HV Power Distribution

Main Battery Pack

add contactors, internal battery architecture, bus bar connections

PrimaryBatteryPack1

HV+

HV−

BPS_ScrutIneering1

Determine scrut boards + voltage taps + thermistor breakouts depending on Powertrain

BPS

8 VoltTemp boards — one per battery segment (?? modules, ?? cells).

PeripheralSOM3

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_BPS
+Shunt
−Shunt

Amperes_Daughter_Shunt

PeripheralSOM1

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_BPS
VoltageTaps
TemperatureTaps

VoltTemp_Daughter (8x)

Volt[1..5]
Volt1
Volt2
Volt3
Volt4
Volt5

Temp[1..8]
Temp1
Temp2
Temp3
Temp4
Temp5
Temp6
Temp7
Temp8

LeaderSOM1

12V_Out1
GND_Out1
+12V
GND
+12V_CarCAN
+CarCAN
−CarCAN
GND_CarCAN
CarCAN
+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_BPS

+12V_Strobe
GND_Strobe
Strobe Light

this strobe is over CAN now..

VentFan1
VentFan2
Fan1
Fan2
Ventilation Fans

+Sens_HV+
−Sens_HV+
Drive_HV+
GND_HV+
HV+ Contactor

+Sens_HV−
−Sens_HV−
Drive_HV−
GND_HV−
HV− Contactor

+Sens_ARR
−Sens_ARR
Drive_ARR
GND_ARR
Array Contactor

BPS_Daughter

LeaderSOM3

12V_Out3
GND_Out3
+12V
GND
+12V_CarCAN
+CarCAN
−CarCAN
GND_CarCAN
CarCAN
+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Motor

Array Precharge Contactor
+Sens_APCHGD
−Sens_APCHGD
Drive_APCHGD
GND_APCHGD
+Sens_APCHG
−Sens_APCHG
Drive_APCHG
GND_APCHG

GND_MPCHG
Drive_MPCHG
−Sens_MPCHG
+Sens_MPCHG
+Sens_MPCHG
−Sens_MPCHG
Drive_MPCHG
GND_MPCHG
Motor Precharge Contactor

Motor Contactor
+Sens_MTRD
−Sens_MTRD
Drive_MTRD
GND_MTRD
+Sens_MTR
−Sens_MTR
Drive_MTR
GND_MTR

VehicleControlUnit

MotorController

MTR_HV+
MTR_HV−
DC+
DC−
PhaseAD
PhaseBD
PhaseCD
PhaseA
PhaseB
PhaseC
M1
Mitsuba M2096−III Motor
+12V_ICAN
+ICAN
−ICAN
GND_ICAN
PCAN_Motor

MotorControllerInterface

+12V_ICAN
+ICAN
−ICAN
GND_ICAN
PCAN_Motor
Fan1D
Fan2D
Fan1
Fan2

Cooling

PeripheralSOM9

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
CarCAN
Pump
RadFan1
RadFan2
Pump
Fan1
Fan2
Radiator Fans
Flow1
Temp1
Temp2
Temp3

Pump_Control_Board

LV Power Distribution

PeripheralSOM10

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
CarCAN
+12V_In
GND_In
+12V_OutBus
GND_OutBus

PowerDistributionBoard

12V_Out[1..12]
GND_Out[1..12]
12V_Out1
12V_Out2
12V_Out3
12V_Out4
12V_Out5
12V_Out6
12V_Out7
12V_Out8
12V_Out9
12V_Out10
12V_Out11
12V_Out12
GND_Out1
GND_Out2
GND_Out3
GND_Out4
GND_Out5
GND_Out6
GND_Out7
GND_Out8
GND_Out9
GND_Out10
GND_Out11
GND_Out12

PDU and PowerBoard may be combined — TBD

PowerBoard

+12V_Out
GND_Out
+12V_Supp
GND_Supp
+12V_DCDC
GND_DCDC

DC−DC−Converter

+12V_DCDC
GND_DCDC
HV+
HV−

Supp Enable switch on dashboard

SW3
Supp_Enable
2
1

SupplementalBattery

+12V_Supp
GND_Supp

PeripheralSOM11

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
CarCAN
+12V_Supp
GND_Supp

SuppMonitoringBoard

add shunt?

Driver Controls

LeaderSOM2

12V_Out2
GND_Out2
+12V
GND
+12V_CarCAN
+CarCAN
−CarCAN
GND_CarCAN
CarCAN
+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Controls

Controls_Daughter (Dashboard)

PeripheralSOM7

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Controls
Accel_Pot
Brake_Fluid
Brake_Pot

Pedal_Board

Determine what dashboard LEDs and buttons will be connected

Backup_Camera
Left_Side_Camera
Right_Side_Camera
USB

Driver_Display

USB1
USB2
USB3
USB4
HDMI
+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Controls

Display_Screen

HDMI
+12V
GND
12V_Out2
GND_Out2

Determine how many USB/whether using USB hub on canopy

Lighting

PeripheralSOM4

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Controls
FTLT_Headlight
FTLT_Turn
FDLT_Turn
SDRT_Turn
FTRT_Turn
FTRT_Headlight

Lighting_Daughter_Front

PeripheralSOM5

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Controls
RRLT_BRK_Turn
RRRT_BRK_Turn

Lighting_Daughter_Back

PeripheralSOM8

+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Controls
BRK_Canopy
BPS_Strobe

Lighting_Daughter_Canopy

Steering_Board

File: Steering_Board.kicad_sch

Telemetry

add leader (+ wireless stuff), dynamics + linpot (4x), environment (6x??), TPMS transceiver (4x), broker?

LeaderSOM4

12V_Out2
GND_Out2
+12V
GND
+12V_CarCAN
+CarCAN
−CarCAN
GND_CarCAN
CarCAN
+12V_PCAN
+PCAN
−PCAN
GND_PCAN
PCAN_Telemetry
GPS
LTE
RF
GPS
XBee_LTE
XBee_RF

Telemetry Daughter (Wireless Transceiver)

Array

add blackbody A/C (temp/irradiance sensors)

MPPT_A

+12V_CarCAN
+CarCAN
−CarCAN
GND_CarCAN
CarCAN
BATT+
BATT−
PV+
PV−
ARR_HV+
ARR_HV−
SC1
Rear_SubArray

MPPT_B

+12V_CarCAN
+CarCAN
−CarCAN
GND_CarCAN
CarCAN
BATT+
BATT−
PV+
PV−
ARR_HV+
ARR_HV−
SC2
FrontRight_SubArray

MPPT_C

+12V_CarCAN
+CarCAN
−CarCAN
GND_CarCAN
CarCAN
BATT+
BATT−
PV+
PV−
ARR_HV+
ARR_HV−
SC3
FrontLeft_SubArray

TODO:
- Controls Daughter Board
- Steering board
- Fans
- Battery boards (internal HV?)
- Telemetry sensors/leader
- Array (MPPTs, Blackbody sensors)
- VCU + MotorCAN?
- Explain purpose of each CAN
- Diagram CAN loop topology

define what we mean by HV, HC,...

Wire Legend:
- High−Voltage High−Current (6 AWG)
- High−Voltage Low−Current (14 AWG)
- Low−Voltage High−Current (14 AWG)
- Low−Voltage Low−Current (20 AWG)
- Wireless

Notes

CAN Topology

The main CAN bus is CarCAN, which is utilized for system−wide communication (EX...). There are four peripheral CAN (PCAN) buses: BPS (Battery Protection System), Controls, Telemetry, and Motor (between VCU and motor controller).

CarCAN

PCAN_BPS
PCAN_Controls
PCAN_Telemetry

PCAN_Motor

Longhorn Racing Solar	
Sheet: /	
File: ElectricalSystem.kicad_sch	
Title: 2026 High−Level Electrical Schematic	
Size: User	Date: 2025−04−05
KiCad E.D.A. 9.0.0	Id: 1/43
	Rev: Rev A

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM3/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 4/43

+Shunt

−Shunt

Sheet: /Amperes_Daughter_Shunt/
File: Amperes_Daughter_Shunt.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 5/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

USB1

USB2

USB3

USB4

HDMI

Sheet: /Driver_Display/
File: Driver_Display.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 6/43

Sheet: /Left_Side_Camera/
File: Backup_Camera.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 7/43

Sheet: /Controls_Daughter (Dashboard)/
File: Controls_Daugther.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 8/43

+Sens_HV+

Drive_HV+

−Sens_HV+

GND_HV+

+Sens_HV−

Drive_HV−

−Sens_HV−

GND_HV−

+12V_Strobe

GND_Strobe

+Sens_ARR

Drive_ARR

−Sens_ARR

GND_ARR

Fan1

Fan2

Sheet: /BPS_Daughter/
File: BPS_Daughter.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 9/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM1/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 10/43

VoltageTaps

TemperatureTaps

Sheet: /VoltTemp_Daughter (8x)/
File: VoltTemp_Daughter.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 11/43

+12V

GND

+12V_CarCAN

GND_CarCAN

+CarCAN

−CarCAN

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /LeaderSOM2/
File: LeaderSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 12/43

FTLT_Turn

FTRT_Turn

FTLT_Headlight

FTRT_Headlight

SDLT_Turn

SDRT_Turn

Sheet: /Lighting_Daughter_Front/
File: Lighting_Daughter_Front.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 13/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM4/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 14/43

RRLT_BRK_Turn

RRRT_BRK_Turn

Sheet: /Lighting_Daughter_Back/
File: Lighting_Daughter_Back.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 15/43

Sheet: /BPS_Scrutineering1/
File: BPS_Scrutineering.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 16/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM5/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 17/43

+Sens_MTR

Drive_MTR

−Sens_MTR

GND_MTR

+Sens_MPCHG

Drive_MPCHG

−Sens_MPCHG

GND_MPCHG

+Sens_APCHG

Drive_APCHG

−Sens_APCHG

GND_APCHG

Sheet: /VehicleControlUnit/
File: VehicleControlUnit.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 18/43

+12V

GND

+12V_CarCAN

GND_CarCAN

+CarCAN

−CarCAN

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /LeaderSOM3/
File: LeaderSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 19/43

Accel_Pot

Brake_Pot

Brake_Fluid

Sheet: /Pedal_Board/
File: Pedal_Board.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 20/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM7/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 21/43

HV+

HV−

Temp_+5V[0..61]
Temp_Sense[0..61]
Temp_GND[0..61]

Volt_RowA[0..7]
Volt_RowA_GND

Volt_RowB[0..7]
Volt_RowB_GND

Volt_RowC[0..7]
Volt_RowC_GND

Volt_RowD[0..6]
Volt_RowD_GND

Sheet: /PrimaryBatteryPack1/
File: PrimaryBatteryPack.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 22/43

HV+

HV−

+12V_DCDC

GND_DCDC

Sheet: /DC−DC−Converter/
File: DC−DC−Converter.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 23/43

Sheet: /SupplementalBattery/
File: SupplementalBattery.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 24/43

+12V_LV

GND_LV

+12V_DCDC

GND_DCDC

+12V_Supp

GND_Supp

Sheet: /PowerBoard/
File: PowerBoard.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 25/43

+12V_In

+12V_OutBus

GND_In

GND_OutBus

Sheet: /PowerDistributionBoard/
File: PowerDistributionBoard.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 26/43

+12V_ICAN

+ICAN

−ICAN

GND_ICAN

DC+

DC−

PhaseA

PhaseB

PhaseC

Sheet: /MotorController/
File: MotorController.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 27/43

+12V_Supp

GND_Supp

Sheet: /SuppMonitoringBoard/
File: SuppMonitoringBoard.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 27/43

+12V

GND

+12V_CarCAN

GND_CarCAN

+CarCAN

−CarCAN

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /LeaderSOM1/
File: LeaderSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 28/43

Sheet: /Backup_Camera/
File: Backup_Camera.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 29/43

Sheet: /Right_Side_Camera/
File: Backup_Camera.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 30/43

BRK_Canopy

BPS_Strobe

Sheet: /Lighting_Daughter_Canopy/
File: Lighting_Daughter_Canopy.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 31/43

HDMI

+12V

GND

Sheet: /Display_Screen/
File: Display_Screen.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 32/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM8/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 33/43

Pump
Fan1
Fan2
Temp1
Temp2
Temp3
Flow1

Sheet: /Pump_Control_Board/
File: Pump_Control_Board.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 34/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM9/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 35/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM10/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 36/43

+12V_ICAN

+ICAN

−ICAN

GND_ICAN

Fan1

Fan2

Sheet: /MotorControllerInterface/
File: MotorControllerInterface.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 37/43

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /PeripheralSOM11/
File: PeripheralSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 37/43

Sheet: /Steering_Board/
File: Steering_Board.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 38/43

+12V_CarCAN

GND_CarCAN

+CarCAN

−CarCAN

PV+

PV−

BATT+

BATT−

Sheet: /MPPT_B/
File: MPPT.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 39/43

+12V_CarCAN

GND_CarCAN

+CarCAN

−CarCAN

PV+

PV−

BATT+

BATT−

Sheet: /MPPT_C/
File: MPPT.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 40/43

+12V_CarCAN

GND_CarCAN

+CarCAN

−CarCAN

PV+

PV−

BATT+

BATT−

Sheet: /MPPT_A/
File: MPPT.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 41/43

◇XBee_LTE

◇XBee_RF

◁GPS

Sheet: /Telemetry Daughter (Wireless Transceiver)/
File: Telemetry_Daughter.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 42/43

+12V

GND

+12V_CarCAN

GND_CarCAN

+CarCAN

−CarCAN

+12V_PCAN

GND_PCAN

+PCAN

−PCAN

Sheet: /LeaderSOM4/
File: LeaderSOM.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 9.0.0		Id: 43/43