

NOTES:

1. Unless otherwise stated:
Resistors are 250 mW, 1% tolerance.
Capacitors are 50V, 10% tolerance.

2. Port and Net Name scopes for this project are:
Port NOT Global (connected via Sheet Symbols)
Net Name Local (connected on same page only)

3. Do not install (DNI).

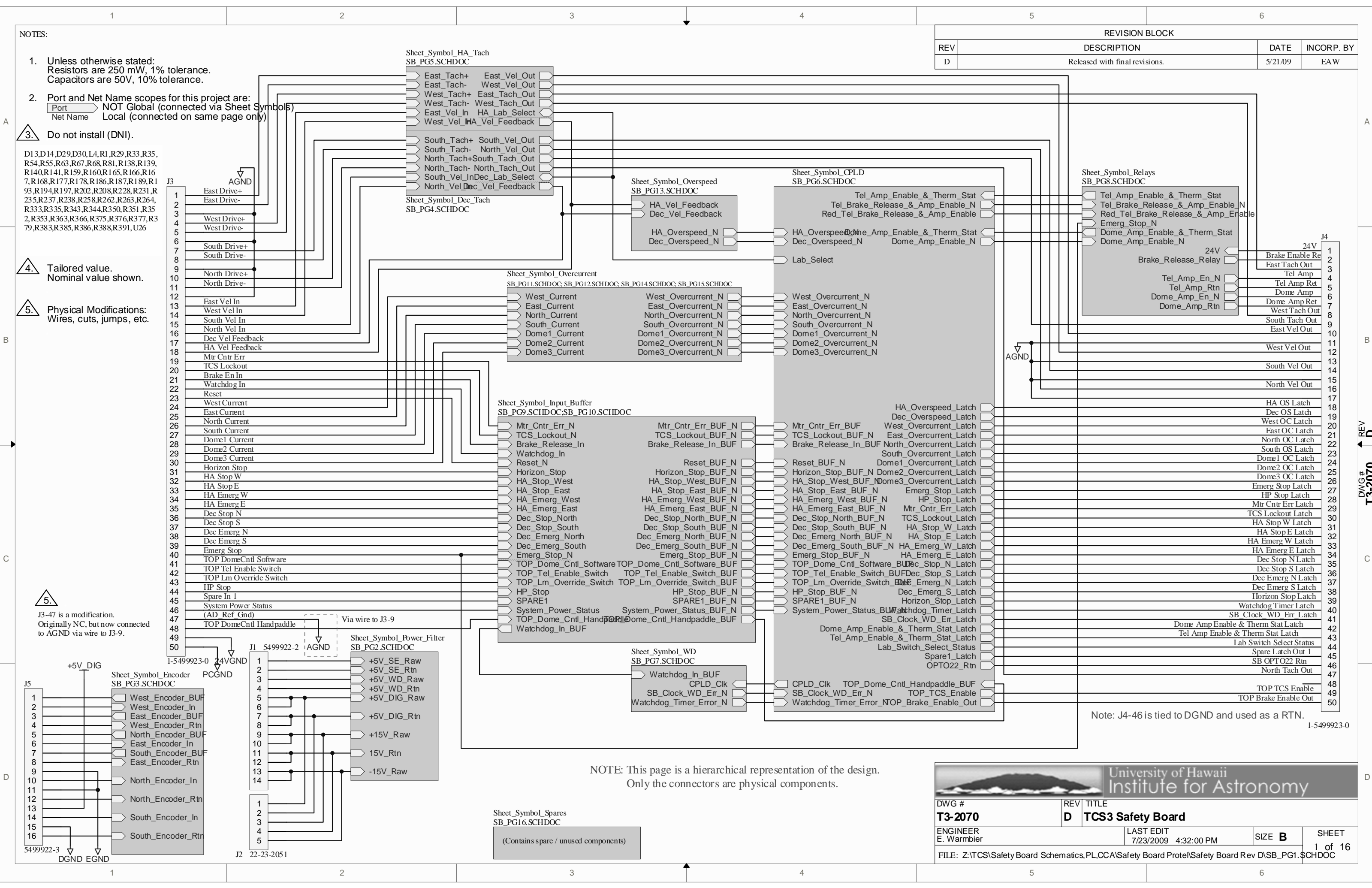
D13,D14,D29,D30,L4,R1,R29,R33,R35,
R54,R55,R63,R67,R68,R81,R138,R139,
R140,R141,R159,R160,R165,R166,R16
7,R168,R177,R178,R186,R187,R189,R1
93,R194,R197,R202,R208,R228,R231,R
235,R237,R238,R258,R262,R263,R264,
R333,R335,R343,R344,R350,R351,R35
2,R353,R363,R366,R375,R376,R377,R3
79,R383,R385,R386,R388,R391,U26

4. Tailored value.
Nominal value shown.

5. Physical Modifications:
Wires, cuts, jumps, etc.

5. J3-47 is a modification.
Originally NC, but now connected
to AGND via wire to J3-9.

REVISION BLOCK			
REV	DESCRIPTION	DATE	INCORP. BY
D	Released with final revisions.	5/21/09	EAW



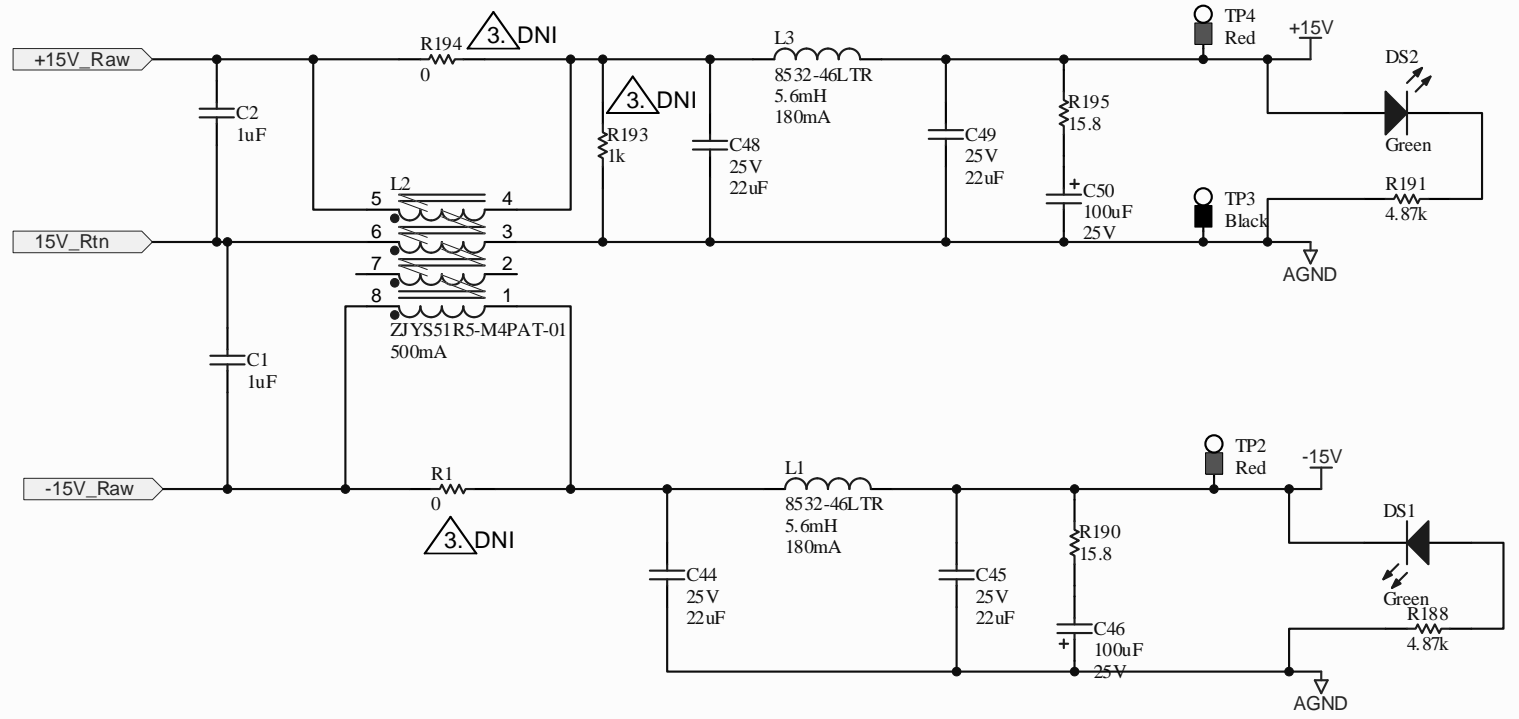
Note: J4-46 is tied to DGND and used as a RTN.
1-5499923-0

NOTE: This page is a hierarchical representation of the design.
Only the connectors are physical components.

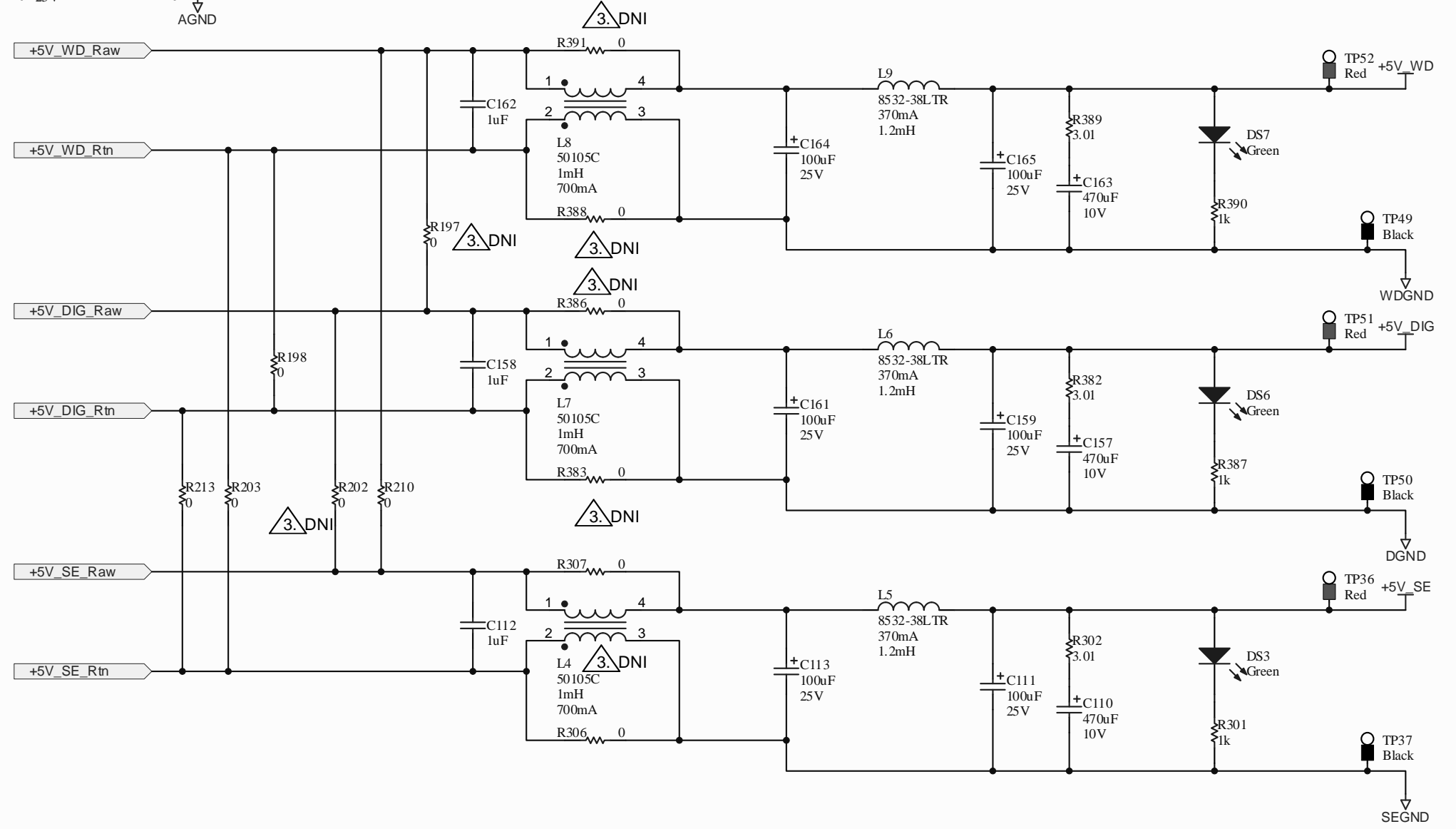
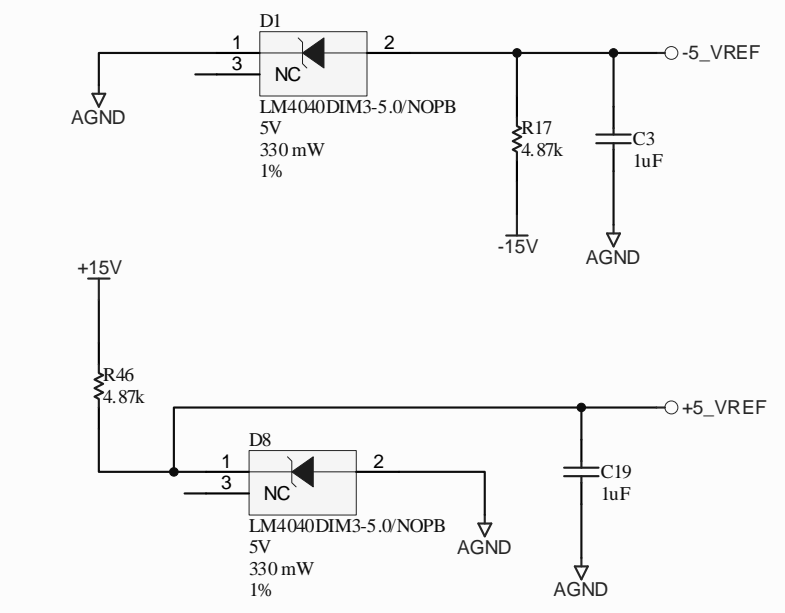
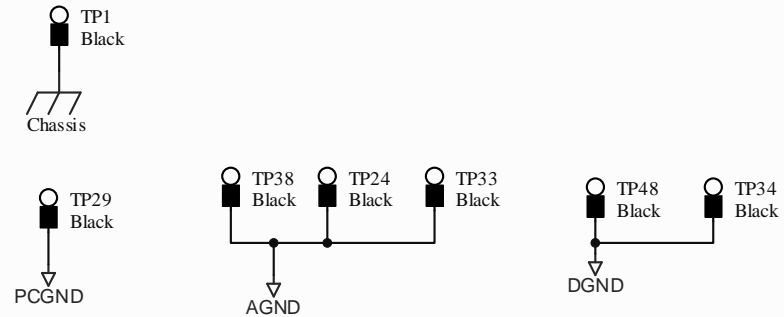
DWG #	REV	TITLE
T3-2070	D	TCS3 Safety Board
ENGINEER	LAST EDIT	SIZE
E. Warmber	7/23/2009 4:32:00 PM	B
FILE: Z:\TCS\Safety Board Schematics,PL,CCA\Safety Board Prote\Safety Board Rev D\SB_PG1.SCHDOC	SHEET	1 of 16

Sheet_Symbol_Spares
SB_PG16.SCHDOC
(Contains spare / unused components)

REV D
DWG# T3-2070



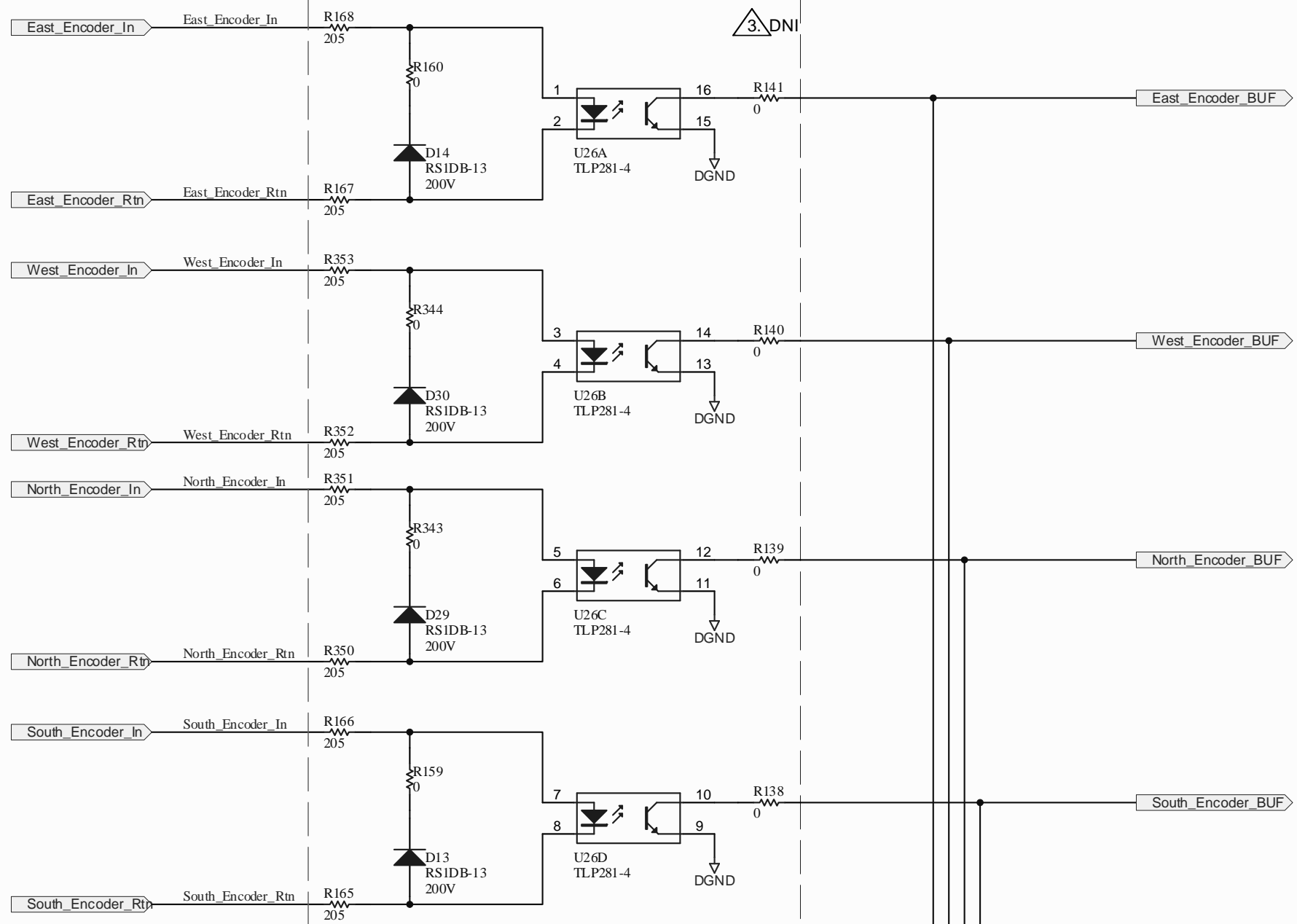
Note: DO NOT overlap input and output planes of filter in layout. This defeats the whole purpose by creating a bypass capacitance.



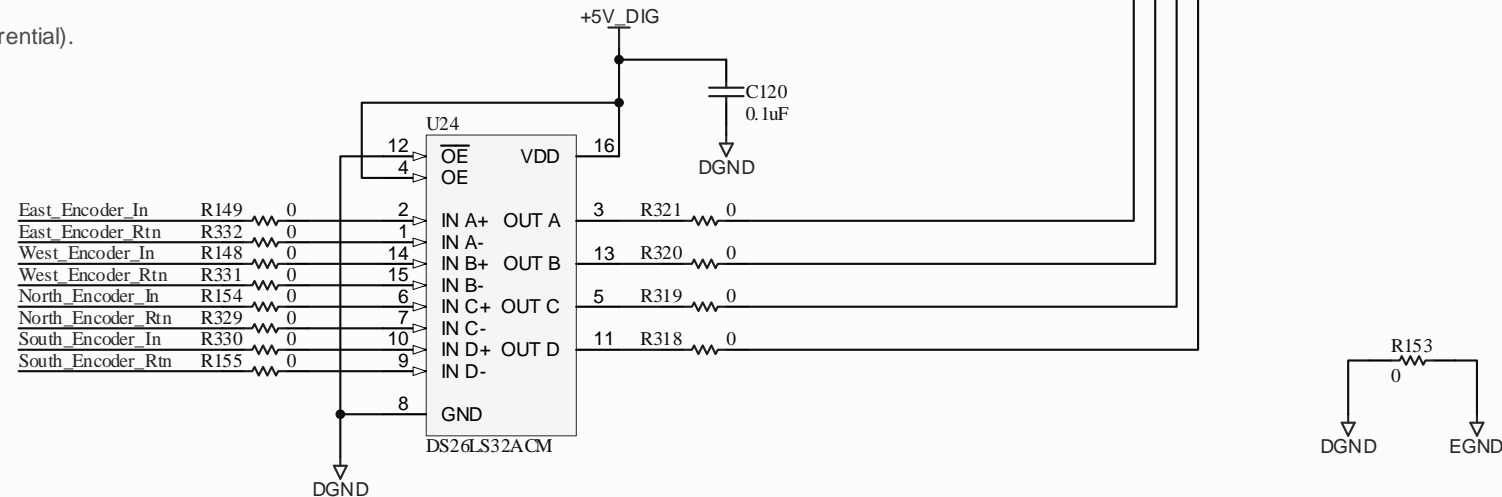
Power Filtering & References

DWG #	REV	SIZE	SHEET
T3-2070	D	B	2 of 16

DWG # T3-2070



Note: Input signals are RS422 (differential).



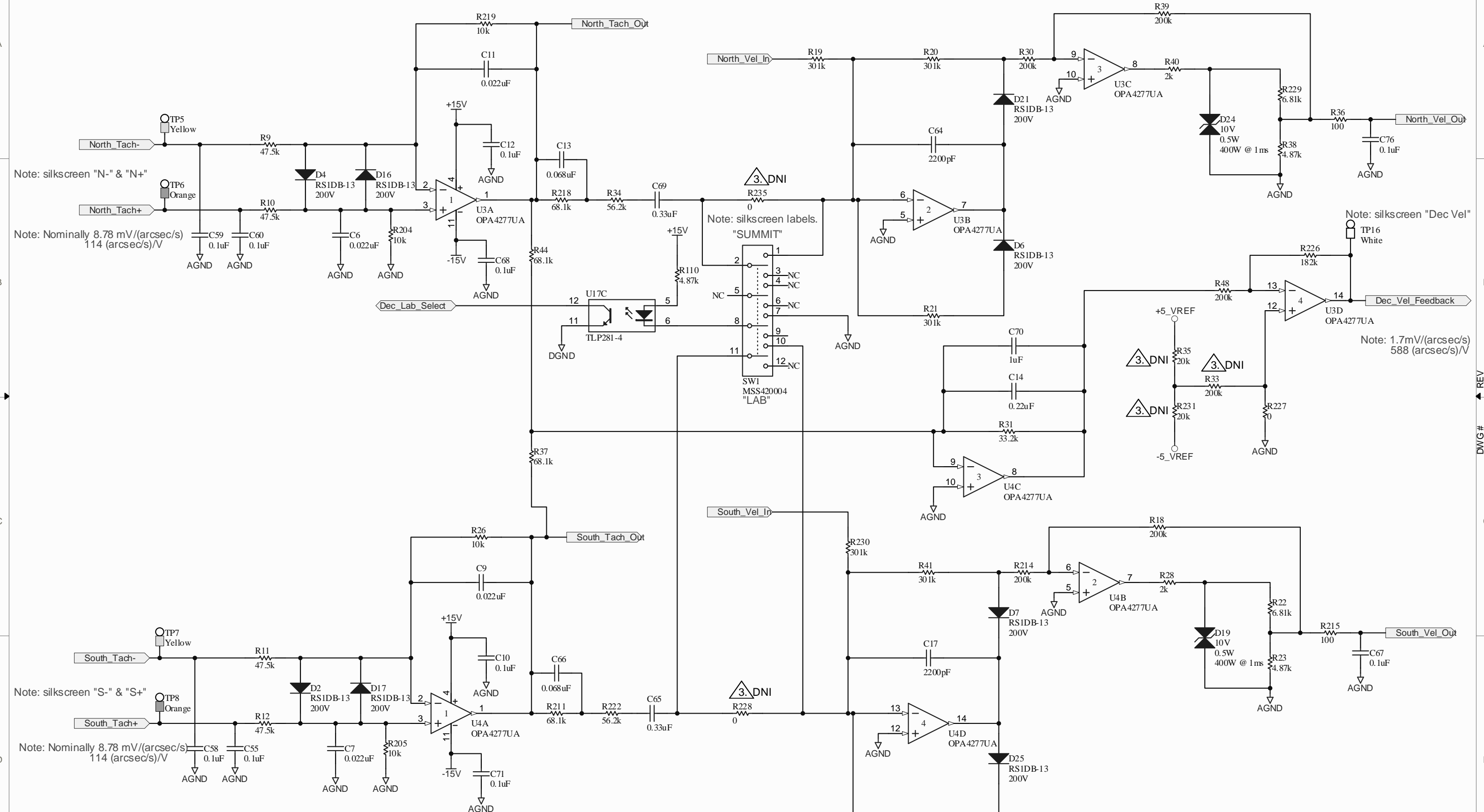
Note: All XXX_Encoder_In and XXX_Encoder_Rtn pairs should be matched to within 100 mil.
All XXX_Encoder_BUF traces should be matched to within 100 mil.

Axis Incremental Encoder Converters

DWG # T3-2070	REV D	SIZE B	SHEET 3 of 16
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DWG # T3-2070 REV D

REVISION BLOCK
SEE SHEET 1



Note: silkscreen "N-" & "N+"

Note: Nominally 8.78 mV/(arcsec/s)
114 (arcsec/s)/V

Note: silkscreen labels.
"SUMMIT"

Note: silkscreen "Dec Vel"

Note: 1.7mV/(arcsec/s)
588 (arcsec/s)/V

Note: silkscreen "S-" & "S+"

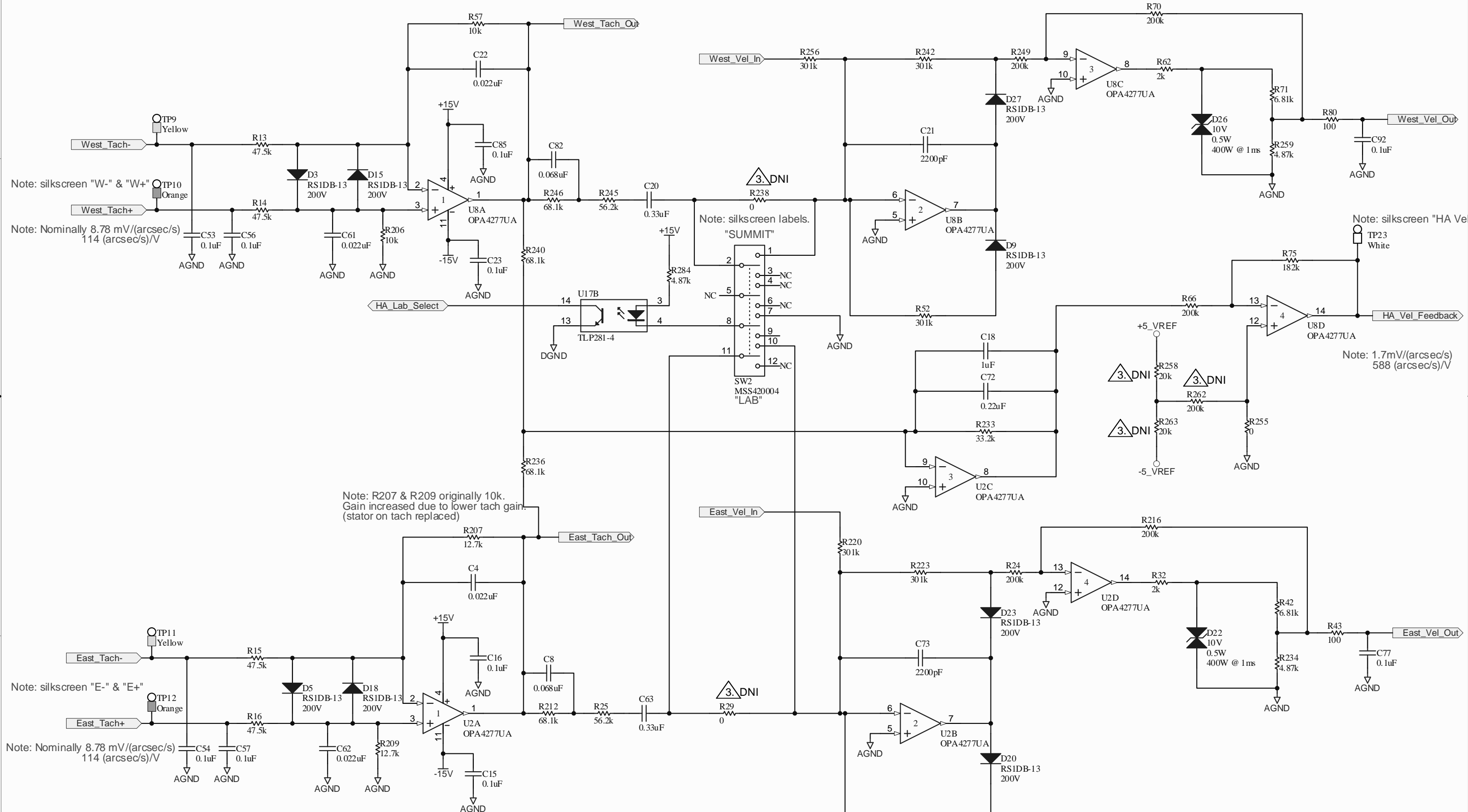
Note: Nominally 8.78 mV/(arcsec/s)
114 (arcsec/s)/V

Dec Tachometer & Servo Command

DWG # T3-2070	REV D	SIZE B	SHEET 4 of 16
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DWG # T3-2070

REV D



Note: silkscreen "W-" & "W+"
Note: Nominally 8.78 mV/(arcsec/s)
114 (arcsec/s)/V

Note: silkscreen labels.
"SUMMIT"

Note: silkscreen "HA Vel"

Note: R207 & R209 originally 10k.
Gain increased due to lower tach gain.
(stator on tach replaced)

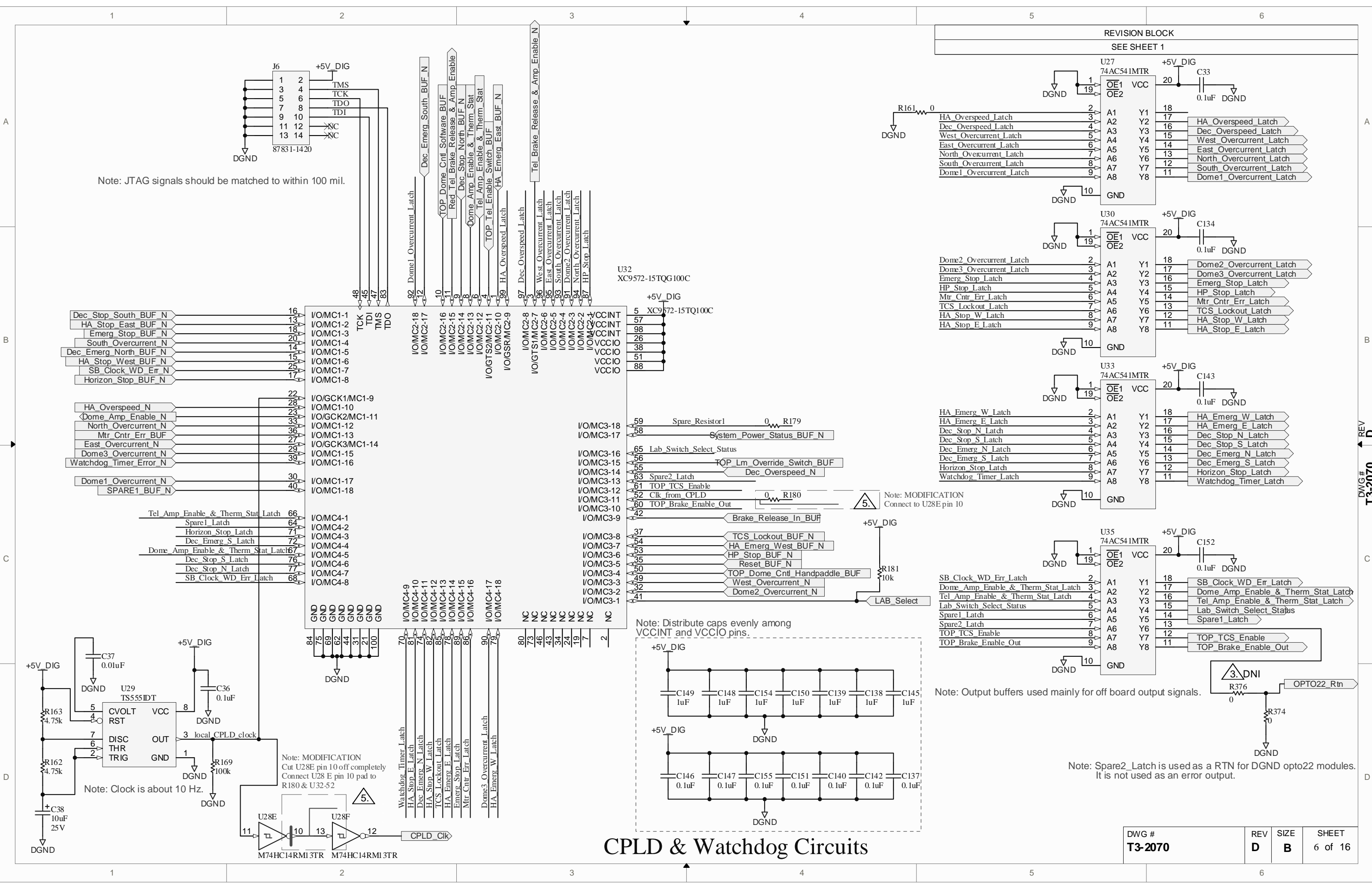
Note: silkscreen "E-" & "E+"
Note: Nominally 8.78 mV/(arcsec/s)
114 (arcsec/s)/V

HA Tachometer & Servo Command

DWG # T3-2070	REV D	SIZE B	SHEET 5 of 16
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DWG # T3-2070

REV



Note: JTAG signals should be matched to within 100 mil.

Note: MODIFICATION
Cut U28E pin 10 off completely
Connect U28 E pin 10 pad to
R180 & U32-52

Note: Clock is about 10 Hz.

Note: Distribute caps evenly among
VCCINT and VCCIO pins.

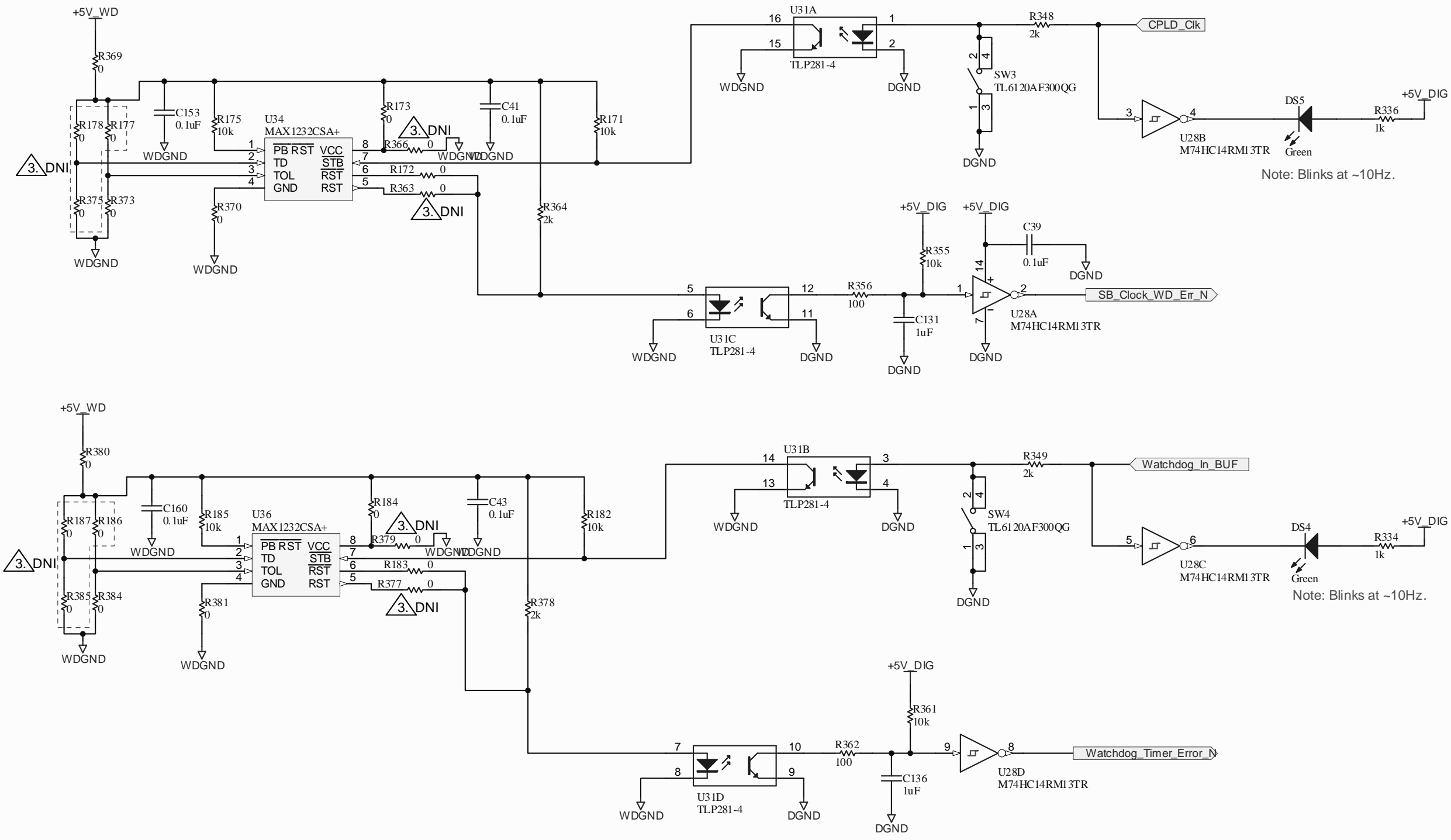
Note: Output buffers used mainly for off board output signals.

Note: Spare2_Latch is used as a RTN for DGND opto22 modules.
It is not used as an error output.

CPLD & Watchdog Circuits

DWG #	REV	SIZE	SHEET
T3-2070	D	B	6 of 16

REV D
DWG# T3-2070



Note: Blinks at ~10Hz.

Note: Blinks at ~10Hz.

Note: The 0 ohm jumpers make it possible to use another watchdog IC. For example, a PIC 16F629 microcontroller could be programmed as a watchdog IC.

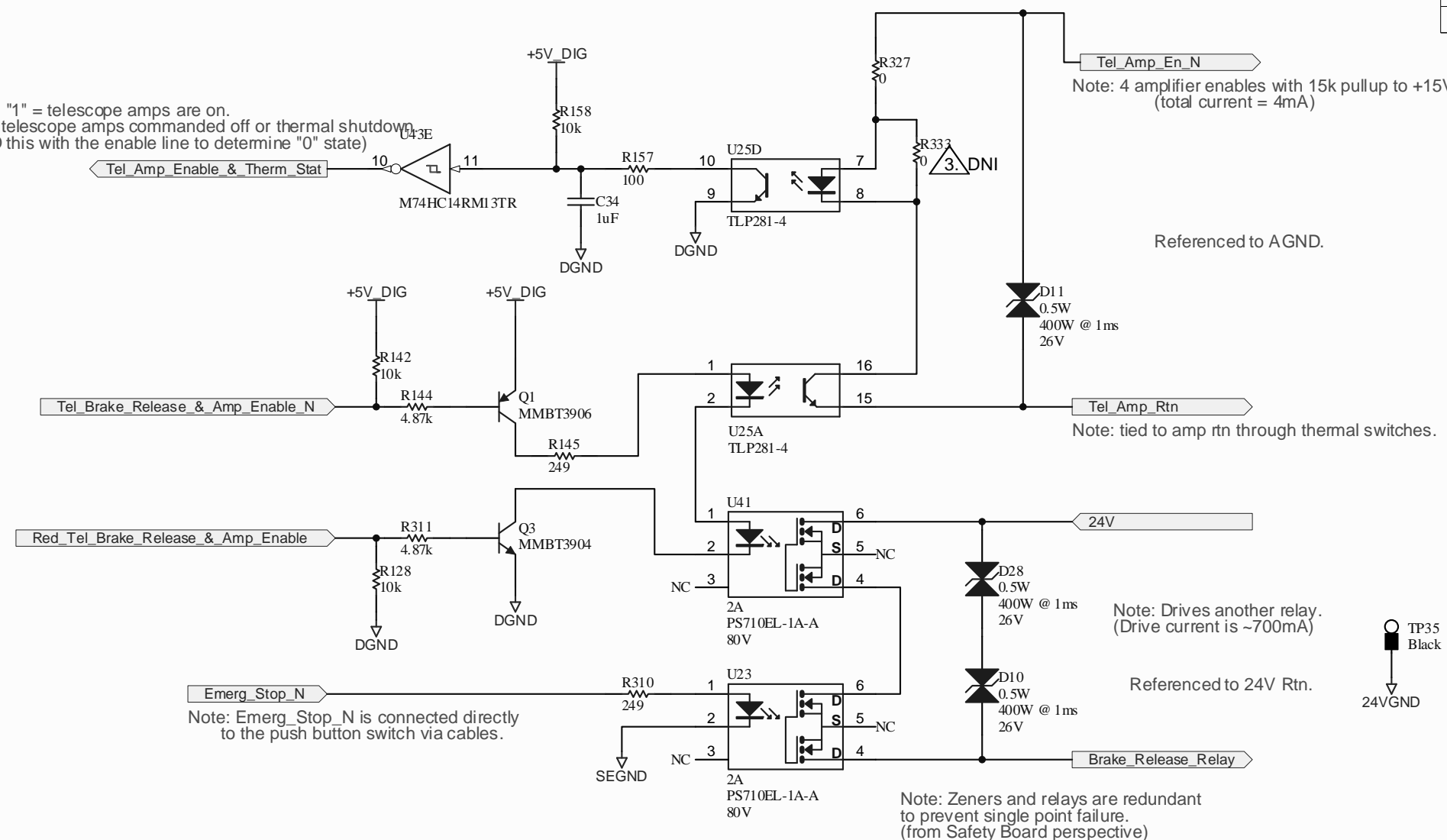
Watchdog Circuits

DWG # T3-2070	REV D	SIZE B	SHEET 7 of 16
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DWG # T3-2070

REV D

Note: "1" = telescope amps are on.
"0" = telescope amps commanded off or thermal shutdown.
(AND this with the enable line to determine "0" state)



Note: 4 amplifier enables with 15k pullup to +15V.
(total current = 4mA)

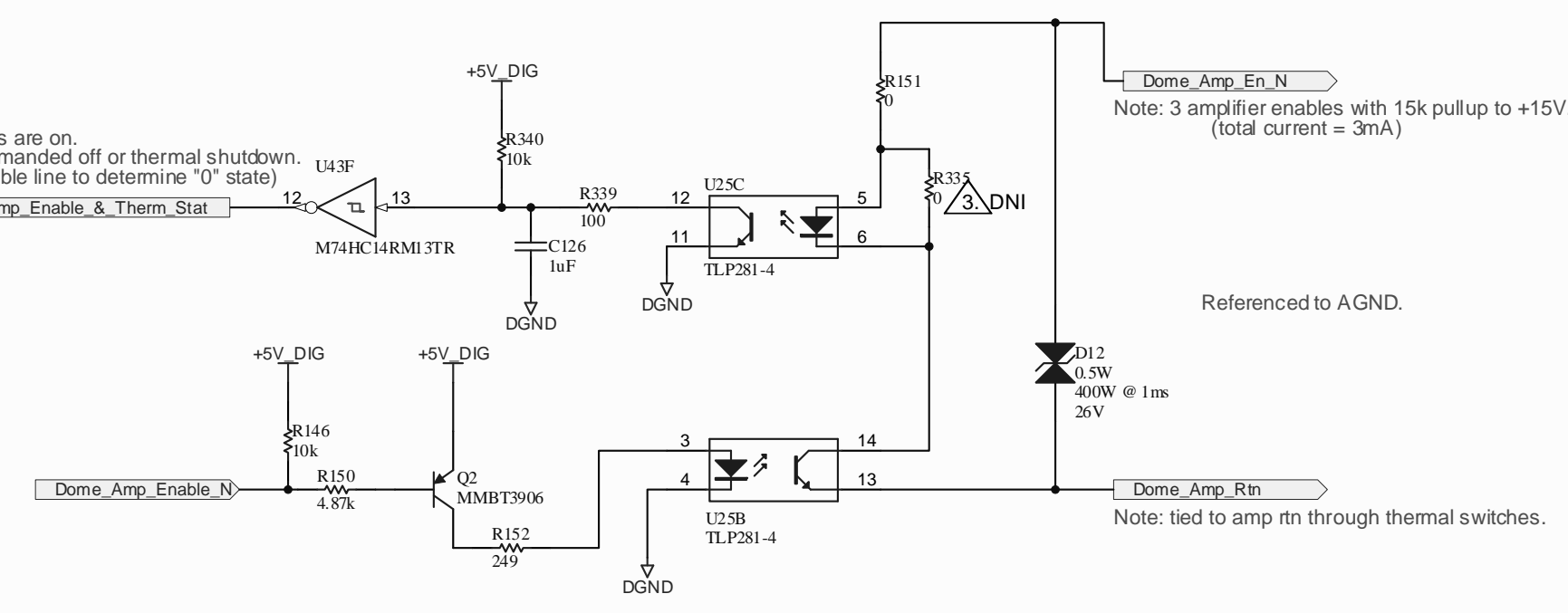
Note: tied to amp rtn through thermal switches.

Note: Drives another relay.
(Drive current is ~700mA)

Note: 3 amplifier enables with 15k pullup to +15V.
(total current = 3mA)

Note: tied to amp rtn through thermal switches.

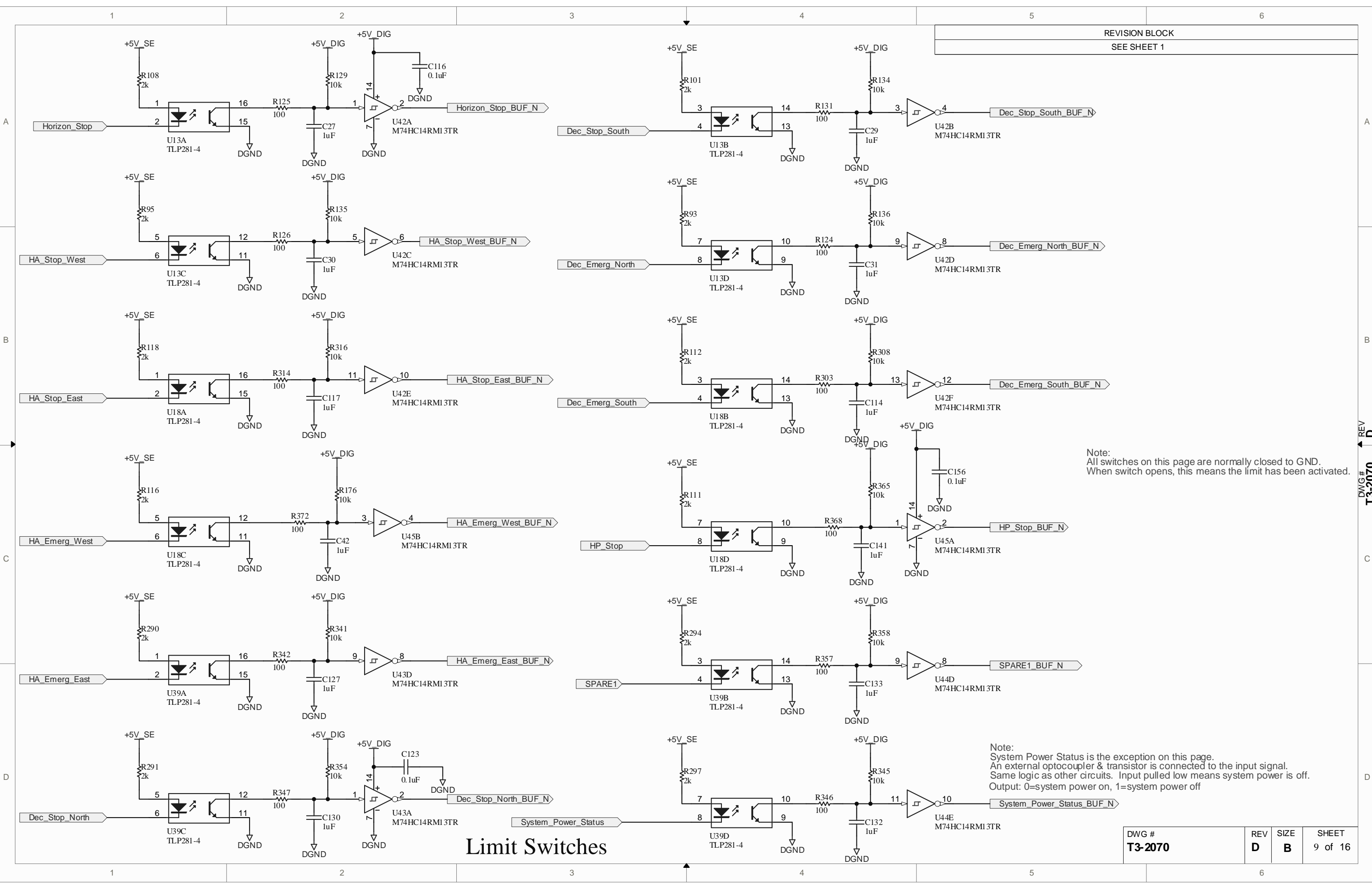
Note: "1" = dome amps are on.
"0" = dome amps commanded off or thermal shutdown.
(AND this with the enable line to determine "0" state)



Relays - Brake, Telescope Amp, Dome Amps

DWG #	REV	SIZE	SHEET
T3-2070	D	B	8 of 16

DWG # T3-2070 REV D



REVISION BLOCK
SEE SHEET 1

Note:
All switches on this page are normally closed to GND.
When switch opens, this means the limit has been activated.

Note:
System Power Status is the exception on this page.
An external optocoupler & transistor is connected to the input signal.
Same logic as other circuits. Input pulled low means system power is off.
Output: 0=system power on, 1=system power off

Limit Switches

DWG # T3-2070	REV D	SIZE B	SHEET 9 of 16
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DWG # T3-2070

A

B

C

D

A

B

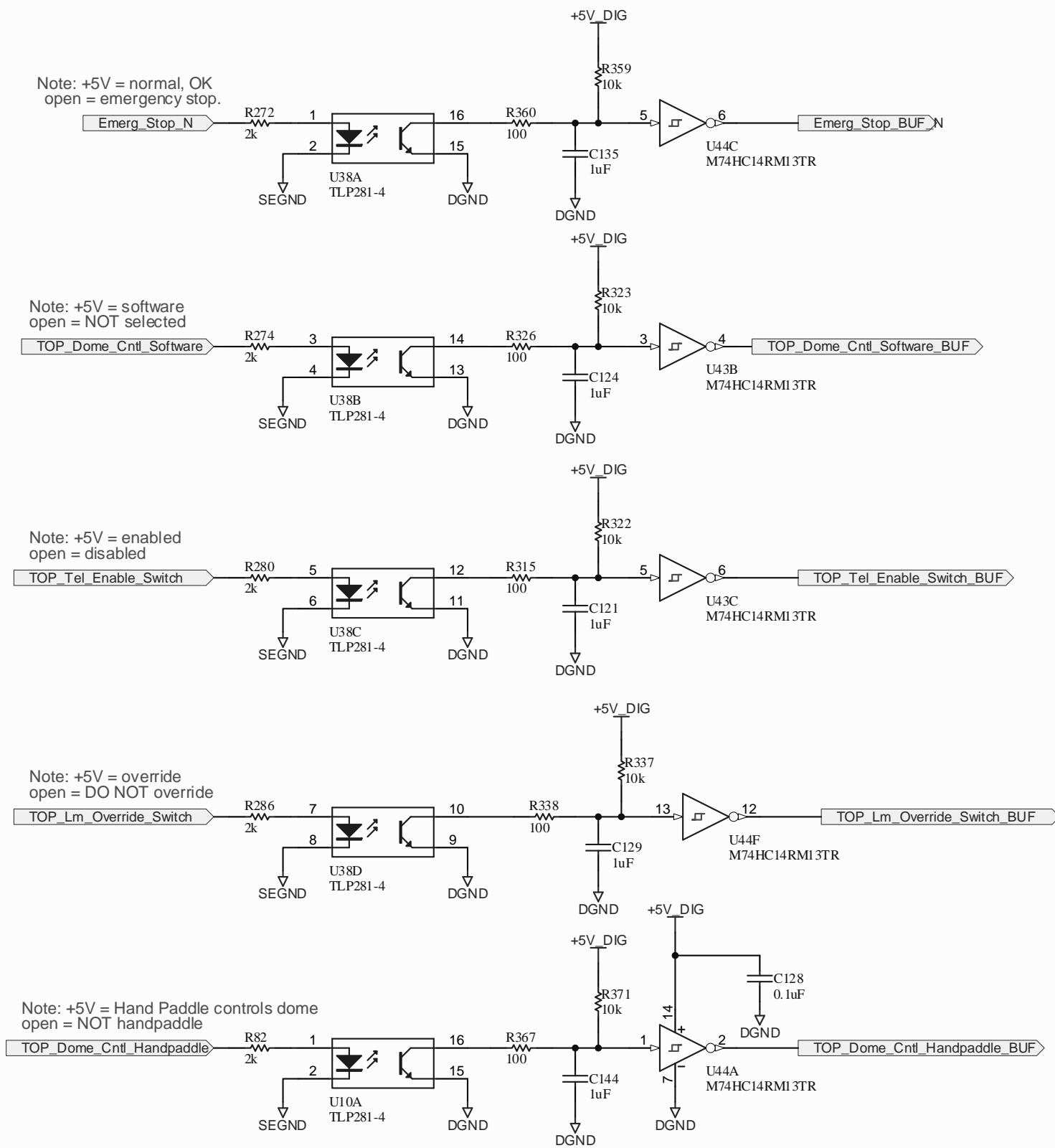
C

D

1 2 3 4 5 6

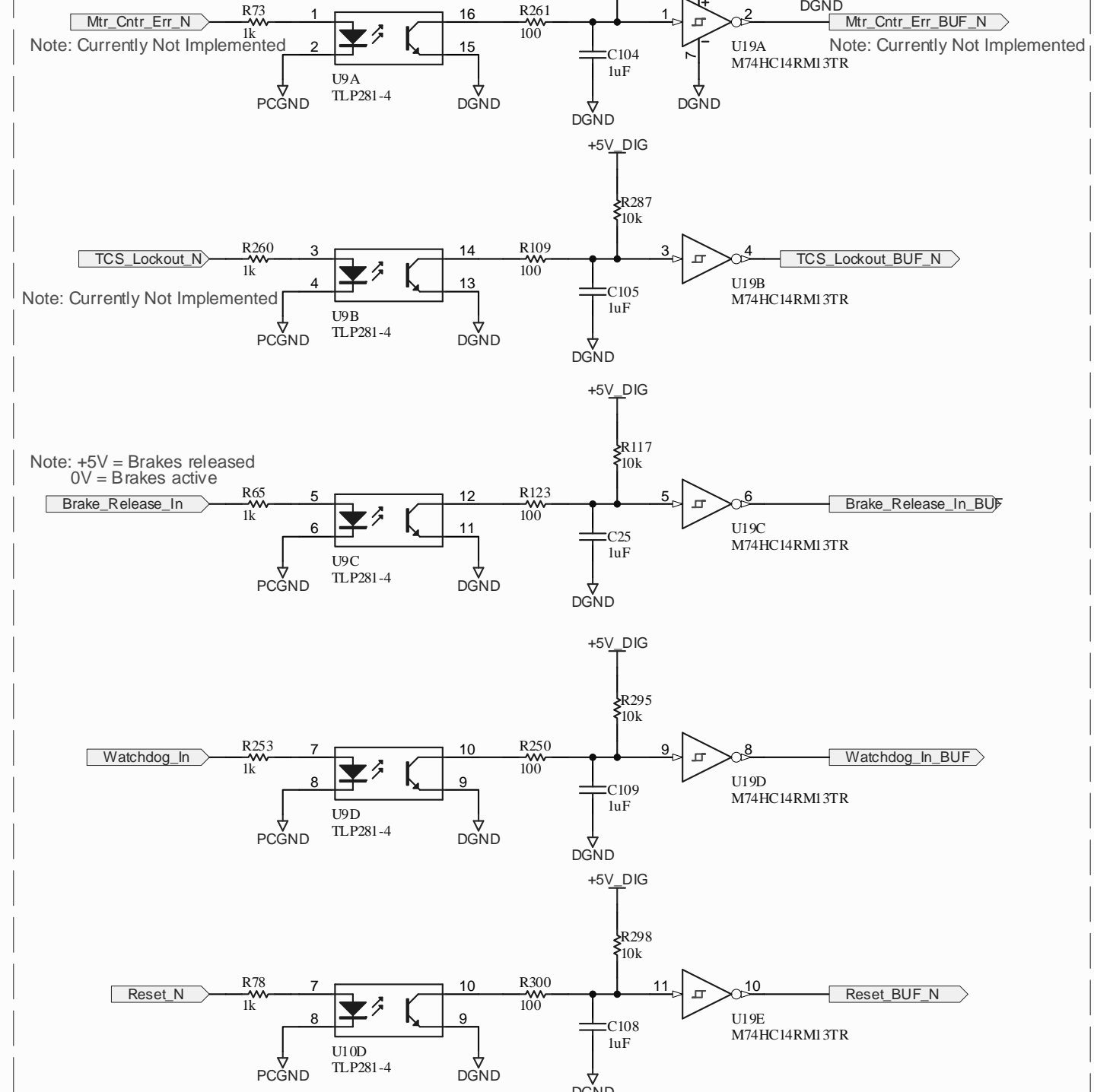
1 2 3 4 5 6

Limit Switches & Parallel Port



Parallel Port Inputs

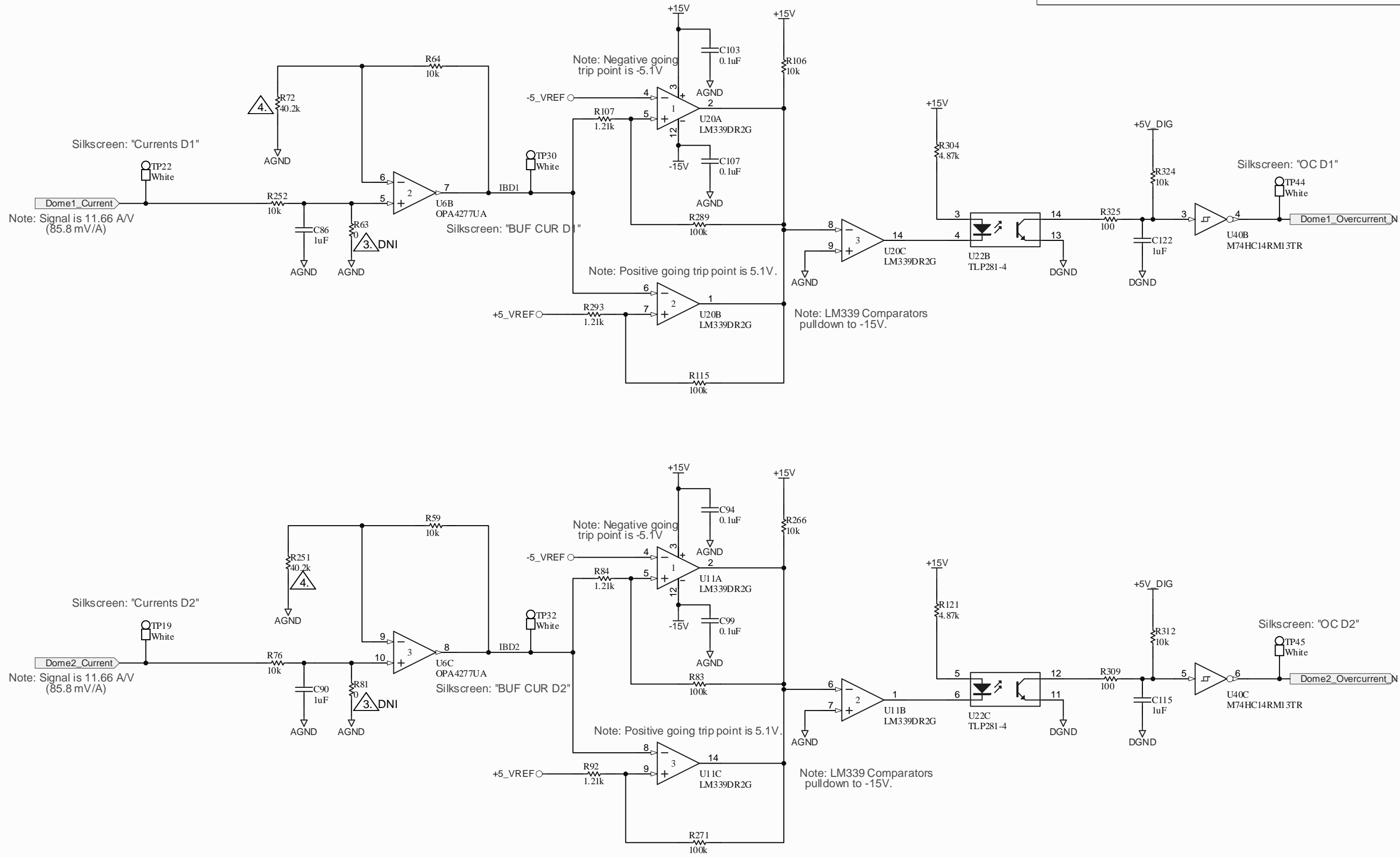
Note: Parallel Port drive is 2.6mA @ 2.4V (which equates to approximately Vs=5V and Rs=1k)



REVISION BLOCK
SEE SHEET 1

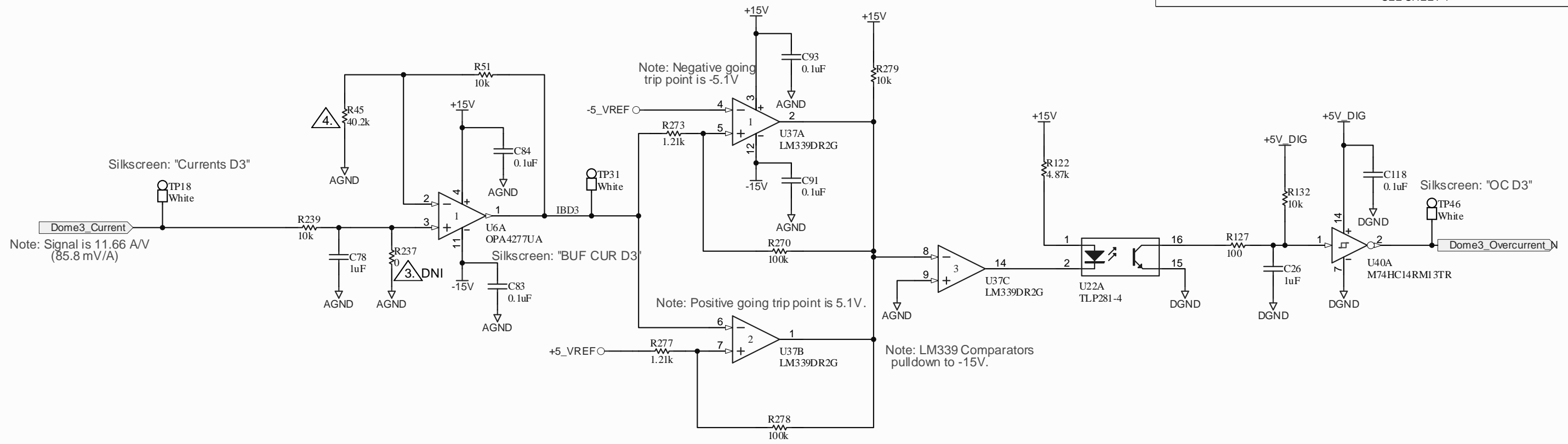
DWG # T3-2070	REV D	SIZE B	SHEET 10 of 16
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DWG # T3-2070 REV D



Dome Overcurrent

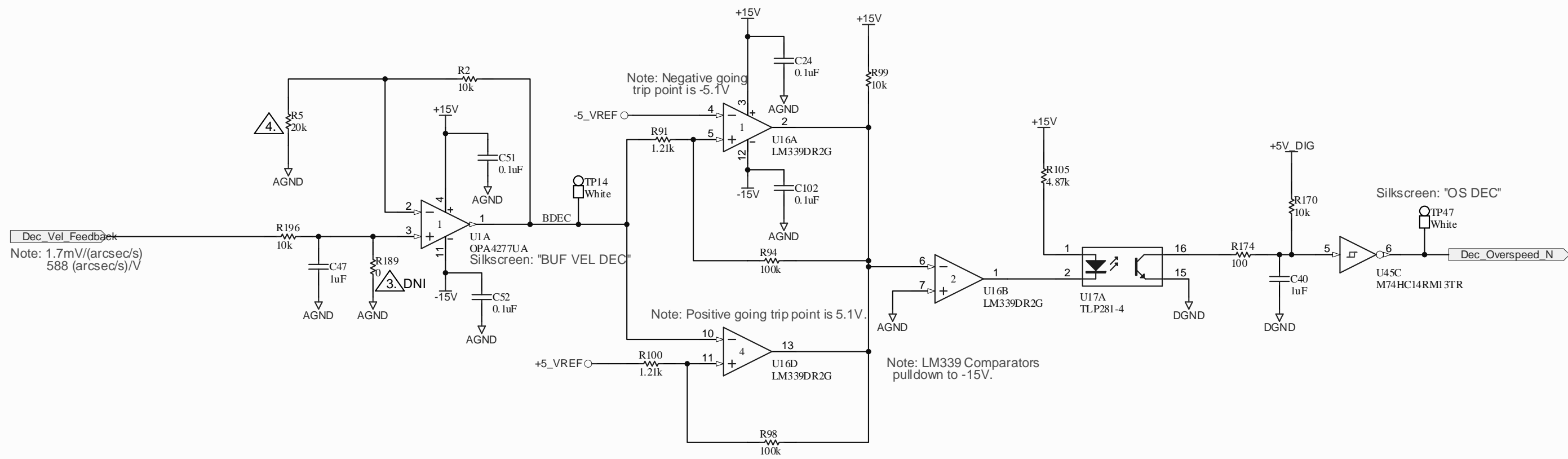
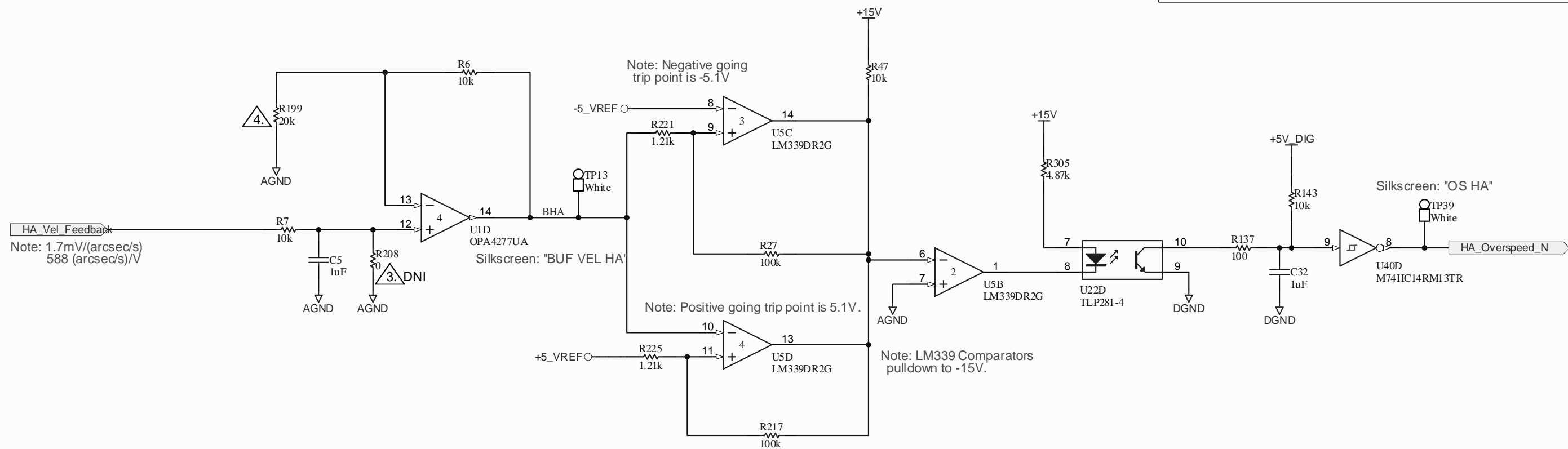
DWG # T3-2070	REV D	SIZE B	SHEET 11 of 16
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Dome Overcurrent

DWG # T3-2070	REV D	SIZE B	SHEET 12 of 16
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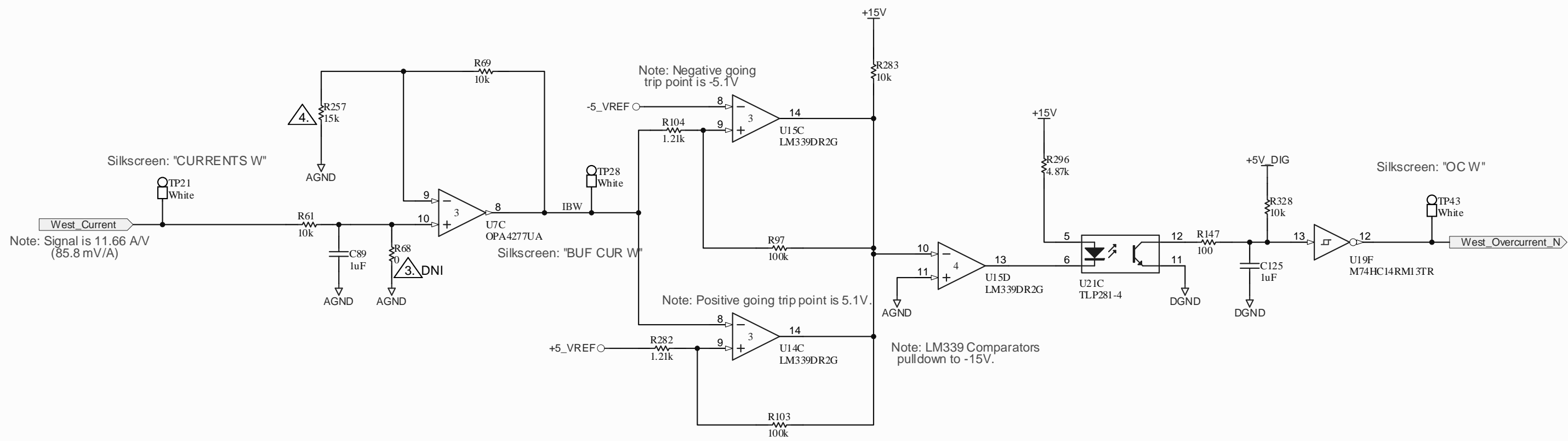
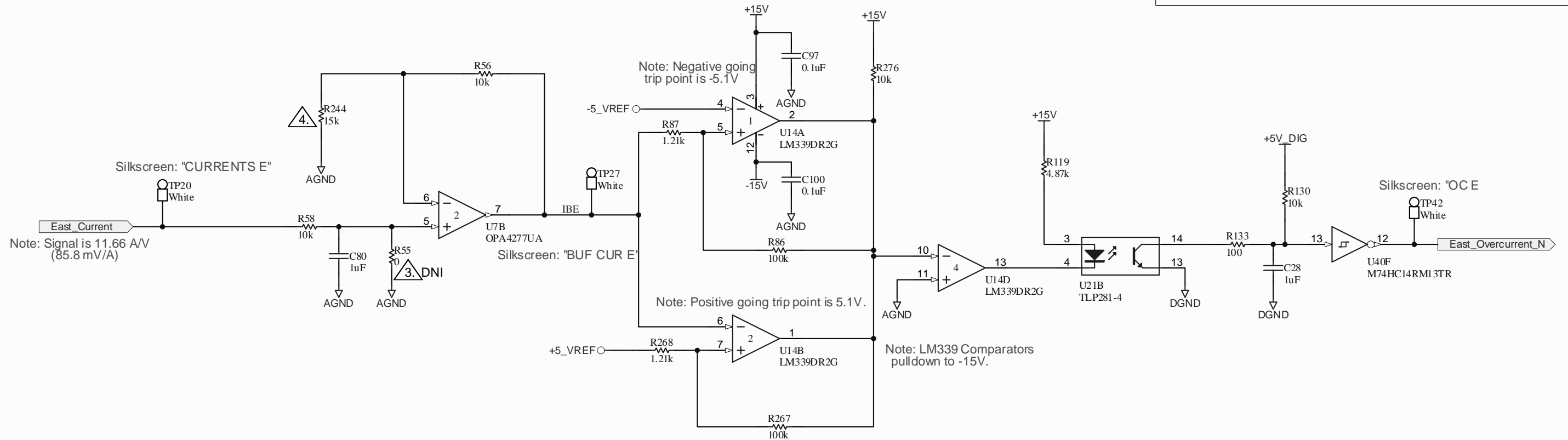
DWG # T3-2070 REV D



HA & Dec Overspeed

DWG # T3-2070	REV D	SIZE B	SHEET 13 of 16
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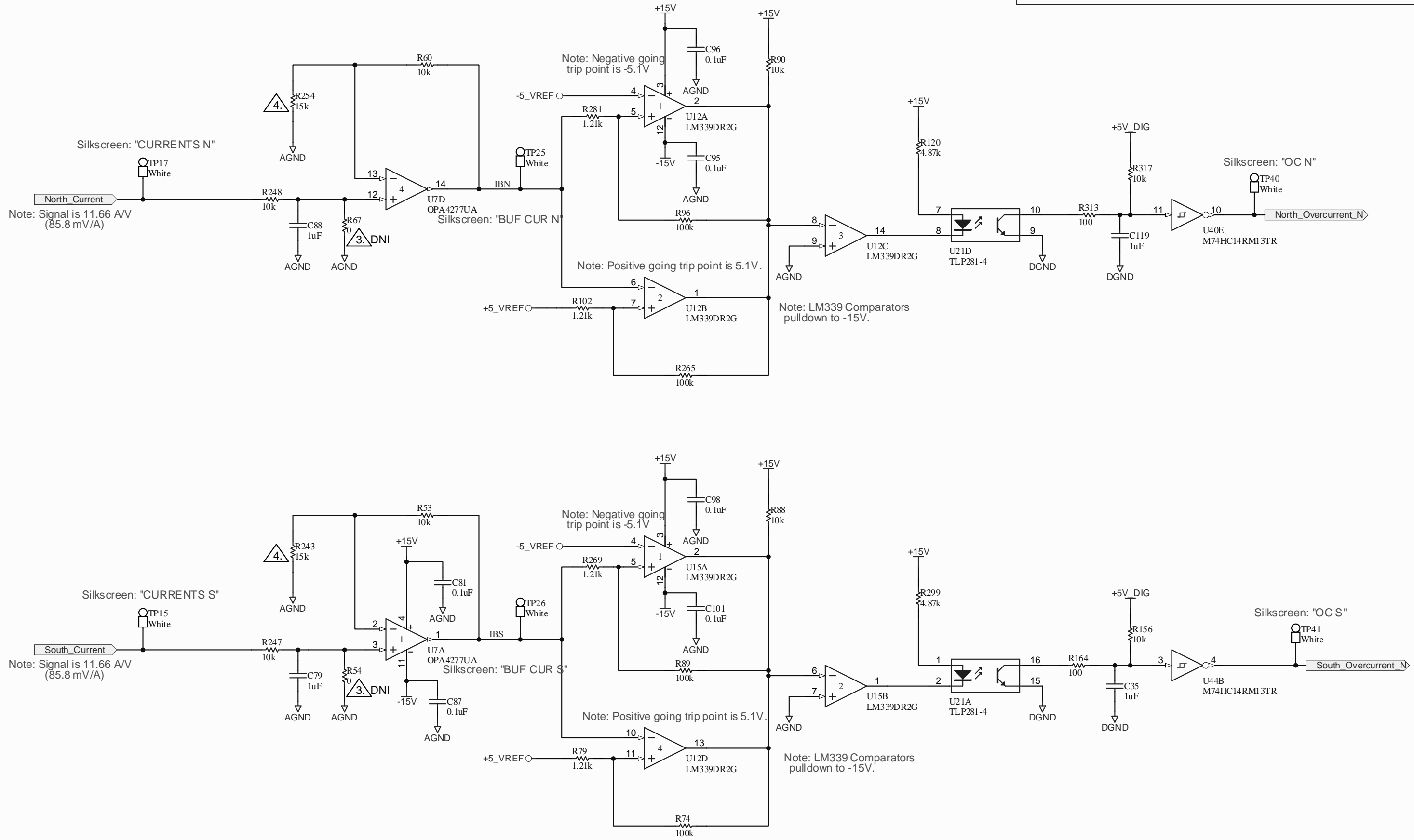
DWG # T3-2070 REV D



East & West Overcurrent

DWG # T3-2070	REV D	SIZE B	SHEET 14 of 16
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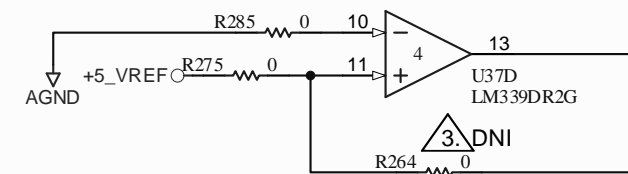
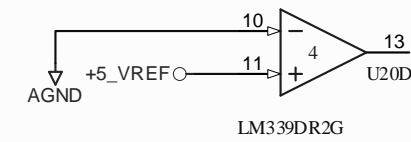
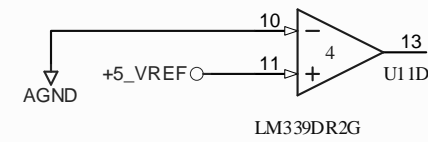
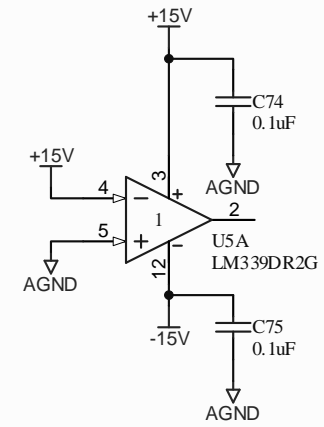
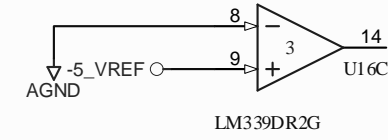
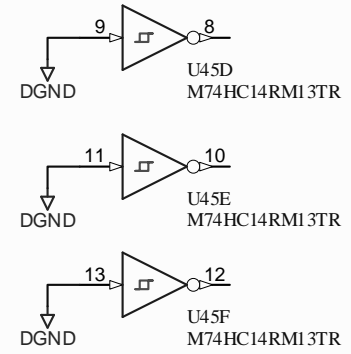
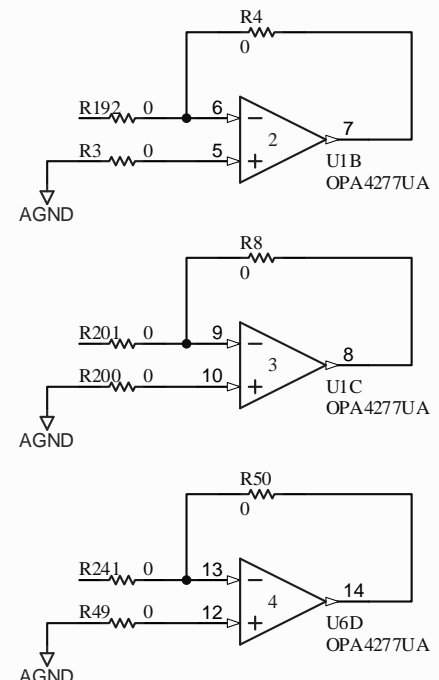
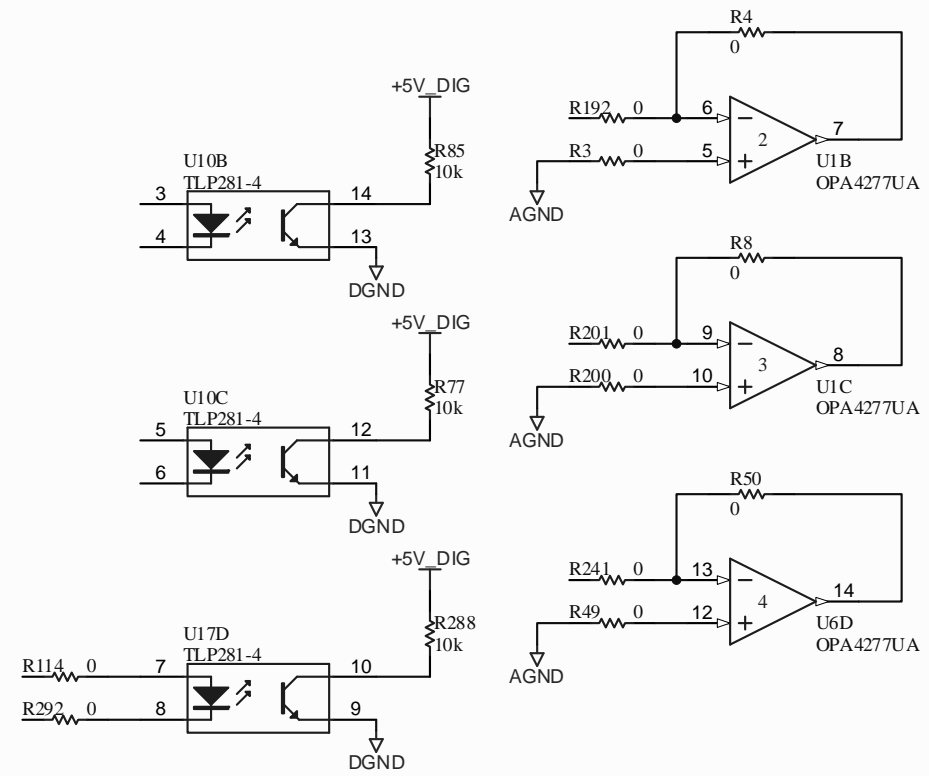
DWG # T3-2070 REV D



North & South Overcurrent

DWG # T3-2070	REV D	SIZE B	SHEET 15 of 16
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DWG # T3-2070 REV D



Spare / Unused Multipart Circuits

DWG # T3-2070 REV D