

STELLA Lab Spec parts

Line	Type	Part	Qty	Category	Type	Vendor	PN	.STL details, or link to part
15	C2	Cuvette	1	Cuvette config	Consumables	Thomas Scientific	1180W05	https://www.thomassci.com/p/spectrophotometer-cuvettes?q=1180W05
40	P2	PCR 0.2mL tube	1	PCR tube config	Consumables	Fisher Scientific	14-222-262	https://www.fishersci.com/shop/products/costar-pcr-tubes-3/07200681#?keyword=pcr tube
1	LS	Adafruit half size proto board	1	Common	Electronics	Adafruit	1609	
2	LS	Magnet coupler 4 pins	1	Common	Electronics	Adafruit	5358	
3	LS	Magnet coupler 3 pins	1	Common	Electronics	Adafruit	5360	
4	LS	Adafruit ADS1015 quad 12 bit ADC	1	Common	Electronics	Adafruit	1083	
5	LS	Adafruit MCP4728 quad 12 bit DAC	1	Common	Electronics	Adafruit	4470	
6	LS	Socket headers, 6 pos	4	Common	Electronics	Digikey	4627-FH254V-06-6TBKG98	
7	LS	PN2222ABU transistor	4	Common	Electronics	Digikey	PN2222AFS-ND	
8	LS	1Ω 1% 1/4W resistor	4	Common	Electronics	Digikey	13-MF0207FRE52-1RTR	
9	LS	100kΩ resistor	4	Common	Electronics	Digikey	RNF14FTD100K	
10	LS	50Ω resistor	4	Common	Electronics	Digikey	RNF14FTD49R9	
11	LS	Socket header 3x3 pos	2	Common	Electronics	Digikey	SSW-103-01-G-T	
12	LS	Socket header 3x2 pos	1	Common	Electronics	Digikey	SAM12901-ND	
13	LS	Socket header 3x1 pos	1	Common	Electronics	Digikey	SAM11930-ND	
16	C2	Sparkfun mini proto board	2	Cuvette config	Electronics	Digikey	PRT-12702	
17	C2	Proto-Advantage small proto board	1	Cuvette config	Electronics	Proto-Advantage	SBB1002-1	https://www.proto-advantage.com/store/product_info.php?products_id=200009
18	C2	Adafruit AS7341 spectral sensor	1	Cuvette config	Electronics	Adafruit	4698	
19	C2	Proto-Advantage LED2 - DIP adapter	1	Cuvette config	Electronics	Proto-Advantage	IPC0224	https://www.proto-advantage.com/store/product_info.php?products_id=3100234
20	C2	365nm LED 3mm	1	Cuvette config	Electronics	Digikey	1125-MTE3660C5-UV-ND	
21	C2	640nm LED 3mm	1	Cuvette config	Electronics	Digikey	MTE7063C2-UR	
22	C2	488nm LED smt	1	Cuvette config	Electronics	Mouser	GC VJLPL1.13-KQKS-V2V3-1	https://www.mouser.com/ProductDetail/ams-OSRAM/GC-VJLPL1.13-KQKS-V2V3-1?qs=QpmGXVUTftHD6Ze6bLOUKg==
23	C2	Pin header 3x2 pos	1	Cuvette config	Electronics	Digikey	67997-206HLF	
24	C2	Pin header 3 pos	1	Cuvette config	Electronics	Adafruit	392	PN 392 order only one package at \$5 for all lines with this part number
25	C2	Pin header single	6	Cuvette config	Electronics	Adafruit	392	PN 392 order only one package at \$5 for all lines with this part number
26	C2	50Ω resistor	2	Cuvette config	Electronics	Digikey	RNF14FTD49R9	
27	C2	Socket header 6 pos	1	Cuvette config	Electronics	Digikey	4627-FH254V-06-6TBKG98	
28	C2	Pin header RA 6 pos	3	Cuvette config	Electronics	Adafruit	1540	PN 1540 order only one package at \$6 for all lines with this part number
29	C2	White LED panel	1	Cuvette config	Electronics	Adafruit	1626	
41	P2	Sparkfun mini proto board	1	PCR tube config	Electronics	Digikey	PRT-12702	
42	P2	Pin header 3x2 pos	1	PCR tube config	Electronics	Digikey	67997-206HLF	
43	P2	Pin header 3 pos	1	PCR tube config	Electronics	Adafruit	392	PN 392 order only one package at \$5 for all lines with this part number
44	P2	Pin header single	12	PCR tube config	Electronics	Adafruit	392	PN 392 order only one package at \$5 for all lines with this part number
45	P2	Pin header 6 pos	1	PCR tube config	Electronics	Adafruit	392	PN 392 order only one package at \$5 for all lines with this part number
46	P2	Socket header, RA, 6 pos	1	PCR tube config	Electronics	Digikey	S5481-ND	
47	P2	Proto-Advantage small proto board	1	PCR tube config	Electronics	Proto-Advantage	SBB1002-1	https://www.proto-advantage.com/store/product_info.php?products_id=200009
48	P2	Adafruit AS7341 spectral sensor	1	PCR tube config	Electronics	Adafruit	4698	
49	P2	50Ω resistor	2	PCR tube config	Electronics	Digikey	RNF14FTD49R9	
50	P2	365nm LED 3mm	1	PCR tube config	Electronics	Digikey	1125-MTE3660C5-UV-ND	
51	P2	640nm LED 3mm	1	PCR tube config	Electronics	Digikey	MTE7063C2-UR	
52	P2	488nm LED smt	1	PCR tube config	Electronics	Mouser	720-GCVL113KQKSV2V31	
53	P2	Proto-Advantage LED2 - DIP adapter	1	PCR tube config	Electronics	Proto-Advantage	IPC0224	https://www.proto-advantage.com/store/product_info.php?products_id=3100234
14	LS	LS housing base	1	Common	Print	NA	3d print part	0.2mm layers
30	C2	LS-C2 end cover	1	Cuvette config	Print	NA	3d print part	0.2mm layers
31	C2	LS-C2 cuvette block	1	Cuvette config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
32	C2	LS-C2 cuvette block foot pair, 2up	1	Cuvette config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
33	C2	LS-C2 blackout shutter	1	Cuvette config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
34	C2	LS-C2 side LED cover, plain	1	Cuvette config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
35	C2	LS-C2 side LED cover, flag	1	Cuvette config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
36	C2	LS-C2 cuvette pedestal	1	Cuvette config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
37	C2	LS-C2 detector block	1	Cuvette config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
38	C2	LS-C2 detector block assembly fixture	1	Cuvette config	Print	NA	3d print part	0.2mm layers
39	C2	LS-C2 swing lid	1	Cuvette config	Print	NA	3d print part	0.2mm layers
54	P2	LS-P2 end cover	1	PCR tube config	Print	NA	3d print part	0.2mm layers
55	P2	LS-P2 swing door	1	PCR tube config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
56	P2	LS-P2 test position (single or triple source)	1	PCR tube config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred) Add supports to main overhang, organic style seems to be easier to remove
57	P2	LS-P2 sensor retainer	1	PCR tube config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)
58	P2	LS-P2 hinge pin	1	PCR tube config	Print	NA	3d print part	0.1mm layers - black filament required (matte black preferred)

STELLA Lab Spec Main Board					
Step	Action	What value? / Note	Where? / Note	What color?	Done
1	Get board	Adafruit Permaproto Half Size		White	☐
2	Cut traces:		Rear		☐
2.01	Cut trace		30A / 30B		☐
2.02	Cut trace		30B / 30C		☐
2.03	Cut trace		30C / 30D		☐
2.04	Cut trace		30H / 30i		☐
2.05	Cut trace		30i / 30J		☐
2.06	Cut trace		29A / 29B		☐
2.07	Cut trace		29B / 29C		☐
2.08	Cut trace		29C / 29D		☐
2.09	Cut trace		29H / 29i		☐
2.10	Cut trace		29i / 29J		☐
3	Install magnetic couplers:		Front: See magnetic coupler installation diagram.		☐
3.1	Install magnetic coupler	4 pos RA, w spring pins	30: A, B, C, D		☐
3.2	Install magnetic coupler	3 pos RA, w spring pins	30: H, i, J		☐
4	Install bus wires:		Front		☐
4.1	3V		A29-30 to 3V (+ bus below A)	+3.3V	☐
4.2	GND		B29-30 to GND (- bus below A)	GND	☐
4.3	SCL		C29-30 to SCL	i2c Serial Clock	☐
4.4	SDA		E30 to SDA	i2c Serial Data	☐
4.5	5V		J29-30 to G2	5V	☐
5	Install transistors:	PN2222ABU	Front: Flat face towards J: Solder the center pin first, then straighten the body before soldering the other two pins.		☐
5.1	Install transistor	PN2222ABU	B12-13-14		☐
5.2	Install transistor	PN2222ABU	G12-13-14		☐
5.3	Install transistor	PN2222ABU	B16-17-18		☐
5.4	Install transistor	PN2222ABU	G16-17-18		☐
6	Install shunt resistors:	R1Ω 1% tolerance 1/4W	Front		☐
6.1	Install shunt resistor	R1Ω	B21 to GND		☐
6.2	Install shunt resistor	R1Ω	B22 to GND		☐
6.3	Install shunt resistor	R1Ω	B23 to GND		☐
6.4	Install shunt resistor	R1Ω	B24 to GND		☐
7	Install pull down resistors:	100kΩ	Front		☐
7.1	Install pull down resistor	100kΩ	B5 to GND		☐
7.2	Install pull down resistor	100kΩ	B6 to GND		☐
7.3	Install pull down resistor	100kΩ	B7 to GND		☐
7.4	Install pull down resistor	100kΩ	B8 to GND		☐
8	Install bias limit resistors:	R50Ω	Front		☐
8.1	Install bias limit resistor	R50Ω	C11-E13		☐
8.2	Install bias limit resistor	R50Ω	H11-J13		☐
8.3	Install bias limit resistor	R50Ω	C15-E17		☐
8.4	Install bias limit resistor	R50Ω	H15-J17		☐
9	Install socket headers: Front		Front		☐
9.1	Install socket header	6 pos	D4-D9		☐
9.2	Install socket header	6 pos	G4-G9		☐
9.3	Install socket header	6 pos	D20-D25		☐
9.4	Install socket header	6 pos	G20-G25		☐
10	Install socket headers: Rear		Rear		☐
10.1	Install socket header	3x3 (9 pos)	A,B,C x 1,2,3		☐
10.2	Install socket header	3x3 (9 pos)	H,i,J x 1,2,3		☐
10.3	Install socket header	2x3 (6 pos)	GND 1,2,3 and 3V 1,2,3		☐
10.4	Install socket header	1x3 (3 pos)	SDA 1,2,3		☐
11	Install ground wires:		Front	GND	☐
11.1	Install ground wire		B9 to GND	GND	☐
11.2	Install ground wire		F24 to GND	GND	☐
12	Install 3V wires:		Front	+3.3V	☐
12.1	Install 3V wire		B4 to 3V	+3.3V	☐
12.2	Install 3V wire		F25 to 3V	+3.3V	☐
13	Install SCL wires:		Front	i2c Serial Clock	☐
13.1	Install SCL wire		G3 to SCL	i2c Serial Clock	☐
13.2	Install SCL wire		J7 to SCL	i2c Serial Clock	☐
13.3	Install SCL wire		J23 to SCL	i2c Serial Clock	☐
14	Install SDA wires:		Front	i2c Serial Data	☐
14.1	Install SDA wire		J6 to SDA	i2c Serial Data	☐
14.2	Install SDA wire		J22 to SDA	i2c Serial Data	☐
15	Install channel 0 wires:		Front	CH0	☐
15.1	Install channel 0 wire	LED lamp low to collector	F1 to E12	CH0	☐
15.2	Install channel 0 wire	DAC to base through R_limit	C8 to A11	CH0	☐
15.3	Install channel 0 wire	emitter to R_shunt at ADC	A14 to C21	CH0	☐
16	Install channel 1 wires:		Front	CH1	☐
16.1	Install channel 1 wire	LED lamp low to collector	E1 to A16	CH1	☐
16.2	Install channel 1 wire	DAC to base through R_limit	C7 to A15	CH1	☐
16.3	Install channel 1 wire	emitter to R_shunt at ADC	E18 to E22	CH1	☐
17	Install channel 2 wires:		Front	CH2	☐
17.1	Install channel 2 wire	LED lamp low to collector	E2 to F12	CH2	☐
17.2	Install channel 2 wire	DAC to base through R_limit	E6 to F11	CH2	☐
17.3	Install channel 2 wire	emitter to R_shunt at ADC	F14 to E23	CH2	☐
18	Install channel 3 wires:		Front	CH3	☐
18.1	Install channel 3 wire	LED lamp low to collector	E3 to F16	CH3	☐
18.2	Install channel 3 wire	DAC to base through R_limit	E5 to F15	CH3	☐
18.3	Install channel 3 wire	emitter to R_shunt at ADC	F18 to E24	CH3	☐
19	Test board for continuity and shorts				☐
20	Install MCP4728 12 bit DAC		D4-D9: Vcc, VD, VC, VB, VA, GND G4-G9: RDY, LDAC, SDA, SCL, GND, Vcc		☐
21	Install ADS1015 12 bit ADC		D20-D25: A-, A0, A1, A2, A3, A+ G20-G25: ALERT, ADDR, SDA, SCL, GND, Vin		☐
	this page last updated:	20260502			
	reference drawing file:	lab spec main board.PDF			

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surface mount technology LED adapter board build

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STELLA Lab Spec Cuvette Cantilever Board

Step	Action	What value?	Where?	What color?	Done
1	Get board	Sparkfun mini		Red	☒
2	Using main board as a template, install pin headers	3x2 one place, 3 pos one place, 1 pos six places	1-2ABC, A4, B5, C6, C13, B14, A16, 17ABC		☒
3	Fixture detector board at right angles to cantilever board	6 pos right angle pin header	G7-12		☒
4	Install socket header for drop board	6 pos socket header	G1-6		☒
5	<i>Note: flatten the wiring along row F to clear the drop board</i>	<i>Wires can stick up between D, E and F</i>			☐
6	Install ground wires		E2-F11	GND	☒
7	Install power wires		E1-F12	+3.3V	☒
8	Install SCL wires		E15-F10	i2c Serial Clock	☒
9	Install SDA wires		E17-F9	i2c Serial Data	☒
10	Install 5V wire		E14-F6	5V	☒
11	Install channel 0 wires		E13-F5	CH0	☒
12	Install channel 1 wires		E6-F4	CH1	☒
13	Install channel 2 wires		E5-F3	CH2	☒
14	Install channel 3 wires		E4-F2	CH3	☒
15	Test fit the drop board				☒
16	Test board for continuity and shorts				☐

STELLA Lab Spec Cuvette Drop Board

Step	Action	What value?	Where?	What color?	Done
1	Get board	Proto-Advantage 1.1x1.7"		Epoxy color	☐
2	Cut traces		F1-2, F2-3, F3-4, F4-5, F5-6 F6-7		☐
3	install right angle pin headers, long pins towards the edges of the board	6 pos, two places	B1-6, G1-6		☐
4	Install current limit resistors, short to G pins on header	50Ω, three places	FG2-C2, FG3-C3, FG4-C4		☐
5	Install channel 0 wires, short to G pin on header		FG5-C5	CH0	☐
7	Install 5V wire, short to G pin on header		FG6-C6	5V	☐
7	Test board for continuity and shorts				☐

STELLA Lab Spec Cuvette Excitation Board

Step	Action	What value?	Where?	What color?
1	Get board	Sparkfun mini		Red
2	Cut traces		F1-G1, F16-G16	
3	Install bottom LED, smt	488nm	(1,dot) FG7, (2,+) FG10	
4	Trim backlight LED panel (score with diagonal cutters, snap, trim corners)	Shorten the panel by 15mm	TBD fixture for this step	
5	Install CH3 backlight LED panel		(-) J8, (+) J9	
6	Bend CH1 and CH2 LEDs, match polarity and height below			
7	Install CH1 LED, set height with cuvette block	365nm (for DAPI)	(+) F1, (-) G1	
8	Install CH2 LED, set height with cuvette block	640nm (for Cy5)	(+) F16 (-) G16	
9	Install 5V wires		i13 - i10+i9, C12 - F13, H13 - F15+F16, D12 - F1+F2	5V
10	Install channel 0 wires		D13 - H7	CH0
11	Install channel 1 wires		F14 - i1	CH1
12	Install channel 2 wires		F15- i16	CH2
13	Install channel 3 wires		F16 - H8	CH3
	join to drop board... TBD			
14	Test board for continuity and shorts			

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STELLA Lab Spec PCR Tube Cantilever Board

Step	Action	What value?	Where?	What color?
1	Get board	Sparkfun mini		Red
2	Cut traces		GH7, ...GH12	
3	Pull 6 pins from a spare pin header			
4	Install the pins, sticking up from the board, into a right angle socket header		F7,...F12	
5	Using main board as a template, install pin headers	3 pos in three places, 1 pos in six places	1ABC, A4, B5, C6, C13, B14, A16, 17ABC	
6	Install ground wires	REAR, single layer, no crossovers	H8 - E2	GND
7	Install power wires	REAR, single layer, no crossovers	H7 - E1	+3.3V
8	Install SCL wires	REAR, single layer, no crossovers	H9 - E13	i2c Serial Clock
9	Install SDA wires	REAR, single layer, no crossovers	i10 - E17	i2c Serial Data
10	Install 5V wire	REAR, single layer, no crossovers	G10 - D14	5V
11	Install channel 0 wires	REAR, single layer, no crossovers	G11 - E15	CH0
12	Install channel 1 wires	REAR, single layer, no crossovers	G12 - E6	CH1
13	Install channel 2 wires	REAR, single layer, no crossovers	G8 - E5	CH2
14	test the sensor function with the qwiic connect cable before installing			
15	Mount the detector board, face up, extending off the cantilever board		J7, ...J12	
16	Test board for continuity and shorts			

STELLA Lab Spec PCR tube excitation board

Step	Action	What value?	Where?	What color?
1	Get board	Proto-Advantage 1.1x1.7"		Epoxy color
2	Cut trace		E6-E7	
3	install right angle pin headers	6 pos, 2 places	i4, ... i9	
4	test the CH0 LED polarity before installing			
5	install CH0 LED		[+,2] G6,G7 [-,1, dot] D6,D7	
6	install CH1 LED		[+] F11, [-] E11	
7	install CH2 LED		[+] F2, [-] E2	
8	Install channel 0 wires		REAR: G8 - C7	CH0
9	Install current limit resistor CH1	50Ω	REAR: G9 - E10	CH1
10	Install current limit resistor CH2	50Ω	REAR: G4 - G1	CH2
11	Test board for continuity and shorts			

Table 1

	units	value		
hfe ~ gain PN2222		100		
max current	mA	700		
base current	mA	7		
base resistor	Ω	50		
BE voltage	V	0.7		
DAC max	V	1.05		
Supply	V	3.3		
DAC max / Supply		0.3		
DAC set max		65535		
DAC use max		19660.5		
DAC nominal max		20000		

Line	condition	program action	result	note	result
0	INTERFACE TESTS:				
1	date correct		PASS		
2	time correct and live		PASS		
3	selection change on rotary		PASS		
4	correct selection order		PASS		
5	push when main selected	go to main page	PASS		
6	push when B+ selected	increment batch number	PASS		
7	batch number correct		PASS		
8	battery % correct		PASS		
9	status correct		PASS		
10	status highlight color correct		PASS		
11	measure button color correct		PASS		
12	push when measure selected	run measurement sequence	PASS		
13	push when excitation selected	selectable, green	PASS		
14	second push when excitation selected	not selectable, white	PASS		
15	rotate when excitation selectable	cycle lamp choice	PASS	make this list wrap around	DONE
16	excitation lamp ID correct		PASS		
17	push when current selected	selectable, green, show REQ	PASS		
18	second push when current selected	not selectable, white, show last	PASS		
19	rotate when current selectable	change REQ %	PASS		
20	current percentage or last correct		PASS		
21	push when gain selected	selectable, green	PASS		
22	second push when gain selected	not selectable, white	PASS		
23	rotate when gain selectable	change gain	PASS		
24	gain correct		PASS		
25	push when integration selected	selectable, green	PASS		
26	second push when integration selected	not selectable, white	PASS		
27	rotate when integration selectable	change integration	PASS		
28	integration correct		PASS		
29	push when view A selected	selectable, green	PASS		
30	second push when view A selected	not selectable, white	PASS		
31	rotate when view A selectable	change view A channel	PASS		
32	view A correct		PASS		
33	push when view B selected	selectable, green	PASS		
34	second push when view B selected	not selectable, white	PASS		
35	rotate when view B selectable	change view B channel	PASS		
36	view B correct		PASS		
37	show A B choice collision warning colors		PASS		
38	instruction line		TBD	not implemented yet	
39	back arrow		TBD	not implemented yet	
40	DO		TBD	not implemented yet	
41	next arrow		TBD	not implemented yet	
42	M number correct		PASS		
43	A value correct		PASS		
44	B value correct		PASS		
45	Ratio correct		PASS		
46	%DR correct		PASS		
47	make mmt display values change with A B choice		TBD	not implemented yet	
100	FUNCTIONAL TESTS:				
101	read current on lamp choice ADC channel		PASS		
	assign correct part numbers to each lamp				
1000	ADD FUNCTIONALITY:				
1001	work with as7343 sensor				
1002	accept configuration file to describe lamps				