



8.1 Main Light Switch

All models have the same main light switch implementation mounted in the top left dashboard pod position. This 3 position switch has 2 poles with variously configured throws on the primary pole. The configuration is rather unusual to support the special lighting functions of the 928. This includes the headlight pod motor, parking light modes, auxiliary high beam feed and dashboard ‘marker lights (only)’ lighting indicator.¹

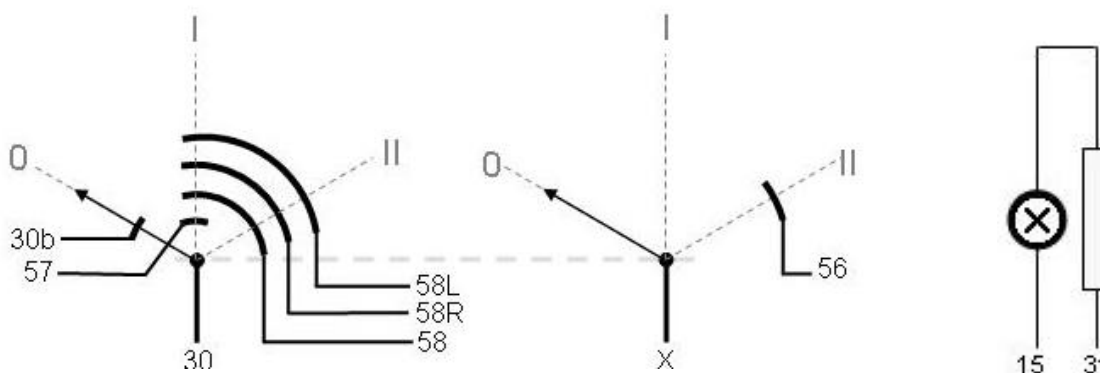
Table 5 Main Light Switch Functions

Position	Function
0	Lighting Off – This mode enables parking lights via the turn signal stalk
I	Marker Lights On (independent of ignition switch position)
II	Marker Lights & Headlights* on (*requires ignition switch in: I, II)

ROW cars indicate with the green ‘marker lights’ confirmation indicator that the light switch is in either the I or II position while on USA cars this same indicator in a different way – the ‘marker lights only’ warning illuminates only in position I and therefore serves more as a warning that the headlights are not on. In both cases this green indicator is useful since the 928 dashboard is always illuminated – unlike many contemporary vehicles where the dashboard was only illuminated when the external lighting was active.

This marker light/marker light only indicator is the only dash indicator that is illuminated in a steady state during normal driving.

Figure 36 Main Light Switch Configuration



¹ USA models have a “Marker Lights Only” indicator, ROW vehicles have a “Marker Lights” indicator



Table 6 Main Light Switch Inputs & Outputs

ID	Modes	Function
30	Input	Battery supply input (NB unfused)
X	Input	X-Bus input – feeds 56 switched output only
15	Input	Ignition input (powers switch illumination only)
31	Input	Ground (for switch illumination)
30b	Output-on: 0	Headlight relay - controls pod lowering
58L	Output-on: I,II	Left side marker lights (58L/58R/58 not linked in 0)
58R	Output-on: I,II	Right side marker lights (58L/58R/58 not linked in 0)
58	Output-on: I,II	Dash/console, license plate & dash 'marker lights' indicator
57	Output-on: I	Dash "marker lights only" indicator
56	Output-on: II	OP to headlight relay (incl. pod raising) & hi/lo/flash switch

8.2 Headlights

USA models ('87-'95) were delivered with H5 headlights and **ROW** models with H4 headlights. See the project sections on H4/H5 bulb upgrades and H4 ROW headlights for differences. These headlights are interchangeable although the bulb connectors need to be changed. In general stock power output levels were similar but the optics & projection patterns are superior on **ROW** H4 versions.²

The headlights are supplied by separate fuses for high and low beams and for left and right sides (total 4).³ The headlight relay contains several functions. It controls headlight on & off and high & low beam switching. It also controls the motor to raise/lower the headlight pods. This motor rotates the pods up when the headlights are turned on until they get to the 'up-park' position when it stops - only when the headlight pods are fully up does the headlight relay turn on. Most H4 & H5 headlights have little glass tabs on the glass face at the pod top that reflect light backwards so you can quickly determine when a headlight bulb has failed – if its not obvious directly from road illumination.

When the headlights are turned off they go out immediately and when the marker lights are also turned off (with the ignition on) the headlight pod motor reverses direction⁴ and rotates the pods down until it gets to the 'down-park' position when it again stops. The auto parking switch mechanism is built into the headlight motor and is connected back to the relay.

Note that the motor & park switch and the headlight relay type changed between '86 & '87 models and the two types are not interchangeable. Headlight electrics other than

² US DOT disagrees! – but many regulations that limited this have now been changed for new vehicles

³ This is avoid simultaneous loss of both lamps due to a fuse failure

⁴ Earlier models used a non-reversing motor that continued in the same rotation direction to 'down-park'

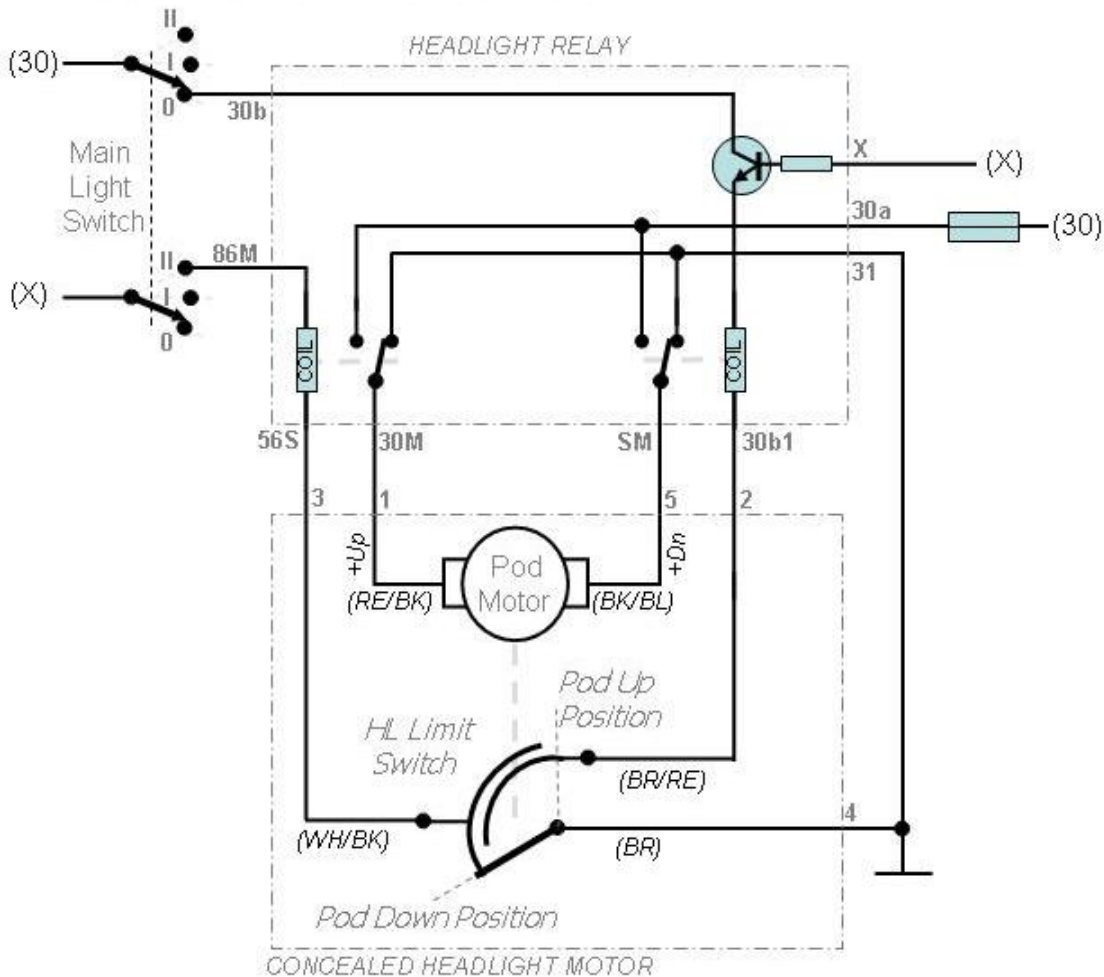


bulbs/sockets & aim adjusters were the same across '87-'95 and USA/ROW. The flash-to-pass feature flashes the main high beams only if the headlight pods are already up.⁵

8.2.1 Configuration for Motor Drive & Headlight Switching

The headlight electrical system has a single master relay that control 2 separate functions – raising & lowering the headlight pods and switching the headlights on and selecting either high or low beam. This large 'relay' can fill 2 relay bases on the CE panel and has 4 actual relays inside it - 2 for each function.

Figure 37 Headlight Motor Control '87-'95



Headlight Pod Motor Control

Starting with the headlight pod motor control the design has a limit switch built into the headlight motor to control the parking positions for upward rotation and downward rotation. These switch the ground signals to coils of a pair of relays configured for a motor reversing drive. At rest both sides of the motor are at ground but either side can be switched to (30) by one relay switching, allowing the motor to run in either direction.

⁵ Note the driving lights always flash with flash-to-pass regardless of headlamp position

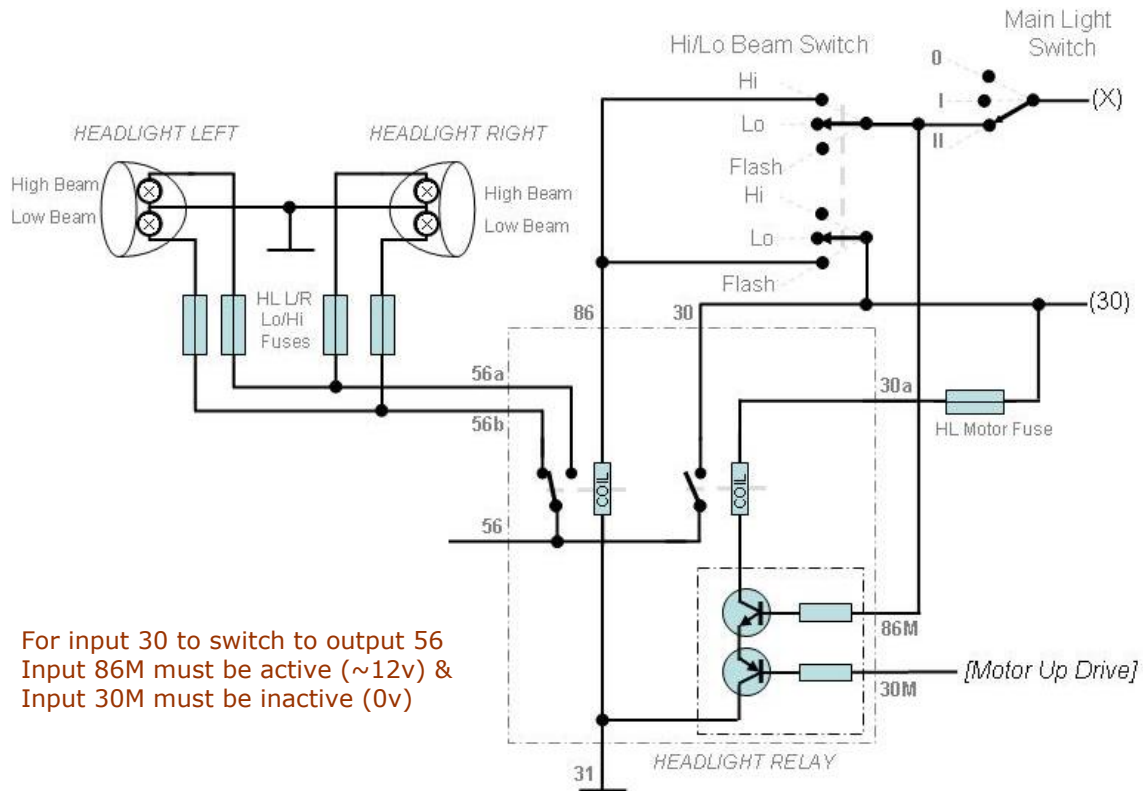


The signal to control the headlight pods rotating up comes from the headlight switch which in position II connects the relay coil to the X-Bus (X) – the motor will run until the up-park position is reached when the relay coil ground is disconnected.

The signal to control rotating down comes from the relay onboard logic which detects position 0 on the main light switch via terminal 30b and activates the coil to the X-Bus (X) – the motor will run until the down-park position is reached when the relay coil ground is disconnected.

The effect of this being connected to the X-Bus is that if the ignition is turned off before the light switch is turned to the 0 position the pods will stay up. The lights are then left up and turned off – convenient for washing the headlight pods. If the pods are left up in this manner – they can be lowered by simply turning the ignition to the accessory position with the main light switch off (position 0).

Figure 38 Headlights On/Off & Hi/Lo Beam Switching



Note the 30M terminal that drives the pod motor up is an output of the relay – see 0

Headlight Switching Control

The separate headlight switching function is a combination of an on/off relay and a selector relay for low or high beams. The on/off relay coil is fed by the light switch position II but the coil ground is controlled by the onboard electronics which prevent the lights coming on while the relay is still driving the motor to the up-park position – they turn on only when the relay stops driving.



8.2.2 Headlight Failure Mechanisms

Headlights can fail to illuminate correctly when raised or the headlight pods may fail to rise correctly (or at all). There is a separate fuse for the headlight motor so if the pods don't rise check that. Wind them up manually with the knob under the rubber cover on top of the headlight motor, (front LHS in front of radiator). If they bind up check for mechanical issues – you can pivot the headlamp pods up without rotating the drive-shaft (they just detach from the drive shaft mechanism so they can't trap hands etc if obstructed when lowering) – look/feel around underneath for binding wiring etc. You may need to remove the front wheels, wheel liners & splash shields if there are mechanical issues you can't solve from above. If the headlights rise - but not all the way - this could be a motor mounting/alignment/parking issue; (is the motor loose?) a drive-shaft position/linkage issue; or an end stop adjustments issue. The latter two will require investigation under the front fenders. If the motor is loose you will need to realign. The motor stop position is controlled by a parking mechanism integrated into the motor. When the motor rotates to the correct position to up-park a feedback switch contact tells the headlamp relay to stop driving the pods up. A mechanical stop (in the fender) should hold the pods tight at this same up-position. You may need to adjust the motor mount and shaft connection to get this correct. Note that if the motor has not yet reached its up-park position the headlights will not come on and the motor will still be driven - consuming power and likely getting very hot. This motor is not designed for continuous/stalled operation. If your motor is getting hot disconnect it or remove the fuse until you can fix the problem. If all seems good but the pods will not go up – or will not go down check the wiring and connection from the motor to the relay. You may need to disassemble and clean the contact tracks for the parking mechanism – or replace the motor. Alternatively the issue may be with the headlight relay. See if you can test an alternate headlight relay - but again note these were not the same for all years, use 1987 or later types.

If your pods come up but the lights do not go on check the fuses – especially if the lights come on in some modes (Left/Right, High/Low). There are 4 fuses to check.

Remove the pod covers and check the bulb connections to ground – the brown lead should be well connected to vehicle chassis via a ground point. Check for resistance when off & voltage with lights on. If your lights are on but dim – this is the first thing to test out. Clean those ground points! Test the bulbs to make sure both filaments work (ohmmeter) but it's very unlikely all 4 filaments failed at the same time...

If the pods are up, fuses are good and no lights come on its likely the pods are not fully in the up-park position. If the motor is not parked it will still be driving the shaft and will not have turned on the headlights via the relay. The easiest way to determine this is to remove the headlight motor fuse and see if that circuit is still active – create a test light with a 12v bulb connected between two ¼" male blade connectors and plug these into the fuse connector or use a 20A capable ammeter between those fuse terminals to test for illumination/current flow. If the motor is still driving you will need to adjust or clean the motor park mechanism. If the pods correctly rotate back down to the down-park position when turned off it's probably not a problem with the headlight relay.



If the pod position is stuck fully up or down, motor is immobile and the motor fuse is still good the failure is in the motor (or parking switches), relay or wiring – test the motor operation directly if you can. Try substituting a known good headlight relay – again see if you can borrow a suitable type to test. You can also test the contacts at the headlight relay socket for the parking switch contact operation as you wind the motor up and down manually, does the relay see the switches open when they get to the up-park & down-park positions.

8.2.3 Headlight Remote Aim Adjustment

ROW/Euro vehicles have a remote headlight adjustment system installed; this system was not allowed in the USA due to DOT regulations. ROW vehicles have a single knob next to the handbrake allowing a continuously variable fine adjustment of the headlights vertical aim - for example to compensate for loading changes of the vehicle.

The earlier adjustment system was fully hydraulic with a dual circuit circulating silicone fluid via the knob movement through semi-rigid tubes to hydraulic actuators in the bottom of each headlight yoke. This drove the ball & socket connection at the bottom of the headlight frame forward & back to pivot the whole headlight frame. USA versions have a fixed ball unit in the bottom of each yoke and non-pivoting headlight frames.

This hydraulic system was quite problematic over time primarily due to the tubing becoming brittle yet required to flex on each operation causing eventual leakage; so in 1990 an all electric system replaced it. Mechanically the operation of the system is unchanged. The same control knob near the handbrake now operates a potentiometer wired to a motor unit in each headlamp yoke. These motors are the brains of the system and use electronic feedback control to match the potentiometer position to the headlamp elevation (both sides together). They operate the ball unit tilting the headlamp just as the hydraulic system does. It has proven to be a much more reliable system.

The electric system works well for the H4 beam pattern – it would not work as well for the less well horizontally defined H5. In any case it's only possible to retrofit the system to USA vehicles that have H4 headlamps installed since only these have the required lens pivot attachment hardware.