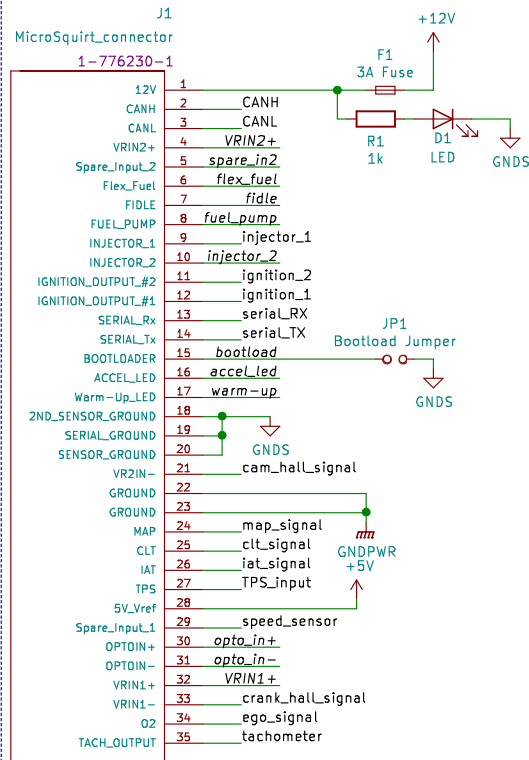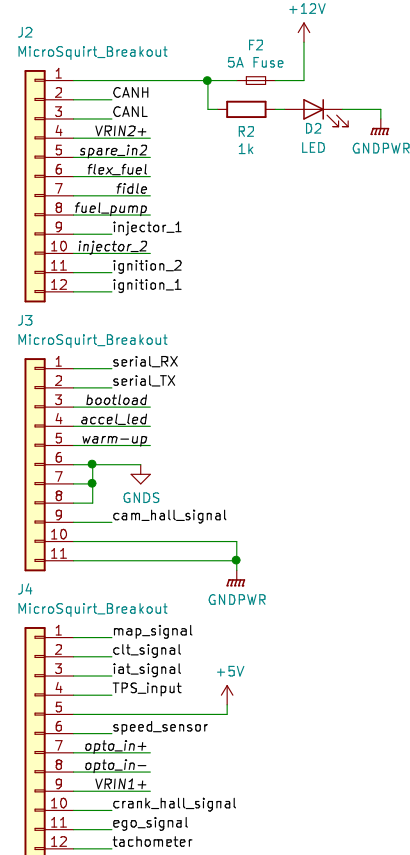## MicroSquirt

Connector to the MicroSquirt ECU. The Bootload jumper is to allow flashing new firmware. The connector must be wired with the same pinout as the MicroSquirt.

The left oriented labels in italic are not actually used, but only utilized to rout the breakout connector.

J1
MicroSquirt_connector
1-776230-1

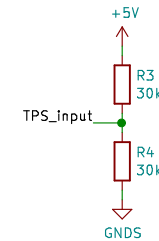| Pin	Signal		Breakout
1	12V		+12V
2	CANH	CANH	
3	CANL	CANL	
4	VRIN2+	*VRIN2+*	F1 3A Fuse
5	Spare_Input_2	*spare_in2*	
6	Flex_Fuel	*flex_fuel*	R1 1k
7	FIDLE	*fidle*	D1 LED
8	FUEL_PUMP	*fuel_pump*	GNDS
9	INJECTOR_1	injector_1	
10	INJECTOR_2	*injector_2*	
11	IGNITION_OUTPUT_#2	ignition_2	
12	IGNITION_OUTPUT_#1	ignition_1	
13	SERIAL_Rx	serial_RX	
14	SERIAL_Tx	serial_TX	JP1 Bootload Jumper
15	BOOTLOADER	*bootload*	
16	ACCEL_LED	*accel_led*	GNDS
17	Warm-Up_LED	*warm-up*	
18	2ND_SENSOR_GROUND		
19	SERIAL_GROUND	GNDS	
20	SENSOR_GROUND		
21	VR2IN-	cam_hall_signal	
22	GROUND		
23	GROUND		GNDPWR +5V
24	MAP	map_signal	
25	CLT	clt_signal	
26	IAT	iat_signal	
27	TPS	TPS_input	
28	5V_Vref		
29	Spare_Input_1	speed_sensor	
30	OPTOIN+	*opto_in+*	
31	OPTOIN-	*opto_in-*	
32	VRIN1+	*VRIN1+*	
33	VRIN1-	crank_hall_signal	
34	O2	ego_signal	
35	TACH_OUTPUT	tachometer	

MicroSquirt Breakout

All pins of the Microsquirt are broken out to more easily accessible connectors to allow for future modifications. Fuse dimension should be adjusted according to expected load.
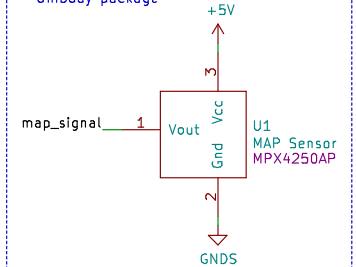
J2
MicroSquirt_Breakout

1		+12V
2	CANH	F2 5A Fuse
3	CANL	
4	*VRIN2+*	R2 1k
5	*spare_in2*	D2 LED
6	*flex_fuel*	GNDPWR
7	*fidle*	
8	*fuel_pump*	
9	injector_1	
10	*injector_2*	
11	ignition_2	
12	ignition_1	

J3
MicroSquirt_Breakout

1	serial_RX
2	serial_TX
3	*bootload*
4	*accel_led*
5	*warm-up*
6	
7	GNDS
8	
9	cam_hall_signal
10	
11	GNDPWR

J4
MicroSquirt_Breakout

1	map_signal
2	clt_signal
3	iat_signal
4	TPS_input
5	+5V
6	speed_sensor
7	*opto_in+*
8	*opto_in-*
9	VRIN1+
10	crank_hall_signal
11	ego_signal
12	tachometer

TPS

As Vera does not have a throttle the throttle position sensor input is given a constant input.

+5V

R3 30k

TPS_input

R4 30k

GNDS

MAP sensor

MAP Sensor Model: NXP MPX4250AP
Unibody package

+5V

map_signal — 1 — Vout
U1
MAP Sensor
MPX4250AP
Gnd   Vcc

GNDS

Sheet: Connectors

injector_1	injector_input	crankshaft_signal	crank_hall_signal
ignition_1	ignition1_input	camshaft_signal	cam_hall_signal
ignition_2	ignition2_input		
tachometer	tachometer	ego_signal	ego_signal
serial_RX	serial_rx	clt_signal	clt_signal
serial_TX	serial_tx	iat_signal	iat_signal
CANH	CANH	start_motor_signal	button_to_start_motor_relay
CANL	CANL	main_power_signal	button_to_main_relay
relay_to_start_motor	start_motor_power	speed_sensor	speed_sensor

File: connectors.sch

Sheet: Relays

button_to_main_relay	main_relay_input		
button_to_start_motor_relay	start_motor_relay_input	start_motor_relay_output	relay_to_start_motor

File: relays.sch

Both relays are of type ISO Mini (aka ordinary automotive relay) and must be rated for at least 40 A.
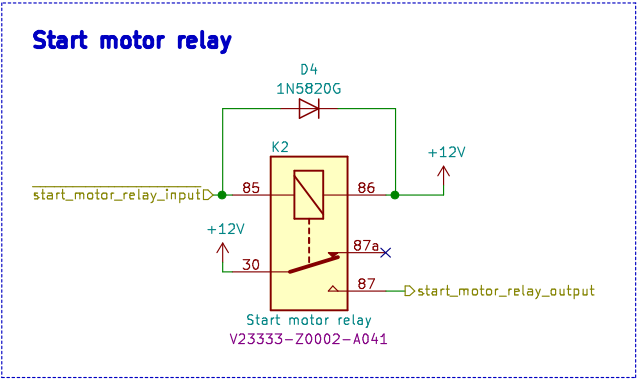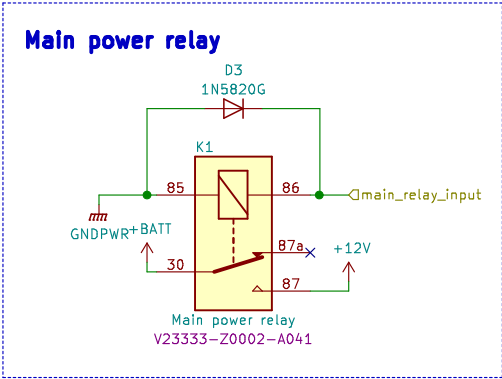
Main power relay

D3
1N5820G

K1

85   86 ▷main_relay_input

GNDPWR +BATT

30   87a ✕ +12V

87

Main power relay
V23333-Z0002-A041

Start motor relay

D4
1N5820G

K2

+12V

start_motor_relay_input▷ 85   86

+12V

30   87a ✕

87 ▷start_motor_relay_output

Start motor relay
V23333-Z0002-A041

Title: Vera ECU Board

| Size: A4 | Date: 2019-09-29 | **Rev: 0.1** |
| KiCad E.D.A. kicad 5.1.4 | | Id: 2/3 |

Battery

Battery power is only connected to the main power relay, as well as the normally open bistable power switch controlling said relay.

The battery input must be protected by an external fuse.

+BATT

XT60PW-M
Battery power conenctor
J5

D6
1N5820G

R5
1k

D5
LED

GNDPWR
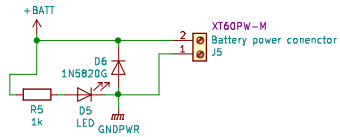
Start motor

The start motor power is switched by a normally open monostable switch. The motor should be protected by a 50A in-line fuse.

start_motor_power

J9
Motor connector
XT60PW-F

D9
1N5820G

R7
1k

D8
LED

GNDPWR
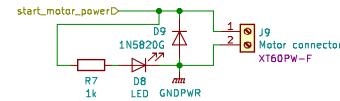
Backlight

The backlight is lit at all times the start motor is powered.

start_motor_power

F4
3A Fuse

R6
1k

D7
LED

J8
Backlight connector

GNDPWR
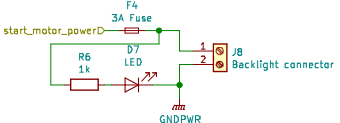
Injector

Injector input is switched by a normally open dead man's switch.

deadmans

F3
5A Fuse

injector_input

J7
Injector connector

R8
1k

D10
LED

GNDS
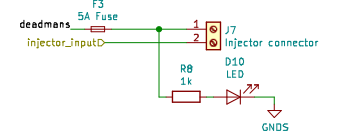
Start motor controller

Interface to a separate circuit which handles timing of start motor depending on engine RPM. The start motor is activated by pulling start_motor_signal low.
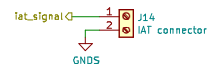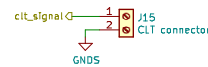
+12V

tachometer
deadmans
start_motor_signal

J6
Controller connector

GNDS
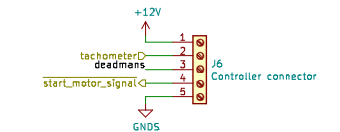
RS232 Serial Port

DB9 serial connector for mapping of MicroSquirt.

serial_tx
serial_rx

J11
Serial DB9 connector
5747844-4

GNDS

Intake Air Temperature

iat_signal

J14
IAT connector

GNDS
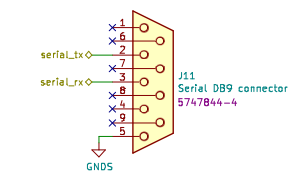
Motor Coolant Temperature

clt_signal

J15
CLT connector
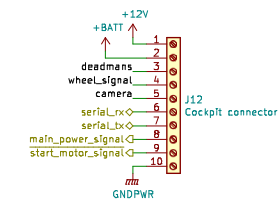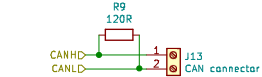
GNDS

Cockpit connections

Connection to the Raspberry Pi based HMI. Button inputs for relay control of main power, starter motor and dead man's switch to injector.
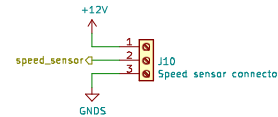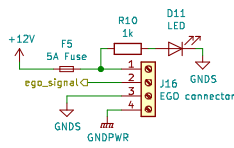
+BATT

deadmans
wheel_signal
camera
serial_rx
serial_tx
main_power_signal
start_motor_signal

J12
Cockpit connector

GNDPWR

CAN

With termination resistor.

R9
120R

CANHD
CANLD

J13
CAN connector

Speed sensor input

+12V

speed_sensor

J10
Speed sensor connector

GNDS

EGO Lambda sensor

+12V

F5
5A Fuse
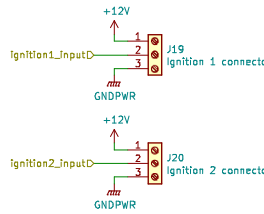
R10
1k

D11
LED

ego_signal

GNDS

J16
EGO connector

GNDS

GNDPWR

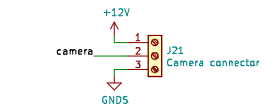## Ignition

The electrical system is designed to function with either one or two ignition coils. Currently it is only using ignition 1.
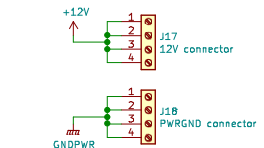
+12V

ignition1_input

J19
Ignition 1 connector

GNDPWR

+12V

ignition2_input

J20
Ignition 2 connector

GNDPWR

Camera

The back camera is connected by RCA to the LCD display in the cockpit.

+12V

camera

J21
Camera connector

GNDS

Redundant power output

Extra power outputs for unforeseen expansions or prototyping.

+12V

J17
12V connector

+12V

J18
PWRGND connector

GNDPWR

Hall sensors

Hall Sensor Model: Littlefuse 55110-3M-03-A
Crankshaft Sensor: CYKN8-02CLO
Second ground is for potential shielding.
Jumpers enable using other hall sensors.

+12V

R11
10k

crankshaft_signal

J22
Chrankshaft Hall connector

GNDS

+12V

JP2
R_unpopulated

camshaft_signal

J23
Camshaft Hall connector

GNDS

+12V

JP3
R_unpopulated

wheel_signal

J24
Wheel Hall connector

GNDS