

LIGHTING+SOUND

International



THE AMERICAN LEG OF U2'S ZOO TV TOUR

- Triple show month: full reports from Frankfurt, Rimini and USITT
- Light & Sound Design: going for massive growth
- Sound and Light for Moby Dick
- Clive Green + Co: the CADAC company profiled
- With U2 in the States
- Plus all the latest News and Equipment

APRIL 1992

A BETTER TYPE OF CONSOLE

Clive Green & Co continues to make the top marques in theatre mixing consoles but their Cadac J Type introduces a new element of affordability, reports Simon Croft



Clive Green: "radically different" design.

A cut price Cadac console occupies the same place in live sound mythology as Santa Claus or a free lunch. All three are attractive propositions but experience tells us that such kindness does not happen in real life. Yet the Cadac J-type exists and is, according to managing director Clive Green, "at least 30 per cent cheaper" than the E-type console, found in top end productions such as *Miss Saigon*.

The J-type was developed after consultation first with Martin Levan and then Andrew Bruce. Both sound designers specify Cadac for the majority of productions but could see a need for a less expensive system.

Levan subsequently specified the J Type for *Moby Dick*, now showing at the Piccadilly Theatre London, the subject of a separate feature in this issue, and has specified the console for two future productions in Toronto: *Joseph and the Amazing Technicolour Dreamcoat* and *Kiss Of The Spider Woman*. Bruce has specified a J-type for the next US production of *Miss Saigon* which opens in Chicago. In New York, Premier has selected the J-type for *Guys and Dolls*, which is in rehearsal at the time of writing, and *Five Guys Named Mo*, scheduled for later in the year.

Green is aware of "the enormous amount of trust" the designers place in Cadac when they order consoles that have been designed but are not yet in production. And yet it is not a new experience. March 27th 1984 is a date he recalls with a speed most of us reserve for our date of birth. It was the opening date of a show for which Levan had specified a new design of Cadac, which was actually ordered by Bruce's company Autograph Sound. That show was *Starlight Express*.

The responsibility born by Cadac was brought home to Green when he read in the newspaper that The Queen would be at the Gala Preview. The console was still in the workshop at the time. "Autograph went over to Cadac that year. The E-type came as a result of Andrew pushing me: the J came as a result of Martin pushing me. So we are being led by our customers."

While the new console is clearly up to customer expectations, it is still something of a culture shock to hear Green describe the J-type as no more than twice the price of a popular mass-produced desk. Cadac will soon produce a unit for stock in order to introduce the J-type to a broader range of sound hire companies. This all looks like a move down market but Green puts it down to "radically different" design and manufacturing methods in comparison to the E-type.

The change has led to streamlining in mechanical construction and assembly, circuit board design and the way in which the automation is implemented. The result appears to be a console that shares the E-type pedigree but with the ability to rearrange the module layout for each production. Sometimes, it is the simplest changes that make the most difference and this is certainly the case with the connectors used between the channel modules and the backplane.

Since 1968, Cadac has used ITT ISEP connectors on the vast majority of product. But this means that all the connectors in the frame have to be hand wired, an extremely time consuming business when there are 100 odd solder connections per channel. For this reason Green opted for the DIN 41612, a "standard rack and panel connector around for over ten years" for the J-type.

He has configured a plug, cradle and socket combination that allows ribbon cable to be used in place of rigid PCBs. At the same time, the sockets are secured to the frame so that removing one of the modules doesn't bring "a couple of feet of ribbon cable hanging off the end of it."

For Cadac, it has "revolutionised the production of the mixing console", allowing even the biggest frame to be completed in seven days instead of seven or eight weeks. There is no screened cable required in the frame itself, apart from customised versions which specify multiway connectors. Even the screened cable from the fader has been eliminated because the only audio to the fader panel drives the LED metering. The fader is used only to control the VCA in the module.

Cadac has its own motorised fader design. Although it employs parts supplied by Penny and Giles, it uses a different motor and drive system, which relies on nothing more esoteric than fishing line. "It doesn't break or stretch," Philip Jones notes with satisfaction. Tests have shown that the unit continues to function until the fader track wears out, which puts it on a par with manual faders. Mechanically, frames are built to very high standards but construction time is greatly reduced by the use of complex aluminium extrusions exclusive to Cadac.

Efficient R&D is extremely important for a small company because it cannot throw endless resources and technicians at a problem. At the



Tony Waldron: technical manager.



The English National Opera has recently installed a Cadac sound desk in its control position, seen here at the rear of the auditorium.



One of the largest Cadac E-type mixing consoles in use on 'Miss Saigon' in London. Clive Green & Co's E-type system provides a total of 86 inputs to handle the sound of the 41-strong cast, the elaborate sound effects and 30 musicians.



Philip Jones with a motorised fader unit.

same time, the specialist manufacturer will have a limited number of units sold over which to recoup R&D investment.

Cadac employs 15 people and the majority of R&D is completed by Green, technical manager Tony Waldron and software designer Philip Jones. Astonishingly, the design of the J-type modules was turned around in just eight weeks. This was only possible because Waldron developed a system that ensured that the various elements of the design process were then undertaken by the most appropriate person and combined in the computer environment to eliminate duplication of effort. He wrote various software routines that allow work to be passed between the proprietary design packages used at Cadac.

Schematics can then form the basis of physical component layouts, which mate up with mechanical designs for the front panel. Once components are located, the design can be transferred to the Calay PCB router, where the 'incredibly fast' Carol places all the connections.

"The Calay machine is very good for PCB routing but it's old - it dates from 1973 - so it's not as user-friendly as systems made today," Waldron explained. "Its biggest advantage is that you can communicate with it from other software via a relatively simple text file." Apart from the inherent efficiency of the work flow,



Clive Green launches 'Concert' at the APRS show in July 1991.

the system ensures that all the parts actually fit together.

The linking software was developed over a period of 12 months, during which time the team also developed a one-off console for the Royal Opera House.

"We couldn't have done the J-type without this flow, in the time," said Waldron. Eight new main modules were designed, along with two variations of the fader configuration. "Best of all the accuracy was extremely good, something like 95 per cent first time." Not a bad achievement, considering the software was still being written while Green designed the first module.

The circuits embody some sophisticated techniques including four layer PCBs with tracks embedded in the centre of the sandwich. Extensive use is also made of balanced lines, which are implemented without cabling by running symmetrical tracks surrounded by the ground plane.

Paths on the other side of the board are run at right angles to prevent crosstalk. Internal balancing has become increasingly important to combat any possibility of interference from the internal computer circuits. But despite the more sophisticated control systems, Waldron reckons computer noise has been reduced to system level. Electronic balancing has now been adopted for all inputs, outputs and inserts.

Green says the change has eliminated the low frequency saturation problem presented by transformers.

An obvious difference between the E-type and J-type input boards is the overall reduction in cabling. The next generation will implement the same philosophy on the sub group boards which carry the 16x32 way matrix but for the first issue it was decided to "tolerate a little hand wiring".

Removing that wiring could lead to a 25 per cent reduction in manufacturing cost. Jones also continues to refine the central module, implementing changes suggested by user feedback. The J-type module does away with the interface box, allowing a PC to be plugged directly into the console. Internally the system is different as well, using parallel addressing and data distribution.

Beyond the J-type, there is the Concert, which has been unveiled in conceptual form but has yet to be engineered. "I'm rather looking forward to it now we've got these wonderful systems," says Waldron. The main concepts behind the Concert are high sonic integrity, protected by features such as subminiature switching relays rather than electronic switching in the signal path, combined with a recall system facilitated by localised nulling LEDs.

The first one is likely to go to the National Theatre in London. (Prestigious venues are an



The Cadac E-type owned by the Shiki Theatrical Company of Japan which was first commissioned during the Japanese Festival in London in September 1991. The E-type is now resident with Shiki in Japan.



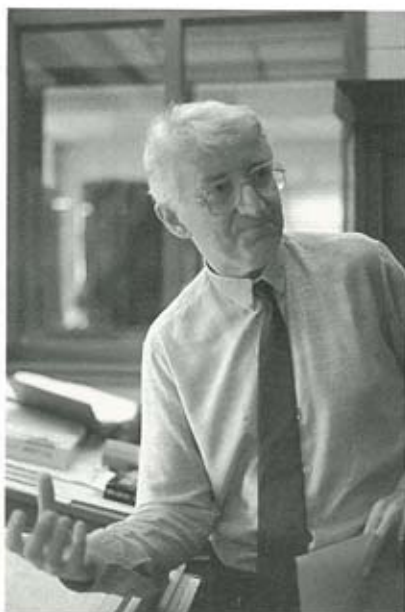
Clive Green & Co's 48-channel Cadac sound console, now in its ninth year mixing the successful musical Starlight Express. The Cadac was the first theatre sound console in the West End to feature computer control.



Clive Green explains the advantages of specially-designed extrusions.

important secondary market for Cadac, after shows. In addition to the Royal Opera House mentioned above, there is a Cadac at the English National Opera, and the Olivier Theatre, both again in London, among many venues world-wide).

Clive Green's first console designs were actually for the recording market. He joined Lansdowne Studios from Olympic Studios in 1967 and ended up building a console for them. Or rather, he built a pair, because Morgan Studios (now Battery) decided that they would like one as well. He also installed the first studio console automation system at Pye in 1976, a full two weeks before Neve put its first automation



Tony Waldron: into detail.

system into Air.

These days, Clive Green has no real interest in building desks for the studio market, although Cadac produces a rack mounting version of its equalisation system that has a certain following among rock 'n' roll engineers.

He believes that Cadac build the products customers want, while studios are "led by the nose" by manufacturers and fads. In such an environment, there is less use for the "bullet proof" engineering that theatre sound designers have learned to rely on. You could drive a tank over a Cadac power supply and with two fitted to a console, it is possible to unplug one of them in mid performance without disturbing the



The final touch. Chris Hall (right) checks out leatherette dust covers.

audience.

Actually, Green set his own bench marks for reliability back in his days at Lansdowne Studio. Although the electronics had been revamped, the console he built them was only decommissioned in 1989, 20 years after it was installed.

Green's regard for quality engineering reflects the harsh theatre environment in which his consoles are expected to perform without fault, night after night and sometimes for years on end. The J-Type series is made in the same mould, but at a price which may bring ownership of the Cadac marque into the grasp of more than a select few.

- COMPREHENSIVE STOCK OF LIGHT AND SOUND EQUIPMENT, TOGETHER WITH A RANGE OF CONSUMABLES
- UK DEALERS FOR CLEARCOM INTERCOM SYSTEMS

SALES

- OVER 21 YEARS OF SERVICE
- OPEN UNTIL 7pm WEEKDAYS AND 2pm ON SATURDAYS
- CUT COLOUR SERVICE
- SAME DAY DESPATCH TO EUROPE

- RELIABLE AND PROMPT SERVICE
- STATE-OF-THE-ART TECHNOLOGY

TSL

- TRAINED TECHNICAL AND SHOW PERSONNEL
- BE RIGHT - FIRST TIME

- CONFERENCE/PRESENTATION PRODUCTION SERVICE
- DUBBING SUITE
- COMPLETE SLIDE/TAPE PROGRAMMING FACILITY

HIRE

- COMPREHENSIVE SOUND, PROJECTION AND LIGHTING HIRE STOCKS
- REHEARSAL FACILITIES



3 Wigton Place, London SE11 4AN

Telephone: 071-582 8009

Fax: 071-820 9584

Theatre Sound & Lighting (Services) Ltd

Communicating Art with Technology