

“Bridging the Gap”: Slot.it oXigen FAQ

General questions

Q: what is oXigen?

A: The obvious answer is – an element of the periodic table, normally found in a bi-atomic (O₂) form, wrongly spelled and written with the capital letter in the wrong place.... in the slot world, however, it is a new wireless control system for slot cars which bridges the gap between digital and analog.

Q: who is developing oXigen?

A: Galileo Engineering, the company known by the brand name 'Slot.it'. The same people who developed all the Slot.it cars and accessories, the SCP-1 electronic controller in all its forms, and many other electronic stuff for toy companies in toys, industries and multimedia (Giochi Preziosi, Landi Renzo, IK Multimedia, and others).

Q: how many cars can run on the track at the same time?

A: Up to 20 cars per track in digital mode, or as many cars as lanes in analog.

Q: 'only' 20 cars?

A: Have you ever tried more than 20 cars on a track at one time? :) Technically, we could make more cars run on the same track, but feel that 20 cars per track for a maximum of 4 tracks in the same wireless area is more than enough...

Q: can I still run my analog cars on the track, with my old controllers?

A: Certainly. O₂ *bridges the gap*, it is 100% compatible with your old analog track. Of course, to change lane, lane changers are necessary, but they stay straight when lane changing is not requested. Not only that: the latest development in O₂ takes advantage of the O₂ cartridge, to turn the SCP-1 for any supported system, into a wireless, untethered controller!

Q: what tracks does it run on?

A: O₂ can use existing Scalextric Sport Digital LCs so if you have an SSD track, you keep all your existing investment; just add start/finish lines and PC interface if you need more than 6 cars. You can confidently buy SSD LCs knowing that you will put them to good use in both systems. oXigen specific LCs are being designed and come with bells and whistles like live flippers, anti collision, radio interface: these, and Start/Finish lines will be made for Scalextric Sport and Ninco tracks. Just buy the O₂ track pieces and plug them in your circuit with no rewiring, cutting, gluing... they fit your track just like ordinary track pieces.

Maybe, eventually something will be done for Carrera, but we cannot commit ourselves at the moment: in any case, a small custom PCB, for Carrera only, must be made.

Q: sounds good: how does this work?

A: Traditional digital systems use the track rails to bring both the power and the control signals to the cars. This limits the number of cars because more cars you want to run, more current you must provide. However transmitting control signals with large currents becomes increasingly difficult, hence current cannot exceed a certain limit. Besides, the control signals are transmitted in a very noisy environment (rails, braids, dirt, and electric arcing from motors) which further complicates things. The oXigen solution is: full power on rails, control signal from wireless 2.4GHz transceivers. So the cars get the power they need when they need it, and the control signal stays clean.

Q: what do I need then for an O2 system?

A: First of all, a track, controllers and cars: we don't make tracks but we make fine slot cars and controllers. Then, you need at least oXigen in-car chips (ICC), and SCP-1 controllers fitted with oXigen module. If you already have the SCP-1, all you need is the relevant cartridge. Once again, investment is safe. With this setup you can run chipped cars as if they were analog cars. Read below for lap counting and lane changing.

Q: how do the cars get their ID programmed?

A: There is a specific procedure for the SCP-1: use the knobs to select the channels and program the car and the controller for a specific ID. The LED displays on the controller will show you the programmed ID.

Q: what power supply does it need?

A: An adjustable power supply with enough wattage to satisfy your needs. 9V to 18V with at least 1A per car is what we would recommend.

Q: is a PC strictly needed?

A: For lap counting and race management in O2 mode, yes. Other operations, like programming the car ID, and running the car either analog or digital, do not need a PC. In SSD mode, a PB is all you need; read in the “compatibility” section below.

Q: can the embedded software be reprogrammed in all the devices?

A: Certainly reprogramming the software embedded in all the devices is of paramount importance, especially for a new technology like this one. New features can be added and software bugs can be removed throughout the life of the parts. All the components of the O2 system can be reprogrammed either through USB, in case of the 'PC dongle', or 'over the air', that is, by means of the 2.4GHz radio link.

Q: what do I need to transform the SCP-1 into a wireless controller for any system? (new Jan 2010)

A: A complete SCP-1, and oXigen cartridge, and an oXigen-SCP1 cartridge interface. The oXigen cartridge is of course a completely standard unit which can be used inside a full O2 environment.

Q: Can we have pit lane speed limits? (new Jan 2010)

A: in principle, yes. Each car's speed can be individually limited, so, once the car crosses a detector at the beginning of the pitlane, its speed could be reduced.

Q: Does O2 support ghost cars? (new Jan 2010)

A: The SCP-1 already has a built-in ghost feature.

Questions on compatibility

Q: What protocols is it compatible with?

A: As of today (Jul 2010) oXigen is the *only* known system compatible with SSD legally, thanks to an agreement with Hornby Hobbies. oXigen cars 1 to 6 are recognized by SSD power base as cars 1-6; any SSD lane changer works with O2 cars (yes, all 20 of them!); O2 start/finish line and O2 lane changers are fully SSD compatible. Note that by design, O2 cars do not recognize Hornby's SSD Protocol: the compatibility is at the lane changing/car detection level. O2 is not compatible with SCX, Ninco and Carrera protocols.

Q: Can I use O2 cars with SSD hardware?

A: Hornby SSD lane changers work well with oXigen cars, and with some ingenuity you can use Hornby's power base as a lap counting/finish line for oXigen cars. The trick is to power the rails separately to a fixed voltage and use the Power Base as a lap counter only, for up to 6 cars: oXigen cars are not compatible with the rail-transmitted SSD protocol, but the O2 LED protocols used for lap counting and lane changing are compatible with SSD devices.

Q: Can I use O2 cars along with SSD cars in a SSD environment? (new Jul 2010)

A: The latest O2 in-car module makes it possible, through an external add-on board (a 'smart' add on, that we keep under cover for the time being), to place the O2 car on SSD powered rails and race it along with SSD cars. The only drawback is that, as we make no attempt to decode the SSD protocol, race start and stop are not under the control of the SSD base. However, all the rest, that is lap counting and lane switching, works nicely. O2 cars can obviously be programmed as cars 1 to 6 only to be detected by the SSD powerbase.

Q: Can I use O2 parts within SSD?

A: Yes, O2 Lane Changers detect SSD cars and the same applies to O2 Start/Finish lines.

Q: is the RMS software available for anything other than MS Windows?

A: The software tool that we use for writing the RMS is available for Linux and Mac as well. Our company is Linux-centric, but the world is not, so we developed a Windows RMS version first. Hopefully we will also release Linux and Mac versions (at a certain point). Anyway, the base RMS will probably be open-sourced, and the dongle protocol will be disclosed free of charge. As far as the PC is concerned, the dongle is only a serial port. Note that our software is only a basic, but robust, RMS system. We leave the fancy features to the external developers.

Q: will any of the existing RMS programs be compatible with O2?

A: Currently, we have contacts with the nice guys behind PcLapCounter and Wincrono who have both decided to support O2.

Q: can I use my existing lap counters with O2?

A: Yes. The PC drives the parallel port(s) so that race positions can be displayed on DS lap counters (car 1 on DS lane 1, etc...) as if they were used with a standard analog track. You can then hook them up to a PC running DS software, and so on. In other words, you can replace the track sensor bridge with the parallel port of your PC.

For DS systems, a small basic level translator is needed, though, as the DS system expects to have a minimum 7V signal as its input. Systems accepting a 5V input can be used directly.

Q: can I use my analog cars with O2? (new Jan 2010)

A: On the same track, O2 can peacefully coexist with analog cars, but of course to run digital races with all that's involved you need to run the chipped cars. However, please read the "SCP-1 cartridge radio interface" section to see how O2 can turn any SCP-1 in a remote wireless controller...

Q: is O2 compatible with the Slot.it Telemetry Box (new Jul 2010)

A: Yes: a Telemetry Box mounted on an oXigen SCP-1 in an oXigen world behaves just like a Telemetry Box mounted on an analog SCP-1 in a standard analog world.

Hardware components: Start/Finish lines (SF)

Q: Why a dedicated unit and not using any of the LCs?

A: We have chosen to manufacture a separate, half straight finish line with all the tooling costs involved (the part will be available for SSD and Ninco, for Carrera possibly but in the future) for several reasons:

1. the aim of O2 is to handle pure analog races as well. You will actually be able to use the O2 finish line in an analog-only track, using O2 finish line and PC 2.4GHz USB dongle for lap counting.
2. there are situations where it is highly advisable to have a separate finish line - e.g. when you have a pit lane. A radio LC as finish line would not be cost-effective in this case.
3. If the customer decides to use plain Hornby SSD LCs, O2 can be up and running in no time with an O2 SF line.

Besides, our rule of thumb is that screws work best when driven with screwdrivers and not with hammers :)

Q: how is the car detected?

A: O2 lap counting works with LEDs the same way as SSD does, but with an extra sensor, whose purpose is to raise a warning should any cars cross the line without being properly detected. The RMS or the race director can then take appropriate actions. This extra sensor (IR barrier for pickup detection) is used for analog racing lap counting as well as speed measurement for digital cars. If there is anything which must not fail, it is lap counting as any error can wreak havoc during racing.

Q: how can I use the SF line within SSD?

A: O2 finish lines properly detect Hornby's SSD cars 1-6. The PC dongle works with the RMS to display lap counting. This actually gives to SSD the possibility of using more than two lanes for lap counting.

Q: So what cars can O2's SF line detect?

A: It detects up to 20 different oXigen cars or 6 SSD cars, and analog cars as well, for up to 10 lanes. In other words it can be used as an oXigen SF, an SSD S/F for more than 2 lanes, or a traditional analog S/F. In most cases, the O2 S/F line requires a PC interface (dongle) and an O2 race RMS, but something might change here to make matters even more simple.

Q: what brands are you making the SF line for?

A: Scalextric Sport Digital and Ninco track pieces will be made. For Carrera, it is highly desirable but we cannot make any promises now.

Hardware components: PC 2.4GHz interface (dongle)

Q: What is the 'dongle'?

A: a USB small key which plugs into any USB port and glues all the parts of the O2 system together with the SW running on the PC.

Q: is there a specific software?

A: Yes, the RMS sw speaks to the dongle which in turn speaks to the various parts of the O2 system: SF lines, LCs, and controllers.

Hardware components: Lane changers (LC)

Q: can SSD Lane Changers be used?

A: For Scalextric Sport tracks, Hornby SSD Lane changers are a perfect first choice. Reliable and reasonably priced, they can also be integrated into Ninco tracks by commercial Ninco and Scalextric track adaptors.

Q: how is the car detected?

A: By decoding the LED code (the same as Start/Finish lines do)

Q: are there O2 specific lane changers?

A: Slot.it is developing oXigen lane changers for SSD as well as for Ninco tracks. These O2 LCs add extra functionality like live flippers, anti collision, optional radio interface, programming, 'selective lane change' (read below) and one more feature that we cannot disclose yet.

Q: what sort of skill is needed to assemble these lane changers?

A: None, these parts are assembled in the track in the same way as any other off-the-shelf LC is assembled.

Q: what tools are needed to install the LCs?

Your hands, and for the LC for Ninco tracks, a cross head screwdriver to secure the Ninco-compatible plastic clip in its place: as the LC piece can be positioned across track pieces, the clip must be suitably moved. No other adjustment, wiring, soldering is necessary.

Q: do the lane changers send radio signals to the car?

A: no, it could be done, but it is not necessary, because it would currently just make things more complicated. The O2 architecture is based around a server (the PC through the USB 2.4GHz dongle interface). If a specific action must be taken on a specific car (e.g. drive through, speed reduction...), the lane changers are informed by the PC and, when they detect the said car, they do what they have been instructed to do. As easy and simple as that. Should any specific needs arise, or in case we hit a brick wall, we might reconsider. So far, no brick walls have been encountered.

Q: can I use the car without a PC?

A: Certainly. The PC is there to count laps, start/stop races, etc. The O2 cars can be used on a standard analog track as well.

Q: What is the 'Selective Lane Change'? (new Jan 2010)

A: when driving a digital car, fast approaching a lane changer, the decision which must be taken is either to stay on the lane or change... but to which one? Is the next LC going from, say, lane 2 to 3, or from lane 2 to 1? From lane 4 to 3 or from lane 4 to 5? Anyone racing with digital slot car systems knows that it takes a long time to master the circuit well enough to know where each lane changer leads to, lane by lane. Well, the O2 native LCs, currently on the drawing boards, together with the SCP-1, offer this unique feature: want to change from lane 4 to 5? Press the UP button. Want to move to an inner lane? Then press the DOWN button on the SCP-1.

It works like this: each Lane Changer can be programmed, by radio, about whether crossing from right to left moves you to the inside or the outside of the circuit, and viceversa. So that when you reach the LC with the DOWN button pressed, if you are on the, say, left lane, and the LC knows that a LC from left to right brings you to the inner lanes, it will change lane for you, else, if it knows that the same left to right change moves to an outer lane, it will not.

Actually when we designed the SCP-1 we put in two LC buttons imagining that some day some big company would build a digital system with this feature built in, and we could make it compatible – we could not imagine we would have used it for our own digital system.

Hardware components: in-car chip module (ICM)

Q: will the in-car chip be Slot.it specific only?

A: Certainly not; for ease of design and testing, we have started with the traditional Slot.it shape but rest assured that we will make a module which fits most cars, including Slot.it cars that are too small for the current PCB.

Q: can the car detect SSD rail code?

A: No.

Q: what are the operating limits the in-car chip can withstand?

A: Current: 3A continuous, 6A peak at least. Voltage: 9 to 18V.

Q: does it have a lighting system, and if so, how is it operated

A: yes, it is compatible with Slot.it's lighting system SP16. Lights can be remotely operated from the SCP-1 buttons

Hardware components: Controller (SCP)

Q: is it a specific controller?

A: No, it is an SCP-1 with dedicated cartridge. The cartridge receives the operating data from the SCP-1 top part and sends it to the car.

Q: can I use my old SCP-1?

A: Yes.

Q: can I use my SCP-1 telemetry box?

A: Yes. It is compatible with O2.

Q: can I use any other controllers?

A: No. At least not for now.

Q: do I get curves, selectable braking, antispin, telemetry...?

A: Everything the SCP-1 can do, is transferred to O2. Selectable curve(s)/linear mode, power reduction, adjustable braking, ghost mode, latched lane change, telemetry, lap timing audio playback...

Q: can it be battery operated (untethered)? (updated Jan 2010)

A: Yes, battery power is not an issue anymore: take a look for example at <http://www.batteryjunction.com/> : the choice is simply mindboggling.

We are designing an external piggyback case which will contain the necessary batteries.

In any case, a standard 9V transistor battery, rechargeable or otherwise, can be used. Lithium 9V rechargeable batteries are on the market already , with a capacity of 500mA which guarantee, with their flat discharge, several hours of continuous use and zero operating costs. The current generation of SCP-1 needs at least 8 V to operate, so NiMh 9V batteries can only be used if rated at 9V, not 7.2V or 8.4V. Future versions of the SCP-1 will be able to work at considerably lower voltages.

A further cheap option are AAA NiMh batteries.

Hardware components: SCP-1 cartridge radio interface (optional, CRI) (new Jan 2010)

Q: what does it do?

A: It enables radio, wireless communication between the hand controller (SCP-1 only) and *any* system in the world – analog or digital. If you have a SCP-1, no matter which one, you can turn your controller into a wireless controller.

Q: what is it?

A: A small module, a pocket size receiver which plugs directly into *any* SCP-1 cartridge, regardless of polarity and type. It comes with a small plastic case which secures itself on the cartridge (think of it as the middle half of the SCP-1 controller). It connects by 2.4GHz radio link to the oXigen cartridge which is plugged into the controller, and transmits in real time the power, brake and any other commands (lane change, lights, etc.) coming from the controller to the cartridge, thus creating a wireless, remote control SCP-1 for all the SCP-1 supported systems: analog (common ground or common positive), and digital (Hornby, Carrera, Ninco, SCX).

Q: do I need it to run a full oXigen system to have this?

A: Not at all. This is independent of the O2 system but takes advantage of the O2 cartridge and technology.

Q: So to make my system wireless what do I need exactly?

A: SCP-1 throttle, oXigen standard cartridge, oXigen radio interface for the cartridge, SCP-1 cartridge. In other words: a complete working SCP-1, an oXigen cartridge and an interface.

Q: does it bring along any other advantages from the O2 world?

A: Yes, certainly some O2 race management system features are carried over: start and stop of racing, and maximum speed limiting (pace car). A dongle is needed for this.

Pricing (*preliminary, might vary*) in EU – retail (new Jan 2010)

| <i>Item</i> | <i>Price (retail)</i> |
|------------------------|-----------------------|
| Dongle | 89 |
| In-car chip | 30 |
| SCP-1 oXigen cartridge | 59 |
| Finish line | 49 |

This is all you need for the basic system. Lane Changers are not included, and retail from Hornby at 35 EU each, approximately. The complete SCP-1 for oXigen will retail for about 110 EU.

Q: Does this include shipment and taxes?

A: Yes of course. There are no hidden extra charges – we publish retail prices at your preferred shop. Please keep in mind that these prices are preliminary and might change.

Q: So how much does a complete system cost?

A: In this scenario: three cars, three cartridges for the SCP-1, one dongle, three lane changers, and finish line,

| <i>Item</i> | <i>Price (retail)</i> |
|----------------------------|-----------------------|
| Dongle | 89 |
| In-car chip * 3 | 90 |
| SCP-1 oXigen cartridge * 3 | 177 |
| Finish line | 49 |
| Hornby LC * 3 | 105 |
| <i>Total</i> | <i>510</i> |

In case three complete SCP-1s are needed, price rises to 663 EU – including taxes, shipment.

Compatible with any of Hornby's Lane Changers. The price for a oXigen lane changer track piece for Ninco or Scalextric Sport has not been established yet, but it is expected at around 50 to 60 EU *including track*.