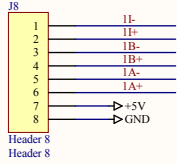
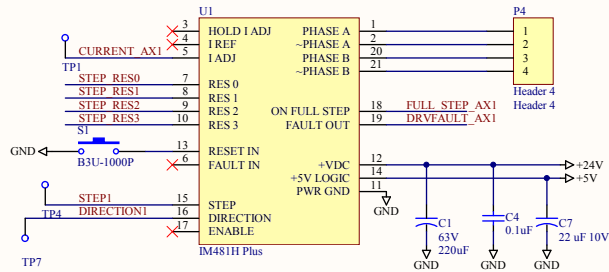


AXIS 1



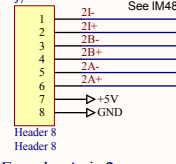
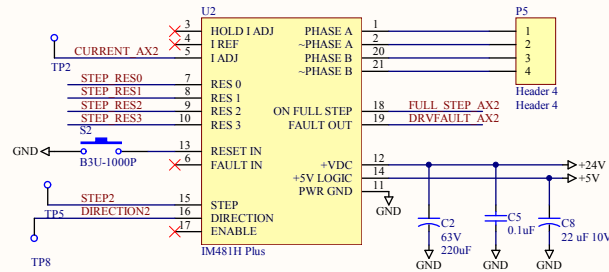
Encoder Axis 1

See IM481 Data sheet for cap layout
Need to spec 220 uF 35V (see data sheet in M2 folder)

Motors will always be enabled
All axis will have the same step resolution

Motor current will be set by watching 'at rest' signal for each axis on the PMD chip. When 'at rest' DAC will go to programmed holding current. When moving, DAC will go to programmed run current. Will not use IREF and HOLD I ADJ pins on driver

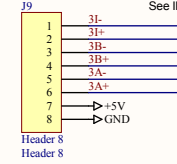
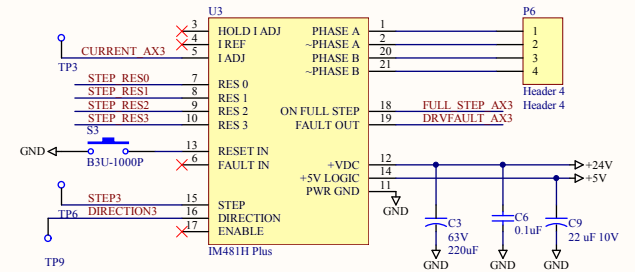
AXIS 2



Encoder Axis 2

See IM481 Data sheet for cap layout

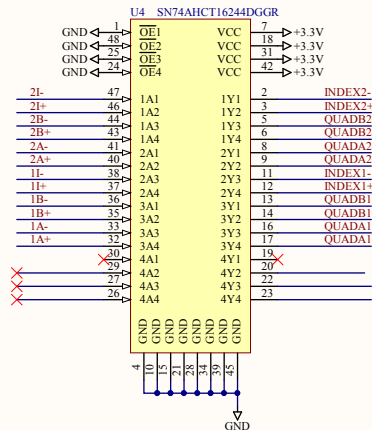
AXIS 3



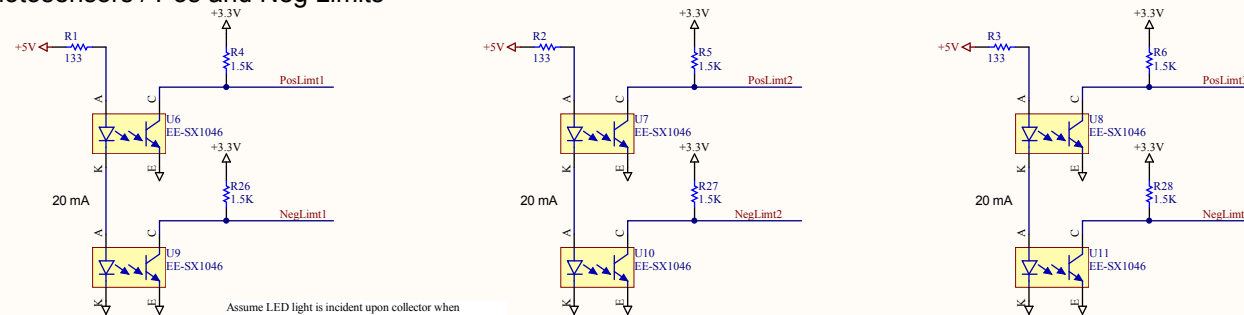
Encoder Axis 3

See IM481 Data sheet for cap layout

Translators +5V to 3.3V

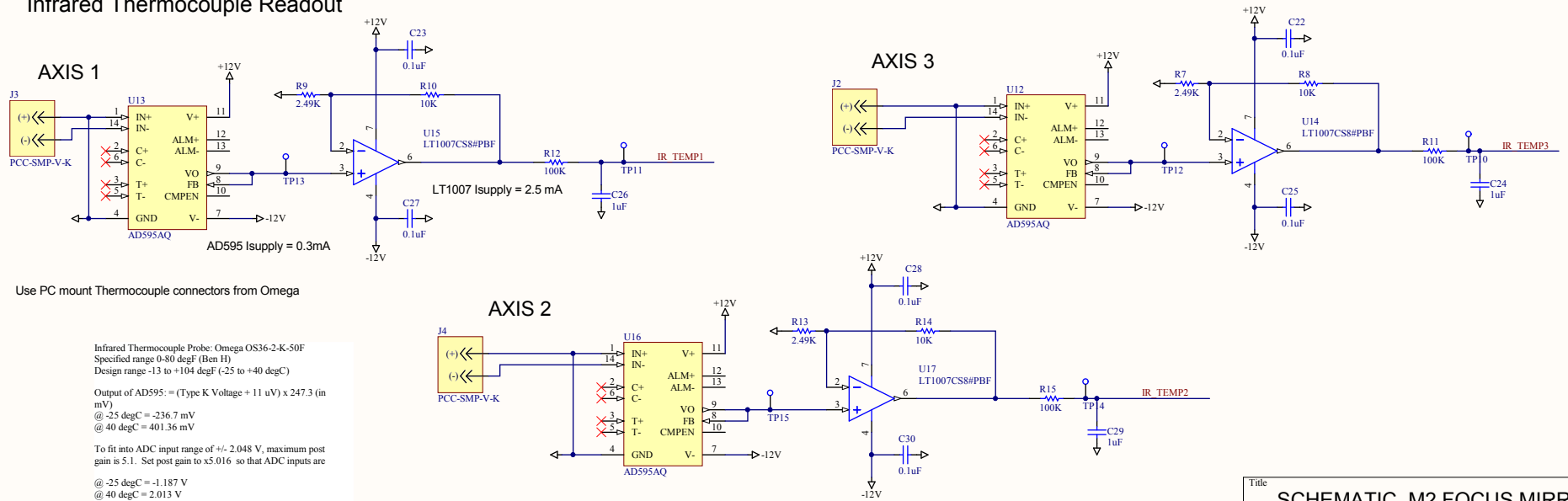


Photosensors / Pos and Neg Limits

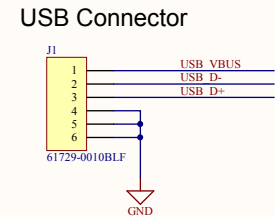
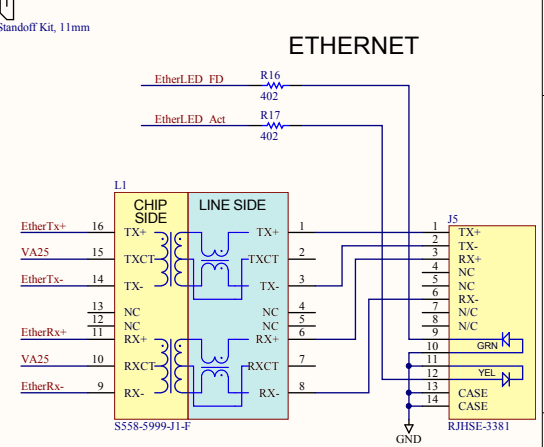
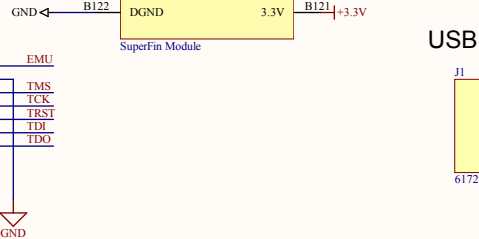
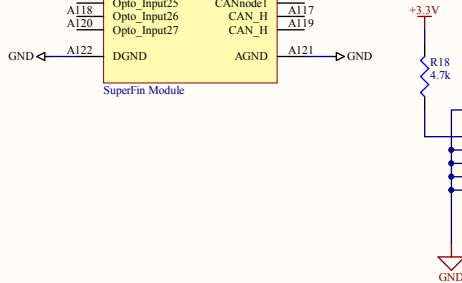


Assume LED light is incident upon collector when motion is NOT at limit. This means that transistor is conducting. Opto coupler at SuperFin input has diode COM connected to GND hence they are in parallel with transistor of photosensor. SuperFin has pull-down resistor on emitter of opto transistor. So when photosensor is ON, no current is going through SuperFin opto and PMD chip sees a LOW as it should. When limit is reached, photosensor does not conduct, current goes through SuperFin input diode and input to PMD chip goes HIGH.

Infrared Thermocouple Readout

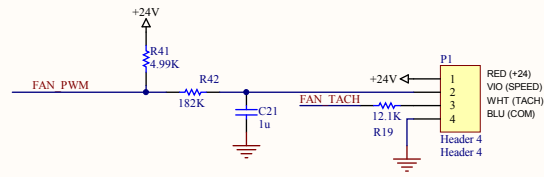


Title		
Size	Number	Revision
B	780-00012	2
Date:	7/6/2011	Sheet 2 of
File:	\\.\780-00012-P2_rev2 Sch M2 Focus Drive SchDocBy:	

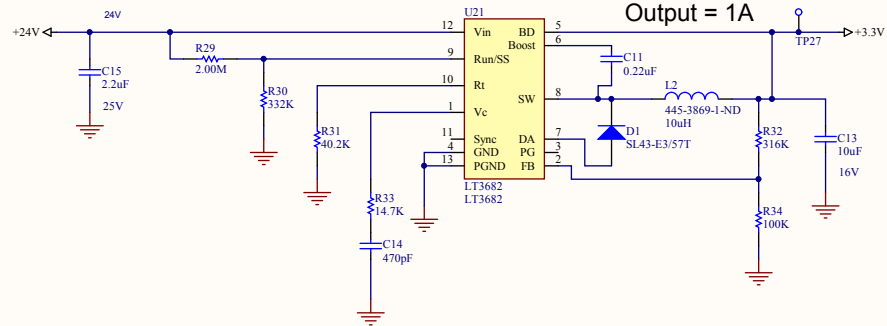


Title			SCHEMATIC, M2 FOCUS MIRROR		
Size B	Number			Revision	
	780-00012			2	
Date:	7/6/2011		Sheet of		
File:	\\1780-00012-P3_rev2 Sch M2 Focus Drive\SchDocBv.				

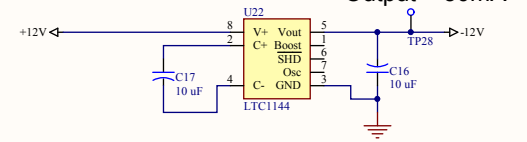
TOP FAN DRIVE



24V to 3V step-down

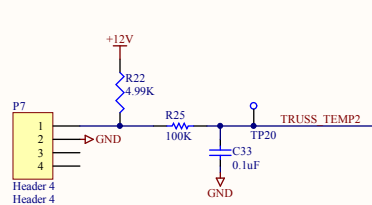
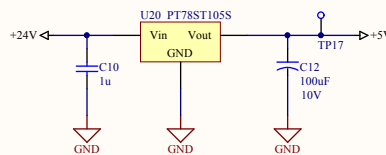
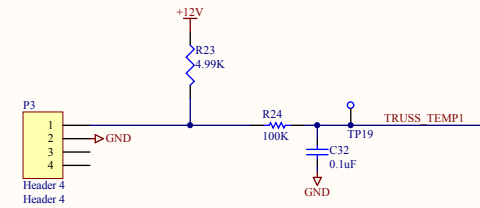
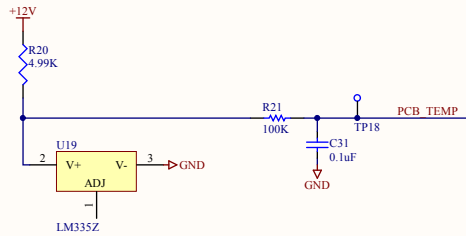
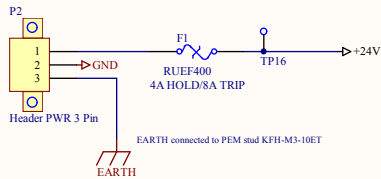
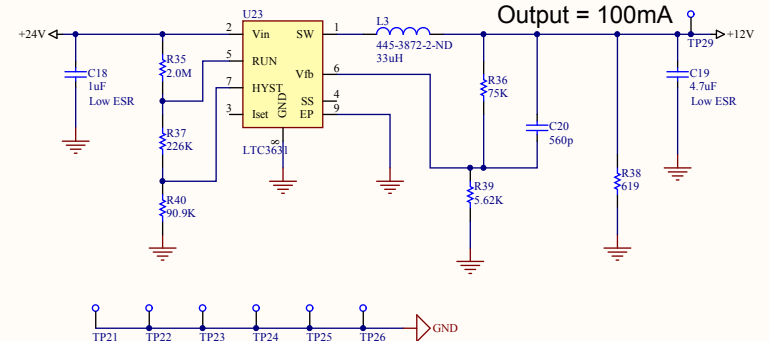


+12V to -12V inverter



Note on +/- 12V supplies:
Since +12V is driving -12V, the maximum balanced current is 50 mA

24V to 12V step-down



Title		SCHEMATIC, M2 FOCUS MIRROR	
Size	Number	Revision	
B	780-00012	2	
Date:	7/6/2011	Sheet of	
File:	\\780-00012-P4_rev2 Sch M2 Focus Drive\Sch008v		

NOTES (UNLESS OTHERWISE SPECIFIED):

GENERAL

- 1) PCB IS 12-LAYER, .062" THICK.
- 2) CONSTRUCTION IS SOLDER-MASK-OVER-BARE-COPPER (SMOBC).
- 3) ACCEPTABILITY SHALL BE BASED ON IPC-A-600, CLASS 2.
- 4) THE FOLLOWING GERBER R5274X PHOTO TOOL FILES SHALL BE USED TO DEFINE ALL CIRCUIT FEATURES:

*GTL — TOP LAYER GERBER DATA
*G1 — MID LAYER 1 GERBER DATA
*GP1 — INTERNAL PLANE LAYER 1 GERBER DATA
*GP2 — INTERNAL PLANE LAYER 2 GERBER DATA
*GP3 — INTERNAL PLANE LAYER 3 GERBER DATA
*GP4 — INTERNAL PLANE LAYER 4 GERBER DATA
*GP5 — INTERNAL PLANE LAYER 5 GERBER DATA
*GP6 — INTERNAL PLANE LAYER 6 GERBER DATA
*GBL — BOTTOM LAYER GERBER DATA
*GTO — TOP OVERLAY GERBER DATA
*GBO — BOTTOM OVERLAY GERBER DATA
*GTP — TOP-SIDE SOLDER PASTE MASK
*GBP — BOTTOM-SIDE SOLDER PASTE MASK
*GTS — TOP SOLDER MASK GERBER DATA
*GBS — BOTTOM SOLDER MASK GERBER DATA

- 5) THE PHOTO TOOL SHALL NOT BE COMPENSATED WITHOUT PRIOR ENGINEERING APPROVAL.
PCB DESIGNER: RICH LOBELL PH (805) 880-1621 FAX (805) 961-1792.

FABRICATION TOLERANCES

- 6) END PRODUCT CONDUCTOR WIDTHS AND PAD DIAMETERS SHALL NOT VARY MORE THAN 0.002" FROM THE 1:1 DIMENSIONS OF THE MASTER ARTWORK.
- 7) THE CONDUCTIVE PATTERN SHALL BE POSITIONED SO THAT THE LOCATION OF ANY PAD OR LAND SHALL BE WITHIN 0.005" DIAMETER TO THE TRUE POSITION OF THE HOLE IT CIRCUMSCRIBES.
- 8.1) DRILL TOLERANCES $\pm 0.003"$
- 8.2) ALL DRILL HOLE SIZES AND TOLERANCES APPLY AFTER PLATING.
- 9) THE MINIMUM ANNUAL RING SHALL BE 0.005".
- 10) BOW AND TWIST SHALL NOT EXCEED 0.010" PER INCH.
- 11) FOR PCB ROUTING DIMENSIONS: $JXX = \pm 0.005"$ $JX = \pm 0.020"$

MATERIAL

- 12) BASE MATERIAL IS FR4 EPOXY FIBERGLASS
- 13) SEE STACK-UP LEGEND FOR COPPER CLADDING CALL OUTS

PLATING

- 14) ALL HOLES AND CONDUCTIVE SURFACES SHALL BE PLATED WITH A MINIMUM OF 0.001" COPPER.
- 15) AFTER SOLDERMASK, ALL EXPOSED HOLES AND CONDUCTIVE SURFACES SHALL BE COATED WITH A GOLD IMMERSION PLATING TO PRESERVE SOLDERABILITY.

COATINGS

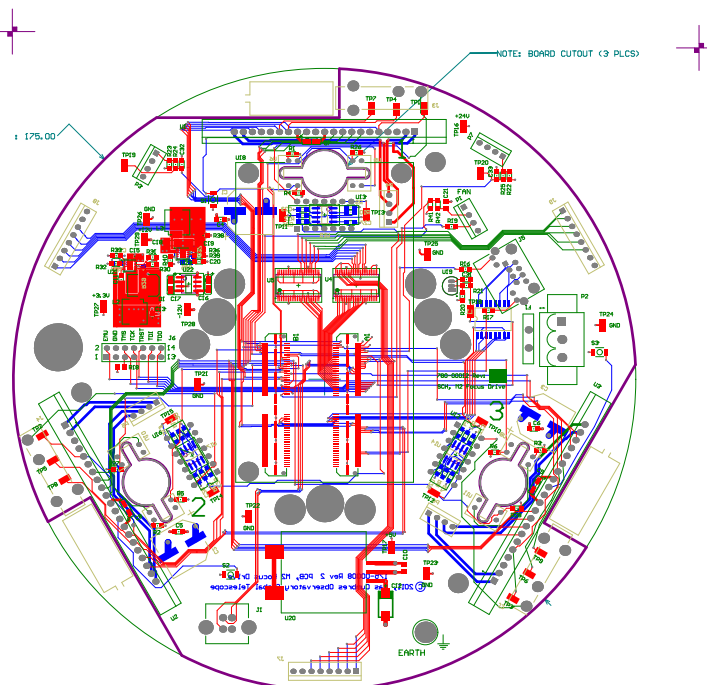
- 16) THE SOLDERMASK SHALL BE BLACK LIQUID PHOTO-IMAGEABLE PER IPC-SM-840, TYPE-B, CLASS 2.
- 17) THE SOLDERMASK REGISTRATION ALLOWANCE IS 0.003". THERE SHALL BE NO SOLDERMASK ON ANY SOLDER PAD OR LAND.

MARKING

- 18) THE LEGEND SHALL BE SCREEN-PRINTED USING PERMANENT YELLOW EPOXY INK.
- 19) THE SCREEN PRINTING REGISTRATION ALLOWANCE IS 0.007". THERE SHALL BE NO INK ON ANY SOLDER PAD OR LAND.
- 20) THE VENDOR CODE AND UL FLAMMABILITY RATING MAY BE ETCHED IN THE FOIL OR MARKED IN PERMANENT EPOXY INK (VENDORS OPTION).

ELECTRICAL TESTING

- 21) ALL BOARDS SHALL BE ELECTRICALLY TESTED TO THE SUPPLIED IPC-D-356A NET LIST FOR CONTINUITY, OPENS AND SHORTS.



175-00008 Rev 2, M2 Focus Drive
LAS CUMBRES OBSERVATORY 5/13/2011

*GTO—TOP OVERLAY GERBER DATA

Layer Stack Up Detail for: 175-00008 rev 1, PCB, M2 Focus Drive,PcbDoc

Layer Name	Copper cladding
Top Layer (*,GTL)	1/2 oz. (1 oz. Finished)
Mid-Layer 1 (*,G1)	1/2 oz
+24V (*,GP1)	1/2 oz
GND (*,GP2)	1/2 oz
+5V (*,GP3)	1/2 oz
+12V (*,GP4)	1/2 oz
-12V (*,GP5)	1/2 oz
+3.3V (*,GP6)	1/2 oz
Bottom Layer (*,GBL)	1/2 oz. (1 oz. Finished)

NOTICE
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PRIMARY PCB SPECIFICATIONS
(REFER TO COMPLETE SPEC LISTING AT LEFT FOR FURTHER DETAILS)

NUMBER OF LAYERS	—	9
FINISHED THICKNESS	—	.094
BASE MATERIAL	—	FR4
PLATING TYPE	—	GOLD IMMERSION
SOLDER MASK COLOR	—	BLACK

NOTE: Non-standard board thickness

Las Cumbres Observatory Global Telescope Network		Las Cumbres Observatory, Inc. 6740 Cortona Dr. Goleta, CA 93117 www.lcoglnet	
DATE 5/13/2011	DESIGNED BY Rich Lobell	DRAWN BY Rich Lobell	REVIEWED BY 1 : 1
PROJECT NAME 175-00008, M2 Focus Drive			
REV C	REV — GPT	REV 2	REV 1 OF 20