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Interview

**Matt Black — Coldcut**





/ Zoom F8n and cables, with well-protected exhaust mics mounted on door sill

# Chris Jojo

Recording the legendary Ferrari Daytona — **JO BOYD** describes how Codemasters' senior sound designer and principal sound recording engineer captured the magic

Chris Jojo's original ambition was to be a conceptual illustrator and production designer. His degree from Manchester University of Art and Design trained him in computer-aided design and illustration and, taking contracts in postproduction houses, he moved to Hong Kong at a time when the NES Nintendo game console and the Super NES had become incredibly popular. Jojo's obsession with playing guitar had already led him to take an audio engineering and sound

production course before attending university.

Meanwhile, a friend of Jojo's in the UK was working with an elite group of developers who'd reverse-engineered a codec compression routine for Nintendo. Manchester-based Software Creations was able to create Nintendo audio content without the expense of proprietary development kits. Between Hong Kong contracts, Software Creations asked Jojo if he'd work on some game storyboarding and design for game packaging and characters.

“I've been fortunate to record a number of classic Formula One cars, which were some of the loudest cars I've ever had to record

Knowing Jojo had musical ambitions, they also asked if he'd do some audio programming.

Jojo worked for Software Creations for over ten years before going freelance. He tried his hand at writing commercial music — but it was only when he began freelancing for Mark Knight — creative director of audio for Codemasters, that he began recording cars and trucks. In 2008, after much pestering from Knight, Jojo took a fulltime role with Codemasters — and the sourcing and recording of legendary sports and Formula One motor icons began in earnest.

This Autumn, one of Codemasters best loved franchises, *GRID*, made its comeback. At the end of *GRID*'s two-year development cycle, we caught up with Jojo, to find out how he captured audio for the legendary Ferrari 365GTB/4 Competizione.

“Authenticity of driving experience for the player is the ultimate goal of the games and the quality of the engine audio is a big contribution to their popularity,” explains Chris.



*GRID* has featured new and exclusive car content with every iteration. This latest release adds some truly iconic Ferrari and Porsche GT Le Mans cars. With some pride, Jojo states: "Over 90% of our car recordings are matched to the original works cars we've licensed, with the same heritage or calibre," adding, "We're plugging gaps now with cars that have become available for recording at the tail end of *GRID*'s development schedule."

With 69 cars for *GRID*'s day one release and a significant number of cars scheduled for DLC (Downloadable Content) release, Jojo must source and record cars to meet the production milestones across a tight development schedule — no easy feat with such rare and historic motor cars as the epic Ferrari 330 P4 or BMW M1 Procar.

For the on-board sound recording, Jojo adopts a multi-microphone approach to capture every significant aspect of a given car's engine — induction, exhaust and transmission systems — for a complete set of recorded assets for the in-game audio engine. As he explains: "It's important to capture focussed recordings of induction systems, such as supercharger whine, carb intake, turbo dump valves and waste-gate chatter that's intrinsic to the sound of a specific car."

The selection includes gear clunks, transmission whine and diff clatter (rear differential): every distinction of the vehicle that represents it as authentically as possible in-game. Each recording session is critical and Jojo needs to trust his equipment, particularly when it's required to withstand the rigours of day-long track date recording. "With competition cars," He says, "I'm often allowed access to record at 'shakedown testing' by the good grace of a team. In these types of scenario, the selection and installation of equipment is determined in strict consultation with the team principal and lead engineer."

With weight and bulk often being an issue, these types of installation are streamlined. Jojo continues: "On the 'shakedown' date it's a case of hitting record and just standing back. The kit can stay on the car for up to three days. I can't step in to tweak settings, I can't get in the way of the engineers. I just have to trust it all! Obviously, everything has to be robust... and fireproof, right down to the cable ties."

Jojo relies on the Zoom F8, and more recently the F8n multitrack field recorders, to capture the eight channels of all-important, fully synchronised engine audio, along with in-cabin Ambisonic recordings from a timecode-synced Zoom F4.

"I've been using the Zoom F8 since it launched back in 2015. Zoom kit stands up to my needs: they're robust, lightweight and easy to use — and the F8n is even better now, with improved gain on the headphone amplifier," explains Jojo.

### Surges up to red line

Jojo is also impressed by the -10dB attenuation on the F8n, though as he states several times, "I



/ Ferrari 365GTB/4 Competizione at Turweston Aerodrome

don't use limiters!" The reasoning is that he wants the recording as pure as possible. "I need to preserve dynamics, so I just dial that in and

monitor on the fly when I'm conducting a session in-cab. I have used the F8n's limiters on 'shakedown' dates, and in instances with single

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/ Sennheiser Ambeo VR mic positioned for 360-degree recording in Ferrari cabin

seat competition cars where I can't physically be on-board. I'm so comfortable with the F8n now, I'm pretty adept at judging input settings and I'll apply limiting only as a safeguard, to reign in any sharp transients from exhaust detonations and surges up to red line or on the limiter."

Having captured engine audio for Codemasters' games for over a decade, Jojo is very clear about his requirements. "What I need are high-quality preamps, low noise-floor, clarity and gain in headphone monitoring, responsive look-ahead limiters, dial-able high pass filtering, lightweight portability and intuitive operation. I've never had to bury my head in a manual. The recorders I have are very intuitive and easy to use." Chris has taken the Zoom F8 and F8n head-to-head with other pro recorders. "The difference in quality to me is negligible. Zoom Labs Japan have really outdone themselves with the F8n preamp design."

Purity of recording from the inputs is what Jojo is looking for. "The mics are really important, but the recording itself, and the clarity of that without too much colouration, is critical. It's the two sides of the equation."

With the Ferrari 365 GTB4, just as with every other car he records, Jojo runs step-by-step through the same recording run-plan to capture the required performance takes with which to build the in-game engine sound. With its normally aspirated 4.4-litre V12 engine, miking is minimal. He uses DPA MMC4007 omnidirectional large capsule mics secured either side of the cylinder bank and a Shure TwinPlex lavalier focussed on the carburettor induction ports (air intakes). On each of the



/ Recording a BMW M1 at the Ascari Race Resort

car's side-porting exhaust pipes, Jojo uses a pair of DPA 4007s and Shure SM57 dynamic cardioids. These inputs form the mainstay of the engine/exhaust capture. "The DPA MMC4007 is a phenomenal mic, pretty much a permanent fixture on both engine and exhaust recordings. It has exceptional clarity, excellent off axis response, and most importantly it can handle up to 165dB SPL". Chris protects all of his mics and cabling with bespoke wind proofed enclosures and fire-retardant shrouds. "It's

important to be mindful of airflow and heat sources when choosing where to position and secure the engine and exhaust mics".

### 360-degree audio

In the cabin, a Sennheiser Ambeo (review, *Resolution* V17.1) on an ARRI arm feeds into a Zoom F4 capturing 360-degree audio. Jojo emphasises the importance of capturing the transmission harmonics of a car, particularly on rally and competition track cars that have



/ When your ride is worth half a million, better check the rev limit first!



**“It’s important to be mindful of airflow and heat sources when choosing where to position and secure the engine and exhaust mics**

‘straight cut’ gears or sequential transmission. “I’ve used the Sennheiser Ambeo across the entire slate of *DiRT rally 2.0* and *GRID* recordings. It’s a superb microphone and pulls everything from the cabin space, from transmission to differential clatter to internal [dust] kick-up on a rally stage.” Jojo uses Magix [now Steinberg] SpectraLayers to extract and render the transmission whine harmonics, which are then edited and integrated into the in-game engine audio system.

The three to four inputs from the engine, and the same again from microphones secured to capture the exhaust, go into the master recorder — a Zoom F8n with its new firmware. Imperative for the car’s audio profile within the game, the two sets of audio are synched by Zoom’s TCXO (Temperature Compensated Crystal Oscillator) Time Code generating 0.2 ppm accuracy.

Currently, game audio’s ‘memory footprint’ doesn’t have the capacity to run synchronised ambisonic cabin audio — but when it does, Codemasters is ready.

Whilst recording the Chevrolet Corvette C7-R GTE recently at Zandvoort Circuit, Jojo set up a Zoom H3-VR compact recorder on the pit lane wall and “came back to some amazing sounds”. He explains: “Zoom had kindly given me a unit to try out and it’s a fantastic little Soundfield recorder. All those reflections bouncing off the pit straight wall and surrounding paddock when the ‘Vette was raging past had so much depth, clarity and vivid detail.”

With so many iconic racing car performance sounds now recorded, tracking down the rarest historic cars often leads to a dead end. “Some cars just aren’t attainable. They’re either in private or heritage museum collections and often priceless.” Given that scenario, Jojo will try to source a prior or following iteration of that particular model to stay as close to the specification as possible. Honoured to have been a part of what is actually a very extensive archiving project, he tells us: “I’ve been fortunate to record a number of classic Formula One cars, which were some of the loudest cars I’ve ever had to record.” As racing moves towards electric, he predicts an increase in

demand for classic motorsports content and engine sounds.

Meanwhile, Jojo continues to plug the gaps, often flying out to where the cars are — in some instances without the luxury of a smooth racetrack. “There have been instances when I’ve had to resort to recording cars ‘guerrilla’ style on isolated B roads and dirt tracks. It’s tricky when the length of straight falls short of requirements. Ideally, I need around 900m of straight unbroken tarmac, any major undulations, particulate, bumps and cracks in the surface can result in a loss of traction which will be heard in the recorded audio.”

As well as the performance capture of each car’s transmission upshift and downshift modulations, he captures two other building blocks of audio: “An on-load sweep from the lowest achievable revs in each gear going right up to the limiter, just letting the gear do the work, and the same again with the off-load component when the car is decelerating from limiter to base rpm.” With those captures achieved and secured in his laptop, and offloaded via USB-3, Chris re-packs his essential basic kit: “Toothbrush, Kindle, mics, cabling and Zoom” and flies off to the next car. **1**

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