



Ralph Denyer

# SKY

**S**KY is a group whose very existence relies on achieving a successful blend of acoustic and electric instruments. As they all have very different musical backgrounds, there is a wide range of influences in their music. This also means they have to achieve what is at times a delicate balance of musical values and criteria. After many years as a top classical virtuoso

guitarist, John Williams requires a far greater use of dynamics than is the norm with rock bands. Yet Sky's music employs many rock elements. Though also a classical guitarist, the major part of Kevin Peek's guitaristic input to the group is most definitely rock. The same can be said of bassist Herbie Flowers though his abilities to play virtually any type of music are legendary. Both percussion-

ist Tristan Fry and keyboards man Steve Gray bring a wide range of musical expression to Sky.

With the exception of Tristan, they all play electric and acoustic instruments, and all are very discerning when it comes to amplification and recording of their music. As a result, there is a continuous dialogue between the group, their on-the-road sound crew headed by tour manager Andy Peacock and

chief sound engineer Andrew Jones, the group's co-record producers Tony Clark and Haydn Bendall, and Malcolm Hill who designs, builds and supplies their touring sound systems.

The group, producers and sound crew worked together for two weeks at Abbey Road rehearsing for the group's *Sky Five Live* album, before the recording was made during a tour of Australia using the AAV-

**T**HE group's chief sound engineer, Andrew Jones, has been with the group since their first tour. So how different is it for him working as sound engineer with Sky, a purely instrumental band?

"With an instrumental band, you are not masking the sound with a vocalist so therefore the quality of the sound on every instrument has to be that much better. So the approach is to go for more expensive microphones, using condensers when you normally wouldn't on the road. The DI boxes are all active instead of passive, so we don't get problems like saturation in the transformers and things like that. The approach is, in that way, more radical. With bands that have vocals, you tend to go for a certain quality which would be good enough.

"We can use a smaller system because we don't need the headroom for a vocalist over the top. We can use the whole system for the instrumentation which is why it can be small but loud."

At the other end of the scale the music can, at times, be very quiet indeed. During quiet sections such as

Tristan's marimba feature, you could hear the proverbial pin drop. Andrew went on to explain the way in which he uses the gain structure in the system.

"You don't run the amps full out because you'd just amplify the hiss in the desk. We can drive the desk a little harder because, once again, we don't need the headroom. And we can turn the amps right down to a third power which is something you'd never be able to do with vocals, because you'd need a lot of headroom on the desk and need to get the amps turned up so you can do it. So the approach to how you use gain is different as well."

In fact, much of Sky's way of working on stage is closer to a recording studio approach.

Andrew continued: "I do go to the studio when they are recording and pick up on ideas. I talk to Tony Clark (co-producer of Sky's albums) about what to do on certain things. The whole live album was made easier because I've taken the studio approach on the road, everything was worked out in advance."

The live album was recorded with the AAV-Australia mobile. The only

differences between the equipment used for the live recordings and British tour was that Neumann mics were used on the piano in addition to a *C-Ducer* transducer, Neumanns were used on the marimba and an extra mic was used on the snare.

On the subject of the Malcolm Hill sound system, let's hear more about the very low levels of background noise they have been able to achieve.

"The real noise comes off the stage amplification, Kevin's amps and effects. But there's virtually no noise at all from the system."

"Malcolm's worked really hard on the EQ, there are no phase problems between the bands. There are not many selection switches. The desk has eight bands of EQ so you can cut or boost virtually anything you want. It gives you much more versatility than a 4-way parametric or something like that. It makes life a lot easier; obviously it takes a little bit longer to set up because you've got more of a choice but it certainly works well. So Malcolm's really come up with the goods this time."

The Hill *J-2 Series* mixing console is one of the key elements in the

success of the sound system.

"This desk seems to be the Rolls Royce so far but another one's in the pipeline already. We get the newest desk he's got every time we go out on tour."

Giving Sky his latest equipment to work with obviously provides advantages for both parties. Malcolm Hill gets a chance to check out the practicabilities of his designs while Sky get the best quality of equipment he can offer. And once again, the band's use of dynamic range gives Malcolm a chance to hear his equipment being stretched in ways that it wouldn't be with his rock band users such as AC/DC. If the desk is quiet enough for Sky, it will certainly be quiet enough for AC/DC or Saxon.

## The System

Though the *M3* was originally designed very much to meet Sky's requirement for a high fidelity type of system, it is now used in all new Hill sound systems at the top end of the scale. Broadly speaking, previously the company had been making three types of systems. One type of system intended to meet the requirements of

# LIVE

Ralph Denyer



Ralph Denyer

Australia Pty Ltd mobile. They are now seriously considering recording all future material live because they were so pleased with the sound of the acoustic instruments—acoustic guitars, harpsichord, grand piano and double bass—when making use of natural acoustics.

Sky's music covers a wide dynamic range in terms of sound levels which is more akin to that employed by a classical

orchestra than a rock band. Whereas the monitor sound level on stage with most bands using the kind of amplification the group does is quite high, Sky keep theirs relatively low. To achieve this, Kevin's guitar amps are situated underneath the drum riser with the speakers heavily muted. Also perspex screens are placed around the drum kit. This is all done partly to give separation because of the

acoustic instruments, but also because John doesn't like a high sound level on stage. Initially, as any rock guitarist would know, this made life extremely difficult for Kevin as he was not able to play at the volume required to produce an overdriven valve amp sound.

But together they worked on the problem and by means of their current stage set-up, achieve a solution acceptable to

all. So John didn't leave the group, Kevin met the challenge and now plays with a degree of control that most guitarists should envy. Indeed, solving the problem added to the individuality of his playing.

During Sky's British tour in February, members of the band, sound crew and Malcolm Hill were asked about various aspects of the group's approach to live sound and recording.

high volume rock bands including AC/DC, one for Gary Numan and similar acts, and then one for Sky. They all make different demands on a sound system, so the drivers have to offer high sound quality, versatility and be robust.

Malcolm says: "Our attitude was that our job was to reproduce—as accurately as possible—what the artist was putting in at the other end so that it didn't matter what type of act you were dealing with, it should be possible to design a cabinet which would reproduce the heaviest rock and roll to the lightest classical music and we've got about 95% there."

Much development has gone into the M3 cabinet, distinct in its design in that one cabinet houses all the drivers covering the bass, mid and high frequencies. Also the bass drivers are 12 in units whereas most large concert systems currently employ bass bins using 15 in units. Each cabinet is rated at a power handling capacity of 1 kW by means of three ATC 12 in long coil high excursion drivers to handle bass end, two Tannoy 10 in ferro-cooled dual-concentric drivers for mid-range and

a Malcolm Hill designed dispersive flare glass fibre horn on a 1 in Renkus-Heinz throat. The bass driver section is heavily ported and the two Tannoy drivers set at an angle on either side of the horn. An interesting design feature involves crossing over from the horn into the high frequency tweeter in the Tannoy speakers. (The horn is a custom item designed to meet Sky's specific demands. Normally, a 2 in Renkus-Heinz throat is used in a similar horn.) More of the details of the speaker configuration and cabinet design will be covered later.

In terms of practical considerations, the cabinet has quite a lot to offer. The systems work on a simple modular basis. Each cabinet is driven by its own individual tri-amplifier and connected by one multicore connection. Andrew Jones told us that the actual wiring up of the Sky system takes literally 10 minutes after everything has been put in place.

The cabinets are relatively compact and pack together well for transportation purposes. On their last USA tour, AC/DC used a massive 80 kW Hill system. They were able to

transport the entire rig in one trailer when usually a system with that kind of power handling capacity would require three vehicles. Continuing on the standard modular unit concept, all the cabinets incorporate a steel flying system. This does away with having two types of cabinet or separate hardware to fly sections of a rig.

## Acoustic guitar

Moving on to the question of the sound of individual instruments, John Williams explained his requirements for his acoustic guitar in Sky.

"Well, I start from the ideal—which is obviously impossible but is the right aim to have—which is a completely faithful acoustic Spanish (or classical) guitar sound at unlimited volume with no intentional distortion."

The Spanish guitar produces a wide range of sounds with a strident bass, harmonically rich middle tones and a clear, sparkling treble. The traditional Spanish guitar sound is of course purely acoustic and it is a relatively quiet instrument. Because of the variety of tonal character

within the instrument, when it is amplified problems are frequently encountered.

John's diverging musical activities, including solo concert performances, digital recording and working with Sky, have resulted in a keen interest in the questions of reproduction and amplification of the sound of the classical guitar. For his solo classical performances apart from Sky he uses light amplification, as the situation demands. His purely acoustic *Greg Smallman* classical guitar is miked up and he places two cabinets—similar to the monitors used with Sky—to face at an angle across the stage so that no one in the audience gets the direct sound from them. As a general rule he finds that the preponderance of harmonic overtones in the middle of the guitar's register frequently becomes over-accentuated in concert halls. To combat this he reduces the effect by an EQ cut at around 400 to 500 Hz. The third G string has a fundamental of 196 Hz and its first harmonic is at 392 Hz. The second B string has a fundamental of 246.9 Hz and a first harmonic of 493.8 Hz. So the 400 to 500 Hz cut makes sense. ▶

# SKY LIVE

He then uses a boost at around 10 kHz to bring out the percussive elements of the sound of each note, including the nail striking the string as well as many of the characteristic sounds that make a guitar sound like a guitar. Following these basic guidelines, John achieves an amplified sound that he can live with.

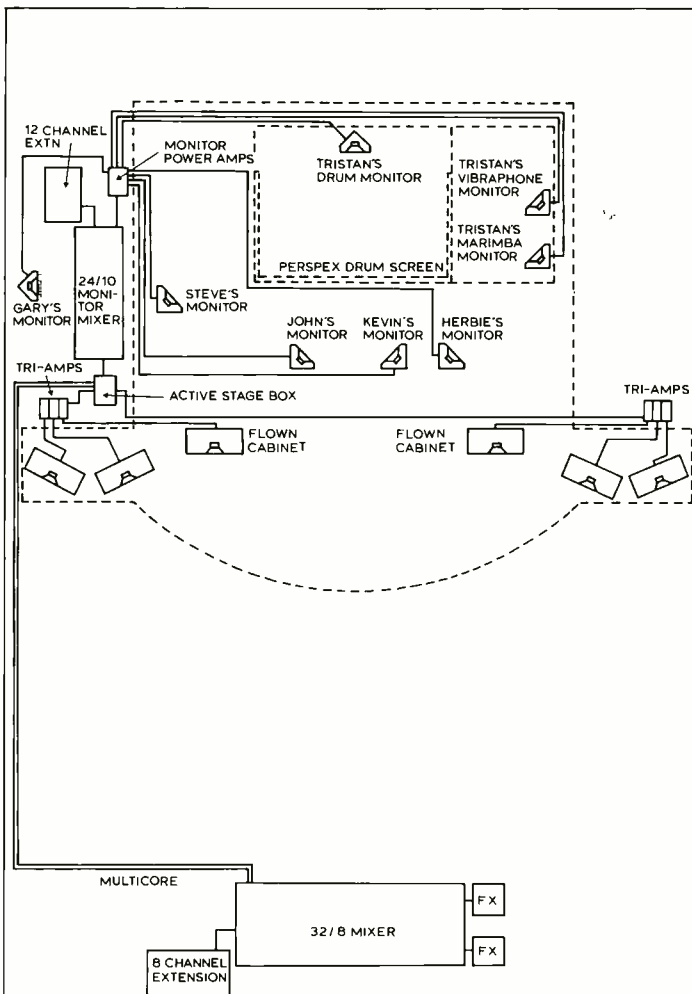
His experience on the classical concert platform and with Sky (until recently playing an Ovation *Classic* model with a piezoelectric-type transducer built into the bridge of the instrument plus a built-in preamp) has made him well aware of the problems involved when trying to produce a true Spanish guitar sound through amplification.

John says, "Sky would not have existed without Ovation Guitars," but he now plays a Takamine *Hirade E9* classical model guitar about which he is ecstatic. The instrument is fitted with a piezoelectric transducer and preamp arrangement which is the same as that of the Ovation in principle. However, apart from the fact that it has a florentine cutaway, it is constructed on traditional lines.

During the time in which he was playing an Ovation with Sky, John was constantly trying to improve the quality of the amplified sound. This he did mainly by using an MXR graphic equaliser on stage and the EQ on the sound system desk.

The change to the Takamine came when, during the time they spent working on the material for the *Sky Five Live* album at Abbey Road, John was experimenting, trying to get a particular effect for a piece called *The Animals*. He couldn't get the sound he wanted from the Ovation. He tried out the Takamine he now plays and was so impressed he bought it on the spot. The guitar turned out to be ideal for his requirements. He now just has to plug directly into the mixing console via an active stage box. In fact Andrew Jones said that if there is anything amiss with John's sound at the soundcheck for a live gig, he immediately knows that something is not quite right in his lining up of the sound system to the acoustics of the hall.

By the end of the February British tour, they were just boosting around 200 to 250 Hz to compensate for the slightly light bass. The bottom E string fundamental is 82.4 Hz with a first harmonic of 164.8 Hz while the fifth A string fundamental is 110 Hz with a first harmonic of 220 Hz. John



## Hill Audio Sound System

### Sky at the Hammersmith Odeon

J2 Series mixing console 32/8 used in conjunction with 8-channel extension console  
Six TX 1000 tri-amplifiers, each powering one M3 full range 1000 W cabinet (two M3 cabinets were flown at balcony level)

### Sound processing equipment:

Four White 27-band graphic equalisers, one on each side of sound system, one on piano bottom end, one on harpsichord  
Four ADR *Complex* compressor/limiters for bass drum, snare top, double bass and electric bass guitar  
One Lexicon *Prime Time* digital delay line  
One Lexicon 224 digital reverberation unit  
One Eventide *Harmonizer*  
(Number of amps and cabinets varies with size of venue)

### Monitor system:

J2 Series monitor mixing console 24/10 used in conjunction with 8-channel extension console  
Four DX 701 dual channel amplifiers, each channel powering one of eight monitors of various designs, custom made for Sky

adjusts the active tone control on the guitar itself to take off a bit of top and that is it.

"So what you do by boosting the first harmonic is you add a little bit to the overtone warmth to the sound but you don't muddy it up by boosting the fundamental. The Takamine—compared to the classical Ovation—is a little bit light in the bass, which can be an extremely useful thing to have. Its sixth string is a little light whereas the Ovations are notorious for having quite a woofy sort of bass resonance.

"The Takamine is a very good straightforward acoustic guitar; there's *life* in the sound. From my point of view, the Takamine is an enormous advance.

"We find that it's got all the warmth and harmonic content in the mid-range and it really *speaks*. Andrew says it's like a veil being lifted.

"To cover the general approach, I'd rather attempt the sound I want for the guitar within Sky on exactly the same principles as I do for a classical solo performance using a microphone. A lot of the acoustical problems are the same. The Takamine shows that you can successfully combine the natural ingredients of an acoustic sound which means overtones and harmonics. Those things which make a guitar sound like a guitar, sound like the *magic* of the guitar if you like.

"I think the main reason for them achieving this is they've made the guitar on absolutely traditional Spanish guitar lines. It's got a straightforward spruce top which is reasonably flexible, if you put your thumbs on it you can move it.

"It is the top of the guitar—as we all know—which produces 100% of the vibration. The fact that it is a proper Spanish guitar top means that crystal pickups are actually picking up wood movement as well as string vibrations through the bridge. Each harmonic the string sends is blended by the top of the guitar. If the top is not moving freely, it cannot integrate all those many harmonics and overtones."

This feature continues in next month's *Studio Sound* and covers various aspects of recording live, live performance, the combined use of acoustic, electric and electronic instruments, the main sound system and the monitoring system.

# SKY LIVE

recording live that had most interested Steve?

"Quite simply, the acoustics. As far as I am concerned, Studio 3 at Abbey Road—where we have recorded all our studio work in the past—is as good a studio as you will get.

"But for Sky it will *never* be as good as recording live. I think we *might* have made a policy decision to record *everything* live even though we may not present it in a live format."

During the recording of the live album, Sky found that they were able to capture qualities which had previously alluded them in the studio. The general feeling within the band is that way because of the relatively high sound level moving large volumes of air in a spacious interior. So although they may record in concert halls, they may not necessarily have audience tracks. When the experiment started in Australia, Steve wasn't so sure that it was going to work, as he explained.

"Personally, I didn't go and listen to the playbacks. I did one day but it was so horrible listening to it in a cramped mobile, there just wasn't the space for all of us to listen. At the time, I thought we'd made a terrible mistake. When we got back to Abbey Road and heard it I thought 'Blimey, this is fantastic'.

"But it's as simple as that, just a big volume of air being moved around at fairly high levels creates a bloom or beauty of sound on the acoustic instruments. I don't know if you could get that in a studio.

## The other guitar

Kevin Peek was a well-known session guitarist on the London scene before the formation of Sky. Nowadays, he lives in his native country, Australia, and commutes to far flung corners of the globe to team up with Sky.

The guitars he plays with Sky are a Fender *Stratocaster Anniversary* model, two Gibson *L5S* models. His acoustic guitars (with piezo transducers built in) are an Ovation *Folklore* and an Ovation *Classical*. The effects he uses on the solid electrics are one Electro Harmonix *Big Muff*, one MXR *Dyna-Comp*, one Ernie Ball foot volume control, one Boss *KM04* Micro Mixer. His RSD *Studiomaster* and Roland *Jazz Chorus* amplifiers are, as previously stated, muted and positioned under the drum riser in order to keep the on-stage sound level relatively low.

Kevin's electric playing with Sky is very controlled. With the amps muted and hidden away he cannot use feedback or feedback-assisted sustain, techniques that a great many guitarists rely on. So how is it done?

Kevin: "It's done differently in different numbers. Sometimes with

the compressor, sometimes with the fuzz, and also with a combination of both. Sometimes it's done with a straight guitar sound. The Gibson *L5S* sustains beautifully by itself.

And what are Kevin's feelings about Sky recording in halls with a mobile? "The majority of the guys would like to do the next and possibly other future albums recording in a live context. Not recording with an audience even. What they really like and have grown very fond of with this first live album is the ambience that being in a hall gives to a lot of instruments, particularly things like the harpsichord and John's guitar. We've never been able to quite get that with all the artificial reverbs and everything in the studio. I'm still a bit of a studio buff, I like being in the studio. With everything we do, we take a majority vote and the majority of the guys want to record in a hall with natural ambience as much as is possible in the future.

Going back to *Sky Five Live* for a moment, there is only one thing wrong with recording a lot of dates on a tour. You end up with a lot of reels of tape. At the end of the Australian tour, Sky came home with 117 reels of multitrack master tapes. Was the editing a big job?

Kevin: "Yeah, I ducked out of it, I stayed in Australia. Our engineers and co-producers did virtually all of that, thank goodness."

## The bass

It is hard to say if Herbie Flowers is best known among his peers as a humorist, individualist or musician but as a result of being all three, he's a legend on the British session recording scene. The famous 6-note tuba riff that can be heard at the beginning of vintage 'Hancock's Half-hour' programmes is played by Herbie on the very instrument he features in his 'novelty' number with Sky, though it is now covered in sound-triggered LEDs, blows soap bubbles and is amplified by a radio microphone.

So what is important to Herbie in terms of sound quality with regard to his main instrument, the bass guitar?

"Really I don't mind, Ralph. Bass players are the cop-out merchants, there's no doubt about that. Universally, they're not really sure. If they've got a highfalutin point of view, it's bullshit. Because the bass, you actually feel it through the soles of your feet or through your tum. If there's too much treble on it, it inhibits you 'cos the fact that you can hear it very loud means you are not going to go for things that—if you can't hear it—you'll try for.

"As long as it sounds woolly and deep, you can play quite a few bad

notes, so I think bass players aim for the low register.

*But*, on the other hand . . . the acoustic double bass is actually hard to amplify well. If you use a pickup, you're cheating, you're really playing a pogo stick 'cos you're not amplifying the organic sound element of the double bass, the *wood* in fact."

Herbie: "I think a double bass should sound as much like a tree as possible. If you put your ear to a tree in the wind, that's what a double bass should sound like. All the squeaks and all the rattles."

The quantum jump in terms of sound on the double bass was when they fitted, an 8 in *C-Ducer* strip, positioned just above the bridge at a slight angle. Gary pointed out that the monitor wedges had to be reinforced to handle the low frequencies.

Andrew and his team have in fact tried just about every type of pickup, transducer, microphone, contact mic and device ever made, in countless positions and combinations, to achieve the most natural acoustic sounds possible. They also tried all the different lengths of *C-Ducers* and settled for the 8 in model for piano, harpsichord and double bass because they considered them to have the widest frequency bandwidth as well as the smoothest response. During the stage performance of *Meheeco*, which includes his double bass feature, the sound is indeed truly 'noble' with all the distinctive tonal centres and characteristics of the instrument amplified beautifully.

## The recording

Haydn Bendall and Tony Clark engineer and—with the band—co-produce Sky's records. They are staff engineers at Abbey Road Studios as well as producers of other acts. Tony and Haydn describe their working relationship as 'a sharing one' with neither taking on a specific role. As engineers, they knew all the musicians in Sky with the exception of John Williams. After hearing the group's demos they went into No 3 studio at Abbey Road and were soon caught up in the excitement.

Coming up to the present, on *Sky Five Live* how were the two weeks spent working on the initial recordings?

Haydn: "It was done as a demo recording really. They always do bits of the writing in the studio, more on some numbers than others. Previously we'd always recorded the albums in the studio, then the band would go out on the road and do a couple of tours and the music would evolve.

"They would find better ways of playing things and change the arrangements. This time, we spent

two weeks in the studio really sorting out the writing and arrangements so that we could all become absolutely familiar with the material. So it was just like expensive demos really."

Business and contractual factors also came into play. The group were cutting things a bit fine inasmuch as they were committed to delivering an album by a certain time. If there had been problems recording out on the road which resulted in no album, the studio recordings gave a safety net.

When they arrived in Australia, Haydn and Tony found that the AAV Australia Pty Ltd mobile was not of the standard they would have expected in England but they say the Australian people with whom they worked more than made up for below par equipment with their enthusiasm and helpfulness. (The mobile was due to re-equip after the Sky recordings.)

Tony: "They were amazing people to work with. Whatever we asked for, they put together. I can't remember the name of the main mixer, but we had to have two more Yamaha mixers slung on the side of the thing. The people we were working with had their hearts in it, even though they knew the equipment wasn't the way it should be."

Tony regards Sky as a unique band. As such, he feels they should experiment and try different approaches, using the recording medium in ways to suit the group and not *vice versa*.

Tony: "There is talk of using an auditorium as a studio and that idea excites me. In Australia there were times when we did the rehearsal during the afternoon, and the control of the sound was really exciting because you didn't have an audience and therefore didn't have to hold back because of extraneous noises.

"I did make certain suggestions to the band. It would be great to record in No 1 studio (Abbey Road) and have them play using their own monitor system. Because they're musicians, they *know* their instruments and they *love* their instruments, but they don't *particularly* like hearing them through headphones. That is because they are a live, acoustic band. The approaches to recording will develop and I think must do so over the next few years. I think it will be really exciting if we can keep going, trying all these various ideas and experimenting."

Haydn: "Although we are not set on how we are going to record the next album, I would say that we can be sure of two things. One, that it won't be a *live* album and two, that it won't be a *studio* album. I think we'll be trying to combine both atmospheres, and that will be very interesting." ■

# SKY LIVE

Gary Nielsen is Sky's monitor sound engineer and enjoys a close relationship with the band and the resulting exchange of ideas.

Gary: "This is the first tour on which I've been 100% happy with the equipment."

"The monitor desk is really still at the prototype stage but it's good and with a few more refinements which I've mentioned to Malcolm, it's going to be great."

How does Sky's somewhat individual approach make his job different from the occasions when he works with other bands?

"It's different in as much as with the acoustic and electric instruments, and the varying levels required, I can't leave anything on when it's not being used. Consequently, in a piece like *Love Duets* I'm switching things on and off continuously. While we were in Australia, I worked out that there are 321 cues in a Sky concert. People laugh and say: 'How can there be that many?'"

"But if you think about it, I've got six independent mixes, so therefore divide 321 by six and the figure is believable."

"It's really a case of having to concentrate. You certainly can't leave things like Tristan's vibes or marimba mics on because they obviously pick up everything. During a soundcheck, I can even hear Steve and Pete talking through the *C-Ducer* strips on the piano. I can hear people talking through the *C-Ducer* strip on Herbie's double bass."

## System operation

What is the ideal sound level for a Sky concert? That apparently innocuous little question is guaranteed to garner different answers from members of the band and the sound crew. Certainly, a percentage of the group's followers—and there are quite a few—don't like the music to be as loud as is generally accepted at most rock concerts.

Andrew feels that they are mainly the people who will complain to members of the band or the crew after a concert if they think something has been too loud. Sometimes it turns out that they've been sitting close to a 2,000 W array of speakers.

Andrew thinks that perhaps the band are sometimes a little too sympathetic to the complainants whom he refers to as "music centre listening people" at the expense of the vast majority of the group's following.

He thinks that 90% of the audience are 'true fans' and as such would prefer much more of a rock concert sound level, at least during the music's dynamic peaks. For them—as well as himself—he'd like to "...

give it a bit more welly". Of the nights when the audience is up on its feet and yelling for more, he's convinced that wouldn't be the case if he didn't surreptitiously ease up the volume. And then he feels frustrated when he goes backstage after the show to find the band happy with their performance and the audience reaction but telling him the sound was too loud.

Andrew: "I know in my heart of hearts that any quieter and those people would have just sat there, clapped and gone home".

Andrew's fierce personal loyalty for Sky doesn't colour his judgement on this point, though perhaps he may at times temper his expressed opinions. Also it should be pointed out that this is the only major point of disagreement with regard to performance resulting in a 'Them and Me' division of opinion.

If it were not for the relatively low monitor sound level on stage, the situation would arise far less often, as the band would not hear as much of the sound coming from the main system. Andrew points out that both Herbie and John actually start to play quieter if the level of sound they hear on stage coming from the main system makes them feel that the sound in the house is too high, or if they see someone in the front of the audience close to a speaker array putting their fingers in their ears.

Final words from Andrew on the subject: "And so I have to mix in that situation, not one where I can achieve the optimum sound. Try to make it all full without being loud, so you try to use all the frequencies to achieve that full sound."

"In fact on this last tour I've used a bit more volume and a bit more punch, there's been comeback from fanmail saying how good it sounded as opposed to the last tour. That kind of reassures me but with the band—it's still a case of 'It's a bit loud'."

Andrew makes great efforts to minimise problems relating to the acoustics in different venues. His vast experience with a whole range of acts is of course a major plus factor. Also, Sky tend to play more-or-less the same halls each time they tour, with the odd exception here and there. As a general guide, he finds that most British concert halls seem to accentuate bass and low-mid with 160 to 200 Hz in particular.

Each afternoon prior to a concert, the sound check begins when Herbie arrives. He does an individual check and tune up on his instruments—double bass, bass guitar and tuba—and the others do likewise before they run through a few numbers together.

In terms of getting the best possible group sound, Andrew finds that the

major compromises have to be made on the acoustic instruments. The solo or semi-solo features present far fewer problems. Add together magnificent sounding harmonically rich acoustic instruments such as the piano, guitar and double bass with the electric instruments, all shifting large volumes of air and without careful EQ work, the result would of course be instant mush. But with Sky, the acoustic instruments often provide the main thrust of their music. As the EQ is tweaked to provide a good balance, gradually harmonics are removed from the sound of the acoustic instruments more than the electric or electronic variety. The result is that the acoustic instruments begin to sound artificial and lose their character. As John Williams had said earlier: "You end up taking out the frequencies that make a guitar sound like a guitar."

And this is only talking very generally about all the instruments. Take them individually and you have to consider individual tonal centres, particular to different parts of the register of one instrument, as Andrew pointed out: "We've only just got to the stage where if Steve plays a bottom C on the piano, it actually sounds like a bottom C and not a middle C with a little bit of rumbling underneath."

The piano—a Steinway grand hired for each gig—is amplified via two 8 in *C-Ducer* strips and one AKG 451 microphone. All go to active stage boxes. Andrew generally finds that he must reduce the bass and low-mid to avoid feedback when the group are playing together and to this end there is a White graphic equaliser on the bottom end.

Andrew: "With the *C-Ducer*, we can get more bass on the piano using phase cancellation switches on the desk to reduce feedback problems, but you never actually use all of the bottom end".

When the whole band is playing fairly loudly together there is a certain amount of slight of ear involved. Andrew: "If you hear the top end and bottom of the piano, then what goes on in between you can almost imagine to be there."

When the piano is featured and the rest of the band are quieter, Andrew can bring up the mid-range, mainly with the microphone. He has found this to be the best way of making the instrument sound full and natural during the times when it is featured. If there is too much low-mid or mid when they are all playing together, the piano tends to make the sound far too muddy.

He uses similar techniques with the harpsichord but it is only fitted with one *C-Ducer*.

"In the louder parts, if you really analysed it, there would be relatively little audible middle."

When Herbie's double bass is featured Andrew explained: "If I want to lift the double bass in a certain section of a number, I tend to use the EQ rather than volume, to give it a little bit of cut and additional very low bottom... bringing that out instead of bringing the fader up."

"I've never really analysed it as such, but I'm doing this kind of thing all the time. It's funny really, electric instruments seem to work well with the ear. An electric bass guitar will still sound bassy if it's amplified quietly but acoustic instruments seem to lose the body of their sound."

As with all the instruments fitted with *C-Ducer* strips, Andrew and Pete Sullivan—the keyboards technician with Sky—have spent many hours experimenting and finding the optimum positions for the devices. They regard this point as very important as placement can affect the performance considerably.

## The keyboards

On the British tour, keyboards player Steve Gray used a Steinway grand piano, a William DeBlaise double manual harpsichord, a Yamaha *GS1* synthesiser, a Roland *JP8* polyphonic synthesiser, an Oberheim *OBXA* polyphonic synthesiser, a Korg *CX3* organ, a Yamaha *CS01/BC1* monophonic *Gob* synthesiser, all looked after by Pete Sullivan.

Steve: "We've got a lot of keyboards. I use them—to a certain extent—because Kevin and I are the ones who give the band an orchestral sound. John, Tris and Herbie tend to play one main instrument most of the time. So any changes of colour come from Kevin's assortment of guitars and pedals and my assortment of synths. I always come back to the piano because I am a piano player. I started lessons when I was ten, so everything revolves around the piano. For Francis Monkman—who was in the band before me—it all revolved around the harpsichord."

One interesting feature of the setup is the use of a keyboard interface on the piano and harpsichord. When either instrument is played, the keys trigger one or sometimes two synths to play unison figures.

Steve: "I inherited the interface from Francis. He used to interface the harpsichord (and a clavinet) with synths and I thought it would be fantastic if we did it with the piano."

The live album is a double, featuring material previously released on studio albums as well as new material. What were the aspects of

# LIVE

Ralph Denyer



by Renkus-Heinz. It is coated with a hard smooth reflective polyurethane finish to minimise ringing. (A matt finish would reduce the ringing but at the same time absorb high frequencies.) Normally for vocal bands, the *M3* has a similar flared horn on a 2 in Renkus-Heinz throat.

On the subject of transient response Malcolm continued: "We work very hard to get all the speaker units to have a very good transient response commensurate with the frequency at which they are operating, which is one of the reasons why we have those 12 in bass drivers instead of 15 in or 18 in. The idea is that as well as reproducing the steady state frequency response, the system is not limited by lack of transient response at a particular frequency.

"We tend to have smaller, higher transient response units, working at lower frequencies than other people. So we've got the 10 in mid-range instead of 12 in, then the tweeters at the top. We make sure that all the units have a transient response capable of handling the requirements within their frequency range."

Another part of Malcolm's policy with regard to equipment design is that his systems should produce the most 'transparent sound' possible, and he works very hard towards ensuring that they add the least sound colouration. He went on to explain how he considers acceptance of a narrow frequency bandwidth to represent too much of a compromise, as well as his aims with regard to faithful amplified reproduction of sound in the concert environment.

"Most, shall we say, rock 'n' roll systems are designed to work between 60 Hz and 5 to 6 kHz and that's where most people leave it. But we're working towards 20 Hz to 20 kHz. We've only got to 25 Hz to 15 kHz at the moment but that is still a full two octaves wider than most other concert systems. Between half and a full octave on top and a good octave or so below."

Accepting that the average person has the capability to hear frequencies up to somewhere in the 17 kHz range, and that some instruments produce harmonics (aka upper partial tones) up to and sometimes beyond 15 kHz,

systems with a relatively narrow frequency bandwidth must in effect colour sound.

Malcolm: "So we try for minimal distortion, minimal colouration, full bandwidth, and apply that to whatever the music is, the development work then being on making the technology reliable."

Malcolm holds the opinion that far too little attention is paid to overall dynamic range and the transient response of concert sound systems. He feels that these factors should be given similar attention to that paid to achieving high sound pressure levels, good frequency response and reaching low distortion figures. An important feature of his sound systems is the absence of any overall compression or limiting devices to protect the system itself.

"There are no actual limiters as such on the system. Everything is designed with a lot of headroom. Most systems—as some attempt at safeguard or reliability—have some form of overall limiting. We design everything to have a lot of headroom so that we avoid the usual problems of a system with an overall compressor-limiter.

"What happens—especially with a loud act—when you get near the maximum capability of the system, is that the limiter is having a lot of effect so you lose all your dynamic range. A band is playing away and they come crashing in with a chord but it's not doing much because it's held back. Even at rated output our systems have still got 12 dB of dynamic headroom. So if you drive an *M3* cabinet at 1,000 W and then hit it with a peak, it will respond up to 12 dB beyond that. So you can drive it full out, hit the snare drum and still have a dynamic impact rather than being lost in the compression."

As well as protecting a system from overload damage, limiting and compression are often also used to prevent the unpleasant audible and damaging effect of an amplifier going into clip. Malcolm claims that his amplifiers are designed so that they do not clip.

"Obviously, the sound gets progressively distorted," he said, "but there's no obvious clip point at which

there's mass disaster. If you've got dynamic headroom in the amplifier you don't need a compressor to stop the amplifier making a nasty noise. And then all the drive units are built to take large excursions beyond their nominal power rating for short periods. So the whole system—all the way through—can be run around its full power level and still have dynamic headroom."

It would be unfair and misleading to use Sky as a typical amplified band because they do play at decidedly lower levels than most users of Hill Audio systems. But at the Hammersmith Odeon dates they only used a total of six, one tri-amplifier/one cabinet 1,000 W module units, to achieve a full sound.

Certainly they also achieved a full sound throughout the three-week tour, on a couple of occasions they only used two 1,000 W module units and to good effect. (It should be pointed out that two Tannoy studio monitors that were set up at the back of the Hammersmith Odeon were only used for experimental effects well below the level of the main system.)

Malcolm went on to explain how the system operated when Sky used only 1,000 W each side.

"At the extreme peaks they were just going beyond the nominal rating, even with Sky you can do that perfectly cleanly and you can't hear that it has gone over the top. If the system had standard amplifiers, Andrew would have had to operate the system at a lower level because he wouldn't dare let it go into the area where the (clip) distortion would have come in. Or, he would have had to put a compressor on there and lose his dynamic range.

"It's very noticeable with Sky actually. Halfway through a number they gradually die away then BANG, they come straight back in at a high level and you get a dramatic effect. I've calculated that they actually work to about a 70 dB dynamic range, so they'd make life very difficult with a conventional sound system."

The 70 dB figure tied in with the fact that John Williams had told me that he likes the group to aim for

similar dynamics to a classical orchestra, which would be in that region.

Malcolm continued: "Although rock bands have got louder and louder—obviously a lot louder than a classical orchestra—they've tended to lose the dynamic range. So they're not really achieving anything apart from ruining people's ears. So what we try to do, and have done by approaching it in this way, is to keep some element of dynamic range."

Malcolm feels that even very loud rock acts who do not employ the same dynamic range as Sky can benefit from using his approach to system design. He says that AC/DC work with around a 30 dB dynamic range—basically varying between loud and extremely loud—but with his system their peaks and crescendos are discernible as such.

Malcolm: "I went to see the Rolling Stones with a ShowCo system last year, and it was so compressed that in fact it got *quieter* on the crescendos. So when they hit a loud chord, the whole system shut, it was actually quieter. The system was in compression all the time, they had it set so that the limiting was too far advanced and it was over emphasising the limit. But even if they had tuned it better, it would still have been reducing the dynamic range to hardly anything. I use that as an example of a typical system and the point was particularly noticeable on that occasion."

## The Monitors

The monitor cabinets are custom-built by Hill Audio to meet Sky's specific requirements. John and Kevin's each have two Tannoy 10 in dual concentric speakers as fitted to Tannoy *Little Red* studio monitors with a specially adjusted crossover between the cone and central tweeter. The cabinet is ported.

The larger units used by other members of the band each have two ATC 12 in speakers, as fitted to the *M3* cabinets, plus one 10 in Tannoy. Accordingly, there is a 3-way crossover and once again, the cabinets are ported.



Ralph Denyer

## Part 2

# SKY

**I**N Part 1 of this feature I outlined the basic design and concept of the Hill Audio *M3* speaker cabinet which forms the basis of the Sky system which can now be examined in more detail. Essentially, it is an all-in-one unit housing bass, mid-range and high frequency speakers. Measuring 53 x 45 x 21 in and weighing in at 350 lb, the *M3* has three ATC bass drivers positioned in a central vertical array with a flared horn directly above and between the two mid-range units which are angled inwards slightly.

Part of the motivation behind using 12 in bass drivers arises from the desire to get the fundamental response of the cabinet as low as possible. If they had used a 15 in or even 18 in driver—as do most companies in the concert sound business—the size of the cabinet would have had to be considerably bigger in order to achieve the same fundamental response, which relates directly to the cone area to cabinet volume ratio.

Malcolm: “The advantage of having a cabinet with a low fundamental resonance is that you don’t have to boost the very low frequencies electronically, because they are there naturally. The fundamental of the *M3* is something like 19 Hz. In fact you have a situation where quite often you have to roll off the very low frequencies, especially if you are using a very large system. As you stack more and more cabinets up, the fundamental drops lower and lower.

“So if you’ve got about 40 of those cabinets you have to electronically roll the system off at 40 Hz, otherwise it shakes the walls and becomes fairly uncontrollable.

“Also, the 12 in unit gives a very nice clean tight bass section because the cone doesn’t flex like a 15 in unit, so there are no additional colourations there. Further, the speaker is not under excessive pressure because the cabinet is relatively large as well as being heavily ported. The driver is free to respond. The end result is a deep, tight, uncoloured bass sound.

“The 12 in speakers are driving a compression chamber of relatively low compression compared to normal PA designs. Then there’s a

horn-loaded port either side of the bass speakers. This means that there is so little pressure within the cabinet that you are not wasting energy on vibrating wood. In most typical units with high compression, you waste a lot of energy trying to shake the cabinet apart. Not only do you waste energy, that effect of the cabinet vibrating also colours the sound.

“Approaching it from the studio monitor point of view as we do, you’ve got a very solid freely-moving cabinet design. We have taken that type of approach and developed the way it’s done—especially the drive units—to stop it falling apart, which is what normally happens if you try to use studio monitors for PA applications.”

I asked Malcolm about the question of phase interference.

“The phasing of the mid-range has really been the topic in sound circles over the past couple of years. For the first decade of the sound industry’s activities, creating ‘bottom end’, as they call it, was the important thing. Shifting air, which is what we concentrated on with our 12 in bass unit.

“Then recently, mid-range colouration has been the problem, mainly due to phasing distortion and various people have had different attitudes to it. One common direction—used by our competitors—was creating phasing throats to put in front of the speakers to correct for phase, which was a worthwhile improvement. However, it didn’t help when you had lots of units together. And the throat itself adds its own colouration although the phase is more maintained.

“We put the mid-range speakers at an angle that we calculated was the best compromise as far as phase was concerned. But the main thing that we did as far as mid-range is concerned was to investigate into what was the absolute highest quality, most accurate driver we could find and that is the crucial element.”

That unit is a special version of the Tannoy 10 in dual concentric speaker used in Tannoy *Buckingham* studio monitors. It was the most accurate they were able to find and

the most powerful to boot. They tried several mid-range units designed for studio monitors which they found to be accurate but unable to take the kind of continual pounding and rough treatment which is commonplace with a rock act on the road.

Malcolm: “Fortunately the Tannoy—mainly due to the company having extremely high standards of quality control anyway—and the use of ferro-fluid round the coil, has proved very reliable even with acts like AC/DC and Saxon.”

Normally, the Tannoy has a crossover between the cone and dual concentric tweeter, as would be expected. For their concert system applications, Hill Audio have a crossover from the cone of the Tannoy into the separate flared horn and then back into the tweeter of the dual concentric.

Malcolm: “This gives a lot more SPL at critical frequencies for PA which are in the 2 to 5 kHz area. Normally if you have a horn handling a couple of octaves of the high

frequency, as you go up in frequency, the sound tends to beam. In other words it becomes very directional. Now the nice thing about the design of using the dual concentric Tannoys with the units at an angle is that as you go up in frequency, the horn itself becomes quite directional, but as this happens, the tweeters at either side come in. So in fact, you get quite a nice dispersion up to 20 kHz. That’s rather a fluke advantage of following the Tannoy dual concentric routing in that way. “So as you move off the axis of the actual horn, you move into the axis of the tweeters.”

Accepting that the different units have varying natural acoustic roll-off the actual mid points of crossover are: 250 Hz from the ATC bass driver to the Tannoy mid cone, 1.5 kHz from the Tannoy mid cone to the custom high frequency horn, and 7 kHz from the horn into the Tannoy dual concentric’s tweeter.

The horn in the *M3* cabinets used by Sky is a Hill designed fibreglass dispersive unit on a 1 in throat made



Ralph Denyer

Hill Audio M3