IRLabs
Infrared Laboratories

1808 East 17th Street
Tucson, AZ 85719 - 6505 / USA
Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

| | |
|---|---|
| Customer : | Univ. AZ / Don Mccarthy |
| P.O. number : | UAZNPE24S |
| Dewar number : | 3272 |
| Job Order number : | |
| Quote number : | |
| Components : | Hawaii - 2RG, Preamps IREMB and GUMP with 34 outputs and x8 Motor Control |

section # Most recent REV DATE : Jun - 28, 06 M. Reed

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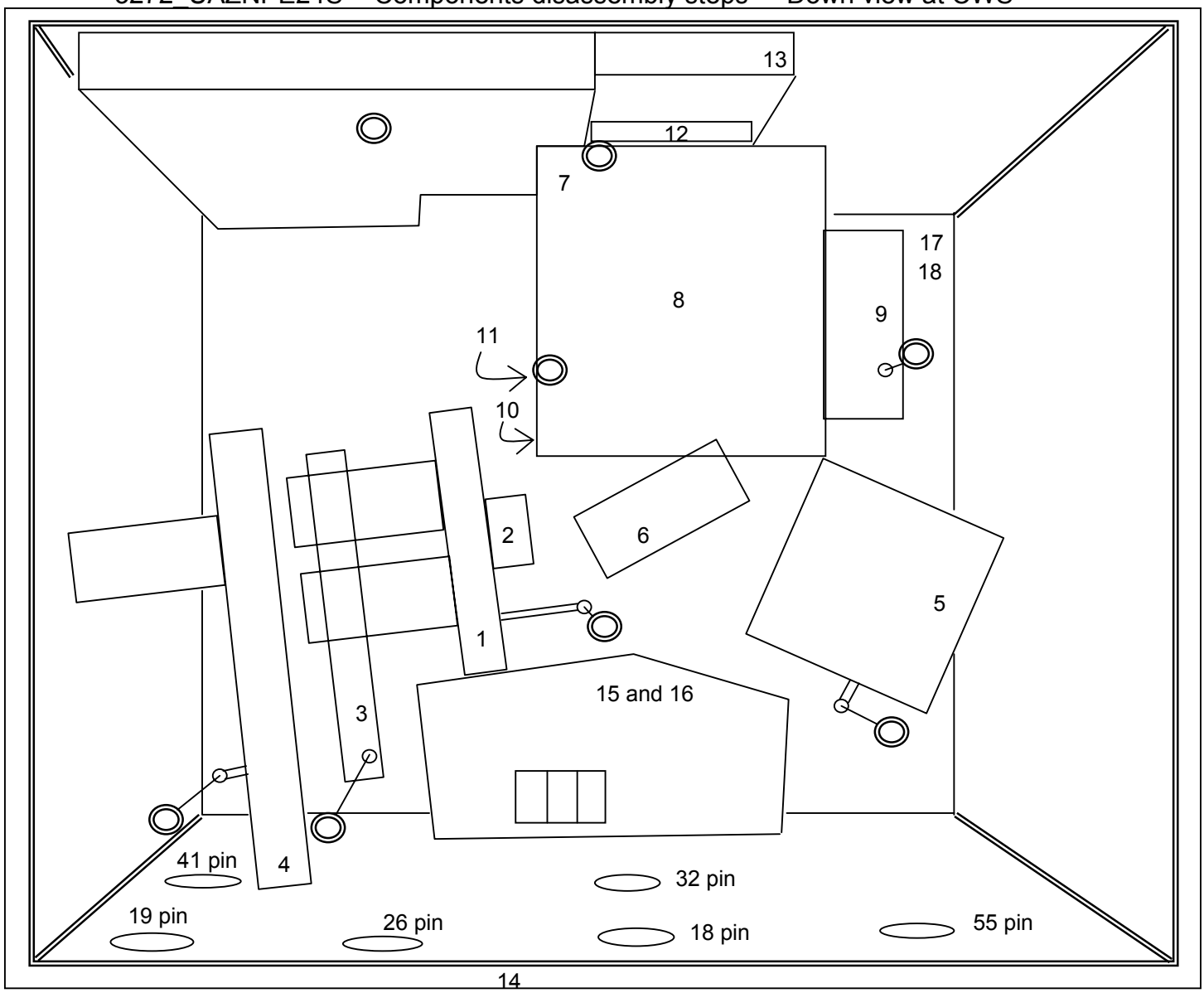
| Customer : | Univ. AZ |
| P.O. number : | UAZNPE24S |
| Dewar number : | 3272 |
| Job Order number : | |
| Quote number : | |
| Components : | disassemble steps, Dewar layout info |
| REV DATE : | 6/23/06 |

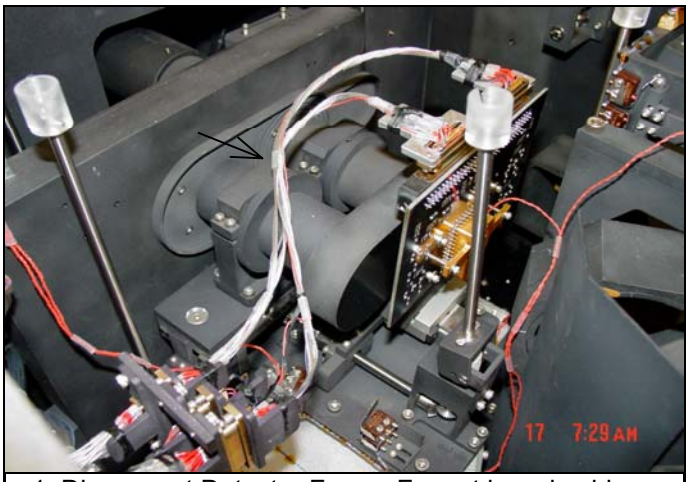
page #

3272_UAZNPE24S - Components disassembly steps - Down view at CWS

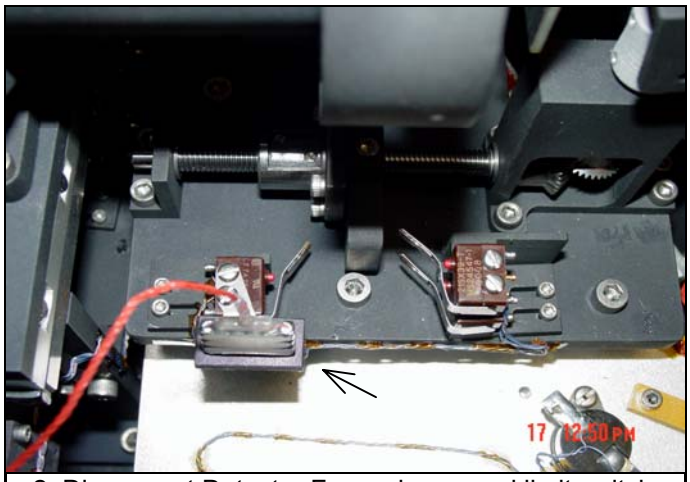



| Page # | Step # | Internal connector # | internal components - disconnect order |
|---|---|---|---|
| | 1 | | Array fanout board cables going to MDM connectors on Pumped vessel |
| **2** | 2 | J1 | Detector Focus - home and limit switches |
| | 3 | S1 | Detector Focus (Array Sensor) |
| | 4 | J2 | Optics Slide - home and limit switches |
| | 5 | J3 | Filter Wheel Box - home switch |
| **3** | 6 | J4 | Echelle - limit switches |
| | 7 | - | Filter Holder 2 |
| | 8 | J5 | Upper Grating - Limit switches |
| | 9 | S2 | Upper Grating - sensors |
| | 10 | J6 | Rotating Mirror - home switch |
| **4** | 11 | J7 | Lower Grating - limit switches |
| | 12 | S3 | Lower Grating - Sensor |
| | 13 | - | Filter Holder 1 |
| | 14 | J8 | Aperture Slit Wheel |
| | 15 | S4 | Outer Shield - sensor |
| | 16 | S5 | Pumped Vessel CWS - Sensor |
| | 17 | J9 | Pumped Vessel CWS - Heaters and thermostats |
| | 18 | S6 | Main CWS Sensor |
| **5** | 19 | J10 | Main CWS - Heaters and thermostats |
| | 20 | S7 | Mating Dewar - Outer Shield sensor |
| | 21 | S8 | Mating Dewar - CWS sensor |
| | 22 | J11 | Mating Dewar - Heaters and thermostats |

# 3272_UAZNPE24S - Components disassembly steps

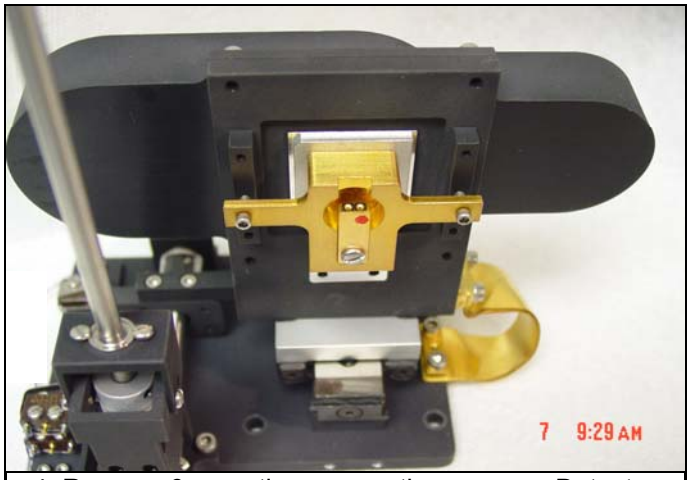



1. Disconnect Detector Focus, Fanout board cables going to MDM connector brackets on pumped vessel.

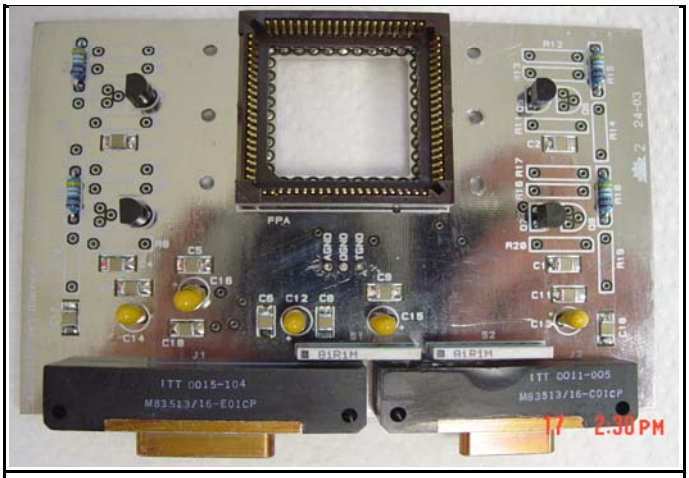



2. Disconnect Detector Focus, home and limit switches connector # J1.

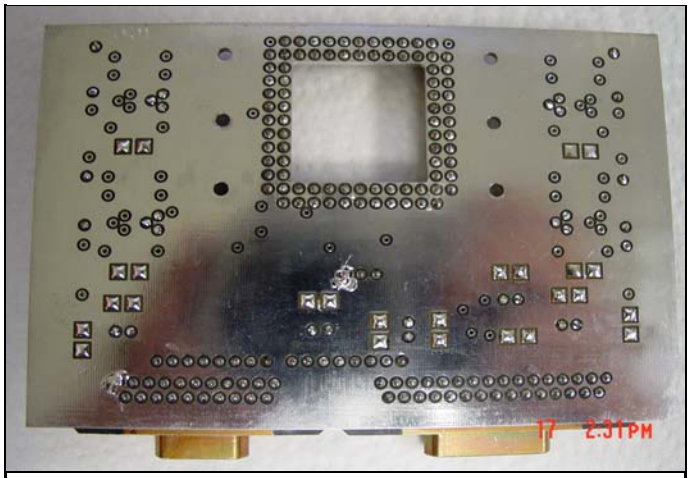
3. Disconnect Array temperature sensor connector # 1, sensor mounting screw can remain as is.



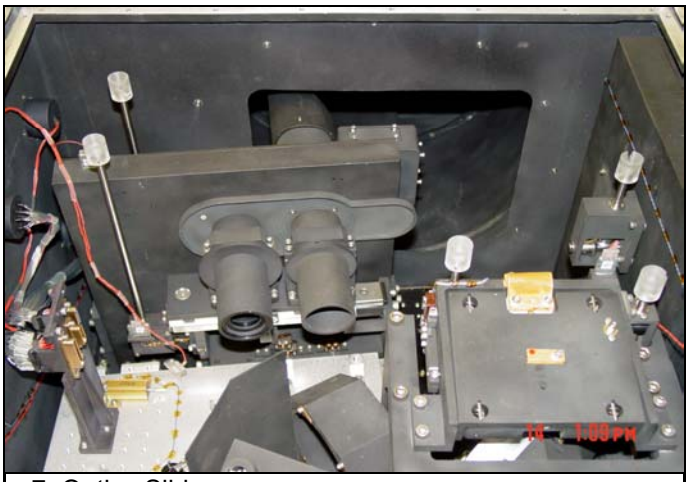

4. Remove 6 mounting screws then remove Detector Focus unit. Fanout board not shown in this picture.



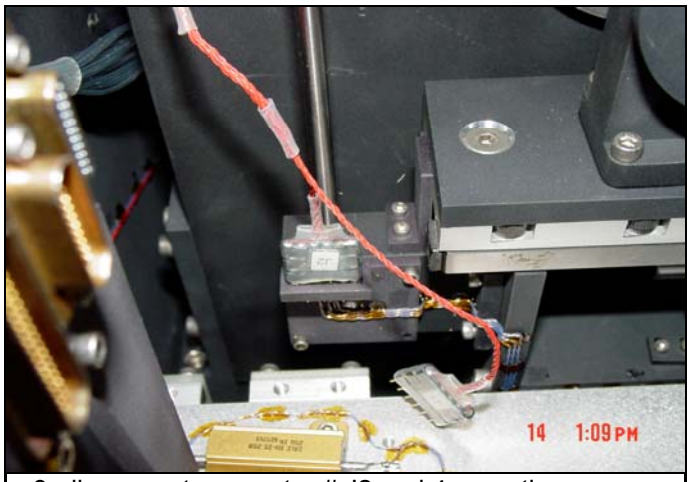

5. Fanout board - F25 # 014, top view.




6. Fanout board - F25 # 014, back view.

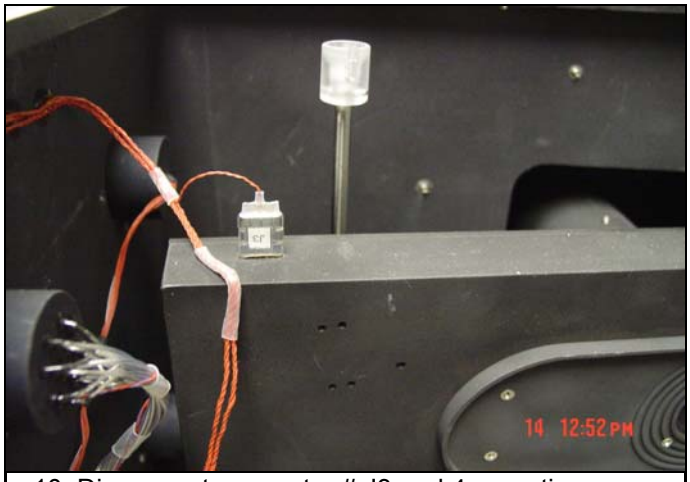


7. Optics Slide.

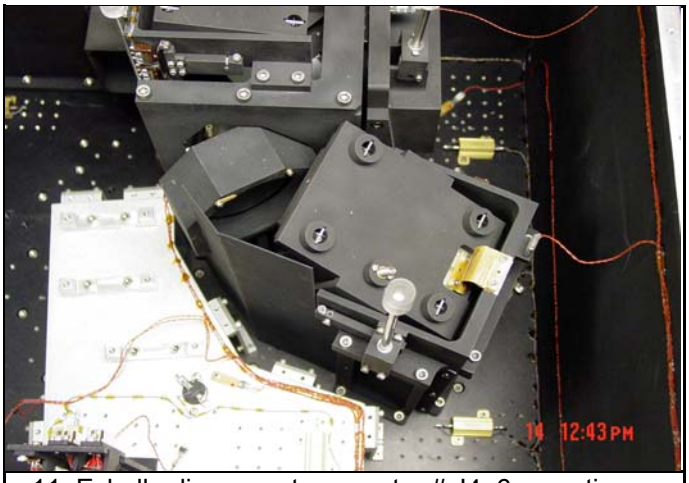


8. disconnect connector # J2 and 4 mounting screws then remove Optics Slide unit.

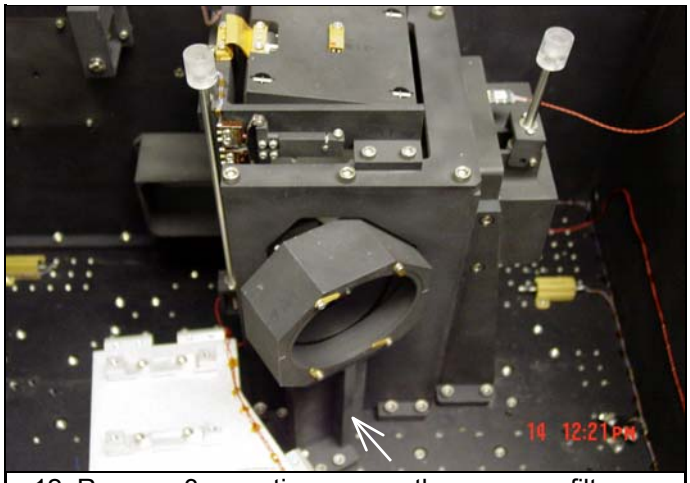
9. Filter Wheel box.



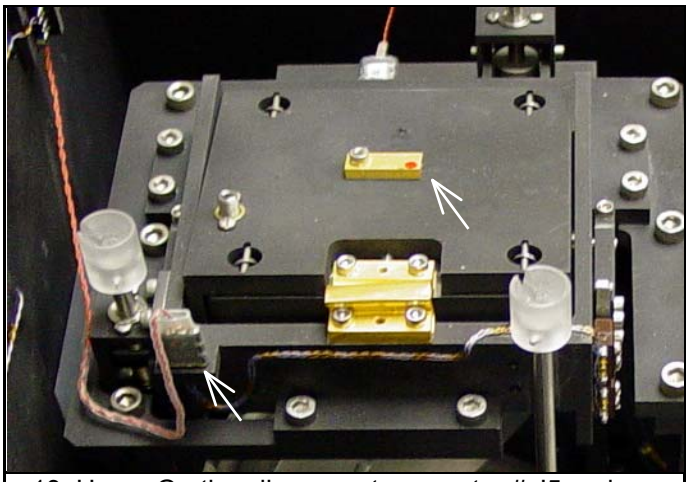
10. Disconnect connector # J3 and 4 mounting screws.



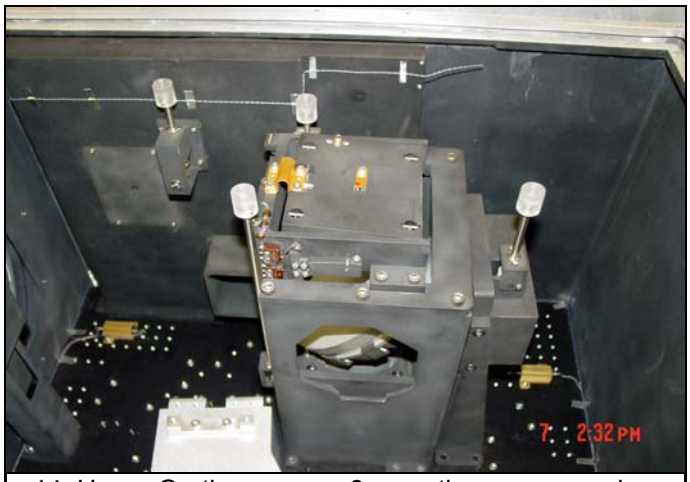
11. Echelle disconnect connector # J4, 6 mounting screws then remove.



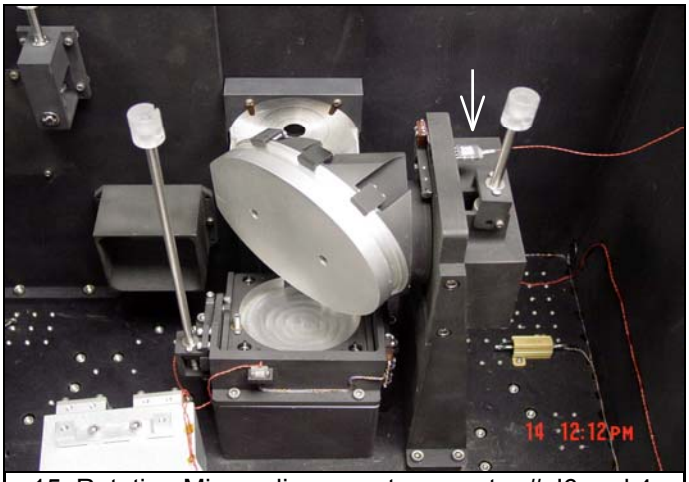
12. Remove 3 mounting screws then remove filter holder 2.



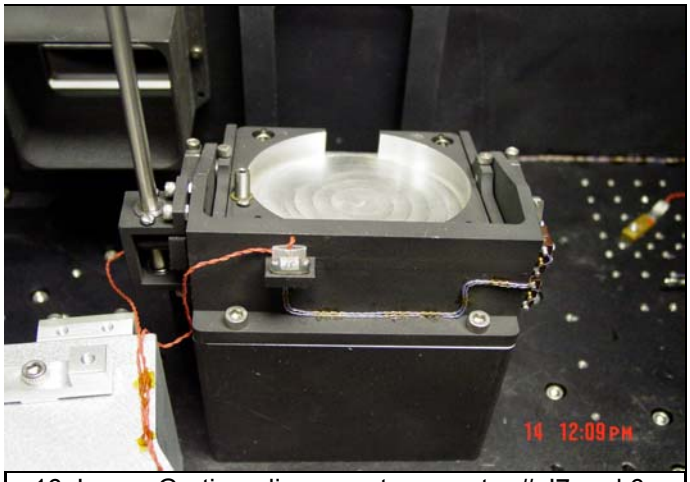
13. Upper Grating disconnect connector # J5 and temperature sensor # 2



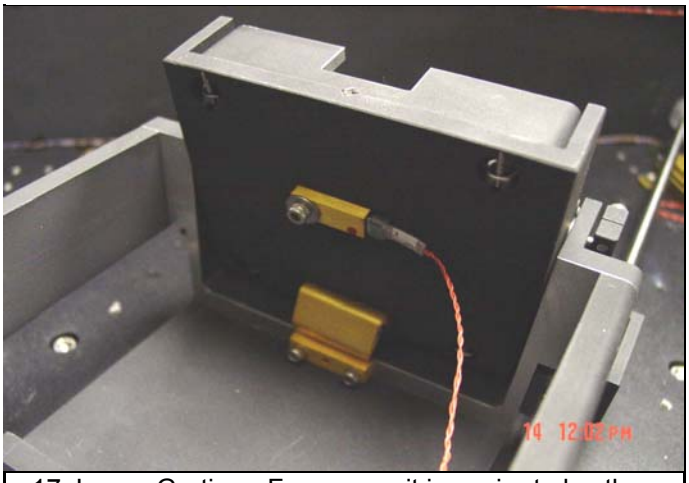

14. Upper Grating remove 6 mounting screws and slide unit up to separate from lower sections.



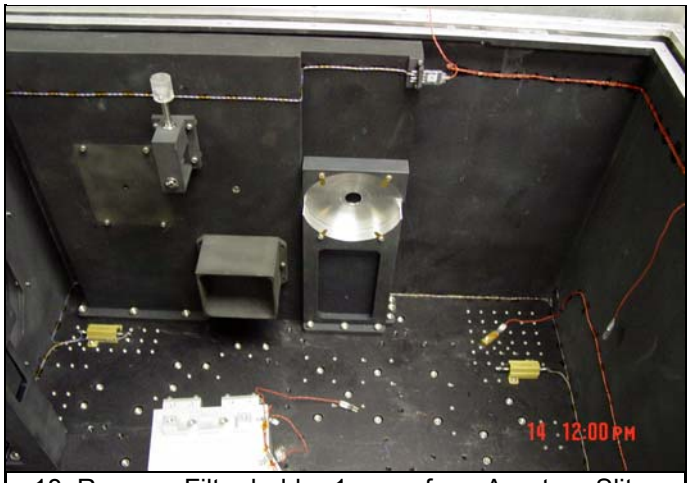

15. Rotating Mirror, disconnect connector # J6 and 4 mounting screws.



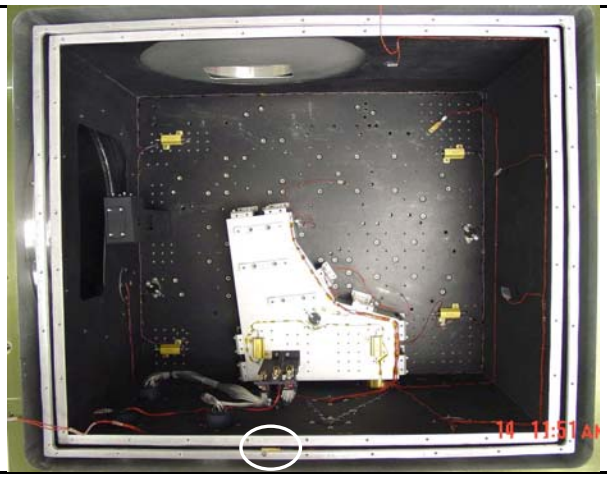

16. Lower Grating, disconnect connector # J7 and 6 mounting screws. ( see step 17 )



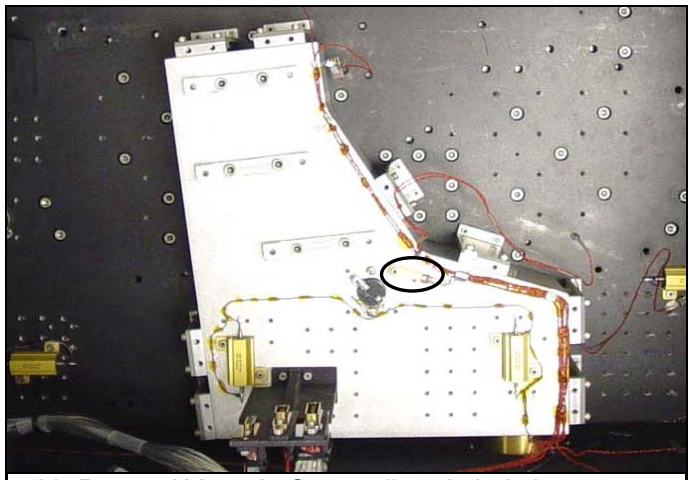
17. Lower Grating - For access it is easier to lay the unit back as shown then disconnect temperature sensor connector # 3.



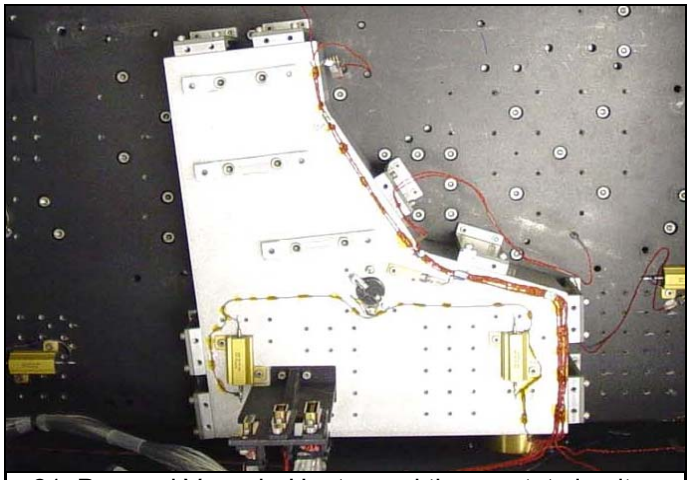

18. Remove Filter holder 1 away from Aperture Slit Wheel. Next disconnect connector # J8, Then remove 6 mounting screws



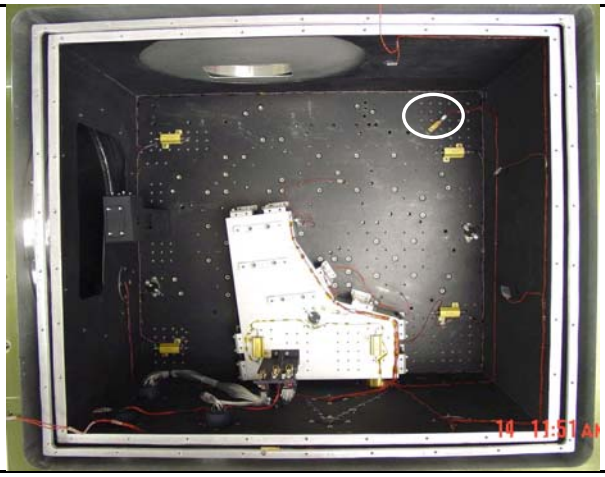
19. Outer shield sensor # 4 is mounted on the same side as dewar case connectors, circled above.



20. Pumped Vessel - Sensor # 5, circled above.

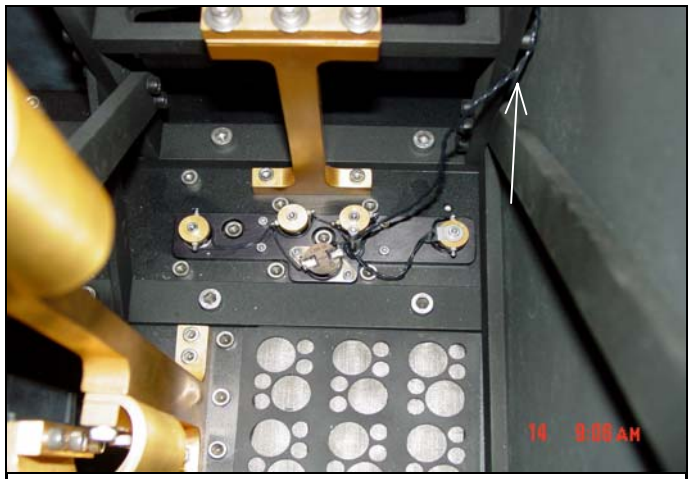


21. Pumped Vessel - Heater and thermostat circuit can be removed as a harness along with the Main section Heater circuit, if needed.



22. Main cold work surface - Temperature sensor # 6 is circled above, the cable is long enough to relocate if needed.

23. Mating Dewar - Temperature sensor # 7 (Outer shield) and # 8 (Inver Frame) are circled above.



24. Mating Dewar - CWS heater circuit, 1 heater button can be relocated to the getter box. The connector # J 11 is between the frame and shield, see arrow.

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| Dewar number : | 3272 |
| Job Order number : | |
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| Components : | Temperature Sensors and Heaters |
| REV DATE : | 6/23/06 |

page #

# Temperature Sensor connections

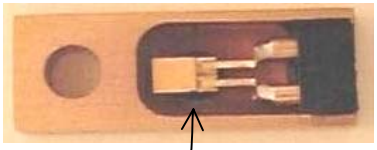
## MMSD - Moveable Mount Silicon Diode

this side should face up

−

+

mount this side toward cold work surface

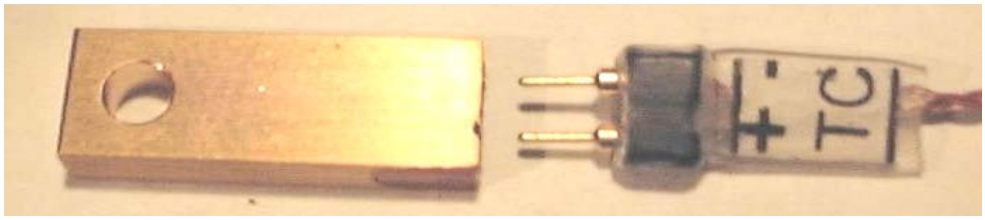


+

−

sensor is epoxied with stycast

polarity marks on sensor and cable connector indicate the positive side



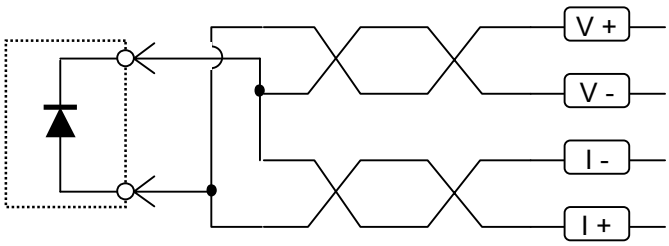


mount hole

red mark

On the sensor connector "TC" indicates Temperature Control cable. The "TC" cable is intended to be used to control nearby heater elements. A number indicates the readout sensors position on the Dewars case connector.

Wiring diagram of sensor and twisted pair cable inside Dewar

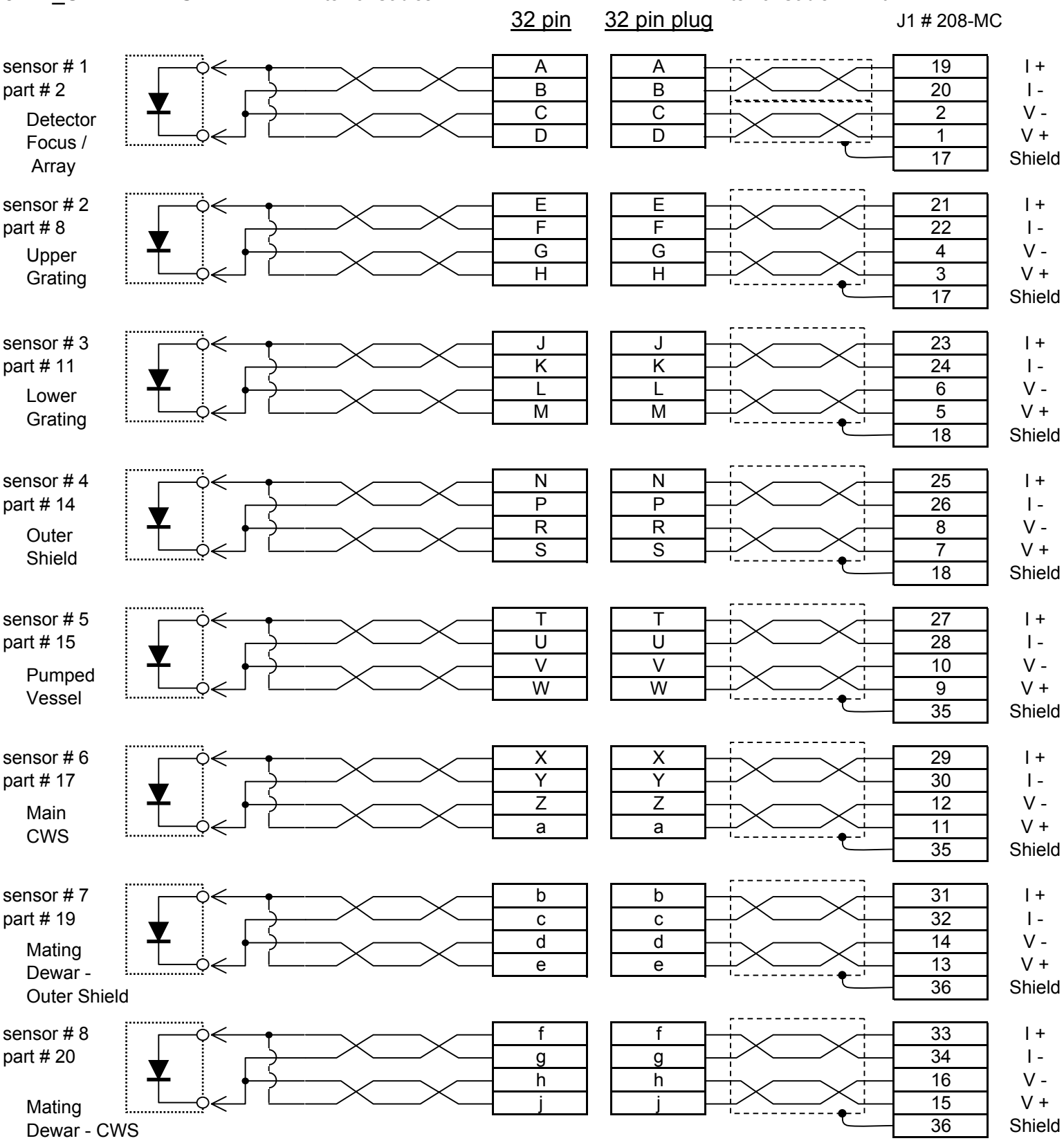



use an ohm meter to check polarity of final wiring. (similar to a diode)
at room temperature : forward bias is around 3.5 MΩ
reverse bias is infinite.
at nitrogen temperature : forward bias is around 18 MΩ
reverse bias is infinite.

3272_UAZNPE24S

Internal Cables

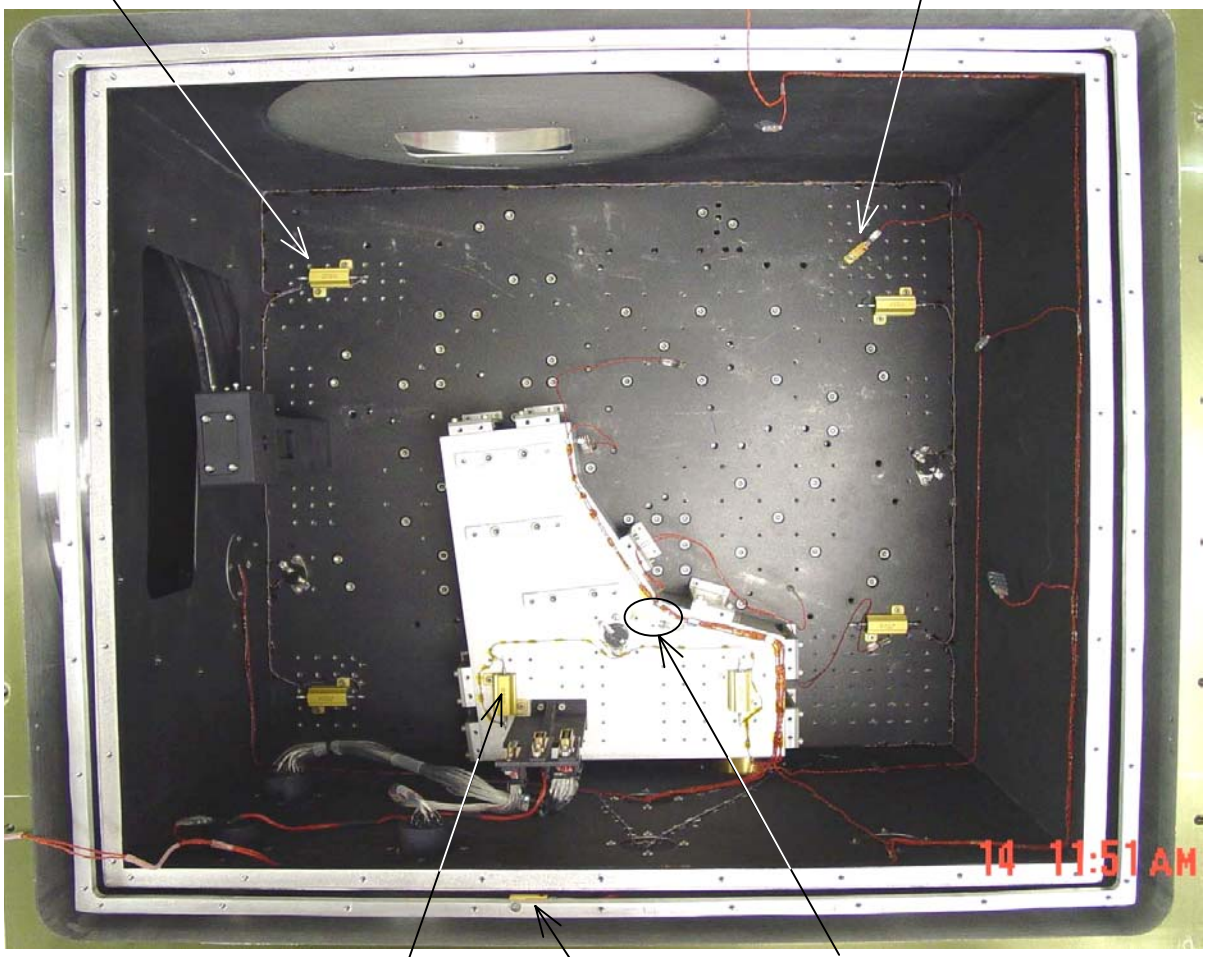
External Cable = 12 ft



# 3272_UAZNPE24S - Warm-up heater circuits, Layout

**Heater Circuit #1**, mounted on Main Section, Cold Work Surface, x4 25Ω heaters mounted near each corner with thermostat mounted near middle of x2 shield areas.

Temperature sensor # 6 mounted on Main Section, Cold Work Surface

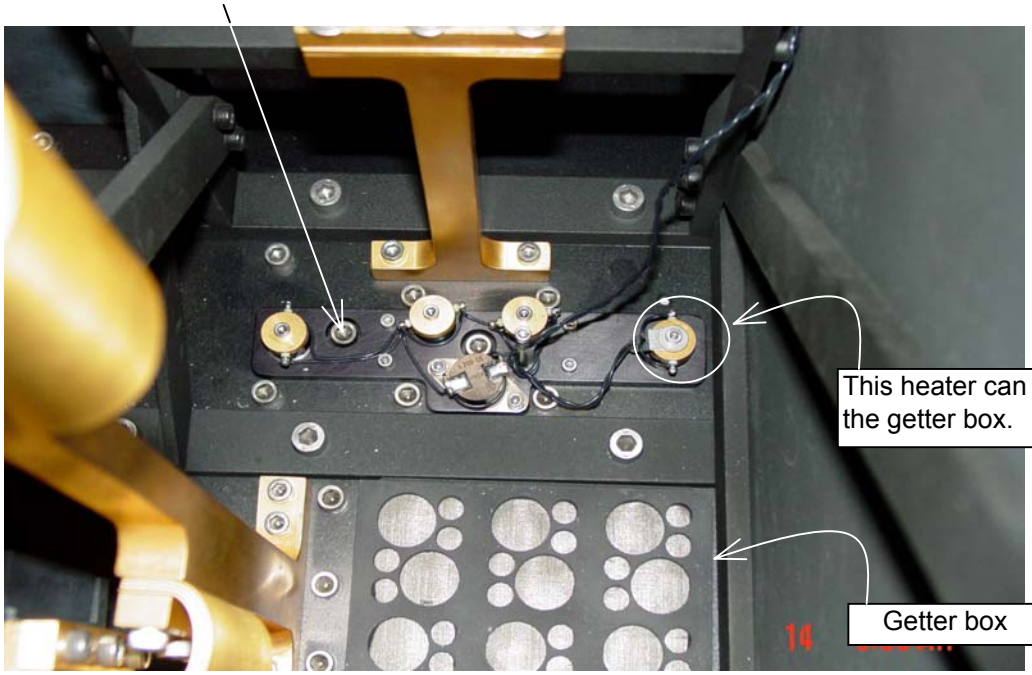



Heater Circuit # 2
x2, 25Ω heaters and x1 thermostat mounted on Pumped Vessel CWS

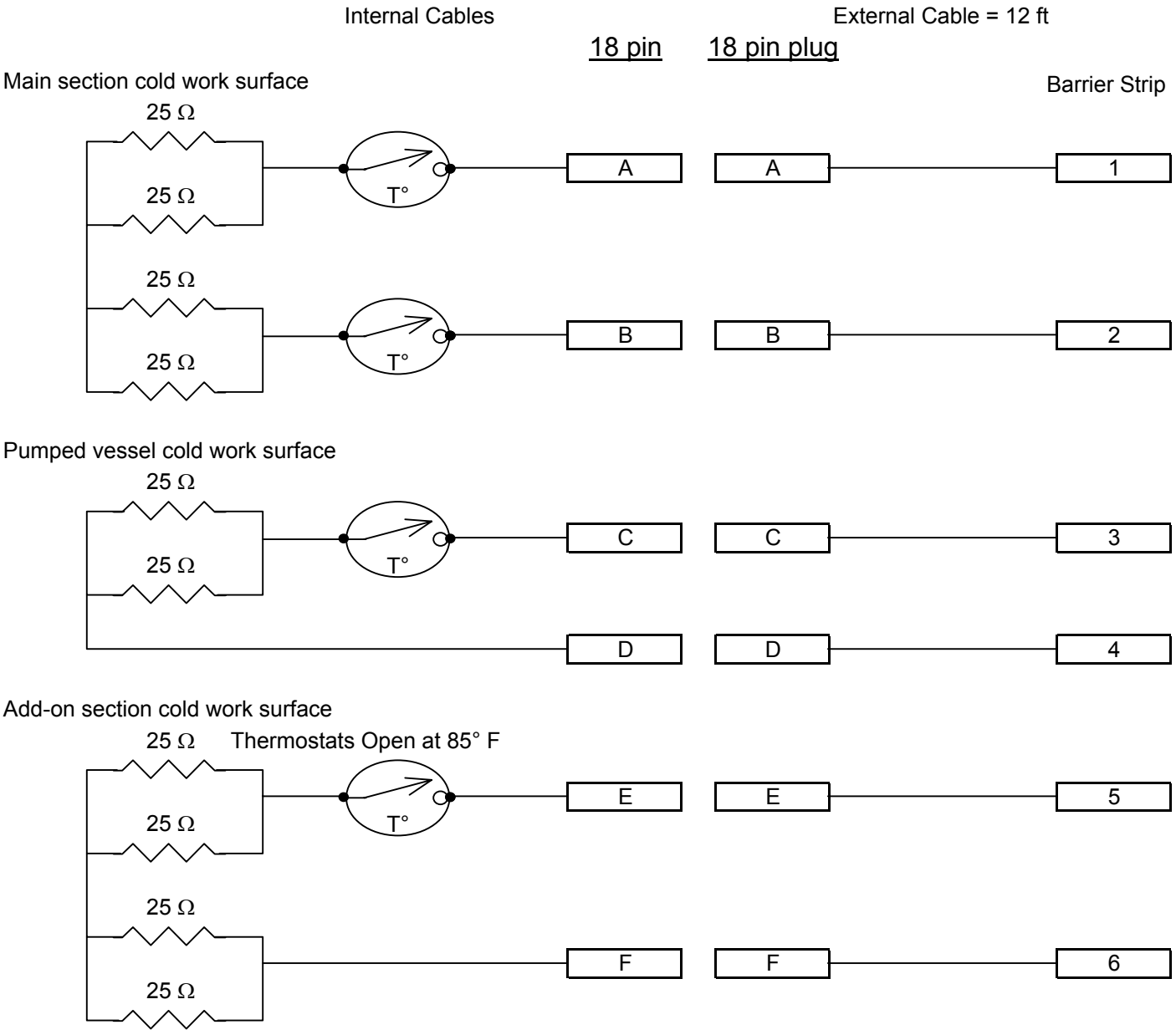
Temperature sensor # 5 mounted on pumped vessel

Temperature sensor # 4 mounted on Outer Shield

Heater Circuit # 3
Attached Dewar Section Cold Work Surface Plate



3272_UAZNPE24S - Warm-up heater circuits, wiring diagram




Note 1 : Thermostats Open at 85° F

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| Components : | Motor Drive - Home and / or Limit Switches |
| REV DATE : | 6/23/06 |

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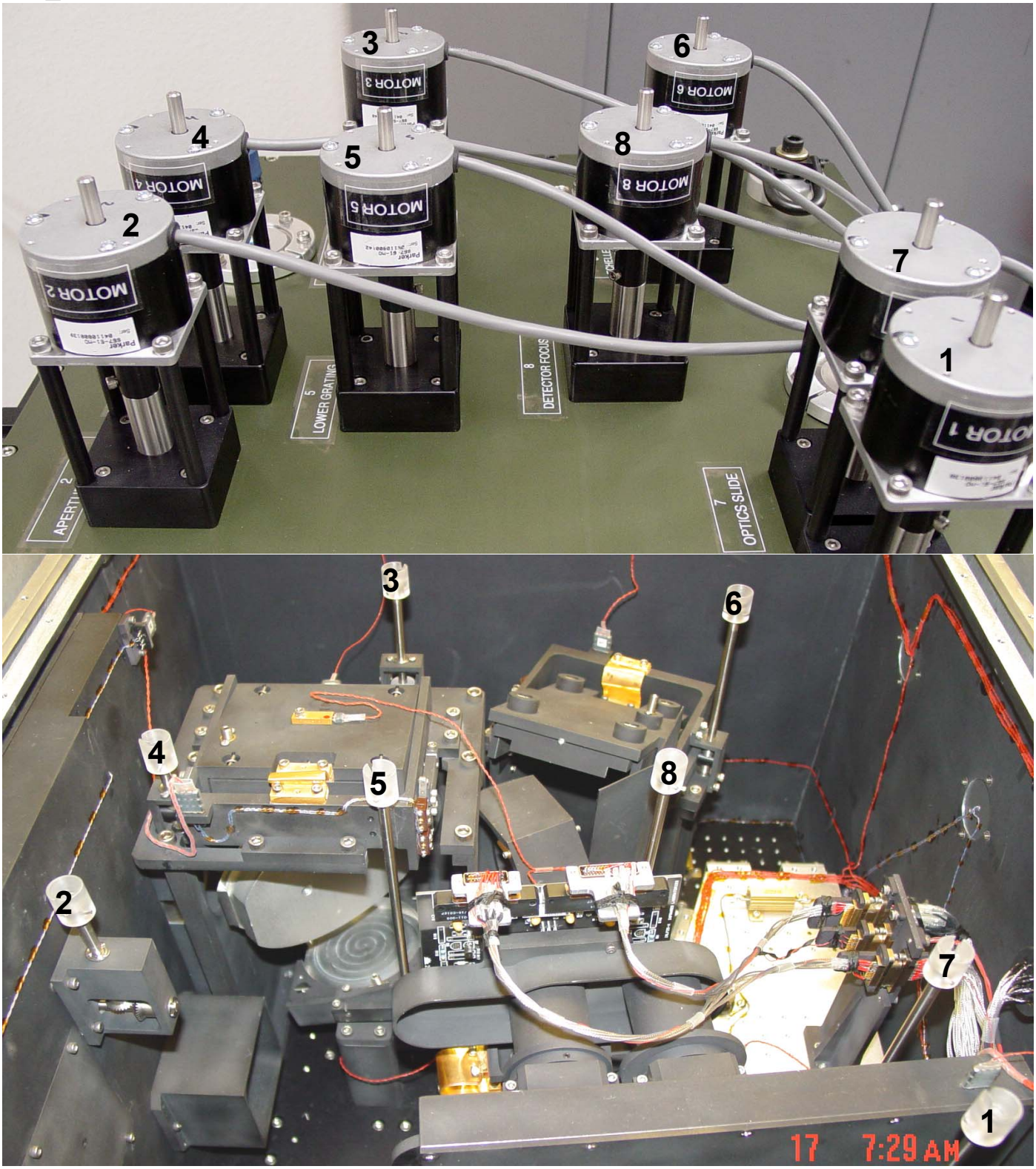
3272_UAZNPE24S - Overall View

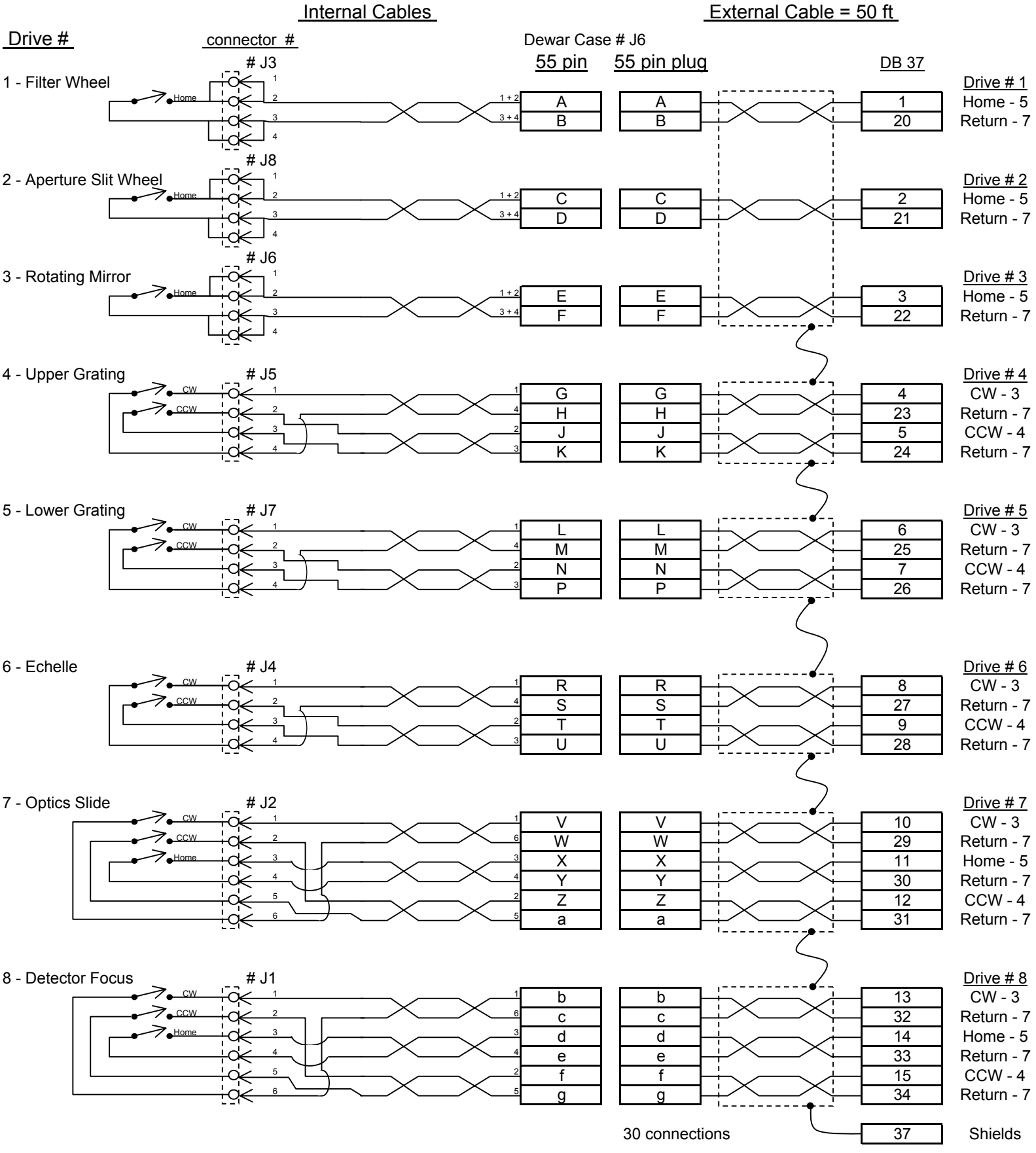



| | | | |
|---|---|---|---|
| 1 | Filter Wheel | 5 | Lower Grating |
| 2 | Aperture Slit Wheel | 6 | Echelle |
| 3 | Rotating Mirror | 7 | Optics Slide |
| 4 | Upper Grating | 8 | Detector Focus |

Motor Drive - Home and / or Limit Switches

3272_UAZNPE24S

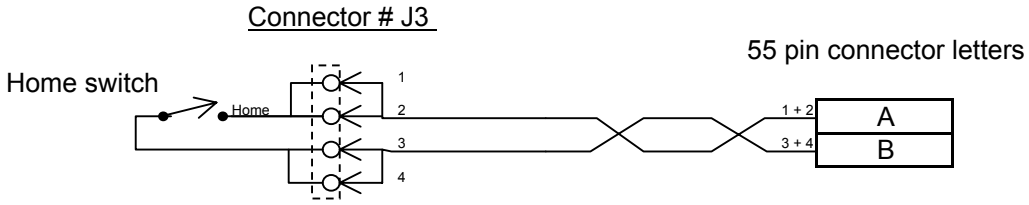
Note : Internal connectors are wired to allow connection in either direction.



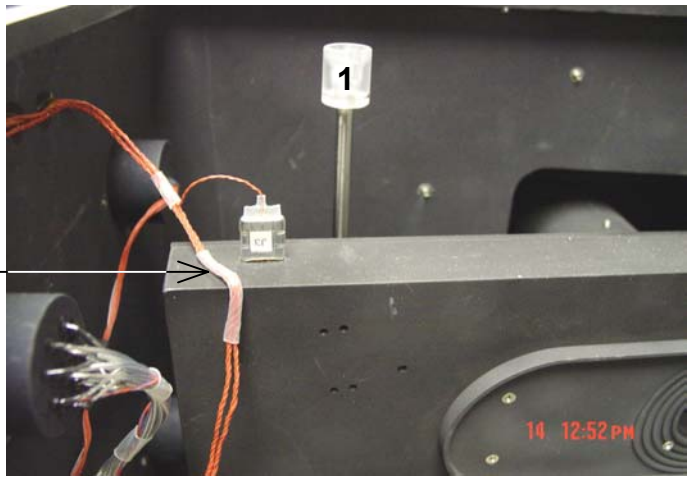
# 3272_UAZNPE24S - Filter Wheel - Motor Drive Address # 1

Switches connector # J3


From this view if the knob is turned clockwise the wheel turns clockwise.

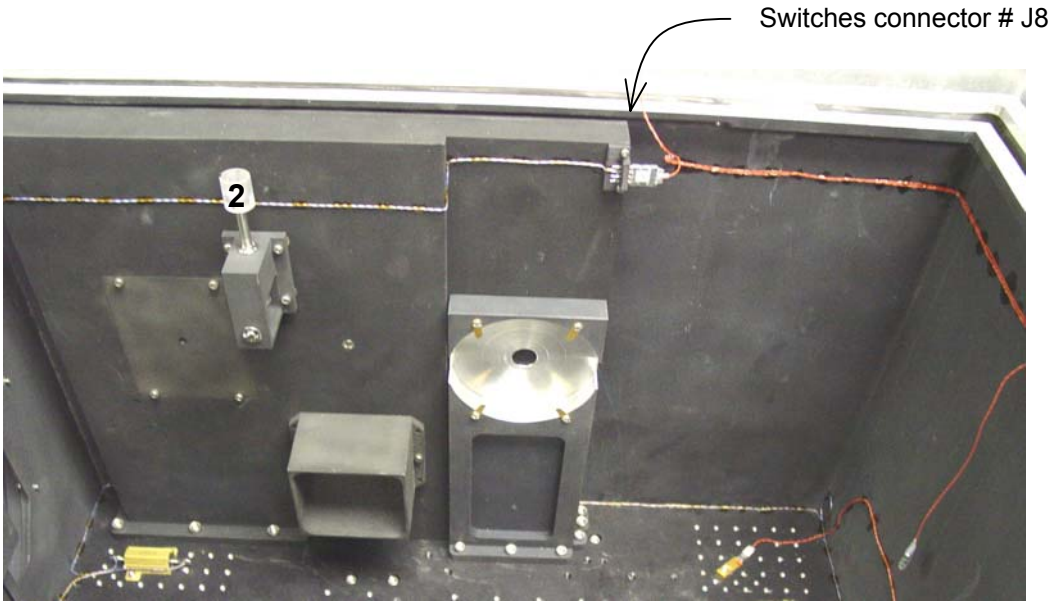



This bend in tubing helps cable harness to lay in direction toward other connectors.

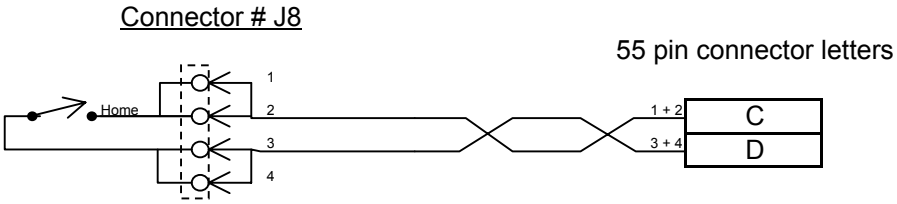



Note 1 : All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

3272_UAZNPE24S - Aperture Slit Wheel  - Motor Drive Address  # 2




From this view if the knob is turned clockwise the wheel turns clockwise.

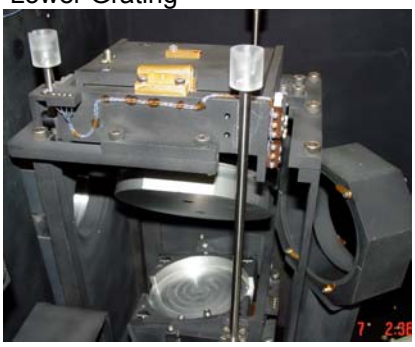



Note 1 :  All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

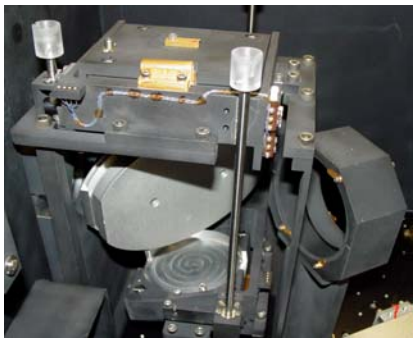
# 3272_UAZNPE24S - Rotating Mirror - Motor Drive Address # 3

Control knob is turned clockwise in each view.

Position 1, Home, reflects toward Lower Grating

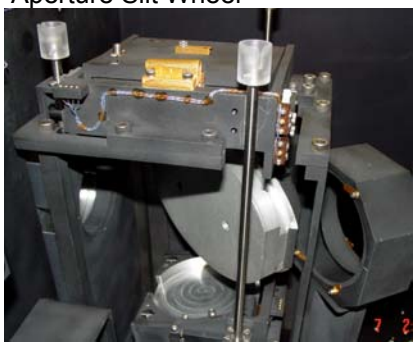


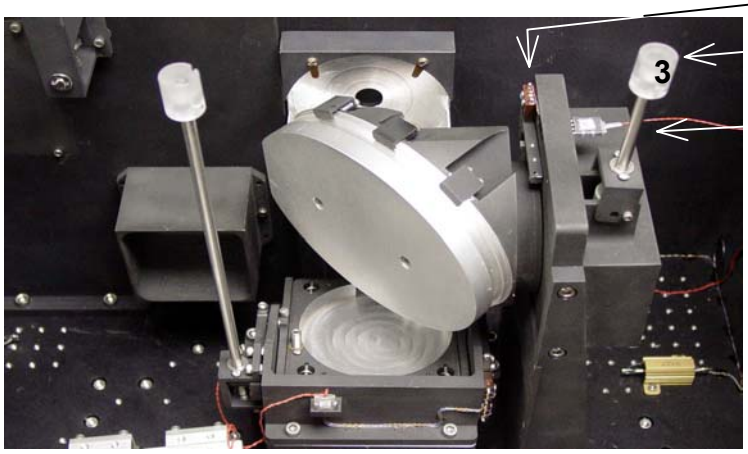
Position 2, reflects toward Echelle



Position 3, reflects toward Upper Grating

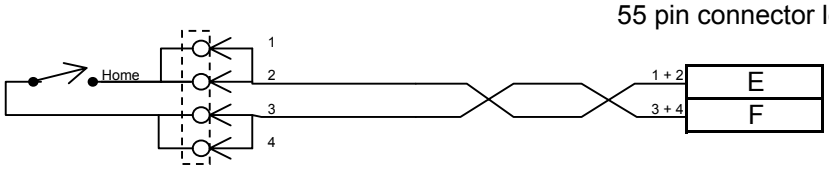
Position 4, reflects toward Aperture Slit Wheel





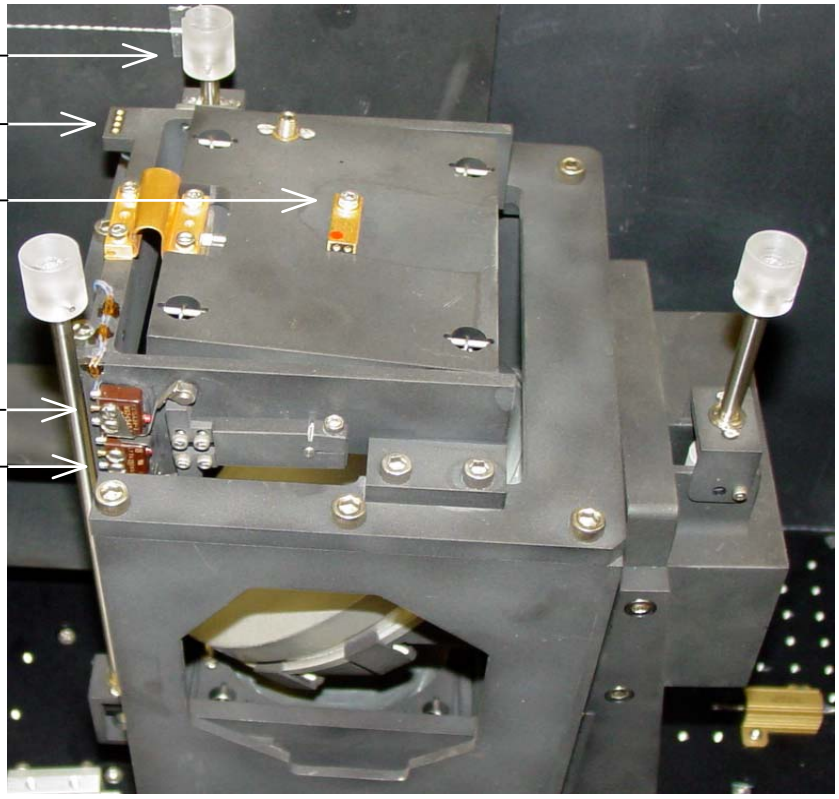

Connector # J6

55 pin connector letters

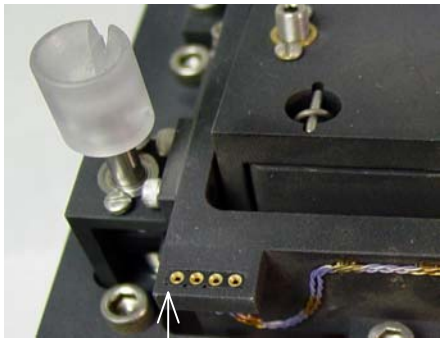



Note 1 : All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

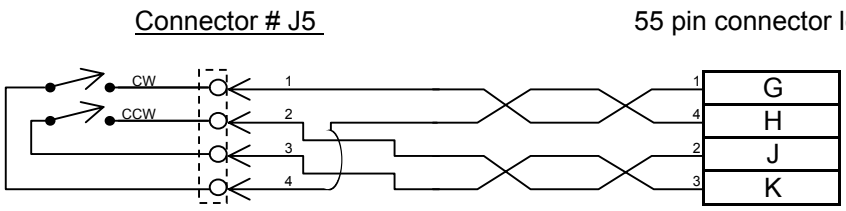
# 3272_UAZNPE24S - Upper Grating - Motor Drive Address # 4




The Grating mount tilt angle is closer to parallel with the cold work surface when the CCW switch is activated.

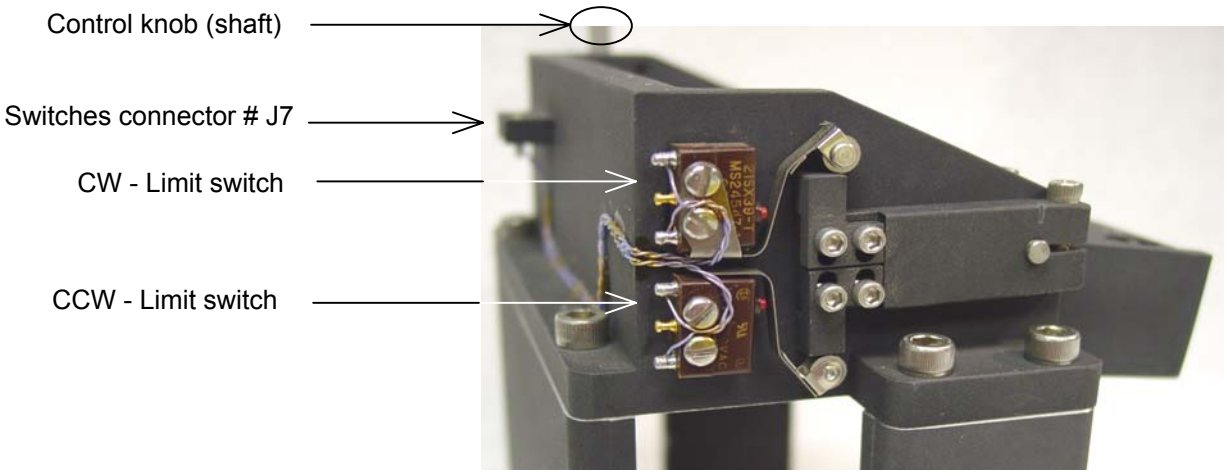


Connector # J5, Pin # 1

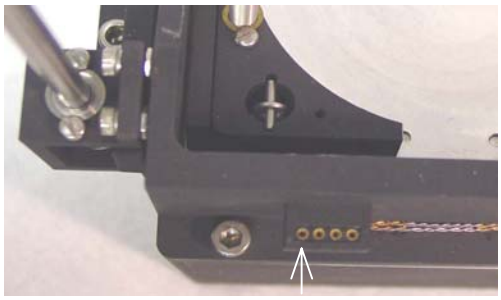



Note 1 : All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

# 3272_UAZNPE24S - Lower Grating - Motor Drive Address # 5



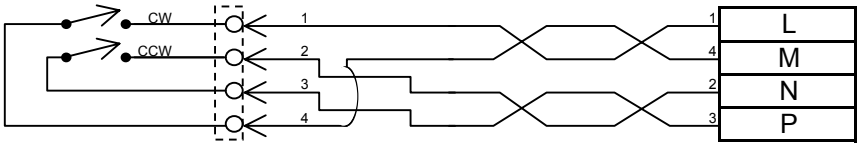

The Grating mount tilt angle is closer to parallel with the cold work surface when the CCW switch is activated.



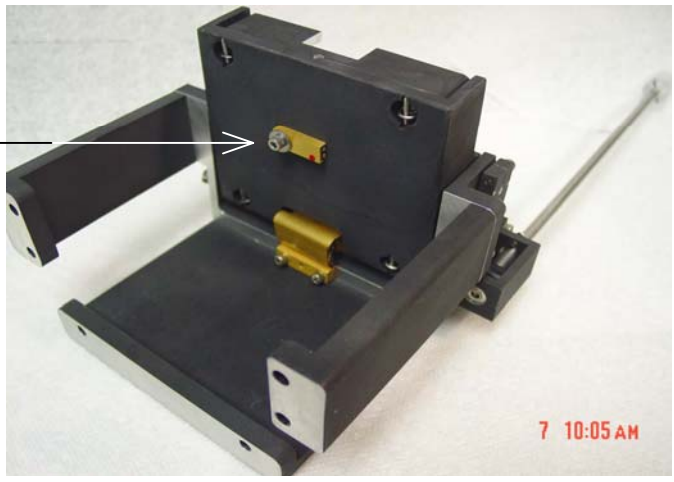
Connector # J7, Pin # 1

Connector # J7

55 pin connector letters

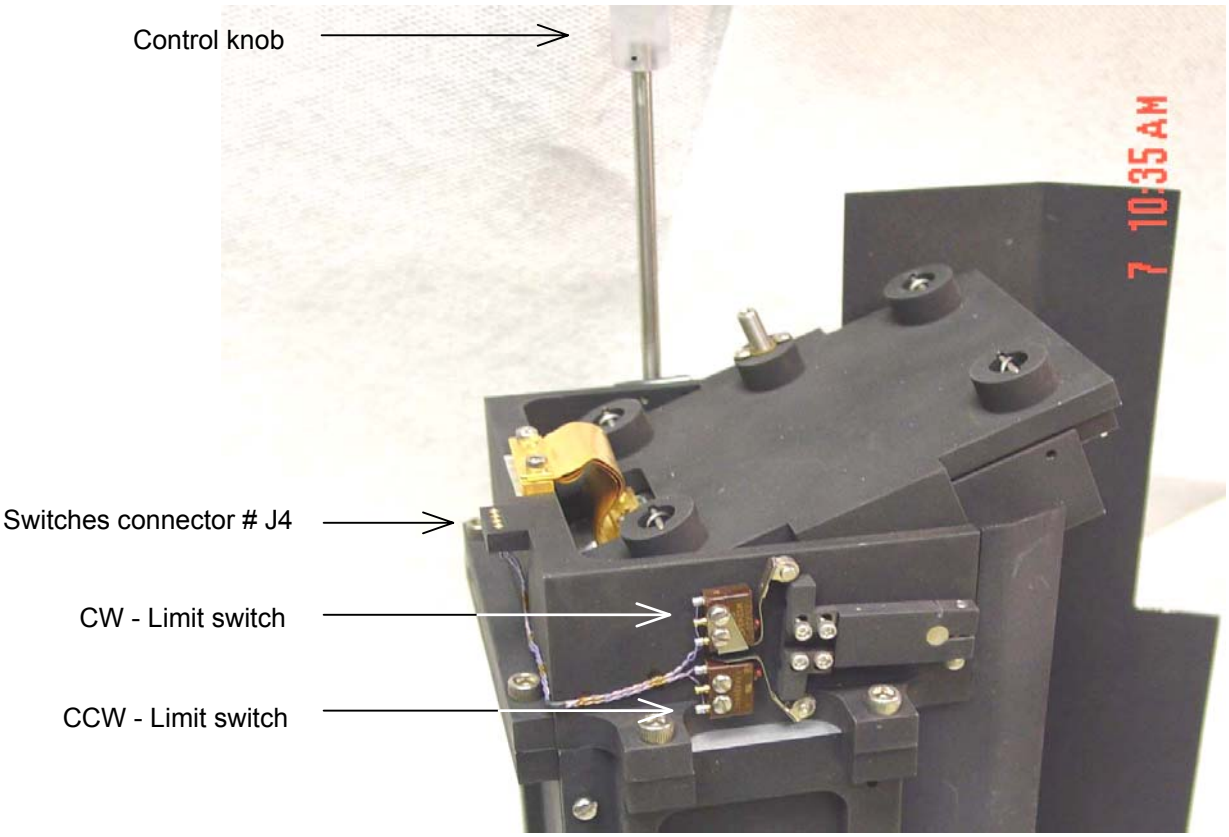



Temperature Sensor # 3
refer to MMSD info in
temperature sensor section.

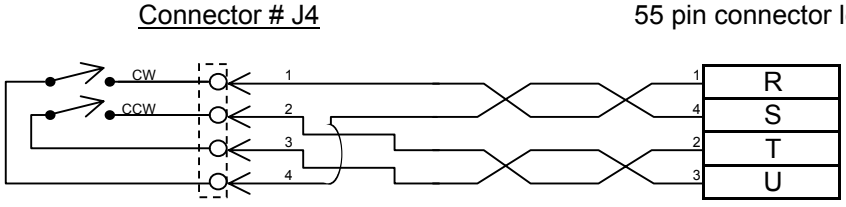



Note 1 : All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

# 3272_UAZNPE24S - Echelle - Motor Drive Address # 6

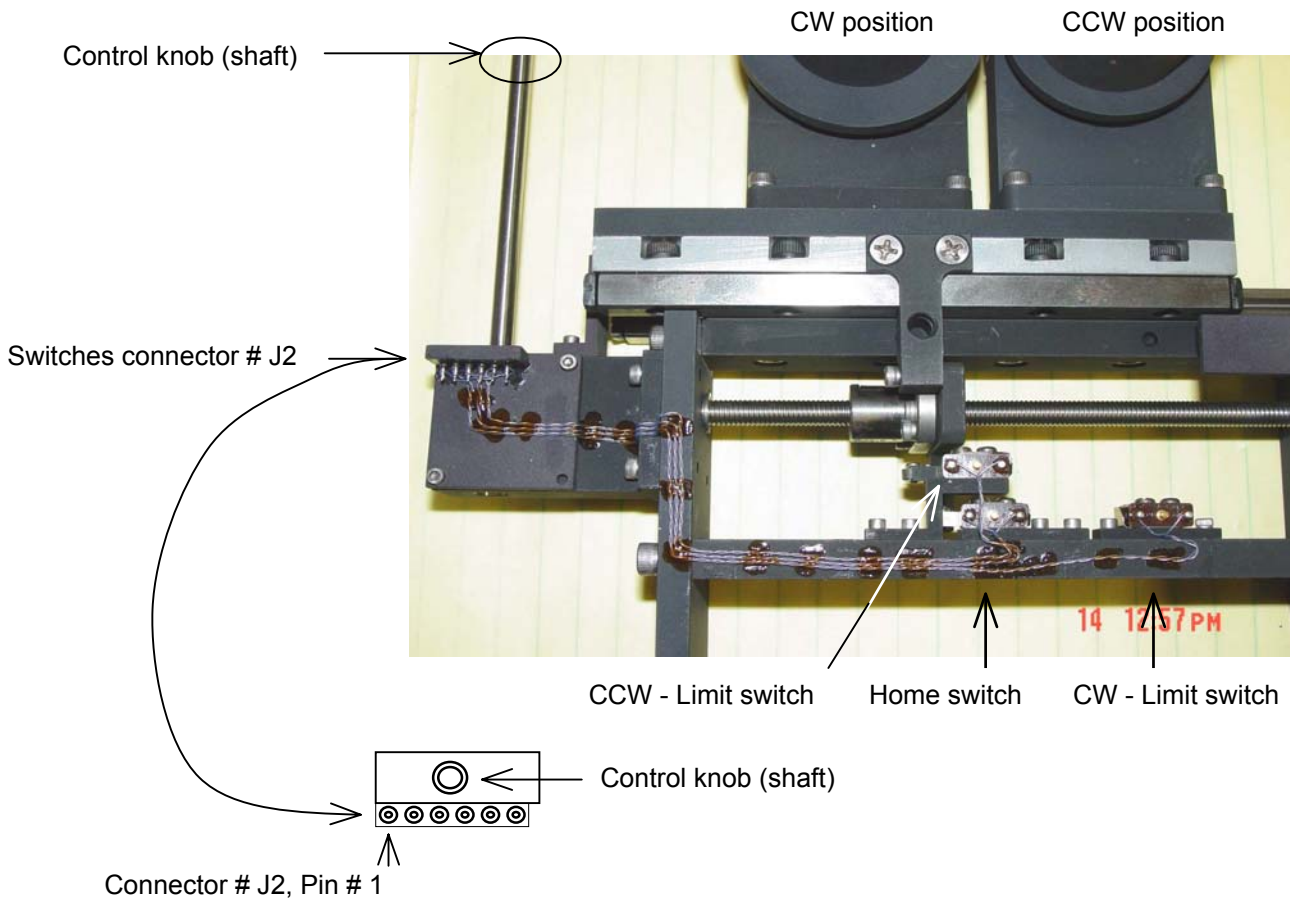


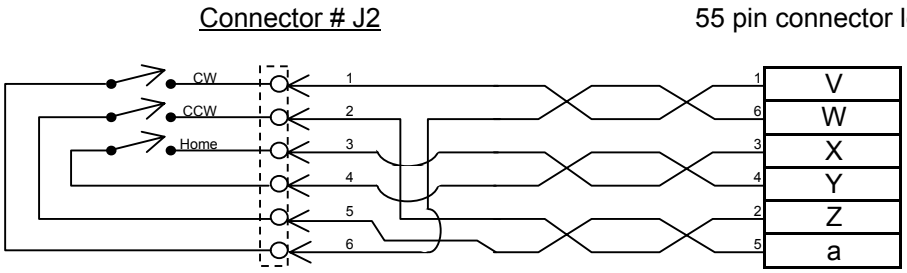

The Echelle mount tilt angle is closer to parallel with the cold work surface when the CW switch is activated.


Note 1 : All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

# 3272_UAZNPE24S - Optics Slide - Motor Drive Address # 7



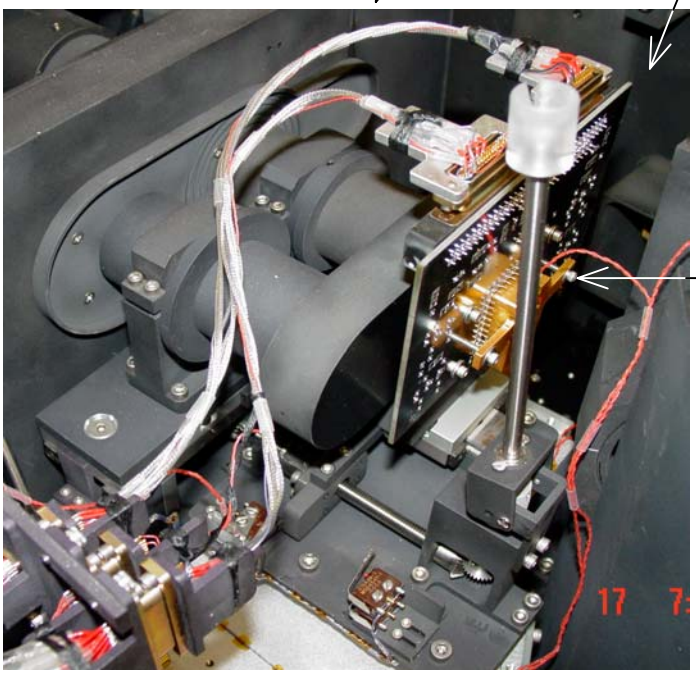



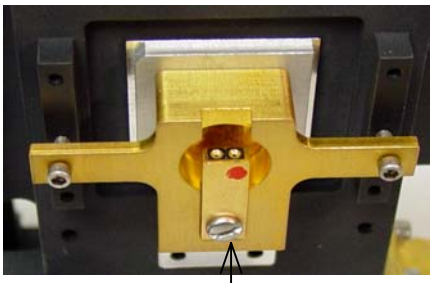

Note 1 : All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

# 3272_UAZNPE24S - Detector Focus - Motor Drive Address # 8

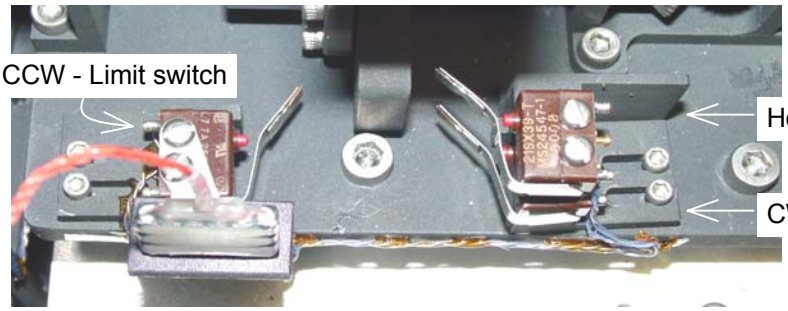
HAWAII 1 - Device dependent wiring harness, refer to Array wiring section.

HAWAII 1 - (F25) fanout board, refer to Array wiring section.





Temperature Sensor # 1
refer to MMSD info in
temperature sensor section.



CCW - Limit switch

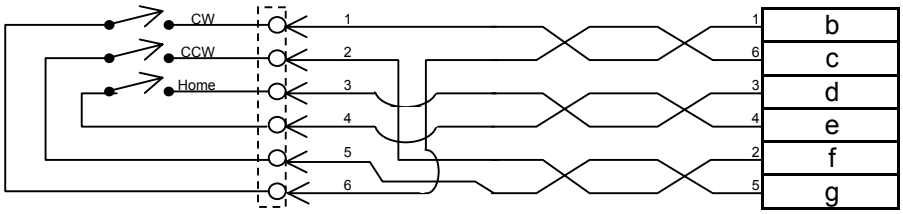
Home switch

CW - Limit switch

Connector # J1, Pin # 1

Switches Connector # J1

55 pin connector letters




Note 1 : All switches are wired to Open at the end of travel.
Note 2 : Clockwise (CW) and Counter Clockwise (CCW), Reference the knobs turning direction.
Note 3 : Switch connectors are wired to allow non-polarity connection.

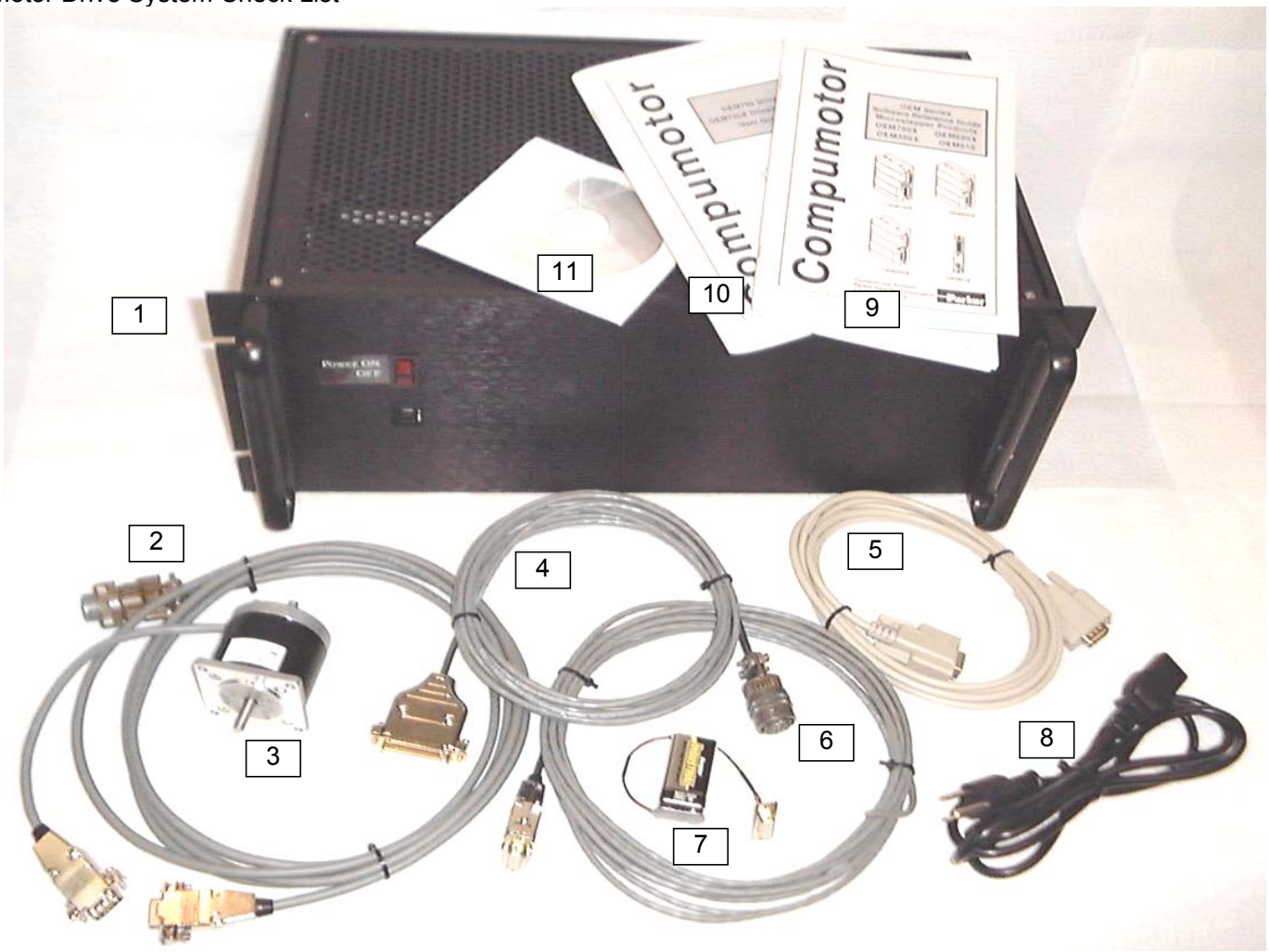
IRLabs, Inc.

1808 East 17th Street
Tucson, AZ 85719 - 6505 / USA
Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

Customer : University of Arizona
P.O. number : UAZNPE24S
Dewar number : 3272
Job Order number :
Quote number :
Components : 8 Drive - Motor Controller System
REV DATE : 6/26/06

page #

Motor Drive System Check List

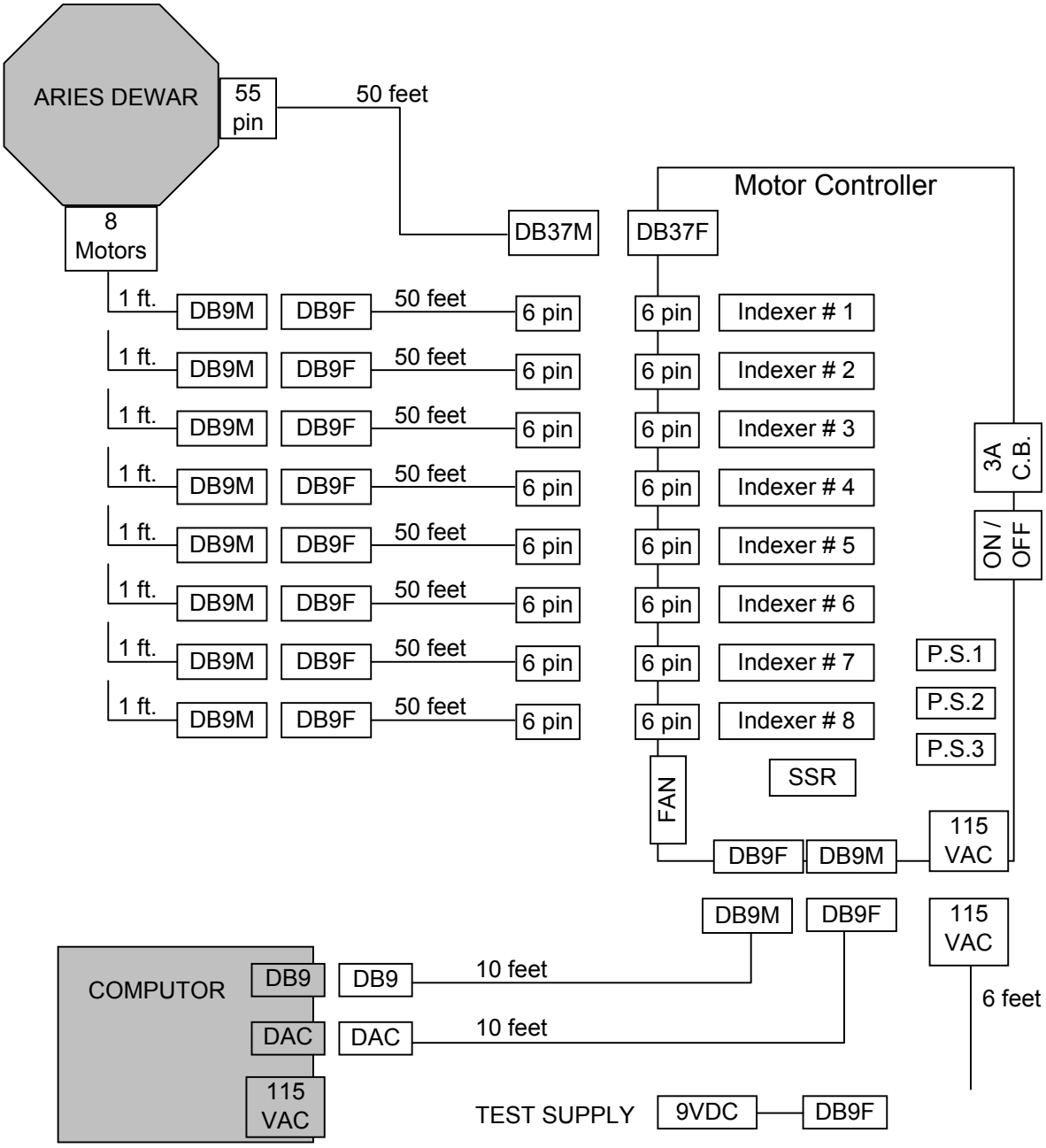



| check list | | |
|---|---|---|
| | 1. | Motor Drive enclosure contains : |
| | | Indexer (configured for # QM-57-51 motor) |
| | | Power Supply (configured for 115 VAC) |
| | | operation components |
| | | External accessories : |
| | 2 | motor drive cable |
| | 3 | motor |
| | 4 | Home / Limit switch connecting cable |
| | 5 | RS-232 Serial cable (Non-Nulling) |
| | 6 | Remote Power On / Off Control Cable, connects to computer DAC card for user's software control |
| | 7 | Remote Power On / Off Control, 9 volt battery to DB9 connector for testing use. |
| | 8 | AC power cord |
| | 9 | Compumotor - Software Reference Guide |
| | 10 | Compumotor - 750X Drive Indexer User Guide |
| | 11 | CD ROM disk contains : |

| | File Named : | Description : |
|---|---|---|
| | OEM750__RevA_UG.pdf | Copy of - Compumotor - 750X Drive Indexer User Guide |
| | software_commands.pdf | Copy of - Compumotor - Software Reference Guide |
| | MD_Astec_ACV24N36.pdf | Copy of - Astec Power Supply info. |
| | XWare_6p0p2.exe | XWARE 6.0 Program for Windows |
| | 3272_MD8_wiring.pdf | Dewar and Motor Controller specific, wiring diagrams and information. |

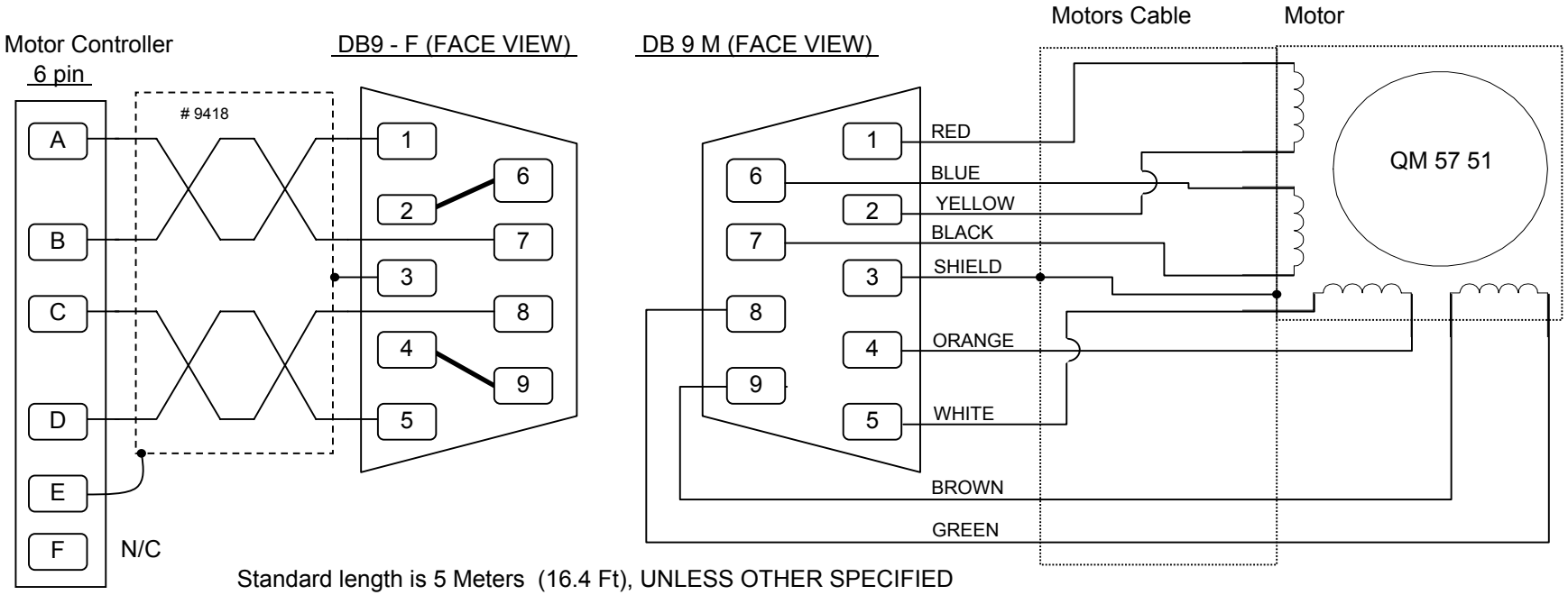
(XWARE program can also be downloaded from - http://www.compumotor.com/scripts/support_cds.asp#XWARE )

# Motor Control Components and external Cables to Stepper Motors



Motor Drive Cable - standard wiring connections

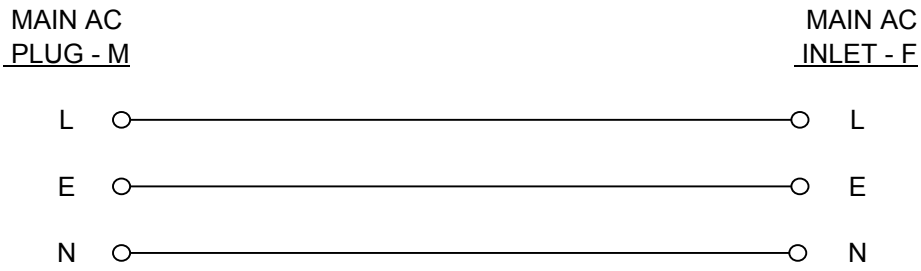
Motor # QM 57 51 - series wiring



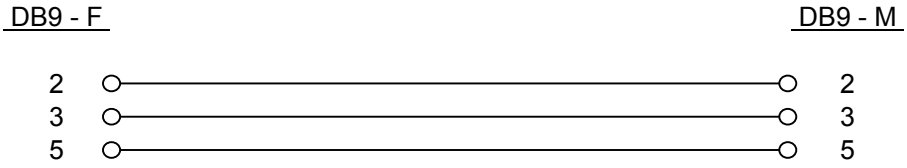

Standard length is 5 Meters (16.4 Ft), UNLESS OTHER SPECIFIED

# Motor Controller Connecting Cables

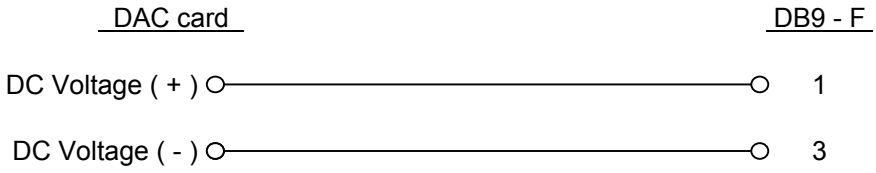
## AC voltage supply cord



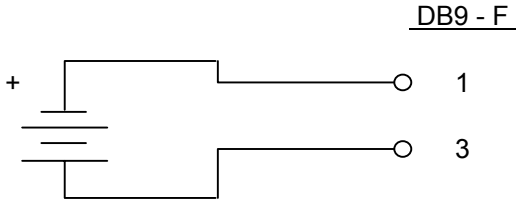

## computer RS - 232
## (Non - Nulling Serial Cable)




## Remote - Power ON / OFF Control cable



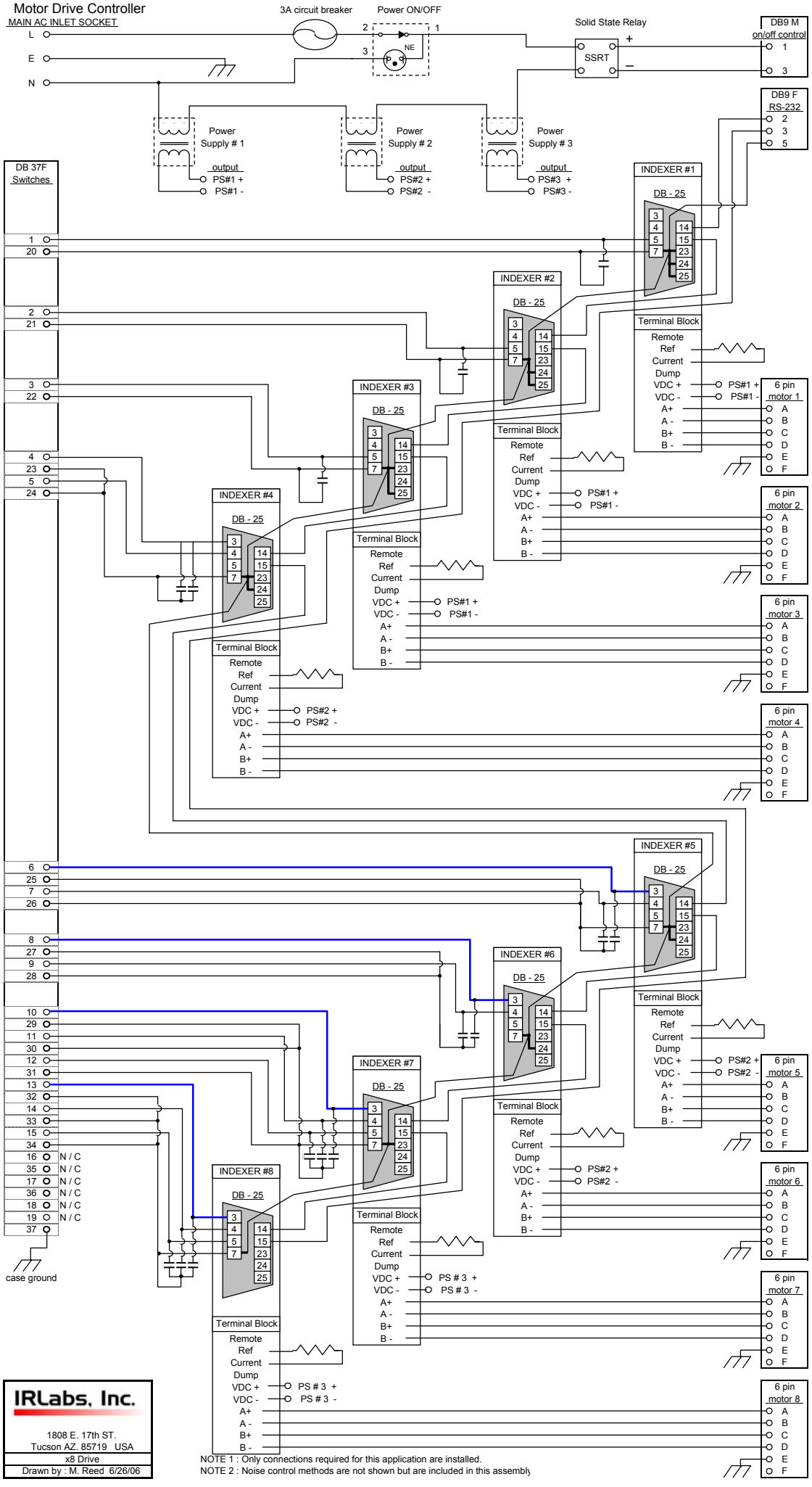

## Remote Power ON / OFF - Test battery




Remote Power ON / OFF control is useful during Array Camera operation. If the Motor Controller Power is turned off during Array Camera use it wil reduce Array signal noise.

The Remote Power ON / OFF Control cable connects to the computers DAC card, The DAC card connector side is not attached unless specific DAC card connections information is supplied by the end user.

For motor Controller function testing or troubleshooting a 9 volt battery with a DB9 connector is included.


Motor Drive Controller
MAIN AC INLET SOCKET
L
E
N
3A circuit breaker
Power ON/OFF
2
1
3
NE
Solid State Relay
SSRT
+
–
DB9 M
on/off control
1
3
DB9 F
RS-232
2
3
5
Power Supply # 1
output
PS#1 +
PS#1 -
Power Supply # 2
output
PS#2 +
PS#2 -
Power Supply # 3
output
PS#3 +
PS#3 -
DB 37F
Switches
1
20
2
21
3
22
4
23
5
24
6
25
7
26
8
27
9
28
10
29
11
30
12
31
13
32
14
33
15
34
16 N / C
35 N / C
17 N / C
36 N / C
18 N / C
19 N / C
37
case ground
INDEXER #1
DB - 25
INDEXER #2
DB - 25
INDEXER #3
DB - 25
INDEXER #4
DB - 25
INDEXER #5
DB - 25
INDEXER #6
DB - 25
INDEXER #7
DB - 25
INDEXER #8
DB - 25
3
4
5
7
14
15
23
24
25
Terminal Block
Remote
Ref
Current
Dump
VDC +
VDC -
A+
A -
B+
B -
PS#1 +
PS#1 -
PS#2 +
PS#2 -
PS # 3 +
PS # 3 -
6 pin
motor 1
motor 2
motor 3
motor 4
motor 5
motor 6
motor 7
motor 8
A
B
C
D
E
F
IRLabs, Inc.
1808 E. 17th ST.
Tucson AZ. 85719 USA
x8 Drive
Drawn by : M. Reed 6/26/06
NOTE 1 : Only connections required for this application are installed.
NOTE 2 : Noise control methods are not shown but are included in this assembly

# Motor Controller Settings

IRLabs
Infrared Laboratories

1808 East 17th Street
Tucson, AZ 85719 - 6505 / USA
Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

| | |
|---|---|
| Customer : | University of Arizona |
| P.O. number : | UAZNPE24S |
| Dewar number : | 3272 |
| Job Order number : | |
| Quote number : | |
| Description : | x8 Drive - Motor Control System - Settings |

System Drive 1 through 8 configurations :

Indexer : Parker # CP-OEM750XM2-10050

| | |
|---|---|
| Anti-resonance : | Enabled |
| Steps per revolution : | 50,800 |
| Waveform : | Pure Sine |
| Automatic Standby : | 25 % Current |
| Automatic Test : | Disabled |
| Current Loop Gain : | 64 |
| Current Limited to : | 1.1 Amps |

Motor : Compumotor # QM-57-51-MO
Series wiring at external cable, DB9 connector.

Power Supply :(x3 used) Astec # ACV 24N3.6
120 VAC Input
24 VDC / 3.6 A Output

Tuned and tested with these component combinations

| System Drive # | Make / Model # : | Serial # : |
|---|---|---|
| 1 | Parker # CP-OEM750XM2-10050 | 04110800283 |
| | Compumotor # QM-57-51-MO | 4110800138 |
| 2 | Parker # CP-OEM750XM2-10050 | 04110800285 |
| | Compumotor # QM-57-51-MO | 04110800139 |
| 3 | Parker # CP-OEM750XM2-10050 | 04110800297 |
| | Compumotor # QM-57-51-MO | 4110800140 |
| common for 1, 2 and 3 | Astec # ACV 24N3.6 | 0103 |
| 4 | Parker # CP-OEM750XM2-10050 | 04110800295 |
| | Compumotor # QM-57-51-MO | 04110800141 |
| 5 | Parker # CP-OEM750XM2-10050 | 04110800287 |
| | Compumotor # QM-57-51-MO | 4110800142 |
| 6 | Parker # CP-OEM750XM2-10050 | 04110800292 |
| | Compumotor # QM-57-51-MO | 04110800143 |
| common for 4, 5 and 6 | Astec # ACV 24N3.6 | 0104 |
| 7 | Parker # CP-OEM750XM2-10050 | 04110800296 |
| | Compumotor # QM-57-51-MO | 4110800144 |
| 8 | Parker # CP-OEM750XM2-10050 | 04110800294 |
| | Compumotor # QM-57-51-MO | 04110800145 |
| common for 7 and 8 | Astec # ACV 24N3.6 | 0105 |

# Motor Controller System - Function Test

IRLabs
Infrared Laboratories

1808 East 17th Street
Tucson, AZ 85719 - 6505 / USA
Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

Customer : University of Arizona
P.O. number : UAZNPE24S
Dewar number : 3272
Job Order number :
Quote number :
Description : x8 Drive - Motor Control System - Test Information

| Note # | Testing includes : | Test temperature | Room | Cold |
|---|---|---|---|---|
| 1 | All switches are wired to OPEN at end of travel or home position. | | good | good |
| 2 | All switch wiring is isolated from Dewar case. | | good | good |
| 3 | find home and / or limit switches at high and low speeds | | good | good |
| 4 | check for unusual gear noise or rattle sounds | | normal | normal |
| 5 | Motor does not stall while going through stop or home positions | | good | |
| 6 | Motor temperature is normal during run and at idle | | normal | normal |

General Info :

| System Drive # | Name / Location of end component : | 55 pin Dewar Case Connector | Switch Function : | Wire Continuity Resistance with switch closed | | Number of Motor turns for end to end travel or full rotation. |
|---|---|---|---|---|---|---|
| 1 | Filter Wheel | A | Home Signal | 52.8 | Ω | 10 |
| | | B | Home Return | | | |
| 2 | Aperture Slit Wheel | C | Home Signal | 75.7 | Ω | 6 |
| | | D | Home Return | | | |
| 3 | Rotating Mirror | E | Home Signal | 60.0 | Ω | 20 |
| | | F | Home Return | | | |
| 4 | Upper Grating | G | Clockwise Signal | 93.9 | Ω | 5.5 |
| | | H | Clockwise Return | | | |
| | | J | Counter Clockwise Signal | 93.9 | Ω | |
| | | K | Counter Clockwise Return | | | |
| 5 | Lower Grating | L | Clockwise Signal | 67.3 | Ω | 10.75 |
| | | M | Clockwise Return | | | |
| | | N | Counter Clockwise Signal | 67.3 | Ω | |
| | | P | Counter Clockwise Return | | | |
| 6 | Echelle | R | Clockwise Signal | 45.6 | Ω | 6 |
| | | S | Clockwise Return | | | |
| | | T | Counter Clockwise Signal | 45.6 | Ω | |
| | | U | Counter Clockwise Return | | | |
| 7 | Optics Slide | V | Home Signal | 66.9 | Ω | 47.75 |
| | | W | Home Return | | | |
| | | X | Clockwise Signal | 66.5 | Ω | |
| | | Y | Clockwise Return | | | |
| | | Z | Counter Clockwise Signal | 65.5 | Ω | |
| | | a | Counter Clockwise Return | | | |
| 8 | Detector Focus | b | Home Signal | 72.2 | Ω | 18.75 |
| | | c | Home Return | | | |
| | | d | Clockwise Signal | 72.1 | Ω | |
| | | e | Clockwise Return | | | |
| | | f | Counter Clockwise Signal | 71.3 | Ω | |
| | | g | Counter Clockwise Return | | | |

IRLabs
Infrared Laboratories

1808 East 17th Street
Tucson, AZ 85719 - 6505 / USA
Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

| | |
|---|---|
| Customer : | Univ. AZ / Don Mccarthy |
| P.O. number : | UAZNPE24S |
| Dewar number : | 3272 |
| Job Order number : | |
| Quote number : | |
| Components : | Array Related Cables - Internal and External |

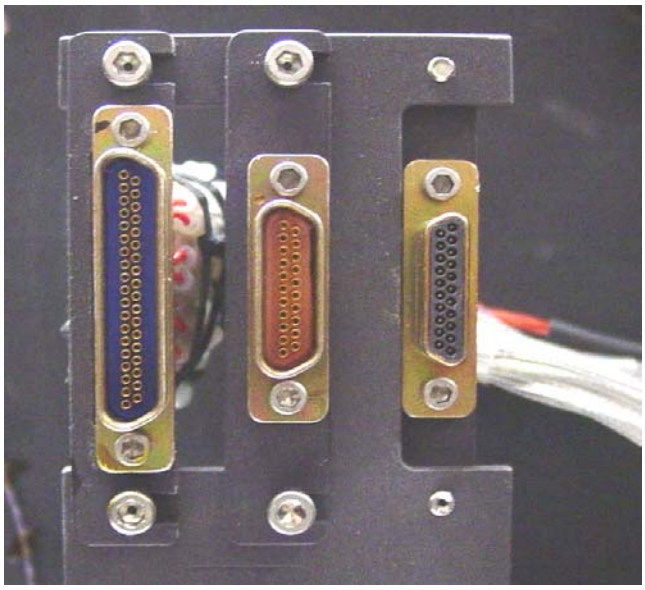
Most recent REV DATE : Jun - 26, 06

page #

# 3272_UAZNPE24S - Array Cables

Device Independent Wiring Harness
Face view of MDM connectors mounted to bracket attached to pumped vessel.

DI - 1 DI - 2 DI - 3



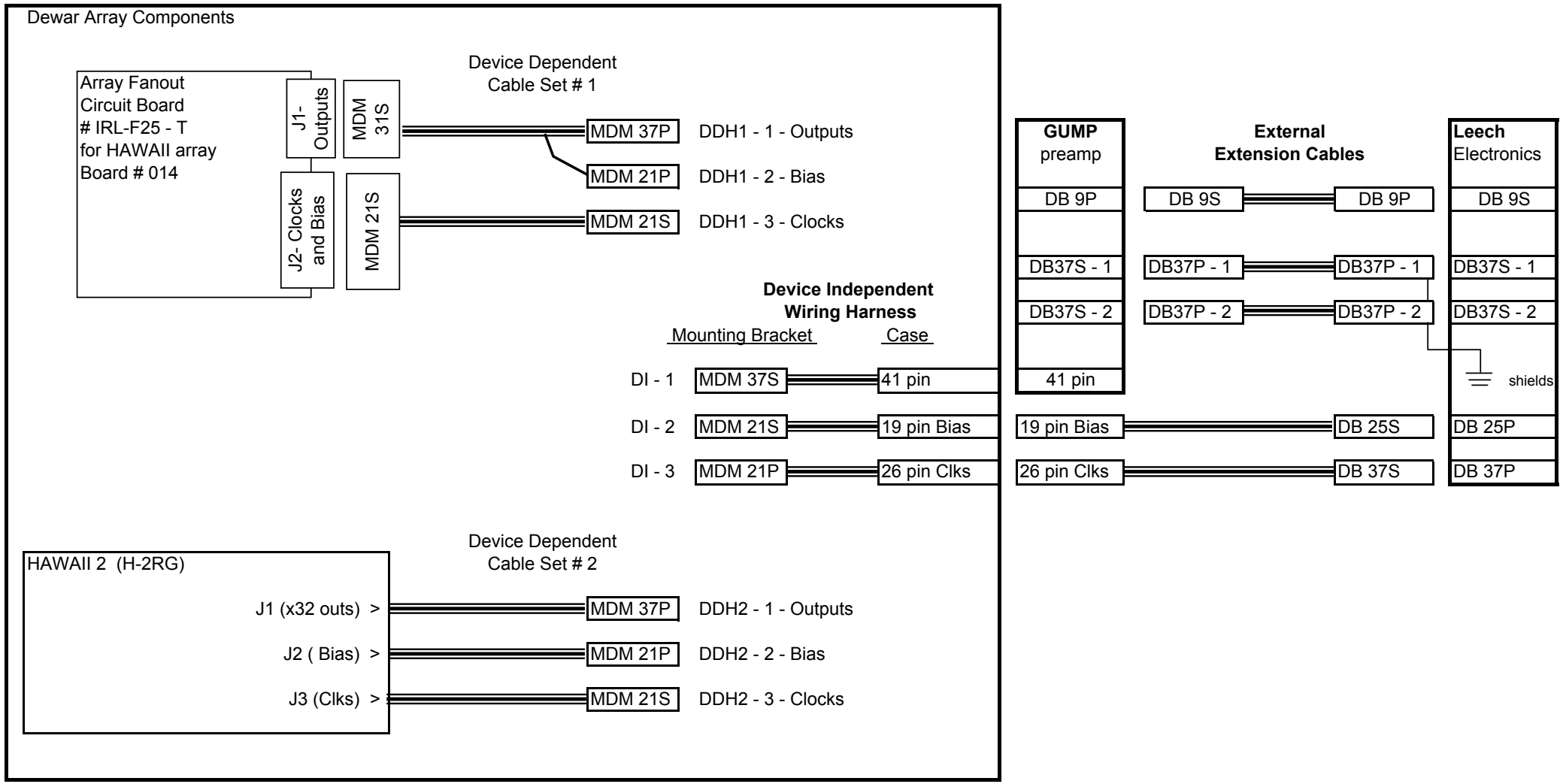
DI - 1, Outputs, MDM 37 S  Cable connects to Case connector,  J1 - 41 pin.

DI - 2, Bias , MDM 21 S  Cable connects to Case connector,  J2 - 19 pin.

DI - 3, Clocks, MDM 21 P  Cable connects to Case connector,  J3 - 26 pin.

3272_UAZNPE24S

Last UPDATED : 6/26/06



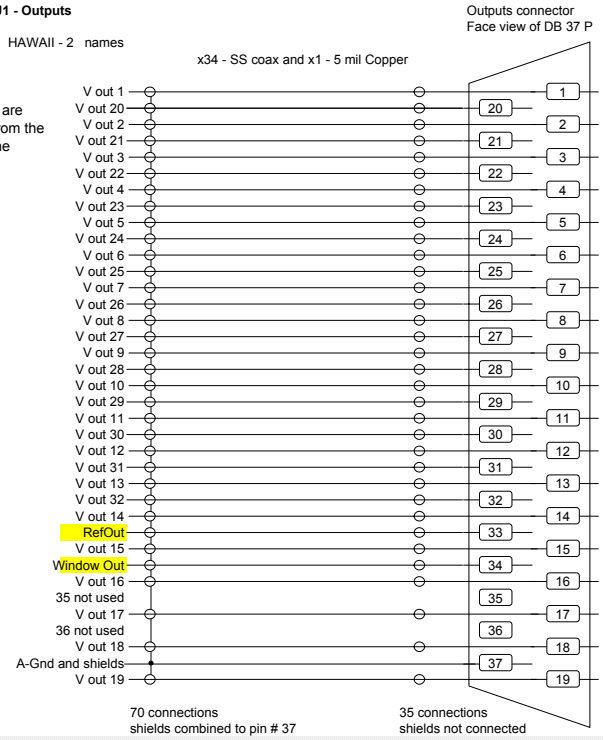
3272_UAZNPE24S

HAWAII - 2 Layout For Comparison to HAWAII - 1 Layout

Matting Connectors on Bracket to Cables attached to Case connectors

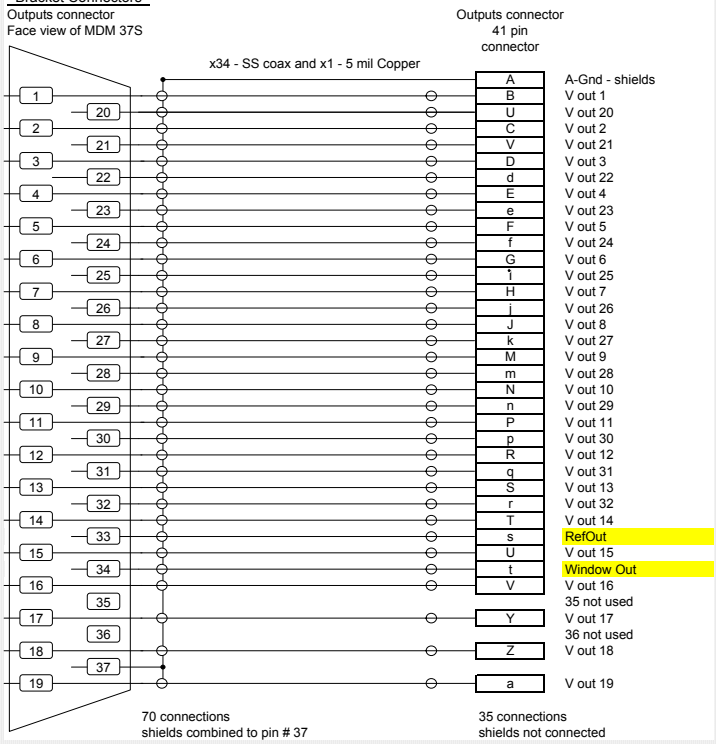
H2 - Device - Dependent Wiring Harness 1 of 3

HAWAII 2 Array connecting cables are directly attached from the Fanout Board to the matting Bracket connectors.




Device - Independent Wiring Harness 1 of 3

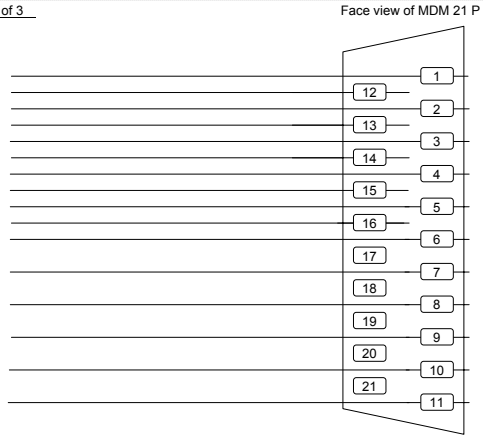
Bracket Connectors



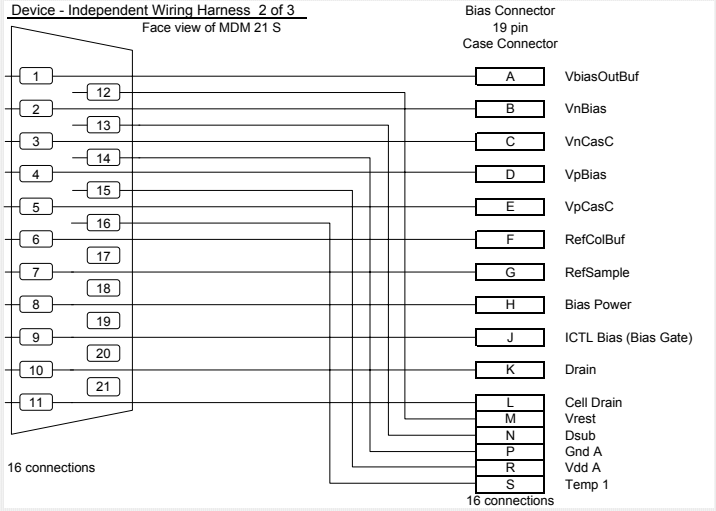

3272_UAZNPE24S

H2 - Device - Dependent Wiring Harness 2 of 3

HAWAII 2 Array connecting cables are directly attached from the Fanout Board to the matting Bracket connectors.



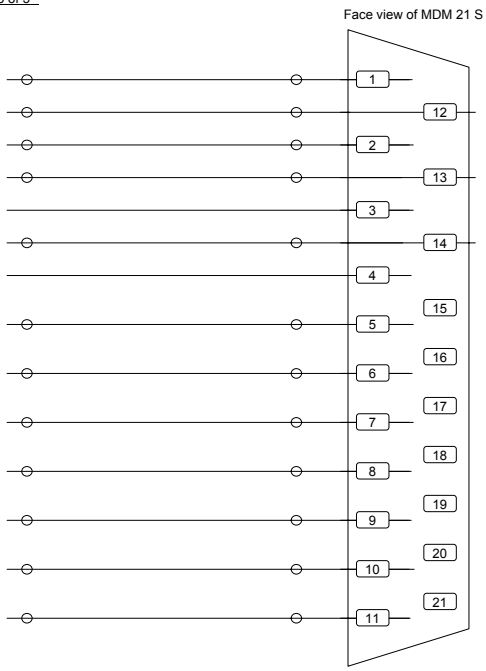

Device - Independent Wiring Harness 2 of 3



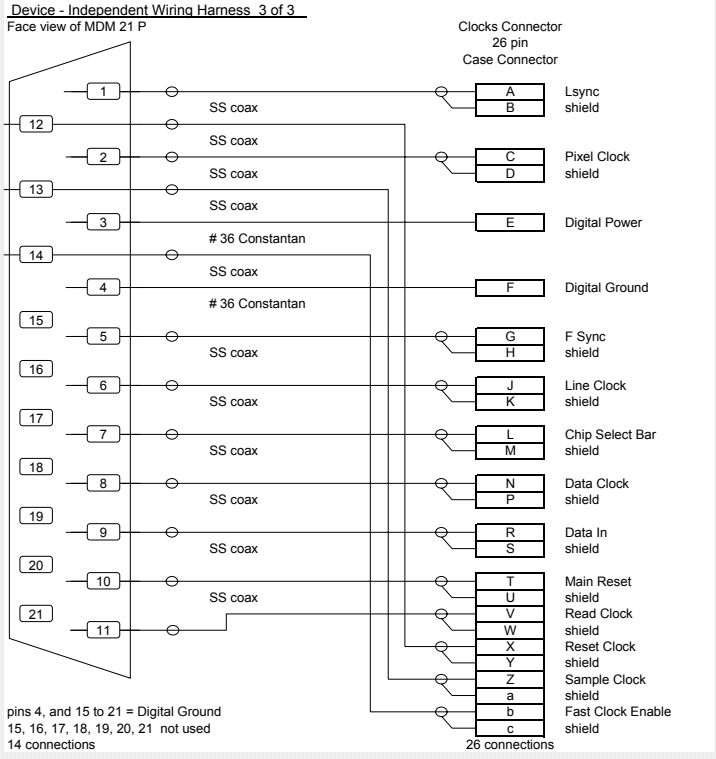

3272_UAZNPE24S

H2 - Device - Dependent Wiring Harness 3 of 3

HAWAII 2 Array connecting cables are directly attached from the Fanout Board to the matting Bracket connectors.



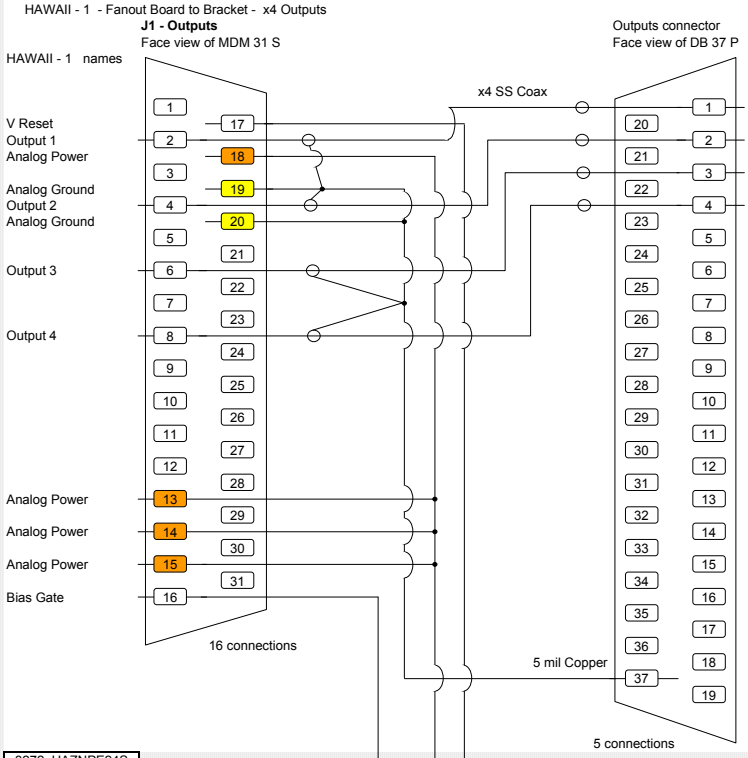

Device - Independent Wiring Harness 3 of 3



3272_UAZNPE24S

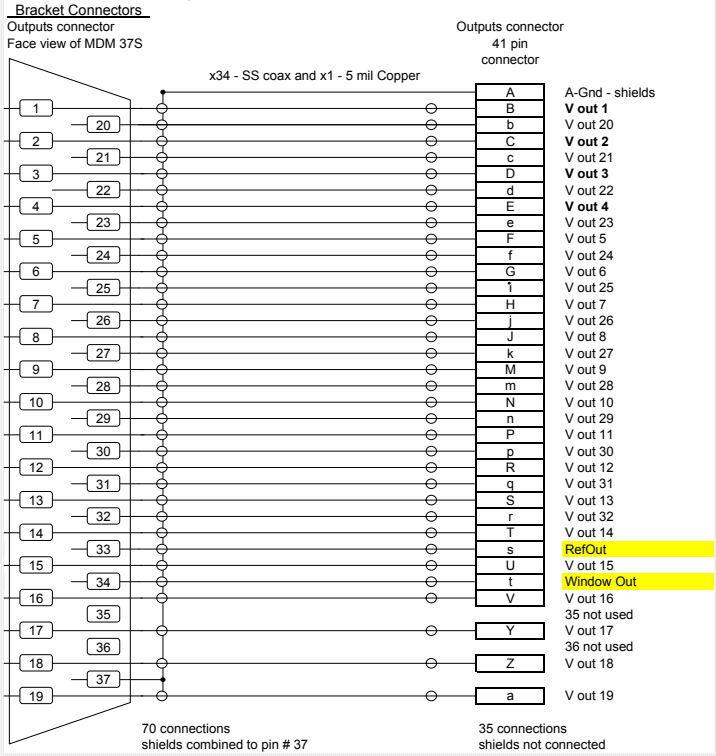
## H1 - Device - Dependent Wiring Harness 1 of 3

HAWAII - 1 - Fanout Board to Bracket - x4 Outputs



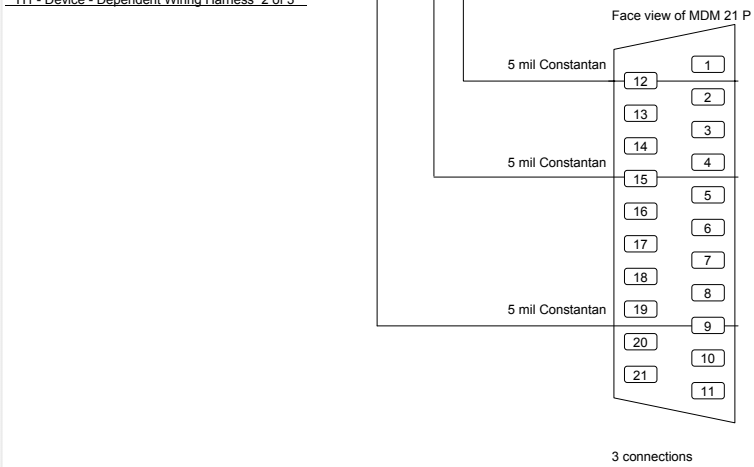

## Device - Independent Wiring Harness 1 of 3

Bracket Connectors

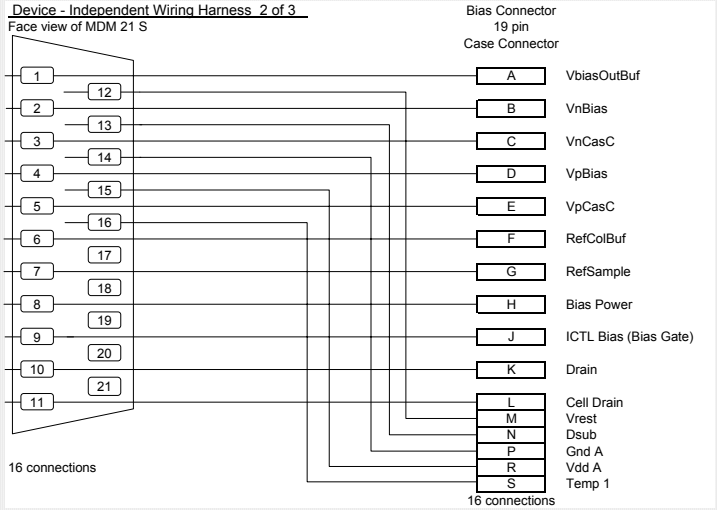



3272_UAZNPE24S

## H1 - Device - Dependent Wiring Harness 2 of 3

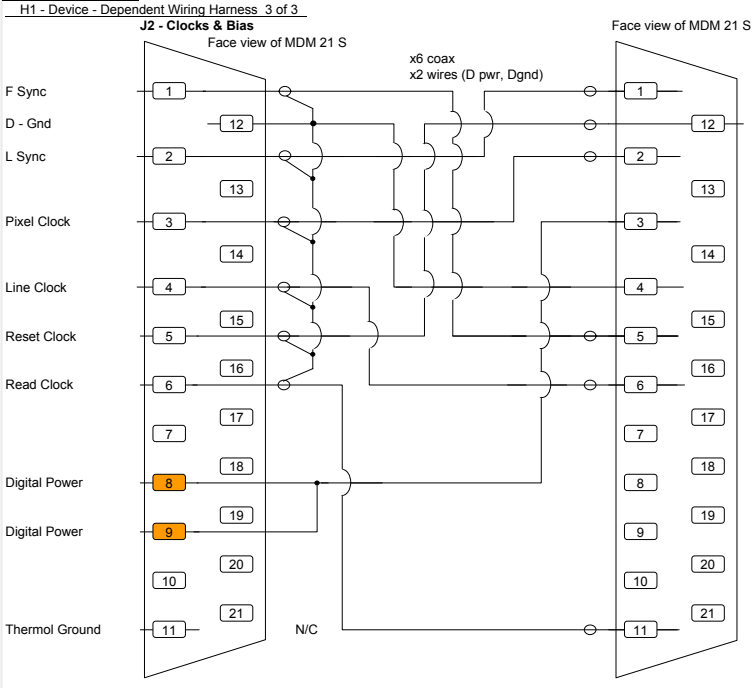



## Device - Independent Wiring Harness 2 of 3

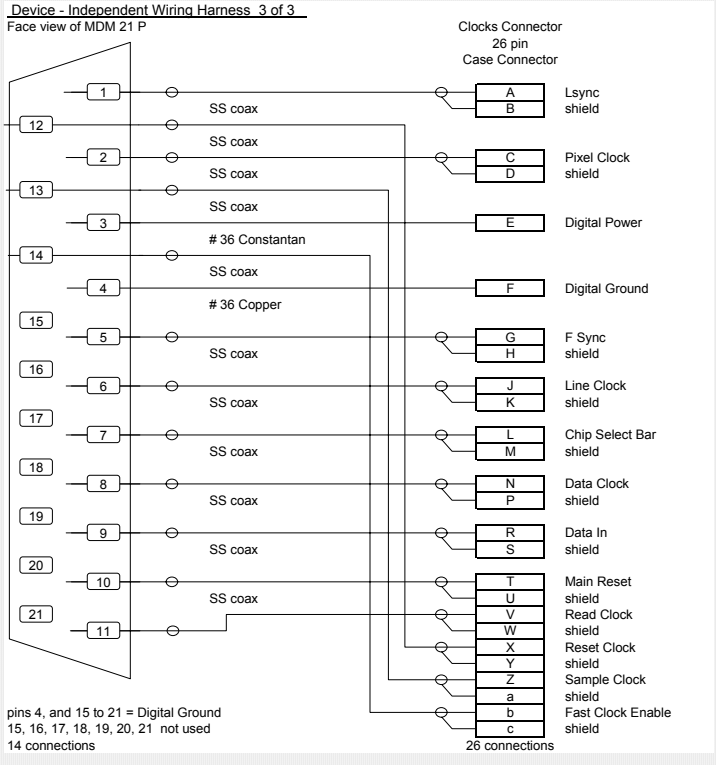



3272_UAZNPE24S

## H1 - Device - Dependent Wiring Harness 3 of 3



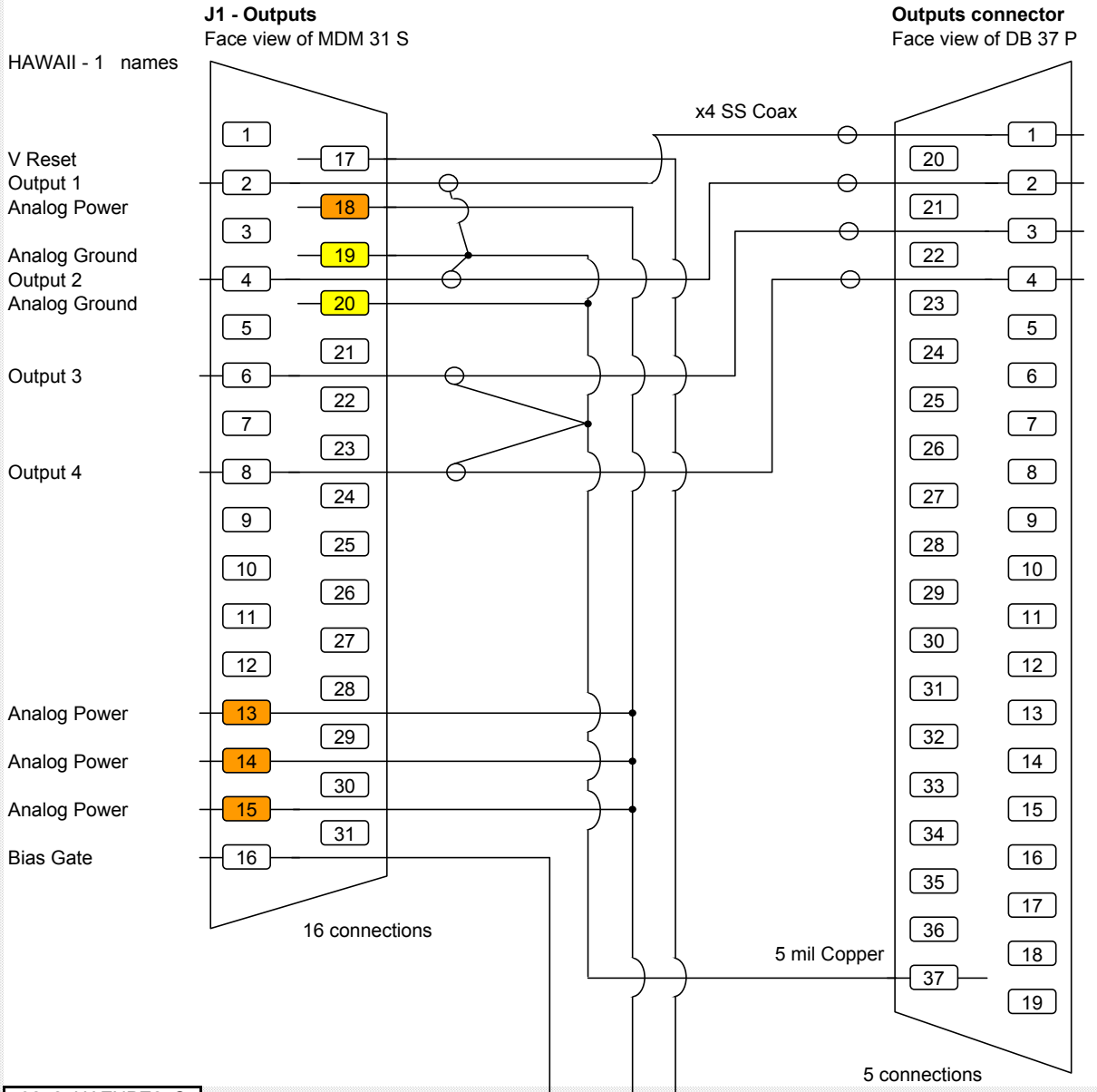

## Device - Independent Wiring Harness 3 of 3



3272_UAZNPE24S

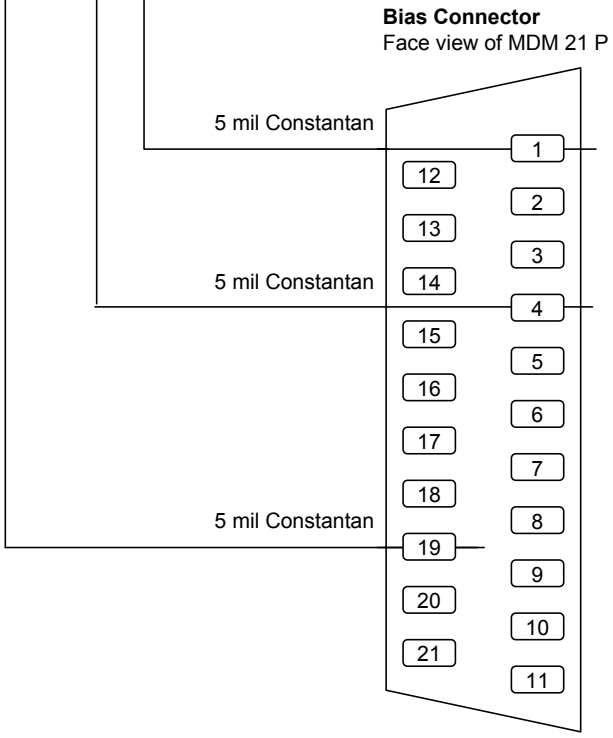
H1 - Device - Dependent Wiring Harness 1 of 3

HAWAII - 1 - Fanout Board to Bracket




3272_UAZNPE24S

H1 - Device - Dependent Wiring Harness 2 of 3



3272_UAZNPE24S

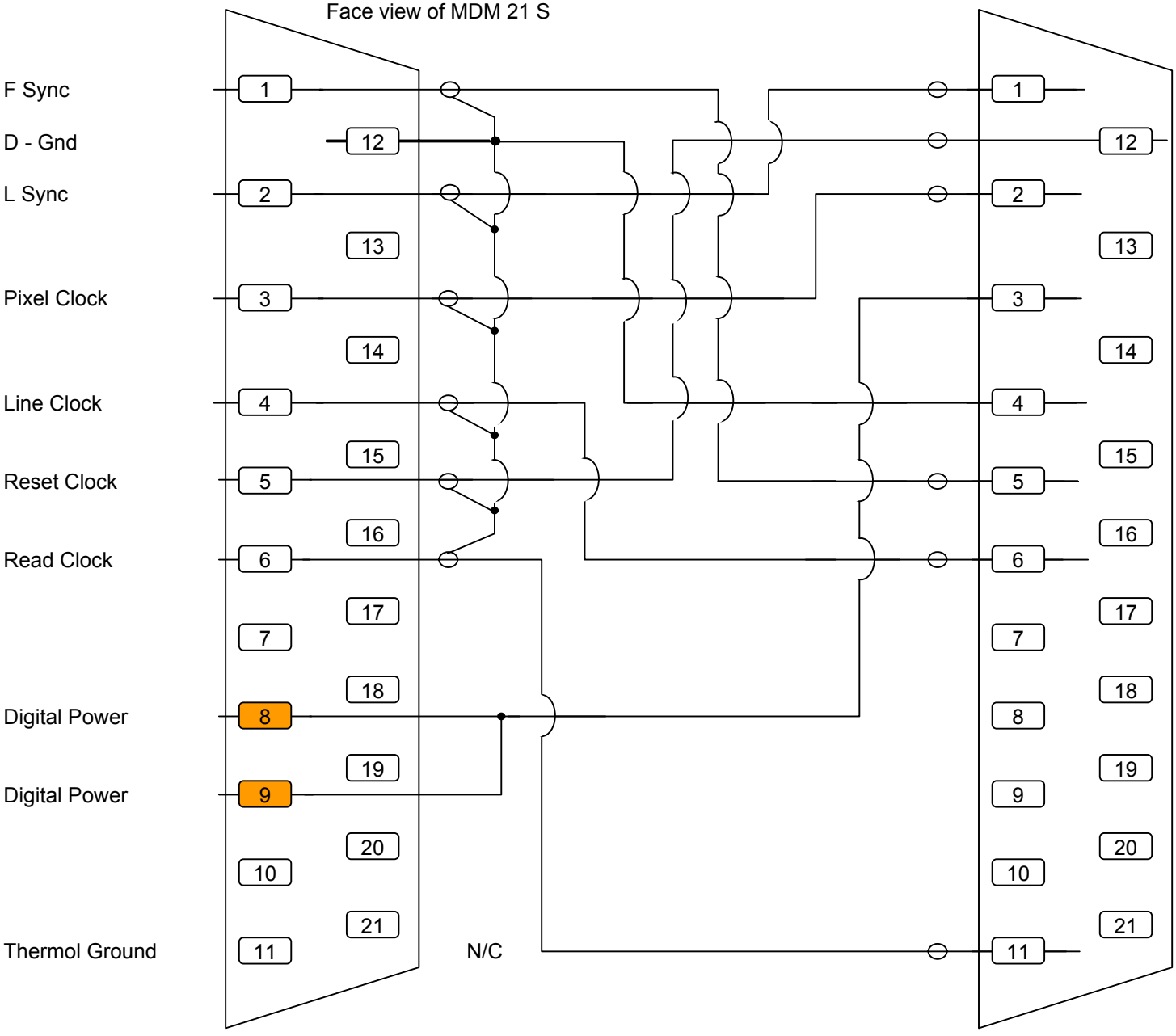
H1 - Device - Dependent Wiring Harness 3 of 3

**J2 - Clocks**

Face view of MDM 21 S

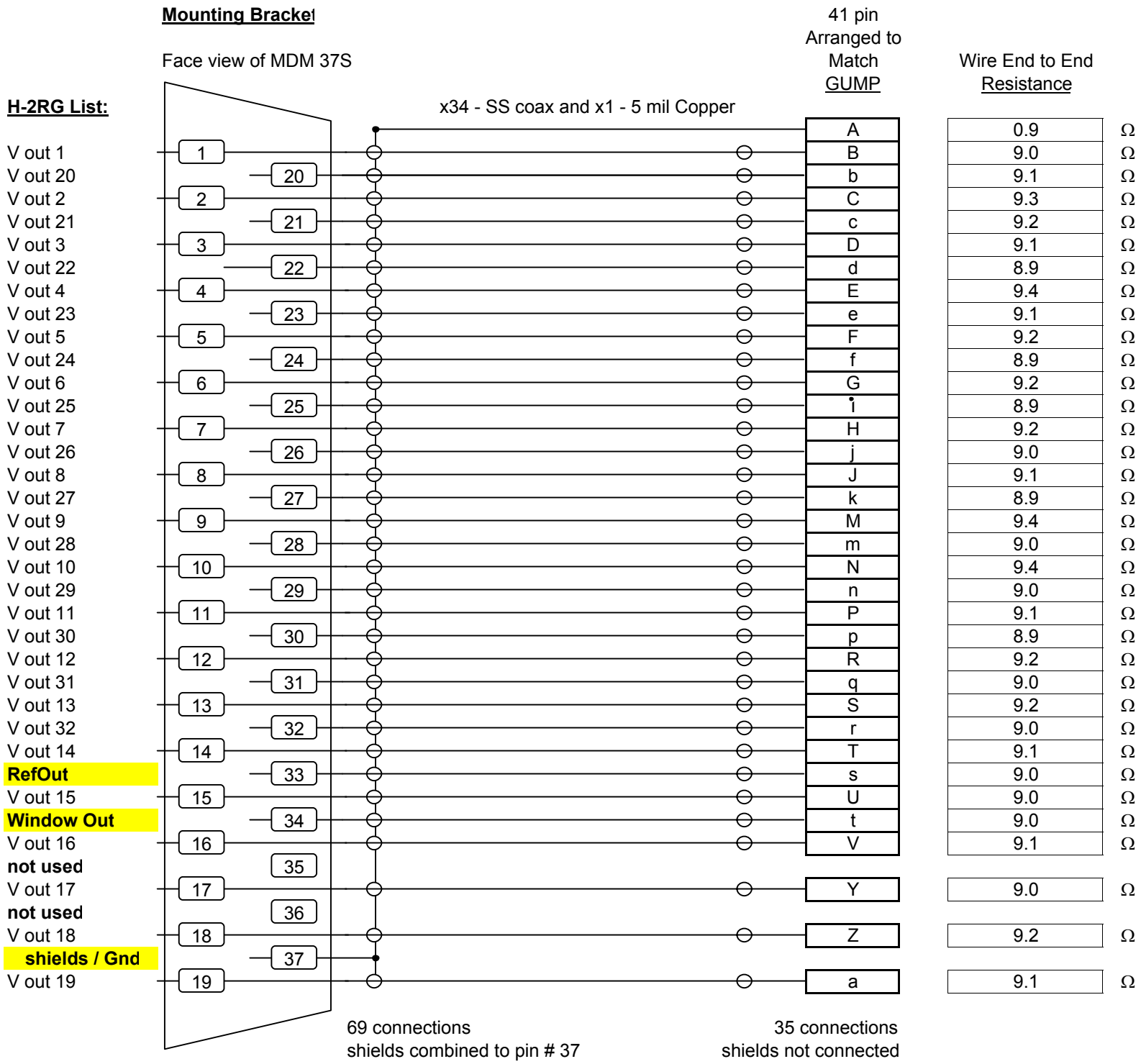
**Clocks connector**

Face view of MDM 21 S



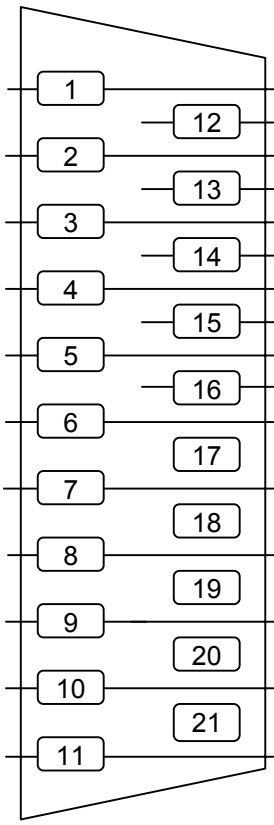

Attach Shields to Digital Ground on board side

# Device - Independent Wiring Harness # 1 of 3 - Outputs connector



Device - Independent Wiring Harness 2 of 3

Face view of MDM 21 S



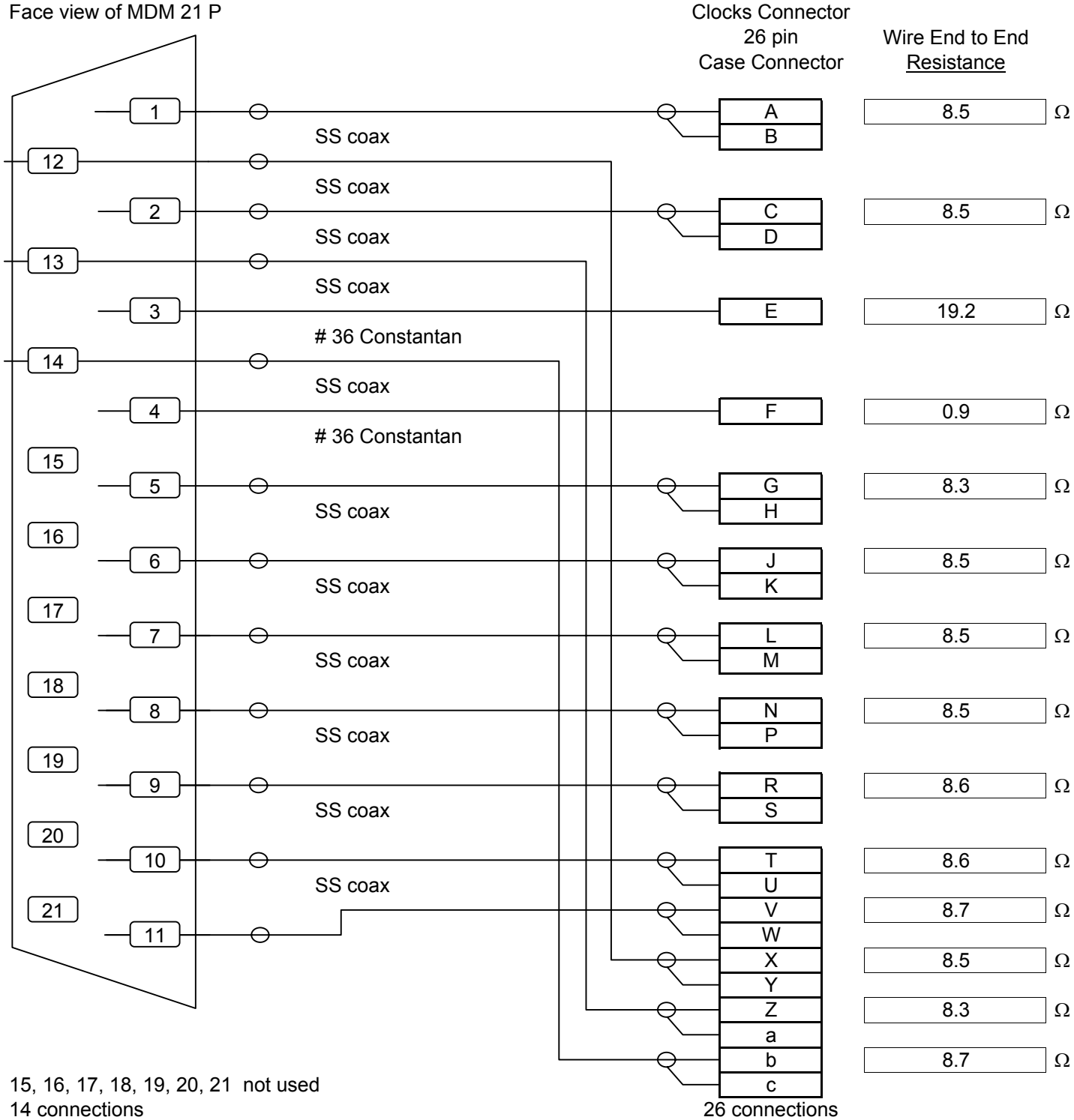

16 connections

| Bias Connector 19 pin Case Connector | Wire End to End Resistance |
|---|---|
| A | 17.6 Ω |
| B | 17.4 Ω |
| C | 17.3 Ω |
| D | 17.8 Ω |
| E | 17.5 Ω |
| F | 16.2 Ω |
| G | 16.5 Ω |
| H | 17.6 Ω |
| J | 16.6 Ω |
| K | 16.6 Ω |
| L | 17.7 Ω |
| M | 17.3 Ω |
| N | 17.3 Ω |
| P | 0.6 Ω |
| R | 17.3 Ω |
| S | 17.3 Ω |

16 connections

Device - Independent Wiring Harness 3 of 3

Face view of MDM 21 P



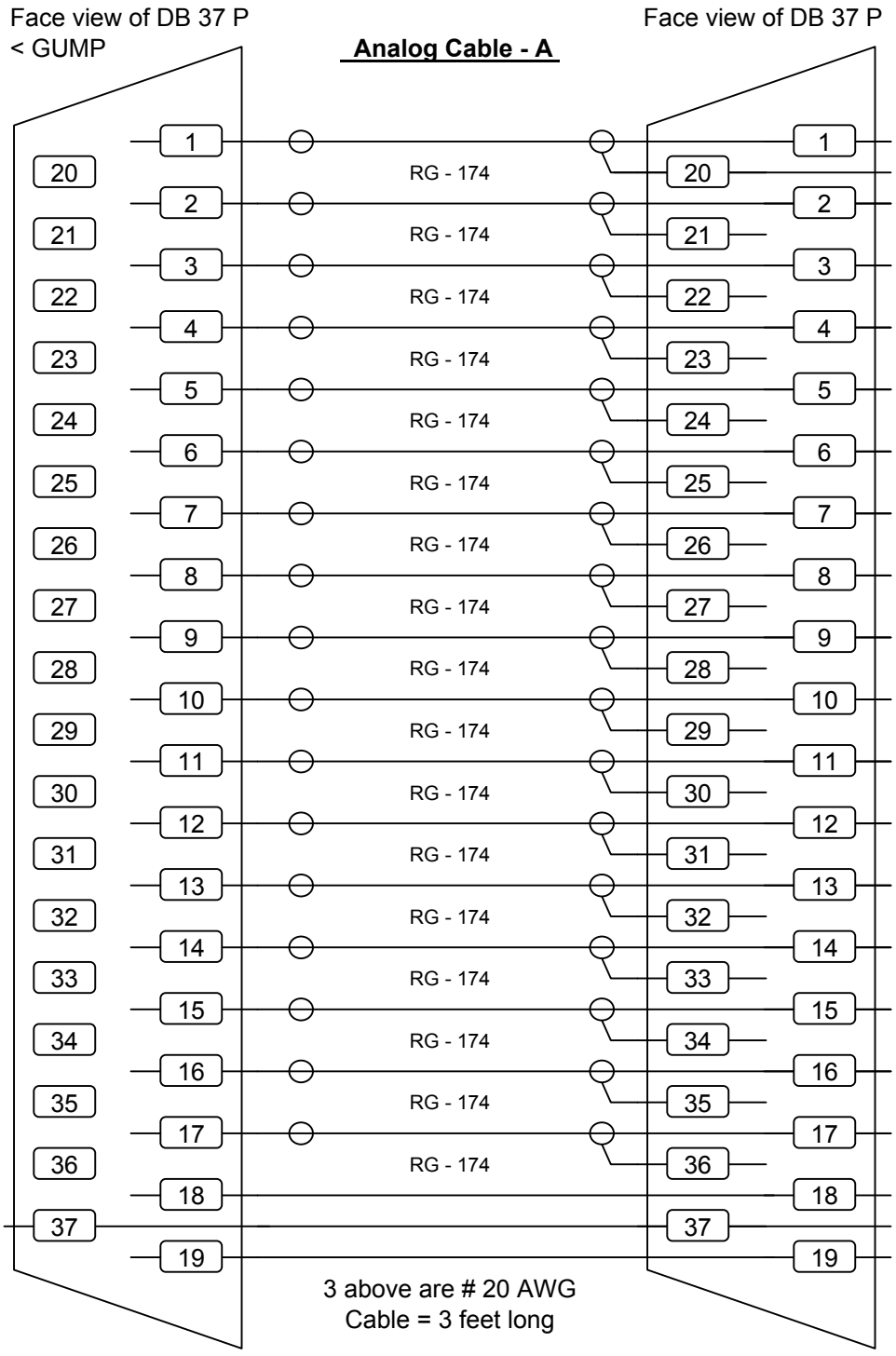

15, 16, 17, 18, 19, 20, 21 not used

14 connections

26 connections

3272_UAZNPE24S

External Outputs A,  Cable - DB37-P to DB37-P

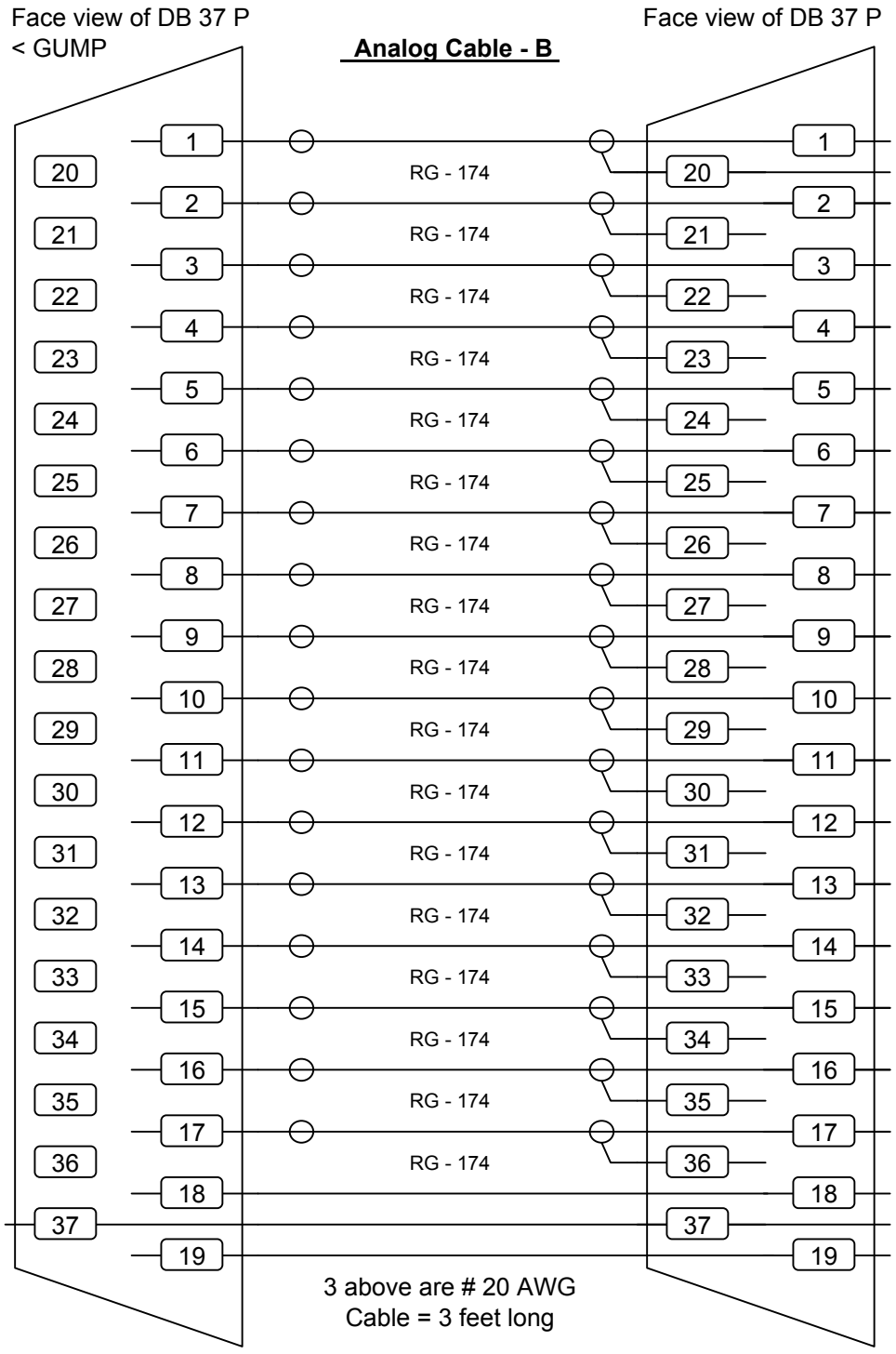



Leech >
Functions

| |
|---|
| Output # 1 |
| shield / gnd |
| Output # 2 |
| shield / gnd |
| Output # 3 |
| shield / gnd |
| Output # 4 |
| shield / gnd |
| Output # 5 |
| shield / gnd |
| Output # 6 |
| shield / gnd |
| Output # 7 |
| shield / gnd |
| Output # 8 |
| shield / gnd |
| Output # 9 |
| shield / gnd |
| Output # 10 |
| shield / gnd |
| Output # 11 |
| shield / gnd |
| Output # 12 |
| shield / gnd |
| Output # 13 |
| shield / gnd |
| Output # 14 |
| shield / gnd |
| Output # 15 |
| shield / gnd |
| Output # 16 |
| shield / gnd |
| Output # 33 **RefOut** |
| shield / gnd |
| offset channels 1 - 16 & #33 |
| Ground |
| offset channels 17 - 32 & 34 |

3272_UAZNPE24S

External Outputs B,  Cable - DB37-P to DB37-P




Leech >
Functions

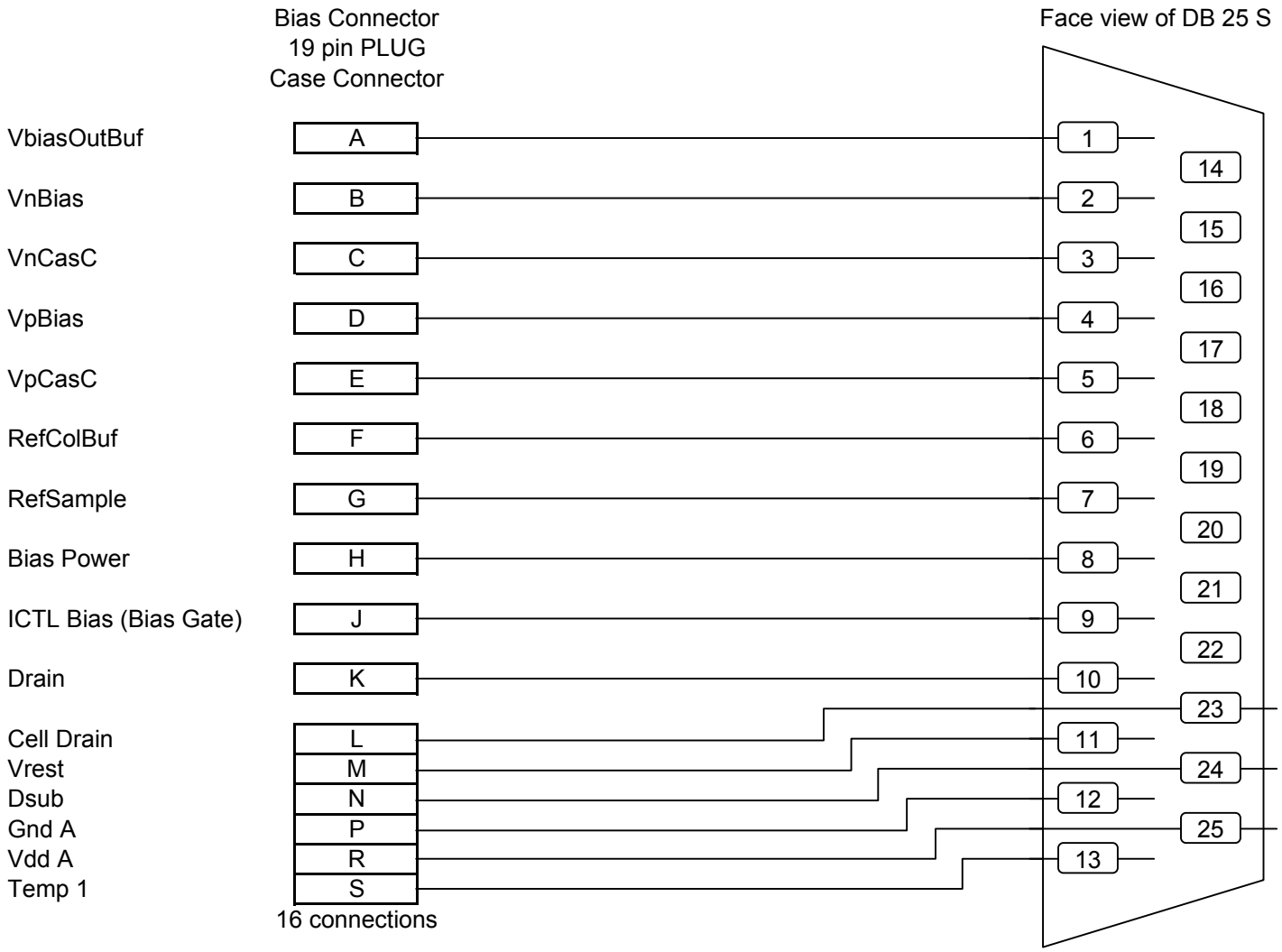
| |
|---|
| Output # 17 |
| shield / gnd |
| Output # 18 |
| shield / gnd |
| Output # 19 |
| shield / gnd |
| Output # 20 |
| shield / gnd |
| Output # 21 |
| shield / gnd |
| Output # 22 |
| shield / gnd |
| Output # 23 |
| shield / gnd |
| Output # 24 |
| shield / gnd |
| Output # 25 |
| shield / gnd |
| Output # 26 |
| shield / gnd |
| Output # 27 |
| shield / gnd |
| Output # 28 |
| shield / gnd |
| Output # 29 |
| shield / gnd |
| Output # 30 |
| shield / gnd |
| Output # 31 |
| shield / gnd |
| Output # 32 |
| shield / gnd |
| Output # 34 **Window Out** |
| shield / gnd |
| offset channels 1 - 16 & #33 |
| Ground |
| offset channels 17 - 32 & 34 |

( 20 connections )

( 37 connections )

3272_UAZNPE24S

External Bias Cable - 19 pin to DB25-S

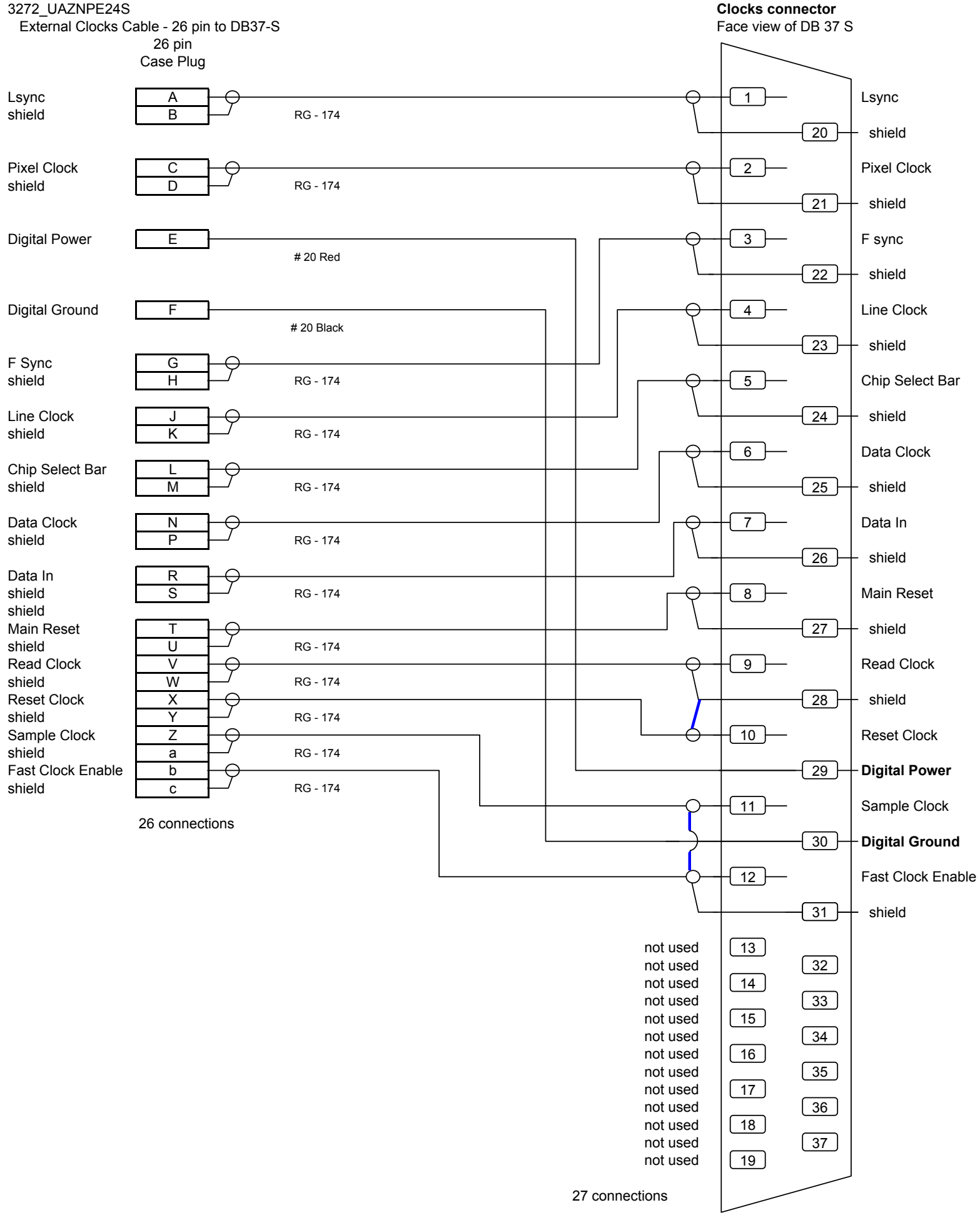


3272_UAZNPE24S

External Clocks Cable - 26 pin to DB37-S

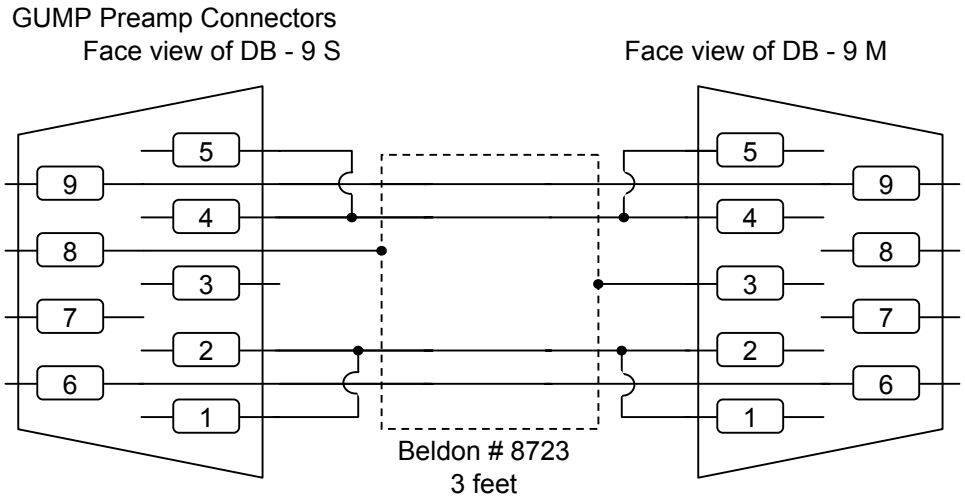
26 pin
Case Plug

**Clocks connector**
Face view of DB 37 S



3272_UAZNPE24S
Gump Preamp external power supply cable

| Function |
| --- |
| -15 V preamp power |
| Vs Analog Ground |
| -15 V preamp power |
| Vs Analog Ground |
| Vs Analog Ground |
| Vs Analog Ground |
| +15 V preamp power |
| Vs Analog Ground |
| +15 V preamp power |



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Tucson, AZ 85719 - 6505 / USA
Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

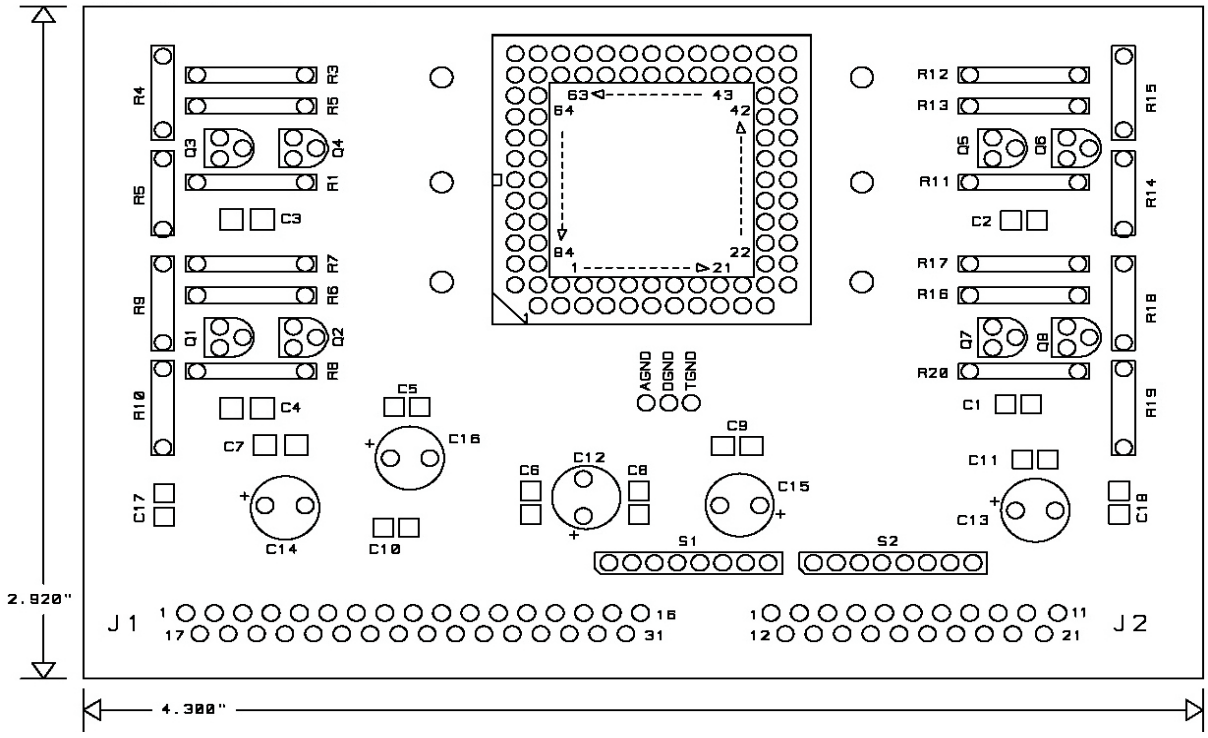
| | |
|---|---|
| Customer : | Univ. AZ / Don Mccarthy |
| P.O. number : | UAZNPE24S |
| Dewar number : | 3272 |
| Job Order number : | |
| Quote number : | |
| Components : | HAWAII 1 - Fanout Board # IRL-F25 |
| REV DATE : | 6/26/06 |

page #

# PARTS LIST FOR SEV IRLF25-A FANOUT BOARD

| component / position | Part # / Value |
|---|---|
| BOARD | IRLF25-A |
| J1 | MDM-31PBR |
| J2 | MDM-21PBR |
| FPA SOCKET | AMP # 643066-2 (84 pin) |
| S1 | 1 MΩ SIP - R pack (8 pin) |
| S2 | 1 MΩ SIP - R pack (8 pin) |
| Q1 | not used |
| Q2 | J230 FET |
| Q3 | not used |
| Q4 | J230 FET |
| Q5 | J230 FET |
| Q6 | not used |
| Q7 | J230 FET |
| Q8 | not used |
| C1 | not used |
| C2 | not used |
| C3 | not used |
| C4 | not used |
| C5 | .1UF SM cap |
| C6 | .1UF SM cap |
| C7 | .1UF SM cap |
| C8 | .1UF SM cap |
| C9 | .1UF SM cap |
| C10 | .1UF SM cap |
| C11 | .1UF SM cap |

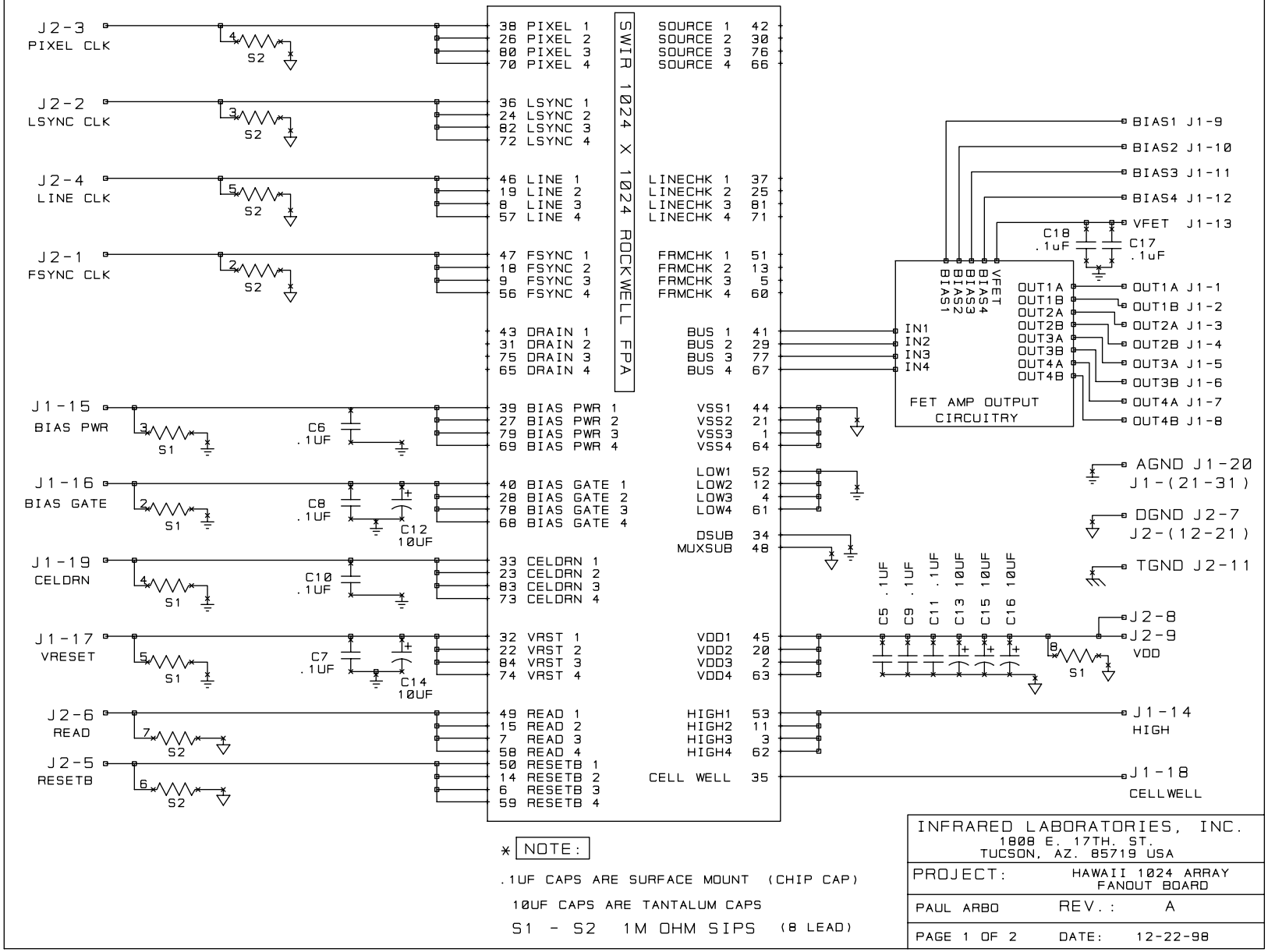
| component / position | Part # / Value |
|---|---|
| C12 | 10UF / 25Vdc, Tantalum cap |
| C13 | 10UF / 25Vdc, Tantalum cap |
| C14 | 10UF / 25Vdc, Tantalum cap |
| C15 | 10UF / 25Vdc, Tantalum cap |
| C16 | 10UF / 25Vdc, Tantalum cap |
| R1 | not used |
| R2 | not used |
| R3 | not used |
| R4 | 5KΩ 1% |
| R5 | not used |
| R6 | not used |
| R7 | not used |
| R8 | not used |
| R9 | 5KΩ 1% |
| R10 | not used |
| R11 | not used |
| R12 | not used |
| R13 | not used |
| R14 | not used |
| R15 | 5KΩ 1% |
| R16 | not used |
| R17 | not used |
| R18 | 5KΩ 1% |
| R19 | not used |
| R20 | not used |



# IRL F-25-A Fanout Board Topside Connector Definition - REV 11/10/99

| Pin # | Analog Connector J1 (MDM31-P) | Digital Connector J2 (MDM21-P) |
|---|---|---|
| 1 | Out 1 A | Fsync Clock |
| 2 | Out 1 B | Lsync Clock |
| 3 | Out 2 A | Pixel Clock |
| 4 | Out 2 B | Line Clock |
| 5 | Out 3 A | Reset B |
| 6 | Out 3 B | Read |
| 7 | Out 4 A | Digital Gounnd |
| 8 | Out 4 B | Vdd |
| 9 | Bais 1 | Vdd |
| 10 | Bias 2 | |
| 11 | Bias 3 | Thermal Ground |
| 12 | Bias 4 | Digital Gounnd |
| 13 | VFET | Digital Gounnd |
| 14 | High | Digital Gounnd |
| 15 | Bias Power | Digital Gounnd |
| 16 | Bias Gate | Digital Gounnd |
| 17 | Vreset | Digital Gounnd |
| 18 | Cell Well | Digital Gounnd |
| 19 | Cell Drain | Digital Gounnd |
| 20 | Analog Ground | Digital Gounnd |
| 21 | Analog Ground | Digital Gounnd |
| 22 | Analog Ground | ---------- |
| 23 | Analog Ground | ---------- |
| 24 | Analog Ground | ---------- |
| 25 | Analog Ground | ---------- |
| 26 | Analog Ground | ---------- |
| 27 | Analog Ground | ---------- |
| 28 | Analog Ground | ---------- |
| 29 | Analog Ground | ---------- |
| 30 | Analog Ground | ---------- |
| 31 | Analog Ground | ---------- |

# IRLF25A FAN OUT BOARD




* NOTE:

.1UF CAPS ARE SURFACE MOUNT (CHIP CAP)

10UF CAPS ARE TANTALUM CAPS

S1 - S2 1M OHM SIPS (8 LEAD)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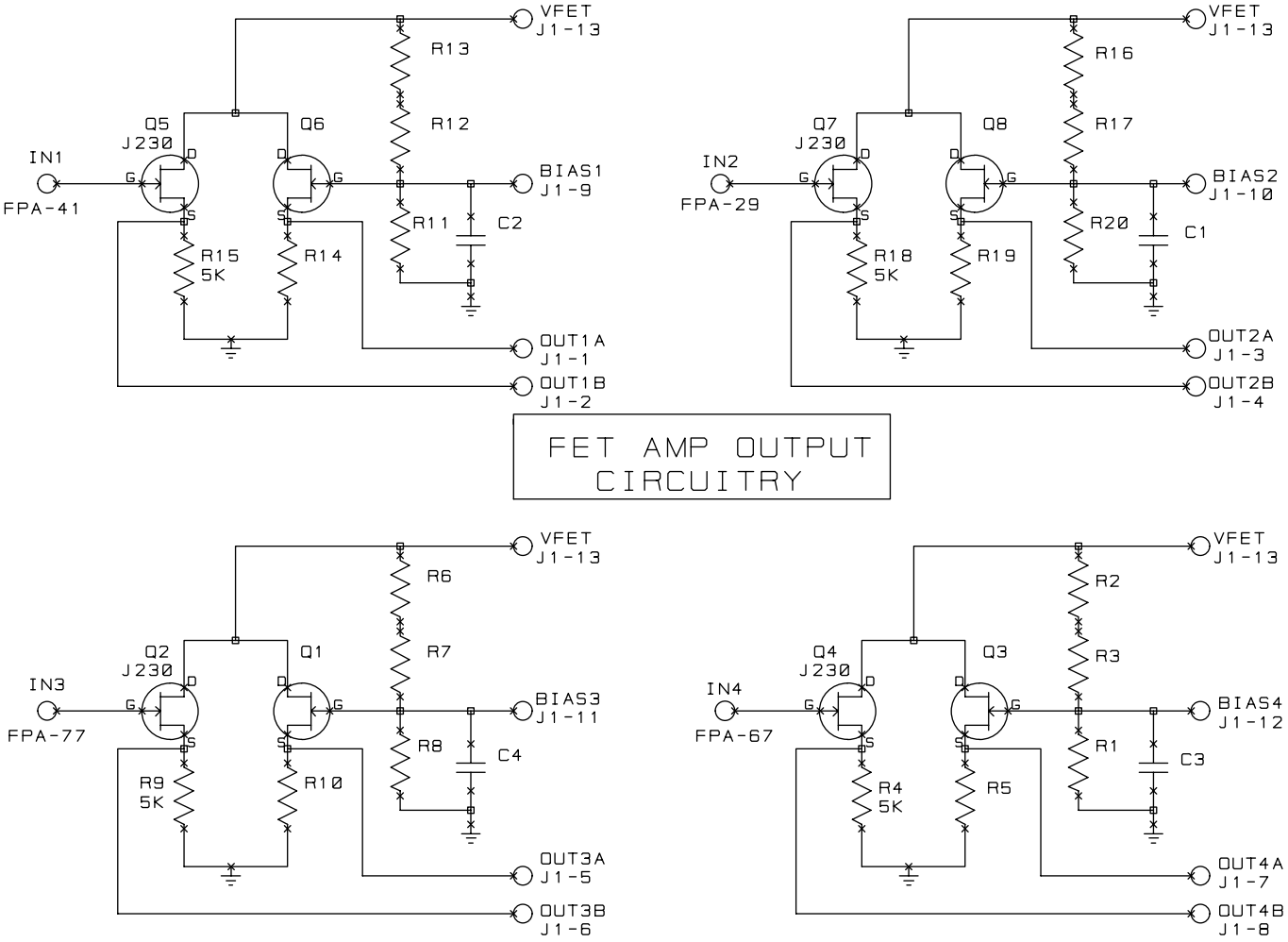
1808 E. 17TH. ST.
TUCSON, AZ. 85719 USA


| | |
|---|---|
| PROJECT: | HAWAII 1024 ARRAY FANOUT BOARD |
| PAUL ARBO | REV.: A |
| PAGE 1 OF 2 | DATE: 12-22-98 |




| | |
|---|---|
| INFRARED LABORATORIES, INC.<br>1808 E. 17TH. STREET<br>TUCSON AZ. 85719 USA | |
| PROJECT: | HAWAII 1024 ARRAY<br>FAN OUT BOARD |
| PAUL ARBO | REV.: A |
| PAGE 2 OF 2 | DATE: 12-22-98 |

# Array Fanout Board Test Information

JC#, DWR # : 3272_UAZNPE24S
board use notes : HAWAII array
circuit board # : F25
circuit board S/N # : 014
check date : 4/17/06
below checked by : M. Reed

general appearance

- [ ] circuit board cleaned, no finger prints, flux residue, dross, etc..
- [ ] all connectors and components parallel or vertical to board
- [ ] all solder joints filled, no voids, orange peel or cold solder joints
- [ ] fiberglass, thermal layers and pads not damaged

FPA socket installed correctly

- [ ] pin #1 is over board pin #1 marking
- [ ] socket feet touch the thermal layer
- [ ] corners bottom edges are same distance from the thermal layer
- [ ] contact pins are not bent in or dirty

all Tantalum capacitors

- [ ] 5 caps installed, Tantalum, 16V / 10 μF
- [ ] bottom touches the board
- [ ] polarity correct
- [ ] no shorts to thermal layer

other

- [ ] serial number is scratched on the back upper left side (J1 and J2 at bottom)
- [ ] SIP / Rpack resistors oriented correctly
- [ ] SIP / Rpack resistors are ceramic type
- [ ] 4 matched 5 KΩ resistors installed in R4,R9,R15,R18 others not used
- [ ] J1 / J2 bottom or top connector - matches cables configuration
- [ ] top and back pictures are in focus and copied to the bottom of data sheet)

JFETS

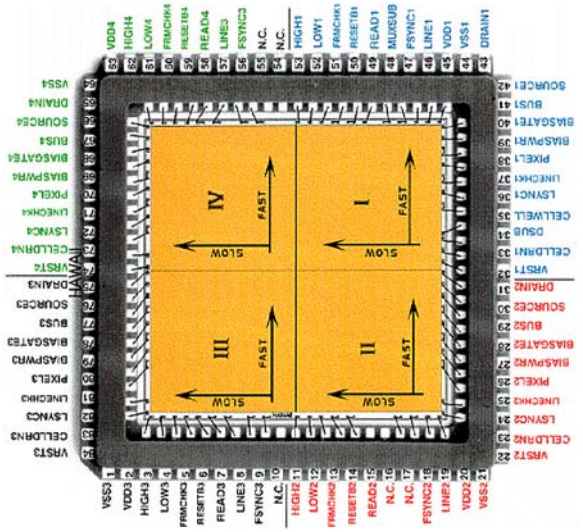
- [ ] bottom edge of the JFET .060" away from board (20 AWG wire thickness)
- [ ] no shorts from any of the 3 pins to the thermal layers
- [ ] installed correctly (orientation of drain, source and gate to board)
- [ ] final cold test - data sheet is filled in completely

## Assembled Board JFET $V_S$ Test at 300K and 77K.

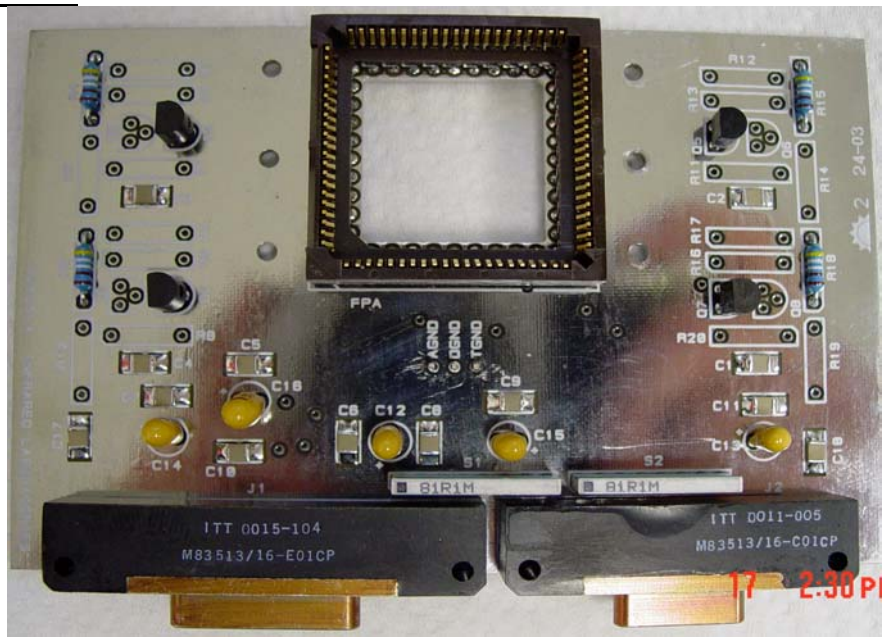
JFET inputs (Gates) = Grounded through blank shorted LCC chip
Test Voltage (Drains) = 5.0 V
matched JFETs tolerence range = 0.001 mV
Matched Source resistor values at 77K = 4.99 K Ω

| Installed Position | JFET Serial # | VS ~300 K | VS ~77 K | RS Position |
|---|---|---|---|---|
| Q5 | 399 | 1.037 | 0.856 | R15 |
| Q7 | 1100 | 1.056 | 0.856 | R18 |
| Q2 | 1152 | 1.037 | 0.856 | R9 |
| Q4 | 1160 | 1.077 | 0.856 | R4 |

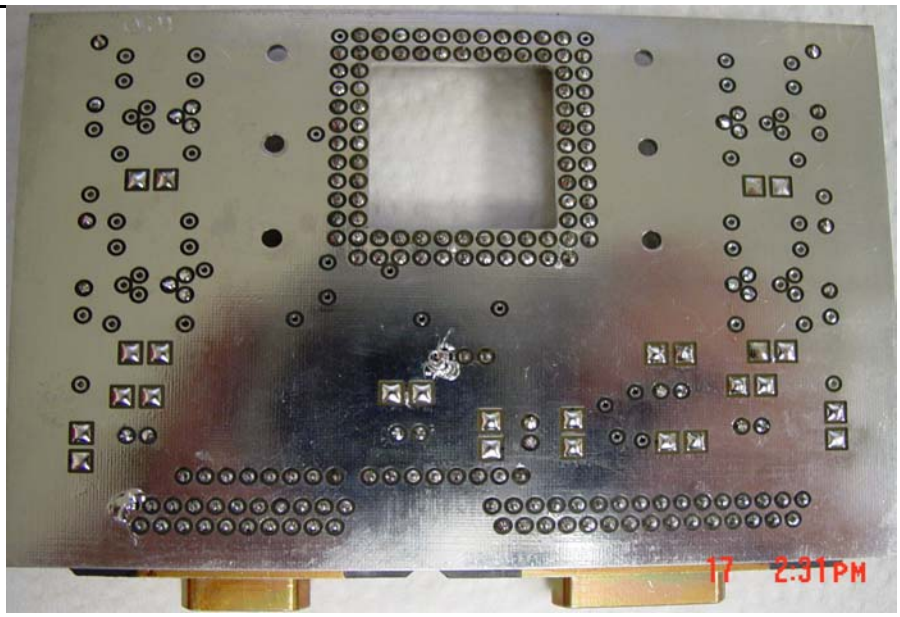
DWR #,JC#, : 3272_UAZNPE24S
board use notes : HAWAII array
circuit board F# : 25
circuit board S/N # : 014




TOP VIEW




BACK VIEW



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Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

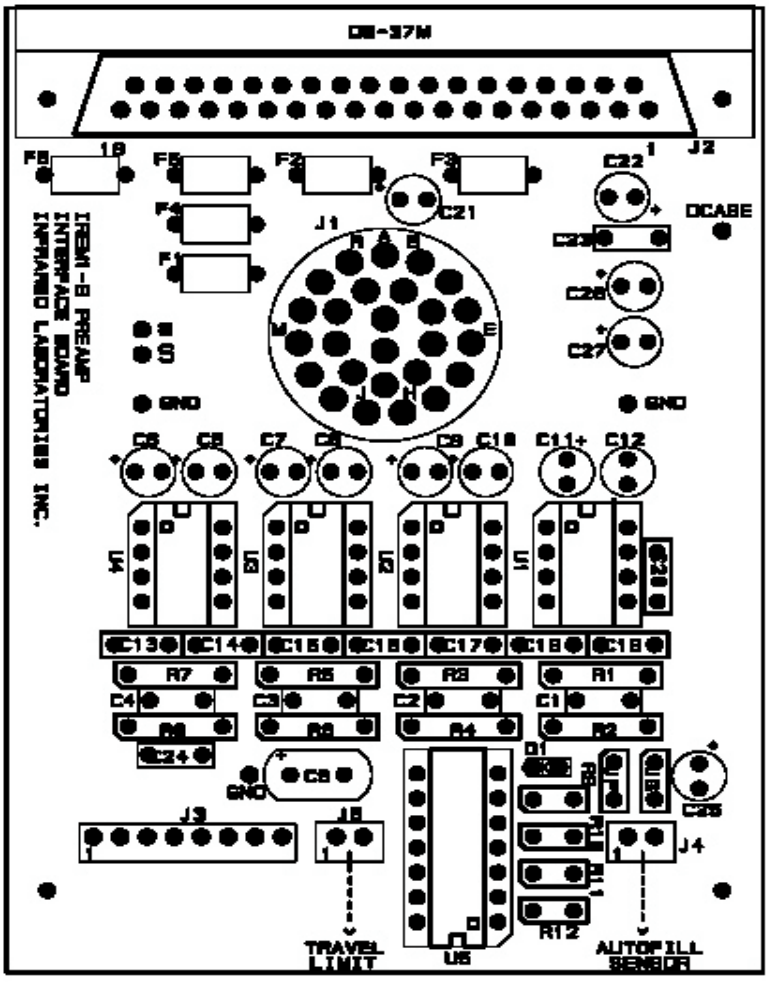
| | |
|---|---|
| Customer : | Univ. AZ / Don Mccarthy |
| P.O. number : | UAZNPE24S |
| Dewar number : | 3272 |
| Job Order number : | |
| Quote number : | |
| Components : | Preamp # IREMB |
| REV DATE : | 6/26/06 |

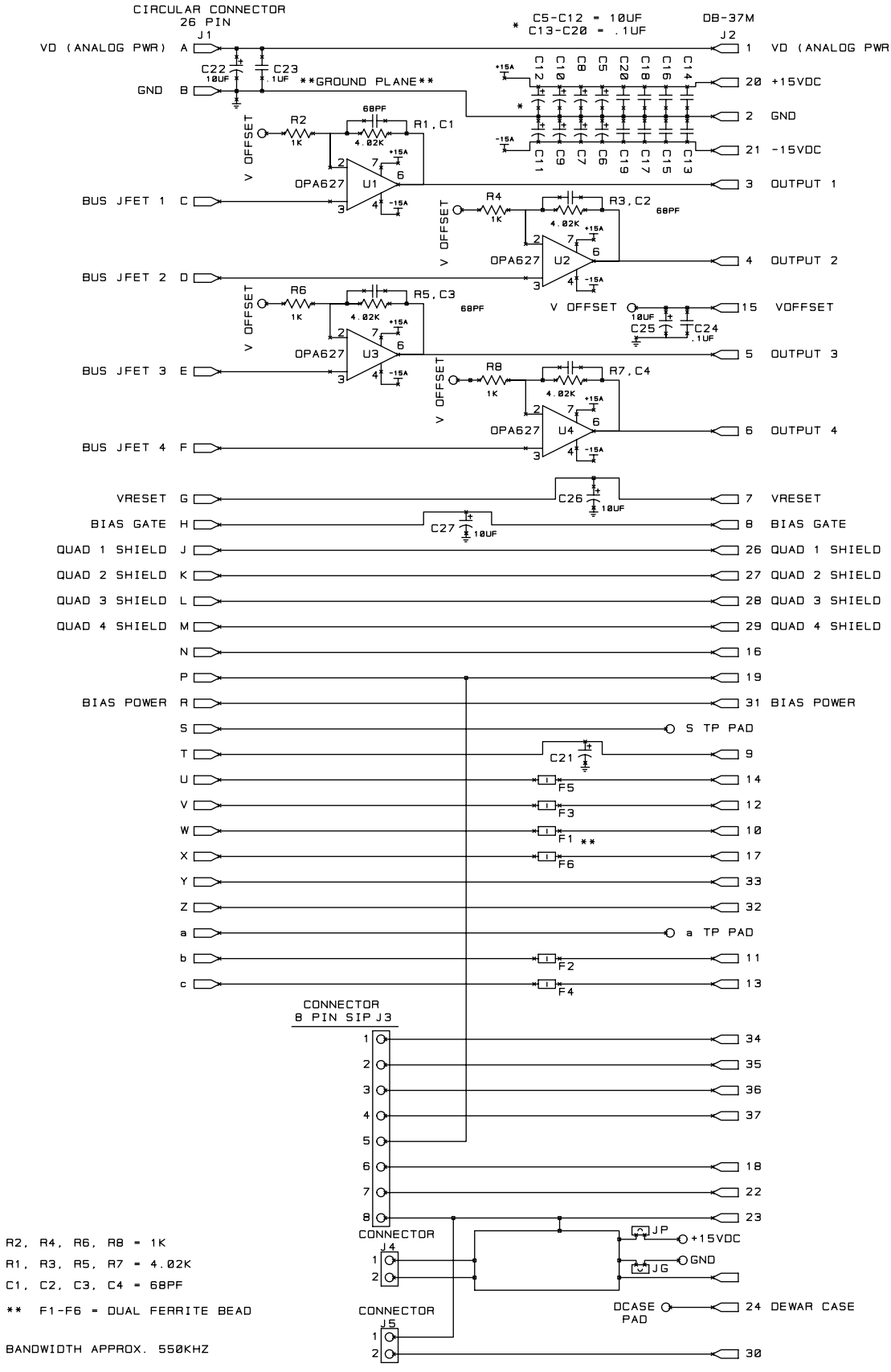
page #

# PARTS LIST FOR IREMB PREAMP BOARD - SEV ( no AF )

| component / position | Part # / Value |
|---|---|
| BOARD | IREM-B |
| enclosure | - |
| J1 | 26 pin plug - MS3116F16-26S |
| J2 | BD 37 pin Male right angle |
| J3 | not used |
| J4 | not used |
| J5 | not used |
| JP | not used |
| JG | not used |
| R1 | 4.02 KΩ, 1 % |
| R2 | 1.0 KΩ, 1 % |
| R3 | 4.02 KΩ, 1 % |
| R4 | 1.0 KΩ, 1 % |
| R5 | 1.0 KΩ, 1 % |
| R6 | 4.02 KΩ, 1 % |
| R7 | 4.02 KΩ, 1 % |
| R8 | 1.0 KΩ, 1 % |
| R9 | not used |
| R10 | not used |
| R11 | not used |
| R12 | not used |
| D1 | not used |
| U1 - socket | 8 pin DIP socket |
| U2 - socket | 8 pin DIP socket |
| U3 - socket | 8 pin DIP socket |
| U4 - socket | 8 pin DIP socket |
| U1 - OP Amp | BB - OPA627AP |
| U2 - OP Amp | BB - OPA627AP |
| U3 - OP Amp | BB - OPA627AP |
| U4 - OP Amp | BB - OPA627AP |
| U5 - OP Amp | not used |
| C1 | 68 PF |
| C2 | 68 PF |

| component / position | Part # / Value |
|---|---|
| C3 | 68 PF |
| C4 | 68 PF |
| C5 | 10UF / 25Vdc, Tantalum cap |
| C6 | 10UF / 25Vdc, Tantalum cap |
| C7 | 10UF / 25Vdc, Tantalum cap |
| C8 | 10UF / 25Vdc, Tantalum cap |
| C9 | 10UF / 25Vdc, Tantalum cap |
| C10 | 10UF / 25Vdc, Tantalum cap |
| C11 | 10UF / 25Vdc, Tantalum cap |
| C12 | 10UF / 25Vdc, Tantalum cap |
| C13 | .1UF |
| C14 | .1UF |
| C15 | .1UF |
| C16 | .1UF |
| C17 | .1UF |
| C18 | .1UF |
| C19 | .1UF |
| C20 | .1UF |
| C21 | 10UF / 25Vdc, Tantalum cap |
| C22 | 10UF / 25Vdc, Tantalum cap |
| C23 | .1UF |
| C24 | .1UF |
| C25 | 10UF / 25Vdc, Tantalum cap |
| C26 | 10UF / 25Vdc, Tantalum cap |
| C27 | 10UF / 25Vdc, Tantalum cap |
| F1 | pair of Ferrite beads |
| F2 | pair of Ferrite beads |
| F3 | pair of Ferrite beads |
| F4 | pair of Ferrite beads |
| F5 | pair of Ferrite beads |
| F6 | pair of Ferrite beads |
| F7 | pair of Ferrite beads |
| F8 | pair of Ferrite beads |






R2, R4, R6, R8 = 1K

R1, R3, R5, R7 = 4.02K

C1, C2, C3, C4 = 68PF

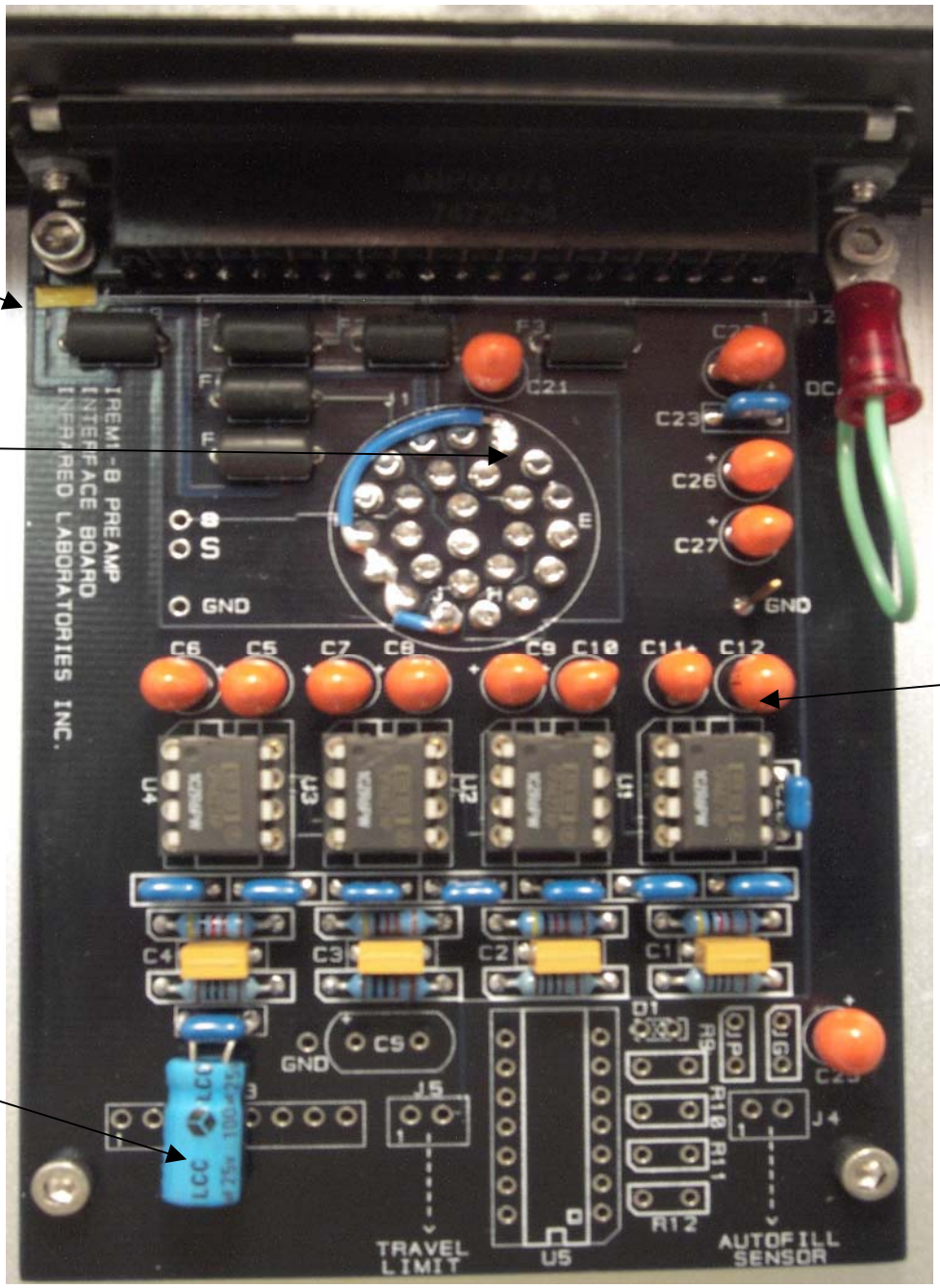
** F1-F6 = DUAL FERRITE BEAD

BANDWIDTH APPROX. 550KHZ

HAWAII-2 DEWAR INTERFACE PREAMP BOARD

| | |
|---|---|
| INFRARED LABORTORIES, INC.<br>1808 E. 17TH. STREET<br>TUCSON, AZ. 85719 USA | |
| PROJECT: HAWAII-2 PREAMP | |
| DESC.: PREAMP AUX BOARD<br>PREAMP CIRCUIT BOARD | |
| PAUL ARBO | REV.: C |
| PAGE: 1 OF 1 | DATE: 12-22-99 |

IREMB Preamp



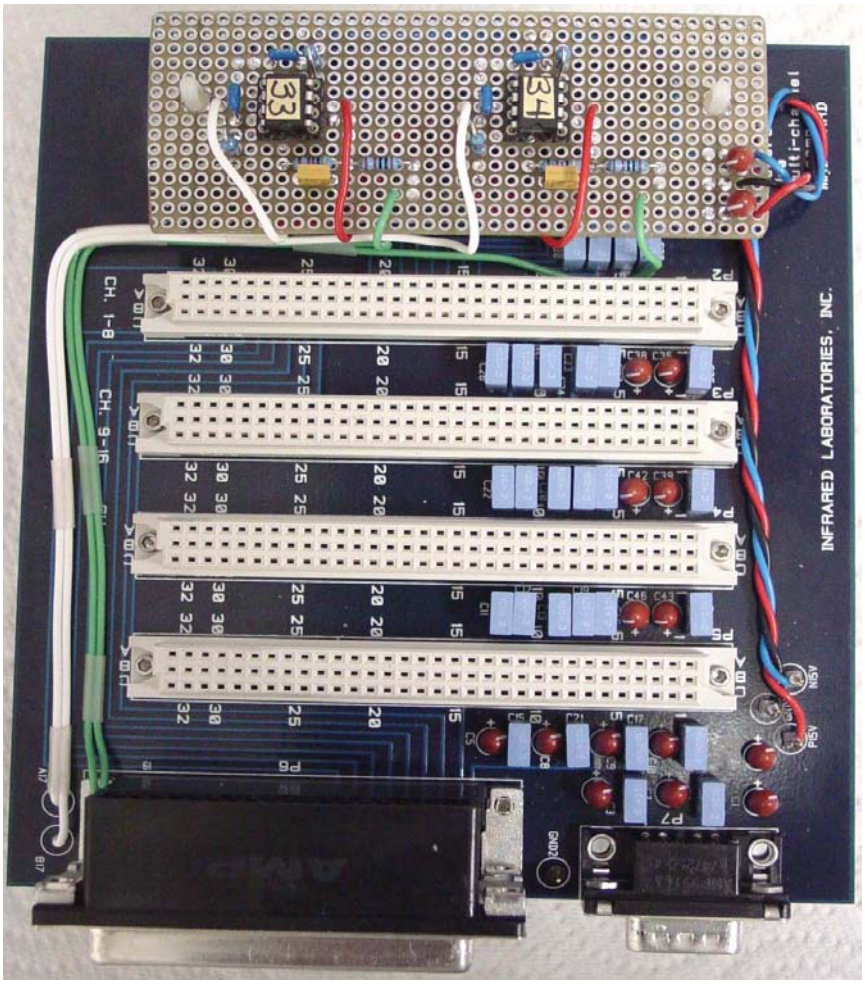
IRLabs
Infrared Laboratories

1808 East 17th Street
Tucson, AZ 85719 - 6505 / USA
Phone # : 520 - 622 - 7074
Fax # : 520 - 623 - 0765
Email : irlabs.com

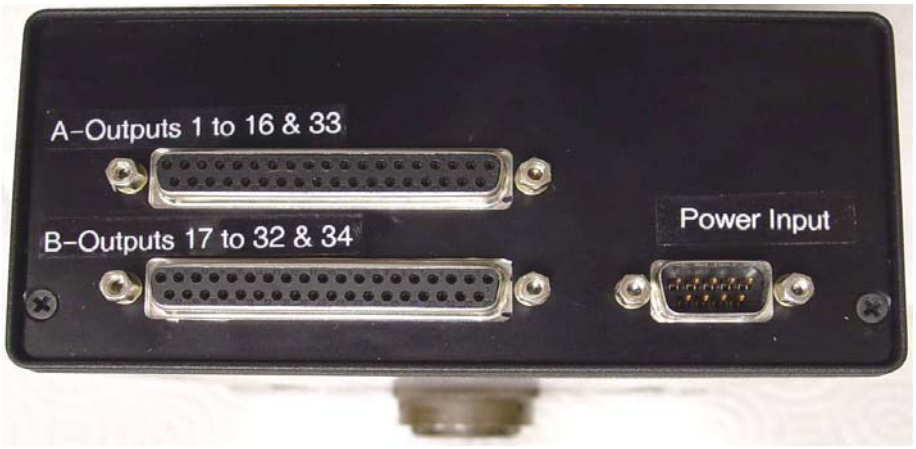
| | |
|---|---|
| Customer : | Univ. AZ / Don Mccarthy |
| P.O. number : | UAZNPE24S |
| Dewar number : | 3272 |
| Job Order number : | |
| Quote number : | |
| Components : | GUMP Preamp, configured for 32 channels and 2 channels added. ( 34 outputs ) |

section # Most recent REV DATE : Jun - 28, 06

GUMP Mainboard Layout - with add-on 2 channel circuit




GUMP end panel

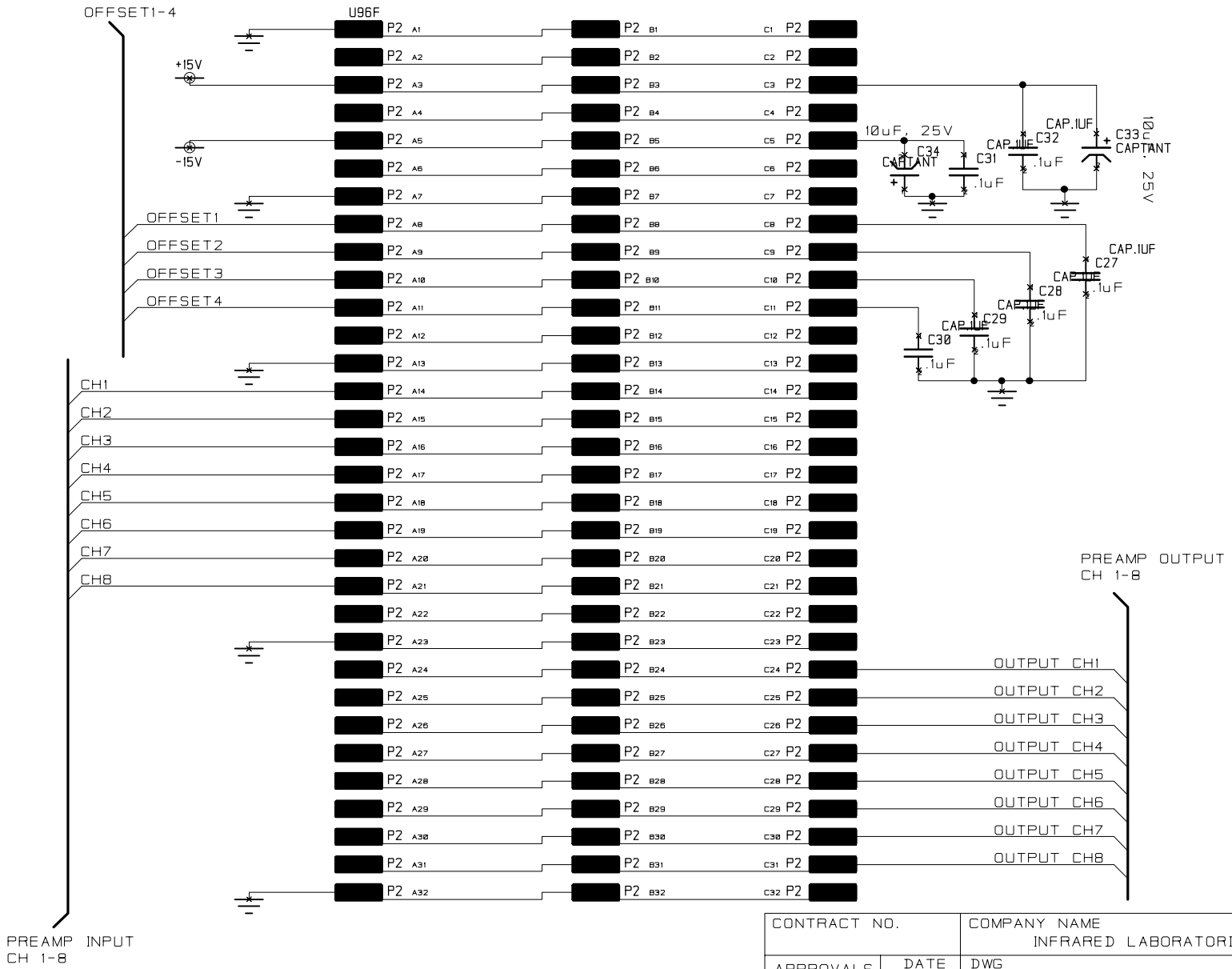



Main Board Parts List (populated for 4 Daughter Boards)

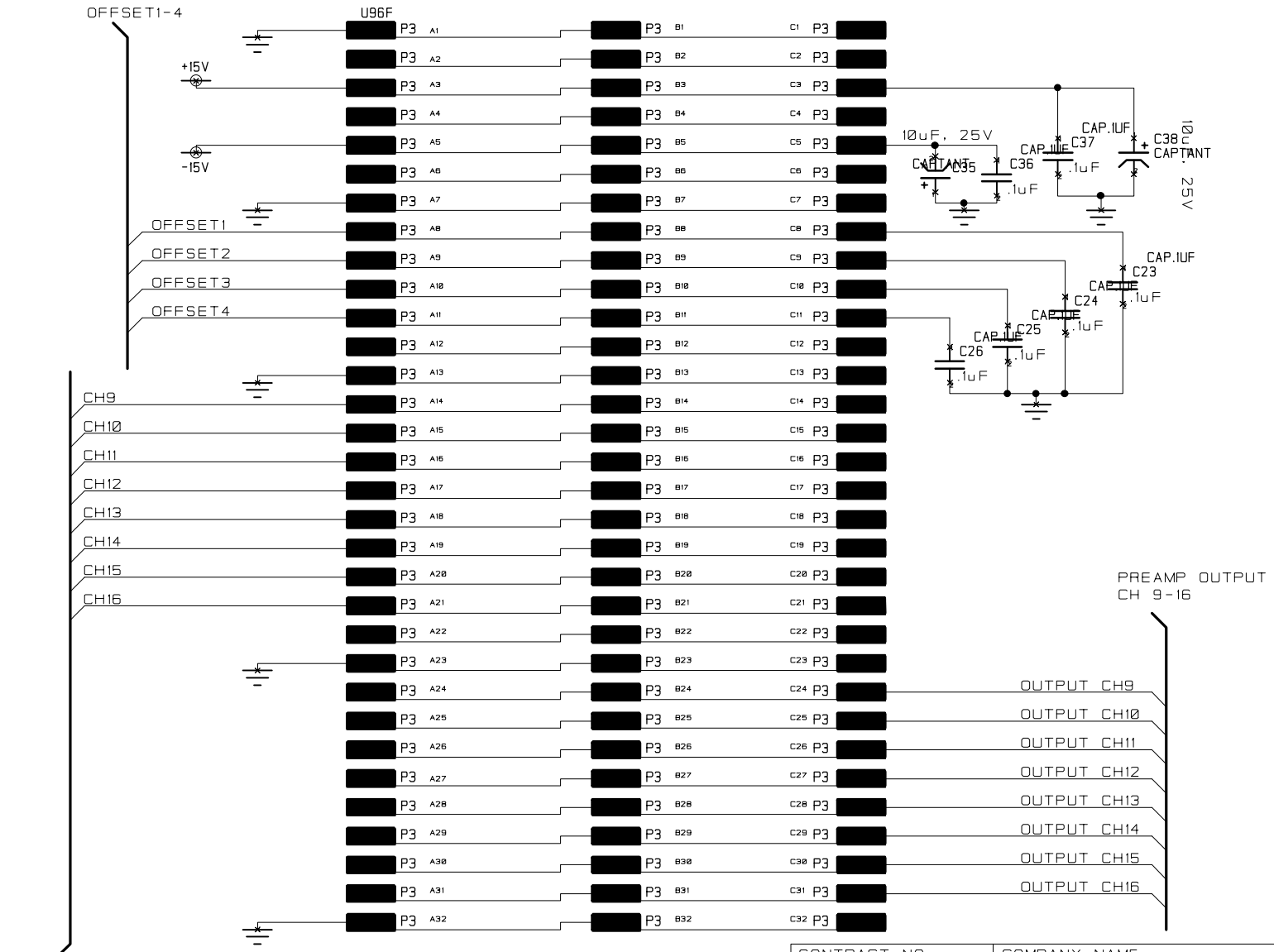
| QTY | Description |
|---|---|
| 16 | capacitors, 10 UF / 25 VOLT |
| 30 | capacitors, 0.1 UF caps |
| 1 | connector, 41 PIN Bulkhead Recepticle |
| 4 | connector, 96 pin, DIN, 3 row straight mount |
| 1 | connector, D-SUB 9 pin male right angle, PCB mount |
| 1 | connector, DUAL DSUB 37 pin male right angle, PCB mount |
| 3 | connector, D-SUB mounting Hardware kit |
| 8 | connector, Header pins, Breakaway type |
| 1 | enclosure, Lansing box |

SILK SCREEN

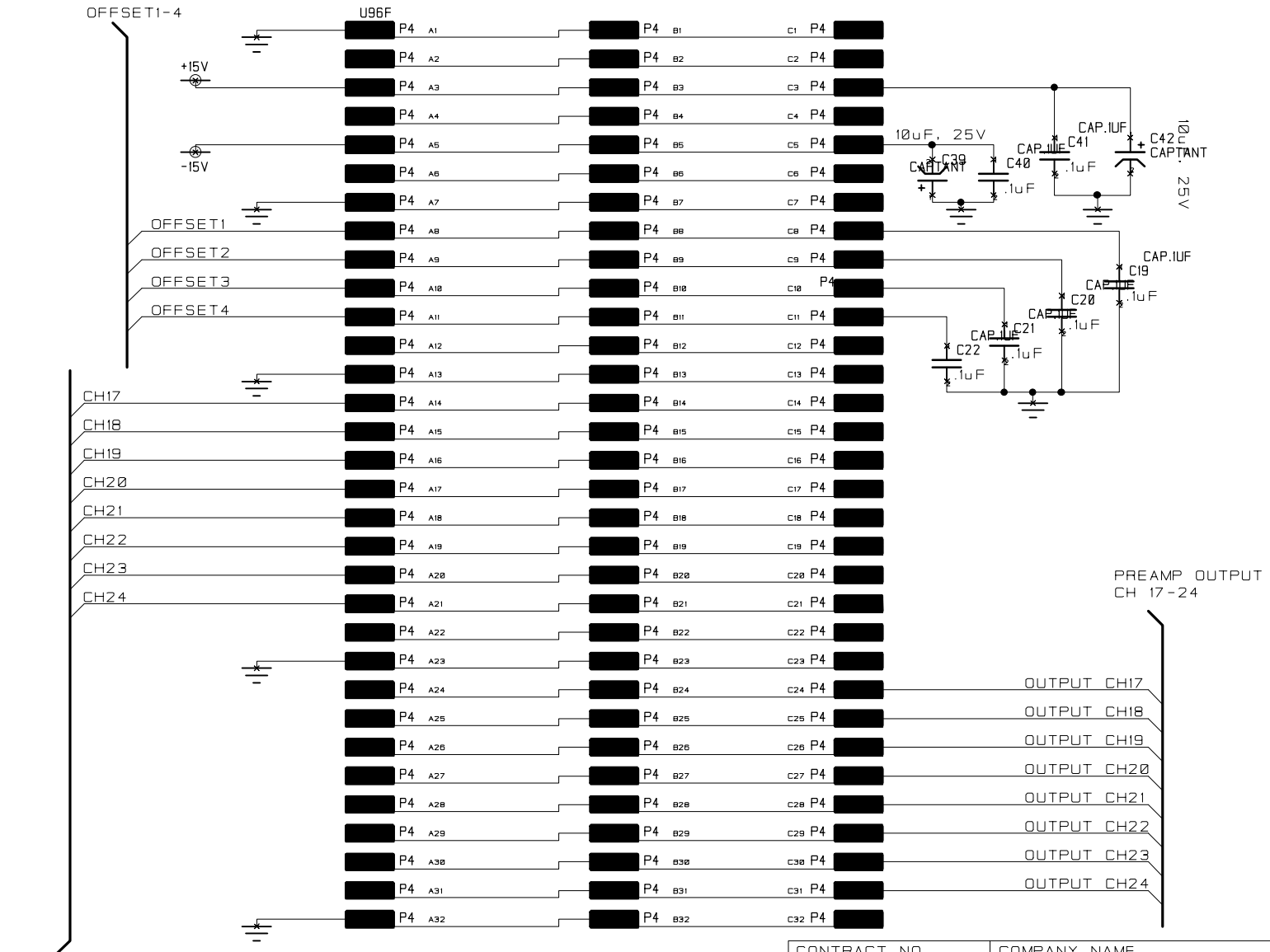

INFRARED LABORATORIES, INC.
General
Use
Multi-channel
Preamp
MAINBOARD
CH. 1-8
CH. 9-16
CH. 17-24
CH. 25-32
P1
P2
P3
P4
P5
P6
P7
GND
GND2
GND3
N15V
P15V
A17
B17



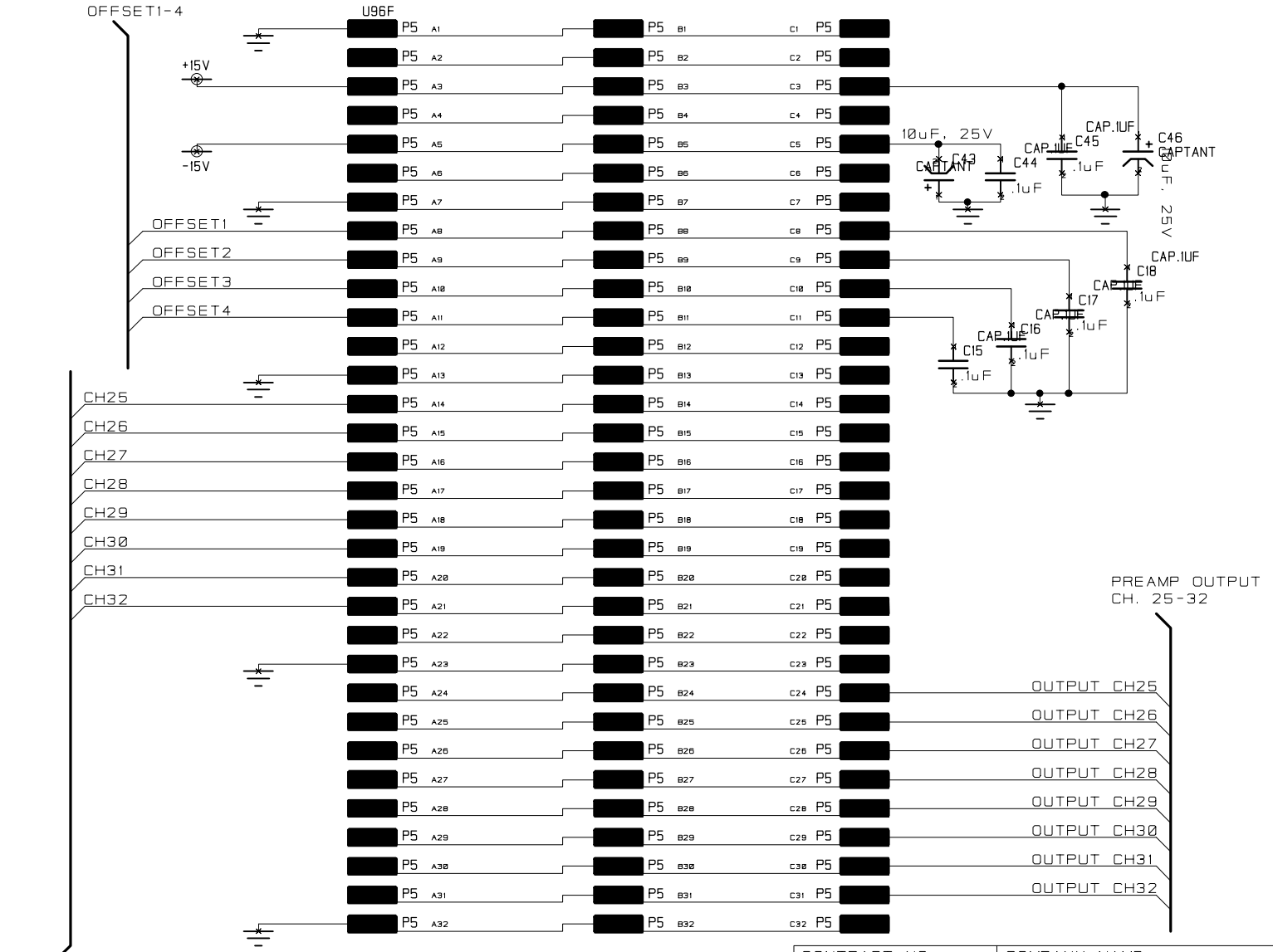

| | | | |
|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES INC. | |
| APPROVALS | DATE | DWG PREAMP CH. 1-8 | |
| DRAWN | | SIZE A | FSCM NO. / DWG NO. / REV. |
| CHECKED | | | |
| ISSUED | | SCALE | PAUL ARBO / SHEET 3 of 7 |



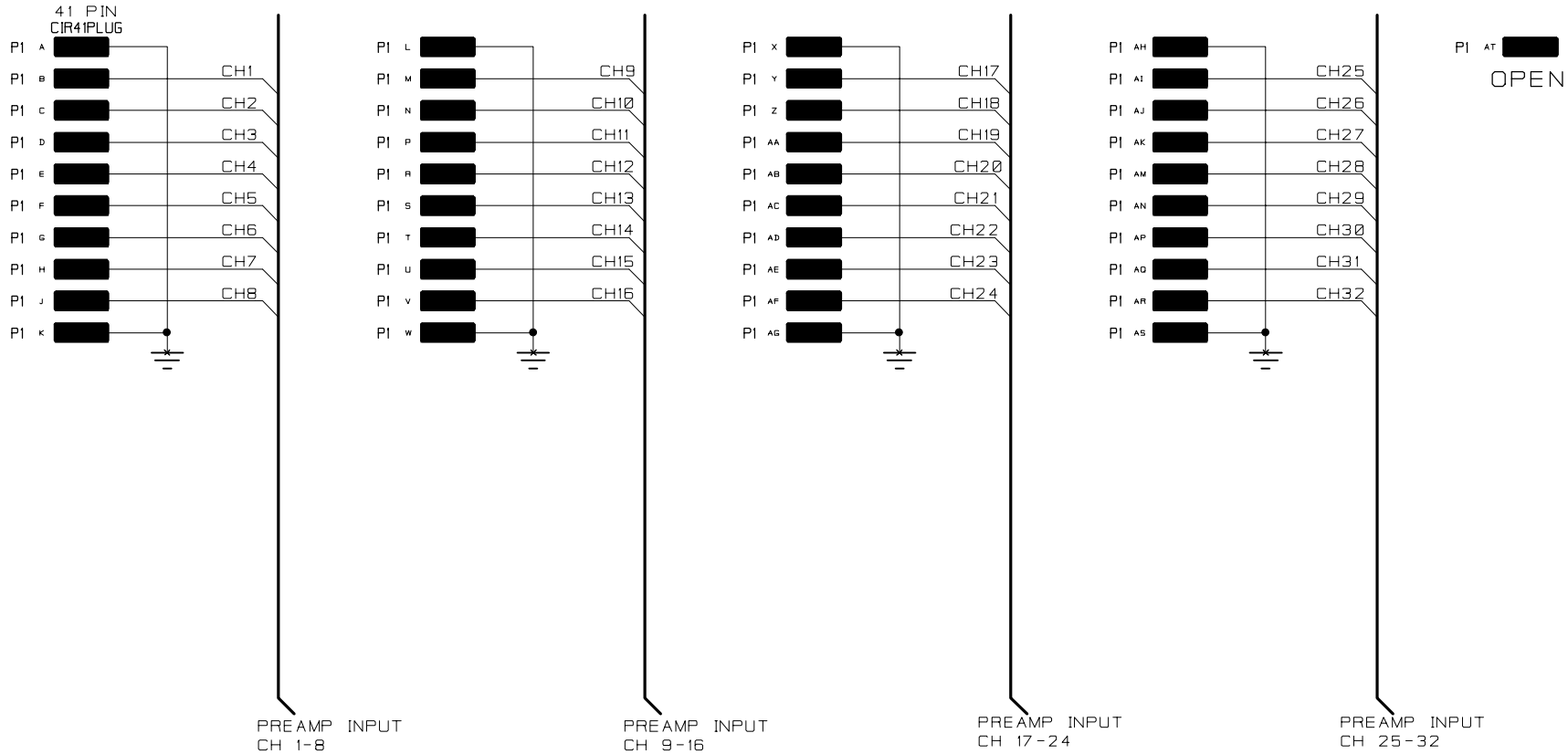

| | | | |
|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME: INFRARED LABORATORIES INC. | |
| APPROVALS | DATE | DWG: PREAMP CH. 9-16 | |
| DRAWN | | SIZE: A | FSCM NO. / DWG NO. / REV. |
| CHECKED | | | |
| ISSUED | | SCALE | PAUL ARBO / SHEET 4 of 7 |



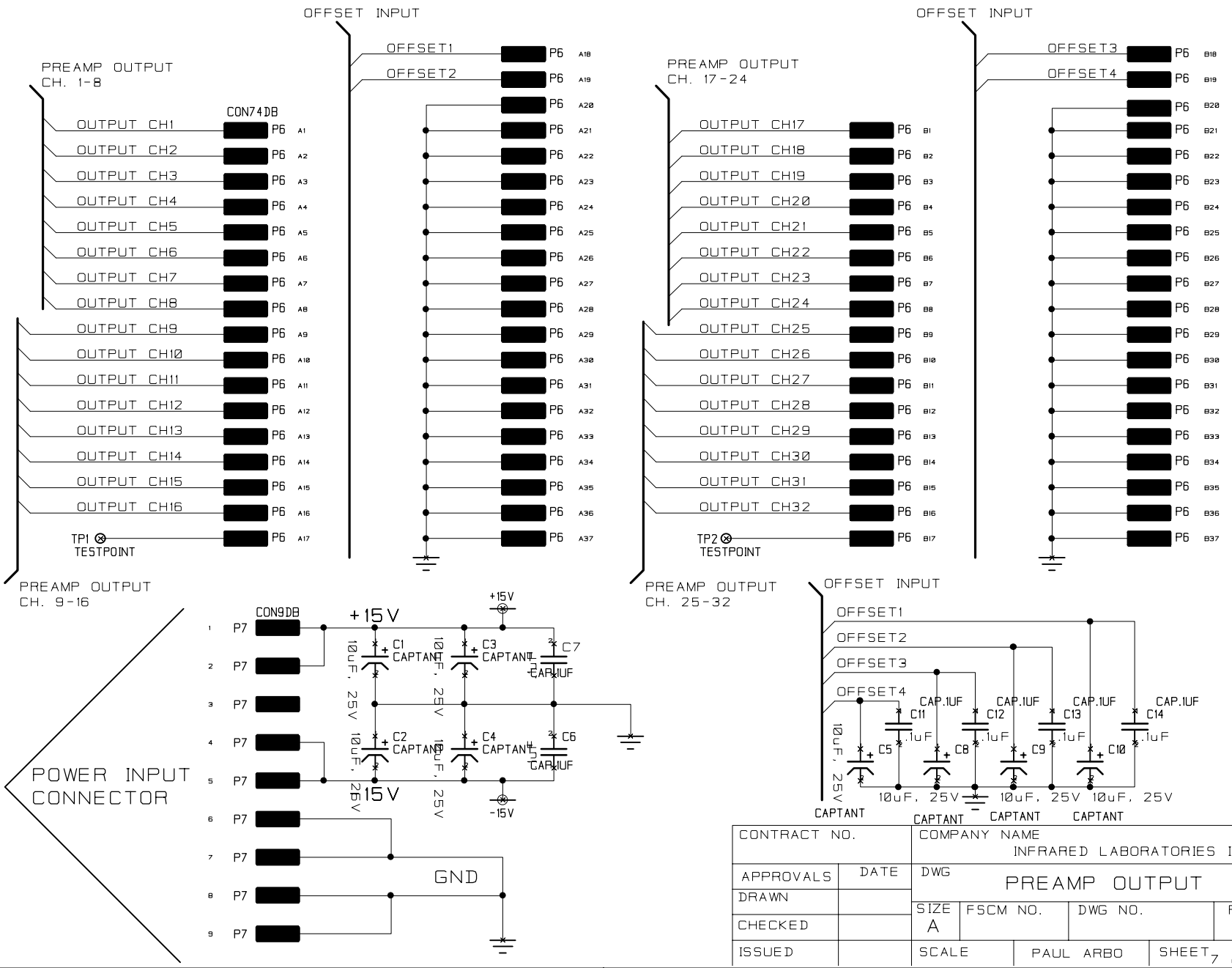

| | | | | |
|---|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES INC. | | |
| APPROVALS | DATE | DWG PREAMP CH. 17-24 | | |
| DRAWN | | SIZE A | FSCM NO. | DWG NO. REV. |
| CHECKED | | | | |
| ISSUED | | SCALE | PAUL ARBO | SHEET 5 of 7 |




| | | | |
|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES INC. | |
| APPROVALS | DATE | DWG PREAMP CH. 25-32 | |
| DRAWN | | SIZE A | FSCM NO. / DWG NO. / REV. |
| CHECKED | | | |
| ISSUED | | SCALE | PAUL ARBO / SHEET 6 of 7 |



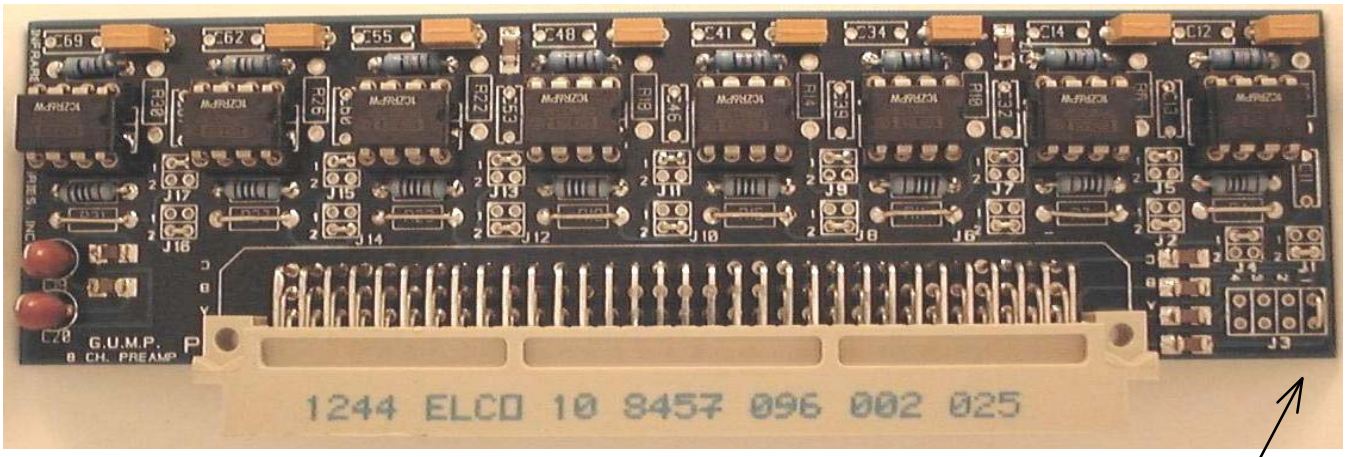

| | | | | | |
|---|---|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME<br>INFRARED LABORATORIES INC. | | | |
| APPROVALS | DATE | DWG<br>PREAMP INPUT | | | |
| DRAWN | | SIZE<br>A | FSCM NO. | DWG NO. | REV. |
| CHECKED | | | | | |
| ISSUED | | SCALE | PAUL ARBO | SHEET 2 OF 7 | |




| | | | |
|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES INC. | |
| APPROVALS | DATE | DWG PREAMP OUTPUT | |
| DRAWN | | SIZE A | FSCM NO. / DWG NO. / REV. |
| CHECKED | | | |
| ISSUED | | SCALE | PAUL ARBO / SHEET 7 of 7 |

G.U.M.P. daughter boards

Ch 8 Ch 7 Ch 6 Ch 5 Ch 4 Ch 3 Ch 2 Ch 1




NOTE : All Daughter boards are simular and are configured for a specific group of channels.

Voltage Offset is applied to the group of channels depending on the jumper position on **J3**.

Channels 1 through 8 - J3 jumper is installed in position 1 (as picture above shows)
Channels 9 through 16 - J3 jumper is installed in position 2
Channels 17 through 24 - J3 jumper is installed in position 3
Channels 25 through 32 - J3 jumper is installed in position 4

Parts List

| Channel Components | Channel 1 | Channel 2 | Channel 3 | Channel 4 | Channel 5 | Channel 6 | Channel 7 | Channel 8 |
|---|---|---|---|---|---|---|---|---|
| .1 UF - SM 25V | C3, C4 | C5, C6 | C36, C35 | C43, C42 | C50, C49 | C57, C56 | C64, C63 | C71, C70 |
| 68 PF | C1 | C2 | C31 | C38 | C45 | C52 | C59 | C66 |
| 4 KΩ | R1 | R8 | R9 | R13 | R17 | R21 | R25 | R29 |
| 8 pin OP Amp socket | U1 | U2 | U3 | U4 | U5 | U6 | U7 | U8 |
| 1 KΩ | R2 | R5 | R12 | R16 | R20 | R24 | R28 | R32 |
| jumper - input | R4 | R7 | R11 | R15 | R19 | R23 | R27 | R31 |
| jumper - input select | J1 - 2 | J2 - 2 | J6 - 2 | J8 - 2 | J10 - 2 | J12 - 2 | J14 - 2 | J16 - 2 |
| jumper - V offset input select | J4 - 1 | J5 - 1 | J7 - 1 | J9 - 1 | J11 - 1 | J13 - 1 | J15 - 1 | J17 - 1 |
| open | R3 | R6 | R10 | R14 | R18 | R22 | R26 | R30 |
| open | C11 | C13 | C32 | C39 | C46 | C53 | C60 | C67 |
| open | C12 | C14 | C34 | C41 | C48 | C55 | C62 | C69 |
| OPA 627 AP | U1 | U2 | U3 | U4 | U5 | U6 | U7 | U8 |

POWER SUPPLY COMPONENTS

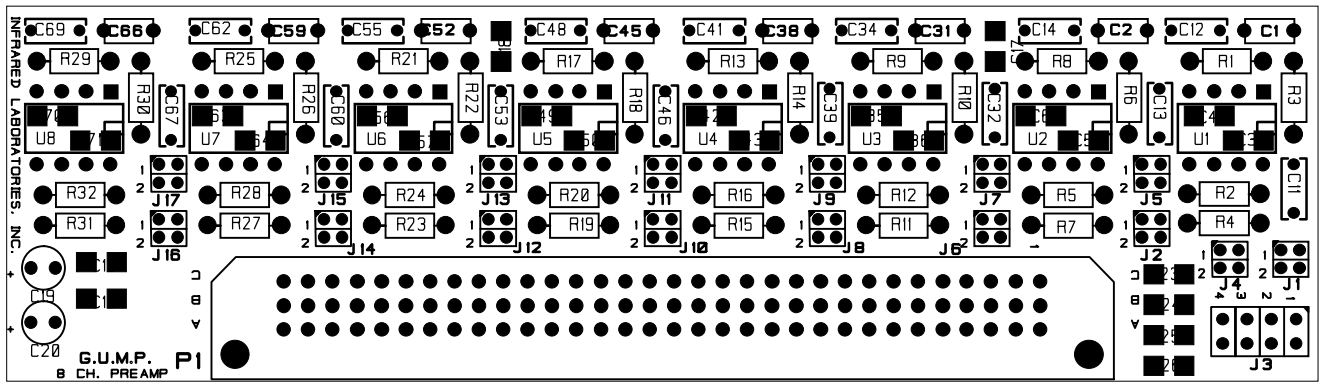
| | |
|---|---|
| .1 UF - SM 25V | C15, C16, C7, C18 |
| 10 UF, 25 Volt | C19, C20 |

VOLTAGE OFFSET COMPONENTS

| | |
|---|---|
| .1 UF - SM 25V | C23, C24, C25, C26 |
| jumper selection | SEE ABOVE NOTE |

BOARD CONNECTOR

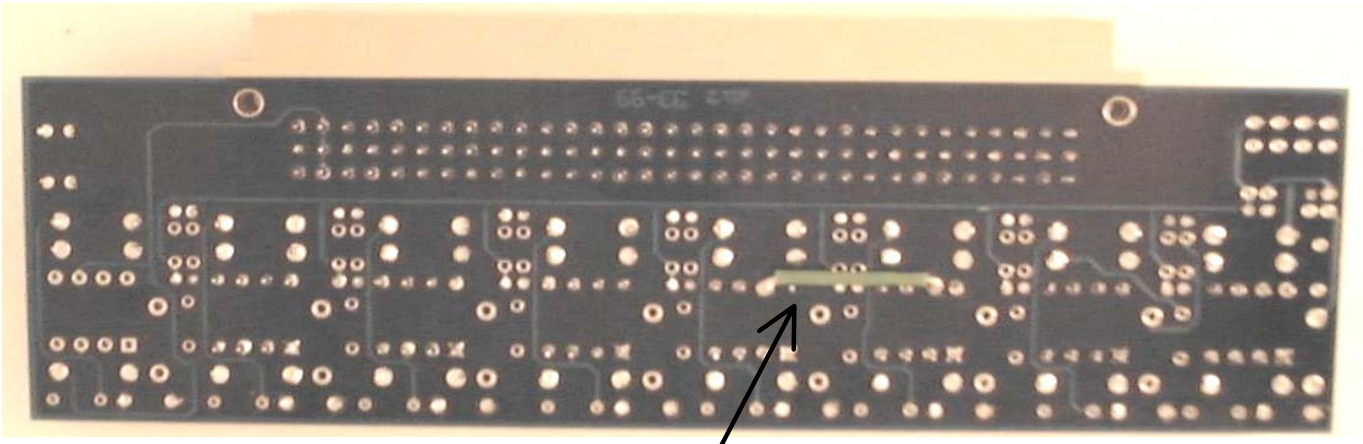
| |
|---|
| 96 pin IDC, right angle |



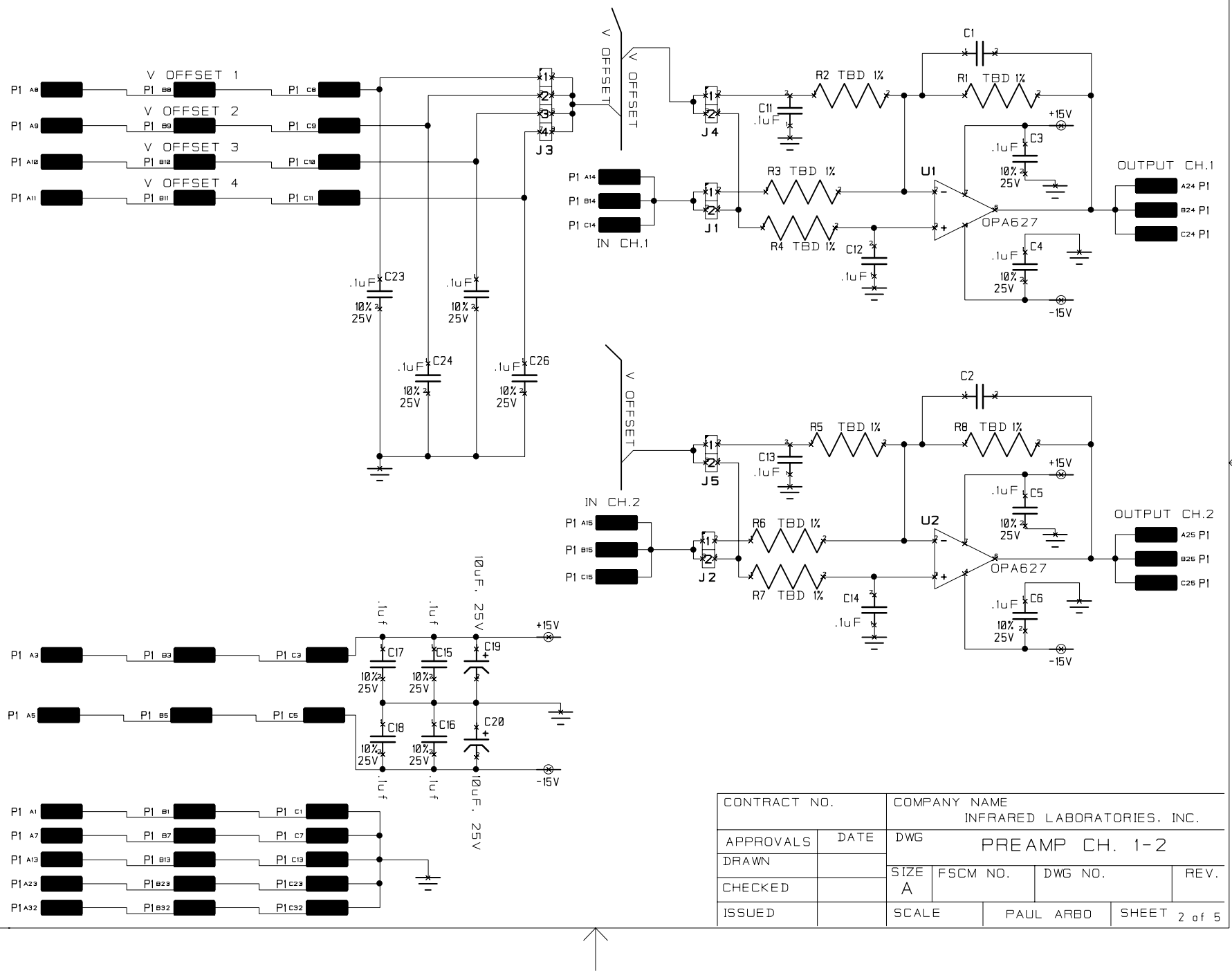

L1 SILKSCREEN

G.U.M.P. Daughter board - Some of the boards are missing trace and repaired if needed.

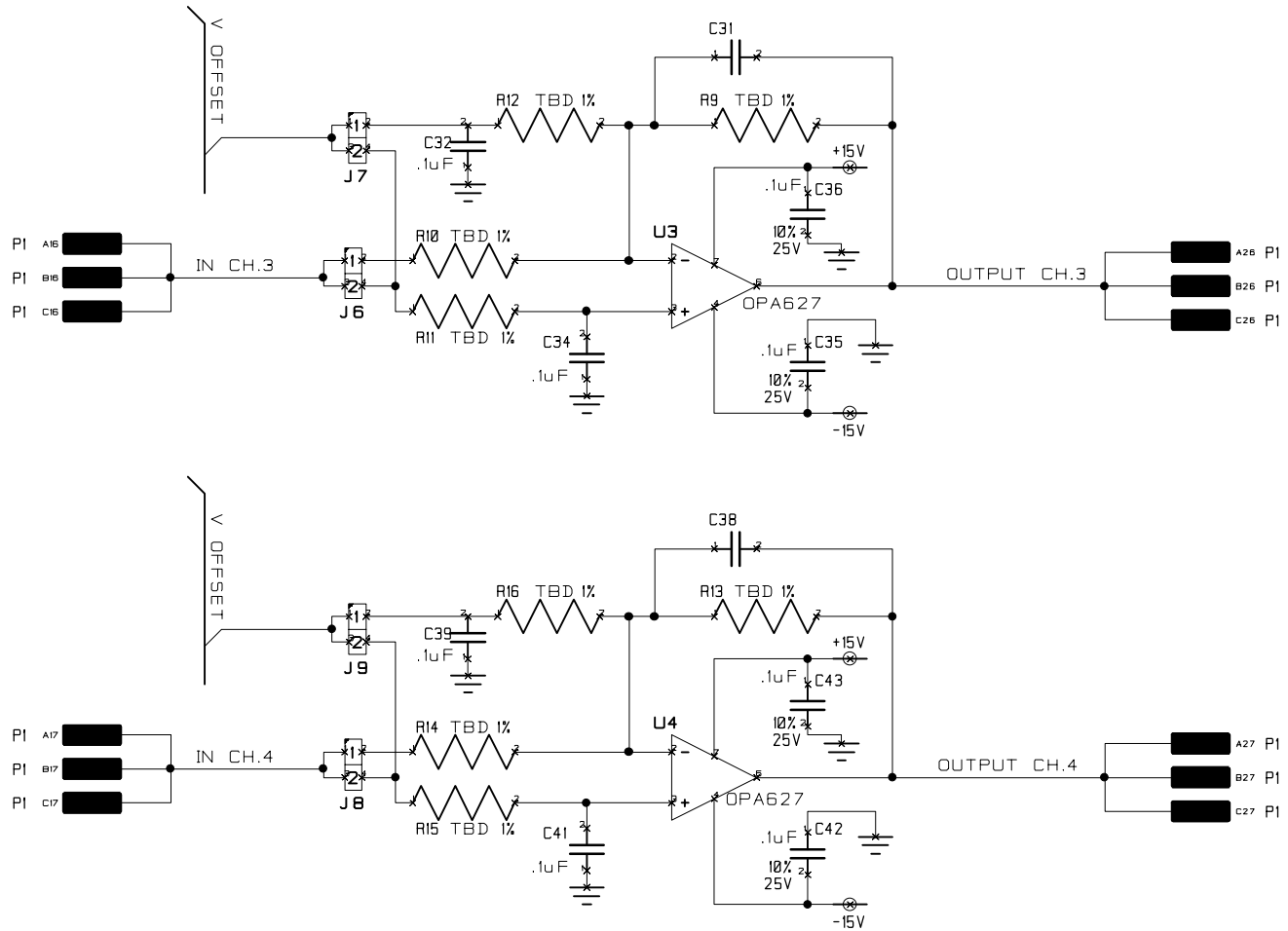
back view of circuit board



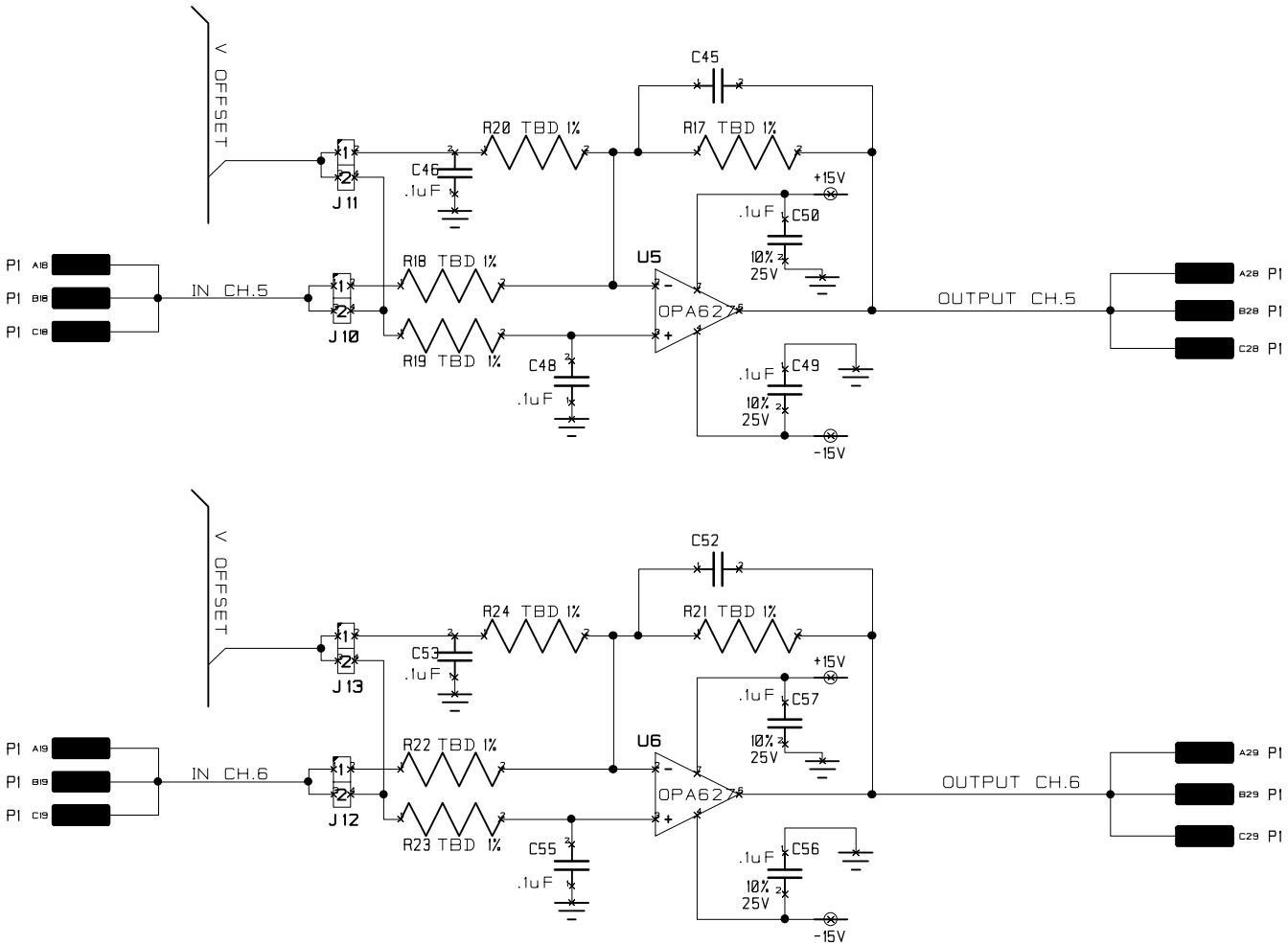
U4 pin 7 is missing the (+ V )  trace in the board.
This is repaired with a JUMPER from U3 pin 7 to U4 pin 7



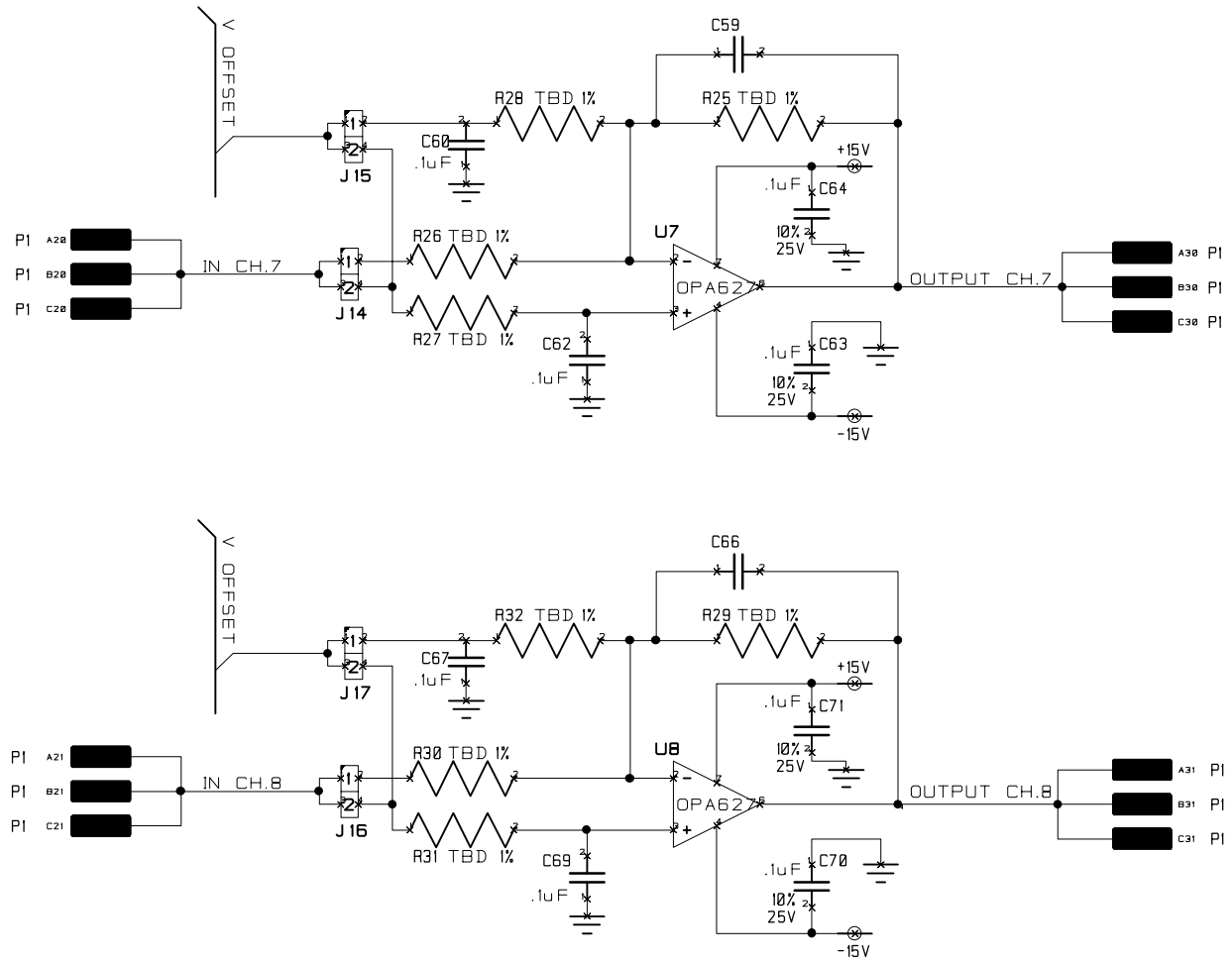

| | | | |
|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES, INC. | |
| APPROVALS | DATE | DWG | PREAMP CH. 1-2 |
| DRAWN | | SIZE A | FSCM NO. / DWG NO. / REV. |
| CHECKED | | | |
| ISSUED | | SCALE | PAUL ARBO / SHEET 2 of 5 |




| | | | | | |
|---|---|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES, INC. | | | |
| APPROVALS | DATE | DWG | PREAMP CH. 3-4 | | |
| DRAWN | | SIZE A | FSCM NO. | DWG NO. | REV. |
| CHECKED | | | | | |
| ISSUED | | SCALE | PAUL ARBO | SHEET | 3 of 5 |

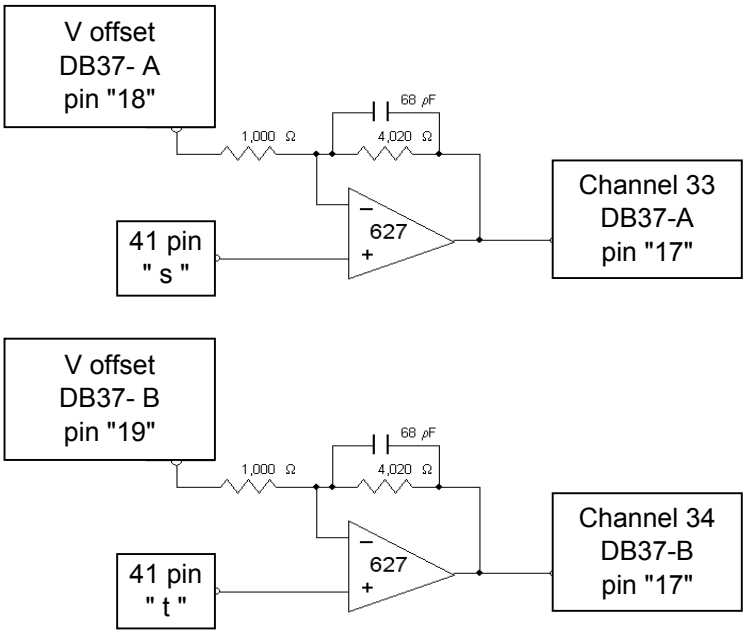



| | | | |
|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES, INC. | |
| APPROVALS | DATE | DWG PREAMP CH. 5-6 | |
| DRAWN | | SIZE A | FSCM NO. / DWG NO. / REV. |
| CHECKED | | | |
| ISSUED | | SCALE | PAUL ARBO / SHEET 4 of 5 |



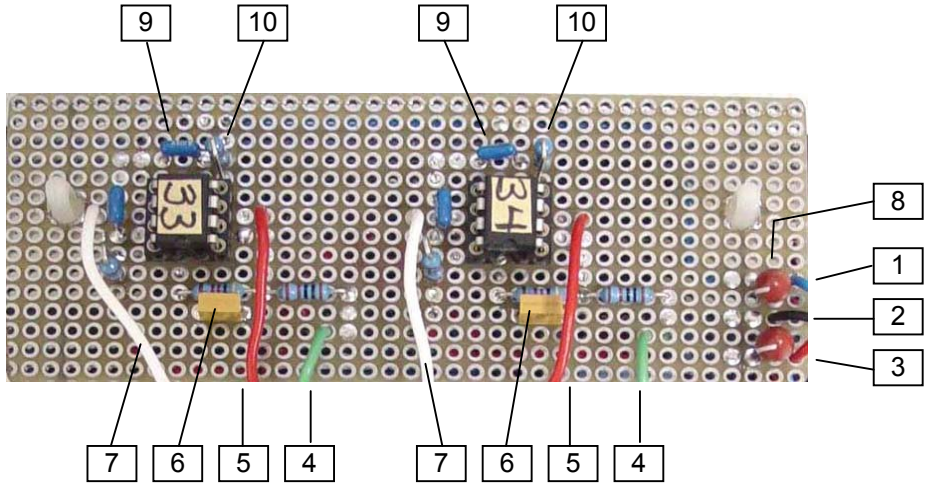

| | | | |
|---|---|---|---|
| CONTRACT NO. | | COMPANY NAME INFRARED LABORATORIES, INC | |
| APPROVALS | DATE | DWG PREAMP CH. 7-8 | |
| DRAWN | | SIZE A | FSCM NO. / DWG NO. / REV. |
| CHECKED | | | |
| ISSUED | | SCALE | PAUL ARBO / SHEET 5 of 5 |

3272_UAZNPE24S
Add - on circuit mounted to GUMP main board




Layout #

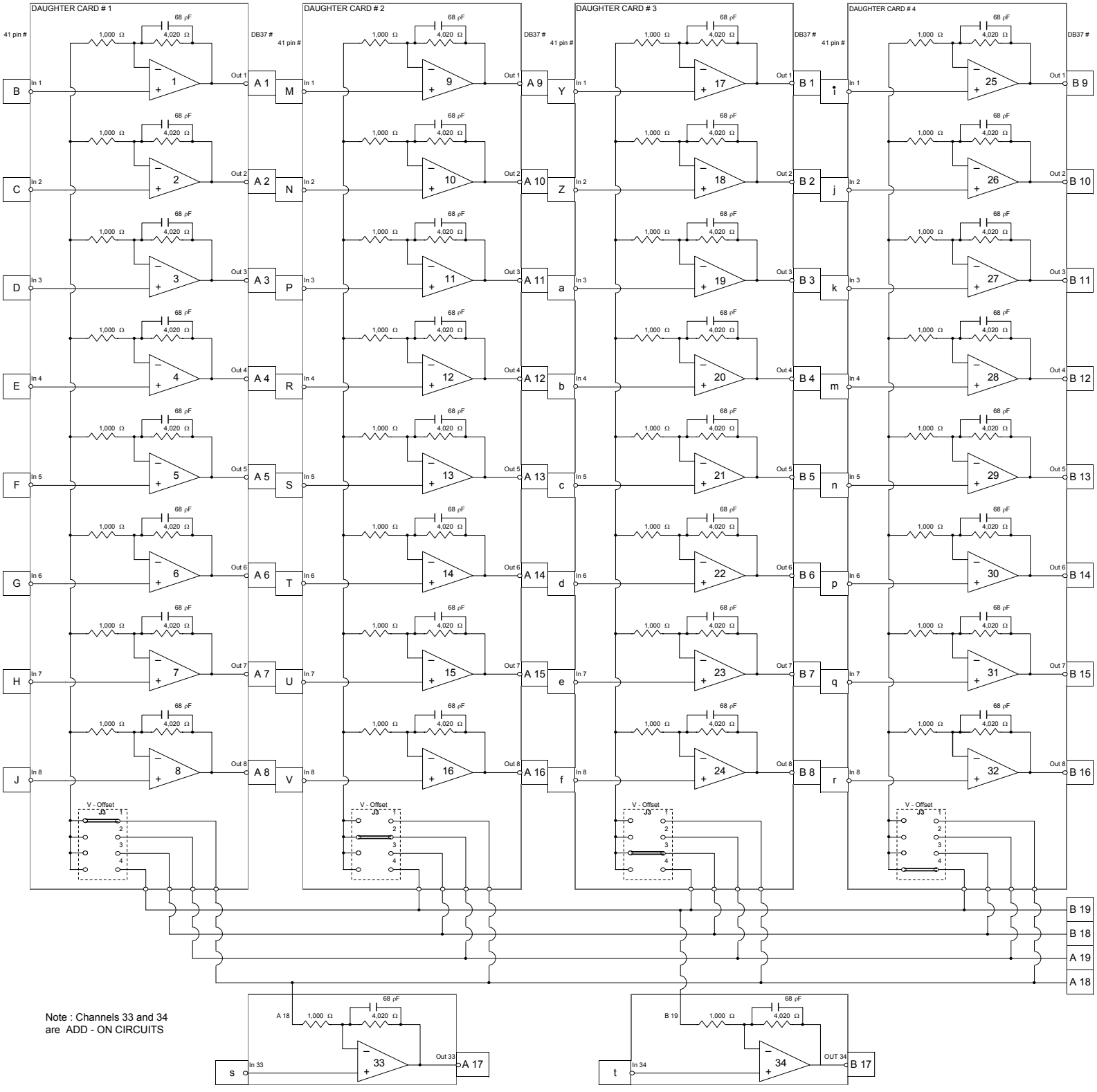
| | |
|---|---|
| 1 | Power supply - V, Blue wire |
| 2 | Power supply Ground, Black wire |
| 3 | Power supply + V in, Red wire |
| 4 | 1K Ω resistor and Green, V offset wire |
| 5 | Signal Input Red wire from 41 pin connector |
| 6 | 4.02 KΩ Feedback resistor and 68ρf capacitor in parallel |
| 7 | Signal Output White wire to DB 37 connector (A or B) |
| 8 | Power supply filter capacitors 10μF/25 volts |
| 9 | Power supply filter capacitors 0.1μF/50 volts |
| 10 | Power supply resistors 10 Ω / ¼ watt, on both ± voltage inputs |



## 34 channel - Signal Trace List on GUMP Preamp

| 41 pin connector from Dewar and Main Board | INPUTS from Main board / Daughter Cards Edge connector # | Daughter Cards Position # and channel # | OUTPUTS from Main board / Daughter Cards Edge connector # | Use Description | OUTPUT signal on (A or B) DB37 # |
|---|---|---|---|---|---|
| A | - | - | - | GND | P6 - A20 to A37 |
| B | P2 - 14 | 1 - 1 | P2 - 24 | Vout 1 | P6 - A1 |
| C | P2 - 15 | 1 - 2 | P2 - 25 | Vout 2 | P6 - A2 |
| D | P2 - 16 | 1 - 3 | P2 - 26 | Vout 3 | P6 - A3 |
| E | P2 - 17 | 1 - 4 | P2 - 27 | Vout 4 | P6 - A4 |
| F | P2 - 18 | 1 - 5 | P2 - 28 | Vout 5 | P6 - A5 |
| G | P2 - 19 | 1 - 6 | P2 - 29 | Vout 6 | P6 - A6 |
| H | P2 - 20 | 1 - 7 | P2 - 30 | Vout 7 | P6 - A7 |
| J | P2 - 21 | 1 - 8 | P2 - 31 | Vout 8 | P6 - A8 |
| K | - | - | - | GND | P6 - A20 to A37 |
| L | - | - | - | GND | P6 - A20 to A37 |
| M | P3 - 14 | 2 - 1 | P3 - 24 | Vout 9 | P6 - A9 |
| N | P3 - 15 | 2 - 2 | P3 - 25 | Vout 10 | P6 - A10 |
| P | P3 - 16 | 2 - 3 | P3 - 26 | Vout 11 | P6 - A11 |
| R | P3 - 17 | 2 - 4 | P3 - 27 | Vout 12 | P6 - A12 |
| S | P3 - 18 | 2 - 5 | P3 - 28 | Vout 13 | P6 - A13 |
| T | P3 - 19 | 2 - 6 | P3 - 29 | Vout 14 | P6 - A14 |
| U | P3 - 20 | 2 - 7 | P3 - 30 | Vout 15 | P6 - A15 |
| V | P3 - 21 | 2 - 8 | P3 - 31 | Vout 16 | P6 - A16 |
| W | - | - | - | GND | P6 - B20 to B37 |
| X | - | - | - | GND | P6 - B20 to B37 |
| Y | P4 - 14 | 3 - 1 | P4 - 24 | Vout 17 | P6 - B1 |
| Z | P4 - 15 | 3 - 2 | P4 - 25 | Vout 18 | P6 - B2 |
| a | P4 - 16 | 3 - 3 | P4 - 26 | Vout 19 | P6 - B3 |
| b | P4 - 17 | 3 - 4 | P4 - 27 | Vout 20 | P6 - B4 |
| c | P4 - 18 | 3 - 5 | P4 - 28 | Vout 21 | P6 - B5 |
| d | P4 - 19 | 3 - 6 | P4 - 29 | Vout 22 | P6 - B6 |
| e | P4 - 20 | 3 - 7 | P4 - 30 | Vout 23 | P6 - B7 |
| f | P4 - 21 | 3 - 8 | P4 - 31 | Vout 24 | P6 - B8 |
| g | - | - | - | GND | P6 - B20 to B37 |
| h | - | - | - | GND | P6 - B20 to B37 |
| i | P5 - 14 | 4 - 1 | P5 - 24 | Vout 25 | P6 - B9 |
| j | P5 - 15 | 4 - 2 | P5 - 25 | Vout 26 | P6 - B10 |
| k | P5 - 16 | 4 - 3 | P5 - 26 | Vout 27 | P6 - B11 |
| m | P5 - 17 | 4 - 4 | P5 - 27 | Vout 28 | P6 - B12 |
| n | P5 - 18 | 4 - 5 | P5 - 28 | Vout 29 | P6 - B13 |
| p | P5 - 19 | 4 - 6 | P5 - 29 | Vout 30 | P6 - B14 |
| q | P5 - 20 | 4 - 7 | P5 - 30 | Vout 31 | P6 - B15 |
| r | P5 - 21 | 4 - 8 | P5 - 31 | Vout 32 | P6 - B16 |
| s | Board modified for add-on circuit | | | Ref out - Vout 33 | P6 - A 17 |
| t | Board modified for add-on circuit | | | Window out - Vout 34 | P6 - B 17 |
| | | | | V offset, channels 1 to 8 and 33 | P6 - A 18 |
| | | | | V offset, channels 9 to 16 | P6 - A 19 |
| | | | | V offset, channels 17 to 24 | P6 - B 18 |
| | | | | V offset, channels 25 to 32 and 34 | P6 - B 19 |

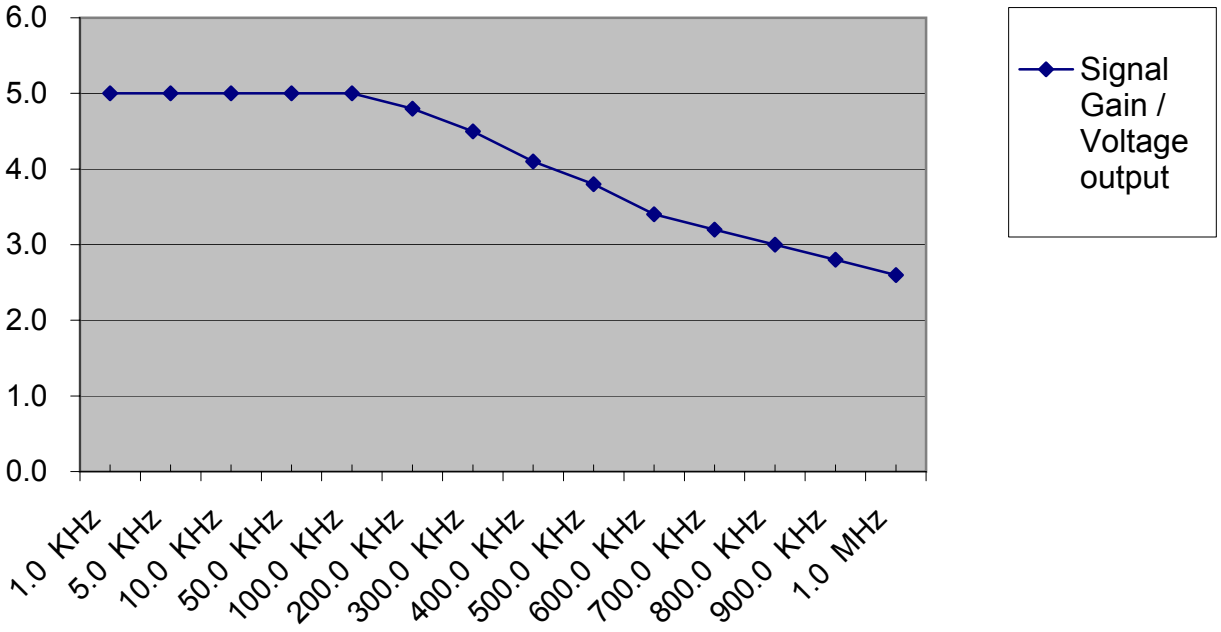
GUMP Preamp with 34 Outputs



Preamp Model : G.U.M.P. x34 channels
Test Date : 6/16/06

Power Supply Voltage = ± 15.00 VDC (tested at circuit board)
Circuit Offset Voltage = 0.0 VDC (Grounded)
Test OP AMP # OPA627AP

# Voltage output Compared to Frequency Input




All channels where tested and gave the same results.
< 15 minutes Current draw = 230mA
~ 30 minutes Current draw = 230mA
~ 60 minutes Current draw = 240mA (circuit stabilized, enclosure warm)
~ 120 minutes Current draw = 230mA (no other changes)

Voltage measurement tolerence is ± 2%

| Frequency input at 1 volt P-P | Signal Gain / Voltage output |
|---|---|
| 1.0 KHz | 5.0 |
| 5.0 KHz | 5.0 |
| 10.0 KHz | 5.0 |
| 50.0 KHz | 5.0 |
| 100.0 KHz | 5.0 |
| 200.0 KHz | 4.8 |
| 300.0 KHz | 4.5 |
| 400.0 KHz | 4.1 |
| 500.0 KHz | 3.8 |
| 600.0 KHz | 3.4 |
| 700.0 KHz | 3.2 |
| 800.0 KHz | 3.0 |
| 900.0 KHz | 2.8 |
| 1.0 MHz | 2.6 |

Basic circuit layout, The common V offset lines are grounded during testing.