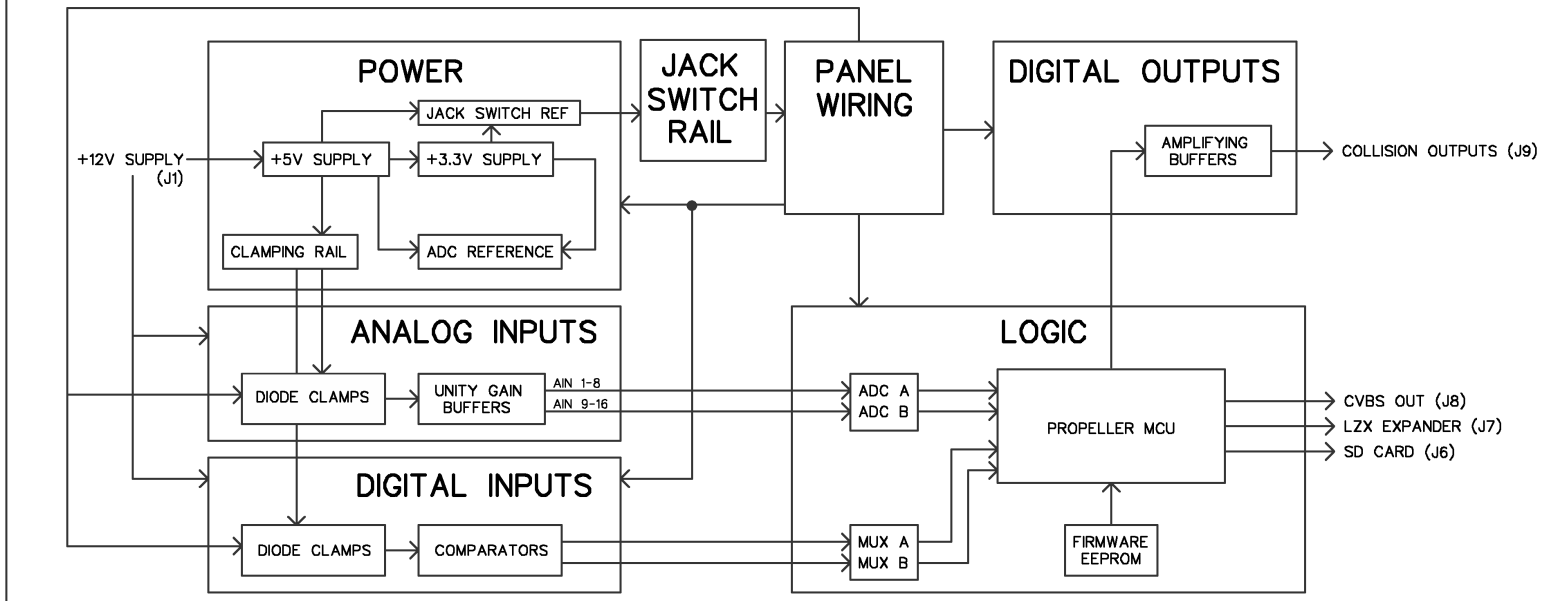
# MING MECCA WORLD CORE

DESIGNED BY JORDAN BARTEE IN PROVIDENCE, RI, WINTER 2013
REVISED IN FRIDAY HARBOR, WA, WINTER 2014

## BLOCK DIAGRAM




special stage systems

# POWER

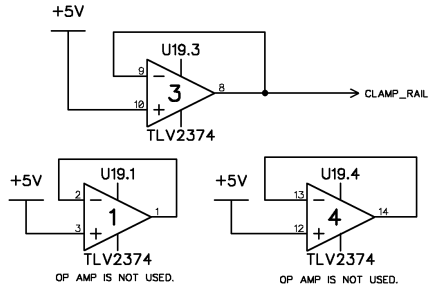
THE 7805 AND 7833 REGULATORS SHOULD BE HEATSUNK AND RATED FOR AT LEAST 200 mA EACH.

ALL CAPACITORS ARE CERAMIC EXCEPT WHERE NOTED.

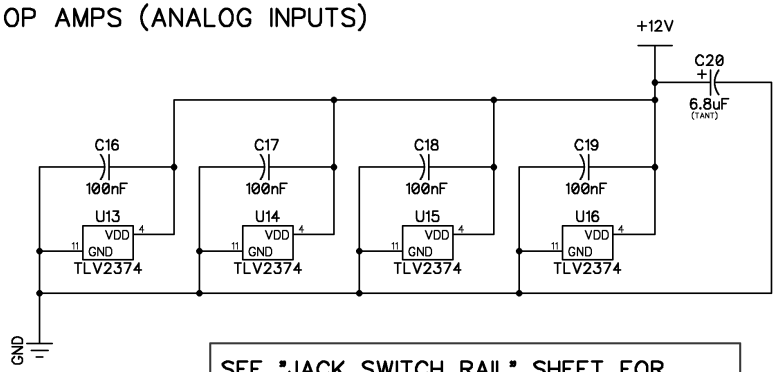
IN ADDITION TO THE MAIN PSU, SCHEMATICS ARE ALSO SHOWN FOR THE OP AMP AND COMPARATOR SUPPLIES, ADC REFERENCE, JACK SWITCH REFERENCE, AND PROTECTION DIODE CLAMPING RAIL. THE ABSOLUTE MINIMUM DECOUPLING CONFIGURATION IS SHOWN, CONSISTING OF A SINGLE 100nF CERAMIC CAPACITOR PER IC AND A 6.8uF TANTALUM CAPACITOR PER IC BLOCK. ALL ICS IN EACH BLOCK SHOULD BE GROUPED CLOSELY TOGETHER SINCE THEY SHARE THE TANTALUM CAPACITOR. ADDITIONAL DECOUPLING MAY BE NECESSARY DEPENDING ON PCB DESIGN.

GROUND PINS 5 AND 6 ON POWER CONNECTOR J1 ARE INTENTIONALLY LEFT UNCONNECTED TO PREVENT DAMAGING SHORTS FROM OCCURING IF J1 IS CONNECTED BACKWARDS DUE TO USER ERROR. PINS 1, 2, AND 13 - 15 ARE ALSO LEFT UNCONNECTED.

## CLAMPING RAIL




## OP AMPS (ANALOG INPUTS)




SEE "JACK SWITCH RAIL" SHEET FOR POWER RAIL INFO ON OP AMPS U20-U25)

## 12V SUPPLY

MULTIPLEXERS U7, U8
COMPARATORS U9 - U12
OP AMPS U13 - U19

## 5V SUPPLY

ADCS U5, U6

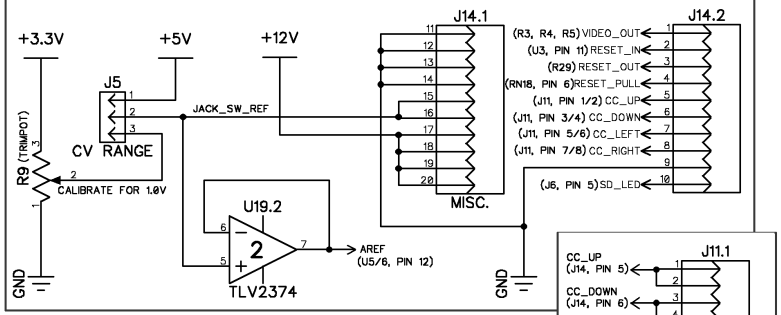
## 3.3V SUPPLY

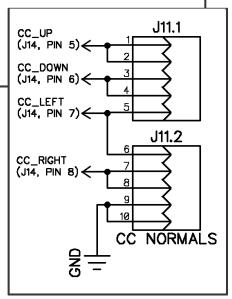
PROPELLER U3
EEPROM U4
SD CARD ADAPTER

## TOTAL CURRENT CONSUMPTION

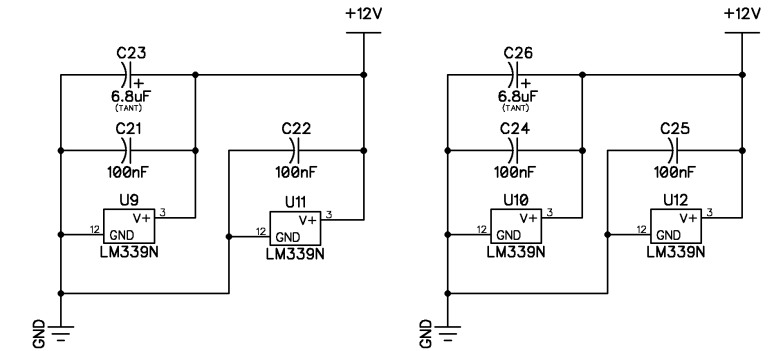
APPROX. 216 mA

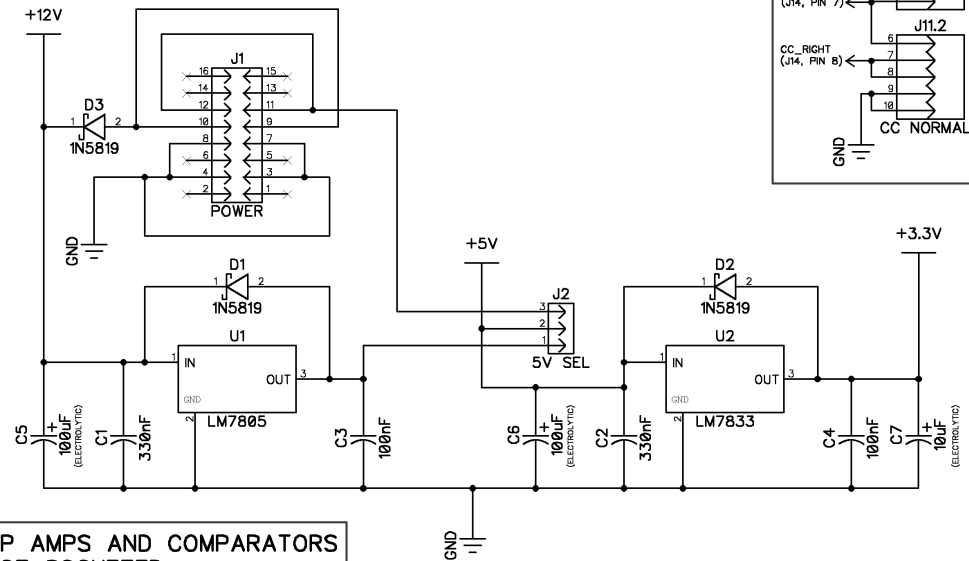
## ADC REFERENCE, JACK SWITCH REFERENCE, MISC.



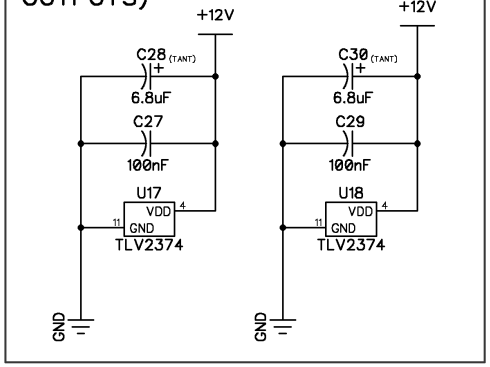

## COMPARATORS (DIGITAL INPUTS)



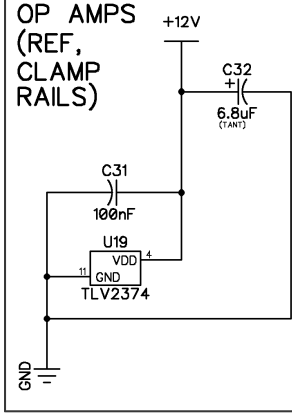




OP AMPS AND COMPARATORS NOT SOCKETED.

## OP AMPS (DIGITAL OUTPUTS)

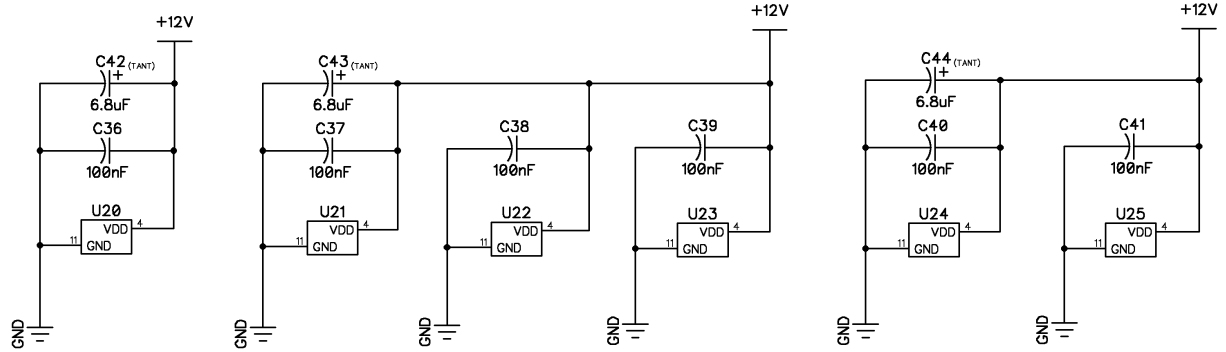



## OP AMPS (REF, CLAMP RAILS)



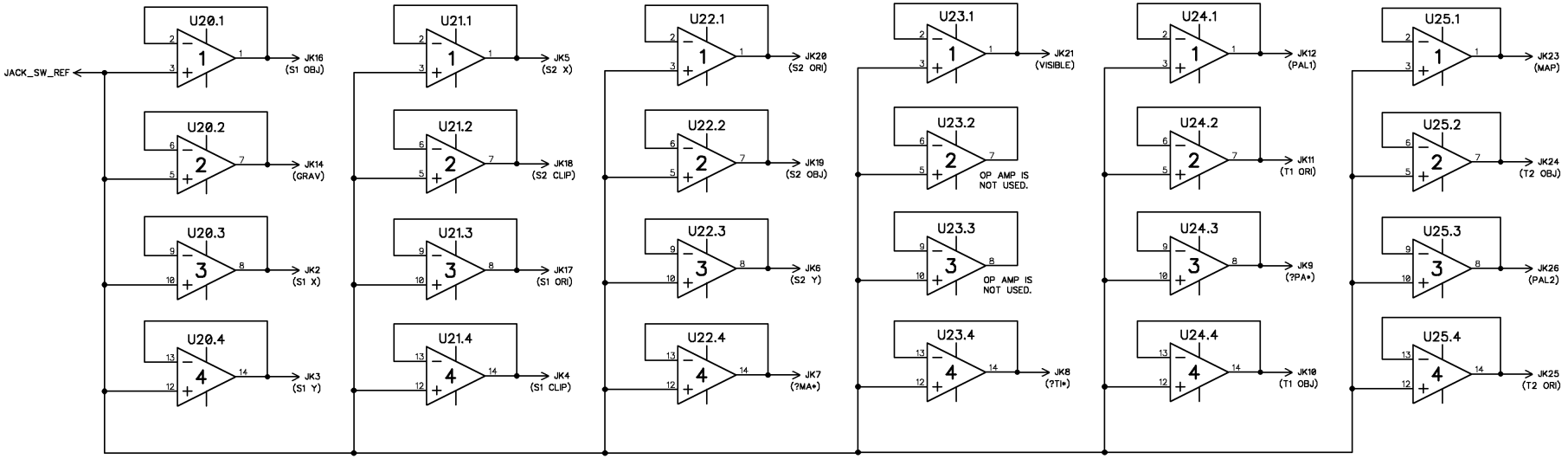
# JACK SWITCH RAIL

## OP AMPS (POWER)

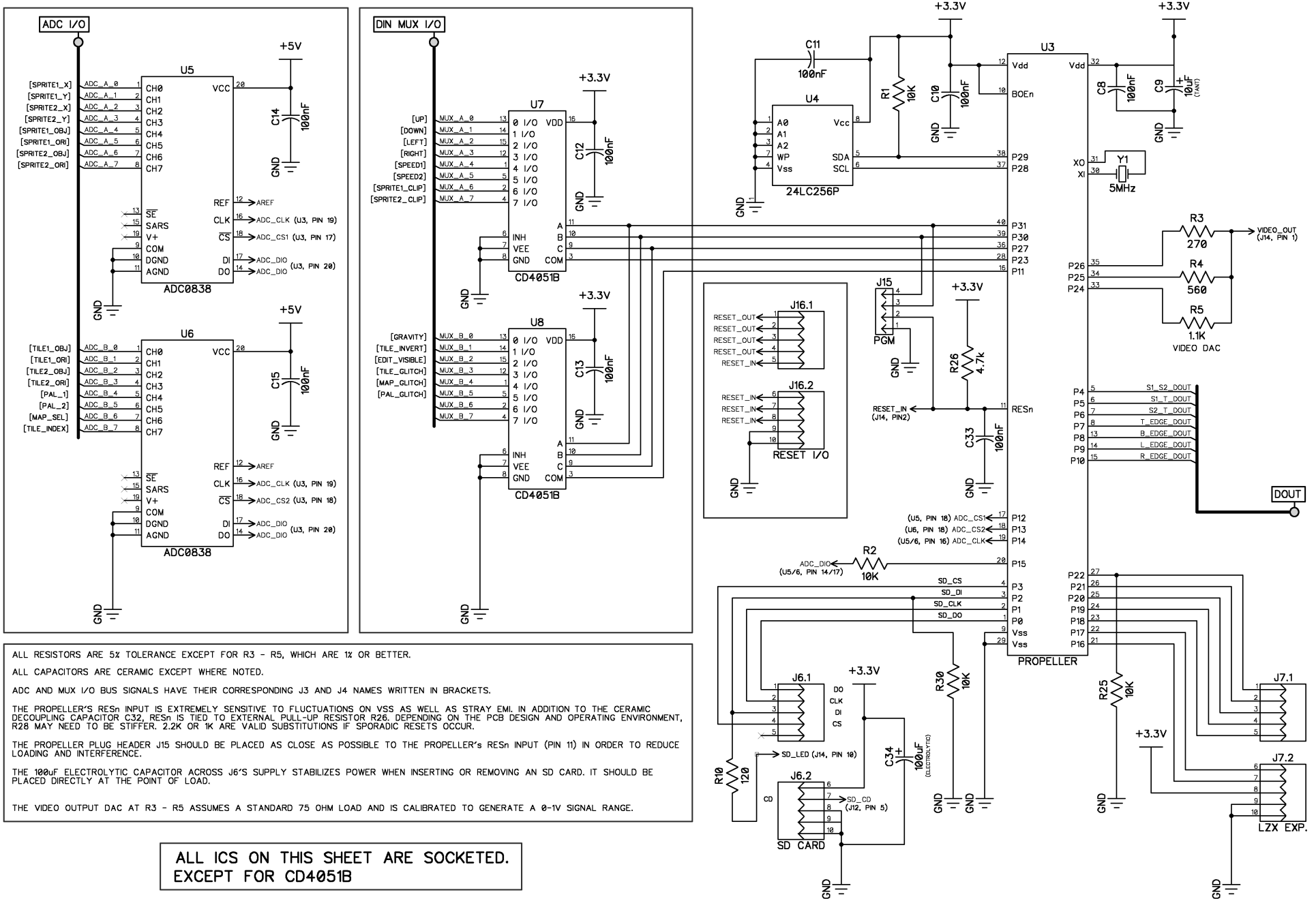



EACH JACK SWITCH IS INDIVIDUALLY BUFFERED
SEE "ADC REFERENCE, JACK SWITCH REFERENCE, MISC." SECTION OF POWER SHEET FOR REFERENCE FEEDING THE OP AMP BUFFERS

## OP AMPS (UNITY GAIN BUFFERS)



# LOGIC




ALL RESISTORS ARE 5% TOLERANCE EXCEPT FOR R3 - R5, WHICH ARE 1% OR BETTER.

ALL CAPACITORS ARE CERAMIC EXCEPT WHERE NOTED.

ADC AND MUX I/O BUS SIGNALS HAVE THEIR CORRESPONDING J3 AND J4 NAMES WRITTEN IN BRACKETS.

THE PROPELLER'S RESn INPUT IS EXTREMELY SENSITIVE TO FLUCTUATIONS ON VSS AS WELL AS STRAY EMI. IN ADDITION TO THE CERAMIC DECOUPLING CAPACITOR C32, RESn IS TIED TO EXTERNAL PULL-UP RESISTOR R26. DEPENDING ON THE PCB DESIGN AND OPERATING ENVIRONMENT, R28 MAY NEED TO BE STIFFER. 2.2K OR 1K ARE VALID SUBSTITUTIONS IF SPORADIC RESETS OCCUR.

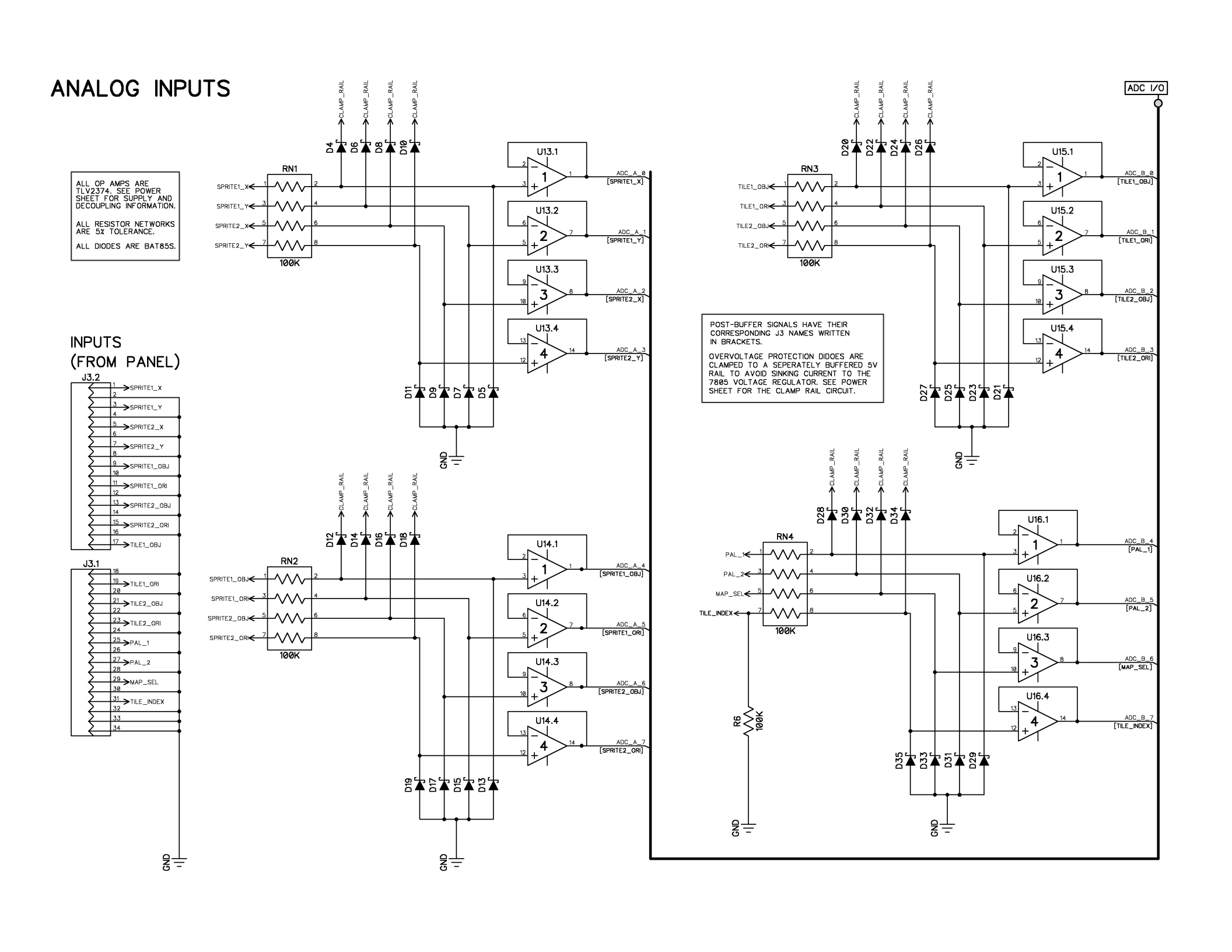
THE PROPELLER PLUG HEADER J15 SHOULD BE PLACED AS CLOSE AS POSSIBLE TO THE PROPELLER's RESn INPUT (PIN 11) IN ORDER TO REDUCE LOADING AND INTERFERENCE.

THE 100uF ELECTROLYTIC CAPACITOR ACROSS J6'S SUPPLY STABILIZES POWER WHEN INSERTING OR REMOVING AN SD CARD. IT SHOULD BE PLACED DIRECTLY AT THE POINT OF LOAD.

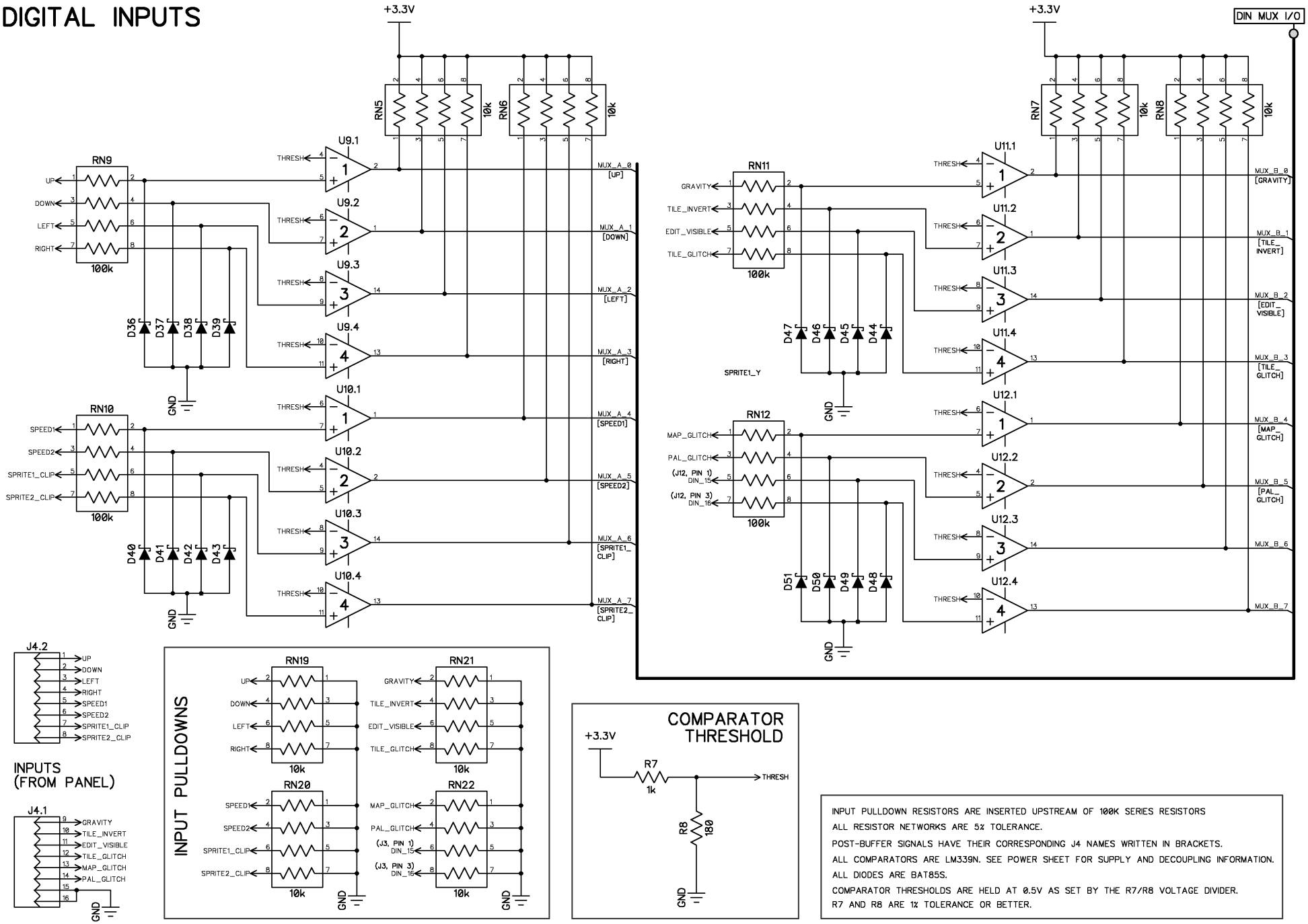
THE VIDEO OUTPUT DAC AT R3 - R5 ASSUMES A STANDARD 75 OHM LOAD AND IS CALIBRATED TO GENERATE A 0-1V SIGNAL RANGE.

ALL ICS ON THIS SHEET ARE SOCKETED.
EXCEPT FOR CD4051B

# ANALOG INPUTS



# DIGITAL INPUTS







INPUTS (FROM PANEL)










INPUT PULLDOWN RESISTORS ARE INSERTED UPSTREAM OF 100K SERIES RESISTORS
ALL RESISTOR NETWORKS ARE 5% TOLERANCE.
POST-BUFFER SIGNALS HAVE THEIR CORRESPONDING J4 NAMES WRITTEN IN BRACKETS.
ALL COMPARATORS ARE LM339N. SEE POWER SHEET FOR SUPPLY AND DECOUPLING INFORMATION.
ALL DIODES ARE BAT85S.
COMPARATOR THRESHOLDS ARE HELD AT 0.5V AS SET BY THE R7/R8 VOLTAGE DIVIDER.
R7 AND R8 ARE 1% TOLERANCE OR BETTER.

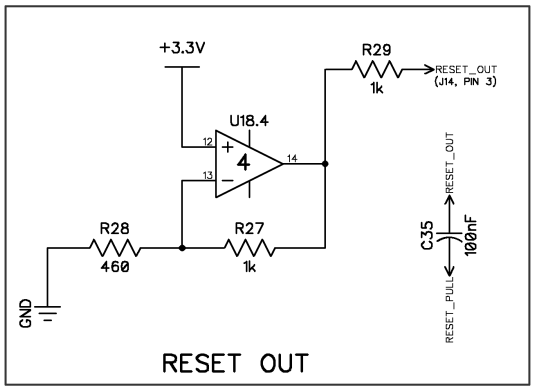
# DIGITAL OUTPUTS

ALL RESISTOR NETWORKS ARE 5% TOLERANCE.

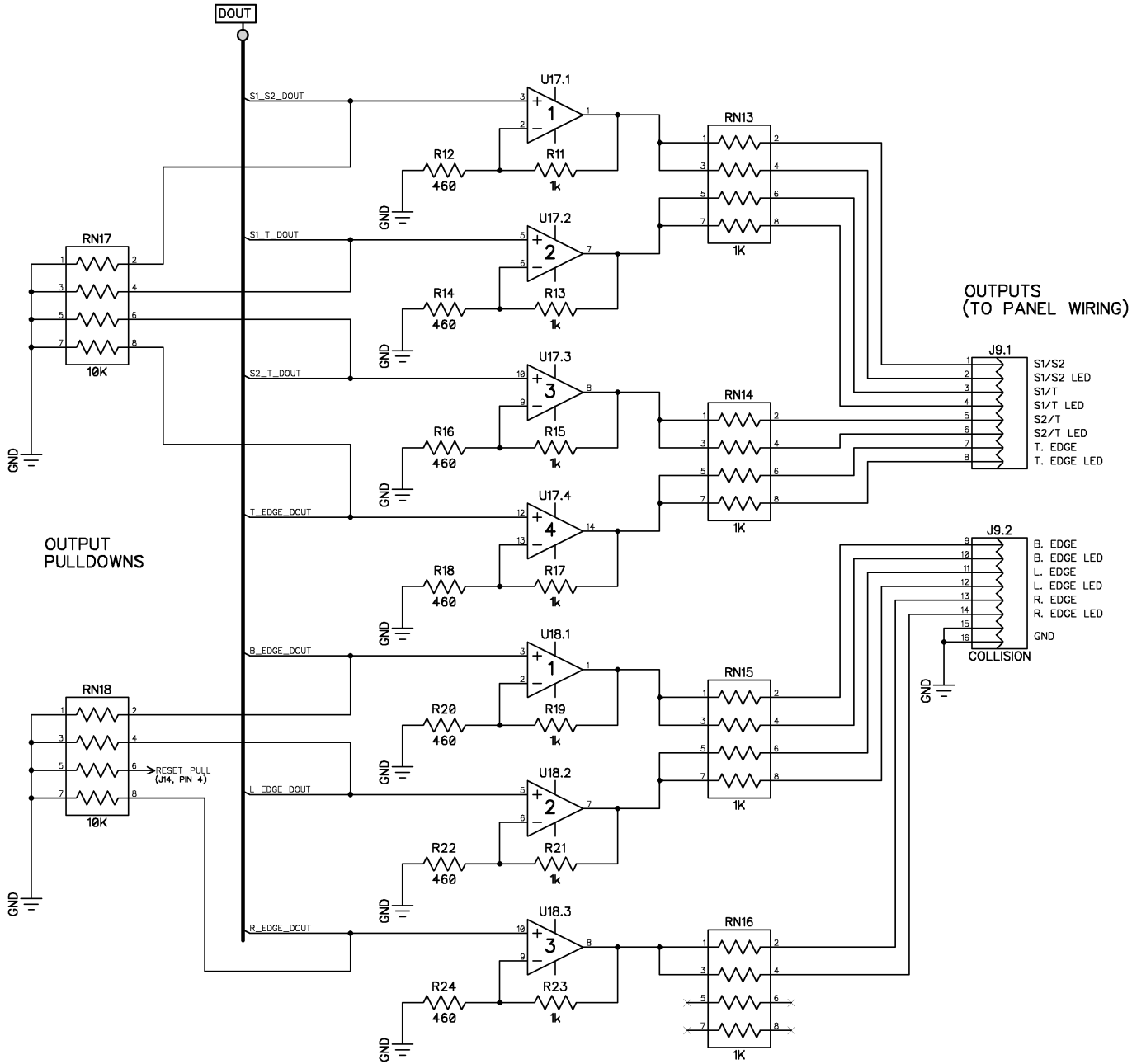
R11 - R24 AND R27 - R29 ARE 1% TOLERANCE OR BETTER.

OP AMP GAIN IS CALIBRATED FOR 10.5V GATE OUTPUTS.

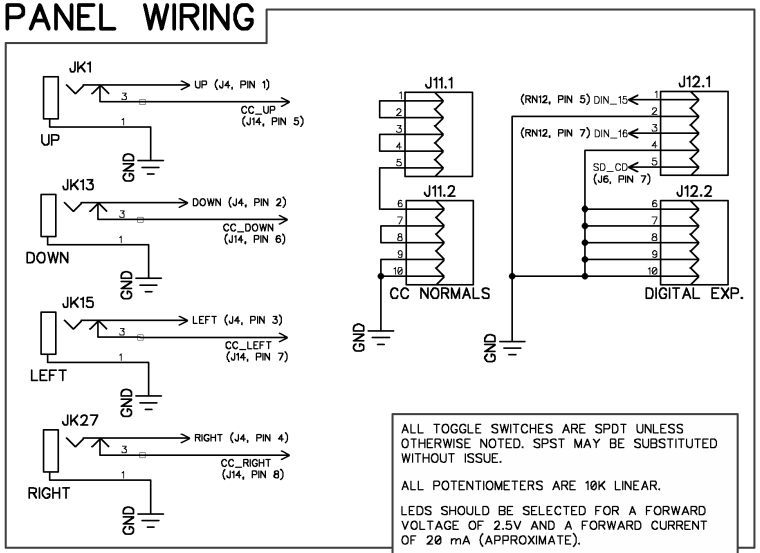
NOTE:
THE "RESET OUT" CIRCUIT BLOCK HAS DIFFERENT OUTPUT WIRING THAN THE COLLISION OUTPUTS AT J9. J13, PIN 1 CONNECTS TO A MOMENTARY TOGGLE, AND THE PULLDOWN RESISTOR AT J13, PIN 2 CONNECTS TO THE OUTPUT JACK, POST TOGGLE. SEE PANEL WIRING SHEET FOR MORE INFORMATION.



RESET OUT



# PANEL WIRING




ALL TOGGLE SWITCHES ARE SPDT UNLESS OTHERWISE NOTED. SPST MAY BE SUBSTITUTED WITHOUT ISSUE.

ALL POTENTIOMETERS ARE 10K LINEAR.

LEDS SHOULD BE SELECTED FOR A FORWARD VOLTAGE OF 2.5V AND A FORWARD CURRENT OF 20 mA (APPROXIMATE).

PREFERRED HARDWARE:
RV16AF 16MM ALPHA POTS
SERIES M NKK TOGGLE SWITCHES
ERTHENVAR 3.5MM JACKS
161- KOBICONN RCA JACKS
RED 660NM KINGBRIGHT LEDS
SMB200RTP RED FRESNEL VCC LED LENSES