Advanced® Micro-Osmometer Model 3320

Service Manual

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3325SM Rev10 092515

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1. Introduction

Model 3320 Osmometer Specifications

Electrical:

Voltage: 100 to 240 VAC

Frequency: 50 or 60 Hz

Fuses: 250V time delay (Type T): 1.25 Amp

Power: 60 Watts

Memory Backup: integral lithium cell; 10-year life (typical); (not user replaceable)

Sample Volume: 20 µL

Sample Capacity: single sample

Readout: 2 line by 24-character vacuum fluorescent display

Units: mOsm/kg H_2O

Range: 0 to 2000 mOsm/kg H_2O

Resolution: 1 mOsm/kg H_2O

Communications: DTE EIA-232/V.24 (RS-232) serial port, parallel printer port and optional barcode scanner

Performance at Reference Conditions[1]

Linearity: Less than ±1% from a straight line over calibrated range

Repeatability:
0 to 400 mOsm: Std. Deviation ≤ 2 mOsm/kg H_2O
400 to 2000 mOsm: Std. Deviation ≤ 0.5% of value mOsm/kg H_2O

Drift: Less than 1 mOsm/kg H_2O per month

Performance Over Operating Conditions

Temperature Effects: Less than 1 mOsm/kg H_2O for every 5°C (9°F) ambient temperature change.

Operating Conditions

Temperature: 18°C to 35°C (64°F to 95°F)

Humidity: 5 to 80% relative humidity; (non-condensing)

Storage Temperature: -40°C to +45°C (-40°F to +113°F)

Start-up Time: 30 seconds from power-on

Test Time: 60 seconds

Dimensions	inches	centimeters
Width:	14.0	35.5
Depth:	15.0	38.1
Height:	14.0	35.5

Weight	pounds	kilograms
Net:	13.4	6.1
Shipping:	25.0	11.4

Warranty: One-year limited warranty on workmanship and all parts except glass, plastic and parts warranted by their makers.

Certification: Intertek 98214

Refer to Regulatory Notices (see page 11) for applicable standards.

Installation Class:	I
Over-Voltage Category:	II
Pollution Degree:	2
Moisture Protection:	IPXO (ordinary)

[1]Reference Conditions: 20 to 25°C (68 to 77°F); 40 to 60% Relative Humidity; tolerances of reference or calibration solutions excluded.

General Description and Purpose

The Advanced® Model 3320 Osmometer uses the freezing-point depression method to measure the osmotic concentration of body fluids such as blood, serum and urine. The Model 3320 automatically tests a single 20 µL sample.

This Service Manual contains:

- instructions for performing repairs.
- guides for troubleshooting operational and mechanical problems.
- circuit system illustrations.
- information about replacement parts and service repairs.

This manual is designed to assist service technicians, and does not imply a license to perform repairs without proper qualifications.

Service Assistance

To contact Advanced Instruments Product Service:

- Call (800) 225-4034 (toll-free within the USA and Canada; after normal business hours, dial extension 2191)
- Call +US (781) 320-9000 (elsewhere)
- Or fax (781) 320-0811

When calling Advanced Instruments, have the model and serial number from the label on the bottom of the instrument, and a description of the problem. Use a telephone as close to the instrument as possible in order to facilitate making recommended diagnostic checks.

A service technician may assist in making minor repairs over the phone, providing you with recommended parts (or part numbers), or may issue an authorization (RMA) to ship the instrument for factory repair.

The RMA procedure is as follows:

1. Contact Advanced Instruments to obtain an RMA.
2. Pack and ship the instrument in its original carton. Do not send instrument supply items.
3. Prepay shipment to the factory. Advanced Instruments cannot accept collect shipments. Insure the shipment or accept the damage risk.

Safety / Regulatory Information

To reduce the risk of bodily injury, electric shock, fire, and damage to your instrument, please read and observe the following precautions.

- If the product is used in a manner not in accordance with the equipment design, operating instructions or manufacturer's recommendations, the operation of the product may be impaired to the extent that a safety hazard is created.
- Do not attempt to perform electrical work if you are not fully qualified. This manual is not a substitute for electrical training.

Symbol Conventions

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying this product.

The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute risk of electric shock to persons.

The static symbol within an equilateral triangle is intended to alert the user to the presence of internal components that could be damaged by static electricity.

This static symbol is intended to alert the user to the presence of a specific component that could be damaged by static electricity.

This symbol indicates the presence of alternating current (AC).

This symbol indicates the presence of a fuse.

This symbol indicates the presence of protective earth ground.

This symbol indicates the power is ON.

This symbol indicates the power is OFF.

General Cautions

- This product should be operated only with the type of power source indicated on the product's electrical ratings label. Refer to the installation instructions included with the product.
- If the power cord provided is replaced for any reason or if an alternate cord is used, the cord must be approved for use in the local country. The power cord must be approved for the product's listed operating voltage and be rated at least 20% greater than the ampere ratings marked on the product's electrical ratings label. The cord end that connects to the product must have an IEC 60320 connector.
- Plug the product into an approved grounded electrical outlet.
- Do not disable the power cord's grounding plug.
- If an extension cord or power strip is used, make sure that the cord or strip is rated for the product, and that the total ampere ratings of all products plugged into the extension cord or strip do not exceed 80% of the cord's or strip's rating limit.
- Route power cords so that they will not be walked on, tripped on, or pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cord exits the product.

- Do not pull on cords and cables. When unplugging cords or cables, grasp the corresponding connector.
- Do not install or use this product in any area subject to extreme short-term temperature variations, or locations that exceed the specified operating environment temperatures.
- Never use this product in a wet area.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.
- Do not install or use the product on an unstable, non-level work surface.
- Do not operate this product with the covers removed or unsecured.

Service & Maintenance Cautions

- Unplug the power cord prior to opening or removing covers, or else you may be exposed to electric shock, excessive temperatures, or mechanical hazards.
- Performing service or maintenance not detailed in the User's Guide, with or without this Service Manual, should only be done by a qualified service technician.
- Never restrict airflow into or out of the product. Occasionally, check the air vents for blockage.
- Wipe the exterior of the product with a soft, damp cloth as needed. Using cleaning products other than those specified, may discolor or damage the finish.
- If the product requires service for any of the following reasons, unplug the product from the electrical outlet and refer service to a qualified service technician.
  - The power cord, extension cord, power strip or power input module is damaged.
  - Liquid has been spilled into the interior of the product.
  - A foreign object has fallen into the product.
  - The product has been dropped or damaged by a falling object.
  - There are noticeable signs of overheating or a burning odor.
  - The product does not operate normally when you follow the operating procedures.
  - The main supply fuse(s) or any internal fuse(s) continually fail.
- A discharge of static electricity from contact with the human body or other conductor may damage system boards or static sensitive devices. Never perform internal maintenance without following recommended static protection procedures.
- The product is equipped with operator accessible fuses. If a fuse blows, it may be due to a power surge or failure of a component. Replace the fuse only once. If the fuse blows a second time, it is probably caused by failure of a component part. If this occurs, refer service to qualified service personnel. Always replace the fuse with one of the same rating, voltage, and type. Never replace the fuse with one of a higher current rating.
- When servicing the product, use only factory-specified parts.
- WARNING: When returning this product for service, or shipping this product to a second location, remove all hazardous specimens and decontaminate the product before packaging for shipment. If the product cannot be decontaminated, consult with your shipping agent on appropriate packaging and marking.

Hazardous Material Cautions

- **WARNING**: Handle all biohazardous materials according to established good laboratory practices and follow your institution's exposure control plan. Persons handling human blood and body fluid samples must be trained in blood-borne hazards and observe universal precautions. Universal precautions is an approach to infection control, where all human blood and body fluids are treated as if known to be infectious. Use personal protective equipment such as gloves, gowns, etc., to prevent exposure. Store biohazardous materials in regulated waste containers and dispose of these materials in a safe and acceptable manner that is in compliance with all country, state and local requirements.
- If a biohazardous material is spilled on or inside the equipment, decontaminate the equipment using a 1% bleach solution, or as outlined by those policies and procedures established within your institution.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Regulatory Notices

- This product has been designed and manufactured in accordance with U.S., Canadian, and European regulatory requirements as outlined below. Modifications made to this product that are not expressly approved in writing by the manufacturer will void the user's authority to operate this product, previously issued factory approvals, and the user's rights under the warranty.
- The distributor or dealer may have applied additional local, national, or international approvals to this product. Consult the distributor or dealer for more information and documentation.
- Connections to this product must be made with shielded cables. Use of non-shielded cables may violate RFI/EMI limits.

Symbol Conventions

CE This symbol indicates conformity to relevant European directives.

ETL C US LISTED Intertek 98214 This symbol indicates the product was tested to conform to relevant Canadian and U.S. safety standards by Intertek Testing Services NA, Inc. The ETL mark is approved in the United States as a Nationally Recognized Testing Lab (NRTL) by OSHA, and in Canada by the Standards Council of Canada.

IVD *In Vitro* Diagnostic Medical Device complying with EU Directive 98/79/EC.

Pb This symbol, depending upon its location, indicates the assembly, component, and/or product are free of lead. In respect to its inclusion on a circuit component or assembly, the following must be adhered to when servicing. Failure to do so may result in defects caused by dissimilar metals.

1. Do not repair or modify using a lead-containing solder.
2. Do not repair or modify using any soldering tools that have been in contact with lead-containing solders.
3. Do not repair or modify with any lead-free solder other than that specified by the manufacturer or as indicated by the symbology of standard IPC-1066.
4. Do not repair or modify using any soldering tools that have been in contact with any other incompatible lead-free solders.
5. Contact factory service for further information.

EXAMPLES ONLY

The number in this symbol indicates the type of lead-free solder used in the assembly of printed circuit boards, per standard IPC-1066. Repair or modification must be performed using the same or compatible type lead-free solder and matching tools. Failure to do so may result in defects caused by dissimilar metals.

Contact factory service for further information.

FCC Requirements

- **WARNING**: Changes or modifications to this unit not expressly approved by Advanced Instruments could void the user's authority to operate the equipment.
- 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 in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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.

Regulatory approval type	Description
U.S. Safety	This product has been listed by ETL testing laboratories as being in compliance with the requirements of UL 61010-1, Second Edition, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use; Part 1: General Requirements". The "US" in the lower right of the ETL mark demonstrates this listing.
Canadian Safety	This product has been listed by ETL testing laboratories as being in compliance with the requirements of CAN/CSA C22.2 No. 61010-1, "Second Edition, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use; Part 1: General Requirements". The "C" in the lower left of the ETL mark demonstrates this listing.
EC Declaration of: Conformity - Low Voltage	This product meets the intent of Directive 2006/95/EC, the Low Voltage Directive. Compliance was demonstrated using the following standards as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update. · EN 61010-1, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements". · IEC 61010-2-101, "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use; Part 2-101: Particular Requirements for In Vitro Diagnostic (IVD) Medical Equipment, First Edition".
EC Declaration of Conformity - EMC	This product meets the intent of Directive 2004/108/EC for Electromagnetic Compatibility. Compliance was demonstrated using the following standards, as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update. • EN 61326-1, Group 1, Class B, "Electrical Equipment for Measurement, Control, and Laboratory Use".

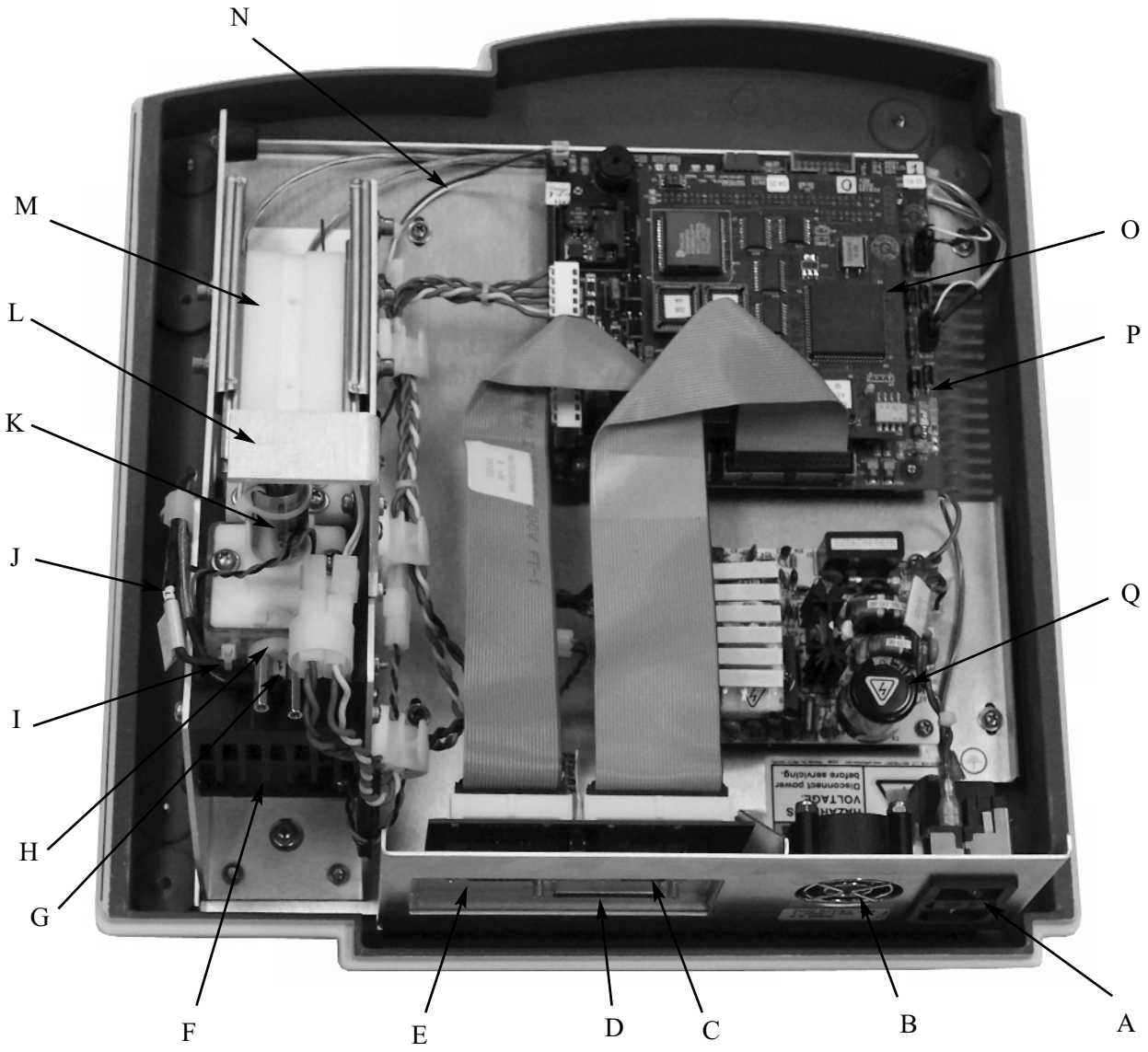
Regulatory approval type	Description
EC Declaration of Conformity - IVD	This product meets the intent of Directive 98/79/EC for In Vitro Diagnostic Medical Devices. Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update.
CB Report Available upon request	A CB report to standard IEC 61010-1 and IEC 61010-2-101 has been prepared by Intertek Testing Services. A certificate is available upon request.
FCC - Part 15 Subpart B, Class A	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Canadian ICES-003	This Class A digital apparatus complies with Canadian ICES-003. *Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.*
U.S. FDA Listing	The osmometer, along with the calibrators and controls manufactured by Advanced Instruments, are listed with a U.S. Department of Health and Human Services, Food and Drug Administration, as: Osmometer Class 1 Calibrators Class 2 Controls Class 1

Regulatory approval type	Description
Health Canada License	The osmometer, along with the calibrators and controls manufactured by Advanced Instruments, are licensed with Health Canada, Therapeutic Products Directorate, Medical Devices Bureau, as: Osmometer Class 2 Calibrators Class 2 Controls Class 2
EC Declaration of Conformity - WEEE	This product meets the intent of Directive 2002/96/EC as amended by 2003/108/EC for Waste Electrical and Electronic Equipment (WEEE). Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update.
RoHS	This product meets the intent of Directive 2002/95/EC for the Restriction of Use of Certain Hazardous Substances. This product is exempt under the terms of Article 2, paragraph 1 due to its listing in Category 8 and/or 9 of Directive 2002/96/EC.

Notes:

2. General Overview

Overview



A. Power Entry Module
B. Secondary Cooling Fan
C. RS-232 Port
D. Printer Port
E. Barcode Port
F. Cooling Fan
G. Sample Probe Bin Number
H. Sample Probe
I. Block Probe
J. Block Probe Bin Number
K. Solenoid
L. Solenoid Retainer
M. Sample Handling Assembly
N. Actuator Switch Cable
O. Central Processor Board
P. Application Board
Q. Power Supply

Notes:

3320 Circuit Description

The 3320 is comprised of the following functional blocks:

Power Supply - Part No. 332950

The power entry assembly interfaces the AC voltage presented to the instrument with the power supply. The power supply provides +15VDC to the main printed circuit board. The thermoelectric cooling well fan and solenoid operate at +15VDC. The secondary cooling fan operates at +12VDC via a drop-down resistor.

Front End (sample handling assembly)

The sample thermistor measures the temperature of the sample. The thermoelectric (whose duty cycle is controlled through the block probe/thermistor) supercools the sample. When the supercooled sample reaches a set temperature (3200 mOsm), the impactor strikes the sample, causing the sample to freeze. The main cooling fan remains on as long as the thermoelectric is running.

The sample handling assembly also includes a mechanical slide for holding and introducing the sampler. Under this slide is a microswitch connected to the application PCB, to automatically start and stop the test routine.

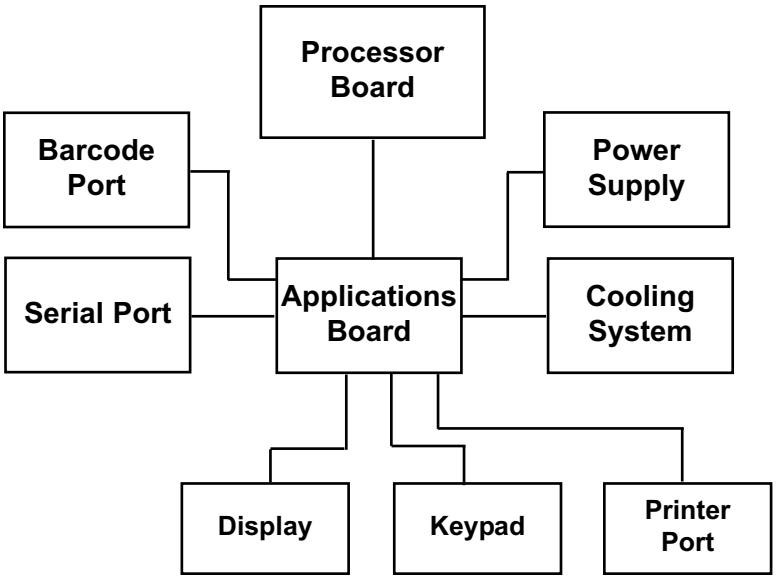
332620 Control Board Set

General: The control board set is made up of two printed circuit boards in a motherboard/daughterboard configuration.

PCB120 Processor Board

Processor: The processor used is an Intel 80C186 16-bit embedded processor. The 80C186 contains three programmable 16-bit timers, two serial ports, programmable interrupts, 1 megabyte of memory address space, and 64 kilobytes of input/output (I/O) address space. The processor uses an external 32 MHz crystal to generate the internal 16 MHz system clock. The processor controls access to all memory and all I/O.

Memory Map: The 1 megabyte of memory address space contains read-only memory (Flash EPROM), read/write memory (static RAM), and the real time clock. About half of the address space is unused, allowing for



future expansion. The read-only memory is divided into four sections: reset vector, boot code, parameter blocks (unused), and applicaiton code. The reset vector tells the processor where to first start executing code; in this case, the boot code is executed first after reset. The boot code determines if new software will be downloaded by checking if the program switch or dip switch is in the "PROGRAM" position. If it is, the boot code waits for new software to be downloaded through the serial port. If not, the application code starts.

The real time clock maintains the current date and time, and contains nonvolatile memory where the instrument's operation parameters are stored. A internal lithium battery preserves the contents of the nonvolatile memory when the instrument is turned off. Finally, the read-write memory is used for stacks, variables, etc., except for the small section allocated for the interrupt vectors. The interrupt vectors tell the processor what code to run when an interrupt occurs, and functions similarly to the reset vector.

Please note that all memory addresses and sizes are always defined in terms of bytes, even though the processor handles words (1 word = 2 bytes, 1 byte = 8 bits; therefore, 16 bits = 1 word).

Input/Output Map: The 64 kilobytes of I/O address space control access to all peripherals such as the serial ports, application board, etc. The processor uses 256 bytes, called the Peripheral Control Block, to control the integrated serial ports, timers, interrupts, chip selects, and I/O pins. The Peripheral Control Block is fully described in the 80C186EB/80C188EB Microprocessor User's Manual. The application board's registers and the CPU board's registers control access to various functions and are described later.

Memory: Two types of memory are available: read-only and read/write. The chips used here have 8-bit wide data buses. Used in pairs, the memory becomes compatible with the processor's 16-bit wide data bus. The read-only memory is implemented using two 128 kilobytes x 8 bits Flash EPROMs. Flash memory is only programmable when a programming voltage (in this case, 12 volts DC) is applied to the memory; otherwise, it behaves like read-only memory. The boot code controls the programming voltage, since this is the only place where new software can be downloaded. The read/write memory is implemented using two 128 kilobytes x 8 bits static RAMs.

Watchdog Timer: The watchdog timer provides a mechanism to reset the processor when the software is not behaving normally. The software "pets" the watchdog every 100 - 200 milliseconds. As long as the watchdog is "petted", nothing happens. However, if the software stops "petting" the watchdog, the watchdog "bites" the processor by activating the processor's RESET pin, causing the processor to reset. The watchdog will also reset the processor if the power supply falls below 4.75 VDC. These two features allow the instrument to recover from abnormal software and hardware conditions.

Real Time Clock (RTC): The real time clock maintains the current date and time. The RTC uses an internal clock circuit with an internal, 10-year life, lithium battery to perform timekeeping. The battery also preserves the contents of internal memory.

Dip Switch: The four-position dip switch allows the user to download new software via one switch. The other three switches are available for selecting different operating modes. These operating modes and the process for downloading software are described later in this manual.

Voltages: Three voltages are present on the CPU board: +5 VDC, +12 VDC, and V_{PP}. +5 VDC powers all the logic. +12 VDC is switched on and off to create the flash memory's programming voltage, V_{PP}.

Glue Logic: The glue logic performs the functions of creating the RAM memory chip selects, the Flash memory write signals, the

V_{PP} control signal, the watchdog control signal, and accessing the dip switch. The CPU board has two software accessible hardware registers to read the dip switch and to control watchdog and V_{PP}.

Connectors: A 64-pin connector provides address, data and interrupt signals. A 16-pin connector provides general chip selects and serial receive/transmit signals. The application PCB uses a subset of the available signals.

PCB115 Application Board

The application PCB contains all circuitry specific to the 3320 instrument. The board includes voltage supplies, indicators, analog-to-digital converters, drive circuitry, parallel ports, serial ports, and various switches.

Analog-to-Digital Converters: Two analog-to-digital, 24-bit sigma-delta converters are provided; one for the sample thermistor probe, and one for the block thermistor probe. The thermistors vary in resistance from approximately 2 kilo ohms at room temperature, to approximately 10 kilo ohms at -12ºC. Typically, a 0.6 ohm change in the thermistor's resistance equates to a 1 mOsm/1.86mºC change. A separate Wheatstone bridge circuit is used to measure the voltage across each thermistor probe. This voltage is first filtered and then sampled by the analog-to-digital converter. The analog-to-digital converter uses a sigma-delta conversion technique with on-chip filtering and a 2.5 VDC reference voltage.

Drive Circuitry: Drive circuitry is provided to turn on and off the three high current loads such as the impactor, the thermoelectric cooler, and the fan.

The impactor coil is controlled by the FET transistor Q3 on PCB115, that is interfaced to the processor through the PLD application logic.

The thermoelectric cooler is controlled by the FET driver transistor (Q4) on PCB115. The FET is, in turn, controlled by the microprocessor through the PLD application logic. The processor varies the duty cycle square wave in response to software commands and block probe resistance.

The fan is controlled by FET transistor Q2 on PCB115, that is interfaced to the processor through the PLD application logic.

Back Panel I/O Board Description - Part No. PCB140

Circuitry for the two serial ports (RS-232 and barcode), the parallel printer port, and a remote programming switch are present on the I/O board mounted to the rear of the chassis, with cabling back to the application board.

Display & Keypad - Part No. 202511: The display and keypad are interfaced to the processor via programmable logic devices (PLDs). The keypad provides a two-button interface between the user and the instrument. The second line of the display is used to indicate the function of each key. The software changes the button description on the second line of the display.

Light Emitting Diodes (LED): LEDs are provided to indicate when a high current load is active, a sensor is tripped, or a voltage supply is active. Green LEDs are used on the power supply voltages, yellow LEDs are used on driver signals such as the fan and impactor, and red LEDs are used for factory diagnostics.

Application Logic: The application logic is made up mainly of one programmable logic device (PLD). This provides software accessible hardware registers, enabling the software to read the keypad, sensors, and analog-to-digital converters. This also allows manipulation of the display, external components such as the fan, impactor, etc., and interface to the RS-232 ports. The external printer is controlled directly from the microprocessor through an 8-pin D-latch.

Connectors: Connectors are supplied for the CPU PCB, display, keypad, power, drives, probes, and back panel I/O ports.

Serial (RS-232) Port Interface: An RS-232 line driver/receiver provides the microprocessor with a serial port interface that supports both hardware and software handshaking.

The DB-9 RS-232 port conforms to the DTE RS-232C standard and has the following pin assignments:

Signal	Pin	Direction
Carrier Detect	1	to 3320
Receive Data	2	to 3320
Transmit Data	3	from 3320
Data Terminal Ready	4	from 3320
Signal Ground	5	common
Data Set Ready	6	to 3320
Request to Send	7	from 3320
Clear to Send	8	to 3320

Note that the instrument is only designed to support unidirectional communication with an external device. At this time, there is no protocol for bidirectional communication.

For a sample RS-232 Port Setup, please see the RS-232 Supplemental Information in the Appendix at the end of the user's guide.

Note: *This instrument requires the use of a null modem RS-232C cable. There are several variations on null modem cables. Advanced Instruments recommends that the RS-232C cable be purchased directly from our factory.*

Barcode Port: A D-type, 15-pin barcode port is provided in the back of the 3320 for connecting and providing power to such a device. For proper operation, the barcode port requires a 1200 bps, RS-232 signal providing asynchronous serial data containing 1 start bit, 8 data bits, 1 stop bit, and no parity.

A suitable barcode scanner is available from Advanced Instruments. To interface with the 3320, the barcode scanner must be programmed as follows, referring to the scanner users guide.

1200 bps
CR suffix
disable beep after good decode
triggerless trigger mode (optional)

Signal	Pin	Direction
+5V DC	1	to reader
receive data	10	from reader
gnd/earth	9	common

Barcode Port Connections

Secondary Cooling Fan: A 12VDC secondary exhaust fan is mounted to the rear panel and used for providing cool air flow over the power supply and control board set. This fan remains on as long as power is on for the instrument. The fan is connected to the +15VDC output from the power supply through a power resistor, which drops the voltage to +12VDC.

Instrument Software Updates

Software for the Advanced Instruments Model 3320 instrument is contained in factory-installed integrated circuits called Flash EPROMs, “Electrically Erasable Programmable Read-Only Memory”, and is sometimes referred to as “Firmware”.

This type of memory is furnished in two PLCC (Plastic Lead Chip Carrier) devices on the PCB120 processor board at locations U3 and U4. U3 is the lower 8 bits of the 16-bit processor address bus, and U4 is the upper 8 bits.

Advanced Instruments products using this “FLASH” technology can be field-updated using a Windows PC and Advanced Instruments serial cable. For the latest instructions on performing the RS-232 port firmware upgrade, consult the documentation supplied with the upgrade package. For information on available updates, consult Advanced Instruments or your distributor.

Performing FLASH firmware update

Performing this update should not affect any of your calibrations or system settings, unless the update has made changes to this area of memory. For specific information, consult the documentation included with the update.

1. Turn off the instrument.
2. Attach the Advanced Instruments serial cable between your PC and the instrument.
3. Locate the small hole in the back panel sheetmetal between the barcode and serial port connectors. Using an unfolded paperclip or similar item, depress the recessed switch behind the small hole while performing the next step.
4. Turn on the instrument. After about four seconds, the display should read “Flash BOOT Program”. Remove the paperclip.
5. Perform the download, using the instructions provided with the update software.

   After download is complete, the instrument will reboot and report the new software version.

If any problems occur, check the connections and switch position settings, and then try the download again. If after download the instrument does not function correctly, consult the rest of this service manual before contacting Advanced Instruments for service.

Option Switch Settings

Processor board PCB120 is equipped with a four-position dip switch. Each switch position and combination of positions can be used to configure different programming options, such as the programming option listed above for Flash update mode.

If your settings should accidentally get changed, or your replacement processor board is shipped from the factory with the incorrect settings for your product, the following table details the appropriate switch positions for restoring your instrument to proper operation.

Option Switch Setup Table

	SW1			
	1	2	3	4
Program	ON	OFF	OFF	OFF
210	OFF	OFF	OFF	OFF
3320	OFF	ON	OFF	OFF

NOTE:
ON = 1 = CLOSED
OFF = 0 = OPEN

Design Changes

The serial number suffix (referred to in this manual simply as the *suffix*) indicates the revision of the instrument. The chart below lists the major changes made at each revision of the 3320 Osmometer.

Model 3320 Osmometer	Description
Serial Suffix 'A' June 2005	Original model released.
Serial Suffix 'B' October 2009	New power supply.

Replacement Parts

Actuator Switch 332318R
Back Panel I/O Board PCB140R
Block Probe Cable 332341R
Block Probe 332340R
Cooling Assembly 332400R
Cooling Fan 330330R
CPU and Application PC Board Set:
PCB115, PCB120 . . . . . .332620R
Display Module 330800R
Fuses (2 required):
1.25-Amp Time Delay Fuse 70013R
Keypad 202511R
NVRAM Battery 71027R
Power Entry Fuse Holder 332148
Power Entry Module 332149R
Power Supply (Suffix A) 332950R
Power Supply (Suffix B) 332951R
Printer Parallel Cable 3D3556
Sample Handling Assembly 332310R
Sample Probe Cable 240725R
Sample Probe 330700
Secondary Cooling Fan 332087R
Software Upgrade Kit* SFW008
Solenoid Impactor 3M2353R

Supplies & Accessories

Clinitrol™ Reference Solution (10 X 2-mL ampules) 3MA029
Protinol® 3-Level Protein Control (9 X 3-mL bottles, 3 of each level) 3MA028
Renol™ Urine Osmolality Controls (8 X 3-mL bottles, 3 of each level) 3LA085
5-Value Osmolality Linearity Set (10 X 5-mL ampules, 2 of each value) 3LA028
50 mOsm/kg Calibration Standard (10 X 2-mL ampules) 3MA005
850 mOsm/kg Calibration Standard (10 X 2-mL ampules) 3MA085
2000 mOsm/kg Calibration Standard (10 X 5-mL ampules) 3LA201
20-µL Sampler 3M0825
Micro-Sample Test Kit (500 tests) 3MA800
Sampler Plunger Wires (2) 3M0828
Thermal Printer with Interface Cable, Operation Manual, Thermal Paper Roll, and Printer Power Supply
100-120 VAC . . . . . .210555_NA
230 VAC . . . . . .210555_EU
Printer Paper (5 rolls) 3D3835
User's Guide 3325
Service Manual 3325SM
Serial Cable RS232-Cable
Barcode Scanner 330016

* *Upgrade kit SFW008 comes with a 3-meter serial cable.*

How to order:

To order parts, supplies and accessories, contact Advanced Instruments Customer Service.

- 800-225-4034 (toll-free within the USA and Canada)
- +US 781-320-9000 (elsewhere)
- +US 781-320-3669 (fax)

Notes:

3. Maintenance

Maintaining the Instrument

1. Cleaning Air Vents

Examine the air vents on the underside and rear of the instrument to ensure that they are unobstructed by dust or debris.

2. Cleaning the Instrument Exterior

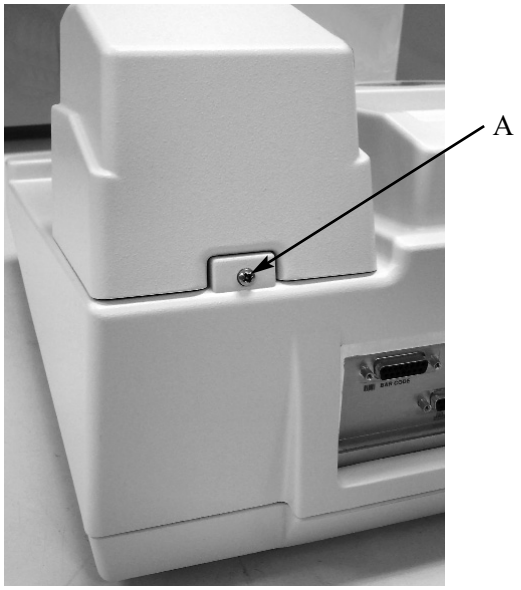
Use a mixture of warm water and soap. A mixture of Isopropyl Alcohol may also be used to further decontaminate the exterior. Do not use abrasive cleansers or scouring pads, as they may mar the surface. Do not allow liquid to enter the cooling chamber or other portions of the instrument.

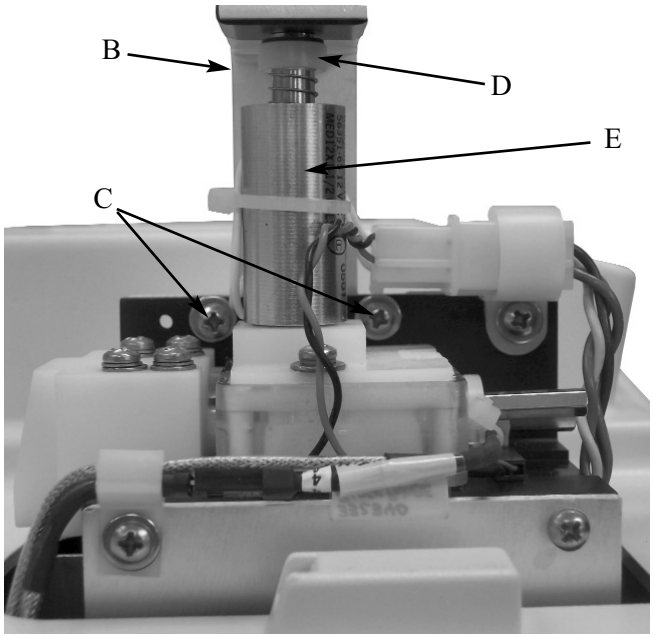
Notes:

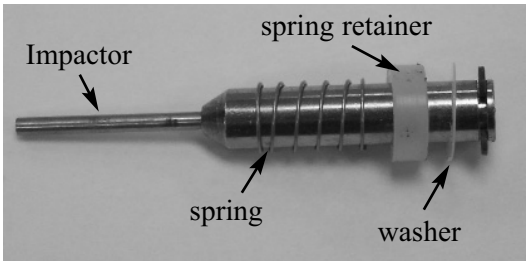
Solenoid Cleaning Procedure

This cleaning procedure should be used if you suspect that your samples are not freezing properly because the solenoid impactor cannot move freely due to the accumulation of sample residue within the freezing chamber.

1. Remove the power cord from the rear of instrument.
2. Loosen the screw (A) holding the solenoid cover on the instrument and remove the cover.
3. Place a dry chamber cleaner in the cooling chamber.
4. Locate the solenoid retainer (B) and loosen both screws (C). Remove the retainer.
5. Withdraw the solenoid plunger (D) while leaving the solenoid body (E) in place. Care must be taken when removing the solenoid plunger to not lose the spring, spring retainer, or plastic washer (if present).

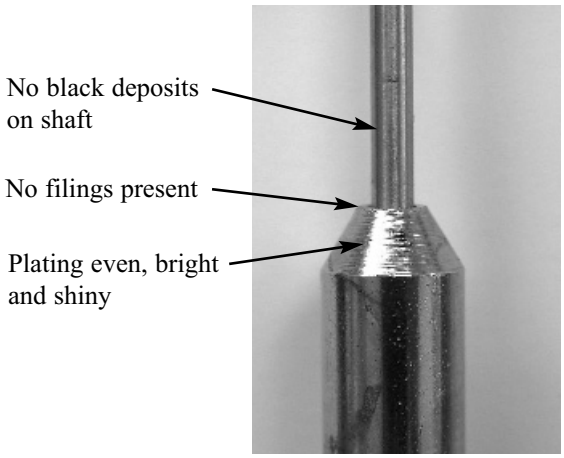




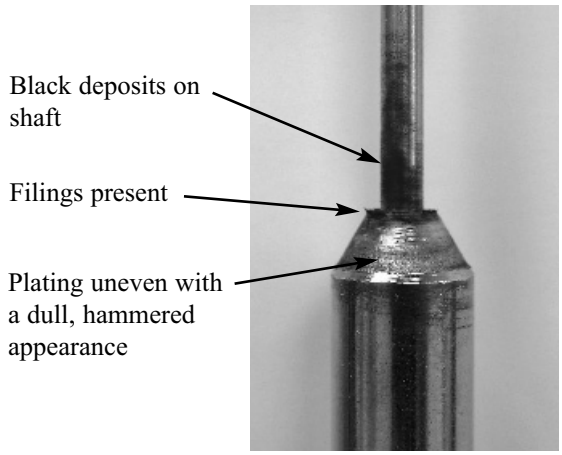


6. Inspect the impactor for excessive wear (see photo examples).
7. Clean the smaller diameter tip of the solenoid plunger with a 70% isopropanol solution. Do not use any abrasive for this cleaning procedure.
8. Dampen the wooden end of a cotton-tipped applicator with a 70% isopropanol solution, and insert it through the solenoid body into the smaller diameter plunger hole until it reaches the chamber cleaner. Move the applicator in and out to scrub the sides of the hole.
9. Return the cleaned solenoid plunger, including spring, retainer and any washers, to the solenoid body. Secure the retainer and remove the chamber cleaner.
10. Replace the solenoid cover, restore power and recalibrate, if necessary.

If you have difficulty or if the instrument does not function properly, please obtain Hot-Line service by calling 800-225-4034 (toll-free within the USA and Canada) or (+US) 781-320-9000 (elsewhere), 24-hour service extension 2191.



Impactor with No Visible Wear



Impactor with Substantial Wear

4. Troubleshooting

Introduction

All troubleshooting must be performed by qualified service technicians who have basic electrical troubleshooting skills and the proper equipment (i.e., voltage meter). This manual does not imply a license to troubleshoot or perform repairs without proper qualifications.

CAUTION: Some troubleshooting requires the instrument to be turned on while the cover is removed. Use extreme caution when operating the instrument without the cover. Hazardous voltages are present at the AC input and power supply.

The troubleshooting chart in this section lists problems that may occur while operating the instrument. The left column describes the symptom, the middle column lists checks to determine what is causing the problem, and the right column suggests an action to resolve the problem. Follow the checks in the order they are listed. If you perform checks out of order, you risk replacing the wrong part. If, after performing all checks, there is still a problem, call the Advanced Instruments Product Service Department. See Service Assistance (Section 1 - Introduction) for the appropriate phone number to call.

Diagnostic Menu

The Diagnostic Menu **[DIAG]** contains items that allow discrete testing of each component of the instrument. Enter the Diagnostic Menu by scrolling to it, and pushing the **[DIAG]** button. A description of the available tests follows.

1. **A/D Tests**
   A/D Tests are designed to check the performance of the cooling assembly, and the efficiency of heat transfer between the components of the cooling assembly. The result of an A/D Test gives a "duty cycle", expressed as a percentage indication of how much power the thermoelectric cooler uses to reach an operating temperature sensed by the block probe. An increasing duty cycle indicates deteriorating performance of the cooling assembly. Pressing the left button will change the set or selected cooling assembly temperature. Pressing the right button will change the display from resistance to temperature. The sample probe readings are also displayed.

2. **Probe Bin Test**
   The bin test is used to determine the resistance of the sample probe at a specific temperature. (-0.093°C is used for convenience, which corresponds to the 50 mOsm/kg calibration standard.) When a new sample probe is installed, the bin number must be determined and entered into the instrument from the Setup Menu. With age or hard use, the resistance of a probe may change. It is therefore useful to recheck the bin test as part of a routine diagnostic check.

3. **Solenoid Test**
   The Solenoid Test will manually trigger the freeze solenoid. The solenoid should give an audible impact sequence immediately on pressing the [**START**] button.

4. **Display/Print Test**
   This test sends a complete character set to the display, serial port and printer port. This test will identify any problems with these areas.

5. **Key/Beeper Test**
   Proper function of the keypad can be confirmed by this test. As each button is pressed, **[*******]** appears above the button and a beep is heard.

6. **Barcode Test**
   This menu selection is for testing a barcode scanner. Scanned information will appear on the display, and a short beep will occur. Additional scans may be performed until the test is cancelled. Please

note that the barcode scanner may also beep, if its beeper is not disabled.

Exit

Returns the user to the "Osmometer Ready" prompt.

Troubleshooting Table

Symptom	Check	Suggested Action
1. Abrupt loss of power (no display)	Power availability. Temporarily unplug the power cord from its wall outlet and replace it with a known workable lamp or small appliance. Measure the AC voltage supplied at the power outlet used for this instrument. Unplug the power cord from the power entry module. Use a small screwdriver to pry out the fuse holder. Visually check the two 5mm x 20mm fuses for a blown fuse. If there is any doubt, test the fuses with a continuity checker or ohmmeter or simply replace them. Also check the values marked on the fuses. Locate the main power supply. Check for + 15VDC at supply output. Check for your AC voltage at the input.	Have the power restored. Make sure the power cord is firmly plugged into both the wall outlet and the socket on the back of the instrument. Replace blown or incorrect-value fuses with 1.25 Amp 250V time delay (T) fuses. If a fuse was blown and a replacement fuse blows too, contact our product service department for assistance. If there is power at the supply input but none at the output, replace the power supply. If the problem persists, contact our product service department for assistance.
2. "Block Probe Open?"	Switch the instrument off, then on. Check the block probe by running the A/D tests. Check the block probe by using the ohmmeter. Probe should be approximately 2000 ohms at room temperature.	If the error message does not persist and other error messages are not displayed, ignore this message. If the problem persists, contact our product service department for assistance.
3."Fan Driver Failure"	Switch the instrument off, then on. This instrument has two fans, one on the rear panel and the other under the sample handling assembly. This message indicates a problem with the latter. Check the fan wire connection to the drive harness.	If the problem persists, contact our product service department for assistance.
4. "No Plateau Detected..."	Check the sampler's calibration for proper volume.	Retry the test. Verify that the sample osmolality should be within the range limits for the instrument (i.e., within 0-2000 mOsm/kg H_2O). If the problem persists, contact our product service department for assistance.

Symptom	Check	Suggested Action
5. "Parameter RAM Failed" or "No Parameters in RAM"	Switch the instrument off, wait 10 seconds, then on.	Possible battery replacement required. If the problem persists, contact our product service department for assistance.
6. "Recalibration Needed"	Calibrate the instrument.	Recalibrate. If this message is combined with message #5 above, that is your primary problem.
7. Results not repeatable (too scattered)	Were the sample cell and sampler clean for each test? Is the sampler plunger wire replaced every 500 tests? Is the sampler properly calibrated? Has solenoid become loose?	Replace and calibrate the plunger wire according to the instructions supplied with the sampler. Calibrate the sampler according to the instructions supplied. Tighten the solenoid.
8. "Sample Did Not Freeze..."	**Impacts Occurred** • Was the sample configuration correct? • Refer to the instructions supplied with the sampler. • Is the block probe bin number correct? **No Impacts** Check the impactor solenoid by running the solenoid test.	**Impacts Occurred** • Retry the test. • Check/correct the probe bin number. **No Impacts** • Retry the test. • Please refer to the solenoid cleaning procedure in this manual. • If the problem persists, contact our product service department for assistance.
9. "Sample Pre-freeze..."	Was the sample chamber clean? Is the sample probe bin number correct?	Clean the cooling chamber, and then retest. Check/correct the probe bin number. If the problem persists, contact our product service department for assistance.
10. "Sample Probe Open?"	Switch the instrument off, then on. Check the sample probe by running the A/D tests. Check the probe by using an ohmmeter. Probe should be approximately 2000 ohms at room temperature.	If the error message does not persist and other messages are not displayed, ignore this message. If the problem persists, contact our product service department for assistance.

Symptom	Check	Suggested Action
11. Standards Reversed? Please Repeat..."	Calibration standards. Switch the instrument off, then on.	Recalibrate with correct standards. If the problem persists, contact our product service department for assistance.
12. "T E Driver Failure"	Check connections to cooling assembly with ohmmeter.	Retry the test. If the problem persists, contact our product service department for assistance.
13. "Test Time-out Error"	Is the probe bin number correct? Was the sampler tip fully seated in the cooling chamber during the test?	Check/correct the block probe bin number. If the problem persists, contact our product service department for assistance.
14. Other error messages	- - -	Turn the instrument power off and on. If the problem persists, contact our product service department for assistance.
15. Date and time are not maintained when instrument is powered off	- - -	Contact our product service department for assistance.
16. “Pull Cradle Out”	Cradle position.	Pull cradle toward instrument front.
17. “Cooling System Error”	Use “A/D Test” to check the sample and block channels. Check sample and block probes with ohmmeter. Probes should be approximately 2000 ohms at room temperature.	If either probe shows a fixed, non-fluctuating reading, the application PCB is suspect. If probes read short or open on ohmmeter, replace probe. If the problem persists, contact our product service department for assistance.
18. Low Battery	Turn instrument off and on. If problem persists, is it accompanied by loss of date and time, bin numbers, etc.?	Consider replacement of memory back-up battery or processor control board.
19. Wrong model number/ operation	Processor board option switch SW1.	Verify (and correct) switch positions 1-4 are set to **off**, **on**, **off**, **off**. If the problem persists, contact our product service department for assistance.

Notes:

5. Replacement Instructions

Actuator Switch Replacement
332318R

Reference: Use this instruction with replacement part 332318R.

Tools Needed: Cross-point screwdrivers, 3/16-inch nut driver or wrench.

Warning-Hazardous Voltage

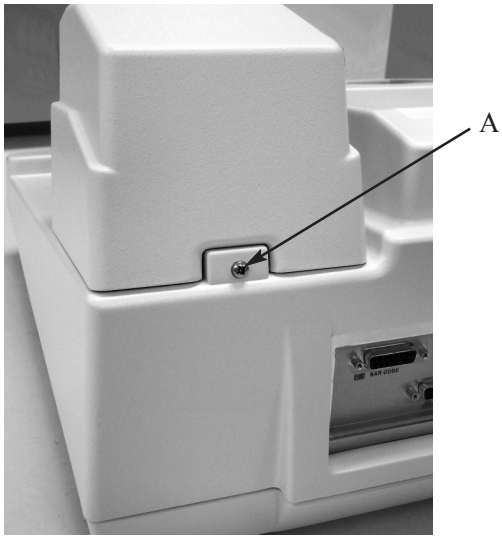
CAUTION: Improper connections may cause damage to the instrument.

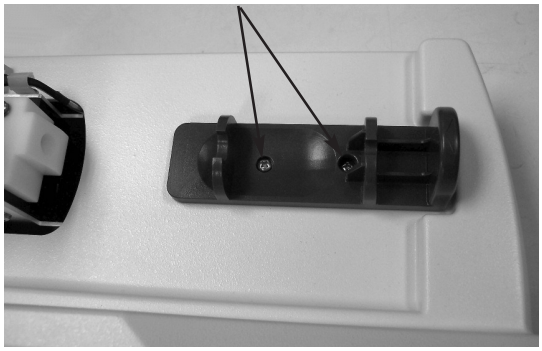
Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.





4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

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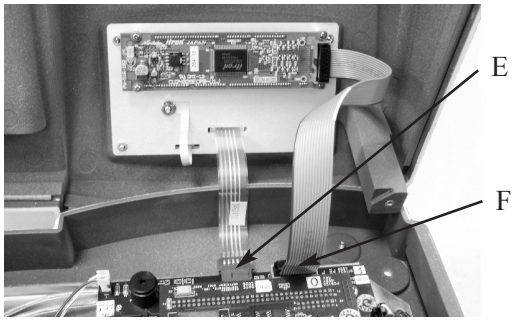
5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

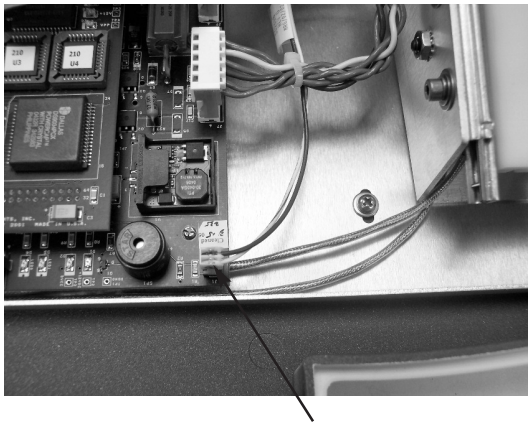
6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Unplug the actuator switch cable (G) from connector J1 of the circuit board assembly.

8. Make sure that the slide plate (H) is pushed all the way toward the front of the instrument.

9. Insert a small cross-point screwdriver through the access hole (I) in the right side of the sample handling assembly bracket to engage screws (J) holding the

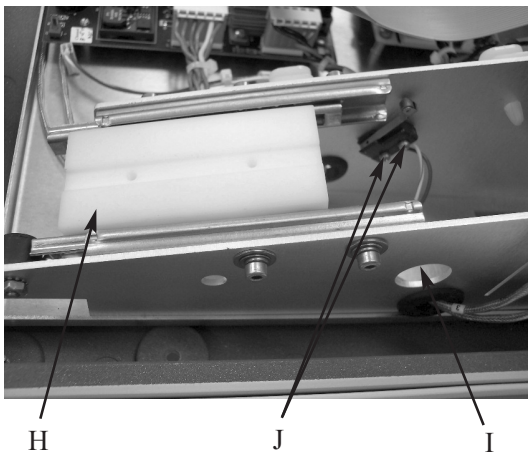




switch assembly. Use a 3/16-inch nut driver or wrench to remove the two nuts securing the switch assembly. Remove the two screws and the switch assembly, pulling the cable through the access hole in the left side of the sample handling assembly bracket.

10. Pass the end of the replacement switch cable through the access port in the left side of the sample handling assembly bracket. Replace the actuator by reinstalling the two sets of screws, lock washers and nuts.

11. Plug the actuator switch cable (G) into connector J1 of the circuit board assembly.



12. Switch Adjustment: Adjust the actuator switch so that it makes contact when the slide plate is pushed toward the rear of the instrument. Listen for a click, indicating that the switch is making contact. Tighten the nuts securely, but do not overtighten.

13. Reassemble the instrument by reversing steps 1 - 6, noting the proper pin 1 orientations for all cable assemblies and their connectors.

Back Panel I/O Board Replacement
PCB140R

Reference: Use this instruction with replacement part PCB140R.

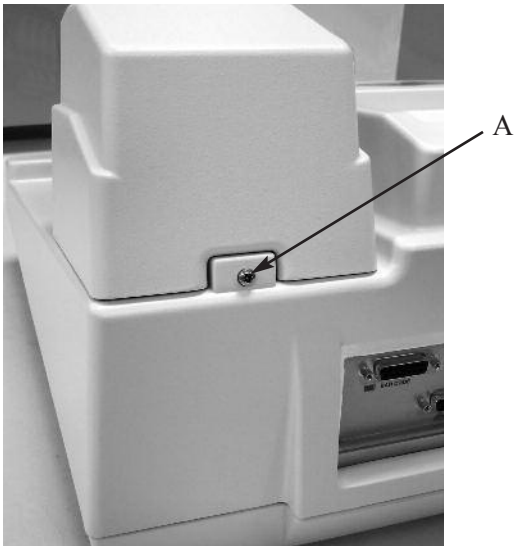
Tools Needed: Cross-point screwdriver, pliers, static grounding (earthing) wrist strap (included).

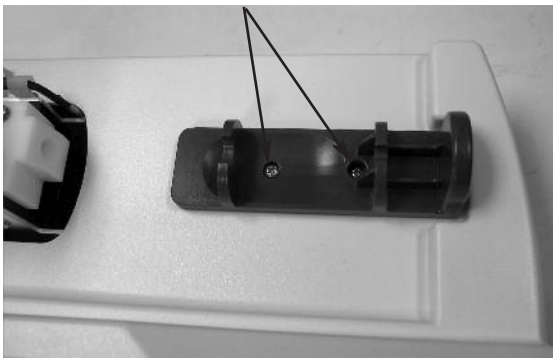
Warning-Hazardous Voltage

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.





2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

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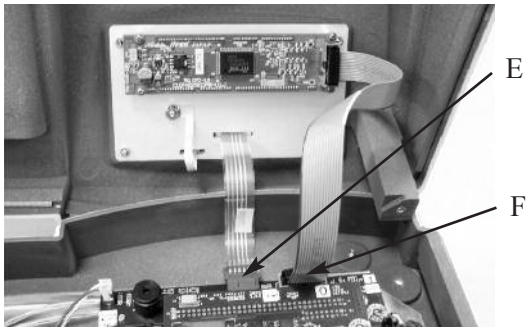
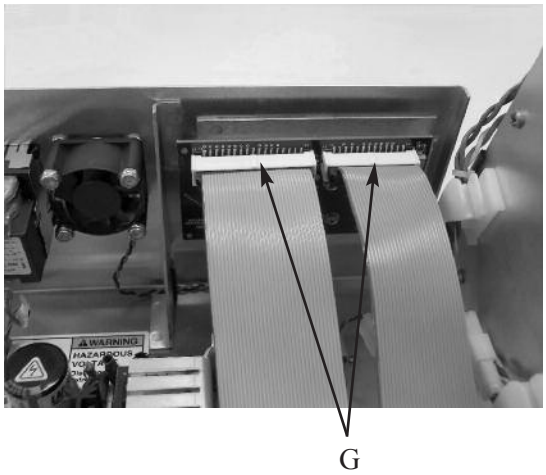
Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.



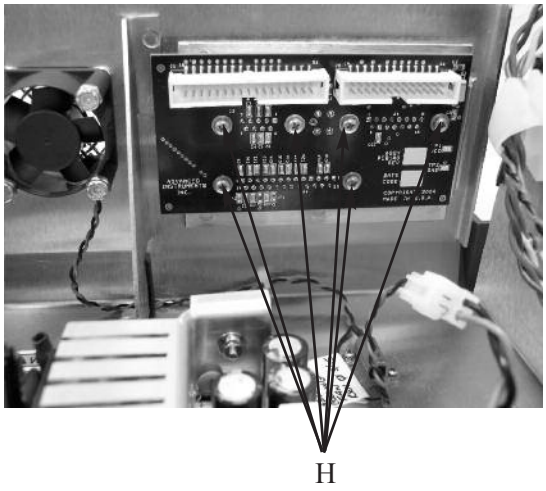
7. Disconnect the two ribbon cables (G) from the connectors on the rear panel circuit board.



8. Remove the I/O circuit board (six screws) (H).

9. Install the new I/O board. Make sure that all screws are tightened securely to provide proper electrical grounding (earthing).

10. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors.



Block Probe Replacement
332340R

Reference: Use this instruction with replacement part 332340R.

Tools Needed: Cross-point screwdriver, cutters, 3/16-inch nut driver or wrench.

Supplies Needed: Thermal grease, Loctite 222, cable tie.

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

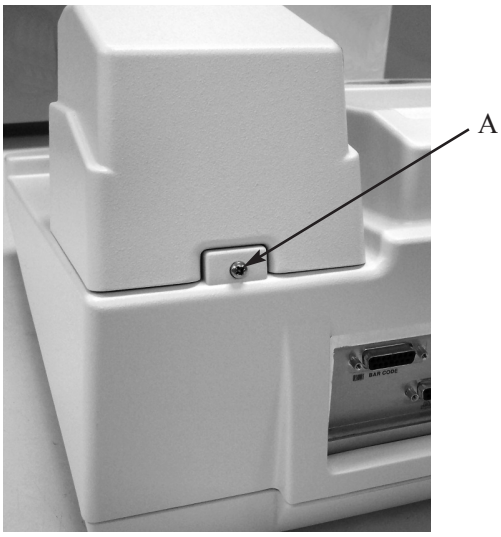
CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.

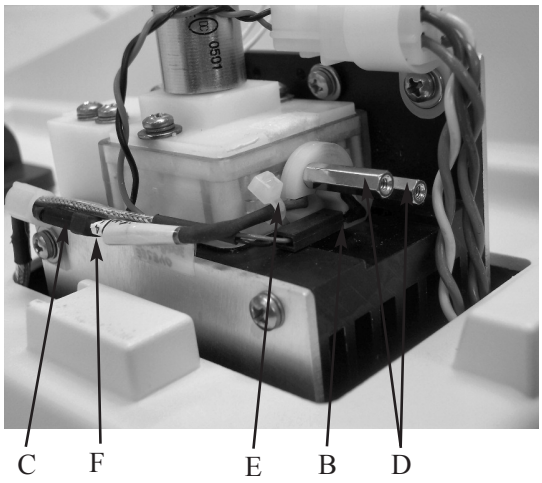
2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Disconnect the sample probe cable connector (B) and the block probe cable connector (C).



4. Use a 3/16-inch nut driver or wrench to remove the two standoffs (D) securing the sample probe to the cooling assembly. Remove the sample probe and spacer.

Note: *The spacer may not be present on all instruments. It has been integrated into the cooling assembly.*



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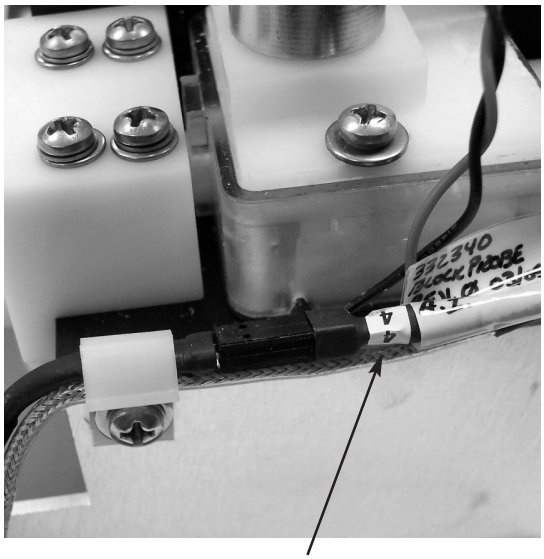


F

5. Cut the cable tie (E) securing the block probe to the cooling well housing. Carefully pull out the old probe.

6. Inject thermal grease into the far end of the hole for the block probe. Slide the new probe slowly into the hole until it will not go any farther. **Take care not to damage the probe**.

7. Bend the block probe cable and secure it to the sample well housing using a cable tie (E). Make sure that it is positioned so that it will fit within the slot in the sample probe spacer.

Note: *On some instruments, the spacer has been integrated into the sample well housing.*

8. Note the bin number of the block probe (F).

9. Reinstall the sample probe spacer and sample probe.

Note: *The spacer may not be present on all instruments. It has been integrated into the sample well housing.*

10. Add Loctite 222 thread lock (or equivalent) to the two standoffs securing the sample probe. Install the standoffs (D) and tighten each using the following sequence to avoid damaging the sample probe or cooling well housing:

    a. Tighten both standoffs finger-tight.

    b. Using a 3/16-inch nut driver or wrench, tighten each standoff 1/2 turn.

    c. Tighten each standoff an additional 1/4 turn.

    The sample probe should be tight, with a slight bow.

Note: *The spacer and the probe may be touching each other, or there may be a small gap between the two parts. Either condition is acceptable. However, no gap is allowed between the standoffs and the probe. The spacer may not be present on all instruments. It has been integrated into the sample well housing.*

11. Plug the sample probe cable connector (B) into the sample probe. Plug the block probe cable connector (C) into the block probe.

Note: *If the bin number (F) for the new block probe is different from that for the old probe, restart the instrument and reset the bin value to the new number.*

12. Reinstall the solenoid cover.

13. Plug in the instrument and turn on the power. Verify proper block probe bin number and recalibrate, if required.

Block Probe Cable Replacement
332341R

Reference: Use this instruction with replacement part 332341R.

Tools Needed: Cross-point screwdriver.

Warning-Hazardous Voltage

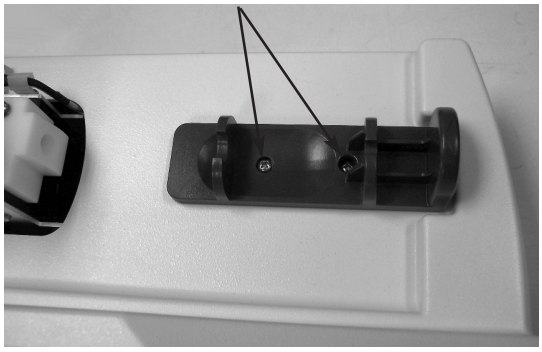
CAUTION: Improper connections may cause damage to the instrument.

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.

B



2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

C (Some units may not have this screw.)

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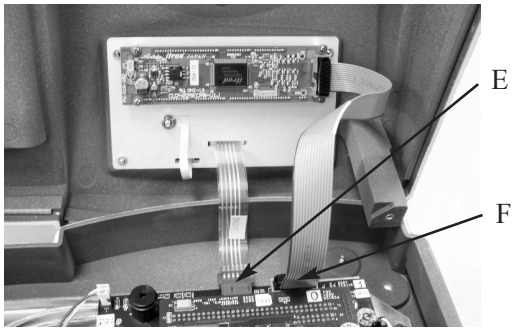
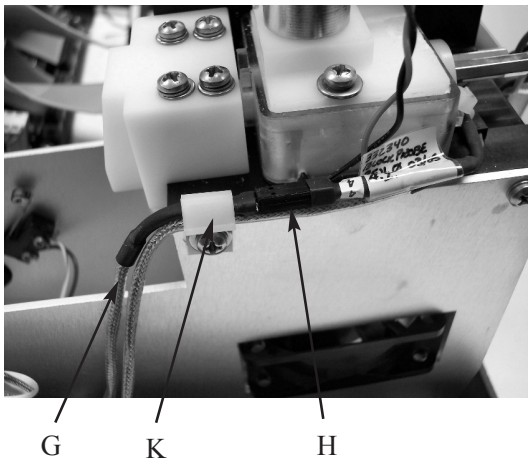
Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Disconnect the block probe cable (G) from the block probe (H) and from the circuit board assembly (I). Remove the probe cable.

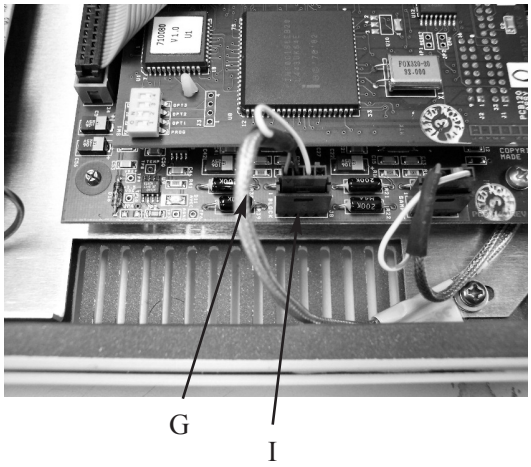


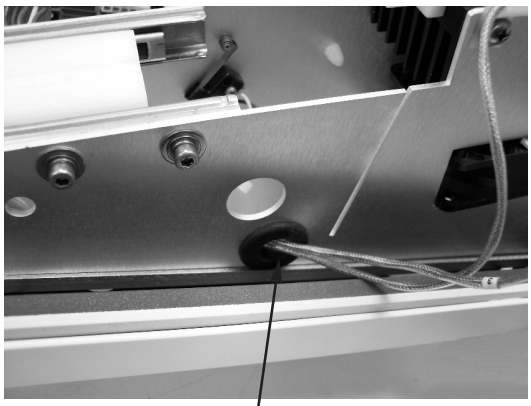


8. Connect the new block probe cable to the connector on the circuit board assembly (I).

9. Route the cable under the front of the circuit board assembly and into the front of the sample handling assembly. Pass the end of the cable through the grommet (J) in the right side of the sample handling assembly, and through the cable clamp (K) on the right side of the cooling assembly.

10. Plug the block probe cable into the block probe connector (H).





J

11. Reassemble the instrument by reversing steps 1 - 6, noting the proper pin 1 orientations for all cable assemblies and their connectors.

PCB120 Central Processor Board and PCB115 Application Board Set Replacement 332620R

Reference: Use this instruction with replacement part 332620R.

Tools Needed: Cross-point screwdriver, pliers, static grounding (earthing) wrist strap (included).

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

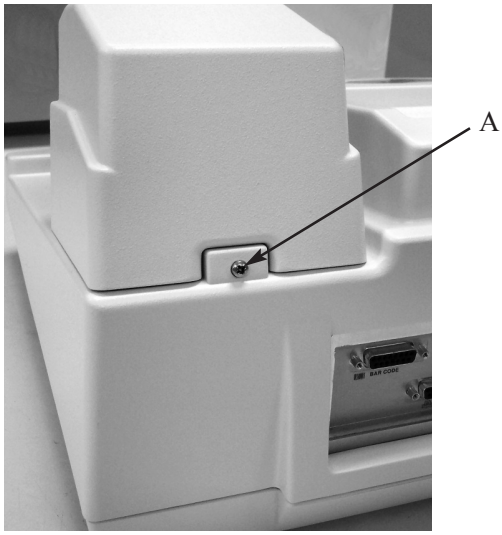
PLEASE NOTE: The processor printed circuit board holds all the custom setup parameters in memory. Replacement of this board will require that you transfer your settings to the new board after installation. If your current board is still bootable, please write down your sample and block bin numbers, instrument serial number, and feature lockout information. These and other setup parameters will need to be entered after completing the installation.

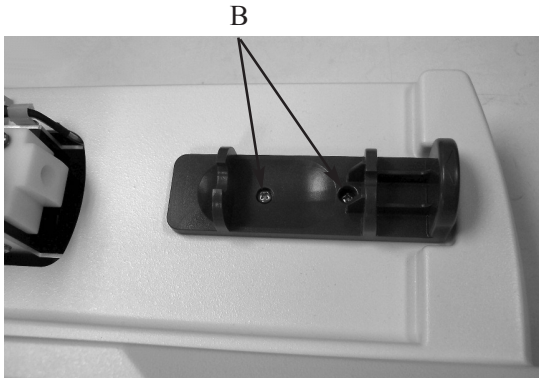
Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.





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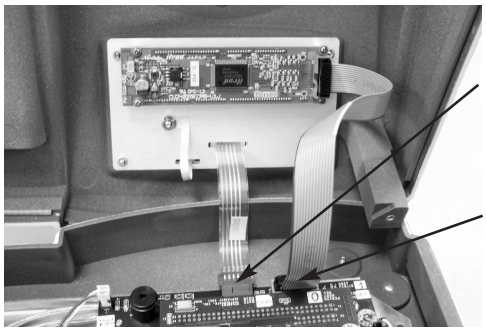
4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

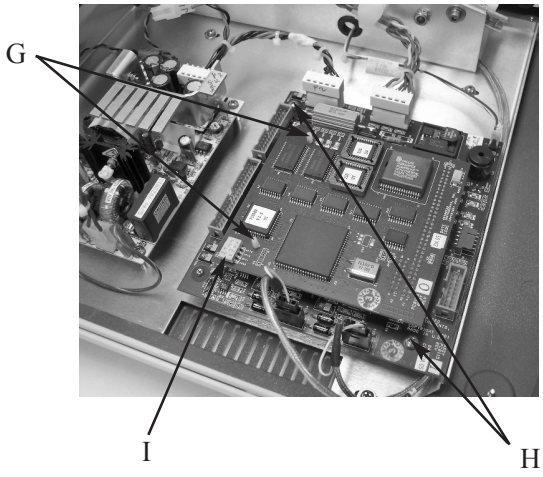


6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Disconnect the two ribbon cables from the application board.

8. **To remove the PCB120 central processor board only**, use pliers to squeeze the tabs on the two plastic standoffs (G) and pull the PCB120 board away from the PCB115 board. Separate the boards carefully to prevent damaging the connector pins.

9. **To remove the PCB115 application board or the complete circuit board set**, disconnect all cables from the board. Remove the two screws (H) securing the PCB115 application board. Lift the board off of the two press-fit standoffs.



10. Install the new circuit board(s) by reversing step 7 and/or 8, noting the proper pin 1 orientations for the cables and their circuit board connectors.

11. Locate processor board option switch SW1 (I) and verify the following sequence of switch positions 1-4: **off**, **on**, **off**, **off**.

12. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors.

13. After completing reassembly, apply power to the instrument and enter the SETUP menu. Transfer the information and custom settings from your original board set, as noted at the start of this document.

Cooling Assembly Replacement
332400R

Reference: Use this instruction with replacement part 332400R.

Tools Needed: Cross-point screwdriver, right-angle cross-point screwdriver, cutters, and 3/16-inch nut driver or wrench.

Supplies Needed: Thermal grease, Loctite 222, cable tie.

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

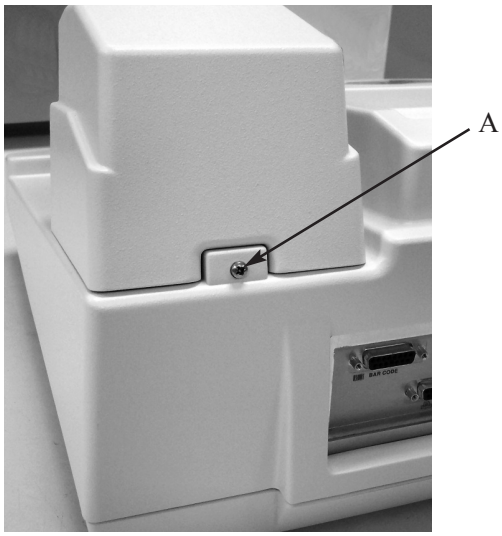
CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

Note: ***Be careful to avoid dropping screws inside the instrument.***



3. Remove the screw and cable clamp (B) securing the connectors for the cooling well assembly and the solenoid assembly. Disconnect the two connectors (C).

4. Disconnect the block probe cable connector (D) and the sample probe cable connector (E).

5. Remove the four screws (F) securing the cooling assembly to the sample handling assembly bracket. Lift the cooling assembly out of the bracket.

6. Install the new cooling assembly into the sample handling assembly bracket. Install the four screws (F) securing the cooling assembly to the bracket, finger-tight. Make sure that the cable clamp (G) for the two probe cables is inserted under the head of the screw in the right front corner of the cooling assembly.

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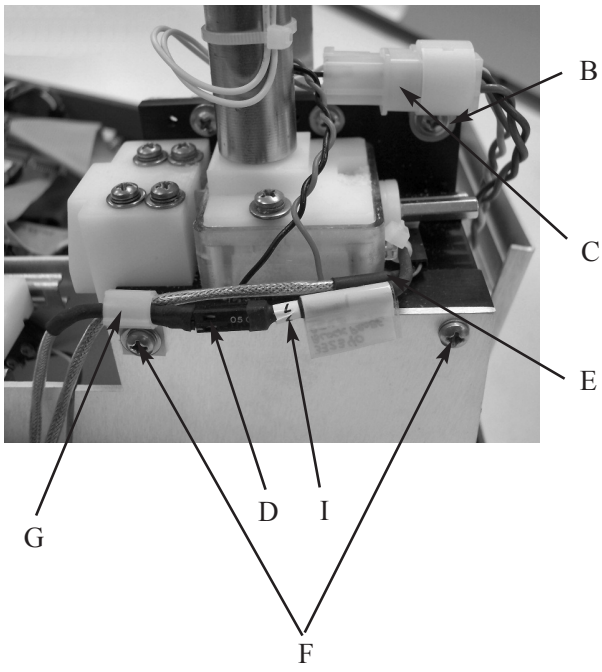
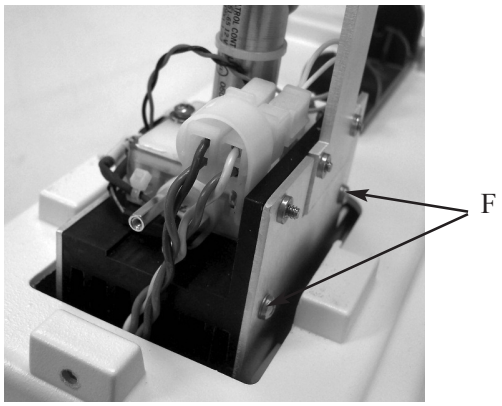
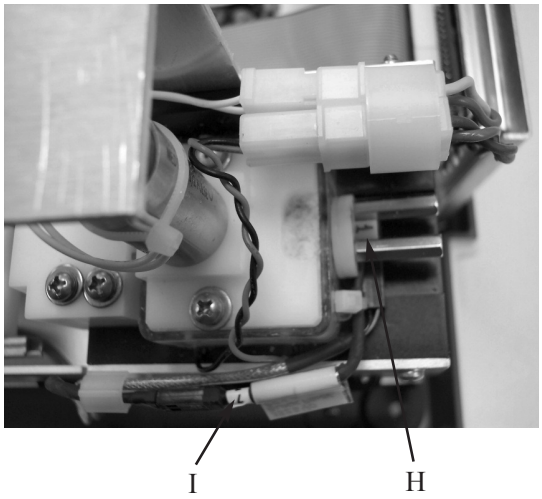






7. Align the edges of the cooling assembly heat sink so that they are parallel to the edges of the bracket. Tighten all screws securely.

8. Note the bin numbers of the sample probe (H) and block probe (I).

9. Reinstall the solenoid cover and screw (A).

10. Reconnect the power cord and turn on the power.

11. In the Setup Menu, enter the bin numbers for the sample probe and block probe. Make sure to “save” the changes, and then recalibrate the instrument.

Cooling Fan Replacement
330330R

Reference: Use this instruction with replacement part 330330R.

Tools Needed: Cross-point screwdriver.

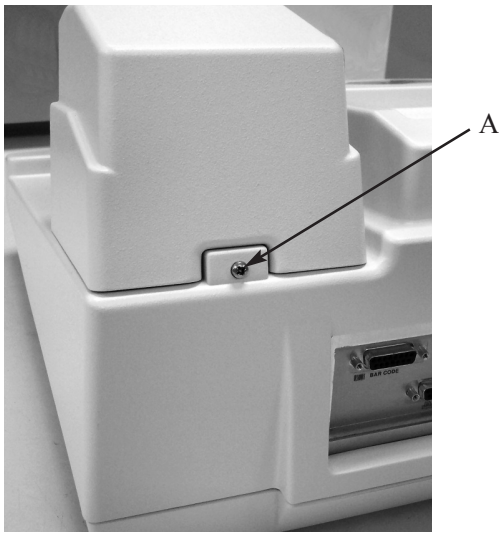
Warning-Hazardous Voltage

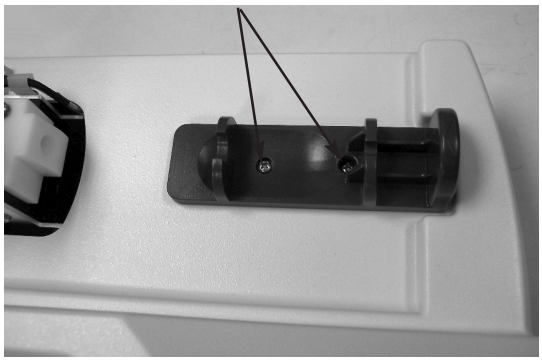
CAUTION: Improper connections may cause damage to the instrument.

Instruction:

Note: *The 3320 contains two fans. The main cooling fan is located under the cooling assembly. The secondary cooling fan is the small fan visible in the rear of the instrument. This instruction describes the replacement of the main cooling fan.*

1. Turn off the power and unplug the instrument.





2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

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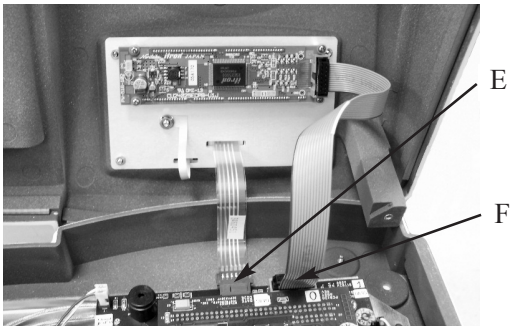
Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.



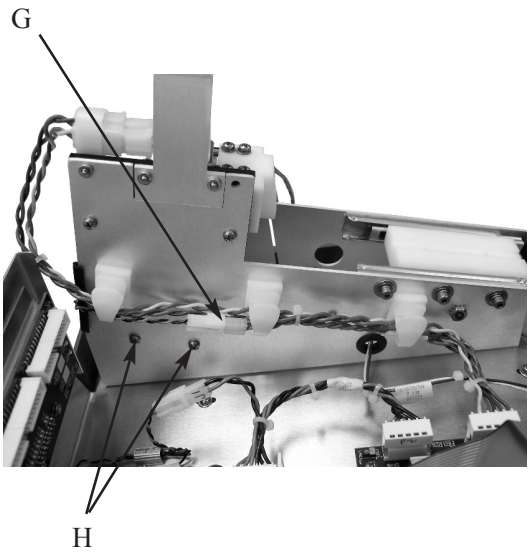
7. Disconnect the fan from the sample handling assembly wiring harness (G).

8. Remove the two screws (H) securing the fan and bracket assembly. Disassemble the fan from the bracket (two screws).

9. Assemble the new fan to the bracket (two screws). Make sure that the airflow arrow is pointing upward and the fan wires are oriented toward the rear corner of the bracket.

10. Reinstall the fan assembly into the sample handling assembly bracket, making sure that the fan wires are not pinched between the fan bracket and the sample handling assembly bracket.

11. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors.



Display Module Replacement
330800R

Reference: Use this instruction with replacement part 330800R.

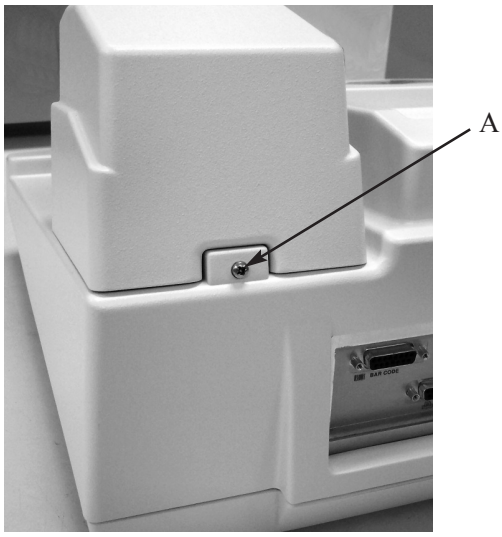
Tools Needed: Cross-point screwdriver, pliers, static grounding (earthing) wrist strap (included).

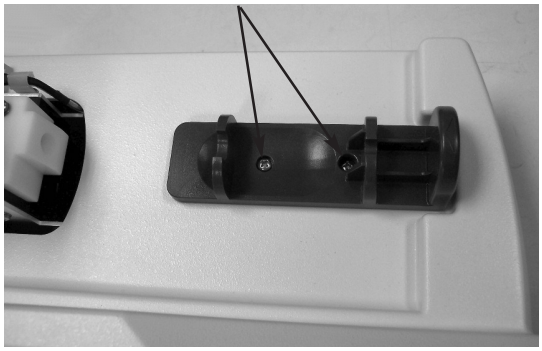
Warning-Hazardous Voltage

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.





2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

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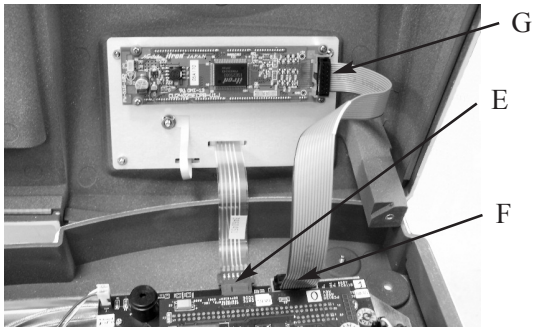
5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

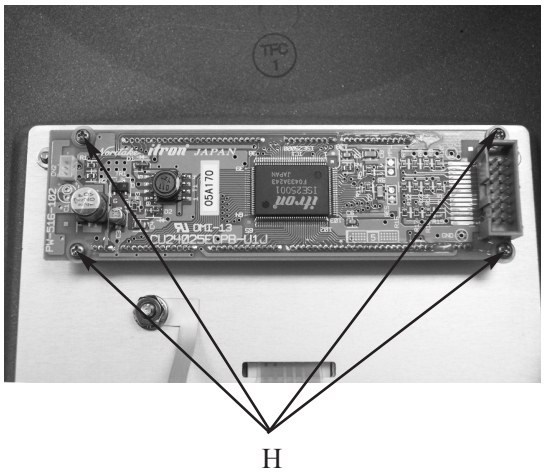
6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Remove the display ribbon cable from the circuit board connector (G).

8. Remove the four screws and washers (H) and the display module from the top cover.

9. Install the new display module (four screws).





10. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors.

Fuse Replacement
70013R

Reference: Use this instruction with replacement part 70013R.

Tools Needed: Small flat-bladed screwdriver.

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

Instruction:

1. Turn off the power and unplug the instrument.

2. Insert a small flat-bladed screwdriver into the recesses between the fuse holder and the power entry module. Carefully pry open the fuse holder and remove it from the power entry module.

Note: *Use caution when removing the fuse holder from the power entry module.*

3. Remove the old fuses. Install the new fuses by placing them in the fuse holder brackets.

4. Reinstall the fuse holder in the power entry module. Make sure that the fuse holder is fully seated in the recess.

5. Reconnect the power cord and turn on the instrument.

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Keypad Replacement
202511R

Reference: Use this instruction with replacement part 202511R.

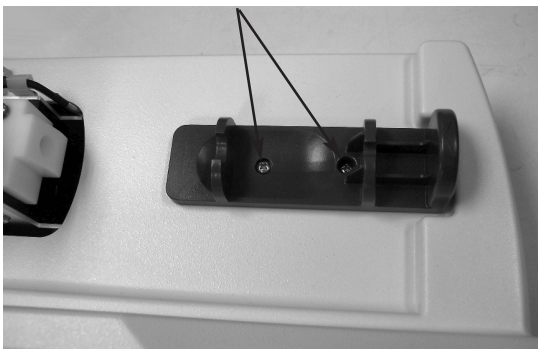
Tools Needed: Cross-point screwdriver, pliers, static grounding (earthing) wrist strap (included).

Warning-Hazardous Voltage

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.



2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

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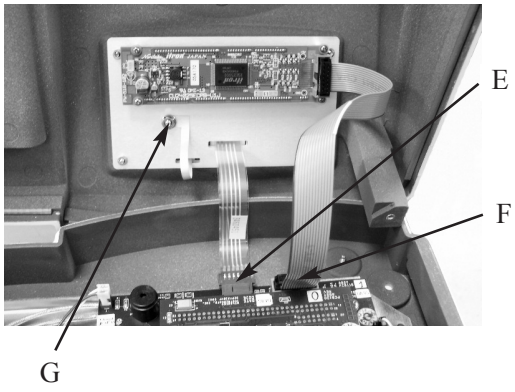
5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Remove the hardware securing the ground tab (G).



8. Pull the keypad off the front of the top cover. Pull the grounding tab and ribbon cable through the slots in the top cover.

9. Remove the adhesive backing from the new keypad. Carefully insert the ground tab and ribbon cable through the slots in the top cover.

10. Position the keypad symmetrically within the recess in the top cover. Do not apply firm pressure to attach the keypad until it is centered.

11. Press the keypad firmly against the top cover.

12. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors.

13. Perform the keypad test to verify that the keypad is functioning properly.

NVRAM Battery Replacement
71027R

Reference: Use this instruction with:

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4250 Cryoscopes
3250 Osmometers
3320 Osmometers
2020 Osmometers
4-digit year Model 3300 Osmometers
Intel-based 3D3 Osmometers
Intel-based 4D3 Cryoscopes

Fiske Associates

210 Osmometers
Intel-based MK-3 Osmometers
Intel-based MK-2 Cryoscopes

Tools Needed: Small flat-bladed screwdriver, static grounding (earthing) wrist strap (included).

CAUTION: Unplug the power cord prior to opening or removing covers, or else you may be exposed to electric shock, excessive temperatures, or mechanical hazards.

Performing this service or maintenance should only be done by a qualified service technician.

A discharge of static electricity from contact with the human body or other conductor may damage system boards or static sensitive devices. Never perform internal maintenance without following recommended static protection procedures.

Instruction:

1. Turn off the instrument power and remove the power cord from the rear of the instrument.

2. Open the instrument cover.

3. Attach the static grounding strap according to the instructions on its packaging.

4. Locate the processor Printed Circuit Board (PCB120, PCB125, PCB620, 200016PC, or 210102PC) and the NVRAM chip:

   - If using PCB120, locate U14.
   - If using PCB125 locate U13.
   - If using PCB620, remove the processor board from the application board and locate U15 on the back side.
   - If using 200016PC, locate U11.
   - If using 210102PC, locate U11.

5. Once you have located the NVRAM chip, locate the small notch and insert the small screwdriver, as described in figure 1.

POWERCAP REMOVAL

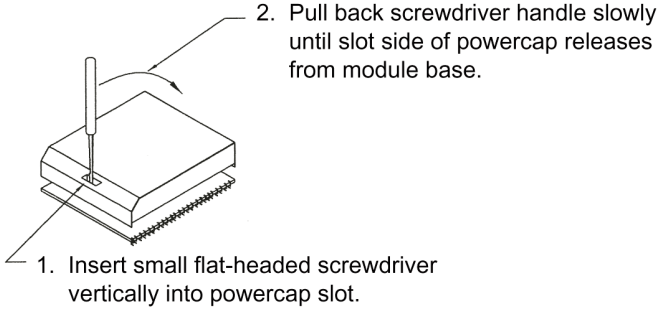

Figure 1

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6. Remove the cover (powercap) and set it aside.

7. Remove the replacement powercap from the anti-static bag and install it on the component base, as described in figure 2.

8. Reinstall the processor board, if removed.

9. Restore power to the instrument and verify correct power-up sequence without any LOW BATTERY warnings.

10. Set the date and time, following the instructions in the user's guide.

11. Turn off the power and wait ten minutes. Turn the instrument back on and verify that the correct time has been maintained.

12. Turn off the power and restore the instrument cover.

13. Reset all stored parameters (e.g., block and sample bin numbers, plateau modes, etc.) and recalibrate the instrument.

POWERCAP ATTACHMENT

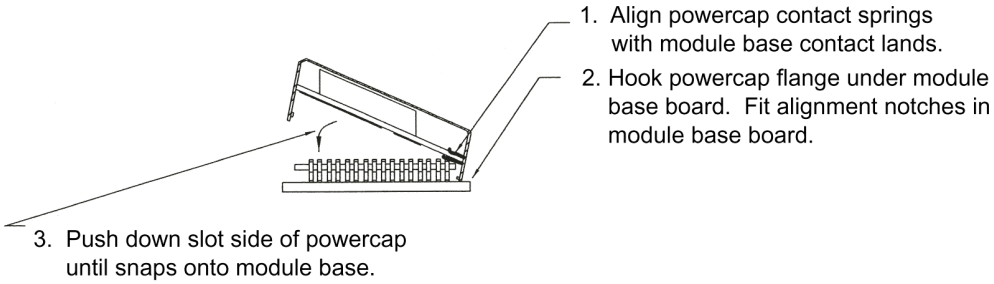


Figure 2

Power Entry Module Replacement
332149R

Reference: Use this instruction with replacement part 332149R.

Tools Needed: Cross-point and flat-bladed screwdrivers.

Warning-Hazardous Voltage

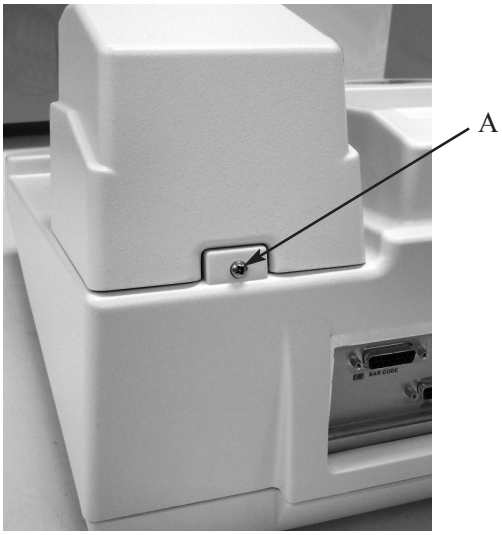
CAUTION: Improper connections may cause damage to the instrument.

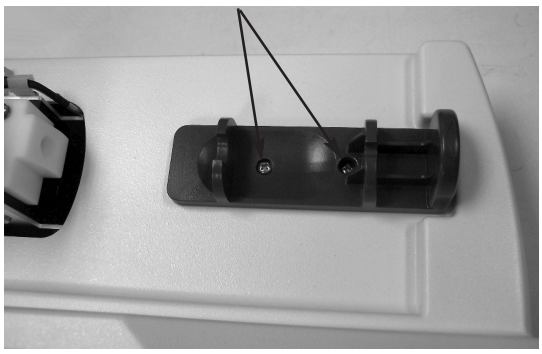
Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.





4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover

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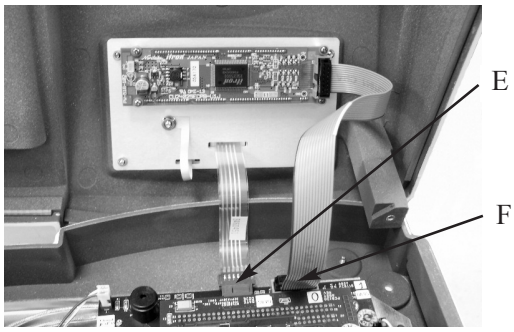
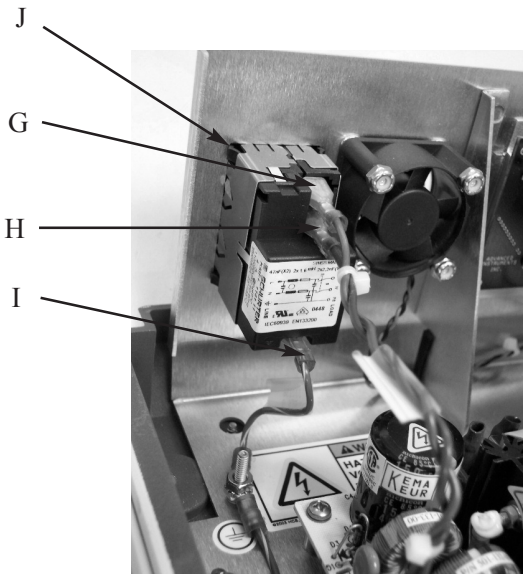
while keeping the front portion close to the bottom cover (D).

6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Disconnect the brown lead (G) from the top terminal of the power entry module. Disconnect the blue wire (H) from the middle terminal. Disconnect the ground wire (I) from the lower terminal.

8. Using a flat-bladed screwdriver, compress each of the five locking tabs (J) securing the power entry module in the chassis, while pushing on the module. Once all tabs have been pushed through the chassis opening, remove the power entry module.





9. Insert the new power entry module into the opening. Push it firmly into place to seat all five locking tabs. A distinct click should be heard when the tabs lock in place. Carefully inspect the module to ensure that all five tabs are properly engaged.

10. Insert a flat-bladed screwdriver into the recesses between the fuse holder and the old power entry module. Carefully pry open the fuse holder and remove it from the power entry module.

11. Install the fuse holder and fuses in the new power entry module. Make sure that the fuse holder is fully seated in the recess.

12. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors.

Power Supply Replacement
332950R/332951R

Reference: Use this instruction with replacement part 332950R. or 332951R.

Tools Needed: Cross-point screwdriver.

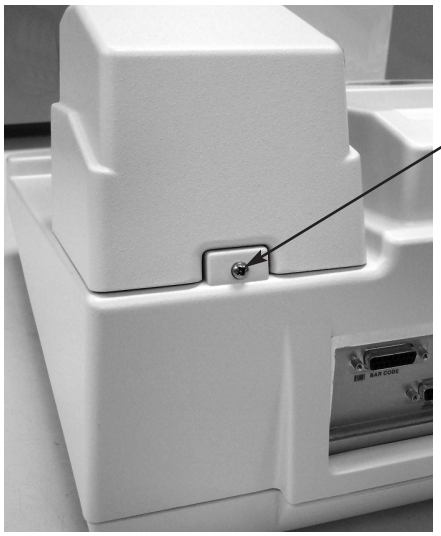
Warning-Hazardous Voltage

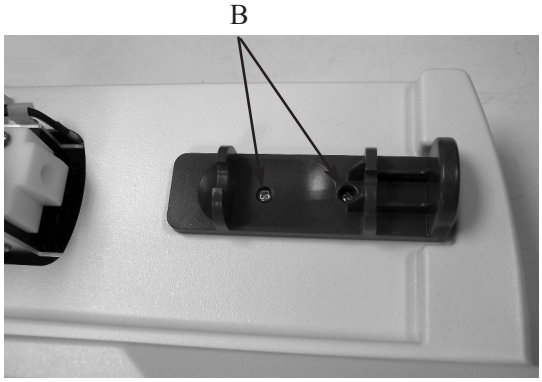
CAUTION: Improper connections may cause damage to the instrument.

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.





2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

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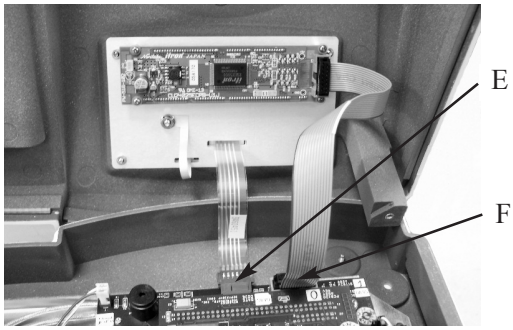
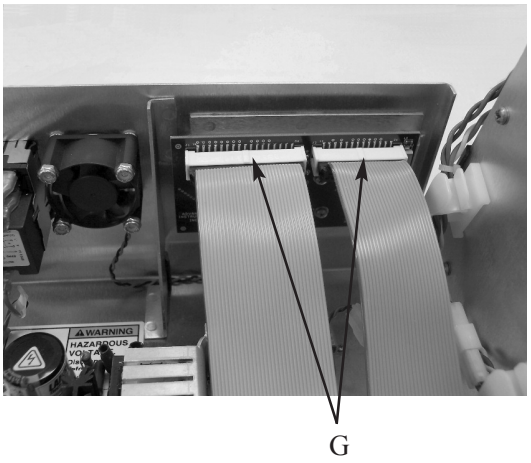
5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Disconnect the two ribbon cables (G) from the connectors on the rear panel circuit board.

8. Using the photos in Figures 1, 2, and 3 and your instrument serial number, determine if you have a suffix A (Figure 1) or suffix B (Figure 2) power supply. You may also have a suffix A power supply that has been previously upgraded to the suffix B version (Figure 3).





If you have the suffix A power supply (Figure 1) and have ordered kit 332950R: You should have received a new suffix B power supply, DC replacement harness, AC replacement ground wire, and a mounting plate with hardware. Continue steps 9 - 16:

9. Remove your old power supply input cable (I).

10. Remove and discard the ground wire (H) and DC output cable (K), but keep any mounting hardware. (Cable replacements are included in the 332950R kit.)

11. Remove the four mounting screws (J).

12. Locate the new ground wire (H) and install it on the chassis stud using the original hardware.

13. As shown in Figure 3, install the mounting plate (L) using the original power supply mounting screws (J).

14. Install the new power supply on the mounting plate using included hardware (M). Note the installation of the replacement ground wire under one of these mounting screws (see Figure 3).

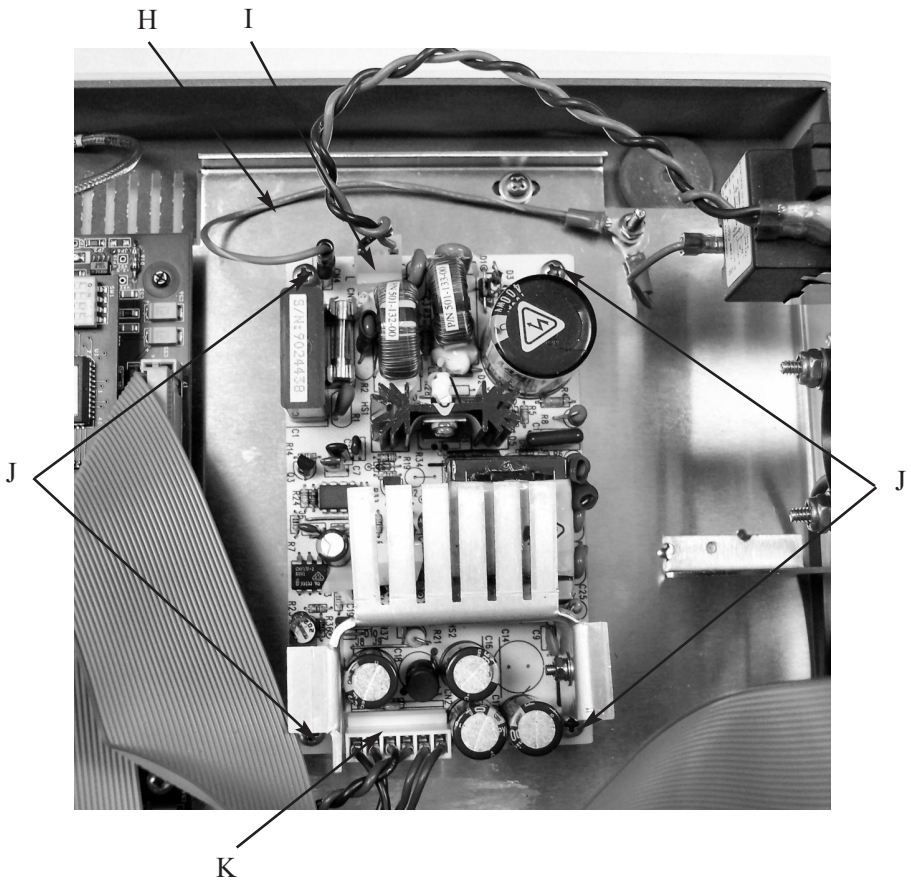


Figure 1. Suffix A Power Supply

15. Locate the new DC output harness (K). Install it on the output connecter and then install the remaining connections to the Application PCB and the rear panel cooling fan (Figure 3).

16. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors

If you have the suffix B power supply (Figure 2), or a suffix A instrument that was previously upgraded to suffix B power supply (Figure 3): You should have received parts kit 332951R. Continue steps 17 - 21:

17. Remove and replace the power supply only by removing input (I) and output (K) wiring connectors.

18. Remove the four mounting screws (M) and the ground wire (H).

19. Replace the power supply using the same hardware and ground wire (H).

20. Reconnect the input (I) and output (K) connections.

21. Reassemble the instrument by reversing steps 1 - 7, noting the proper pin 1 orientations for all cable assemblies and their connectors.

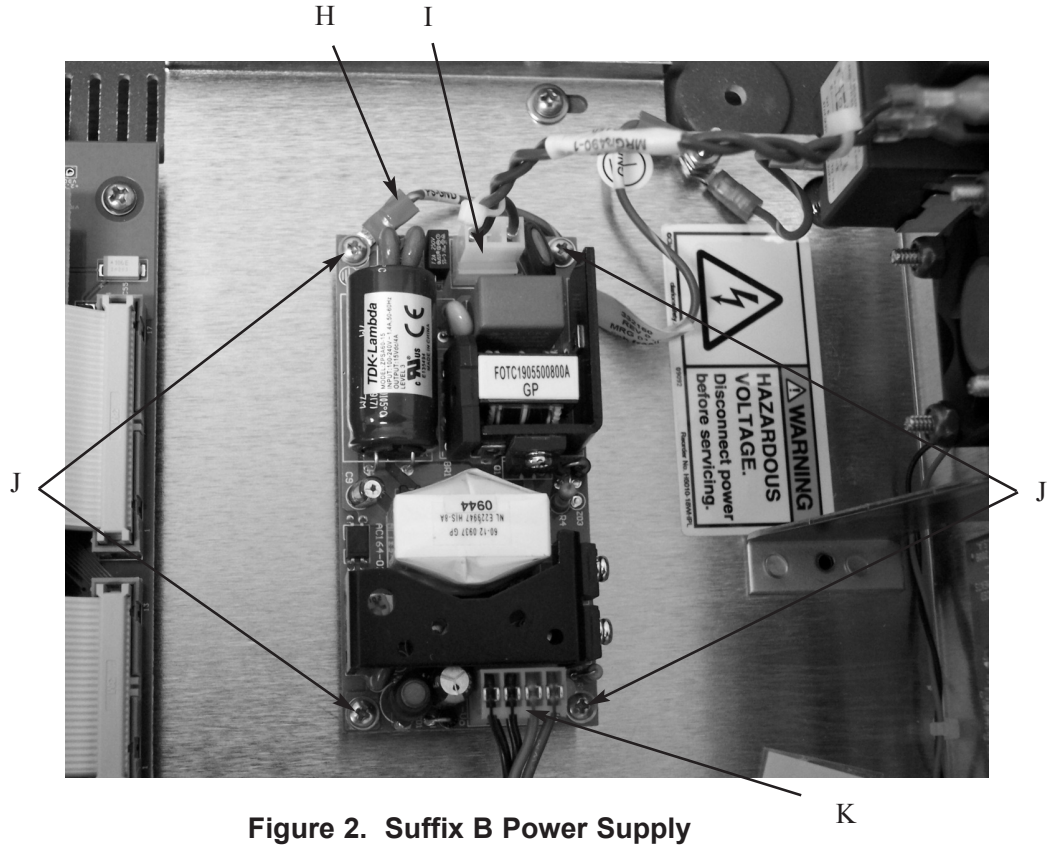


Figure 2. Suffix B Power Supply

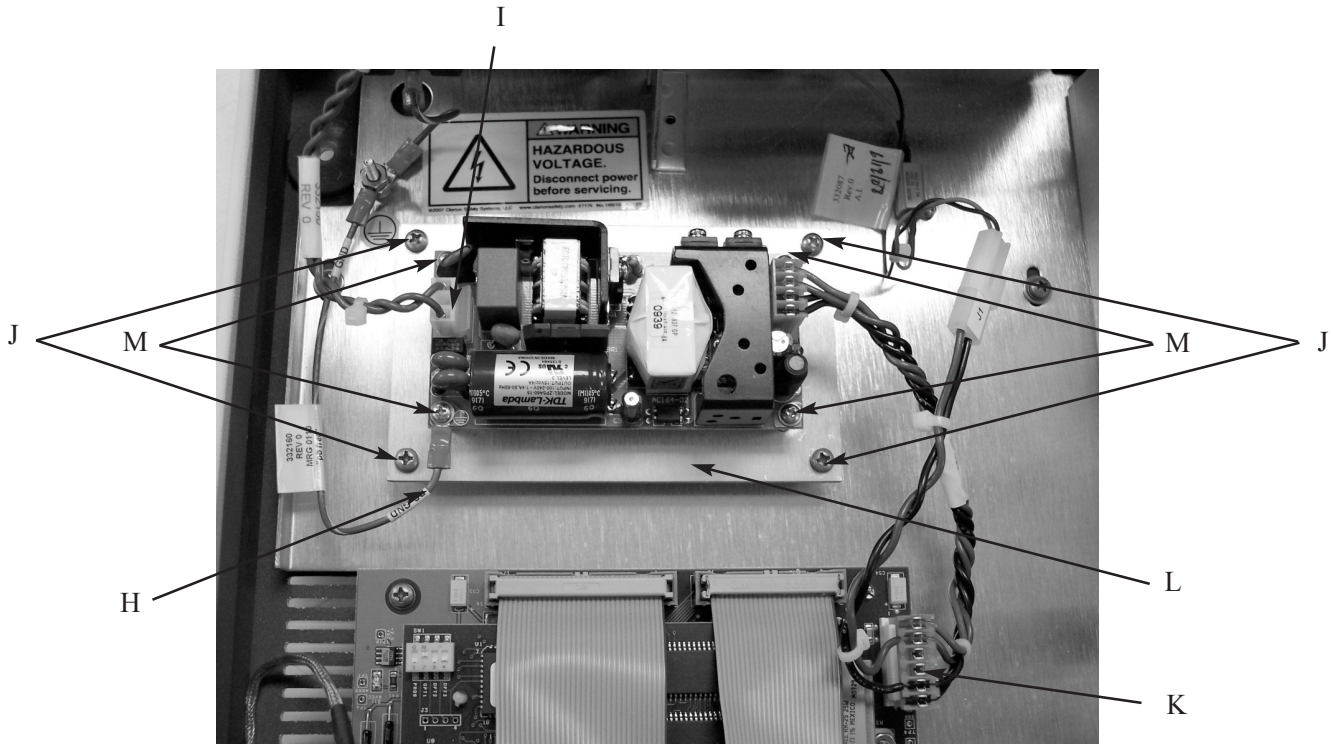


Figure 3. Suffix A Instrument, Upgraded to Suffix B Power Supply

Sample Handling Assembly Replacement
332310R

Reference: Use this instruction with replacement part 332310R.

Tools Needed: Cross-point screwdriver, flat-blade screwdriver.

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

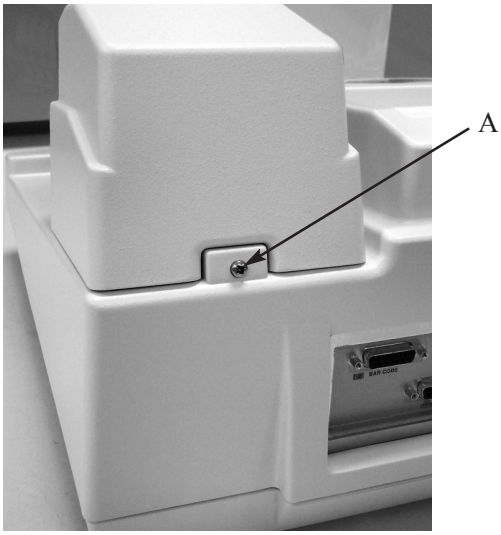
1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

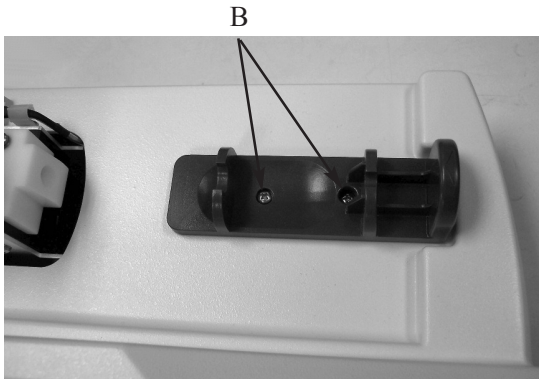
4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*



5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.



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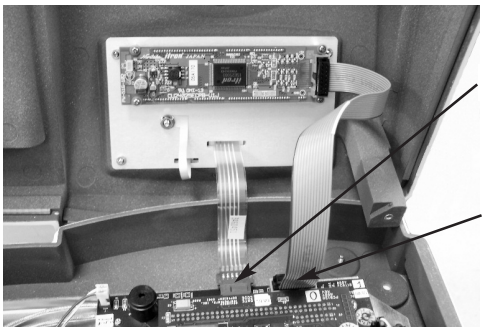
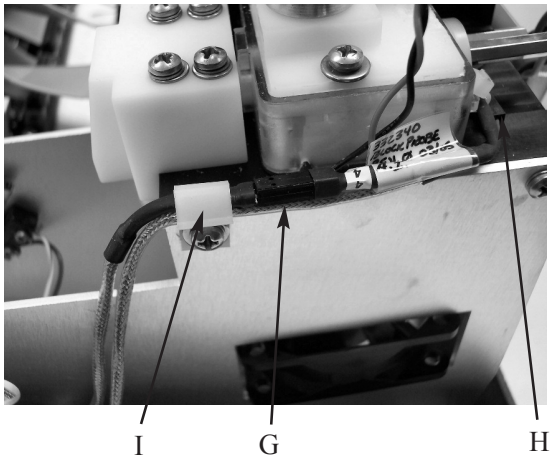
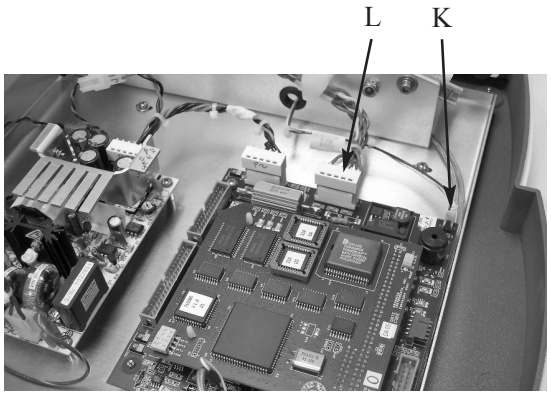




7. Disconnect the block probe cable connector (G) and the sample probe cable connector (H) from the probes. Carefully pull the cables out of the cable clamp (I) and through the grommet (J) in the right side of the sample handling assembly bracket.

8. Disconnect the actuator switch cable (K) from connector J1 of the circuit board assembly. Disconnect the sample handling assembly main wiring harness (L) from the circuit board assembly.



9. Reposition the base assembly to permit access to the four screws (M) on the bottom that secure the sample handling assembly. Remove the sample handling assembly.

10. Position the new sample handling assembly over the center portions of the slots in the base assembly. Insert the four screws and tighten them lightly.

11. Reposition the base assembly upright and reconnect all cable assemblies by reversing steps 7 and 8.

12. Make sure that the slide plate is positioned toward the front of the instrument. Reassemble the instrument by reversing step 6, noting the proper pin 1 orientations for the cables. Position the top cover so that it extends evenly over the edges of the bottom cover.

13. Install the sampler cradle into the slot in the slide plate.

14. Verify that the sampler cradle is centered in the recess in the top cover. If not, loosen the four screws and reposition the sample handling assembly. Also, make sure that the position of the sample handling assembly permits installation and removal of the solenoid cover.

15. When the proper position of the sample handling assembly is obtained, tighten the four sample handling assembly screws.

16. Install the screws for the top cover and sampler cradle. Tighten all screws securely.

17. Reinstall the solenoid cover.

Sample Probe Replacement
330700

Reference: Use this instruction with replacement part 330700.

Tools Needed: Cross-point screwdriver, 3/16-inch nut driver or wrench.

Supplies Needed: Loctite 222.

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

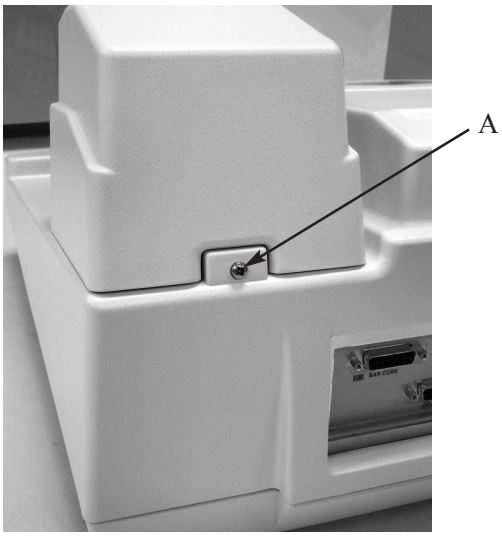
Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Disconnect the cable (B) from the sample probe.

4. Use a 3/16-inch nut driver or wrench to remove the two standoffs (C) securing the sample probe to the cooling assembly. Remove the sample probe.

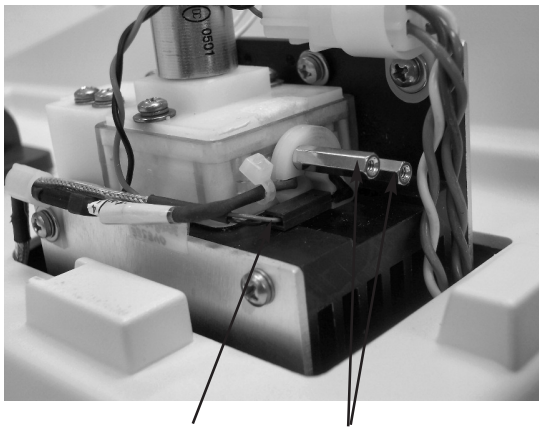


5. Install the new sample probe.

6. Add Loctite 222 thread lock (or equivalent) to the two standoffs securing the sample probe. Install the standoffs (C) and tighten each using the following sequence to avoid damaging the sample probe or cooling well housing:

   a. Tighten both standoffs finger-tight.

   b. Using a 3/16-inch nut driver or wrench, tighten each standoff 1/2 turn.



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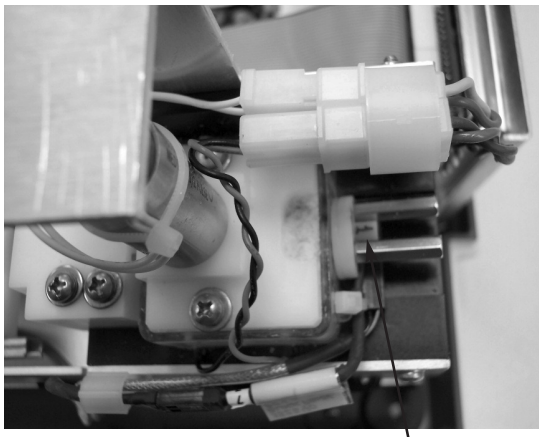
c. Tighten each standoff an additional 1/4 turn.

The sample probe should be tight, with a slight bow.

Note: *The spacer and the probe may be touching each other, or there may be a small gap between the two parts. Either condition is acceptable. However, no gap is allowed between the standoffs and the probe. The spacer may not be present on all instruments. It has been integrated into the sample well housing.*



7. Plug the sample probe cable connector into the sample probe (B).

Note: *If the bin number* (D) *for the new sample probe is different from that for the old probe, restart the instrument and reset the bin value to the new number.*

8. Reinstall the solenoid cover.

9. Plug in the instrument and turn on the power. Run four probe bin tests to determine the resistance and bin number of the sample probe. The resistance obtained during the last three probe bin tests should be within 2 ohms of each other. Using the bin number displayed at the completion of the last probe bin test, reset the sample probe bin number and recalibrate (see User's Guide for procedure).

   If the resistance values obtained during the last three probe bin tests exceeds 2 ohms of each other, replace the sampler plunger wire (part number 3M0828) and repeat the sample probe bin tests.

Sample Probe Cable Replacement
240725R

Reference: Use this instruction with replacement part 240725R.

Tools Needed: Cross-point screwdriver.

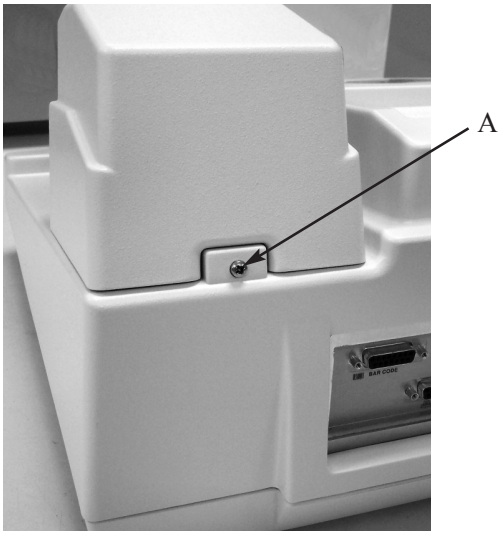
Warning-Hazardous Voltage

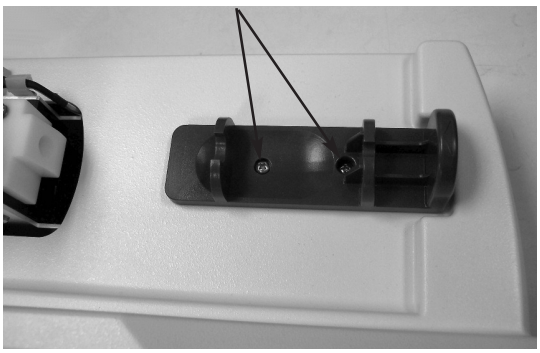
CAUTION: Improper connections may cause damage to the instrument.

CAUTION: A discharge of static electricity from contact with the human body or other conductor may damage system boards or static-sensitive devices. **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE**.

Instruction:

1. Turn off the power and unplug the instrument.





2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.

Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

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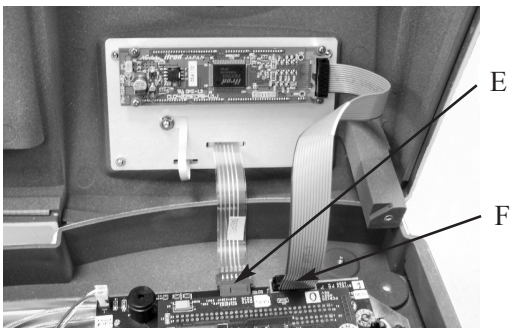
5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).

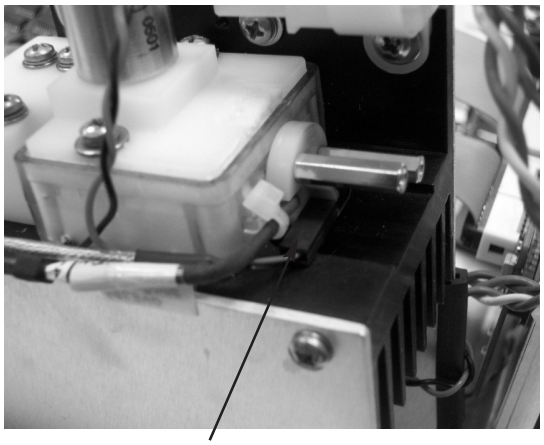
6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.



7. Disconnect the sample probe cable from the sample probe (G) and from the circuit board assembly (H). Remove the cable.

8. Connect the new sample probe cable to the connector on the circuit board assembly (H).

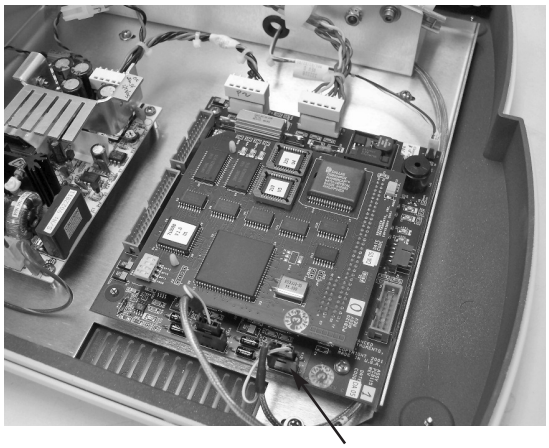
9. Route the cable under the front of the circuit board assembly and into the front of

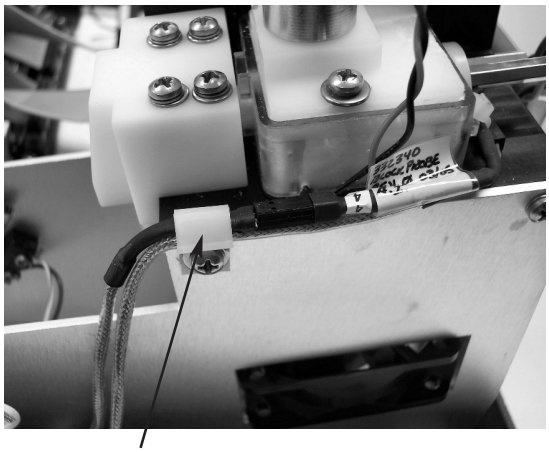


the sample handling assembly. Pass the end of the cable through the grommet in the right side of the sample handling assembly bracket, and through the cable clamp (I) on the right side of the cooling assembly.

10. Plug the sample probe cable into the sample probe connector (G).

11. Reassemble the instrument by reversing steps 1 - 6, noting the proper pin 1 orientations for all cable assemblies and their connectors.





I

Secondary Cooling Fan Replacement
332087R

Reference: Use this instruction with replacement part 332087R.

Tools Needed: Cross-point screwdriver.

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

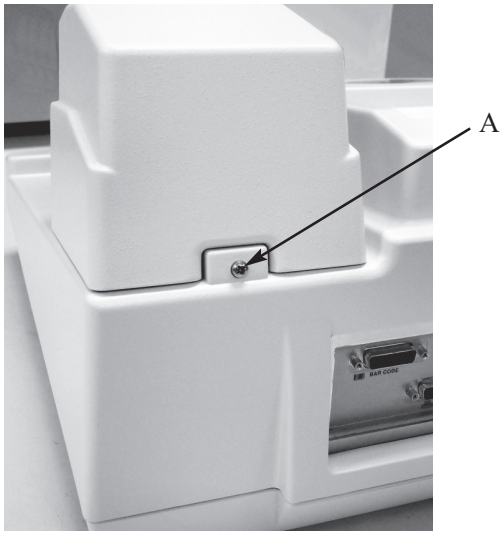
Instruction:

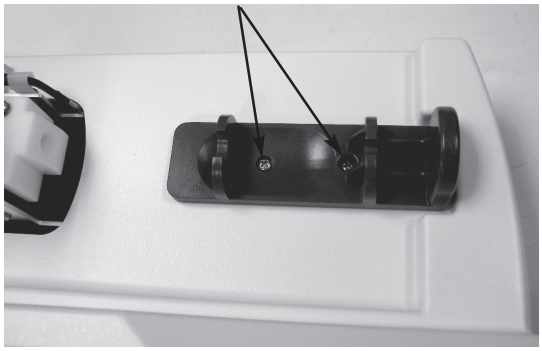
1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

3. Remove the two screws (B) securing the sampler cradle, and remove the cradle.

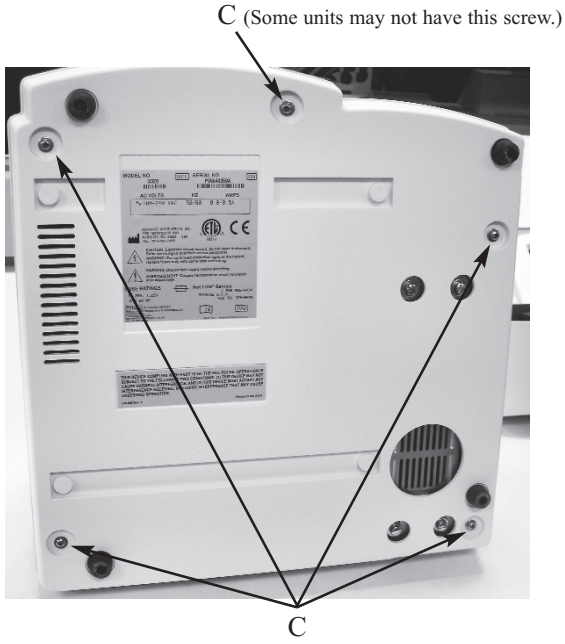
4. Carefully tip the instrument to rest on the back panel and remove the five screws (C) securing the top cover.





Note: *Use caution when separating the top and bottom covers to avoid damaging the display and keypad cable connections.*

5. Return the instrument to its upright position and carefully rotate the rear of the cover up and away from the bottom cover while keeping the front portion close to the bottom cover (D).



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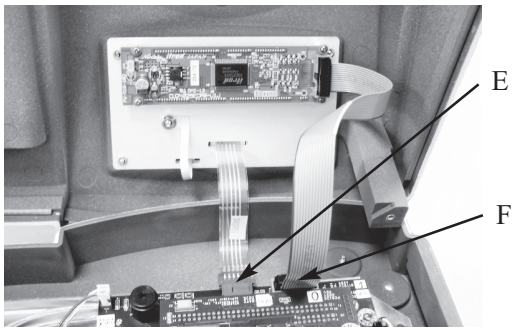
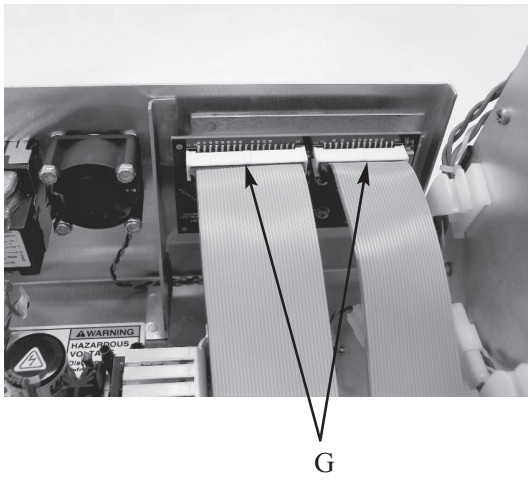
6. Unplug the keypad cable (E) and the display cable (F) from the connectors on the circuit board assembly, and remove the instrument cover.

7. Disconnect the two ribbon cables (G) from the connectors on the rear panel circuit board.

8. Disconnect the fan assembly connector (H) from the power supply wiring harness.

9. Remove the two screws (I) securing the fan assembly resistor, if equipped, and the four nuts (J) securing the fan to the chassis.



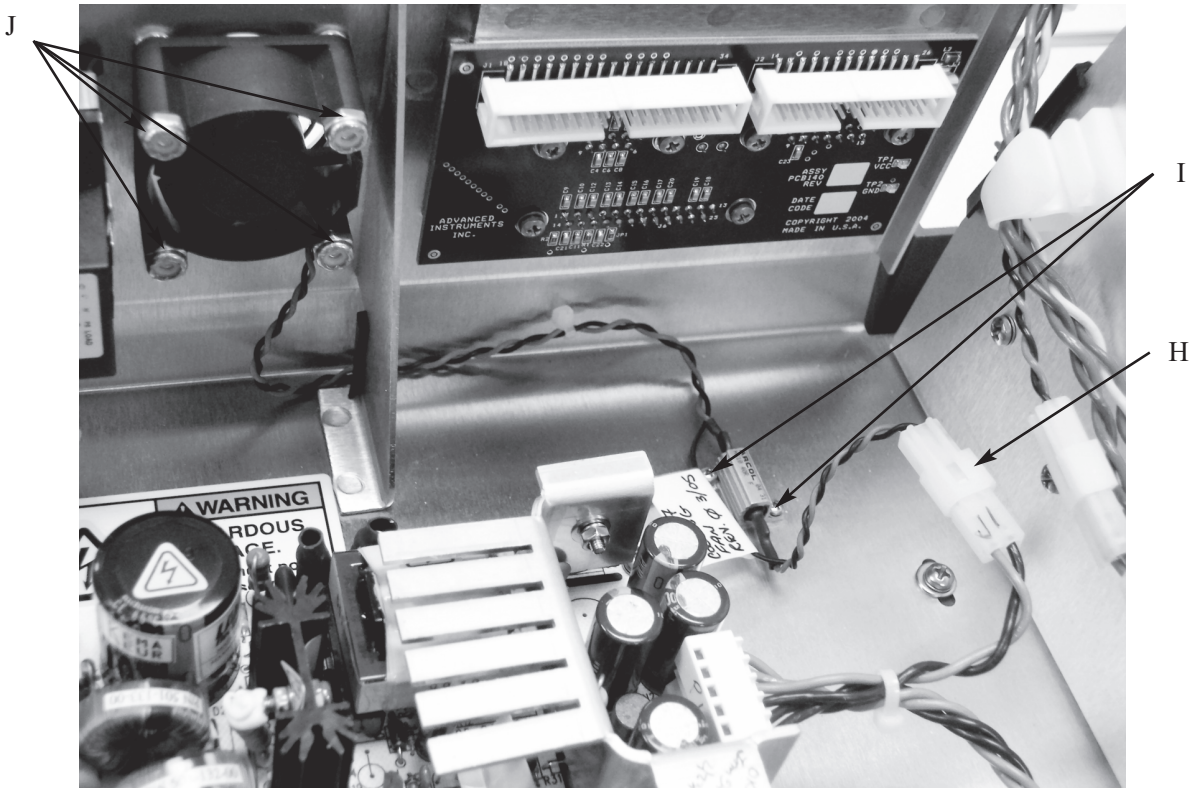


10. Remove the fan from the mounting studs and carefully pull the resistor, if equipped, and the connector through the opening in the chassis bracket.

11. Carefully route the connector of the new fan assembly through the opening in the chassis bracket.

12. Reassemble the instrument by reversing steps 1 - 9, noting the proper pin 1 orientations for all cable assemblies and their connectors.

Note: *Fan assemblies manufactured after July 2015 no longer use a chassis-mounted resistor. If replacing an assembly with a chassis-mounted resistor, the two screws may be discarded.*



* See note on page 2.

Solenoid Impactor Replacement
3M2353R

Reference: Use this instruction with replacement part 3M2353R.

Tools Needed: Cross-point screwdriver, 3/16 inch nut driver or wrench, Mitutoyo calipers (Model 505-641-50) or equivalent, slip joint pliers, feeler gauge set.

Supplies Needed:

Supplied with kit:

Shims (.001 through .008, .010 and .012 inches), gauge pin (.160-inch diameter), cable tie

Other:

5% sodium hypochlorite solution, Loctite 222.

Warning-Hazardous Voltage

CAUTION: Improper connections may cause damage to the instrument.

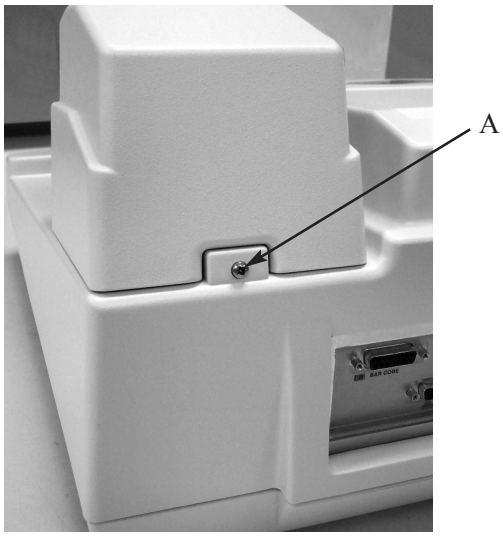
Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screw (A) securing the solenoid cover, and remove the cover.

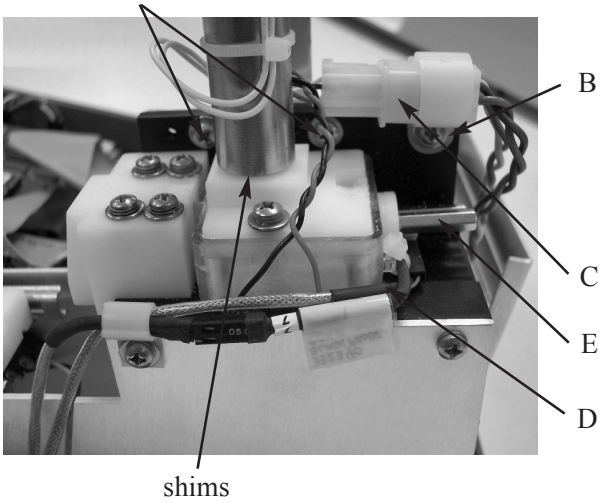
Note: ***Be careful to avoid dropping screws inside the instrument.***

3. Loosen the screw and cable clamp (B) securing the connectors for the cooling well assembly and the solenoid assembly wiring. Disconnect the solenoid assembly connector (C).



4. Disconnect the cable (D) from the sample probe.

5. Use a 3/16-inch nut driver or wrench to remove the two standoffs (E) securing the sample probe to the cooling assembly. Remove the sample probe.



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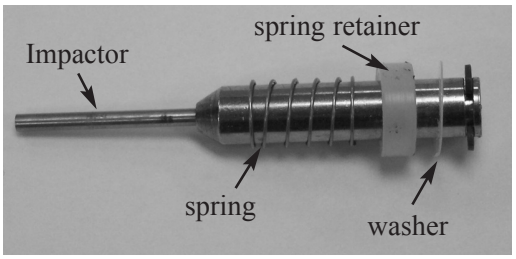


6. Remove the two screws securing the solenoid impactor retaining bracket (F).

7. Remove the impactor, spring, spring retainer, and washer (if present).

8. Remove the solenoid body using slip joing pliers.

9. Remove and save the shims installed around the threads on the solenoid body. Make sure that there are no shims remaining around the hole in the cooling assembly where the solenoid is installed.

10. Measure the thickness of the shims removed. Place them in the corresponding shim bags in the kit. (They can be reused with other instruments.)

11. Clean the impactor hole and mounting threads using a solution of 5% sodium hypochlorite. Make sure that all sample residue and other debris is removed.

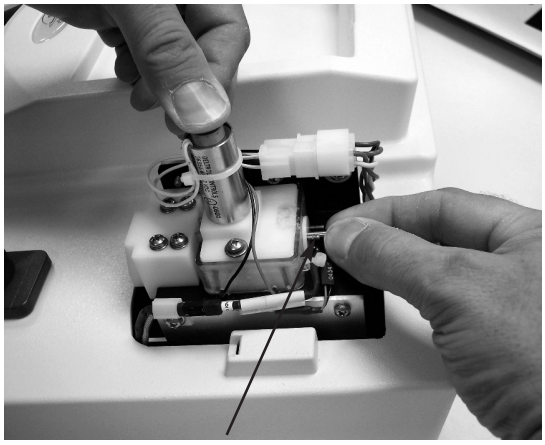
12. Remove the tape holding the impactor into the solenoid body. Use care to prevent losing the spring and spring retainer. Set the impactor, spring and retainer aside.

13. Insert the .160 gauge pin into the sample probe hole. Check to make sure that the pin is visible through the impactor hole.

14. Screw the solenoid body halfway into the mounting hole without adding any shims. Do not tighten.

15. Insert the impactor, spring, spring retainer, and washer (if present) into the solenoid body. Press the impactor in against the solenoid body as far as it will go.

16. Continue to press on the impactor against the solenoid body and gradually screw in the solenoid body. Keep checking the .160 gauge pin (G) until a light, even drag is felt from the inner, small end of the impactor contacting the pin.



G

17. Using a feeler gauge, measure the gap between the end of the solenoid body and the plastic block. If no feeler gauge is available, use one or more shims to determine the gap, then measure the shims used to determine the gap.

18. Select a combination of shims that provide the required thickness determined in the previous step.

19. Remove the impactor, spring, spring retainer, and washer (if present) and set to one side. Remove the solenoid body.

20. Place the shims over the threaded portion of the solenoid body, then screw the solenoid body into the mounting hole. Tighten the solenoid body using slip joint pliers.

Note: *Use moderate force to tighten the solenoid body.* ***DO NOT OVER-TIGHTEN****.*

21. Insert the impactor, spring, spring retainer, and washer (if present) into the solenoid body.

22. Press the impactor against the solenoid body and, sliding the .160 gauge pin in and out, check to make sure that it still has a light, even drag between the inner, small end of the impactor and the gauge pin. If the gauge pin is too loose or tight, shims should be added or subtracted until the desired light, even drag is felt. It is recommended that shims be added or subtracted in increments of .001 inches.

23. Position the solenoid wire leads back down the outside of the solenoid body and hold in place with the cable tie.

24. Reinstall the solenoid impactor retaining bracket.

25. Install the sample probe.

26. Add Loctite 222 thread lock (or equivalent) to the two standoffs securing the sample probe. Install the standoffs (B) and tighten each using the following sequence to avoid damaging the sample probe or cooling well housing:

    a. Tighten both standoffs finger-tight.

    b. Using a nut driver or wrench, tighten each standoff 1/2 turn.

    c. Tighten each standoff an additional 1/4 turn.

    The sample probe should be tight, with a slight bow.

Note: *The spacer and the probe may be touching each other, or there may be a small gap between the two parts. Either condition is acceptable. However, no gap is allowed between the standoffs and the probe. The spacer may not be present on all instruments. It has been integrated into the sample well housing.*

27. Reassemble the instrument by reversing steps 1-4.

Plunger Wire Replacement
3M0828

Reference: Use this instruction with replacement part 3M0828 (2 per package). **Replace the sampler plunger wire with each new test kit (500 samples).**

See your instrument User's Guide for detailed operating instructions and illustrations.

Instruction:

Replace the plunger wire on the sampler every 500 tests (each package of sampler tips):

1. Unscrew the calibration gauge and key (A). Rotate the shaft (B) until the calibration setscrew appears beneath the access hole (C) in the side of the sampler body. Use the calibration key to loosen the setscrew.

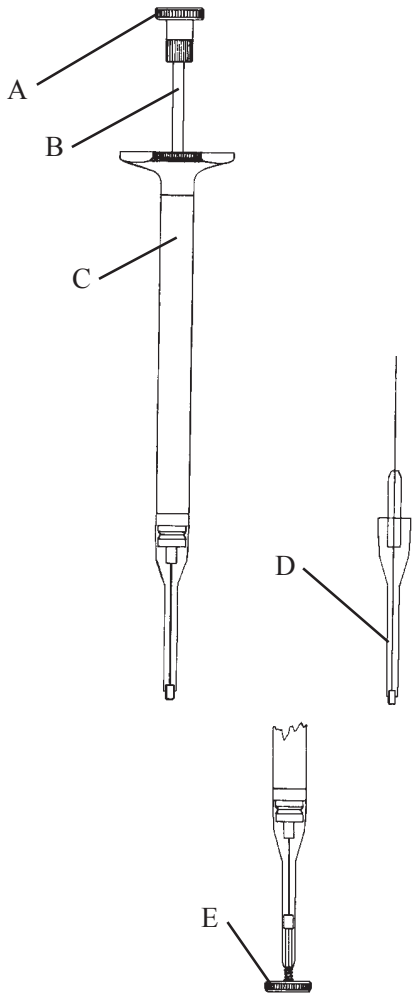
2. Carefully remove the old sampler plunger wire. If it contains a plastic sleeve, save and install it on the new plunger.

3. Slip a new sampler plunger wire into a new sampler tip so the teflon plunger tip protrudes about 1/16" or 1.6 mm (D).

4. Insert the plunger wire into the sampler body and secure the sampler tip onto it.

5. Using the calibration gauge and key, push the plunger into the sampler as far as it will go (E).

6. Tighten the calibration setscrew with the calibration gauge.



7. Screw the calibration gauge and key back into the top of the sampler.

8. Your 20 µL Sampler is now calibrated and ready to use.

(For calibration only, simply follow steps 1, 5, 6 and 7.)

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The disposable sampler tips in the 3MA800 Micro-Sample Kit and the Ease-Eject™ Sampler are specially designed for freezing-point depression osmometry with the Advanced Micro-Osmometers, Models 3300 and 3320. The use of any other means of containing the sample for use in these models is not recommended. These specialized items should not be used in conjunction with any other laboratory procedure.

Calibration

Your 20 µL Sampler has been carefully calibrated at our factory and is ready to use. Should you wish to re-calibrate your 20 µL Sampler, follow steps 1, 5, 6, and 7 of the plunger replacement procedure (over).

Operation

Sampler Tip Installation:
Mount one sample tip firmly on the sampler. Be sure the sampler tip is straight and firmly seated.

Sampling:
Depress the sampler plunger and insert the sampler tip into the sample at least 1/4" or 6 mm below the fluid surface. Gently release the plunger to draw 20 µL of sample into the sampler tip and remove the sampler from the sample.

Visually inspect the sample in the sampler tip. If there are any large voids or bubbles, the sample must be expelled and another sample drawn.

Wipe all excess sample from the outside of the sampler tip with a clean, no-lint, non-ionic, absorbent paper tissue to remove any clinging droplets.

The sample should not extend beyond the end of the sampler tip (F). Blot the sampler tip with tissue as necessary to remove excess fluid but be careful not to wick out the sample. If you are in doubt, leave a slightly concave meniscus (G).

Holding the sampler by the barrel (not the plunger), insert the sampler tip into the sample port until it comes to a positive stop.

Do not push the sampler in by the plunger handle and do not attempt to inject the sample into the sample port.

Do not remove the sampler until the test has been completed. The sample osmolality is measured inside the sampler tip.

Use a fresh sampler tip for each sample.

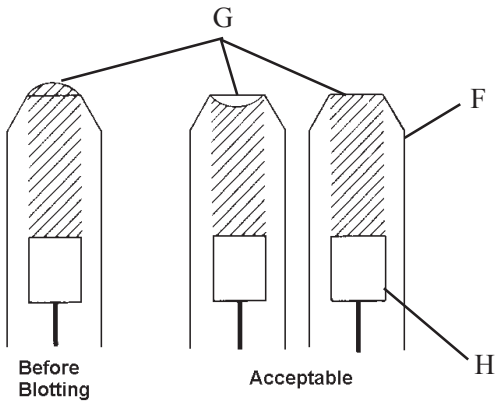
Sampler Tip Removal:
To dispose of the used sampler tip, remove the sampler from the instrument and press down hard enough on the plunger to dislodge the tip, then discard.

Blot the sampler plunger with a lint-free tissue to avoid contaminating the next sample. Be careful not to dislodge the teflon plunger tip (H).

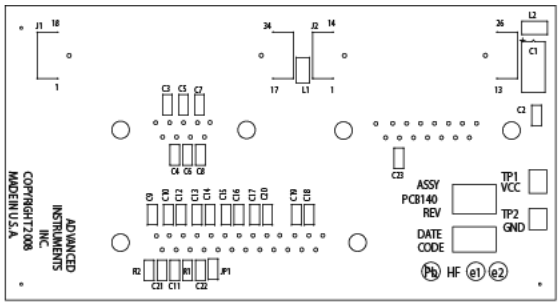
Install a fresh, disposable sampler tip.

Between runs, rinse the plunger with water or alcohol and wipe dry.

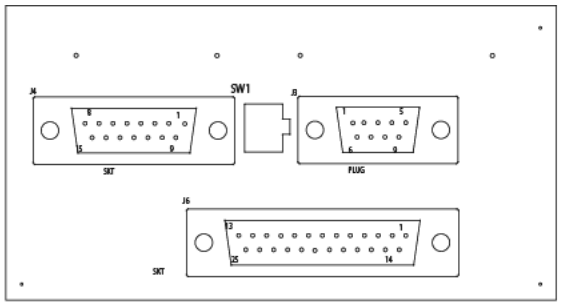
Check the sample size with the calibration key daily.



6. Schematics



SILKSCREEN TOP SIDE

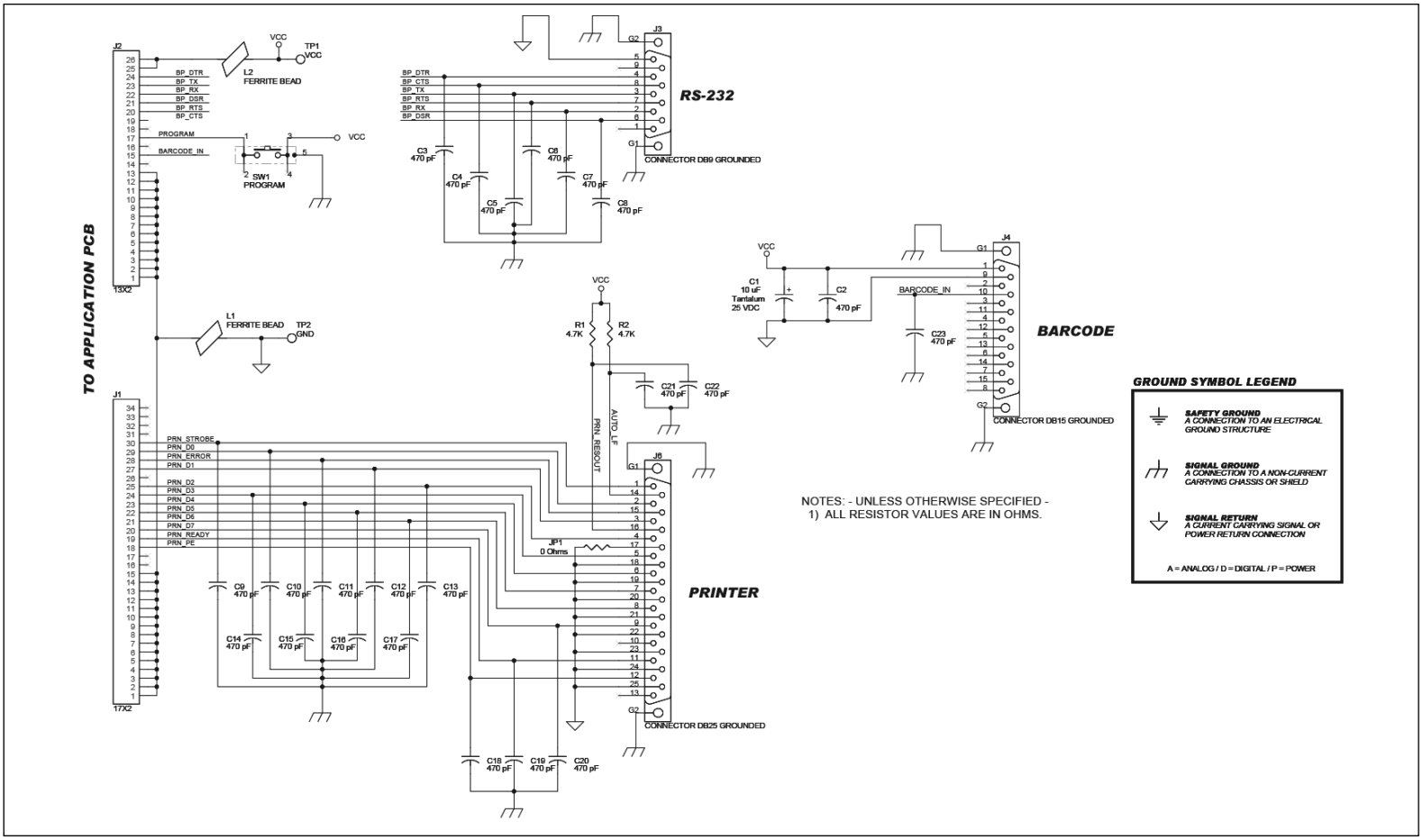


SILKSCREEN BOTTON SIDE

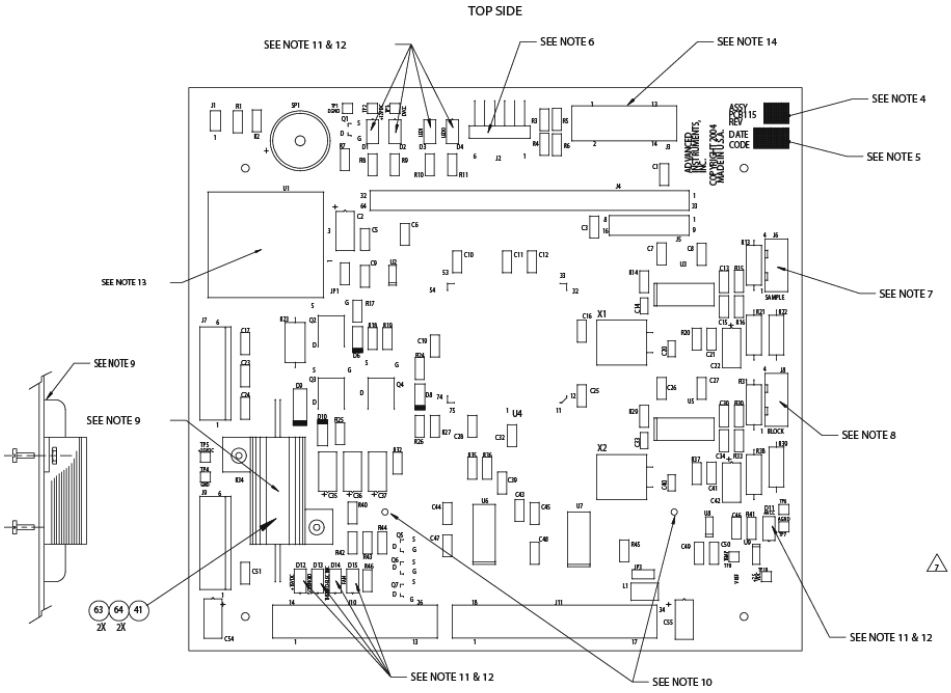
NOTES:

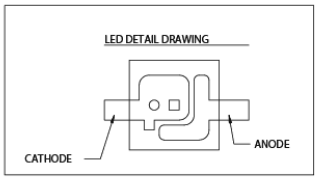
1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL.
2. MARK DATE CODE, VENDOR IDENTIFICATION AND BOM REVISION LEVEL.
3. ASSEMBLY QUALITY WILL MEET IPS STANDARD IPC-S-610 CLASS 2.
4. BOARD TO BE ASSEMBLED IN COMPLIANCE WITH EU-ROHS DIRECTIVE.
5. SW1, J3, J4, & J6 ARE MOUNTED ON BOTTOM SIDE.

PCB140 Rev3 Back Panel I/O Assembly Drawing



PCB140 Rev2 Back Panel I/O Board Schematic

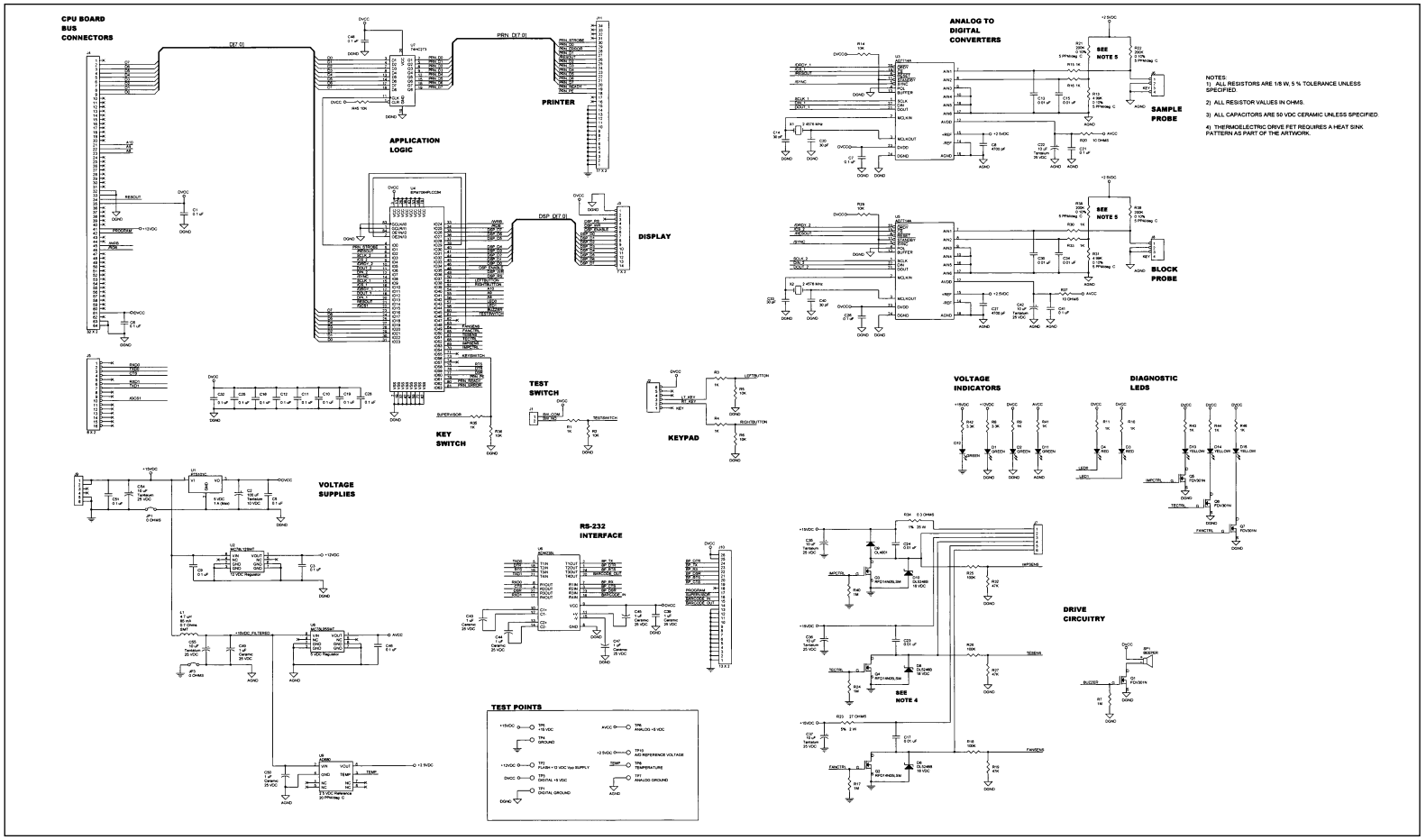




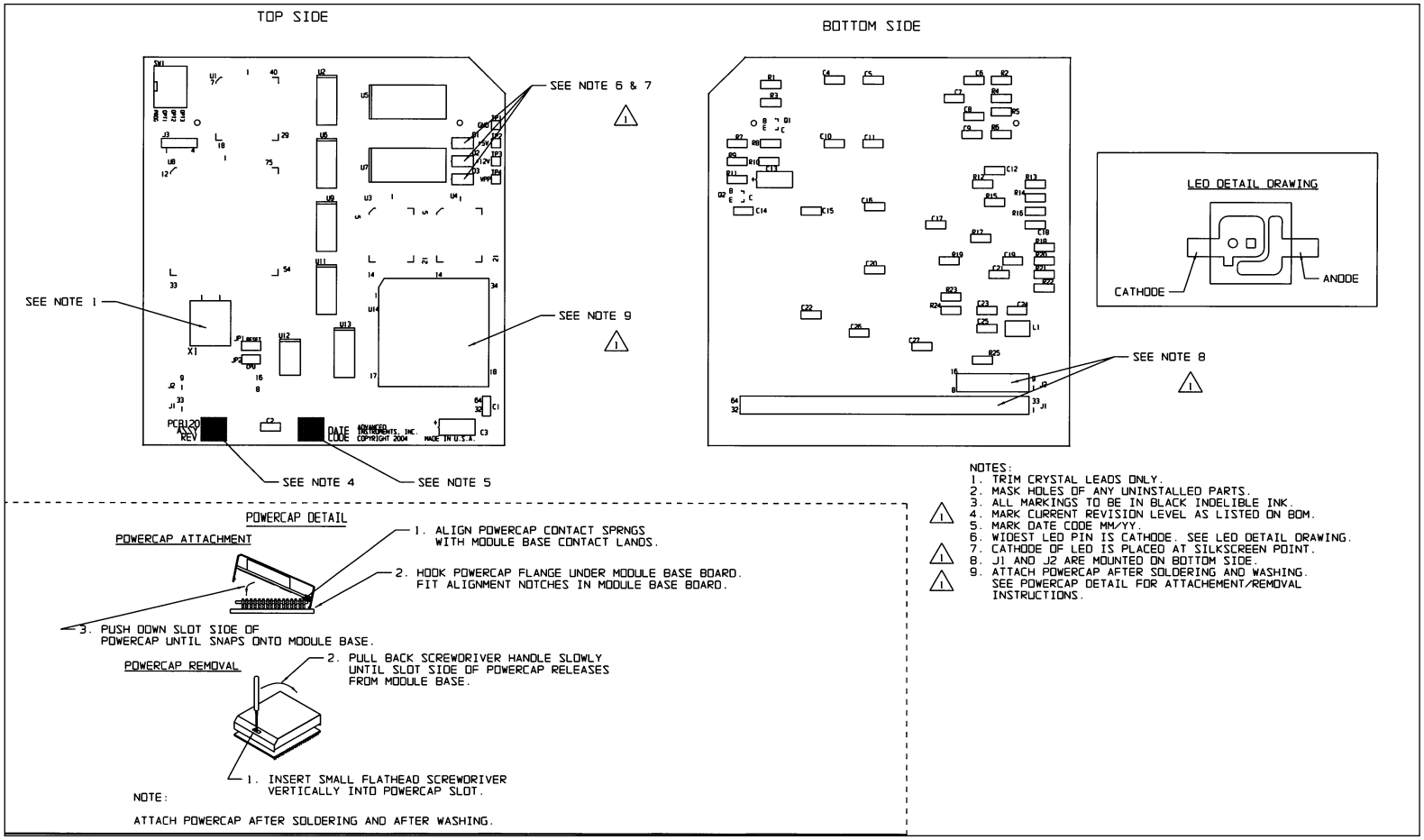
NOTES:

1. TRIM LEADS OF ALL THROUGH HOLE COMPONENTS EXCEPT CONNECTORS.
2. MASK HOLES OF ANY UNINSTALLED PARTS.
3. ALL MARKINGS TO BE IN BLACK INDELIBLE INK.
4. MARK CURRENT REVISION LEVEL AS LISTED ON BOM.
5. MARK DATE CODE MM/YY.
6. REMOVE PIN 1 OF J2 BEFORE ASSEMBLY.
7. REMOVE PIN 3 OF J6 BEFORE ASSEMBLY.
8. REMOVE PIN 4 OF J8 BEFORE ASSEMBLY.
9. SOLDER 18 AWG BUSS WIRE FROM R34 TO PCB. SECURE WITH HARDWARE AS SHOWN.
10. INSERT STANDOFF HERE.
11. WIDEST LED PIN IS CATHODE. SEE DETAIL DRAWING.
12. CATHODE OF LED IS PLACED AT SILKSCREEN POINT.
13. SECURE PART TO BOARD WITH RTV (ITEM 70).
14. PIN 1 OF J3 HEADER IS INSTALLED AT SILKSCREEN POSITION 2.
15. THIS ASSEMBLY CONTAINS SENSITIVE CIRCUITS AND MUST BE FREE OF ANY SURFACE CONTAMINATION, CLEAN BOARD AFTER SOLDERING, HANDLE WITH LINT FREE COTTON OR DISPOSABLE PLASTIC GLOVES, THIS BOARD MUST BE TESTED PERIODICALLY PER ADVANCED INSTRUMENTS PROCEDURE 6309_MTP

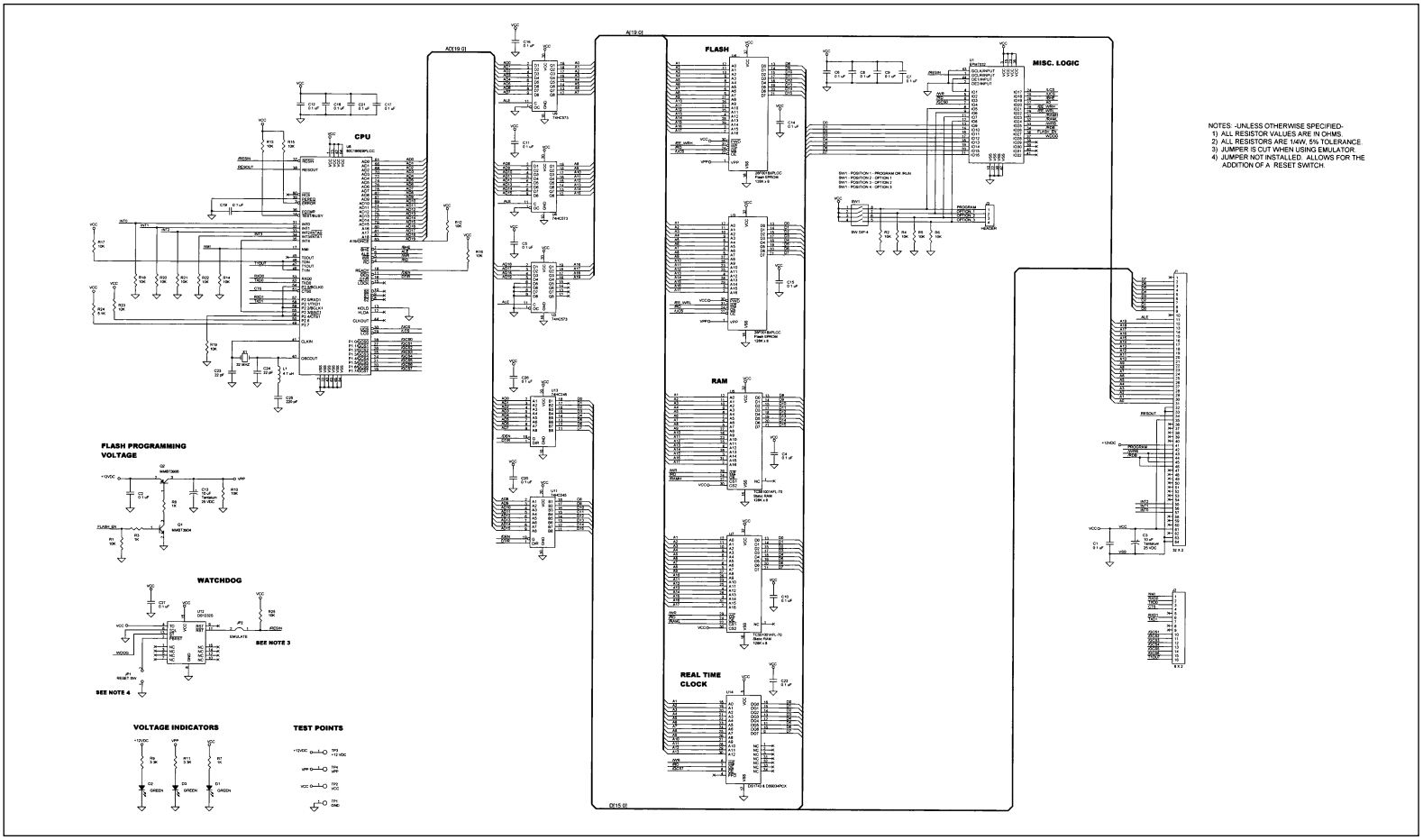
PCB115 Rev7 Application Board Assembly Drawing



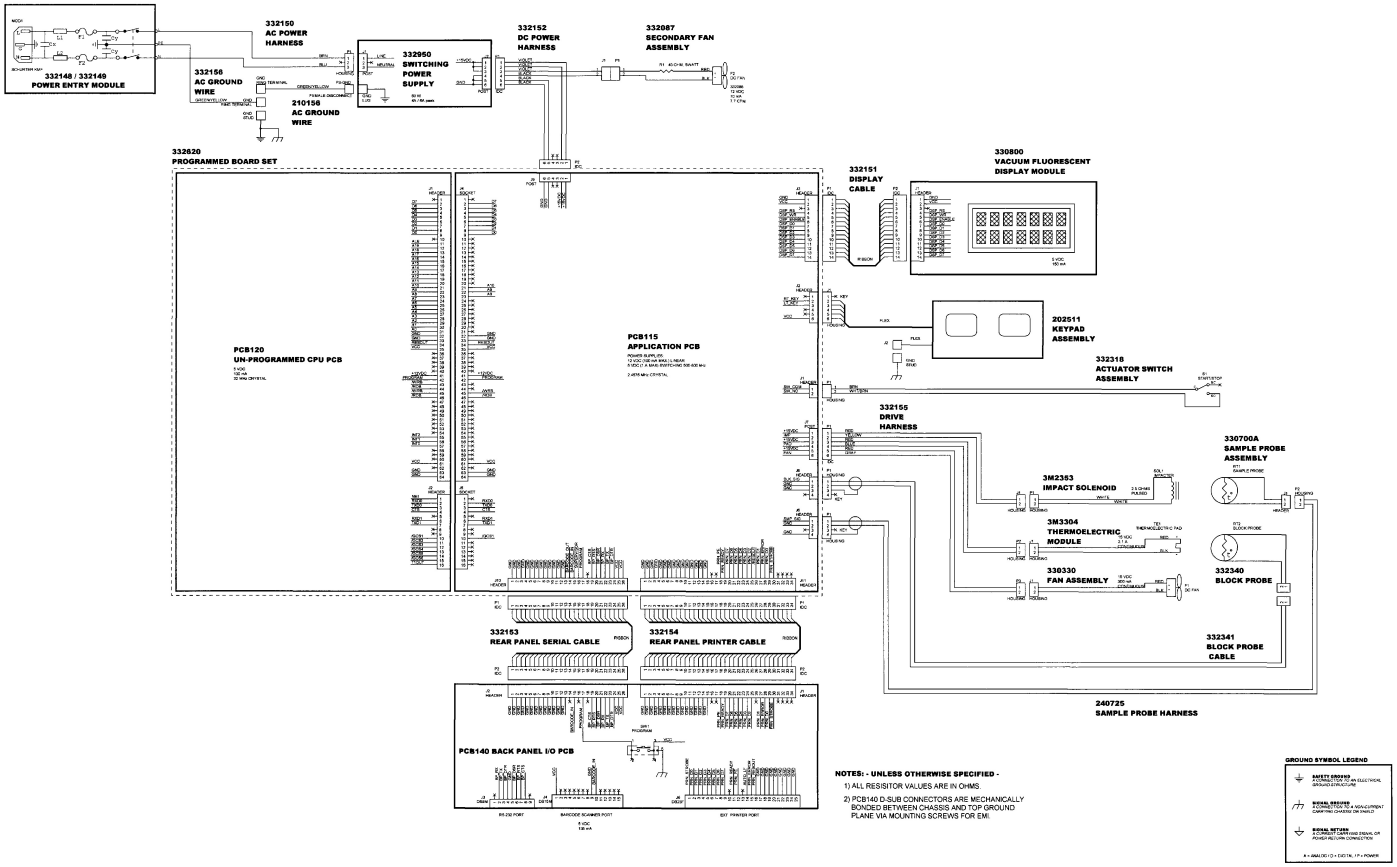
PCB117 Rev2 Application Board Schematic



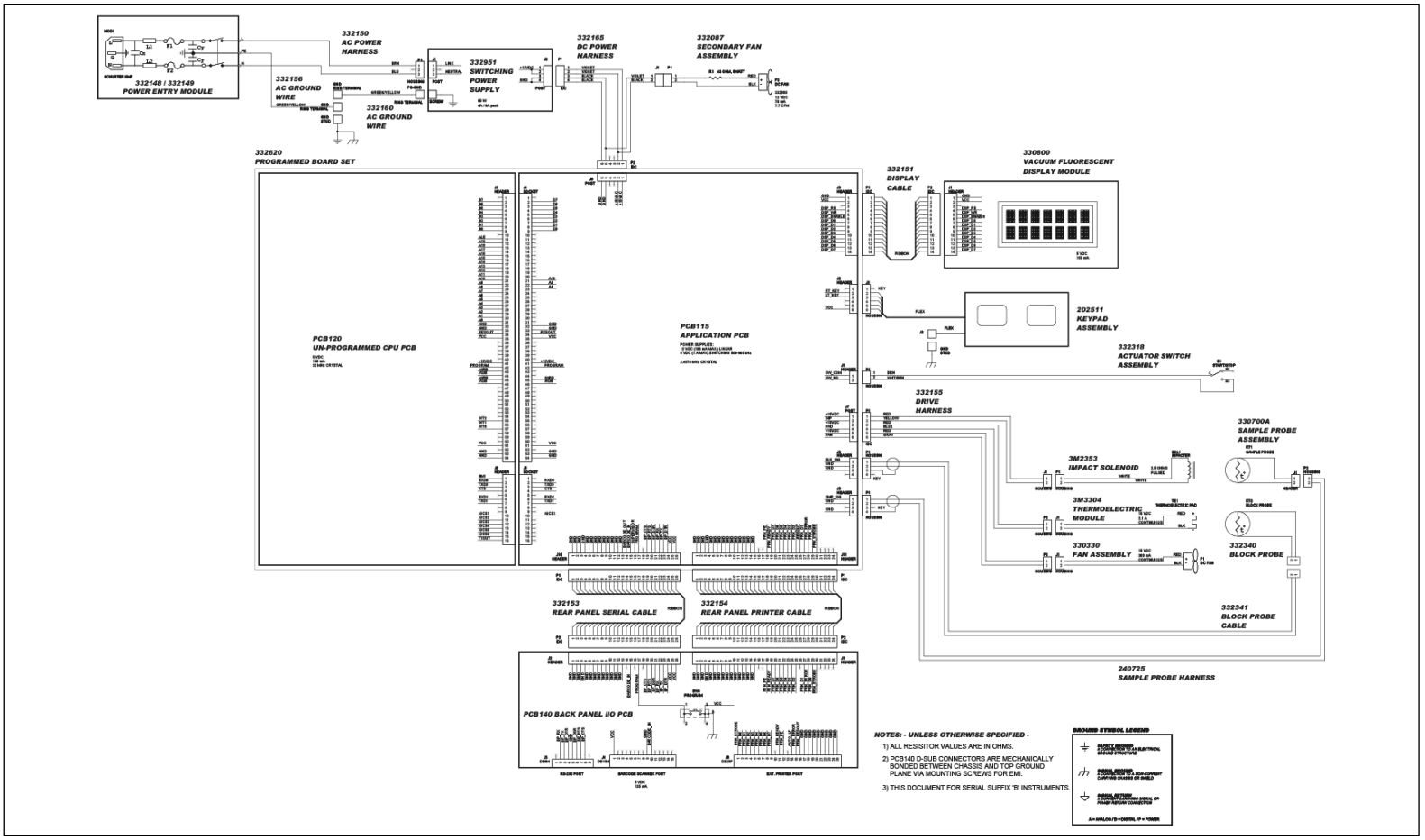
PCB120 Rev1 CPU 80C186 Assembly Drawing



PCB122 Rev1 CPU 80C186 Schematic



332000 Rev2 3320 System Interconnect for Serial Suffix A



332000 Rev3 3320 System Interconnect for Serial Suffix B

Appendix A
Event Record

Event Record

The Event Record displays the last actions of the instrument, and is used when servicing the instrument. The output should look like:

```
 #   Code  Description      Data    Date/Time
=============================================
 1:    0  State Change        2  [10/31/2006 11:02:11 AM ]
 2:    0 State Change         9  [10/31/2006 11:02:14 AM ]
 3:    4 Diagnostic Test      5  [10/31/2006 11:02:26 AM ]
 4:    2 Bar Code Scan        0  [10/31/2006 11:02:33 AM ]
 5:    5          Error   212    [10/31/2006 11:02:35 AM ]
 6:    5          Error   207    [10/31/2006 11:33:51 AM ]
 7:    0 State Change         7  [10/31/2006 11:33:53 AM ]
 8:    8 Utility Routine      0  [10/31/2006 11:33:55 AM ]
 9:    8 Utility Routine      2  [10/31/2006 11:33:57 AM ]
 10:   5          Error   207    [10/31/2006 11:33:58 AM ]

End Event Record
Download Complete
```

Event Record output consists of:

A sequential row number from 1 to 100.

Code: A number used to identify the table containing the data definition.

Description: A text field describing the code table.

Data: A numerical descriptor that, when located in the appropriate code table (see below), identifies the action recorded.

Date/Time: The date and time the event was recorded.

The code, data, and error numbers presented in the Event Record can be decoded, using the following tables.

INSTRUMENT STATES	**CODE: 0**
DATA	DESCRIPTION
0	RESET
1	ERROR
2	READY
3	STANDBY
4	TEST
5	CALIB
6	CALI_TEST
7	UTIL
8	SETUP
9	DIAG
10	BINTEST

SWITCHES	**CODE: 1**
DATA	DESCRIPTION
0	NONE
1	RIGHT
2	LEFT
4	TEST
8	SUPERVISOR
NOTE: Value reported is a combination of above switches.	

BAR CODE SCANS	**CODE: 2**
DATA	DESCRIPTION
NOTE: No subcategories.	

PARAMETER EDIT COMMANDS (*instrument must be in factory mode),* subset of code-3 data-6	**CODE: 3**
DATA	DESCRIPTION
Solenoid Freeze Parameters	
0	A On time
1	B Off Time
2	C Impacts
Solenoid Buzz Parameters	
3	D On Time
4	B Off Time
5	C Impacts
Temperatures	
6	G Supercool
7	H Post-Freeze
8	I TE Cooler Off
9	J Freeze Difference
10	K Buzz Difference
11	L Coldest
Calibration	
12	M Slope
13	N Intercept
14	Y High Pt. Coefficient
15	O No. of Calibration Samples
16	P Reference Solution A
17	Q Reference Solution B
18	Z Reference Solution C
Probes	
19	R Block Bin
20	S Sample Bin
Misc.	
21	U Plateau Mode
22	V Serial Number

NOTE: The shared "CODE:3" is a bug, recorded as #123 on 11/6/2006. Care should be taken when decoding any serial port logs after a code-3 data-6 sequence.

SERIAL COMMANDS (*instrument must be in factory mode)*	**CODE: 3**
DATA	DESCRIPTION
0	? Help
1	~ Reset Instrument
2	= Instrument Status
3	B Beep
4	C Add Comment to File
5	D Toggle Curve Trace On/Off
6	E Edit Parameters
7	H Block Temp (H+xxxxx mC)
8	I Impact (Ixx mS)
9	L Change Language
10	M A/D Channel Utilities
11	P Print Test
12	S Set Date/Time
13	T Show Date/Time
14	# Clear Parameters
15	1 Parameter Contents
16	2 Dump Results
17	3 Dump Events
18	4 Statistics
19	5 Manual Calibration
20	6 Memory Contents
21	0 Burn Parameters
22	Extra Carriage Returns

DIAGNOSTIC ROUTINES	**CODE: 4**
DATA	DESCRIPTION
0	A/D TEST
1	PROBE BIN TEST
2	SOLENOID TEST
3	DISPLAY/PRINTER TEST
4	KEYPAD/BEEPER TEST
5	BAR CODE TEST

ERRORS	**CODE: 5**
DATA	DESCRIPTION
LEVEL 1 ERRORS	
0	System Error: NMI
1	System Error: Trap
2	System Error: ESC
3	Memory Allocation Error
LEVEL 2 ERRORS	
100	Fan Driver Failure
101	TE Driver Failure
102	Solenoid Driver Failure
103	Block Probe Open?
104	Block Probe Failure
105	Sample Probe Open?
106	Sample Probe Failure
107	Cooling System Error
108	Event Record Lost
LEVEL 3 ERRORS	
200	Sample Pre-Freeze
201	Sample Freeze Error
202	Sample Did Not Freeze
203	No Plateau
204	Test Cancelled
205	Calibration Cancelled
206	Test Time-Out Error
207	Recalibration Needed
208	Standards Reversed?
209	Calibration Out of Range
210	Reset Probe Config.
211	Parameter RAM Failed
212	No Parameters in RAM
213	Count Error: Parameter
214	ROM Serial Number Error
215	Baudrate Error
216	Key Input Timeout
217	Lift Sample Probe
218	A/D Init Failure
219	A/D High Filter Error

ERRORS (*continued*)	**CODE: 5**
DATA	DESCRIPTION
220	A/D Low Filter Error
221	A/D Cal Mode Error
222	Bar Code Cancelled
223	Diagnostics Cancelled
224	Low Battery
225	Out of Range

SETUP ROUTINES	**CODE: 6**
DATA	DESCRIPTION
0	FEATURE LOCKOUT
1	SET BIN NUMBERS
2	SET KEY BEEP
3	SET TIME
4	SET SERIAL RATE
5	SET SERIAL NUMBER
6	SET LANGUAGE

SETTING CHANGE	**CODE: 7**
DATA	DESCRIPTION
NOTE: No subcategories.	

UTILITY ROUTINES	**CODE: 8**
DATA	DESCRIPTION
0	RECALL RESULTS
1	STATISTICS
2	EVENT RECORD
3	ASSISTANCE

EVENT_TEST	**CODE: 9**
DATA	DESCRIPTION
NOTE: Data is the final result of a successful test.	

CALIB ROUTINE	**CODE: 10**
DATA	DESCRIPTION
NOTE: No subcategories.	

Notes:

Appendix B
Symbol Definitions

Symbol Definitions

The following symbols may appear in product literature, or on intruments or product packaging.

	On-Off
	Feed
	Interrupt
	Test
	Start
	Stop
	Record Review
	Setup
	Calibration
	Cancel; Delete
	Functional Arrow
	Printer
	Enter
	RS232
	Bar Code
	Attention

	Caution Hot Surface
	Dangerous Voltage
	Lifting Hazard
	Calibrator
	Content
	Control
	Negative Control
	Positive Control
	Flammable
	Fragile
	Irritant
	Keep Dry
	Date Manufactured
	Sterile
	Non-Sterile
	Serial Number

SOLN	Solution
	Do Not Open Top
	Handle With Care
	Toxic
	Use Blade To Open
	Do Not Re-Use
IVD	For *In Vitro* Diagnostic Use
CE	European Conformity
	Temperature Limit
	See Instructions
LOT	Lot Number
	Manufacturer

	Use By; Expiration Date
EC REP	Authorized Representative
REF	Part Number
Σ x	Sufficient for [x] Tests
	Open Here
	Low Fluid Level
	Keep Hands Clear
LATEX	Latex-Free
SAMP DIL	Diluent
	See Instructions for Temperature Guidelines
	Potential Puncture Hazard
	Electronic Equipment - Dispose of Properly

Appendix C
Product Disposal and Recycling

Product Disposal and Recycling

International concern about environmental pollution resulting from improper disposal of products and materials at the end of their useful life has resulted in an increase in legislation to control the methods and procedures used to handle waste electrical and electronic equipment. While the regulatory status in some regions of the world has progressed to the point where formal legislation is already in effect, many other regions are in the process of creating similar legislation or adopting that already in existence in other areas. The result in the years ahead will be more stringent control over disposal of products and recycling of their components once they are withdrawn from use.

Since regulations governing the disposal of your instrument and accessories may vary depending upon your geographic location, the following guidelines are provided to assist you in identifying the options available to you once the decision has been made to replace or dispose of this product:

- Contact the supplier who sold you the product. Whether this was Advanced Instruments itself, or one of its authorized dealers, this supplier should be knowledgeable about the national and local regulations governing disposal and recycling of products in your area. In some cases, this supplier may be legally obligated to accept the product from you and arrange for proper disposal or recycling with no further involvement on your part. Alternately, the supplier can provide you with specific instructions for actions that you can take to dispose of the product properly.

- Contact your local government agency responsible for waste collection and disposal. They can identify procedures and restrictions in effect to ensure proper disposal, and available locations where products can be sent.

- Contact Advanced Instruments Hot-Line Service:

  - 800 225-4034 (toll-free within the USA and Canada; after normal business hours, dial extension 2191)
  - +US 781-320-9000 (elsewhere)
  - 781-320-0811 (fax)

  Service personnel will provide you with contact information for local disposal, or instructions for returning the product directly to Advanced Instruments.

Notes:

Appendix D
Service Log

Service Log

To call for Service:	(781) 320-9000 or (800) 225-4034	
FAX	(781) 320-8181	

Model Number 3320 **Serial Number** _____

Symptoms or Problems	Repairs, Replacements or Changes	Serviced by

Symptoms or Problems	Repairs, Replacements or Changes	Serviced by

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