P03 CONTROL / INTERFACE R01 — BENCH PROTOTYPE

#FLG1
5V_IN
5V_IN
PWR_FLAG

#FLG2
5V_FUSED
5V_FUSED
PWR_FLAG

#FLG3
MCU_5V
MCU_5V
PWR_FLAG

#FLG4
HEAD_5V
HEAD_5V
PWR_FLAG

#FLG5
GND
GND
PWR_FLAG

#FLG6
HEAD_3V3
HEAD_3V3
PWR_FLAG

#FLG7
BUS_VIO
BUS_VIO
PWR_FLAG

BODY MCU / USB behind rear cover

U1
TX_EN 1 D0/GPIO1
STOP_N 2 D1/GPIO2
3 D2/GPIO3
IMU_INT 4 D3/GPIO4
SDA 5 D4/GPIO5
SCL 6 D5/GPIO6
SERVO_TX 7 D6/GPIO43
D7/GPIO44 8 SERVO_RX
D8/GPIO7 9 HEAD_TX
D9/GPIO8 10 HEAD_RX
D10/GPIO9 11
3V3_OUT 12 3V3
GND 13 GND
5V/VBUS 14 MCU_5V
XIAO ESP32-S3

HALF DUPLEX TTL — NO SERVO POWER ON THIS PCB

U2
3V3 1 VCCA
GND 2 GND
SERVO_TX 3 A
BY 4 SERVO_DRV
OE 5 TX_EN
VCCB 6 BUS_VIO
TXU0101DCKR

U3
1 NC
SERVO_DATA 2 A
GND 3 GND
Y 4 SERVO_RX
VCC 5 3V3
SN74LVC1G17DBVR

JP1
3V3 1 3V3
BUS_VIO 2 BUS_VIO
5V 3 5V_FUSED
VIO 1-2=3V3 DEFAULT

TP1
GND 1 GND
TP2
3V3 1 3V3
TP3
SERVO_DATA 1 SERVO_DATA
TP4
TX_EN 1 TX_EN
TP5
HEAD_5V 1 HEAD_5V

R1
TX_EN 1
2 GND
100k

R2
SERVO_DRV 1
2 SERVO_DATA
100R

J2
SERVO_DATA 1 DATA
GND 2 GND
SERVO SIGNAL ONLY

REGULATED 5V ONLY / independent diode feeds

J1
5V_IN 1 5V
GND 2 GND
5V LOGIC IN

F1
5V 1
2 5V_FUSED
2A fuse

D1
MCU_5V 1
2 5V_FUSED
STPS2L40U

D2
HEAD_5V 1
2 5V_FUSED
STPS2L40U

C1
5V_FUSED 1
2 GND
10u/10V

C2
MCU_5V 1
2 GND
10u/10V

C3
HEAD_5V 1
2 GND
22u/10V

C4
3V3 1
2 GND
10u/10V

HEAD: ONE XIAO SENSE CAMERA / UART

U4
3V3 1 VCCA
GND 2 GND
HEAD_TX 3 A
BY 4 HEAD_RX_PIN
OE 5 3V3
VCCB 6 HEAD_3V3
TXU0101DCKR

U5
1 NC
HEAD_TX_PIN 2 A
GND 3 GND
Y 4 HEAD_RX
VCC 5 3V3
SN74LVC1G17DBVR

J3
HEAD_5V 1 5V
GND 2 GND
HEAD_RX_PIN 3 RX@HEAD
TX@HEAD 4 HEAD_TX_PIN
3V3_RETURN 5 HEAD_3V3
GND 6 GND
HEAD SENSE / UART

IMU: I2C 0x6A / MODE 1

U6
GND 1 SA0
GND 2 SDx_MODE1_TIE
GND 3 SCx
IMU_INT 4 INT1
3V3 5 VDDIO
GND 6 GND
GND 7 GND
VDD 8 3V3
INT2 9
OCS_AUX 10
SDO_AUX 11
CS 12 3V3
SCL 13 SCL
SDA 14 SDA
LSM6DSOXTR

STOP REQUEST IS NOT MOTOR POWER DISCONNECT

J4
GND 1 GND
3V3 2 3V3
SDA 3 SDA
SCL 4 SCL
I2C 3V3 ONLY

J5
STOP_N 1 STOP_N
2 GND
STOP REQUEST

R5
STOP_N 1
2 3V3
10k

C5
STOP_N 1
2 GND
100n/16V

H1
M2 / NPTH
H2
M2 / NPTH
H3
M2 / NPTH
H4
M2 / NPTH

R3
SDA 1
2 3V3
4k7

R4
SCL 1
2 3V3
4k7

R6
3V3 1
2 LED_A
2k2

D3
GND 1
2 LED_A
GREEN LED

DECOUPLING C6/C7 U2; C8 U3; C9/C10 U4; C11 U5; C12/C13 U6

C6
3V3 1
2 GND
100n/16V

C7
BUS_VIO 1
2 GND
100n/16V

C8
3V3 1
2 GND
100n/16V

C9
3V3 1
2 GND
100n/16V

C10
HEAD_3V3 1
2 GND
100n/16V

C11
3V3 1
2 GND
100n/16V

C12
3V3 1
2 GND
100n/16V

C13
3V3 1
2 GND
100n/16V

Not fabrication released: servo electrical interface and power tests pending

Zoo Robotics

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File: penguin-control-r01.kicad_sch

Title: P03 Penguin Control Interface

Size: A3	Date: 2026-11-09	**Rev: R01 DRAFT**
KiCad E.D.A. 10.0.6		Id: 1/1