THE MERIDIAN LINE...

Martin Colloms talks to designer Bob Stuart and reviews the Merdian component amplifier

WHEN FIRST ENCOUNTERING A NEW PRODUCT, it is often as useful to discuss the philosophies, aims and achievements with the designer as it is to carry out independent lab and listening evaluation. This is particularly true when the product is as radical and eagerly anticipated as Meridian's Component Amplifier. Accordingly, as a supplement to Martin Colloms' detailed assessment and analysis which begins on page 69, we arranged for a 'conversational interview' between Martin and Bob Stuart, Meridian's technical design engineer. This was essentially a wide-ranging conversation rather than a tightly focused interview, covering topics well beyond amplification and the new product. Hopefully, it reveals the attitudes and philosophies which find their expression within the product. Editing a three-hour conversation into something readable and informative is far from straightforward, so subheadings are used to trace the main thread of the conversation.

Connecting cables

Currently a favourite topic in hi-fi circles, this discussion was sparked off by the sight of some PWB lead connecting wire, which had given rise to some initially interesting but so far inconclusive listening test results for Martin. PWB consider that connecting cable effects may be at least partly explained with recourse to the Heaviside theory of electrical transmission. Bob commented that he was in broad agreement with this concept of the transmission of energy as a wave, with the conductor acting as guide rather than simply a physical carrying medium. With this model the dielectric (insulator) surrounding the wire carries the power, and may have more influence on the signal than the wire itself.

Ohm's law happily holds for DC, very low frequencies, and very short cables. Traditionally audio has been regarded as a near DC phenomenon, but some of the subtle subjective effects now reported suggest that the Heaviside approach may have some audio validity. The conventional concept of current flow is fine where volts and ampères in the raw state are transmitted to a load such as a loudspeaker. But a more sophisticated model is needed to explain the recently well publicised effects of audible cable directionality.

Bob noted that during extensive listening tests on numerous types of cable, there were many instances in which one direction of connection was preferred, the difference perceived as an enhanced music-to-noise ratio. Martin commented that while his results had been less conclusive, he had encountered a minor degradation in stereo image when one of two cables was reversed, a phenomenon corroborated by Naim Audio in connection with their cable, and which Bob described as increased 'phasiness'.

Investigations into cables have shown that the manufacturers are generally unable to determine the 'direction' of multi-strand wire during the processes of winding and braiding. However, the

application of the insulating sheath involves heating and stretching as the hot PVC or similar extrusion is applied, a distinctly directional process which is probably the main contributory factor. Bob commented that annealed copper wire (*ie*, single strand enamelled) should theoretically be non-directional, but that directional copper conductors the 'right way round' in fact gave better results. Interestingly, the braided flexible cable used in loudspeaker drive-units to connect the voice coil to the frame-mounted terminals has been found to be particularly directional, suggesting problems which only drive-unit manufacturers are in a position to sort out.

Meridian are sufficiently certain of the significance of these audible effects that they now incorporate a special cable in their electronics, which is manufactured in Germany to a specified draw rate and extrusion temperature, with a selected grade of PVC sheath.

From the Heaviside perspective, Bob pointed out that passive loudspeakers absorb the surges of electrical energy driven down a pair of conductor guides by the amplifier, and this is in a sense a balanced drive, since no ground return is necessary. This conceptualisation renders the idea of directionality rather more credible, particularly the premise that it is important to maintain common directionality for each conductor to the speakers. Bob felt that deliberately randomising directionality, for example using twisted paired cable of, say, RS or QED multi-strand type, was most unwise practice. His experiments with PTFE-insulated copper wire had suggested that any advantages were negated by the need to silver-plate the copper.

Good cable sound seemed to rely upon a combination of exploited directionality, high conductor purity, and careful manufacturing techniques. Although attention has mainly been focused upon loudspeaker cables, Bob feels that the benefits of good cable practice should extend throughout the hi-fi chain. The difficulty in transmitting energy in the audio range over more than two inches without degradation or noise is one reason Meridian have pioneered balanced wiring and circuitry.

Earthing and Grounding

This balanced technique, with which Meridian are identified, avoids the concept of a common return or ground, useful since they feel that there is no such concept which is valid for hi-fi! Experience has shown Bob that a clean zero reference ground is almost impossible to achieve in an amplifier, because ground lines inevitably become contaminated with power supply artefacts, crosstalk and other spuriae, all of which prejudice musical transparency.

Surely one implication of the statement that it is well nigh impossible to get earthing really right even for an amplifier, is that the connection of other components with their own grounding idiosyncrasies will compound the problems? Bob feels that this is a significant factor which might well account for occasional unreliable findings in listening tests. He added that the advances in sound quality in recent years were more to do with this sort of engineering, than the fancy circuit topology and devices which are often claimed to reduce distortions.

Theoretically the 'star earth' should solve the internal problems of unbalanced circuitry. However, it is difficult to execute effectively in practice, and some commonality of current flow at the star is virtually inevitable. Meridian's balanced circuitry, on the other hand, allows the concept of multiple earths to be exploited. Comparatively 'dirty' power supply decoupling signals, for example, have their own ground return, separate from the reference ground.

Bob is firmly of the opinion that a hi-fi system always sounds better when properly earthed, due to an almost subliminal yet worthwhile reduction in interference and related power supply effects. Countries with two-wire mains rarely offer a true ground return on the mains supply, and this usually results in some sonic degradation.

The Component Amplifier

Getting on to the new amplifier itself, Martin questioned whether it was not rather on the expensive side, bearing in mind that one pays £350 for a 35watt per channel, moving-magnet only, combination. Alternatively, it was pointed out that one could regard the MCA1 as a quite reasonably priced preamp of audiophile quality, with a useful bonus power amp for headphone drive! Furthermore, the benefit of the modular approach enables it to be 'stretched' of course (and paid for) as need or funds allow, an amplifier – or of course receiver – on a real instalment plan!

It is clearly difficult to make value judgements on such an unusual package as this, and it is hard to know whether comparisons should be made with the more run-of-the-mill commercial integrated models, or whether, as Meridian suggest, it should be regarded as a comparatively modestly priced audiophile product, the preamp having been compared favourably with much more expensive models. If these claims are justified, there is obvious merit in a system which allows one to begin from a minimal system of uncompromised quality, working up in stages as more inputs and facilities are desired and acquired.

Future plans

Bob mentioned the plans for a more powerful amplifier arrangement, involving two mono power amp modules and rated around 80 watts per channel. This should be available late Spring 1984 at around £400 the pair. This variation will further improve isolation between pre- and power sections, and in the more distant future these switching supply modules will be adapted for active speaker applications, which are the main part of Meridian's business.

Output stage design

Martin drew attention to the very small heatsinks, which imply that the amplifier must 'run cool' and therefore operate with low quiescent current, risking undesirable crossover artefacts. In reply it was pointed out that a circuit principle had been adopted after Hawksford which prevented the output devices from being fully turned off. Furthermore, the devices themselves are overrated, with a very comfortable margin at 250W, and are capable of extended high temperature thermal cycling, coping with heatsink temperatures of 120°C.

Questioned on performance variations over such a wide temperature range, and whether pure class-A operation might be a better solution from this point of view, Bob admitted he liked the essential 'sweetness' of class-A designs, particularly at low volume settings, but did not feel the over-engineering was justified, and felt the MCA had much of this 'class-A' character, in any case.

Magnetic materials and component selection

The case of the new Component Amplifier is largely plastic, and has a low content of steel or ferromagnetic material. Was Meridian following Trio's example in minimising residual distortions due to ferromagnetic material in proximity to sensitive circuits? Bob explained that experiments with the case or chassis as specific items had not been carried out, but that extensive tests on components, including resistors, capacitors and even relays, had frequently demonstrated the audible presence of steel. It is not commonly known that many resistors and capacitors use steel lead-out wires, and some relays place steel very close to the signal current carrying parts. In these cases, distortion is audible and even measureable. Components are now carefully selected to be free, as far as possible, from these defects. Even the horizontal MCA1's module-linking bars are made of non-magnetic brass.

In addition to resistor lead-out wire effects, Bob commented on resistor nonlinearity, which is in fact part of the specification of better types *eg*, Rhodensteins. The use of the smallest, one-sixteenth watt resistor is audibly inferior, and where high signal currents are concerned, choosing a larger resistor than strictly necessary on power dissipation grounds can improve the sound. It is also worth overrating the voltage specification for capacitors, working them in a region of lower dielectric stress. The new solid aluminium capacitors appear to provide a good sonic performance, and are often used with polycarbonate and polystyrene bypasses. The days are now gone when a designer can freely use ordinary electrolytic capacitors, particularly unpolarised examples, in the signal path; furthermore, the performance of such capacitors deteriorates with age.

Meridian take equal care over the dielectric properties of the insulators and supports within the units, the structure of the plugs and sockets, the printed circuit board, and the cable supports, all chosen for low dielectric absorption on the same basis as the selected connecting cable. Where possible, signal lines which are not within feedback loops are kept off the circuit track.

It has also been reported that printed circuit board can exhibit directional properties, varying with the form and weave of glass-fibre reinforcement, if used; so far, however, problems of time and manpower have prevented further investigation. Recalling his past work on oscilloscope design, Martin mentioned that the pulse response of wideband (10MHz) amplifiers could be seriously disturbed by dielectric absorption effects in circuit boards. At that time phenolic paper material was quite superior to glass epoxy in this application, and it was agreed that there was still much work to be done in this area.

Bob laughingly said that he now found himself doing things to amplifiers which we had all scoffed at a few years ago. We appeared

THE MERIDIAN LINE...

to know less about amplifier sound and its relationship to technical performance than we had imagined, and a number of previously dismissed techniques were now producing audible results, albeit with little measurement-based verification.

Balanced/unbalanced operation and circuit design

With the concept of a variable length (perhaps more correctly variable width) amplifier design, balanced or semi-balanced mode (fig. 1) is used throughout for signal connection. (In semi-balanced mode one line is shorted to ground and merely carries the ground error signal.)

The unbalanced option still runs at the same 600 ohms impedance

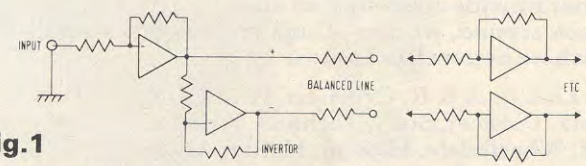
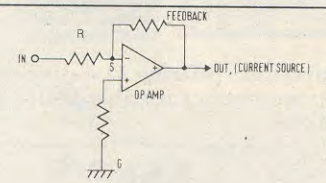


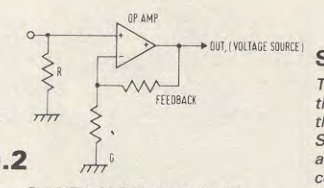
Fig.1 BALANCED LINE CONFIGURATION (SHUNT FEEDBACK UNITS)

as the balanced line and thus similarly rejects interference. Bob admitted that the adoption of balanced lines has made the amplifier more complicated. Integrated circuits are used throughout except in the moving-coil input which employs discrete parts in addition to the 5534, this a superior quality low-noise 'chip'. Very few capacitors are required for signal coupling. He commented that ICs can indeed be inferior to discrete, but only when improperly used, which is borne out by the observation that neither Musical Fidelity nor Burmester designs appear to suffer subjectively. Furthermore, ICs have played an essential role in the realisation of Meridian's new designs.



Shunt Feedback

Summing point S is a virtual earth, the input resistance defined by series resistor R. Signals arising at ground point G do not appear.



Series Feedback

The input resistance is defined by R. In the equivalent circuit representation the feedback appears in series mode. Stray signals appearing at G are also added to the feedback signal, a common-mode effect.

Fig.2 SHUNT & SERIES FEEDBACK

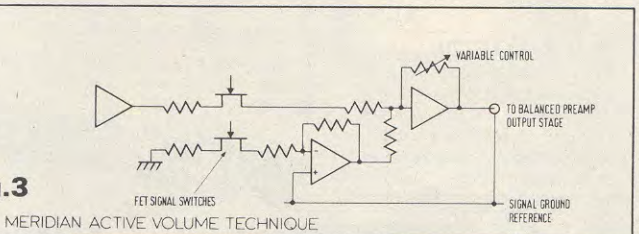


Fig.3 MERIDIAN ACTIVE VOLUME TECHNIQUE

One of the primary design rules has been to employ shunt rather than series feedback (fig. 2) wherever possible, since there is no common mode signal with this system. Only in the moving-magnet input is series feedback used, the alternative being a poor signal/ratio, defined by the obligatory 47k-ohm series resistor at this input. While op-amps can provide a differential, or balanced, input, a second inverting op-amp is required here for a balanced output. These are alternated down the signal chain to ensure equal delay for each half of the balanced line. The active volume control (fig. 3) is unbalanced, and is referenced to the clean signal reference ground, remaining independent of the power amp ground. Likewise, the power amps themselves do not use a common ground return, since this is a reference point for return current from the load and logically should not be contaminated with current from the other channel.

By using a shunt feedback m-c input, loading variations are largely eliminated, and ultrasonic load capacitance effects side-stepped. The preamp provides a resistive 12 ohm input impedance in series with a 700µF coupling capacitor of a selected tantalum type with good characteristics, at the signal levels required, this, in any case, bypassed by polycarbonate components. Signal/noise ratio is more than satisfactory, defined by the 12 ohms + cartridge source impedance. The m-c input was designed as a complete unit with optimal equalisation, not, as is so often the case, as an afterthought head-amplifier in cascade with the normal m-m input. Consequently the m-c performance may well be subjectively better than the m-m.

CD input

Asked for his views concerning CD, Bob replied that it was already a fine music source of real merit, granted a good-sounding player. CD units however, can demonstrate some grounding problems, and those with superior error correction sound consistently better.

However, the present state of 'upfront' recording, together with speaker systems currently in use with a mid bias, favour analogue disc tonal response and dynamics, and Meridian have felt it worthwhile to include a special CD input module with mild frequency tailoring – a gentle downtilt of – 2.5dB by 20kHz. This helps produce a more compatible sound with analogue-based systems.

'Envelope distortion'

Underlying the Meridian approach to designing a clean-sounding amplifier is the belief that a number of effects occur which may loosely be described as 'envelope distortion'. This is a kind of 'noise modulation' that occurs in the presence of signal. On their own, as demonstrated for example in the Quad subtraction test, these may appear to be at a level below reasonable audibility. However, psycho-acoustic research suggests that the ear can hear very low level sounds in the presence of higher level signals, particularly if these are related in some way. Bob believes such low level distortions do affect sonic quality, and he explored this subject in a recent AES, London section, lecture on which we hope to give more detail in the near future.

Some causes of envelope distortion include coupling between the half cycle currents from the power supply rails to the low level circuits, either by mutual electrostatic or electromagnetic coupling, or common mode paths in the circuitry. The flux field from a power transformer is also coupled to some degree into many circuits and although it may be regarded as harmless in itself, its variation with output power can produce another form of envelope or modulation distortion. The dielectric absorption in cable insulation, mouldings, round contacts, circuit boards and capacitors appear to give rise to odd, almost subliminal, noises, which can be either slightly delayed, tracking or even synchronous in relation to the signal. Modulation noise on magnetic tape falls into this category, though at –30 to –50dB it is hardly subliminal for those listeners accustomed to recognising its presence!

Bob explained that the envelope of the signal – viewed simply as the mean energy variation – can appear as a signal itself at several points in an amplifier, and become added to the main path via a common mode point, for example. The envelope signal is strongest in the power supply, and may be introduced into low level circuitry via a poor internal grounding system.

Other distortions

Despite sterling efforts, Meridian have found great difficulty in convincingly establishing any correlation between measured high frequency distortion and sound quality. Even the more 'difficult' tests like those used to assess TIM have proved to be red herrings, merely confirming the findings of the simpler two-tone CCIR intermodulation test. If anything, more sonic improvement has been achieved from changes outside the feedback loop, to cables, capacitors, resistors; circuit topology may ultimately matter less than component and system quality.

Frustrated by the lack of audible benefit obtained from reducing high frequency distortion, Bob turned his attention to low frequency effects, such as those caused by loudspeaker stands and power supply changes. The earlier Meridian amplifiers should not have been affected by supply changes, due to their high common mode rejection of the order of 100dB, but auditioning indicated otherwise. For example, VDR clamping on the mains supply does appear to reduce background noise in some instances, even though this effect seems to be unmeasureable.

Noise measurements are normally carried out with the amplifier quiescent, and Bob suggested that the much more difficult task of measuring noise in the presence of a dynamic signal should be attempted, as this is closer to the ear's synchronous detector action, which works well into threshold levels and over a dynamic range far

larger than existing measurement systems. Considerable effort has therefore been devoted to reducing noise, hum and crosstalk effects in the new Meridian amplifier, and a major contribution has been made by adopting a carefully engineered switching power supply, which throws away the mains transformer and its hum field as starters!

Switching power supplies

This technique is an essential part of the MCA power amp sections, though it is a principle which has been used for some years by other manufacturers, notably Sony. Off-line rectified, the high frequency convertor runs at 33kHz, above audibility; signal modulation products should therefore also lie at 33kHz, and be inaudible.

The Meridian design recognises the need to provide a short-term current store, so still uses large reservoir electrolytics (2 × 10,000μF), which is generous for the 35wpc rating. Whereas these would be recharged at 100Hz in a conventional supply, the Meridian 'tops up' at 300 times that rate, ensuring great stability. Other benefits are that the supply is isolated from mains supply noise and interference, while synchronous noise is blocked in the chain. Bob pointed out that this configuration differed from others such as the Sony Esprit design, which he described as 'through' converters, without optimum line/secondary isolation. Simply speaking, the Meridian uses the magnetic field in the 'flywheel' inductor core as an isolating energy store.

Questioned on possible disadvantages of switching power supplies, particularly in the area of RF radiation and interference, Bob admitted that great care had been needed when designing for two-wire mains, because grounding is preferred to reduce the radiation of supply harmonics, which extend to higher frequencies. Interference hadn't yet proved any problem, and the unit is currently under test at the ERA laboratory to meet the DIN standard for EMI (Electromagnetic Interference). No problems were found when a normal transistor radio was brought to within a few inches, and indications were that performance would better the more powerful Sony in this respect.

Martin commented that he thought long-wave was likely to be the area where problems might arise, and questioned whether there were any plans to produce an AM tuner module, Bob responding with the observation that he would expect to use an outside aerial rather than simple ferrite rod in such an application.

Bob regards both the Meridian's regulated nature and its noise levels (up to 40dB better than conventional designs) as influential factors in the sound of the new electronics. He pointed out that a conventional amplifier could be said to play off the reservoir capacitors, which are momentarily recharged by a transformer whose impedance (and quality) could vary from almost zero to significantly high values. With the switching design, the capacitors recharge quickly, but with the conventional supply the recovery time to full reservoir voltage could take some time. A balance must be drawn between supply impedance or stiffness, and reservoir capacitor size.

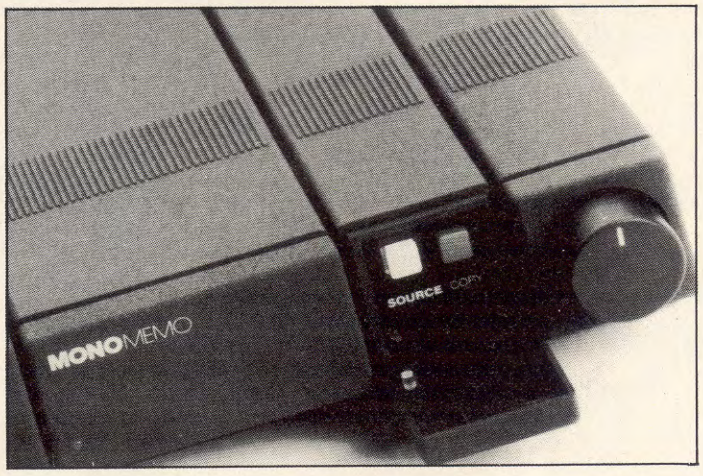
The alternative solution of designing the switching power supply to be capable of delivering the full peak current likely to be met under adverse load and possibly clip conditions is by implication uneconomic. In theory the supply would need to be four or five times larger than required for normal use, which is the kind of costly overkill which can be seen in the power supplies used in the Krell class–A models and the like.

The Meridian supply will produce typically up to 15A peak currents on a duty cycle of 1:4 or less, with the power supply rated at 3.5 amps continuous. Bob conceded that it was not a 'blood and thunder' design, since his supply ratios indicate an output level below the normal 8 ohm load figure of 2–3dB for 4 ohms and down by 8dB into 2 ohms if measured on a continuous basis.

He added that with sensible peak-to-mean ratios on good quality program with anything better than the very worst speaker loads, the designed sound quality of the Meridian should be properly maintained.

Bob concluded by summarising his objectives: to obtain good musical transparency and neutrality, with a freedom from spurious noise, conventional and envelope distortions, plus high system flexibility, and good appearance and user convenience.

The Meridian Component Amplifier



MERIDIAN HAVE BEEN WORKING hard for some time now on a new range of electronics, expanding further on their established approach using flexible modular systems. The first such item to appear is the cumbersomely titled 'Meridian Component Amplifier'. A stylised zebra has been turning up in Boothroyd Stuart's literature recently, so some dealers have suggested that this logo could be used as a preferable title for the amp, bearing in mind the 'banded' appearance!

Previous established 100 series Meridian amplifiers have been visually modular, in terms of their common 'building block' case construction. Coming in neat brown slab-like boxes, tuner, preamp and three alternative power-amp combinations could be placed together as a tidy package. This modular concept was continued particularly within the preamplifier, which was designed as a power supply and control chassis, with plug-in modules used for m-m/m-c disc sources and output. Although attractive to look at, the 100 series did have one drawback in the complex rear interconnections needed to link the units and their various power supplies. Aside from the inconvenience involved, these were also a potential source of weakness, not just in terms of reliability but more importantly in terms of system subjective sound quality.

The new Component Amplifier is also modular but with a major difference. Where 100 series connections were made and units arranged as needed, the result often a sort of stack, expansion takes place laterally in the new Component Amp, with a number of self-contained boxes wired into the system automatically via integrated multiway plugs and sockets built into the side of the units. These literally clip together, and internal mechanical rails allow each combination to be locked together to form a secure assembly.

In its simplest and least expensive form, the system would comprise modules for power supply, an integral 35W (15dBW) per channel stereo amplifier, a moving-magnet input and, as always, a volume control/preamp output module. This will make up the basic 'Component amplifier' and will retail for around £350, or £370 if moving-coil matching is chosen instead. A more comprehensive combination comprising tape, aux, m-m and m-c inputs will set you back close on £500.

However, this product should not be regarded as just a classy, integrated amplifier of modest power. It aims to set well-above-average standards for sound quality, and contains the basis of a range of preamp and tuner electronics for active speakers as well as other products. The Component Amplifier may be upgraded to receiver status by the addition of the tuner module (£170).

The system design is so flexible that with the appropriate power supplies, over 20 modules may be fitted to provide control sections offering unparalleled versatility. Units planned include an AM tuner add-on to the FM tuner module; a headphone monitor amp; a tone control unit with memorised settings for individual inputs; filter and tape dubbing units. For configurations with excessive numbers of modules, a 'fold over' unit will be provided to continue interfacing on a second layer!

As with earlier Meridian models, the amplifier electronics have been designed by Bob Stuart, with external styling by Alan Boothroyd, who has gone for a 'low profile' creation, devoid of all spurious lights, knobs and displays. Its stark appearance is only relieved by the neat volume control mounted on the right hand side. The units are finished in charcoal grey Nextel, a coating chosen both for its neutrality and for the important ability to maintain a colour match for modules bought over a period of time.

Most of the module fronts consist of spring-loaded hinged doors. Depressing them, logically, selects the function engraved on the door. Further facilities are provided in the form of buttons concealed

THE MERIDIAN LINE...

behind the doors, for example, mono selection and tone memory. Connecting cables are concealed at the rear by a 'roof extension' over the socket area, though this actually makes connection rather difficult since the labels are then hard to read.

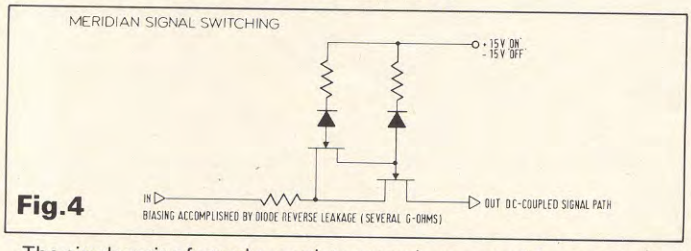


Fig.4

The single pair of speaker outlets are pcb-mounted 4mm sockets set rather close together. 'Preamp-out' is on a 5 pin DIN, and may be balanced or unbalanced, depending on the plug wiring. Signal inputs on the modules so far available are via gold-plated phonos (aux, disc etc), but on our sample these had become detached from the board due to a lack of plating adhesion, and needed careful resoldering before we could proceed with our tests; this is an aspect which Meridian are looking into for future production. We also noticed a further problem on particularly damp days, when the signal switching logic failed due to board leakage (see fig. 4 FET switch topology), so perhaps this amplifier is not ideally suited to high humidity conditions:

Technical details

Running horizontally through the modules is the main information bus bar. This 24-way system is capable of signal traffic flow in both directions, for example to serve a tape recording loop. The lines carry a variety of signals, six for the control logic comprising muting, mono mode, filter, tone and input socket etc. Lines go to and from the active volume control to tape record out etc. In addition to several regulated and unregulated power supplies, a storage cell powers the memories even when the unit is switched off. Three ground wires give signal reference zero, logic reference, and power supply ground return.

Employing direct-coupled 5534 op-amp integrated circuits for most sections, all stages bar the moving-magnet input are of shunt feedback configuration to give high common mode rejection. Special low noise transistors are used for the moving-coil input, whose input reference is defined by the series 12 ohm resistor to the amplifier's virtual earth signal point.

Rated for a 3.5 ohm source/cartridge impedance, the moving-coil module incorporates IEC rolloff set by a 700µF series capacitor to around 20Hz, −3dB. However, both the gain and the rolloff point will ultimately depend on the chosen cartridge. For example, a Denon or

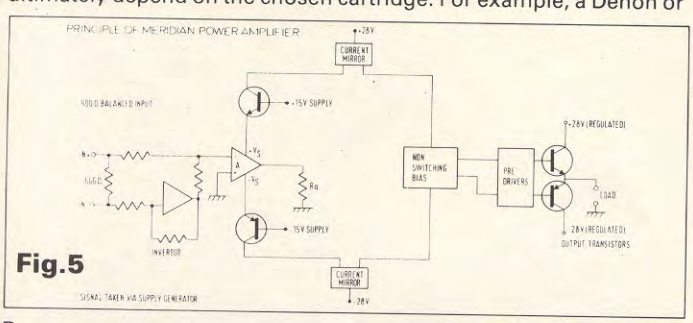


Fig.5

Dynavector m-c with 30 ohm resistance will appear to have lower than usual (though still sufficient) sensitivity, and the IEC rolloff will be inoperative, the −3dB point moving to around 6Hz. The subsonic rolloff, and to a lesser degree the bass tonal balance, will therefore vary from cartridge to cartridge. The low input resistance means that the gain is to some extent self matching for different cartridges, and any ultrasonic electrical resonances are well damped.

On moving-magnet a series feedback arrangement provides the optimum signal/noise ratio, and input impedance is a conventional 47 k-ohms. Output lines from each module are in balanced 600 ohm form, fed to the signal bus in the interconnect system.

A balanced volume control is difficult to engineer, so Meridian revert to unbalanced mode here. The gain control is active, in theory to place any control contact imperfections within a correcting feedback loop. Reverting to balanced mode the output is taken both to the rear connector (600 ohm balanced or 300 ohm unbalanced output impedance) and across the interconnect to the power amp.

This unit is unusual in several respects. In theory 80W-rated output devices should be sufficient for a continuous rated 35W power, but taking into account safe operating area margins and temperature considerations, Meridian have chosen to use 250W devices. These are metal-cased complementary transistors with high thermal tolerance, allowing the use of small high temperature heatsinks.

Run at a low quiescent current, a special circuit biasing configuration prevents the output transistors from turning off – the so-called non-switching quasi-class-A mode. Variants of this principle have been used recently by a number of Japanese designs, although Threshold are generally credited with the first application. The Meridian version is, in fact, based on the exposition due to Malcolm Hawksford of the University of Essex.

Fitted with a balanced input (fig. 5), the converted unbalanced signal is fed to the operational amplifier which has a dummy load, R_a. The current drawn by such an amplifier is an exact replica of its output signal, and this is conveniently exploited *via* the supply terminals to derive a symmetrical output appearing on the collectors of the cascode transistors. Current mirrors feed the signal forward to the output stage. The whole arrangement is symmetrical and complementary, direct-coupled to the load *via* a small air-cored stabilising inductor.

The power supply also breaks new ground for Meridian, using the switching regulator principle which has become increasingly popular in industrial circles, though is less commonly encountered in audio amplifiers. The mains supply is directly rectified to 300V or so and stored. A switching transistor passes current pulses in a controlled manner to another isolating energy store, a transformer inductor. Only when the current input has ceased does the magnetic field in this inductor begin to collapse, inducing power in its secondary windings; the amplifier supply lines are derived from these. Practical design constraints restrict the maximum current capability on a continuous basis, but not the instantaneous peak demand required for adverse loads; this is satisfied by 2 × 10,000µF for the power amp section. Subsidiary regulators provide clean DC to lower level signal circuitry and ancillaries such as FM tuner if fitted.

The reinforced plastic mouldings are very strong, so a minimum of metal chassiswork is used, mainly in the power supply. While a little tricky to disassemble at the first attempt, the individual circuit boards actually come apart quite easily, although probably service will best be done on an exchange module basis.

Sound quality

The MCA-1 was tried under a variety of conditions, both as preamplifier and as a complete unit, using several speaker and source combinations. Speakers included Quad ESL-63, Celestion SL600 and Spendor SP1; used as a preamplifier, we tried both Krell KSA-50 and Mission 777BU power amps with it; moving-coil sources used included Van den Hul EMT and Koetsu Red; a Shure V15V was used for moving-magnet, while a Philips CD200 digital player and Sony PCM701 digital recorder were connected via aux. Subsidiary details include the use of rigid floor-coupled speaker stands, Mission speaker cable and a Zeta tonearm on a converted Lux PD300 player.

First impressions were encouraging. Bearing in mind the specified 35W per channel, the MCA-1 was initially used at sensible sound levels. Before attempting to describe the sound in detail it is worth giving an indication of the general effect which seemed valid for all sources – a well balanced and tonally neutral character of subjectively wide bandwidth. Transients seemed in firm control throughout the frequency range, and the amplifier remained true to character on both soft and loud passages. The overall impression was of a relaxed musical performance, unfatiguing and easy on the ears.

In stereo terms the sound stage was more distant than usual, the amplifier lacking the slight 'upfront hardness' encountered in varying degrees with other designs. The image was broad and well-focused, with sharp central positioning for the soloists. The MCA-1 proved highly capable of portraying depth, space and ambience in the more distant sectors of the stereo image.

The bass achieved a high standard, sounding articulate and tuneful. It also showed good 'weight' and extension, if slightly lacking in ultimate 'slam' and 'attack'. The mid-range was tonally pleasant, almost sweet-sounding in a valve amplifier sense. In the treble, performance was still well above average, though not quite to the high standard achieved elsewhere: difficult to describe, and less noticeable with the sweeter sound sources such as the EMT VDH cartridge, the highest frequencies appeared to show a trace of 'edge' or 'brittleness', but thankfully more serious distortion effects such as fizz or grain were absent.

The amplifier was considered good on detail rendition and subjective transparency, though compared with more costly references some mild loss of immediacy and detail could be

detected, and, on occasion, the Meridian could sound too distant and polite, in accord with its relaxed and slightly 'laid back' presentation.

Reasonably good sound levels were possible using Celestion SL600s, but the MCA-1 was found to show audible distress when in clip, so 35W is a real power limit. (Some models are capable of rather more relatively clean output than their continuous power rating might suggest.) Driven hard into a simulated 4 ohm 'difficult' load, some curtailment of the maximum sound level was noted. Spendor SPIs, some 4dB more sensitive than the Celestions, were also used, and here the maximum sound level was sufficient for most purposes.

Used as a preamplifier only, for example with the Krell, some improvement was noted, but not sufficient to impair our appreciation of Meridian's own component power amp stages. The basic character of the unit was maintained, with the difference coming from improved dynamics, even better bass control, plus some mild extra detail. There is little doubt that the MCA-1 is a worthy performer as an upmarket preamplifier, representing a significant advance over Meridian's previous and quite well regarded 101B.

Lab results

The amplifier met its 35W (15dBW) specifications to very tight limits, determined by the factory-set regulated supply. Not unexpectedly it coped with single or dual channel drive very well, while the reduction into 4 ohms at around 1dB was quite low. Power bandwidth was good. No increase was obtained for pulsed or peak-program-equivalent conditions for 8 ohms or 4 ohms, but these signals allowed its 2 ohm performance to be assessed. Here the output level held up remarkably well, falling only 0.8dB below the 8 ohm figure; however, on longer duty cycles (>20ms) the output began to fall. This means that the unit will drive full level into almost any conceivable load on program if unclipped, but cannot be expected to maintain this if driven too hard, *ie*, into clip or when fed heavy continuous bass, as may happen with a smaller amplifier such as this.

Total harmonic distortion was generally low at typically −80dB, though it deteriorated at full power towards 20kHz. Here an unusual crossover-type distortion was noted, only just 50dB down on a peak basis; with 1dB or so reduction in power level it disappeared, so I assume it is pretty harmless. (See fig. 6.)

At medium power levels into both 4 and 8 ohm loads distortion fell to very low levels, for example −100dB at 20Hz, −96dB at 1kHz. No crossover effects were noted at low powers. High frequency intermodulation distortion was equally good, bettering −86dB under all tested conditions save full power, where a still fine −78dB was recorded. The amplifier performed well in the high frequency noise intermodulation test, producing essentially reference standard results under the four test conditions. Reactive load handling was judged to be very good in terms of peak current delivery capability.

Noise levels were very good, with mains-related hum almost undetectable and power switching harmonics quite insignificant, provided that the three-core mains cable was properly grounded. The m-c input ARM noise was −76dB ref 1kHz, as were, interestingly enough, both the m-m and aux inputs, all these being good CCIR ARM weighted figures. Input overload levels were fine, referenced to the IHF 1kHz level, while channel separation at typically −75dB was particularly good via all inputs.

The output impedance was sufficiently low to be regarded as neligible, though the DC offset at the output terminals was higher than usual, measuring up to 60mV depending on warm-up time and recent power delivery; I regard 20mV as a maximum preferable offset. Meridian have managed to dispense with presets in the power amp section, but a lower output offset would nonetheless be beneficial.

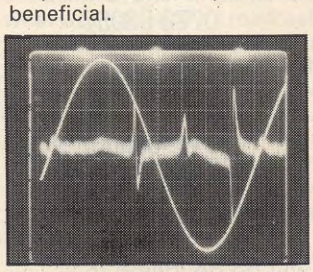


Fig.6 *Distortion characteristic, full power, 20kHz*

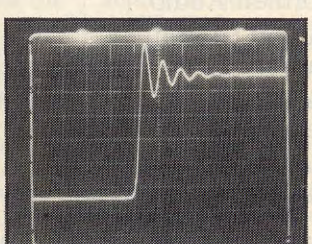
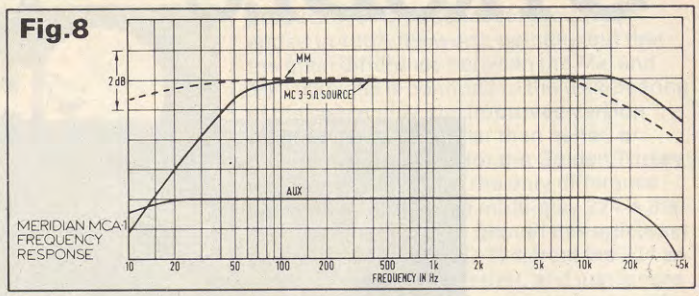


Fig.7 *Step response, 8ohm + 2μF load*

The addition of 2μF to the standard 8ohm load provoked some mild overshoot on the squarewave leading edge (see fig. 7) shown here with a 5μs risetime. The response lifted by a mild 0.7dB at 20kHz, with 2μF, and held to just 0.1dB at 10kHz.

Channel balances were very good except at the very lowest volume settings, a mild 0.85dB imbalance being noted at −60dB. Sensitivities and impedances were fine, though a lower sensitivity input module would be a help in expanding the volume control travel

Fig.8



for CD players. The preamp output impedance was fairly low, at 600 ohms balanced and 300 ohms unbalanced.

RIAA m-m equalisation (fig. 8) was very uniform, +0.03 −0.5dB, 20Hz to 15kHz. Moving-coil was also good, though the IEC rolloff (20Hz, −3dB) with 3.5 ohm source impedances results in 0.5dB loss at 60Hz. The high frequency range showed little rolloff, typically measuring −6dB at a high 90kHz. Via auxiliary the −1dB points were below 5Hz and above 25kHz; −7.5dB at 100kHz is quite wideband.

Conclusions

Overall this is a well designed and well engineered product. In the laboratory it set comfortably high standards on all the tests and demonstrated very low noise, very low distortion, and fine load tolerance. It was also accurate in tonal balance terms as judged by both measurement and audition.

In sound quality terms it was musical and relaxed with a fine stereo stage, well-defined in precision, focus, depth and ambience. However, it does not play particularly loud, as some models can be can be persuaded to do: rather it has more of an intellectual appeal, quietly impressing by its refinement rather than by providing a dynamic and forceful sound.

Viewed dispassionately, I must comment that the Component Amplifier is rather expensive for what is on the face of it a modestly powered unit. But if the good sound quality is taken into consideration, perhaps strict value judgments lose some of their relevance. Of course, the unusual design and presentation of the product are probably also reflected in the slightly high price.

Moving out of value-for-money territory, the preamplifier stands up well when compared with some of the more costly audiophile products, offering an interesting proposition. Hardly a bargain, it is nevertheless capable of respectably good sound quality, which is potentially open to further improvement when used as designed, feeding Meridian balanced interconnect cable to Meridian active loudspeaker systems. Here the merits of the Component Amplifier system will be seen at their best.

MERIDIAN RESULTS TABLE

Specified output power 2 × 35W, 8Ω = 15dBW

Power Output	**dBW**	**20Hz**	**2kHz**	**20kHz**
	8Ω both	14.4	15	14.0
	4Ω singly	14.0	14.2	13.6
	8Ω+2μF	–	–	12
Peak Power	**2kHz**	**8Ω**	**4Ω**	**2Ω**
	dBW	15.4	14.8	14.6
Total Harmonic Distortion				
	at rated power	–80dB	–93dB	–70dB
	at 10W	–100dB	–97dB	–80dB
	via disc 1W	–80dB	–80dB	–75dB
High Frequency Intermodulation		19/20kHz	(at +6dB ref IHF)	
	m-m	–86dB		
	m-c	–88dB		
Noise Intermodulation	16kHz-⅓ octave noise input (1kHz diff. signal)			
	8Ω pre-clip		–70dB	
	8Ω+2μF preclip		–35dB	
	8Ω–10dB		–70dB	
	8Ω+2μF–10dB		–70dB	

Input	Noise (1kHz ref)			
	CCIR ARM	**UNWTD**	**Sens IHF**	**Imp.**
m-m	–76dB	–68dB	360μV	50k/100pF
m-c	–76dB	–74dB	source dep.	12Ω
Aux	–76dB	–75dB	25mv	50k

Output Impedance	**Pre-output 600Ω balanced, 300Ω unbalanced**			
		20Hz	**2kHz**	**20kHz**
		0.06Ω	0.055Ω	0.11Ω
Channel Separation	m-m	82dB	77dB	57dB
Channel Balance	± 0.3dB typically (no balance control)			
Output Offset	40/60mV, L/R			
Frequency Response	See graph (fig.8)			