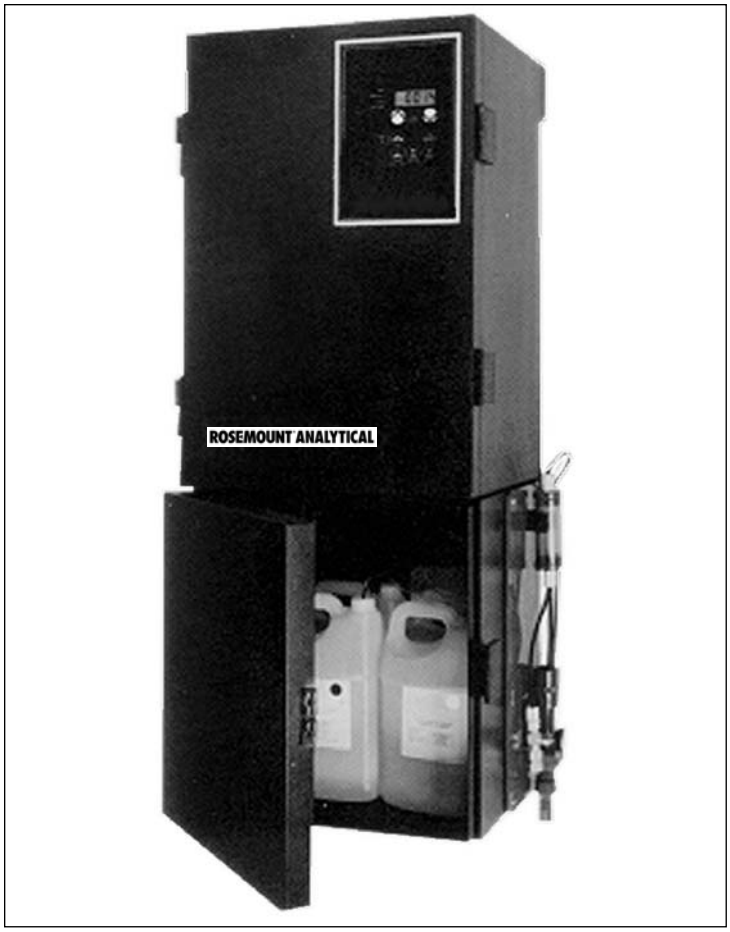
Instruction Manual
PN 51-CFA3000ISE/rev.F
December 2013

CFA-3000

Ion Selective Electrode (ISE) Analyzer



ROSEMOUNT® Analytical

EMERSON. Process Management

ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Your purchase from Rosemount Analytical, Inc. has resulted in one of the finest instruments available for your particular application. These instruments have been designed, and tested to meet many national and international standards. Experience indicates that its performance is directly related to the quality of the installation and knowledge of the user in operating and maintaining the instrument. To ensure their continued operation to the design specifications, personnel should read this manual thoroughly before proceeding with installation, commissioning, operation, and maintenance of this instrument. If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

- Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.
- Ensure that you have received the correct model and options from your purchase order. Verify that this manual covers your model and options. If not, call 1-800-854-8257 or 949-757-8500 to request correct manual.
- For clarification of instructions, contact your Rosemount representative.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Use only qualified personnel to install, operate, update, program and maintain the product.
- Educate your personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in the Installation section of this manual. Follow appropriate local and national codes. Only connect the product to electrical and pressure sources specified in this manual.
- Use only factory documented components for repair. Tampering or unauthorized substitution of parts and procedures can affect the performance and cause unsafe operation of your process.
- All equipment doors must be closed and protective covers must be in place unless qualified personnel are performing maintenance.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

WARNINGS

RISK OF ELECTRICAL SHOCK

⧈ Equipment protected throughout by double insulation.

- Installation of cable connections and servicing of this product require access to shock hazard voltage levels.
- Main power and relay contacts wired to separate power source must be disconnected before servicing.
- Do not operate or energize instrument with case open!
- Signal wiring connected in this box must be rated at least 240 V.
- Non-metallic cable strain reliefs do not provide grounding between conduit connections! Use grounding type bushings and jumper wires.
- Unused cable conduit entries must be securely sealed by non-flammable closures to provide enclosure integrity in compliance with personal safety and environmental protection requirements. Unused conduit openings must be sealed with NEMA 4X or IP65 conduit plugs to maintain the ingress protection rating (NEMA 4X).
- Electrical installation must be in accordance with the National Electrical Code (ANSI/NFPA-70) and/or any other applicable national or local codes.
- Operate only with front and rear panels fastened and in place over terminal area.
- Safety and performance require that this instrument be connected and properly grounded through a three-wire power source.
- Proper relay use and configuration is the responsibility of the user.

CAUTION

This product generates, uses, and can radiate radio frequency energy and thus can cause radio communication interference. Improper installation, or operation, may increase such interference. As temporarily permitted by regulation, this unit has not been tested for compliance within the limits of Class A computing devices, pursuant to Subpart J of Part 15, of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense, will be required to take whatever measures may be required to correct the interference.

WARNING

This product is not intended for use in the light industrial, residential or commercial environments per the instrument's certification to EN50081-2.

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CFA-3000 ISE Analyzer
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SECTION 1
INTRODUCTION

The Rosemount Analytical CFA-3000 Series analyzers are designed for minimum maintenance and maximum reliability. The touch of a button starts the microprocessor-controlled program, calibrates the analyzer, keeps it calibrated, and reports results directly - unattended - for months at a time. Maintenance is simplified by a modular design with special fittings, labeled tubing, and color-coded components.

The CFA-3000 Series includes analyzers for parameters commonly measured using Ion Selective Electrode (ISE) technology including sodium, fluoride and chloride. Sample concentration is clearly indicated on the digital display panel, and output signals are provided to drive recorders, alarms, or other external devices such as printers or computers. The specific chemistry of your individual analyzer is discussed in **Appendix A, Chemistries**, or in an accompanying method sheet..

Your purchase from Rosemount Analytical provides you with one of the finest instruments available for your particular application. These instruments have been designed and tested to meet many national and international standards. Experience indicates that its performance is directly related to the quality of the installation and knowledge of the user in operating and maintaining the instrument.

1.1 Thoroughly Read This Manual

This instruction manual describes installation, operation, and maintenance of the **CFA-3000 ISE Analyzer.** To ensure continued operation to the design specifications, personnel should read this manual thoroughly before proceeding with installation, operation, or maintenance of the analyzer.

- Ensure that you have received the correct model and options from your purchase order. Verify that this manual covers your model and options. If not, call: **1-800-854-8257 or 949-757-8500** to request the correct manual.
- For any inquiries about your analyzer, contact your Rosemount Analytical representative.
- Failure to follow the documented instructions may cause any one of the following situations to occur: damage to this instrument and warranty invalidation.
- Follow all warnings, cautions, and instructions supplied with the product.
- Only qualified personnel should install, operate, update, program, and maintain the product.
- All personnel must learn proper installation, operation, and maintenance of the product.
- Install, operate, and maintain equipment exactly as specified in this manual.
- Follow appropriate local and national codes.
- Only connect the analyzer to electrical sources specified in this manual.
- Use only components supplied by Rosemount Analytical or recommended by them for replacement. Tampering or unauthorized substitution of parts and procedures may affect the performance of the analyzer as well as void the warranty.
- All protective covers must be in place and cabinet panels must be closed at all times after installation or maintenance.

1.2 Analyzer Benefits

Rosemount Analytical listened to you and decided to move away from a peristaltic pump assembly requiring monthly replacement of the pump tubing. The new pump assembly has a vacuum/pressure valve system which eliminates pump tubing and used significantly less reagent. Since the new valve pump swiftly moves fluids through the analyzer, the potential for clogging within any internal component is reduced. Significantly. As a result, maintenance is required less frequently and procedures such as cleaning flow cells and the mixing system are no longer required.

The upgraded software now identifies a fixed standard that allows one to change the range of the 0-5 V and the 4-20 mA output signals to your requirements.

1.3 WARNING – Electrical Shock Hazard

- Installation of cable connections and servicing of this product require access to shock hazard voltage levels.
- Main power and relay contacts wired to separate power sources must be disconnected before servicing.
- Non-metallic cable strain relief does not provide grounding between conduit connections! Use grounding type bushings and jumper wires.
- Electrical installation must be in accordance with the National Electrical Code (ANSI/NFPA- 70) and/or any other applicable national or local codes.
- Operate only with:
  1. Main console rear cover fastened.
  2. Left side power terminal cover closed.
  3. Keypad assembly latched closed.
- Safety and performance require that this instrument be connected and properly grounded through a three-wire power source.
- Proper configuration and use is the responsibility of the user.

Mark	ID	Description
CE	EN 61010-1	Safety of electrical equipment
	EN 55011	Limits of RF equipment
	EN 50082-1:92	Generic immunity from electrostatic discharge, RF & Fast Transient/Burst Immunity
EtL 9700516		ETL LISTED CONFORMS TO UL STD. 3101-1
EtL		ETL LISTED CERTIFIED TOCAN/CSA C22.2 No. 1010.1-92

SECTION 2
INSTALLING THE ANALYZER

2.0 INSTALLING THE ANALYZER

2.1 UNPACK PARTS

When you receive your new CFA-3000 analyzer, carefully unpack the items in the following list.

- √ Main cabinet
- √ Reagent cabinet
- √ Mounting brackets
- √ Overflow sampler assembly
- √ Waste tube assembly
- √ Accessories pack
- √ Startup reagents
- √ Valve pump assembly (integrated housing includes pump, labeled tubes with straws)

If any of the items are missing or damaged, contact Rosemount Analytical at: our:

Toll-free number: (800) 854-8257

Direct number: (949) 757-8500

Fax: (949) 863-9159

Inspect each piece to confirm that there is no damage or loose parts. If anything is missing or appears broken or damaged, contact Rosemount Analytical at the toll-free phone number above.

After analyzer has been unpacked and all parts accounted for, install as described in following sections. Refer to Figure 2-1 to view a completely installed analyzer.

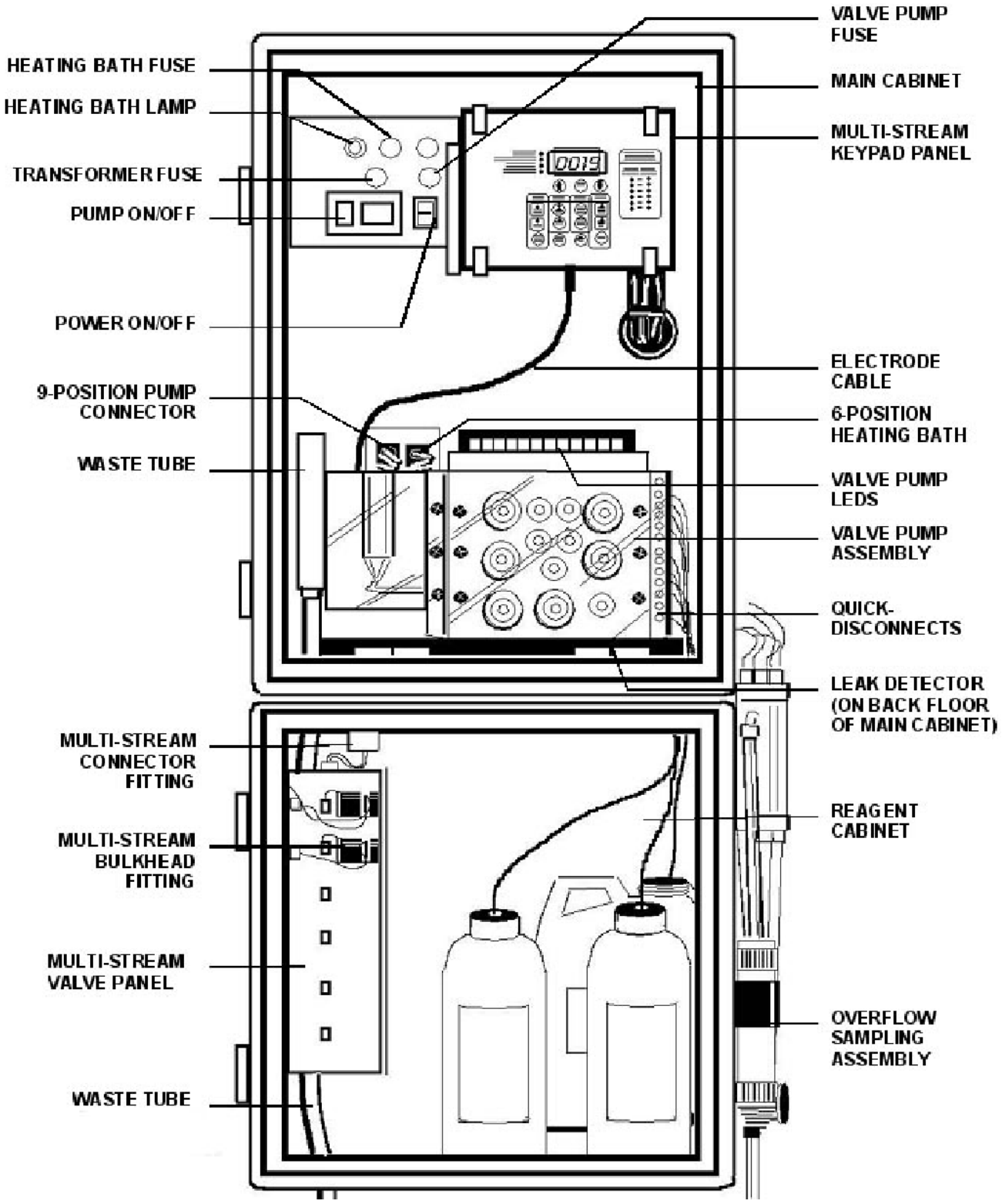


Figure 2-1. Opened Assembled Cabinet

2.2 Mount Main Cabinet

General Recommendations

- **This cabinet is not for outdoor installation.**
- **Environmental conditions of enclosed facility:**
  - **Temperature:**
    min. 50°F to max. 113°F
    (min 10°C – max. 45°C)
    ±10° within regulated range.
  - **Humidity: non-condensing**
- **Mount cabinet on a wall or other suitable vertical surface, at least 42" (107 cm) wide and 43-1/2" (111 cm) off the floor.**
- **Mounting surface must be able to support 250 pounds (113.6 kg).**
- **Allow 1-1/2 feet (.5 m) of clearance at left side of analyzer for access to input/output panel, and allow for swing out for rear access.**
- **Allow 12" (.3 m) at right side for access to overflow tube assembly (if single stream). Mount cabinet level, or with a slight backward tilt for proper leak detector operation.**

To mount main cabinet, proceed as follows (see Figure 2-2):

1. Securely attach supplied "L" brackets to wall using suitable hardware. Brackets must be anchored properly to support 250 pounds (113.6 kg).
2. Attach main cabinet to "L" brackets using supplied four bolts, split ring washers, and hex nuts.

2.3 Mount Reagent Cabinet

To mount reagent cabinet, proceed as follows:

1. Loosen the four bolts in bottom of main cabinet.
2. Lift reagent cabinet and attach to main cabinet by placing heads of bolts into keyhole slots in top of reagent cabinet.
3. Slide reagent cabinet back.
4. Feed grounding strap on bottom of main cabinet through notched hole in left rear corner and attach it to stud on back of reagent cabinet (see Figure 2-3).
5. Tighten screws to attach reagent cabinet to main cabinet.
6. For multi-stream units, plug valve bank cable into positive fit receptacle at left side of cabinet (refer to Figure 7-1, "Multi-stream Valve Panel Connector").

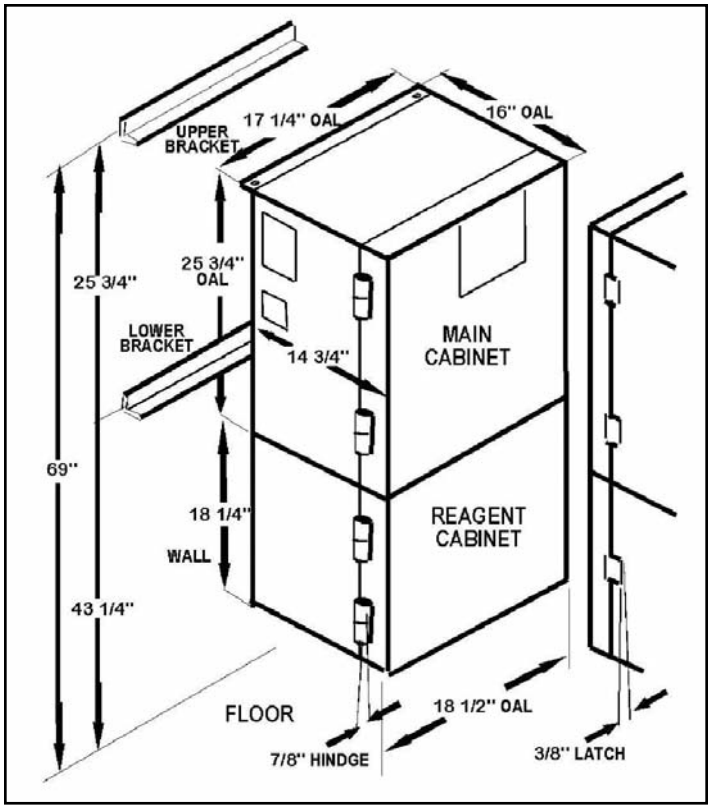


Figure 2-2. Mounting Main and Reagent Cabinets

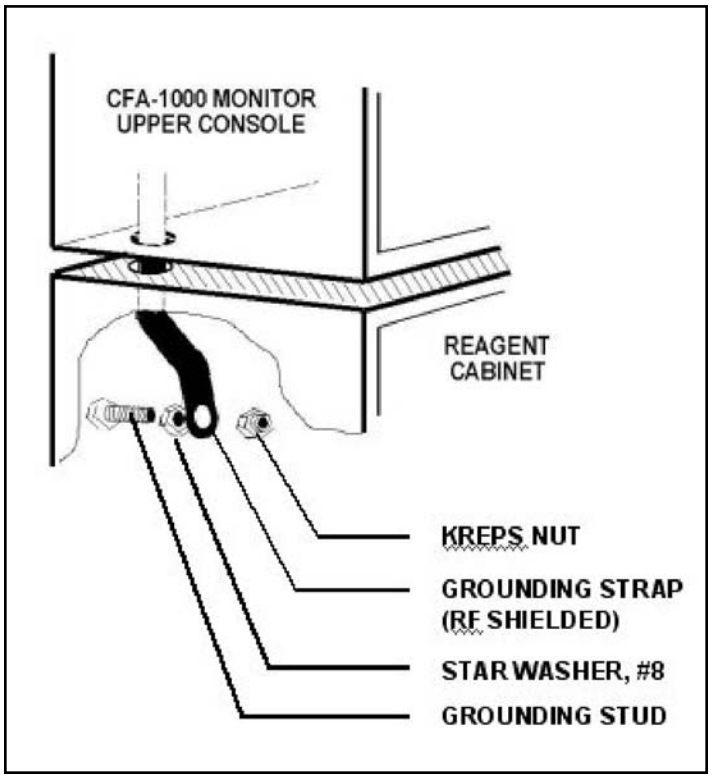


Figure 2-3. Attaching Grounding Strap

2.4 Install Waste Tube

To install waste tube, proceed as follows (refer to Figure 2-1):

1. Guide waste tube through main cabinet into reagent cabinet and out through bottom of reagent cabinet.
2. Secure plastic waste tube in clamp in lower right side of main cabinet.
3. Insert Colorimeter drain tube into waste tube.

2.5 Mount Overflow Sampling Assembly

The Sample intake tube should extend into The overflow tube approximately 1½" – 2" 3.81 –5.08 cm).

To mount overflow sampling assembly proceed as follows (for sample configurations, see Figures 2-4a and 2-4b):

1. Mount overflow sampler assembly on outer, right side of reagent cabinet using the provided four machine screws. For multi-stream units, mount overflow assembly on left side of cabinet. (If using IF-100 In-Line Filter, refer to instruction sheet accompanying filter for complete installation instructions.)
2. Place ends of air vent tubing and overflow waste tubing into waste pipe.
3. Connect waste pipe to drain.
4. Supply sample stream to regulating or intake valve with 1/4" tubing (plastic or steel) as follows: Insert tubing into tube fitting. Make sure tubing rests firmly on shoulder of fitting and nut is finger-tight. Mark nut at 6 o'clock position. While holding fitting body steady with a wrench, tighten nut 1-1/4 turns (go to 9 o'clock position).
5. For multi-stream assembly, connect sample intake line to bulkhead fitting.
6. For single-stream assembly, attach sample intake line to valve pump.
7. Make sure that sample liquid overflows into overflow chamber.

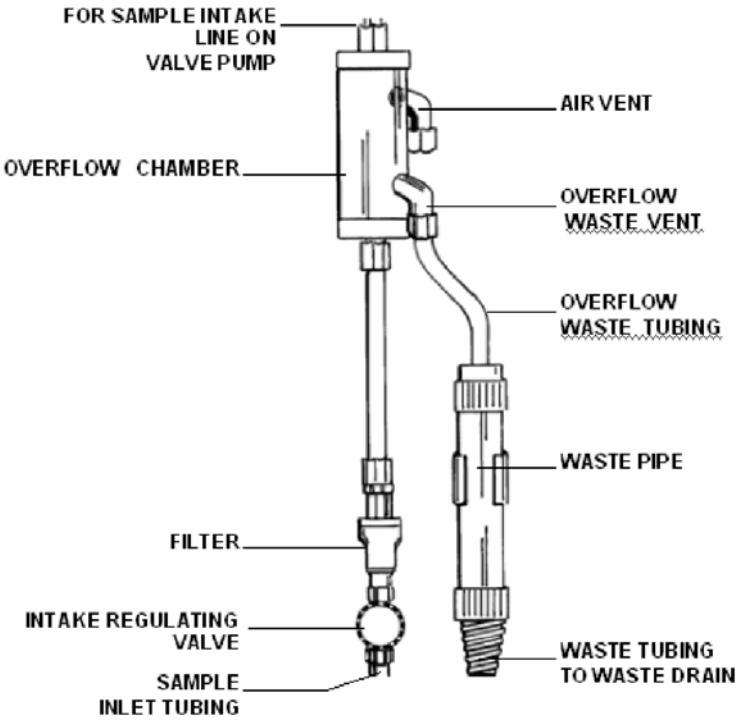


Figure 2-4a. Single-stream Overflow Sampling Assembly

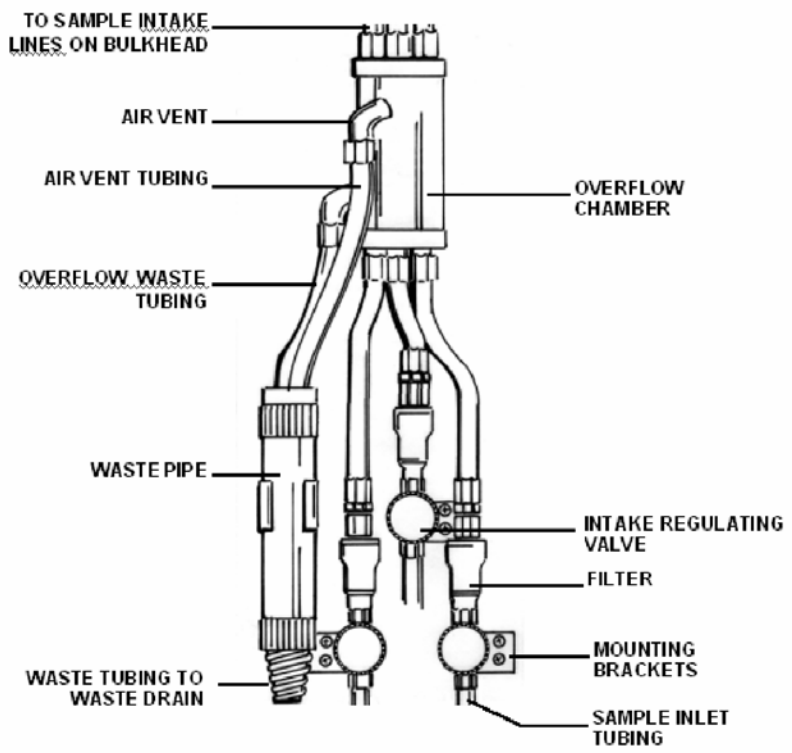


Figure 2-4b. Multi-stream Overflow Sampling Assembly, three-stream option)

2.6 Prepare Electrical Connections

WARNING:

Connect output signals, if any before connecting the power supply.

CAUTION:

- **For proper operation and for safety, electrical connections to this equipment must be made in accordance with local or national electrical code as applicable.**
- **This equipment must be grounded. A qualified electrician should wire this equipment to an electrical circuit.**

Electrical connections are made to and from the cabinet at the input/output panel, located on the left side of the analyzer. See Figure 2-5.

- Terminals are provided for ground, power supply, high/low alarms, output signals, calibration and status relays
- Output signals - a voltage output of 0-5 Vdc and a floating, ungrounded current output of 4-20 mA are available for remote readout or control of a process.
- Also available are contact closures for the following:

High alarm	Calibration
Low Alarm	Leak Alarm

To make electrical connections, proceed as follows:

Use cable glands to hold cables securely in holes above input/output panel.

1. Remove solid caps from the holes above the input/output panel by puncturing with an awl and prying them out. (Note: remove caps only from those holes that will be used.)
2. Replace with permanent connectors.
3. Connect alarms and external computer interfaces (if any).
4. Feed 3-wire power cable into analyzer through hole above the input/output panel.
5. Connect wires to appropriate contacts on Terminal Strip TB3.(See next page)

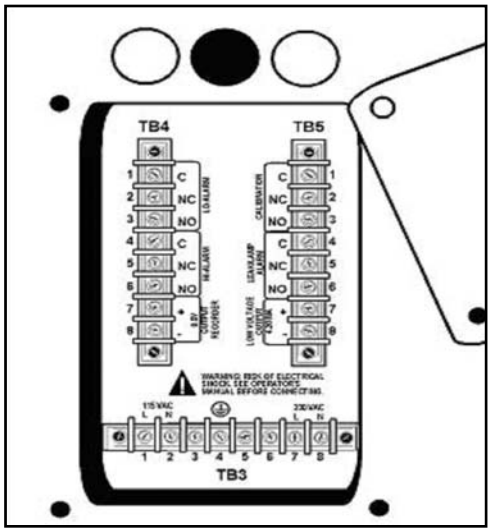


Figure 2-5.
Input/Output Panel

2.7 Install Valve Pump Assembly

The pump assembly has a vacuum pressure system that:

- Eliminates internal pump tubing
- Uses significantly less reagent
- Accurately moves fluids through the analyzer.

Perform the following procedure to install valve pump assembly:

1. Tilt pump assembly towards you.
2. Align the hinge pins and sockets, and slide assembly tray as far as possible to right (see Figure 2-7). Carefully lay tray down into cabinet
3. Plug in the two connectors to the back of the cabinet (6-position connector for heating bath; 9-position connector for pump) (see Figure 2-8).
4. Connect 16-pin connector from pump assembly to small connector on CPU board (yellow ejector) above connector for keypad panel.
5. Attach colorimeter inlet tubing on left side of pump to flowcell inlet (see Figure 2-1).
6. Continue with procedure depending on whether system is single-stream or multi-stream.

For single-stream, continue:

6. Thread tube labeled Sample" through hole 0n bottom of shelf to the right of pump assembly, and out through hole on left side of cabinet.
7. Connect Sample tube to top of overflow sample on left side of cabinet.
8. Guide all other tubes that are attached to valve pump assembly through reagent cabinet access hole.

For multi-stream, continue:

6. Thread Sample tube from pump assembly through reagent access hole on the right side of the valve pump assembly, and connect to Common (C) on #1 multi-stream solenoid valve on left side of reagent cabinet.

Guide all other tubes that are attached to valve pump assembly through reagent cabinet access hole.

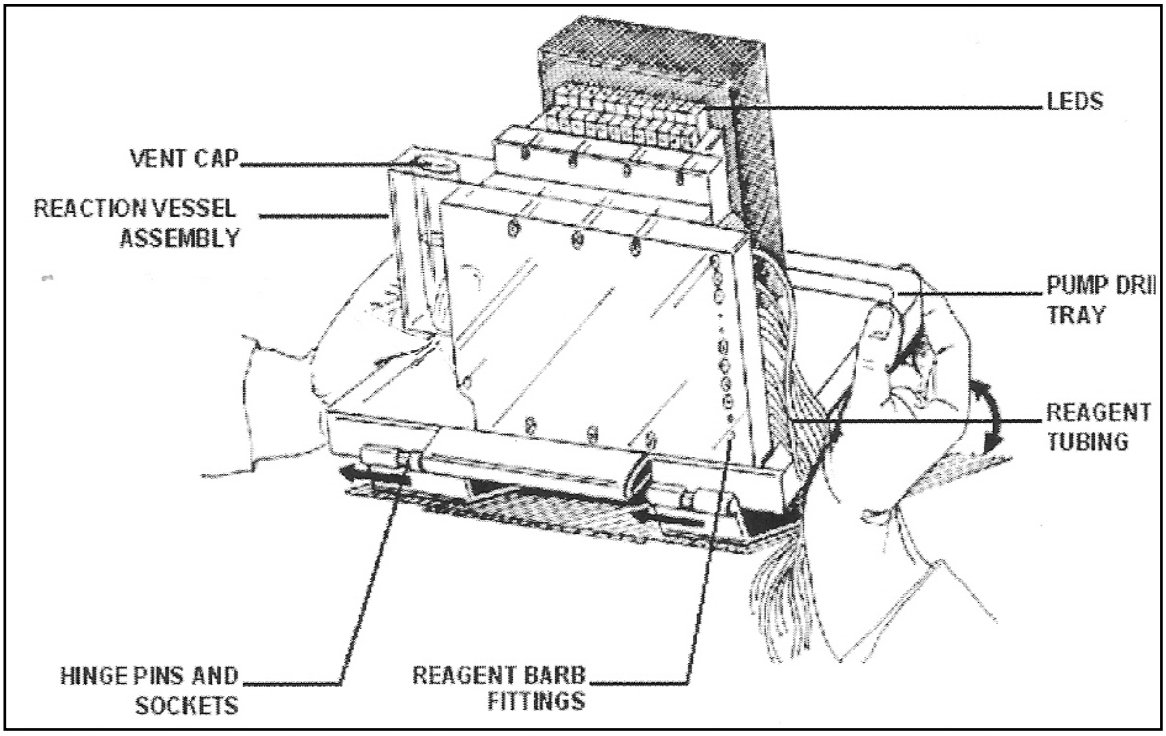


Figure 2-6. Valve Pump Assembly

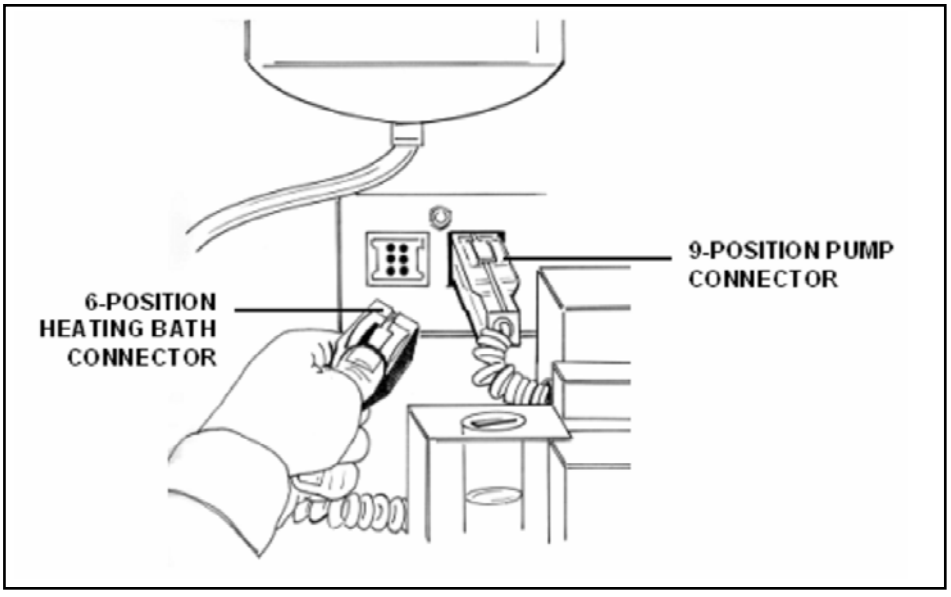


Figure 2-7. Pump Connector

2.8 Prepare Reagent Containers

Prepare reagent containers as follows:

1. Remove screw caps from reagent bottles.
2. Using an awl, make one hole in foil for the reagent straw. Do not allow awl to touch reagent or standards.
3. Place Standard and Reagent bottles into reagent cabinet, as shown in Figure 2-8.
4. Insert color-coded reagent straws and labeled Standard straw leading from valve pump assembly into holes punched in corresponding bottles.

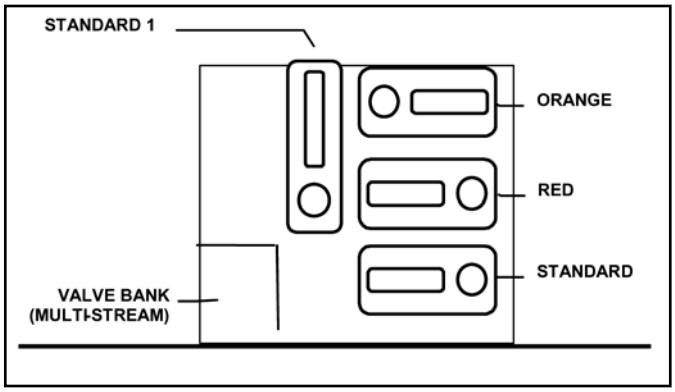


Figure 2-8. Sample Bottle Placement in Cabinet (for all methods; colors refer to reagent straw colors)

SECTION 3
OPERATING THE ANALYZER

3.0 Operating the Analyzer

3.1 Operational Overview

The analyzer uses a batch flow method for automatically analyzing a sample against a fixed standard (refer to block diagram in Figure 3-1). That is, the touch of a button starts the microprocessor-controlled program, calibrates the analyzer, takes measurements of samples, and reports results directly --- unattended---for months at a time.

The automated monitoring program determines the sequence for activating each of the valve pumps in the valve pump assembly to inject air and fluids into the reaction chamber. Each valve pump is associated with a specific input via the quick disconnect connector on the side of the assembly (the number of reagents is determined by your particular chemistry and procedure).For example, the inputs for sodium chemistry would be:

- Buffer or Ionic Strength Adjustor, reagent #1
- Sample
- Grab sample
- Baseline
- Standard
- Air
- Evacuation of chamber
- Re-circulate

For a multi-stream system, solenoid valves in the analyzer reagent cabinet open and close streams for sampling. When sampling, the keypad panel LEDs identify which sample stream (valve number) is associated with the displayed value, and which valve is now open for sampling. Although the system runs samples on its own, you may also perform a manual grab sampling or a manual calibration at any time.

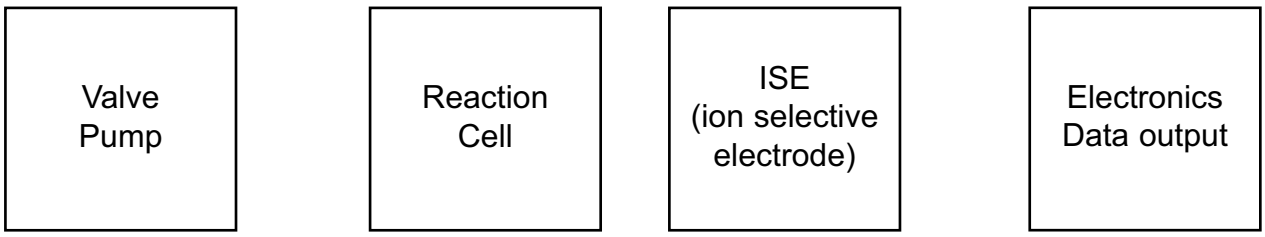


Figure 3-1. Simple Block Diagram

3.2 Check Sample Stream

- Check that the sample intake tube is 1½ to 2 inch (3.81 to 5.08 cm) into the liquid.
- Sample should just overflow the overflow tube. There should be no particulate or bubbles in the tube.

Using a Multi-Stream Overflow Sampler

Multi-stream analysis requires an overflow sampler assembly that will accommodate the extra sample streams. One multi-stream chamber allows for up to three sample streams; for 4 - 6 streams, use two chambers.

The sample tubes connect to solenoid valves in the reagent cabinet. The analyzer uses the valves to cycle through all sample lines, in sequence. First, stream 1 valve is opened, and Valve 1 LED on the keypad panel is lit. When the measurement is complete, Valve 1 will be closed, and Valve 2 is opened to begin sampling stream 2. The keypad panel will show Valve 1 LED lit as the Displayed Stream, and Valve 2 LED is lit for the Selected Stream.

LED's on the valve pump assembly light up when a particular fluid is taken up by the valve pump assembly. Figure 3-2 identifies the valve pump LED designations.

3.2.1 Check Fluidics

Check the following:
- Liquid should overflow in overflow chamber.
- Waste tubing is in waste pipe.
- Sample tube is connected to Overflow Sampler Assembly for single stream; and, for multi-stream, it is connected to Common (C) port of sample solenoid valve #1, on left side of reagent cabinet.
- System has no leaks.

3.2.2 Check Reagents

Check the following:
- One hole has been punched in all reagent cap liners.
- Reagent straws are placed in appropriate reagent containers.
- High and low standard tubing are in appropriate containers.

3.2.3 Turn On Power

1. Open the keypad panel door to expose the circuit boards.
2. Press each board in to ensure proper seating.
3. Simultaneously press Power button on the back wall of upper cabinet and Reset button on the CPU board (yellow ejector), then release.
4. First release the Power button, then the Reset button. The Keypad should display ”H E L O", then four dashes "-- -- -- --".
5. Pull pump forward and check leak detector by dipping finger in tap water and touching detector behind pump. Leak detector LED on keypad panel will light up.
6. Turn main power switch to OFF.
7. Dry leak detector
8. Wait 20 seconds, then switch main power switch back to ON. Leak detector LED should be off.

Reaction cell takes approx. 30 minutes to heat up.

If leak detector LED does not light up:

Adjust potentiometer on analog board counter-clockwise for more sensitivity.

Turn off power to reset system.

Wait 20 seconds, and simultaneously press Power and Reset buttons.

Dip finger in tap water and touch leak detector contacts on bottom of cabinet behind the valve pump. LED should light up.

If problem persists, contact Rosemount Analytical.

3.2.4 Test Valve Pump Operation

The test procedure allows you to confirm that all physical connections are installed properly, and to ensure that the pump is taking up the proper fluids at the correct time.

Enter Test Mode:

1. Put all straws and Sampling tube into a beaker of DI water.
2. Turn power on by simultaneously pressing Power button on the back of upper cabinet and Reset button on CPUboard (yellow ejector).
3. First release Power button, then Reset button. Keypad should display "H E L O", then four dashes "-- -- -- --".

To enter test mode, continue with the step appropriate for your analyzer setup:

For single-stream, continue:	For multi-stream, continue:
Referring to Figure 3-2, on keypad panel, press position 15 and then 2	On keypad panel, press: DECIMAL then MANUAL .

The keypad buttons may now be used to test pump operation. Do not rush through the test steps – when a specific step is initiated, it takes approx. 2 seconds to pump air through the system. Actual pumping of a liquid takes approximately 4 seconds. After this operation is finished, another 4 seconds elapses before the pump is primed for the next test step.

To exit the test at any time, press the ENTER button on the keypad panel.

If a test step does not work properly, try the following:

√ **Take a syringe and shoot air through straw to make sure it is not clogged.**

√ **Check that corresponding LED on valve pumps lights up (refer to Figure 4-1).**

√ **Check that fluid is picked up in correct tube.**

If the problem still persists, contact Rosemount Analytical.

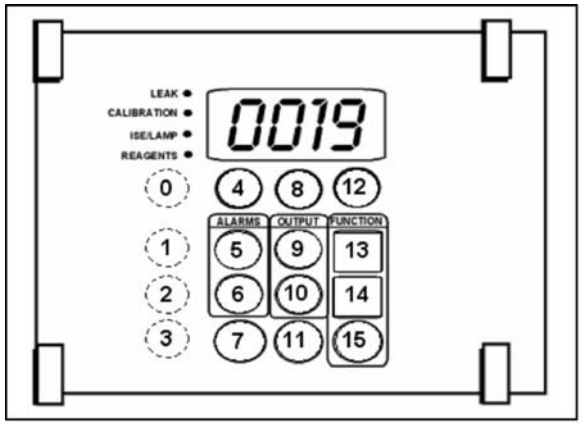


FIGURE 3-2. KEYPAD PANEL

Begin Test:

Confirm that the corresponding Pump LED lights up for each step (refer to Figure 3-3 for LED designations during test):

1. Press ZERO to test air. Press ZERO to turn off.

2. Press 

to simulate one shot of Reagent #4. Look at blue straw to confirm that water is pumped up through tube. Repeat a few times until you see water is in clear section of tube

3. Press 

to simulate one shot of Reagent #3. Check green straw and its clear tube

4. Press 

to simulate one shot of Reagent #2. Check orange straw and its clear tube.

5. Press 
to simulate one shot of Reagent #1. Check red straw and its clear tube

6. Press 

to simulate one shot of Sample coming from overflow sampler. Check tube labeled "Sample."

7. Confirm that fluid is going to flowcell.

8. Press 

to simulate one shot of Standard. Check corresponding clear straw and its clear tube.

9. Press 

to pump one shot of air into analyzer.

10. Press 

to simulate one shot of Baseline solution. Check clear straw labeled, BASELINE, and tube.

11. Repeat Step 9 until you see fluid shoot into reaction chamber.

12. Press 

to simulate evacuation from the reaction chamber to the flowcell. Check the tube going up to flowcell.

13. Press 

to simulate one shot of Grab solution. Check clear straw and tube.

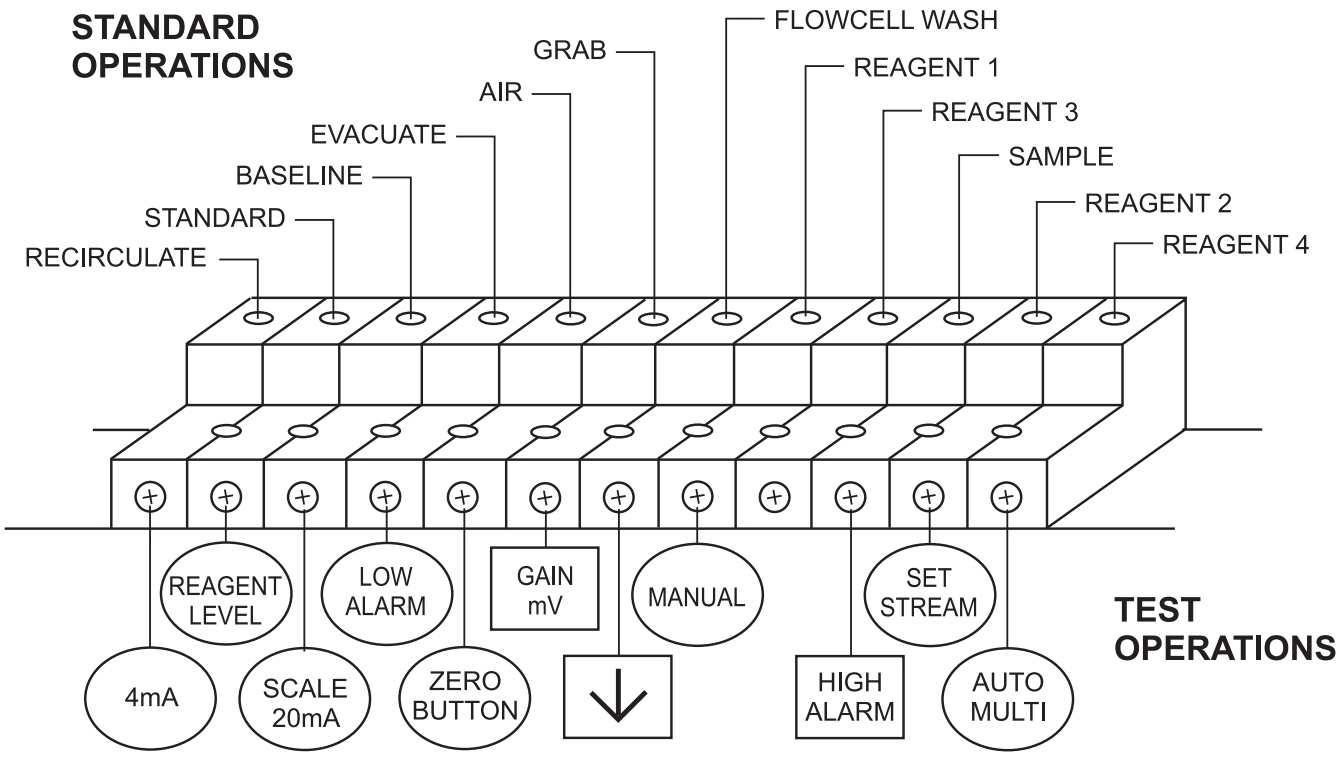
14. Press 
to wash flowcell.

15. Press LOW ALARM to empty reaction chamber. If there is any fluid left, it will be shot through to Waste.

16. Press ENTER once to exit test.

NOTE: The LCD on the display board will display the keypad position which is assigned to a specific valve-pump. When the LCD number disappears, the next position may be pressed. The sequence is given on page 24.

Figure 3-3. Valve Pump LED Designations



3.2.5 Set Up Stream Parameters

The analyzer is programmed to measure a single-stream system at 4 sample cycles per hour. The multi-stream default is 1 cycle per stream, but you may define parameters for individual streams, such as modifying the number of cycles or the alarm threshold values.

The alarm values are used to activate alarms or controllers when the sample is outside of the specified concentration range. A high alarm will activate when the sample concentration exceeds a pre-set limit. A low alarm will activate when the sample concentration is below the pre-set limit.

The contacts for the alarm outputs are located at the input/output panel on the cabinet side. The system must be in an alarm condition for at least one minute to activate the alarm contact.

Use the logical flows below to define desired stream parameters.

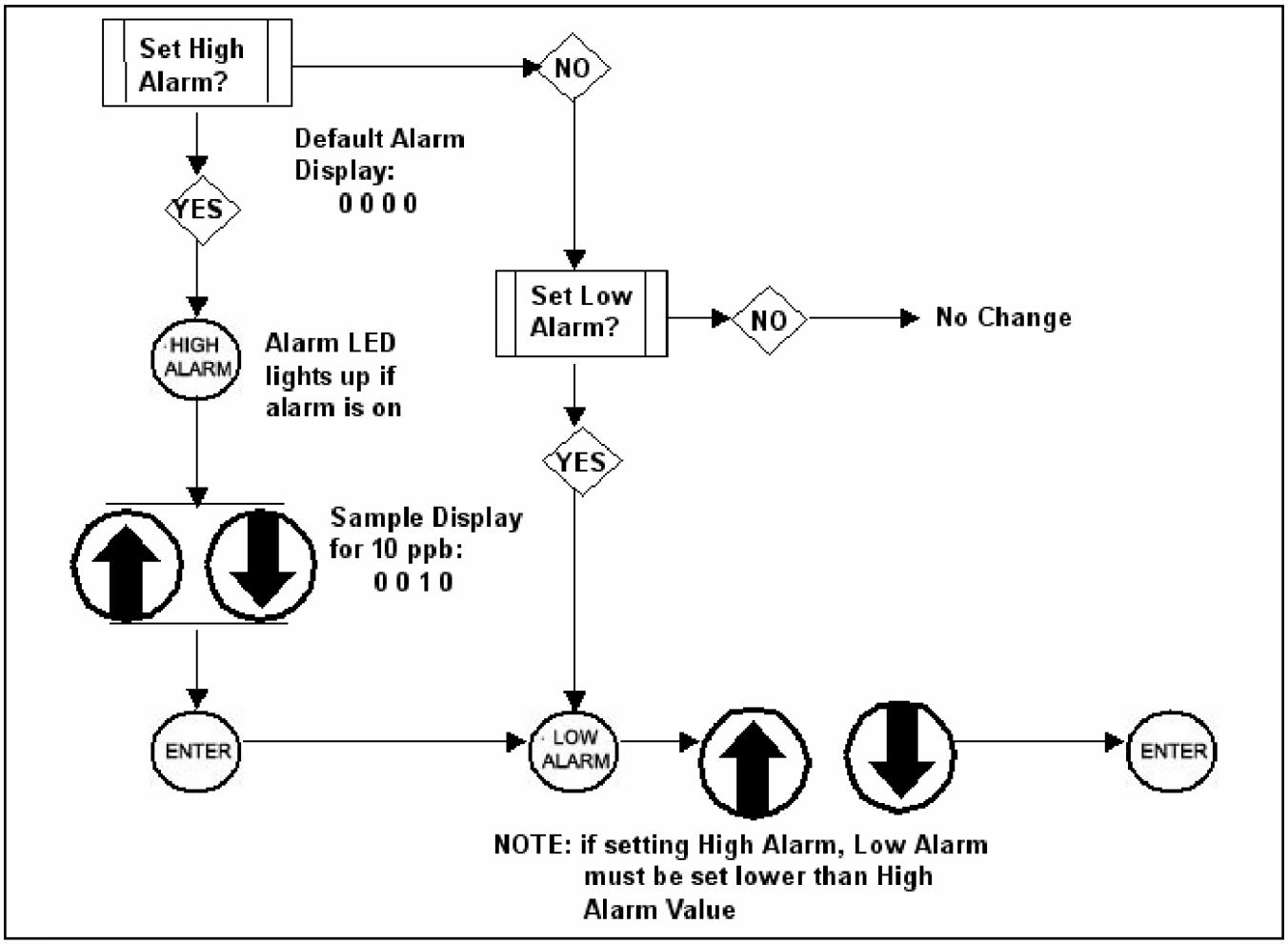


Figure 3-4. Logic Flow for Single-stream Parameter Definition

(Note: Use decimal on the keypad using arrows to place decimal in the correct position)

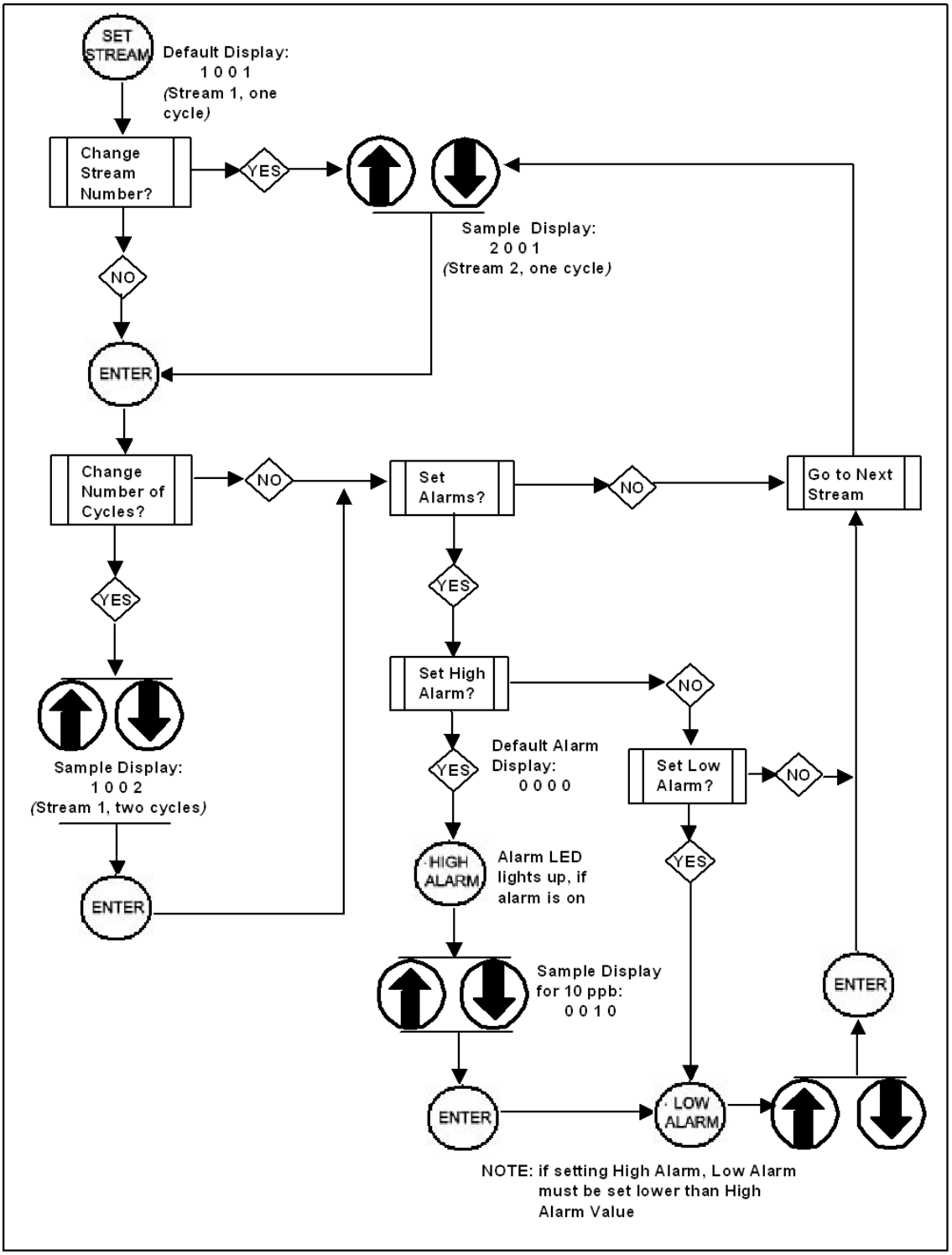


Figure 3-5. Logic Flow for Multi-stream Parameter Definition

3.3 Set Reagent Supply Time

Use the keypad panel to remind you when you need to replace the reagent. The analyzer will count pump cycles and count down the number of days left. To specify the duration, proceed as follows:

1. Press 

once to set counter for 90 days (3 months).

Sample Display: 0 0 9 0

2. Press 

to exit and clear display.

To determine how many days are left until you have to replace reagent,

Press: 

once.

Look at the LCD and record the number of days;

then press: 

again to get out of mode.

3.4 Set Scaling Outputs

Set output 4-20 mA 0-5 Vdc from the keypad panel, (refer to Figures 7-2 and 7-3), then adjust 4-20 mA and 0-5 Vdc at your external device.

Set output scale to: 4 mA/0 V

1. Press: 

.once then 

.to display 4 mA and for 0 Vdc.

The sample Display for 4 mA and for 0 Vdc: 0 0 0 4

2. To exit, press 

<u>Set output scale to: 20 mA/5 V</u>

1. Press 

once then 

to display 20 mA and 5 Vdc.

2. The sample display for 20 mA and for 5 Vdc: 0020

2. To exit, press 

.

To display the full-scale concentration embedded in the E-Prom:

Press 

two times. To exit, press 

.

3.4.1 Record △mV

Use the △mV value to determine that the method's span and slope are correct. The change in millivolts (△mV) is the spread between a baseline and a full-scale standard at the time of calibration. The values are relative to the chemical parameter being measured

Record the millivolt values for both baseline and full-scale standard.

1. Press 

The sample Display for value of 150 mV is: 0 1 5 0

2. To exit function, press 

once.

3.4.2 Initiate Auto Calibration

The analyzer is calibrated automatically usually every two days, depending on the chemistry. **Auto calibration** performs both baseline and full-scale calibration. **Baseline calibration** measures a solution with 10% concentration of the species of interest. **Full-scale calibration** measures a standard solution in the upper range of the parameter of interest.

Before starting calibration, make sure that the analyzer is running reaqgents and baseline solution for at least 20 minutes.

To initiate auto calibration, press AUTO CAL. on the keypad panel – the **CALIBRATION LED** will light. When multi-stream systems are being calibrated, only **Stream 1 LED** is lit.

Baseline calibration will run first for approximately 15 minutes. Full-scale calibration follows, lasting approximately 15 minutes (the actual time for calibration depends on the chemistry). When full-scale calibration is finished, **CALIBRATION LED** goes out and the value is displayed on the **LCD**. The "- - - -" display signifies that a delay is required before the next sample is displayed.

Sample analysis automatically begins after calibration. The time delay from the start of sample analysis to display of results is approximately 15 minutes. This allows sufficient time for the previous solution to wash through system, for sample and reagents to react, for analyzer to measure sample and display concentration value.

When the **CALIBRATION LED** and the "-000-" display in a single-stream system go out, the displayed value on the keypad panel is the actual stream value.

For a multi-stream system, after auto calibration, **Sample Stream status LED's** will light to show sample stream valve currently selected and sample stream concentration currently displayed. For example, for the first stream sample, **VALVE SELECTED LED** is lit for that stream; dashes display on the keypad panel. When analyzer finishes sampling one stream and moves on to the next, the display shows the previous sample stream concentration value, and its **VALVE DISPLAYED LED** lights up. **VALVE SELECTED LED** will be lit for next valve in sequence.

Note: If for any reason a calibration is not wanted and needs to be aborted, press:

DECIMAL then, HIGH ALARM, then SET STREAM to abort the calibration. Press AUTO CAL. twice in rapid succession on initial start-up for priming of sample & reagents

3.5 Process a Grab Sample

The analyzer allows you to rapidly analyze a grab sample.

Press GRAB SAMPLE on the keypad panel, to introduce a grab sample into the analyzer from the holder on the overflow sample panel.

If visible, suspended solids are present in the sample, filter it to 8 microns or less.

Place the clear grab sample inlet tube into a beaker containing the grab sample.

2. Press GRAB SAMPLE one time. The display shows flashing dashes, " -- -- -- --" .
The system analyzes the grab sample and after 15 minutes, displays the results when complete (The results are "flashed" on the display).

Grab Sample Display: 10.0 (flashing for three minutes)

After the display of the grab sample's value, a multi-stream analyzer begins processing the next stream in sequence.

3. To display measurement for previous grab sample, press GRAB SAMPLE twice.

4. Press ENTER button to return to normal operation.

3.6 Manually Sample a Particular Stream.

Use this procedure to manually switch between sample streams in a multi-stream system. This operation can be performed at any time, except during calibration.

Press one time. MANUAL **Sample Display: 0 0 0 1 .**

Press ↑ and ↓ to change stream number. **Sample Display: 0 0 0 3**

Press ENTER to start sampling desired stream.

Press AUTO MULTI to return to multi-stream automatic analysis.

3.7 Shutdown

To shut down the CFA-3000 for only a few days, press main Power button in back of upper cabinet to OFF position. Leave reagent straws in reagent containers.

Some chemistries may require specific wash solutions. Check Appendix A, "Chemistries," for details.

To shut down the analyzer for more than a day, perform the following procedure

1. Remove straws from reagent containers and place them into a beaker of DI water.
2. Press 

twice within a two-second interval to activate priming. This allows wash solution or DI water to be injected rapidly through system.
3. After priming finishes (after 15 minutes or when “auto cal” starts), press the main Power button in back of upper cabinet to OFF position.

3.8 Quick Start

If the analyzer has been shut down during normal operations, turn power on and

press 

once.

If the CFA-3000 has been turned off for an extended shutdown:

Press 

twice to prime; the system will automatically go into :”Auto Cal” after priming

SECTION 4
MAINTAINING THE ANALYZER

Your CFA-3000 Series analyzer is a precision instrument which, if maintained properly, should provide years of accurate and reliable service.

4.1 Analyzer Equipment.

Even though the analyzer normally runs automatically, perform the following activities, quarterly:

1. Start **Auto Calibration** after reagent replenishment (see Section, "Perform Auto Calibration").
2. Check **mV value**

SECTION 5
TROUBLESHOOTING PROCEDURES

This chapter is divided into two sections:

- Troubleshooting Chart: -a list of symptoms, probable causes, and remedies.
- Test Functions:– test functions for diagnostic information.

5.1 Troubleshooting Chart

Symptoms observed during operation are generally enough to identify a faulty component.Such symptoms, together with probable causesand remedies are listed in the following troubleshooting chart.

Table 5-1: Troubleshooting Chart

Problem	Probable Cause	Remedy
No power	Power switch OFF	Press power switch ON
	Power switch failed	Call Rosemount Analytical
Pump is inoperative	Valve pump switch OFF	Press switch ON
	Blown fuse	Replace fuse
	Leak detector activated	Find and fix leaking; check pump's electrical connection
	Bad electrical connection	Check pump's plugs to CPU & connector
	Still inoperative	Call Rosemount Analytical
Keypad lights or display fails to light up or buttons fail to operate	Circuit boards are not seated properly	Remove and reinstall circuit boards
	Display or associated power circuit faulty	Call Rosemount Analytical
Keypad lights or display fails to light up or buttons fail to operate	Display or associated power circuit faulty	Call Rosemount Analytical
	Connector faulty or not properly inserted	Check connection

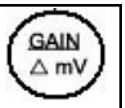
Problem	Probable Cause	Remedy
Alarms not activated	Incorrect settings	Readjust settings, making sure that low alarm is set lower than high alarm
	Insufficient time for alarm to respond	Alarm condition must exist for minimum of 60 seconds before alarm activates
Signal not repetitive (same sample not repetitive)	Small leak or clogging in fluidics	Check all tubing lines and connections
	Clogged tubing	Replace tubing
No signal, or signal “off-scale” high	Connector or wires loose Faulty circuit board Incorrect mV value	Check circuit boards for proper seating Replace power supply circuit board
Loss of mV Sensitivity LED ISE on	Reagents, standards old, contaminated or improperly prepared	Change reagents
	Reagent straws in wrong reagent or standard	Check placement of straws
	Loss of sample flow	Replace sample filter on overflow panel
Decreased pumping volume	Tubes pinched shut or clogged from deposits	Remove condition causing “pinched” lines; replace sample filter at overflow panel
Leak detector LED lights up	Leak in fluidics	Repair leak and dry leak detector contacts; turn main power **OFF** for 20 seconds
	High humidity	Adjust screw on leak detector potentiometer on analog board; turn clockwise to decrease sensitivity
	Connector faulty or not properly insertede	Check connection to analog board; replace analog board.

5.2 Test Functions

Table 5-2: Test Functions

Problem	Probable Cause	Remedy
Front panel display	Test LED’s and LCD on keypad: a. Press Power button and reset button on the CPU board (yellow ejector) b. Release power, then Reset button. Press power	Press: 

Check	button. **Test Procedure**	**Exit**
Front panel display	c. Press the following keys in sequence: (key #'s 15, 5, 6) 	Press:

Sensitivity (△mV)	Press:  then 	Press:  then 

SECTION 6
REPAIR PROCEDURES

The Ion-selective electrode analyzers are designed with modular components for quick and easy replacement. The following sections contain instructions to remove parts and replace them. For more complex repairs, or diagnostic assistance, contact Rosemount Analytical at:

- Telephone: (800) 854-8257, (949) 757-8500
- Fax: (949) 474-7250
- Email: www.raihome.com

6.1 Replace Valve Pump Assembly

Use the following procedure to replace pump assembly:

1. Turn off power to analyzer.
2. Pull back of pump assembly towards you to a 45-degree angle (see Figure 6-1).
3. Unplug the two connectors from the back of the cabinet. (9-position connector for pump).
4. Disconnect pump assembly's "D" connector from right side of pump.
5. Remove all liquid tubes from pump.
6. Disconnect waste tube from bottom of reaction cell (right side of valve pump).
7. Slide assembly to the left to disengage from pins, and remove pump assembly.
8. To install a new pump assembly, refer to Section, " Install Valve Pump Assembly".

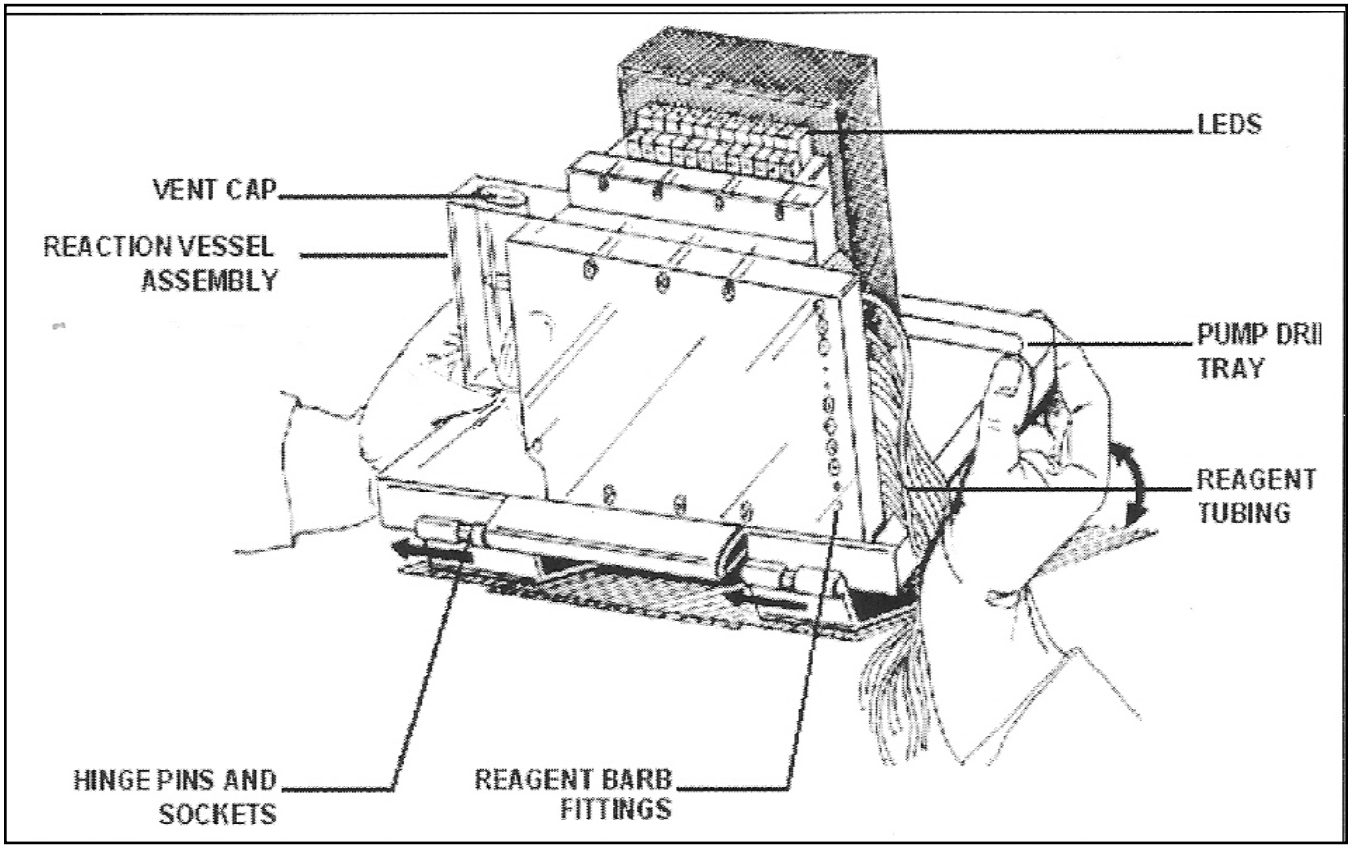


Figure 6-1. Remove Valve Pump Assembly

6.2 Replace Circuit Boards

Use the following procedure to replace circuit boards:

1. Turn off power.
2. Open latch from right side of keypad panel; and open door.
3. Disconnect all cables and plugs from board to be replaced.
4. Unlatch colored clip from board to be replaced (refer to Figure 6-2).
5. Pull circuit board straight out.
6. Reverse steps to replace board and reconnect cables. Press firmly to ensure that boards are properly seated.
7. Turn power on.
8. Perform Automatic Calibration (refer to Section, “Initiate Auto Calibration”).

Please NOTE: Valve-pump connector is on CPU board

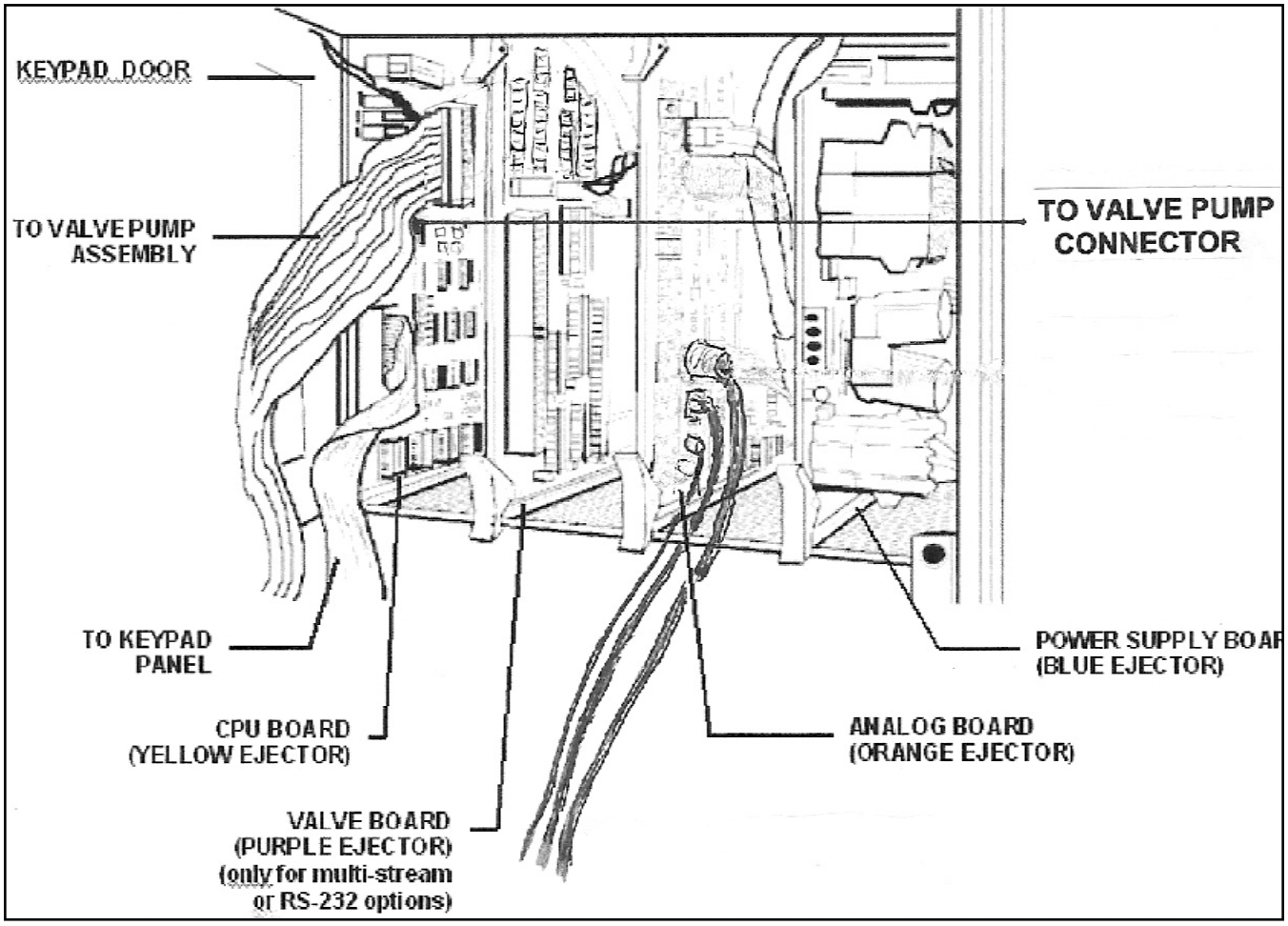


Figure 6-2. Card Cage

IMPORTANT: ***Do Not remove any PC board or component without first shutting off Power to the analyzer.***

6.3 Replace Fuses

Use the following procedure to replace fuses (all fuses are 1A):

1. Turn off power.
2. From inside upper left corner near pump switch, press down on fuse cap and turn counter-clock wise to remove.
3. Pull fuse and cap straight out.
4. Replace fuse in cap (make sure the new fuse is the same type and rating as the one you are replacing).
5. Press fuse cap in place and turn clockwise.
6. Turn power on.

6.4 ISE Reaction Cell Assembly, Electrodes

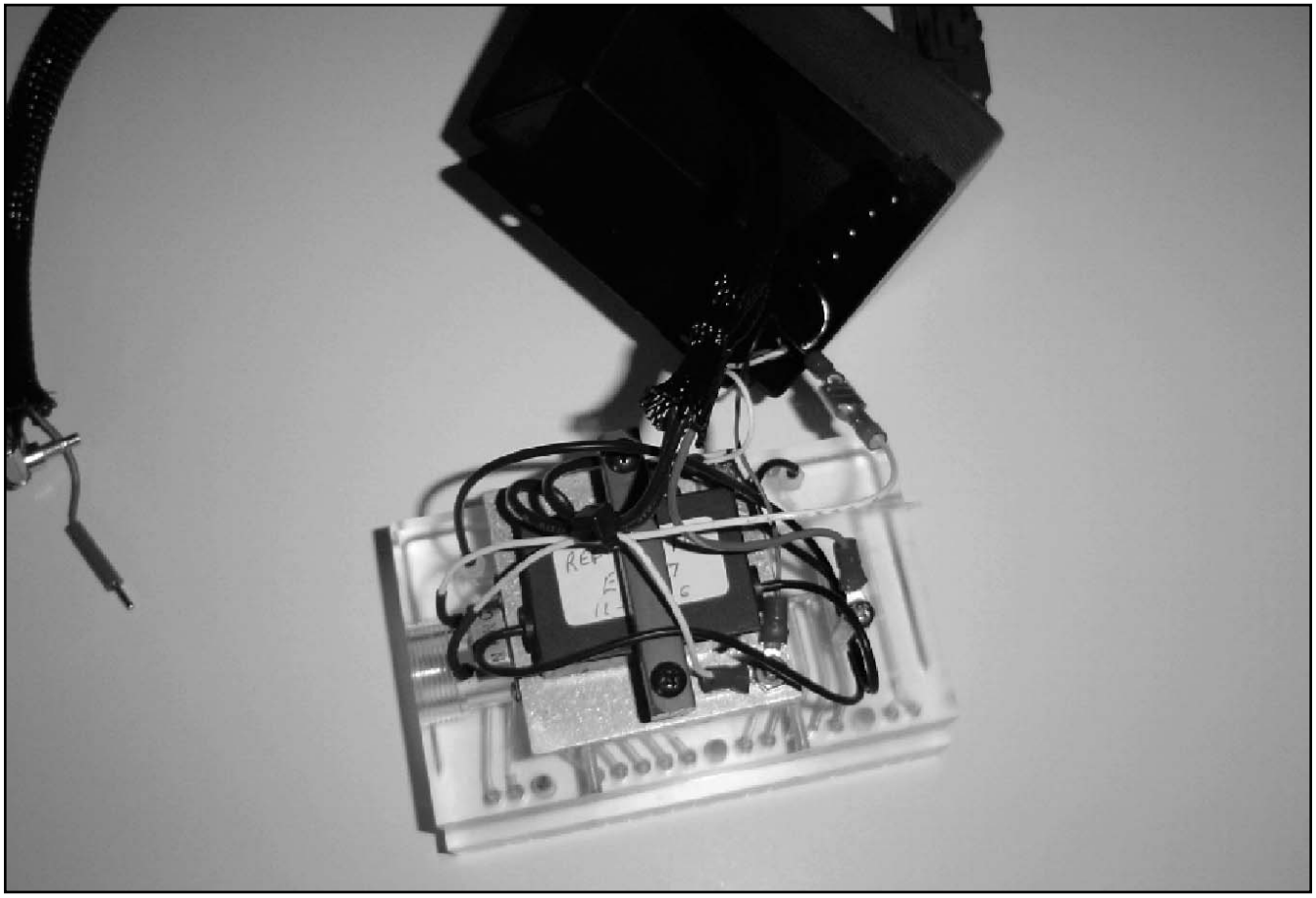


Figure 6-3. ISE Reaction Cell Assembly, Electrodes

6.4.1 The sodium electrode used in the CFA-3011 sodium analyzer is a proprietary “solid state” electrode which is joined with a reference electrode in a sealed cartridge. The buffered sample stream flows into the reaction cell—through the ground stud to the sodium electrode, then into the reference electrode, out through the ground stud and then to waste. The sample concentration is measured in the sodium electrode, compared to the reference value and the sodium concentration is determined.

SECTION 7
INSTRUMENT DESCRIPTION

7.1 Analyzer Front View (Refer to Fig. 7-1).

Table 7-1.1: Main Cabinet Parts

Part	Function
Main Cabinet	Splash-proof enclosure protects analyzer
Reagent Cabinet	Splash-proof enclosure protects reagents and solenoid valves
Door Hinges	Pin hinges mount doors on main and reagent cabinets
Door Latch	Secures cabinet door
Keypad Panel and Driver Board	External side contains touch buttons for controlling analyzer, digital display, and status panels. Internal side contains driver board
HB Lamp	Indicates when proportional controller is heating the heat bath
HB T 1 A	1 A fuse for heating bath
LAMP PS T 1.0 A	1 A fuse for power supply to ise lamp
PUMP T 1.0 A	1 A fuse for pump
XFMR T 1.0 A	1 A fuse for transformer
Pump On/Off	Lighted switch controls power to pump
On/Off	Main power switch
Colorimeter	Detector
Waste Drain Pan	Drain pan directs waste solutions to waste tube
Pump Connector	9-position connector connects pump to main cabinet electronics
Heating Bath Connector	6-position connector connects to heating bath assembly
Valve Pump Assembly	Includes pump, PC board, labeled tubes, and reaction vessel assembly (chemistry module with integrated

7.1.1 Main Cabinet

	(heating bath)

Part	Function
Chemistry Module Tubing	Carries sample and reagent to valve pump assembly
Quick-disconnects	Connects reagents, samples, and standards to valve pump assembly
Waste Tube	Carries waste solutions to drain
Leak Detector	Senses leakage of solutions in main cabinet, shuts pump off, and activates leak LED

7.1.2 Reagent Cabinet

Table 7-2. Reagent Cabinet Parts

Part	Function
Multi-Stream Valve Panel (Multi-Stream option only)	Allows sequential analysis of up to six sample streams
Multi-Stream Connector (Multi-Stream option only)	Positive fit connector connects Multi-stream valve panel to main cabinet electronics
Bulkhead Fitting	Fitting that directs individual sample stream to sample valve
Overflow Sample Assembly	Supplies continuous sample streams for analyzer

Note: For multi-stream monitor, Overflow Sampling assembly mounts on left side, facing the analyzer

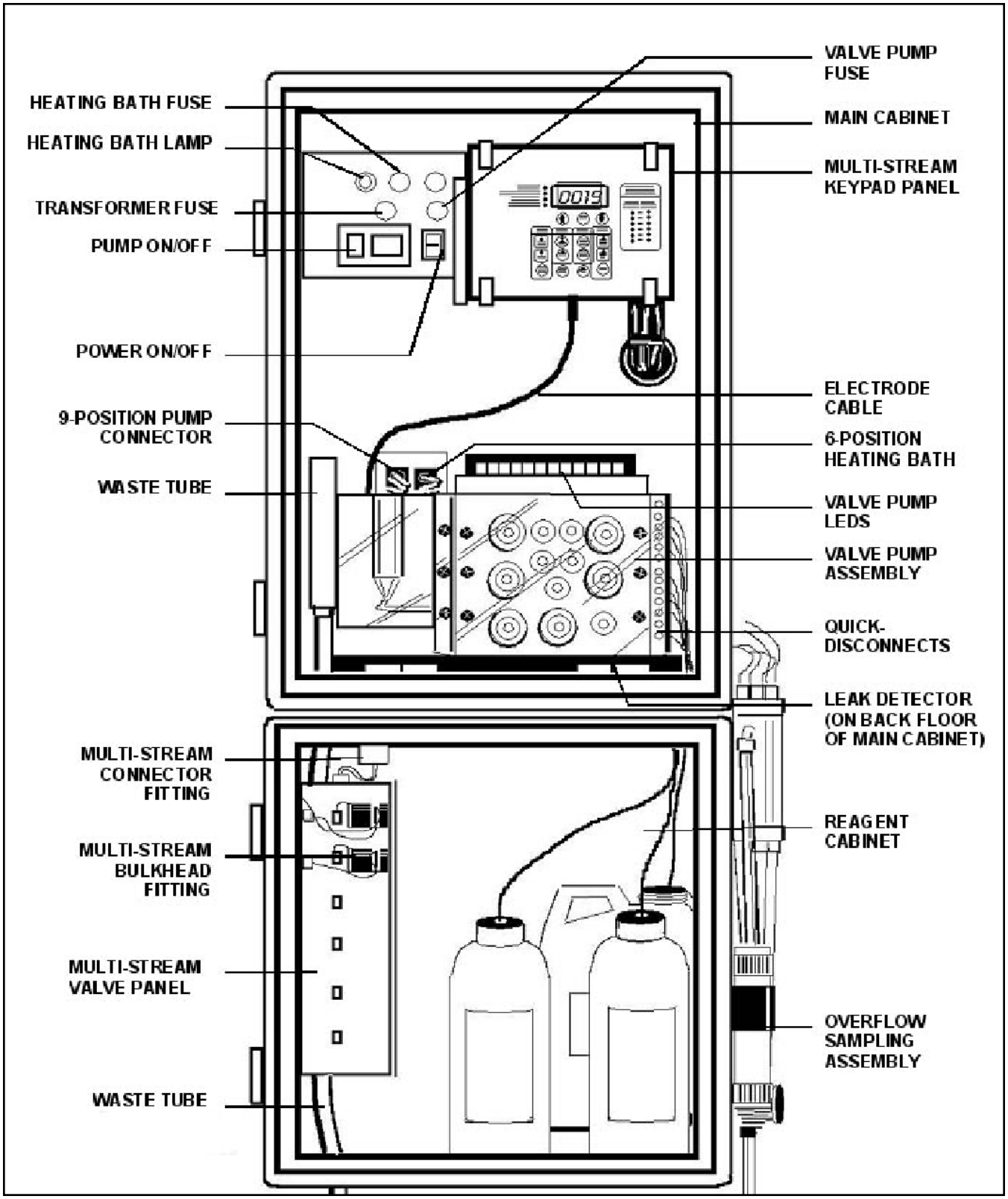
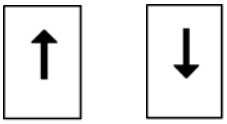


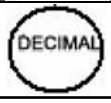
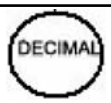
Figure 7-1. Analyzer Front View

7.2 Keypad Panel

The keypad panel has a four-digit liquid crystal display with an adjustable decimal point. The panel also has indicator ***LED's*** and pressure-sensitive buttons.

Table 7-3 Buttons/LED Functions

Button/LED	Function
For Both Single and Multi-stream Options	
LEAK LED	When lit, indicates leak in main cabinet
CALIBRATION LED	When lit, indicates calibration in progress
ISE/LAMP LED	Will light when millivolt level is below default levels.e
REAGENTS LED	When lit, indicates reagents need to be replaced
UP or DOWN Arrow 	Increases or decreases displayed value
	Sets value or exits function
	Sets high alarm limit
	Sets low alarm limit
	Two functions: -- Sets 90 day clock for reagent usage -- Displays number of days remaining until next replacement of reagents
	Sets scale to adjust output to 4 mA and 0 Vdc on recording device
	Sets scale to adjust output to 20 mA and 5 Vdc on recording device

Button/LED	Function
	Function: Displays Systems △ mV
	Initiates processing from grab sample
	Initiates automatic calibration of analyzer
	Used for setting alarm values.
For Multi-stream option only	
Sample Streams LED's	VALVE SELECTED shows which valve (stream) is being analyzed, and VALVE DISPLAYED shows which valve is associated with completed and displayed value
	Initiates automatic multi-stream analysis
	Initiates single stream analysis
	Enters function to identify parameters for each stream (such as number of cycles and high and low alarms)
	(Not used)

7.3 Card Cage

The card cage is located directly behind the keypad panel. To access the card cage, lift latches from right side of keypad panel and open hinged door. (Refer to Figure 7-2.)

7.3.1 Card Cage and Door

Table 7-4: Card Cage Parts

Part	Function
Keypad Panel Door	Opens to access card cage
Display Board	Circuit board contains electronics for keypad and LCD display
CPU Board 180-B028-01	Central processing circuit board processes the signal fed to the digital display and any external devices. (Yellow ejector)
Valve Board 180-B016-01 (only supplied for multi-stream option or for RS-232 output on single stream)	Circuit board controls multi-stream accessory. Jumper should be installed on back of valve board. (Purple ejector)
Analog Board 180-B025-02 For multi-stream configurations: 180-B025-01*	Circuit board converts signals from analog to digital and processes signals from "fault" detectors (Orange ejector)
Power Supply Board 180-B012-03	Supplies voltage to electrical circuitry (Blue ejector)

7.3.2 CPU Board

Table 7-5: CPU Board Components

Component	Function
0Vdc - 5Vdc Connector	To recording device.
4mA –20mA Connector	To recording device.
Computer Memory Reset	Clears microprocessor memory
Computer Memory Reset	Clears microprocessor memory
Valve Pump Connector	Connector for cable from valve pump
Display Board Cable Connector	Connector for display board cable

7.3.3 Analog Board

Table 7-6: Analog Board Components

Component	Function
Potentiometer	Adjusts sensitivity of leak detector – clockwise for less sensitivity; counter-clockwise for greater sensitivity
Analog Board DIP Switch	Contains 8 rocker switches for setting various functional processes (see Figure 7-3)
Signal Input Connector	For process signals
On 180-B025-01: 20 multi-stream output potentiometers	For each stream 2 – 6, potentiometers for 4 mA, 20 mA, 0 V, 5 V (multi-stream only)

7.3.4 Valve Board

Table 7-7: Valve Board Components

Component	Function
Multi-stream Panel Connector	Connector for cable connector from display board

7.3.5 Power Supply Board

Table 7-8 Power Supply Board

Part	Function
18-pin Female Connector	For relays
6-pin Male Connector	Operating power
6-pin Female Connector	Valve Pump Power

PLEASE NOTE: VALVE-PUMP CONNECTOR IS ON CPU BOARD

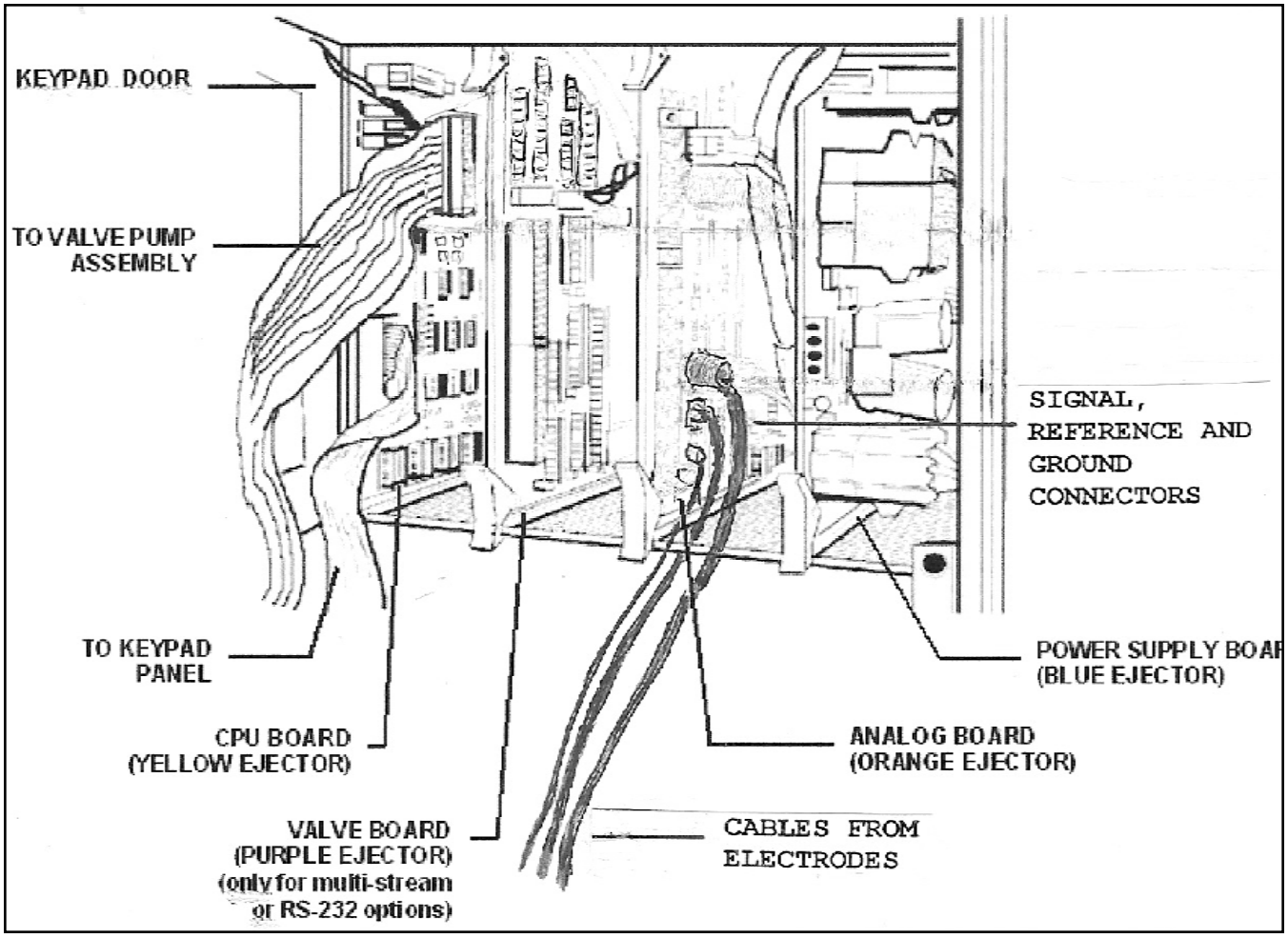


FIGURE 7-2. CARD CAGE AND BOARDS

IMPORTANT: **DO NOT** remove any PC board or component without first shutting off Power to the analyzer.

7.3.6. Analog Board DIP Switches

The following list describes the conditions for each switch to be in the ON or OFF position:

Table 7-9. Analog Board DIP Switch Positions

Switch No.	Position	Condition	Remarks
1	ON	When using Analog Board, Part # 180-B026-02	Analog Board has no adjustment ports for individual output device and/or 0-5 Vdc, 4-20 mA outputs.
1	OFF	When using Analog Board, Part # 180-B026-01	Analog Board has individual ports for adjusting each output device (up to 6) and/or 0-5 Vdc, 4-20 mA outputs.
2	ON	Quick calibration -- on	
2	OFF	Quick calibration -- off	
3	ON		
4	ON		Non-functioning switch
5	ON		Non-functioning switch
6	ON		Non-functioning switch
7	ON	For stream ID and “brackets” before and after calibration	Allows markers to be recorded on strip charts and other recording devices.
7	OFF		No markers will be recorded on strip charts and other recording devices.
8	ON	For 80 column printers	Formats printer output
8	OFF	For 40 column printers	Formats printer output

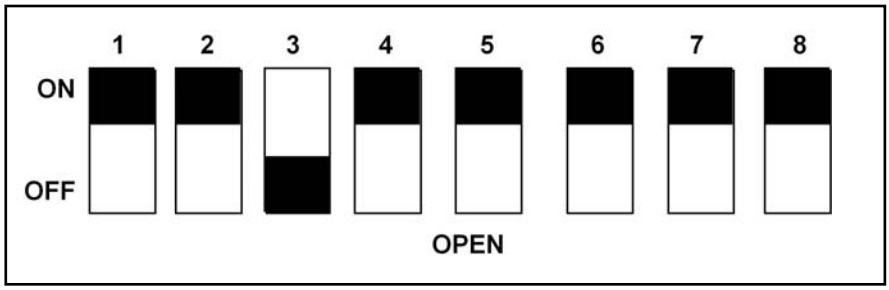


Figure 7-3. Analog Board DIP Switches

(with #3 set in OFF position for multi-stream analyzer) Colorimeter Assembly

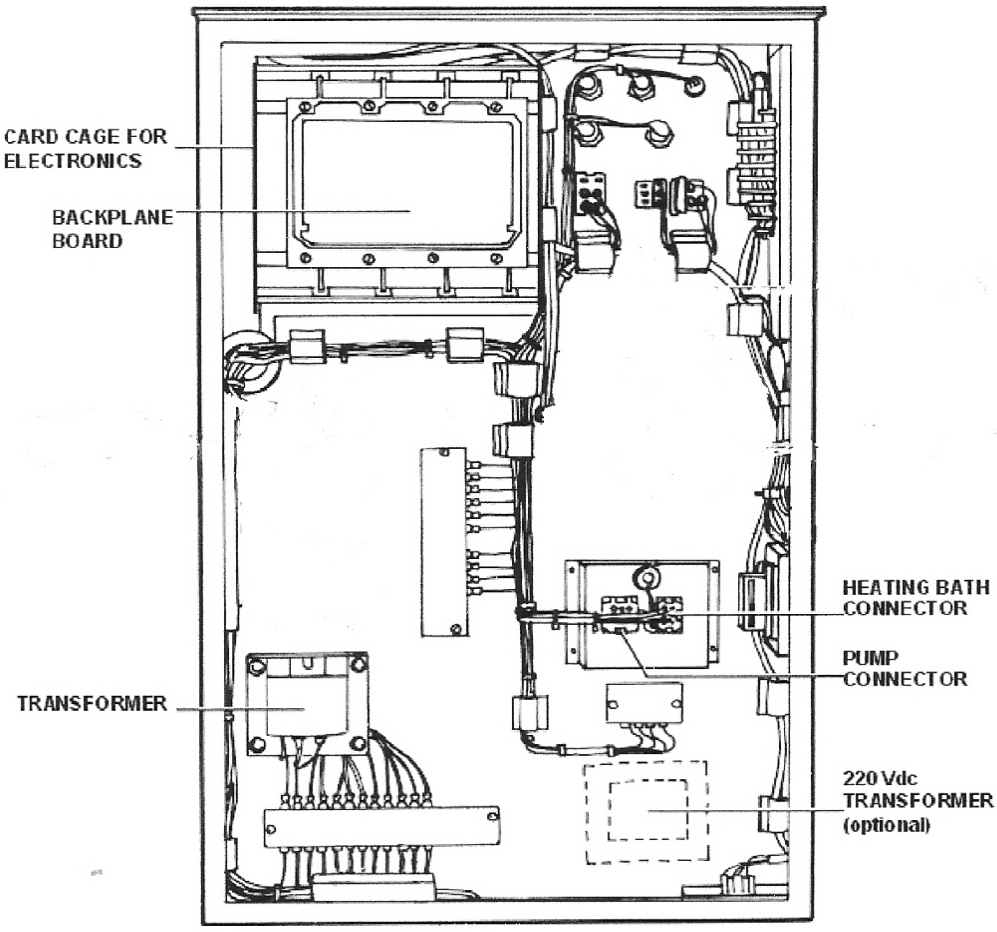
7.4 Rear of Main Cabinet

In the rear of the main cabinet are a number of electrical components and connectors. The following diagram is for reference, only.

Table 7-10: Back Cabinet Parts

Component	Function
Backplane Board	Circuit boards plug into front side
Power Transformer	Supplies ac voltage to electronics
Heating Bath Connector	Interconnect to heating bath
Pump Connector	Interconnect to valve pump
220Vdc Transformer	Optional part for specific electrical requirements (208 V – 240 V)

FIGURE 7-4. REAR OF MAIN CABINET



7.5 Valve Pump Assembly

The vacuum pump assembly includes the pump, PC board, and reaction cell.

Table 7 11: Valve Pump Parts

Part	Function
Pump Housing	Contains and protects valve pump electronics
Pump	Valve pump routes sample and reagents through the analyzer
Reagent Barb Fittings	Male half of tubing connector. Tubes are connected to reagents and sample
Reaction Vessel Assembly	Contains reaction cell, heating block
6-position Connector	Electrical power to heating bath
9-position Connector	Electrical power to pump
LED	Green is OK; RED is Low pressure
Sample and Reagent Tubing	Color-coded straws and labeled tubes for transport of solutions
“D” Connector	Connects to small, 16-pin connector on CPU boards
Vent Line	Vents reaction cell to waste
Pump Drip Tray	Catches leaks and directs them to the leak detector
LEDS	Identify which injector is active.

* Vacuum/Pressure ***LED*** is located on the upper right corner of the Valve-Pump as it is installed

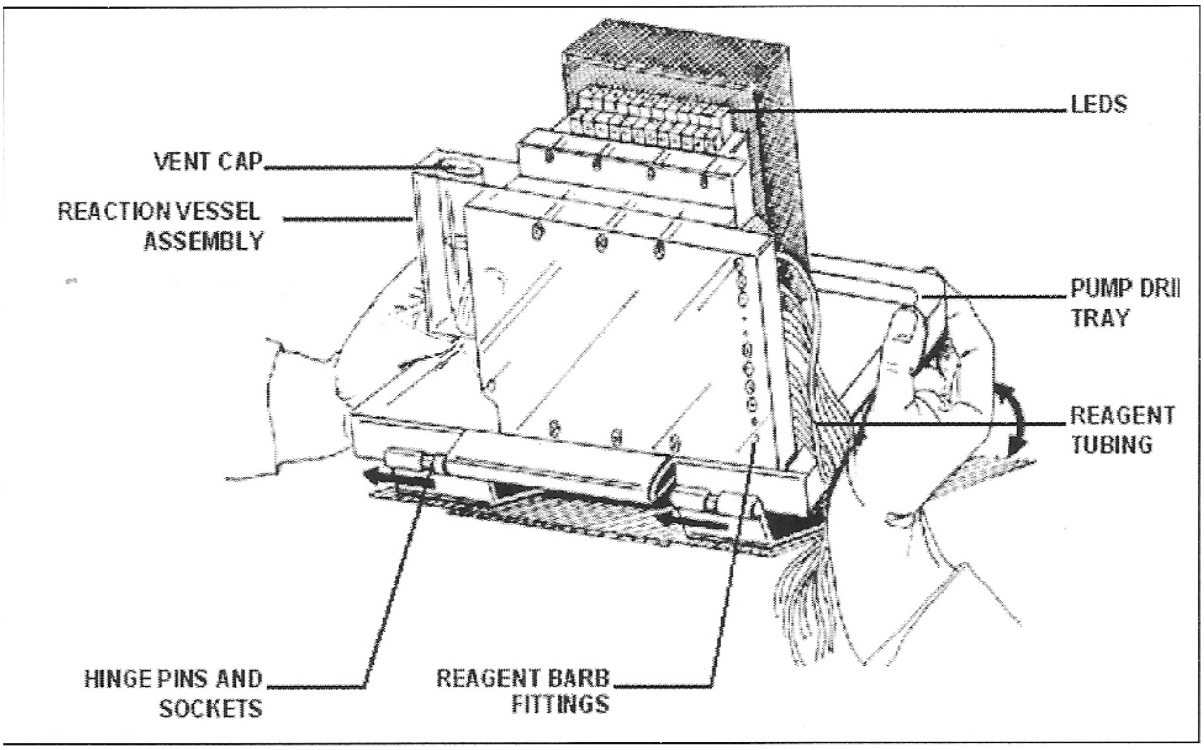


Figure 7-5. Valve Pump Assembly

7.6 Interface Ports

The interface ports (labeled for recorder, printer, relay output, and RS-232) are located on the lower, left outside wall.

Table 7-12: Interface Ports

Port	Function
RS-232-C	For connection of computer interface or other accessories
Relay Output	Optional relay contact (multi-stream analyzer only)
Printer	For connection of printer cable
Recorder	For connection of external recorder; for multi-output, 4-20 mA and 0-5 Vdc outputs for streams 2 through 6.

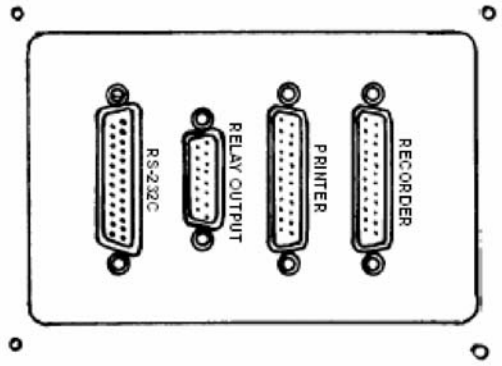


Figure 7-6. Interface Ports

7.7 Relay Output Option

This port (see Figure 7-7) is a collection of contact closures that can be used to identify either the stream being displayed or the alarm that is activated (multi-stream systems only). these are not “powered” contacts.

Relay Contact Ratings:

100 Vdc -- max voltage
10 Vdc-- max DC current
1.0 A -- max carry current
0.5 A -- max switched current

Table 7-13: Relay Output Option Pin Assignments

Pin No.	Description
1 NO 9 C	Stream #1 Alarm or ID
2 NO 10 C	Stream #2 Alarm or ID
3 NO 11 C	Stream #3 Alarm or ID
4 NO 12 C	Stream #4 Alarm or (#1*) ID
5 NO 13 C	Stream #5 Alarm or (#2*) ID
6 NO 14 C	Stream #6 Alarm or (#3*) ID

If there are 3 streams or less, both stream ID and alarms may be optionally configured.

7.8 Multi-Output Board

The output for Stream #1 is obtained from the Input/Output Panel (see Figure 2-5). The additional five outputs are obtained from the lower left-hand side of the analyzer. Table 7-14 gives the pin assignments on the “D” connector for a multi-stream system:

\ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 /
\15 16 17 18 19 20 21 22 23 24 25 /

Figure 7-7. "D" Connector for Relay Output

Table 7-14: Multi-output Pin Assignments on “D” Connector

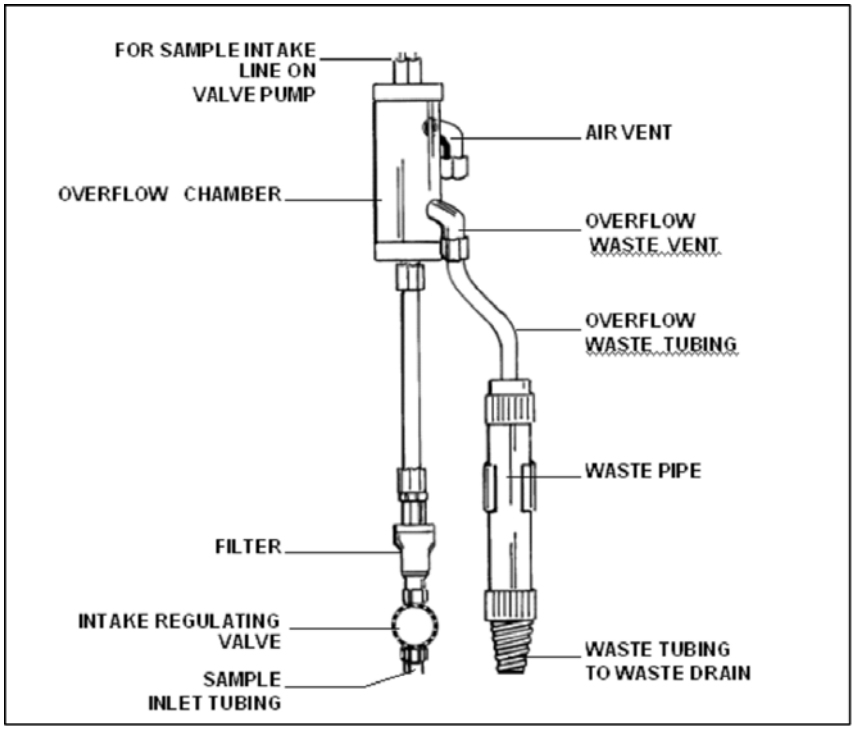
2	15	2	14	1
3	17	4	16	3
4	19	6	18	5
5	21	8	20	7
6	23	10	22	9

7.9: Overflow Sampling Assemblies

Table 7-15: Overflow Sampling Assembly Parts

Part	Function
Intake/Regulating Valve	Regulates flow of sample into overflow sampler assembly
Overflow Tube	Assures adequate supply of sample and reproducible results by eliminating positive pressure from sample stream.
Sample Intake Tubing	Tubing which carries sample from overflow tube to analyzer (one to six stream configurations) NOTE: Sample intake tube should be no more than 1 to 1-1/2" into the sample.
Air Vent	Allows air to escape overflow tube as it fills with sample.
Overflow Waste Vent	Allows excess sample to escape.
Waste Pipe	Carries waste to drain.
Overflow Tubing	All overflow tubes feed into common waste pipe.
Filters (180-1341-08)	Replaceable filters are mounted down stream from each intake regulating valve.
Sample Inlet Tubing	1/8" x 1/4" tubing (provided by customer).
Common Panel	Mounts multi-stream Overflow Sampler Assembly to left side of analyzer (facing front panel). Panel with dimensions 22-1/4” x 9" will support up to six streams.

Figure 7-8. Single-Stream Overflow Sampling Assembly



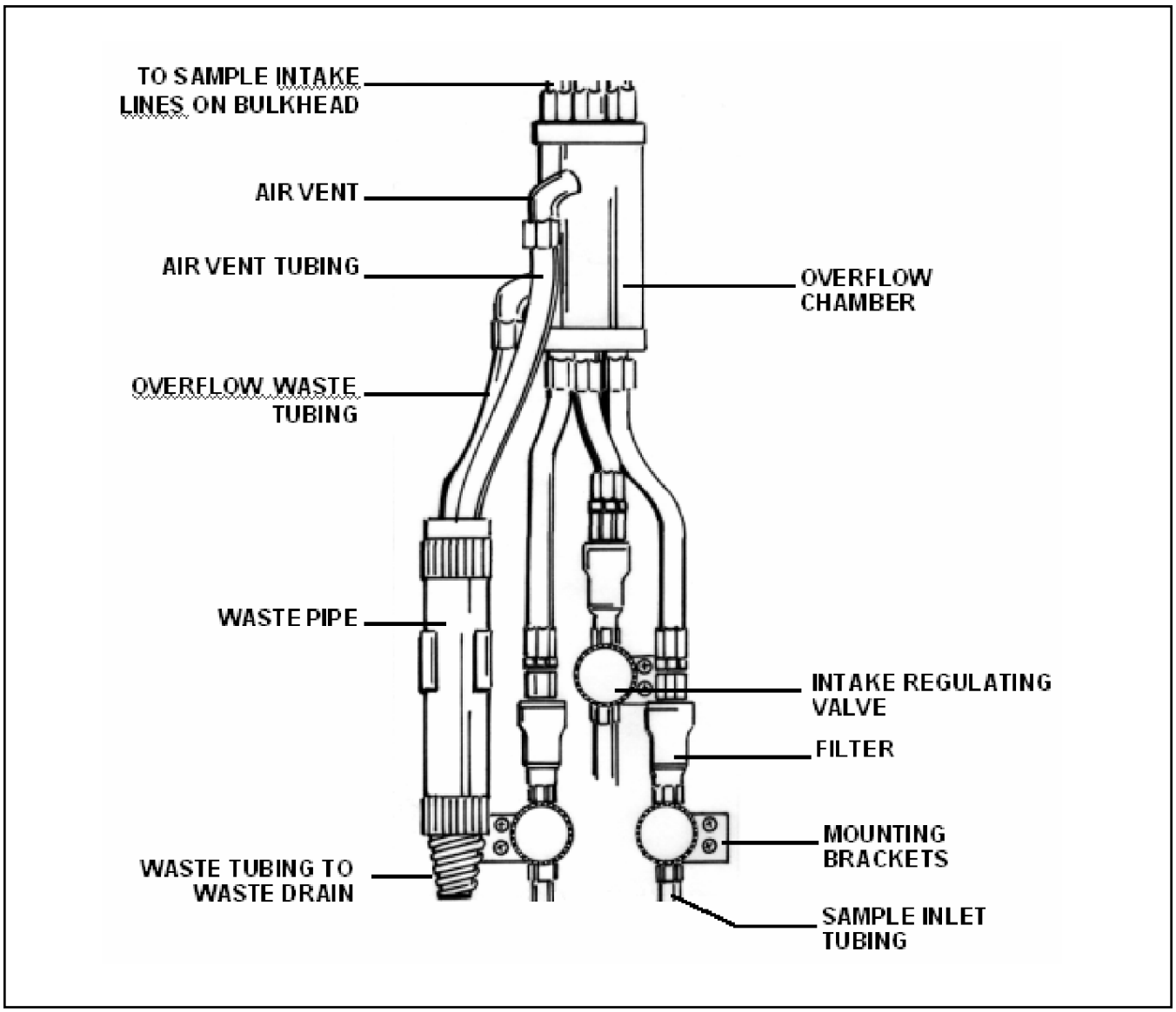


Figure 7-9. Multi-stream Overflow Sampling Assembly (three-stream option)

SECTION 8
ADDITIONAL FEATURES

8.1 Chart Recorders and Data Loggers

A chart recorder or other data acquisition device may be connected to the analyzer for a permanent record of sample concentration. Setting the output 4-20 mA 0-5 Vdc from the keypad panel allows you to adjust 4-20 mA and 0-5 Vdc to a recording device.

These input devices must be isolated or have a floating ground (not reference to ground). The contacts for recorder output are located at the input/output panel on the side of the analyzer (see Figure 8-1).

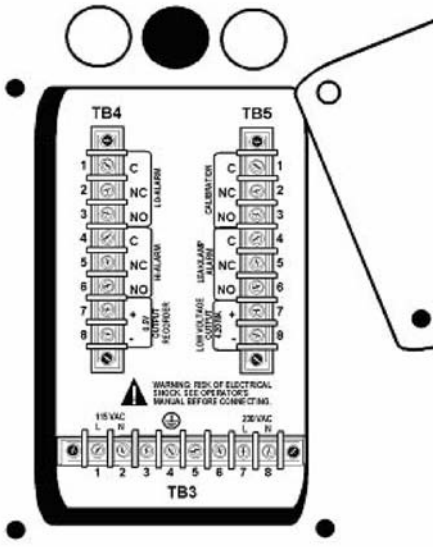
The analyzer will operate normally with data output to the chart recorder or other device. During normal operation, calibration is performed bi-weekly. This may vary by Chemistry. To indicate the beginning and end of a calibration sequence, the recorder makes a quick trace down to zero, and up to full scale. This is called a calibration marker. After calibration, the recorder resumes recording the sample values (refer to Figure 8-2).

When a recorder is connected to a multi-stream system, a ”stream identification blip” (SIB) is produced prior to the output signal for that particular stream. This allows quick identification of individual stream readings on the recorder. SIB values are shown in Table 8-1, and tracings are illustrated in Figure 8-3.

Stream #	Voltage Output	% Scale of Recording Marking
1	0.5	10
2	1.0	20
3	1.5	30
4	2.0	40
5	2.5	50
6	3.0	60
Grab	3.5	70

Table 8-1: Stream Identification Blips (SIB’s)

Figure 8-1. Input/Output Panel



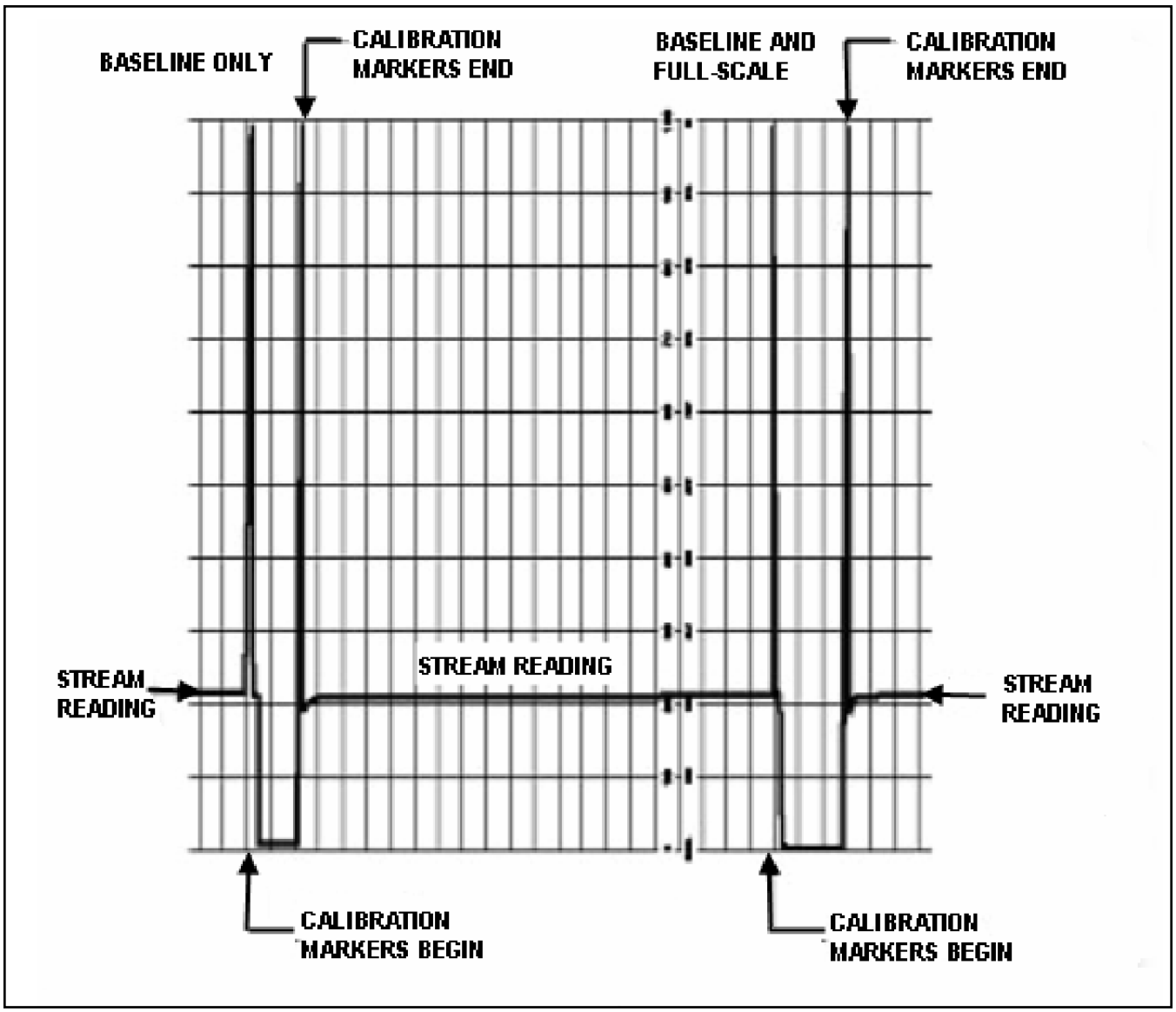


Figure 8-2. Typical Trace Recording with Calibration of Single Stream System

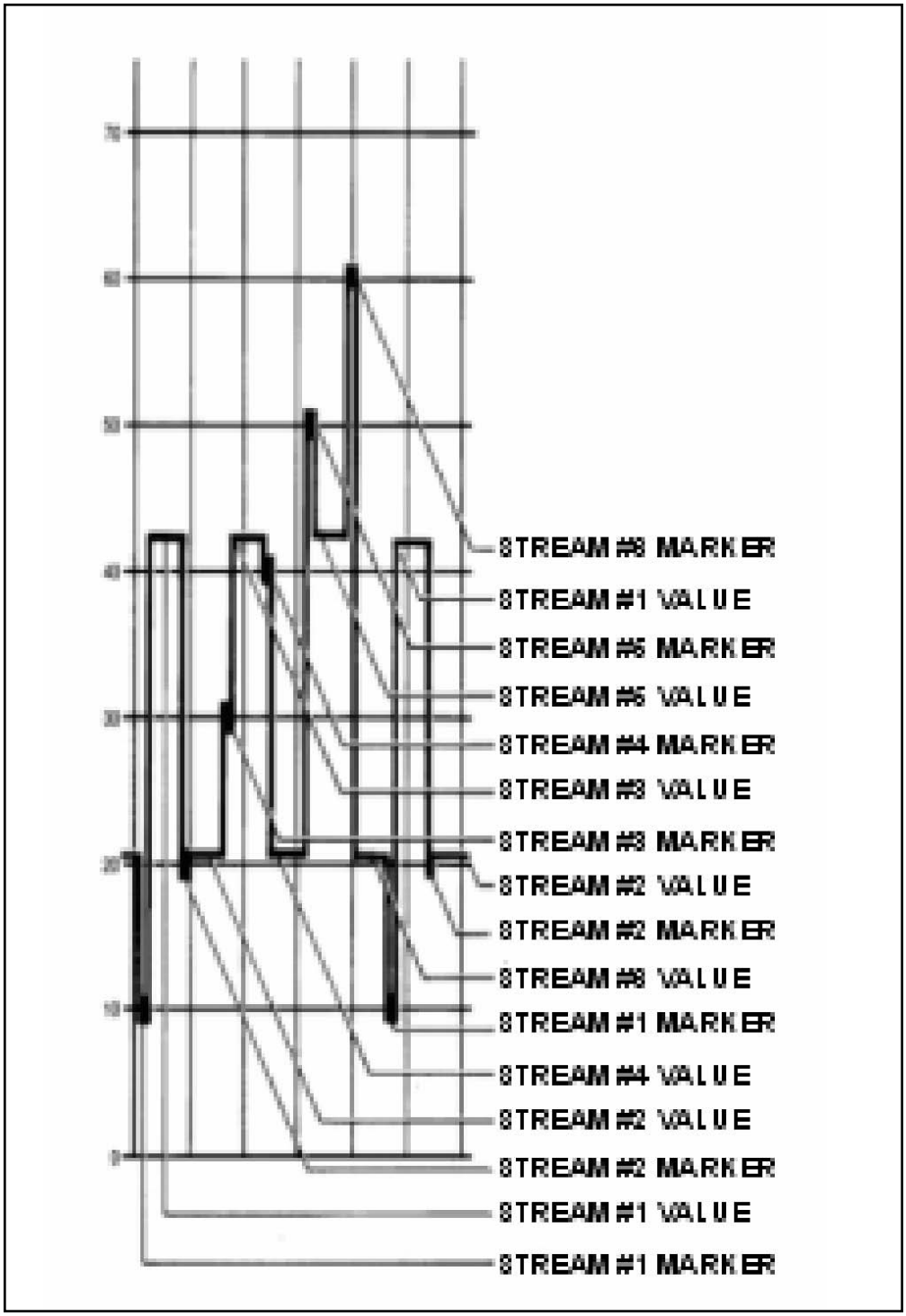


Figure 8-3. Typical Stream Trace Recording with Calibration of Multi-stream System

8.2 Computer Interface

The computer interface is an RS232-C serial data interchange port operating at 1200 baud. The serial port receives the same information as the printer, and has the capability to transmit information, enabling remote control of the analyzer.

8.2.1 Data Output Format

The data output formats contain no control characters, with the exception of <CR> carriage return, <LF> line feed, and the preamble/post amble described below:

Table 8-2: Normal Data Output Format

Data	Format
Preamble	NUL, STX, NUL = (00, 02, 00 Hex notation)
Date/Time	ASCII string of 25 characters, followed by 7 spaces
Concentration	ASCII string of 5 characters, followed by 9 spaces
Stream Number	One ASCII character
Mode	An ASCII string, consisting of 7 spaces, followed by three possible messages: NOT calibrated, Manual, or Automatic.
Calibration Status	There are two ASCII messages transmitted: CAL when calibration is in progress, and blank when good data is available. Postamble: NUL, EOT, NUL = (00, 04, 00 Hex notation)
Postamble	NUL, EOT, NUL = (00,04,00 Hex notation)

8.2.2 Data Configuration

The computer must be set to match the fixed data configuration of the analyzer, which is:

Parameter.	Setting
Baud Rate	1200
Data	8 bits, high order bit set to zero
Parity	None
Stop Bits	1

8.2.3 RS232-C Function Commands

The RS-232C interface can be used as follows:

- By direct hookup to a non-MacIntosh® based computer A program on disc can be obtained from Rosemount Analytical for remote control. Cable length must less than 150 feet.
- By direct hookup to a non-intelligent terminal. No program disc is required. Cable length must be less than 150 feet.
- By communication through a modem. One modem located at the analyzer can communicate over a telephone network to another modem hooked up to an IBM PC or compatible computer or a non-intelligent terminal.

Pin configuration is described in Table 8-4.

Table 8-4: RS232-C Pin Configuration

Pin No.	Circuit EIA	Circuit CCITT	Direction of Signal	Description
1	AA	101	- - - -	Protective Ground
*2	BA	103	From Terminal	Transmitted Data
*3	BB	104	To Terminal	Received Data
*4	CA	105	From Terminal	Request to Send
*5	CB	106	To Terminal	Clear to Send

*6	CC	107	To Terminal	Data Set Ready
*7	AB	102	- - - -	Signal to Ground
*8	CF	109	To Terminal	Received Line Signal Detector
9	- -			Reserved for Data Set Testing
10	- -			Reserved for Data Set Testing
Pin No.	**Circuit EIA**	**Circuit CCITT**	**Direction of Signal**	**Description**
11				Unassigned
*12	SCF (High Speed Indicator)			Secondary Received Line Signal Detector
13	SCB			Secondary Clear to Send
14	SBA			Secondary Transmitted Data
15	DB			Transmission Signal Timing Source
16	SBB			Secondary Received Data
17	DD			Receiver Element Timing (DCE Source)
18				Unassigned
19	SCA			Secondary Request to Send
*20	CD	108.2	From Terminal	Data Terminal Ready
21	CG			Signal Quality Detector
*22	CE			Ring Indicator
23	CH/CI			Data Signal
				Rate Selector
24	DA			Transmit Signal Element Timing
25				Unassigned

8.2.4 Initiating RS232-Communications to the Computer

1. With the computer and CFA-3000 power turned off, connect RS232-C cable to the computer and to the RS232-C port on the CFA-3000 analyzer. (If a printer is to be used, connect it to the printer port on the analyzer).
2. Turn on power to the analyzer.
3. From the analyzer keypad panel, turn on the printer by pressing the following buttons:
   - From a multi-stream keypad:

     DECIMAL and AUTO MULTI, then SCALE 20mA.

   - From a single-stream keypad, referring to Figure 8-4, press position 5, then 1, and then 10.
4. Turn on computer

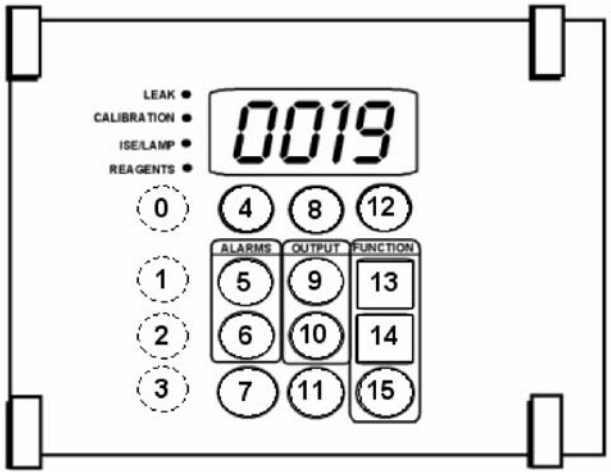


Figure 8-4. Numbered Positions on a Single-Stream Keypad

5. If you purchased program from Rosemount Analytical, run it from your computer, by typing in **CFATERM**, then press **Return**.
6. When a blinking cursor appears on the screen, press **Return**. The screen will display **M>**.
7. At this point, all of the RS232-C functions listed in Table 8-4 are accessible.
8. To set up a file to collect data in the computer, press **<alt-L>** (formatted) or **<alt-C>** (capture).
9. Type in file name (up to 8 characters).
10. To start collecting data, press **Return.** The display will show a blinking cursor.
11. To access the command functions again, press Return. The screen will display **M>**.

Use the commands in Table 8-5 to control the analyzer.

Table 8-5: RS232-C Commands

Command	Function
AUTOCAL	Runs full-scale automatic calibration
AUTOVALV	Resumes automatic valve selection
DATA	Forces printing of analyzer data
DISVALV Command	Displays stream parameters, including sample cycles, low and Function
MANVALV	To operate valves manually (for multi-stream, one stream continuously). For example, to monitor stream 3, enter MANVALV 3.
RESET	Resets the computer for a full wipeout
SETCLO	Sets clock calendar, Date is entered as follows: day of week, year, month, date, hour, minute, second. Day of week is coded as Sunday = 0, Monday = 1, Tuesday = 2, etc. Year is entered as last two digits of year. Month and date must be two digits, use leading zeros as necessary. A 24 hour format is used for hour entry. For example, to set the clock at Thursday, April 12, 2003 at 4:35 p.m., enter SETCLO 4030412163500.
SETHAL	Changes stream high alarm setting. For example, to change stream 1 to 25, enter SETHAL 1,25.
SETLAL	Changes stream low alarm setting. For example, to change stream 2 to 50, enter SETLAL 2,50.
SETVTIM	Changes stream valve cycles. For example, to change stream 2 to 2 cycles, enter SETVTIM 2,20.

8.2.5 Printer Interface

The printer interface is a female parallel port designed to be compatible with IBM PC-type cables and printers. This built-in capability permits text printing only, no graphics.

Table 8-6: Printer Port Pin Configuration

Pin No.	Signal Name	Description
1	STB/	Negative going pulse
2	D0	Data Bit 0
3	D1	Data Bit 1
4	D2	Data Bit 2
5	D3	Data Bit 3
6	D4	Data Bit 4
7	D5	Data Bit 5
8	D6	Data Bit 6
9	D7	Data Bit 7
10	ACK/	Acknowledge from printer
11	BUSY	Busy, from printer
12	PE	Paper empty, from printer
13	SEL/	Printer selected, from printer
14	PFD/	Paper feed, to printer
15	ERR/	Error, from printer
16	INIT/	Initialize, to printer
17	SEL	Select, to printer
18	GND	Ground
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground

8.2.6 Set Printer Internal Clock

Set printer's internal clock before printing; perform the following procedure:

1. From analyzer keypad panel, turn on printer:
   - From a multi-stream keypad, press:
     

   - From a single-stream keypad, referring to Figure 8-4, press position **15**, then **1**, and then **10**

2. Enter data as follows:
   a. Day of the week first, one digit:
      Sunday = 0, Monday =1
      Press enter.
   b. Year, two digits: 2003 = 03, 2007= 07
      Press enter.
   c. Month, two digits: Jan = 01,
      Feb = 02
      Press enter.
   d. Day of the month, two digits: 01, 02
      Press enter.
   e. Hour, using 24-hour format:
      8:00 AM = 08, 1:00 PM = 13
      Press enter.
   f. Minute, two digits: 01, 02
      Press enter.

Example: To set the clock for Friday, August 16, 2003 at 4:35 PM:

Press…	Analyzer Displays	Press…
⬇ or ⬆	5	ENTER
⬇ or ⬆	03	ENTER
⬇ or ⬆	08	ENTER
⬇ or ⬆	16	ENTER
⬇ or ⬆	16	ENTER
⬇ or ⬆	35	ENTER

APPENDIX A CHEMISTRIES

Method: Sodium-01A
(0.1-10, 1-100, 10-1000 ppb to 1000 ppm (contact Rosemount Analytical for other ranges)

General Description:
For this procedure for the determination of sodium, the sodium ion is measured potentiometrically using ion selective electrodes . The addition of an ionic strength adjustor to the sample maintains constant background ionic strength and pH.

Sodium in Water
Range: 0.1-10, 1-100, 10-1000 ppb up to 1000 ppm or higher.

Reagents Kit: (reagent & standards)
185-3011-30

REAGENT #1, Buffering Reagent:
185-3011-34

Working Standards
10 ppb: 185-3011-33
100 ppb: 182-3011-32

Operating Notes

1. The chemicals used for reagents and distilled water should be free of sodium.

2. The sample stream must be filtered to 10 microns or less before being introduced to the system with an in-line filter such as Rosemount Analytical' IF-100
(Part #180-1400-01).

APPENDIX B SPECIFICATIONS

Accuracy: All two-decade ranges up to 1000 ppb maximum: ±10% of reading or ±2 ppb, whichever is greater

0.1-10 ppm range = ±10% of reading or ±0.5 ppm, whichever is greater

Automatic Calibration: 40 minutes

Total Calibration: 40 minutes, twice/week

Reagent Consumption: 5 L of each reagent per 3 months

Standard Consumption: 1 L of high standard,1 L of low standard per 3 months

Sample Requirements:
Flow: 40-50 mL/min
Current standard bottles are:
"0"-(baseline): 1.0 L.
Full-scale: 5.0 L

Pressure: <10 psig (<170 kPa) (overflow cup must drain to atmosphere)

Temperature: 0-50° C (32-122° F)

Filter: 8 micron filter in sample line is Recommended; (#180-1341-08).

Multiple Stream Option: General: up to 6 sample streams; measurement is sequential

Response Time: 15 minutes (method-dependent)

Outputs: 4-20 mA or 0-5 Vdc (non-isolated). (Isolated output is optional.)

Load requirements for 4-20 mA output: 450 ohms minimum, 1200 ohms? maximum

Load requirements for 0-5 Vdc output: 10 k Ohms, minimum

The range of outputs is the same as the measurement range. Parallel output for printer is optional for single stream, standard for multi-stream monitors. RS232C output is optional for single stream monitors, standard for multi-stream monitors.

Alarms:
General: contact closures for
- **leak detection,**
- **calibration in progress,**

Contact closures are rated:2 A at 250 Vac or 3 A at 30 Vdc; delay on/off is 1 minute

Streams 2 through 6 (multi-stream option):
- One alarm relay for each stream; contacts have dc ratings
- 100 Vdc (maximum - carry only)
- 0.5 A (maximum - switched)
- delay on/off time is 1 minute

Display: Single line LCD, 4 1/2 digits, readout in concentration units. For multi-stream option display remains at last value until new stream reading is stable.

Status LEDs:
- Leak,
- Lamp failure,
- Quarterly maintenance due
- Calibration in progress.

For multi-stream analyzers.

Status-LEDs show:
- the sample stream currently selected
- the sample stream for which data is being displayed.

Environmental: The analyzer is not intended for outdoor use. Install in a clean, indoor environment.

Ambient Temperature:
40-120° F (10-45° C) must be regulated to ± 10° within range, avoid temperature swings greater than ± 10° F (± 5± C) over a 12-hour period

Humidity: 5-95% (non-condensing)
Pollution degree: Standard
Altitude: Not applicable

APPENDIX B SPECIFICATIONS Cont.

Dimensions: Height of Analyzer Cabinet:
25.75 in. (654 mm)
Height of Reagent Cabinet: 18.25 in. (464 mm)
Width: 18 in. (457 mm)
Depth: 16 in. (406 mm)

Space Requirements: Wall mounting: Allow 18 in. (457 mm) on one side for swing out access to rear panel. Allow 12 in. (305 mm) on the other side for access to input/output panel and overflow sampler. Panel Mounting: Allow 12 in. (305 mm) on both sides for access to input/output panel and overflow panel.

Weight: 117 lb (53 kg).
Add up to 60 lb (27.3 kg) for full weight of reagents and standards.
Shipping Weight of Analyzer: 138 lb (63 kg)
Shipping Weight of Reagents: up to 64 lb (29 kg) per kit (3 months supply)

APPENDIX C POWER INTERCONNECT DESCRIPTION

The block diagram in Figure C-1 graphically shows the distribution of power and signals throughout the analyzer. The raised numbers (e.g., (6)) in the description below relate to the circled numbers on the diagram. For clarity, minor components such as fuses are not shown.

1. For 110 Vac 50/60 Hz option, line power enters the analyzer at the Power Entry barrier strip TB3 (1), with the following connections (refer to Figure 2-5 and Figure C-1):

- Line (hot) connection is TB3-1
- Neutral is TB3-2
- Safety (chassis) ground connection is TB3-4

For 220 Vac 50/60 Hz option, the following connections are used:

- L1 connection is TB3-7
- L2 connection is TB3-8
- Safety (chassis) ground connection is TB3-4

2. For 110 VAC 50/60 Hz option, line power flows through the Power Switch and other minor components to barrier strip TB1. TB1 serves as the line power distribution point.

For 220 VAC 50/60 Hz option, line power flows through the Power Switch and other minor components to the primary of the stepdown Transformer (2). The Stepdown transformer converts the input 220 VAC to 110 VAC for compatibility with the standard CFA-3000 electronics. From the Step-down Transformer secondary power flows to barrier strip TB1.

3. From TB1, for both options, line power flows to the Colorimeter Lamp Power Supply, (4) , the Power Transformer (3) , the Pump Power Supply (5) and the Power Supply Board (8e) located in the Card Cage (8).

4. The Colorimeter Lamp Power Supply produces highly regulated DC current which energizes the Colorimeter Lamp (4a).

5. The Power Transformer converts standard line-voltage to low-voltage AC for use by the CFA-3000 electronics. The Power Transformer secondaries feed the Power Supply Board, which converts the low-voltage AC to regulated DC current, and to the heater element in the Heating Bath (7) . Relay contacts on the Power Supply Board are externally available at the I/O Panel (10) for activation of alarm and status indicators.

Multi-stream Analyzer Option

In units equipped with the Multi-stream option, a Valve Board (8c) will be installed. This board contains relay contacts that are externally available at the Interface Ports (11) as well as LED drivers to activate the sample stream indicators located on the Keypad Panel (9) . The Valve Board also provides interfaces for a printer and serial data communications, externally available at the Interface Ports.

If the monitor includes a multi-output analog board, analog recorder drivers for each stream are installed on the Analog Board (8d) . These outputs are externally available at the Interface Ports.

APPENDIX D BYPASS FOR CALIBRATION

To avoid extraneous alarms from external devices, rewire output as shown below

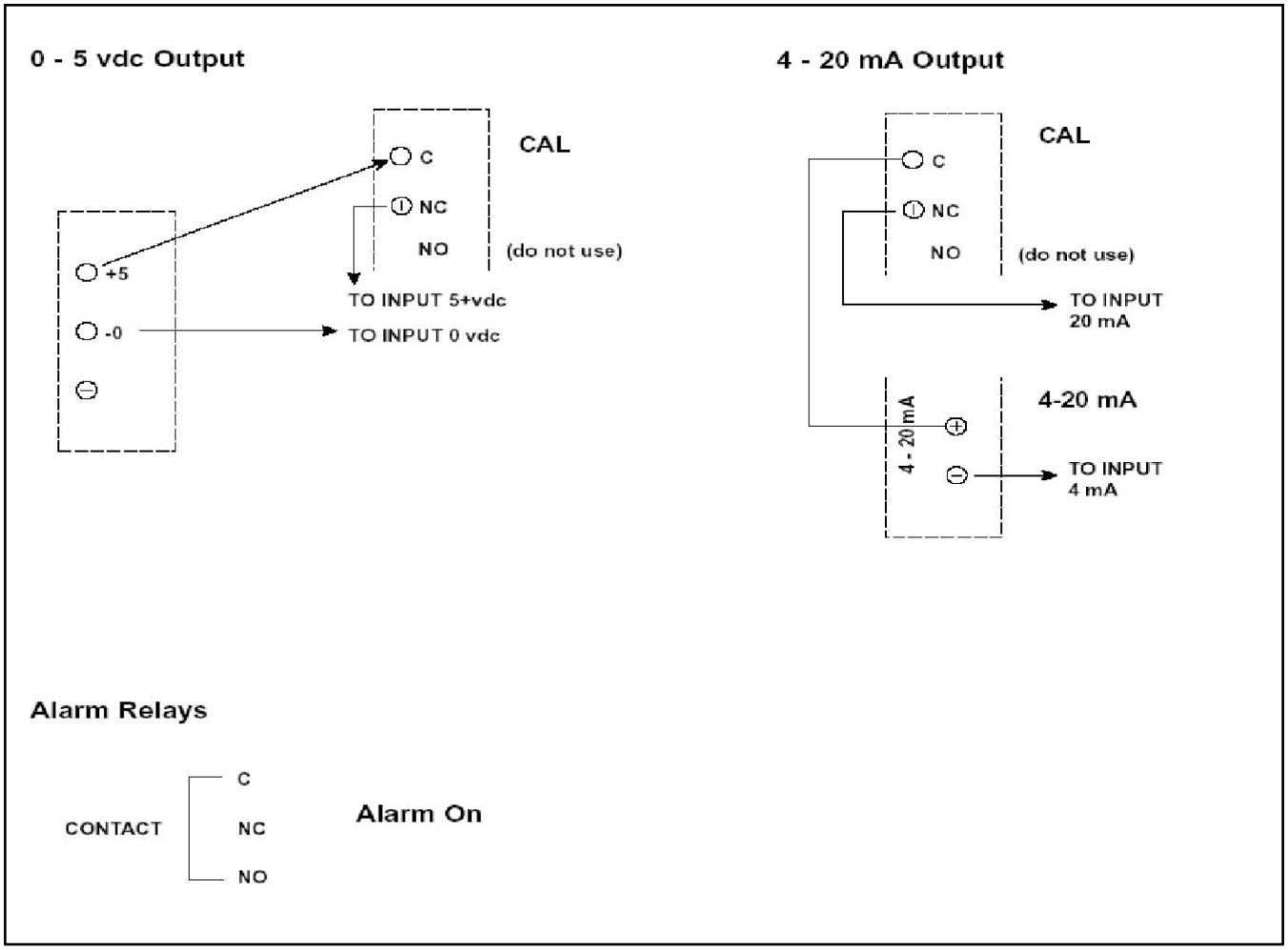


Figure D-1. Calibration Bypass Wiring

APPENDIX E KEYPAD HELP SHEETS

E.1. Single-Stream Keypad "Help Sheet"

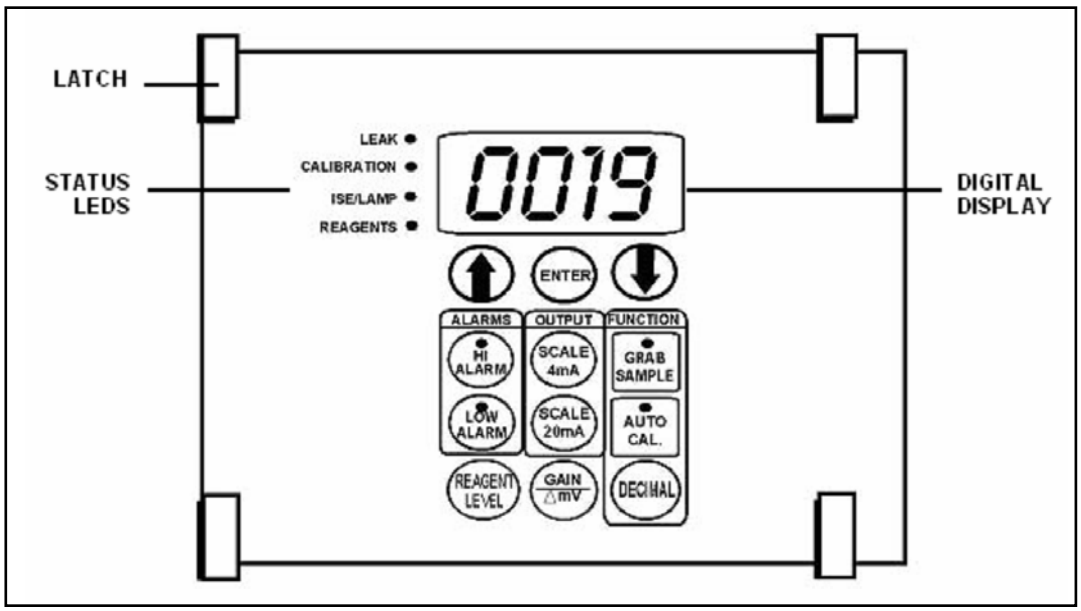


Figure E-1. Keypad Panel for Single Stream Option

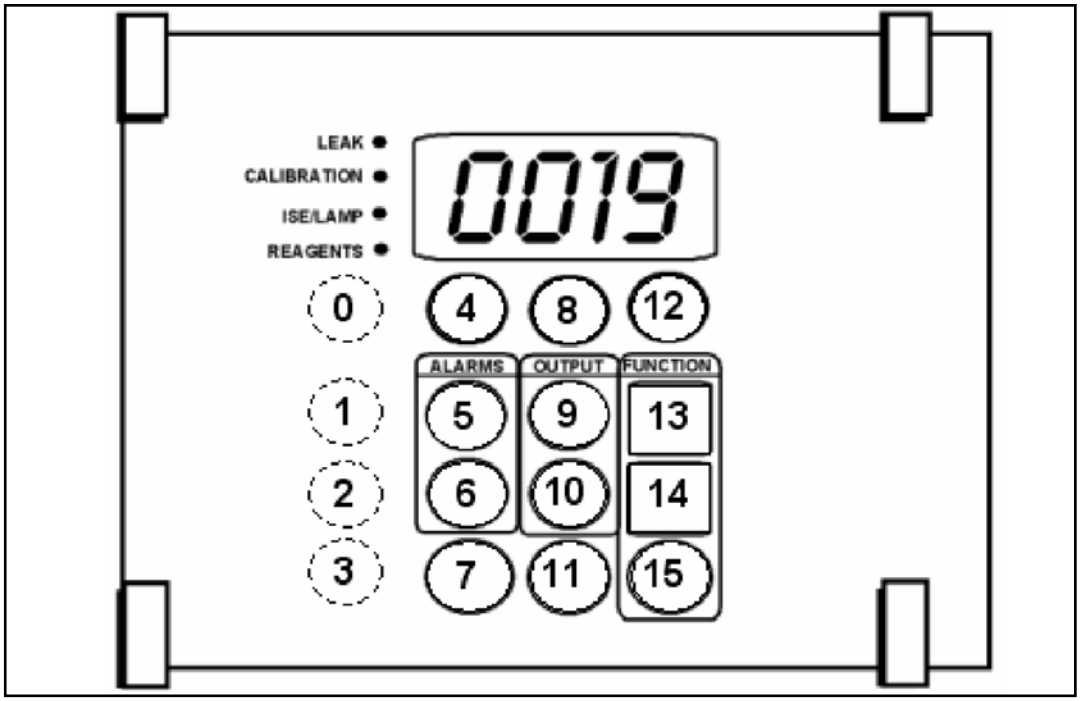
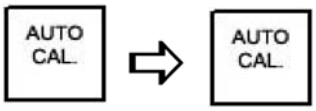
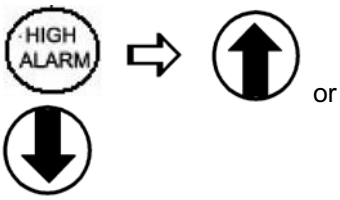
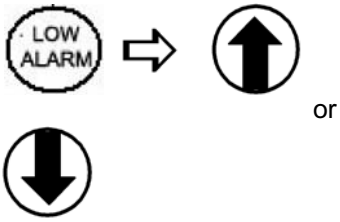


Figure E-2. Number Positions on a Single-Stream Keypad

Table E-1: Single-stream Keypad Help Sheet

Press …	Function	To Exit, Press …
	Initiates automatic calibration	No action required
	Initiates priming and auto calibration	No action required
	Sets scale to adjust output to 4mA and 0 Vdc on external device	
Referring to Figure E-2, on keypad panel, press position 15 and then 2.	Initiate valve pump test operation	
	Display high alarm setting	
	Set high alarm value	
	Display low alarm setting	
	Change low alarm value (MUST BE SET LOWER THAN HIGH ALARM)	

Press …	Function	To Exit, Press …
	Set reagent supply time	
	Display number of days remaining until replacement of reagents	
	Set output scale for 20mA and 5 Vdc	
	Display mV	
	Display Gain value	
	Initiate **grab** sample	
	Display measurement of previous grab sample	
Referring to Figure 8-4, press position **15**, then **1**, and then **10**	Turn on printer	No action required
Referring to Figure 8-4, press position **15**, then **1**, and then **10**	Turn on printer	No action required

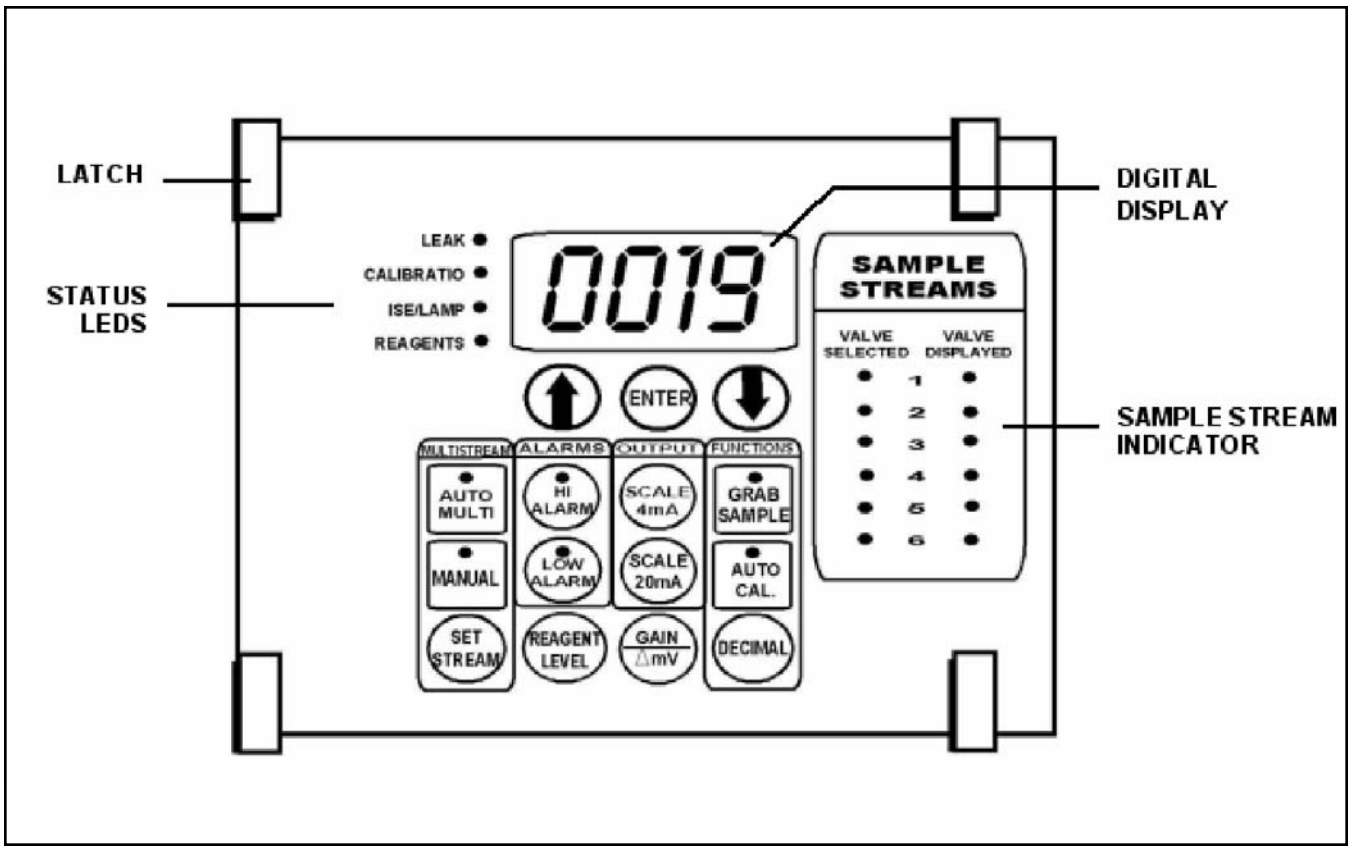


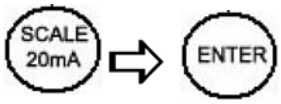
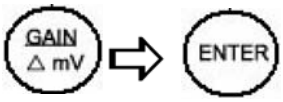
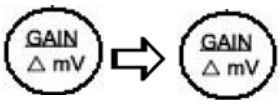
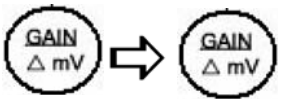
Figure E-3. Keypad Panel for Multi-stream Option

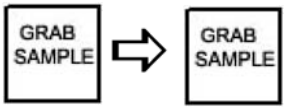
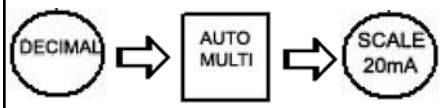
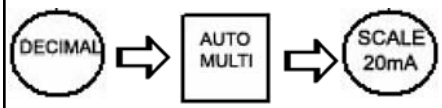
Table E-2. Multi-stream Keypad Help Sheet

Press …	Function	To Exit, Press …
AUTO CAL.	Initiates automatic calibration	No action required
AUTO CAL. ⇨ AUTO CAL.	Initiates priming and auto calibration	No action required
SCALE 4mA ⇨ ENTER	Sets scale to adjust output to 4mA and 0 Vdc on external device	ENTER
DECIMAL ⇨ MANUAL	Initiate valve pump test operation	ENTER

Press …	Function	To Exit, Press …
SET STREAM ⇨ (↑) (↓) or	Display a particular stream in multi-stream system, to set parameters	ENTER
Then, (↑) (↓) or	Set number of cycles for a particular stream in multi-stream system	ENTER
HIGH ALARM ⇨ (↑) (↓) or	Set high alarm value for stream (IF ONLY A LOW ALARM VALUE IS DESIRED, GO TO SET LOW ALARM	ENTER

Press …	Function	To Exit, Press …
LOW ALARM ⇨ (↑) (↓) or	Change low alarm value (MUST BE SET LOWER THAN HIGH ALARM SETTING)	ENTER
LOW ALARM	Display low alarm setting	ENTER
HIGH ALARM	Display high alarm setting	ENTER
AUTO MULTI	Initiates multi-stream sampling	No action required
REAGENT LEVEL	Set reagent supply time (90 days)	ENTER

Press …	Function	To Exit, Press …
	Display number of days remaining until replacement of reagents	
	Set output scale for 20mA and 5Vdc	
	Display mV	
	Display Gain value	

Press …	Function	To Exit, Press …
	Initiate grab sample	
	Display measurement of previous grab sample	
	Turn on printer	No action required
	Turn on printer	No action required

ORDERING INFORMATION

Reagents

Analyzer reagents are available from Rosemount Analytical on a contract basis. Refer to APPENDIX A, "Chemistries" for specific ordering information or contact Rosemount Analytical

Replacement Parts and Accessories

Table E-3 Replacement Parts,

Part	Part No.
Valve Pump Assembly	185-A001-01
Solenoid Valve, multi-stream	180-B301-01
Waste Tube Assembly	180-1346-01
Mounting Brackets	180-2004-01
Overflow Sampler Assembly:	
1 Stream Analyzer	180-1300-01
2 Stream Analyzer	180-1300-02
3 Stream Analyzer	180-1300-03
4 Stream Analyzer	180-1300-04
5 Stream Analyzer	180-1300-05
6 Stream Analyzer	180-1300-06
IF-100 In-Line Filter	180-1400-01
Fuse, T 1 A/250 Vdc	625-0003-02
Clamp, single-stream overflow	180-1327-01
Clamp, multi-stream overflow	180-1337-01
Clamp, drain	180-2029-01
CPU Board	180-B028-01
Power Supply Board	180-B012-03
Analog Board	180-B026-02
Multi Output Board	180-B026-01
Valve Board	180-B016-01
Keypad & Display Board Assembly, single stream	185-B003-01
Keypad & Display Board Assembly, multi-stream	185-B004-01

Part	Part No.
E Prom	(NOTE: specify chemistry range with decimal places, part #'s of analog, and line frequency, 50/60 Hz, number of streams)
Sample Line Tubing (.0625" ID)	180-2852-01
Filter, disposable (for overflow panel assembly)	180-1341-08

WARRANTY

Seller warrants that the firmware will execute the programming instructions provided by Seller, and that the Goods manufactured or Services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first. **Consumables, such as glass electrodes, membranes, liquid junctions, electrolyte, o-rings, catalytic beads, etc., and Services are warranted for a period of 90 days from the date of shipment or provision.**

Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products.

If Buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, promptly correct any errors that are found by Seller in the firmware or Services, or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the Goods/Services.

All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Seller representative. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Seller.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller. Except as otherwise expressly provided in the Agreement, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES.

RETURN OF MATERIAL

Material returned for repair, whether in or out of warranty, should be shipped prepaid to:

Emerson Process Management
Liquid Division
2400 Barranca Parkway
Irvine, CA 92606

The shipping container should be marked:

Return for Repair
Model _____

The returned material should be accompanied by a letter of transmittal which should include the following information (make a copy of the "Return of Materials Request" found on the last page of the Manual and provide the following thereon):

1. Location type of service, and length of time of service of the device.
2. Description of the faulty operation of the device and the circumstances of the failure.
3. Name and telephone number of the person to contact if there are questions about the returned material.
4. Statement as to whether warranty or non-warranty service is requested.
5. Complete shipping instructions for return of the material.

Adherence to these procedures will expedite handling of the returned material and will prevent unnecessary additional charges for inspection and testing to determine the problem with the device.

If the material is returned for out-of-warranty repairs, a purchase order for repairs should be enclosed.

SECTION 9.0
RETURN OF MATERIAL

9.1 GENERAL.

To expedite the repair and return of instruments, proper communication between the customer and the factory is important. Before returning a product for repair, call 1-949-757-8500 for a Return Materials Authorization (RMA) number.

9.2 WARRANTY REPAIR.

The following is the procedure for returning instruments still under warranty:

1. Call Rosemount Analytical for authorization.
2. To verify warranty, supply the factory sales order number or the original purchase order number. In the case of individual parts or sub-assemblies, the serial number on the unit must be supplied.
3. Carefully package the materials and enclose your “Letter of Transmittal” (see Warranty). If possible, pack the materials in the same manner as they were received.
4. Send the package prepaid to:

   Rosemount Analytical
   Liquid Division
   2400 Barranca Parkway
   Irvine, CA 92606

   Attn: Factory Repair

   RMA No. _____

   Mark the package: Returned for Repair

   Model No. ____

IMPORTANT

Please see second section of “Return of Materials Request” form. Compliance with the OSHA requirements is mandatory for the safety of all personnel. MSDS forms and a certification that the instruments have been disinfected or detoxified are required.

9.3 NON-WARRANTY REPAIR.

The following is the procedure for returning for repair instruments that are no longer under warranty:

1. Call Rosemount Analytical for authorization.
2. Supply the purchase order number, and make sure to provide the name and telephone number of the individual to be contacted should additional information be needed.
3. Do Steps 3 and 4 of Section 17.2.

NOTE

Consult the factory for additional information regarding service or repair.

The right people, the right answers, right now.

Immediate, Reliable Analytical Support

Now there's a way to quickly get the right answers for your liquid analytical instrumentation questions: the Analytical Customer Support Center.

Our staff of trained professionals is ready to provide the information you need. If you are placing an order, verifying delivery, requesting application information, or just want to contact a Rosemount Analytical representative, a call to the Customer Support Center will provide you with the right people, the right answers, right now.

A Worldwide Network of Sales and Service

Emerson Process Management's field sales offices are your source for more information on the fill line of Rosemount Analytical products. Field sales personnel will work closely with you to supply technical data and application information.

For more information, please contact your nearest Emerson Process Management sales office.

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F 971.4.8835312

VISIT OUR WEBSITE AT
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