

ISOCOMP I

GAMMA COUNTER
AND
DATA REDUCTION SYSTEM

SERVICE MANUAL

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Note on schematics: In the Adobe Acrobat format of this manual, the schematics are scalable. If the schematics are printed on 8½ by 11” paper, they are unreadable. To print the schematics so that they are readable, select the print function in the Adobe Acrobat reader, and print only the schematic pages to a printer capable of printing on 11” by 17” paper.

If a printer capable of printing on 11” by 17” paper is not available, then by zooming in the Adobe Acrobat reader, the schematics can be viewed quite nicely.

INTRODUCTION

The ISOCOMP I Gamma Counter and Data Reduction System is the latest in a long line of compact yet powerful bench top laboratory instruments from MGM Instruments. A 1.5 inch square Sodium Iodide Crystal turns the gamma radiation emitted from a sample containing ^{125}I or ^{57}CO into an electrical pulse that is amplified and counted by the computer in the Main PCB. Menu driven instructions prompt the user to insert the correct tube and press the proper keys from calibration, to programming, to operation.

Protocols may be programmed and stored in permanent non-volatile memory. Data reduction routines are selected by the user during programming (see Operator's Manual for programming instructions and further information on the data reduction routines.) Types of test that can be performed include; RIAs, IRMAs, Uptakes, screening etc. Simultaneous ^{125}I and ^{57}CO counting is also possible for applications such as a B12/Folate assay.

Instrument calibration is performed automatically by the internal microprocessor, and results are printed by the on board thermal graphics printer. A calibration standard is required to perform instrument calibration and is available through MGM Instruments.

The ISOCOMP I is operated either via the 20 key multi-function keypad on the front panel or remotely by a computer or terminal, utilizing the RS-232 Serial Interface. Results are reported via the 20 character vacuum florescent display on the front panel, the 20 column graphics printer, or through the RS232 interface.

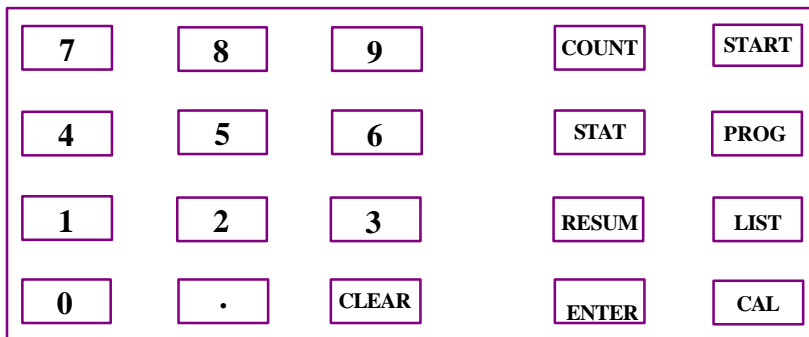
Specifications

Detector	1.5" x 1.5" NaI (thallium doped) crystal
^{125}I Efficiency	> 75%
Isotope Windows	^{125}I - 20 to 75 Kev ^{57}CO - 100 to 200 Kev
Crossover of ^{57}CO into ^{125}I window	>3% at 0.038 μCi of ^{57}CO
Background	^{125}I - Less than 100 CPM ^{57}CO - Less than 200 CPM
Vial Size	Up to 16 mm diameter

Power Requirements	120 TO 240 VAC Selectable 50 or 60 Hz
Operating Temperature	+10 to +40 degrees C +50 to +105 degrees F
Dimensions	Height: 4" Width: 15" Depth: 11"
Weight	24 Pounds

Front Panel Controls

The ISOCOMP is controlled by function keys located to the right of the numeric keys on the Front Panel Keypad.



Function Keys

COUNT	INITIATES A COUNT SEQUENCE
STAT	INTERRUPTS A CURRENT PROTOCOL TO RUN A STAT ASSAY
RESUME	RESUMES INTERRUPTED PROTOCOL
ENTER	ACCEPTS DISPLAYED DATA
START	BEGINS A NEW PROTOCOL
PROG	EDITS PROTOCOL PARAMETERS
LIST	PRINTS A LIST OF PROTOCOL PARAMETERS
CAL	INITIATES A CALIBRATION ROUTINE

CALIBRATION

The Isocomp I gamma counter has the ability to self calibrate utilizing a calibration source of either ^{125}I or the long life, mock ^{125}I (^{129}I) which is recommended.

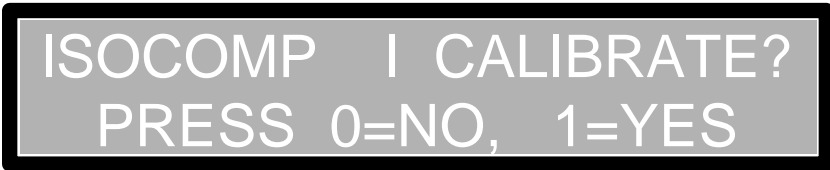
To Calibrate the instrument:

Press the CAL button on the front panel keypad. The following is displayed



ISOCOMP I SN: 105000
ENTER TO ACCEPT

The instrument serial number will be displayed. If the serial number is correct, press ENTER. If it is not correct, enter the proper serial number and press ENTER. The following is displayed.



ISOCOMP I CALIBRATE?
PRESS 0=NO, 1=YES

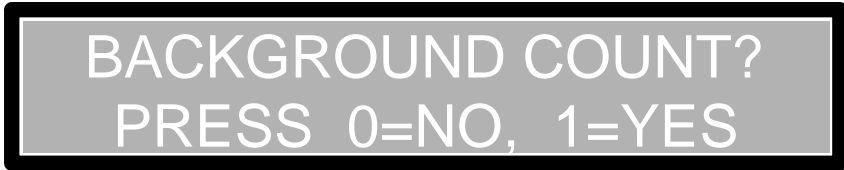
Press 1 to initiate a calibrate sequence. The following is displayed:



INSERT CAL SOURCE
PRESS COUNT

The instrument prompts the user to insert a source. Insert the calibration source and press ENTER.

The instrument will take approximately 1 minute to complete its calibration. At the conclusion of a successful calibration, a calibration number will be printed, and the following will be displayed:



BACKGROUND COUNT?
PRESS 0=NO, 1=YES

Press 1 to perform a background check. The Isocomp will take 10-1 minute counts and store the average of the backgrounds for ^{125}I and ^{57}CO in memory for use (if desired) during an assay utilizing the background subtract parameter.

Consult operator's manual for more information. After the background count is complete, the following will be displayed.

EFFICIENCY TEST?
PRESS 0=NO 1=YES

Press 0 to skip the efficiency test. Press 1 to perform the efficiency test. If 1 is pressed, the following is displayed:

ACTIVITY (uCi)=?

Enter the activity of the calibration source. If the source was purchased from MGM, there will be two numbers printed on the label on the tube. Enter the SIMULATED activity as is printed on the label.

Simulated	0.061	uCi 125I
Contains	0.085	uCi 129I

*ENTER THIS
NUMBER*

The following will be displayed:

INSERT SOURCE
PRESS COUNT

The instrument will perform 10-1 minute counts of the calibration source. After the last tube has been counted, the printer will report the average counts, efficiency, chi2 and report that efficiency is complete. The display will return to the main menu and the instrument is ready to be operated.

NOTE: It is recommended that calibration be performed weekly and the printouts saved to be able to track the performance of the instrument.

```

*****
I SOCOMP QA PROCEDURE
SERIAL # 105000
DATE: _____
BY: _____

DETECTOR CALIBRATION
CAL. NUMBER: 107

BACKGROUND COUNT
I 125 C057
    49 73
    39 65
    41 62
    51 63
    51 78
    43 65
    48 69
    47 75
    26 65
    53 76
-----
    45 69

BACKGROUND COMPLETE

EFFICIENCY TEST

    I 129
    62313
    62748
    62242
    62985
    62589
    62441
    62782
    62847
    62731
    63003
-----
    62668
EFFICIENCY = 80.7%
CHI 2 = 10.1

EFFICIENCY COMPLETE

QA TEST COMPLETE
*****
    
```

**SAMPLE PRINTOUT
OF CALIBRATION**

Should calibration fail the printout will alert the user that the calibration has failed. See below.

```
*****  
I SOCOMP QA PROCEDURE  
SERIAL # 105000  
DATE: _____  
BY: _____  
  
DETECTOR CALIBRATION  
  
CALIBRATION FAILED  
  
BACKGROUND COUNT
```

This would indicate a possible problem with the instrument. Another possibility is that the calibration was performed without a source in the well. It is recommended that the rest of the calibration routine be aborted, and a new calibration routine initiated.

SAMPLE PRINTOUT

The following protocol can be programmed to provide a sample printout to check the operation of the microprocessor and printer in the ISOCOMP I.

Press the PROG key, and assign a number to the sample protocol. For this example we use Protocol 1.

From the Main Menu, press 1, ENTER

The following menu appears:

```
PROGRAM PROTOCOL 1
STANDARDS          0
```

Press 5, ENTER. The following Menu appears:

```
PROGRAM PROTOCOL 1
TOTAL REPS        0
```

Press 1, Enter. The following Menu appears:

```
PROGRAM PROTOCOL 1
NSB REPS
```

Press 1, ENTER. The following Menu appears:

```
PROGRAM PROTOCOL 1
B0 REPS          0
```

Press 1, Enter. The following Menu appears:

```
PROGRAM PROTOCOL 1
STANDARD REPS    0
```

Press 1, ENTER. The following Menu appears:

```
PROGRAM PROTOCOL 1
PAT REPS
```

Press 1, ENTER. the following Menu appears:

```
PROGRAM PROTOCOL 1
COUNT TIME      0
```

Press 1, ENTER. The following Menu is displayed:

```
PROGRAM PROTOCOL 1
1=I   2=CO  3=BOTH
```

Press 1, ENTER. The following Menu is displayed:

```
PROGRAM PROTOCOL 1
I   BKG.SUB   0=N   1=Y
```

Press ENTER. The following Menu is displayed:

```
PROGRAM PROTOCOL 1
I   ANALYSIS
```

Press 3, ENTER. The following is displayed:

```
PROGRAM PROTOCOL 1
I   LO   NORMAL   0
```

Press 3, ENTER. The following is displayed:

```
PROGRAM PROTOCOL 1
I  HI  NORMAL    0
```

Press 11, ENTER. The following is displayed:

```
PROGRAM PROTOCOL 1
I  MARG. RANGE
```

Press ENTER. The following is displayed:

```
PROGRAM PROTOCOL 1
I  CONC  1    0
```

Press 2.5, ENTER. The following is displayed:

```
PROGRAM PROTOCOL 1
I  CONC  2    0
```

Press 5, ENTER. The following is displayed:

```
PROGRAM PROTOCOL 1
I  CONC  3    0
```

Press 10, ENTER. The following is displayed:

```
PROGRAM PROTOCOL 1
I  CONC  4    0
```

Press 15, ENTER. The following is displayed:

```

PROGRAM PROTOCOL 1
I   CONC   5      0
    
```

Press 30, ENTER. The Main Menu is displayed.

Press the START key and select PROTOCOL 1, ENTER. The following is displayed:

```

PROTOCOL 1
SELECT:
    
```

Select 2, Enter and enter the following values as prompted;

<u>PROMPT</u>	<u>ENTER</u>
TOTAL REP 1	80619
NSB REP 1	6464
B0 REP 1	58009
STD 1 REP 1	50660
STD 2 REP 1	43799
STD 3 REP 1	34669
STD 4 REP 1	28032
STD 5 REP 1	18873

The printout for this protocol can be found on the following page.

TEST PROTOCOL PRINTOUT

```

*****
DATE: _____
BY:   _____

TOTAL
  1  80619
AVG  80619  0

NSB
  2  6464
AVG  6464  0

BO
  3  58009
AVG  58009  0

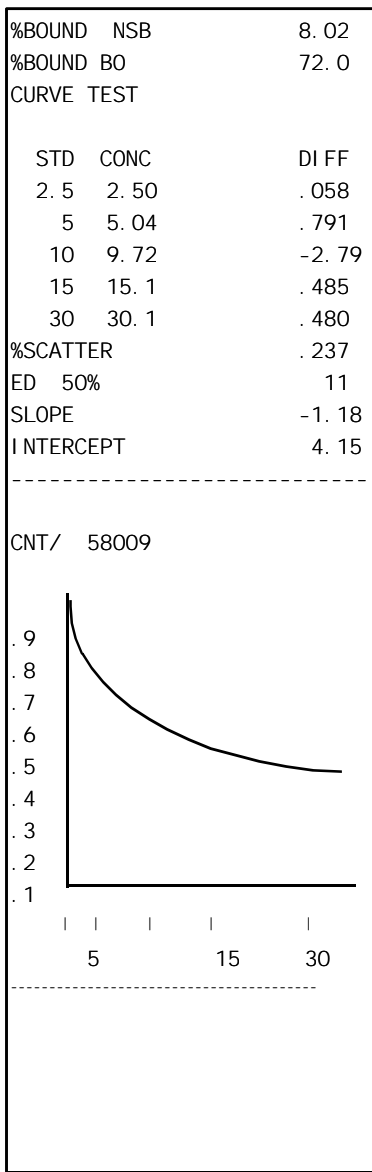
STANDARD 1          2.5
  4  50660          2.50
AVG  50660  0      2.50

STANDARD 2          5
  5  43799          5.04
AVG  43799  0      5.04

STANDARD 3         10
  6  34669          9.72
AVG  34669  0      9.72

STANDARD 4         15
  7  28032          15.1
AVG  28032  0      15.1

STANDARD 5         30
  8  18873          30.1
AVG  18873  0      30.1
    
```



TROUBLESHOOTING

The following chart is intended to assist technical personnel in the troubleshooting and repair of the ISOCOMP I Gamma Counter and Data Reduction System.

CAUTION!

Hazardous voltages exist inside the instrument. Turn the power off and remove the power cord from the wall outlet prior to servicing. Covers are to be removed by qualified personnel only!!

Symptom	Possible Cause	Action
No response at power up	Power cord not plugged in Blown fuse Incorrect line voltage setting Missing +5V	Check both ends of power cord Replace fuses Check line voltage setting Check TP2 on Main PCB
Power up OK, No response from the keypad	Keypad ribbon cable loose Bad ribbon cable Bad keypad	Check both ends of ribbon cable Replace ribbon cable Replace keypad
High background counts	Contaminated well liner Contaminated well Contaminated workbench Reagents stored too close Bad detector	Remove, and decontaminate well liner Decontaminate well Clean work bench Move reagents or instrument Replace detector
Low Efficiency	Incorrect source activity entered during calibration Bad detector	Enter the Simulated activity written on the tube Replace detector
No response from printer	Loose printer harness Bad printer power supply Bad printer	Check connections Replace printer power supply Replace printer
Printer feeds blank paper	Paper installed incorrectly Bail bar pulled back Bad printhead	Turn paper over (treated on one side) Push bail bar toward rear of Isocomp Replace printer
Invalid Protocol displayed	Incorrect protocol number entered Memory erased	Restart protocol Re-enter protocol, restart
Zero counts	Incorrect count time High background value Incorrect isotope selected	Reprogram Disable background subtract Reprogram to use proper isotope

TEST POINTS

Test points are located in the middle of the main board just forward of the heat sink. There are 6 test points for the voltages which run the instrument. They are as follows:

TEST POINT	FUNCTION
TP-1	GROUND
TP-2	+5VDC
TP-3	+12VDC
TP-4	-12VDC
TP-5	+8VDC (DAC REF.)
TP-6	HIGH VOLTAGE

When checking the high voltage use caution! Voltage is typically at or above 600VDC. It is recommended that the voltmeter be set to the proper range, and connected to TP1 prior to applying power to the instrument. If the voltmeter is connected with power applied, arcing may occur, which will cause the ISOCOMP to “lock up” and require the operator to turn the power off to clear this condition.

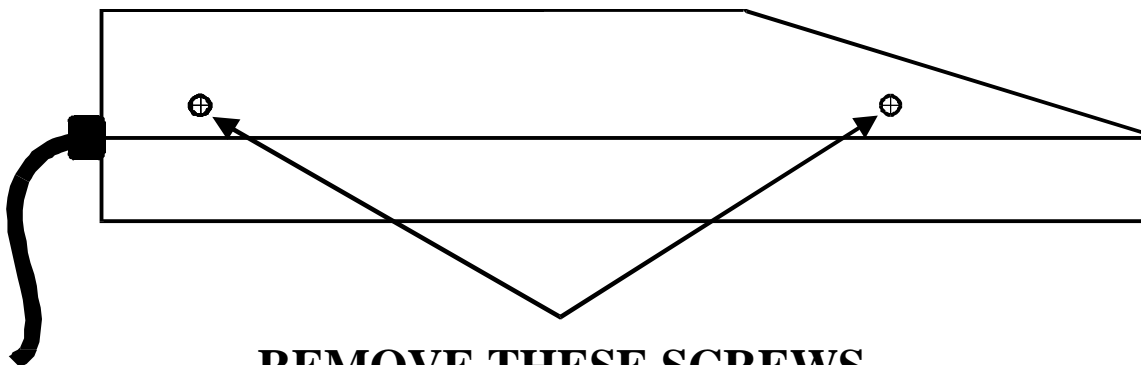
COVER REMOVAL

Tools required; #1 point Philips screwdriver

Turn the instrument off and remove the power cord from the wall receptacle.

Using the screwdriver, remove the four screws, located two on either side of the instrument.

ISOCOMP I SIDE VIEW

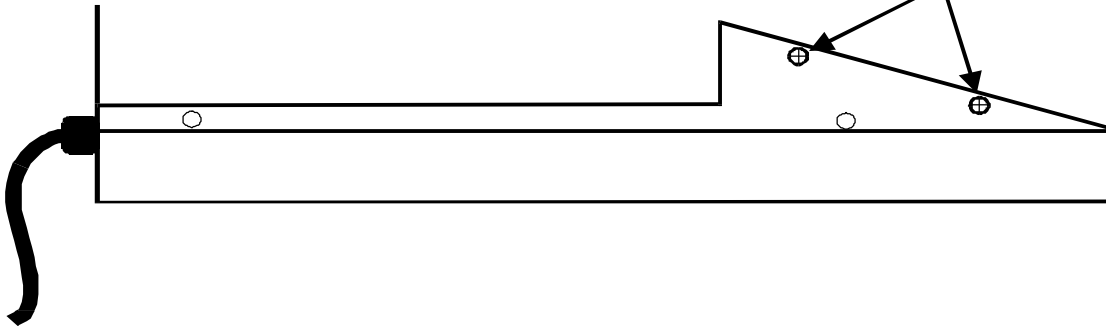


REMOVE THESE SCREWS

Lift the rear portion of the cover, and slide the cover toward the rear of the instrument.

Note: The printer harness will not permit total removal of the cover. There is however, enough slack in the harness to permit access to the inside with out complete removal

Locate the four flat head screws (two on either side) which secure the front panel to the base. Remove the four screws.

REMOVE THESE SCREWS

It is now possible to lift the Front Panel off of the base and gain access to the Main PCB and other components inside the instrument. It is necessary to disconnect the cables from the keypad and display in order to completely remove the panel.

COMPONENT REPLACEMENT

Replacement of internal components involves opening the instrument and exposing a possible shock hazard. Please exercise extreme caution when working on the inside of the instrument, Voltages inside can exceed 600VDC.

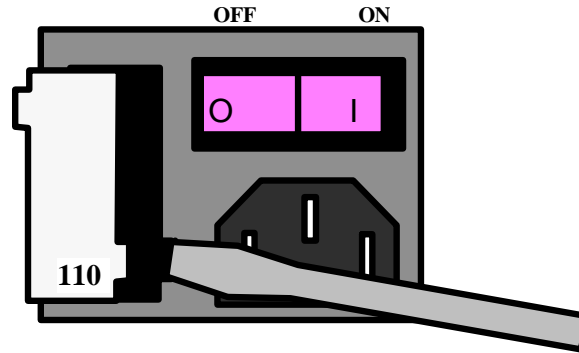
CAUTION!

**INTERNAL VOLTAGES CAN EXCEED 600VDC.
REMOVE POWER BEFORE REMOVING COVERS.
SERVICE BY QUALIFIED PERSONNEL ONLY**

FUSE REPLACEMENT

To replace the fuse(s) on the ISOCOMP, it is first necessary to remove the power cord from the power entry module located at the left rear of the instrument.

1. Turn the power to the instrument off with the power switch located near the power cord.
2. Remove the power cord from the wall receptacle.
3. Remove the power cord from the power entry module
4. Using a small flat blade screwdriver, or something equivalent, remove the fuse block from the power entry module.



5. Remove the bad fuse(s) and replace with a 1/4 amp Slo-Blo fuse.
6. Install the fuse block into the power entry module. NOTE: Observe the voltage setting on the outside of the fuse block. The proper voltage setting should be facing the bottom side of the Power Entry Module as shown.

KEYBOARD REPLACEMENT

1. Turn power off and remove the power cord from the wall outlet
2. Remove the Top Cover.
3. Remove Front Panel.
4. Remove six screws securing the Keypad to the Front Panel.
5. Remove keypad.
5. Install replacement keypad
6. Replace six screws to secure the new Keypad.
7. Replace Front Panel.
8. Replace Top Cover.

DISPLAY REPLACEMENT

Turn power off to the instrument and remove the power cord from the wall receptacle.

Remove the Top Cover and Front Panel as described on page #2-3

Disconnect the two wires from the Display.

Remove the four screws securing the Display.

Remove the Display. If there is a blue filter on the original display, it may be necessary to transfer it to the new display. A piece of tape can be used to hold the filter in place while the display is being secured.

Install the new display. If the original Display was manufactured by Futaba (recognizable by a 40 conductor ribbon cable connection to the main board), J-3 on the main board should be open. If the Display was manufactured by Noritake (discreet wire harness connection to the main PCB) J-3 on the main pcb must be shorted.

PRINTER REPLACEMENT

Turn the Instrument off and remove the power cord from the wall receptacle.

Remove the Top Cover as described above.

Remove the Printer Harness from the printer by gently pulling the connector away from the printer.

Remove the four Philips head screws from the base of the Printer PCB.

Check the DIP switch setting on the original printer, make sure that the replacement printer is set the same way. (SEE BELOW)



It may be necessary to retain the paper tear bar from the original printer. Compare the new printer with the original printer. The paper tear bar is a stainless steel strap that runs across the top of the printer mechanism and snaps into the frame. To remove it, simply lift it off of the frame and transfer it to the new printer. Note: It may be necessary to pry the frame gently to be able to snap the bar into the frame.

Next, pull the bail bar forward and insert the bar into the slot in the cover. The four mounting holes in the Printer PCB should line up with the standoffs.

Install the four mounting screws. NOTE: The ground lug from the Printer PCB must be installed on one of the mounting screws.

Connect the printer to the printer harness. NOTE: The printer PCB has contacts on only one side, check to insure that the contacts line up with the wires of the printer harness.

MAIN PCB REMOVAL/REPLACEMENT

Turn the Isocomp off and remove the power cord from the wall receptacle.

Remove the Top Cover and Front Panel as described on Page#2-3

Disconnect all harnesses from the Main PCB connectors.

Remove 7 Screws from the MAIN PCB, and 5 from the heatsink.

The MAIN PCB can now be removed.

If you are replacing the Main PCB, compare the replacement PCB to the original PCB to make sure that all of the IC's are present

Install the Replacement PCB

Replace the 7 screws into the clearance holes in the Main PCB

Replace the 5 screws into the heatsink.

Connect all harnesses to the Main PCB as listed below.

J-1	RS-232
J-2	Printer
J-3	Keyboard Ribbon
J-4	Preamp Signal/Power
J-6	Preamp High Voltage
J-7	AC In
J-8	Display Data
J-9	Display Power (+5V and Ground)

Reassemble the Front Panel and Top Cover without screwing the covers down.

Plug the instrument in and apply power to it to make sure that the replacement PCB is functioning properly.

When it has been determined that the PCB is functional, remove the top cover and secure the Front Panel with the four flat head screws.

Replace the Top Cover and secure it using the four Philips head screws.

REMOVAL/REPLACEMENT OF PRINTER POWER SUPPLY

Turn the instrument off and remove the power cord from the wall receptacle.

Remove the Top Cover as described on page #2-3

Disconnect the AC Harness and the printer harness from the two connectors on the Printer Power Supply PCB.

Remove the four screws securing the Printer Power Supply PCB

Remove the Printer Power Supply PCB

Install the replacement Printer Power Supply. Position it such that the two harness connectors are facing the Main PCB.

Connect the Ac Harness and the Printer Harness to their respective headers on the Printer Power Supply PCB.

REMOVAL/REPLACEMENT OF PREAMP

Turn the power off to the instrument, and remove the power cord from the wall socket.

Remove the Top Cover as described on page #2-3

Disconnect the Preamp Power and Signal Harness and the Preamp High Voltage Harness from the Main PCB

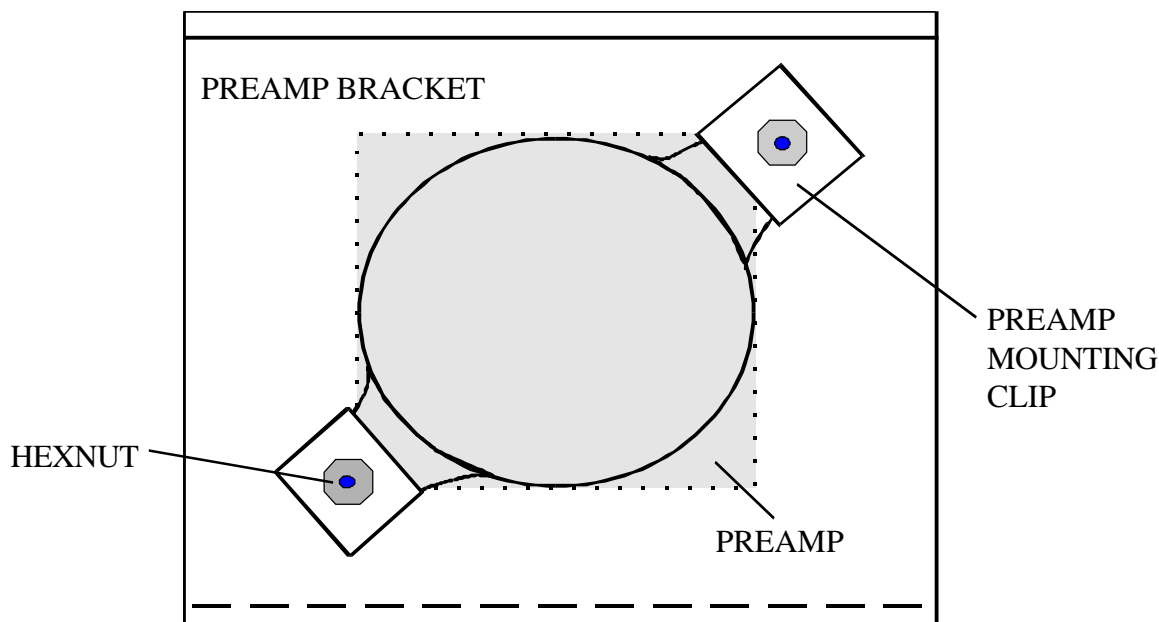
Remove the two screws holding the Preamp Screen to the Mounting Bracket.

From the bottom of the instrument, remove the two #8 Philips head screws that secure the Preamp Bracket.

Gently wiggle the Preamp back and forth while pulling away from the lead block to remove it from the pins of the detector.

Once the Preamp is free of the detector, it can be lifted straight up and removed.

If necessary, remove the Preamp from the mounting brackets by loosening the two clips on the mounting bracket using a 5/16" wrench (preferably open end). *NOTE: The nuts do not have to be completely removed, if they are sufficiently loosened, the Preamp can be rotated and removed from the bracket.*



Install the replacement PREAMP onto the mounting bracket (if necessary) positioned such that the wires of the PREAMP face the Top Cover. The clips on the mounting bracket should be placed over the "tabs" of the Preamp Socket. Do not tighten the Clips at this time.

Install the replacement Preamp onto the pins of the detector. Line up the notch in the PREAMP socket with the key on the detector. Make sure that the Preamp is pushed all the way onto the pins of the detector.

Install the screws from the bottom of the instrument to anchor the PREAMP bracket.

Tighten the clips.

Replace the Preamp Screen

Connect the High Voltage Cable and the Preamp Power/Signal Cables

Replace the Top Cover assembly.

Check the operation of the replacement Preamp by running a calibration routine.

DETECTOR REPLACEMENT

Turn the ISOCOMP off and remove the power cord from the wall socket.

Remove the Top cover assembly as described on page #2-3.

Remove the Preamp shield.

Remove Preamp Mounting Bracket

Remove well liner.

Gently pull the detector out of the Lead Block. The Lead tube will come out along with the Detector.

Place the Lead Tube on the replacement detector.

NOTE: The original detector will have a black foam packing on the outside of the large diameter end. Make sure that the replacement has some sort of packing on it to reduce the chance of the Detector being damaged during transport.

Insert the “head” of the detector into the lead block.

Insert the well liner into the top of the lead block. This will serve to line up the detector with the PREAMP.

Install the PREAMP onto the pins of the detector.

Install the screws into the PREAMP mounting bracket from the underside of the Isocomp base.

Check all connections from the PREAMP to the Main Board.

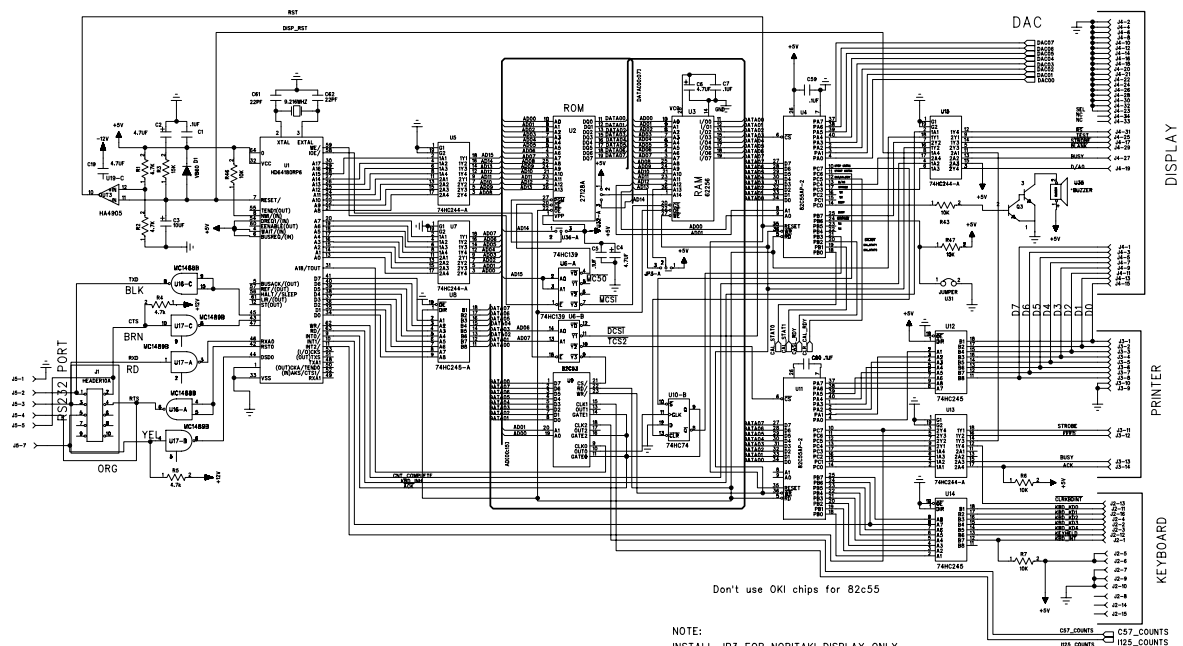
Place all the covers back onto the Isocomp.

Restore power to the Isocomp.

Run a calibration of the instrument to assure proper operation of the replacement detector.

If the instrument is operating satisfactorily, remove power once again and secure the Front Panel and Top cover.

REVISION RECORD			
LT#	ECO. NO.	APPROVED	DATE



U16	MC1488	
1	-11.8	14 +12
2	2.6	13 2.5
3	-11.2	12 2.5
4	0	11 -12
5	0	10 +5
6	+11.6	9 +5
7	0	8 -11.2

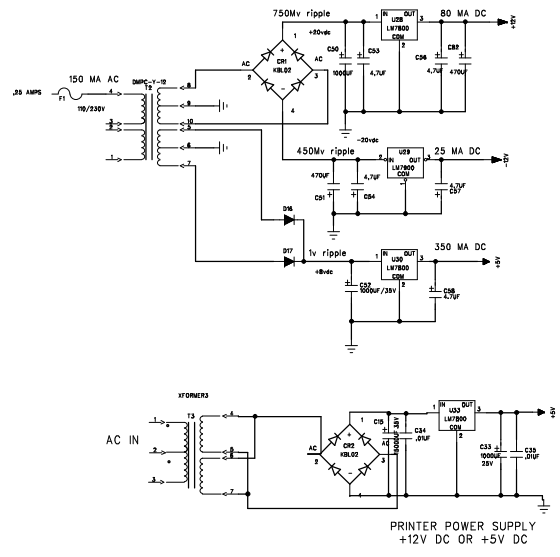
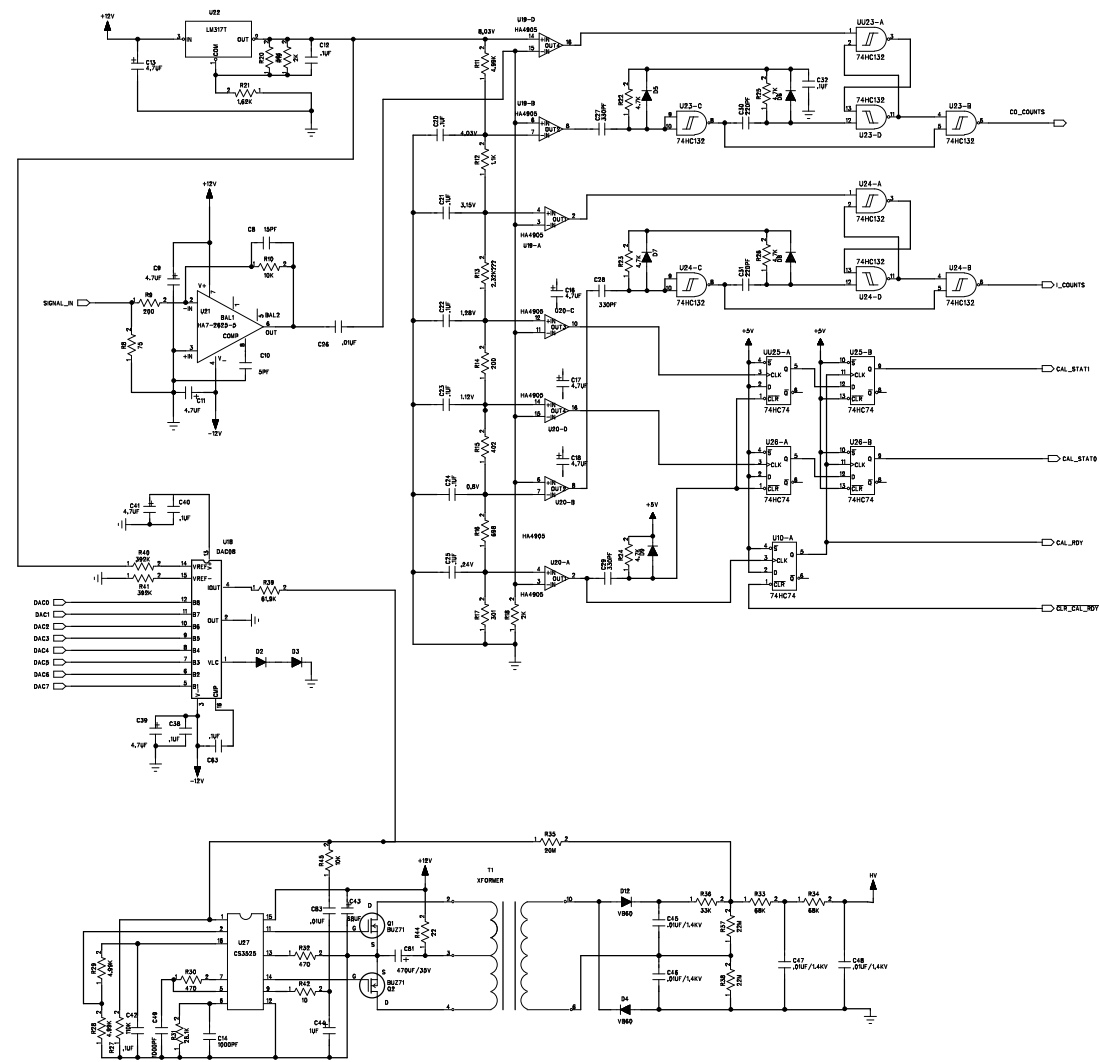
U17	MC1489	
1	0	14 +5
2	0	13 0
3	+5	12 0
4	+5.9	11 +5
5	.8	10 +5.9
6	0	9 .8
7	0	8 0

Don't use Oki chips for 82c55

NOTE:
INSTALL JP3 FOR NORITAKI DISPLAY ONLY

MGM INSTRUMENTS, INC.		
DATE:	APPROVED:	DRAWN BY: ZM
SCALE:		REVISION: 1
PART NAME/TITLE		
MAIN BOARD		
APPLICATION	ISOCOMP 1	DRAWING NUMBER 0700-003-00

REVISION RECORD			
LTR	ECO NO.	APPROVED	DATE



MGM INSTRUMENTS, INC.			
DATE: 9/6/96	APPROVED:	DRAWN BY: ZM	
SCALE:		REVISION: F	
PART NAME/TITLE: MAIN BOARD			
APPLICATION: ISOCOMP 1	DRAWING NUMBER: 0700-0003-00		

6

5

4

3

3

2

1

D

C

B

A

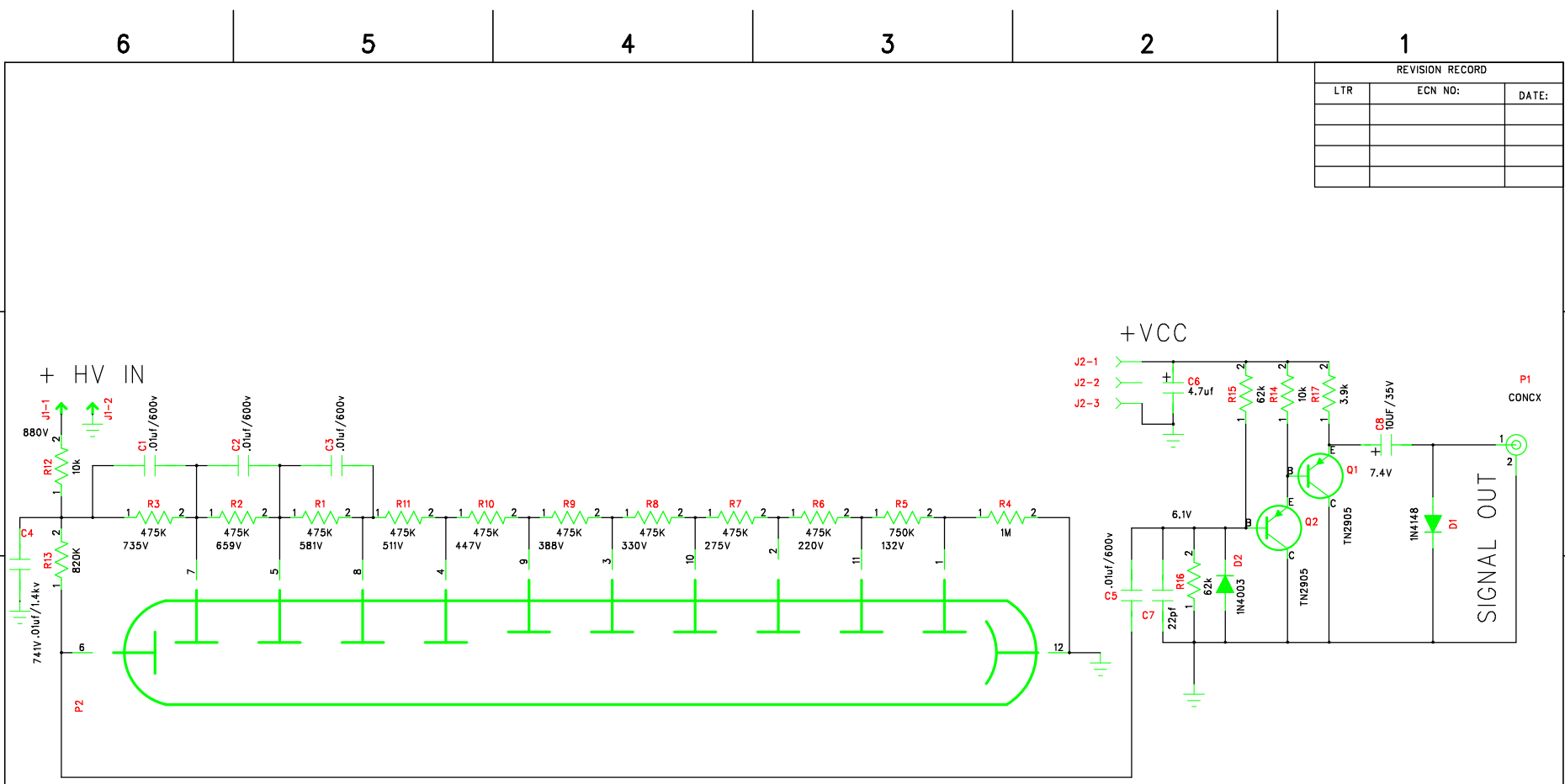
D

C

B

A

REVISION RECORD		
LTR	ECN NO:	DATE:



MGM INSTRUMENTS INC.		
DATE: JUNE 8 1995	APPROVED:	DRAWN BY: ZM
SIZE: B		REVISION:
PART NUMBER/TITLE: PREAMPLIFIER		
APPLICATION: ISOCOMP I	DRAWING NUMBER: 998001A	

D
C
B
A

6
5
4
3
2
1

