

ENGINE START/STOP PUSHBUTTON SWITCH INSTRUCTIONS FOR JAG XJS (OR?)

By Reinaldo, CA USA

See important footnote at the end

The system is, basically, a single contact push button switch connected to a set of relays which, in term, transfer power to the car's starter motor relay and to the ignition system and to all accessories in exactly the same secured manner in which the OEM switch does such functions. This starting system does not need the OEM key to start the engine, which can still be used, plus it does not interfere with the OEM start switch, and the same is for the opposite.

The Latch circuit

Very important in this design is this "Latch Circuit" that I found on a website. I basically needed a circuit to produce a 12vdc output upon depressing a pushbutton switch and then to switch this voltage OFF the next time this switch is depressed, and so forth. This latch circuit (or "ON-OFF Module") does not use any IC's, or chips, but only 4 small relays and two diodes. The trick is in the way that they're connected together, see diagrams below:

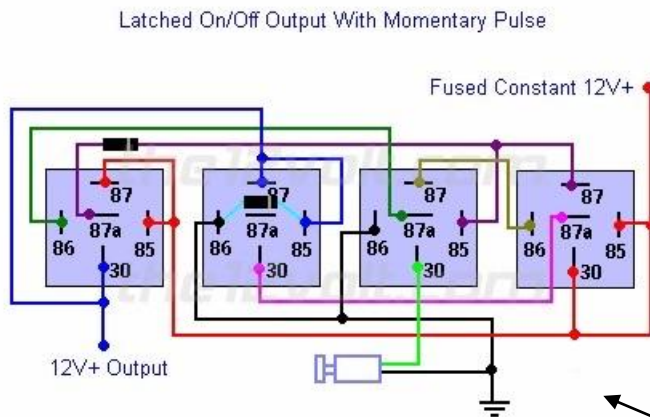
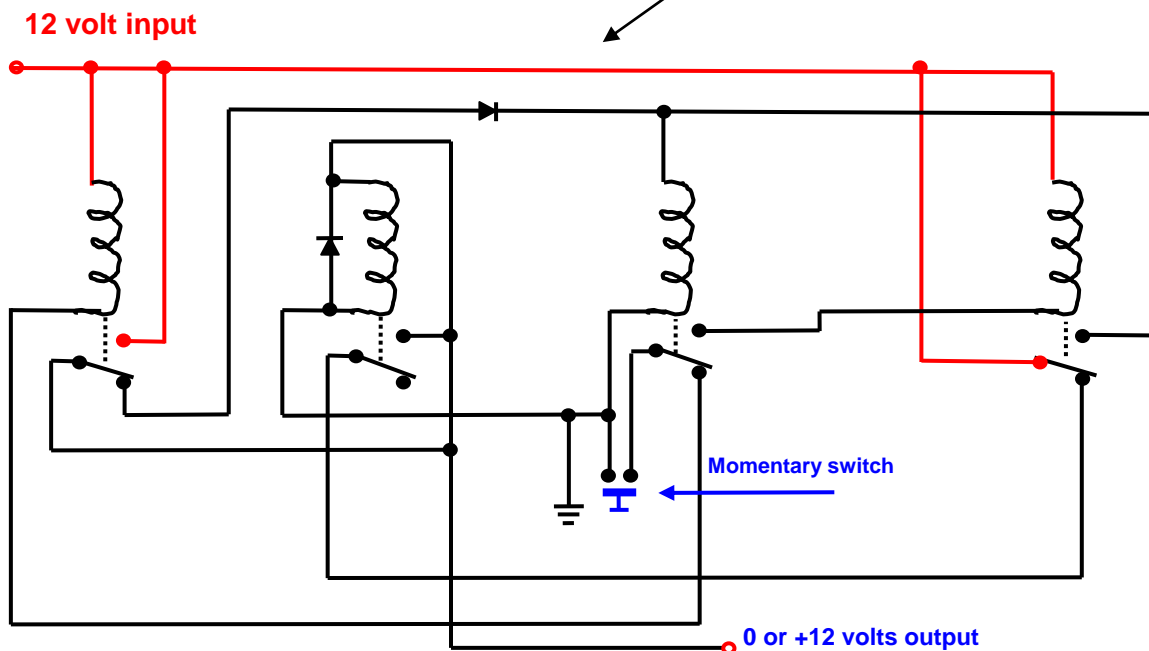


Diagram from original source

Schematic diagram equivalent



The main components in this system are:

- **A push button switch.**
- **A Module housing (Industrial plastic case) that houses the following parts:** (Also called “Relay Network”
A breadboard with the ON-OFF latching circuit’s 4 mini relays and 2 diodes. Relays K1 and K2 which can also be plugged on the breadboard holes. K3, K4, K5 and K6 are heavy duty relays, typical 40 amp Bosch automobile type relays with larger legs that cannot be plugged in to the breadboard, so they’re epoxied on.
A **teflon terminal strip** attached to the outside wall of the housing for the cable coming from the center console.
- A **cable** to connect the housing connector to the center console components. The plastic housing was located by the driver’s left foot well corner, see picture. UK cars would be similar, only in the opposite side.
- Located in the **center console** are:
 - The engine start/stop push button. The switch location is really up to the car owner’s choice.
 - The dedicated **ACC switch** located at the front edge of the center console opening.
 - System test **validity monitor** amber LED installed at the base of the cigar lighter.
 - The **test switch** to select signal validity in case of start failure, located next to the ACC switch. The “valid” indicator is the amber LED that verifies the system’s **ignition power** by depressing the switch downwards to test Latch circuit signal, or upwards to test K3’s output. See electrical diagram, near K6.
 - The “hidden” kill switch. This will be located at the user’s choice
 - **System Power Source** at the cigar lighter. Adding this new system to the cigar lighter’s power source has increased the amount of current being drawn, so for this purpose the power source for the cigar lighter has been changed to direct battery power from the left battery stud on the firewall. A new, dedicated 5amp C/B on my special mini 4 C/B panel (located next to the battery stud) delivers and protects power to the cigar lighter and to the engine start/stop switch system via 10 gauge wire.

About the pushbutton switch: This here was year 2010... but today, there are several types of pushbutton switches available in the market. See more Nissan switch pictures on pages 10 and 11. Also see the cool 2012 Jag XJ button, but it’s also a “cool” \$269.00. I chose the Nissan start/stop push button because it features illuminated signs for “Acc”, for “ON” (Ignition), for “Lock” (so far not used) and for a nice “ENGINE” sign. Plus, to my taste, it looks cooler than the other ones. The down side with using the Nissan unit is the extra work involved in adapting it to this system because the Nissan button is set to turn the LED’s ON with an unusual negative (GND) bias and not with a + bias, hence the extra parts and connections, so relays are added to reverse the biasing. However, several other straight-forward switches without or with partially illuminated signs can be used with far less labor required.

The main component in the **center console** is, of course, the **pushbutton switch assembly** and the following four items are integral to this Nissan assembly (see pictures of the installed Nissan switch below):

1. The white illuminated main center pushbutton switch
2. The white “ON” (Ignition) LED sign
3. The white “ACC” LED sign
4. The blue “ENGINE” LED sign. I changed this sign from white to blue with a blue LED.

Three more items in the center console (2 are OEM) are also part of the system:

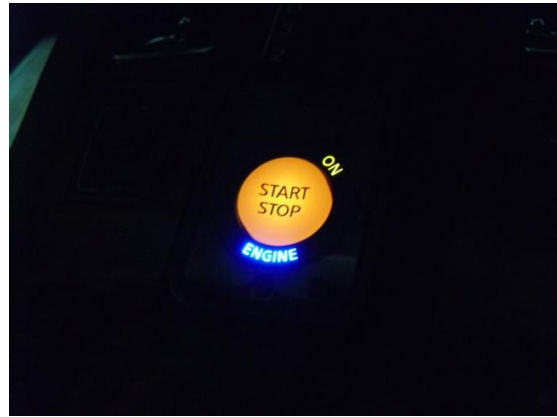
Shifter microswitch (OEM), located at gear selector, “Park” position (Part of the security immobilizer)

Cigar Lighter power feeds power to all the LED’s and the separate ACC ON-OFF switch, see above.

Ignition status LED, amber, located at the base of the cigar lighter. See note above.

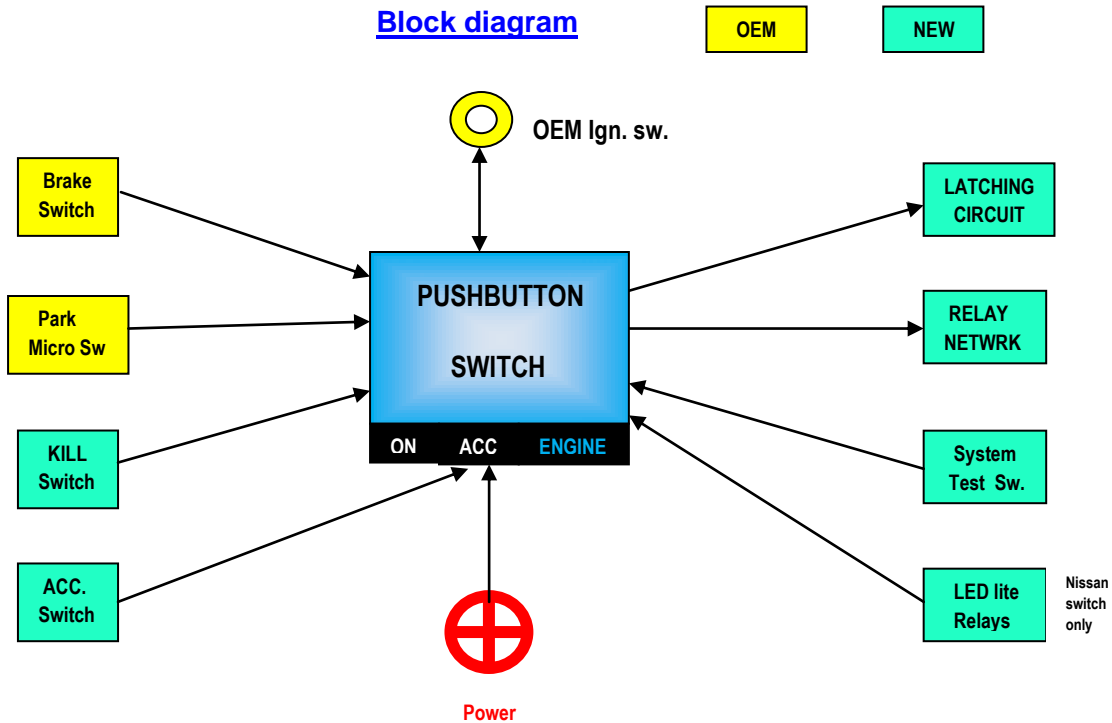


When a door is opened the start button and the blue “engine” sign light up along with the interior lights for 10 seconds



This is with the engine running or just with the ignition ON. The “ACC” sign is located across to the left of the “ON” sign. This neat illumination is what drove me to the Nissan unit.

Block diagram



SYSTEM OPERATION : (For this, please see the main electrical diagram as reference).

When the start button and the brake pedal are depressed while the shifter is in “Park”, K1 and K2 are turned ON. K1 sends a ground signal to the Ignition ON-OFF module, which starts generating a 12 volts output and this turns ON K3 (thus, initiating **ignition power**) and K4, (thus, initiating **Acc power**). K2 sends 12v to the car’s **starter relay** via K1’s second pair of contacts and the starter motor turns: the engine starts to run. Note: Jaguar turns ON all of ACC circuits when the ignition is ON. CR B(lock) is a new addition to block the ACC power from mistakenly turning K3 ON.

As mentioned earlier, K5 and K6 are extra relays required to reverse the polarity bias to the Nissan push button's illumination LED's that come from K3 and K4, if and when the Nissan pushbutton is being used. But if you remove K5 and K6 from the diagram, along with the Nissan push button (towards the right of the diagram) you'll see how simpler the system becomes with a simple ON-OFF push button (but without the fancy lights).

To stop the engine the car must first come to a stop because the tranny needs to be in "Park". With the shifter in "Park", depressing the pushbutton stops the engine. DO NOT depress the brake pedal when stopping the engine: it will grind the gears like it happens when you try to start an engine that's already running.

Note: If you push the start button without depressing the brake pedal, you fail to crank the engine, but the ignition will still come ON. If you try to start the car again, but now with the brake pedal depressed, yes it will crank, but it won't start because with the second attempt you have now turned the ignition OFF and thrown the sequence out of whack. So now you need to recycle the sequence, meaning just depress the brake pedal and push the start button one more time and the car will start nice and cool again.

Some relevant notes on the Ignition ON-OFF "Latch Module". It consists of only four relays of low power rating, plus two diodes and these components can be incorporated into the same breadboard together with the other Relay Network components inside the plastic case module. Just make sure that you assess the relays' sizes before determining the size of the breadboard and housing size needed; that is if you do want to use a breadboard for this purpose. Note: It is unfortunate that I did not take pictures during the course of placing components in various locations when I did my install, but this is far from brain surgeon material... This setup of four relays and two diodes is a very clever little design. The load to this circuit's output is actually the coils of K3 and K4 simultaneously at 160 ma each, or 320 ma total, plus rarely, the test amber LED at a much lower consumption. Then, the circuit's output current capacity is 2 amp (relay contacts rating), or at least six times the load, i.e. it will last forever.

The ACC switch

First, the OEM ignition switches all have a position **I** (ACC) and a position **II** (Ignition). The Nissan push button, like most push button switches, has only one switch in it and that single switch gives us the ON-OFF action that we're using for the Ignition (II) ON-OFF operation (represented by the blue momentary switch on the ON-OFF latch circuit diagram above). As such, there's no second stage switch in it to be used for switching the ACC mode. The Nissan vehicle probably uses a built-in processor for this function. It is for this reason that this installation requires an entirely separate switch for the ACC function. This is a sp/st toggle switch that I located at the front edge of the glove box, right next to the ignition signals test switch, which can be turned ON without lifting the lid. BTW and FYI, depressing the start switch without depressing the brake pedal will turn the ignition ON without starting the car.

PARALLEL CONECTION OF THE OEM IGNITION SWITCH WIRES

One critical step is the connection of this new system to the car in a manner that both systems can co-exist without interfering with the other. This means connecting the new system to the OEM ignition switch via straight forward parallel connections to run the car. See system's electrical diagram. With K2 output parallel to the OEM starter line, K3 output parallel to the OEM Ignition line and K4 output parallel to the OEM Accessory line outputs by means of tapping to the OEM ignition switch wires (see diagram). This is a rather tricky job because it is done under the dash, working with a large, very hot soldering iron and in the close proximity of many other wires and along with the fairly short leads that resulted from cutting open these short ignition switch 10-gauge wires (4 ea.). Cutting, stripping, adding the new wires, soldering, carefully matching colors and heavily insulating those solder taps is some real test.

These four wires that connect the OEM ignition switch to the gray relays module in my US XJS are about 12" to 15" long, but this will vary with different location choices, especially with non-US cars. However, we do want to keep those heavy gauge wires the shortest possible for maximum efficiency.



The grey Relay Module on the left kick panel.
Notice the white teflon connector strip at the end of the wires

Finding the wires

After removing the driver's side under tray, the wires that need to be identified down there are the four heavier gauge leads to the ignition switch as per the following colors (all wires are 10 gauge):

1. BROWN - Power input wire that runs from the (left front) battery post to the ignition switch.
2. WHITE - "Ignition" position ("II"), to all circuits in the "switched power" fuse panel, incl. ACC
3. WHITE/PINK - "Accessory" position, or pos. "I" in the OEM ignition switch, to all ACC circuits
4. WHITE/YELLOW - "Start" function goes to the starter relay. Smaller gauge (14 gauge or so)

The relays used:



Picture of K1 and K2



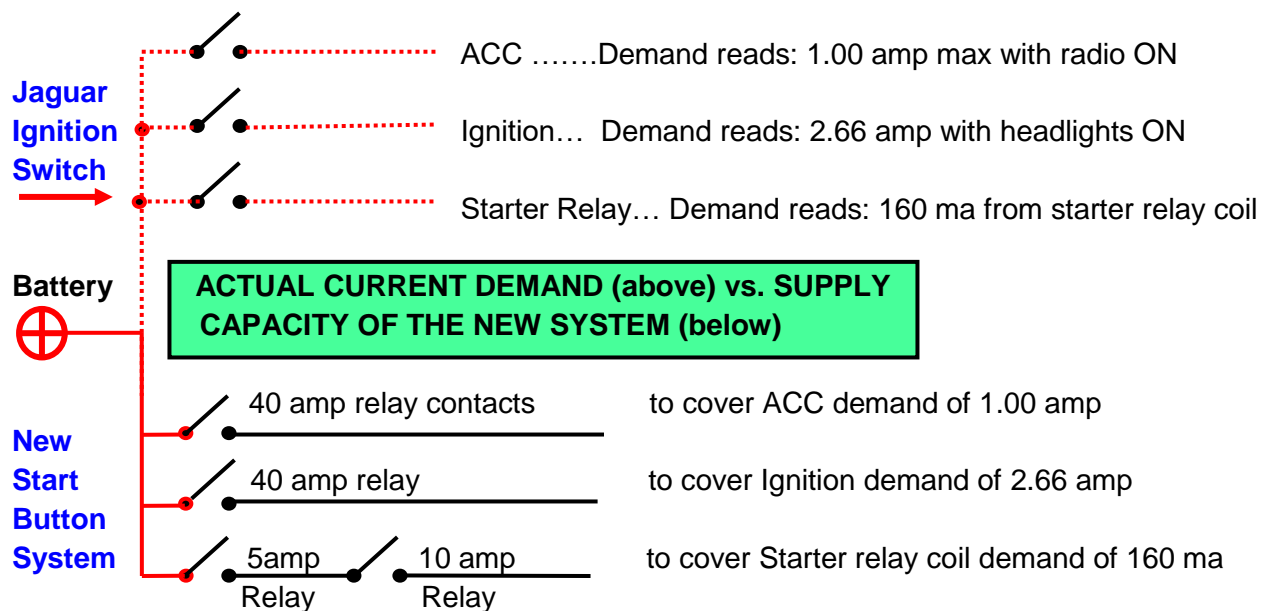
The Bosh type relay
K3, K4, K5 & K6



The mini relays in the
12volt ON-OFF latch circuit

Is this system up to the power demands and capacity of the OEM ignition switch?

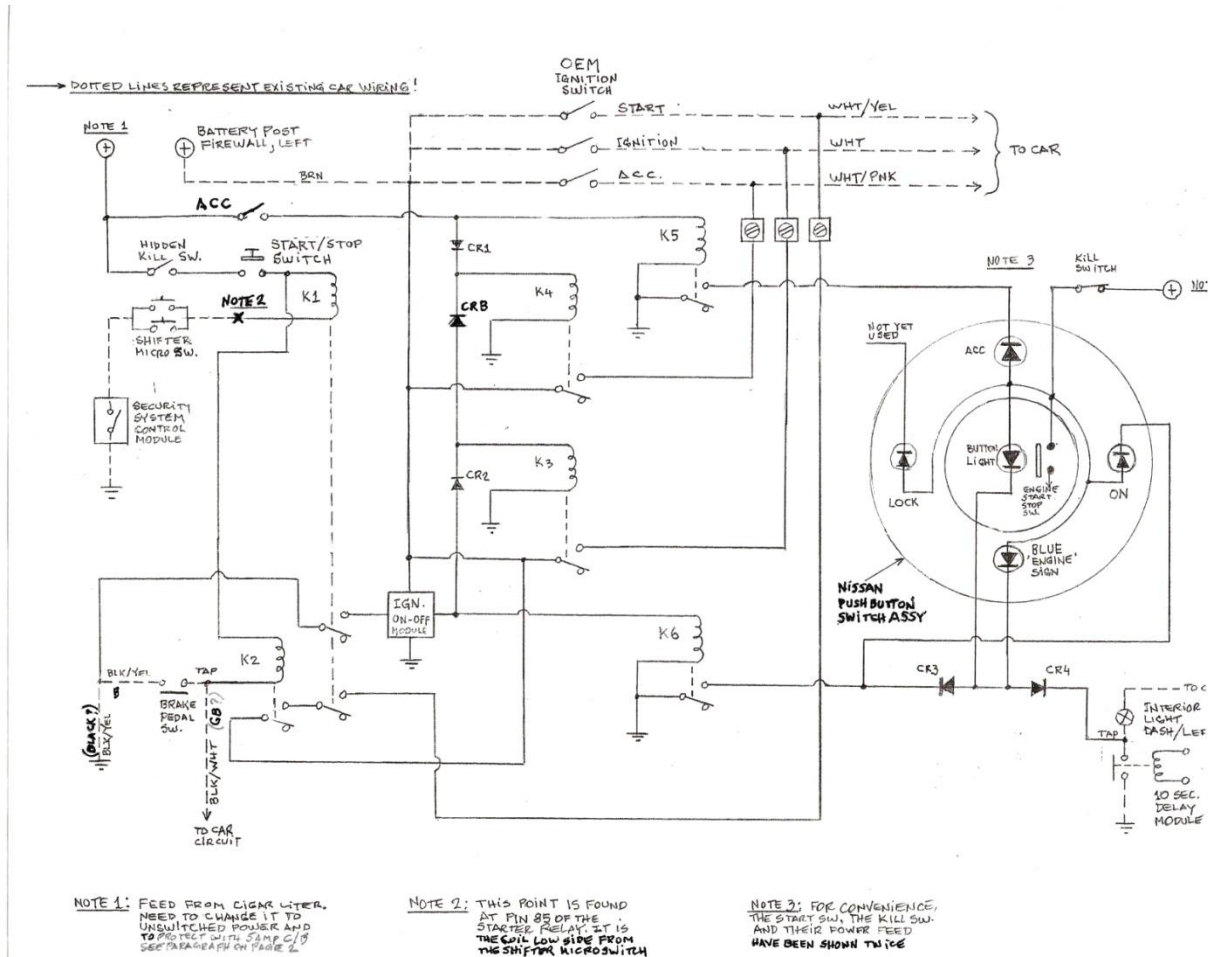
For peace of mind, and to make 100% sure that this new system is strong enough for the actual electrical current demands, I went and measured electrical current to all three branches of the OEM ignition switch: Ignition ON, Accessory ON and engine start, then I compared, as follows:



For ignition ON, Jaguar powers both, Pos 1 ACC and Pos 2 IGN and so does this system, so total demand is IGN (2.66) + ACC (1.00)= **3.66 amp**. This is total overkill, as the new system supplies this power from **40 amp** relays.

As it is well known, the only real heavy currents found in the car's starting system have nothing to do with, neither the car's OEM Ignition switch, nor this new push button ignition switch. The heavy starting current draw is rather handled by the starter solenoid inside the car's starting motor assy.

SYSTEM ELECTRICAL DIAGRAM USING THE NISSAN START/STOP PUSHBUTTON



The circle drawing with LED's to the right is the detailed Nissan switch drawing. Notice that the actual switch in the center is a repeat of the switch by K1's coil

NOTE:

If a switch other than the Nissan push button switch is used, such as just a simple straight forward switch, the same diagram would apply but without:

- Relays K5 and K6
- Diodes CR3 and CR4
- All those LED's inside the Nissan switch
- The connection to the 10 second delay module shown at bottom right.

There are plenty of simpler switches available for this purpose.

General Installation comments

Center console items

If this new start push button switch will be located on the tranny dial, the transmission mode switch will need to be moved out of the way, preferable to where Reinaldo moved his, which is right next to the tranny dial, on the ski slope area. For this, a precise cut needs to be done to fit the switch at its new location. If not using the Nissan switch, make sure that there's enough depth room under the tranny dial, unless you don't mind the switch protruding above it.



See the **amber test light** at cig. Lighter



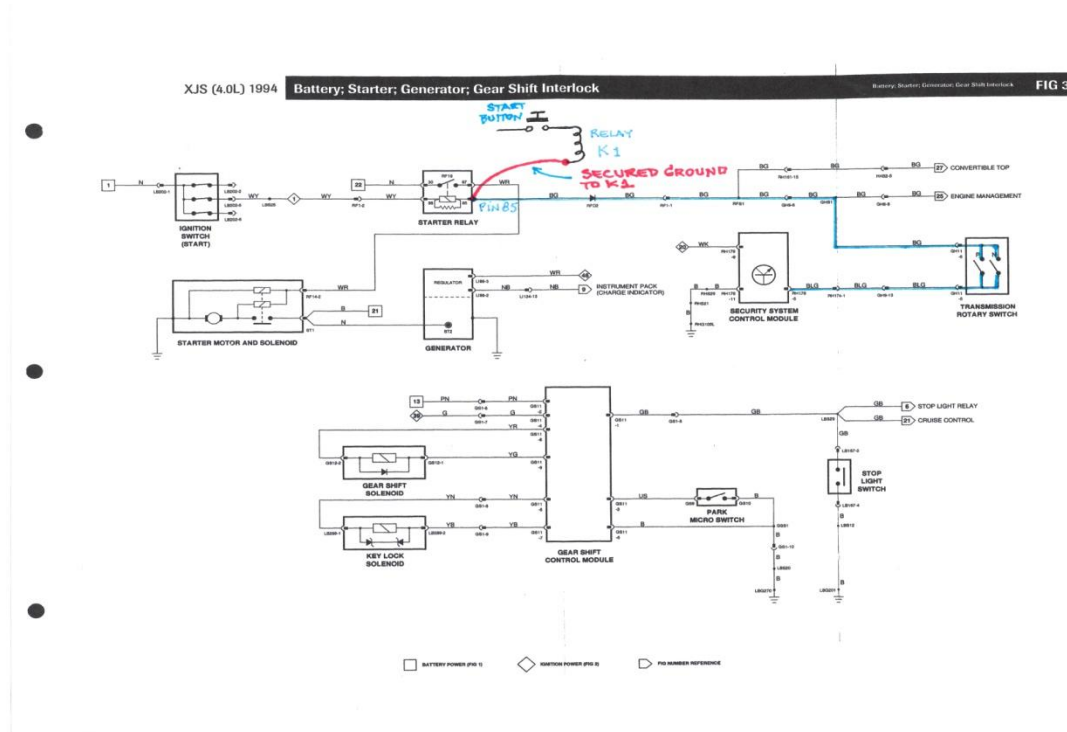
Switch leads somewhere in there . . .

If the Nissan switch is chosen, wire leads will have to be soldered for all of the switch leads behind the switch body, which include those for the LED reversing bias. The Nissan unit I purchased came with no indication as to what lead is for what, so I used an ohmmeter in addition to lower test voltage to identify the LED's leads and to determine which wire from the relays will go where. Follow the electric diagram for this. Also, I know that it is possible to find a Nissan electrical diagram that shows their start switch connections.

Then, cut the hole for the switch on the dial to the exact diameter of the switch body. Use top quality epoxy or JB Weld to firmly attach the switch to the back of (under) the dial. If necessary, it is a good idea to place some piece of wood under the switch, precisely cut to the correct size in a way that it will block any applied downward force to the switch assy. in case that somebody depresses the button too hard.

Engine start security feature

This new start/stop push button ignition switch is connected in a way so it shares the security features of the OEM ignition switch. See below figure 3 of the Jaguar electrical guide indicating pin 85 of the starter relay as the pickup point for the secured ground signal that our system's relay K1 needs in order to launch the engine starting sequence. The XJS starter relay is one of three relays located in the Right Front Component Panel, by the cruise control items.



Brake light switch. For this purpose, ground signal is tapped at the stop light switch by the brake pedal. The stop light switch provides ground signal to the car's stop light relay and now to the new engine start/stop pushbutton.

Start/stop failure test

At the center console front edge we have the start/stop operation failure test switch; it works with the amber LED located at the cigar lighter base. See page 2 above for a description of this diagnose tool.

ACC switch

On the front edge of the center glove box is the new ACC switch. See full description on page 4.

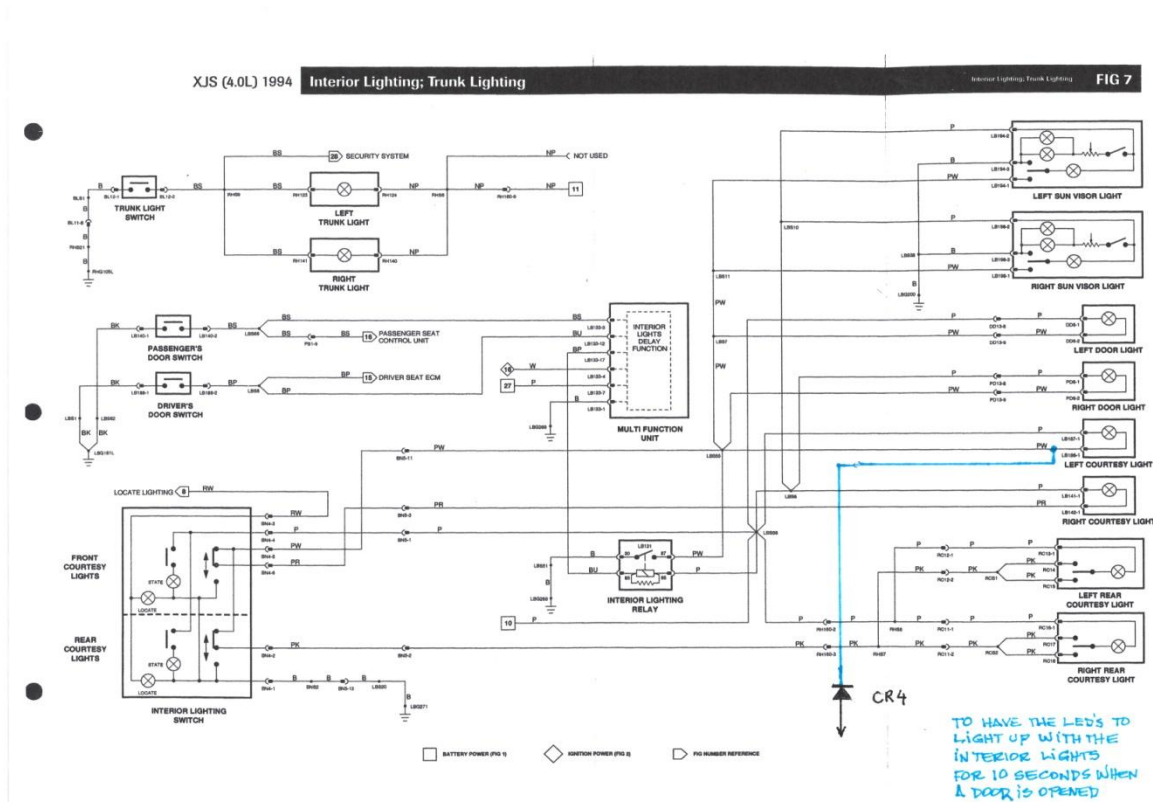
LED's lights up when getting in the car

If you want the fancy feature of having the Nissan push button switch LED's to light up along with the interior lights when a door is opened, run a wire from the cathode of CR4 to the switching side (not the always hot side) of either one of the left or right courtesy lights. See attached figure 7 of the Jaguar electrical guide. Also, see pictures on page 3 here.

For LED's to light up when a door is opened

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Pull out the courtesy light assy. and identify the lead that gets ground when a door is opened and NOT the one with constant 12 volts...



Some Jaguar Engine Start/Stop Pushbutton Switches:

(Not cheap)



2011 - 2012 Jaguar XJ ignition switch **\$256.00**



Jaguar XK Ign. Sw. **\$208.50**
Little too long for the XJS console

Nissan switches samples:

Nissan GTR-R35 Start/Stop switch



Nissan ignition switches, ave. \$40 to \$60, new



Reinaldo's XJS' Nissan switch, with the chrome ring



Back view with the contact terminals seen

CLOSING NOTES

It's been at least 10 years since I designed, built and installed this nice little system on my glorious XJS. In the last few days I have gathered lots of information pieces from a number of never ending, almost scary looking little piles of notes and drawings from the design steps. I apologize for possible typos and/or misplacing info in, perhaps, incorrect sequence or, simply, just repeating myself.

I HOPE THIS WORKS FOR YOU PEOPLE AND THAT THERE IS A SECOND, THIRD AND TENTH JAGUAR XJS WITH A COOL START/STOP PUSHBUTTON SOMEWHERE IN THE WORLD IN THE NEAR FUTURE.

ANY QUESTIONS, PLEASE, DO NOT HESITATE TO CONTACT ME AND I'LL BE HAPPY TO RESPOND.

Reinaldo

September, 2020

FOOTNOTE:

PLEASE BE AWARE: Before going any further, at this point the XJS owner must acknowledge that, although this push button switch emulates everything electrical that the OEM switch does, including the interfacing with the car's security system, there is one function that's mechanical in nature (not electrical) which the push button cannot perform and this is the **locking of the steering wheel**. This function is done by a metal pin inside the stock ignition switch which gets pulled out of the way when the ignition key is turned into position "II", and this is something that this all-electrical push button system simply cannot do, therefore the pin needs to come out, unless we somehow came out with a clever way to move the pin electromagnetically, but it's not really a must. In addition to the existing OEM Security System Immobilizer, plus a possible extra hidden ignition system power cut-off function can be added for further protection in lieu of steering wheel locking. Up to the owner.



XJS steering wheel locking pin in OEM ignition switch