C.C. Clements
Thesis, Spring 1980
Prof. Laseau
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One of the more interesting and positive current trends is that of audio-visual recording. Video-cassette players are rapidly becoming obtainable to the public. Video records have recently become commercially available. The latter technological innovation will require a very specialized working environment which will require the services of a specialized architect.

Records as we know them today will become things of the past; when we go shopping for a record in the near future, we'll no longer be content to merely hear them— we'll want to see them as well. Television replaced radio in a similar way. The big difference is that we will be able to choose what we want to hear and see.

To design a space that can accommodate such objectives is clearly a challenge. Rooms become much more than "people spaces." Acoustics and lighting become critical. The choice of materials and the construction methods become a science. The building becomes truly a "living mechanism."
The purpose of my thesis is to design an audio-visual recording studio that formally becomes the College of Recording, Ball State University. This facility will serve two main purposes:

1) To provide B.S.U. students with a state-of-the-art working environment in order to give them professional, on the spot training for what I feel is a desirable college program.

2) To create a successful commercial enterprise for the University by offering specialized services to recording artists and student amateurs.

The design problem, however, entails more than merely designing recording spaces. It is also a campus attraction which offers publicly appealing spaces, both indoor and out. As of this writing, I see the Ball State campus as being potentially exciting, but nonetheless weak due to certain existing environmental conditions.

McKinley avenue is certainly a main circulation axis and somewhat exciting, but is faced with the problem of trying to combine heavy pedestrian traffic with heavy vehicular traffic. Half of the people on campus watch the other half walk by on the other side of the street- almost forty feet away. Interaction is superficial to say the least, particularly in the winter. Bicycles compete with cars. Granted, the scramble light is exciting- and it would remain even more so if traffic were eliminated to the north of it.
If the traffic were re-routed to a campus loop as my site plan indicates, the inner campus would no longer be divided— as the campus boundary would be clearly defined.

The field through which the cowpath crosses is another ambiguity. It's a no-man's land between campus and Muncie residential. Yet it is another widely used axis from one side of the campus to another. My building takes advantage of this fact. It recognizes a "mini scramble-light" and incorporates the cowpath's trajectory into its own circulation. It not only eliminates the fading boundary but acts together with the C.A.P. as an anchor.

The C.O.R., like the C.A.P., is a campus monument whose intent is to symbolize, through its form that it shows to the public, the function of the spaces within the building and the educational philosophy of its student body. Studios radiating from control rooms, classrooms focusing inward toward the educator/performer are clearly evident in the facade. Protruding glazed areas attract. Sturdy concrete elements reflect the precision and rigid control in the recording studios, while there is an organic quality in the geometry of the spacial elements— despite a very formal and mathematical structural grid. (Music, which is the recorded product, is seemingly very free and artistic but based on mathematical concepts of time signatures, bars per measure, duration of note, strict tempo, etc.) The plan itself is symbolic of certain tools of the recording induc-
try. The planning of certain elements in the facade is based on rhythmic concepts. The building as a whole uses a consistent vocabulary of shapes based on a 45 degree angle to a large degree, which can be thought of as composing in a major key using an occasional relative minor.
<table>
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<tr>
<th>Description</th>
<th>S.F.</th>
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<tr>
<td>Control room- 4 @ 400 S.F. (Avg.)</td>
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<td>Studio- 3 @ 1,500 S.F. (Avg.)</td>
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<td>Video studio</td>
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<td>Lounge Area</td>
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<td>Deck Area</td>
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<td>Vending</td>
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<td>Lecture rooms- 2 @ 1,800 S.F. (Avg.)</td>
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<td>Offices- 12 @ 150 S.F.</td>
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<td>Guest rooms- 4 @ 150 S.F.</td>
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<td>Shop/ repair/ storage-</td>
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<td>Mechanical room-</td>
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<td>Retail</td>
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<td>Practice Area</td>
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<td>Support Area/ circulation- @ 25%</td>
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<td><strong>Total</strong></td>
<td><strong>50,250 S.F.</strong></td>
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CONTROL ROOM

Description

The control room is the sound engineer's workshop, where he controls the recording of the music, in all its progressive stages. His base of operations is the console- and electronic instrument panel containing keys, knobs, switches, dials, guides and other devices, some or all of which he uses in one way or another to control the recording.

A soundproof glass wall between the control room and the recording studio provides the engineer with a clear view of the performers, without his having to hear the live performance of the music. He must, instead, hear through the sound system, in order to control the recording. Elsewhere in the control room are monitors, recorders, and other electronic panels.

Number of People

1-3 engineers

Equipment

Built-in console, playback monitors and seating; shelves and counters, 2 tape decks.

Special considerations

Lighting- 30 F.C.

Acoustical design: non-parallel walls

Fresh air- 15CFM/person

400-450 S.F. optimum
STUDIO

Description

The studio is the space in which the musicians perform.

Number of People

Avg. of 5; up to 15-20

Equipment

Acoustical panels, booths, monitor headphones with stands, piano, drums, mics, tables, chairs, "toys" (phasers, wah's...)

Special Considerations

The studio acoustics play no part in much of today's popular music. The internal balance of the band is deliberately surrendered in exchange for electronic versatility. A flute, harmonica and a piano may be given a melody and be expected to sound as loud as a horn section. Special effects may be desired which can only be obtained if the sound of the louder instruments doesn't spill to the mics set at high amplification for the quieter instruments.

These needs call for an acoustically dead studio—more dead than, say, a speech studio. Cutting down on reverberation won't suffice. There must be substantial attenuation at a single reflection from any wall. This means that much less of the sound of the horn section will strike the walls and reach the flute microphone from directions that can't be discriminated against. Attenuation due to air transmission is an acoustical aspect which must be seriously considered.
STC = 56 for construction.

NC curve of 15 max.

Fresh air = 15 CFM/person.

Lighting = 70 F.C.

Humidity = 50% ± 5%.

Temp. = 70 ± 3.
VIDEO STUDIO

Description

This studio combines sight with sound. In addition to containing musicians with instruments, it has a crew of cameramen, with hardware, and a live audience of 300.

Number of People

Musicians, crew and audience

330 people. (with tables and chairs)

Equipment

Control room, fully equipped, along with video monitors.

3 cameras

Flexible props, bleachers, acoustical panels.

2 video recording machines

Storage for cables, equipment,...

Special Considerations

This space is made very dead for its size. The primary reason for this is that if they are not to appear in vision, microphones must be farther away from their subjects than for other types of balance. But it also helps to reduce inevitable noise from distant parts of the studio. A major production may require 200 KW of lighting power; ventilation is provided to remove the heat produced, and this is noisy. Props are erected during the performance. Close to the action cameras drag noisy cables. Scenic projection equipment is noisy.
The floor is tile to allow the smooth movement of heavy equipment; it is acoustically highly reflective, whereas the rest of the surfaces are very absorbent.

Sound which radiates upwards at any angle will be reflected several times before it can reach a microphone, but sound travelling horizontally may be reflected only once. For this reason the most effective place for the absorption of sound is the lower parts of the walls, which is where the acoustical panels are placed.

The video studio studio has acoustics approaching those used in dead music studios; it is therefore suitable for music techniques of this type. This also holds true for the sound control and film dubbing rooms.

- Fresh air 50 CFM/person
- Lighting 20-30 FC over seating.
LIBRARY

Description
Meditative, acoustically absorbent space designed for study, and listening on headphones. Includes office for librarian and assistant, check out desk, stacks, record/tape storage, reading area, listening booths.

Number of People
Librarian, assistant 20 students.

Equipment
Tables, chairs, plants, booths, playback equipment.

Special considerations.
Space acoustically dead and isolated. Natural lighting is provided.
Fresh air- 12 CFM/person.
Lighting- 70 FC.
Humidity 50%.

Acoustical and visual "territory" is designed for each individual.
LOUNGE

Description

A stimulating environment where students, faculty, staff and visitors may gather to relax, take in views, be alone, get a drink, play pinball, etc...

Number of People

30+

Equipment

Vending and arcade machines, pool table, plants, comfortable chairs, tables, ashtrays.

Special Considerations

Natural lighting and views to McKinley are essential in creating a relaxing atmosphere. Natural ventilation is appropriate. Separation from "quiet" zones is necessary.

Fresh air- 12 CFM/person

Lighting- 30 FC.
LECTURE ROOMS

Description

The students gather here to learn about film and tape recording techniques.

Number of People

1 Prof-30 students

Equipment

Closed circuit TV to recording studio with intercom, slide projectors, screens, lecture stands, desks, blackboards, P.A.

Special Consideration

Large lecture spaces are acoustically designed for speech (same shape as studios). P.A. (public address) system required.

Fresh Air- 12 CFM/person.

Lighting- 70 FC.
OFFICES

Description

These are the staff offices- for the people who organize and teach the audio-visual department.

Number of People

2 secretaries
8 faculty
8 conference

Equipment

Phones, intercoms, desks, chairs, typewriters, telex, coffee machines, sink, counters, shelves, tape recorders, Amp, speakers, cabinets, piano.

Special Considerations

Lighting- 100 FC.

Fresh Air- 20 CFM/person

Offices are in a fairly private area with provisions of natural lighting, ventilation, and pleasant views. They are situated relatively close to classrooms/studios.
GUEST ROOMS

Description

In the event of a late night recording session, visiting musicians/engineers are encouraged to use in-house eating and sleeping facilities.

Number of People

1-2 per room.

Equipment

Beds, phone, TV, radio, table, chairs, desks.

Special Considerations

Privacy, good views essential.

Fresh air- 20 CFM/person.

Outdoor deck is provided.
SHOP/REPAIR/STORAGE

Description

This is the area for the engineers' and technical staff's office and workshop. Faulty equipment is repaired here. There is a storage area for instruments and equipment, and facilities for designing and building. (E.g.: Acoustical panels, props).

Number of People

3

Equipment

Mechanics tool set, electricians tool set, arc-welder, table saw, band saw, office set-up with desk and technical library, spare parts storage.

Special Considerations

Fresh Air - 25 CFP/person

Lighting - 100 FC.

Good ventilation to outside is necessary. An access area for visiting musicians' amps is nearby.
RETAIL

Description

This is a small shop that sells tapes, records, supplies, periodicals, etc... which pertain mainly to the C.O.R. It is meant to not only attract recording majors but other students as well. The main purpose is to sell recordings of performances taped "live" in the video studio and in the other studios done by visiting artists and local (student) talent.

Number of People

Avg. of 30

Equipment

Check-out counters, display shelves, storage.

Special Considerations

Natural Lighting (views to outside)

Easy access- egress

Lighting 70 F.C.

Fresh air- 20 CFM/person
- The retail area above is glazed to provide lighting and a pleasant view over the wooded field.

- Roof glazing is handled very conservatively; it serves to define circulation nodes. The pattern is symbolic of a tape deck where the reel flows between two anchor points.
PRACTICE AREA

Description

These are rooms that may be rented to local musicians/bands in lieu of the limited facilities in downtown Muncie on the Walnut Plaza. They may also be used for experimental engineering purposes. The acoustics are variable due to hinged panels, which in turn provide a very flexible recording/practicing environment. (alcoves can be created for isolation purposes to prevent sound bleeding). Spaces may be locked for security of equipment.

Number of People

5-7

Equipment

Additional acoustical panels may be checked out from the shop.

Special Considerations

Lighting- 30 F.C.

Acoustical design- non parallel walls.

Fresh air- 15 CFM/person.
SUPPORT AREAS

W.C.'s, soundlocks, circulation, storage, mechanical, film transfer, patch rooms, editing... Add 25%.
General public (concerts, retail)
Visiting educators
Faculty of C.D.R.
Recording majors
Visiting artists
Technical staff
Local bands (practice rooms)
According to my site plan, McKinley Avenue becomes a pedestrian spine. With the lack of traffic noise, it becomes vibration-free as well, and a perfectly suitable site for a recording studio. More specifically, the site is located to the west of the architecture building. It is a flat, open field which is an unexciting part of campus. I feel that building a modern recording studio here would reinforce the pedestrian spine along its side and serve as an anchor at its northern end.

The basic reasons for the site selection are then as follows:

Sound/vibration isolation
Easy traffic access
Potential of strengthening campus
Parking to the north
Reinforcing of the cowpath
The organization of the C.O.R., as it specifically relates to the site follows certain basic criteria:

- The north and north western facade is windowless and uses earth bermsing to protect it from prevailing winds, thus conserving energy. Lack of windows is due to lack of enjoyable views (parking lot) and lack of sunshine. In addition, the spacial arrangement of the interior of this northern-most area doesn't require windows. (studios, lecture rooms) The loading dock is conveniently placed here directly adjacent to the parking lot and the service road.

- The main public entrance is very dominant due to its funnel shape which is further enhanced by the angle of the north-eastern wall of the video-studio, which is in turn a strengthening of the existing cowpath. The south-eastern entrance off of McKinley parallels this notion of drawing people in.

- The jutting eastern lounge area is very pronounced in its effort to touch McKinley and attract pedestrians. The glazed lounge on the main level appears to float between the top and bottom floors that reflect column-like elements in their precast panel facades. The sunken area in front is in direct contrast to the bermmed area in front of the C.A.P. This serves to further draw pedestrians inward while at the same time providing an area where musicians may congregate.
It also allows light into the lower studio levels which are otherwise dark and windowless out of necessity. The space offers natural stadium-like seating due to its natural slope. A gravel floor permits water drainage and a base on which to set up temporary platforms and stages.

-People seated in the lounge area are afforded a clear view of pedestrian activity on McKinley and the green space in front of the Business College.

-The southern facade is glazed to provide natural lighting to the library area on the first and second levels and also to provide views. A cantilever acts to prevent direct sunlight glare and also to define the pedestrian walkway running along the facade.

-To the west is an open field. Trees are arranged to buffer the vehicular bypass and are set on a diagonal to shield winter winds while allowing the passage of summer breezes. The center of the field is left open to permit outdoor activities.

-The sunken court area allows natural light into the offices below. It is also a semi-private space for the recording artists, engineers.
In planning the C.O.R. (College of Recording) I took into account background noise and acoustical considerations from the start. The site was chosen to reduce the effect of traffic noise on all the studios. The layout eliminates sound leakage from one studio to another. All noise and vibration producing areas are separate from the studio blocks.

Dimensions were decided on for the control rooms. A 400 to 450 square foot range is considered optimum. Provision was made between the studios for fairly massive multilayer walls and hinged acoustical panels that give up to 70 dB mean sound level reduction. Space was allowed for each studio to float on rubber against structure-borne noise transmitted from other parts of the building. (E.g. classrooms above) Resonance of the system is 10 HZ. Studios are defined by structural walls forming part of the main solid shell of the building and by independant inner walls integral with the floated floor.

A 12' ceiling height was required for suspended ceilings containing low-frequency sound absorbers, other sound insulation and ventilation ducting. To further reduce the volume and noise of the ventilation system, small section ducts with high air velocities were used. The advantages are that small axial-type fans may be used, and, although more sound power is produced in the ducts as a result of increased turbulence, both the fan noise and the noise of the turbulence are of a higher frequency than with the low-velocity systems using centrifugal fans and large cross-section ducts, and is therefore much more easily reduced near to the studio outlets.
Also, the absence of low-frequency vibration and noise together with the smaller dimensions, allows the fans to be located nearer to the studios that they serve than is the case with conventional systems. The fan discharges directly into a plenum chamber built into one of the studio walls and the resulting noise level is below the appropriate criterion curve. The velocity in a 5" diameter duct is 50 feet/second which is reduced near the studio inlet to 6 feet/second by expansion of the duct system. High frequency noise is eliminated by means of a labyrinth silencer.

Access to control room and studios is through double doors with pressure seals. The windows between the control area and the studio are double and of different thicknesses- 1/4" and 3/8".

Massive style studio construction is preferred over wood-framed or steel-framed component architecture- and the ideal place to put a studio is on solid ground. Therefore, the studios are located in the basement, where they are well insulated by the earth, and the basic shell is sand-filled concrete blocks, which is the absolute best structure.

This design is reflected above grade as well where the massive walls face north against winter winds and are without windows due to lack of sunlight.
The first scheme for the C.O.R., reveals many concepts that are to be incorporated into the final design. In fact, the basic spacial layout is identical.

Circulation, orientation and vocabulary of shapes have yet to be simplified, but the existing components to be worked on are emerging:

- Use of a strong major axis.
- Cowpath axis perpendicular to main axis.
- Studios and lecture rooms radiating from a central point (intersection of axis)
- Library anchored at opposite end.
- Tri-level design (Studios in basement, main active floor, offices on top)
- Sunken deck levels outdoors, allowing light into basement.
Presentation criticism is offered by Sonny Palmer and Bob Fisher. Palmer's comments and suggestions are as follows:

1) Is the cowpath accessible to anyone 24 hours a day? Will it be so during holidays, etc?

2) There should be an indication from the exterior that it's a through path—there is inconsistent indication.

3) Retail "pods" in the main circulation axis could become a "market type" space.

4) Service dock (to the north) should be played down—it reads too much like a major entry.

5) Why so many elevators?

6) The lecture rooms should be separated at the exterior to emphasize each space.

7) "Good project."

Fisher's comments and suggestions are as follows:

1) Integrate the cowpath axis with the main axis to form one strong axis instead of having the two (at right angles to each other) fight each other.

2) Minimize the number and types of roof forms. "The library doesn't know what it's doing."
3) Too much "tokenism": cowpath entry.

4) Concerning the library skylight, don't "filter" the sunlight through the books— it may be appealing aesthetically but it is damaging.

5) "Gotta keep pushin' on it, C.C."
VIEW FROM LA FOLLIE DORMS
The second scheme for the C.O.R. takes into account basic criticism received from the first scheme. The building forms are toned down and the circulation is more flowing. Existing components emerging are:

- A strong central office/systems core.
- Sloped roofs are exchanged for flat ones—thus letting earth berms downplay building mass.
- Consistent elevation elements—simple structural grid.
Presentation criticism is offered by Paul Laseau, Sonny Palmer and Bob Fisher.

Palmer: "This project has come a long way toward a very successful solution, all the pieces are here...with some adjustments it can be an outstanding project."

Laseau: 1) Good simplification of forms.
2) Basement level needs development.
3) Site needs development.
4) Could use clearer entry/direct to lower level.
5) Further refine vocabulary and extend to total building.

Fisher: 1) Center element is very strong—other elements do not have the same strength.
2) Volume vs. Plane—confusion in form.

Fisher suggests that I look at the project as a whole and then analyze the weaknesses on a large scale. He then draws a partial sketch that suggests a strong relationship with McKinley, as well as a much smoother circulation flow. At this point, the other professors begin drawing similar sketches. The solution now becomes obvious to all of us.
KEY

1. LOUNGE
2. RETAIL
3. CLASSROOM
4. LIVE STUDIO
5. ELEVATOR/ELECTRICAL DUCT
6. RESTROOM/WATER DUCT
7. STORAGE
8. STAGE
9. VENT DUCT
10. FORCED AIR DUCT
11. OFFICE
12. LIBRARY
13. LISTENING BOOTHS
14. PERIODICAL LOUNGE
15. GUEST ROOM
16. SUNDECK
17. STUDIO
18. LOADING DOCK
19. SOUNDLOCK
20. SHOP
21. PRACTICE ROOMS
22. MECHANICAL ROOM
23. VOCAL BOOTH
24. REVERB CHAMBER
25. SPECIAL EFFECTS STUDIO
26. TICKET BOOTH
27. PROJECTION/MIXING ROOM
The third and final scheme for the C.O.R. involves taking the existing components and rearranging them into the ideal combination alluded to in the last jury. Professor Laseau is extremely helpful in designing the transitional spaces needed to connect the existing major spaces. The result:

- Circulation conflicts resolved.
- McKinley is strongly addressed.
- Facade reads strongly throughout.
- Forms simplified; structure simplified.
- Consistent building.
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Without the following people this project would not be:

Paul Laseau - Professor and Teacher
Bob Fisher - Critic
Sonny Palmer - Critic
Julie Layman - Typist
Lesa Jamison - Typist
My Fellow Colleagues
- Paul Laseau - Graphic Thinking For Architects And Designers
- Craig Anderton - Home Recording For Musicians
- Dave McEwen - Thesis Project For Electronic Music Center
- Modern Recording Magazine
- International Musician And Recording World Magazine
PROFILE:
STUDIO DESIGNER
JOHN STORYK

By Don Ketteler

After graduating from Princeton University’s School of Architecture in 1968, John Storyk returned to his native New York City, and a job with the firm of David Todd and Associates. Within three months, he found himself working on, designing, and actually becoming a part producer of a new downtown club called Cerebrum. The club was a very popular avant-garde sensorium of the late 60s which received much attention in the press. This publicity allowed John Storyk, after only four months exposure in New York, to gain a measure of notoriety. And in turn led to contact with Jimi Hendrix in 1969. Hendrix had been to Cerebrum and through a series of relationships and coincidences Jimi and his manager, Michael Jeffrey, met with and asked John to handle the renovation of what eventually became Electric Lady (recording studios), initially conceived as a nightclub.

Shortly thereafter, Mr. Storyk became an independent designer and proceeded with the design of what unknown to him was to become his first recording studio.

MR: Tell us about Electric Lady's beginnings.
JS: I started designing Electric Lady as a club. [Producer/engineer] Eddie Kramer, who had been producing and recording Jimi, then got involved, and what was going to be a little studio in the back of the club became the club itself. Electric Lady became, on the night before we were to present the plans of it as a club, a recording studio.

MR: Did you have any design experience with recording studios at that point in your career?
JS: No. In fact, at that point I officially announced that I'd never been in a recording studio in my life. Kramer’s input was of inestimable value in this regard and the project became a team effort between Eddie, who was chief engineer for years, and brought with him much experience, Jim Marin who was the studio manager, Shimon Ron, head maintenance engineer, Michael Jeffrey's business manager, Jimi Hendrix and myself.

MR: What sort of input did Jimi have in regard to your design?
JS: Jimi had surprisingly little input; most of it was from Eddie.

MR: In 1969 in New York City there weren't many independent studios—particularly downtown where Electric Lady was. What was the industry situation as you saw it?
JS: In New York, that was when the era of independent studios started. At that point in time you really only had A&R and Media (1970). You didn’t have Hit Factory, Sound Mixers, Power Station, Sigma, Automated, MZH, or Plaza as independents. Anybody doing a project downtown, away from the industry center uptown, immediately got a lot of attention. We received attention not only because we were independent and geographically displaced from the industry, but also because of Jimi and Michael’s backing and the artist orientation we built in.

MR: What about the particular problems you encountered in building Electric Lady?

JS: Certainly, by today’s standards, if I were to go down to Electric Lady and look at it as a potential studio space I would recommend that they seriously reconsider it. To be under a movie theater, on top of a river, a hundred yards from a subway, and in a basement location without an elevator... it’s hardly what I’d call an ideal situation to begin with. I guess it was really a break for all of us that no one recognized those disadvantages. Just consider that the Minetta River, unknown to us, was smack under studio B! When we went to jackhammer to dig some footings for walls we struck water inches below slab.

MR: Studio construction in general must be difficult in New York.

JS: New York is actually pretty good training for learning where to put studios where they’re not supposed to be; L.A. is the exact opposite situation. In L.A., studios are usually built in self-contained buildings owned by the studio operator and are on the ground. They have no basements and are of wood construction, which gives them serious cost effective advantages. They don’t use block, and are not forced to use metal studs. Whereas in New York, you run up against a number of problems.

Block as construction is very expensive and can’t be done on most floors anyway because of the weight considerations, which is why I always look for ground floors. So on this level, builders are usually forced to go with studs. But, in New York, wood stud is actually illegal, while metal studs lend some problems. I find that they [metal studs] sometimes are not stiff enough and tend to not accommodate high mass walls.

MR: Does this give L.A. studios any advantages?

JS: Yes. Aside from ease of construction and the ability to utilize different techniques, it allows L.A. studios to be a bit ahead of New York in an innovative sense. Since the entertainment industry is centered more in L.A., it makes for more accessible money and a tendency to be more adventurous in electronic and physical design. They may actually spend more per square foot because money’s easier to get and because they’re more able to make it cost effective. One of the keys to studio construction is to make it stiff and rigid, except in specific instances where you want something to vibrate, as with a diaphragmatic membrane, or a loose baffle or whatever. The fact is, that it’s often easier and cheaper to do that in L.A. than in New York. [In L.A.] They take the savings and invest it in more sophisticated techniques and equipment.

MR: So, you’ve mentioned several construction methods; which do you consider to be the best approach?

JS: Block construction is always the best. What it often isn’t is cost effective. As of right now the most cost effective legitimate technique for the basic shell is wood stud construction, high mass skins, internal insulation, etc. Though, if you can get the basic shell up with blocks, sand filled, you’ve got a physical advantage. I’m not sure everyone would agree with me on that, but it’s always been my feeling that that’s absolutely the best structure.

It’s worth noting that in some jobs, masonry block may work out cheaper because of the availability of the resources locally and the area’s cost of labor. So, the proper answer to what’s best and what’s right for a given condition may not coincide and may be affected by numerous variables.

MR: What are some of the specific problems with building recording studios in New York?

JS: Other than the fact that it is a city of congestion and its resultant complications, and that the recording industry insists on confining itself geographically, limiting the real estate choices, New York has three big problems: columns, neighbors and height. They are the first things I look for, and then there are about a half-dozen secondary considerations.

MR: What do you consider to be a workable column spacing?

JS: It’s very hard to get column-free space in buildings suitable for studios in New York. And when I say column free, I mean a column spacing of at least thirty feet. It seems they’re either too close or don’t exist at all. It’s a big struggle to fit everything in, and not compromise your design while
making the columns as inconspicuous and non-sound transferring as possible. It's a geometric nightmare (See floor plan—Soundmixers, N.Y.C.).

The second one, neighbors—you've always got them. If you're in a building other than your own, self-contained, you've got them above and below. You must worry about not bothering them and you've got to worry about them not bothering you. Generally speaking, if you satisfy one requirement you satisfy the other.

MR: What do you consider to be a minimum gross height of a studio?

JS: Height is a problem that everyone has got to be concerned with. My feeling is that in today's marketplace, if you're thinking of opening up a world class studio, to not have at least twelve feet of height radically limits your possibilities. It becomes much harder and more expensive to return your investment cost effectively and competitively. I have done studios in as little as 7'10" (Leon Russell's), and H&L with a gross height of only 9'10", as well as many under 11'0". So there are some exceptions, but if you don't have twelve feet you should think twice. There are a lot of reasons: (1) the general reverberation requirements of the room itself; (2) air conditioning ducting. To start fighting 10' and 10'6", especially in New York where you're going to have to lose height for isolation, means you're just going to get shortchanged.

MR: What are other considerations?

JS: (1) Power. Do you have enough and is it the right kind and is it clean enough. If not, you may have to spend more money on transformers and running pipes; (2) Air conditioning. Is it there, and if not can you add it?

For instance, in most tall buildings in New York, if you don't have a ledge or access to the roof, or you don't have a lot of height so that you can hang air units somewhere, you're going to have to dedicate a certain percentage of your expensive floor space to a machine room. Whenever I go to a site, I see people noticing height, a lot of people clap their hands, everyone can see if the column spacing is o.k., but everyone always wonders why I'm looking at the electric panels or looking out the windows. I'm always looking for the air conditioning. That's because it's a hassle. In a recording studio in New York today electricity and air conditioning can easily be 40% of the construction budget. And air conditioning ducts and machinery are noisy, take up room and are expensive. The more gracious a solution you can provide in terms of space and height, the cheaper it will be.

MR: Along with all these construction and design considerations now being recognized, how has the recording process been affected?

JS: Studios are getting more accurate. Everybody in the last ten years has certainly learned a lot. It's only two years ago that we could semi-accurately measure reverberation time in a control room—we didn't even have the gear. Real-time analysis, true real-time analysis, is less than ten years old. Any kind of technical accuracy is always a function of the need and the measurement skills. We certainly have them now. We've got gear that demands a more accurate environment and the equipment to measure it. So acoustic accuracy is really the word.

MR: What part of the process or physical plant of the studio has benefited most from this sophistication?

JS: The most progress, and agreement, has been made on the control room. In the beginning people looked to the radio industry for their format, and basically the radio studios were a bunch of boxes with windows—and that became the recording studio. It was all equipment oriented.

Now you're seeing control rooms which are locking in on, interestingly enough, an optimum range square footage. Most of them are in the 400 to 450 square feet range. You will see a certain relationship in the geometry which most people are discovering is optimum. A multi-faceted control room. You will see glass both in plane and in section being tilted and splayed in all kinds of variations. There are all kinds of acoustical techniques going on: the active trap, slat resonators, Helmholtz resonators, compound geometric splays, alcoves for the machines, sound locks that work as isolation booths, etc. The point is, the control room and its immediate surroundings are getting a consistency in level of design thinking, although there are still no totally agreeable standards—there are lots of concerns.

MR: What are some specific factors or considerations being given more scrutiny in the control room?

JS: People are refining what a control room should sound like. Realizing that the frequency response, now easily measurable, and equalizable to a certain extent, is of course very important. People are realizing that the reverb time is very important. Certainly people are also looking at impulse measurements, time delay spectrometry, energy density systems, phase coherence, time corrected monitors, etc.

MR: Does this all mean we are on the verge of some agreed upon standards for the control room?

JS: Everybody is always saying, why don't we standardize, but I see agreeing upon a certain range of standards. What I don't see is a cookie cutter approach, including something as specific and as measurable as control room acoustic standards.

Rooms, on some levels, are all the same. I mean, speakers, console, machines, chairs, lights, doors. And as similar as they all are in program and acoustic requirements, there's always going to be a difference. And at best a family of norms, never the absolute norm. That's because studios are dealing with music, music involves artists, and that's where there's always going to be a difference.

MR: Where does the recording room, or studio, stand today?

JS: The studio is a much different ball game. Because it can range in program from being able to only record one person, right up to and regularly, recording 160 instruments. The studio room, per se, has a very different approach. There's usually a certain order in figuring how that's done. You must define what you want to do in it and you must interface that with the available space and funds. At that point, you've got to shift into a purely acoustical mode. The reality of the matter is, you can make almost any space a recording room if you're willing to accept the physical and volumetric limitations that the space dictates. What you can't do, is make a bathroom become Philharmonic Hall. What you can do is take the bathroom and, given that you'll ever only be able
to put two people in, you can make the room "recordable" and maybe even make it look or feel or partially sound like a variety of spaces.

MR: Generally, do clients pay as much attention to the studio/recording room, as to the control room?

JS: I find there is an increasing level of recognition of the importance of the recording room, both as a functioning element of the studio as a whole and in terms of ambiance. In part, because of magazines like this, other publications, textbooks, etc., people are starting to realize that design of the recording room is a significant portion of the studio program as a whole, as well as the budget. As a tool, people are realizing that the recording room is another piece of studio equipment—highly sophisticated, multi-variable and technically changing.

There isn’t a major studio in America that isn’t constantly redoing and maintaining its environment.

Most major multi-studio complexes in America have a full time carpenter and a shop. It’s a never-ending battle, just like electronic maintenance.

MR: Any other observations on the recording room?

JS: Yes. I think you’re going to see a return in the studio room design to a technique employed twenty and thirty years ago—variable acoustics. You are seeing people making more use of iso-booths, variable tuning in rooms, drapes, movable slab resonators, throw rugs, and the full range of a well designed room’s acoustics (from “live” areas to dead ones).

Simultaneously, you are going to have to see, in all facets of the recording business, a tremendous striving by the people who seriously build studios to try and figure out how to build these studios cheaper. $120, $140, $150 dollars a square foot and up is part of the problem, not part of the solution. Trends in digital and micro-electronics technology are helping to result in cost savings along these lines, but it must get cheaper so that studio owners will have a chance to make money and to still offer recording time at $125 an hour in order to enable records—the end product—to be made at some reasonable price. If it [the cost] keeps spiraling, although there’s always going to be a need for the high-end studio, it will eventually bring everything to a grinding halt.

MR: Do you see this spiraling cost eventually affecting new artists and the whole “farm team” aspect of the recording company?

JS: What will happen is that the record companies will offer less and less opportunity to newer artists. They’ll just keep going with the same old guys. Everybody’s got to try and come up to the challenge. For us, since we’re specifically interested in construction techniques, we’re always trying to do it, always pushing the specs just a little bit more.

MR: You’ve alluded to support space. Are people taking it seriously enough; do they appreciate its significance?

JS: In the last few years, people have started to figure out what it’s about. The studio business is like a taxi or a limo business, i.e., you rent it by the hour. It’s also a place where you make art. And a place where you do work, you assemble data, business is done. It’s an architectural environment. It’s just not as simple as: control room, studio, iso-booth, sound lock and reception area and we’re done. The net usable acoustical space (the interior of the studio, the interior of the control room) divided by the total gross square footage of the facility would reveal a surprising ratio. It’s usually in the neighborhood of .5. In other words, for every square foot of usable net acoustic space, you’ve usually got one buried somewhere else. The newer complexes that we’re working on, in fact, are increasing the amount of support space.

It’s a big point. People are starting to understand it. It is what I consider to be the architecture of the recording studio, and not just the kind of cookie cutter approach. The bottom line is, if you show me control room and studio space and that comes out to X, you should absolutely start looking for 2X. And if the air conditioning isn’t right and the height isn’t right in New York City, and you don’t have a ledge to put the compressor on, you better look for
2.3X, or 2.5X, or maybe even 3X.

MR: We've been discussing studios in general terms to this point. On a more specific level, do your designs differ according to the program or specific intent of the studio?

JS: In New York City in the recording business there are really two kinds of studios: There's the music- or album-oriented studio and then there is the commercial studio, each with its own parameters.

The record studios can afford, and have a need, to be more posh because they're dealing more in fantasy. They're working more at night, there's a more hands-on relationship by the artist, and, in some instances, the artist demands more environmental accoutrements. Whereas the commercial studio is closer to a 9 to 5 operation whose clientele is Madison Avenue. The jingle studio has got to work over and over again—one 3-hour session after another. It must be very durable. In a commercial multi-studio I would, for example, think twice about putting carpet in the hallways. It's got to be tile. Carpet is never going to last because of the traffic. In a music-oriented studio though, you would put carpet down. There are fewer instruments being moved in and out, and when the carpet goes in three years, they'll replace it. I just assume the record studio is going to be a softer, more elegant approach. This is just one simple comparison. Other more compound differences are equipment, lighting, etc.

So yes, there is a difference. If one [studio] is setting up specifically for one or the other [music or commercial] there are certainly different systems and refinements, but the basic acoustic design and principles persist.

MR: It seems you're implying the importance of the prospective operator/owner knowing what he wants.

JS: Generally speaking, if a studio owner can define his needs more accurately, rather than taking potshots at a general market, his studio will benefit. This is actually a very important point, and answers a number of questions—i.e., his program and his needs, his restrictions and limitations and his financial reality should all be known and calculated before he starts. The more they're considered, the better the studio will be. And the more cost effective. It's really the way to get the most out of any studio.

MR: How might this "program" consideration apply to the home-studio and its owner or to the prospective owner?

JS: By defining your needs and your program, you won't end up in something you can't afford. If an individual wants to build a small home-studio, that's a great idea, and we all know why someone would want to do it, but ... if right from the beginning you give me twenty minutes with that person I can make his studio smaller. If you make a studio smaller, it will usually cost less. It sounds so simple, yet people forget it most of the time. Everytime I ask, "How big do you think you want your studio?", if they start to answer in square feet, I say, "No, people, how many people do you want to record in that room." People and program are the yardstick to use to put studio size into perspective. This, of course, relates to an architectural savings. If I bring somebody's studio down from 800 feet to 650 by refining and being realistic about his wants and needs, I saved 150 square feet at whatever per-square-foot cost you're working at.

Suppose I do that sort of refinement a number of times. I do it for square footage, equipment package, for materials (we move from $1.50 per board foot wood to $1.00), etc. Those all are cost savings and they add up.

MR: So planning equals savings and therefore a more obtainable project for someone just getting started?

JS: If you just keep refining your program—I don't mean to be elusive about the point, I feel I am addressing it, because the fact is that there is no one economic panacea.

As to materials, there is no paint you can put on the wall that will keep the sound out, no magic drapes, no magic glass, no magic anything in fact. It's density per square foot per dollar. I don't see any great change. As a matter of fact, if anything, I see no change. Glass is glass. It's been virtually the same for centuries, wood is wood, and so on.

There has got to be a way to put the brakes on costs and it usually comes in planning and design programming. For a designer that's the ongoing challenge: to create space which is acoustically and architecturally correct, and environmentally exciting, while remaining conscious of the economic realities. That's our contribution to the process of making records—reconciling cost to art at the highest level.
Electric Lady heads for the Eighties

Through good times and bad, Electric Lady Studios has always enjoyed a high profile within the music industry due to its association with Jimi Hendrix. Though its history has included periods of severe mismanagement and neglect, the studio's new owners, financier Alan Selby and former Atlantic staff producer Raymond Silva, are intent on creating a renaissance of sorts at Electric Lady. "This place was one of the mainstay studios in the Sixties. We want to make it the place to record in the Eighties," said Selby.

A History Review

The studio's connection with Hendrix is universally known. The details, however, are not as well known. The studio was created in the mid-Sixties as the brainchild of Hendrix, manager Michael Jeffries, engineer Eddie Kramer, and John Storyk. Before its construction, the site was a nite club owned by Rudy Valli. Hendrix' original idea was to keep it that way and use it as a place where he could casually perform for fans and jam with friends. Kramer, Hendrix' engineer at the time, noted the high ceiling and sprawling layout and realized the potential of the building as a studio. Hendrix eventually agreed to the conversion into a studio where he could work on his music. Studio A was to be his play room while Studio B was to be for hire on sessions. Kramer, who has since become established by producing such rock acts as Kiss and the Stones, worked closely on the studio with architect John Storyk (who has since become one of the leading designers of studios). Hendrix, of course, used the studio only briefly. As a result of his death the studio passed to Jeffries. Jeffries died soon after in a plane crash and the studio passed to his estate.

Until recently, the studio remained in the hands of the estate which ran it through a series of managers, many of whom were less than efficient. About 1½ years ago, Selby and Silva bought the studio and have moved quickly to upgrade the services offered and changed Electric Lady's image.

A Facelift in Progress

As Selby explained it, "We intend to expand all the resources here. The studio is undergoing a complete facelift. If this is to be the studio of the Eighties, many remaining vestiges of the Sixties will have to be removed. First, the studio's 'purple haze' carpeting and accompanying red walls will be replaced by more subdued hues." On a comforting note, however, the famed space mural will remain on the lobby wall. "Many musicians like it and, after all, it does remind one of the presence and influence of Hendrix," explained Selby.

Other layout changes include the addition of a two-bedroom cottage in the building's backyard, for use by clients. "Many musicians still like the feel of the Village and this will give them an opportunity to stay close to it and the studio while they work. The cottage has always been there, but it has never been used as a place for clients to stay. We will also be converting the roof into a garden patio so musicians can get a breath of fresh air in between licks."

In addition to expanding outward and upward, the studio is expanding inward: an additional studio is being added on the third floor of the building. It will serve as a mixing room with a small room for overdubs. The room is presently being designed by John Storyk and Westlake Sound in a unique collaboration between the renowned architect and one of the top speaker designers.

The Studios

Walking through the main corridor of Electric Lady, one notices a number of tape recording machines lined up. As Selby explained, "We are updating all the studio equipment. Studio A, which is the largest of the three, has a Neve 807A console which is soon to be computerized. The 24-track MCI machine will be replaced by a 3M 24-track model. All control rooms use Westlake monitor systems and 2 and 4-track Studer tapes; Studio A's 25 foot ceiling and half-carpet/half-wood floor give it what some consider "the best electric guitar sound around."

Studio B is smaller. Selby described it as a "tight little room" and noted that most jazz and disco groups working at Electric Lady prefer Studio B. Recent users include Joni Mitchell, who completed her tribute to Charlie Mingus there. The floor is all wood and the walls are carpeted for dampening. The console is a Neve 806A board which is slated to become automated shortly.

Studios A and B have an extensive array of outboard equipment including DBX 160's, two LM limiters per room, MEQ and PEQ equalizers, Clark-Technic Equalizers, Phasers, Flangers, two Digital Delays per room and four
Kepexes. The studio's seemingly vast supply of mikes include 18 Neumann U-87s and an old reliable Neumann U-47 tube mike. Instruments which are always on hand include two Pearl drum kits, a Steinway grand, Yamaha upright, two Fender Rhodes electric pianos, a Polymoog, two Hammond organs (B-3 and C-3), two Fender Twins (B-16 and B-18), a Fender Super-Six and various Marshall tops and bottoms.

Selby and Silva seem an unlikely alliance at first. Selby owned a loan company and had limited knowledge of music. Silva, with 13 years of experience in the music business, however, supplies the vast musical background in the partnership. After working as a DJ in Puerto Rico, Silva expanded into management and promotion. It was then that he became friends with guitarist John McLaughlin. McLaughlin convinced Silva to come to New York. After landing a job with Atlantic Records there, Silva developed a reputation as a top producer working with such musicians as Roy Buchanan and Charlie Mingus.

"Working at Atlantic was the equivalent of going to the best 'college' possible for this business. With teachers like Arif Mardin and Jerry Wexler, I learned fast," said Silva. Under his guidance, the studio is now establishing a production company, Electric Lady Productions, which will produce and develop new talent. Between the production company, interior facelift, expansion of facilities and equipment overhaul, Electric Lady, famed studio of the Sixties, is quickly developing its stature as the studio of the Eighties.
Broadway's Biggest Hit
SOUNDMIXERS STUDIO

New York has seen a resurgence in many areas of the arts recently and one of the brightest lights on Broadway these days is Soundmixers Studio. Located in the Brill Building, which boasts a great musical tradition having housed some of the finest music publishers in the world, the studio has been developed to carry on that tradition while leading the way in state-of-the-art recording.

While many of the major studios have left New York for the sunny skies of California or the South, Soundmixers is determined to establish itself in the Big Apple. "Right here, in New York, is where it's beginning to happen," said president of the studio, Harry Hirsch. "And we're going to be right in the middle of it."

With a studio like Soundmixers, he has good reason to boast. His claim is backed up by three 24-track machines, three identical control rooms, two automated/computerized consoles, an entire set-up of film/video production equipment, very deliberate space planning and the most modern assortment of accessory equipment available. Much time, effort and planning went into designing a studio where few compromises would be made. Harry explained: "The last thing this studio resembles is the typically cramped New York studio where the lay-out is dictated by the building's pre-existing design rather than the studio architect's imagination."

One is indeed struck by the spaciousness and the presence of rich cedar and oak paneling, which lend the studio an airy, rural feel. The design was the creation of renowned studio architect/acoustician John Storyk, who considers the studio the finest work he's done to date. "Technically," said Storyk, "Soundmixers exceeds industry standards. Most control rooms, through equalization, try to get plus or minus two, or two and one-half dB across the frequency range. Soundmixers' room accomplishes this without equalization."

"The key, according to Storyk, is the right geometry, speaker placement, design of the room, room acoustics, amount of absorption and placement of reflective items. As with most NYC studios the room they were working with didn't have much height and yet there was a great deal of material which could only go in or on the ceiling."

"There are three basic approaches to this problem. You can, after your raw acoustic treatment, put in your air conditioning and other equipment and leave it exposed. This is usually unsatisfactory and expensive. Since it must be made out of stainless steel, it's almost twice the normal cost."

"The second method is to cover the ceiling equipment with a skin. This is commonly done on the West Coast, but that result would lower the room four feet or so, which is also undesirable."

"We came up with a system of putting the mechanical services on the perimeter of the room and then covering them up. This left us with a large open expanse in the middle. By placing them around the room's perimeter we have also given the producers the freedom to make the most intelligent set-ups for their musicians. Since the services are all over, they can push rhythm instruments to the walls for trapping and isolation, and place brightening and sweetening instruments in the middle of the room for expansion and higher reverb times. This not only means they can get more musicians into the family business. We have frequent staff meetings to allow full participation. And we really love each other."

Studio A is the largest of Soundmixers' three 24-track studios. Control room A is identical in design to the other two, so a producer can easily transfer from one studio to the next without any change in sound perception of handling of the equipment. All the control rooms use MCI recording machines. The monitors are Altec speakers with two 15-inch Pioneer woofers, Master Lab crossovers and JBL stereos. Most recently, Meatloaf, Kenny Loggins, John McLaughlin and the Average White Band have found the studio to their liking, but right now, the room is filled with strains of a "Drakes' Cakes" single. "Presently," explained Harry, "the studio is used about 60 per cent of the time for producing commercials, but the ratio of record company bookings is constantly going up."

Some film work is done in Studio A and there is a 9 x 15 foot screen which has footage and time read-out in two-foot high numbers for maximum clarity. The control room contains Sony and JBL video cassette playback units. The headphone system includes four independent cue systems. Even the Urei digital metronome shows the studio's commitment to supply the most up-to-date equipment on the market. Control room A also includes an MCI four-track, two two-tracks, 28 channels of Dolby and DBX, an Eventide Digital Delay, a Harmonizer, continued on page 123
SOUND MIXERS

an Akai 16-track, plus access to the studio's portable outboard equipment of Pultec equalizers, Kepex noise gates, Lexicon Digital Delays, MXR flangers, phasers, distortion units and a healthy array of sundries.

Studio A can hold up to 45 musicians comfortably. Wood ceiling clouds and floors effectively absorb leakage to the point that no gobos are needed for the musicians. To Harry, a former drummer, this is very satisfying. "It seems inhuman to put the drummer in a booth. This way, contact between musicians is maximized, since the ceiling absorbs the sound."

Studio B is a smaller room, comfortably holding about 25 musicians. The masonry wall of fieldstone makes it a livelier room than A. "This room is excellent for brass. Kenny Loggins used it for 'Night Watch'," said Harry.

Studio C, at the heart of Soundmixers, is the mixing studio. The MCI 24-track is fully automated and computerized.

Studio D is presently 16-track although it is being converted into a 32-in/32-out Microprocessor automated board. "This studio," said Harry, "is ideal for small rhythm sections, maybe of five to seven people." The Rodgers drums attest to Harry's preference, although any type is easily made available.

The full assortment of studio lights are inset into the ceiling rather than track mounted. Harry is continually conscious of his obligation to make sure everything runs right. "People come in here with a lot of time and money invested, and a lot riding on their projects. The commercial people are especially sensitive to the pressures of time. Everything has to go right." The staff of 30, including four maintenance engineers, ensures that it does. Five senior engineers are also on staff. Each engineer must have a minimum of five years' mixing experience, 10 LP credits and 20 professional commercials.

Hirsch insists that he will work closely with equipment manufacturers to keep the studio truly a "superstudio" in all ways. "But at the bottom line it is the right mixture of efficiency, state-of-the-art equipment and comfort which will make the studio the best around."

Gary Graifman
STUDIO MASTER 16/4 AND 16/8 GUIDE TO MULTI-TRACK RECORDING

THE MULTI TRACK PRINCIPLE

Recording with a four or eight channel tape recorder is like recording with four or eight separate tape recorders working in perfect synchronisation. In the modern multichannel recorder the recording tape is divided into separate tracks and these can be recorded, played back and re-recorded in perfect synchronisation. The system allows the engineer to record one instrument (or group of instruments) onto one track and then record extra instruments or vocals on each of the other tracks so that during recording the performers can listen to any previously recorded track. On playback each track remains separate and the volume of each track can be individually adjusted (or altered with tone controls etc.) until a satisfactory "mix" is achieved.

HOW THE STUDIO MASTER 16/4 AND 16/8 WORK

Studiomaster Mixers are designed to match any multichannel tape machine. Input is easily achieved and procedure for the 16/8 is identical to the 16/4. The input socket for each channel is on the back panel. The mixer accepts professional Cannon-type plugs. Studiomaster mixers accept almost any type of low impedance input signal and on every channel two controls allow the engineer to match the input level to the mixer circuit. A rotary gain control allows signals to be increased and a small switch introduces a -30dB "pad" which allows even the highest of signals to be controlled. Additionally a tiny red "LED" lamp will light if too much signal is being fed into the mixer.

EQUALISATION

The mixer allows engineers to shape and modify the sound they are recording. Sounds that start off only mediocre can be considerably improved by "equalisation" and therefore Studiomaster 16/4 and 16/8 desks offer "parametric" equalisation to provide the ultimate sound control. "Equalisation" is a term that developed when engineers used to have to equalise for poor room acoustics. Today the term is generally accepted as meaning sophisticated tone control and the Studiomaster desks offer five rotary controls on each channel with both the mid-range and bass controls allowing the engineer to select at which frequency point he wishes to cut or boost the sound.

EFFECTS AND INPUT ROUTING

As the incoming signal passes through the input stage where the incoming level is controlled and through the equalisation stage where the sound is shaped, the signal arrives at the section of the channel where it may be sent "off line" to receive special effects like "echo" or "reverb." When sent to an echo machine the signal returns to the mixer at the main output section (as explained later).

The engineer may select to send only part of the signal for echo and allow the signal to continue through the channel. At this stage he may send the signal back to the performer to hear via the "foldback" control. This graphically tilted control allows the engineer to "mix" the sound being fed back to the musician. After this passing through the foldback stage the signal arrives in the "routing" department. At this point the engineer may choose to "place" the signal in a particular position of a stereo image. This is more usually done on a "mix down" and on initial recording the signal is often recorded onto an individual track which is later positioned for stereo. At this stage the engineer selects which output channel in the mixer the signal will take. This means that he can decide at this stage where he wants the signal to appear on the tape. A clever little button called the "Pre/ade Monitor" button is also provided at this stage. During recording this button can be extremely useful. Pushing this button and selecting PFM monitoring allows him to hear the individual channel and engineers frequently check recording or a mix by using each channel's PFM button in turn to ensure that the signal information is as it should be. Below each input channel is the slide fader. This control governs the volume of each independent channel in relation to the others and the output from this fader is sent to the output section of the mixer.

MONITORING AND THE OUTPUT SECTION

The engineer can monitor both his performance and the performance of the mixer visually and aurally. Four or eight VU meters are provided depending on which mixer is used) and these may be switched to indicate the output levels of the synch/playback returns from the tape machine.

In the first mode the meters show the comparative levels of the four or eight output channels and in the second they indicate precisely what is coming off tape. It is important that the meters in the mixer and tape machine are aligned and this subject is covered elsewhere in this brochure.

TRACK STATUS

The large output section gathers up all the information arriving from each separate input channel and allows the engineer...
to "interface" the mixer with the tape machine. In this section the output level of the four or eight output channels is determined by
group faders. Each one of these controls the overall volume of the
signals routed to that channel on the input channels. Also in this
section are track status selectors which allow this section either to
send the signals to the tape machine or to accept them back for
re-mixing. When recorded signals are sent back to the Studiomaster
desk for re-mixing the four or eight group faders act as volume
controls for each separate recorded track. By mixing these the final
balance is reached and the slide faders fitted to input channels 1 and
2 convert to provide a pair of stereo faders controlling the final
"mixed" stereo signal being sent out to make the master recording.
On a re-mix further equalisation is sometimes required and
an incoming signal for one track (or more) is routed back onto
conventional input channels to allow equalisation or effects injection

to take place before the signal is routed back to a group fader.
The output section of a Studiomaster mixer also makes a
separate monitor mix possible. Engineers usually want to hear an
acceptable "mix" of sounds as they go along and to save routing all
signals back for proper re-mixing this section allows signals to be
mixed for monitoring purposes only. Thus it is possible to listen to
one particular mix whilst recording a very different mix.

EXPANDABILITY

Despite their affordable price, Studiomaster mixers have been de-
dsigned to meet every professional recording requirement and to
expand as the need arises. Special "add on" channel modules are
available and using these a standard 16/4 or 16/8 can grow three
input channels at a time. The Studiomaster grows with you!

A SESSION WITH THE STUDIOMASTER
16/4 OR 16/8

LINING UP THE EQUIPMENT

Before any recording can start it's necessary to ensure all the equip-
ment is lined up. The mixer meters must be aligned with the tape
machine meters. To obtain good recording results it is important to
record at the right level. Too little will allow tape hiss to come through,
too much will cause distortion.

Turn off the monitor send and the foldback send (this is to
protect your speakers, headphones and ears!)

Set the track status switches to 'record' and the monitor
channel selectors to L.O. (line out).

Switch on the usual talk and set the group L.O. faders so that
the meters read 0 VU. (This is approximately the working position
for the group L.O. faders).

Switch the recorder to record and adjust the record level
controls so that the meters on the recorder read to the recom-

Hened level.

With the recorder rewound to playback the previously
recorded tone, set the monitor channel selectors to L.I. (line in).
Adjust the playback level controls so the meters on the desk read
0 VU again.

To line up the stereo (remix) machine the procedure is the
same except the track status switches on groups 1 and 2 must be
switched to 'remix'.

RECORDING THE FIRST TRACK

The first track to be recorded is often a
rhythm track, with perhaps three
separate signals to be equalised and
mixed into one for recording onto a
single track.

The first step will be to use the
appropriate switches on each channel
to route the three signals into one
group. At this stage the pan-pots should
be left central and for clarity and safety, no other channels should
be routed to any group unless for a specific reason. The track status switches should be
set to 'record' and the group faders to
their nominal level.

The signal should now be connected with
the monitor by setting monitor channel 1 to
L.O. The monitor send control on that channel
should be set to 7 and the monitor master
level control can be regulated to a convenient volume.

Now the main monitor switch can be set to PFM, and the signal
level on each channel can be read by depressing its individual PFM
button which will connect its send to L.O. meter 4. Watching this meter,
the gain on each channel can be adjusted to the correct level by
the input gain controls.

Having balanced the signals within the group, you can set the
overall level on the L.O. faders and start recording.

As the recording proceeds, foldback signals may be sent either
from the L.O. mix via the foldback control on the monitor channel,
or for a different mix from the
foldback sends on each of the
input channels. The monitor level controls may be adjusted
at any time, or any channel be
checked on the PFM system,
without disturbing the record-
ing. The channel faders provide
control over the balance and the group L.O. fader may be regarded
as the recording level control.

RECORDING A SECOND TRACK

The first track completed, a second track may involve a mix of six
drum mikes. Before beginning, it is best to turn off the routing
switches used during the first recording to avoid any problems due
to channels being left open.

The channels to be mixed should be
routed to group two, connected to the
monitor by setting monitor channel 2
to L.O. and with the monitor send and
master level controls adjusted appropri-
ately, the mix is made using PFM for
checking as before.

To incorporate the previously recorded track into the
loudspeaker mix and foldback, set Monitor channel 1 to L.I.

The tape machine should be set to synchronize the playing
back of track 1 with the recording of track 2. The L.O. level can now
be adjusted and recording can proceed.

You may want to assess track 2 independ-ently of track 1. This is done by
panning monitor channel one to the left,
and channel two to the right. Or the new
material may be played louder than
previously recorded material.

Tracks are added by repeating the
procedures using further groups. The
choice of which instruments or voices to
Routing for Echo or Effect

Echo, reverb, and other effects may be added either during the recording of each track by routing the echo to the appropriate group, or during the re-mix. If you decide on the latter (after all, you may need less echo than you think and once it's added you can't take it away) the level can still be tried out on the monitors at the earlier stage, without being routed to the recording machine.

Mixing

You now have four or eight complete tracks on your tape, expertly recorded by skilful use of your Studiomaster. The final stage is to remix them for a stereo programme.

First, all track status switches should be set to 'remix'. This done, the tape machine is set to 'play' (as distinct from the 'sync' mode); so that the four tracks from the recorder appear on mic channels 1-4 (or 8). These mic channels are routed so that they can be panned across groups 1 and 2, and mixed down in the usual way. Now the monitors are set to 'L.O.' with channel 1 panned left. Rewinding, the playback may be channels to L.I.

If necessary, fresh material can be introduced into the stereo programme at the remix stage, the extra channel(s) being mixed down in the usual way.

Still More Multi Track Tricks

You may feel the need to mix more basic tracks than the four or eight available on your tape recorder. This may be done by recording tracks 1, 2 and 3 in the usual way and then setting track status switches 1, 2 and 3 to 'Remix' while leaving 4 on 'Record'. Tracks 1, 2 and 3 are thus routed to their respective mic channels, and these in turn can be routed to group 4 for recording on track 4. This mix should be monitored with monitor channel 4 set to L.O.

On the tape recorder, tracks 1, 2 and 3 should be set to 'play' (it is unnecessary to use the 'sync' setting) and track 4 to record. The result will be a mono recording on track 4 of tracks 1, 2 and 3. You will therefore be left with the first three tracks to record again. Precisely the same principle applies to an eight-track tape machine.

If still more tracks are required, two of these three can be recorded and then mixed down along with the first mix on to the fourth track, so that three further tracks are available. Obviously, each time a playback signal is remixed and re-recorded, there is loss of quality. The engineer must use his judgement as to what is tolerable.
1. 30dB input pad
2. Overload led (fires 4dB below clipping)
3. Input gain control
4. Treble ±15dB shelving at 10kHz
5. Mid frequency control 400Hz - 8kHz
6. Mid ±15dB
7. Bass frequency control 20Hz - 300Hz
8. Bass ±15dB shelving
9. Echo 1 post fade send
10. Echo 1 master + Echo 2 master
11. Echo 2 post fade send
12. Foldback master + mon button to PFM bus
13. Foldback pre fade send
14. Foldback volume control
15. Panpot + routing switches
16. PFM prefade monitor button
17. Switch selects monitor mix or PFM buss to loudspeakers
18. Loudspeaker (monitor) volume control
19. Channel fader
20. Talkback (talk to foldback) button
21. Padded armrest
22. Switches route tape track ready to record or remix
23. Lineup osc switch slates 1kHz to all groups
24. Send to monitor (loudspeaker mix)
25. Send to foldback
26. Echo 1 return level control
27. Pans send to monitor across loudspeaker mix
28. Echo 1 return pan + routing
29. Switch selects monitor channel to LO group or LS tape
30. Echo 2 return level control
31. Echo 2 return pan + routing
32. Group LO level fader
THE STUDIOMASTER 16/4 16/8 TECHNICAL SPECIFICATIONS

Inputs
Electronically balanced with active gain control, switched 30dB pad on input.
- Maximum gain: +60dB
- Minimum gain: -15dB
- Headroom: +20dBm
- Input Impedance: >5k Ohms
- Optimum source impedance for microphones: <200 Ohms

Equalisation
- Treble ±16dB at 10kHz
- Mid ±16dB at 400Hz to 8kHz continuously variable
- Bass ±16dB at 30Hz to 300Hz continuously variable
- All outputs have 0dB gain after their respective output level controls.
- Output impedance <10 Ohms
- Minimum terminating impedance is 600 Ohms with the exception of Foldback output when the minimum terminating impedance is 6 Ohms
- Maximum output level +20dBm

Line Inputs
- Line inputs are preset for an input of -10dBm
- They may be very simply modified for an input of +4dBm

Meters
- 0VU = +4dBm
- The following applies from a microphone input to a line input with EQ flat.
  - 1kHz distortion at +4dBm: <0.015%
  - 1kHz distortion at +20dBm: <0.015%
  - Maximum gain throughout mixer: +70dB
  - Maximum input level before clipping: +35dBm
  - Equivalent input noise (200 Ohms input resistor, 16.7kHz)
    - 6dB/Octave filter giving 20kHz bandwidth: <-125dBm
  - Signal to noise ratio with line output fader down
    - Line Output fader nominal, channel faders down: -90dB
    - One microphone channel at 40dB gain: -84dB
    - Four microphone channels at 40dB gain: -80dB
    - Sixteen microphone channels at 40dB gain: -72dB

Multicores
- The standard 16/4 mixer has facilities for two twelve way mic multicores by way of two multicores sockets on the back of the desk. A 150' twelve channel multicores twelve balanced pairs is available on a multicores drum (made of hard wearing ABS plastic) with a detachable stage box with twelve switchcraft C51 numbered 112. Similar multicores are available for the 16/8.

Flight Cases
- Flight cases for both the 16/4 and 16/8 are available as optional extras.

EXPANDER MODULES

It is a general rule of recording that the more sound sources you can mike separately, the more control you have over the final product. None the less, many musicians prefer to start with only a few mikes, wisely bearing in mind that without high quality (and therefore expensive) microphones the best recording equipment is wasted.

RSD have therefore constructed the 16/4 and 16/8 mixers as basic units capable of accepting expander modules of four mike channels each, so that you can expand your mixer at need up to a maximum of 20 channels. If you expect to need still more input capability, you can request a special modification when buying your Studiomaster, which alters its power supply to handle 8 channels over and above this maximum.

Finished in a style identical to that of similar functions on the original desk, the input expander modules are extremely simple to fit. Just remove the wood panel on the side of the desk, bolt your expander module in its place, and replace the wood panel on the outer edge of the module. All electrical connections are simply made without complex wiring.

So remember, if ever you want to expand your ideas, your Studiomaster is ready when you are.