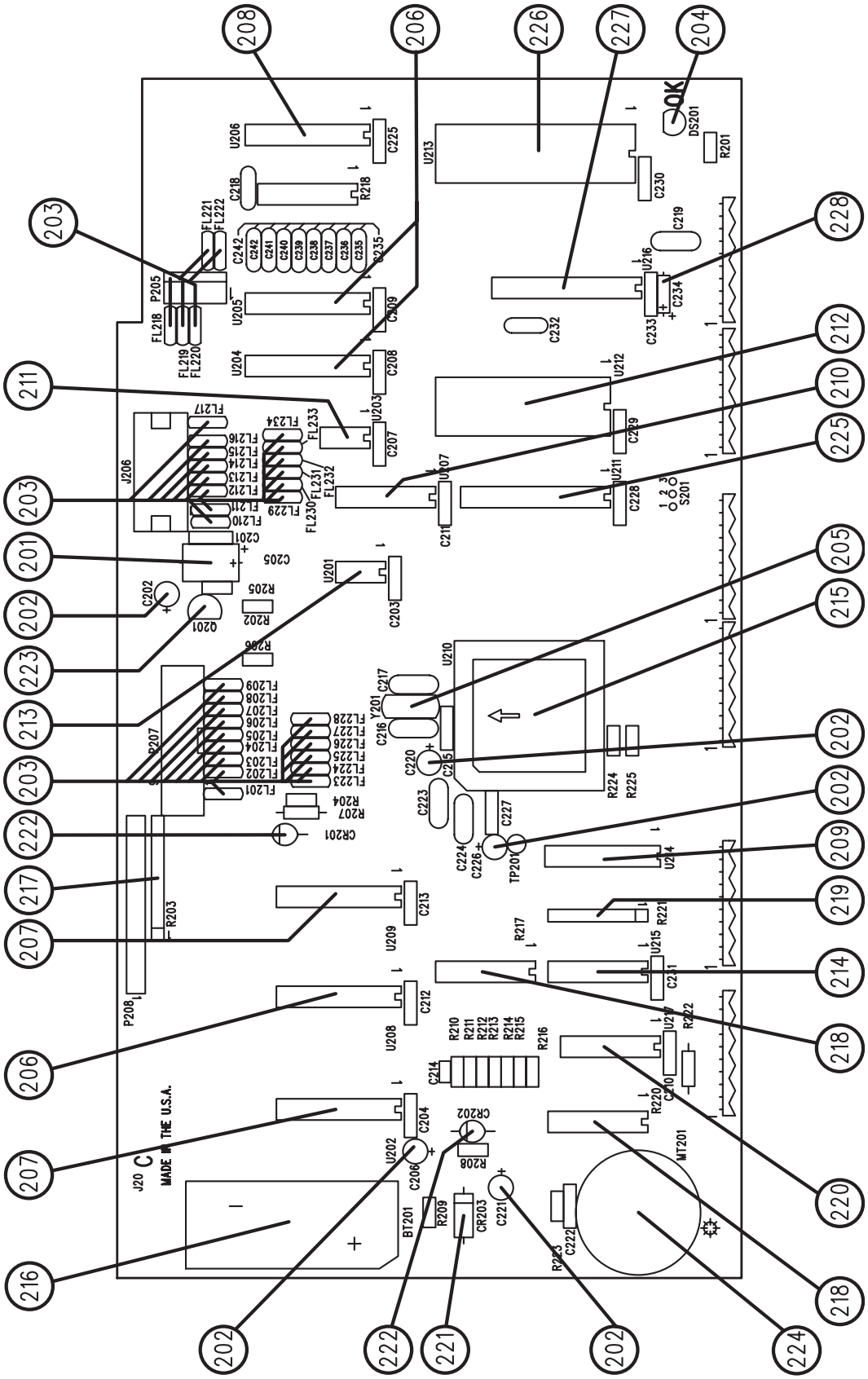
REPLACEMENT PART LIST

POWER CIRCUIT BOARD

DWG NO: 60-3872-093
SHEET: 3 OF 3
REV: D DATE: 03069

ITEM NO	PART NUMBER	REFERENCE DESIGNATION	DESCRIPTION
124	270-2000-01	U108 U110	IC L298
125	279-0022-00	U102 U112	IC 308A OR IC OP-07DP
126	279-0201-05	VR103	IC VR 7815C/340T
127	279-0205-07	U107	IC VREF 336 2.5V
128	279-0205-08	VR102	IC VR 2575T-5.0
129	342-0001-01	VR101	IC VR ML79L05ACP
130	400-0158-19	CR102 CR104 CR109	DIO 1N5819
131	400-2152-21	CR107 CR108	DIO ZENER 3V 1N5225B
132	401-0000-02	CR110	RECT BRDG 1A 200V
133	400-0720-00	CR103 CR105	IC SP720
134	401-0008-00	CR101	DIO KBU8D
135	401-0150-00	CR106	DIO 1N5060
136	411-0311-56	F101	FUSE FUSE 1.5A SB
137	480-8599-01	W101 W102 W103 W104 W105	CABLE RBBN 10 LEAD X 4"
		W106	
138	60-3875-004	U105	IC PLD MOD WHEN ORDERING THIS PART, GIVE THE 9-DIGIT PART NUMBER AND THE PROGRAM REVISION LETTER FROM THE PARTS LABEL.

NOTE: This list subject to change without notice.


208
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OK
DS201
R201
U206
C225
U213
C230
C218
R218
FL221
FL222
C242
C241
C240
C239
C238
C237
C236
C235
C219
U216
C234
P205
FL218
FL219
FL220
U205
C209
C232
C233
U204
C208
U212
U203
C207
C229
FL217
FL234
FL233
FL216
FL215
FL214
FL213
FL212
FL211
FL210
FL229
FL231
FL232
FL230
U207
C211
U211
C228
S201
C201
C205
U201
C203
C202
R205
R202
Q201
R206
U210
C217
Y201
C216
C220
C215
C223
C227
C224
C226
TP201
R224
R225
FL209
FL208
FL207
FL206
FL205
FL204
FL203
FL202
FL201
C207
R207
R204
CR201
U214
R203
C213
U209
R217
R221
U215
C211
P208
C212
U208
R210
R211
R212
R213
R214
R215
R216
U217
R222
C214
R220
C210
J20
MADE IN THE U.S.A.
CR202
C204
U202
C206
R208
MT201
BT201
R209
CR203
C221
R223
C222

REPLACEMENT PART LIST	MAIN CIRCUIT BOARD	DWG NO: 60-3872-138 SHEET: 2 OF 3 REV: B DATE: 00320

ITEM NO	PART NUMBER	REFERENCE DESIGNATION	DESCRIPTION
201	112-3522-00	C205	CAP 22uF 15VDC
202	112-6010-00	C202 C206 C220 C221 C226	CAP 10uF 25VDC
203	120-0015-00	FL201 FL202 FL203 FL204 FL205	FILTER EMI 10000 pFD
		FL206 FL207 FL208 FL209 FL210	
		FL211 FL212 FL213 FL214 FL215	
		FL216 FL217 FL218 FL219 FL220	
		FL221 FL222 FL223 FL224 FL225	
		FL226 FL227 FL228 FL229 FL230	
		FL231 FL232 FL233 FL234	
204	130-0004-00	DS201	LED MV5753 RED
205	170-1000-05	Y201	XTAL 12.0000 MHZ
206	270-0211-10	U204 U205 U208	IC 74HCT574
207	270-0305-02	U202 U209	IC 74HCT244
208	270-0774-57	U206	IC 74HCT573
209	270-0803-01	U214	IC 2803
210	270-1174-40	U207	IC 74HC4040
211	270-1693-46	U203	IC MEM 93C46N
212	270-1300-30	U212	IC 6264LP-12
213	270-1300-39	U201	IC MAX1232CPA
214	270-1400-02	U215	IC 4051B
215	279-1000-00	U210	IC PRCSR 80C196KB
216	340-2012-02	BT201	BATTERY 2.4VDC
217	373-4010-60	R203	RES 9 X 10K
218	379-5001-71	R217 R220	RES 8 X 10K
219	379-5039-60	R221	RES 4 X 39K
220	400-0720-00	U217	IC SP720AP
221	400-0158-17	CR203	DIO 1N5817 SHOTTKY
222	401-0150-00	CR201 CR202	DIO 1N5060
223	402-0014-00	Q201	XSTR NPN MPS-A14

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

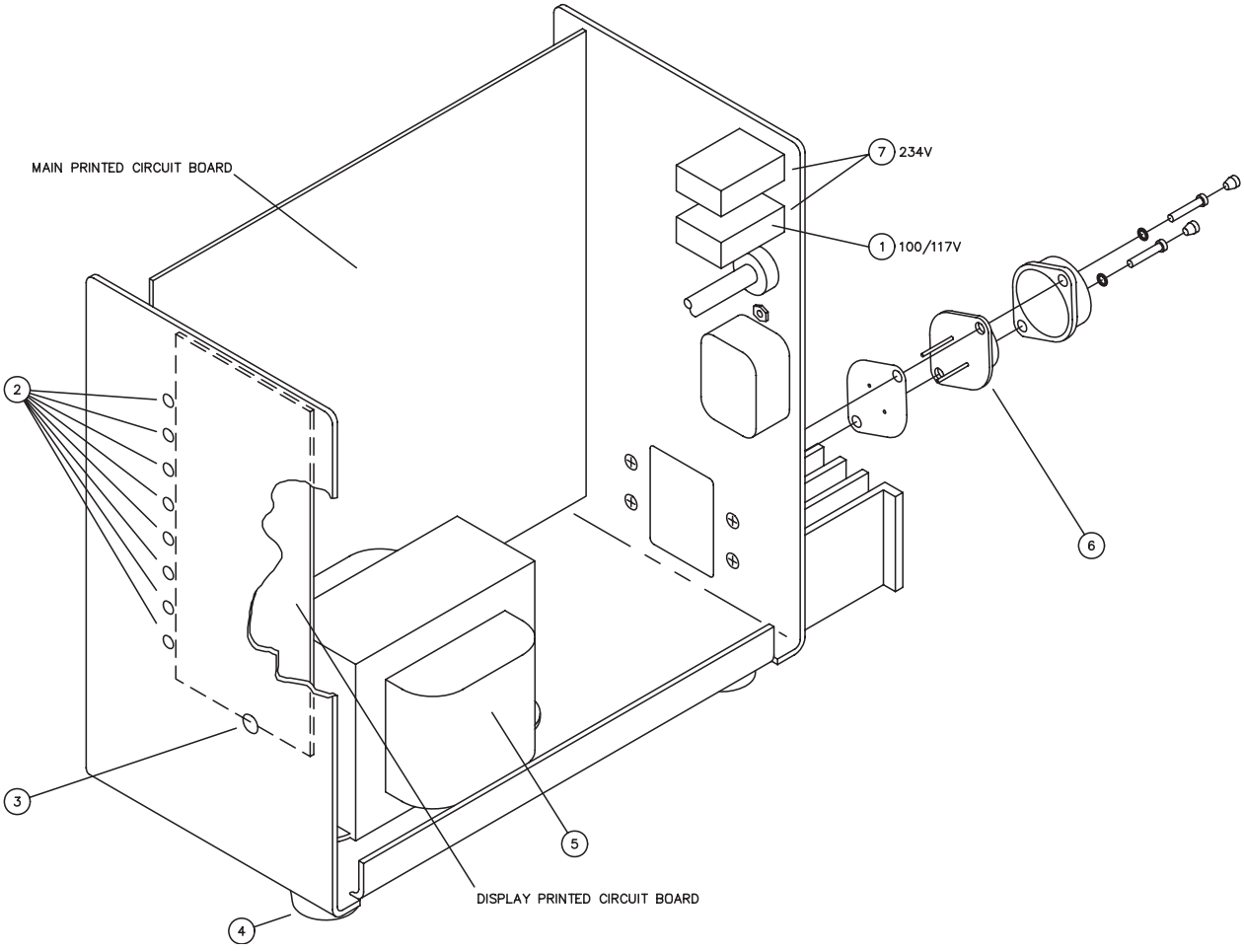
REPLACEMENT PART LIST

MAIN CIRCUIT BOARD

DWG NO: 60-3872-138
SHEET: 3 OF 3
REV: B DATE: 00320

ITEM NO	PART NUMBER	REFERENCE DESIGNATION	DESCRIPTION
224	490-0050-03	MT201	XDCR AUDIO
225	60-3875-003	U211	IC PLD MOD WHEN ORDERING THIS PART, GIVE THE 9-DIGIT PART NUMBER AND THE PROGRAM REVISION LETTER FROM THE PARTS LABEL.
226	60-3875-011	U213	IC EPROM MOD WHEN ORDERING THIS PART, GIVE THE 9-DIGIT PART NUMBER AND THE PROGRAM REVISION LETTER FROM THE PARTS LABEL.
227	60-3875-012	U216	IC PLD MOD WHEN ORDERING THIS PART, GIVE THE 9-DIGIT PART NUMBER AND THE PROGRAM REVISION LETTER FROM THE PARTS LABEL.
228	112-7510-01	C234	CAP 1UF TAN 35WVDC

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

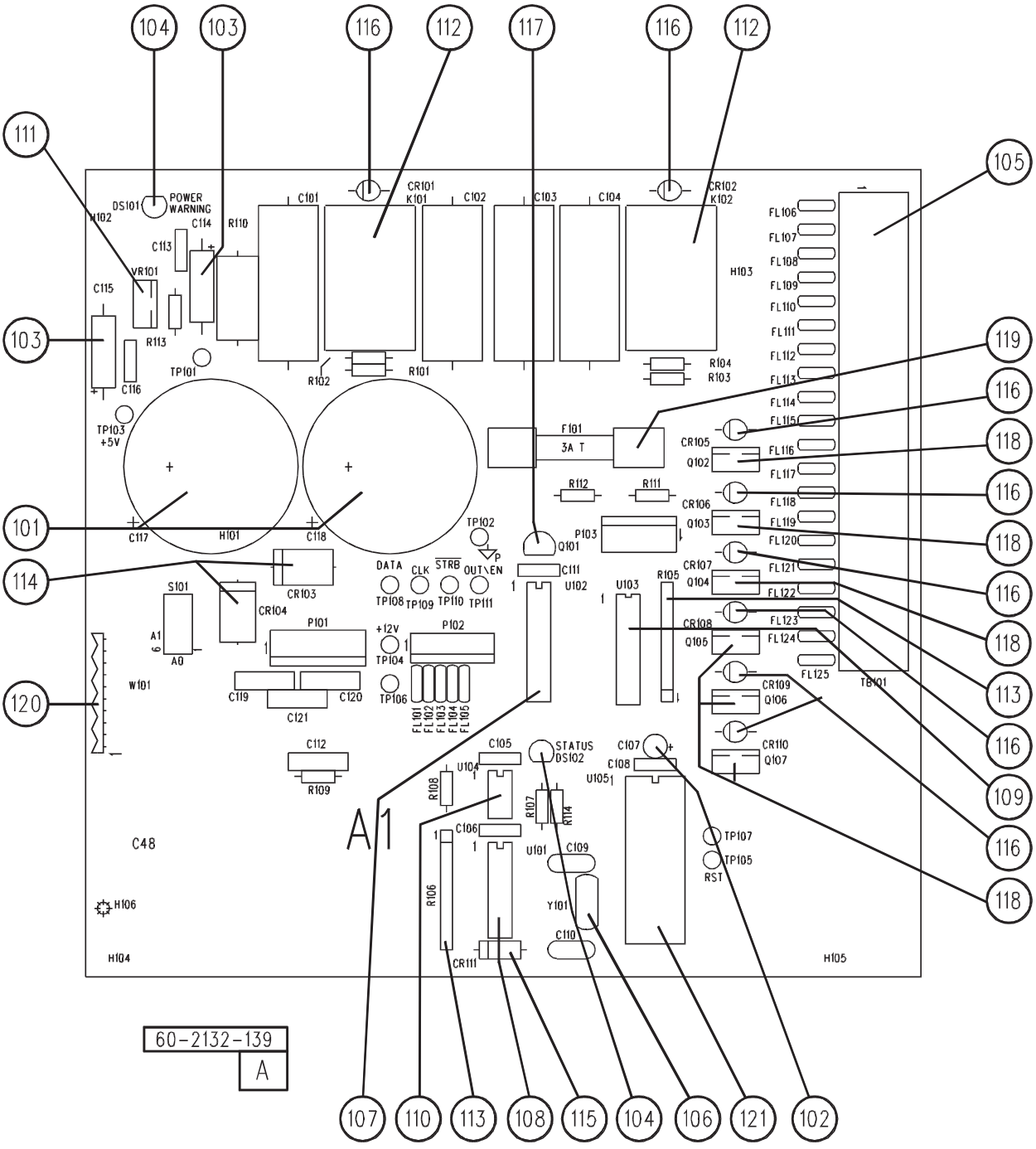

MAIN PRINTED CIRCUIT BOARD
7 234V
1 100/117V
2
6
3
5
DISPLAY PRINTED CIRCUIT BOARD
4

REPLACEMENT PARTS LIST
Isco, Inc.

DWG. NO.: 60–2132–141
SHEET: 2 OF 2
REV.: C DATE: 97020

ITEM NO.	PART NUMBER	DESCRIPTION
1	412–0250–13	CIRCUIT BREAKER 1A (100/117 VAC VERSIONS)
2	321–0000–01	RED LENS (SMALL)
3	321–0000–03	RED LENS (LARGE)
4	109–0043–00	FOOT
5	69–2133–403	TRANSFORMER
6	279–0200–08	VR LT1084CK
7	412–0250–06	CIRCUIT BREAKER (234 VAC VERSIONS)

Note: 1. For current prices and quotations on parts, contact Isco Service Department, (800) 228–4250
2. This list is subject to change without notice.



CE VALVE CONTROLLER CIRCUIT BOARD

REPLACEMENT PART LIST
Isco, Inc

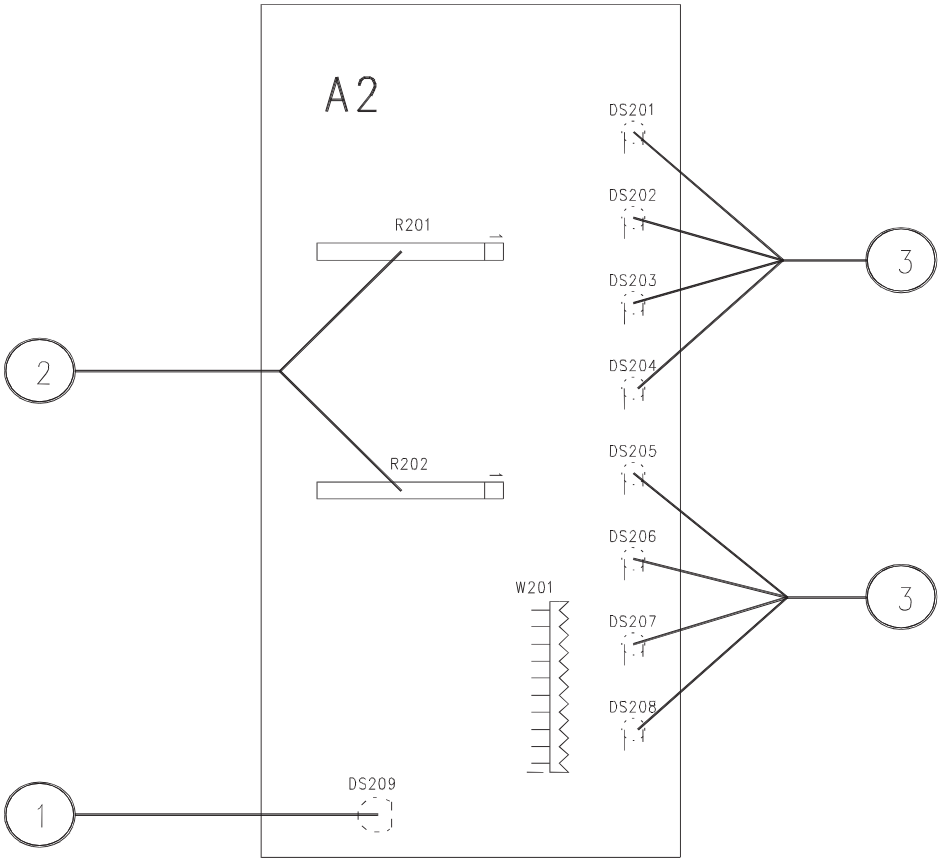
VALVE CONTROLLER CIRCUIT BOARD

DWG NO: 60-2132-139
SHEET: 2 OF 2
REV: A DATE: 94021

ITEM NO	PART NUMBER	REFERENCE DESIGNATION	DESCRIPTION
101	110-6382-00	C117 C118	CAP 8200uF 50VDC
102	112-6010-00	C107	CAP 10uF 25VDC
103	112-7520-00	C114 C115	CAP 2.2uF 35VDC
104	130-0004-00	DS101 DS102	LED MV5753 RED
105	143-2020-00	TB101	TERMINAL BLOCK 20 POS
106	170-1000-05	Y101	XTAL 12.0000 MHZ
107	270-0305-01	U102	IC 74LS240
108	270-0307-00	U101	IC 4049B
109	270-0329-81	U103	IC 2981
110	270-1300-39	U104	IC MAX1232
111	279-0201-00	VR101	IC VR 7805
112	360-1012-02	K101 K102	RLY SPDT 12VDC 3A
113	373-4010-60	R105 R106	RES 9 X 10K
114	400-0154-00	CR103 CR104	DIO 1N5400
115	400-0158-17	CR111	DIO 1N5817
116	401-0150-00	CR101 CR102 CR105 CR106 CR107	DIO 1N5060
		CR108 CR109 CR110	
117	402-0237-01	Q101	XSTR 2N3704
118	402-9120-01	Q102 Q103 Q104 Q105 Q106	XSTR MTP15N06
		Q107	
119	411-0311-70	F101	FUSE 3A SB
120	480-8599-01	W101	CABLE RBBN 10 LEAD X 4"
121	*	U105	PRCSR MOD

* WHEN ORDERING THIS PART, GIVE THE 9-DIGIT PART NUMBER AND THE PROGRAM REVISION LETTER FROM THE PARTS LABEL.

NOTE: 1. For current prices and quotations on parts, contact Isco Service Department, (800) 228-4250.
2. This list subject to change without notice.



DISPLAY CIRCUIT BOARD

REPLACEMENT PART LIST
Isco, Inc

DISPLAY CIRCUIT BOARD

DWG NO: 60-2132-142
SHEET: 2 OF 2
REV: DATE: 94042

ITEM NO	PART NUMBER	REFERENCE DESIGNATION	DESCRIPTION
1	130-0004-00	DS209	LED MV5753 RED
2	379-5001-60	R201 R202	RES 9 X 1K
3	400-9130-20	DS201 DS202 DS203 DS204 DS205	LED HLMP-1302 RED
		DS206 DS207 DS208	

NOTE: 1. For current prices and quotations on parts, contact Isco Service Department, (800) 228-4250.
2. This list subject to change without notice.

Foxy Jr. Fraction Collector

Index

S

T

V

RADIO INTERFERENCE STATEMENT

FCC

NOTE: 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 case 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 matériel 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 Boards	X	O	O	O	O	O
小键盘 Keypad	X	O	O	O	X	O
显示 Display	X	O	O	O	O	O
步进电机 Stepper Motor	X	O	O	O	X	O
内部电缆 Internal Cables	X	O	O	O	X	O
外部电缆 External Cables	X	O	O	O	X	O
变压器 Transformer	X	O	O	O	X	O
接线 Wiring	O	O	O	O	X	O
主电源线 Line Cord	O	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:	Foxy Valve Controller/V Cont
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 - 8kV air discharge	B B
EN61000-4-3	Radiated RF Immunity	80 MHz to 1000MHz 80% AM at 1kHz Level 1 - 1 V/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, 1V 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 June 20, 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

60-2132-163
Rev. D

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:	Foxy Jr.
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 - 8kV air discharge	B B
EN61000-4-3	Radiated RF Immunity	80 MHz to 1000MHz 80% AM at 1kHz Level 1 - 3 V/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, 1V 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	Group1, 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 April 3, 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

60-3872-095
Rev E

*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