BScene Technologies — Solid-State Lighting Controller — SPEC FILL SHEET v2 (tri-state inputs corrected)

YELLOW cells = you fill in • BLUE cells = auto-calculated (don't type over them) • Fill what you know, leave the rest blank — 'and and and' goes in Notes. Companion tabs: 2 = Inputs & Logic, 3 = Software Spec, 4 = Worked Example.

HOW THE AMPS WORK: Amps per channel = Total Watts ÷ System Voltage (cell below). Enter Watts Each + Qty and the sheet does the math. If you only know amps, type amps in the 'Known Amps' column and leave watts blank — say so in Notes.

A — PROJECT & VEHICLE

Project / build name	e.g. Off-road demo truck — lighting controller v1
Vehicle (year / make / model / trim)	
System voltage (V) — used for ALL amp calcs	12.8
Battery(s) / alternator output (A)	
Intended use (off-road / scene / fleet / all)	
Who is it for? (your truck / customer / product to sell)	

B — OUTPUT CHANNELS (one row per light / group of lights — 16 rows, add more if needed)

Ch #	Light / function name	Location	Make / model	Qty	Watts each	Total Watts	Amps (auto)	Known Amps (if no watts)	Wanted fuse / limit (A)	Connector style	Controlled by (input # / logic)	Default mode (on / dim% / pattern)	Notes
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
	TOTALS (all channels on at once)					**0**	**0.0**						

WORST CASE MATTERS: the TOTALS line is everything on at 100% at once. If that number scares the alternator/battery, tell me in Section C which groups will NEVER be on together — the controller can enforce that in software (interlock / max-simultaneous limit).

C — POWER, PROTECTION & BEHAVIOUR

Max total current the controller should EVER draw (A)	
Groups that must never run together	e.g. roof bar + rear scene — interlock in software
Low-voltage cutoff wanted? At what voltage?	e.g. Yes — cut non-essential at 12.0V, all off at 11.8V
Ignition behaviour	e.g. dead with key off / camp mode override for 2 hrs
Engine-off use (camp/scene lights on battery)	
Short-circuit behaviour	auto-retry (how many times?) / lock out until reset
Main feed: wire size / length from battery / fuse location	
Any loads NOT solid-state? (motors, heaters, high inrush	e.g. compressor — inrush matters for MOSFET sizing

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D — ENCLOSURE, MOUNTING & ENVIRONMENT

Mounting location	engine bay / cab / bed / bumper ...
Max box size you will accept (L x W x H)	
Water/dust exposure	IP65? IP67? pressure-washed?
Temp range / engine-bay heat?	
Connector style wanted	Deutsch DT / DTM, Weather Pack, bare pigtails, other
Wire exits / harness style	

E — THE 'AND AND AND' LIST (anything else — no wrong answers here)

Inputs & Logic — TRI-STATE physical inputs (3-way: HIGH / FLOAT / LOW on ONE input) + digital vehicle logic from In-Site

CORRECTED v2 (Ryan, 2026-10-25): HIGH / FLOAT / LOW are NOT three modes you pick between — they are three LIVE STATES the controller reads on the same input at the same time. One wire, three distinct meanings.

A — PHYSICAL INPUTS — EACH INPUT IS 3-WAY / TRI-STATE

HOW IT WORKS: the input rests at NOTHING (its own mid band — weak bias holds it there so FLOAT is a real, deliberate reading, not random noise). Pull the input UP to + and the controller reads HIGH — state 1. Leave it open and it rests at FLOAT — state 2. Pull it DOWN to ground and it reads LOW — state 3. So ONE input can be a 3-position switch (e.g. LOW = mode A, FLOAT = off, HIGH = mode B), OR it can tell the difference between OFF and a BROKEN WIRE — a normal on/off input can't do that. Give EACH state its own function in the three columns below.

Input #	Wired from (source / switch)	Device / switch type	Function when HIGH (pulled up to +)	when FLOAT (nothing /	Function when LOW (pulled to ground)	High band starts (V)	Low band ends (V)	Debounce / delay (ms)	FAULT here? (wire-	Notes
IN1										
IN2										
IN3										
IN4										
IN5										
IN6										
IN7										
IN8										
IN9										
IN10										
IN11										
IN12										

B — DIGITAL VEHICLE INPUTS (virtual inputs fed by the In-Site interface over CAN — no extra wiring)

Tick what you want the lighting controller to 'know' about the vehicle. Each one becomes a logic signal just like a physical input — e.g. V-HIGHBEAM = TRUE. In-Site reads it off the vehicle bus and feeds it to the controller.

Digital signal	Wanted? (Y/N)	True when... (your definition)	Source if known (bus / module)	Used to control (channel / out #)	Notes					
High beam										
Low beam										
Park / marker lights										
Turn signal — left										
Turn signal — right / hazards										
Brake lights										
Reverse gear										
Park / Neutral										
Vehicle speed (km/h)										
Engine running (RPM)										
Ignition / accessory										
Door open										
Battery voltage										
Other — your idea:										

C — LOGIC RULES (combine tri-state physical inputs + digital vehicle inputs — AND / OR / NOT)

Now each physical input gives you THREE conditions to write rules with: IN1=HIGH, IN1=FLOAT, IN1=LOW are all different. Examples: 'IN1=LOW → ditch lights mode A; IN1=FLOAT → all off; IN1=HIGH → ditch lights + bar' (one 3-position switch runs a whole setup). 'IN2 should NEVER be FLOAT while ignition is on → if it is, raise wire-break fault.' 'Fogs ON when IN3=LOW AND V-HIGHBEAM=FALSE.'

Rule #	Output channel(s)	WHEN — condition (tri-state inputs + digital signals)	THEN — action	Delay on (s)	Delay off (s)	Override?	Priority	Notes		
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Controller Software Spec — firmware + config/control app

We design this WITH the board, not after it. Priority: M = Must have for v1 W = Want it, can come later N = No / not on this build. Fill the Setting column with your choices.

CONFIG & SETUP (in In-Site on the Toughpad / Windows — same tool as diagnostics)

Feature	Priority (M / W / N)	Your setting / choice	Notes
Config lives in In-Site: one app configures the interface AND the lighting controller			
Per-vehicle config profiles — save / load / copy a setup to the next truck			
Export a build sheet (PDF) of a finished install: channels, inputs, logic, fuse settings			
Config backup / restore + factory reset			
Set every channel: name, max amps (software fuse), dim levels, pattern, input/logic assignment			
Set every TRI-STATE input: assign a function to EACH state (HIGH / FLOAT / LOW), set the high & low threshold bands, debounce, invert, and float-as-fault (wire-break) alarm			

CONTROL (day-to-day use)

Feature	Priority (M / W / N)	Your setting / choice	Notes
Physical switch panel support (our panel / OEM aux switches / both)			
Phone control over Bluetooth (on/off, dim, presets) — or NO phone, switches only?			
Presets / modes: one button loads a whole scene — list your presets in Notes			
Master OFF / all-on panic button behaviour			
Lockout: no strobe / no full-bright above a speed, or on-road legal mode			

PATTERNS & DIMMING

Feature	Priority (M / W / N)	Your setting / choice	Notes
PWM dimming per channel (how many steps / % levels?)			
Flash patterns: strobe, wig-wag, alternating, chase, hazard — which ones, how fast?			
Pattern editor: build your own pattern, not just pick from a list			
Fade on/off instead of hard switching			

DIAGNOSTICS & SAFETY (the screen that sells it)

Feature	Priority (M / W / N)	Your setting / choice	Notes
Live screen: per-channel actual amps, on/off, fault — PLUS live input-state screen showing every input as HIGH / FLOAT / LOW as you move the switch			
Fault log with time: short, open-load (light unplugged/dead), over-temp, low voltage			
Controller + per-channel temperature display and thermal derating			
Battery voltage display + low-voltage cutoff, set per channel group			
Event log export (what happened, when) for warranty / troubleshooting			

FIRMWARE & UPDATES

Feature	Priority (M / W / N)	Your setting / choice	Notes
Firmware update over USB from In-Site (no special programmer)			
Digital vehicle-logic updates: new vehicle signals added in software, no new hardware			
Failsafe: controller keeps last good config if an update or the tablet dies			
Controller must work standalone if In-Site / tablet is disconnected — yes/no?			

YOUR PRESETS / MODES (name them — e.g. Trail, Highway-legal, Camp, Scene, Dust/Chase, Emergency)

Preset name	What it turns on / does	Triggered by	Notes

SOFTWARE 'AND AND AND' — anything you want it to do that isn't listed

WORKED EXAMPLE — a sample off-road build, just so you can see how to fill yours in

These are EXAMPLE numbers only (typical LED loads), not a design. Copy the style, use YOUR lights' real watts from their spec sheets.

EXAMPLE CHANNELS (at 12.8 V)

Ch	Function	Qty	Watts each	Total W	Amps	Controlled by	Mode / pattern
1	Roof light bar 40in	1	240	240	18.8	IN1 (aux switch, LOW)	Steady 100%, dim to 40% in Camp preset
2	Ditch lights (pair)	2	40	80	6.3	IN2 (LOW) AND V-HIGH BEAM	Steady — auto with high beam
3	Fog / bumper pods (pair)	2	35	70	5.5	IN3 (LOW)	OFF when V-HIGH BEAM=TRUE (legal rule)
4	Rock lights (set of 6)	6	8	48	3.8	IN4 (LOW)	Dim 30% camp / 100% trail
5	Rear chase — amber	1	36	36	2.8	IN5 (LOW)	Flash pattern in Dust preset, steady otherwise
6	Reverse / rear scene (pair)	2	25	50	3.9	V-REVERSE=TRUE OR IN6=HIGH	Steady, only if speed < 10 km/h
7	Side scene lights (pair)	2	50	100	7.8	IN7 (LOW)	Steady, low-voltage cutoff applies
8	Spare — future	0	0	0	0.0	—	—
	TOTAL all-on			**624**	**48.9**		

EXAMPLE TRI-STATE INPUT — ONE input, THREE live states (one 3-position switch)

Input	Wired from	Active state	Pull	Why
IN1	Factory aux switch (switches ground)	LOW	Pull-up	OEM aux switches almost always switch ground — so ON = input pulled LOW
IN2	12V tap from high-beam circuit (backup to CAN)	HIGH	Pull-down	A 12V trigger: ON = voltage present. Pull-down stops it floating when off
IN3	Same 3-position switch, centre position — nothing connected	FLOAT	None (Hi-Z)	FLOAT is the deliberate OFF state here — and if the controller ever sees FLOAT while the switch should be engaged, that's a broken wire, not 'off'
IN4	Shared sense line from another module	FLOAT	None (Hi-Z)	Watching a line without loading it — pulling it up/down would corrupt the other module

EXAMPLE LOGIC RULES: #1 Fogs OFF when V-HIGHBEAM=TRUE even if IN3 is on (priority 1 — legality beats the switch). #2 Ditch lights ON when IN2=LOW AND V-HIGHBEAM=TRUE. #3 All non-essential channels OFF when battery < 12.0V for >30s, engine off. #4 Chase light cannot strobe above 30 km/h (on-road lockout).