W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.01 Rev. D

ECO 915

(Section 1 – Thermal Isolator Fabrication)

January 19, 1999

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 15

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

SECTION 1

1. Thermal Isolator Fabrication (part # 25408-201)

1.1 Drawings

Thermal Isolator Drawing 25408-201
Thermal Isolator Artwork Drawing su0022FG.dwg

1.2 Equipment, equipment set-up procedures, materials, and material preparation.

Note: All temperatures, times, etc are to have tolerance of ± 5%.

1.2.1 Scope

This section describes the laboratory required to fabricate the thermal isolators and the setup and activation of the equipment in the laboratory.

1.2.2 Equipment Description and activation instructions safety precautions - wear gloves and eye protection when working with etching solutions

1.2.2.1 Location

The laboratory used is the STEP Laboratory in the HEPL building.

1.2.2.2 Dip Coater

The dip coater is used to coat parts with photo resist that can not be coated using the traditional spin coating techniques. The coater is programmed to dip the part at one speed and withdraw the part at another. The intent is to dip the part quickly and withdraw it slowly so the balance of surface tension and gravity has an opportunity to produce a consistent thin coating on the surface of the part. The limit switches should be adjusted so at lease 3.5" of substrate will be coated. Record SN_____

1.2.2.3 Reactive Ion Etcher

This etcher is used to etch clean the polyimide substrate <u>after processing</u>. A reactive gas or mixture of gas is ionized using and RF plasma. The gas constituents are designed to be reactive to the material being etched. The reacted material are exhausted though the pumping system. Record SN_____
Turn on power: One switch on front panel.
Start vacuum pumps in service bay: The pumping system consists of a mechanical pump and a roots blower. The mechanical pump will not start without venting the system to atmosphere and waiting until the pump has reach full speed. This is done by breaking the pumping line at the fitting closest to the inlet of the pump and starting the pump. The fitting can then be made up after the pump has reached full speed.
Start the roots blower immediately after making up the fitting on the mechanical pump.
Turn on gas: This process require 2 gases. O2 and CF4 The O2 tank is located in the service bay. The CF4 is located in the Wet Lab under the etcher.

1.2.2.4 Wet Bench

1.2.2.4.1 Dump rinser.

The dump rinser is used to rinse parts with clean DI water.
Turn on main located on controller on wet bench upper control panel.
Cycle once to purge and clean rinser. Rinser is programmed for 2 rinse cycles.

1.2.2.4.2 Fume Exhaust

Fume exhaust for wet chemistry operation.
Ventilation system is always on.

1.2.2.5 Solvent Bench

The solvent bench is used to house the Dip coater. It removes any fumes coming from the photo resist and solvents used in cleaning and stripping photo resist.

1.2.2.6 HEPA Oven 0-110 degrees C

Oven is used to pre-bake photo resist and to dry parts.
Turn on main.
Set temperature to 110 degrees C.
Record SN____none_____, Record Calibration Date_____none_____

1.2.2.7 Collimated UV light source

1. The UV source is used for exposing the photo resist
2. Turn on the main:
3. Push Start button until source starts.
4. Let warm up for 20 min. before use.
5. Record SN 125

1.2.2.8 Photographic film cutter

1. The cutter is used for trimming the photographic masks and cutting the Etch-a-flex material to size.

1.2.2.9 Stereo Microscope

1.2.3 Materials,

1.2.3.1 Sheldahl Nova Clad Copper/ Au coated Kapton film

1. Cut using Photographic film cutter into 3.5" x 4.5 " pieces.
2. Store in plastic container.
3. Record lot number and description here _____

1.2.3.2 Cr/Au coated Sheldahl Nova Clad substrates.

1. Nominal thickness of film is 4000 angstroms. The Cr is 100-200 angstroms thick.
2. Cut ½ strip from long end of substrate and save for further testing if required.
3. Store in Plastic box separated with Lint free wipes.

4. Record lot number here _____

1.2.3.3 Ferric Chloride copper etching solution.

1. Place ~ 550 ml of solution in 600 ml beaker on wet bench counter
2. Record lot number / date here_____

1.2.3.4 Au etching solution

Mix 100g Potassium Iodide, 25g Iodine , with 1000ml DI water.

1.2.3.5 Cr Etch

CR-7 Commercially available from Cyanteck Corp. (510) 651-3341

1.2.3.6 Photo resist developer 303A.

1. Dilute 10:1 in DI water.
2. Place solution in 500ml beaker on wetbench. This solution is used for developing the photo resist after exposure . Record Lot No_____Record Expiration Date_____.

1.2.3.7 Pyralin 2723 photo sensitive liquid polyimide liquid.

1. Remove from freezer and allow liquid to come to room temperature.
2. Record lot number here_____Record Expiration Date_____
3. Store in freezer, 0 F.

1.2.3.8 Pyralin Developer

1. Decant into 500ml polyethylene squeeze bottle.
2. Seal ends with Kapton tape.
3. Record lot number here_____Record Expiration Date_____
4. Pyralin Developer/Rinse % mix 50%/50% developer/rinse in 500 ml polyethlene squeeze bottle. Seal ends with Kapton tape.

1.2.3.9 Pyralin Rinse RI-9180

1. Decant into 500ml polyethylene squeeze bottle.
2. Seal ends with Kapton tape.
3. Record lot number here_____Record Expiration Date_____.

1.2.3.10 Photo resist, Microposit.

1. Stored in 1 liter polyethylene large mouth specimen jar in solvent cabinet under solvent hood.
2. The photo resist is used as a photo-imageable etch resist to pattern the metal thin films on the Kapton substrate.
3. Record lot number here_____

1.2.3.11 Lint free wipes

Many lint free wipes are used for patting dry substrate between processes and provide clean surface to store processed material on bench during processing.

1.2.3.12 2000ml glass beaker

This is used to catch Pyralin developer and rinse during processing.

1.2.3.13 Spin Coater

1. Cover bowl with AL foil to protect bowl and capture the pyralin for disposal.
2. Place O-ring style, 3" OD vacuum chuck on spinner.

1.3 Art work production

1.3.1 Scope

The art work is used as a mask for defining the pattern produce during the photo lithography process.

1.3.2 Equipment

PC running windows AutoCad version 14 and CAMtastic dxf to gerber translator.

Microscope, record SN 204215

1.3.3 Procedure

1. Produce soft tooling by outputting the art work drawing to a AutoCad DXF file format.
2. Post process the DXF file using CAMtastic CAM software to produce a Gerber formatted file.
3. Send file to vendor for production of 4" chrome glass photomasks. A positive film is required for the traces and Pyralin mask and a negative is require for the back. The trace and Pyralin masks shall be mirrored so the films can be used emulsion side down.

1.4 Photo-lithography

1.4.1 Scope

This section describes the process for patterning the parts and electrical traces on the Nova Clad material. This process only differs from traditional lithography processes by using a dip coating process rather than a spin coating process for the photo resist. Two processes will be described. One for parts that will be RIE etched and one for parts that will be laser cut. The primary difference is that the substrate prepared for laser cutting do not require patterning on the copper side.

1.4.2 Equipment (see section 1.2 for details)

Oven
Collimated UV light source
Dip Coater
Dip coater dipping fixtures.
Wet bench

Scissors
4" Plastic storage boxes

1.4.3 Materials (see section 1.2 for details)

Cr/Au coated Sheldahl Nova Clad substrates
Copper etch.
Photo resist developer.
Gold etch.
Cr etch.

1.4.4 Procedure

1.4.4.1 Activate equipment and prepare materials as described in section 1.2.

1.4.4.2 Label plastic boxes.

Create labels for each substrate to be processed in this run. The label will have the serial number for each part on each box. The serial number is created by taking the artwork file name date and a sequential number. Example SU0022FB112097-001A. The first letter at the end refers to each part on the substrate starting from the top. Typically each substrate contains 4 parts.

1.4.4.3 Patterning for Electroplating Mask # _____ - Dip coat

1. Mount 2 substrates to dip coat fixtures.
2. Hang on the dip coater.
3. Set dip coater to 3.5 on the front dial.
4. Dip-coat substrates.
5. Store coated substrate upside down in cabinet, on dip fixture after removing hanging bolt.
6. Repeat 1 - 4 until desired number of substrates are coated (maximum of 8 substrates can be coated for each run because there are 4 fixtures. Each fixture hold 2 substrates

1.4.4.4 Bake substrates

1. Place substrates in oven and bake substrates @ 90 deg C, for 5 minutes. The substrate remains on the dipping fixture and are placed upside down on the floor of the oven.
2. Remove from oven and let cool for 5 minutes
3. Store substrate in dip fixtures until they are place in the exposure frame in the next step.

1.4.4.5 Expose substrates

1. Remove one substrates from dip fixture by pulling substrates using gloved hand by pulling on the bottom edge with thumb and index finger.
2. Place one coated substrate on UV light source. The Au surface must be facing up. Center the substrate to the mask. Place the trace mask on substrate and center.
3. Set timer on UV exposure system controller to 360 seconds.
4. Expose trace side substrate for 360 seconds.

5. Remove substrate and store in cabinet on top of a lint free wipe labeled exposed
6. Repeat steps 1-7 until all substrates are exposed.

1.4.4.6 Develop photo resist

1. Place substrate in photo resist developer using rubber-tipped forceps and agitate for 120 seconds. Agitate by repeated dunking of the substrate into the liquid holding the substrate from one end.
2. Remove using forceps and rinse in dump rinser for 1 cycle.
3. Store on bench on lint free wipe.
4. Repeat steps 1-3 until all parts from run are complete. The development steps can be done in parallel with exposure steps to save time.

1.4.4.7 Electroplating Process

1. Using Kapton tape secure the parts onto a separate 4 inch x 5 inch perforated, non-plated circuit board. All edges should be fixed securely. Make a peel tab for easy removal.
2. Carefully transport parts to Peninsula Coating Services for a soft gold plating of 2.5 to 3.5 microns (a total charge of .1 amp - minute per part).

1.4.4.8 Remove Photoresist

1. Soak in used acetone for approx. 10 seconds
2. Rinse both sides of each substrate with acetone for approximately 30 s on each side while holding substrate with metal forceps from one edge.
3. Place rinsed part on lint free wipe on top of large beaker in sink and blow dry with dry nitrogen on gold side. Store in clean cabinet until next step.

1.4.4.9 Patterning Circuit (Mask # SU0022FG) - Dip coat

1. Mount 2 substrates to dip coat fixtures.
2. Hang on the dip coater.
3. Set dip coater to 3.5 on the front dial.
4. Dip-coat substrates.
5. Store coated substrate upside down in cabinet, on dip fixture after removing hanging bolt.
6. Repeat 1 - 4 until desired number of substrates are coated (maximum of 8 substrates can be coated for each run because there are 4 fixtures. Each fixture hold 2 substrates

1.4.4.10 Bake substrates

1. Place substrates in oven and bake substrates @ 90 deg C, for 5 minutes. The substrate remains on the dipping fixture and are placed upside down on the floor of the oven.
2. Remove from oven and let cool for 5 minutes
3. Store substrate in dip fixtures until they are place in the exposure frame in the next step.

1.4.4.11 Expose substrates

1. Remove one substrates from dip fixture by pulling substrates using gloved hand by pulling on the bottom edge with thumb and index finger.
2. Place one coated substrate on UV light source. The Au surface must be facing up. Center the substrate to the mask. Place the trace mask on substrate and align to gold plated alignment targets.
3. Set timer on UV exposure system controller to 360 seconds.
4. Expose trace side substrate for 360 seconds.
5. Remove substrate and store in cabinet on top of a lint free wipe labeled exposed
6. Repeat steps 1-7 until all substrates are exposed.

1.4.4.12 Develop photo resist

1. Place substrate in photo resist developer using rubber-tipped forceps and agitate for 120 seconds. Agitate by repeated dunking of the substrate into the liquid holding the substrate from one end.
2. Remove using forceps and rinse in dump rinser for 1 cycle. Blow dry with N2 on gold side only.
3. Store on bench on numbered lint free wipe.
4. Repeat steps 1-3 until all parts from run are complete. The development steps can be done in parallel with exposure steps to save time.

1.4.4.13 Gold chemical etch

1. Place a substrate using rubber tipped forceps in the gold etch solution and agitate for 4 minutes. Agitate by repeated dunking of the substrate into the liquid holding the substrate from one end. Turn part over and etch for 4 min. with agitation.
2. Rinse in dump rinser for 1 cycle. Blow dry with N2 on gold side only.
3. Store on bench on numbered lint free wipes.
4. Repeat steps 1-3 until all parts are complete.

1.4.4.14 Chromium wet chemical etch

1. Place a substrate using rubber tipped forceps in the Chrome etch solution (Cr 7) and agitate for 30 secs. Agitate by repeated dunking of the substrate into the liquid holding the substrate from one end.
2. Rinse in dump rinser for 1 cycle. Blow dry with N2 on gold side only.
3. Store on bench on numbered lint free wipes.
4. Repeat steps 1-3 until all parts are complete.

1.4.4.15 Remove Photo Resist.

1. Rinse both sides of each substrate with acetone for approximately 30 s on each side while holding substrate with metal forceps from one edge.
2. Place rinsed part on lint free wipe on top of large beaker in sink and blow dry with dry nitrogen on both sides.

1.4.4.16 Copper chemical etch

1. Heat Ferric Chloride to 55 C in large watch glass.

2. Place a substrate using rubber tipped forceps in the ferric chloride solution and agitate for 4 minutes. Agitate by repeated dunking of the substrate into the liquid holding the substrate from one end.
3. Rinse in dump rinser for 1 cycle.
4. Store on bench on lint free wipe.
5. Repeat steps 1-4 until all parts from run are complete.
6. If parts are to be processed another day, dehydrate parts by placing on a foil substrate and baking for 5 minutes at 90 C and then let cool.

1.4.4.17 Trim Substrates

1. Trim Substrates using scissors along large 3.5"OD outline. Some of the outline may not be present. It is OK to have some flats on the circle.
2. Store in plastic box until ready for the next step.

1.4.4.18 Pyralin Over coat process.

1.4.4.18.1 Scope

This process covers most of the conductors on the trace side with a 5-7 micron coating of Pyralin. The Pyralin is processed in such a way to provide openings where the electrical connection will be made.

1.4.4.18.2 Pyralin Coating.

1. Dehydrate bake the parts by placing on a foil substrate and baking for 5 minutes at 90 C. Then let cool.
2. Place the substrate on the vacuum chuck. Center the part and apply vacuum. Use inner ring to center parts.
3. Puddle acetone on substrate and gently wipe with lint free swab in one direction.
4. Start the substrate spinning @ 1200 rpm and rinse with acetone for 5 seconds.
5. Continue spinning for 85 seconds to allow the substrate to dry.
6. Puddle ~10 ml of Pyralin in the center of the substrate. Cover the entire trace image.
7. Start the spinner with a slow acceleration and spin at 1300 rpm for 90 seconds.
8. Remove substrate from spinner with metal forceps after releasing the vacuum. Place on Al foil tray in clean cabinet.
9. Repeat steps 1 - 7 until all substrates are coated.

1.4.4.18.3 Soft Bake Pyralin

1. Bake in HEPA oven for 60 minutes @ 55 C.
2. Remove substrate and let cool. Place in plastic box until further processing is required.

1.4.4.18.4 Expose Pyralin

1. Place substrate on 4" glass slide and secure with small pieces of scotch tape 3 layers thick.
2. Place chrome Pyralin mask, chrome side down on substrates and align substrate by sliding the mask until the lower left corner is aligned with the moiré pattern.
3. Rotate the substrate until the upper right corner is aligned to the moiré pattern.
4. Inspect under stereo microscope and adjust alignment if require.

5. Expose in UV exposure system for 600 seconds.
6. Store in plastic box for further processing.
7. Repeat steps 1-7 for the remaining substrates.

1.4.4.18.5 Develop Pyralin

1. Half fill 4" petri dish with developer on wet bench.
2. Place substrate, face up in solution and agitate for 60 seconds.
3. Remove substrate from petri dish and rinse using squeeze bottle with Developer for 10 seconds. Rinse part over 2 liter beaker to collect developer. Follow Developer with a 50/50% solution of Developer/Rinse for 10 seconds.
4. Follow developer with Rinse from squeeze bottle for 30 seconds.
5. Place developed part on lint free wipe on top of large beaker in sink and blow dry with dry nitrogen on both sides.
6. Place in plastic box for further processing.
7. Repeat steps 2 - 6 for the remaining substrates.

1.4.4.18.6 Cure Pyralin

In this step the Pyralin coated substrates are cured on a hot plate or programmable oven in a clean room. The hotplate or oven is programmed to provide the necessary cure profile.

1.4.4.18.6.1 Verify the hot plate is programmed. Power on and step up through all the steps

1. Hit "edit" key. Display shows 00.
2. Hit "step up" key again, display 01.L8
3. Hit "step up" key again, display 300 (300C / hour ramp)
4. Hit "step up" key again, display 2.U1
5. Hit "step up" key again, display 150 (150 C is first target temp.)
6. Hit "step up" key again, display 3.U5 (hold)
7. Hit "step up" key again, display 30:00 (wait 30 minutes)
8. Hit "step up" key again, display 4.L8
9. Hit "step up" key again, display 120 (120C / min)
10. Hit "step up" key again, display 5.U1
11. Hit "step up" key again, display 275 (hold at 275 C)
12. Hit "step up" key again, display 6.U5
13. Hit "step up" key again, display 30:00 (hold 30 minutes)
14. Hit "step up" key again, display 7.9 (heater off)
15. Hit "edit" again to exit program editing mode.

1.4.4.18.6.2 Place up to four substrates on hotplate or oven for cure.

1. As each substrate is removed from it's box the wafer number (1 to 6) must be scratched underneath the SU is number.
2. The substrates are placed on the plate and held down with a clean, thin stainless steel ring. A nine inch diameter Aluminum pie pan covers the parts and is supported above the surface by three columns of 3 pennies.

3. Start program by hitting " Run-CLR button " on hot plate. The display should flash between the current temperature, approx 27 C, and the first target temperature of 150 C. The entire cycle including cooling to room temperature, takes about 3 hours.
4. Do not remove the substrates until they have cooled back to room temperature. Removing the parts, even warm will cause them to curl up.

1.4.4.18.6.3 Laser cutting of parts

1. A traveler is started for each substrate. Record the pyralin cure date and shipping date.
2. Each substrate is stored in a separate box and shipped to Potomac or CCT for laser cutting.
3. Laser cutting file SU002fg-ABCD.dxf (10/15/98)_____

1.4.4.18.6.4 Clean parts after laser cutting

1. Rinse parts with Acetone and then methanol.
2. Blow dry each side with N2.

1.4.4.18.6.5 Post laser cut plasma etch of isolators. Certified Personnel Matthew Bye and Michael Bukshpun

1. Vent vacuum chamber and open.
2. Place parts, trace side up, in chamber in 3" recesses on graphite platen and secure with stainless steel rings.
3. Close chamber and start pump down
4. Wait until pressure has gone below 20 milli-torr.
5. Start gas flow for O2.
6. Set pressure to 287 mTorr.
7. Set timer to 2.8 minutes
8. Set RF power to 115 watts
9. Turn on RF supply and tune for minimum reflected power.
10. Etch until timer times out. RF power will terminate automatically.
11. Turn off reactive ion etcher.

1.4.4.18.6.6 Clean boxes after plasma etching

1. Rinse plastic box with methanol.
2. Blow dry with N2.
3. Place individual parts in separate labeled plastic boxes (trace side up) and place each box in a separate polyethylene bag.

1.5 Certified Personnel for section 1: Matthew Bye

Completed:_____
Signature Date

Notes/Discrepancies (if any):

1.6 Inspection of Laser Cut Wafer for Residual Pyralin

Certified Personnel: Dale Gill, Michael Bukshpun

In this step the kapton wafer with four isolators still attached is inspected for any residual pyralin on the solder pads or fingers. A UV light source and microscope are used to detect the pyralin.

List of Equipment:

1) Zeiss Axioskop Microscope
2) UV lamp and fluorescence filter holder
3) Rhodamine filter set

Cleanroom procedures are used in the handling of these parts.

Record Results:

Each wafer will have attached a traveler showing the location of each of the four isolators on the wafer. Verify that the traveler # (SU0022FE....) corresponds to the wafer under inspection. The last digit of the traveler # is scratched on the wafer just under the date.

During the inspection process indicate on the traveler the location of any pyralin residue or other defects. **Sign and date** your observations on the traveler. Pyralin residue can be cleaned with an additional plasma etch.

Return the wafer to the box with the traces facing up so as not to scratch this surface. Place box in clean bag.

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

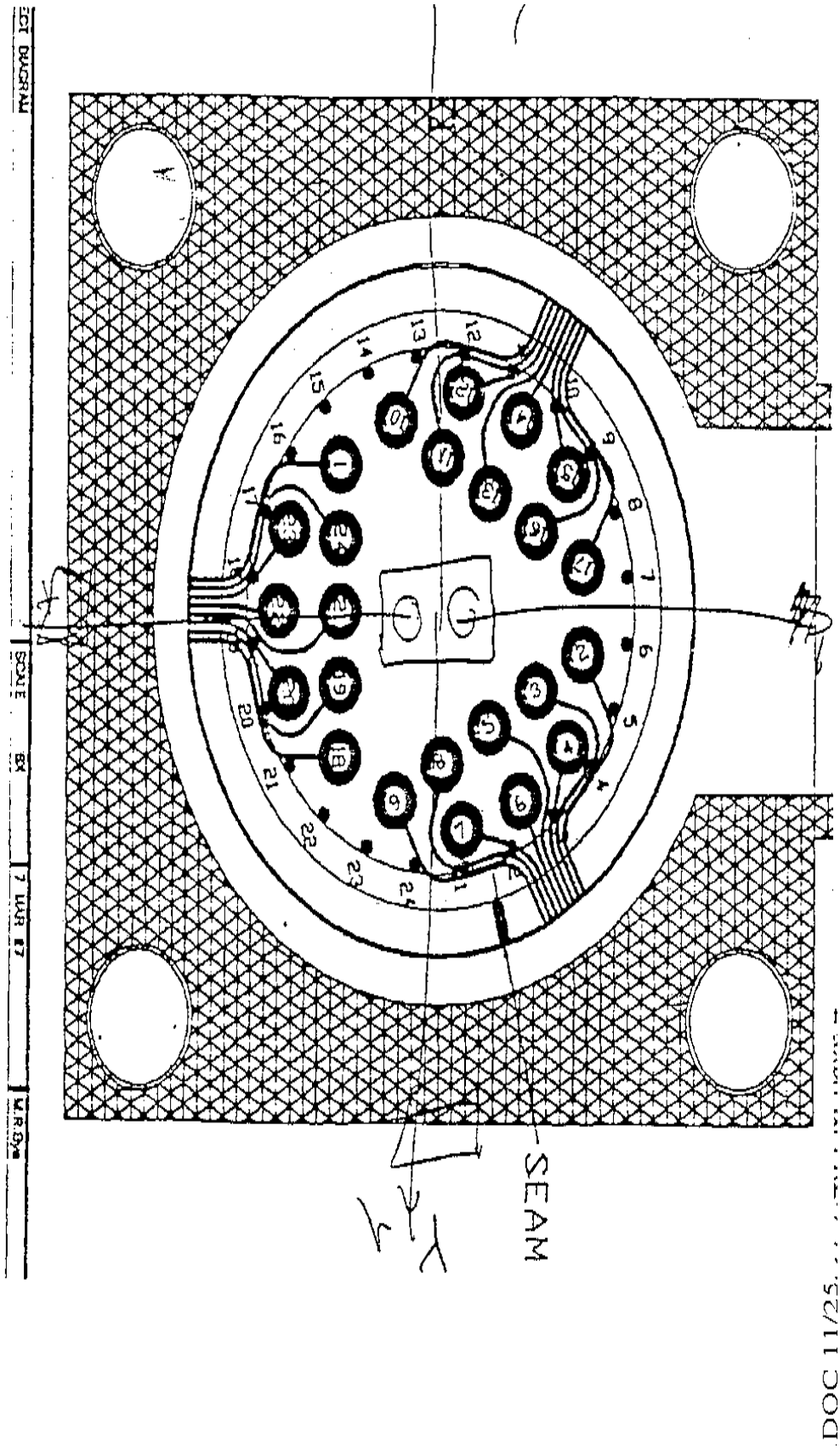
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

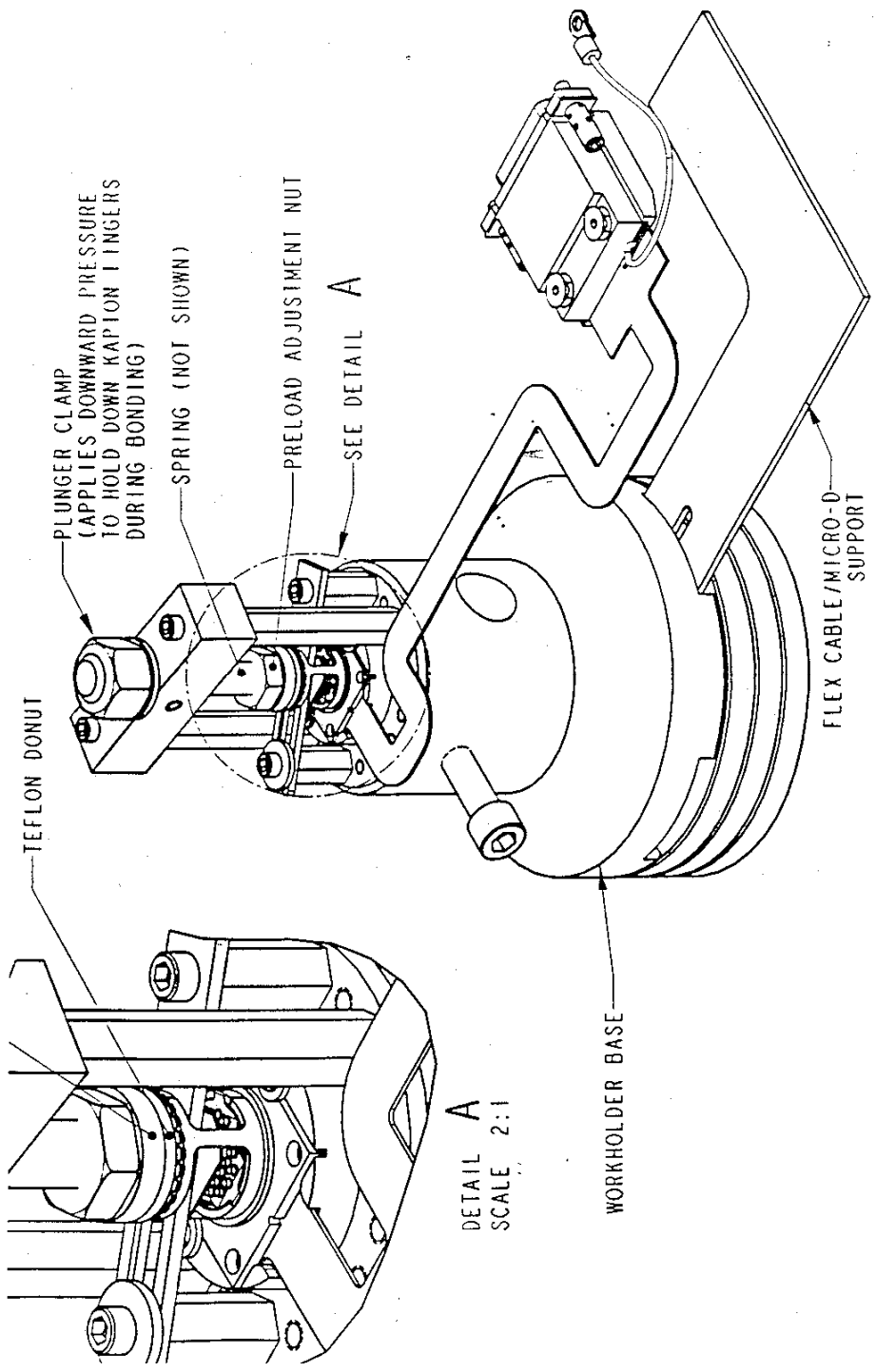
Visual Inspection - Step #1

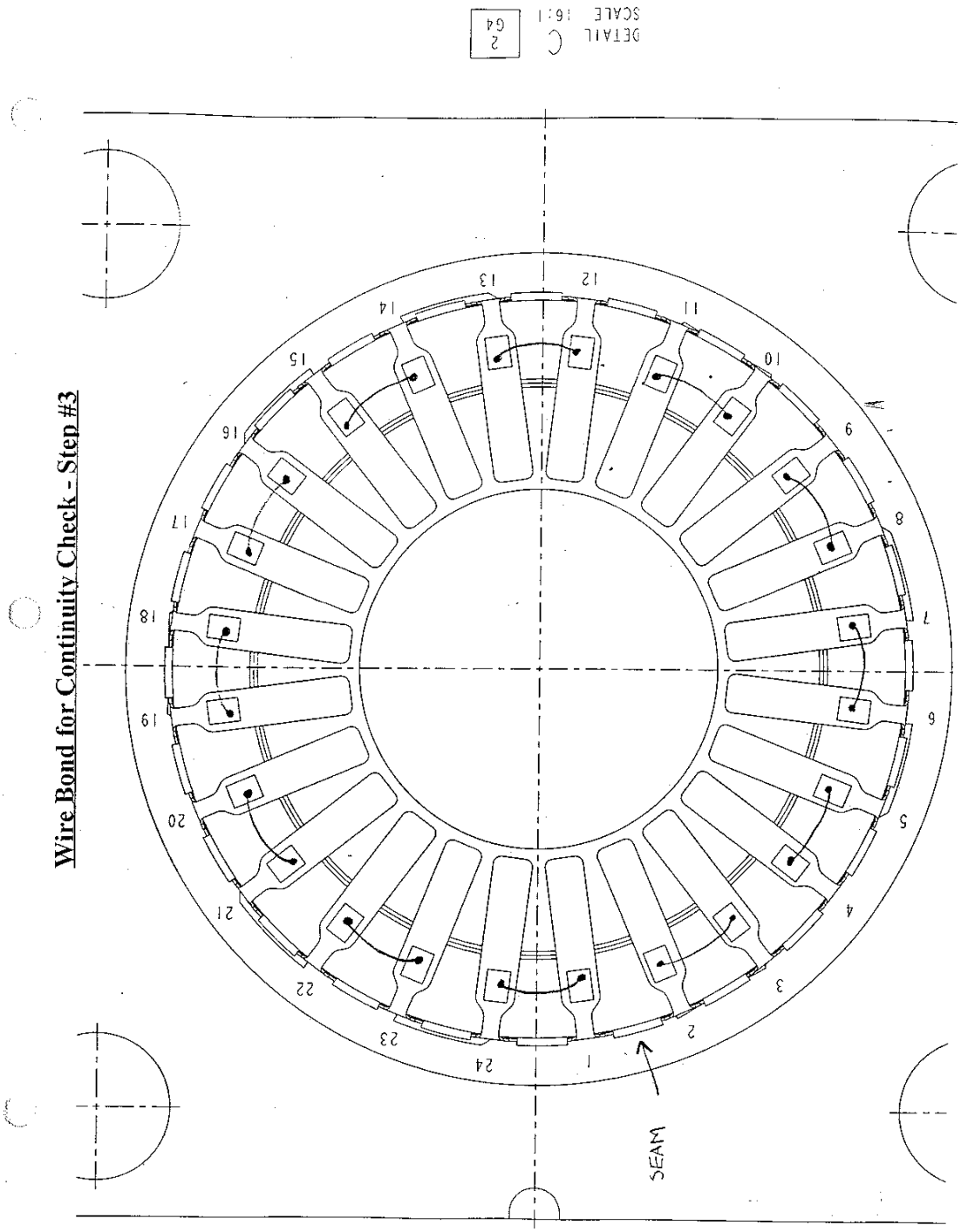
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

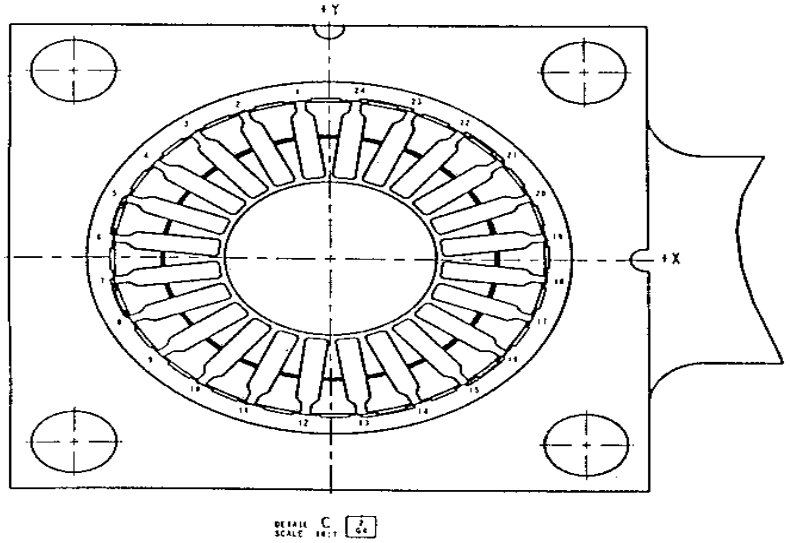
1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

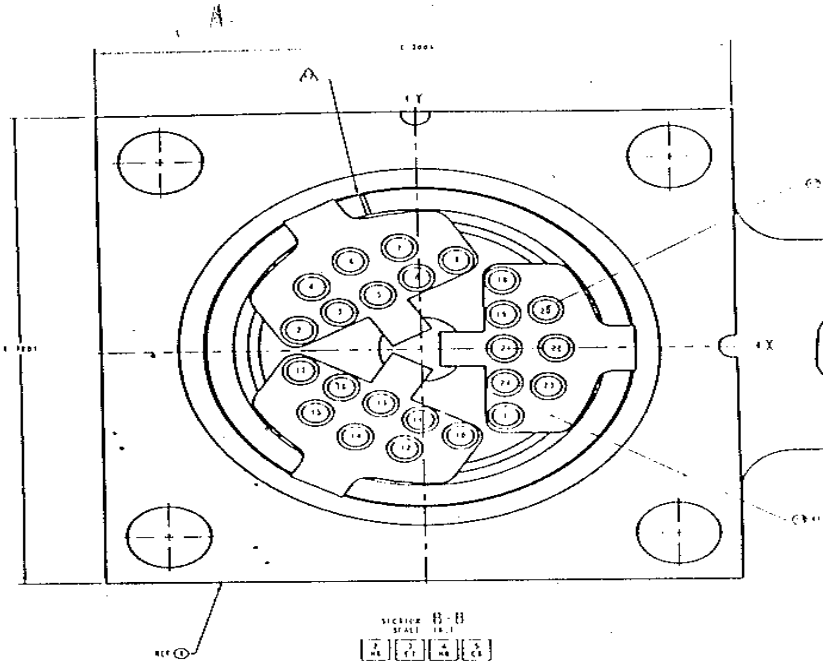


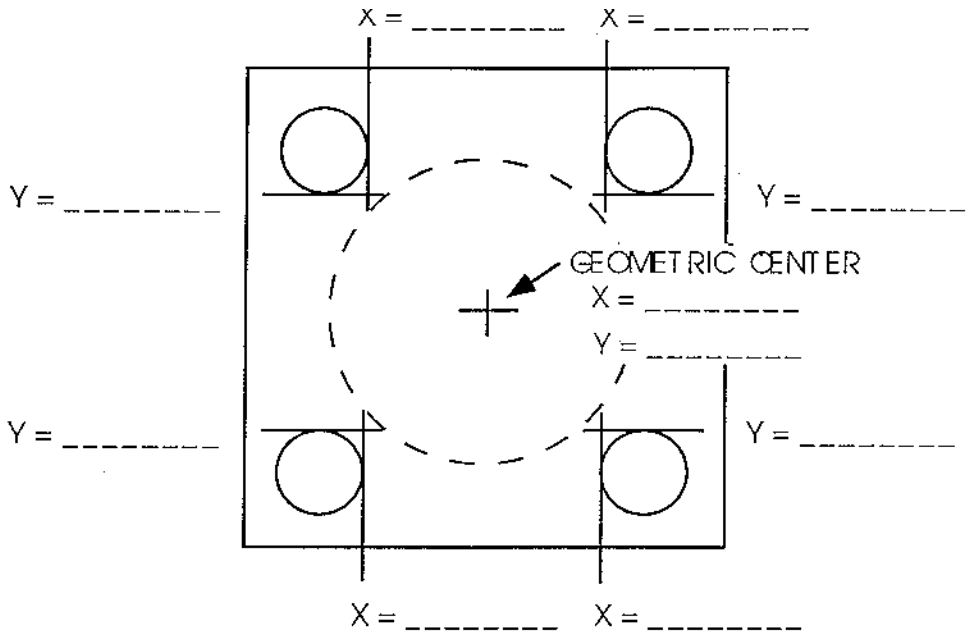

DETAIL C
SCALE 16:1
G4
2
Wire Bond for Continuity Check - Step #3
SEAM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Appendix

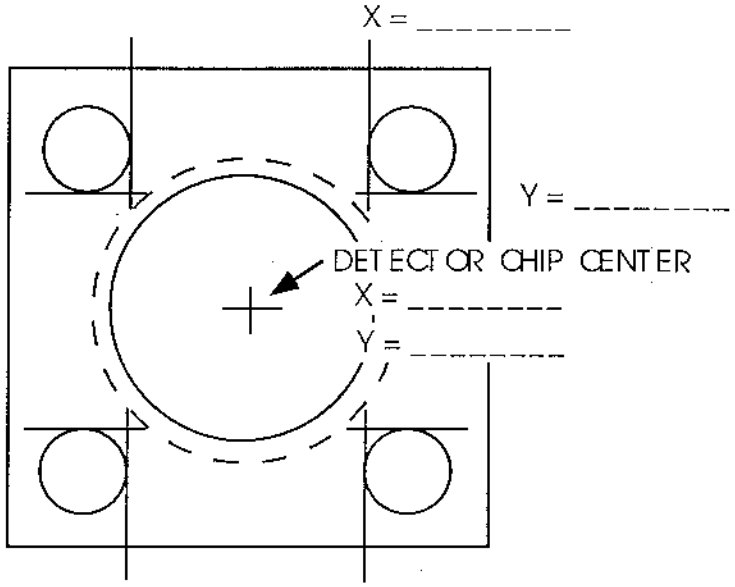
Pin Assignments





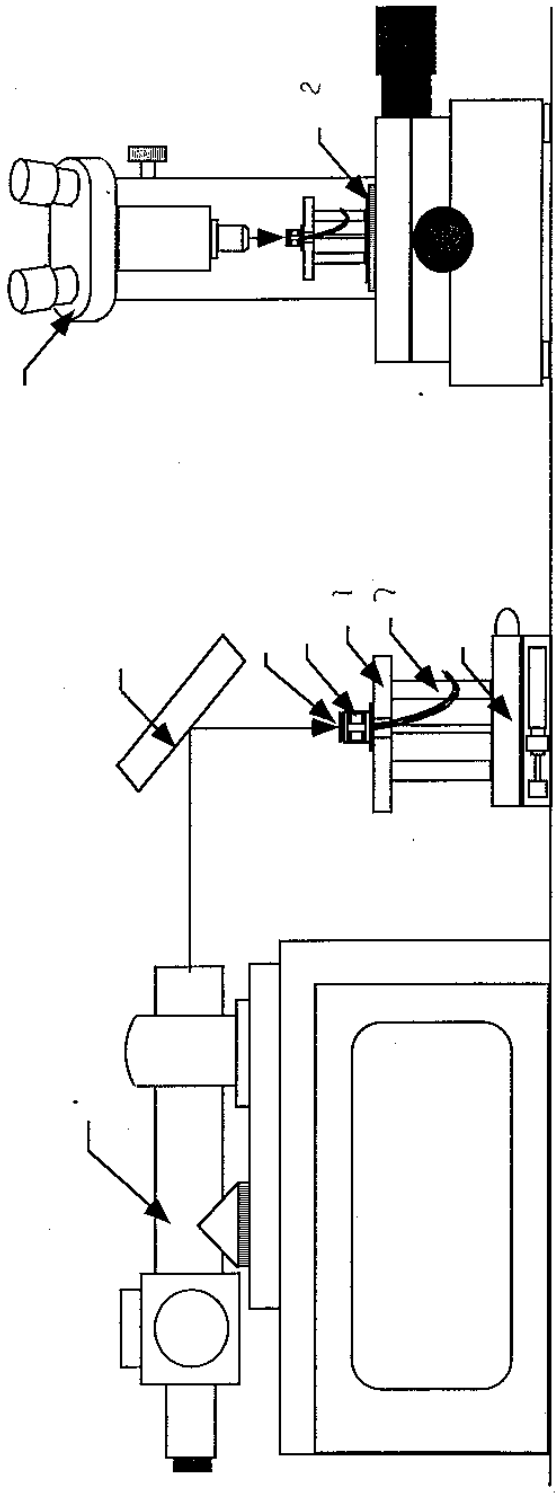


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



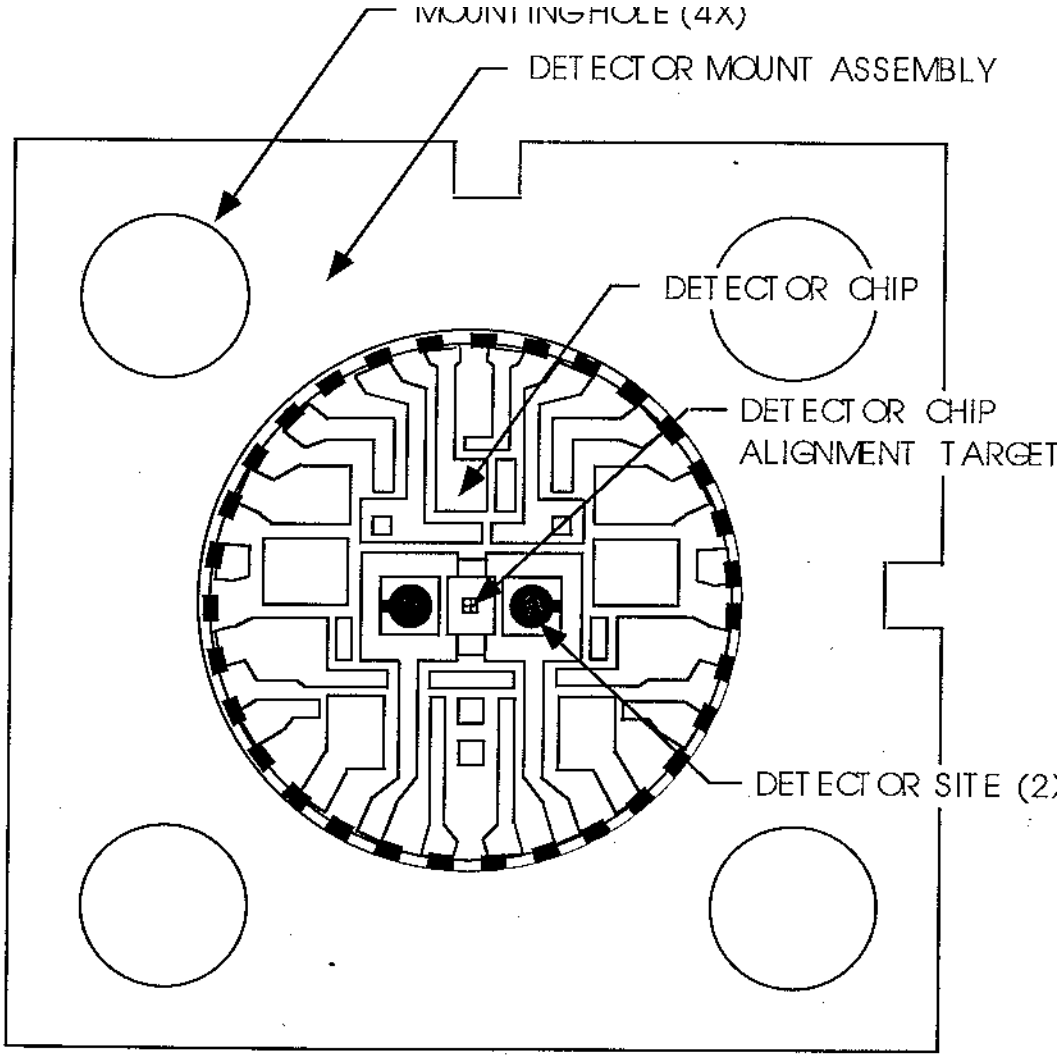


FIGURE 2 DETECTOR CHIP ORIENTATION

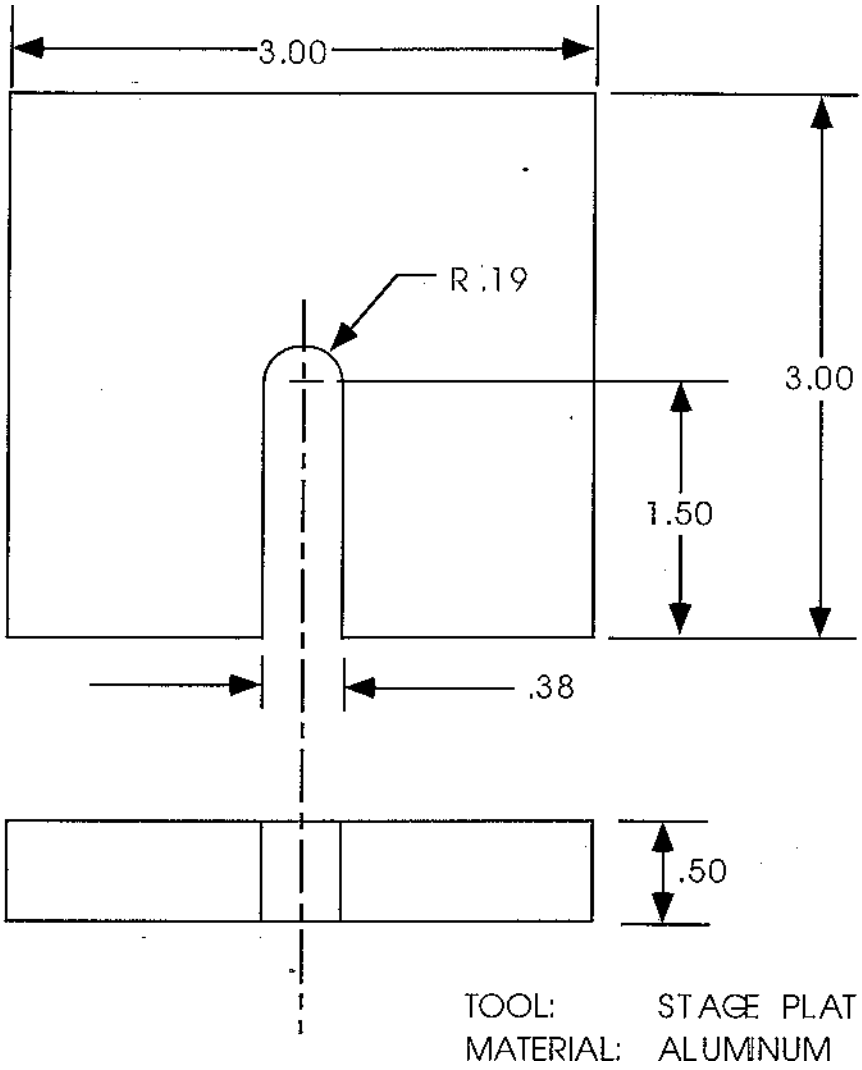
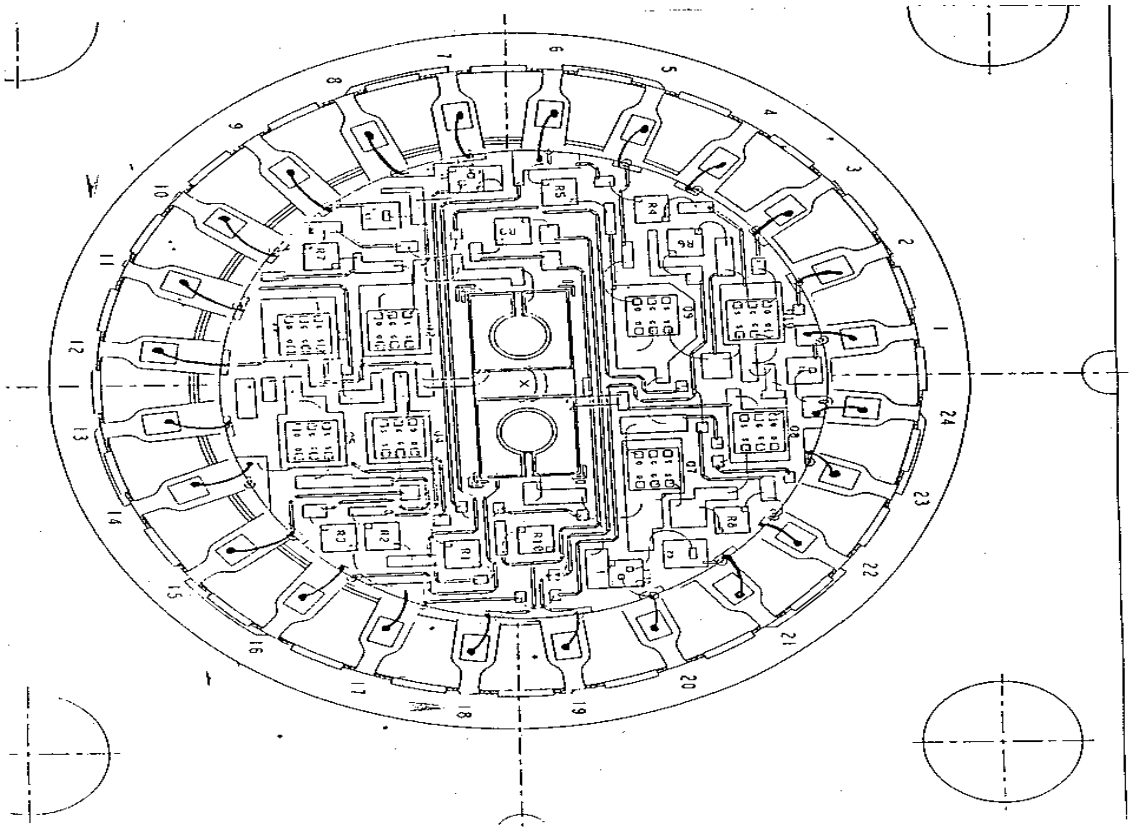
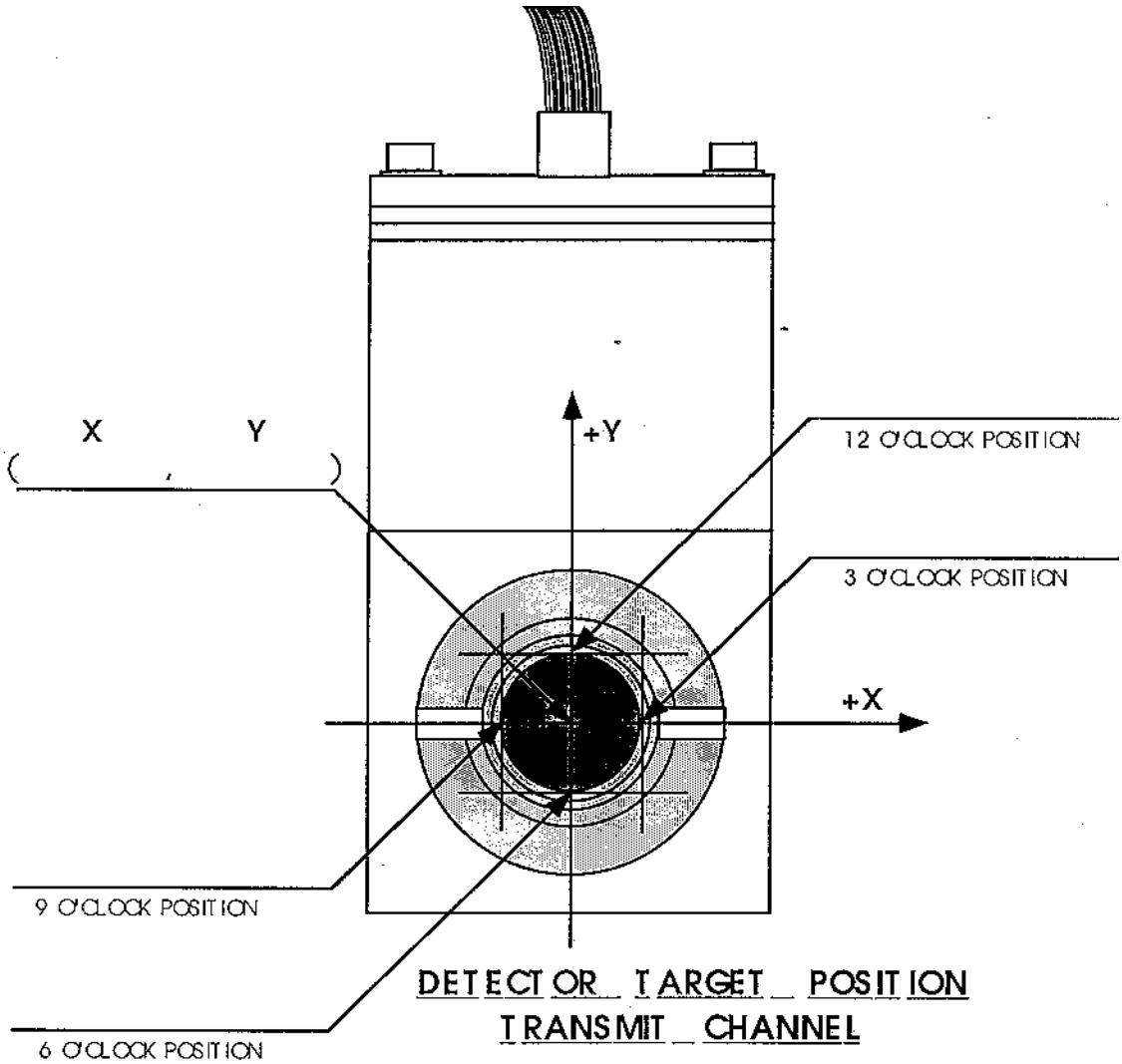


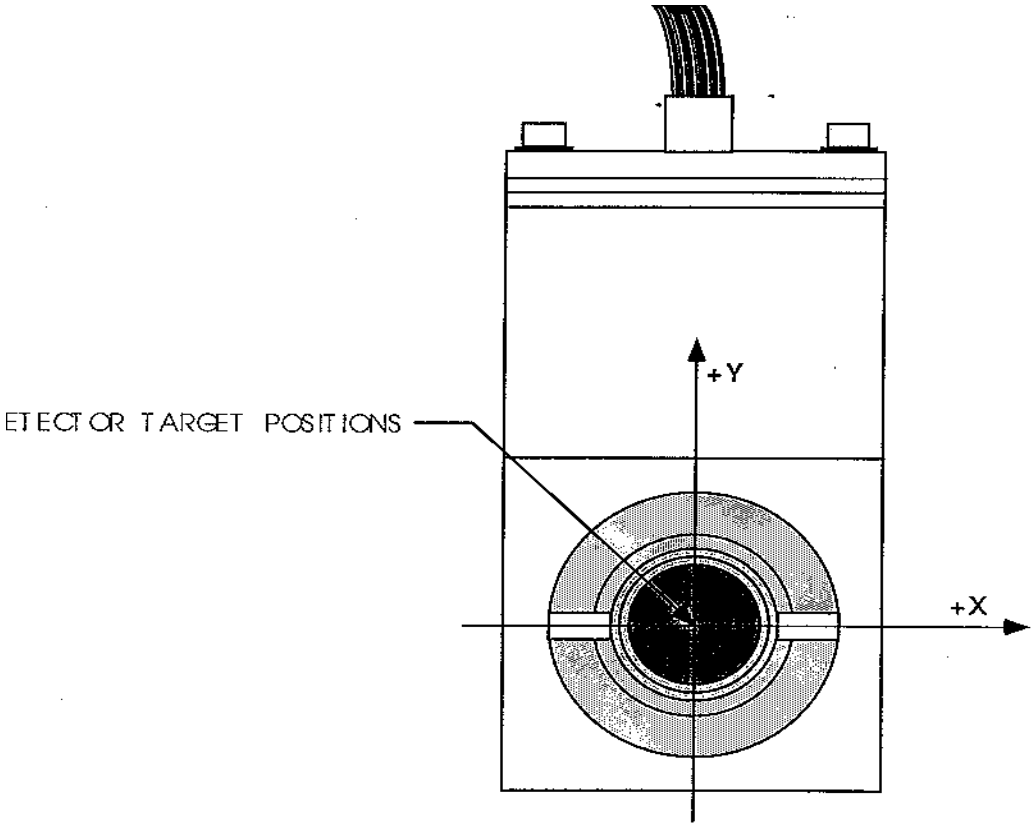
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





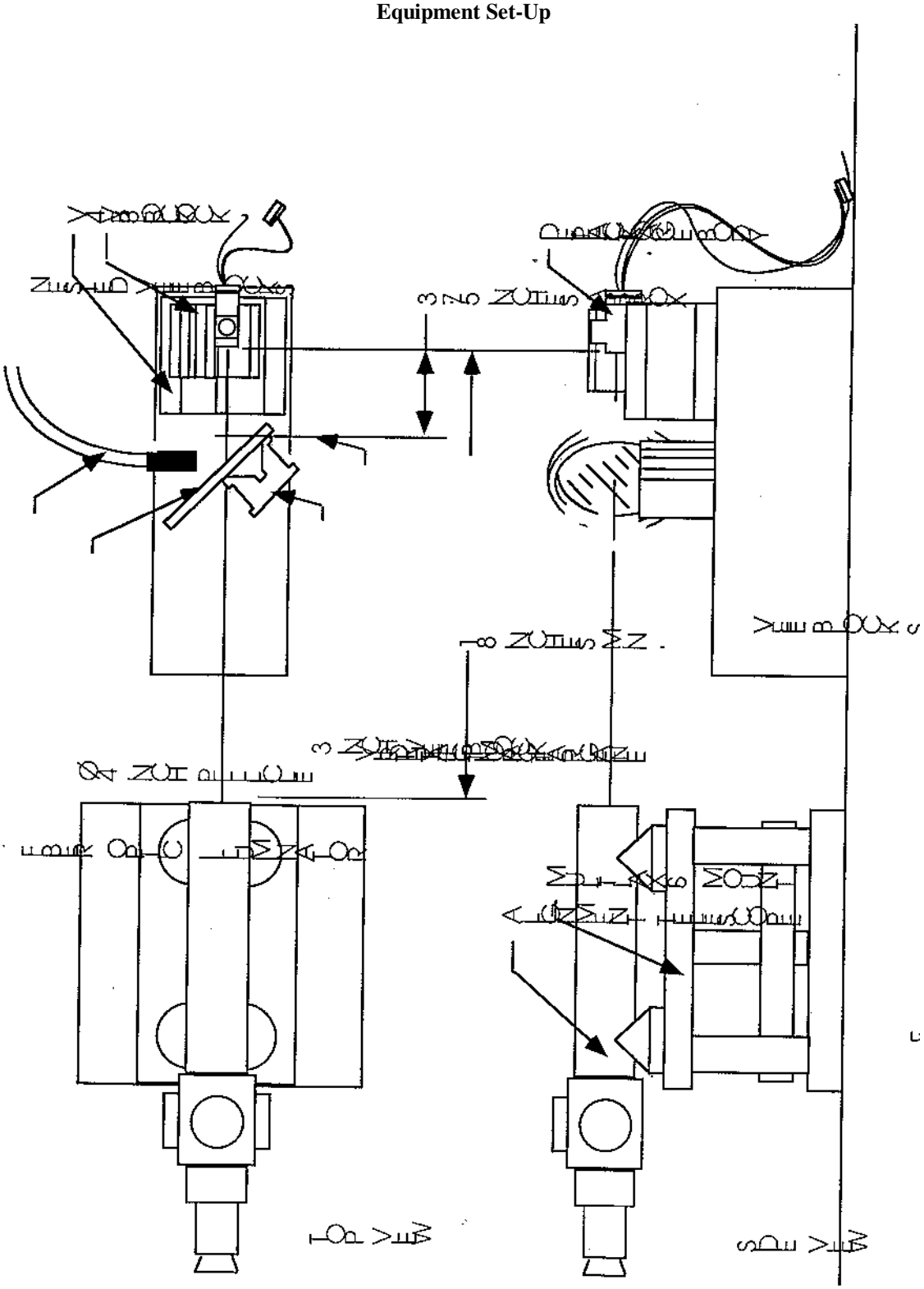
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



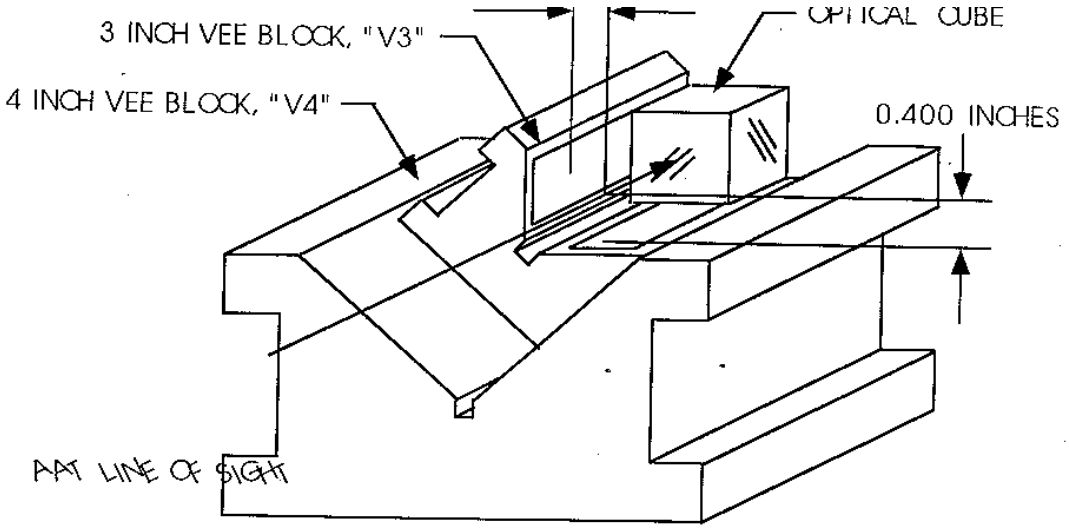


FIGURE 2A OPTICAL CUBE SET-UP

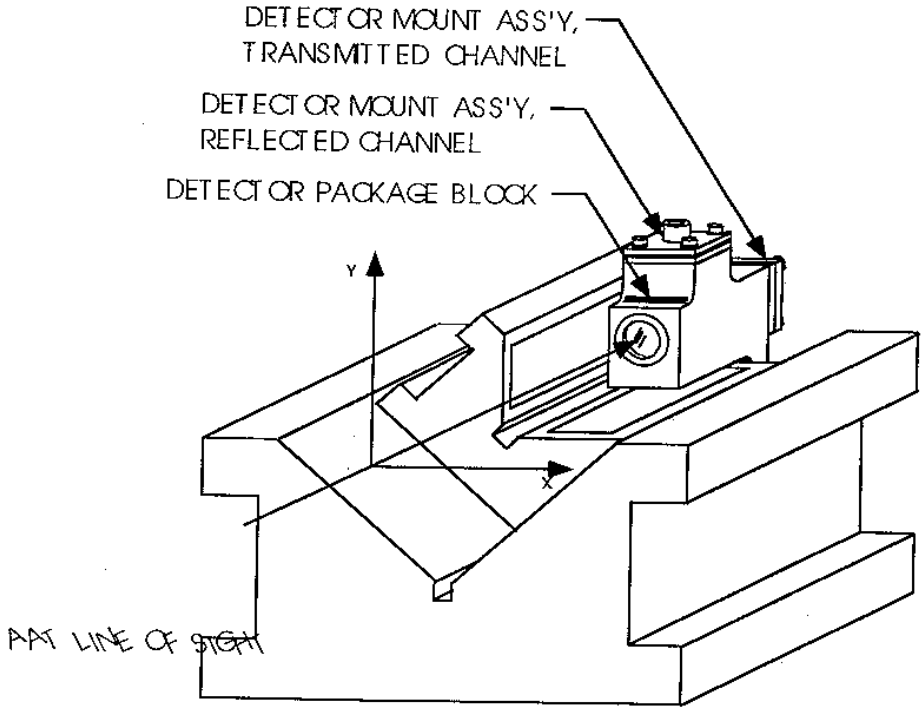


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.02 Rev. D

ECO 915

(Section 2 Visual Inspection of Isolator))

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 05

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 2

PDOC P0151 - Section 2
Visual Inspection of Thermal Isolator
To be performed by certified personnel only. Certified Personnel: Howard Demroff

In this step the thermal isolator is inspected after fabrication and laser cutting. They each carry the same serial number with an A,B,C,D designation for location on the wafer. The " A " isolator is at the top near the fingers, " B, C " are in the middle and " D " is at the bottom nearest the horizontal traces.

List of Test Equipment

Equipment	QA - Serial Number, Cal. date	Location
Multimeter	Lockheed Tool Bin with calibration sticker. **Record S/N _____ Cal. date _____**	Cedar B-13
Laminar Flow Bench	Class 100 Certification to be done	Cedar B13

Record Isolator Serial Number _____ Operator _____ Date/time _____

The left-most trace is number 2 - then 3 and 4 up to 24. Trace number 1 is the right-most trace.

Comments (appearance, scratches, uncovered traces)

Record results on traveler. Select flight isolators and label.

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

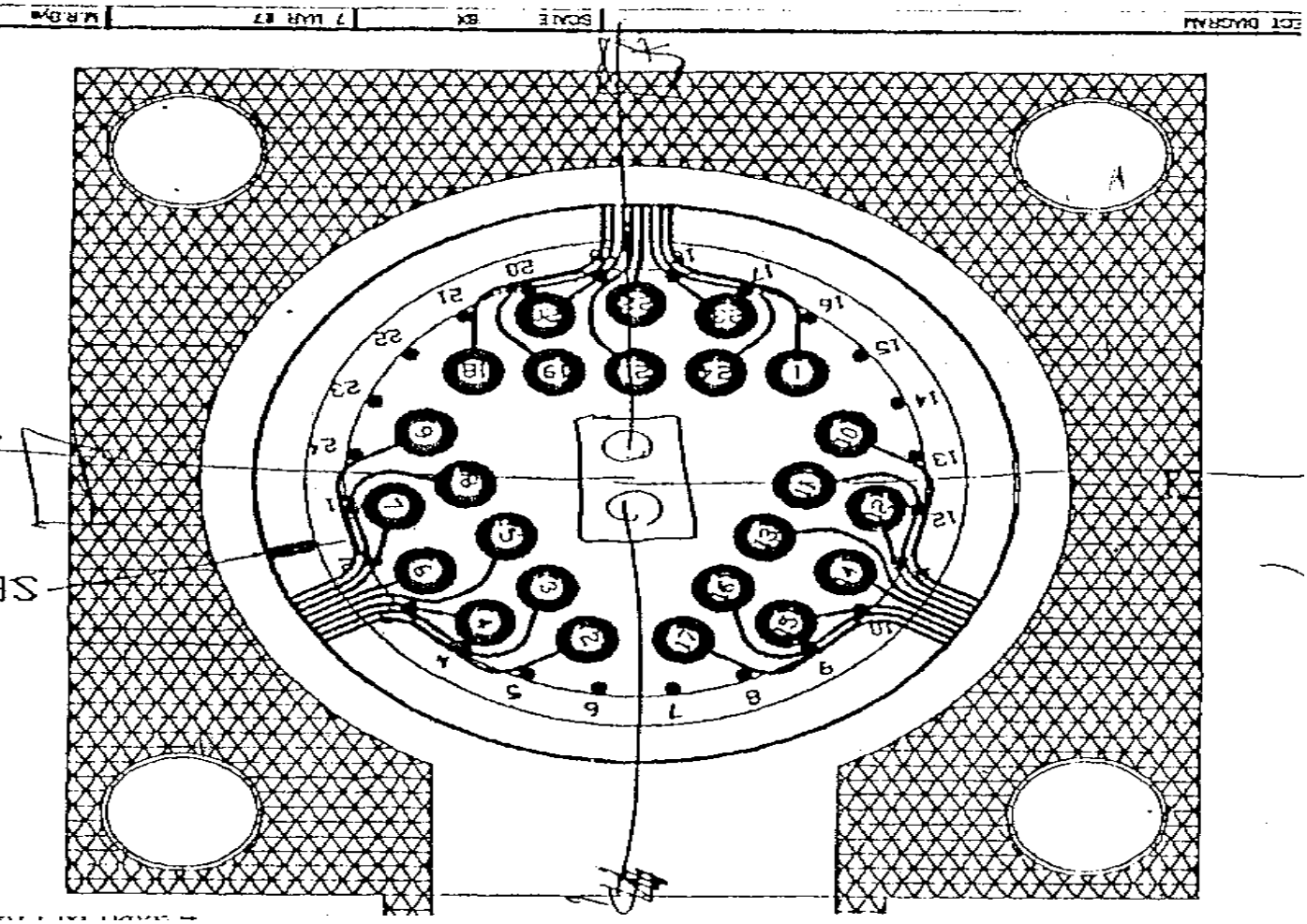
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

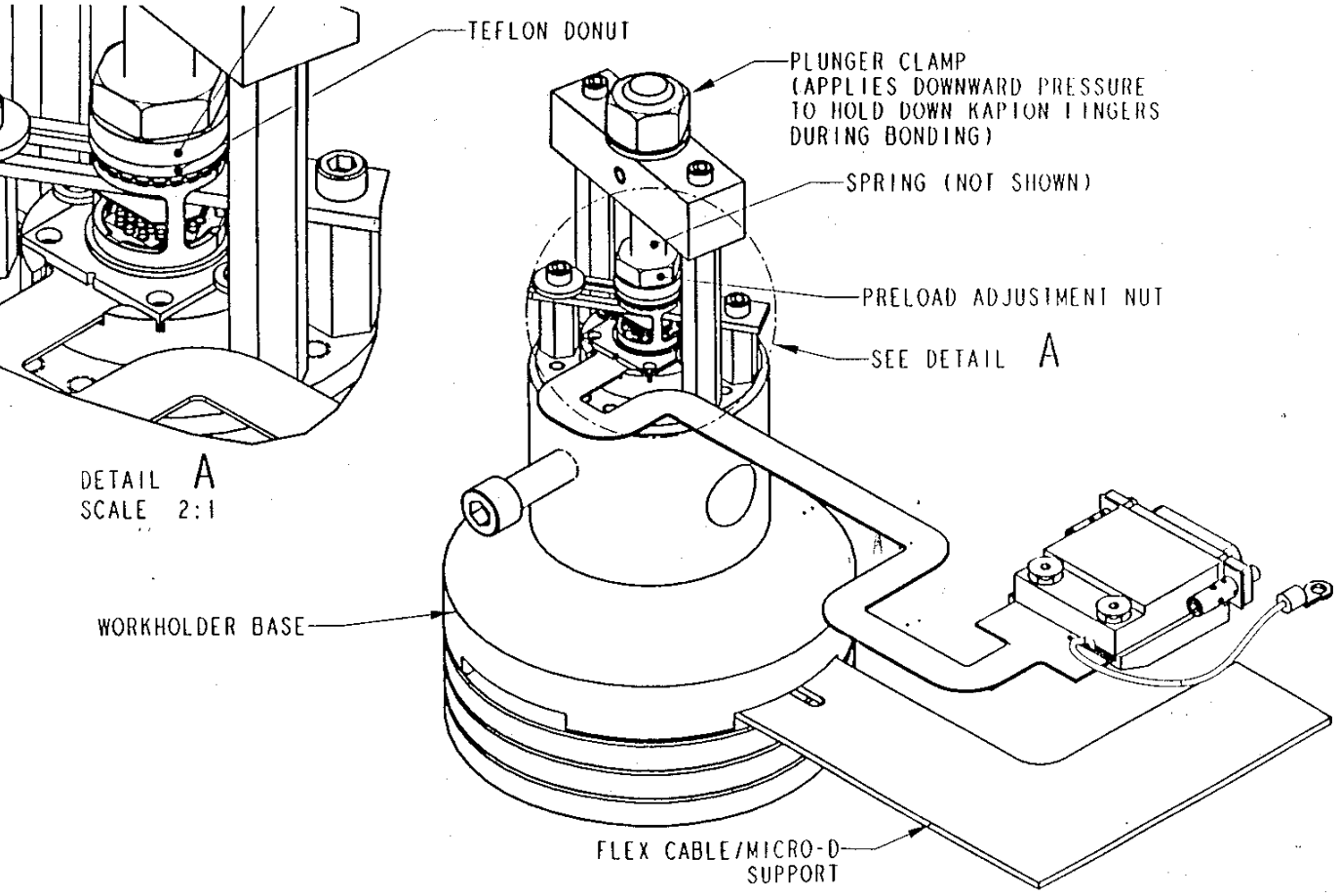
Visual Inspection - Step #1

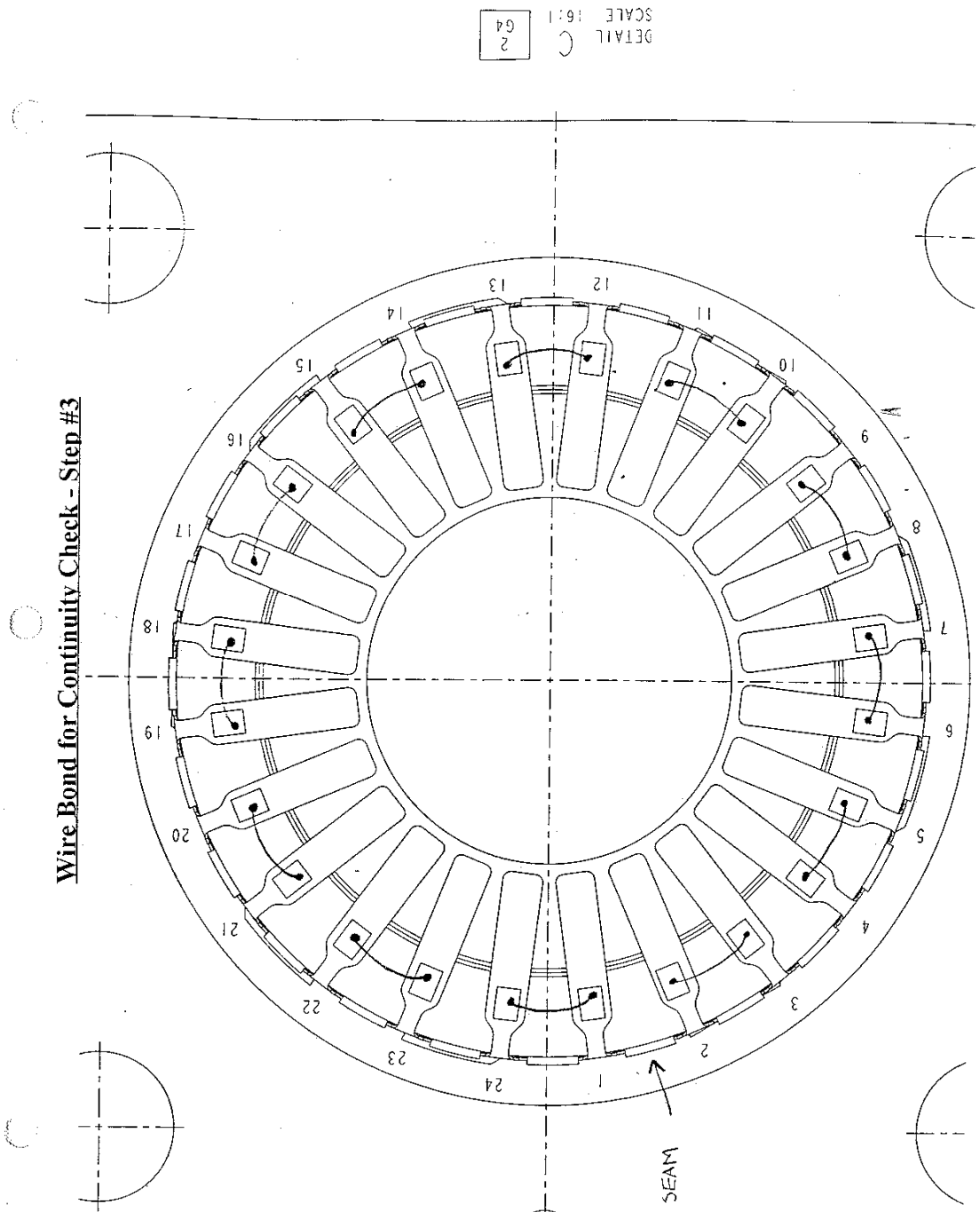
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

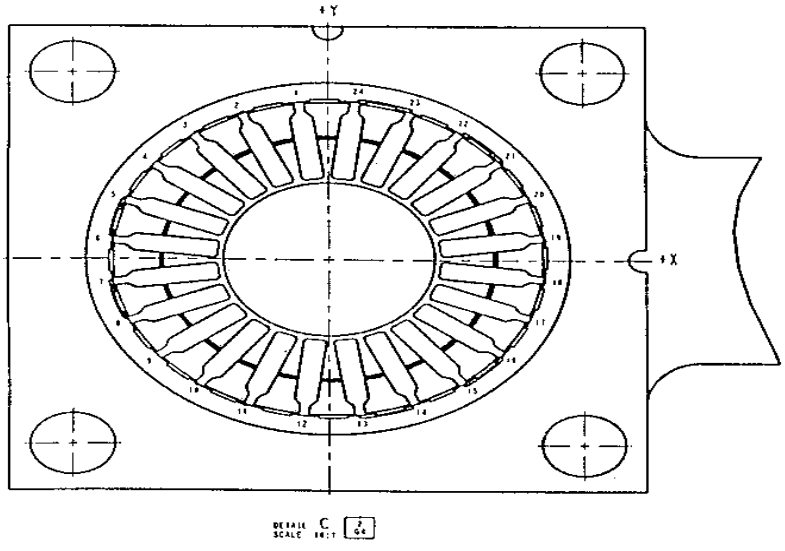
) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

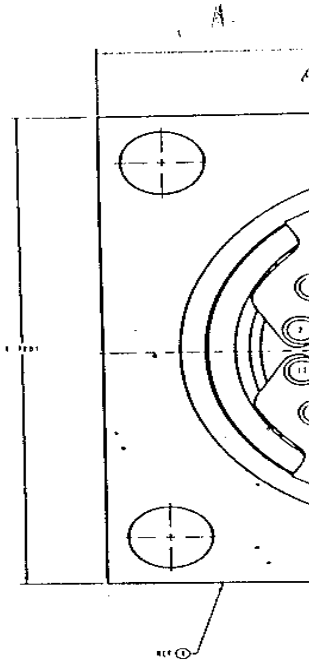


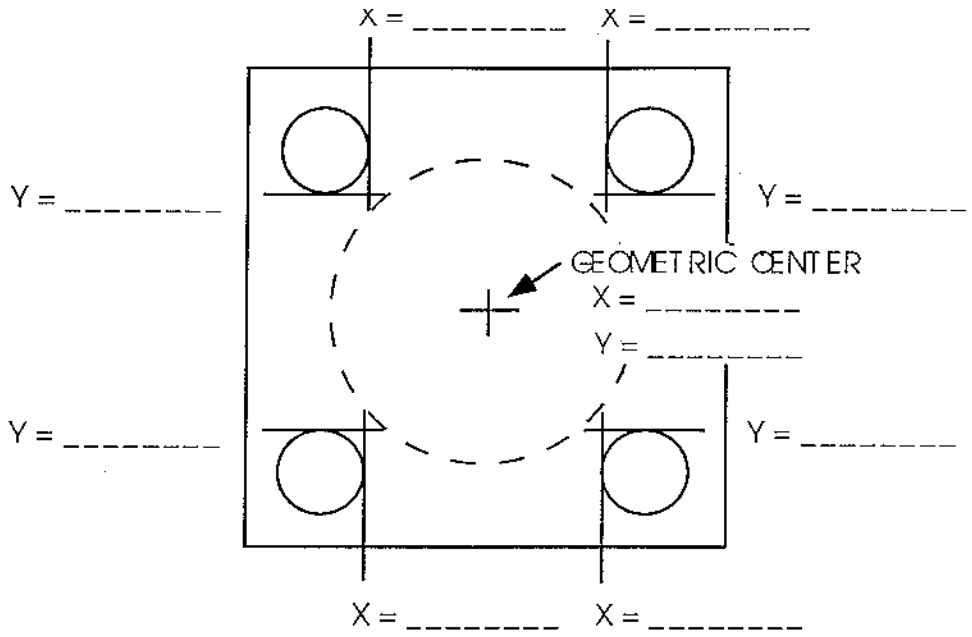

DETAIL C
SCALE 16:1
G4
2
Wire Bond for Continuity Check - Step #3
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
SEAM

Appendix

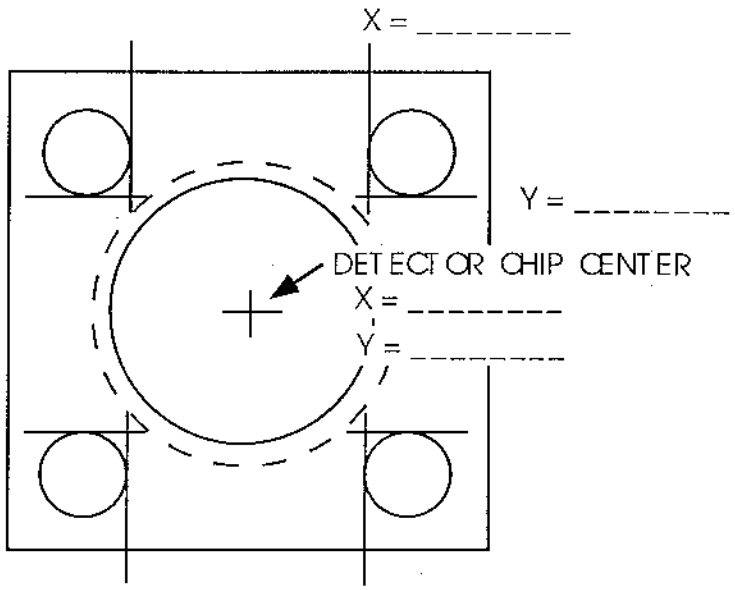
Pin Assignments



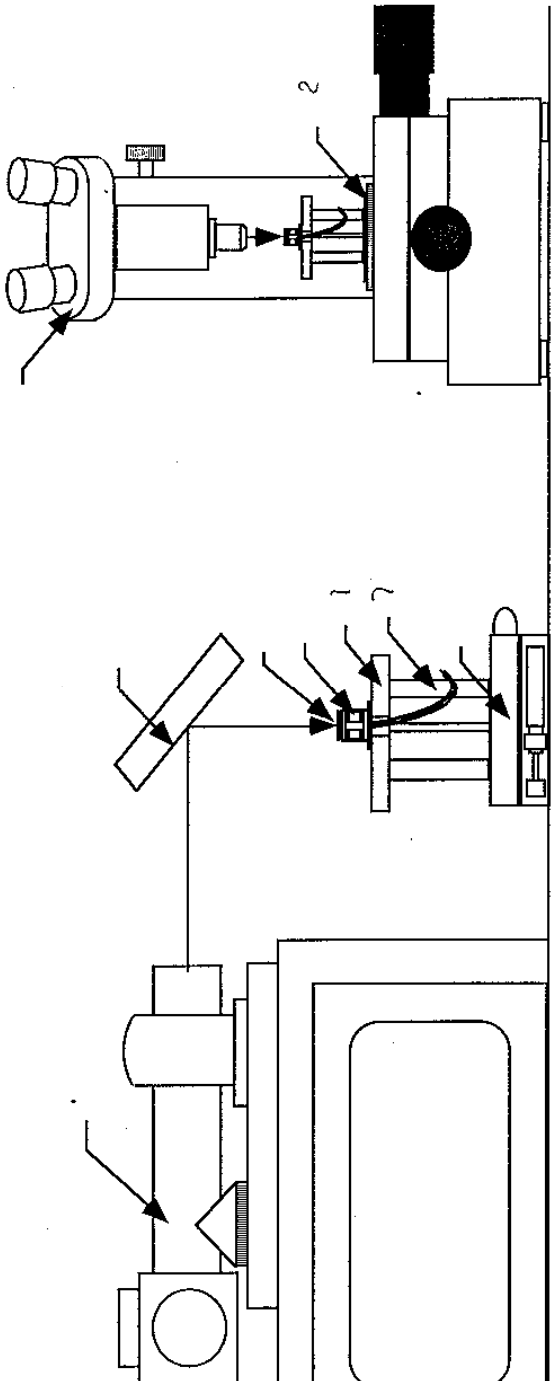




GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



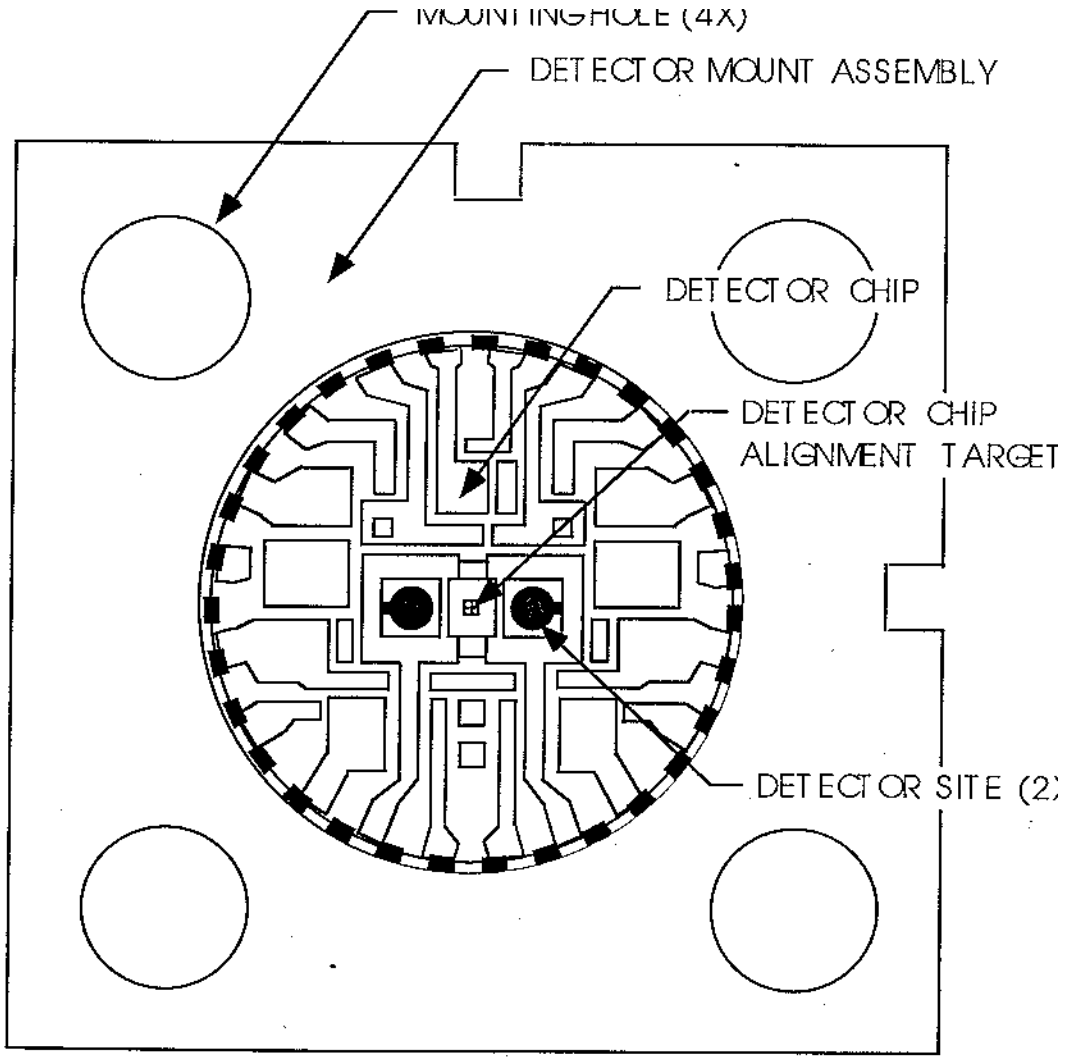


FIGURE 2 DETECTOR CHIP ORIENTATION

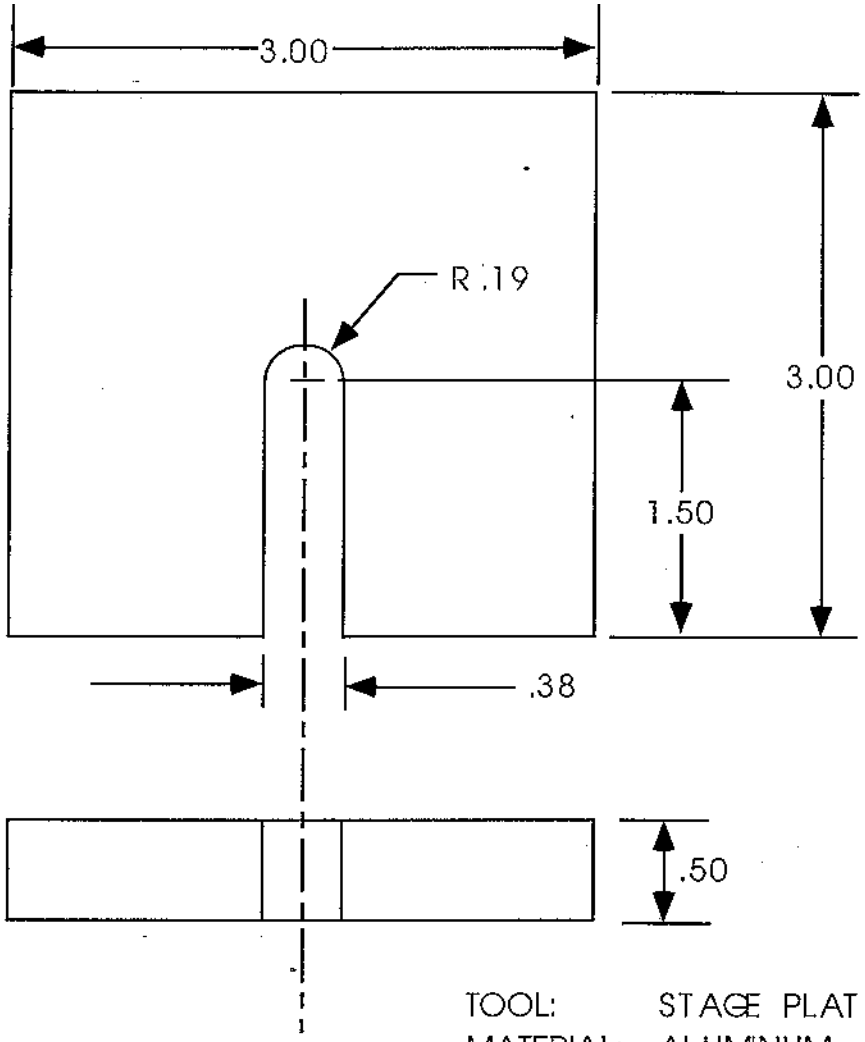
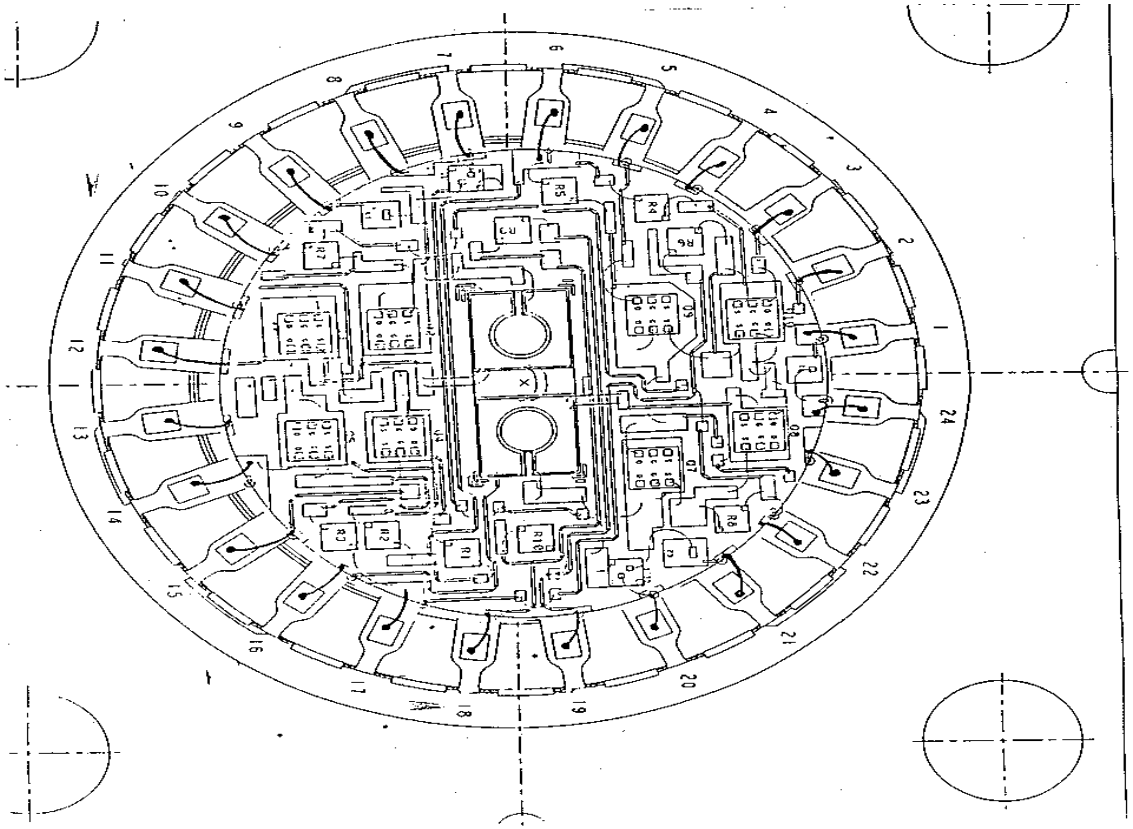
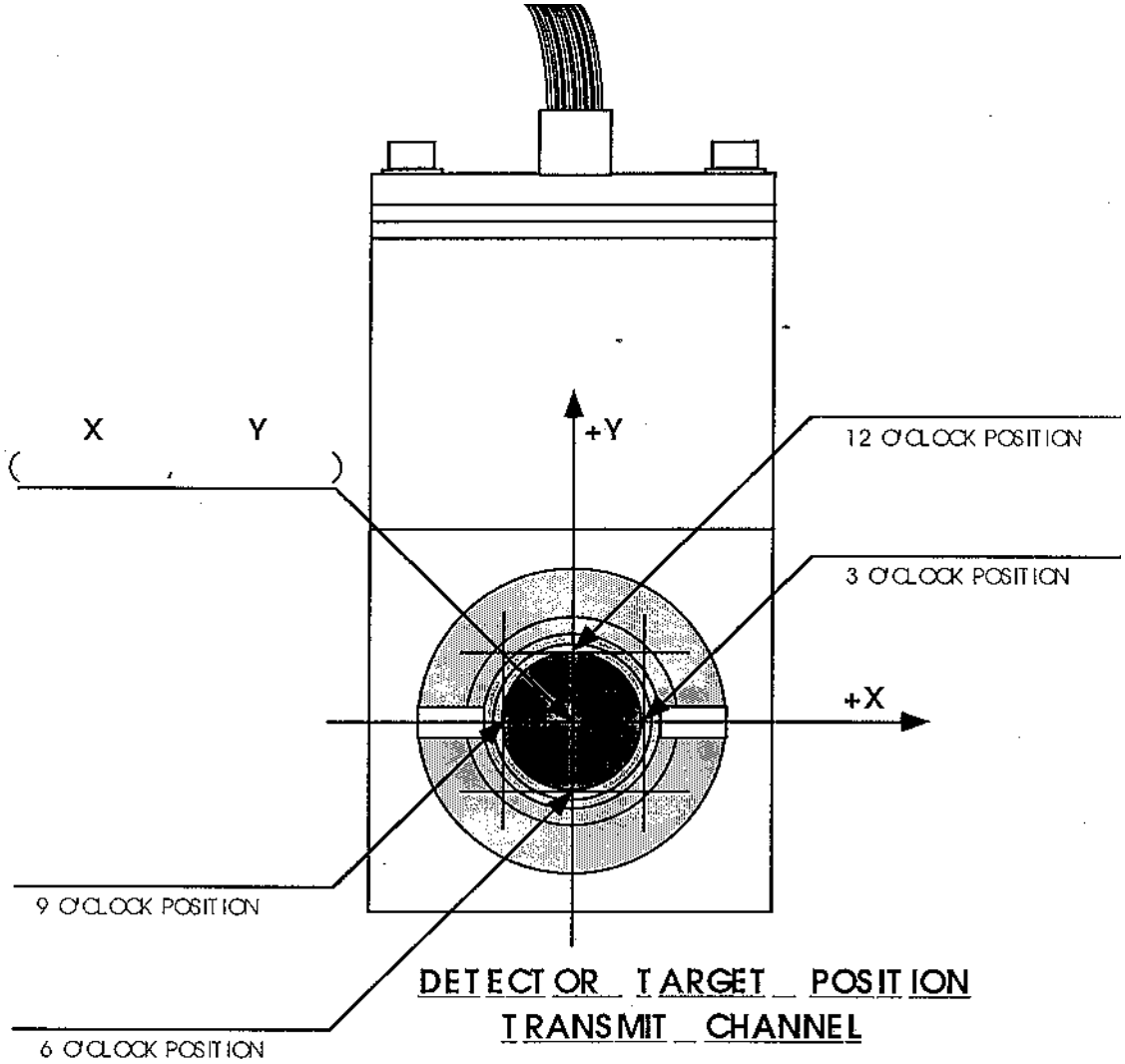

3.00
R .19
3.00
1.50
.38
.50
TOOL: STAGE PLAT
MATERIAL: ALUMINUM

Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4



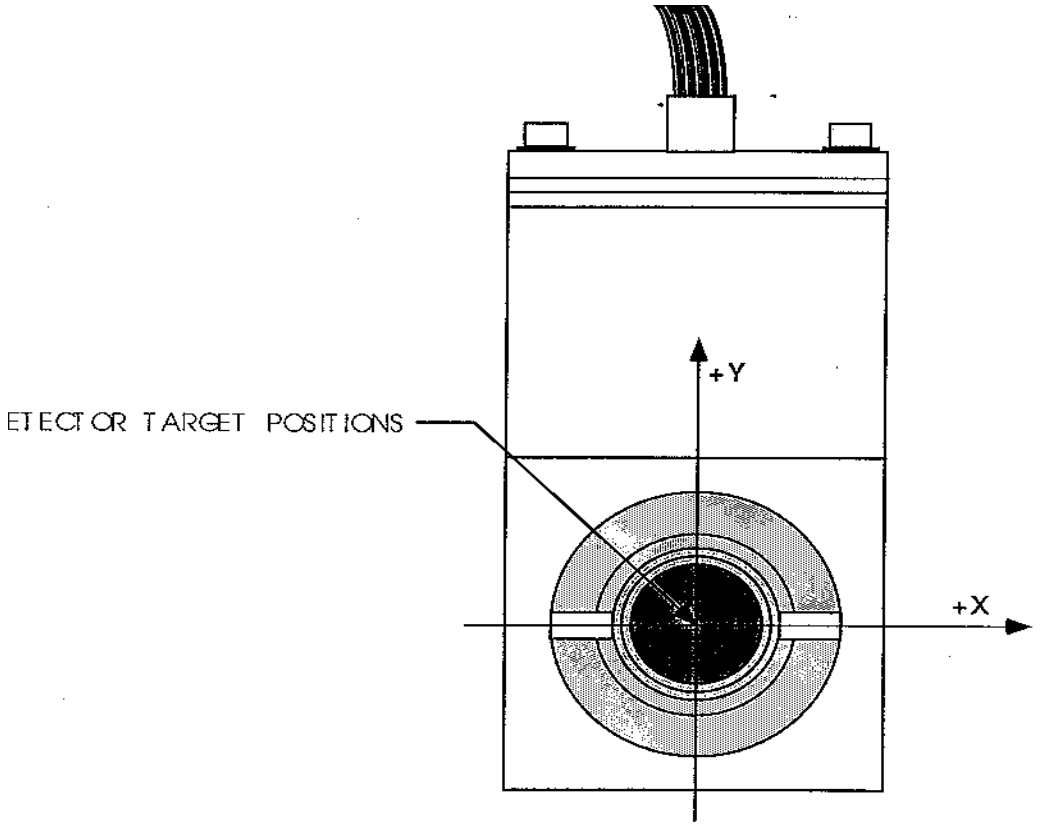


DETECTOR TARGET POSITION
TRANSMIT CHANNEL

X = _____

Y = _____

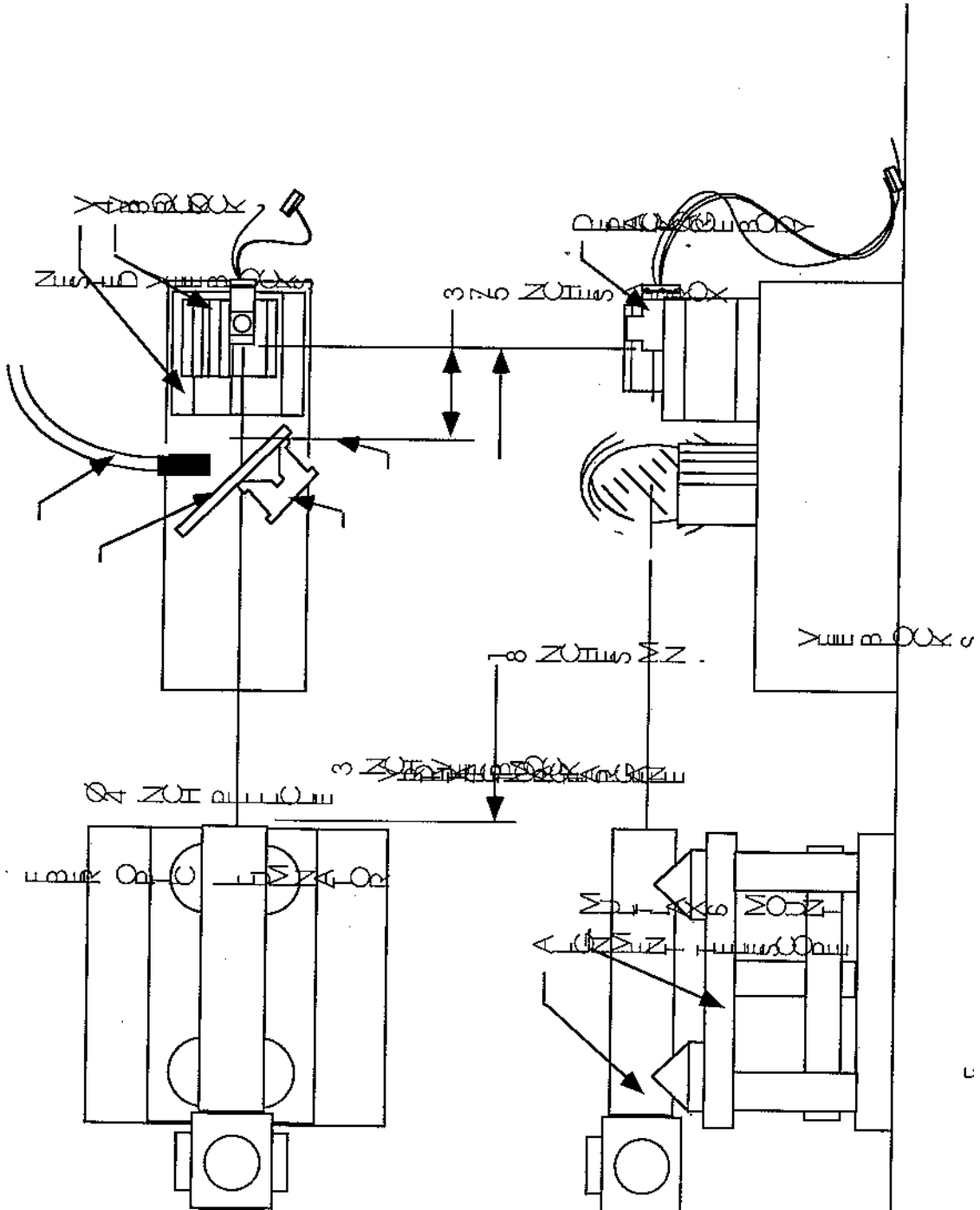
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



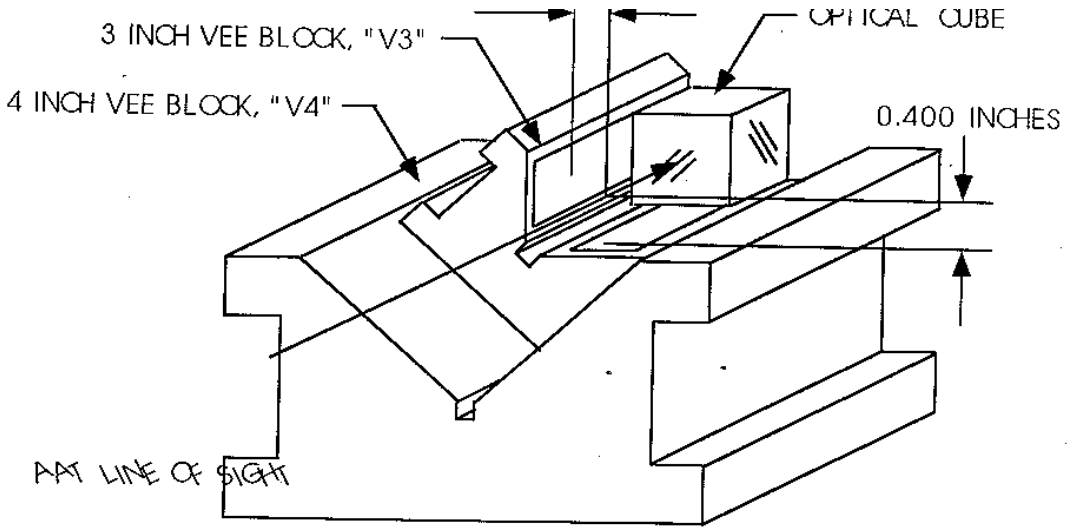


FIGURE 2A OPTICAL CUBE SET-UP

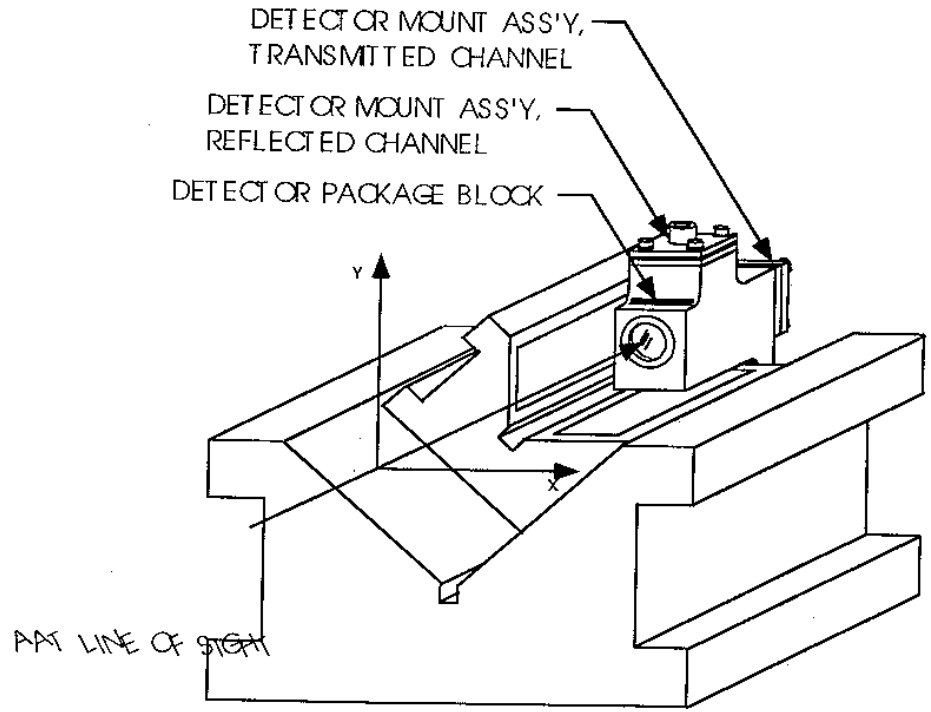


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

EC0915

GP-B P0151.03 Rev. D

(Section 3 Detector Cable/Connector Fabrication)

January 20, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 08

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

3. Detector Cable/Connector Fabrication

3.1 Document Revision Record

Rev	Date	ECO#	Pages Affected	Description
-	10-1-98	EC0 #891	section 3	Revise procedure

3.2 Authorized Personnel
B. Muhlfelder
B. Bogan
H. Demroff
P. Bayer

3.3 Authorized to Redline Procedure
B. Muhlfelder

3.3.1 Note: This assembly is not ESD sensitive.

This procedure cover assembly steps as implied by drawing #25671-20m with ECNs 25671-1 and 25671-2 and drawing #25674-20n with ECNs 25674-1 and 25674-2.

3.3.2 Materials & Supplies

1. 31 Socket Connector Plug #65113-1C34533-102
2. 31 Pin D Mating Connector
3. Backshell, Microminiature D Plug #25683-101.
4. Plate, Lead Micriminiature D Plug #25669-101.
5. Clip, Jackpost #25721-101.
6. Jackpost, Microminiature D Plug #25719-101
7. Detector Flex Cable Y-Channel-TB8A -201 (as needed).
8. Detector Flex Cable X-Channel-TB9A -202 (as needed).
9. Detector Flex Cable X-Channel-TB9B -203 (as needed).
10. Detector Flex Cable Y-Channel-TB8B -204 (as needed).
11. Plate, Thermal, Microminiature D Plug 25670-101.
12. Top shell, Microminiature D Plug 25684-101.
13. Screw, Flathead, 04-40 X .437 25672-108.
14. Thermal Lug, Telescope 65113-1C34473-103.
15. AWG 30 HPN magnet wire Find #12.
16 Chemoloy, high purity alloy activated rosin core #6421-1, 60/40 solder Lead/Tin.
17. Norkorde solder paste.
18. Teflon tubing #3643-NAT Awg.22.
19. Deleted
20. Alcohol #2 Propanol.
21. Texwipe small foam swab # TX751B.
22. Ceramic Blade. #2
23. Bausch & Lomb Microscope #200 M range 0.7x-3.0x.
24. Ultrasonic cleaner (Branson B-220H) 50/60 Hz 117 Multimeter.
25. Clean room wipes Durx #670.
26. Baxter clean room glove #G7300-26.
27. Keithley 196 S/N# 467886

28. Ultrajet 2000 airjet # ES1270
29. Kapton tape 3M #5413
30. Scribe

3.3.3 Procedure

3.3.3.1 Identify part to be built.
Reference travelers 25671-_____ and 25674-_____.

Operator _____ date_____

3.3.3.2 Prepare connector and wire.

1. Pre-solder tin connector with 60/40 solder.
2. Cut 21- 2-inch lengths of magnet wire (30 gauge).
3. Cut Teflon tubing to cover solder cups.
4. Cut 3 -2-inch lengths of magnet wire (30 gauge)
5. Cut 20 -3.5-inch lengths of magnet wire (30 gauge).
6. Cut 20- 5.0-inch lengths of magnet wire (30 gauge).

3.3.3.3 Wire preparation:

1. Remove .1" of insulation from one end of the wires using a ceramic blade.
2. Tin the strip end of the wire. Use 60/40 solder.

3.3.3.4 Solder 31 Socket Connector Plug.

1. Solder one wire each to connector solder cups in row 1 and 2 called out in drawing #25671.
   Note: #25671-201 and #25671-202 are not wired the same. Use foam swabs and alcohol to clean the solder joints.
2 Turn connector assembly over and solder remaining wires in rows 3 and 4 . Use foam swabs and alcohol to clean the solder joints.
3 Solder inspection: Operator_____ date_____ Inspector_____ date_____
4 Slide sleeving over the wires to cover the solder cups.
5 Clean connector assembly with 2-propanol in ultrasonic unit for 5 minutes blow dry.
6 Slide lead plate over wires sufficient for the wires to reach their respective contact pads on the Flex cable. Allow enough excess for cutting and connecting wires to the pads. Push plate against connector.

Operator _____ Date _____

3.3.3.5 Procedure

1. Record the part # and serial # of the Flex Cable Part # 25668- _____ S/N # _____.
2. Record the part # and serial # of connector subassembly # 25671- _____ S/N# _____.
3. Record the part # and serial # of Detector flex cable assembly to be to be built # 25674- _____.
4. Install Plate, Thermal,Microminiature D Plug #25670-101.
5. Align the Thermal Plate and the plated through-holes of flex cable with connector pin wires as shown in drawing #25674.
6. Slide Flex cable flush against Lead Plate, hold in place using clips, jackpost and kapton tape.
7. Strip wires close to solder pads.
8. Solder Flex Cable and connector in place using 60/40 solder using Norkorde solder paste. Use foam

swabs and alcohol to clean the solder joints. Trim wire-ends to solder pads with a trim lengths between 0.1 and 0.2 inch.

9. Solder one end of 20 twisted strands wire (30 gauge) to thermal Plate lug. Solder second end to Thermal Lug Telescope per drawing #25674. Length of the 20 twisted strands wire will be 3.5 inch for Assy 25674-201 and 25674-202 and 5.0 inch for Assy. 25674-203 and 25674-204. Clean solder joints with alcohol, brush lightly.
10. Serialize cable as shown in drawing #25674. Use scribe to mark cable designations.

Operator _____ date _____ Solder Inspection_____ date_____

3.3.3.6 Resistance check

1. Using a 31 pin mating connector and Keithley 196 ohmmeter measure cable resistance. Record all values in Table 1 for assemblies 25674-201 and 25674-202. Use Table 2 for assemblies 25674-203 and 25674-204.
2. Measured values must be within specified range if not, contact Engineering for further instruction.

Operator _____ Date _____

3.3.3.7 Clean Cable Assembly and Isolation check

1. Soak completed assembly in shallow dish of isopropyl for 15 minutes to loosen and dissolve Flux.
2. Brush soldered area lightly to remove any flux.
3. Rinse with clean 2-propanol and drain.
4. Ultrasonic assembly for 5 minutes. Blow dry. Verify that the assembly is completely dry before proceeding with the next step.
5. Assemble the connector plug and the topshell with the 04-40 Flathead screw. # 25672-108.
6. Bag assembly, cycle to 77 K three times. Cool and warm part over a 10 minute period (5 minutes for cooling and 5 minutes for warming).
7. Use the Keithley 196 ohmmeter to check electrical isolation. Set Keithley meter to resistance, Auto range. Check socket to socket isolation and socket to shell isolation. It should read OL (open). The socket to socket test is a check of each socket to all other sockets. Record measurements in Table 1 for assemblies 25674-201 and 25674-202. Use Table 2 for assemblies 25674-203 and 25674-204.
8. Inspect assembly for Kapton delamination or other defects. Note below if any are found.

Operator _____ date _____

3.3.3.8 Package

1. Mark bag with assembly part number, serial number, and date of completion.
2. Record same information here: Part #_____,
   Serial number #_____ Date _____.

3.3.3.9 Completed Detector Cable/Connector Assembly

Completed: _____ date _____
Signature

Notes/Discrepancies (if any):

Serial: _____

Operator: _____

Started: _____

Completed: _____

P0151-Table 1 Resistance/Isolation Measurements
for assy 25674-201 and 25674-202

31 Pin Connector	Nominal Resistance	Measured Resistance	Nominal Isolation	Isolation
Socket # 1	0.2-5 Ω		>100 MΩ	
Socket # 2	0.2-5 Ω		>100 MΩ	
Socket # 3	0.2-5 Ω		>100 MΩ	
Socket # 4	0.2-5 Ω		>100 MΩ	
Socket # 5	0.2-5 Ω		>100 MΩ	
Socket # 6	0.2-5 Ω		>100 MΩ	
Socket # 8	0.2-5 Ω		>100 MΩ	
Socket # 9	0.2-5 Ω		>100 MΩ	
Socket # 12	0.2-5 Ω		>100 MΩ	
Socket # 13	0.2-5 Ω		>100 MΩ	
Socket #14	0.2-5 Ω		>100 MΩ	
Socket # 17	0.2-5 Ω		>100 MΩ	
Socket # 18	0.2-5 Ω		>100 MΩ	
Socket # 19	0.2-5 Ω		>100 MΩ	
Socket # 20	0.2-5 Ω		>100 MΩ	
Socket # 21	0.2-5 Ω		>100 MΩ	
Socket # 22	0.2-5 Ω		>100 MΩ	
Socket # 24	0.2-5 Ω		>100 MΩ	
Socket # 25	0.2-5 Ω		>100 MΩ	
Socket # 27	0.2-5 Ω		>100 MΩ	
Socket # 29	0.2-5 Ω		>100 MΩ	

Notes/Discrepancies (if any):

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

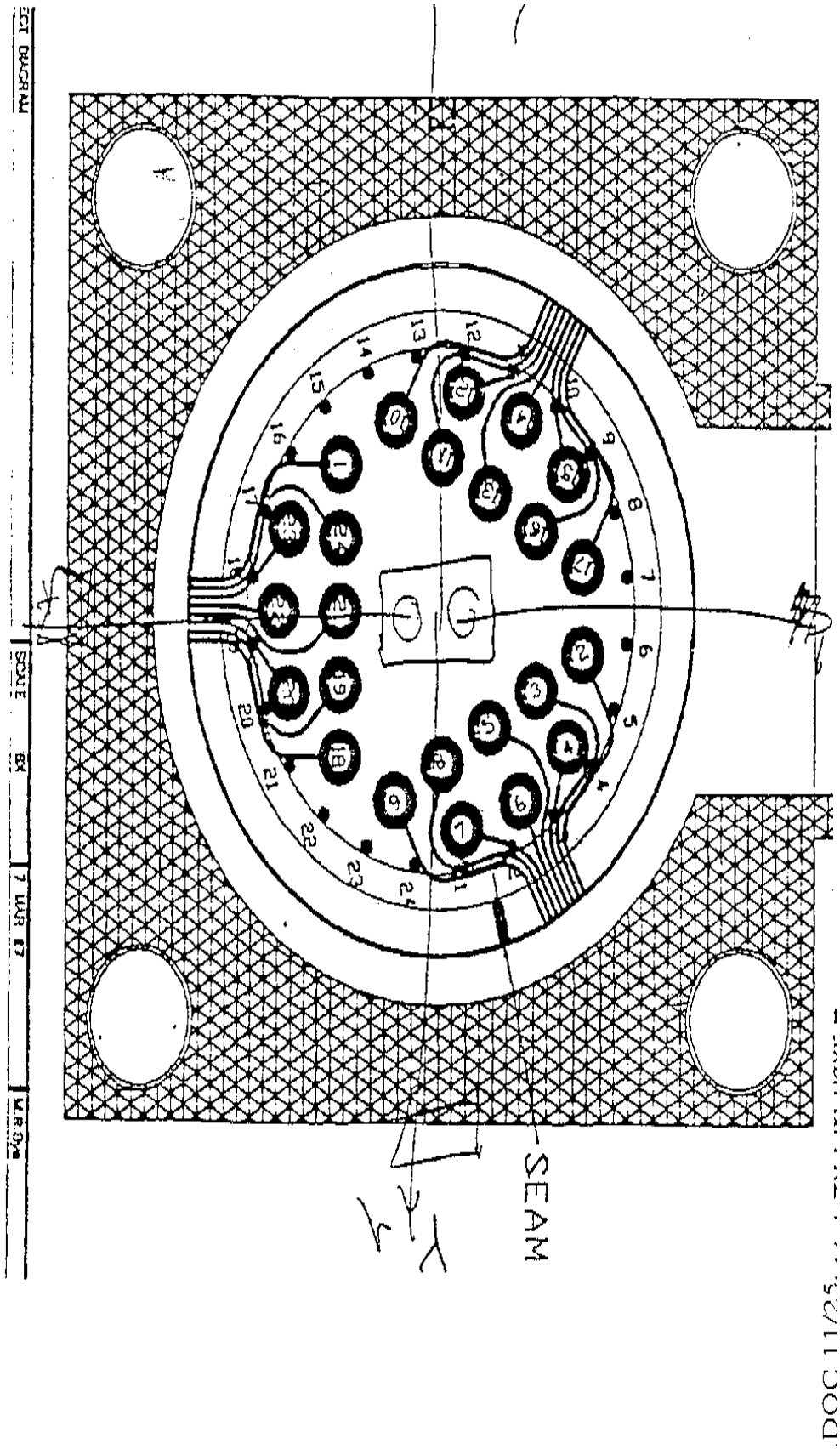
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

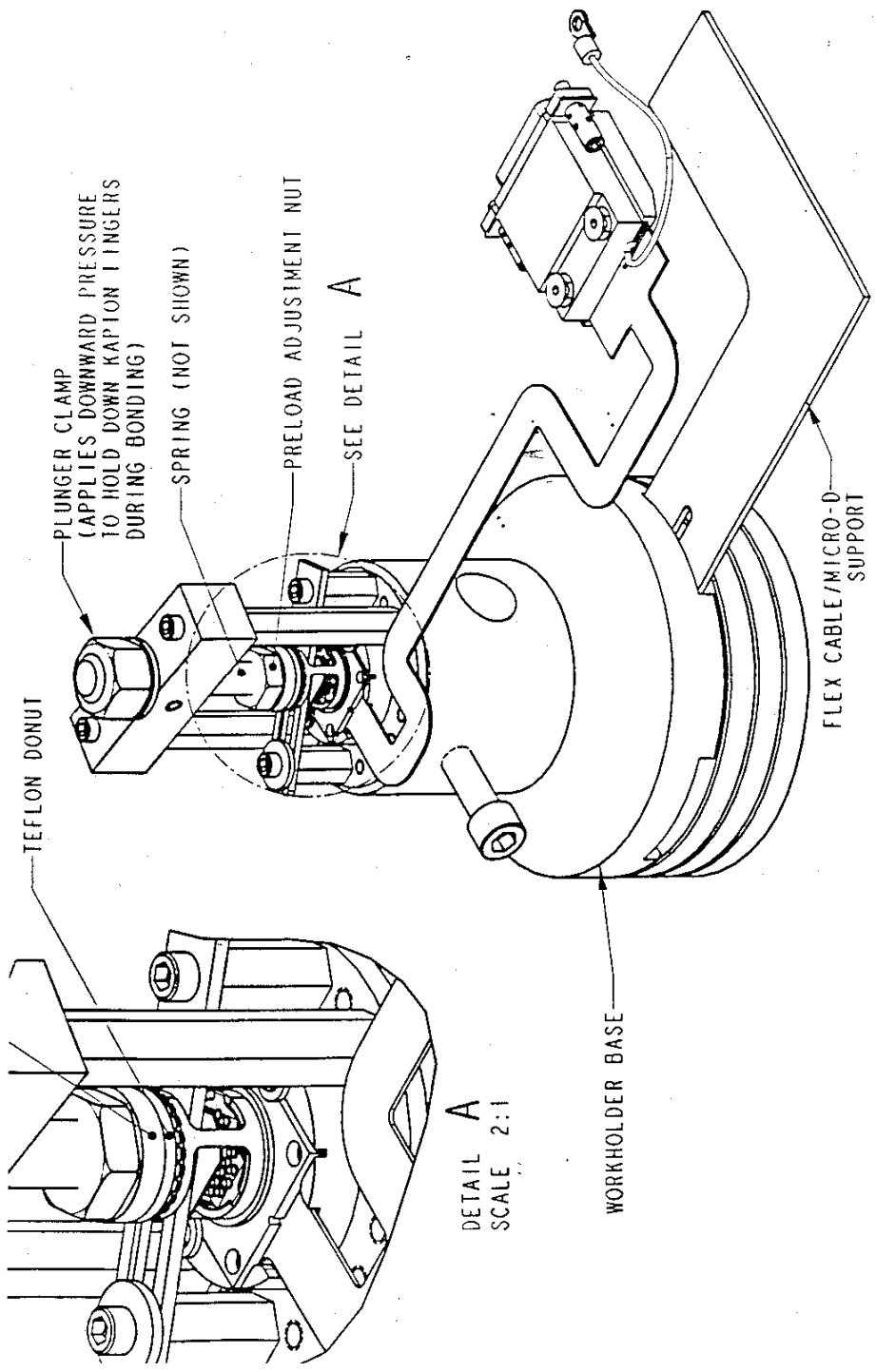
Visual Inspection - Step #1

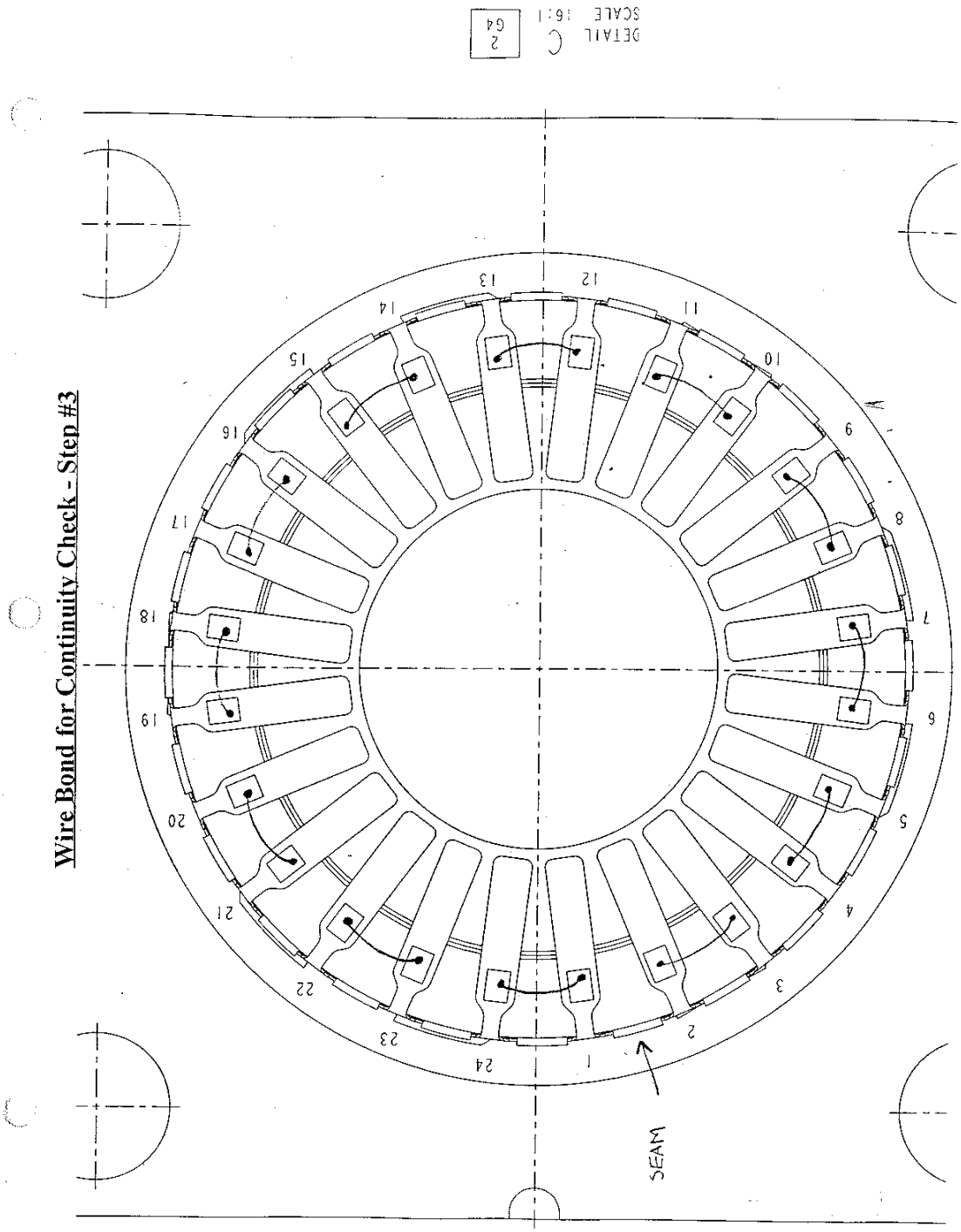
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

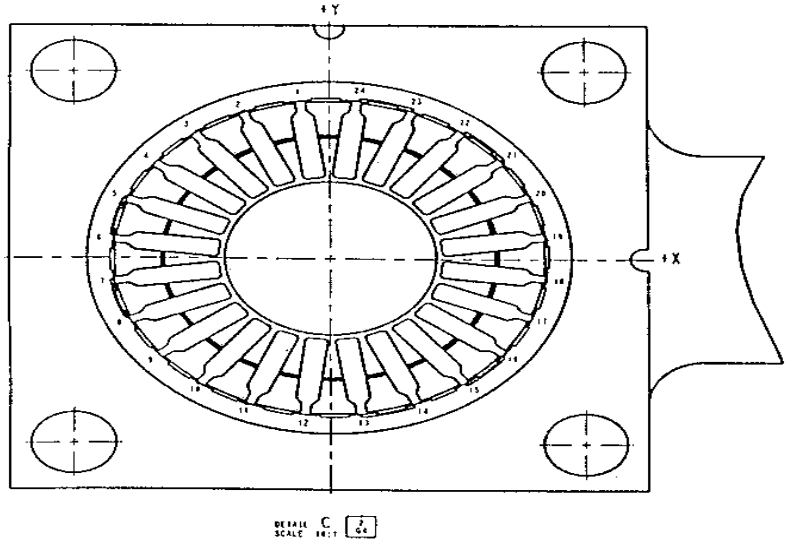
1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

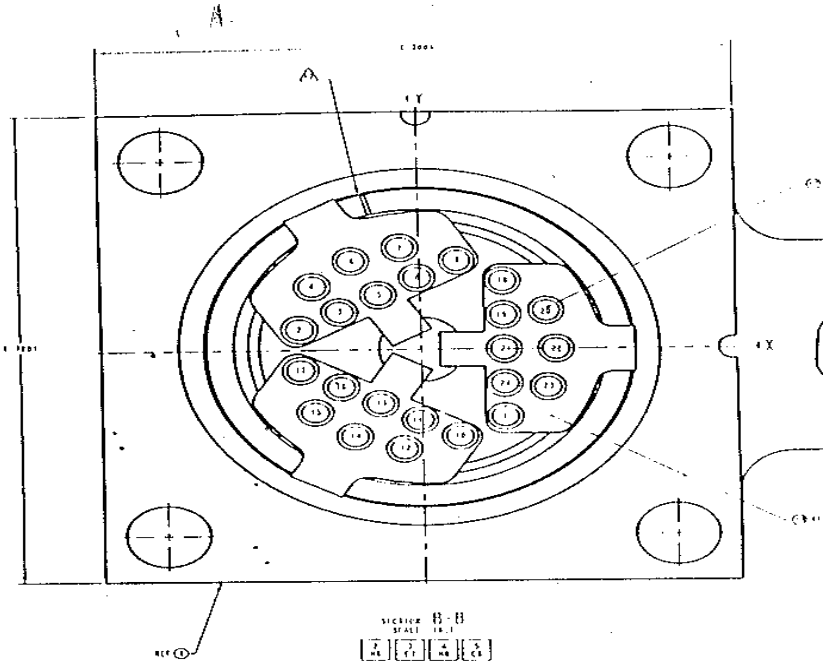


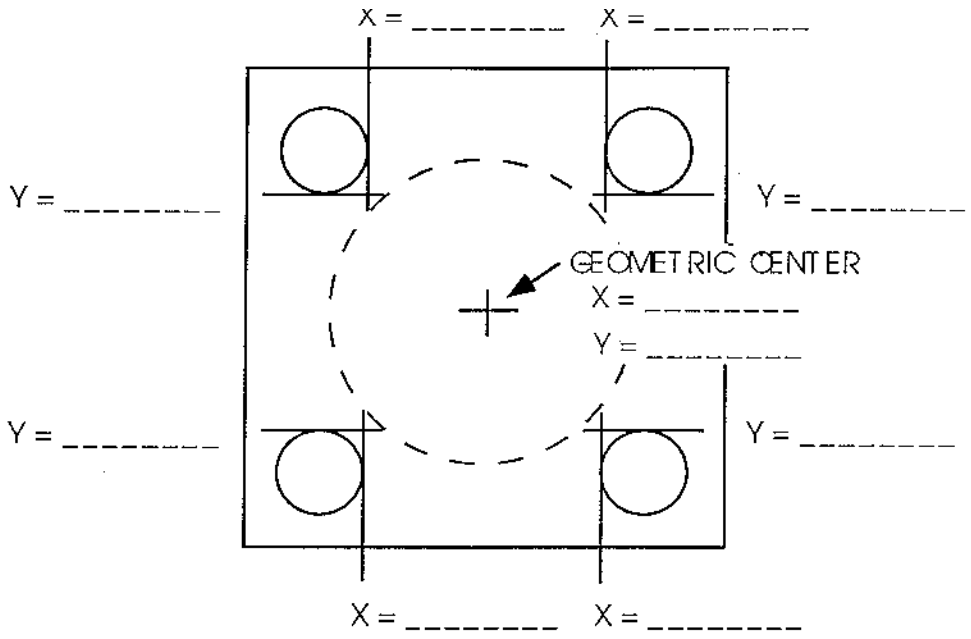

DETAIL C
SCALE 16:1
G4
2
Wire Bond for Continuity Check - Step #3
SEAM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Appendix

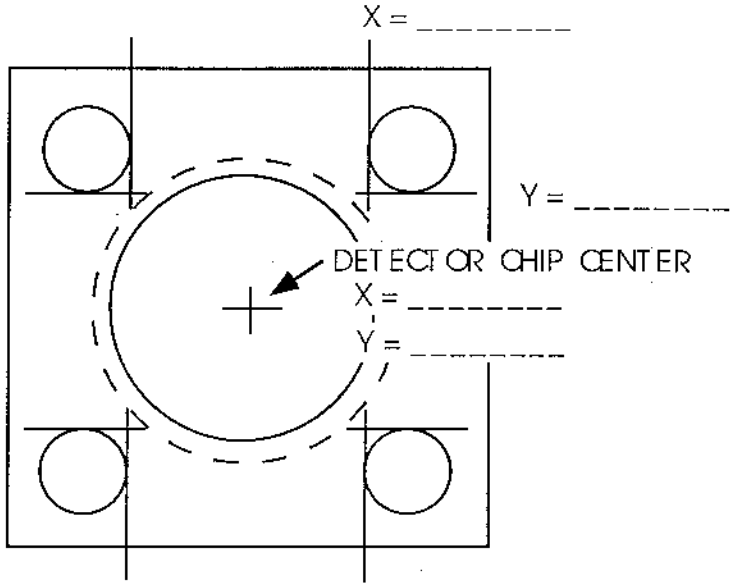
Pin Assignments





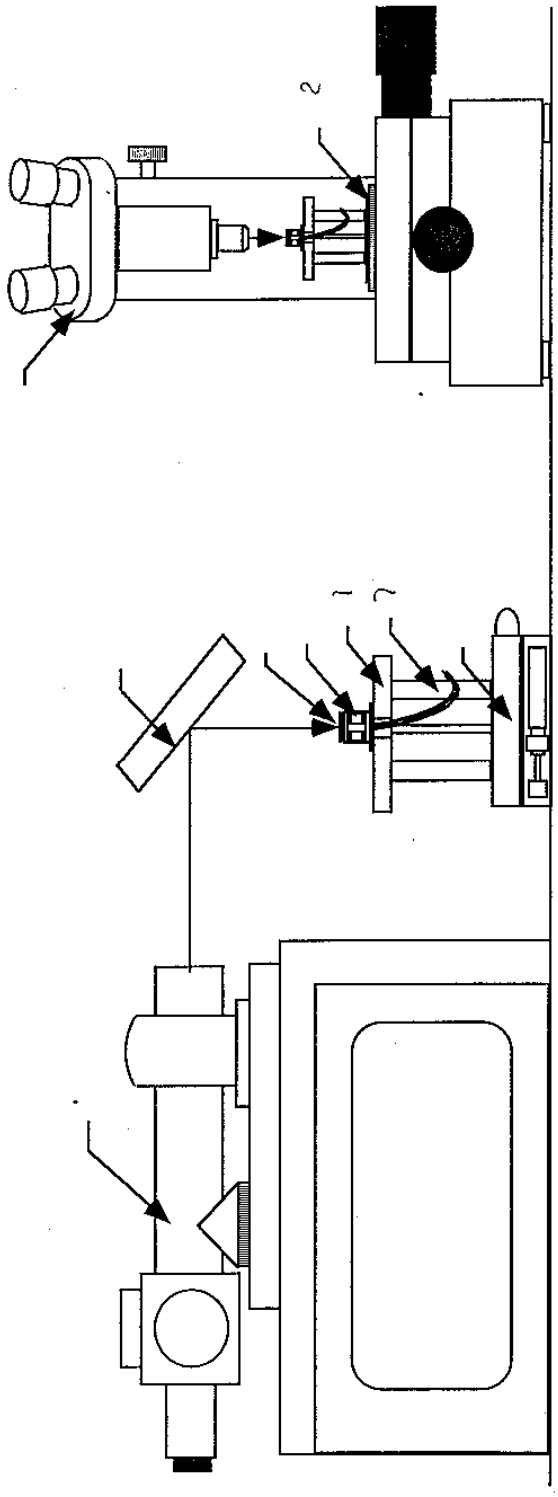


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



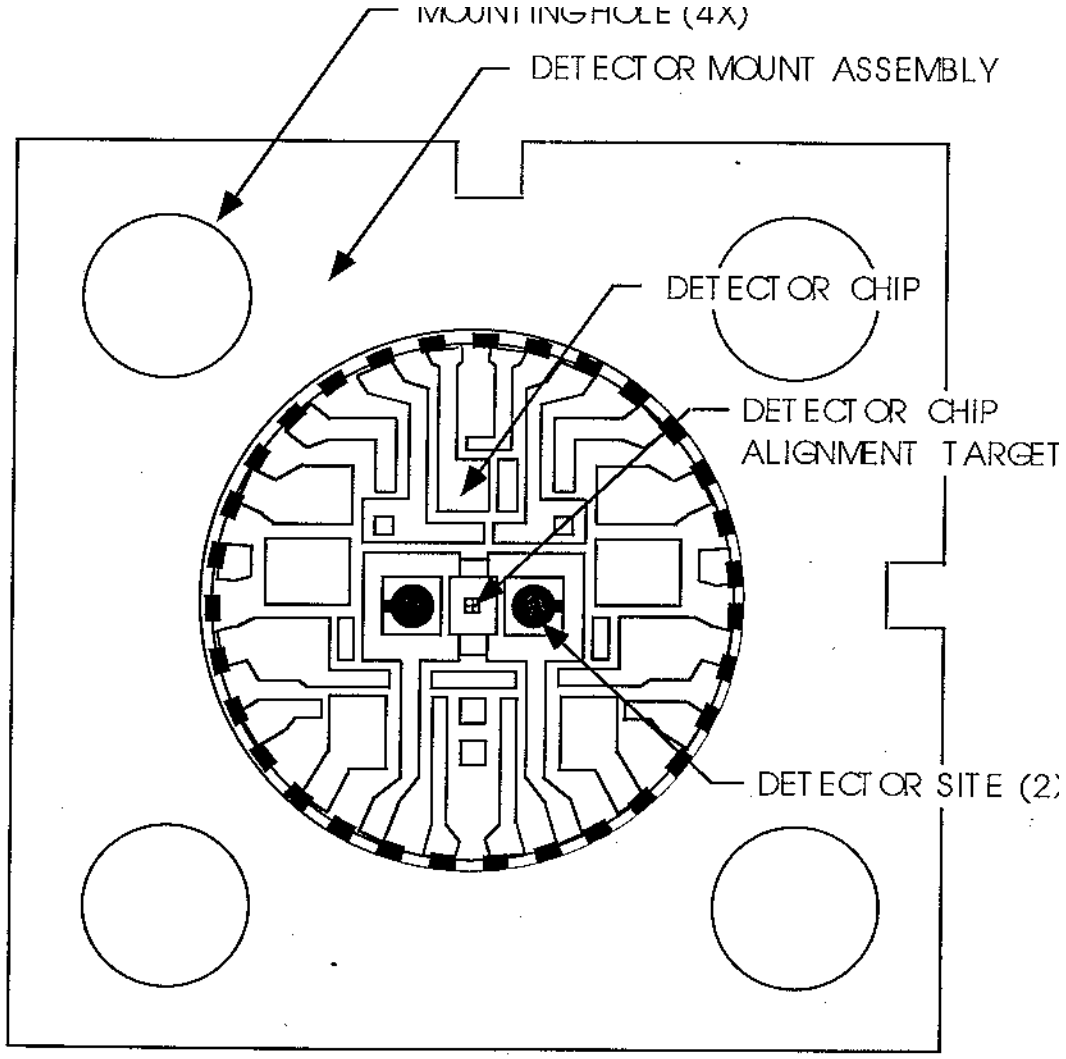


FIGURE 2 DETECTOR CHIP ORIENTATION

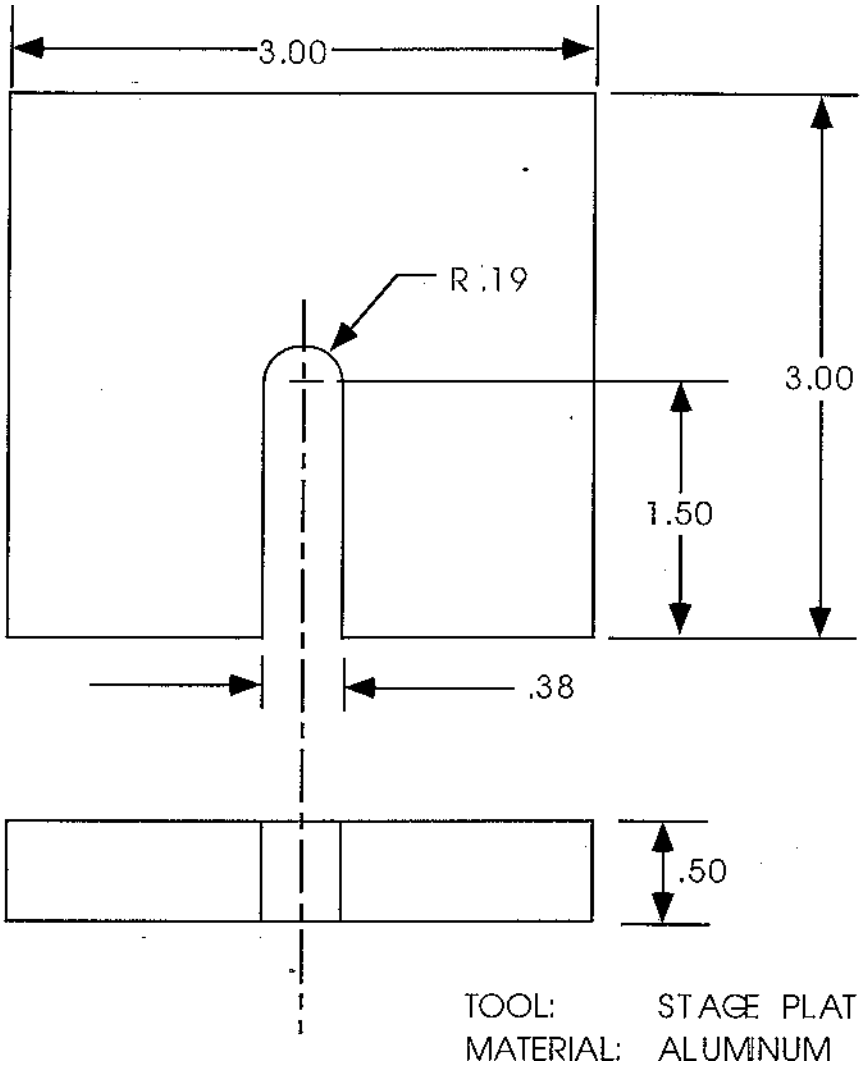
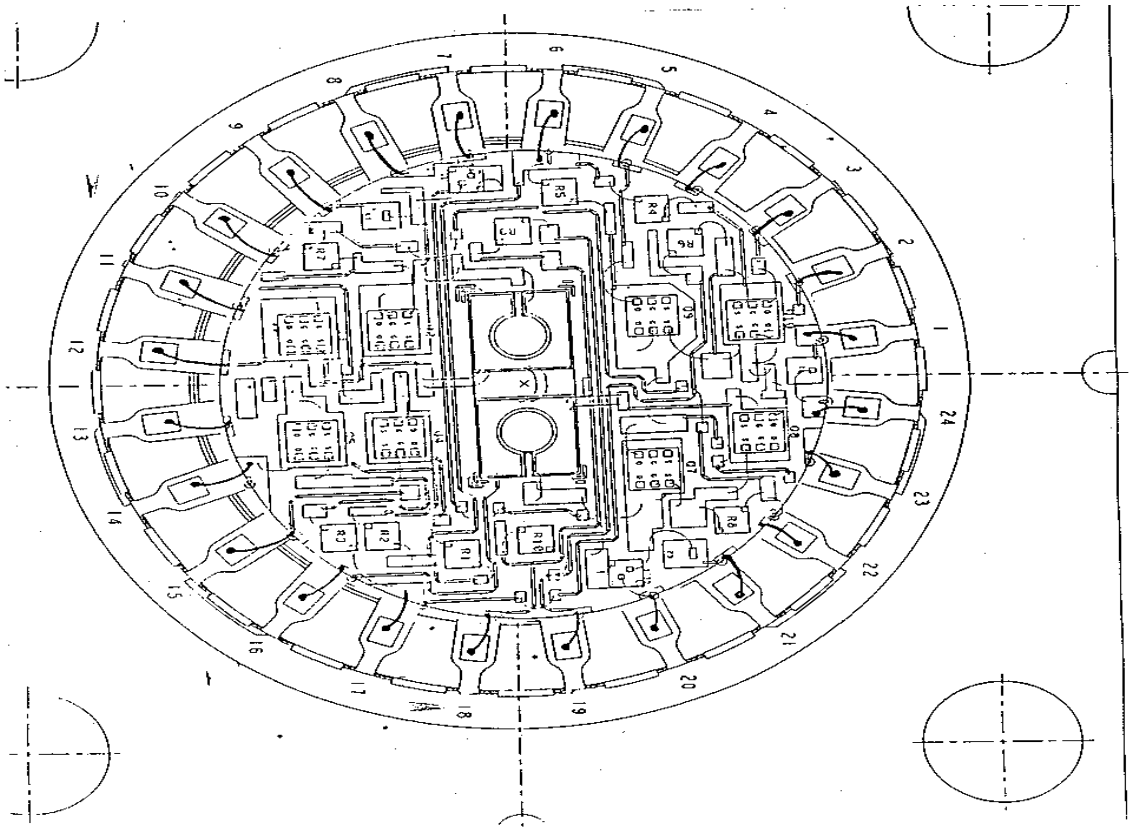
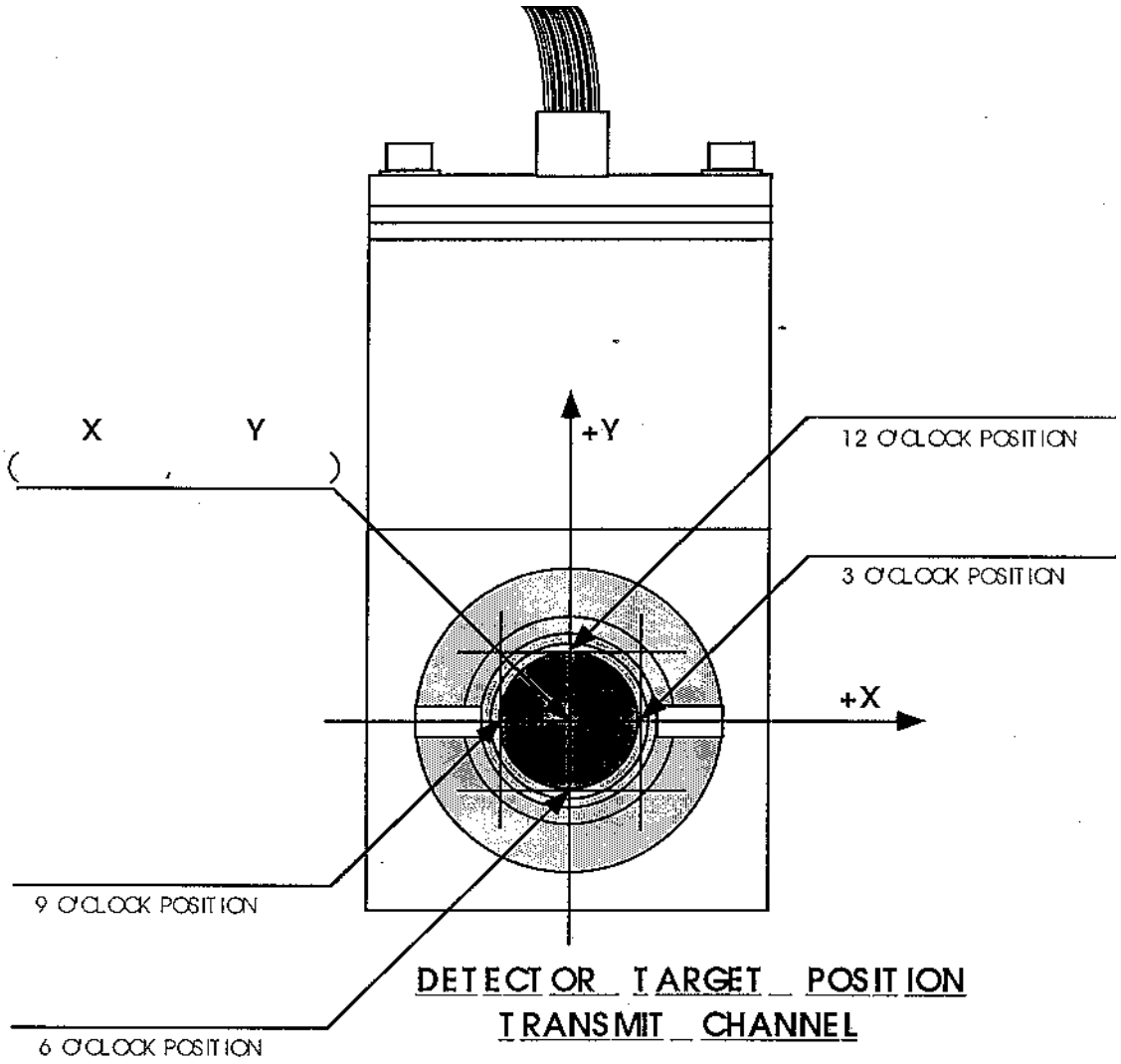


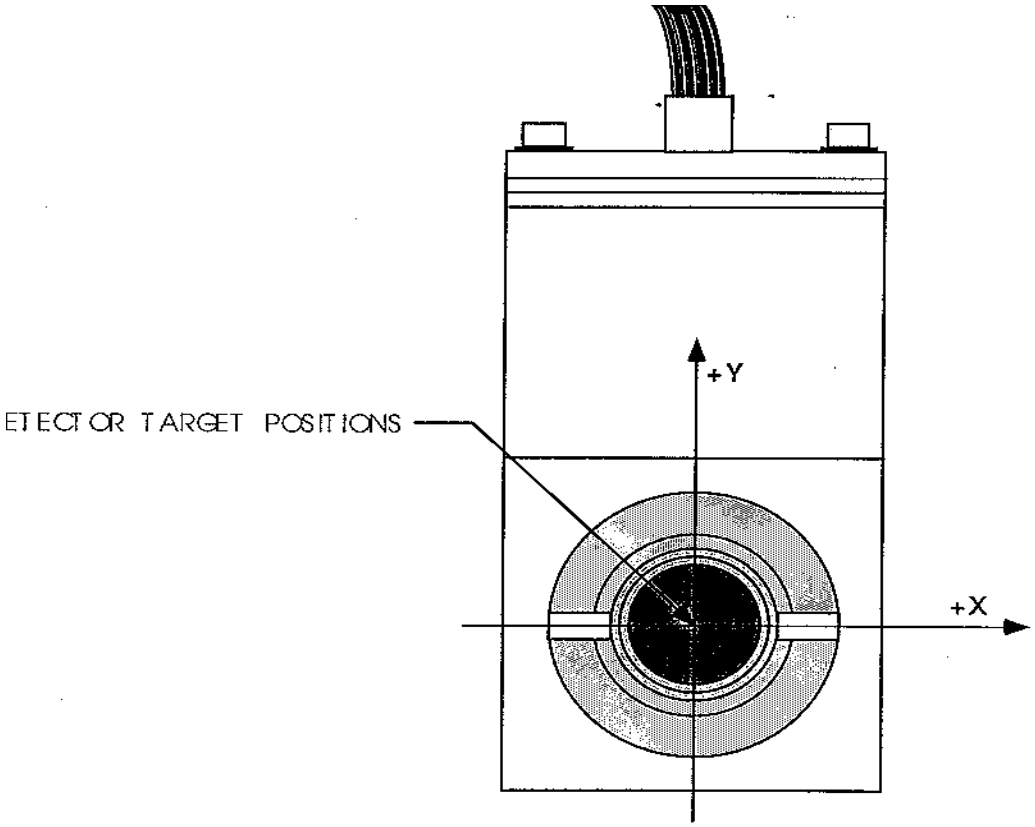
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





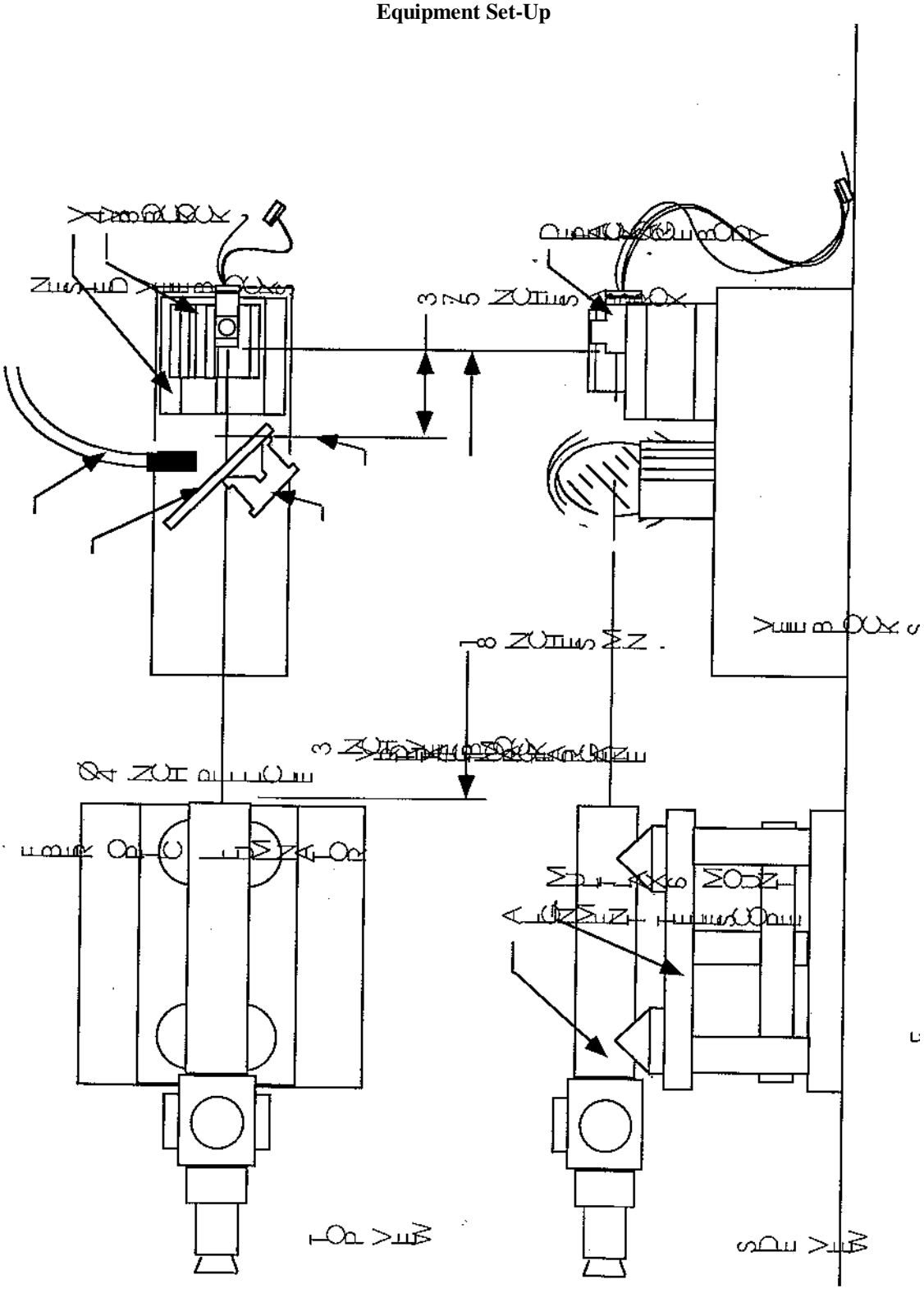
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



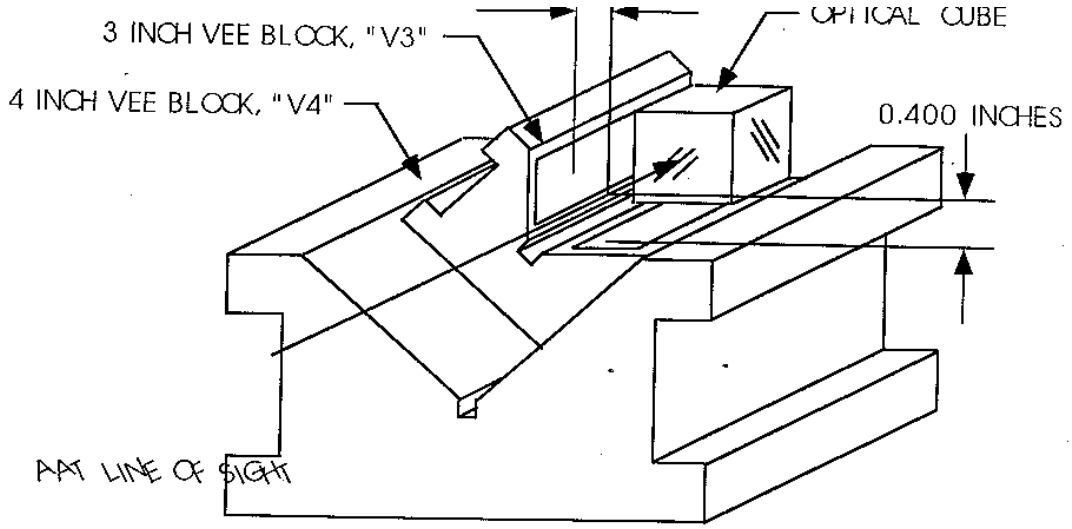


FIGURE 2A OPTICAL CUBE SET-UP

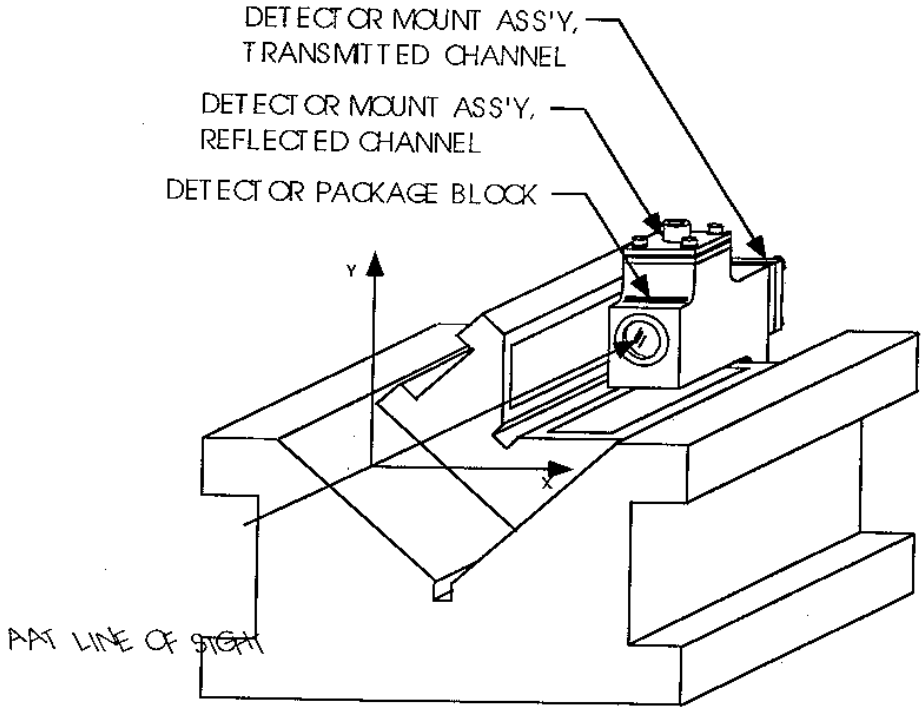


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.04 Rev. D

ECO 915

(Section 4 Detector Mount Sub-Assembly Build)

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 13

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 4

4. Detector Mount Sub-Assembly Build

4.1 Location Varian 002 - Authorized Persons: Scott Fletcher, Bertha Melenez

4.2 Applicable Documents

25681-hhh
23200-119

4.3 Equipment and Materials - Verify availability and location of the following items. Check expiration dates.

Microscope, Leica StereoZoom or equivalent
Balance, electronic
Vacuum chamber
Ultrasonic cleaner
Oven
Weller MT1500 Soldering Station or equivalent
Multimeter, record property tag no. and calibration date_____
Titanium tweezers
Xacto-type knife with ceramic blades
Detector mount assembly jig/clamp
Isolator wrapping jig
Kapton tape
Plastic and wooden applicator sticks
Teflon cutting mat
Aluminum isolator baking sheet
Small benchtop vise modified with nonmagnetic jaws
Solder, Sn62, Spec QQ-S-571, record lot number_____
RMA flux, record lot number_____
2-propanol, reagent grade
Acetone, reagent grade
Stycast #1266 epoxy, record lot number and/or expiration
date_____
Epo-Tek H20E conductive epoxy, record lot number and/or expiration
date_____
Staystik #872 .0015 dry film adhesive, record lot number and/or expiration
date_____

4.4 Procedure

4.4.1 Identify part to be built.

Reference the drawing tree 23200-119 and record the part number as 25681-_____.

4.4.2 Prepare thermal isolator

4.4.2.1 Record isolator SN_____ Check isolation and continuity. Record resistance results on table.

4.4.2.2 Inspection of Isolator - Resistance Check

With meter set to auto-scale, measure trace resistance. Trace 2 is on far left, trace 1 is far right. Isolator A is on top with fingers pointing up. First column is before gold bricks and second is after bricks are epoxied.

4.4.2.3 Separate isolators

Trace	Isolator Flat No Bricks 4.4.2.1	With Bricks 4.4.2.4	After fingers folded.Still on Jig 4.4.4.6	After temp wire bonds 4.4.9	After Centrifuge 4.4.12	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
1						
Date / initials						
Comments						

1. Temporarily secure isolator sheet to Teflon cutting mat using Kapton tape.
2. Remove isolator from sheet by cutting through perforations with a sharp ceramic knife.
3. Tape isolator to isolator baking sheet.

4.4.2.4 Bond gold bricks **date** _____ **initials** _____

1. Clean bricks with 2-propanol or acetone in ultrasonic cleaner for 10 minutes minimum.
2. On a sterile glass microscope slide, place equal parts by volume of Epo-Tek H20E A and B. Mix until completely blended.

3. Cure a test sample at 120 C (248 F) for 20 minutes minimum. Sample should be hard in all places.
4. Apply a drop of material to wide lands at ends of isolator fingers.
5. Use titanium tweezers to place one gold brick on each epoxy drop (smooth, rounded side down, sharp edges up). With a sharpened wooden or plastic applicator adjust bricks and press down lightly to secure.
6. Cure epoxy at 120 C for 20 minutes minimum. Verify epoxy is solid and brick is secure after initial cure. Record date and total cure time_____

4.4.2.5 Roll thermal isolator

Roll thermal isolator around isolator wrapping jig to form a cylinder. Use Kapton tape to temporarily secure isolator.

4.4.3 Thermal isolator and plug assembly

4.4.3.1 Solder gold pins

1. Preheat soldering iron to 600 F.
2. Use Kapton tape to secure gold pins to the edge of a microscope slide.
3. With SnPb solder and RMA flux, hand solder tin each pin from approximately the middle to the small end. Remove from slide and clean pins in 2-propanol for 10 minutes in ultrasonic cleaner to loosen all flux residue. Rinse with clean alcohol.

4.4.3.2 Prepare detector mount for pin installation

1. Assemble lead carrier plug and base, aligning per B/P. Secure pin plug with retaining ring.
2. Secure base/plug assembly in nonmagnetic holding fixture. Place isolator atop base and align seam with base notch.

4.4.3.3 Assemble and solder pins.

1. Place one solder "doughnut" on each of 24 pins.
2. Lubricate first pin with 2-propanol and insert through center solder pad/hole of any one of the isolator "flaps". Carefully bend flap down and insert pin through corresponding hole in lead carrier plug. Insert remaining seven pins in the first section, then press all eight down until flap is flush against plug. Repeat for remaining two sections.
3. Apply small amount of RMA flux to traces and solder doughnuts.
4. Preheat soldering iron to 525 F.
5. Reflow (i.e., melt) solder doughnuts one at a time by applying heat to the head of each pin. Do not allow the soldering iron to touch the isolator! Repeat for all 24 pins.

4.4.3.4 Clean

Clean assembly with 2-proponol in ultrasonic cleaner to remove flux. Do not immerse fingers. Record time in ultrasonic cleaner_____.

4.4.4 Bonding of Fingers to Thermal Platform

4.4.4.1 Assemble platform

Carefully place platform onto isolator/base assembly so that fingers are centered in "cogs" of " gearhead".

4.4.4.2 Prepare Tape Strips

1. Cut strips of Kapton adhesive tape approximately same width as fingers and approximately 0.20″ long.
2. Attach tape pieces to Isolator so that they extend well beyond the ends of the fingers.

4.4.4.3 Prepare Dry Film Adhesive

1. Score Staystick dry film adhesive with sharp ceramic scalpel blade to make 24 pieces approximately .020″ x .020″.
2. Peel film adhesive pieces from paper backing one at a time and place them on perimeter of Thermal Platform where Isolator fingers are to be attached. Gently fold each finger down and tape in place.

4.4.4.4 Clamp

Place assembly on DMA Jig/Clamp. Place Teflon ring (part of shop aid) on top and secure clamp.

4.4.4.5 Reflow/cure

1. Reflow Staystick in 90° C oven for 1 hour. Remove assembly and jig from oven and allow to cool to room temperature.
2. Remove clamp, standoffs and Teflon ring from DMA Jig.
3. Remove Kapton tape from assembly. (With tweezers grab outside end of tape and peel *toward the center of the platform.*). Remove assembly and center plug from jig. Keep assembly on center plug for remaining bonding operations.

4.4.4.6 Verify joints

1. Measure resistance of Thermal Isolator traces from pin plug to gold brick. Record on table p 18. An open or bad joint on any trace but the 4 spares will disqualify this part for flight.

4.4.4.7 Inspection Performed by Howard Demroff, sign off traveler.

4.4.5 Bonding of thermal isolator to platform and base

4.4.5.1 Prepare adhesive

Mix Stycast 1266: Mix 5.0 grams resin and 1.4 grams catalyst. Place mixed material in vacuum chamber to degas. Record time under vacuum_____.

4.4.5.2 Application step 1

Use plastic applicator to apply three drops of epoxy between the isolator and the rim of the base—one drop at the bottom of each leg. Epoxy will wick along the rim to completely bond the surfaces of the base and isolator. After a few minutes verify coverage and add material if necessary.

4.4.5.3 Application step 2

Apply a bead of Stycast to the inside faying surface of Kapton isolator where it will contact thermal platform using the same technique as step 1.

4.4.5.4 Cure

1. Cure assembly at room temperature for 16 hours minimum.
2. Remove Kapton tape.
3. Record date and cure time_____
4. Inspect item for excess epoxy and general appearance. Record observations below:

_____
_____
_____
_____

4.4.6 Bonding of pedestal to thermal platform

4.4.6.1 Prepare adhesive

Mix Stycast 1266: Mix 5.0 grams resin and 1.4 grams catalyst. Place mixed material in vacuum chamber to degas. Record time under vacuum_____.

4.4.6.2 Procedure

1. Apply a generous drop of epoxy to center of Platform. Carefully float Pedestal on epoxy drop.Spread epoxy around center of Platform by moving Pedestal in a circular motion using plastic applicator or tweezers. Allow epoxy to flow onto ends of fingers. Keep gold bricks and traces free of adhesive!
2. Cure epoxy at room temperature for 16 hours minimum. Record cure time_____.
3. Inspect item for excess epoxy and general appearance. Record observations below:

4.4.7 Glue pins to base

1. Allow a mixture of stycast to thicken - approximately one hour. Use a needle to apply stycast to pin just where it comes out of bottom of base. Do not get any epoxy up pin. Any stycast on end of pin will prevent soldering.

4.4.8 Bond Stiffener to Thermal Isolator

1. Mix Stycast 1266 epoxy same as above. Record mixing time and degas duration.
   _____
2. Carefully install stiffener p/n _____ in Detector Mount Assembly by inserting it through one of the three windows, resting notched edges of the stiffener on the small "ledges" midway up the isolator legs.
3. Apply a small drop of Stycast to the three contact points and allow material to wick along the edge. Apply additional epoxy as required to form a complete fillet.
4. Cure 16 hours minimum at room temperature. Record date and cure time.

_____

4.4.9 Make the 12 temporary bonds - Authorized Persons - Howard Demroff

1. Make bonds as per diagram.
2. Measure and record resistance of pairs in table on page 18.

4.4.10 Mechanical Inspection per Drawing 25681 Pass_____Fail_____

Comment_____

1. Measure height of detector mount from base to top of brick.
   _____
   _____
   _____
   _____
   _____
2. Install EMI shield by lowering part along pins.

4.4.11 Centrifuge at 20 g for 5 minute date _____ time _____ operator _____

4.4.12 Measure trace resistance date _____ time _____ operator _____

Record trace pairs resistance in table on page 18.

4.5 Assemble detector mount and flex cable including connector.

4.5.1 Equipment and materials

Microscope (Leica StereoZoom or equivalent), record SN_____

Weller soldering station, record SN_____

Sn63/Pb37 solder (specification QQ-S-571), record lot number_____

RMA flux, record lot number_____

2-propanol

4.5.2 Scope

This subsection describes the process used to attach flex cable assembly to detector mount sub-assembly.

4.5.3 Procedure

4.5.3.1 Align

1. Record part number 25674-_____and SN_____of flex cable assembly.
2. Align DMA pins with plated-through holes of flex cable assembly per B/P.

4.5.3.2 Solder

Install cable and solder in place using Sn63/Pb37 solder wire and RMA flux. Note: Exercise caution when soldering so as not to reflow solder on isolator/pinhead joints. Apply heat no longer than 2 seconds and allow pin carrier to cool between every soldering operation! Use air flow if necessary.

4.5.3.3 Clean assembly.

1. Soak completed assembly in shallow dish of 2-propanol for 30 minutes to loosen and dissolve flux.
2. Rinse with clean 2-propanol and drain.
3. Ultrasonic cleaning unit may be used if any flux remains; however, do not submerge assembly above the base.
4. Final complete rinse in DI water. Allow to completely dry on bench.

4.5.3.4 Package

1. Place completed assembly and holding fixture in container.
2. Mark package with assembly part number, serial number, and date of completion. Record the same data here: part number_____,SN_____, date_____
3. Store container in desiccate cabinet

4.6 Certified personnel: Bertha Melendez and Scott Fletcher

Completed:_____
Signature Date

Notes/Discrepancies (if any):

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

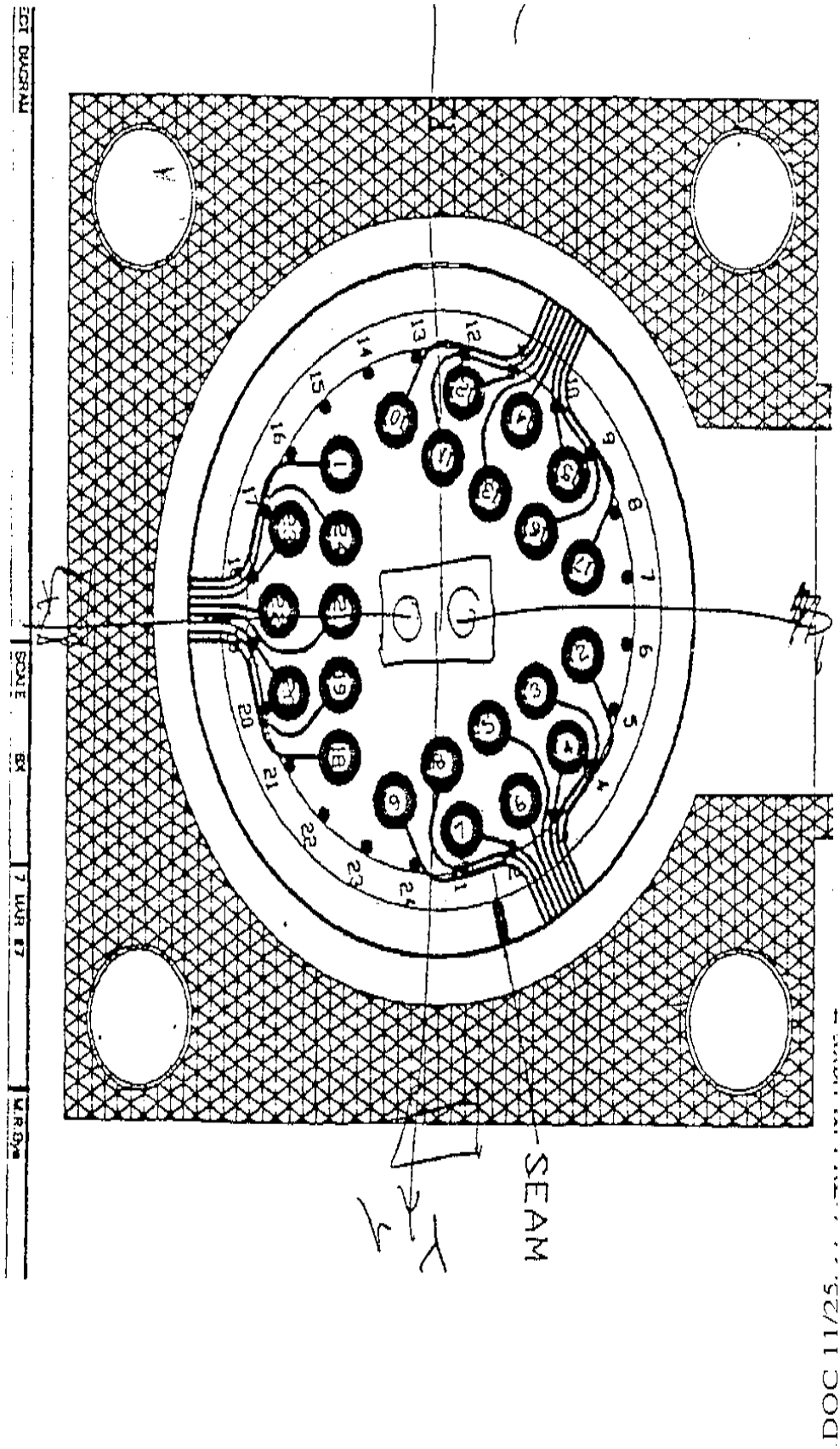
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

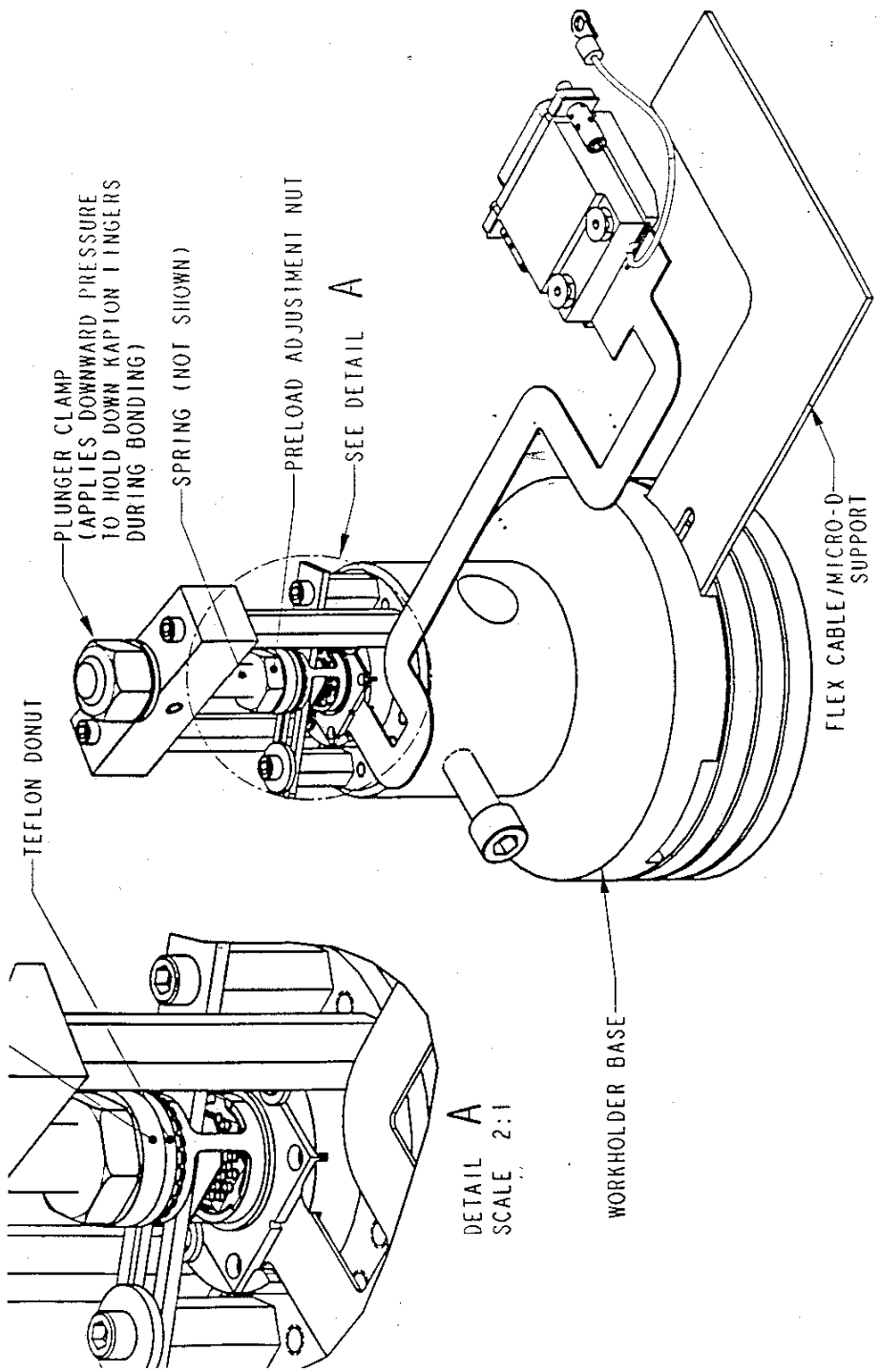
Visual Inspection - Step #1

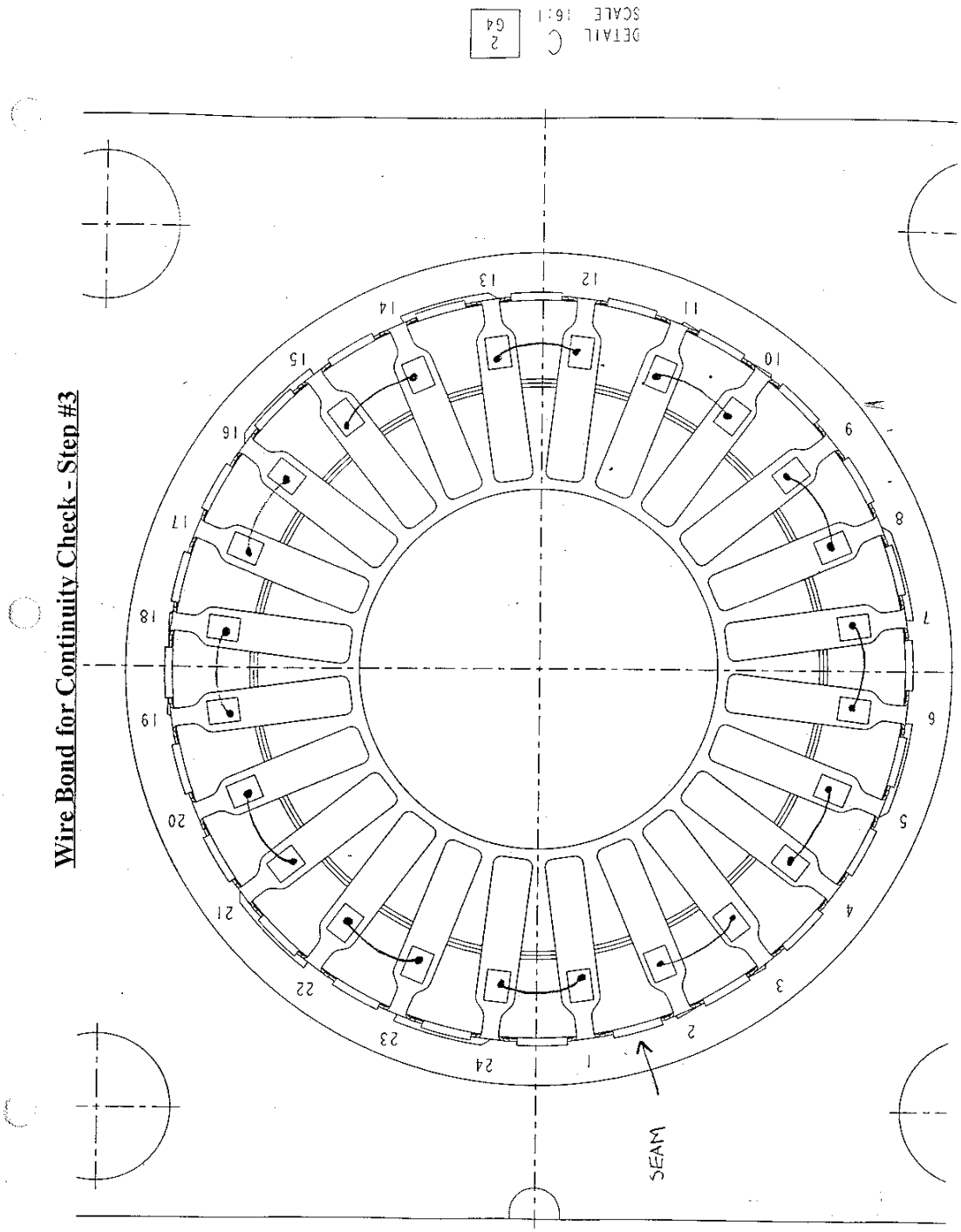
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

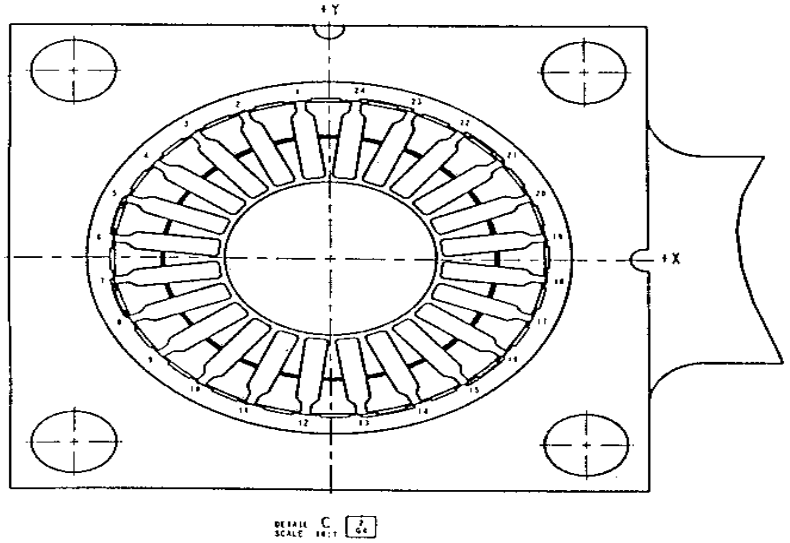
1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

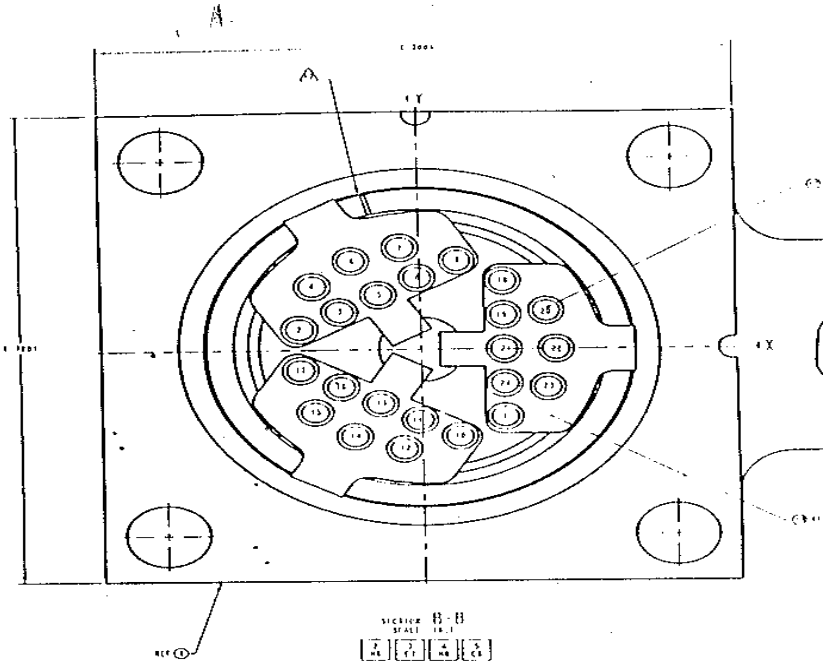


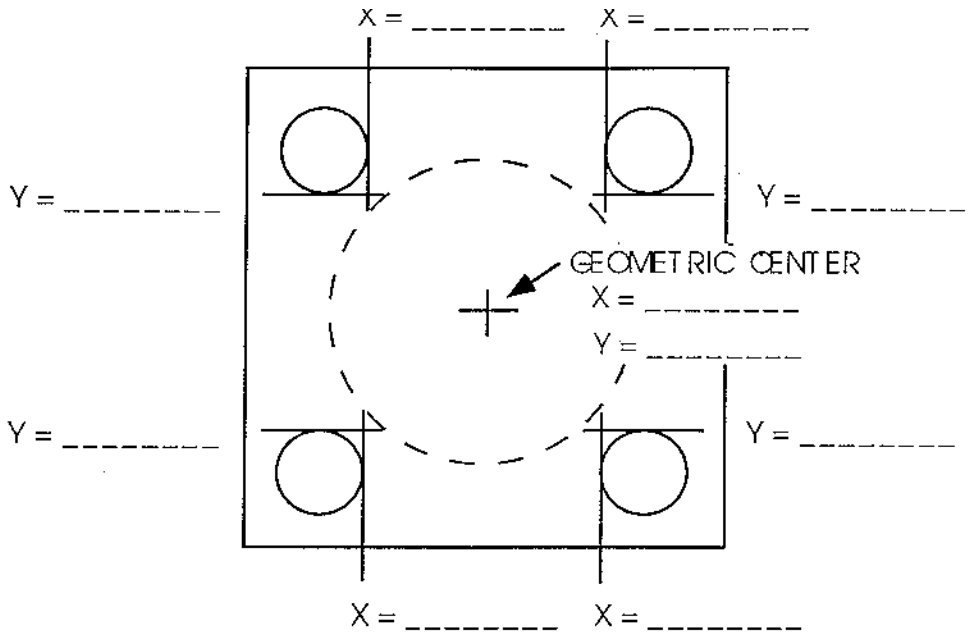

DETAIL C
SCALE 16:1
2
G4
Wire Bond for Continuity Check - Step #3
SEAM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Appendix

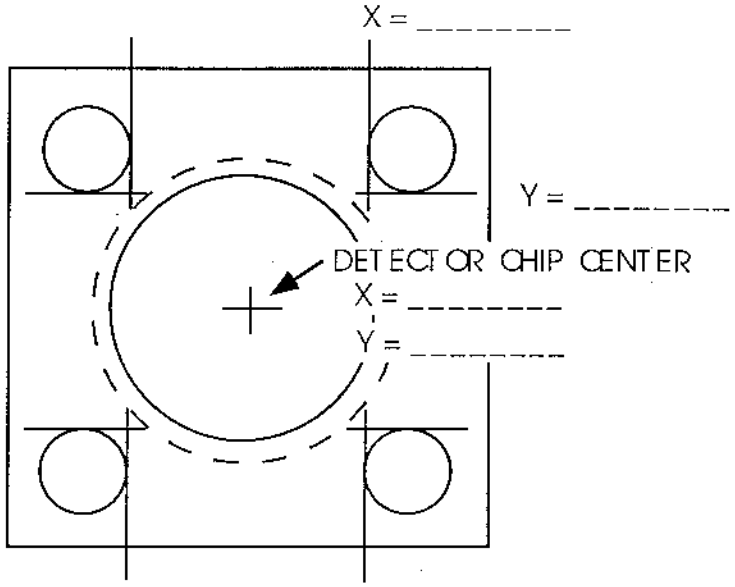
Pin Assignments





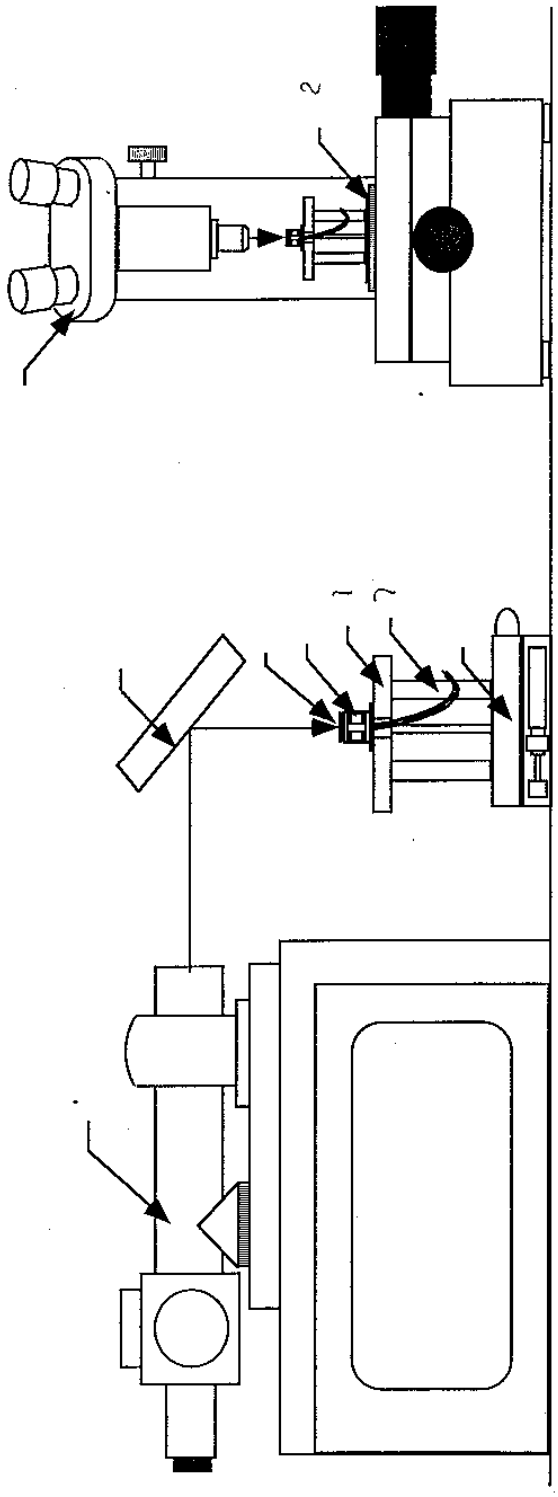


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



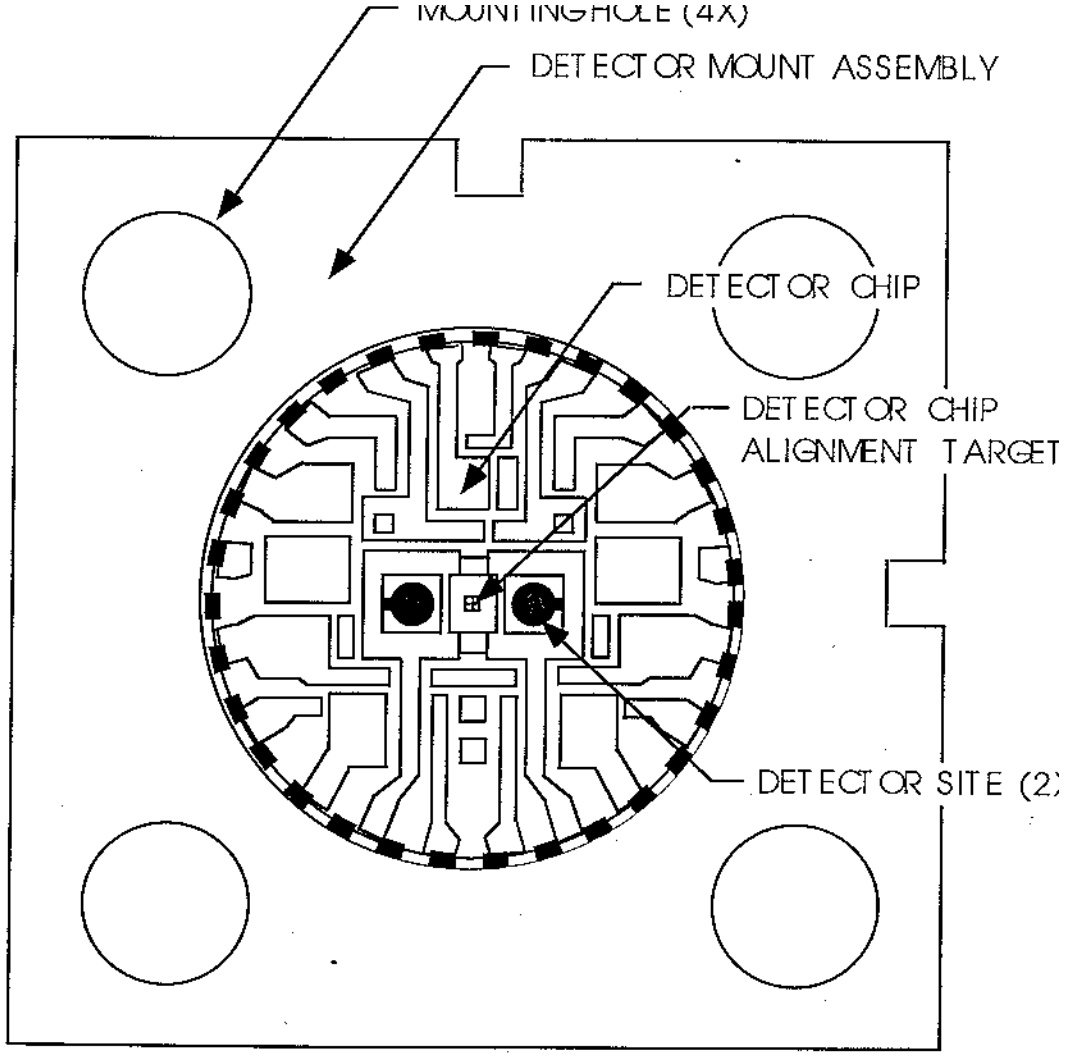


FIGURE 2 DETECTOR CHIP ORIENTATION

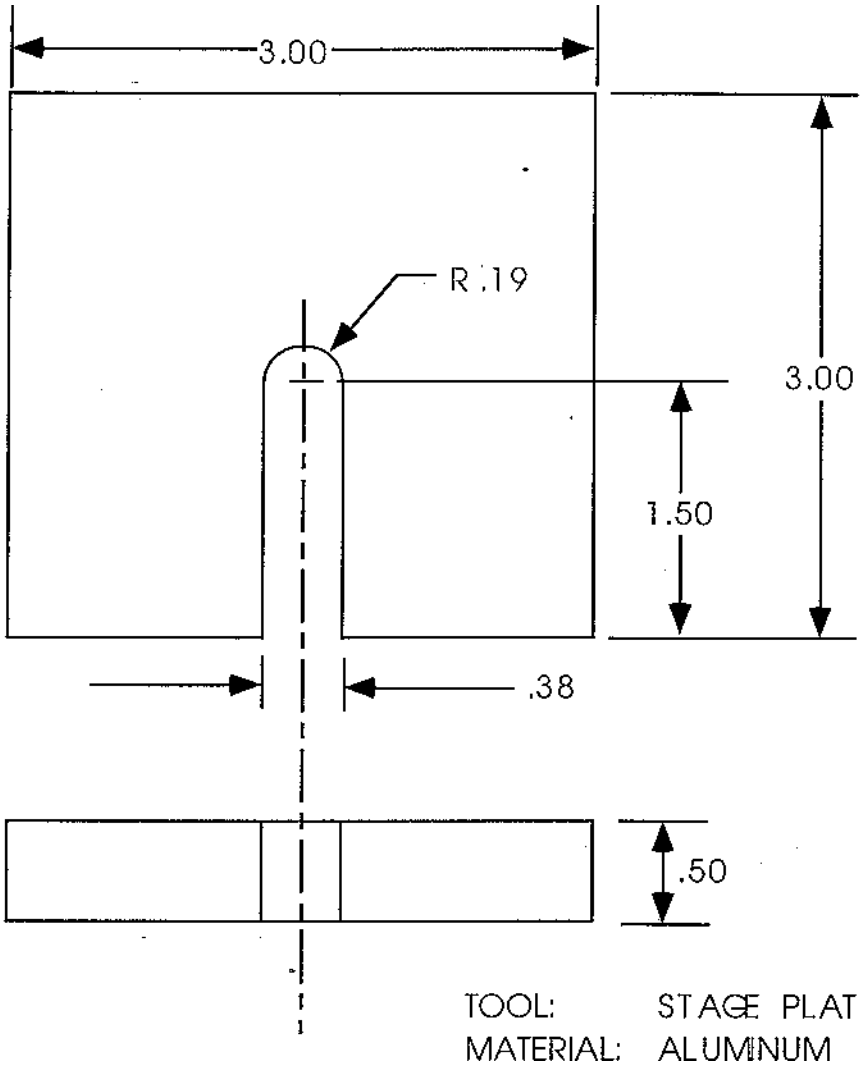
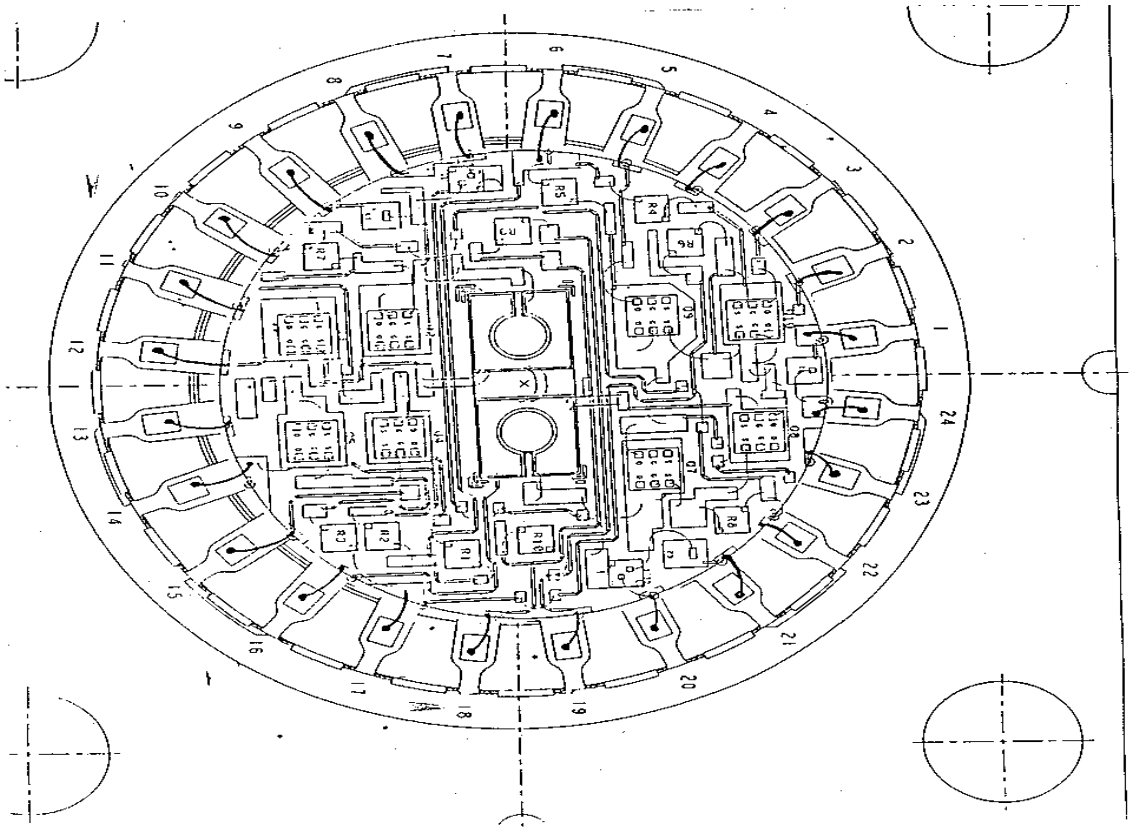
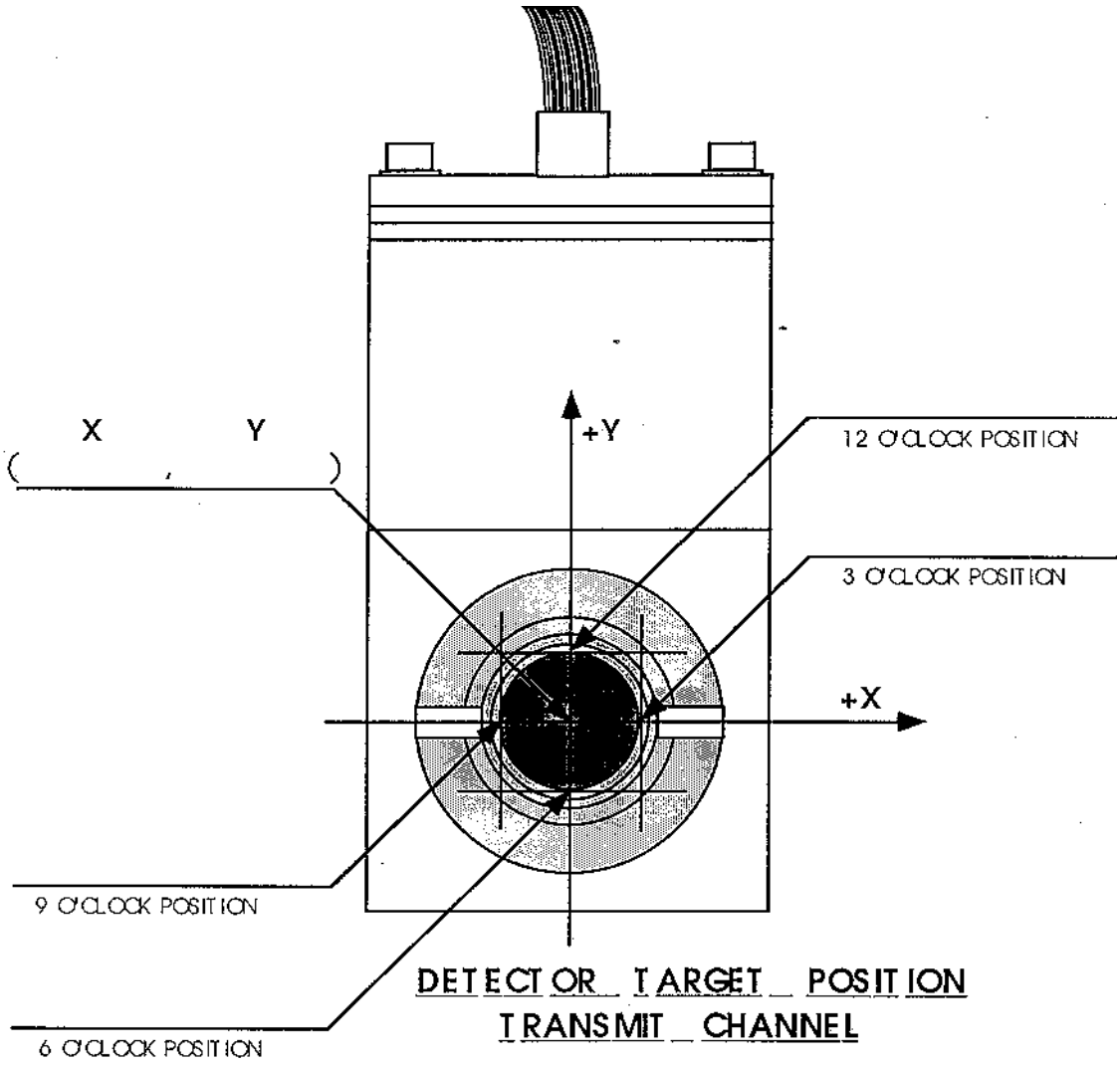


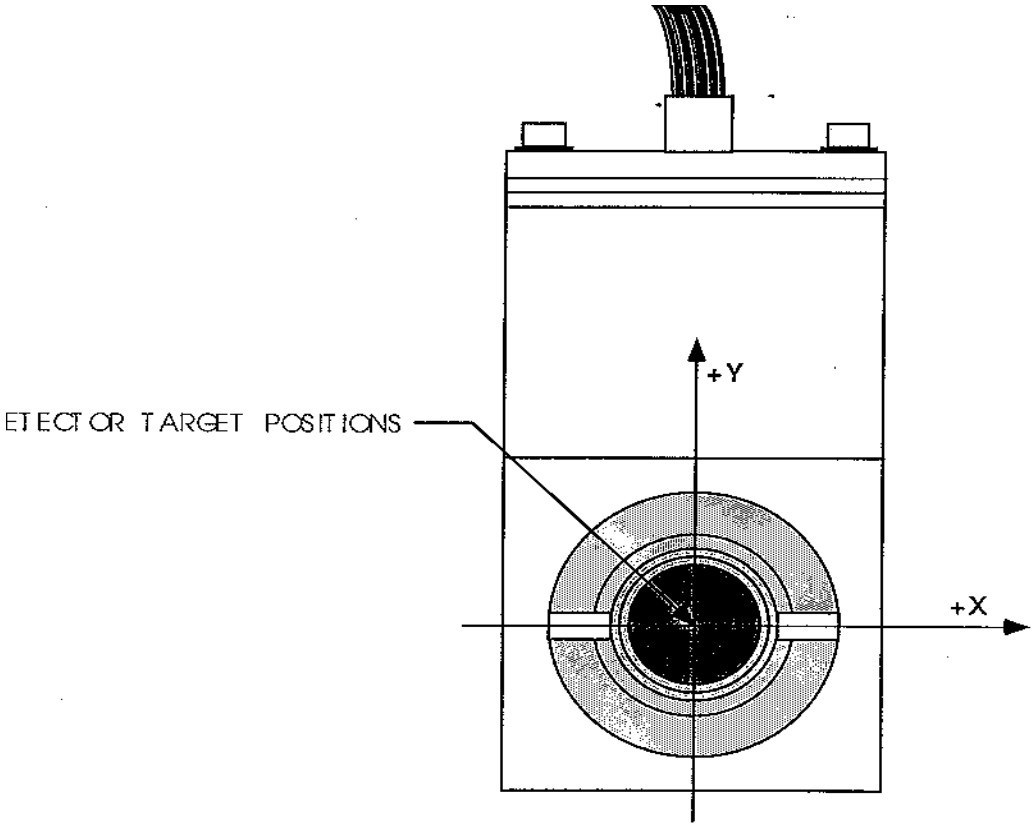
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





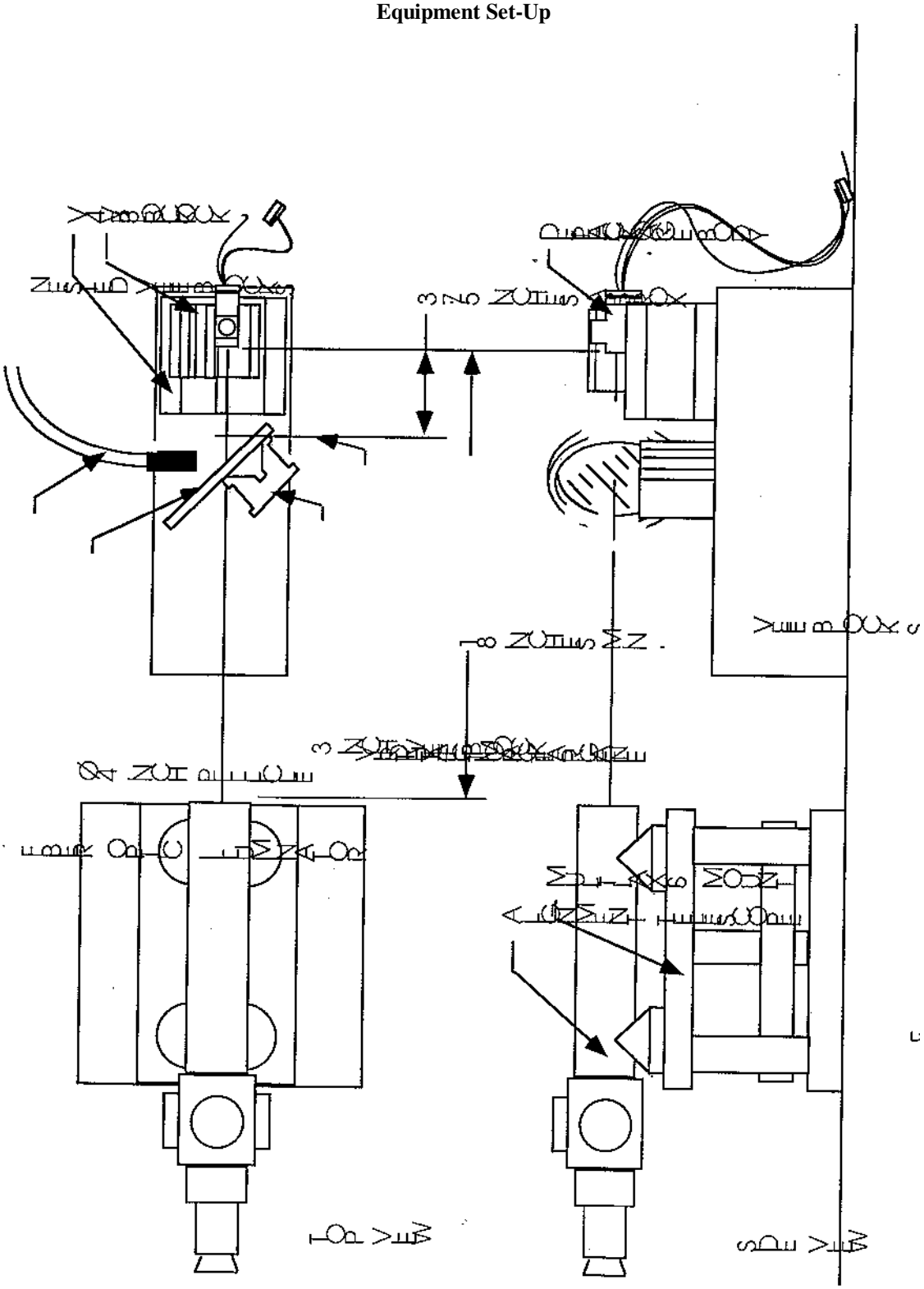
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



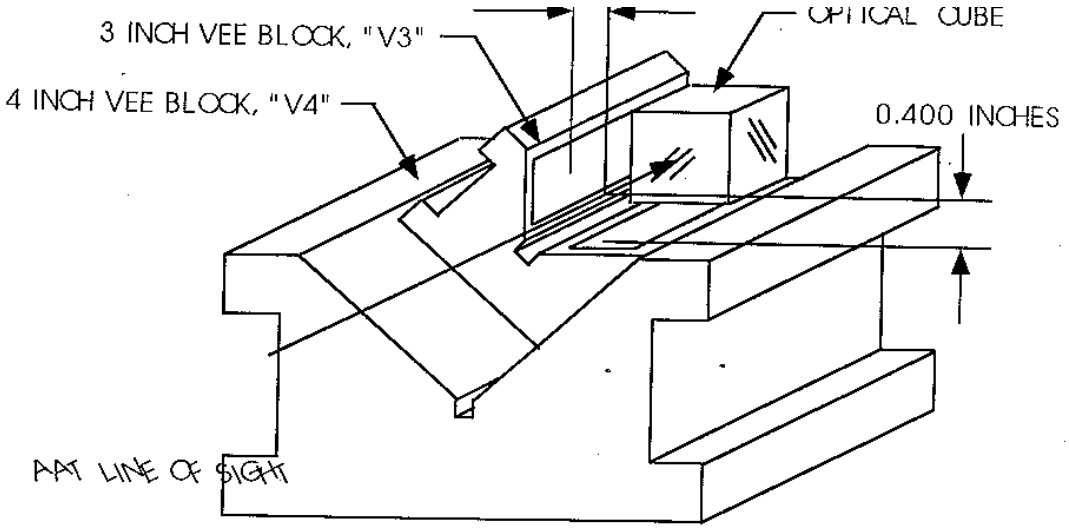


FIGURE 2A OPTICAL CUBE SET-UP

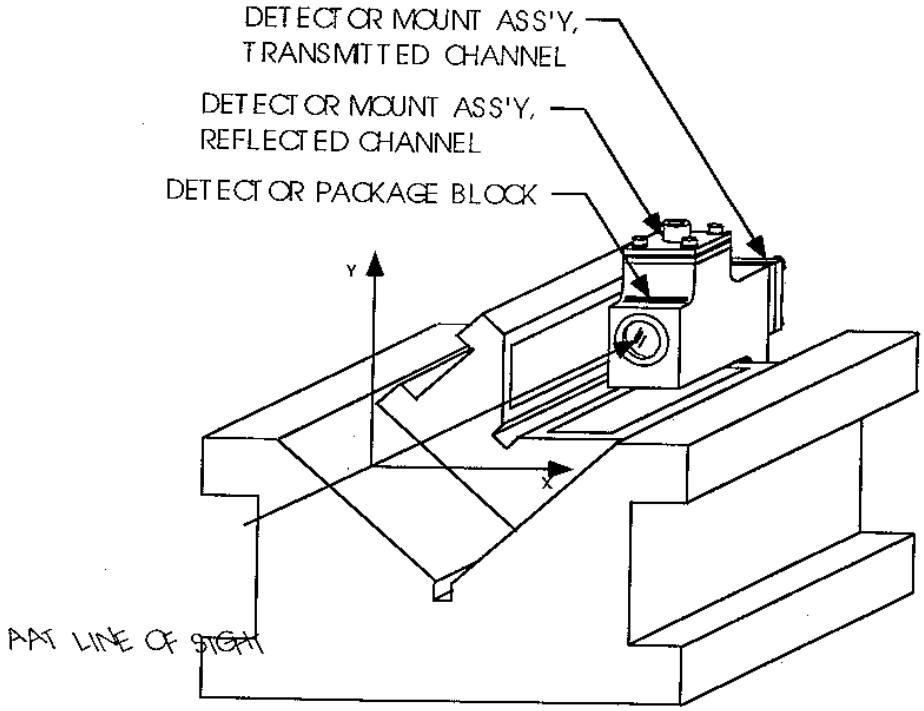


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.05 Rev. D

ECO 915

(Section 5 Detector Mount Sub-Assembly Build)

January 19 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 15

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

5. Detector Mount Sub-assembly Inspection

PDOC P0151 Section 5

DETECTOR MOUNT SUBASSEMBLY INSPECTION

To be performed by certified personnel. Certified personnel: Howard Demroff

Step #	Step Title	Summary and Description of Step/Comments
1	Visual Inspection	Inspect for cold solder joints, scratches or broken traces. Record findings for re-work if feasible.
2	Mount DMS in Assembly Jig	The DMS is mounted for wirebonding.
3	Wire Bond for Continuity Check	These temporary bonds will allow an end-to-end continuity check of the Subassembly. A circuit will be formed that goes down one trace and back another.
4	Continuity Check	Measure the resistance of traces in series.
5	Low Temperature Cycling	Cycle eight times in LN2.
6	Continuity Re-Check	Measure the resistance of traces in series at LN2 and room.
7	Wire Bond Removal and Cleaning	Remove these temporary wire bonds. Alcohol and de-ionized water rinse.

Final Buy Off **RE** _____ **Date** _____

Final Buy Off **QA** _____ **Date** _____

List of Test Equipment

Equipment	QA	Location
Multimeter	Lockheed Tool Bin with calibration sticker	Cedar B-13
Laminar Flow Bench	Class 100 Certification to be done	Cedar B13
Wirebonder	No Cal required (wirebonds are pull tested)	Cedar B13

Visual Inspection - Step #1

DMS number _____

1) Under a laminar flow bench inspect the DMS for the following;

a) Cold solder joints - All joints should show a uniform flow of solder around the pad with good wetting to the pin. Use the following diagram to identify joints for re-work.
Record Results:

_____
_____
_____
_____
_____

b) Cracks in Conductive Epoxy - Inspect the conductive epoxy holding down the gold pads for cracks.
Record Results:

_____
_____
_____
_____

c) Lifting or misaligned fingers - Inspect for lifting fingers or fingers which do not follow the curve of the platform and extend out.
Record Results:

_____
_____
_____
_____
_____
_____

Operator _____ **Date/Time** _____

See Figure titled *Visual Inspection-Step 1* at end of document

See Fgure titled *Mount DMS in Assembly Jig - Step #2* at end of document

See Figure titled *Wire Bond for Continuity Check* at end of document

Wire Bond for Continuity Check - Step #3

Wire bond diagram for the 12 temporary bonds

Continuity Check Step - # 4

1) Using the adapter cable (Micro-D to D25) connect the DMS to the D25 breakout box and measure the resistance of the following circuits. Connect one plug to the D25 breakout box jack in the first column and the second plug to the jack # in the second column and record the resistance of this circuit.

Breakout Box jack	Breakout Box jack	Resistance	Resistance after re-work (if necessary)
6	13		
21	25		
24	17		
3	4		
23	1		
16	10		
2	14		
5	11		
7	20		
9	22		
12	18		
8	19		

All resistance values must be less than 100 ohm Pass [ ] Fail [ ]

If part fails then inspect the temporary wirebond, and all relevant solder joints. Isolate the fault by checking the resistance of individual traces to the gold pads. OK to re-work solder joints.

Comments:

_____
_____
_____
_____
_____
__

Low Temperature Cycling - Step # 5

1) Place DMS in a 8 inch diameter conflat test dewar. Cover dewar with liquid nitrogen. Allow to cool. Then allow dewar to warm back up to room temperature.

2) Repeat between 2 and 5 more times and re-check the temporary bonds. Re-do any broken bonds as per step # 2.

1 _____ 2_____ 3_____ 4_____ 5_____ 6_____ _____
Comments (any observable damage?, record any changes or defects in solder joints):
_____
_____
_____
_____
_____

Continuity Re - Check at Room Temperature Step - # 6

1) Using the adapter cable (Micro-D to D25) connect the DMS to the D25 breakout box and measure the resistance of the following circuits. Connect one plug to the D25 breakout box jack in the first column and the second plug to the jack # in the second column and record the resistance of this circuit.

D25 connector pin #	D25 connector pin #	Resistance
6	13	
21	25	
24	17	
3	4	
23	1	
16	10	
2	14	
5	11	
7	20	
9	22	
12	18	
8	19	

All resistance values must be less than 100 ohm
Pass [ ] Fail [ ]

If part fails then inspect the temporary wirebond.
Re - work of solder joints at this point is not acceptable.

Comments:
_____
_____
_____
_____
_____

Operator _____ **Date/Time**

_____

Continuity Check at Liquid Nitrogen Temperature Step - # 6b

1) Using the adapter cable (Micro-D to D25) connect the DMS to the D25 breakout box and measure the resistance of the following circuits. Connect one plug to the D25 breakout box jack in the first column and the second plug to the jack # in the second column and record the resistance of this circuit while in liquid nitrogen.

Micro D connector pin #	Micro D connector pin #	Resistance
6	13	
21	25	
24	17	
3	4	
23	1	
16	10	
2	14	
5	11	
7	20	
9	22	
12	18	
8	19	

All resistance values must be less than 100 ohm
Pass [ ] Fail [ ]

If part fails then inspect the temporary wirebond.
Re - work of solder joints at this point is not acceptable.

Comments:
_____
_____
_____
_____
_____

Final Continuity Check at Room Temperature Step - # 6c

1) Using the adapter cable (Micro-D to D25) connect the DMS to the D25 breakout box and measure the resistance of the following circuits. Connect one plug to the D25 breakout box jack in the first column and the second plug to the jack # in the second column and record the resistance of this circuit.

Micro D connector pin #	Micro D connector pin #	Resistance
6	13	
21	25	
24	17	
3	4	
23	1	
16	10	
2	14	
5	11	
7	20	
9	22	
12	18	
8	19	

All resistance values must be less than 100 ohm
Pass [ ] Fail [ ]

If part fails then inspect the temporary wirebond.
Re - work of solder joints at this point is not acceptable.
Comments:
_____
_____
_____
_____
_____

DMS passes final inspection and is ready for mounting and alignment of circuit [

Operator _____ **Date/Time** _____

Wire Bond Removal and Cleaning - Step #7

1) Using titanium tweezers carefully remove the temporary wire bonds on the gold pads. Only the wire bond foot should remain.

2) Remove DMS from assembly jig and clean in 50-50 isopropanol and de-ionized water. Allow to dry under laminar flow hood.

3) Store in plastic box in cleanroom.

See figure titled *Pin Assignments* at end of document

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

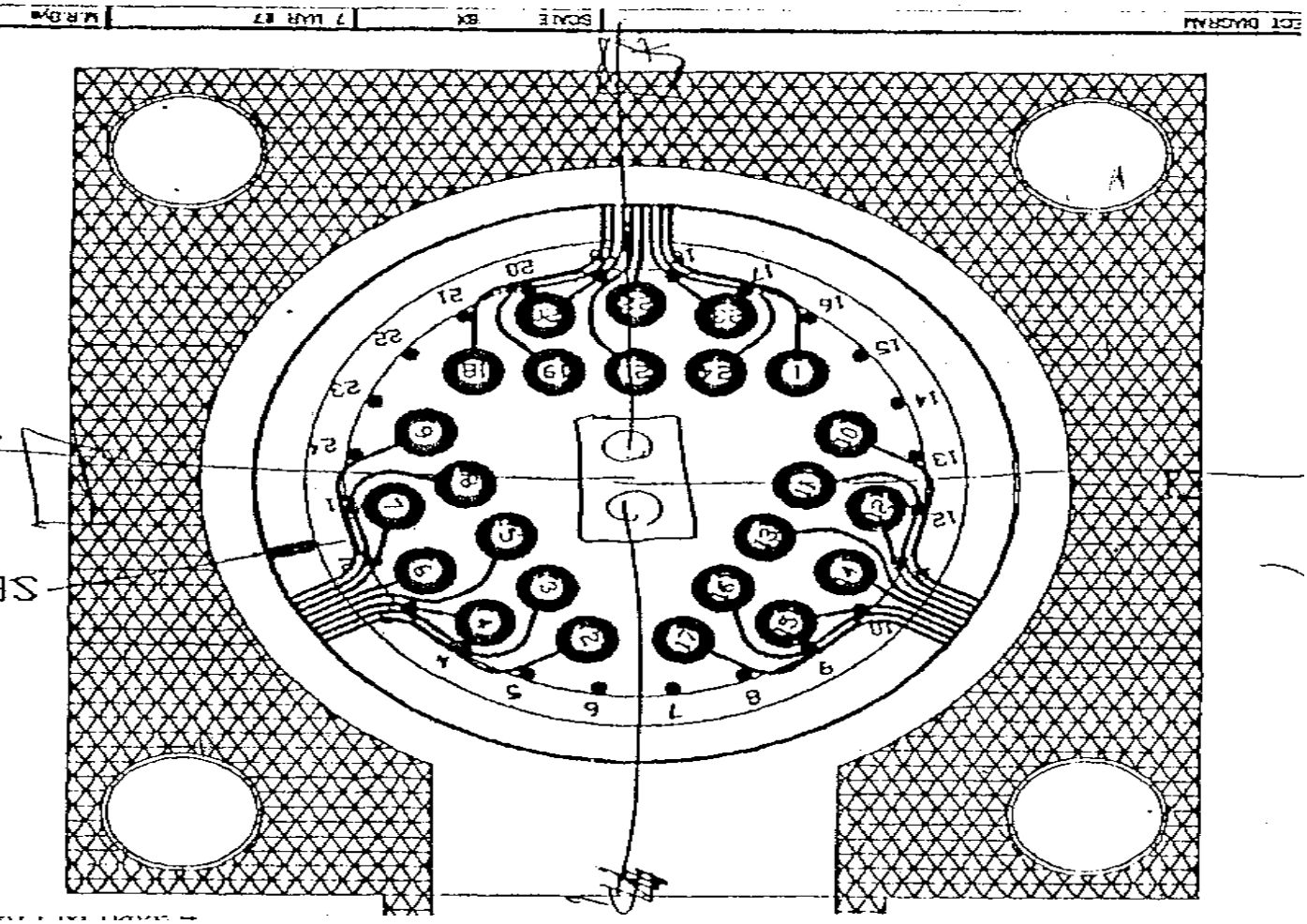
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

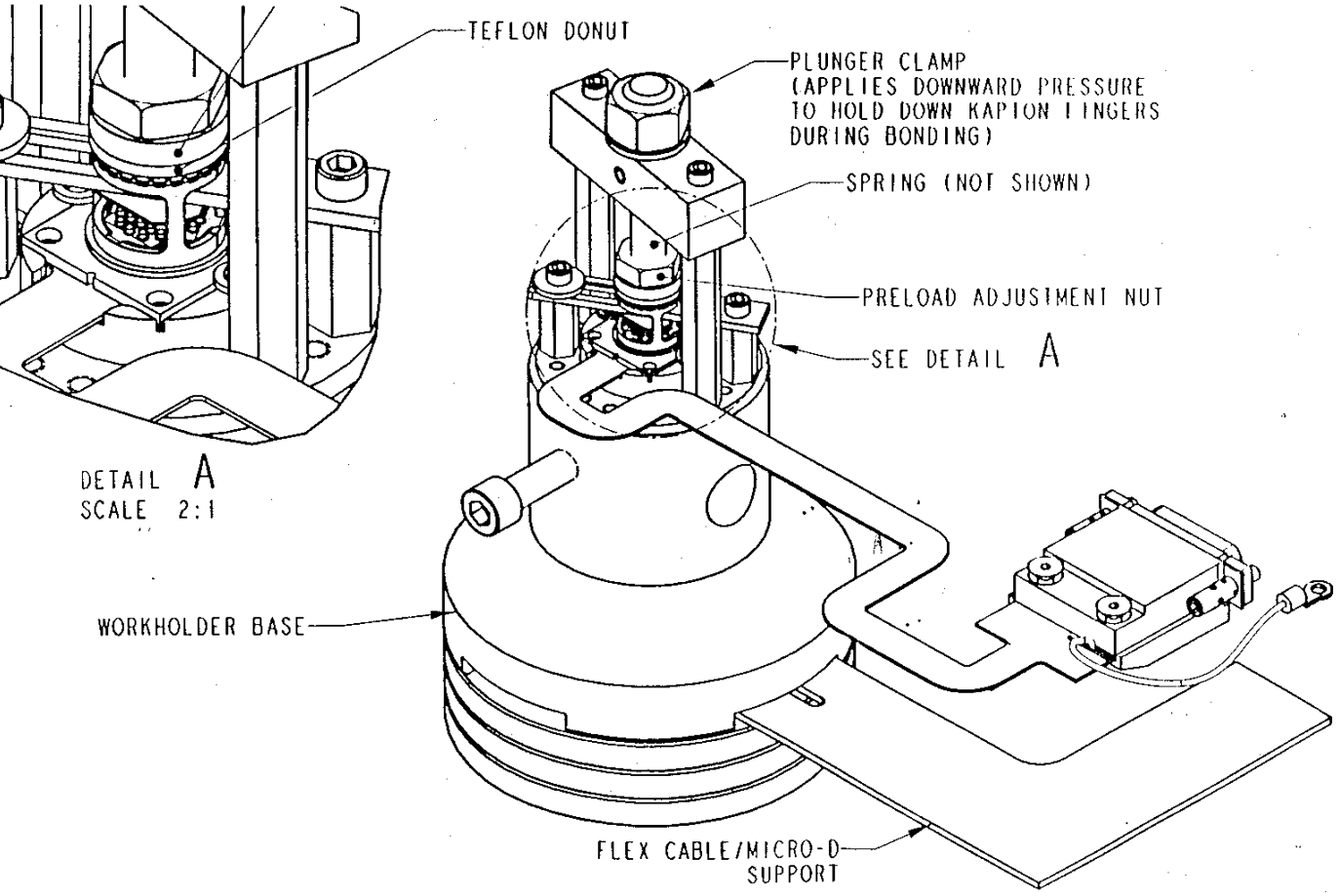
Visual Inspection - Step #1

Inspection Diagram

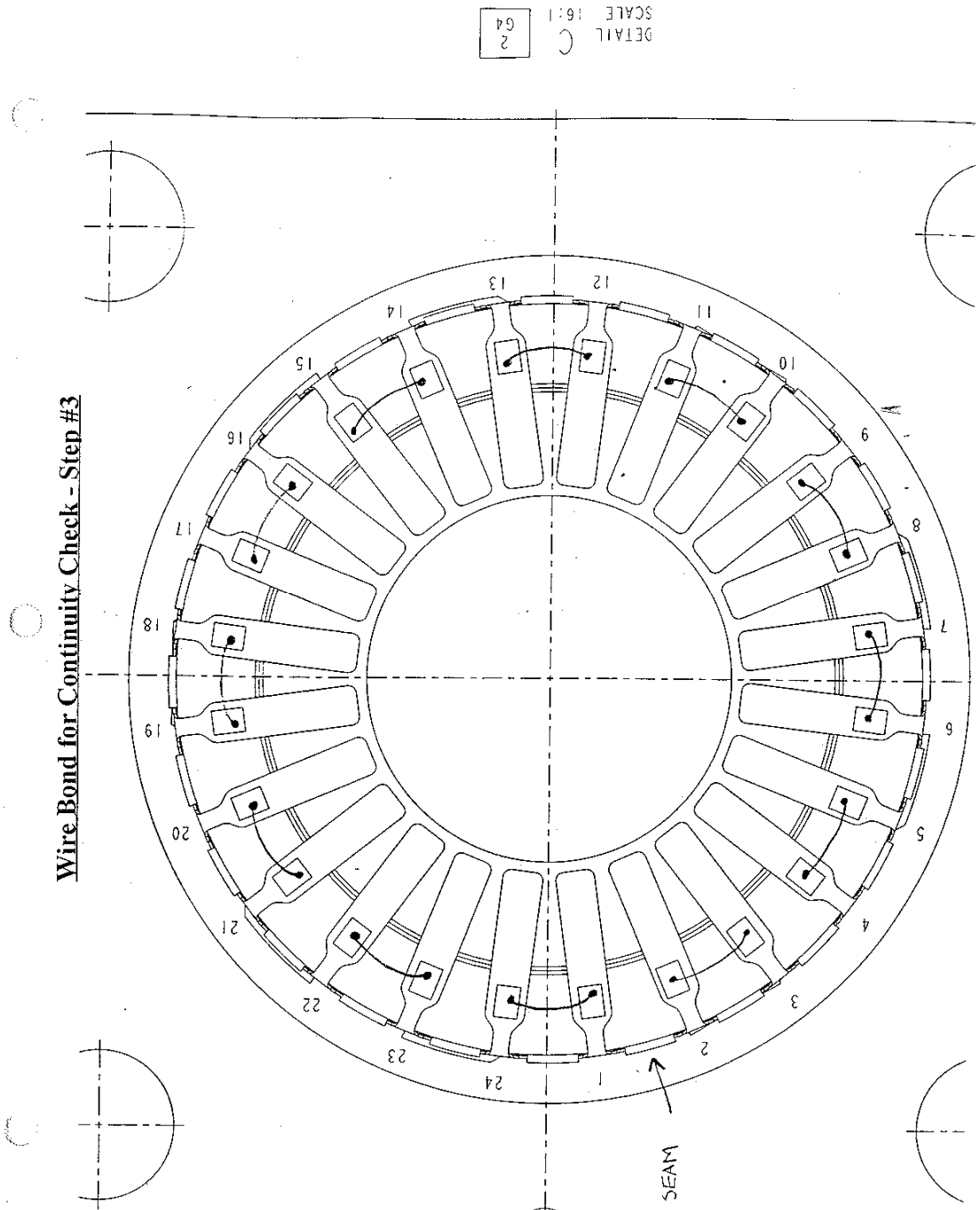


Mount DMS in Assembly Jig - Step #2

) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

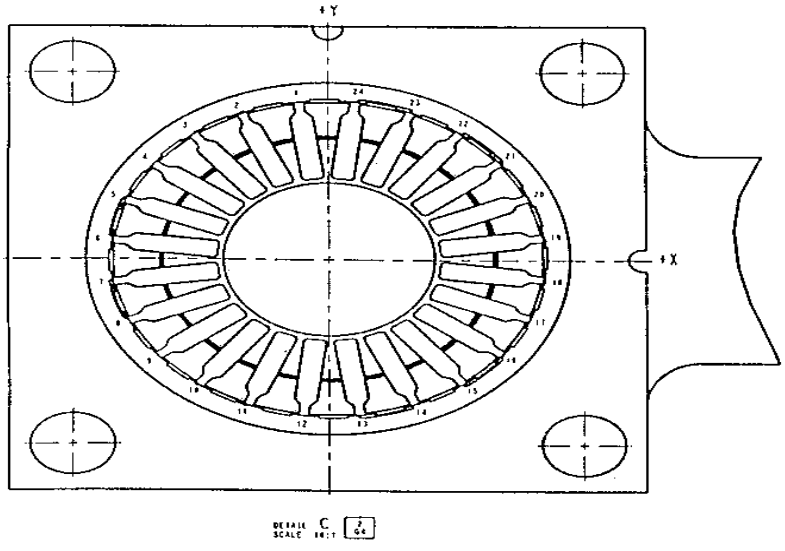


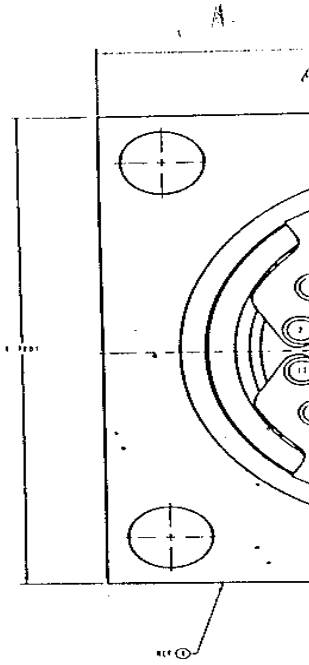
Wire Bond for Continuity Check - Step #3

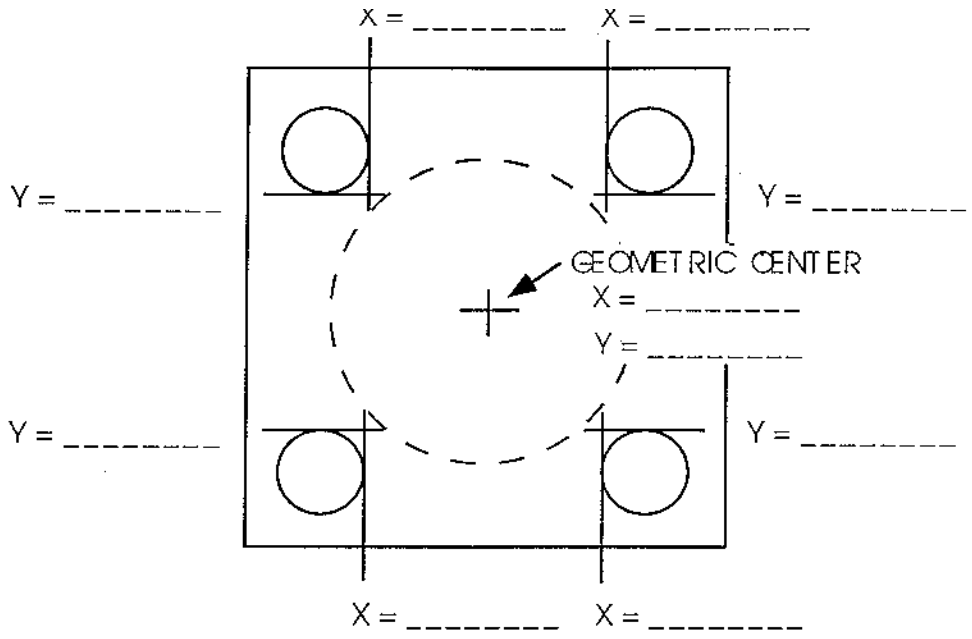


Appendix

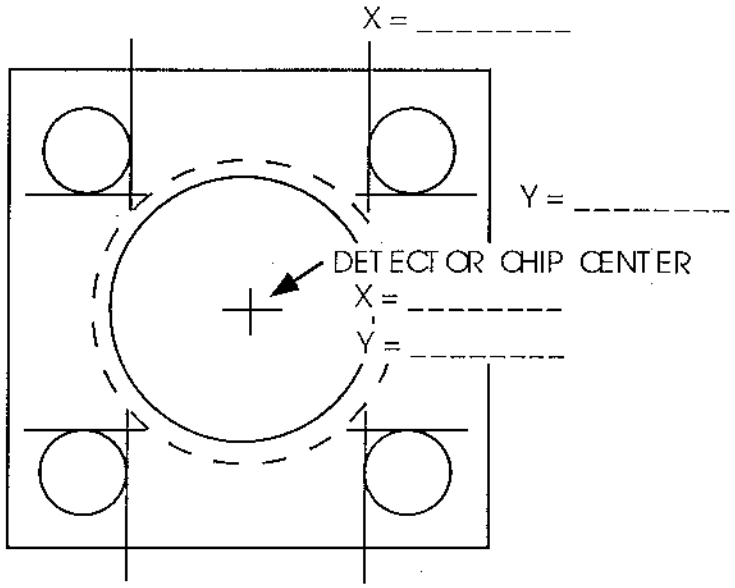
Pin Assignments



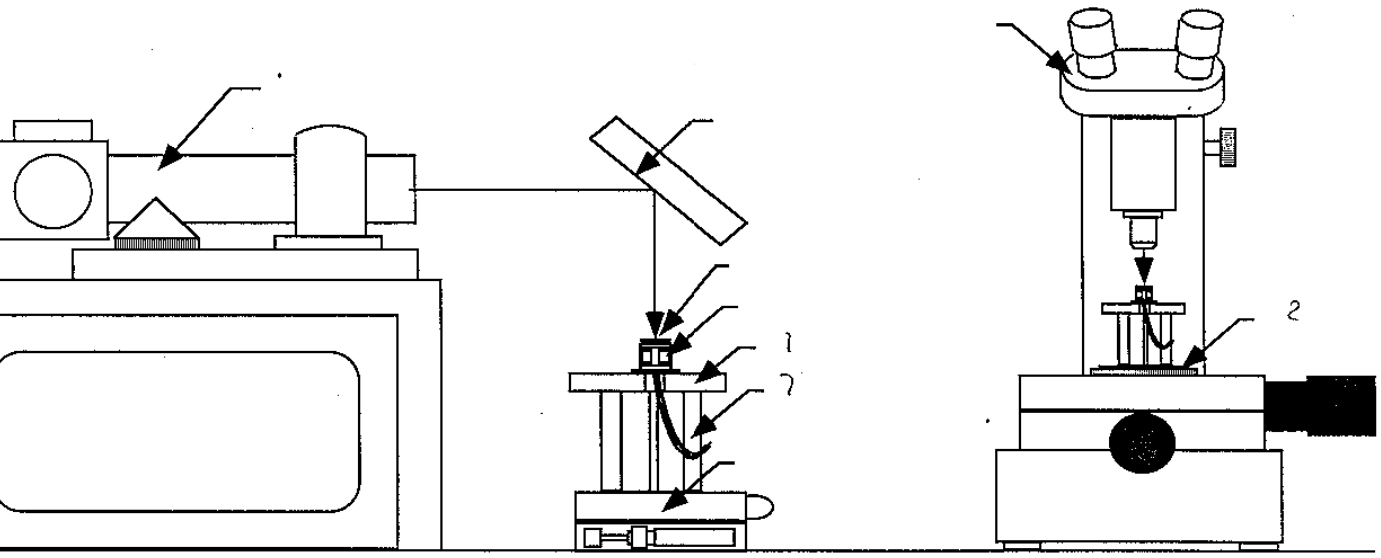




GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



F

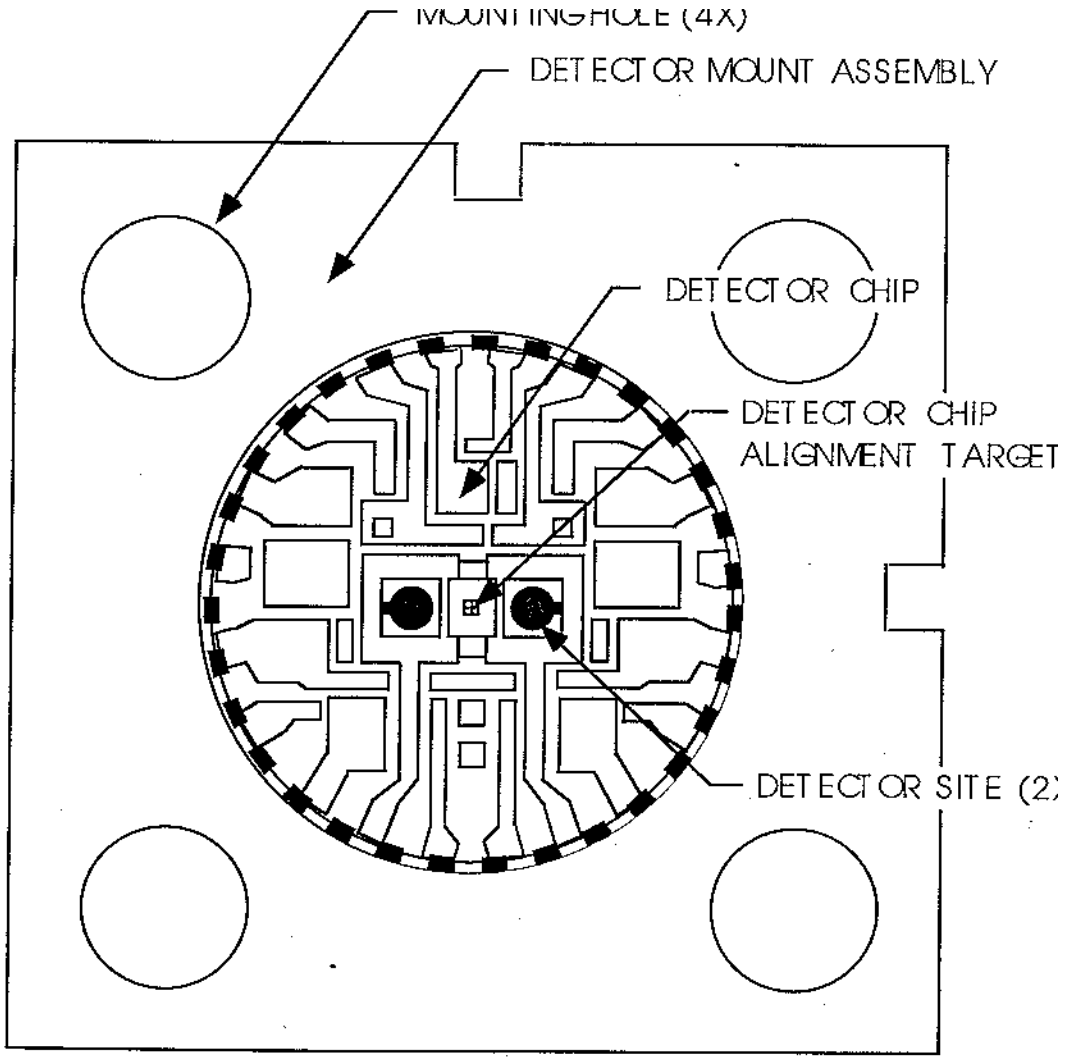


FIGURE 2 DETECTOR CHIP ORIENTATION

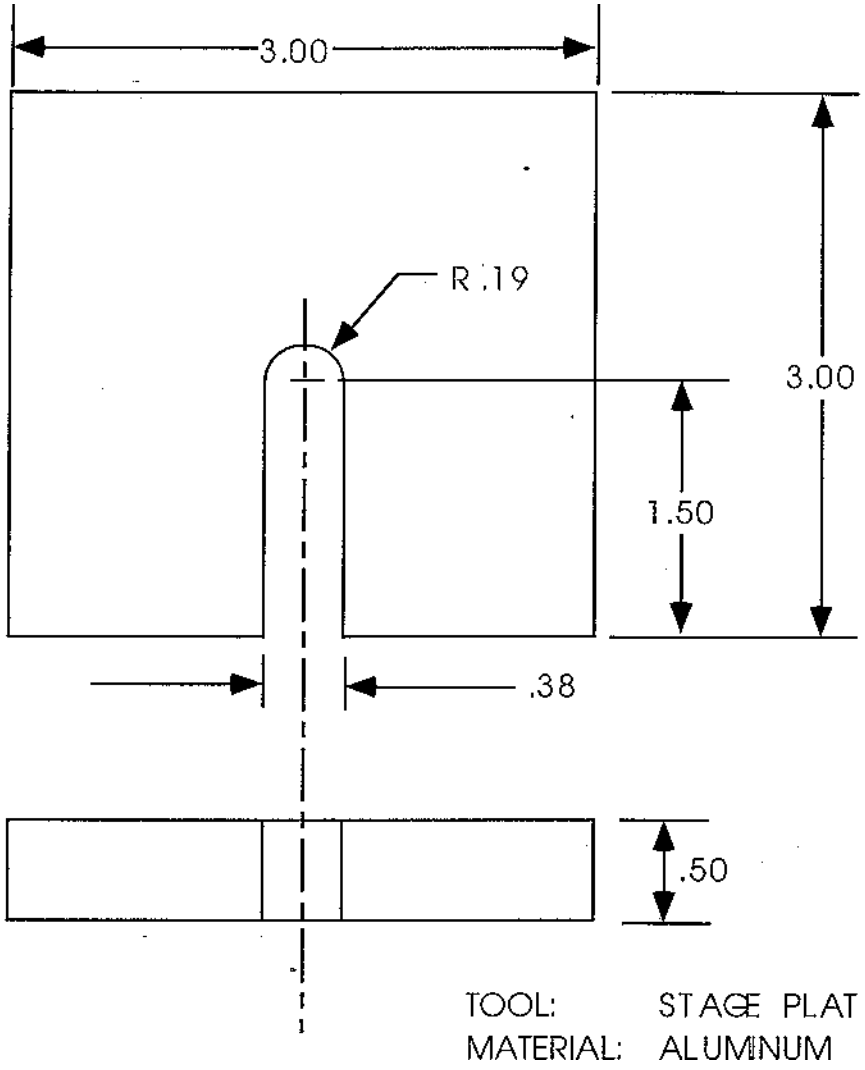
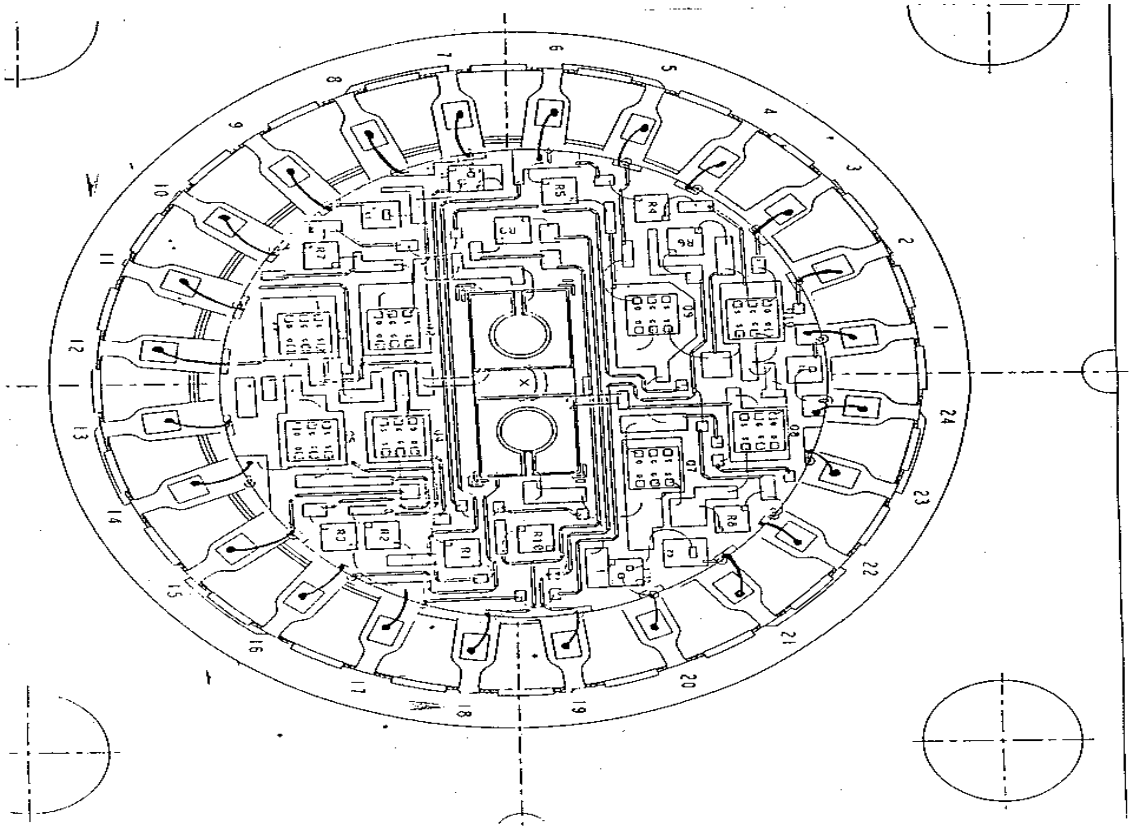
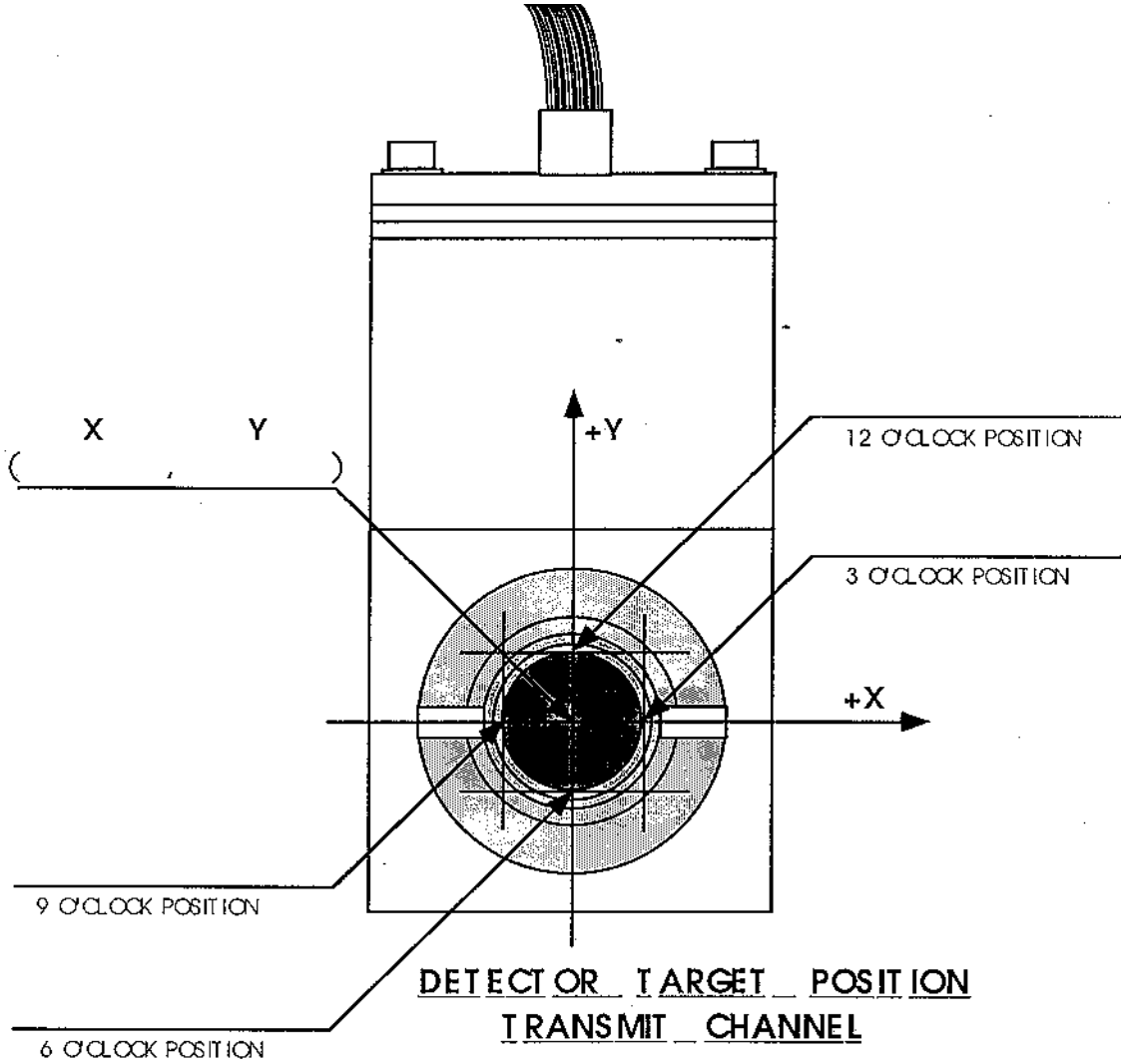


Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4



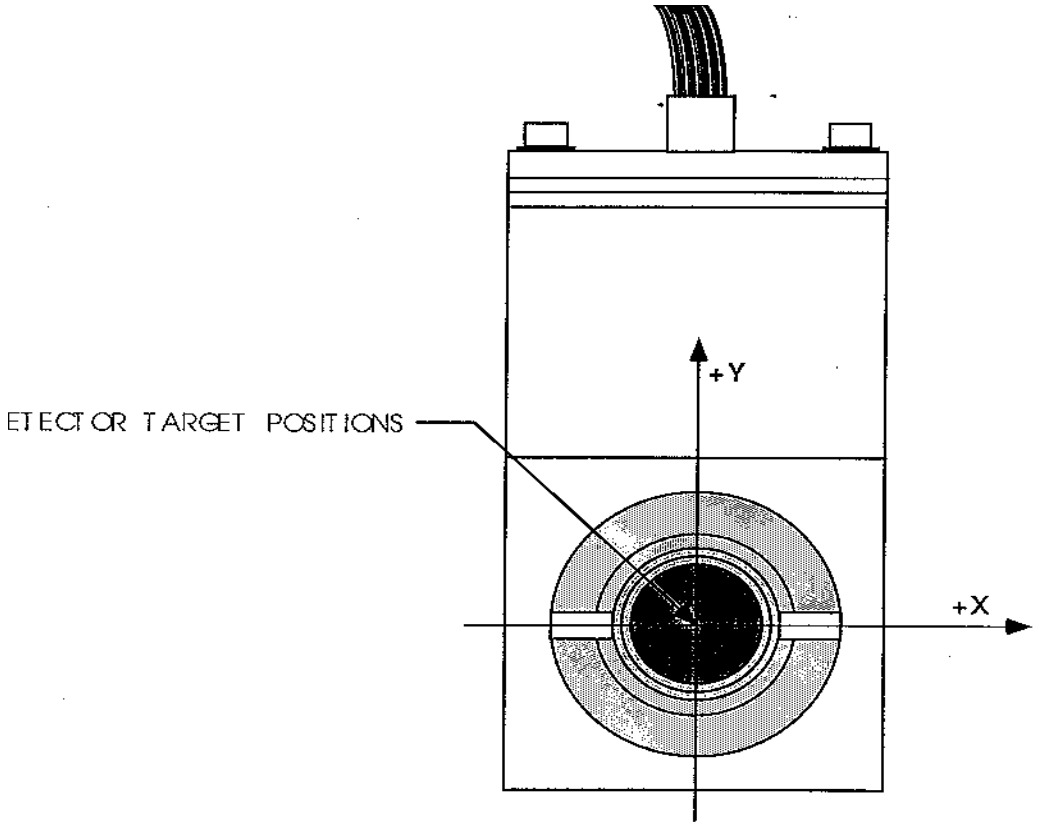


DETECTOR TARGET POSITION
TRANSMIT CHANNEL

X = _____

Y = _____

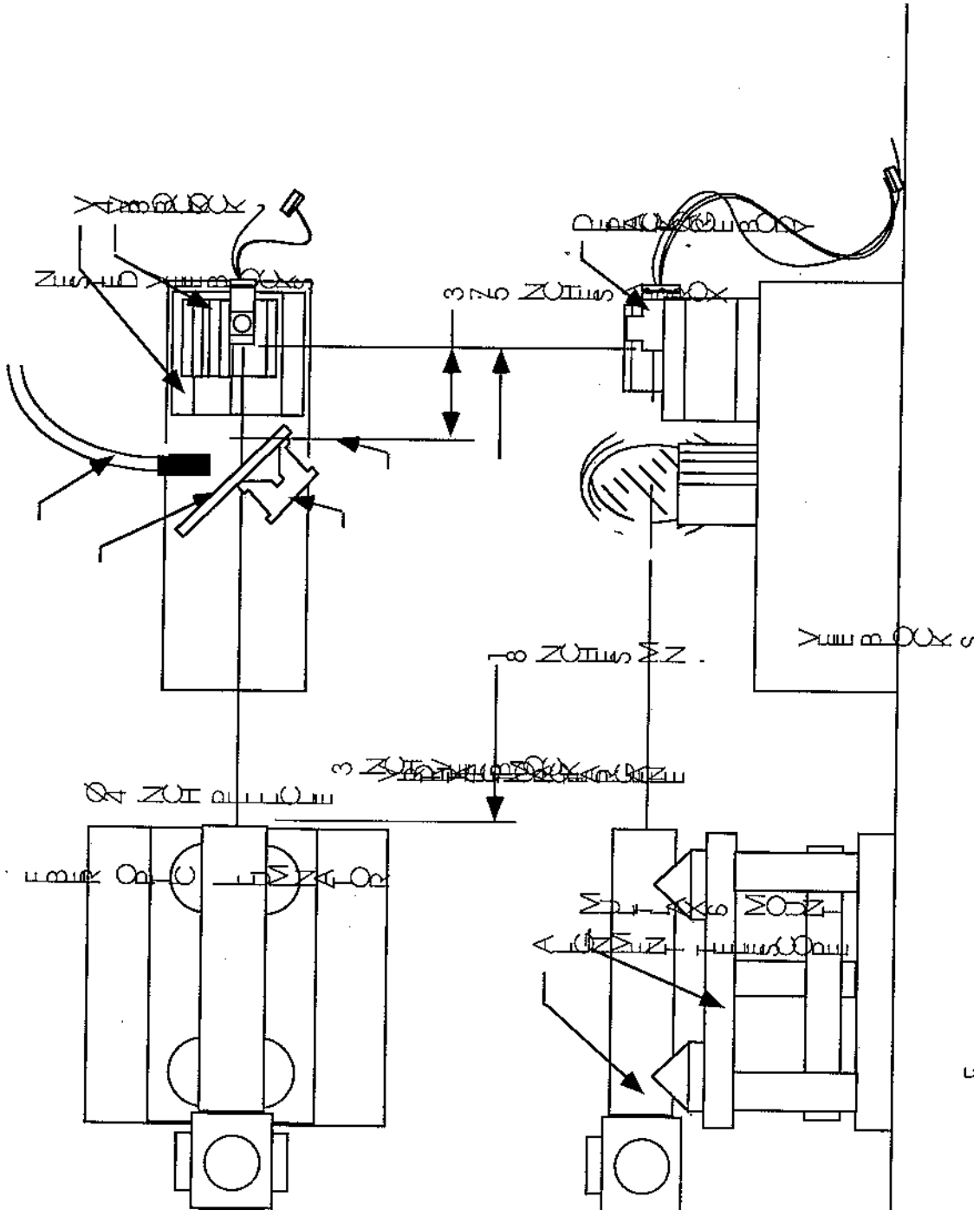
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



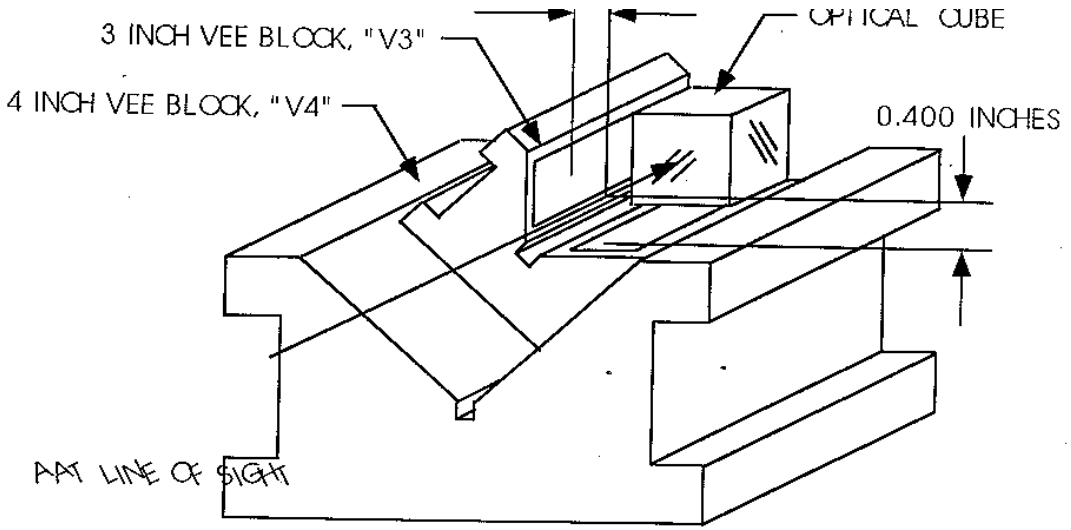


FIGURE 2A OPTICAL CUBE SET-UP

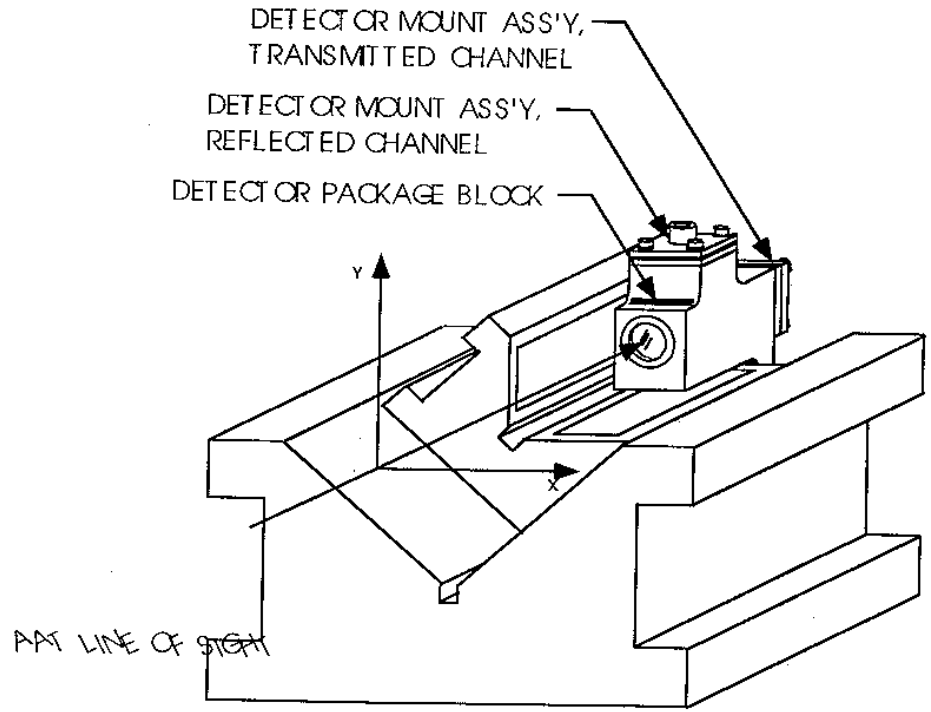


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.06 Rev. D

ECO 915

(Section 6 Assembly and Circuit Integration)

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1 Thermal Isolator Fabrication	P0151.01
Section 2 Visual Inspection of Isolator	P0151.02
Section 3 Detector Cable/Connector Fabrication	P0151.03
Section 4 Detector Mount Assembly Build	P0151.04
Section 5 Detector Mount Assembly Inspection	P0151.05
Section 6 Assembly and Circuit Integration	P0151.06
Section 7 Detector Mount Assembly Build	P05151.07
Section 8 Lens Assembly Build	P0151.08
Section 9 Detector Package Assembly Build	P0151.09
Section 10 Detector Package Assembly Optical Alignment	P0151.10
Section 11 Magnetic Scrutiny	P0151.11
Section 12 Record As-Built Configuration in Dtabase	P0151.12
Figures	16

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

6. Assembly and Circuit Integration (no part number)

1.0 Introduction

This document contains the step-by-step procedural methodology to optically align and epoxy the Detector Chip to the Detector Mount Assembly (DMA). Also incorporated are procedures to establish the optical test set-up.

There are two test setups that can be used, one using a 10X to 30X Toolmaker's Microscope with X-Y Stage or equivalent (preferred), or a 30X Dual Axis Autocollimating Alignment Telescope-based set-up. Each test set-up requires a specific procedure test equipment set-up. The chip alignment procedure is sufficiently generic to be common to both test set-ups. These two test set-ups are depicted in Figure 1.

2.0 Description

The objective of this test procedure is the bonding of the Detector Chip centered to the Detector Mount Assembly. This is performed using optical tooling in conjunction with the procedures in Section 4.

Detector alignment is a two (2) step process. The first step conducts the measurement of the DMA-Detector Package Body (DPB) interface feature locations to determine the assembly's geometric center location. The second step performs the bonding and decenter and clocking alignment of the detector chip to the geometric center of the mount. Alignment is monitored during epoxy cure to insure proper alignment has been achieved.

2.1 Alignment Tolerances

The applicable detector chip alignment tolerances are as follows:

Decenter to Measured Mount Center Location:	± 0.003 inches X, ± 0.003 inches Y
Clocking to Mount Feature Geometry:	Detector axis orthogonal 0.002 inches
Measurement Repeatability per feature:	± 0.001 inches
Measurement Accuracy:	± 0.001 inches over 1 inch travel

2.2 Reference Features

DMA Geometric Center:	DPB Mounting Holes (4x), as-built hole pattern geometry
DMA Clocking Axis:	DPB Mounting Holes (4x), orthogonal to pattern geometry
Detector Chip Center:	Decenter Target (integral to chip)
Detector Chip Clocking Axis:	Detector Sites, (2x)

3.0 Test Equipment

The following test equipment or equivalent shall be used to perform alignments per the procedures contained herein.

3.1 Equipment List, Measuring Microscope Method (See Section 4.1)

The following test equipment or equivalent shall be used to perform alignments per the procedures contained in Section 4.1.

Item	Description	Quantity
Microscope, Measuring	10X to 30X; X,Y Stage w/ 1 inch range	(1)
Stage Plate	Special Tool Item, See Figure 3	(1)
Vee Block, 3”	Standard Shop Tool Item	(1)
Tape	Double-Sided	(A/R)
Tape	Single-Sided, Kapton or equiv.	(A/R)
Epoxy	Fast Drying “5 Minute”-type	(A/R)
Wrist Strap	Anti-static	(1)
Cotton Applicators		(A/R)
Latex Gloves		(A/R)

3.2 Equipment List, Alignment Telescope Method (See Section 4.2)

The following test equipment or equivalent shall be used to perform alignments per the procedures contained in Section 4.2.

Item	Description	Quantity
Alignment Telescope	30X; Dual Axis; Autocollimating	(1)
Mount, Align. Telescope	Standard Dual Axis	(1)
Fold Mirror, Flat	45º mounted,Ø 3 inch minimum	(1)
Tooling Mirror, Flat	(3) Pad, Ø 3 inch minimum	(1)
X,Y Micrometer Stage	1 inch travel, 2 X 2 inch platform min.	(1)
Stage Plate	Special Tool Item, See Figure 3	(1)
Vee Block, 3”	Standard Shop Tool Item	(1)
Tape	Double-Sided	(A/R)
Tape	Single-Sided, Kapton or equiv.	(A/R)
Epoxy	Fast Drying “5 Minute”-type	(A/R)
Wrist Strap	Anti-static	(1)
Cotton Applicators		(A/R)
Latex Gloves		(A/R)

3.3 Equipment List, Flight Hardware

The following flight hardware items form a part of this procedure to an extent described herein.

Item	Description	Quantity
Detector Mount Assembly	Part No. 25412	(1)
Epoxy	Stycast 1266	(A/R)

3.4 Special Precautions

Contamination sensitivity: All work to be performed on typical lab environment with 100K or better cleanliness.

Static Sensitivity: All Detector Chip-related handling requires use of ESD precautionary measures, primarily the use of grounded anti-static wrist straps.

4.0 Test Procedures

The following sections detail the step-by-step processes for test equipment set-up and it’s use in conduct of detector chip alignment.

4.1 Detector Chip Alignment Procedure, Measuring Microscope Method

Note: Refer to test set-up detail contained in Figure 1.

Step	Activity	Check
4.1.1	Double-side tape Stage Plate to face of Vee Block. Plate slot to be over the vee opening and oriented so as to point radically outward from the vee vertex.	_____
4.1.2	Double-side tape vee block to the microscope's glass stage plate, placing the stage plate slot geometry rough-centered to the glass plate	_____
4.1.3	Place double-sided tape around stage plate slot, approximately 1/2 border.	_____
4.1.4	Place the glass stage plate and attached items onto the microscope Ø stage. Secure the glass plate to the stage using single-sided tape	_____
4.1.5	Remove Detector Mount Assembly from protective carrier and attach to the stage plate on the double-sided tape. Secure wire bundle with single-sided tape to the microscope leaving strain-relief to allow 2 inch free travel of the micrometer stages.	_____
4.1.6	Verify Detector Mount Assembly is secure to the stage plate	_____
4.1.7	Sight on a detector mount hole with the microscope and translate the micrometer stages to define measurement axes directionality. Clock the Reticle Eyepiece to set the crosshairs orthogonal to the observed motion. Secure the Reticle Eyepiece from rotation with single-sided tape.	_____
4.1.8	Sight on a pair of mounting holes and rotate the microscope's Ø stage as required to set the mount hole pattern orthogonal to the microscope crosshairs ± 0.0005 inches or less.	_____
Note:	The following steps conduct Detector Chip alignment. The horizontal micrometer stage shall be defined as the X axis stage, the vertical stage shall be the Y axis stage. All Data shall be recorded onto Data Sheet 4.1.	
4.1.9	Translate to the upper right Detector Mount Assembly mounting hole and define it's location: • Center onto the hole inside diameter at the 9 o'clock position and zero the X Axis Micrometer. • Center onto the hole inside diameter at the 6 o'clock position and zero the Y Axis Micrometer.	_____
4.1.10	Translate to the upper left Detector Mount Assembly mounting hole and define it's location: • Center onto the hole inside diameter at the 3 o'clock position and record the X Axis Micrometer reading. • Center onto the hole inside diameter at the 6 o'clock position and record the Y Axis Micrometer reading.	_____
4.1.11	Translate to the lower left Detector Mount Assembly mounting hole and define it's location:	_____

- Center onto the hole inside diameter at the 3 o'clock position and record the X Axis Micrometer reading.
- Center onto the hole inside diameter at the 12 o'clock position and record the Y Axis Micrometer reading.

4.1.12 Translate to the lower right Detector Mount Assembly mounting hole and define it's location: _____
- Center onto the hole inside diameter at the 9 o'clock position and record the X Axis Micrometer reading.
- Center onto the hole inside diameter at the 12 o'clock position and record the Y Axis Micrometer reading.

4.1.13 Calculate the micrometer reading for the Geometric Center of the Detector Mount Assembly mounting holes from the recorded data. _____

4.1.14 Translate to the Geometric Center position.

4.1.15 Add epoxy 1266 to the Detector Mount Assembly chip carrier surface and distribute to form a uniform thin film. Record bonding start time. _____

4.1.16 Review Figure 2 and note chip orientation relative to the Detector Mount Assembly baseplate. _____

4.1.17 Install the detector chip onto the Detector Mount Assembly _____

Note: Pot life for the epoxy is approximately 2 hrs. Conduct and monitor detector chip alignment accordingly. Allow minimum 12 hr cure prior to performing post-cure end-item alignment measurement and subsequent Detector Mount Assembly handling.

4.1.18 Using applicator stick, or equivalent, translate the chip as-required to center the chip's alignment target to the mount Geometric Center (crosshair center) and clock the chip as-required to set the detector axis parallel to the appropriate reticle crosshair. _____

Decenter to Mount Geometric Center Location: ± 0.005 inches X
± 0.005 inches Y

Clocking to Mount Feature Geometry: ±0.002 inches

Note: The following steps conduct Detector Chip post-cure end-item alignment. All data shall be recorded onto Data Sheet 4.1.

4.1.19 Reverify crosshair-to-micrometer stage orthogonality: _____
Sight on a detector mount hole with the microscope and translate the micrometer stages to define measurement axes directionality. Clock the Reticle Eyepiece to set the crosshairs orthogonal to the observed motion. Secure the Reticle Eyepiece from rotation with single-sided tape.

4.1.20 Reverify Detector Mount Assembly -to-micrometer stage orthogonality: _____
Sight on a pair of mounting holes and rotate the microscope's Ø stage

as required to set the mount hole pattern orthogonal to the microscope crosshairs ± 0.0005 inches or less.

4.1.21 Translate to the upper right Detector Mount Assembly mounting hole and define it's location: _____
- Center onto the hole inside diameter at the 9 o'clock position and zero the X Axis Micrometer.
- Center onto the hole inside diameter at the 6 o'clock position and zero the Y Axis Micrometer.

4.1.22 Translate to the Detector Chip alignment target. Measure the X and Y position of the target and measure the detector axis parallelism to the appropriate crosshair. _____

4.2 Detector Chip Alignment Procedure, Alignment Telescope Method

Note: Refer to test set-up detail contained in Figure 1.

Step	Activity	Check
4.2.1	Set-up the alignment telescope horizontal in a multi-axis mount about 12 inches above the work bench surface. Secure mount in place by staking with fast drying epoxy.	_____
4.2.2	Set-up the fold mirror about 6 inches in front of the alignment telescope oriented to reflect the line of sight down. Secure in place by staking with fast drying epoxy.	_____
4.2.3	Place the two-axis micrometer stage, set to midrange, under the fold mirror. Centered to the telescope reflected line of sight visually. Secure in place by staking with fast drying epoxy.	_____
4.2.4	Place tooling mirror on the two-axis micrometer stage and adjust the alignment telescope normal to it via autocollimation, ± 1 arc min.	_____
4.2.5	Sight on a micrometer stage feature and translate the stages. Clock the telescope to set it's crosshairs orthogonal to the observed stage motion with no visible error.	_____
4.2.6	Double-side tape Stage Plate to face of Vee Block. Plate slot to be over the vee opening and oriented so as to point radially outward from the vee vertex.	_____
4.2.7	Place double-sided tape around stage plate slot, approximately 1/2 border.	_____
4.2.8	Remove Detector Mount Assembly from protective carrier and attach to the stage plate on the double-sided tape. Secure wire bundle with single-sided tape to the Vee Block	_____
4.2.9	Place the Vee Block and attached items onto the micrometer stage. Rough center visually and clock the Detector Mount Assembly features to the telescope crosshairs without visible error. Secure Vee block in place by staking with fast drying epoxy.	_____

Note: The following steps conduct Detector Chip alignment. The horizontal micrometer stage shall be defined as the X axis stage,the vertical stage shall be the Y axis stage. The observed image is correct left-to-right and will be inverted vertically .All Data shall be recorded onto Data Sheet 4.1.

4.2.10 Zero the alignment telescope micrometers and maintain at these settings. _____

4.2.11 Translate to the upper right Detector Mount Assembly mounting hole and define it's location: _____
- Center onto the hole inside diameter at the 9 o'clock position and record the X Axis Micrometer.
- Center onto the hole inside diameter at the 6 o'clock position and record the Y Axis Micrometer.

4.2.12 Translate to the upper left Detector Mount Assembly mounting hole and define it's location: _____
- Center onto the hole inside diameter at the 3 o'clock position and record the X Axis Micrometer reading.
- Center onto the hole inside diameter at the 6 o'clock position and record the Y Axis Micrometer reading.

4.2.13 Translate to the lower left Detector Mount Assembly mounting hole and define it's location: _____
- Center onto the hole inside diameter at the 3 o'clock position and record the X Axis Micrometer reading.
- Center onto the hole inside diameter at the 12 o'clock position and record the Y Axis Micrometer reading.

4.2.14 Translate to the lower right Detector Mount Assembly mounting hole and define it's location: _____
- Center onto the hole inside diameter at the 9 o'clock position and record the X Axis Micrometer reading.
- Center onto the hole inside diameter at the 12 o'clock position and record the Y Axis Micrometer reading.

4.2.15 Calculate the micrometer reading for the Geometric Center of the Detector Mount Assembly mounting holes from the recorded data. _____

4.2.16 Translate the stages to the Geometric Center position readings. Reverify: Zero the alignment telescope micrometers and maintain at these settings _____

4.2.17 Add epoxy to the Detector Mount Assembly chip carrier surface and distribute to form a uniform thin film. Record bonding start time. _____

4.2.18 Review Figure 2 and note chip orientation relative to the Detector Mount Assembly baseplate. _____

4.2.19 Install the detector chip onto the Detector Mount Assembly _____

Note: Pot life for the epoxy is approximately 2 hrs. Conduct and monitor

detector chip alignment accordingly. Allow minimum 12 hr cure prior to performing post-cure end-item alignment measurement and subsequent Detector Mount Assembly handling.

4.2.20 Using applicator stick, or equivalent, translate the chip as-required to center the chip's alignment target to the mount Geometric Center (crosshair center) and clock the chip as-required to set the detector axis parallel to the appropriate reticle crosshair. _____

Decenter to Mount Geometric Center Location: ± 0.005 inches X
± 0.005 inches Y

Clocking to Mount Feature Geometry: ±0.002 inches

Note: The following steps conduct Detector Chip post-cure end-item alignment. All Data shall be recorded onto Data Sheet 4.1.

4.2.21 Reverify crosshair-to-micrometer stage orthogonality: _____
Sight on a micrometer stage feature and translate the stages. Clock the telescope to set it's crosshairs orthogonal to the observed stage motion with no visible error.

4.2. 22 Reverify Detector Mount Assembly -to-micrometer stage orthogonality: _____
Rough center visually and clock the Detector Mount Assembly features to the telescope crosshairs without visible error. Secure Vee block in place by restaking with fast drying epoxy.

4.2.23 Translate to the upper right Detector Mount Assembly mounting hole and define it's location: _____
- Center onto the hole inside diameter at the 9 o'clock position and record the X Axis Micrometer.
- Center onto the hole inside diameter at the 6 o'clock position and record the Y Axis Micrometer.

4.2.24 Translate to the Detector Chip alignment target. Measure the X and Y position of the target and measure the detector axis parallelism to the appropriate crosshair. Use this and previously recorded data to determine end-item alignment. _____

See figure titled
Geometric Center, Detector Mount Assembly Mounting Hole Pattern
at end of document.s

See figure titled *End-Item Post Cure Chip Alignment* at end of document

See figure titled *Detector Circuit Alignment Schematic* at the end of document

See figure titled

DETECTOR CHIP ORIENTATION

at end of document

See figure titled *Figure* 3 *Stage Plate Tool* at end of document

Package

4.2.25 Place completed assembly and holding fixture in container.

Mark package with the following :

Detector mount subassembly part number 25681-_____

Detector mount subassembly serial number_____

Circuit Assembly serial number_____

Date_____

4.2.26 Store container in cabinet.

Authorized personnel - Jeff Young

Completed by_____Date_____
Signature

Notes/Discrepancies (if any):

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

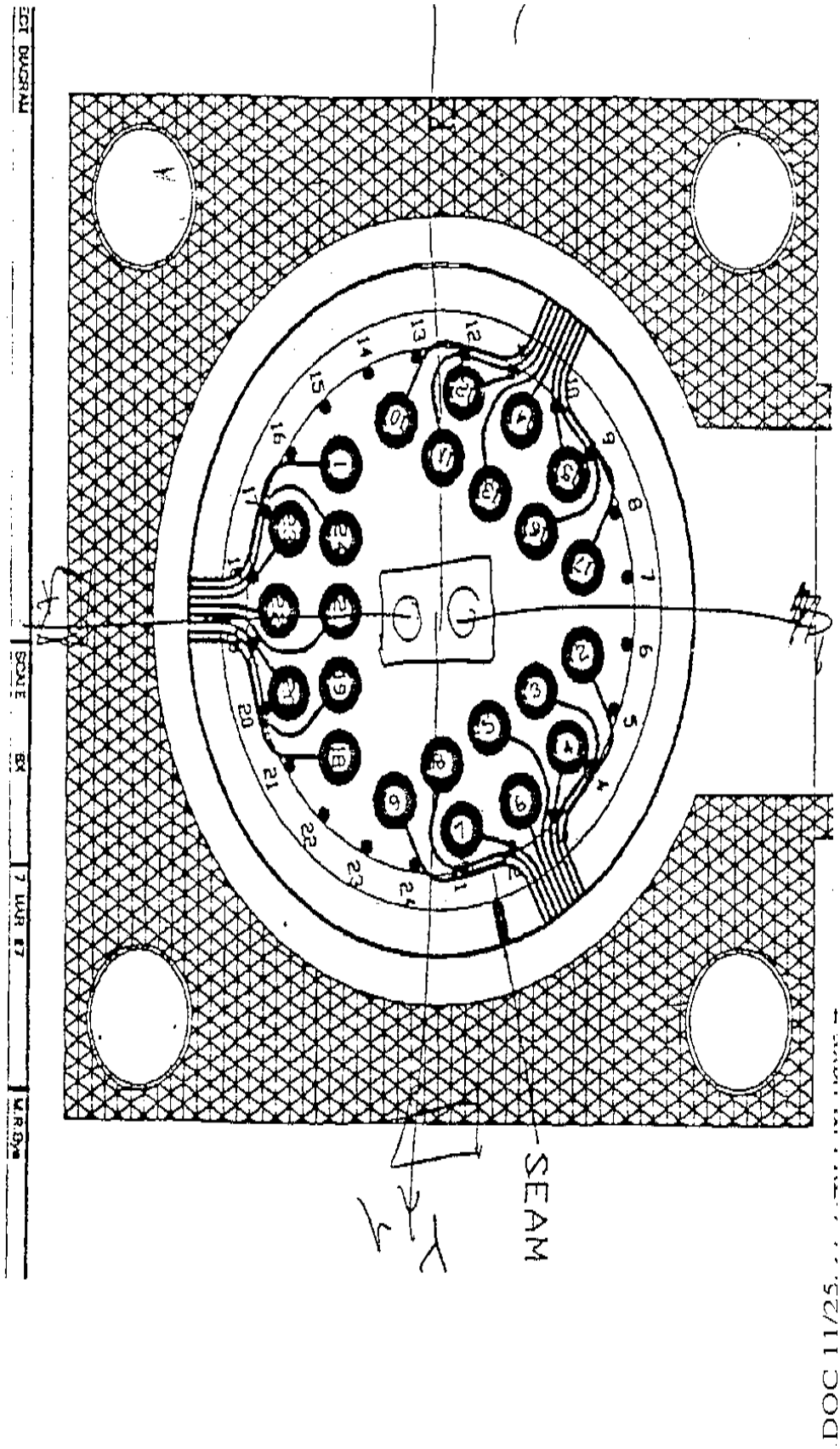
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

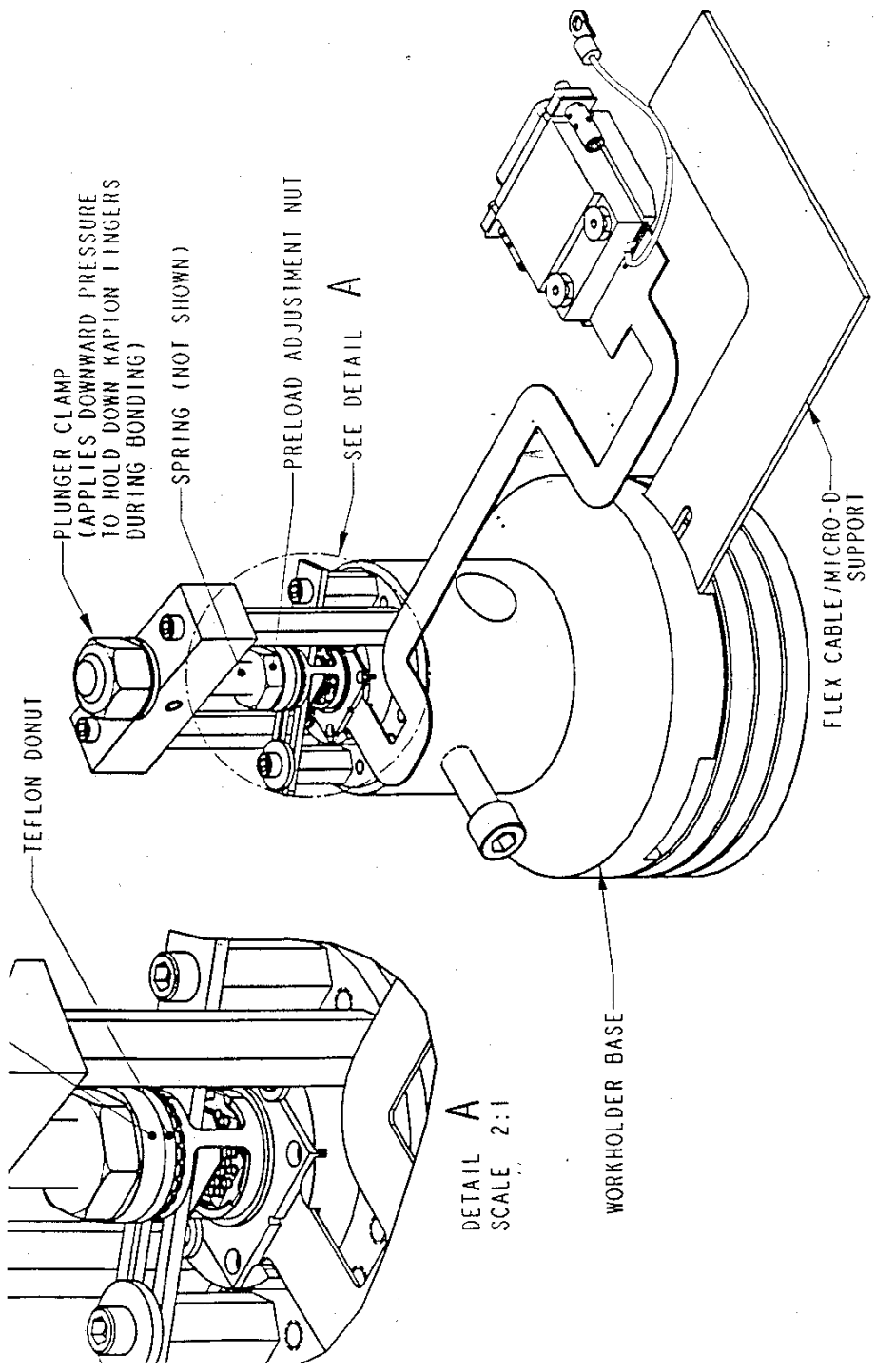
Visual Inspection - Step #1

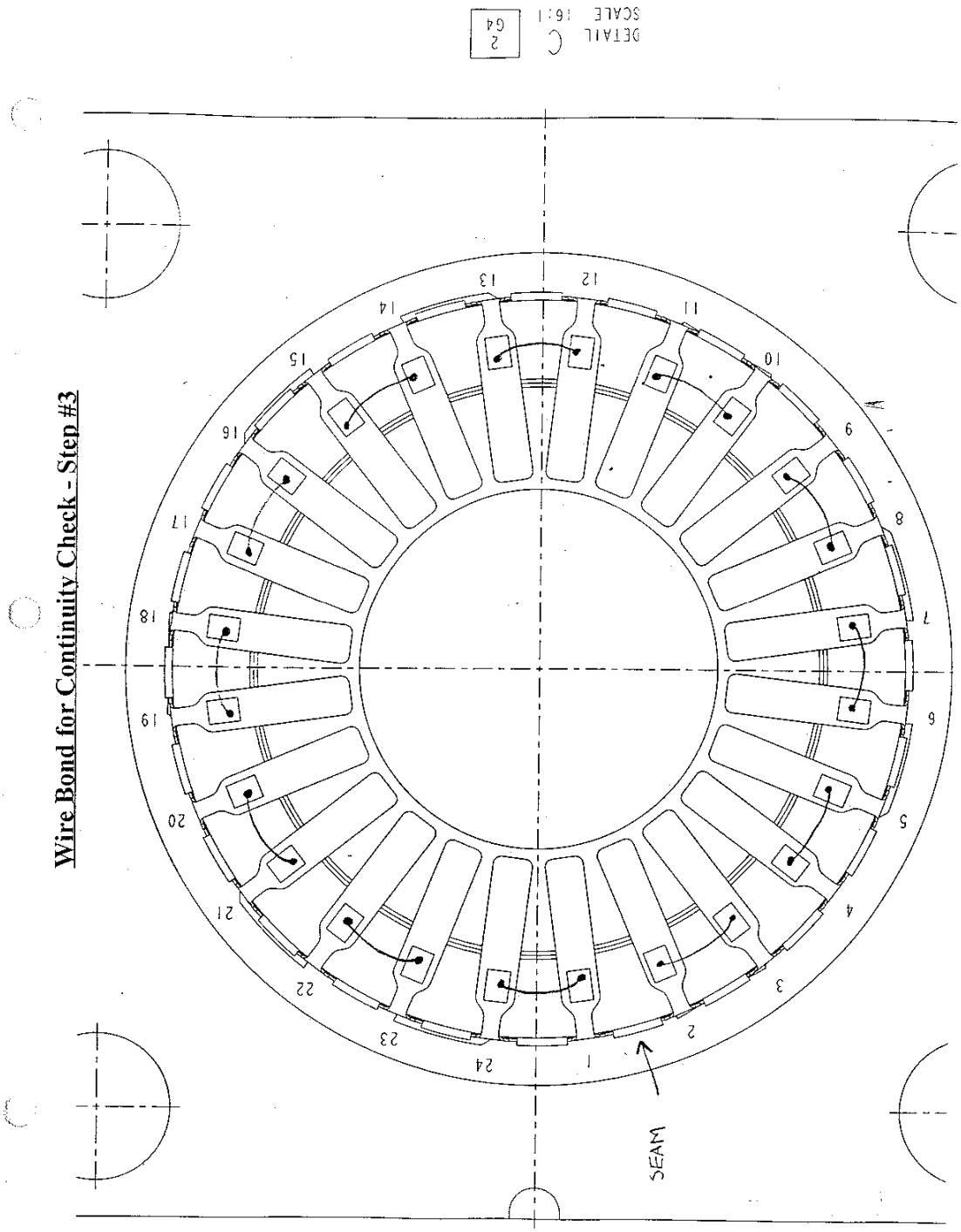
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

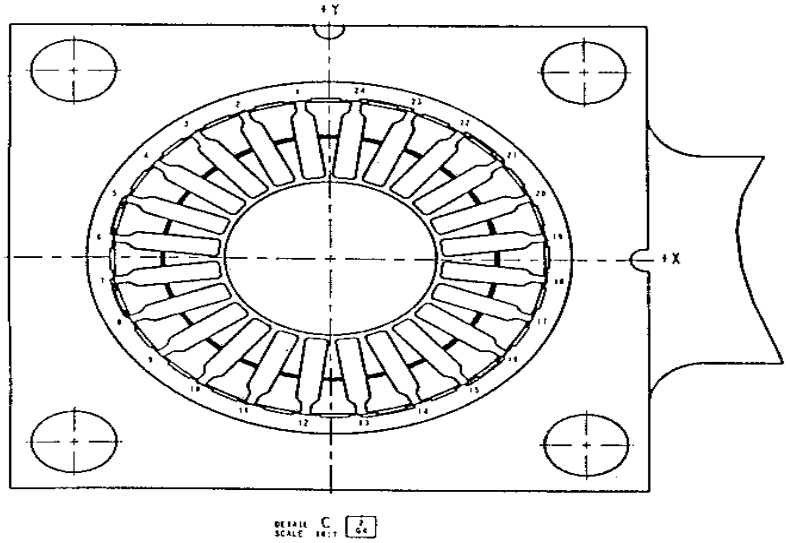
1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

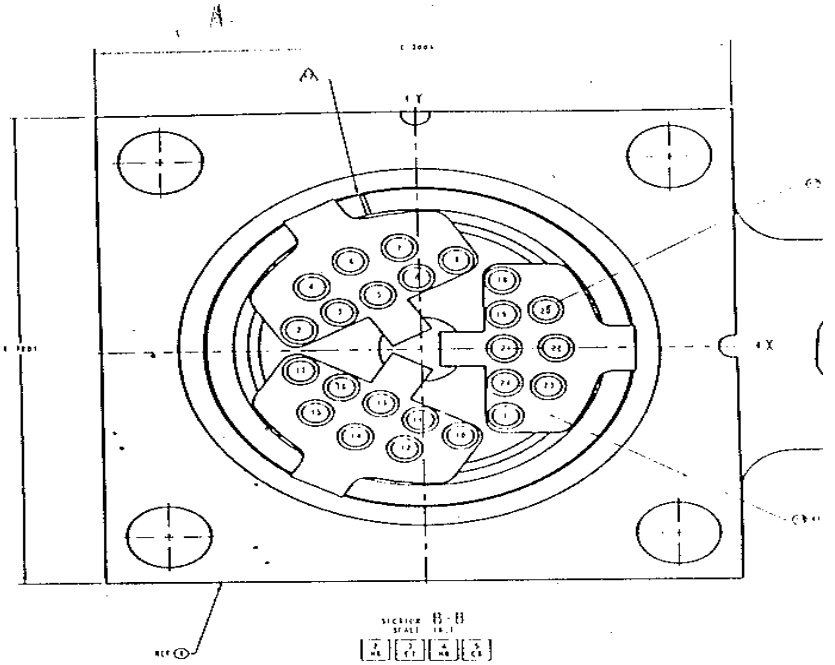


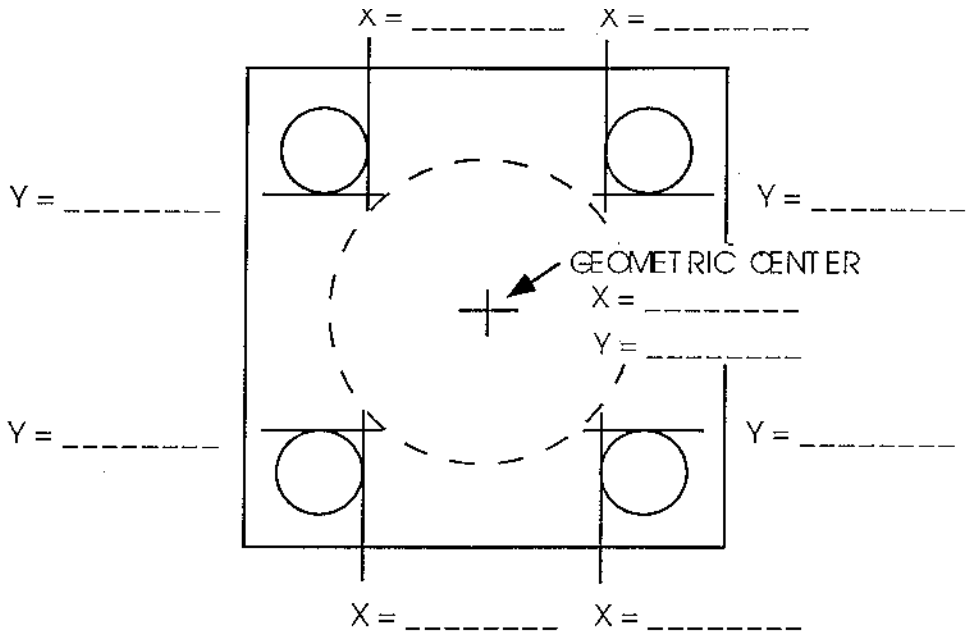

DETAIL C
SCALE 16:1
2
G4
Wire Bond for Continuity Check - Step #3
SEAM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Appendix

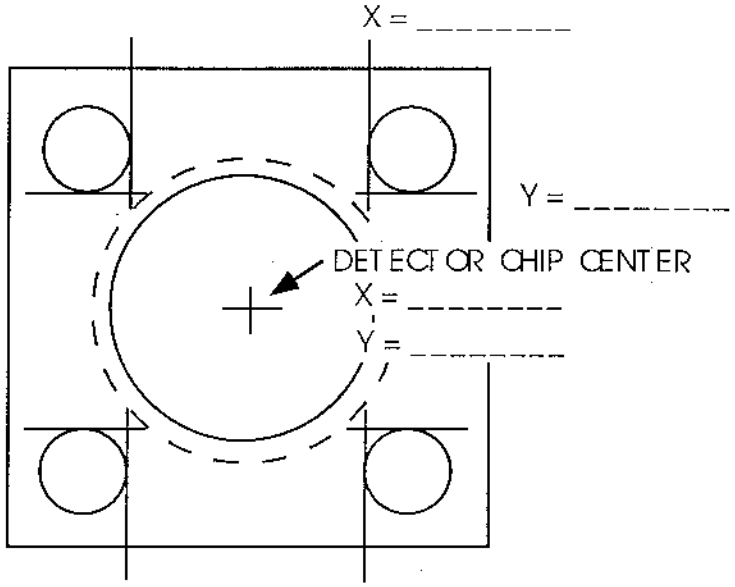
Pin Assignments





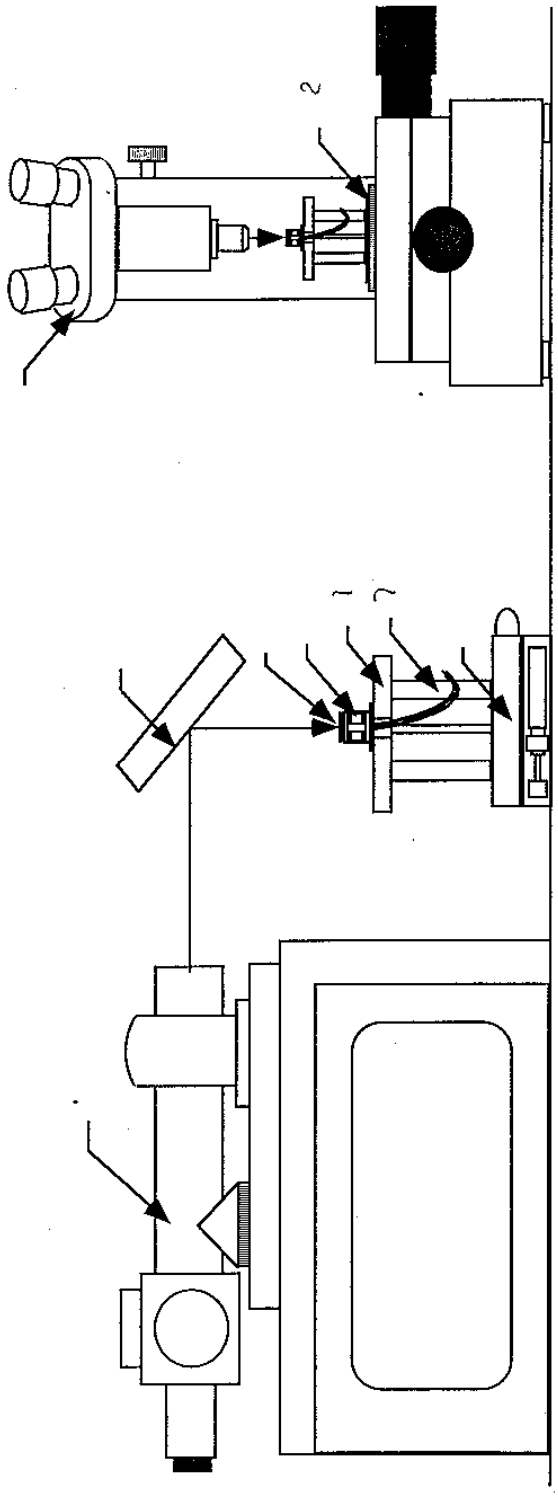


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



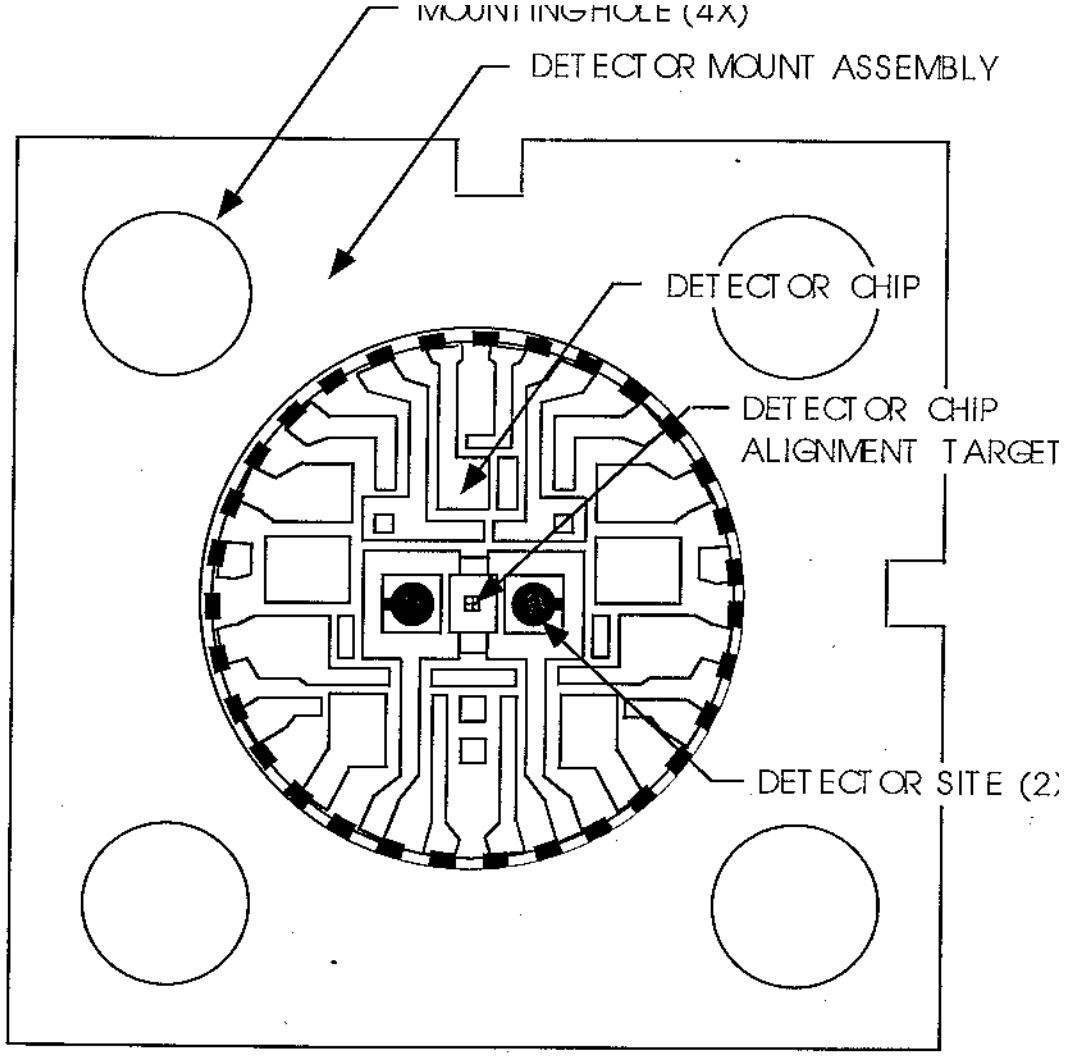


FIGURE 2 DETECTOR CHIP ORIENTATION

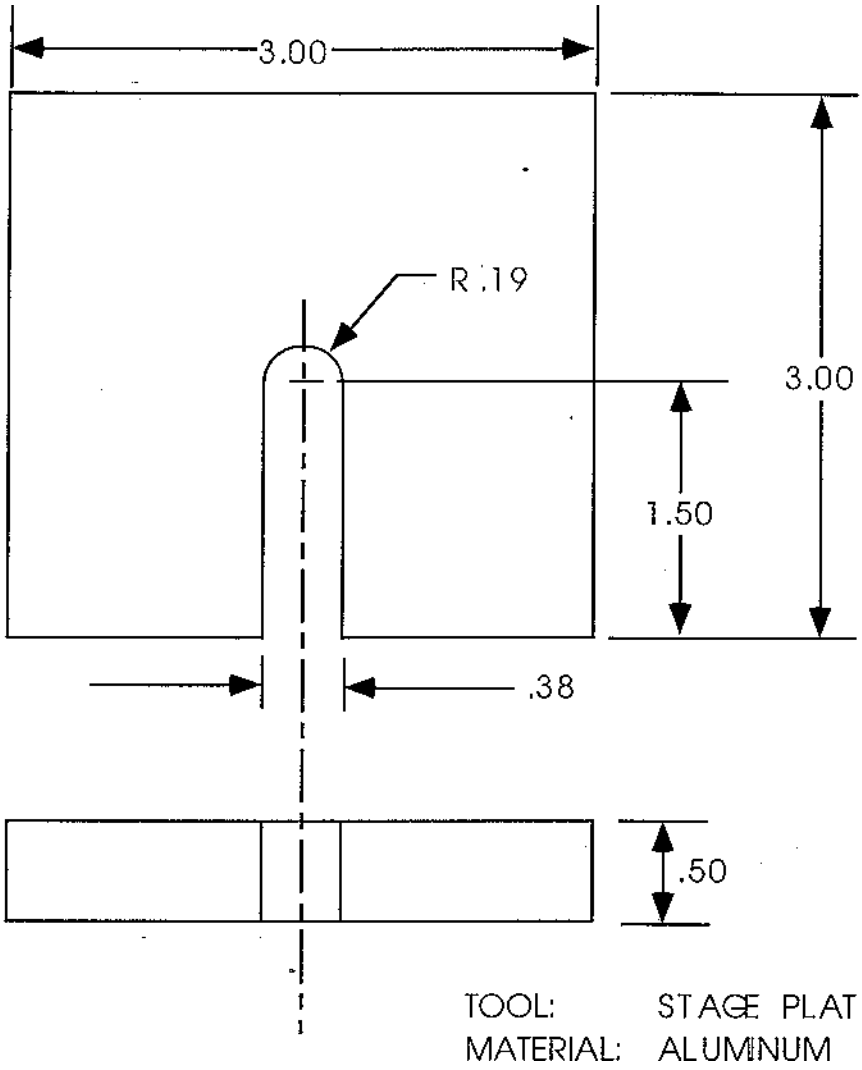
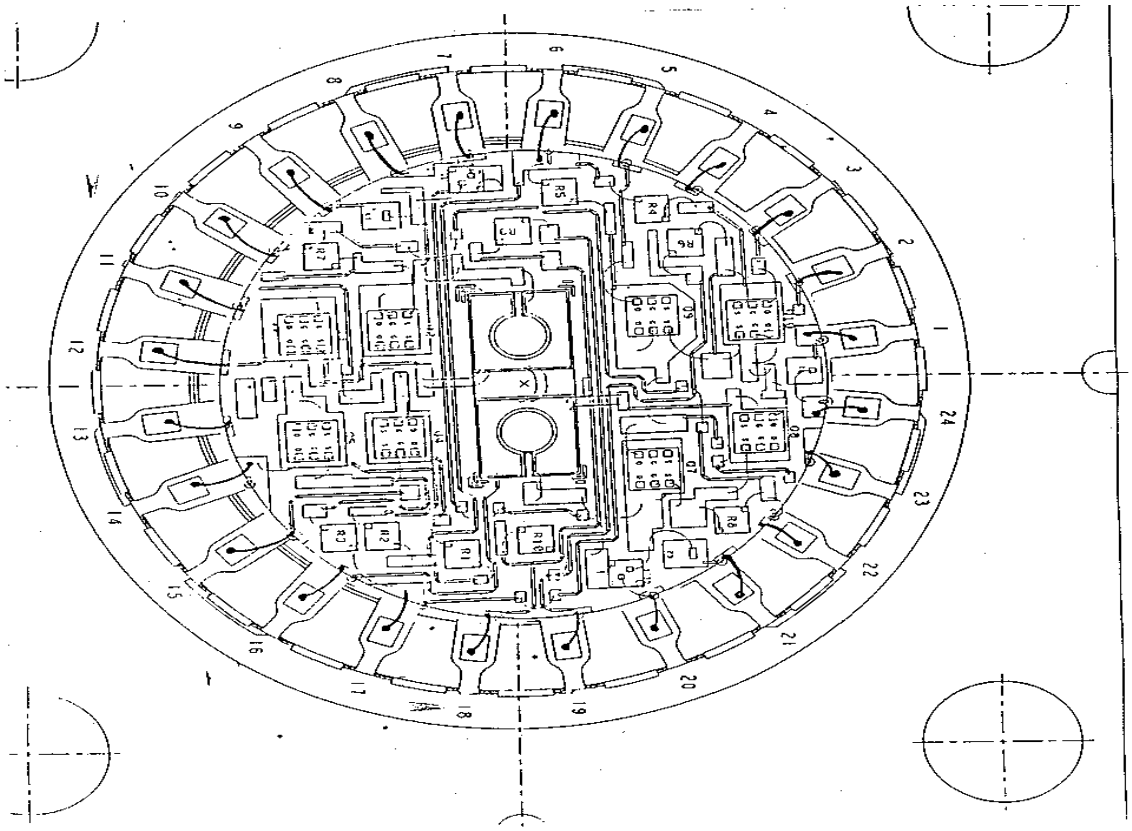
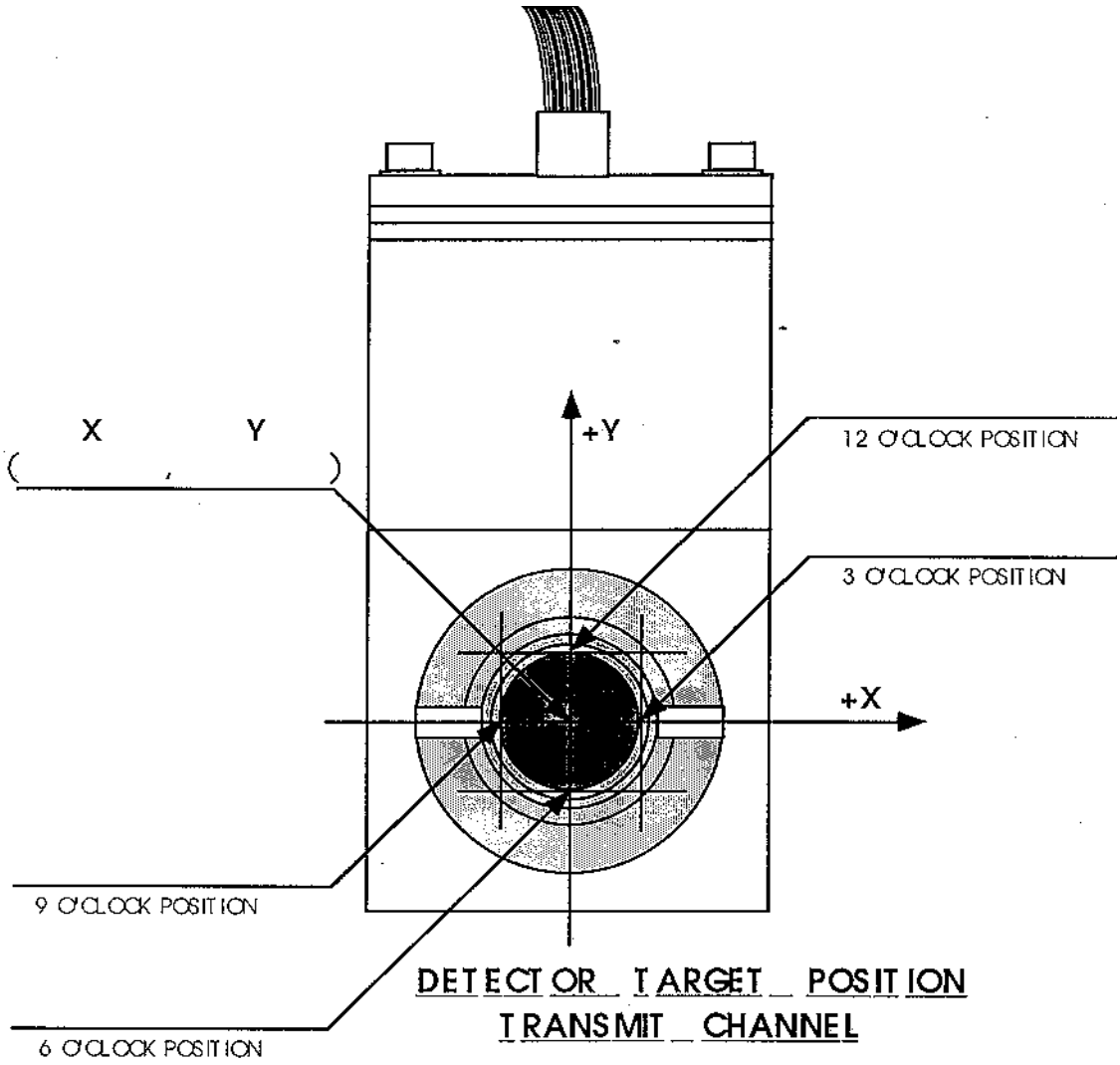


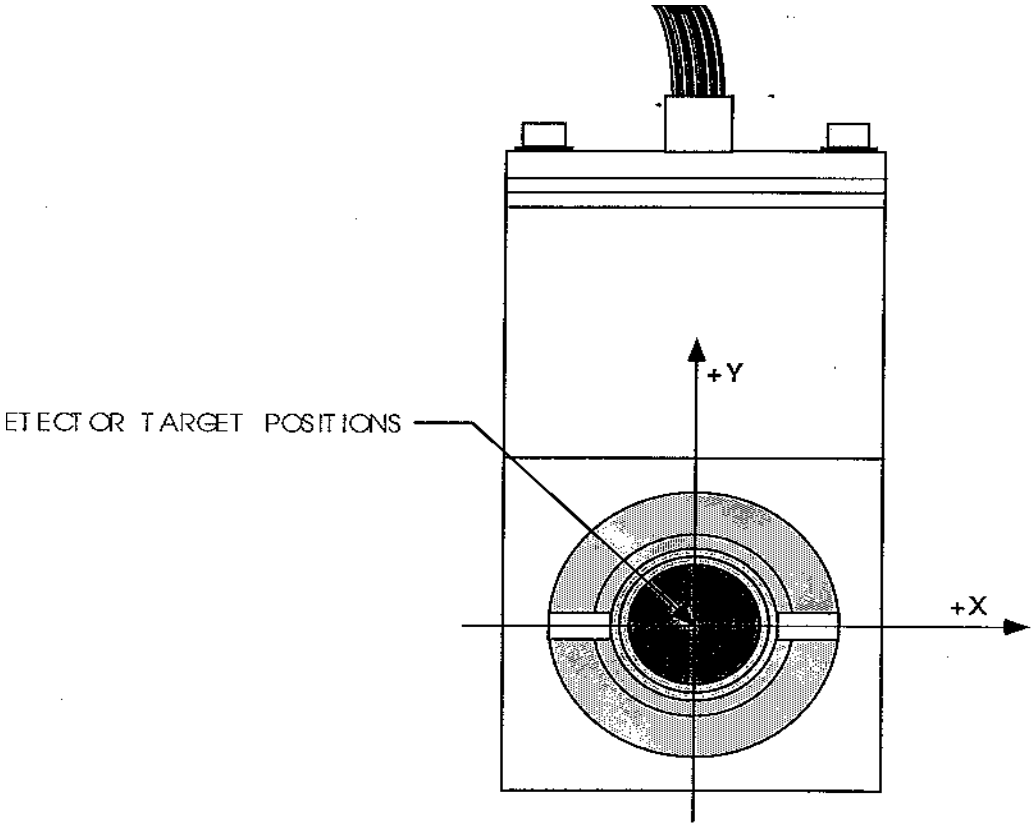
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





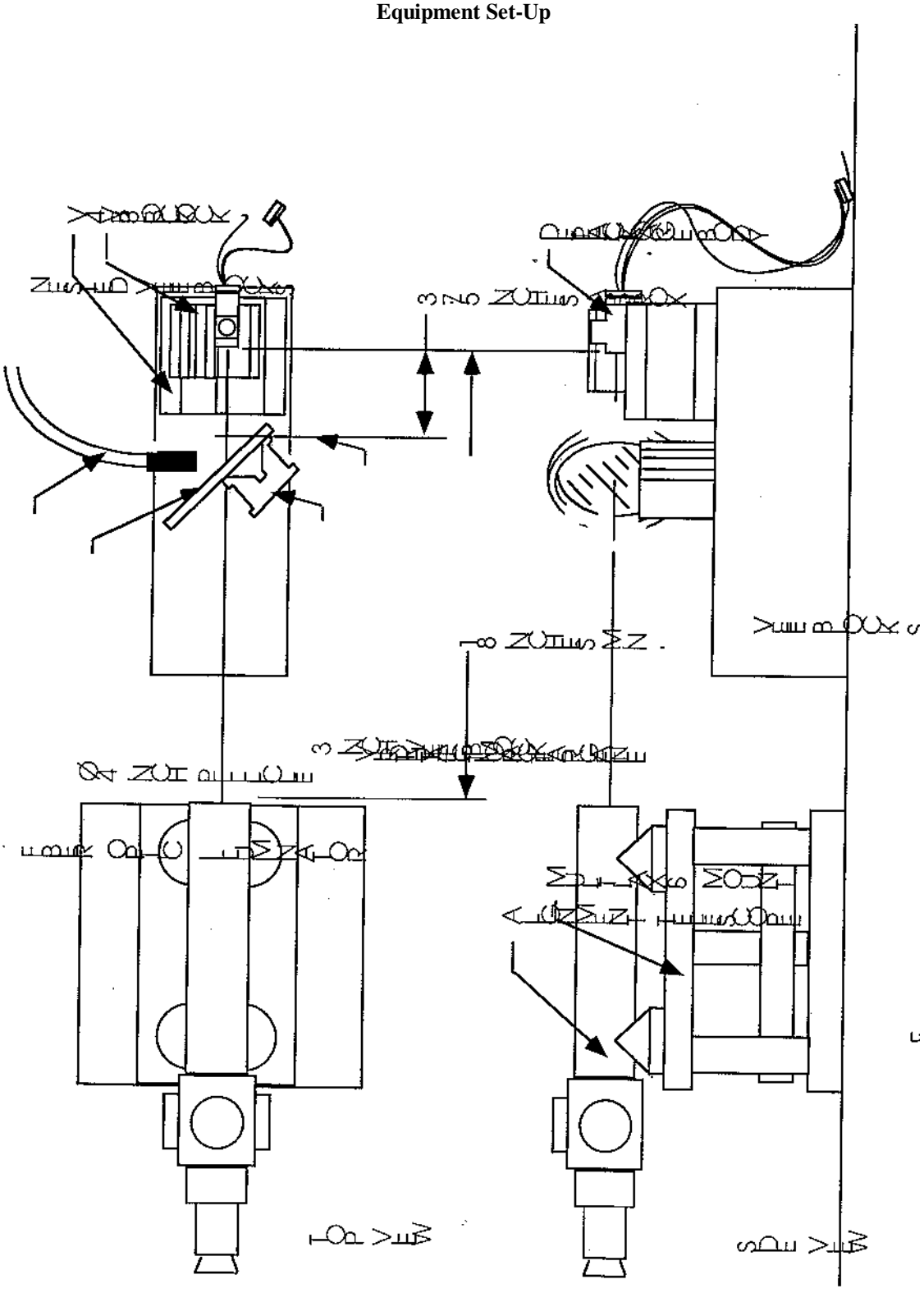
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



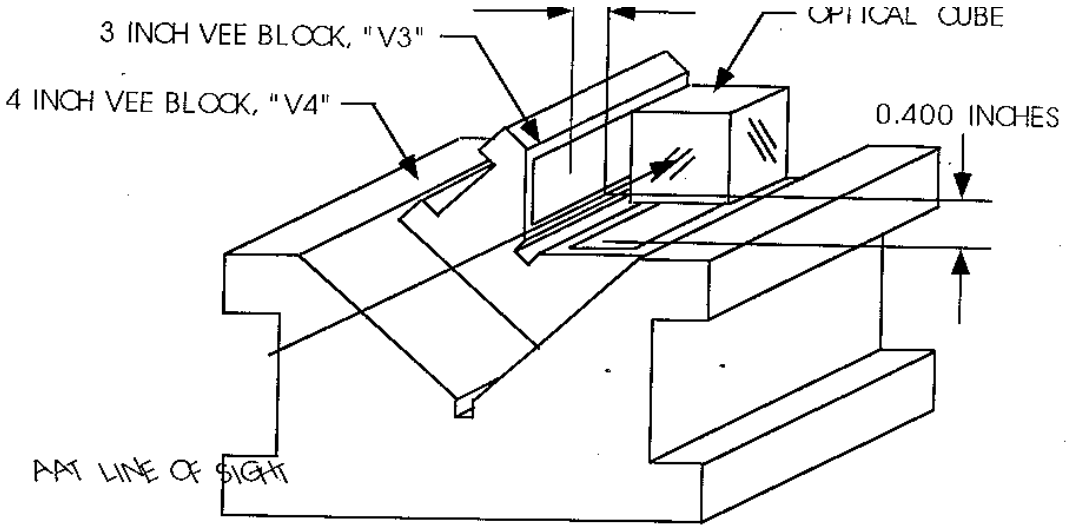


FIGURE 2A OPTICAL CUBE SET-UP

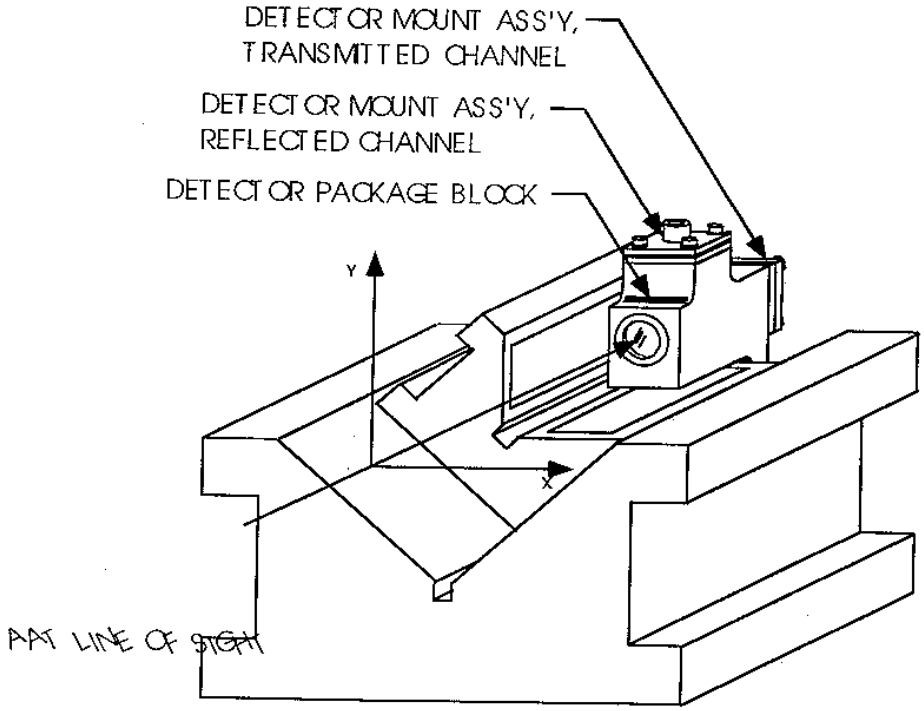


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.07 Rev. D

(Section 7 Detector Mount Assembly Build-Wire Bonding)

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 11

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 7 P0151.07 -

7. Detector Mount Assembly Build

Detector Mount Assembly Build - Wirebonding
Part number 25412 - 20n

To be performed only by certified personnel. Certified personnel: Howard Demroff

Step #	Step Title	Summary and Description of Step/Comments
1	Visual Inspection	Inspect for glue on wirebond pads and contamination on photodiode.
2	Mount DMA in Assembly Jig	The DMS is mounted for wirebonding.
3	Wirebond Setup	Make test bonds on sample DMA. Adjust bonder if necessary
4	Wirebond to Circuit	Make the double bonds to each of the 24 pads.
5	Inspection and Storage	Inspect each bond. DMA complete and ready for integration into package.

Final Buy Off **RE** _____ **Date** _____

Final Buy Off **QA** _____ **Date** _____

List of Test Equipment

Equipment	QA - Serial number, calibration date	Location
Laminar Flow Bench	Class 100 Certification to be done	Cedar B13
Wirebonder	No Cal required (wirebonds are pull tested)	Cedar B13
Pull Tester	Calibrated	"
DMA wirebonding jig	Magnetic Screening per P0057	Cedar B13

Visual Inspection - Step #1

DMS part number _____ Circuit assembly SN _____
Detector mount Subassembly SN_____

1) Operator wears ESD wriststrap **[ ], and follows ESD procedure P0357.** Under a laminar flow bench inspect the DMS for the following;

a) Gold bond pads and wirebonds. - These 24 pads should be free of Stycast used in the circuit alignment. Check for broken or damaged bonds. Repair in Step #3.
Record Results:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

b) Photodiode - The photodiode should be free of contamination.
Record Results:

_____
_____
_____
_____
_____

Mount DMA in Assembly Jig - Step #2

This step is the same as section Detector Mount Sub-Assembly Step #2. The assembly is mounted for wirebonding the circuit to the 24 gold pads. Operator wears ESD wriststrap [ ]

Wirebonder Setup - Step #3

a) Before making the bonds to the circuit, the bonds must first pass a pull test on a test sample DMA. Adjust the bonding parameters until 5 consecutive bonds survive at least a 5 gram pull test.

Record the following;

	First Bond	Second Bond
Bond Force		
Bond Time		
Power		
Wire Break Force		

Adjust parameters again if the break force is less than 5 grams. Repeat.

	First Bond	Second Bond
Bond Force		
Bond Time		
Power		
Wire Break Force		

Pass _____ **Operator** _____
Date/time _____

Wirebond to Circuit - Step #4

Make double bonds to the circuit as shown in the diagram below. Start with the spares, # 4,11,13,22

Inspection and Storage - Step # 5

a) Inspect each of the double bonds on the 24 pads. Re-do any broken bonds recorded in Step # 1. With 2 inches of number 32 gauge wire, lightly push on each wirebond to make sure the ends are secure. Completely remove any faulty bonds. **Operator wears ESD wriststrap [ ] Record results;**

Pin #	Inspected	Inspected (2^{nd} – clockwise)	Re-work ?	Comments:
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				

Comments: (photodiode and wirebonds) _____

Photographs

b) Store in clean, ESD approved box with grounding plug on connector. Place box in clean dry box and mark with PN & SN.

c) Record part # _____ and Serial Number

_____

Operator _____ date/time

_____

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

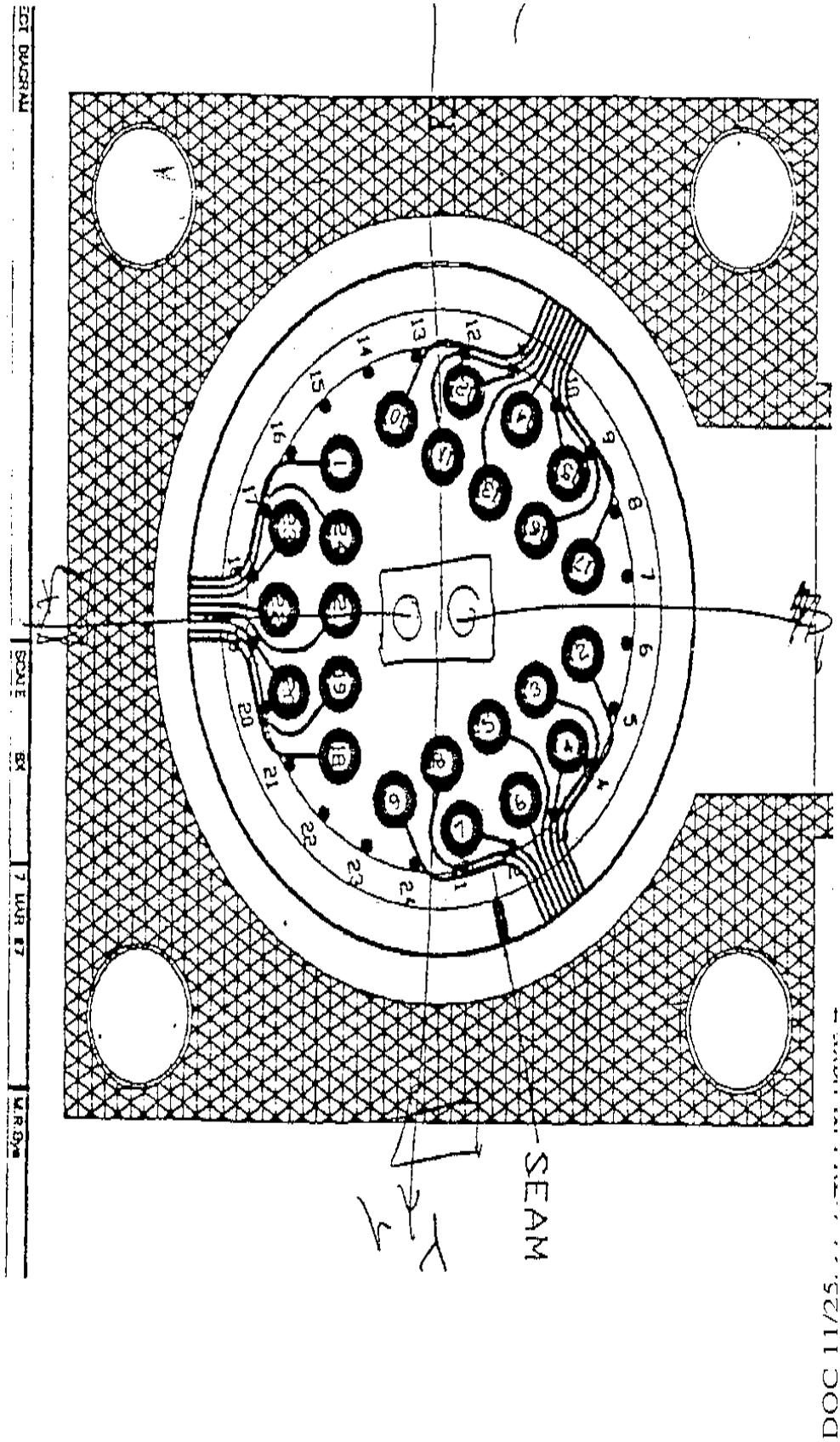
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

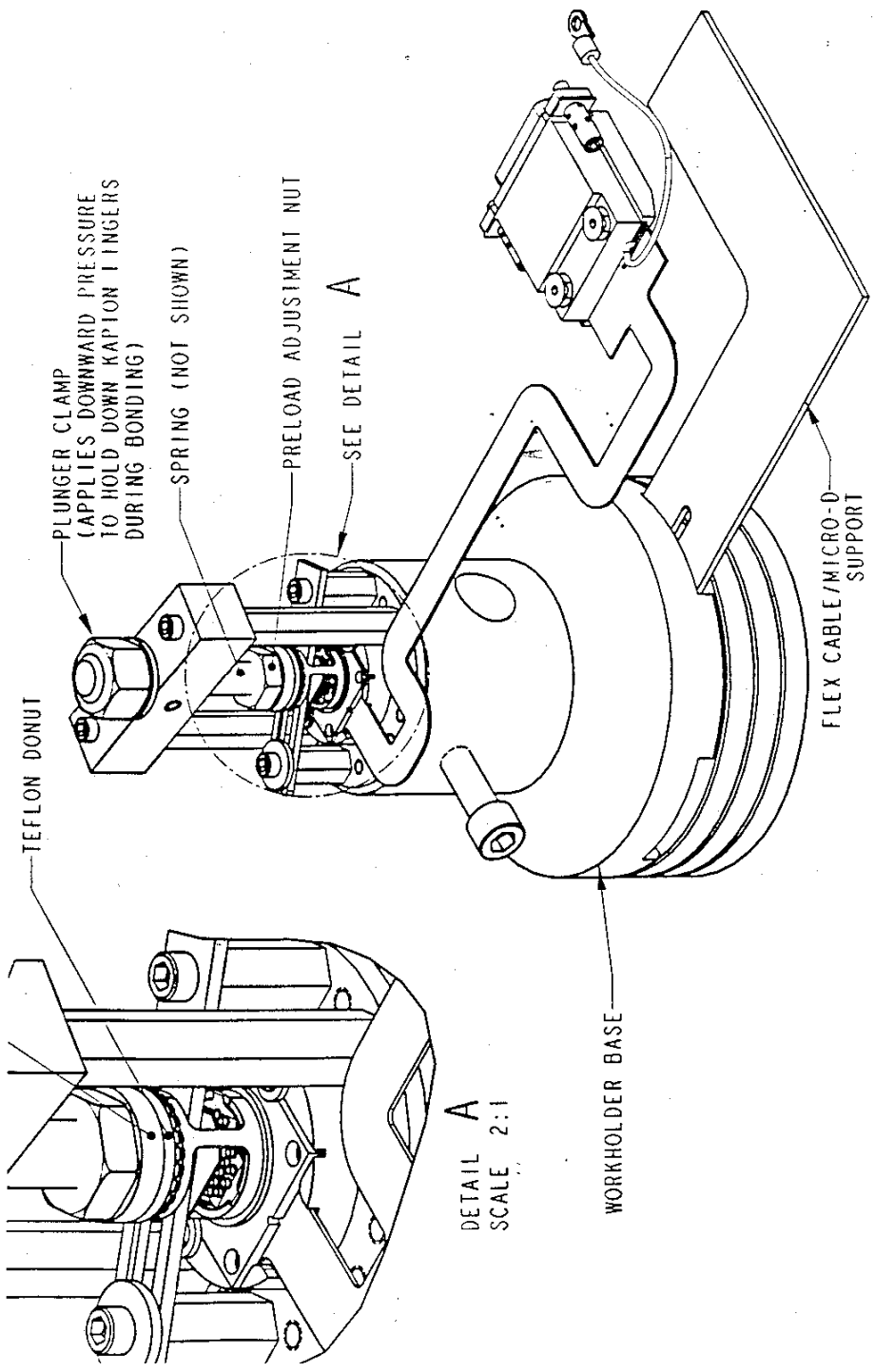
Visual Inspection - Step #1

Inspection Diagram

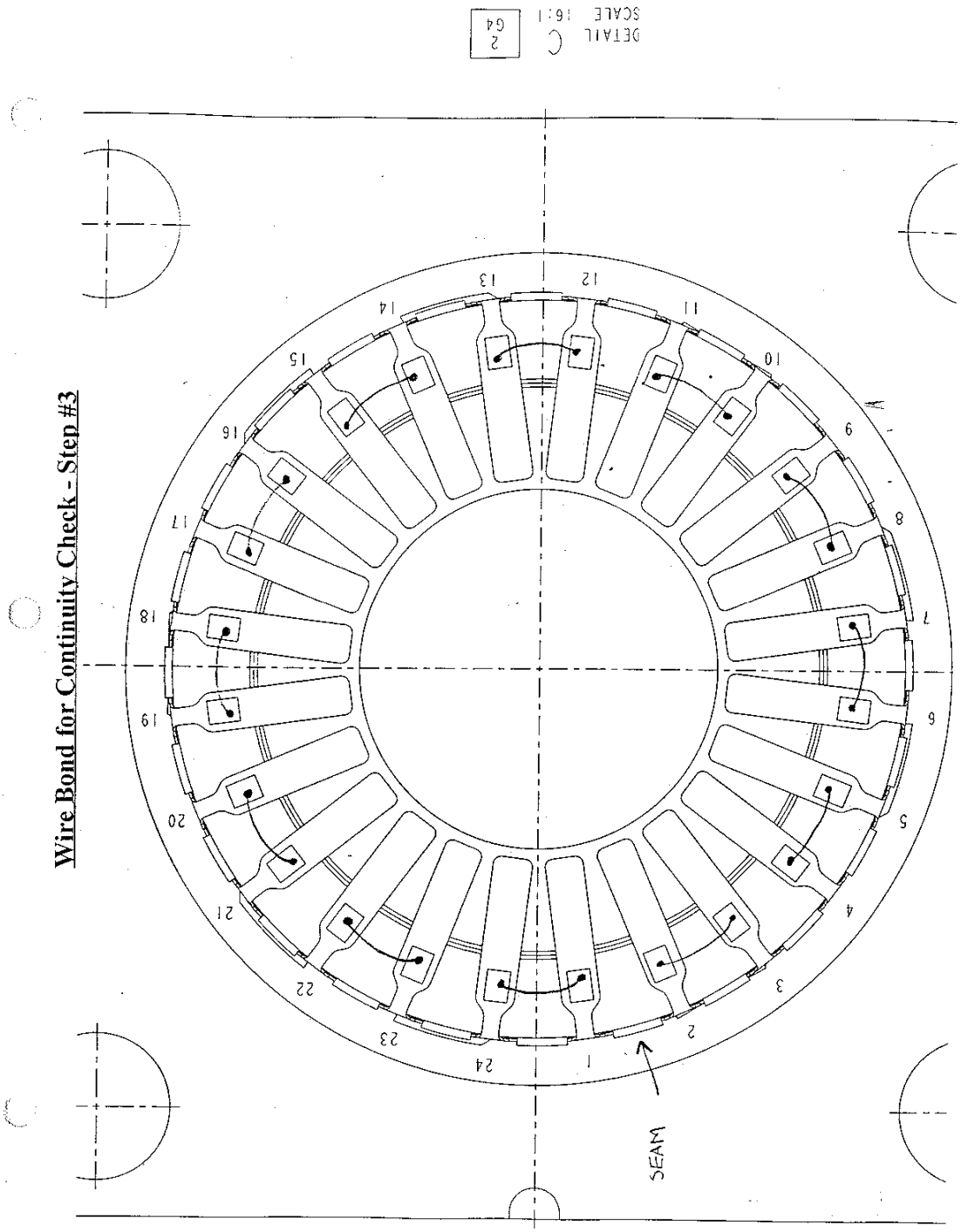


Mount DMS in Assembly Jig - Step #2

1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

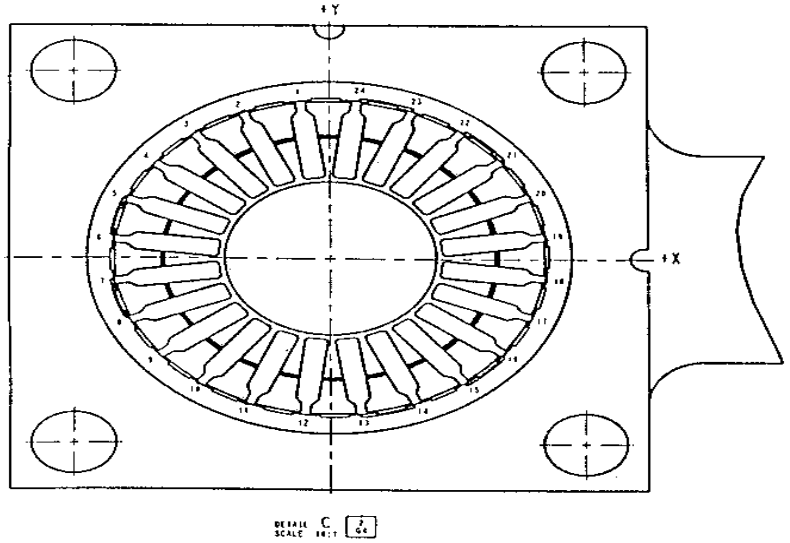


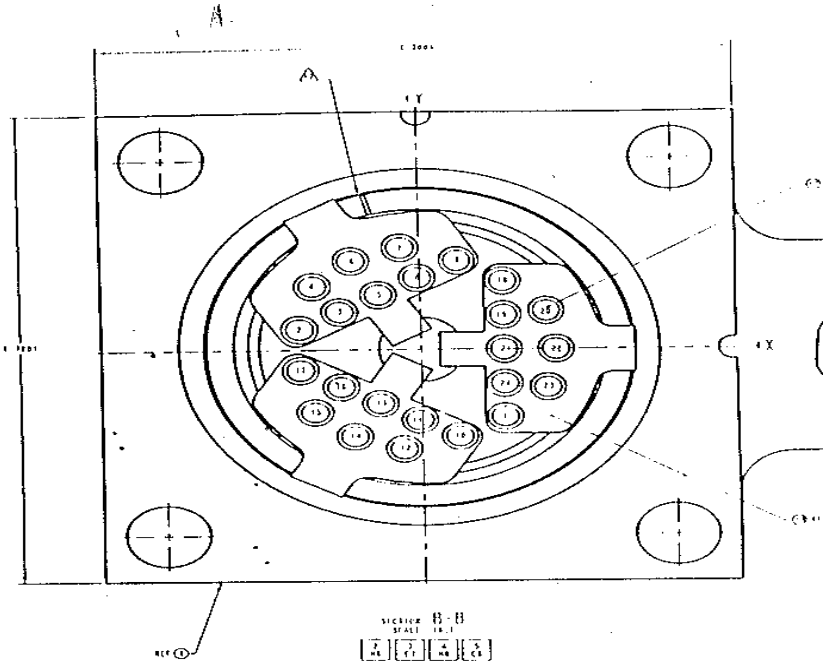
Wire Bond for Continuity Check - Step #3

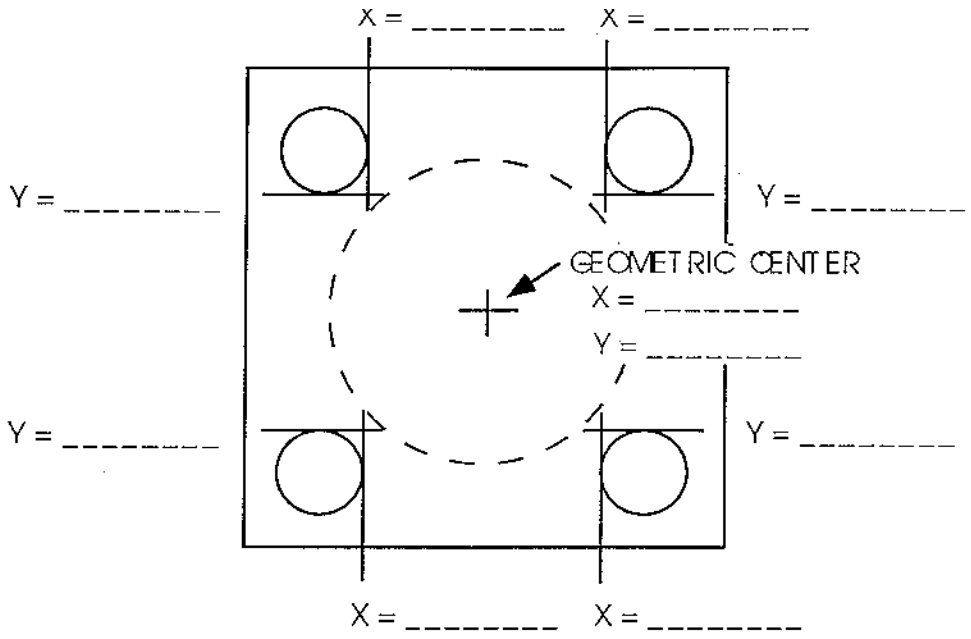


Appendix

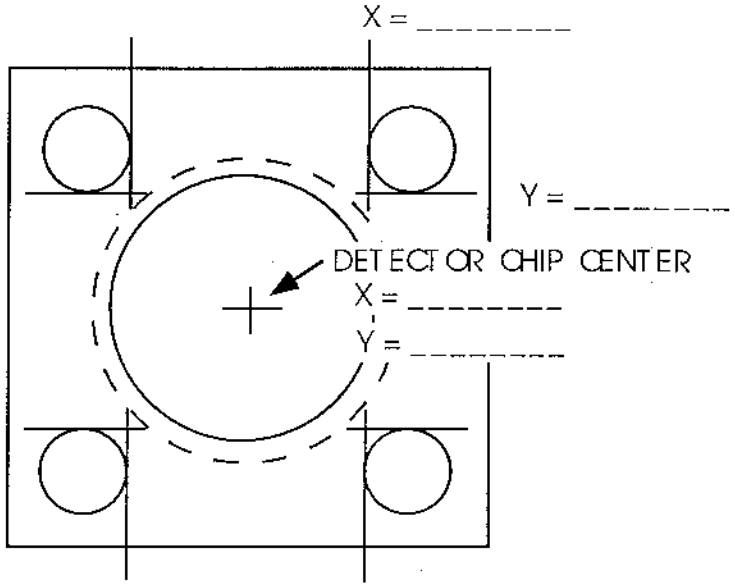
Pin Assignments





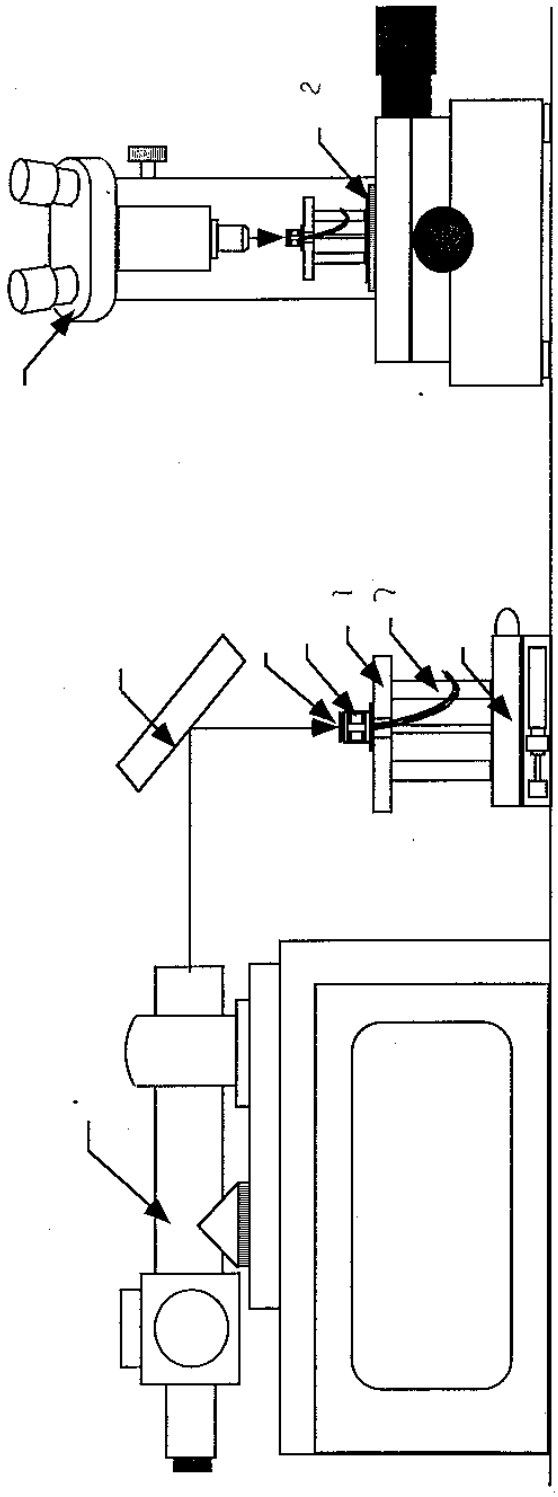


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



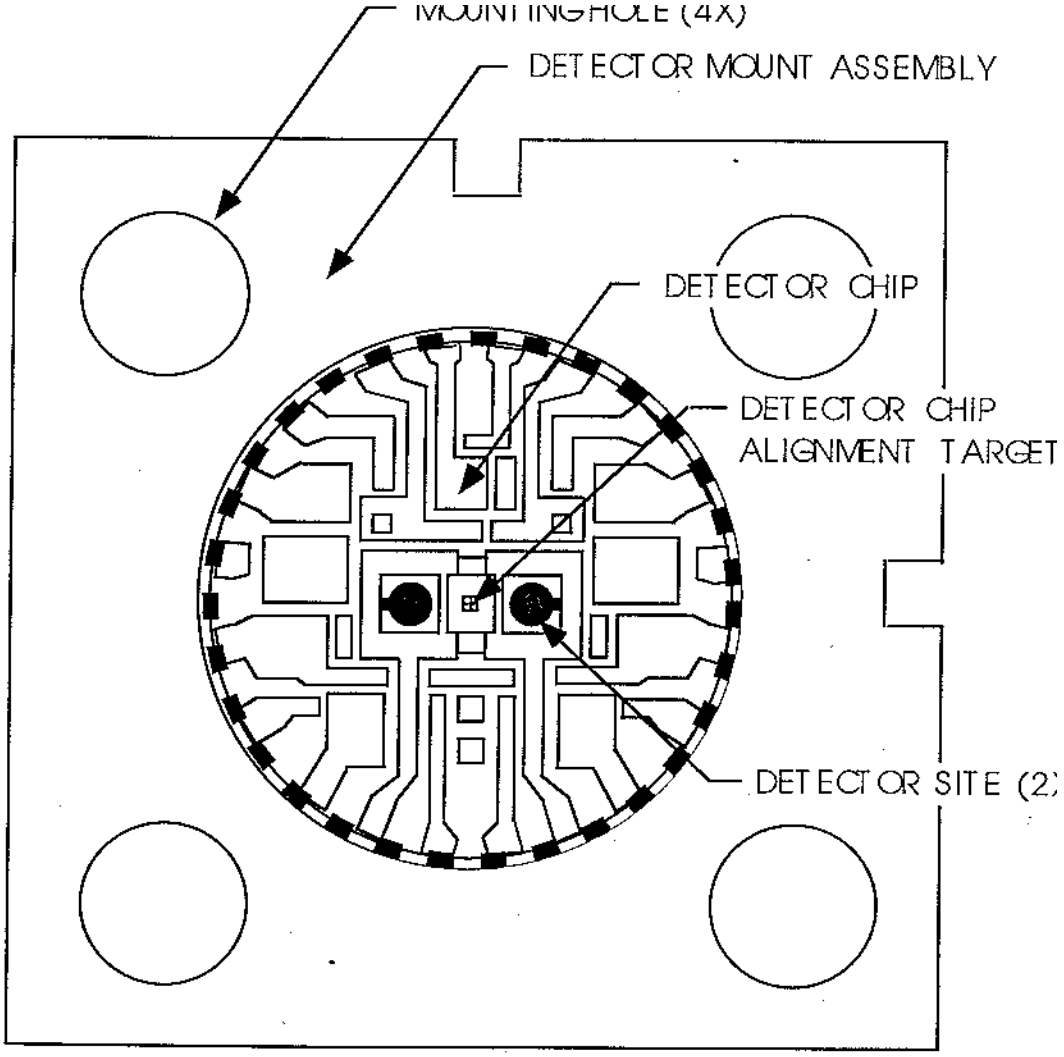


FIGURE 2 DETECTOR CHIP ORIENTATION

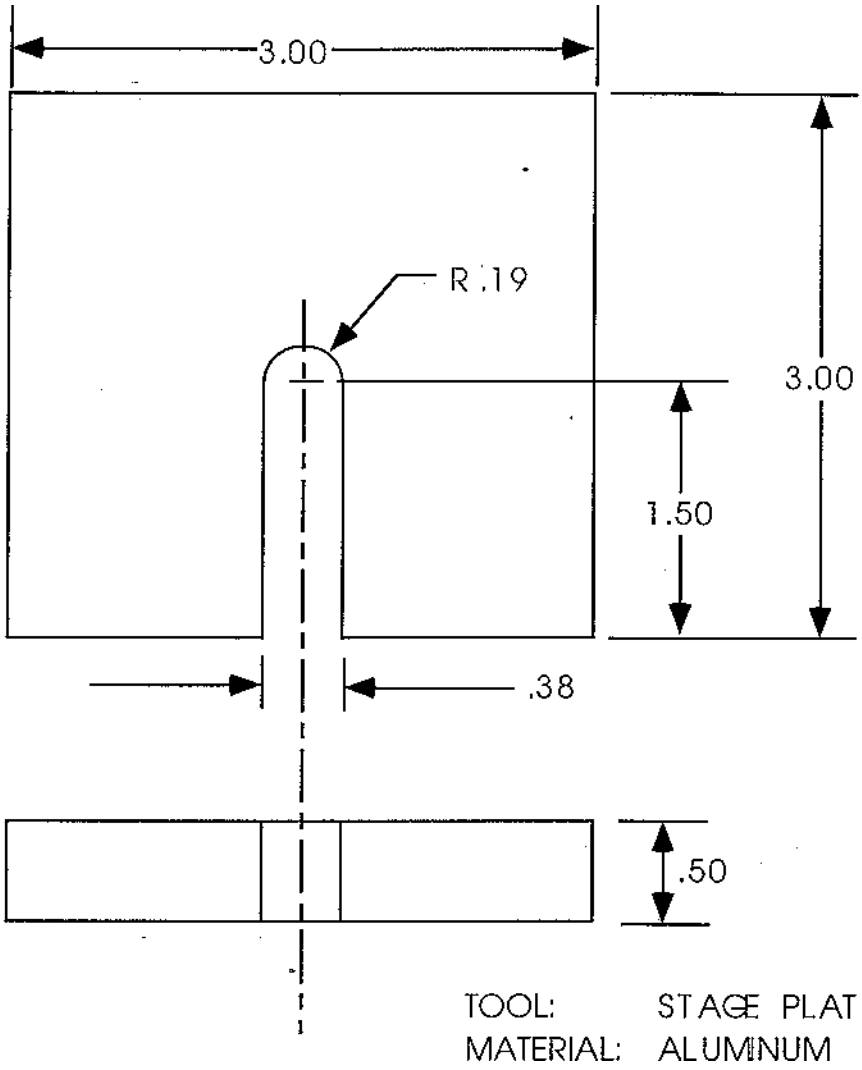
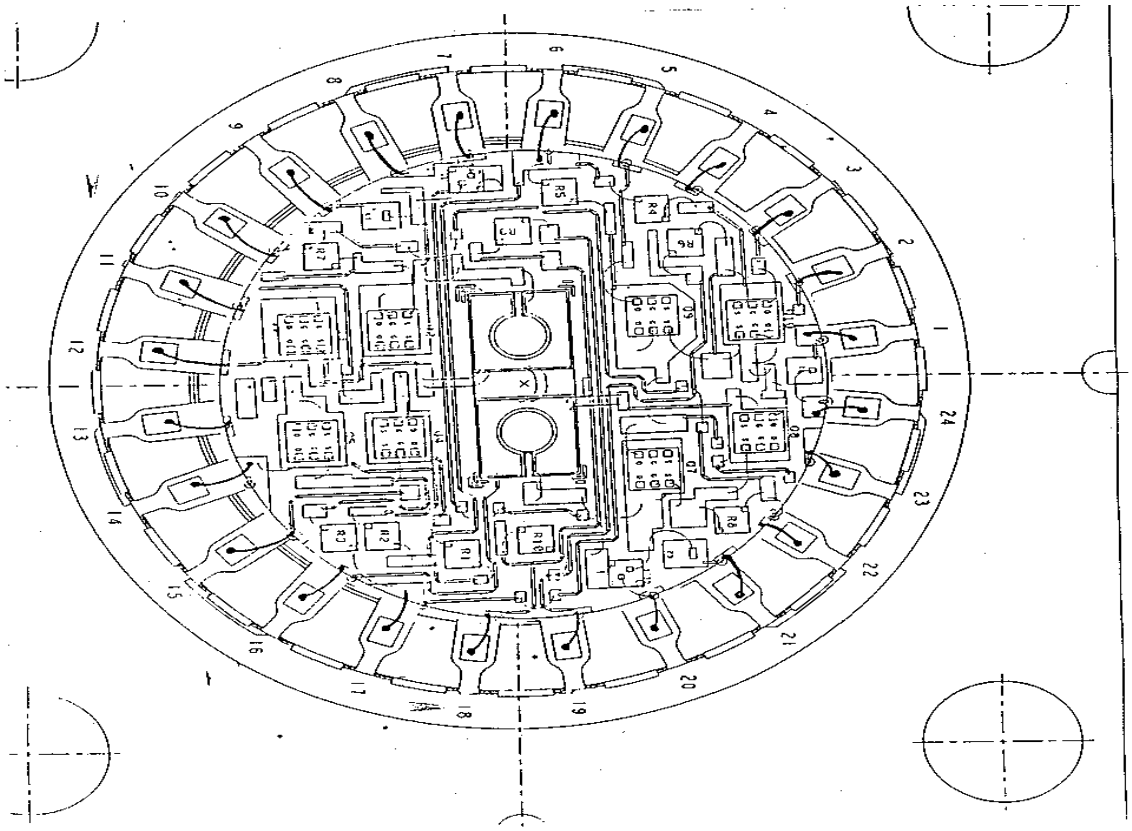
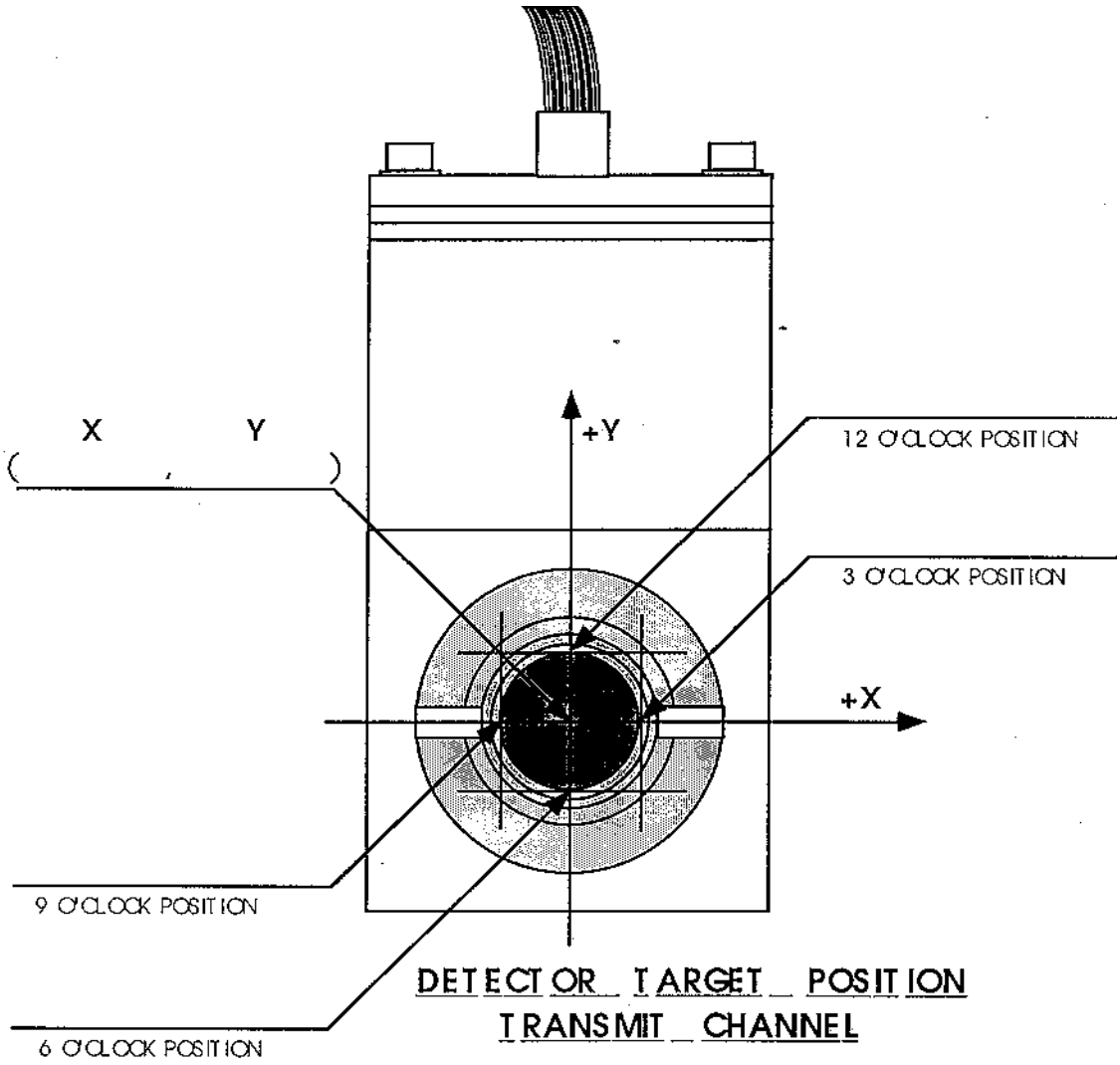


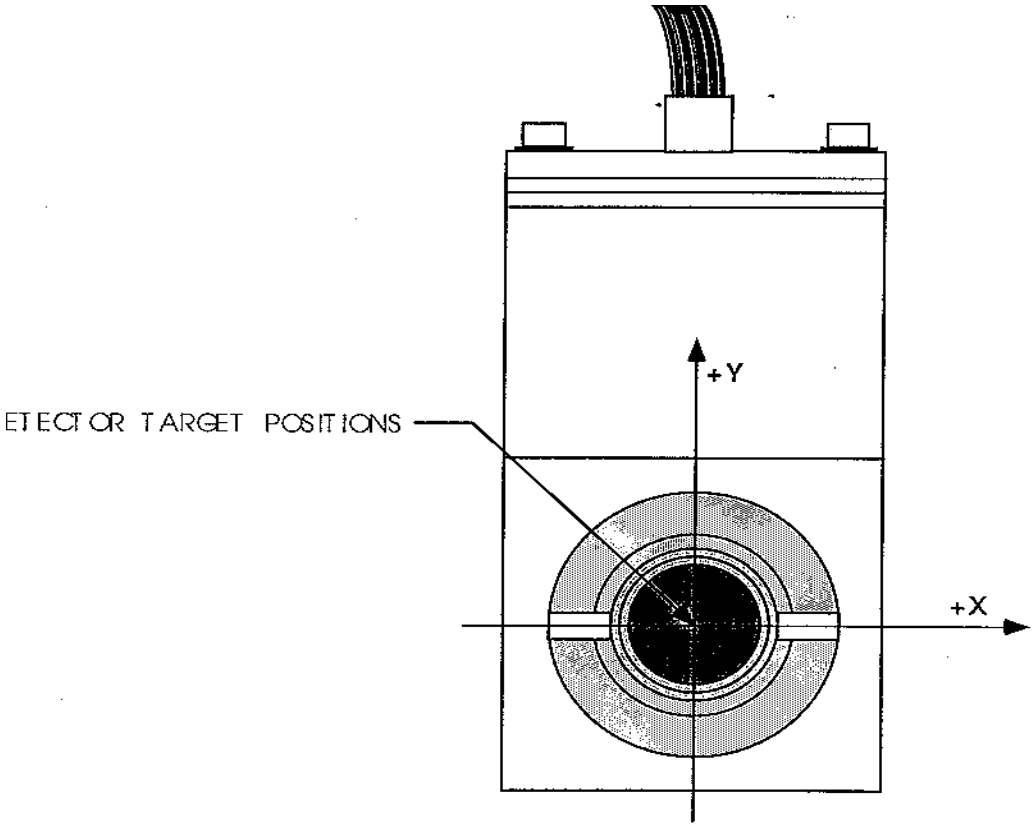
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





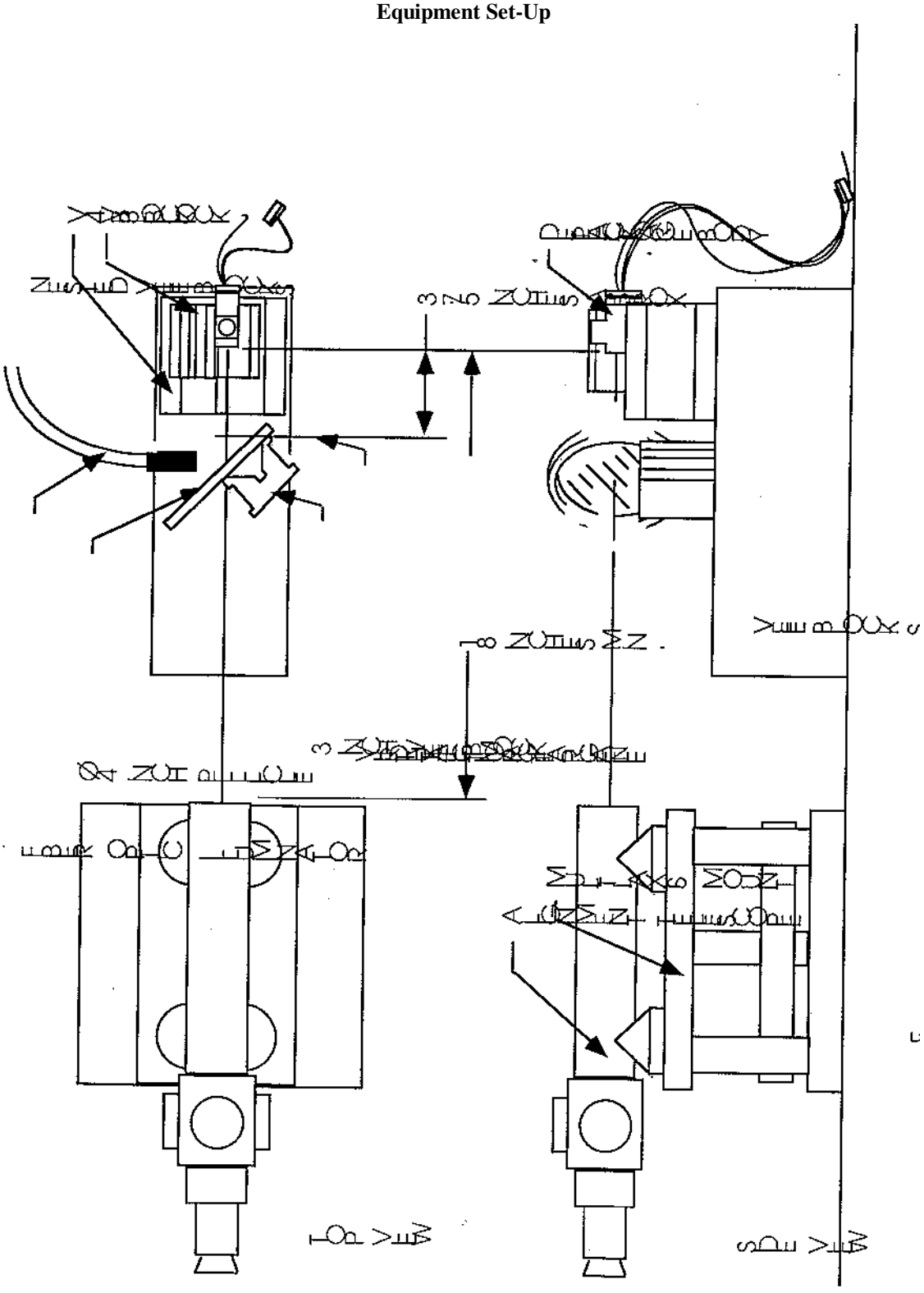
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



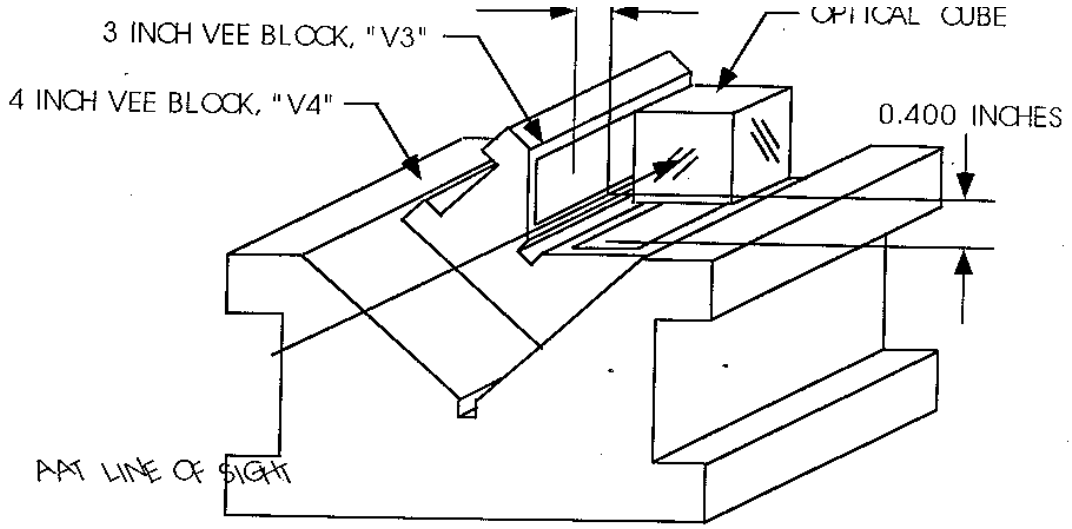


FIGURE 2A OPTICAL CUBE SET-UP

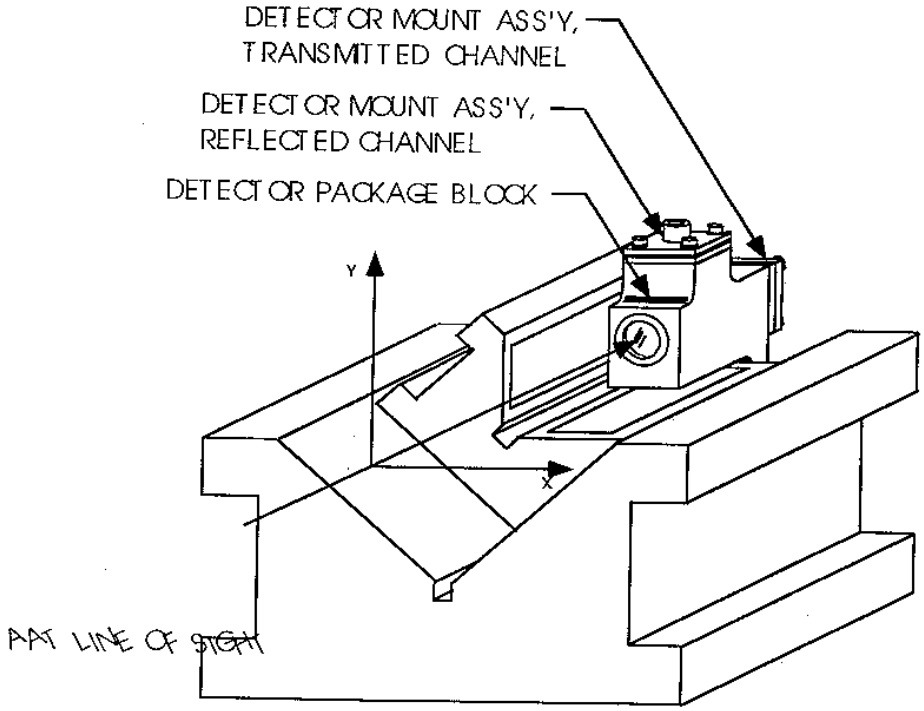


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.08 Rev. D

(Section 8 Lens Assemble Build)

January 19, 1999

Approved by: P. Ehrensberger **Date**

Approved by: P. Unterriener **Date**

Approved by: S. Buchman **Date**

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 05

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 8 Lens Assemble Build

Lens Assembly Build

8.1Scope: This section describes the assembly procedure for the Lens Assembly.

8.2 Applicable Documents:
Drawing 25651-101 and -102 Rev. A; P0361 Rev.-, P0356.

8.3 Facility:
GPB Clean room, Class 100.

8.4 Equipment and Materials: Torque wrench, record SN_____
Titanium screwdrivers and tweezers.
Appropriate material for cleaning according P0361 Rev.-.

8.5 Authorized Personnel:
Scott Fletcher or Ken Bower or M. Bukshpun.

8.6 Procedure

8.6.1 Obtain Kitted parts from bonded stores per drawing 25651. Record Rev # and SN of kitted list per drw
25651:_____

8.6.2 Inspect all the kitted part under 10x magnification for damages and contamination. Any discrepancy
shall be documented on D-Log. Clean if needed using appropriate methods from cleaning procedure
P0361 Rev-, Section 1.

8.6.3 Assemble parts as shown in drawing 25651.

CAUTION: Do not confuse Channel A Lens Assembly with Channel B Lens Assembly. Be sure to install
Beam splitter (P/N25074) with Reflect surface against Lens Mount (P/N 25072).

8.6.4 Prepare Epoxy mix using procedure in P0356, Section 5.1. Degas mixed material under vacuum.

8.6.5 Stack 4 screws 25650-101 applying small amount of epoxy on the thread surfaces.

8.6.7 Torque 4 screws 25650-101 screws to 4 ± 0.2 oz-inches.

8.6.8 Cure epoxy under schedule from P0356, Section 5.3.

8.6.9 Place assembly in clean container and tag per Note 7 of Drawing with part number and serial number. Record information of Lens Assembly built and Date:

8.6.9.a Part # 25651-101 Rev. A , S/N_____
(Channel A)

Completed:_____
Signature Date

Notes/Discrepancies (if any):

8.6.9.b Part #25651-102 Rev. A , S/N_____
(Channel B)
Completed:_____
Signature Date

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

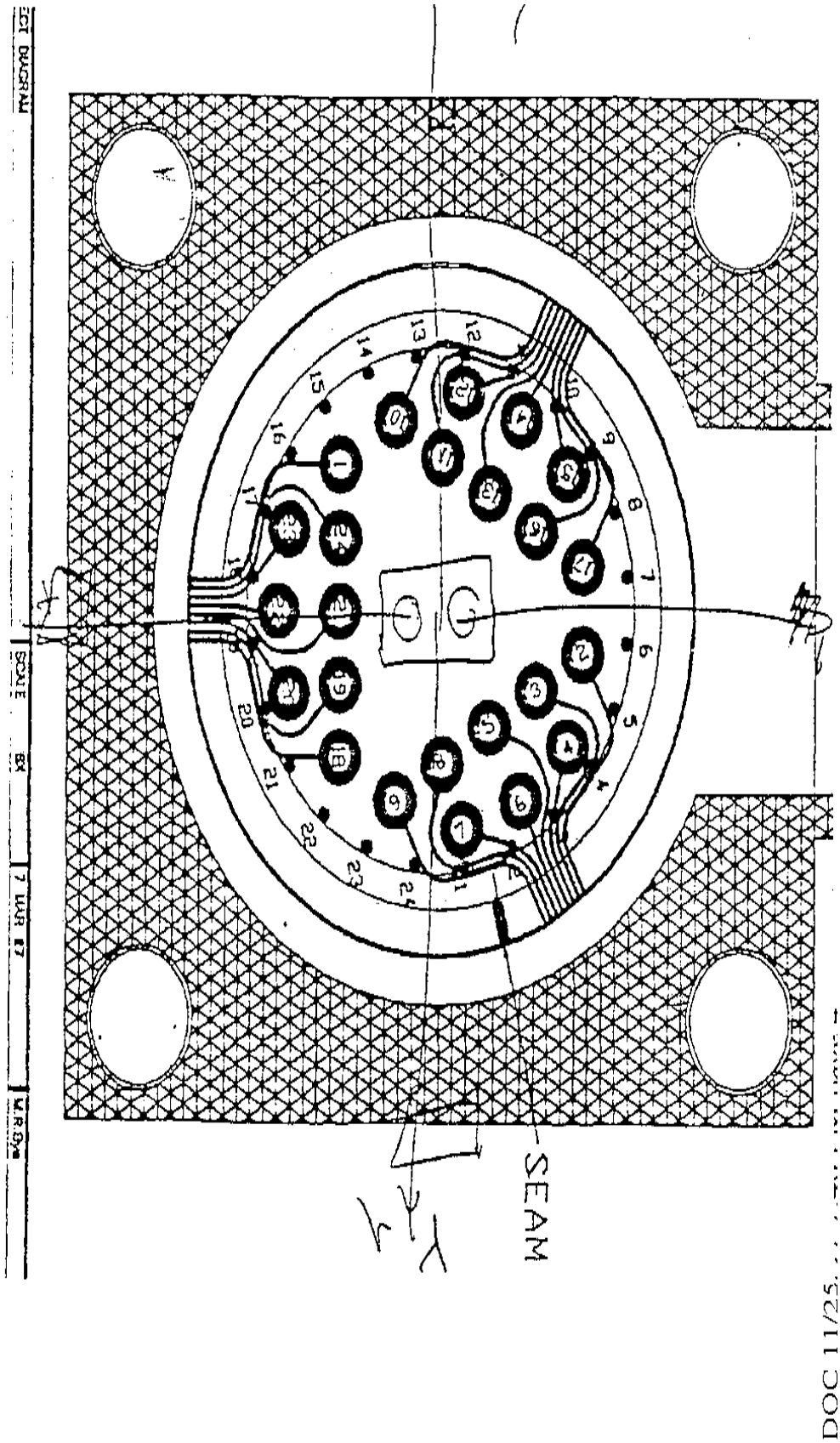
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

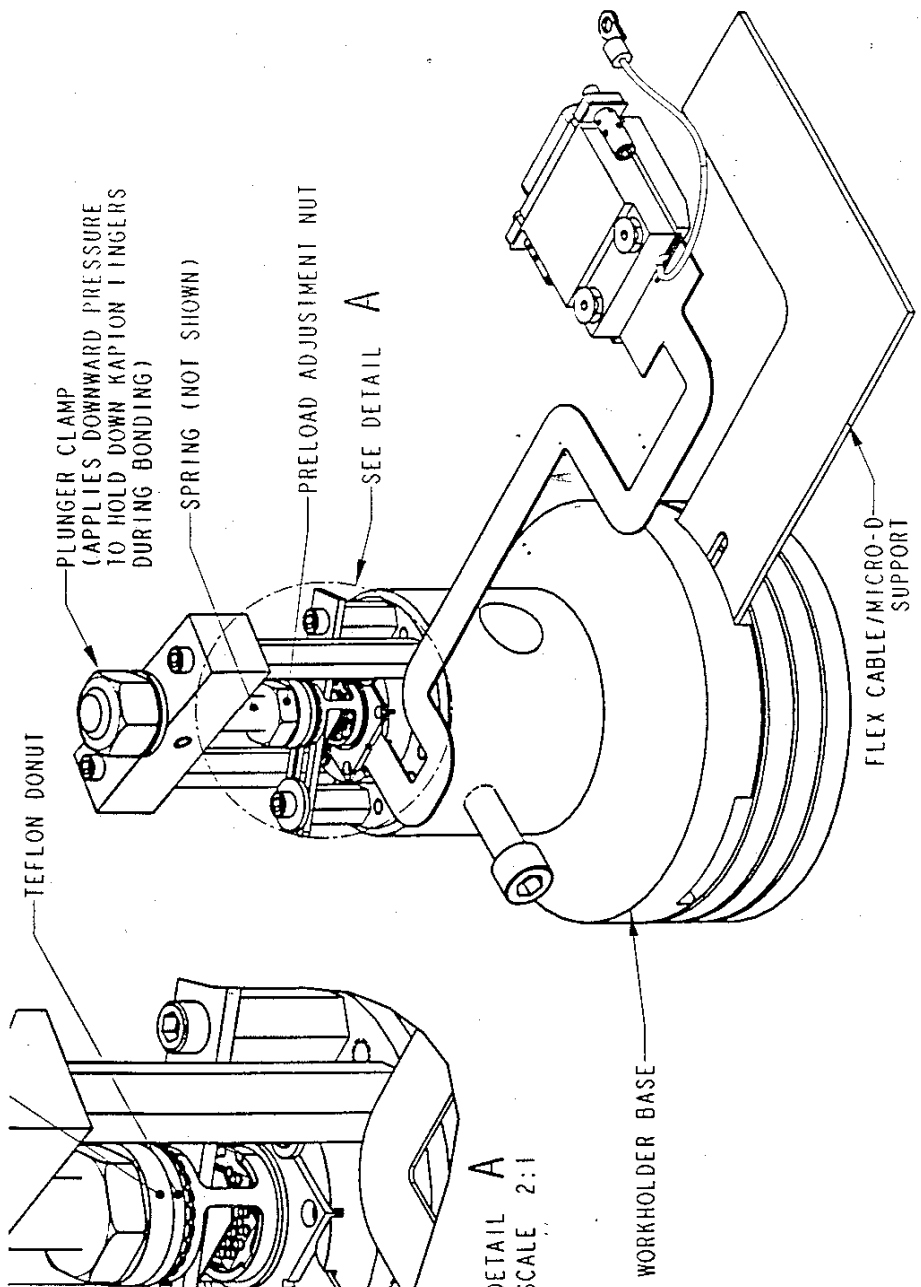
Visual Inspection - Step #1

Inspection Diagram

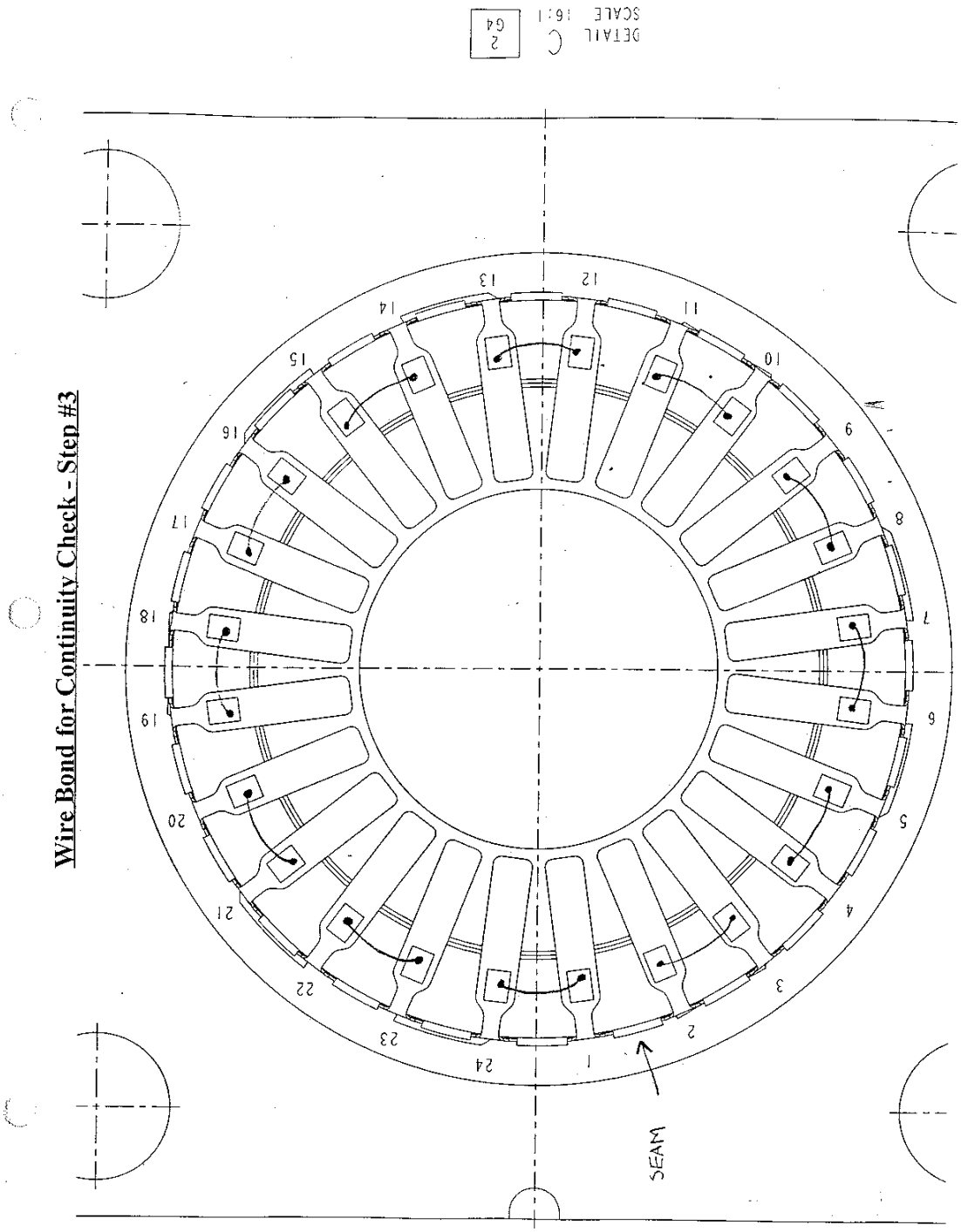


Mount DMS in Assembly Jig - Step #2

1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

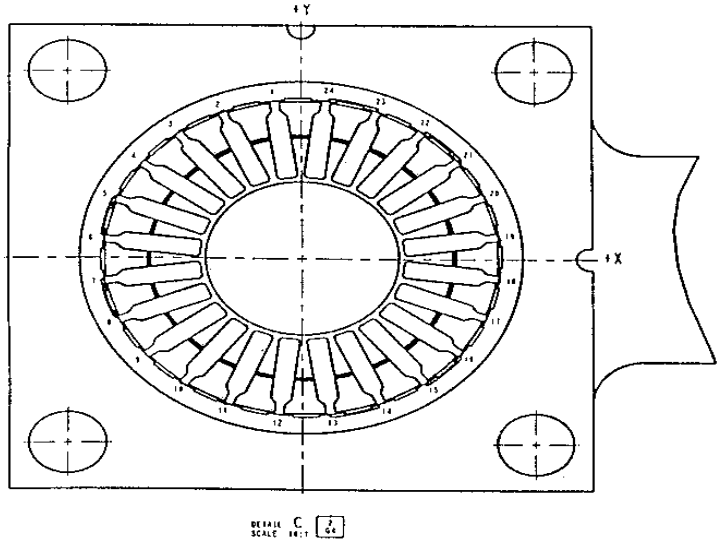


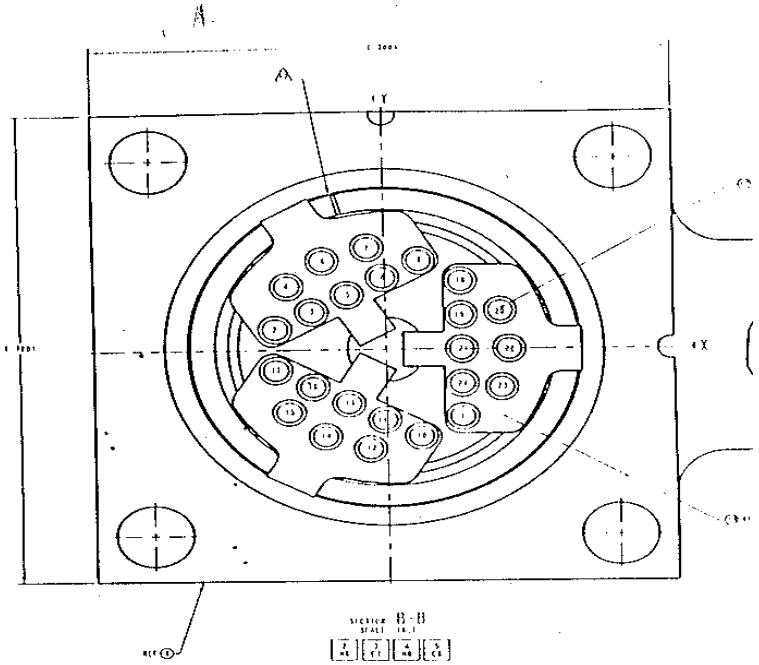
Wire Bond for Continuity Check - Step #3

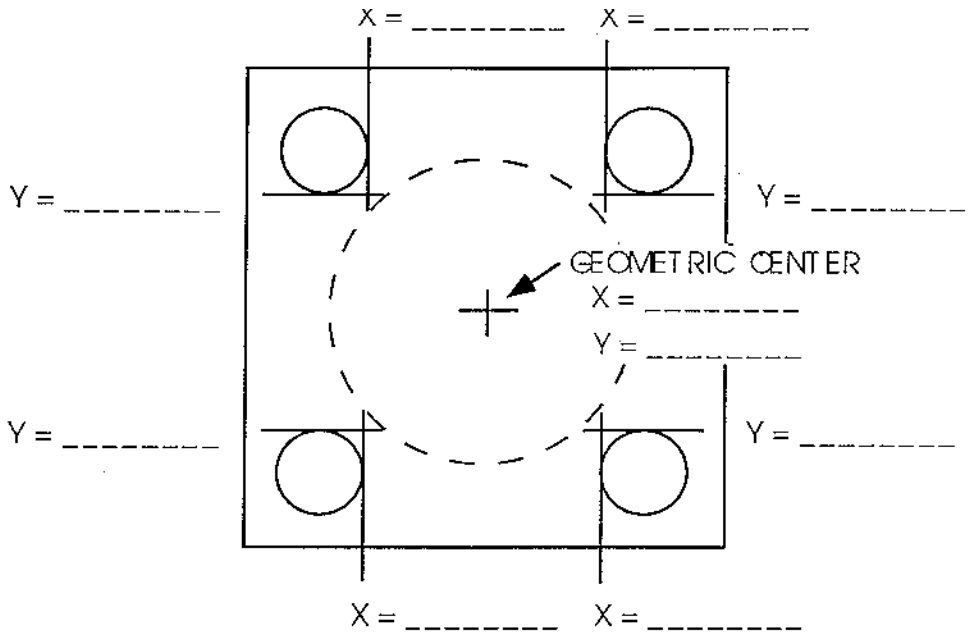


Appendix

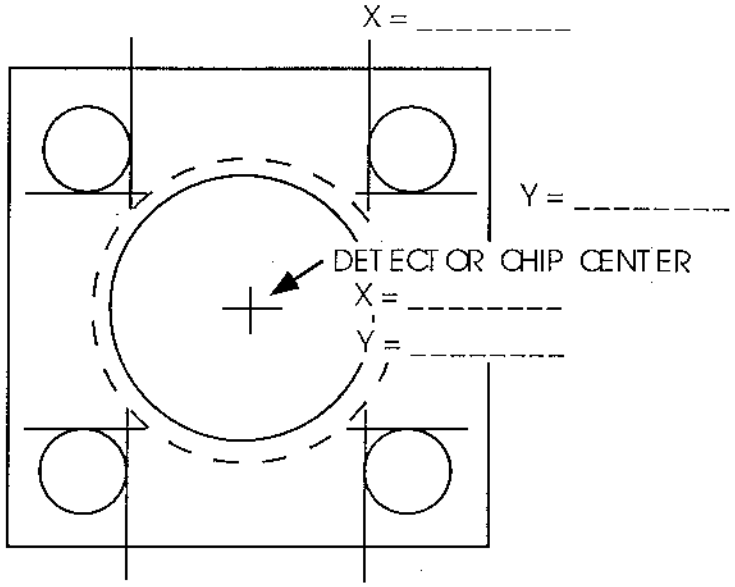
Pin Assignments





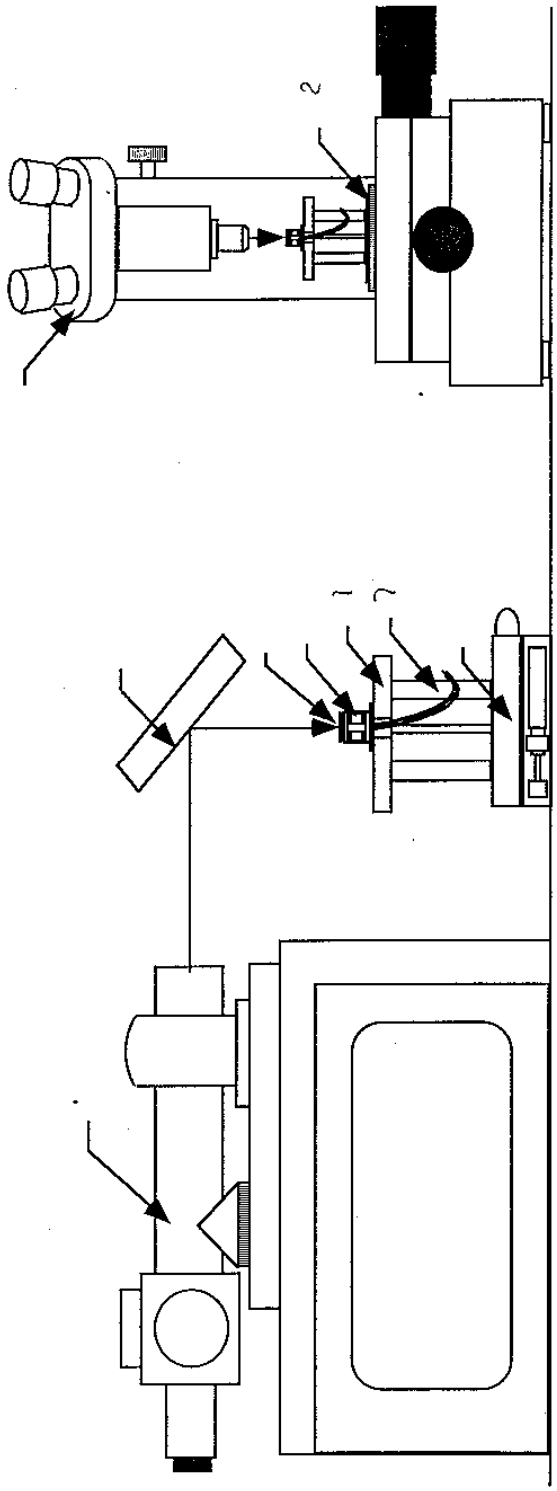


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



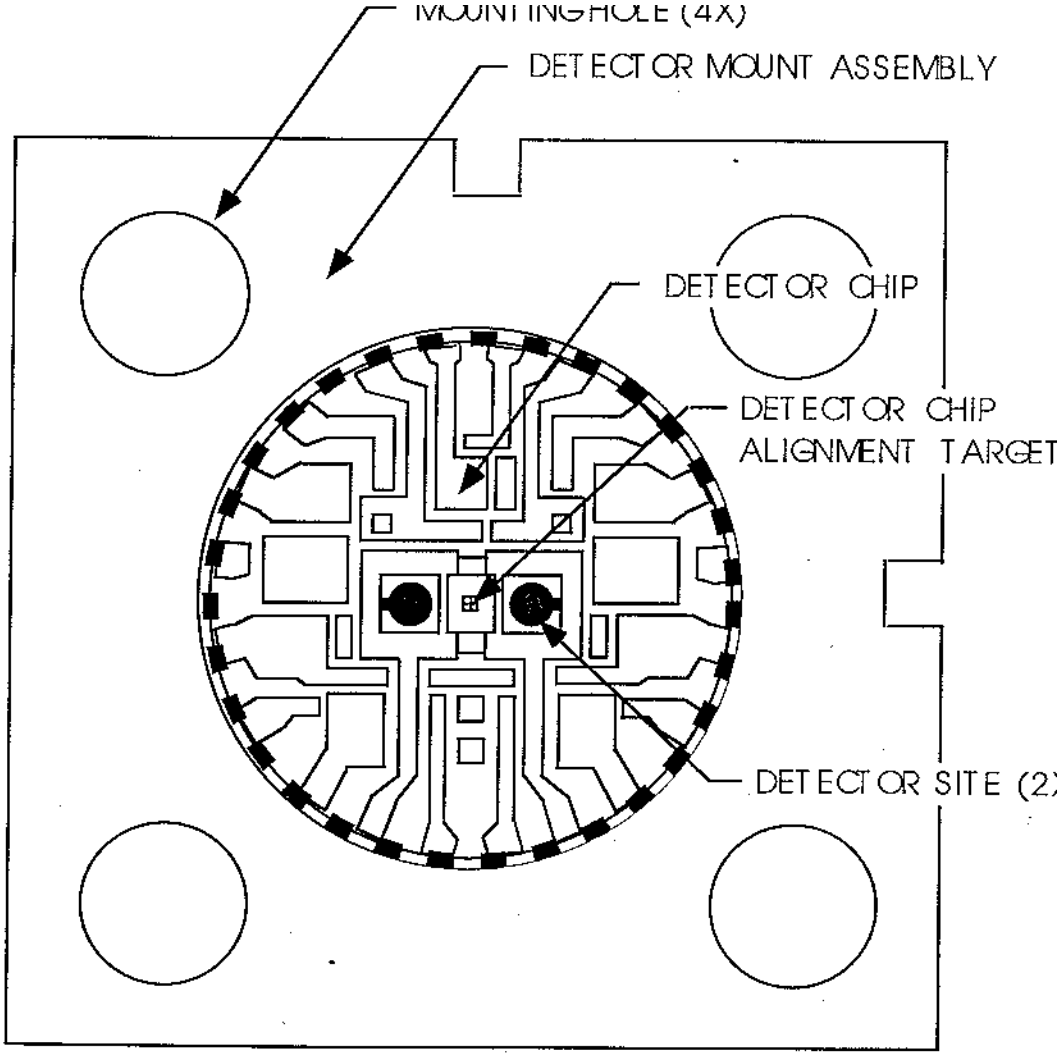


FIGURE 2 DETECTOR CHIP ORIENTATION

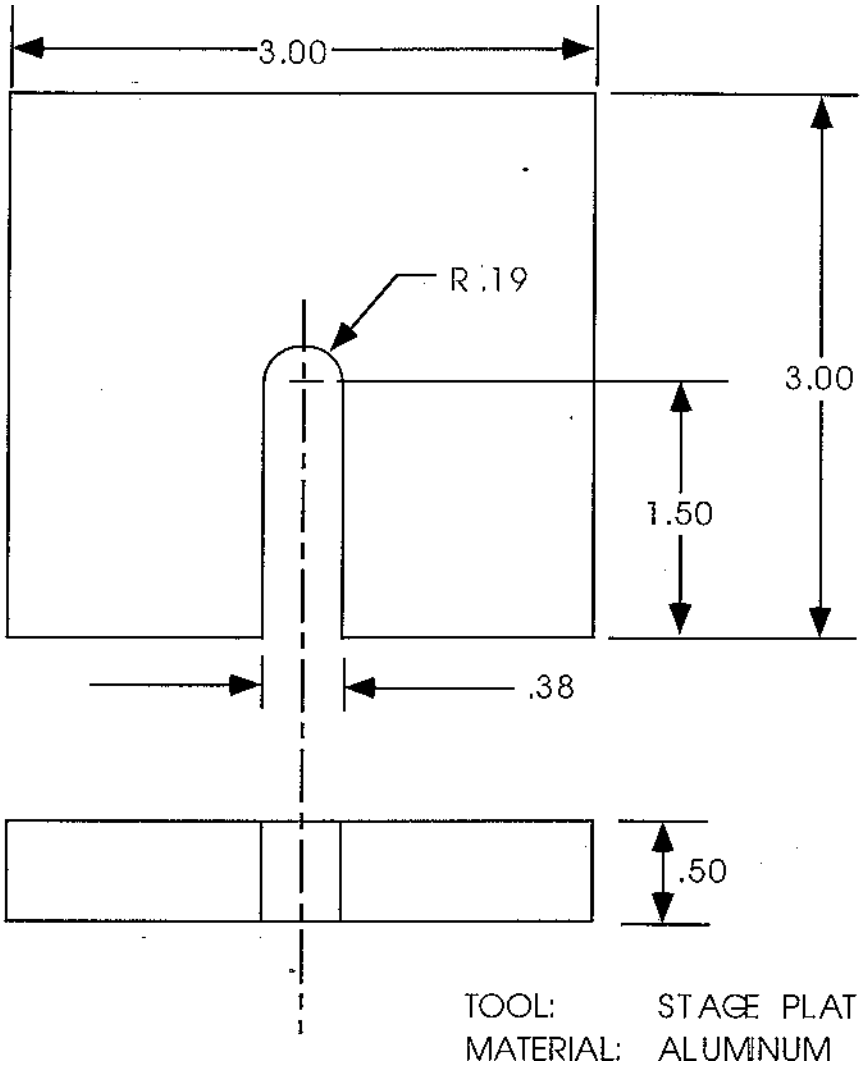
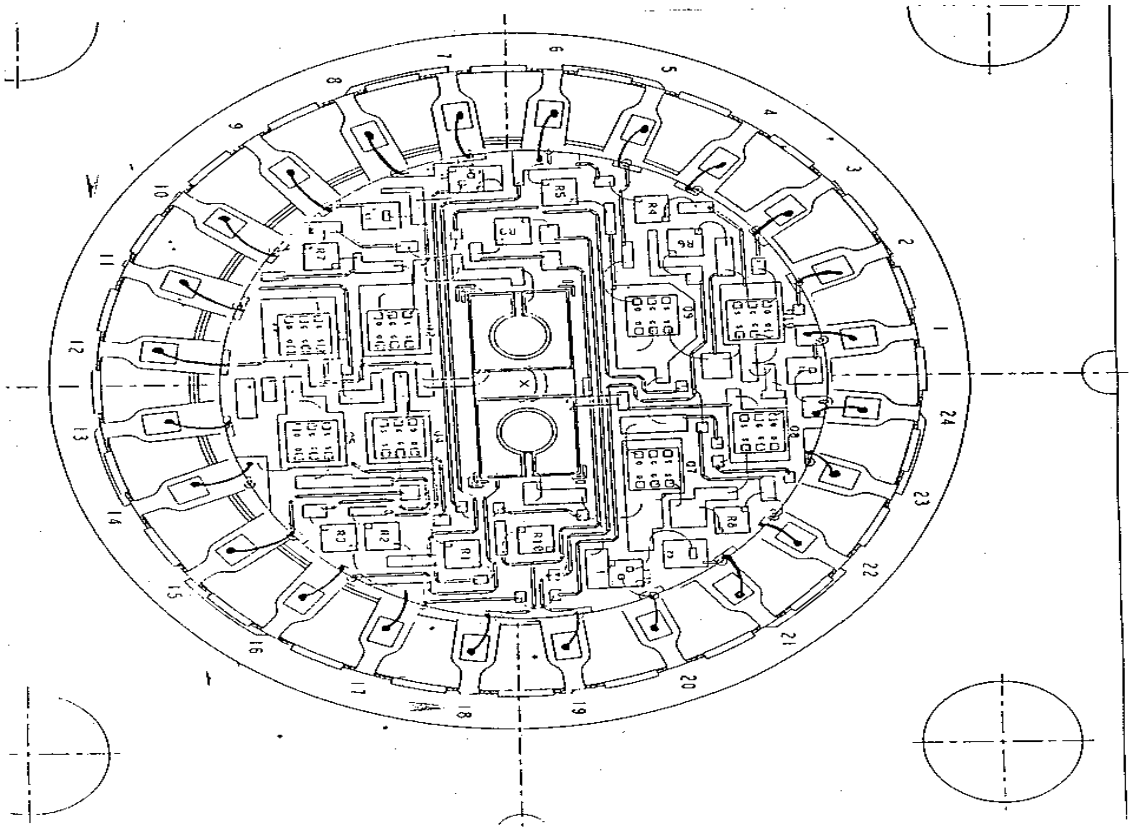
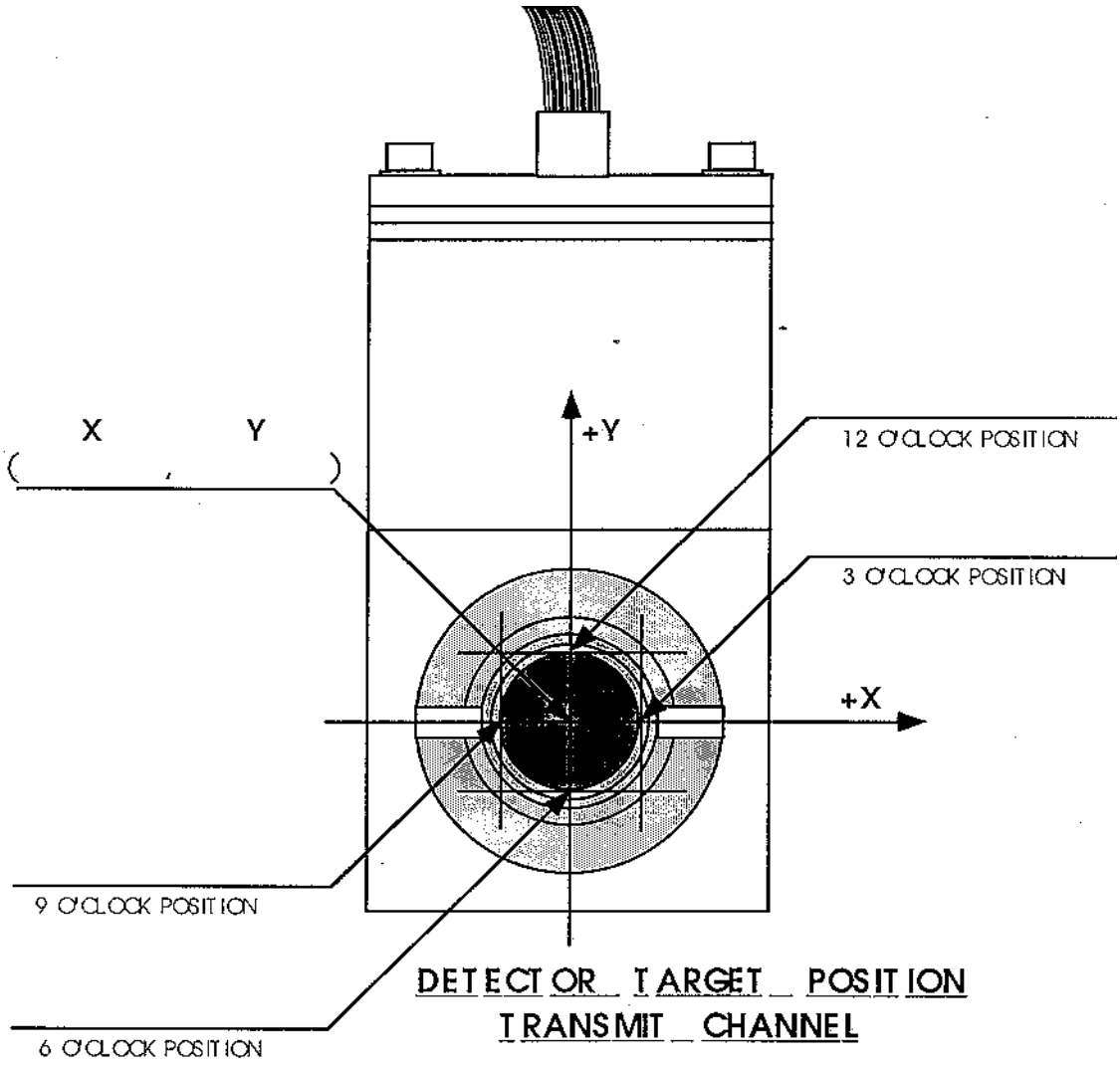


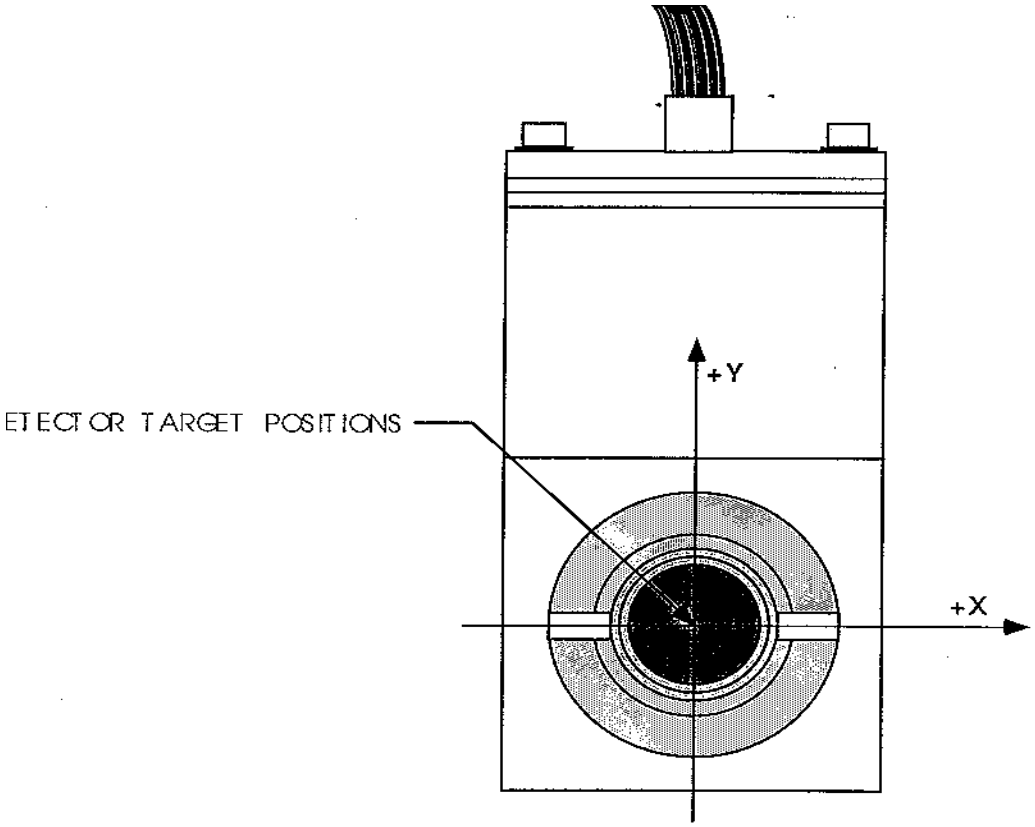
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





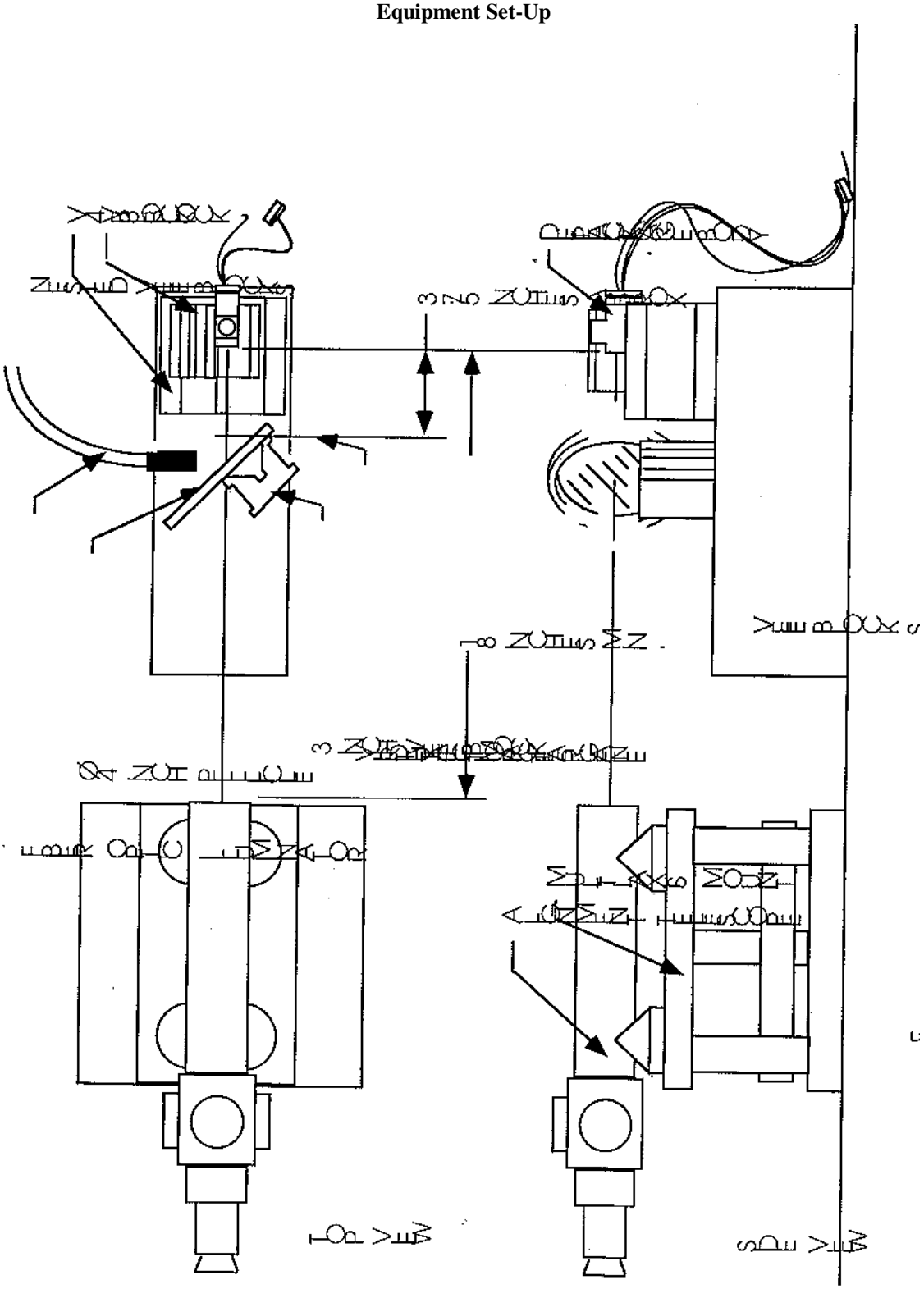
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



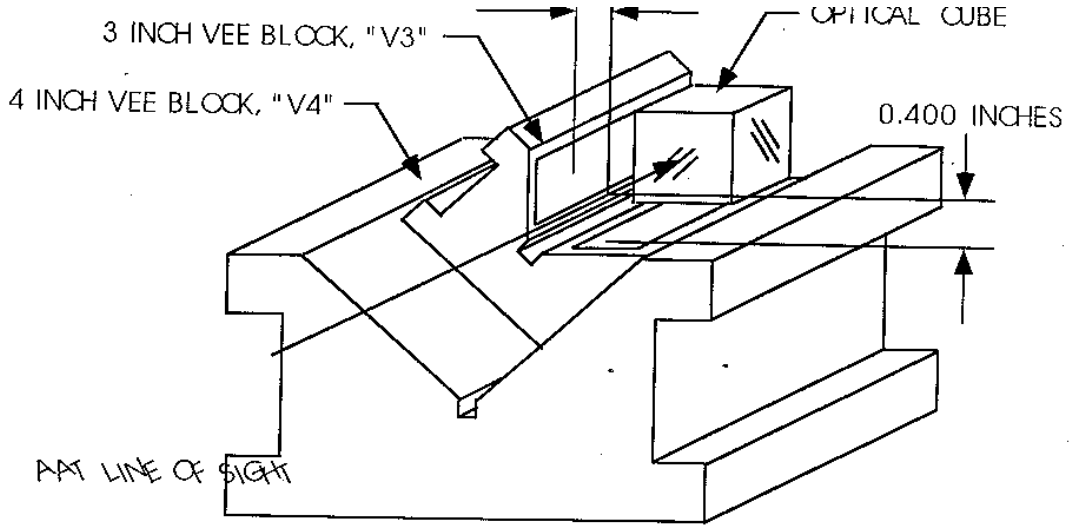


FIGURE 2A OPTICAL CUBE SET-UP

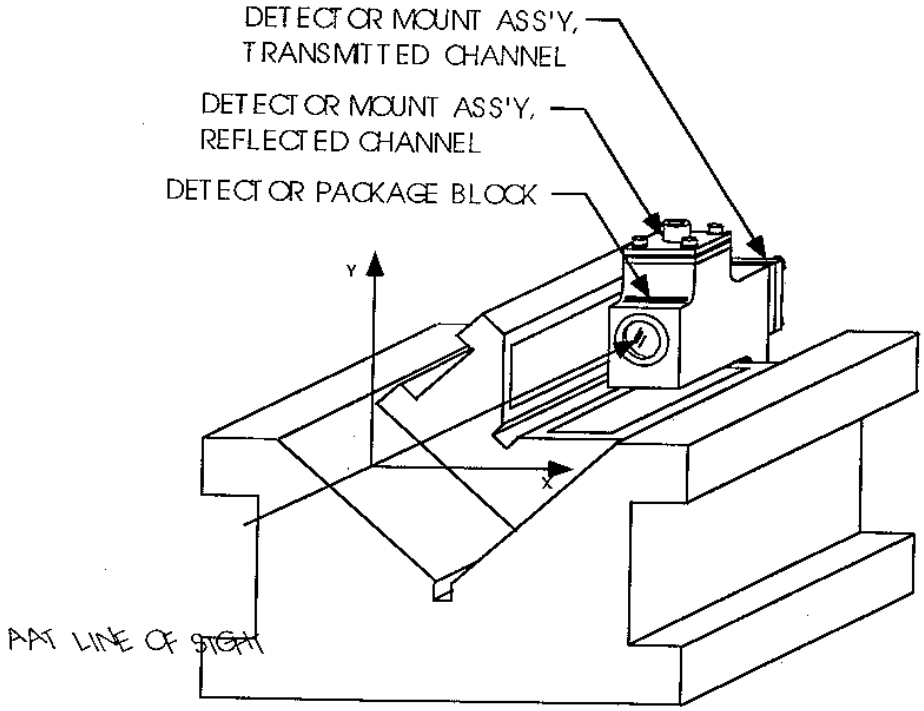


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.09 Rev. D

(Section 9 DPA and Optical Alignment)

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assembly Build	P0151.08
Section 9	Detector Package Assembly and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 09

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 9 DPA Assembly and Optical alignment

Equipment list:
2'x3' Breadboard
8" elevating platform (x2)
Gooseneck illuminator
Autocollimating Alignment Telescope (AAT) Record SN_____
X-stage
Z-stage
AAT structure assembly hardware
4" V-Block
'Brass-V' post simulator
X-stage (2)
X-stage (2)
Z-motion adapter plate
Reference cube
Angle Bracket
clamp arm (2)
Cleaning supplies
Kapton Tape
assorted non-magnetic screw drivers
digital torque wrench Record SN_____

1) This portion describes the initial assembly of the Detector Package Assembly (DPA).

Facility: GP-B Clean Room

Authorized Personnel:
M. Bukshpun shall perform this operation.

Procedure:

Obtain kitted parts from Bonded Stores per drw 25713.

Record Rev # and SN's of kitted parts:
_____

_____

_____

Assemble parts as shown in drawing 25713 with the exception of the DMA's and associated stack of shims and washers.

Torque screws to 4+/-0.2 oz-inches.

Completed:_____
Signature Date

Notes/Discrepancies (if any):

2) Determine DMA locations:

General notes:

also use *GP-B Telescope Image Divider Assembly (IDA) General Alignment and Bonding Procedures* (SUGP-B P0282) when working with the telescope for procedures concerning safety; personnel; work area requirements; fixture cleaning and acceptance; flight part inspection, handling, storage, and cleaning; and sign-off and recording requirements.
During any steps which involve DMA's, appropriate ESD precautions must be observed per P0357.

CAUTION:

The flight telescope used in a part of this operation is heavy, delicate, and valuable with multiple critical surfaces that can be easily damaged or contaminated by normal handling. Compliance with the above defined safe handling practices is critical.

CAUTION:

If at any time during this procedure flight hardware is not live monitored, verify that all flight hardware is seismically secured and protected against airborne contamination.

WARNING:

Some of the solvents, detergents, and/or bonding agents used in this procedure may be flammable, toxic, or reactive. Consult P0282 for information about specific chemicals.
All handling of any uninstalled or otherwise exposed DMA is to be performed in a class 100 clean room environment or better. All handling of any optics-only DPA (without DMA's) is to be performed in a class 1000 clean room environment or better. The completed DPA (with both DMA's installed) must be maintained in a class 1000 clean room environment or better.

Find DMA locations

To be conducted by an authorized telescope flight part handler per P0282 in the yellow room and telescope clean room.

1 Insert a titanium reticle sleeve in each DMA bore of the DPA. Insert a brass 'o+o' reticle in each sleeve. Visually clock each reticle such that the 'o+o' pattern is parallel to the sidewalls of the DPA housing. Secure each reticle and sleeve in place with one or more small pieces of Kapton tape.

2 Set up the flight telescope under the 7" autocollimator (AC) in the telescope clean room (per OID drawing #800-0049C) and roughly align the beam to the forward plate. (Secure or live monitor the telescope.)

3 Install the optical package DPA with reticles on the appropriate post of the telescope per P0266. Install another optical package DPA (does not need to be flight hardware) with one reticle installed on the other post.

4 Mount CCD cameras on the AC structure and insert periscopes as required such that the images of the reticles can be monitored.

5 Finely adjust the orientation of the AC beam such that the light spots on the reticles are about evenly divided in both DPA's (no spot is visually more than twice as bright as its partner)

6 Take photographs and/or sketches of a reticle in the flight DPA showing the relative positions of the spots to the reticle pattern. Rotate the reticle about 90 degrees and repeat (this prevents the interference of the pattern with the spots in the transmitted channel when large offsets exists).

7 Calculate the offset of the midpoint of a line segment drawn between the two spots and the center of the '+' on the reticle pattern (use care to identify correct quadrants). This offset identifies the ideal position of the DMA's. Record offset here:
X=_____ , Y=_____

8 Repeat steps 6 and 7 for the reflected channel reticle of the flight DPA. Record offset here:
X=_____, Y=_____

9 Remove periscopes if used in step 4.

10 Remove the flight optical package DPA (with reticles) from the telescope per P0266.

11 Record SN of DPA _____

Completed:_____
Signature Date

Notes/Discrepancies (if any):

3) Set up for DMA alignment

To be conducted by Ken Bower or Michael Bukshpun in the Yellow Room.

1 Loosen each screw in the bezel faceplate. Remove those screws, the faceplate, wave washer, bezel, and lens from the DPA.

2 Set-up a ~2'x3' breadboard on the laminar flowbench.

3 Mount a Z-stage (Newport MVN-80 w/actuator) on one end of the breadboard. Mount an X-stage atop the Z-stage (use mounting accessories as required) oriented for lateral motion. Mount an autocollimating alignment telescope (AAT) atop the X-stage. Provide lighting as required.

4 Mount an 8" tall platform(s) (Newport 290-SET) as required on the other end of the breadboard. Install a V-block on to the platform. Place the 'brass V' post simulator in the V-block.

5 Assemble and mount an XY-stage and clamp arm such that the clamp is able to grip the flex cable of the redundant channel DMA when a DPA is installed on the 'brassV'.

6 Assemble and mount an XZ-stage and clamp arm such that the clamp is able to grip the flex cable of the primary channel DMA when a DPA is installed on the 'brassV'.

7 Install the flight DPA on to the 'brass V' (using P0266 as required).

8 Roughly align, adjust, and focus the AAT such that it sights onto the entrance aperture of the DPA.

9 Using flat mirrors and/or reference cubes as required, adjust and focus the AAT such that it is optically normal to reference surface 'A' on the DPA housing. note: no specific accuracy is required for this step; this simplifies later adjustments but is not required for accurate alignment.

10 Finely align, adjust, and focus the AAT such that it sights near the center of the entrance aperture of the DPA.

Completed:_____
Signature Date

Notes/Discrepancies (if any)

4 Install DMA's

To be conducted by Ken Bower or Michael Bukshpun in the yellow room with assistance from Howard Demroff:

1 Illuminate the reticle patterns through the entrance aperture of the DPA. Focus the AAT on the reticle patterns and identify the transmitted channel reticle.

2 Offset and clock the crosshairs of the AAT such that they identify the correct position of the DMA to be installed (as determined in part 2). Secure the AAT.

3 Assemble a 'DMA stack':
- Screw in the four titanium guide pins into fixture.
- Slide on RF cap and shim.
- Using nylon screw secure EMI shield to guide ring.
- Slide DMA onto pins with circuit pointing out of package.
- Slide the EMI shield and guide ring assembly over DMA. Keep EMI shield parallel to circuit plane.
- Secure with Ti clamps.

4 Remove the transmitted channel reticle and install the 'DMA stack' (ok to remove from 'brass V' for this operation if required). Insert the four DMA mounting screws, remove Ti clamps, and tighten until the stack is pressed into place, but still able to be laterally adjusted.

5 Place the clamp over the flex cable, adjusting the clamp arm's stage as required, and lightly tighten the clamp in place. Position the flex cable and DMA connector as required to avoid interfering with the sightline of the AAT. Use caution to prevent excessive stress on the flex cable.

6 Adjust the position of the flex cable in the clamp such that the photodiodes are visually clocked to align to the AAT crosshairs and lock the clamp tightly.

7 Adjust the clamp arm's stage as required to position the photodiodes such that they are centered on the AAT crosshairs to <0.005". Loosen the DMA mounting screws as required to ensure that no tension has built up in the stack during adjustment.

8 Tighten each screw to flush contact. Tighten each screw to 4 +/- 0.2 oz.-in. of torque.

9 Remove the clamp from the flex cable.

10 Using the AAT, visually verify that the photodiodes are still correctly clocked and positioned.

11 Repeat steps 1 through 10 for other channel of the DPA.

12 Using the AAT, estimate the mutual position error of the two photodiodes. If the difference is more than 0.005", repeat steps 1 through 11 as required.

13 Remove the DPA from the 'brass V' (using P0266 as required).

14 Reinstall the lens and torque screws to 4 +/-.2 oz-in.

5) Testing

Howard Demroff will test the cable to ensure isolation between signal return and RF shield. Record result here.

Resitence measurement_____

6) Packaging

H. Demroff or M. Bukshpun will package the DPA.

Record SN of transmitted DMA _____

Record SN of reflected DMA_____

Place assembly in clean container and tag with part number and serial number. Record the same information here.

Part #_____SN_____

Completed:_____
Signature Date

Notes/Discrepancies (if any)

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

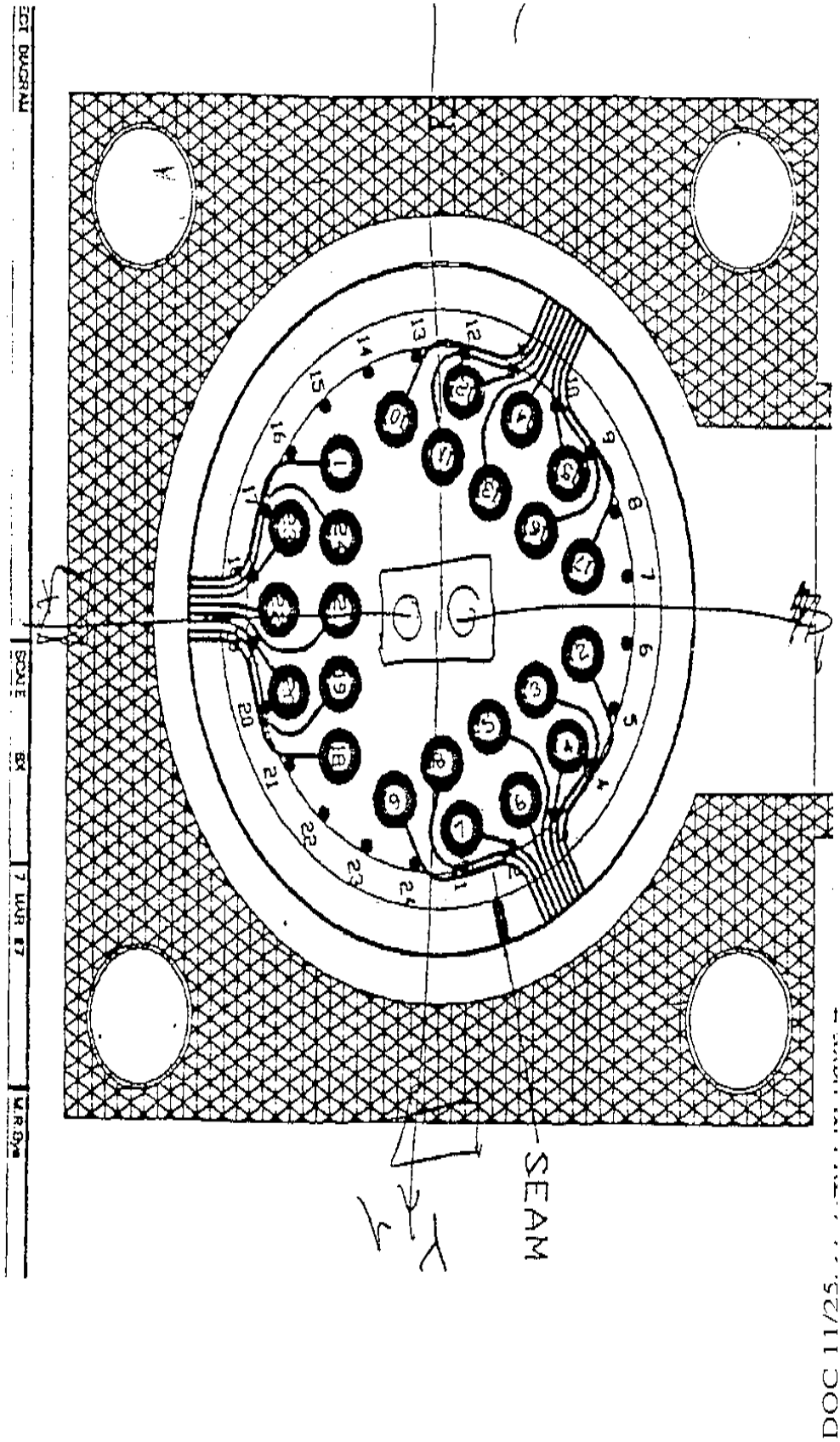
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

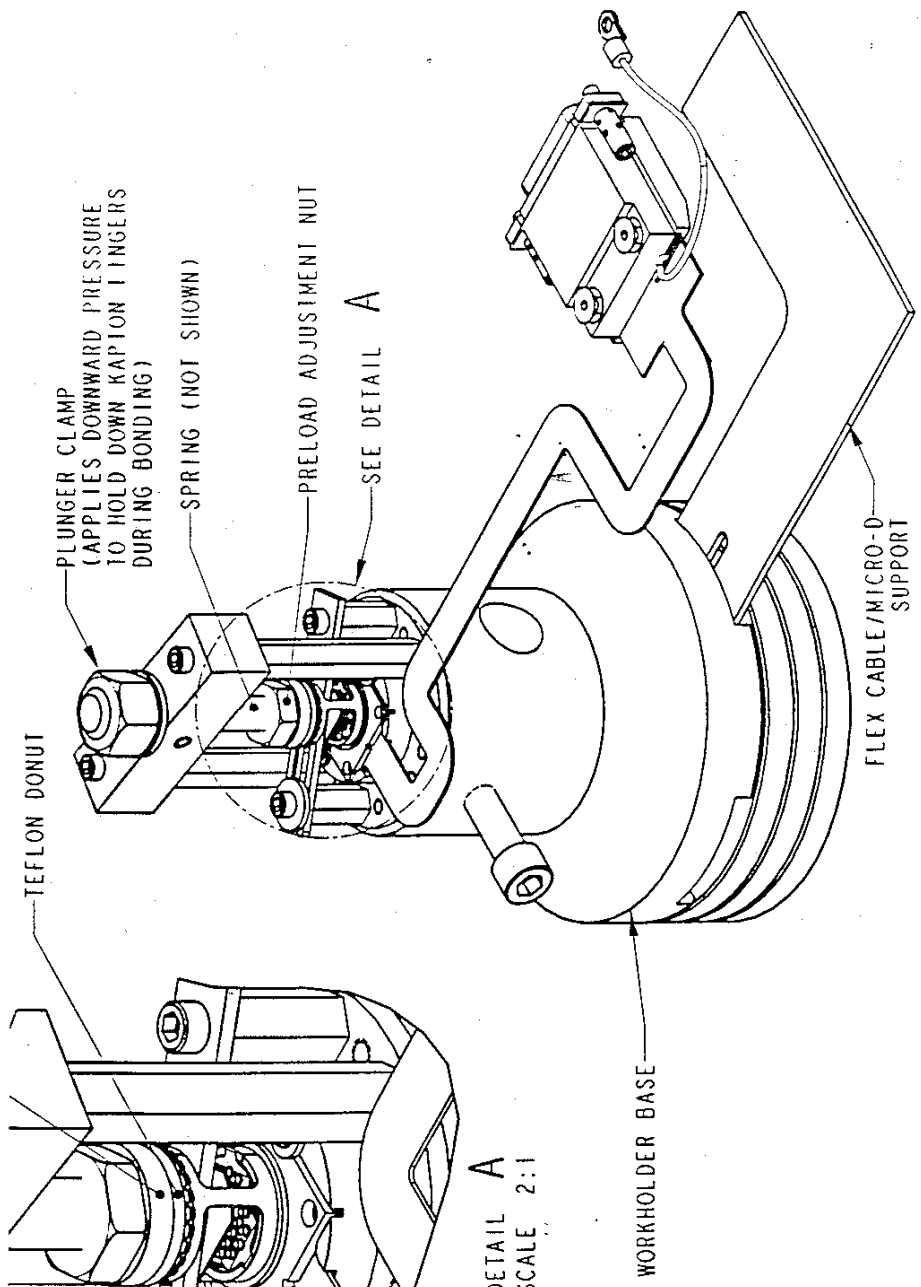
Visual Inspection - Step #1

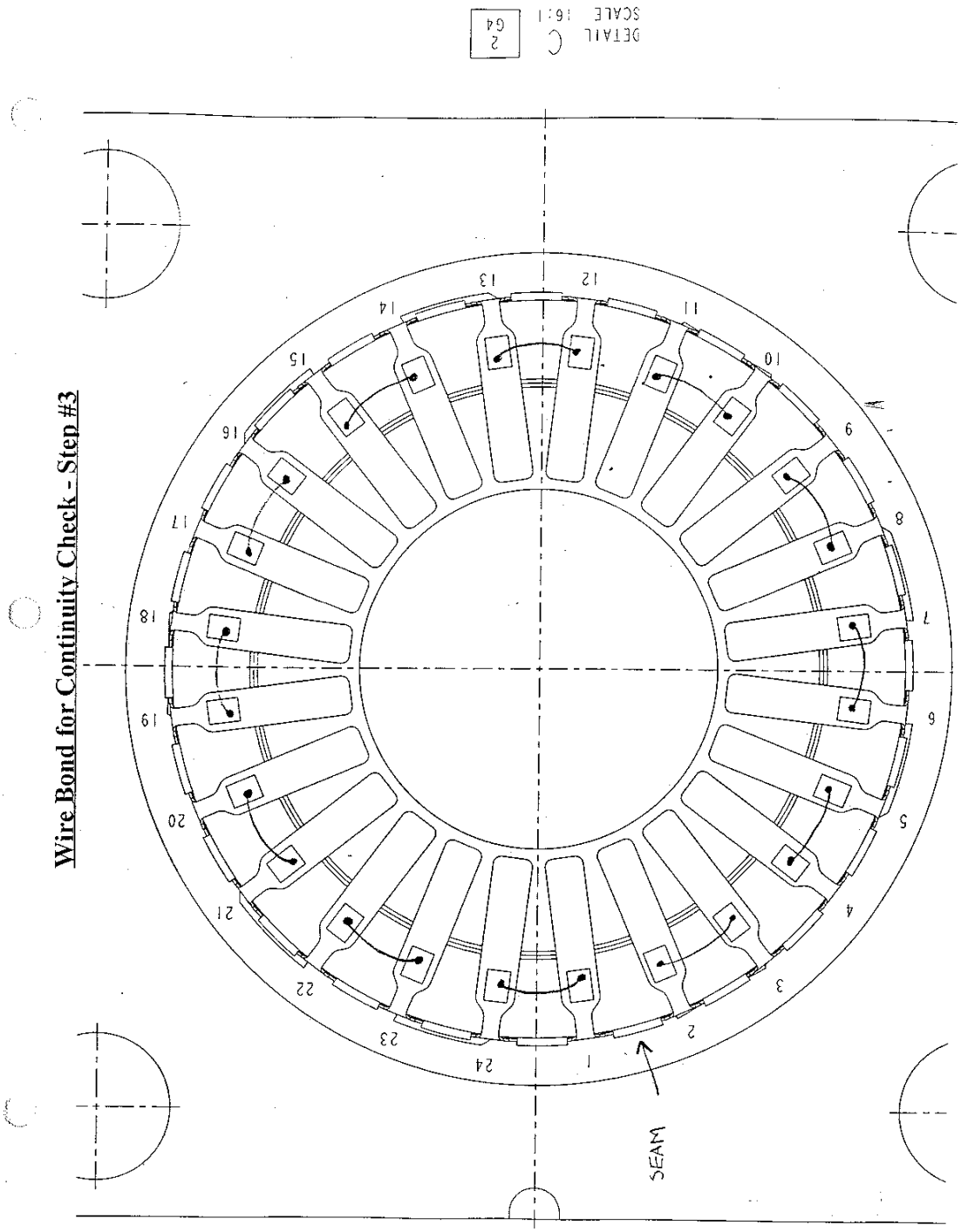
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

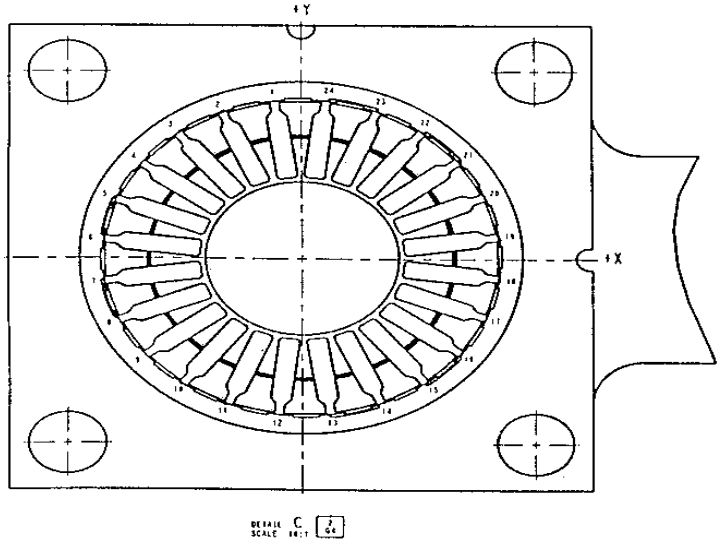
1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

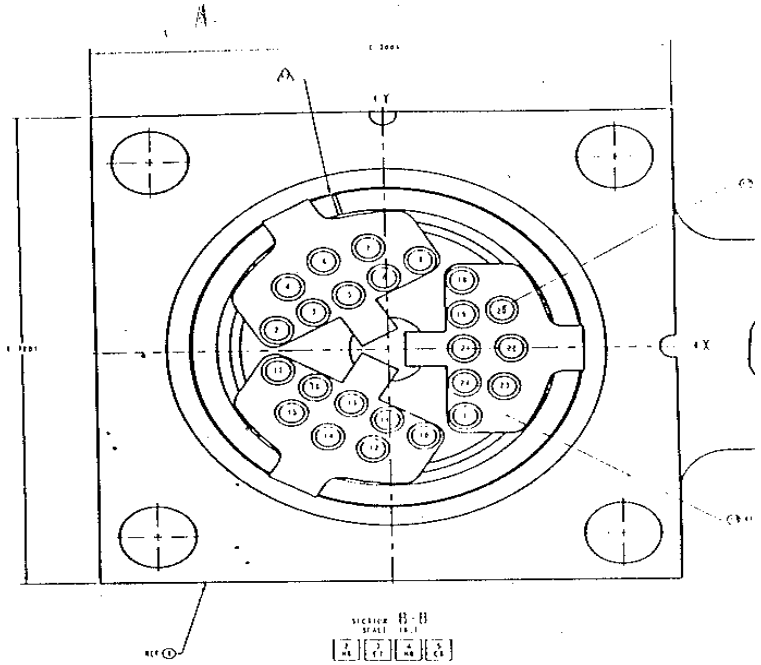


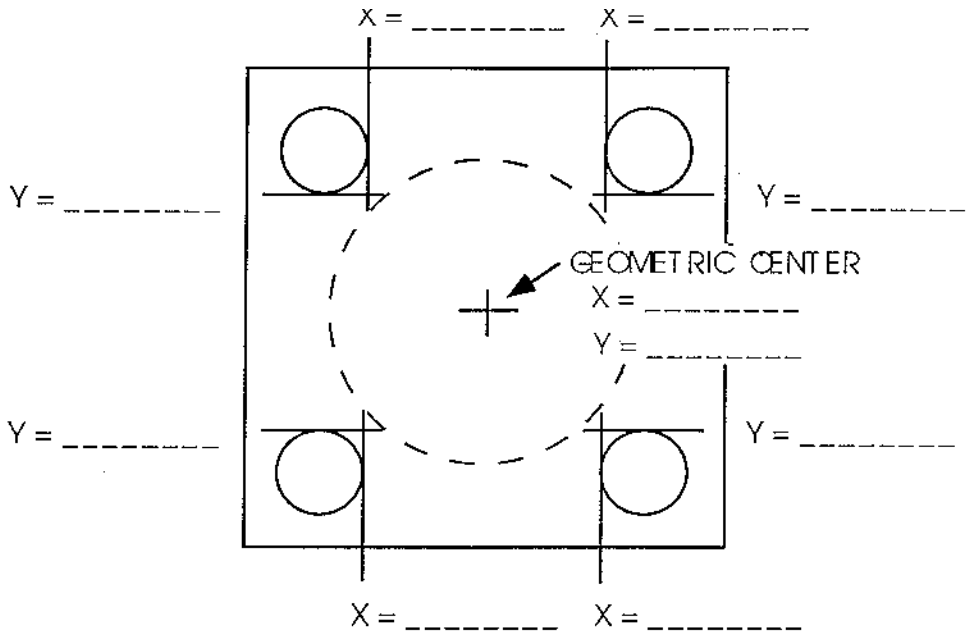

DETAIL C
SCALE 16:1
2
G4
Wire Bond for Continuity Check - Step #3
SEAM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Appendix

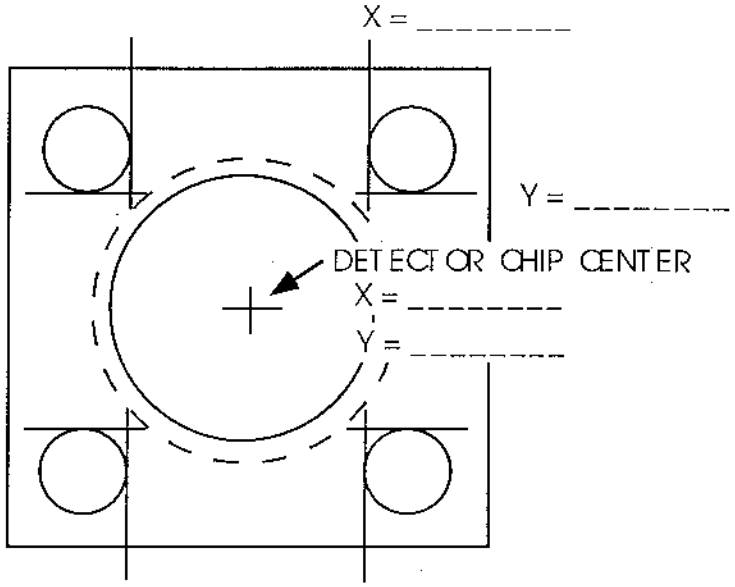
Pin Assignments





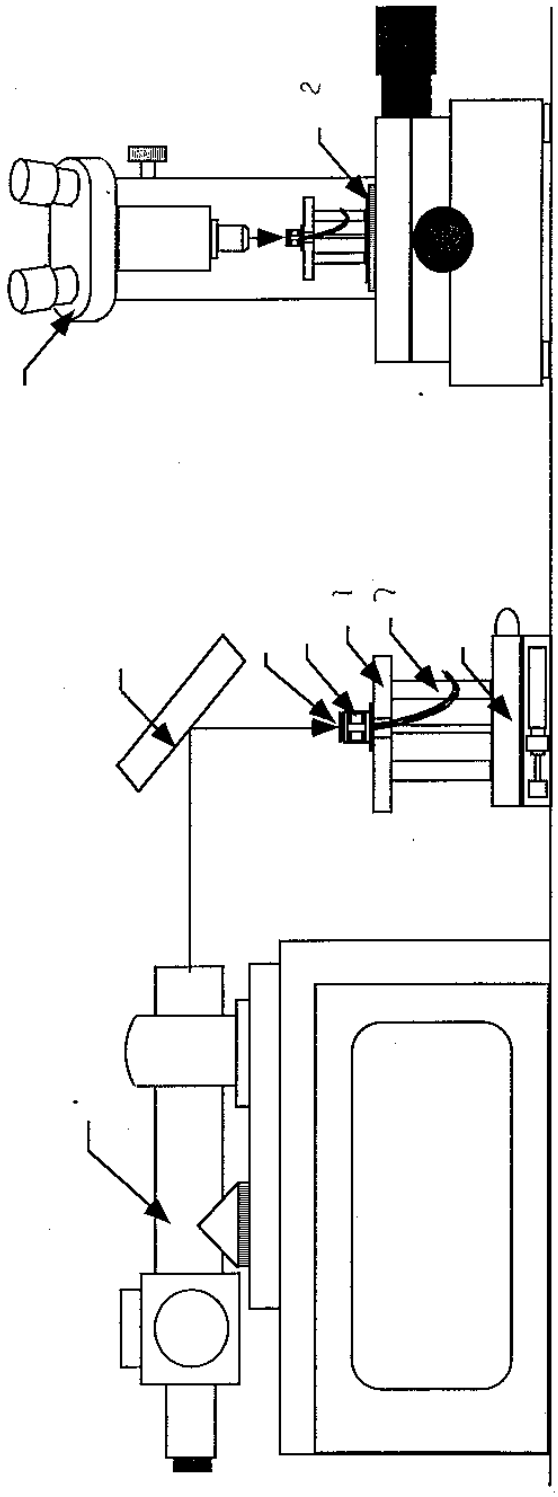


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



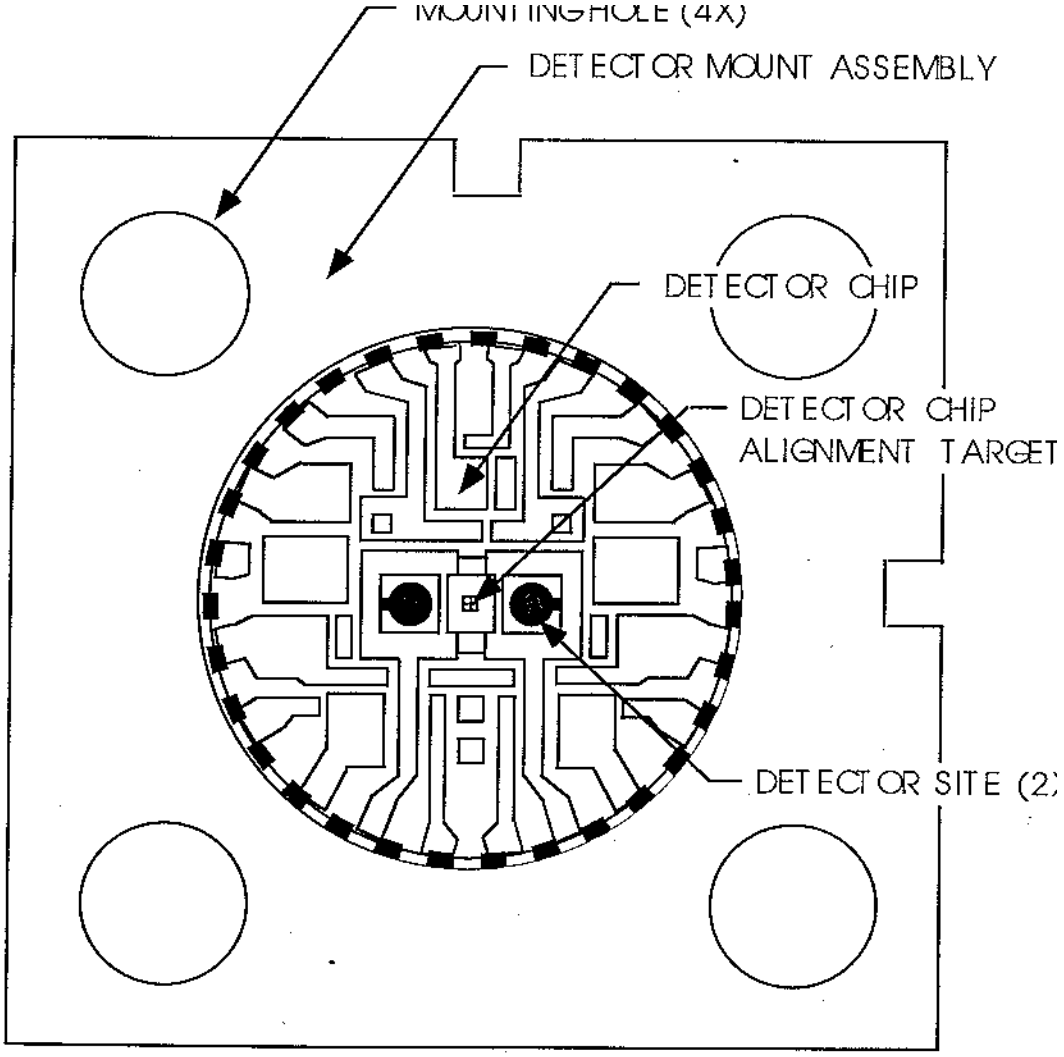


FIGURE 2 DETECTOR CHIP ORIENTATION

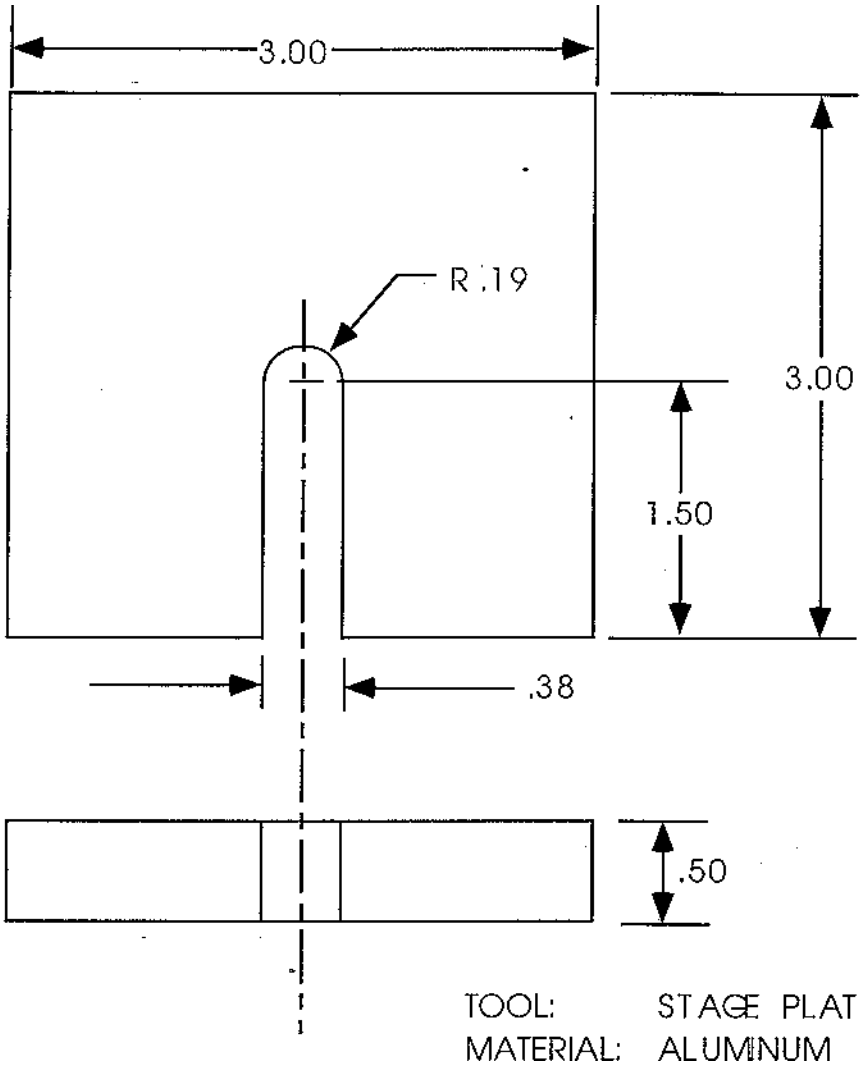
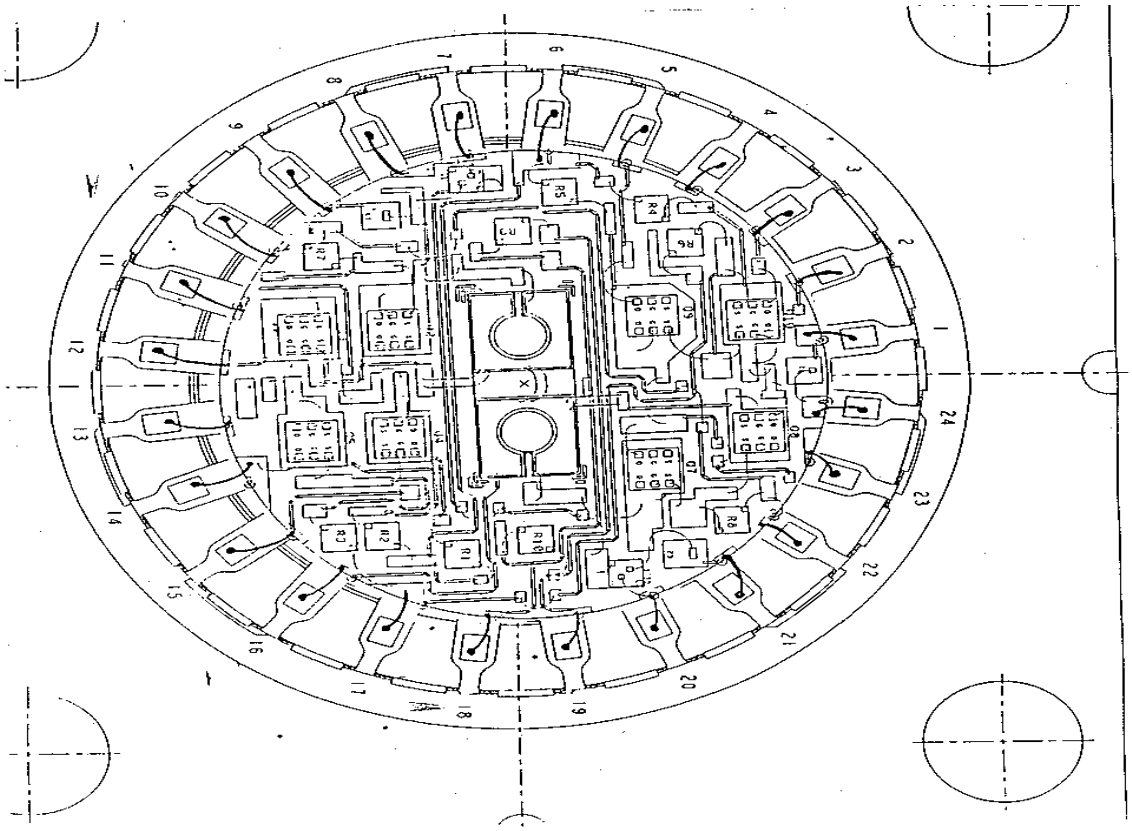
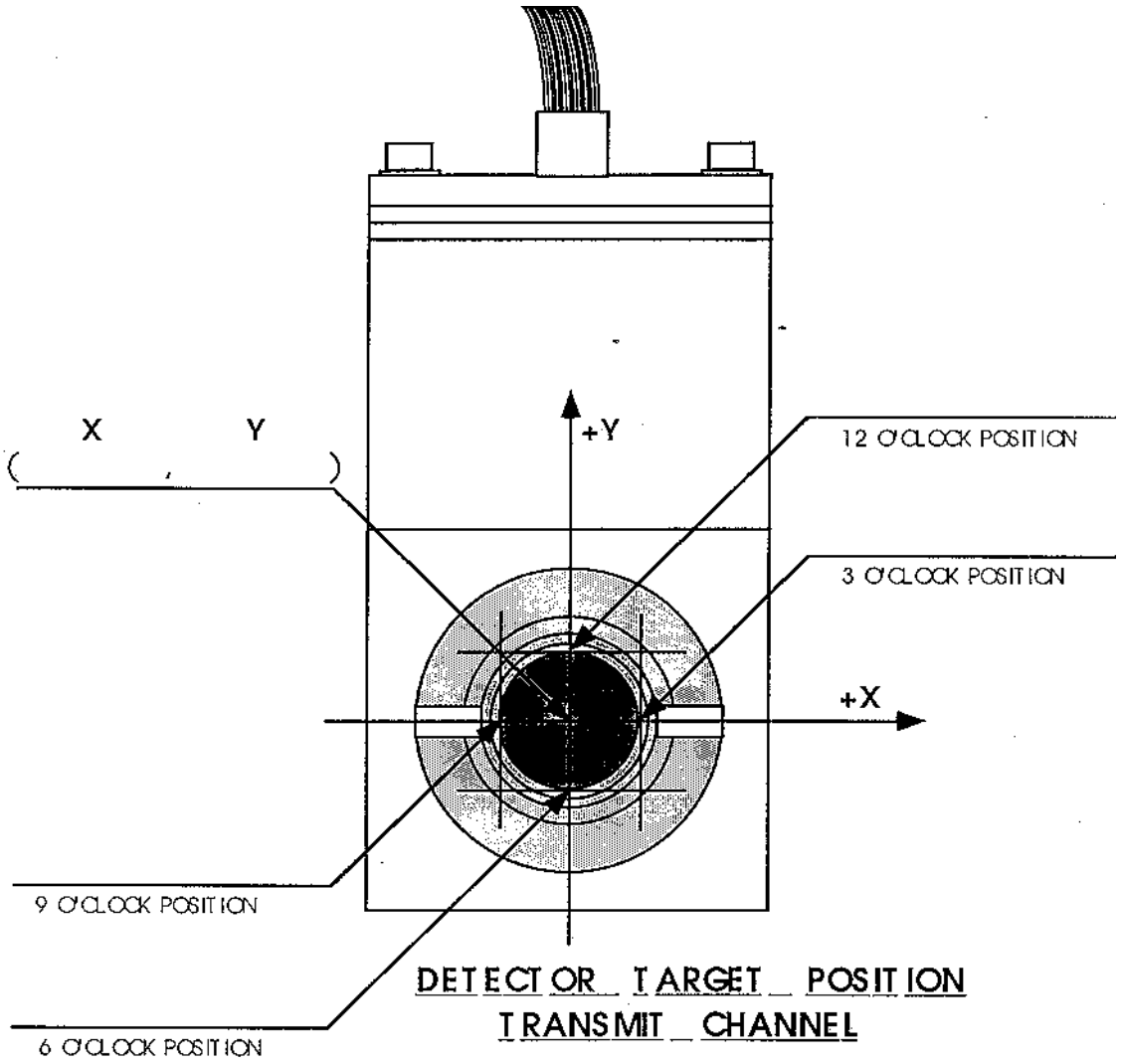


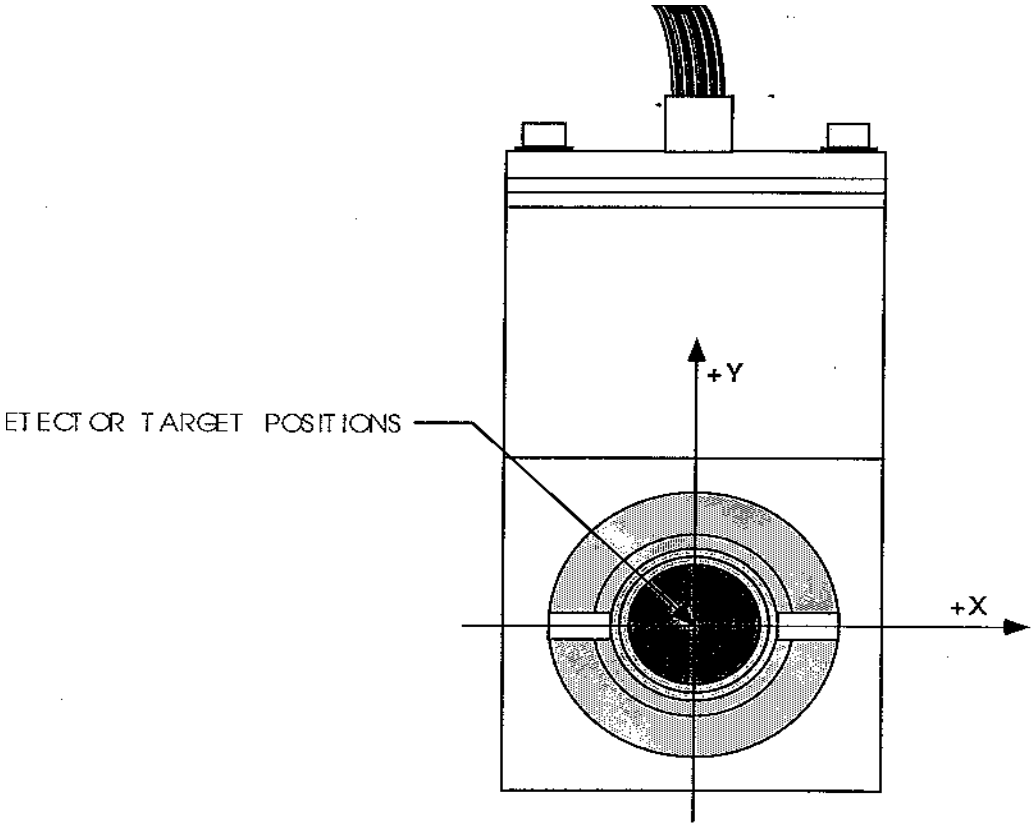
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





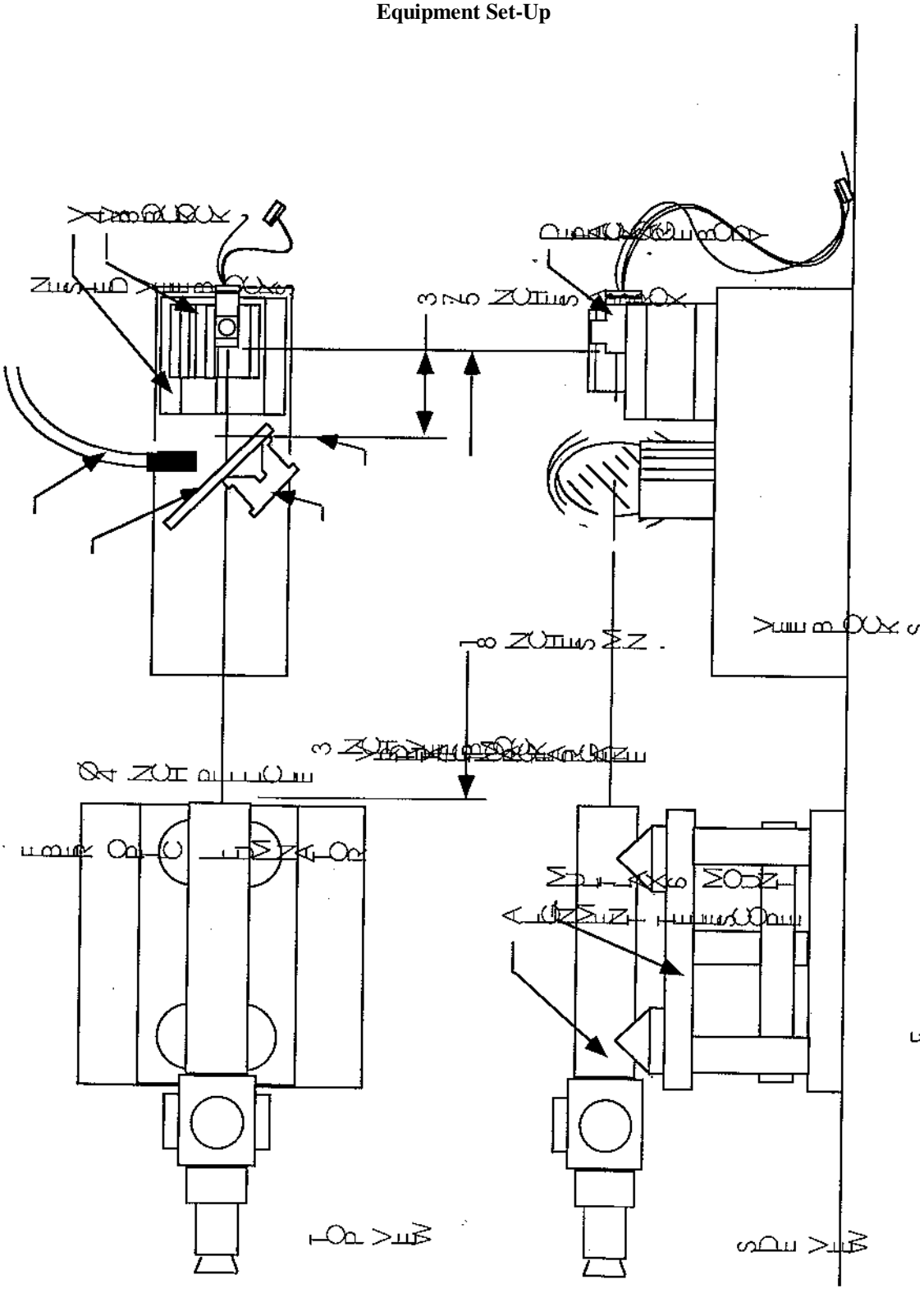
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



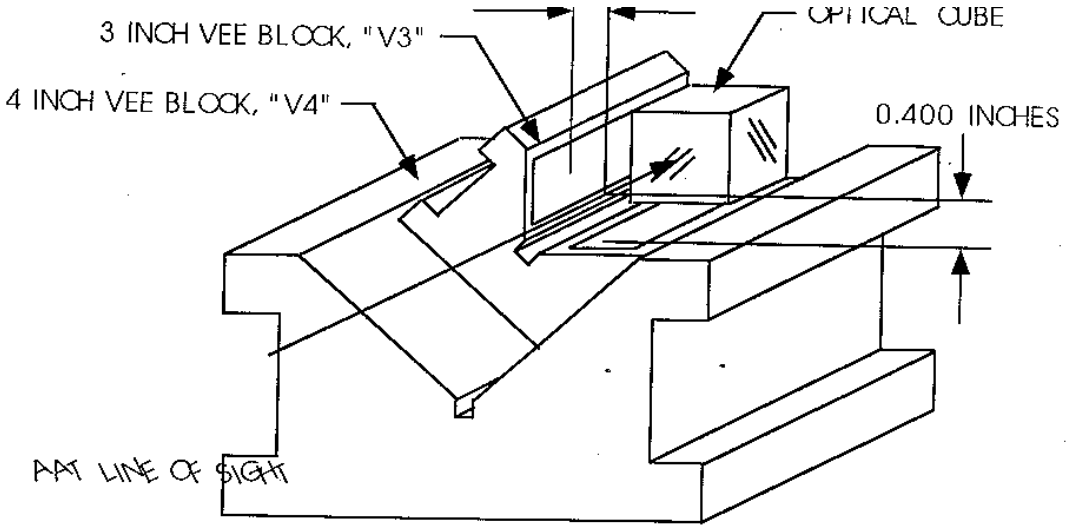


FIGURE 2A OPTICAL CUBE SET-UP

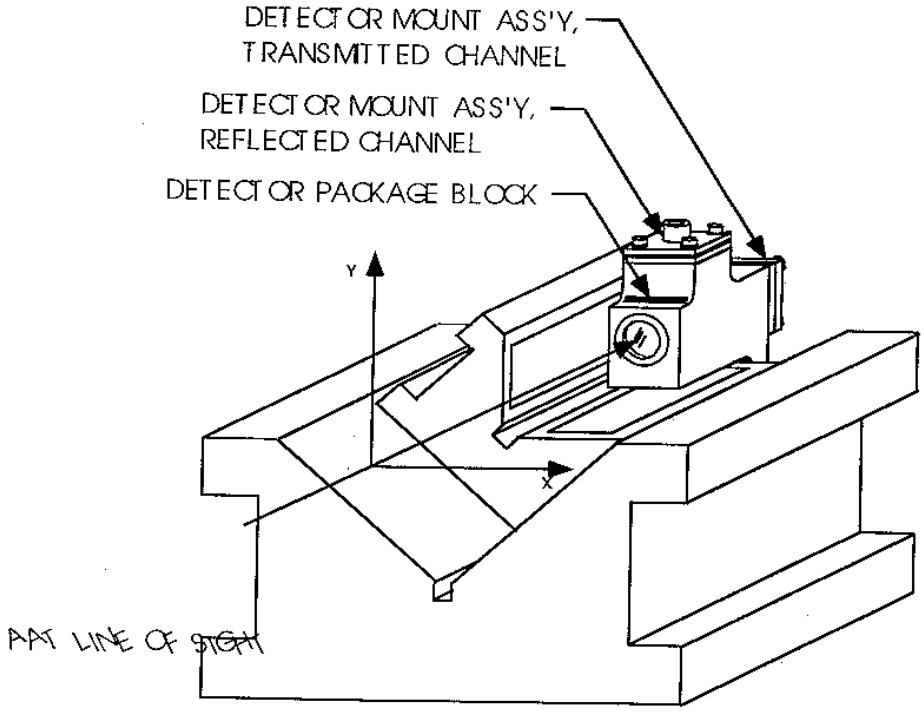


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.10 Rev. D

(Section 10 Magnetic Scrutiny))

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assemble Build	P0151.08
Section 9	Detector Package Assembly Build and Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration	P0151.11
Figures		Page 15

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 10 Magnetic Screening of Detector Package Kit

1 Scope

This section describes the magnetic of the Detector Package Kit. In this procedure, the Detector Package Kits are screened in the GP-B Magnetics Lab with the gradiometer to verify proper control of parts and assembly practices.

2 applicable Documents

Drawing 25712

3 Facility

Gravity Probe B Magnetic Lab

4 Equipment and Materials

Gradiometer
Detector Package Kit per drawing 25713

5 Authorized Personnel

John Mester, Grace Brauer, or Dean Yon shall perform this procedure, but H. Demroff or M. Bukshpun must be present to witness.

6 Procedure

1. Detector Package should be handled extremely carefully. At this point in their build, they are ready for integration with the Telescope. Rough handling of the Detector Packages can damage them Procedures should be in place that do not compromise the cleanliness of the Kits.

2. Inspect Detector Package Kits with Gradiometer. Record measured values below and indicate whether Kit passes or fails for Zone 3 magnetic requirements.

_____

_____

_____

Pass _____

Fail_____

Completed:_____
Signature Date

Discrepancies (if any):

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

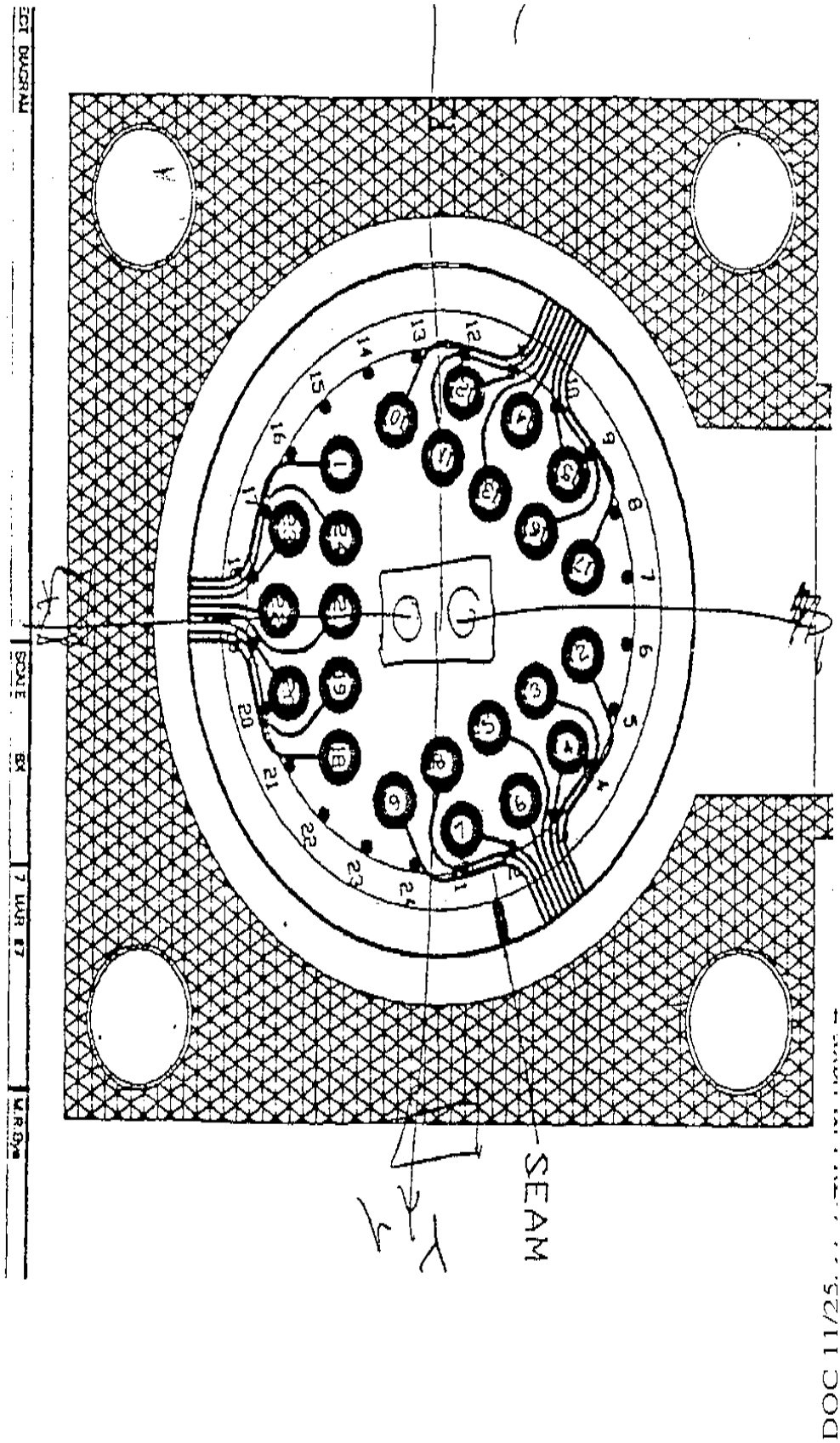
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

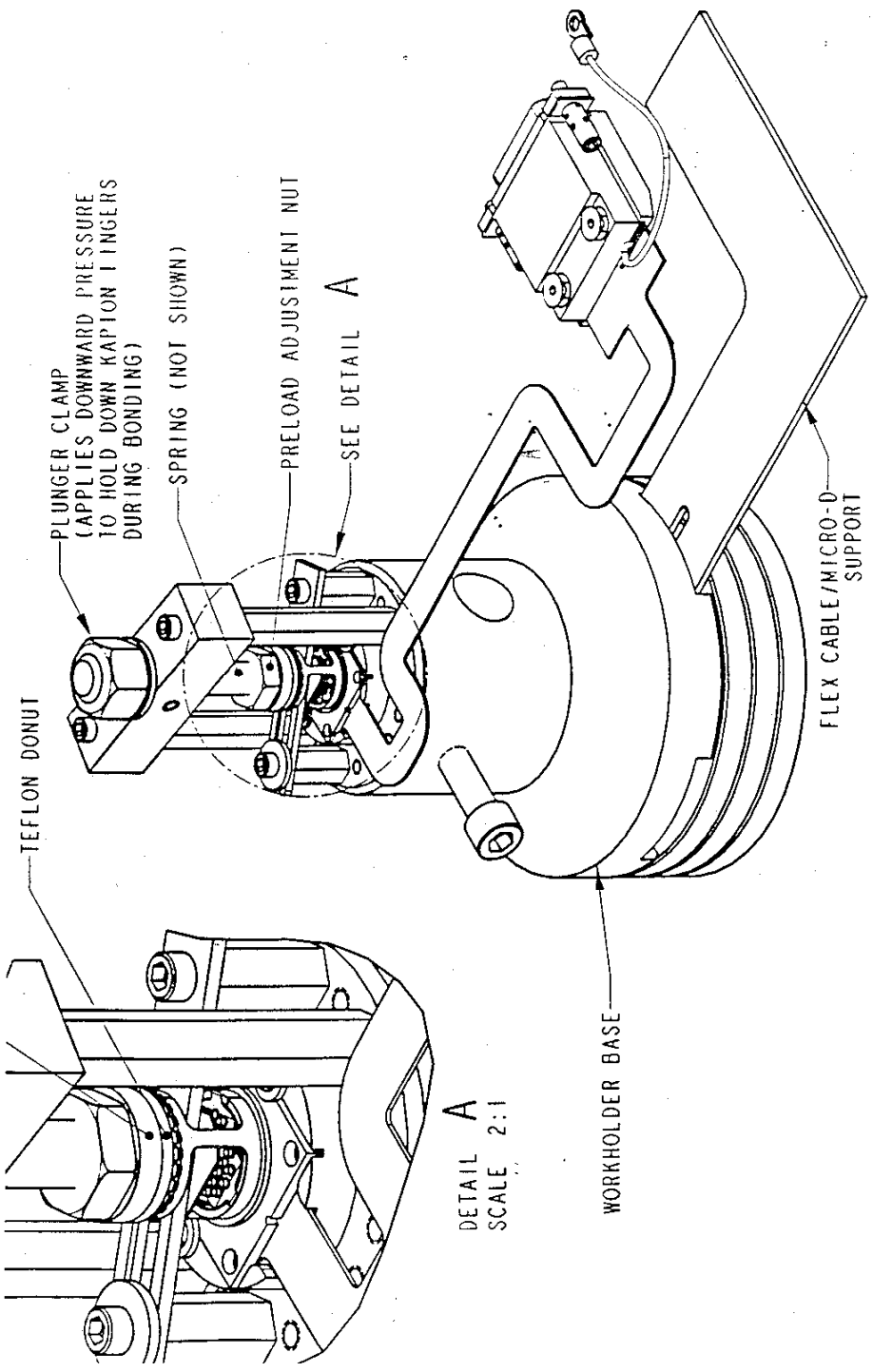
Visual Inspection - Step #1

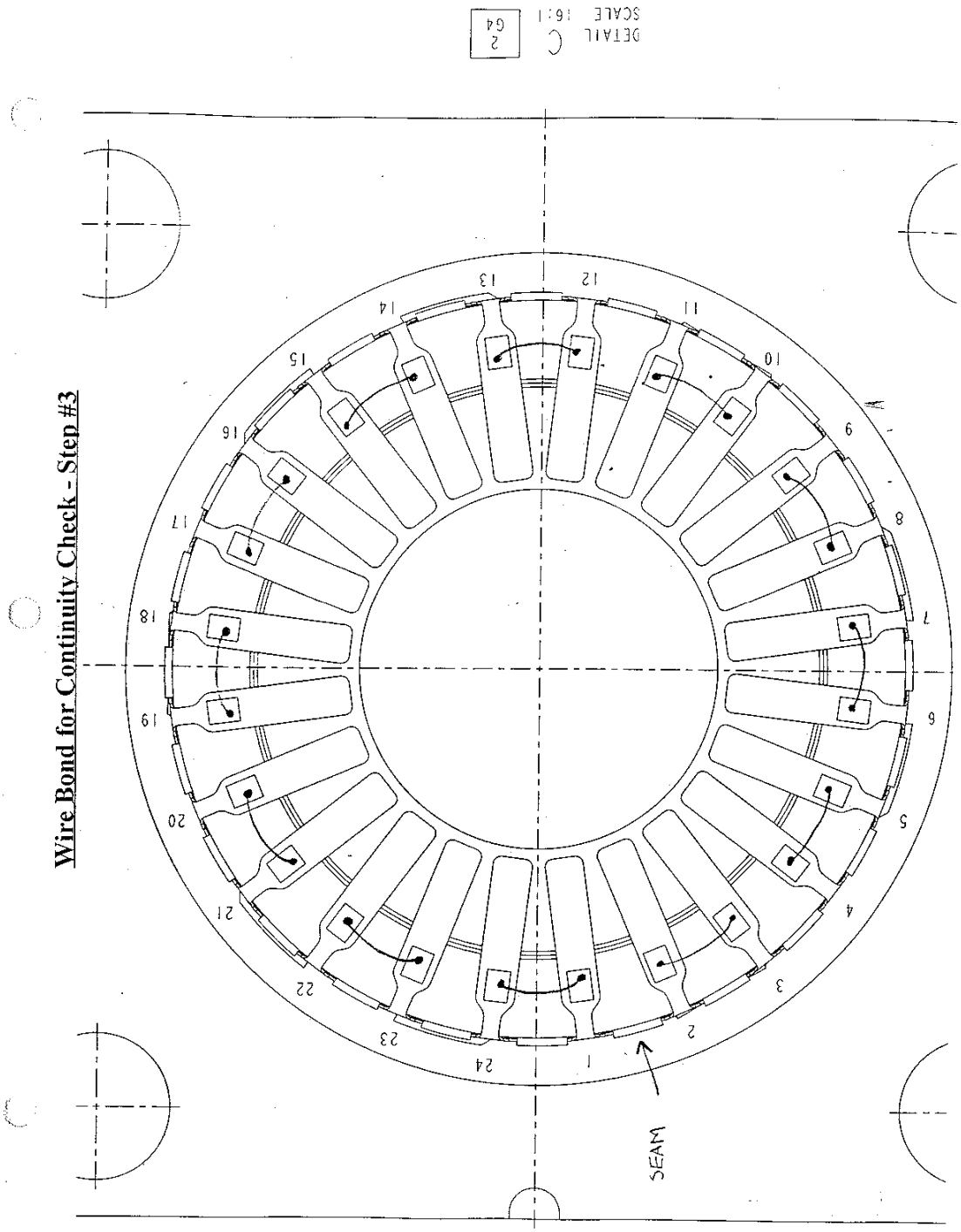
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

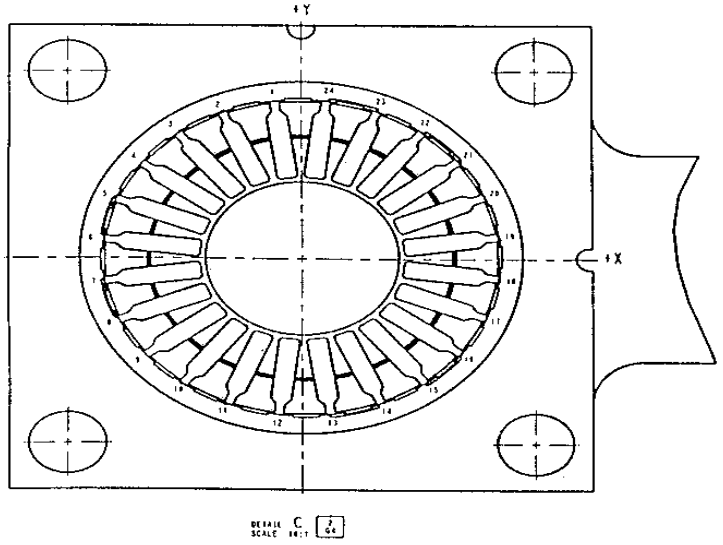
1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

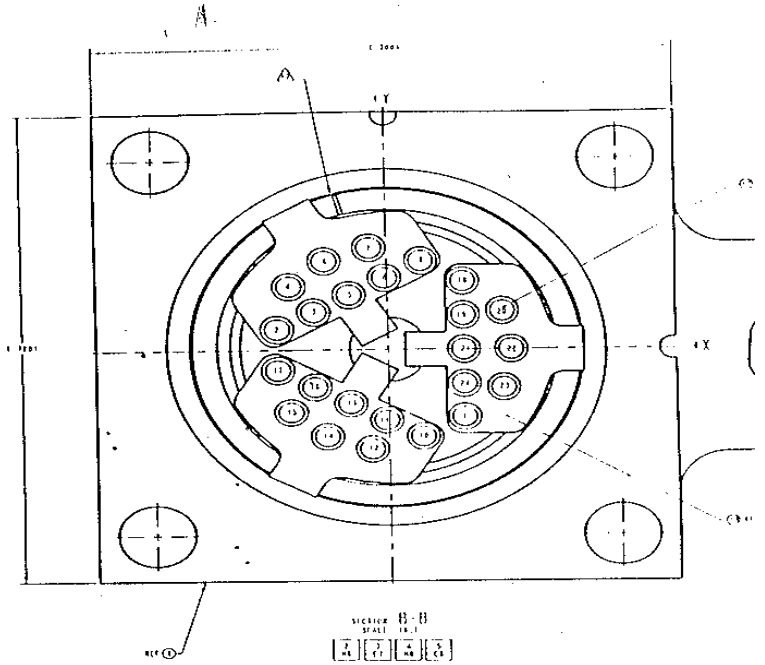


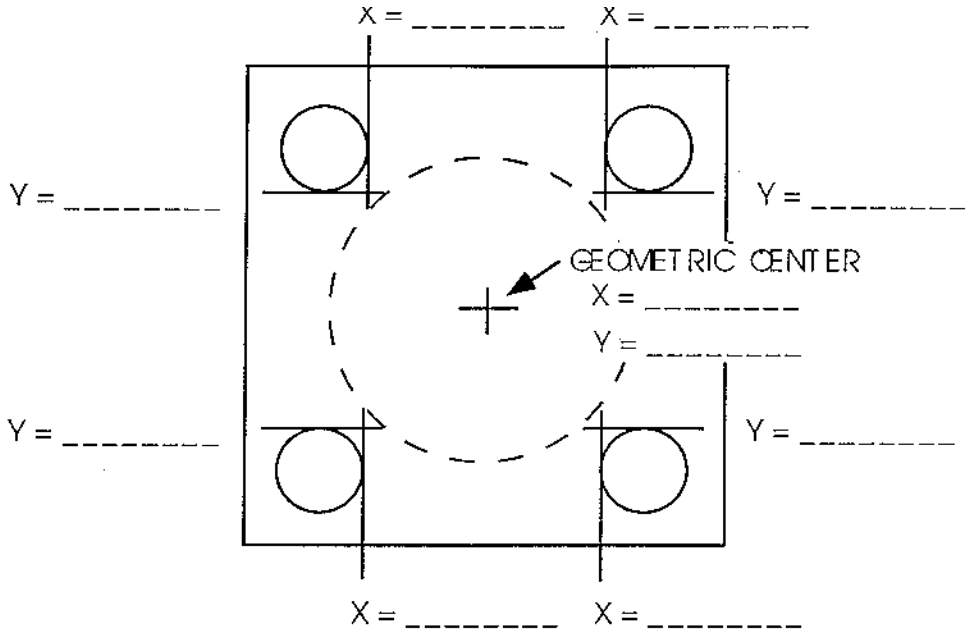

DETAIL C
SCALE 16:1
G4
2
Wire Bond for Continuity Check - Step #3
SEAM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Appendix

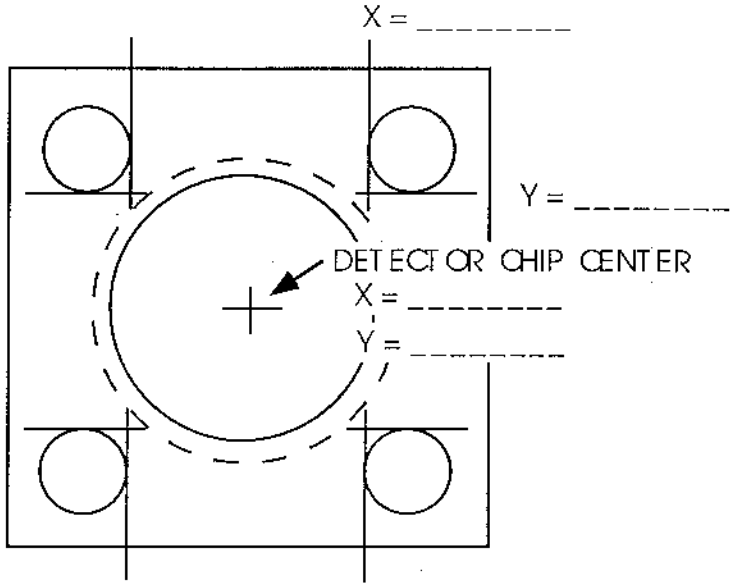
Pin Assignments





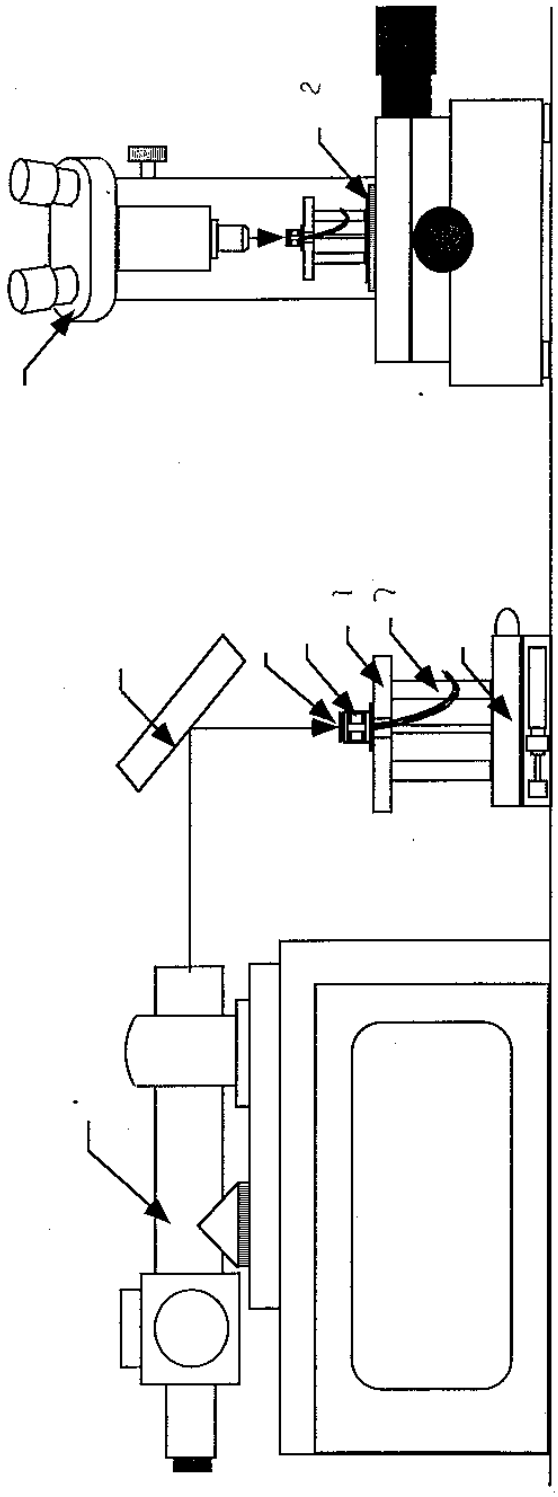


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



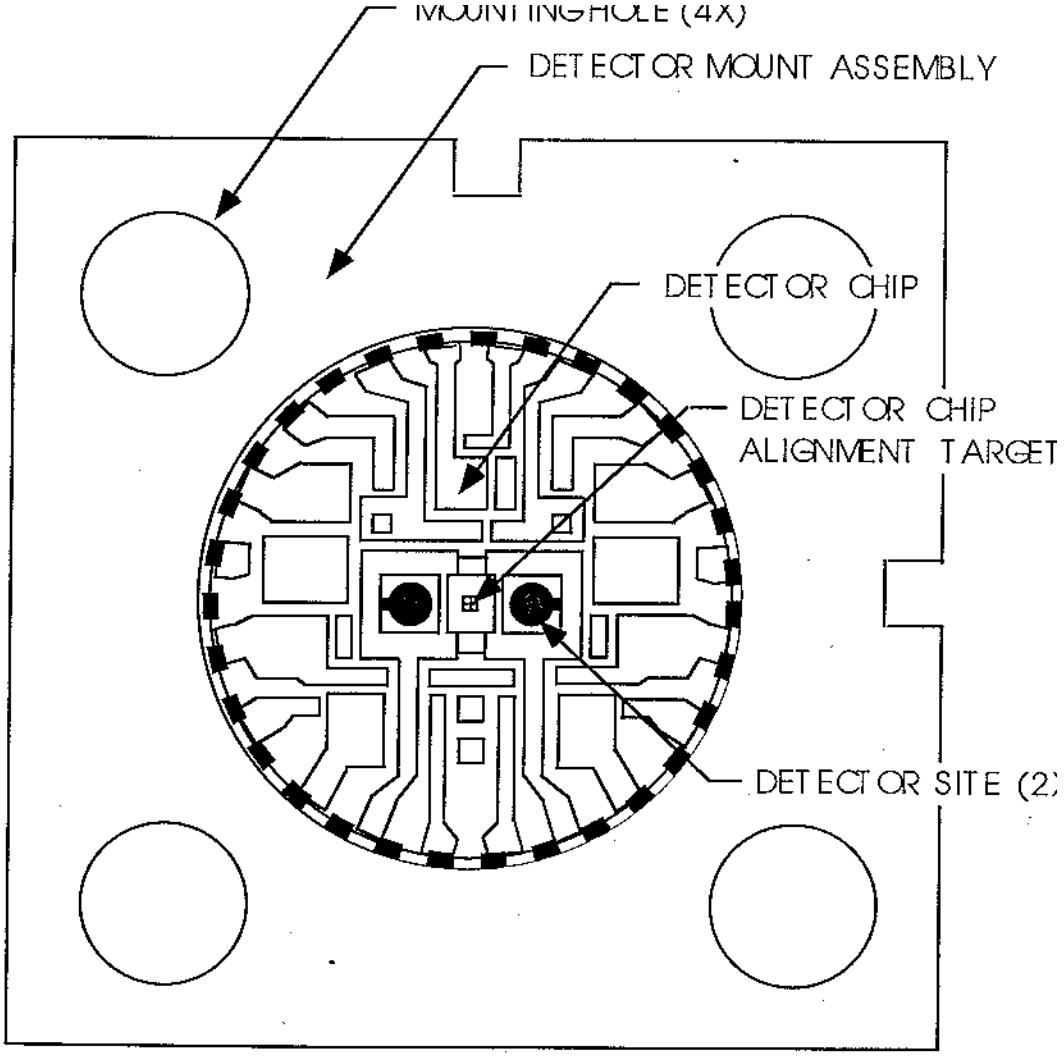


FIGURE 2 DETECTOR CHIP ORIENTATION

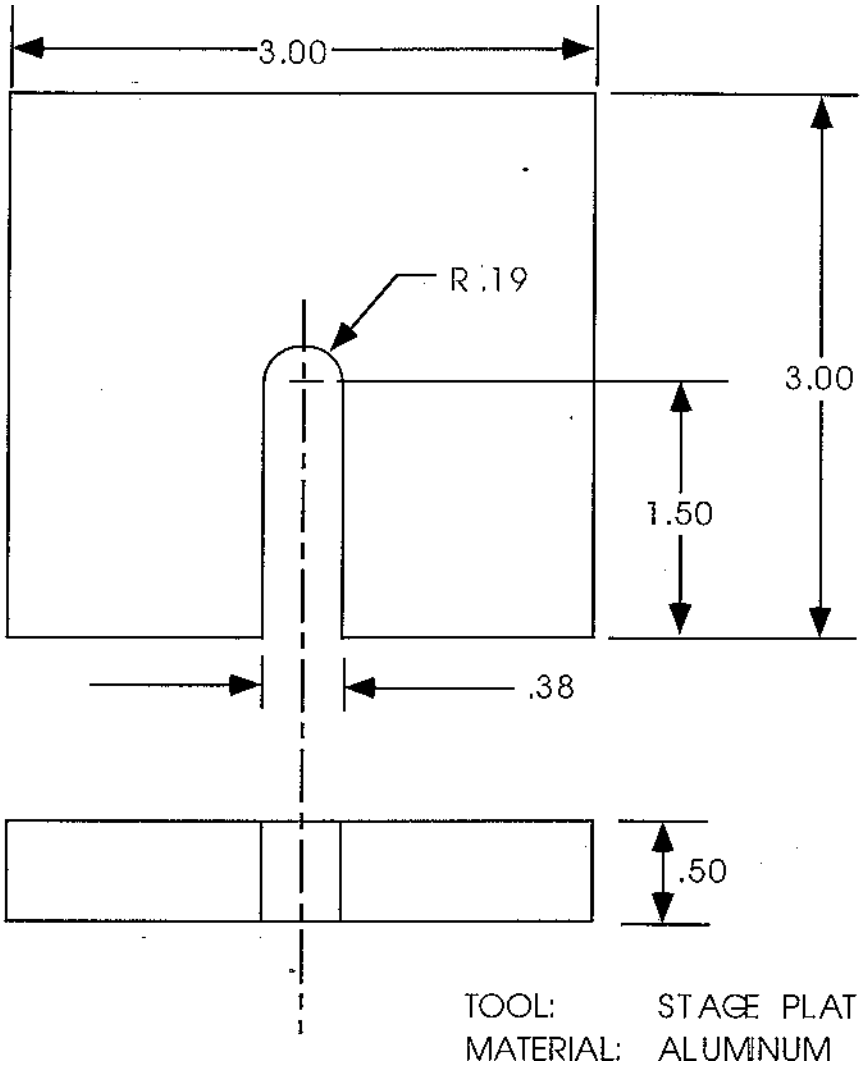
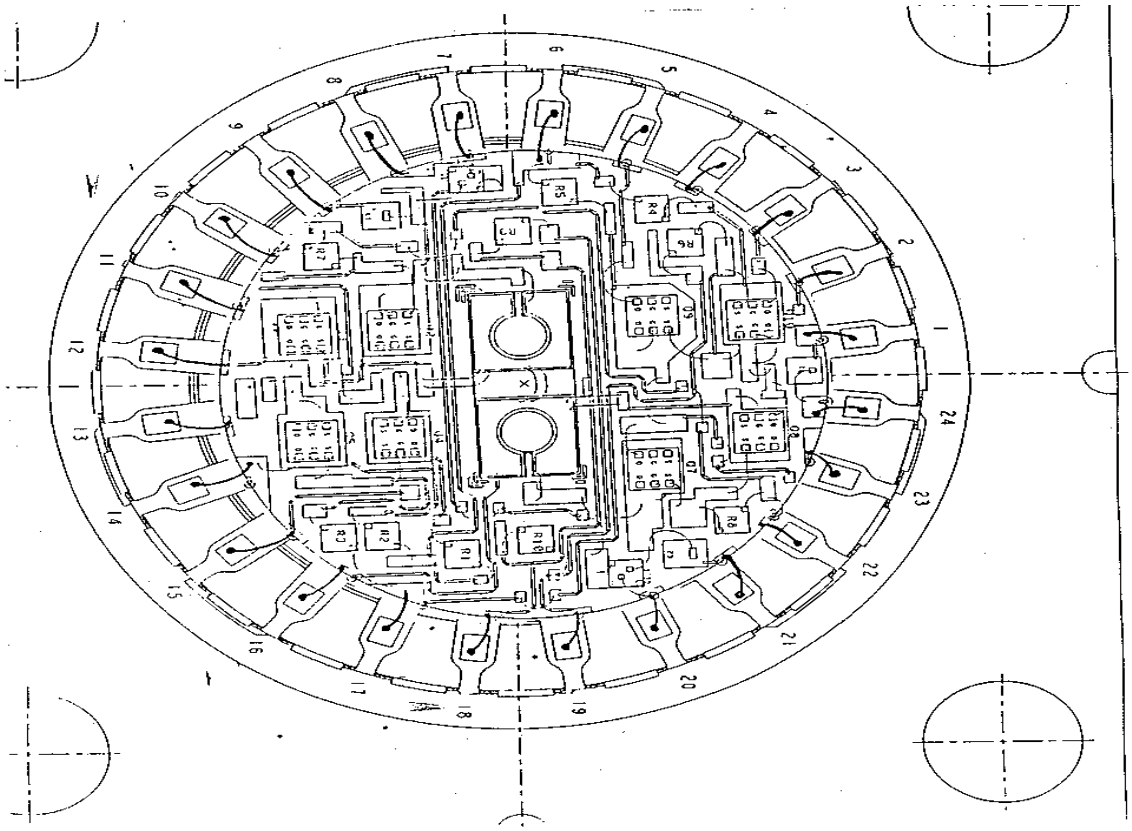
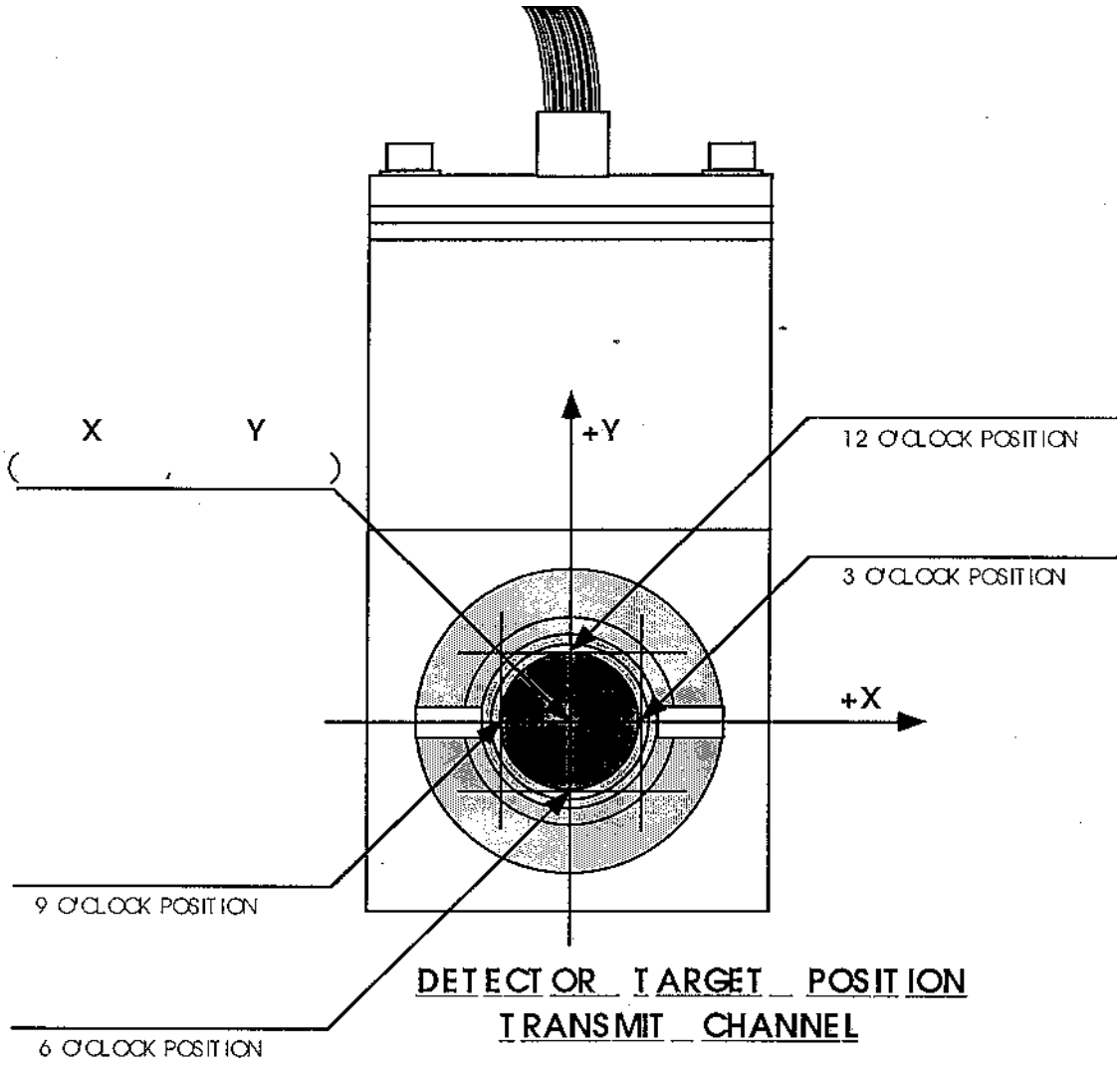


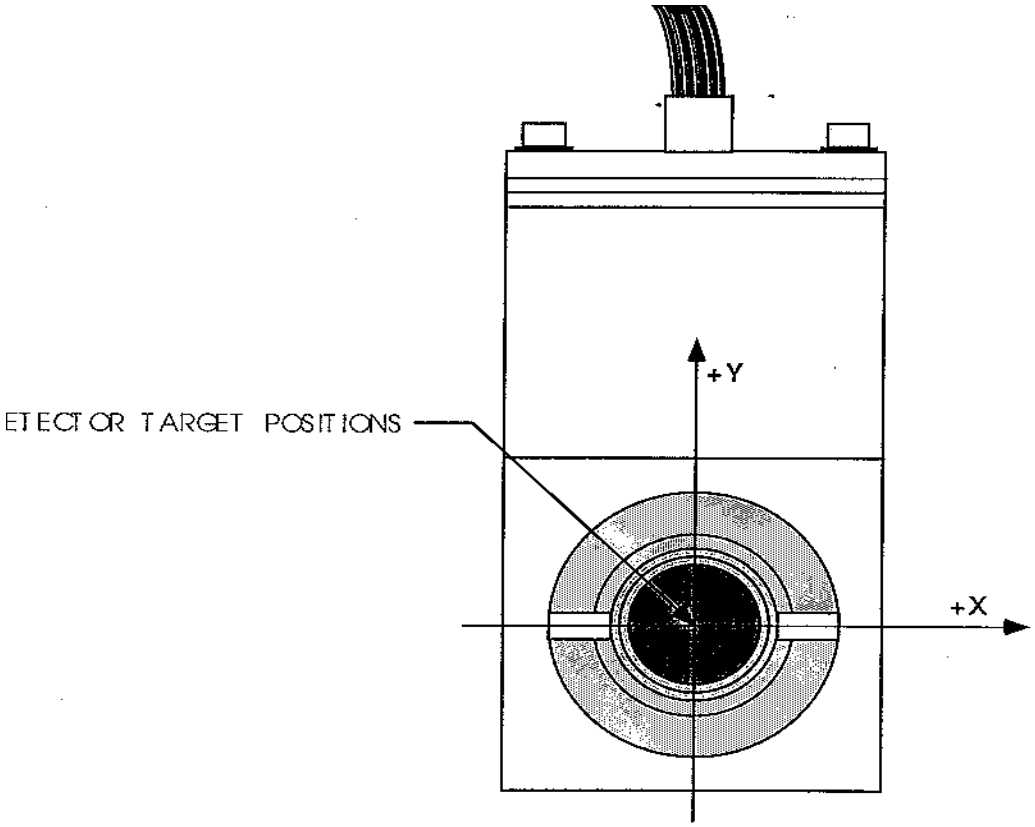
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





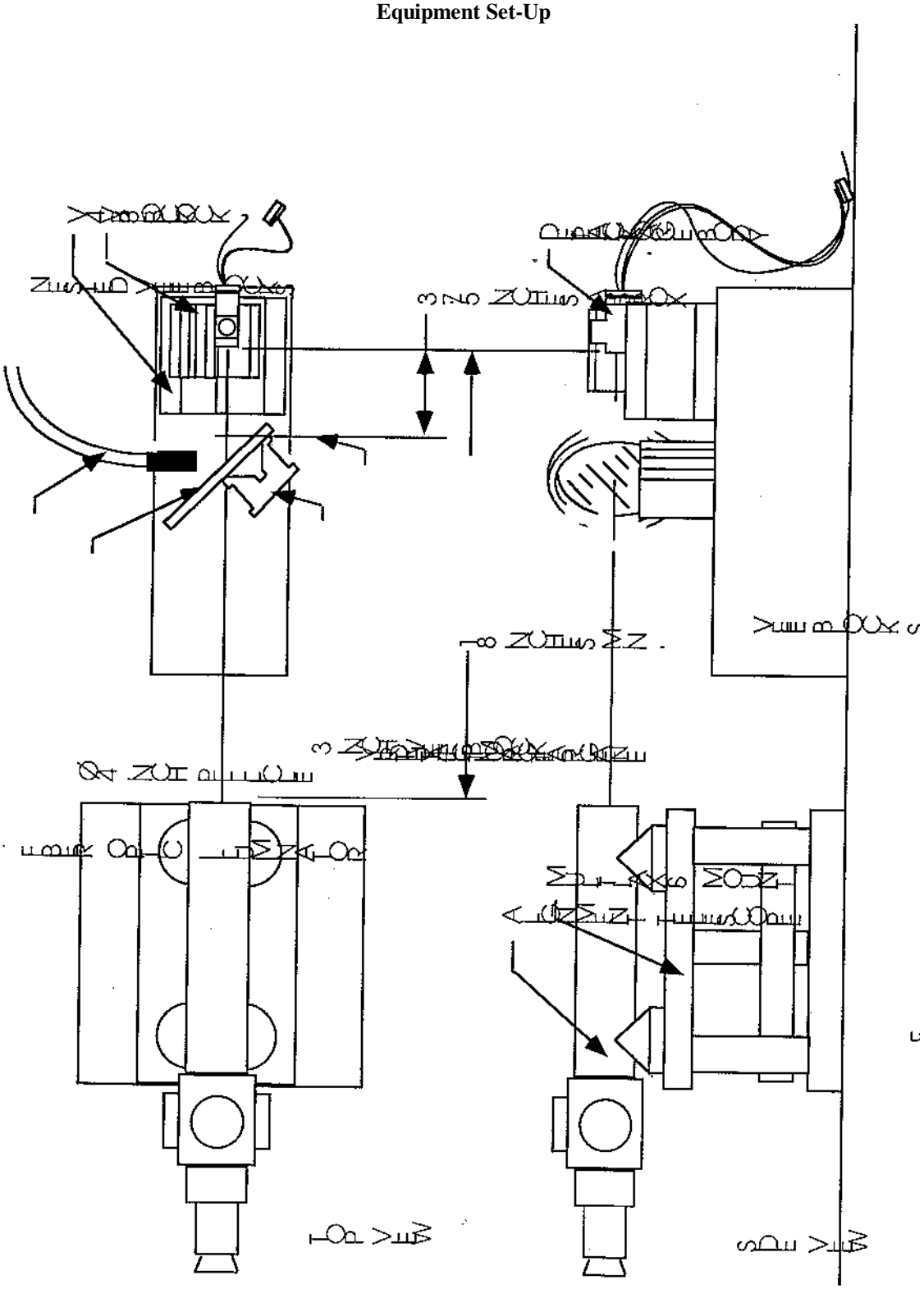
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



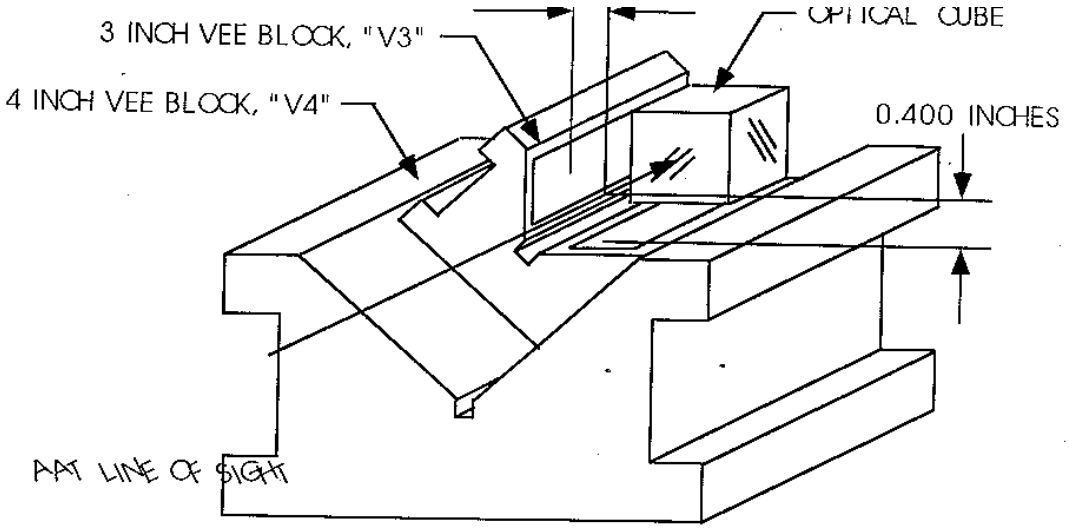


FIGURE 2A OPTICAL CUBE SET-UP

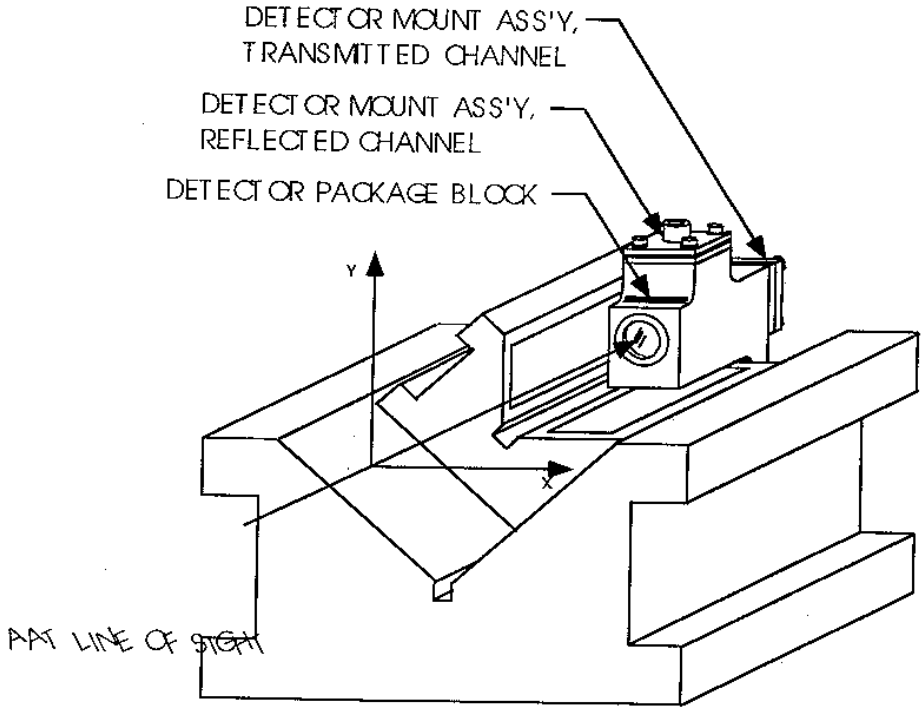


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.11 Rev. D

(Section 11 Record As-Built configuration in Database)

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1	Thermal Isolator Fabrication	P0151.01
Section 2	Visual Inspection of Isolator	P0151.02
Section 3	Detector Cable/Connector Fabrication	P0151.03
Section 4	Detector Mount Assembly Build	P0151.04
Section 5	Detector Mount Assembly Inspection	P0151.05
Section 6	Assembly and Circuit Integration	P0151.06
Section 7	Detector Mount Assembly Build	P0151.07
Section 8	Lens Assembly Build	P0151.08
Section 9	Detector Package Assembly amd Optical Alignment	P0151.09
Section 10	Magnetic Scrutiny	P0151.10
Section 11	Record As-Built Configuration in Database	P0151.11
Figures		Page 05

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 11. Record as built configuration of DPA in data base

Qualified personnel - P. Unterriener

DPA Part number_____

DPA SN_____

DMA SNs: Transmitted channel_____Reflected channel_____

Completed:_____
Signature Date

Discrepancies (if any):

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

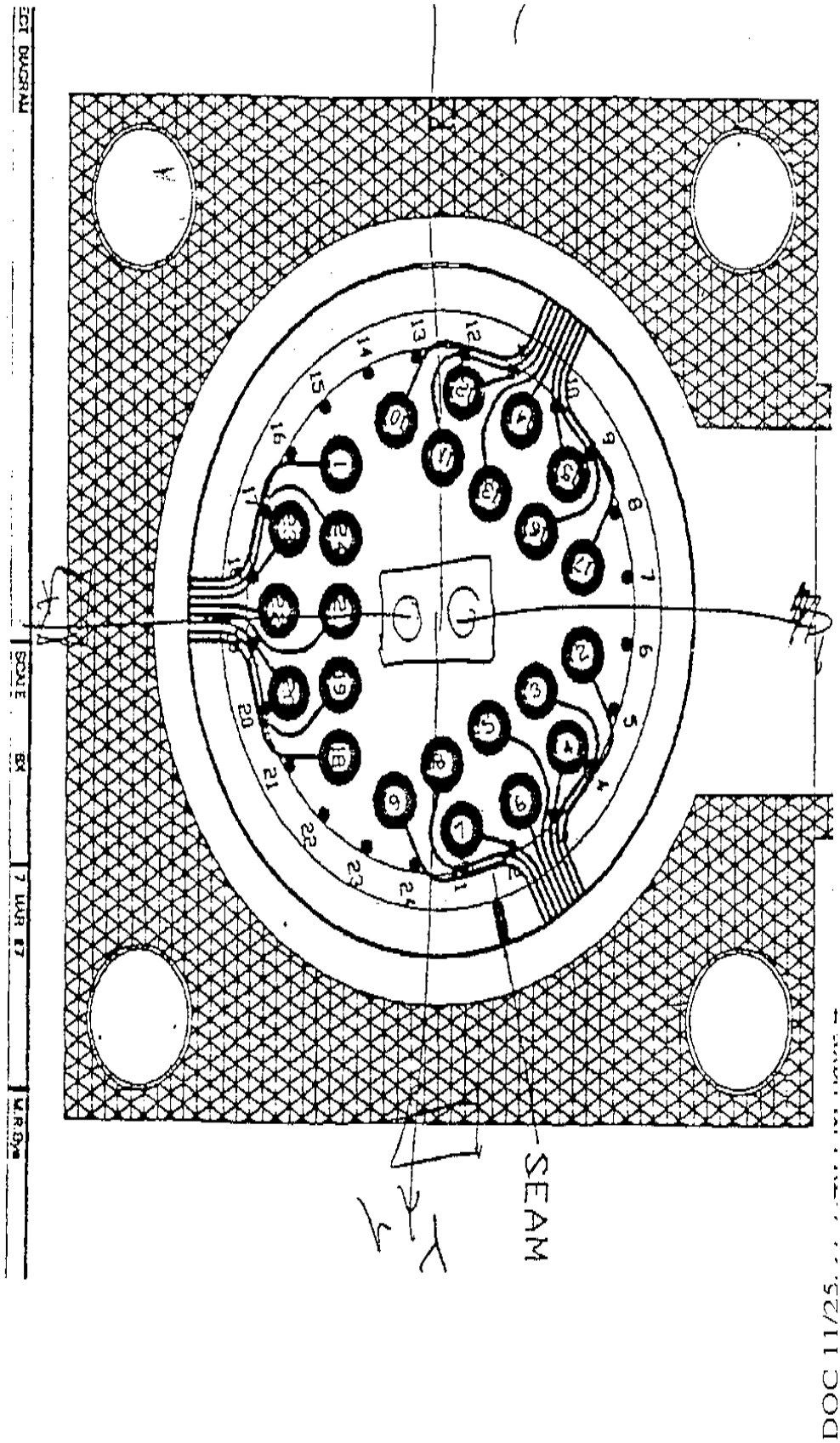
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

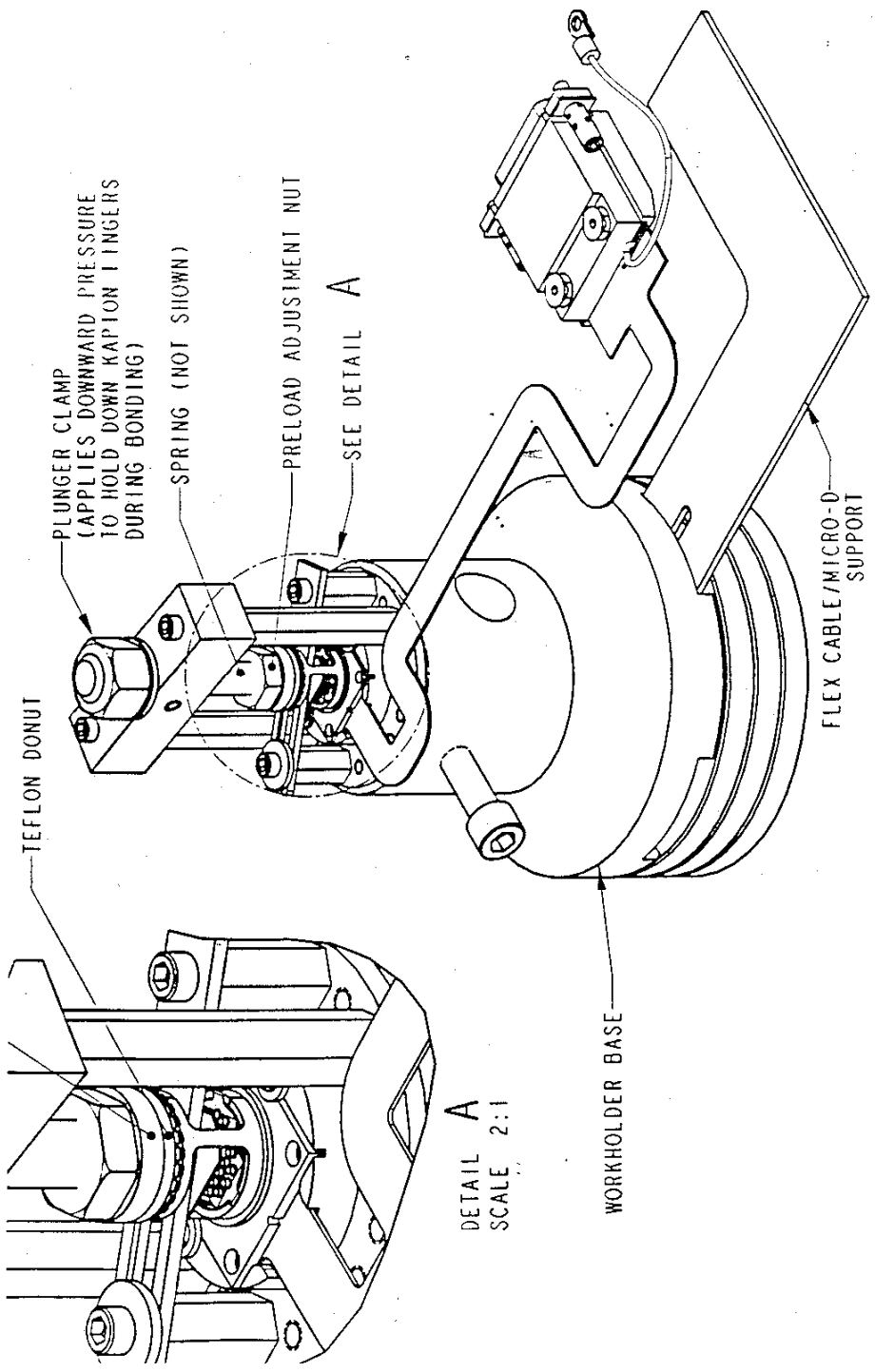
Visual Inspection - Step #1

Inspection Diagram

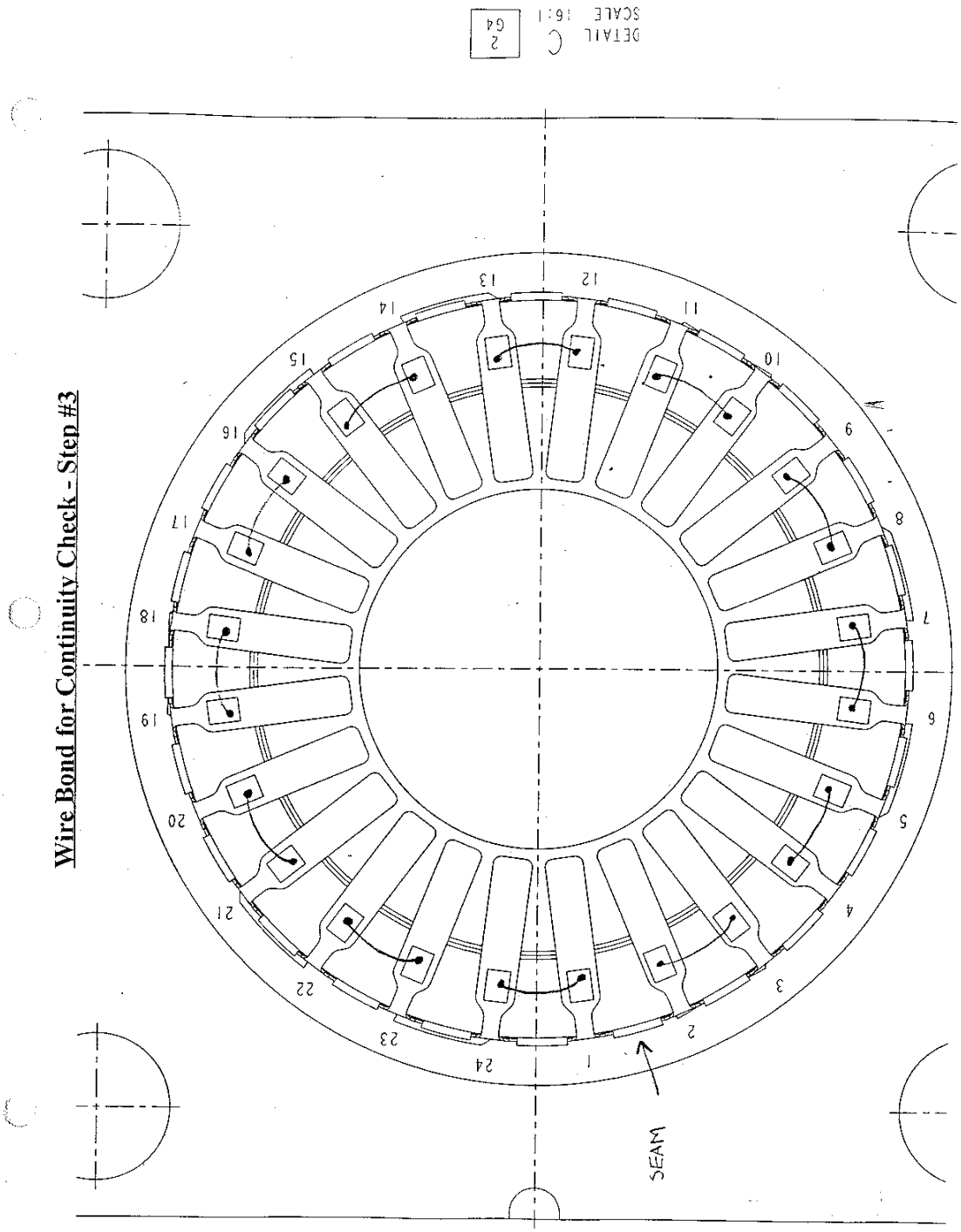


Mount DMS in Assembly Jig - Step #2

1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

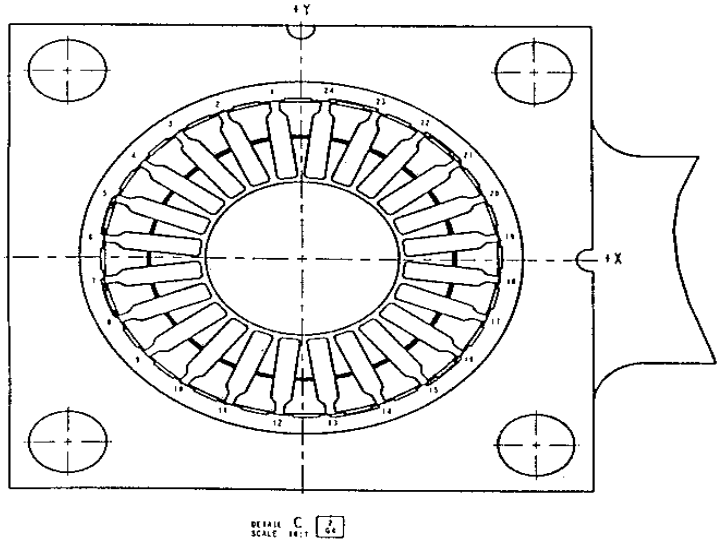


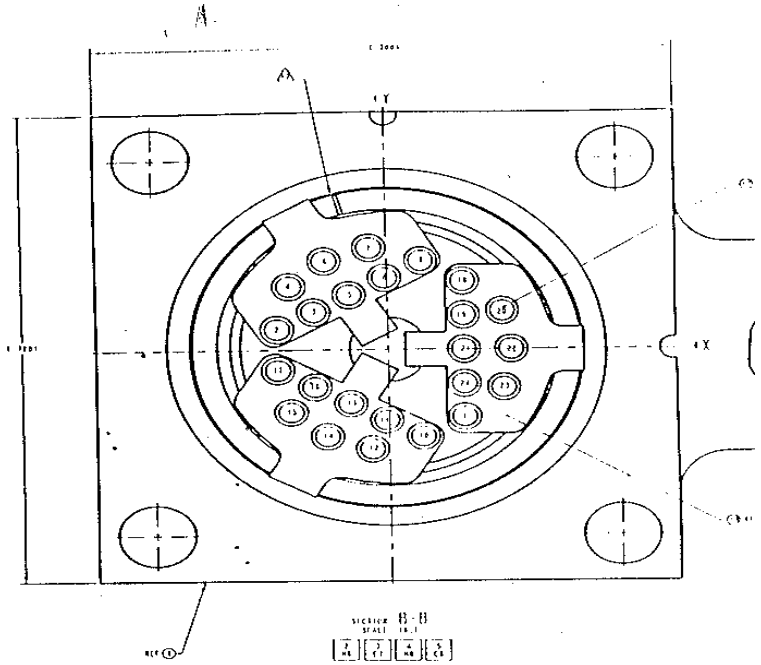
Wire Bond for Continuity Check - Step #3

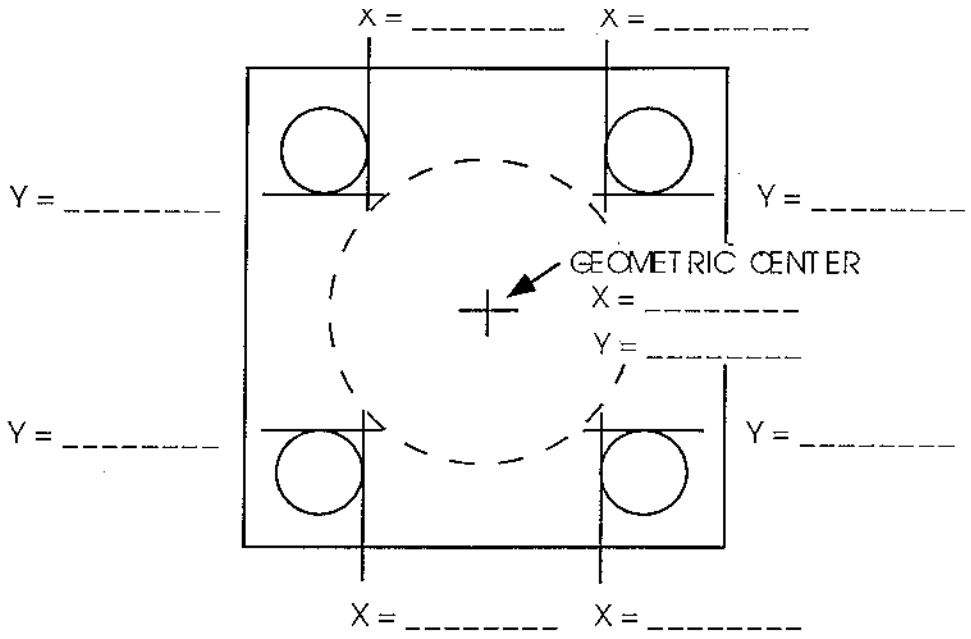


Appendix

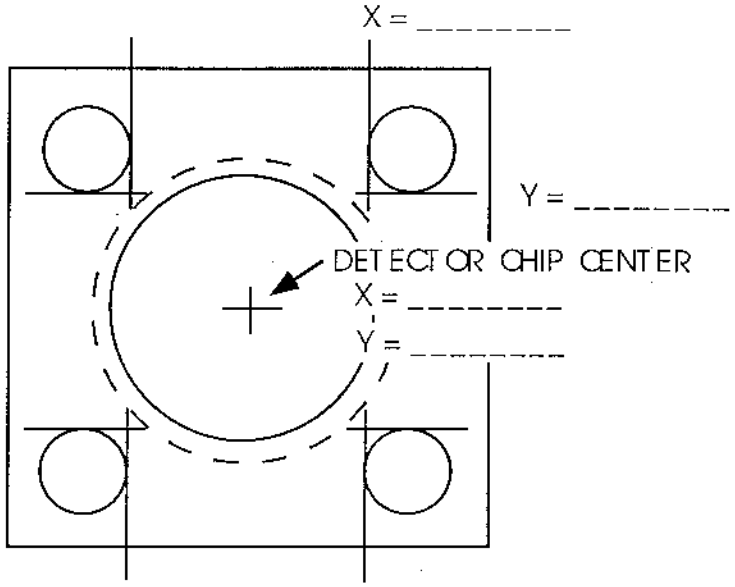
Pin Assignments





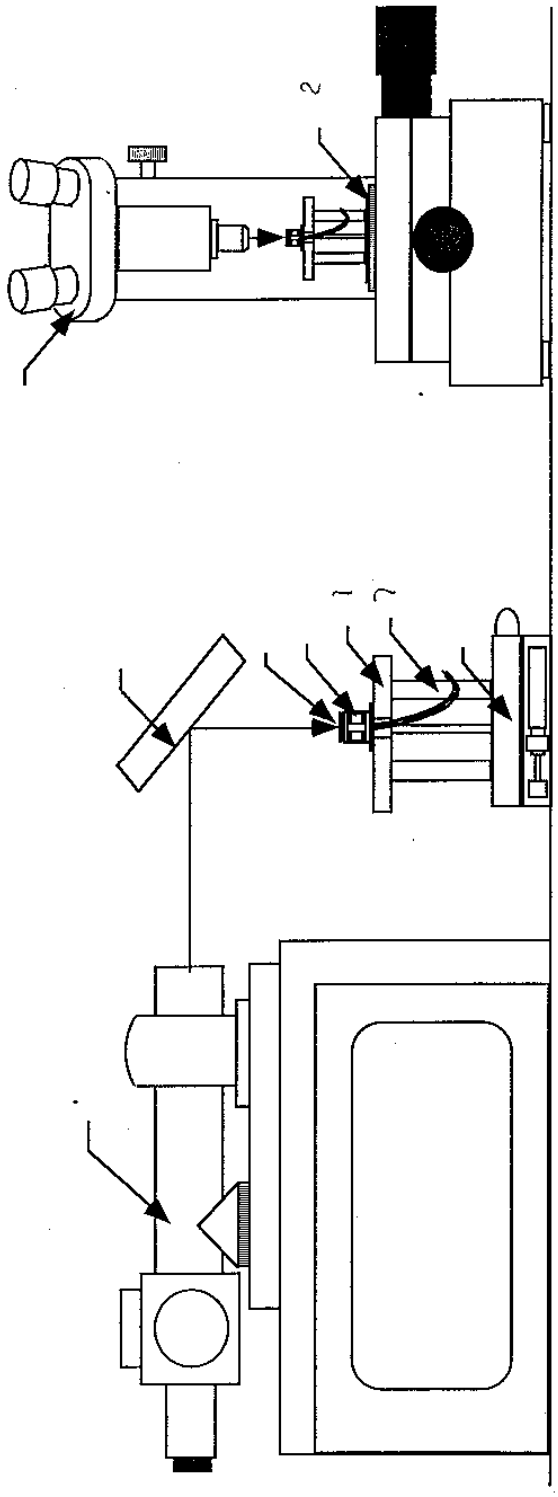


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



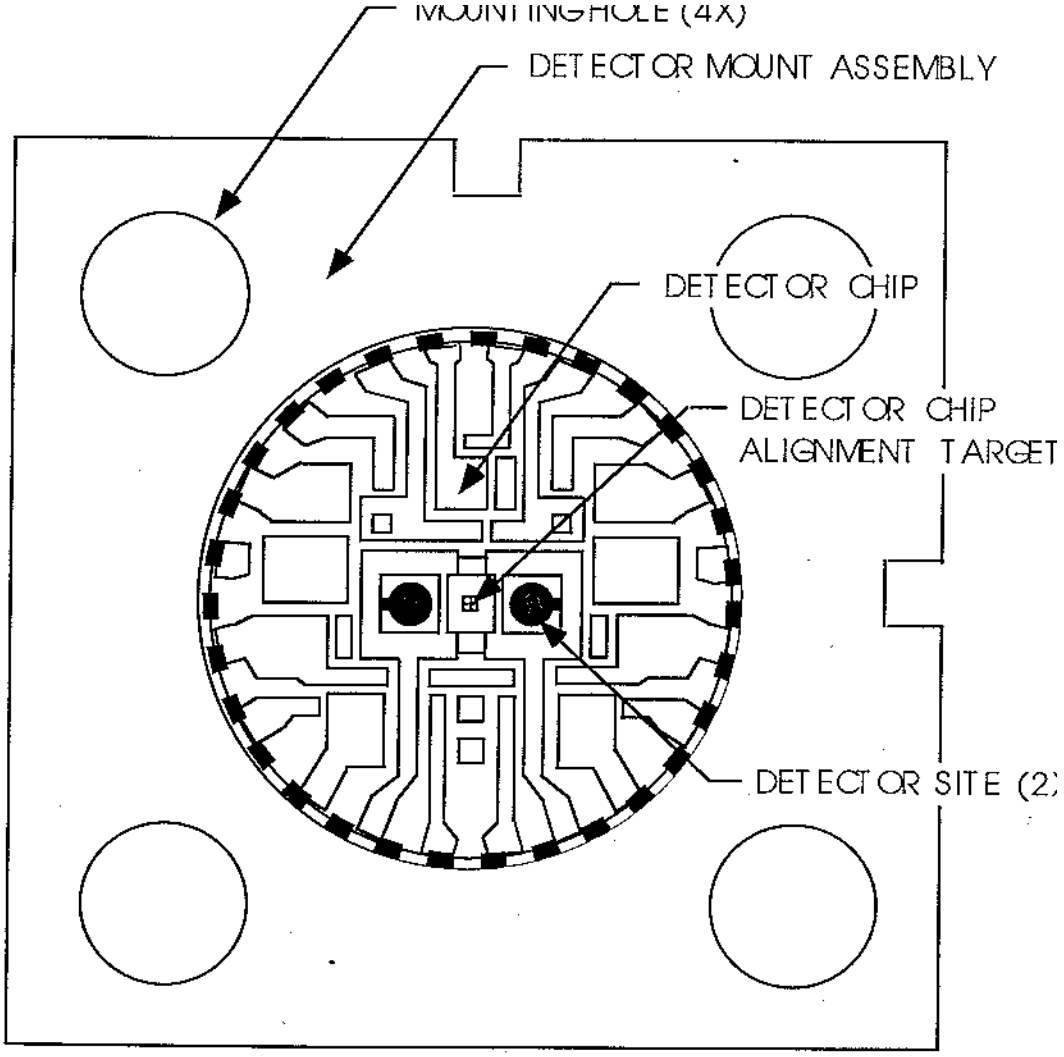


FIGURE 2 DETECTOR CHIP ORIENTATION

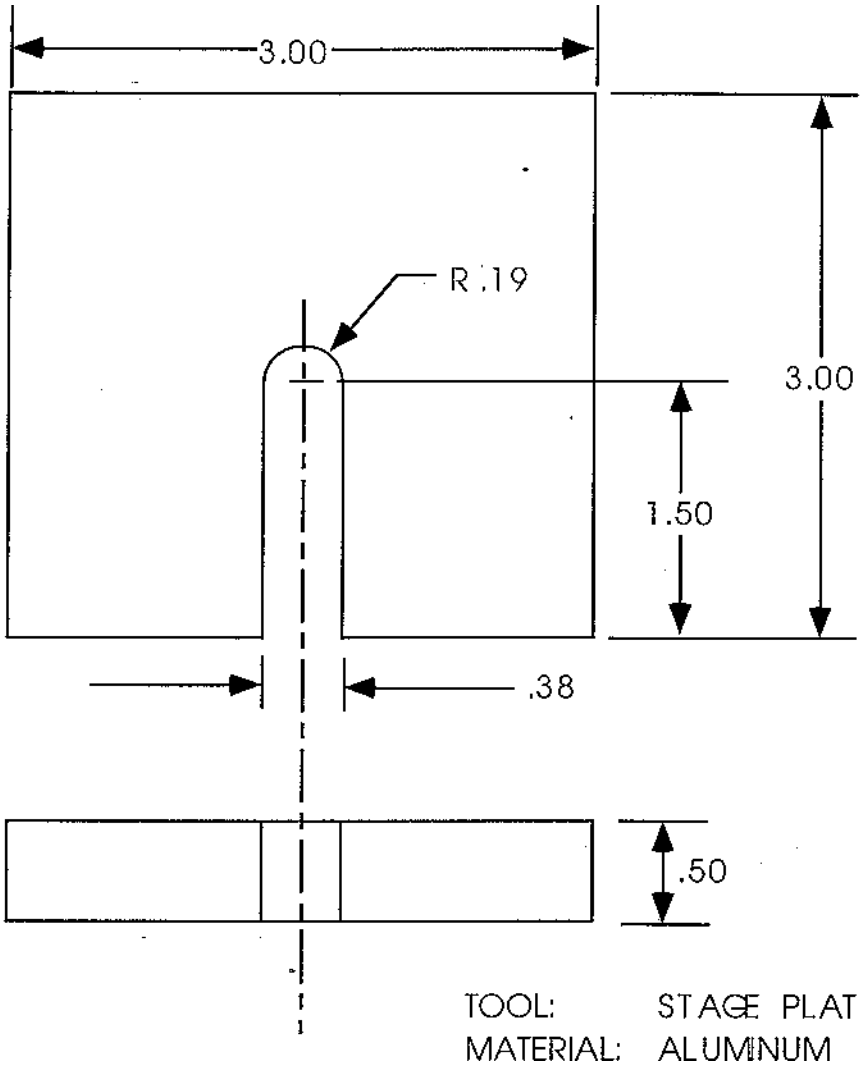
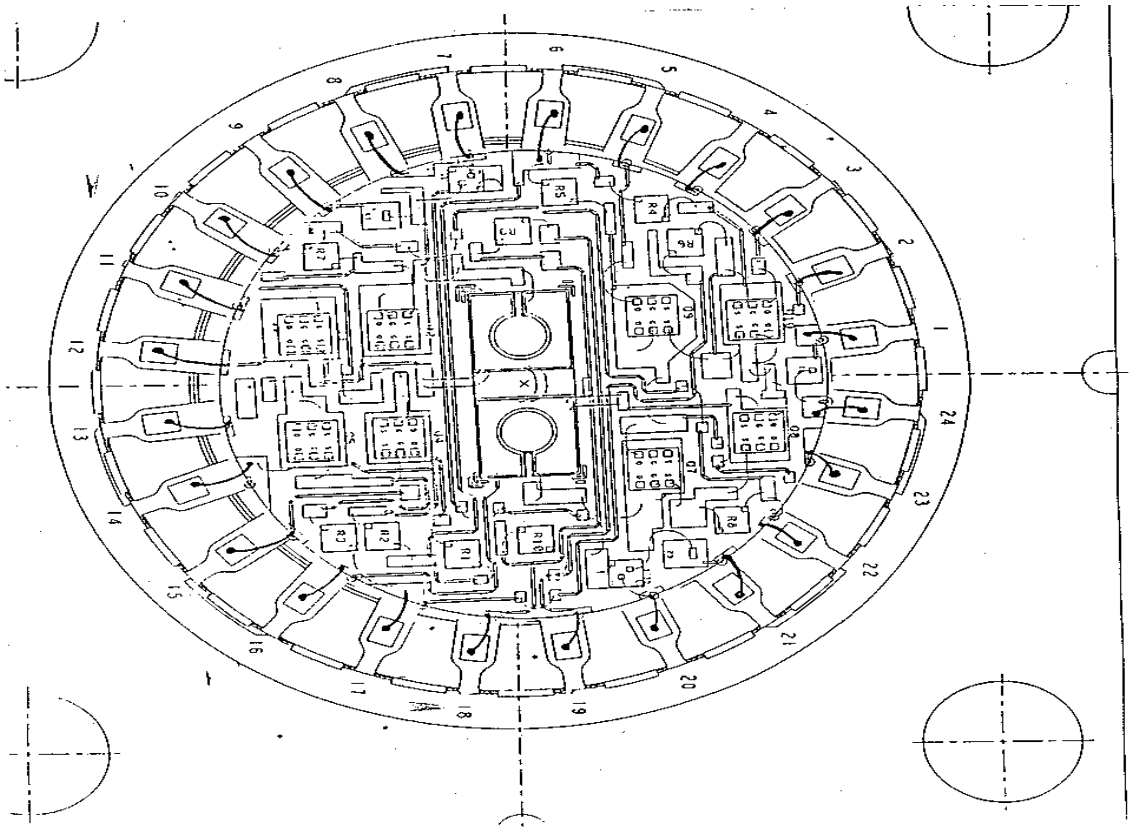
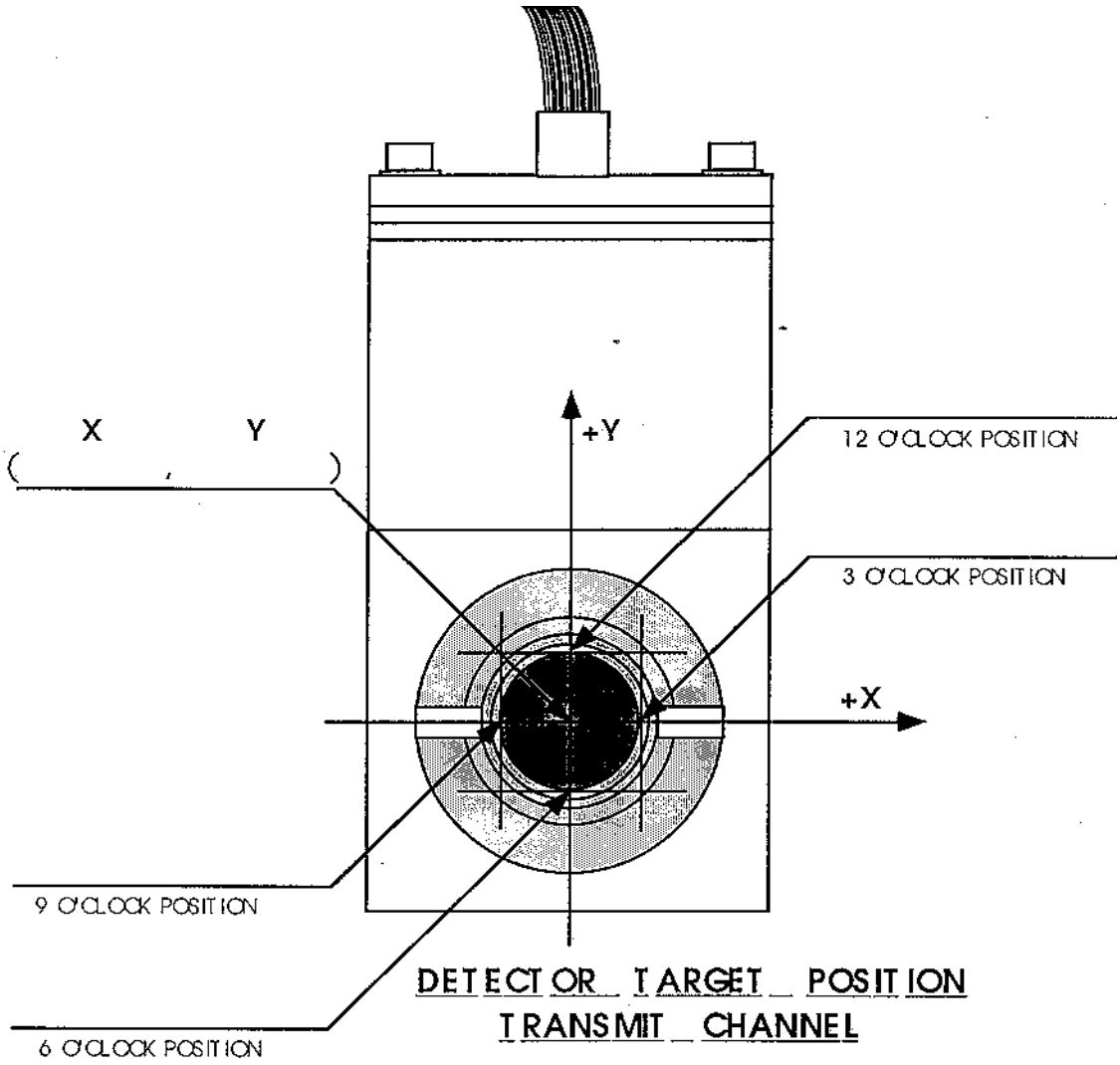


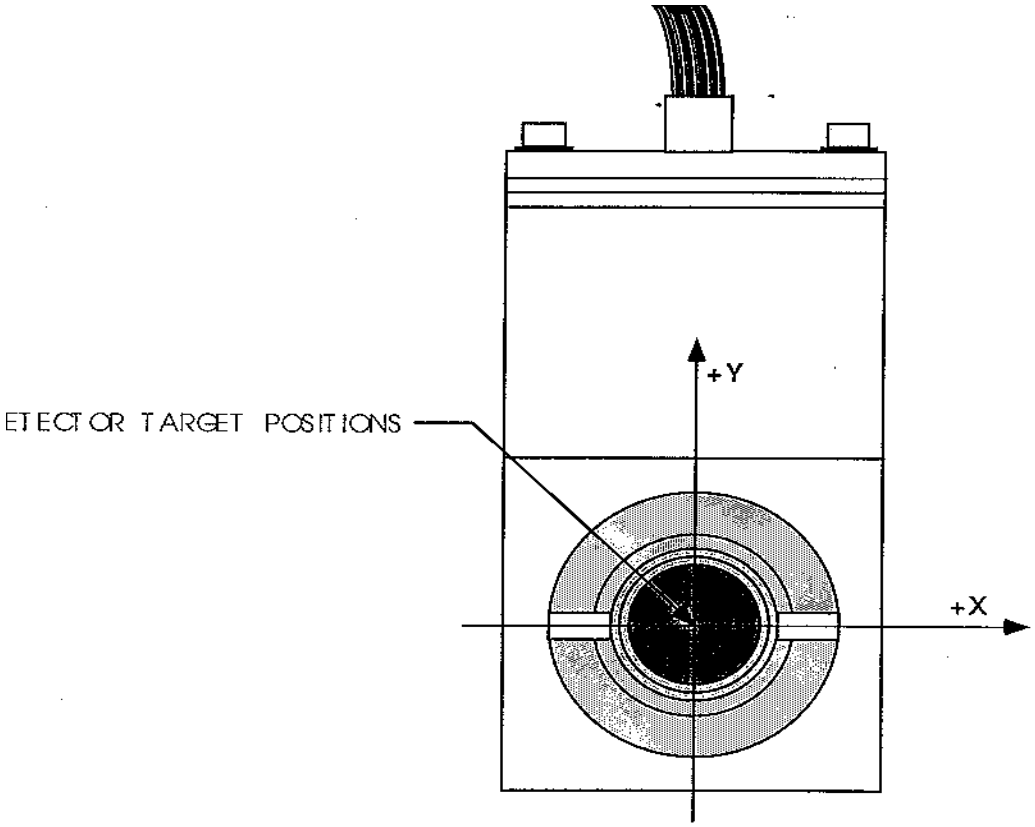
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





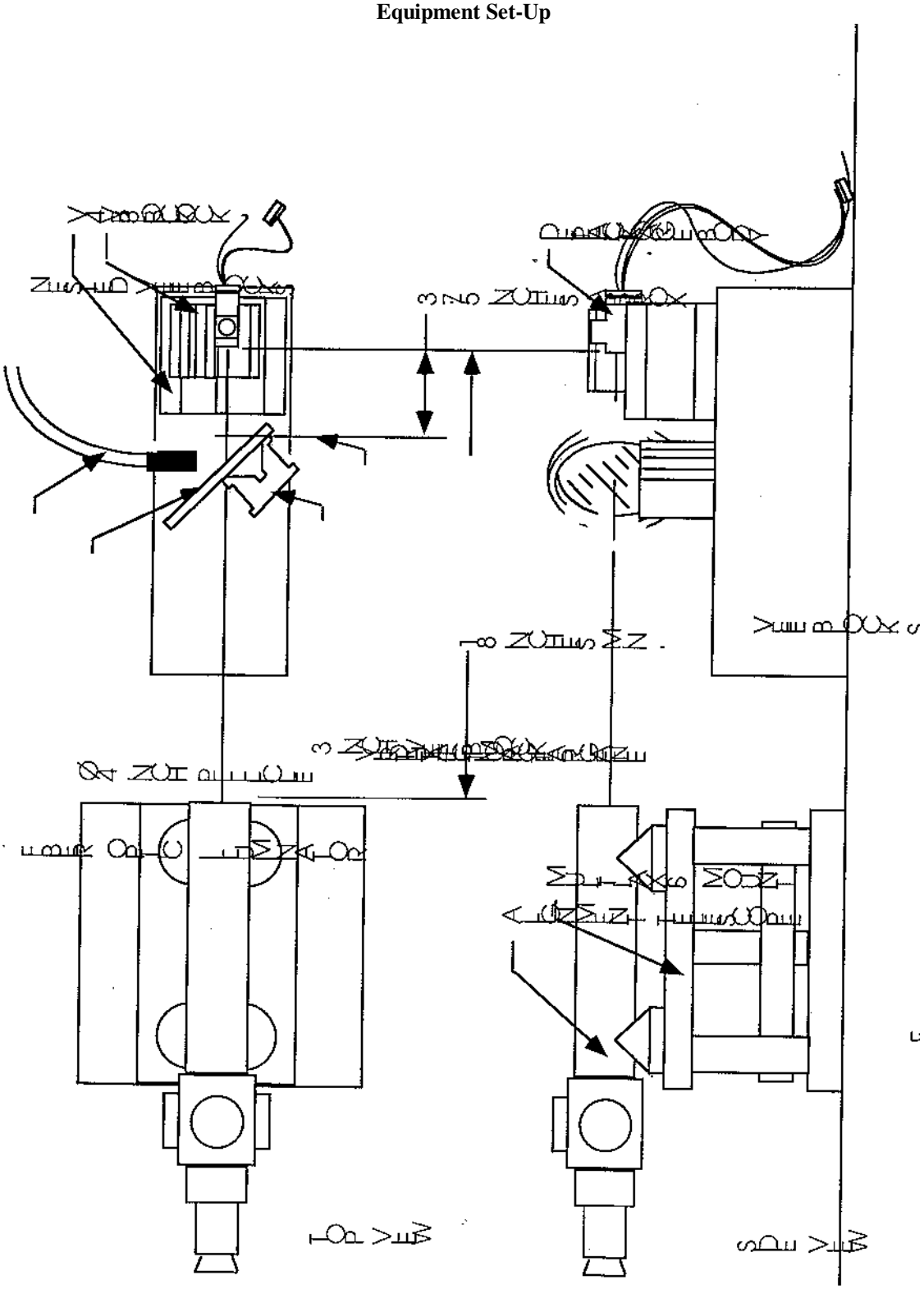
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



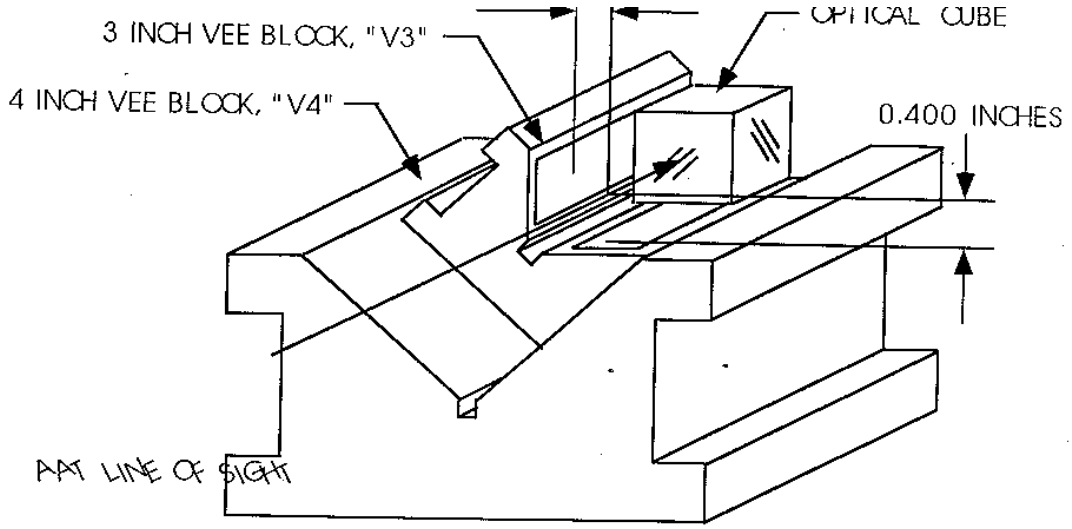


FIGURE 2A OPTICAL CUBE SET-UP

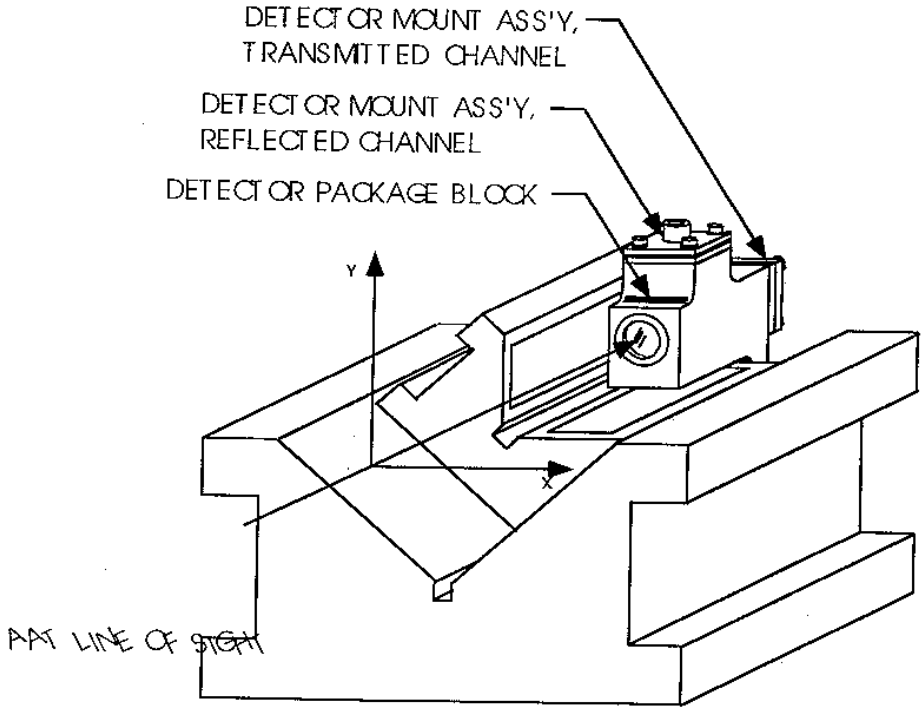


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS

W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

DETECTOR PACKAGE

FOR

TELESCOPE ASSEMBLY PROCEDURE

GP-B P0151.12Rev. D

(Section 12 Record As-Built Configuration in Database)

January 19, 1999

_____

_____

Approved by: P. Ehrensberger Date

_____

Approved by: P. Unterriener Date

_____

Approved by: S. Buchman Date

TABLE OF CONTENTS

Section 1 Thermal Isolator Fabrication	P0151.01
Section 2 Visual Inspection of Isolator	P0151.02
Section 3 Detector Cable/Connector Fabrication	P0151.03
Section 4 Detector Mount Assembly Build	P0151.04
Section 5 Detector Mount Assembly Inspection	P0151.05
Section 6 Assembly and Circuit Integration	P0151.06
Section 7 Detector Mount Assembly Build	P05151.07
Section 8 Lens Assembly Build	P0151.08
Section 9 Detector Package Assembly Build	P0151.09
Section 10 Detector Package Assembly Optical Alignment	P0151.10
Section 11 Magnetic Scrutiny	P0151.11
section 12 Record As-Built Configuration in Database	P0151.12
Figures	5

QUALITY ASSURANCE

Notify Quality Assurance engineering at least 48 hours prior to the start of test.

In the event of a failure during the execution of testing, Quality Assurance shall be contacted.

Any redlines made to this procedure shall be initialed by a program QA engineer prior to his/sher final sign-off.

Section 11.

Record as built configuration of DPA in data base

Qualified personnel - P. Unterriener

DPA Part number_____

DPA SN_____

DMA SNs: Transmitted channel_____Reflected channel_____

Completed:_____
Signature Date

Discrepancies (if any):

LIST OF FIGURES

Visual Inspection - Step #1

Mount DMS in Assembly Jig - Step #2

Wire Bond for Continuity Check - Step #3

Pin Assignments

Geometric Center Detector Mount Assy Mounting Hole Pattern

End-Item Post Cure Chip Alignment

Detector Circuit Alignment Schematic

Detectoror Chip Orientation

Figure 3 - Stage Plate Tool

Wire Bond to Circuit, Step 4

Detector to Boresight Centration, Transmit Channel

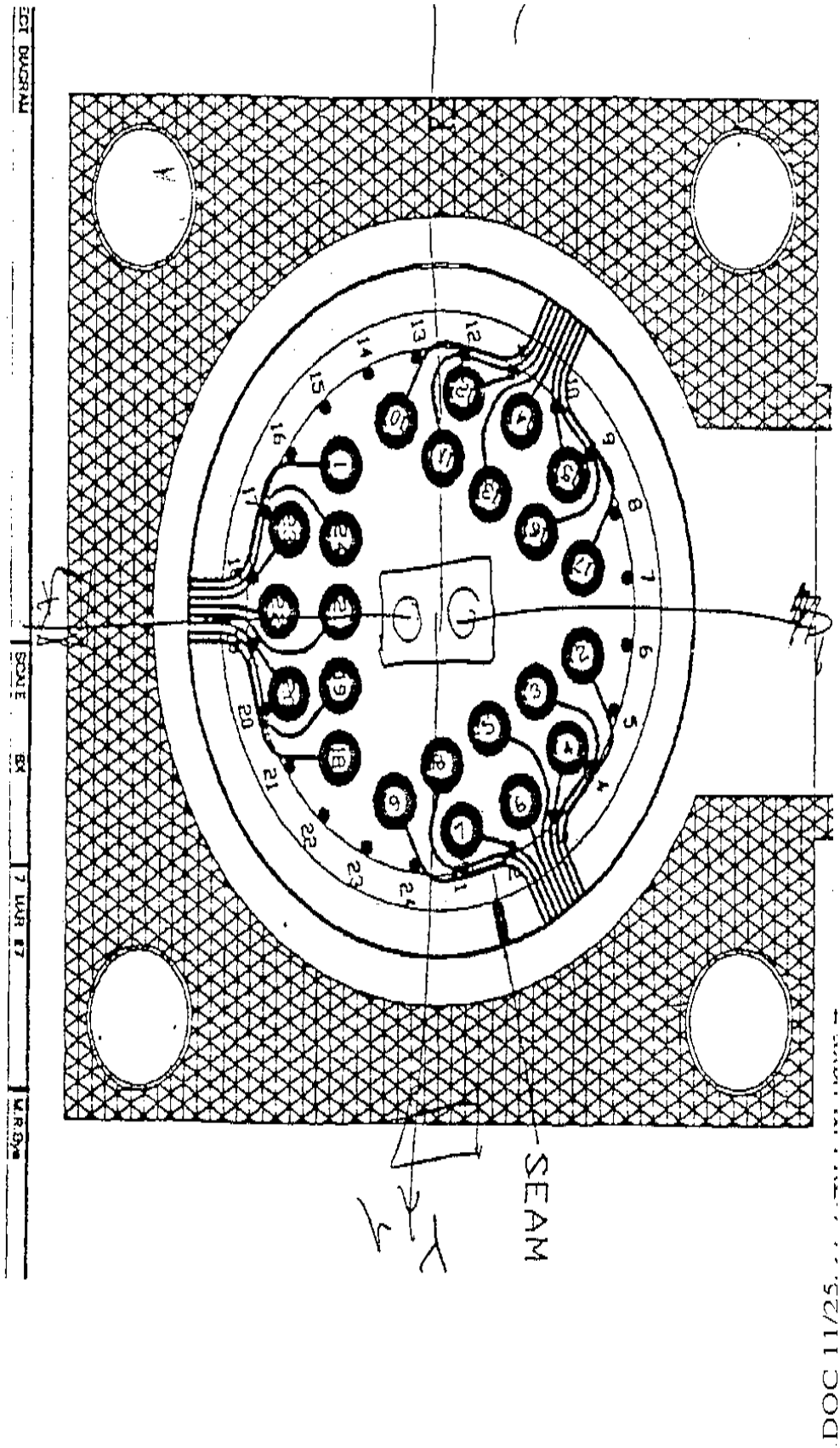
Detector to Boresight Centration, Reflected Channel

Equipment Set-Up

Vee Block Set-Ups

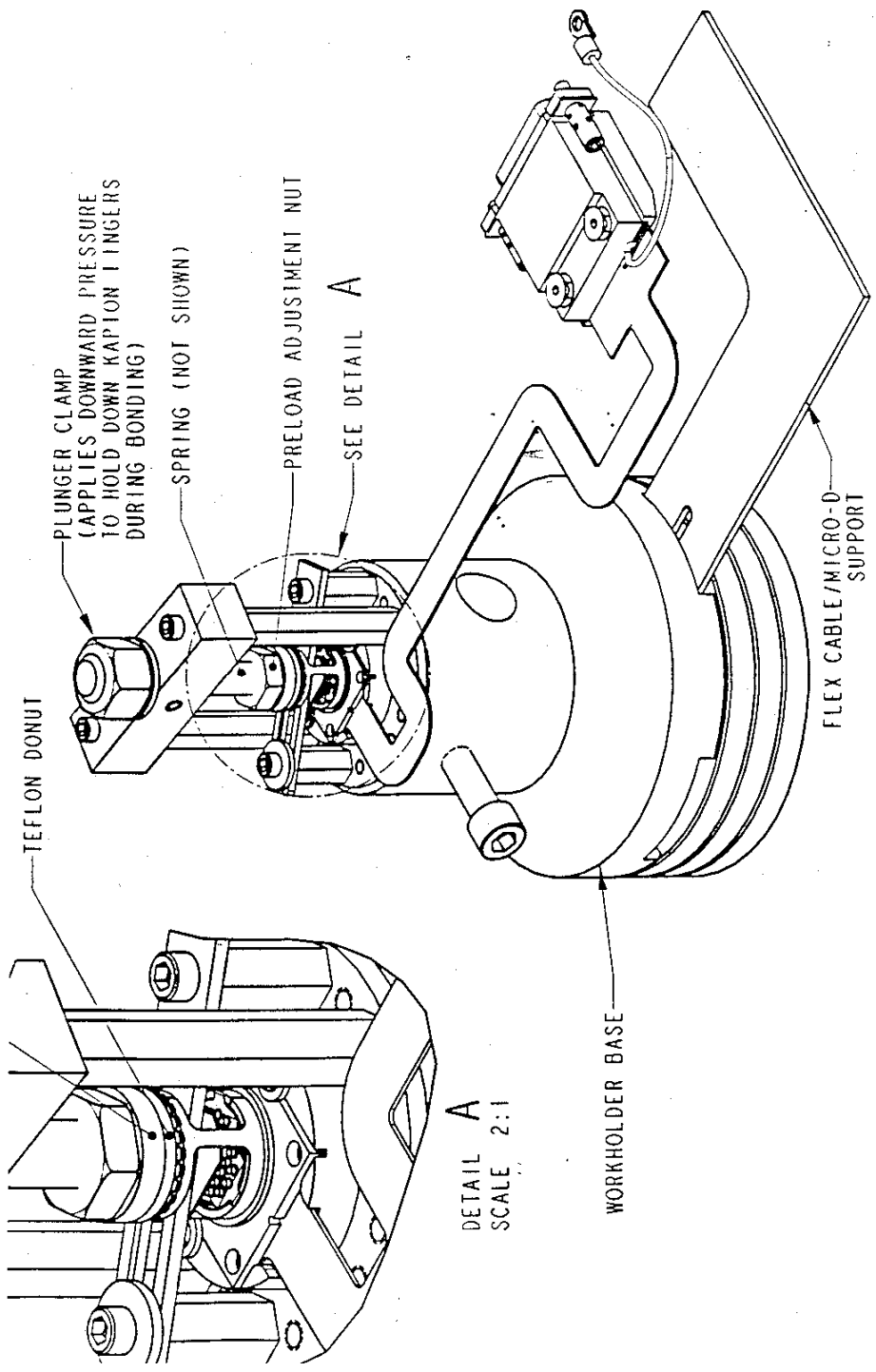
Visual Inspection - Step #1

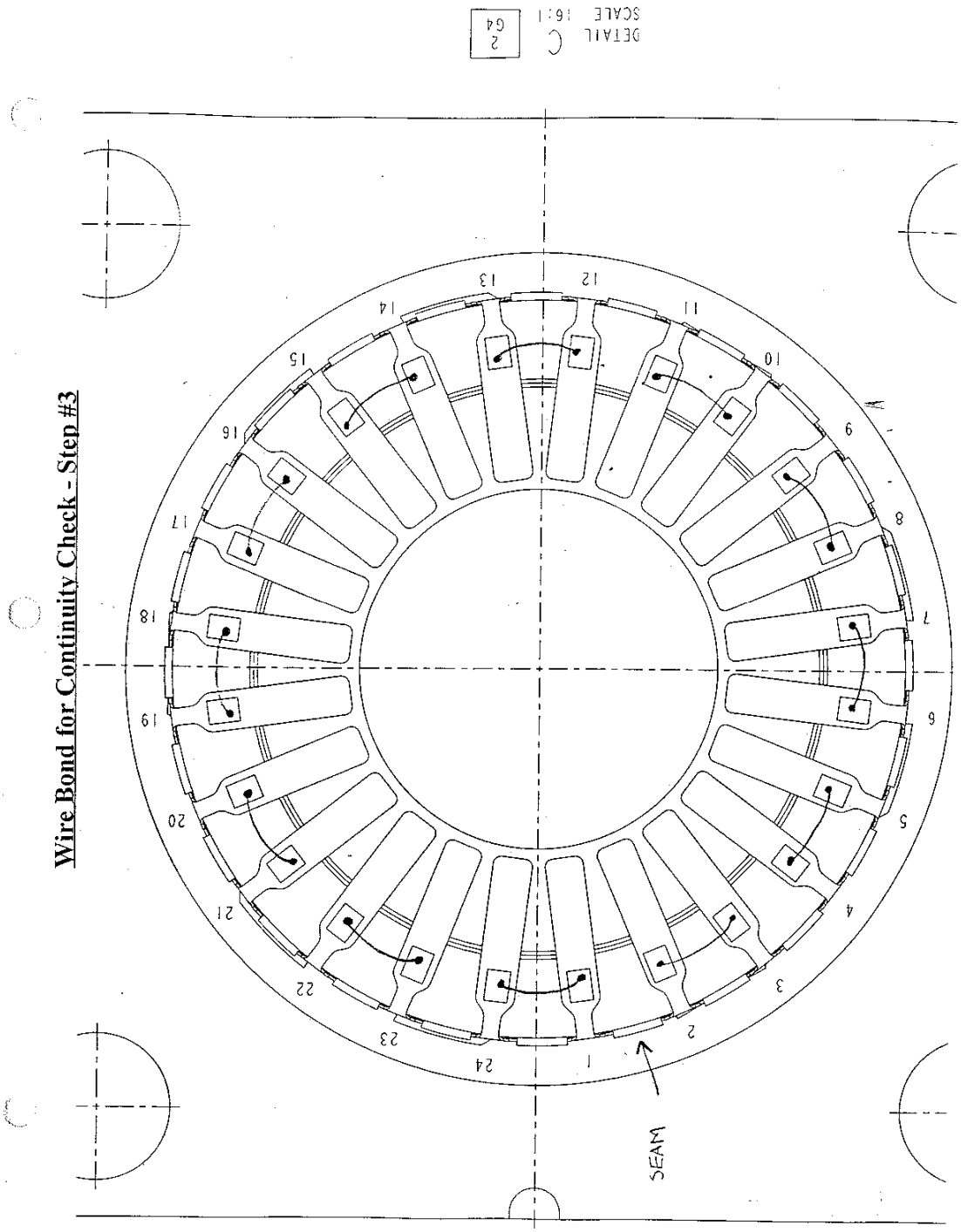
Inspection Diagram



Mount DMS in Assembly Jig - Step #2

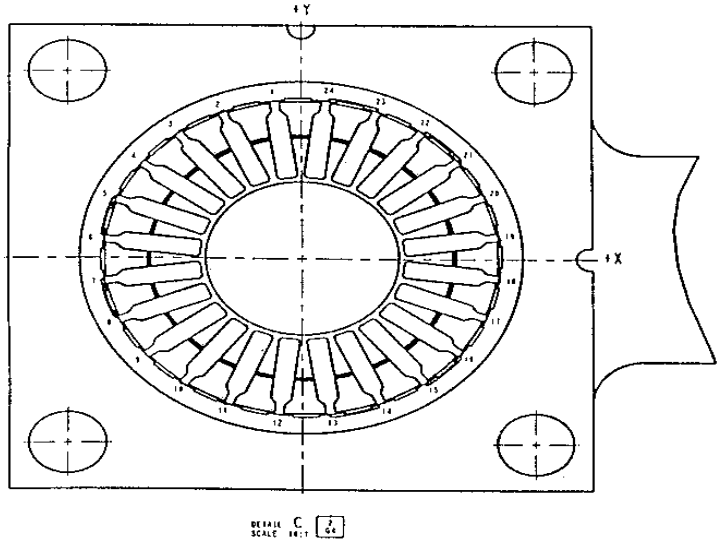
1) Mount DMS as shown in assembly jig. Do not use the plunger attachment.

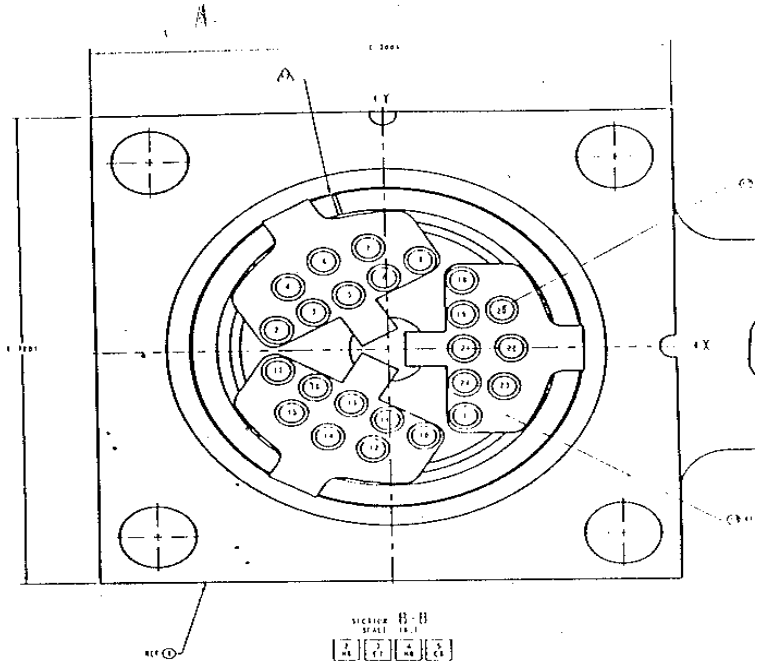


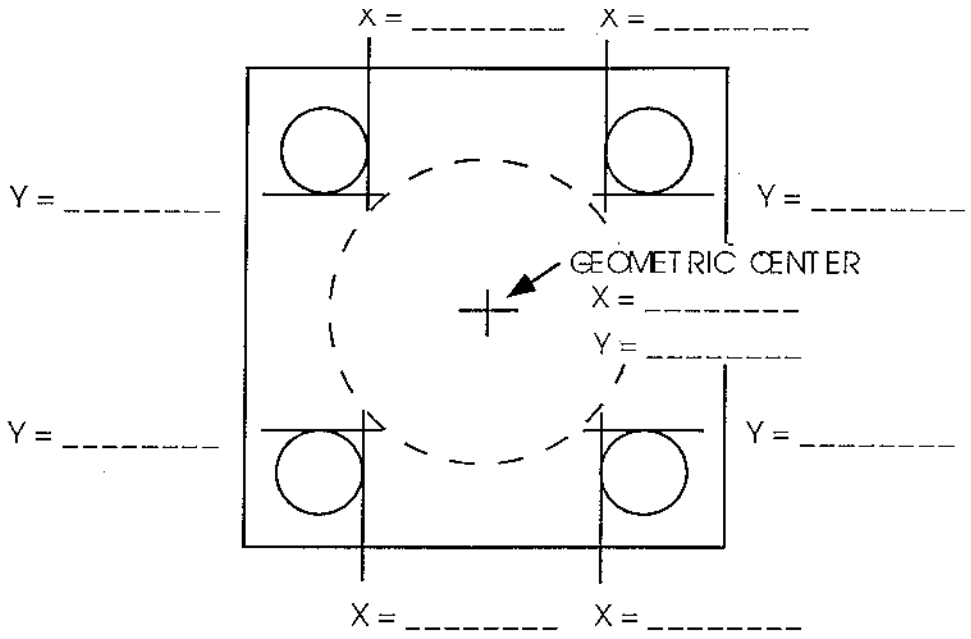

DETAIL C
SCALE 16:1
2
G4
Wire Bond for Continuity Check - Step #3
SEAM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Appendix

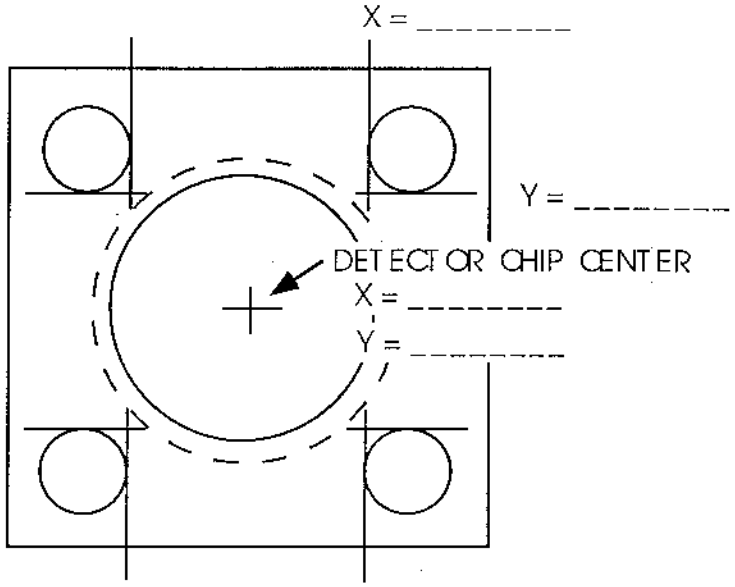
Pin Assignments





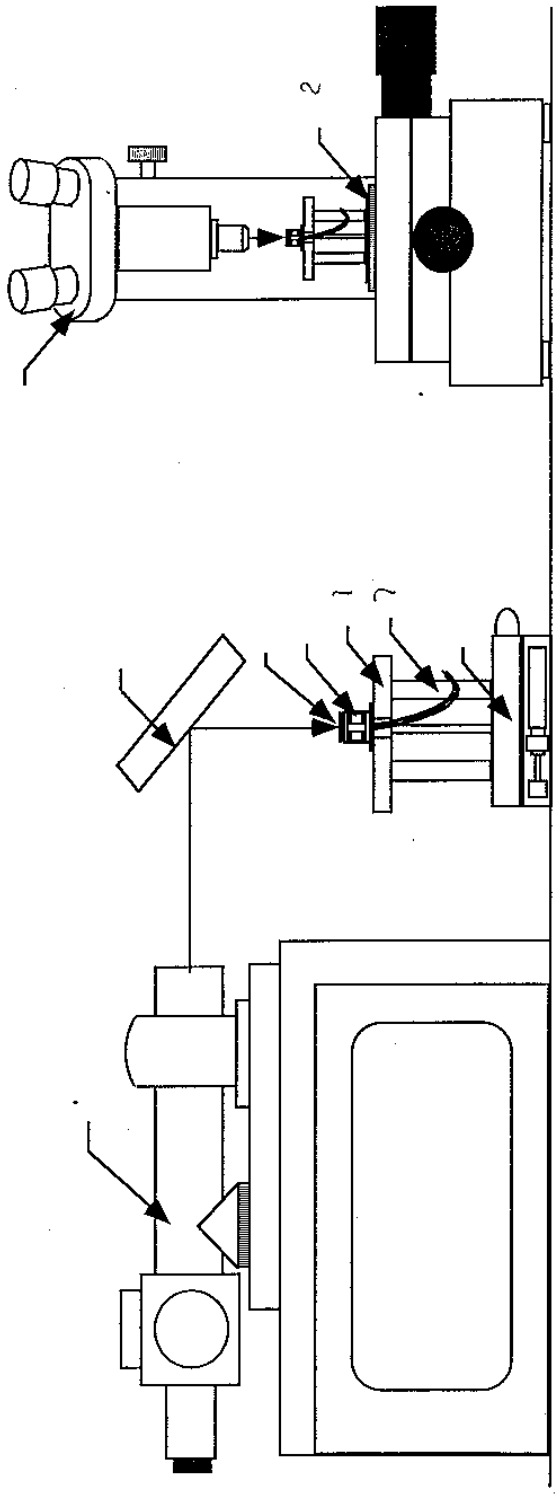


GEOMETRIC CENTER, DETECTOR MOUNT ASSEMBLY MOUNTING HOLE PATTERN



END-ITEM POST CURE CHIP ALIGNMENT

DETECTOR CIRCUIT ALIGNMENT SCHEMATIC



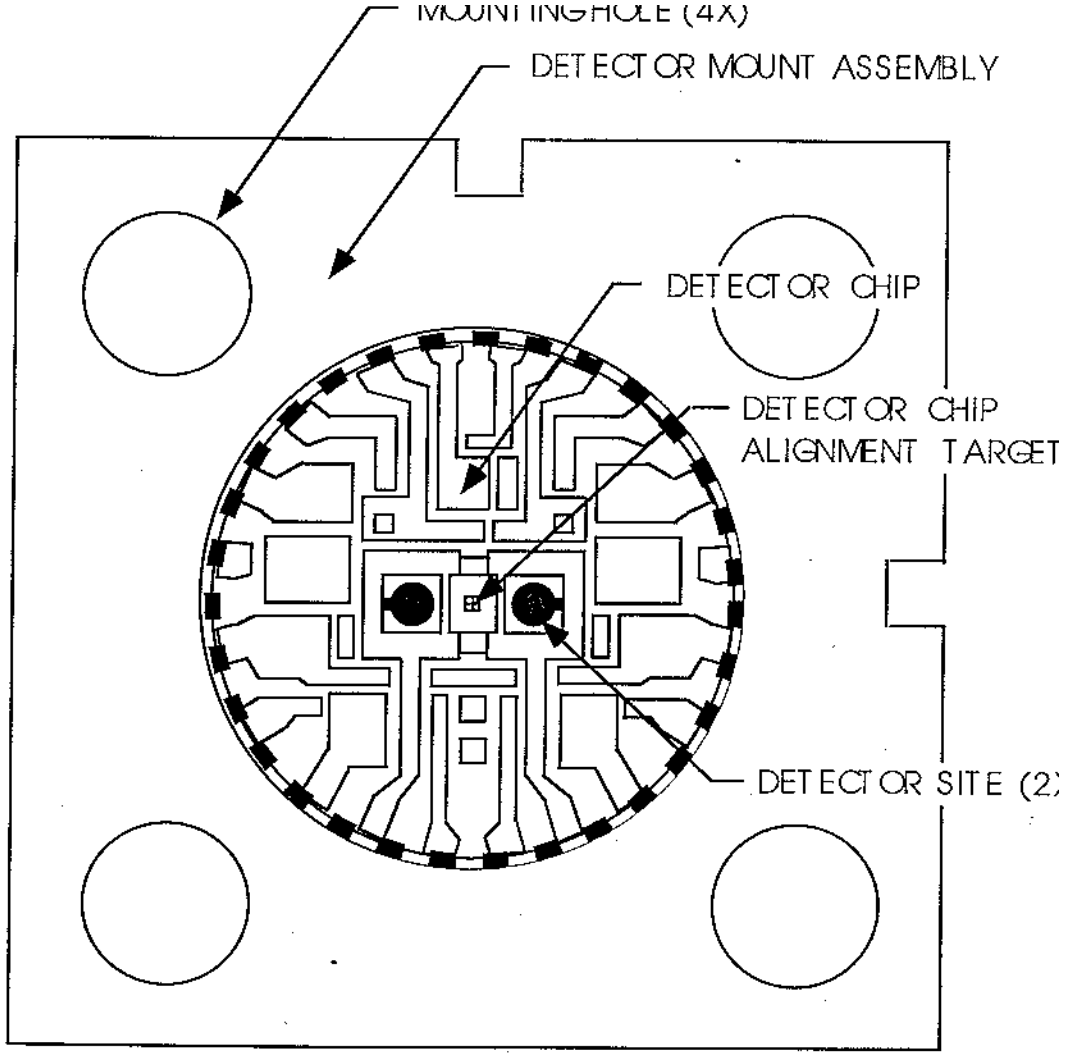


FIGURE 2 DETECTOR CHIP ORIENTATION

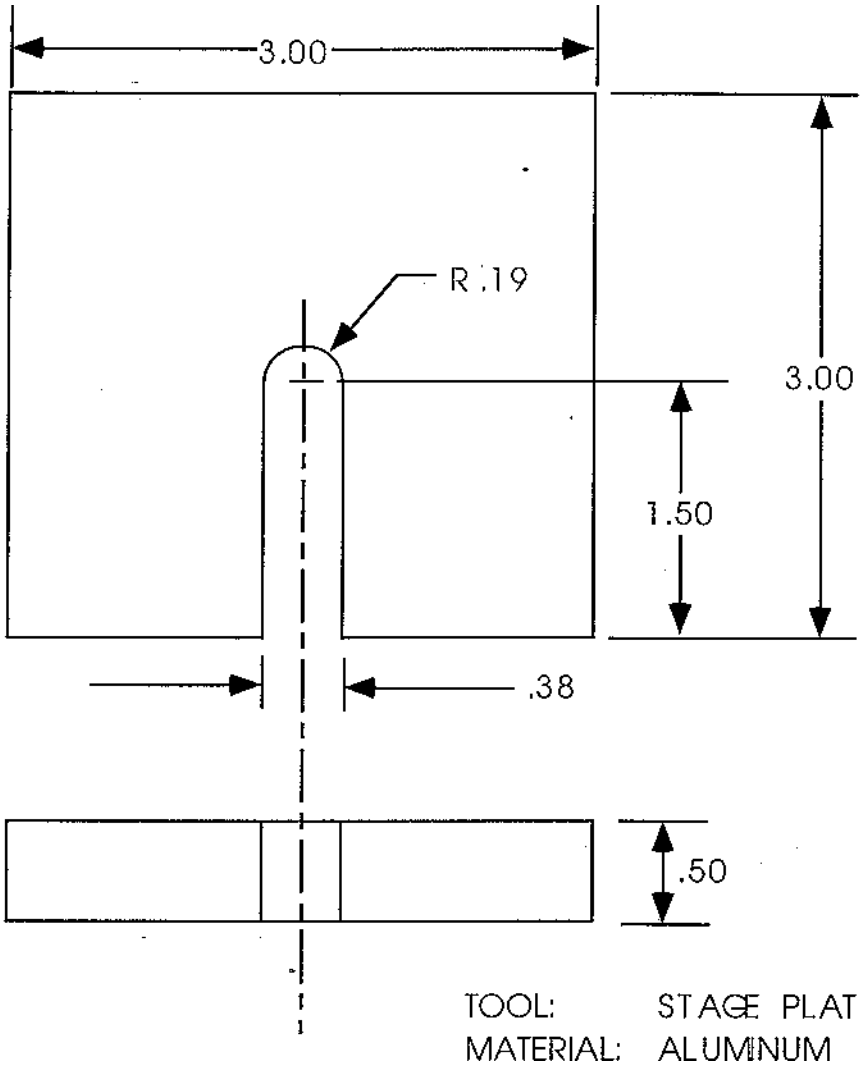
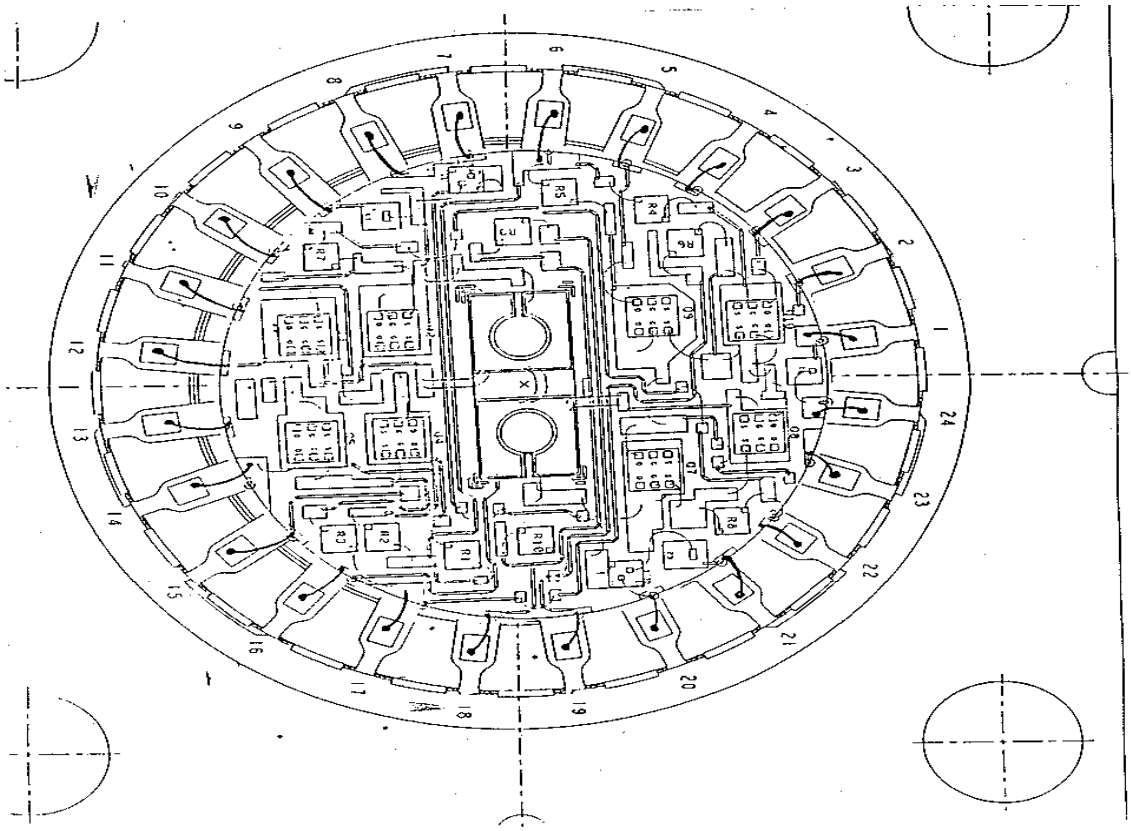
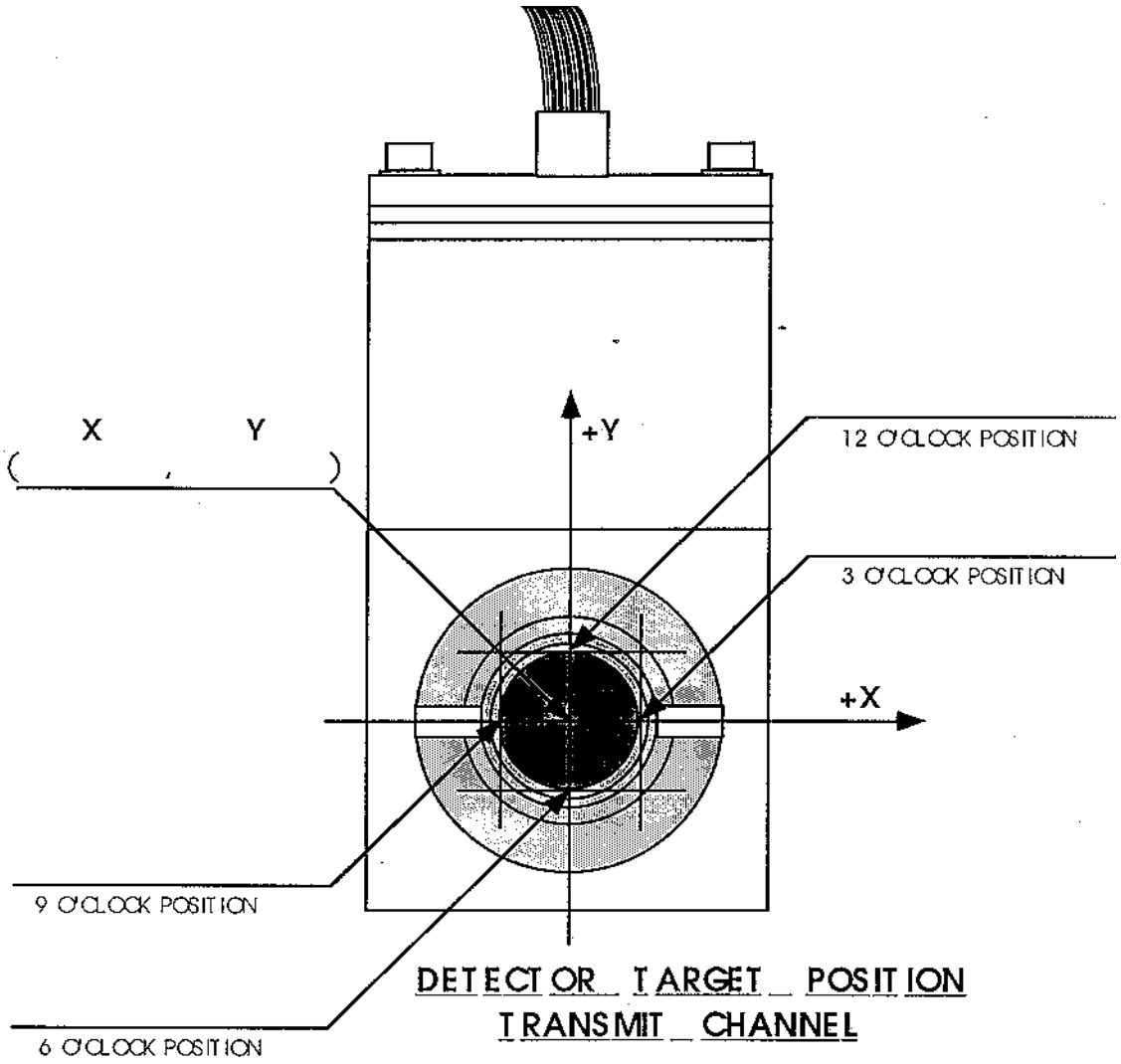


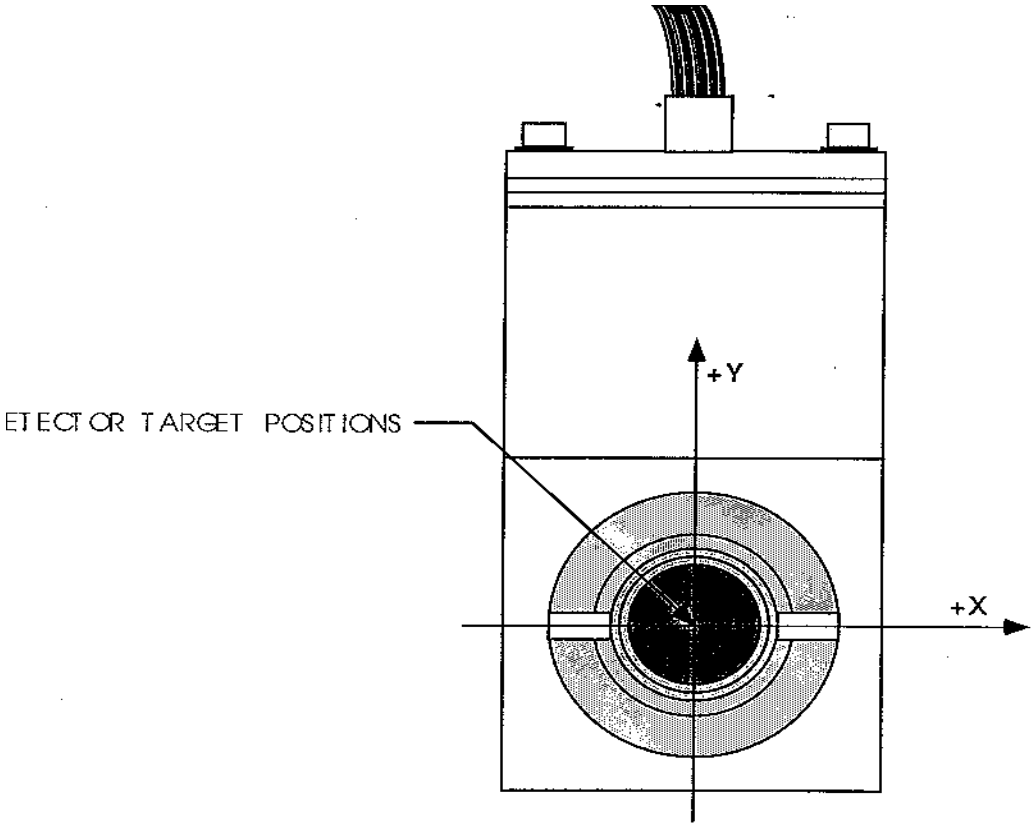
Figure 3 Stage Plate Tool

Wirebound to Circuit - Step 4





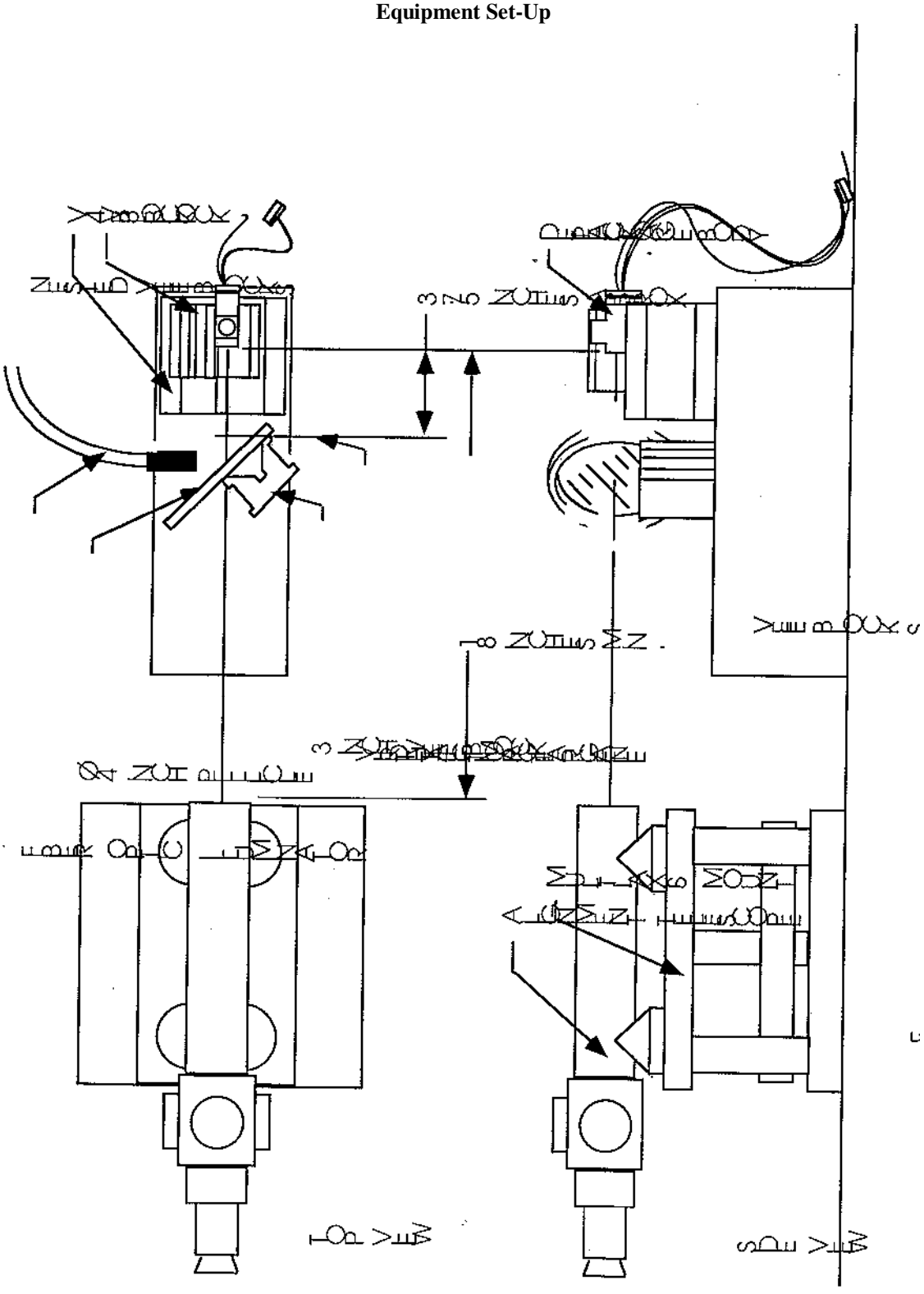
DATA SHEET 4.1 DETECTOR TO BORESIGHT CENTRATION, TRANSMIT CHANNEL



DETECTOR TARGET POSITION TRANSMIT CHANNEL	DETECTOR TARGET POSITION REFLECTED CHANNEL
X = _____	X = _____
Y = _____	Y = _____

DATA SHEET 4.2 DETECTOR TO BORESIGHT CENTRATION, REFLECTED CHANNE

Equipment Set-Up



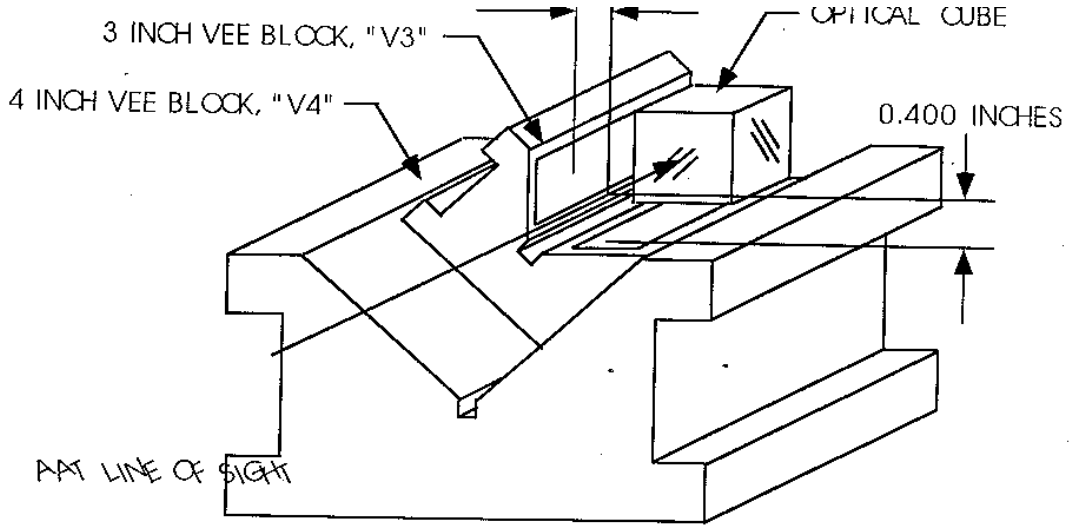


FIGURE 2A OPTICAL CUBE SET-UP

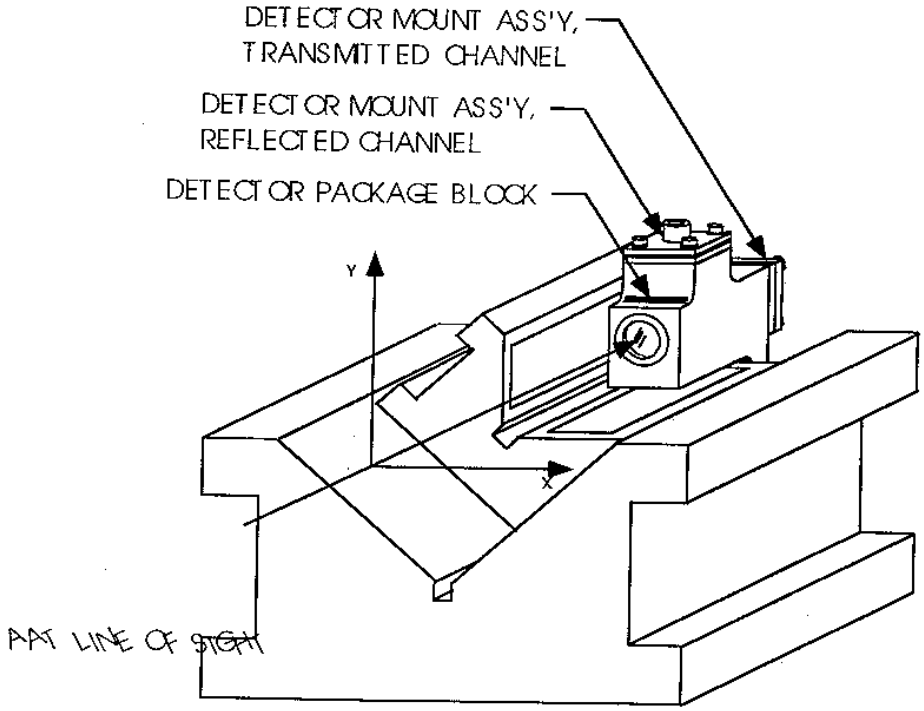


FIGURE 2B DETECTOR PACKAGE ASSEMBLY SET-UP

FIGURE 2 VEE BLOCK SET-UPS