**Composition: Electronic Media I**
025:250
Fall, 1994

Larry Fritts
2060 MB
365-1666
Office hours:
M, W: 9:30-11:30
Open studio hours:
T, Th: 1:30-3:00

Course Description: The course is an introduction to the concepts, techniques, technology, and history of electronic music composition. Material will be presented by means of lecture/demonstrations and students will gain hands on experience through in-class tutorials and outside-of-class studio projects. Topics to be covered include acoustics, audio theory, compositional structures and techniques, tape recording and manipulation, digital synthesis, and MIDI sequencing with a computer.

Course Objectives: Through experience gained in producing several short studio projects, students will complete two compositions, one for tape and the other using MIDI. In doing so, they will have demonstrated that they have acquired the basic skills necessary to operate tape and mixing systems, as well as computer-based MIDI programs. Acquisition of these skills will prepare students for advanced work in digital editing and computer music.

Grading: Final grades are based on work in the following areas:

| | |
|---|---|
| Studio Exercises: | 20% |
| 2 Compositions, 15% each: | 30 |
| 2 Quizzes, 15% each: | 30 |
| Final Exam: | 20 |

Reading: Xeroxes of selected readings from the literature have been placed on reserve in the Music Library. Articles should be read before each class meeting, as indicated in the calendar below.

Studio Time: Each student will be able to reserve studio time for up to 4 hours per week. Students may also sign up for additional time on a weekly basis.

Open Studio Hours: The studios will be un-reserved on Tuesdays and Thursdays from 1:30-3:00. The instructor will be available to help with any problems.

Studio Exercises: Students will complete several short exercises which are designed to develop technique and which may be incorporated into the two larger compositions.

Compositions: Students will complete two compositions. The first will be a concrète piece of approximately 3 minutes duration. The second will be a MIDI piece which may be combined with concrète sounds (which might consist of excerpts or out-takes from the concrète piece, or may even consist of the entire concrète piece itself). The second piece should be at least 5 minutes in length.

Quizzes: Two quizzes will be given. These will be in a multiple choice and essay format and will cover general material from the readings, any material from the lectures, and basic operations of the studios.

Final Exam: The final exam will be given on Wednesday, Dec. 14 at 2:15 PM. It will be cumulative and will include multiple choice and essay questions.

## Calendar

Aug. 22
Lecture: Musical Objects and Transformations
Tutorial: Studio orientation
Read: Boulez, pp. 19-29; Russcol, pp. 76-86.

Aug. 24
Lecture: Vibrating Systems, Sound Waves, and Electrical Systems
Tutorial: Signal routing
Read: Gulick, pp. 19-31.

Aug. 29
Lecture: Tape Recorders
Tutorial: Tape pre-operation and playback
Read: Ciamiga, pp. 94-103.

| | |
|---|---|
| Aug. 31 | Lecture: Microphones<br>Tutorial: Tape recording |
| Sept. 5 | No class |
| Sept. 7 | Lecture: Musique Concrète<br>Tutorial: Tape speed and direction manipulation.<br>Read and listen: Schaeffer, Tapes 1-3 with accompanying text. |
| Sept. 12 | Lecture: Musique Concrète<br>Tutorial: Tape splicing<br>Read and listen: Schaeffer, Tapes 1-3 with accompanying text. |
| Sept. 14 | Lecture: Musical Form, Direction, and Stratification<br>Tutorial: Tape dubbing and mixing |
| Sept. 19 | Lecture: Harmonics, Waveshape, and Timbre<br>Read: Backus, pp. 107-124. |
| Sept. 21 | Lecture: Filtering and Equalization<br>Tutorial: Mixer equalization (EQ), Allison filter, B & K graphic EQ<br>Read: Strange, pp. 49-65. |
| Sept. 26 | Lecture: Pitch, Frequency, and Modulation<br>Tutorial: 20/20 frequency shifter and tape vari-speed control<br>Read: Strange, pp. 12-20. |
| Sept. 28 | Lecture: Effects of Delay on Phase<br>Tutorial: Lexicon digital delay |
| Oct. 3 | Tutorial: Multi-track recording and mixing |
| Oct. 5 | Tutorial: Multi-track recording and mixing |
| Oct. 10 | **Quiz #1**<br>Tutorial: Studio 3 orientation |
| Oct. 12 | Lecture: Introduction to MIDI<br>Tutorial: Computer sequencing with Vision<br>Read: Loy, pp. 8-26. |
| Oct. 17 | Lecture: MIDI Protocol<br>Tutorial: Sequencing with Vision<br>Read: Moore, pp. 19-28. |
| Oct. 19 | Lecture: Principles of Sound Synthesis<br>Tutorial: Voice editing with Galaxy editor/librarian |
| Oct. 24 | Tutorial: Casio voice-editing |
| Oct. 26 | Tutorial: Casio voice-editing |
| Oct. 31 | Lecture: MIDI Objects and Transformations<br>Tutorial: Advanced sequencing |
| Nov. 2 | Tutorial: Advanced sequencing |
| Nov. 7 | **Quiz #2**<br>Lecture: History of Electronic Music: Pre-20th Century Instruments<br>Read: Rhea, pp. 59-63. |

Nov. 9 Lecture: History of Electronic Music: 1900-1948
Read: Griffiths, pp. 7-29; Stuckenschmidt, pp. 174-192.

Nov. 14 Lecture: History of Electronic Music: Tape Studios of the 1950s

Nov. 16 Lecture: History of Electronic Music: Tape and Electronic Studios of the 1950s
Read: Eimert, pp. 1-10.

Nov. 21 Lecture: History of Electronic Music: Voltage-Controlled Synthesizers of the 1960s
Read: Roads, pp. 9-18; Eaton, pp. 54-56.

Nov. 23 No class

Nov. 28 Lecture: History of Electronic Music: Voltage-Controlled Synthesizers of the 1960s
Read: Holmes, pp. 76-84.

Nov. 30 Lecture: History of Electronic Music: Computer Music
Read: Tenney, pp. 24-33.

Dec. 5 Lecture: History of Electronic Music: Computer Music
Read: Aiken, "Max Mathews and John Chowning," pp. 105-109.

Dec. 7 Lecture: History of Electronic Music: Computer Music

Dec. 14 **Final Exam (cumulative).** Wednesday, 2:15.

## Required Reading


Aikin, Jim. "Max Mathews and John Chowning," in The Art of Electronic Music. Compiled by Tom Darter. Edited by Greg Armbruster. New York: Quill, 1984. Pp. 105-109.

Babbitt, Milton. "An Introduction to the RCA Synthesizer." Journal of Music Theory 8.2, pp. 251-265.

Backus, John. The Acoustical Foundations of Music. 2nd ed. New York: Norton, 1977. Pp. 107-125.

Boulez, Pierre. "At the Ends of Fruitful Land..." Die Reihe 1, pp. 19-29.

Ciamaga, Gustav. "The Tape Studio," in The Development and Practice of Electronic Music. Ed. Jon Appleton and Ronald Perera. Englewood Cliffs: Prentice-Hall, 1975. Pp. 94-103.

Eaton, John. "A Portable Electronic Instrument." The Music Journal 24.8, pp. 54-56.

Eimert, Herbert. "What is Electronic Music?" Die Reihe 1, pp. 1-10.

Griffiths, Paul. A Guide to Electronic Music. Bath: Thames and Hudson, 1979, pp. 7-29.

Gulick, W. Lawrence, et al. Hearing. New York: Oxford University Press, 1989. Pp. 19-31.

Holmes, Thomas B. Electronic and Experimental Music. New York: Scribner's, 1985. Chap. 6, pp. 76-84.

Loy, Gareth. "Musicians Make a Standard: The MIDI Phenomenon." Computer Music Journal 9.4, pp. 8-26.

Moore, F. Richard. "The Dysfunctions of MIDI." Computer Music Journal 12.1, pp. 19-28.

Rhea, Thomas L. "Reynold Weidenaar: The Telharmonium: A History of the First Music Synthesizer, 1893-1918." Computer Music Journal 12.3, pp. 59-63.

oads, Curtis. "Interview with Morton Subotnik." Computer Music Journal 12.1, pp. 9-18.

Russcol, Herbert. The Liberation of Sound. Engelwood Cliffs: Prentice-Hall, 1972. Pp. 76-86.

Schaeffer, Pierre. "Solfege de l'objet sonore." from Traite des Objets Musicaux. Paris: Colombet, 1966. Recorded examples, sides 1-6.

Strange, Allen. Electronic Music: Systems, Techniques, and Controls. Wm C. Brown, 1972. Chap 4, pp. 12-20; Chap. 7, pp. 49-65.

Stuckenschmidt, H.H. Twentieth Century Music. Translated by Richard Deveson. New York: McGraw-Hill, 1969. Chap. 9, pp. 174-192.

Tenney, James C. "Sound-Generation by means of a Digital Computer." Journal of MusicTheory 5-6, pp. 24-33.

## Studio Policies

1. You will be assigned a set of studio keys. If you lose these or fail to turn them in to Kirk Corey by the last day of the quarter, the locks will have to be re-keyed at a cost to you of $100.

2. Do not leave the door to the studio open if you are not in the room.

3. No food, drinks, or smoking allowed in the studios.

4. Clean up the studio when you are finished working. Put away your papers, tape supplies, patch cords, etc. The studio should be ready to use by the next person after you are finished.

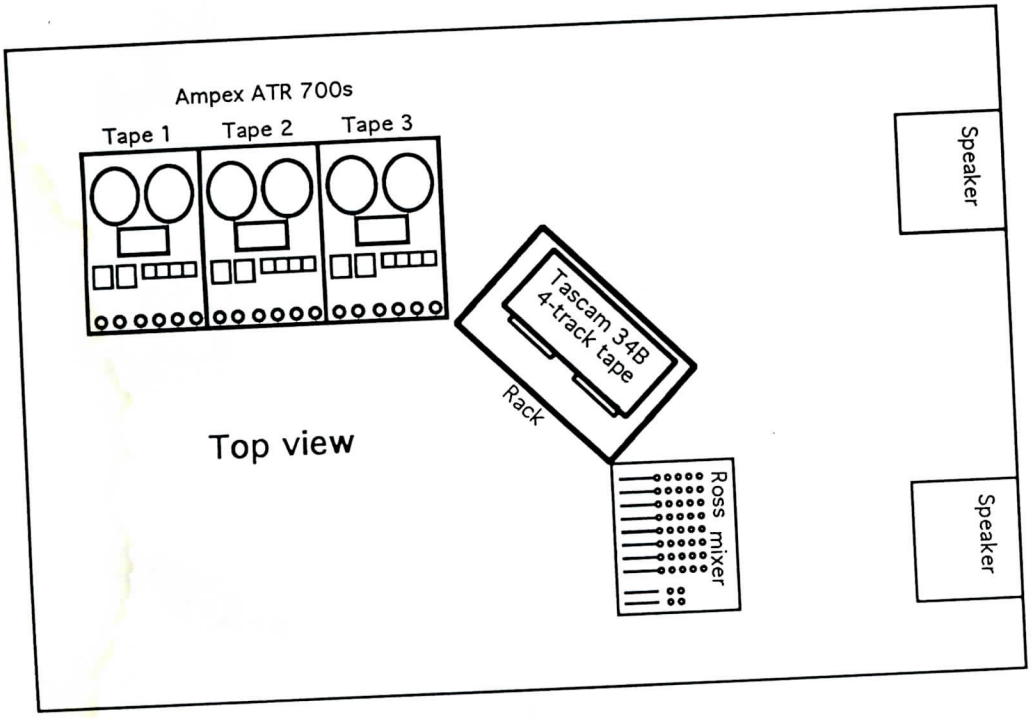
5. Powering up:
   a) Make sure that the tape recorders and power amps are off.
   b) Turn on the main power
      i) In Studio 1, this is the switch under the console beneath Tape 1.
      ii) In Studio 2, these are the 3 circuit breakers on the metal box directly to the right as you enter the room.
      iii) In Studio 3, this is the power strip on the right rear corner of the audio rack.
   c) Turn on tape recorders, power amps, and other equipment you will be using.

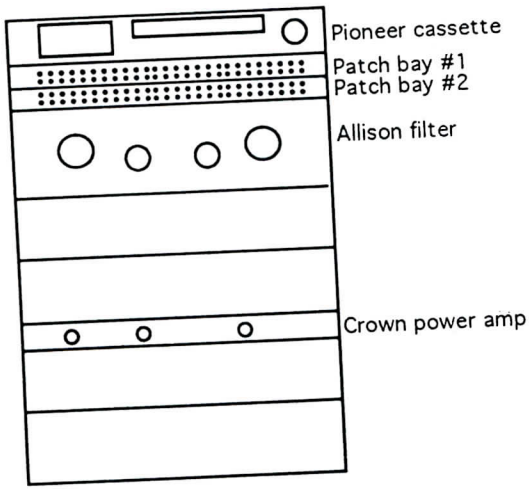
6. Powering down:
   a) Turn off tape recorders and power amps.
   b) Leave processing equipment on.
   c) Turn off main power.

7. In order to avoid damage to the speakers and/or your eardrums, always turn down the volume of the power amps immediately if an audio loop or feedback occurs.

8. Report any problems to Larry Fritts or Kirk Corey.

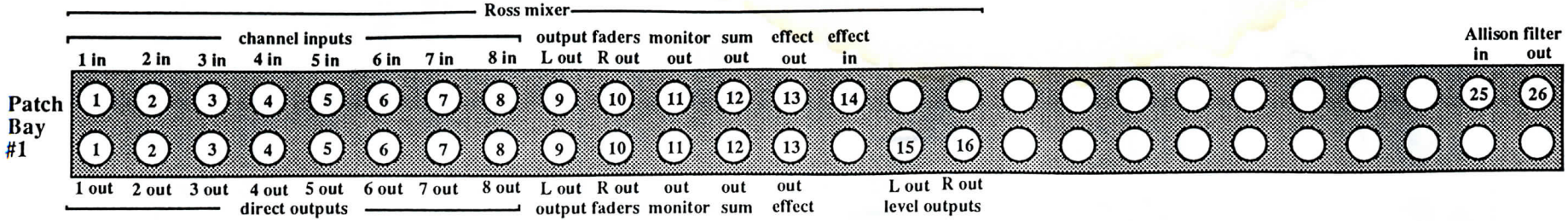
# Studio 1

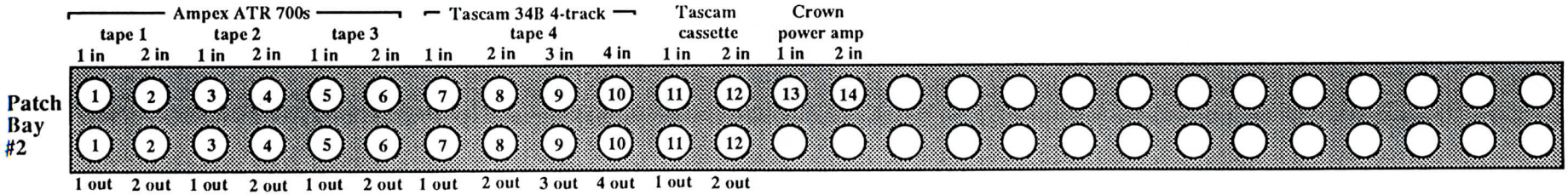


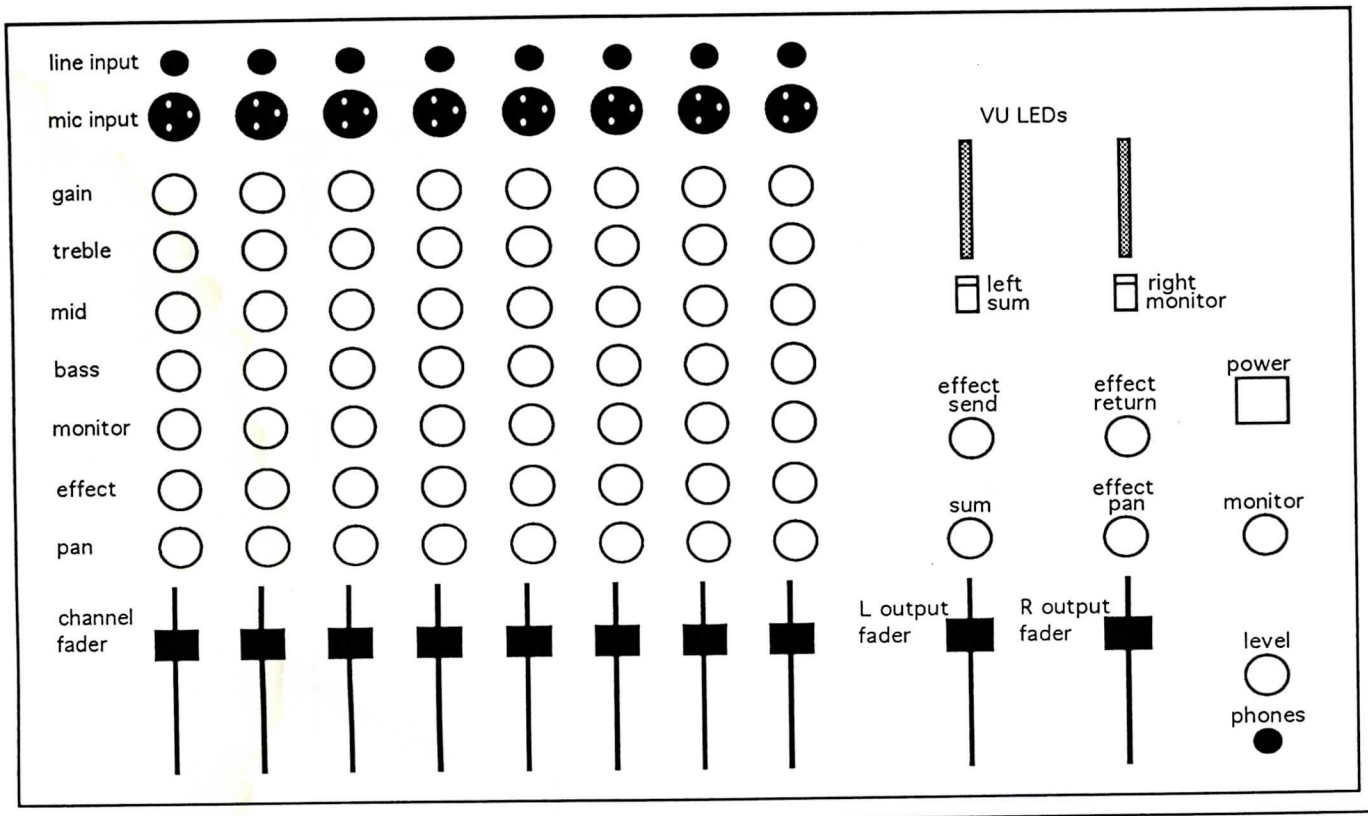

Rack

# Studio 1 Patch Bays



# Ross Mixer




line input — Plug from patch bay permanently inserted. Overrides mic input.

mic input — To record from mic, plug in here and pull out plug from line input.

gain — Normally set to 10 dB. Increase gain only if fader volume at -10 dB isn't loud enough.

treble — Boosts high frequencies from -20 to +20 dB. Set to 0 for flat EQ.

mid — Boosts midrange frequencies from -20 to +20 dB. Set to 0 for flat EQ.

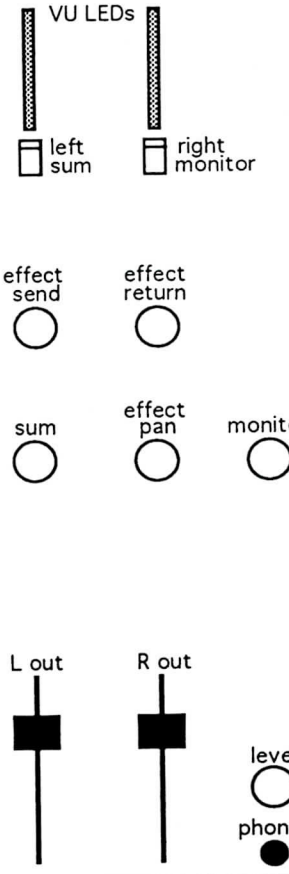
bass — Boosts low frequencies from -20 to +20 dB. Set to 0 for flat EQ.

monitor — Sends signal to monitor output.

effect — Sends signal to effects unit. Not used in current configuration.

pan — Determines how much of the channel output is sent to left and right outputs.

fader — Should normally be set from -20 to -10 dB. For a louder signal, turn up the gain knob above.




VU LEDs show output levels.

VU switches select **left** , **right** , **sum** or **monitor** output levels to be shown by VU LEDs.

**Effect send** controls mono output of channel effect signals.

**Effect return** controls the input of the effect device.

**Sum** controls the mono output of left and right channel faders.

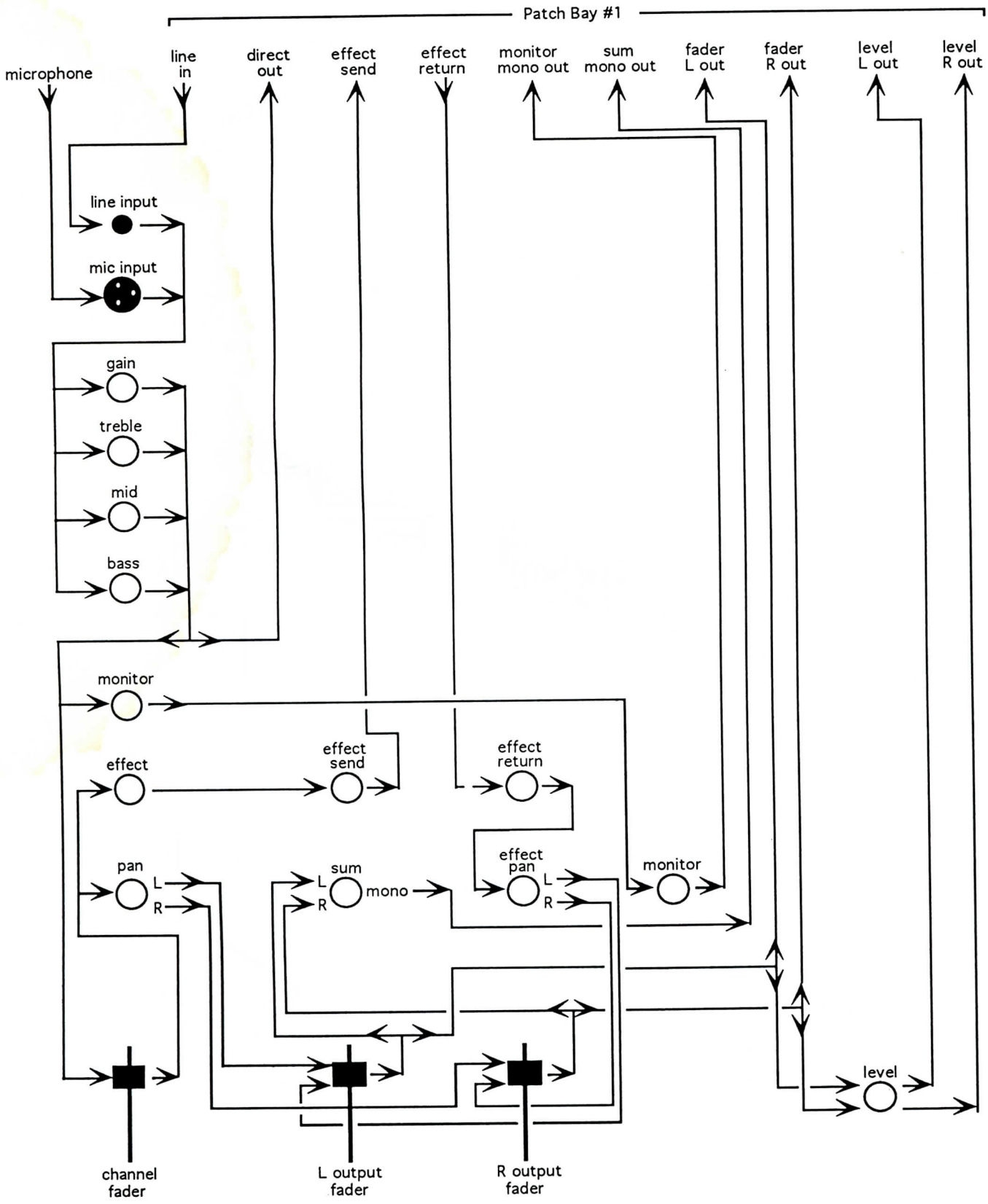
**Effect pan** determines how much of the effect return is sent to left and right fader outputs.

**Monitor** controls the mono output of channel monitor signals.

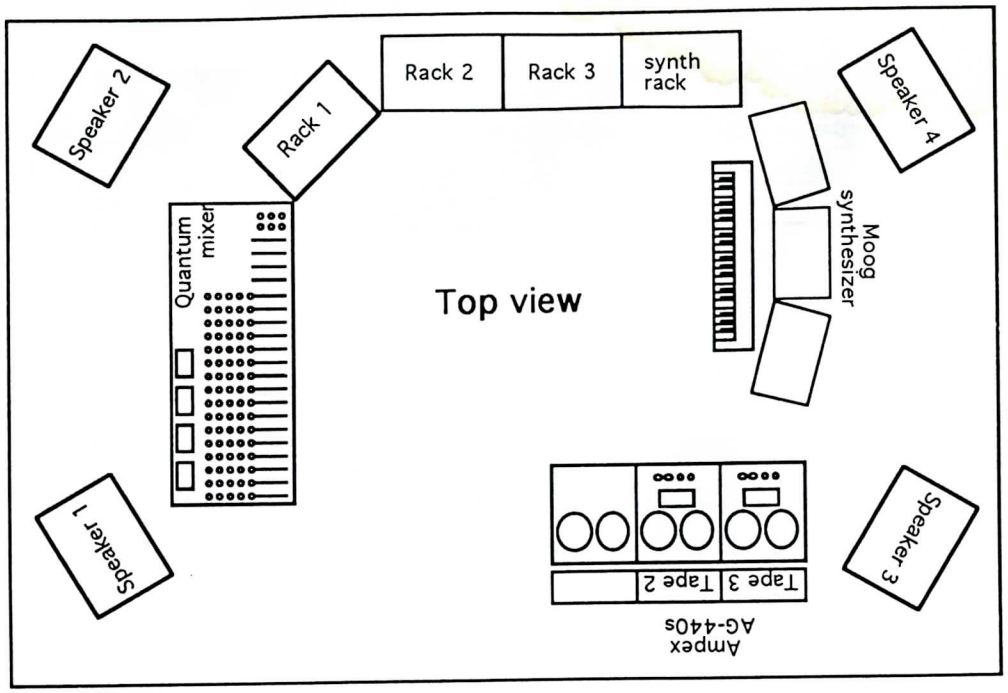
**Left** and **right** faders control left and right outputs.

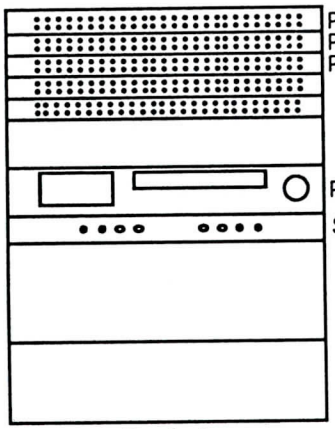
**Level** controls the overall level to a separate stereo output of channel faders and to the **phones** jack.

# Ross mixer signal path

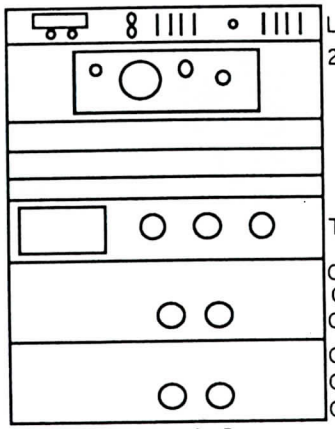


# Studio 2

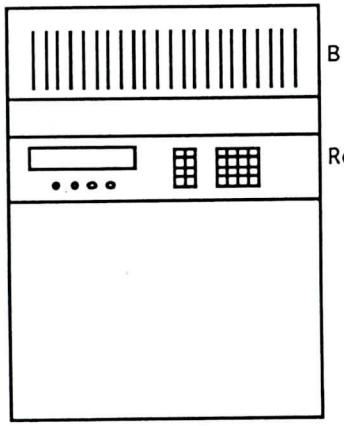



Rack 1

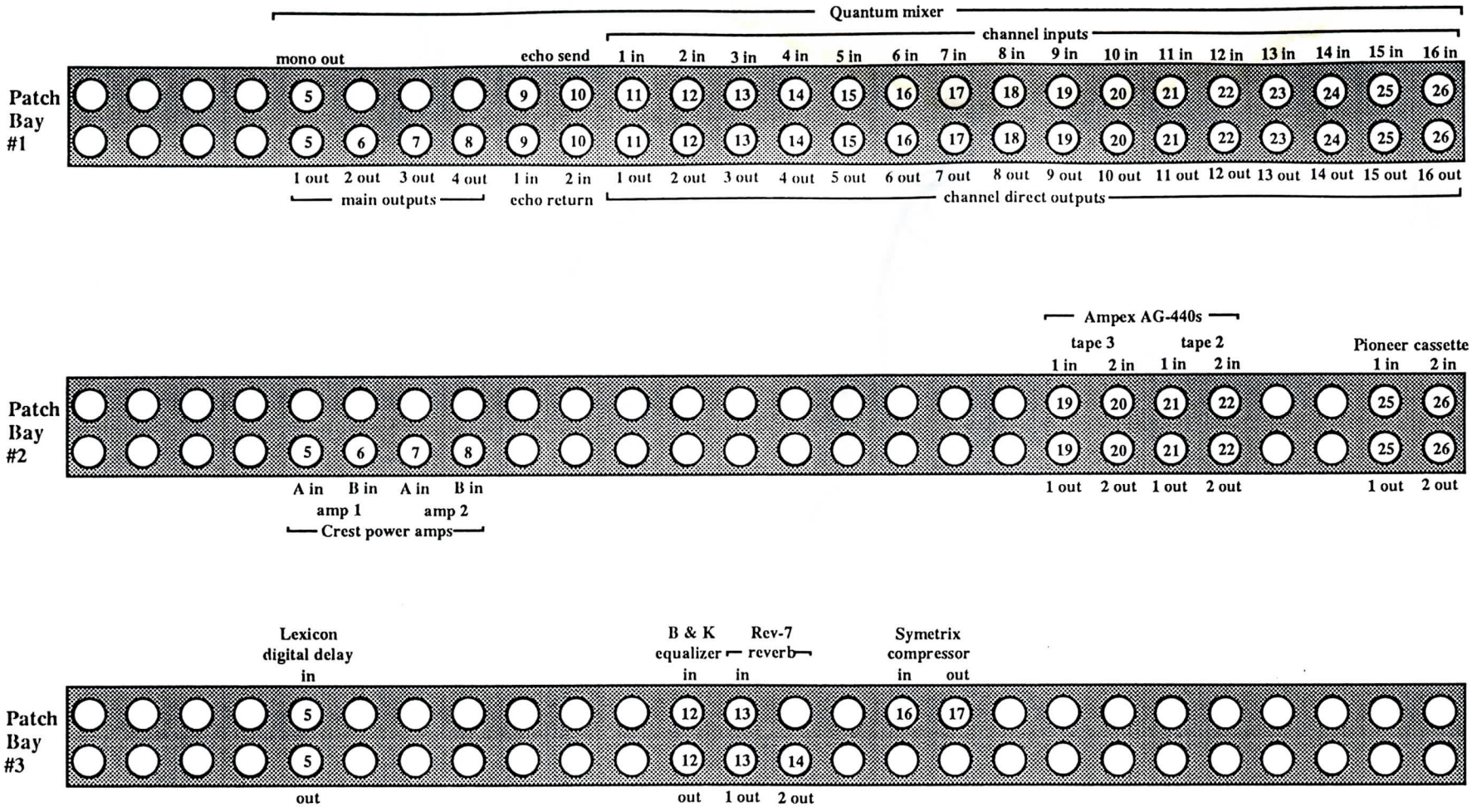


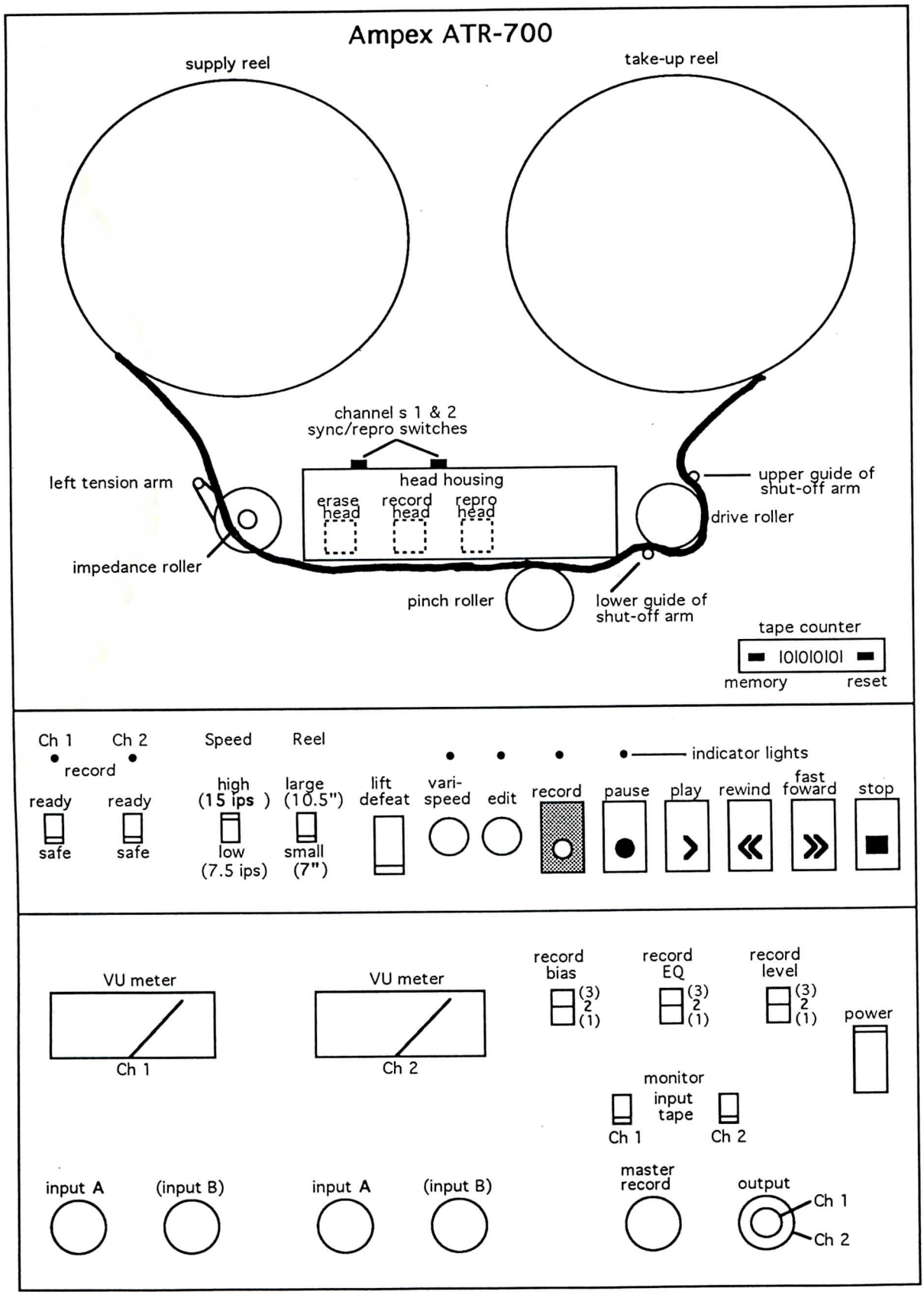

Rack 2




Rack 3

# Studio 2 Patch Bays




Ampex ATR-700
supply reel
take-up reel
channel s 1 & 2
sync/repro switches
head housing
erase head
record head
repro head
left tension arm
upper guide of shut-off arm
drive roller
impedance roller
pinch roller
lower guide of shut-off arm
tape counter
10101010
memory
reset
Ch 1
Ch 2
record
Speed
Reel
indicator lights
ready
ready
high (15 ips)
low (7.5 ips)
large (10.5")
small (7")
lift defeat
vari-speed
edit
record
pause
play
rewind
fast foward
stop
safe
safe
VU meter
Ch 1
VU meter
Ch 2
record bias
record EQ
record level
(3)
2
(1)
power
monitor
input
tape
Ch 1
Ch 2
input A
(input B)
input A
(input B)
master record
output
Ch 1
Ch 2

## ampex ATR-700 Operations

### PRE-OPERATION

1. Patch tape outputs (at patch bay) into: a) desired mixer inputs for monitoring or mixing, or b) inputs of another tape recorder for dubbing
2. Patch into tape inputs (at patch bay): a) desired mixer outputs, or b) outputs of another tape recorder for dubbing
3. Turn **power** on.
4. Turn off: a) **vari-speed** (depressed position; indicator light off) b) **edit** (depressed position; indicator light off)
5. Select: a) **reel size** (usually **small** or 7") b) **tape speed** (usually **high** or 15 ips) c) position **2** for **EQ**, **bias**, and **line**.
6. Place tail-out reel of tape on take-up spindle and thread onto empty supply reel (see diagram for tape path).
7. Press **rewind** to spool tape onto the supply reel.
8. Set **tape counter** to **0000**.
9. Use **fast forward** or **rewind** to position the tape for playback or record. Press **lift defeat** to monitor the tape in fast forward or rewind (turn down the output first).

### PLAYBACK

1. Do pre-operations 1-9.
2. Set **sync/repro** switches to **repro**.
3. Set **record ready/safe** to **safe**.
4. Set both monitor switches to **tape**.
5. Set **output** control knobs to 3 o'clock.
6. Press **play** button to begin tape playback.
7. Press **stop** button to stop tape playback.

### RECORDING

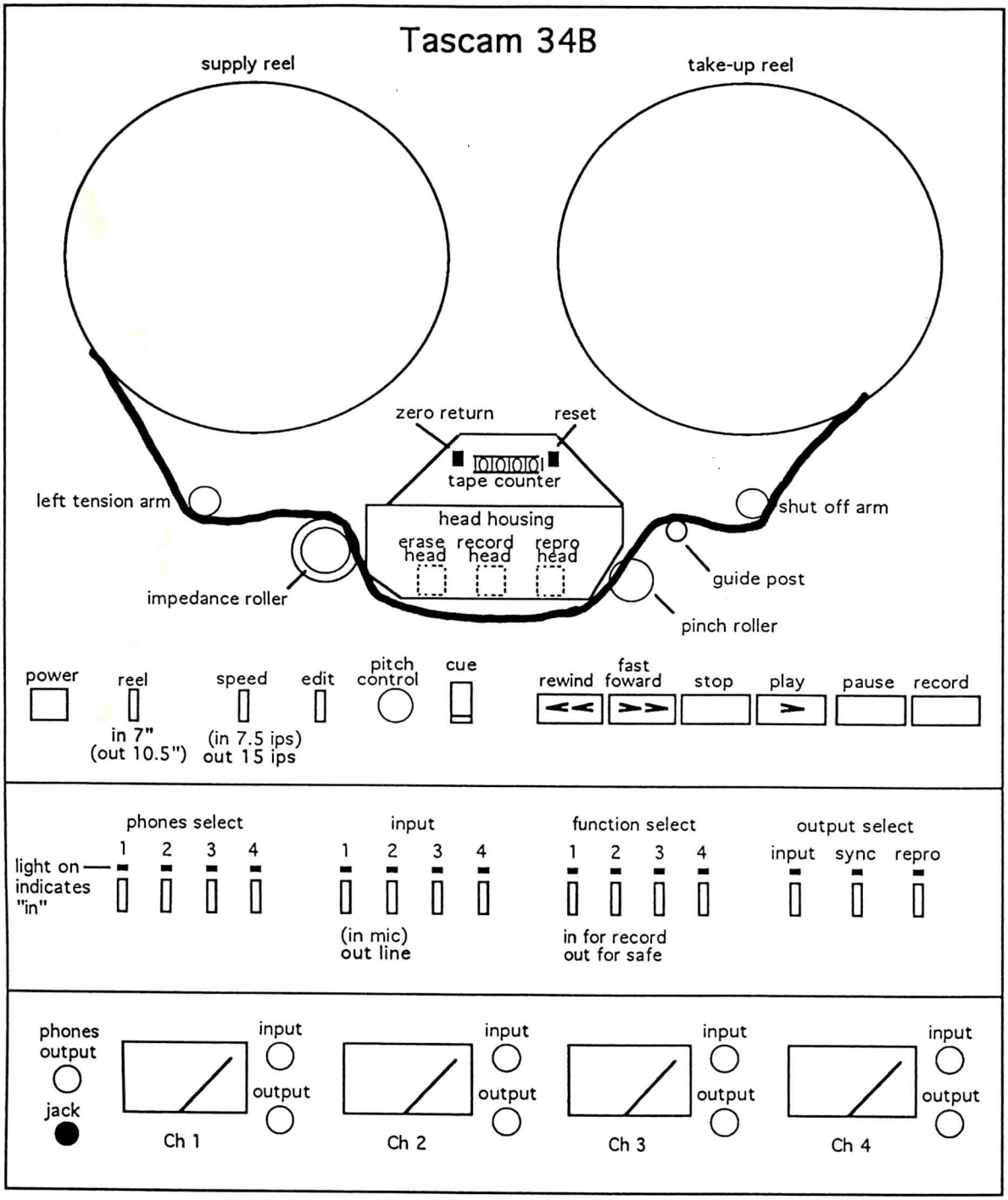
1. Do pre-operations 1-9.
2. Set **sync/repro** switches to **repro**.
3. Set **ready/safe** switch for the channel to be recorded to **ready**.
4. Set **monitor** switch for the channel to be recorded to **input**.
5. Set **output** control knob for the channel to be recorded to 3 o'clock.
6. Set **master** control knob to 2 o'clock.
7. Set **input A** control knob for the channel to be recorded for 0 dB VU level.
8. Press and hold **record** button (button & channel indicator lights on). Hold down record button and press **play**.
9. To pause during a recording, press **pause** button (indicator light on). To resume recording, press **play**.
10. Press **stop** button to stop recording.

### SYNC RECORDING

1. Do pre-operations 1-9.
2. Set **sync/repro** switch to **sync** for the channel used for playback.
3. Do playback operations 3-5 for channel used for playback.
4. Do record operations 3-10 for channel to be recorded.

### EDITING

1. Do pre-operations 1-9.
2. Do playback operations 1-5.
3. Press **edit** to bring tape into contact with repro head.
4. Move reels manually to locate desired section.
5. Warning: pressing **play** will dump the tape since the take-up reel is inoperative in edit mode.


Tascam 34B
supply reel
take-up reel
zero return
reset
tape counter
left tension arm
head housing
erase head
record head
repro head
shut off arm
guide post
impedance roller
pinch roller
power
reel
in 7"
(out 10.5")
speed
(in 7.5 ips)
out 15 ips
edit
pitch control
cue
rewind
fast foward
stop
play
pause
record
phones select
1 2 3 4
light on indicates "in"
input
1 2 3 4
(in mic)
out line
function select
1 2 3 4
in for record
out for safe
output select
input sync repro
phones output jack
input
output
Ch 1
Ch 2
Ch 3
Ch 4

## Tascam 34B Operations

### PRE-OPERATION

1. Patch tape outputs (at patch bay) into: a) desired mixer inputs for monitoring or mixing, or b) inputs of another tape recorder for dubbing
2. Patch into tape inputs (at patch bay): a) desired mixer outputs, or b) outputs of another tape recorder for dubbing
3. Turn **power** on.
4. Turn off: a) **pitch control** (knob in) b) **edit** (button out)
5. Select: a) **reel size** (usually **small** or 7") b) **tape speed** (usually **high** or 15 ips)
6. Place tail-out reel of tape on take-up spindle, lock into place with reel lock, and thread onto empty supply reel (see diagram for tape path).
7. Press **rewind** to spool tape onto the supply reel.
8. Set **tape counter** to **0000**.
9. Use **fast forward** or **rewind** to position the tape for playback or record. Press **cue** to monitor the tape in fast forward or rewind (turn down the output first).

### PLAYBACK

1. Do pre-operations 1-9.
2. Set **output select** switch to **repro** (indicator light on).
3. Set all **function select** switches to **safe** (indicator lights off).
4. Set channel **output** control knobs to **cal**.
5. Press **play** button to begin tape playback.
6. Press **stop** button to stop tape playback.

### RECORDING

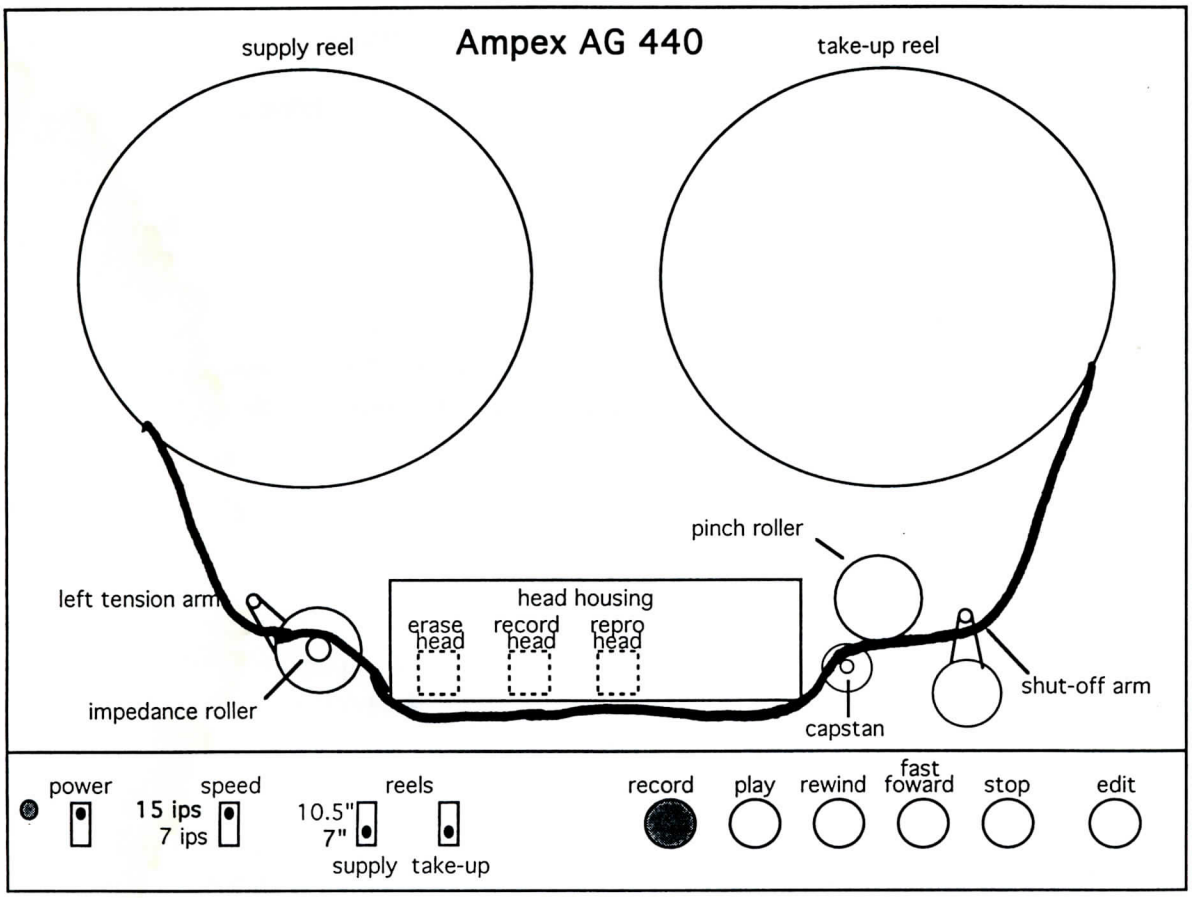
1. Do pre-operations 1-9.
2. Set **output select** switch to **input.**
3. Set **function select** switch for the channel to be recorded to **record** (indicator light flashes).
4. Set **input** switch for the channel to be recorded to **line** for signals coming from patch bay (indicator light off).
5. Set **output** control knob for the channel to recorded to **cal**.
6. Set **input** control knob for the channel to be recorded for 0 dB VU level.
7. Press and hold **record** button (button indicator light on & function select channel indicator light is steady). Hold down record button and press **play**.
8. To pause during a recording, press **pause** button (indicator light on). To resume recording, press **play**.
9. Press **stop** button to stop recording.

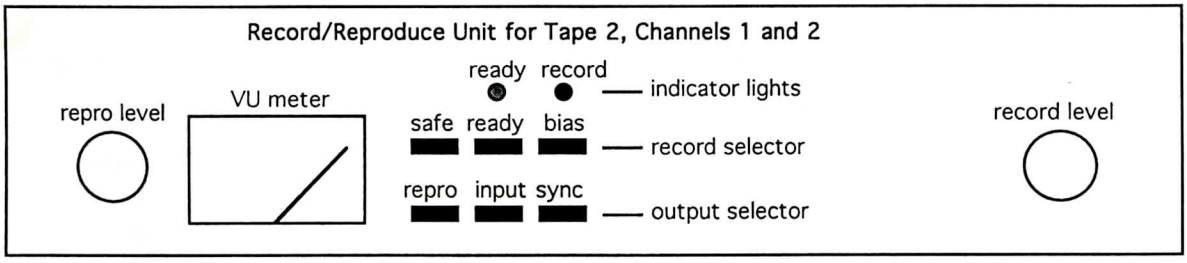
### SYNC RECORDING

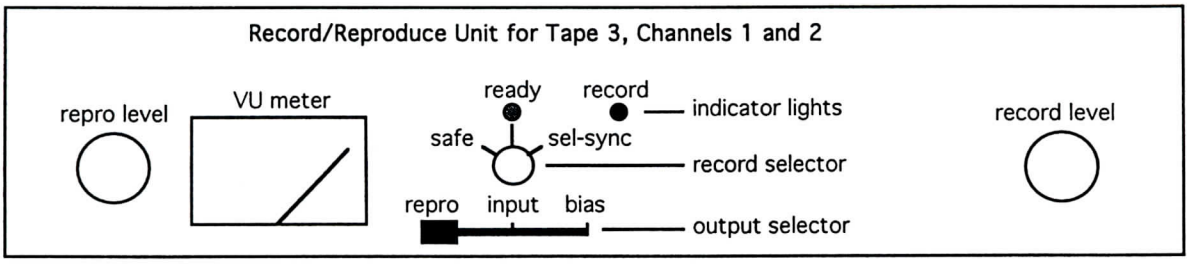
1. Do pre-operations 1-9.
2. Set **output select** switch to **sync**.
3. Do playback operations 3-4 for channels used for playback.
4. Do record operations 3-9 for channels to be recorded.

### EDITING

1. Do pre-operations 1-9.
2. Do playback operations 1-4.
3. Press **cue** to bring tape into contact with repro head.
4. Move reels manually to locate desired section.
5. Warning: pressing **edit** then **play** will dump the tape since the take-up reel is inoperative in edit mode.


Ampex AG 440
supply reel
take-up reel
pinch roller
left tension arm
head housing
erase head
record head
repro head
impedance roller
capstan
shut-off arm
power
speed
15 ips
7 ips
reels
10.5"
7"
supply
take-up
record
play
rewind
fast foward
stop
edit


Record/Reproduce Unit for Tape 2, Channels 1 and 2
repro level
VU meter
ready
record
indicator lights
safe
ready
bias
record selector
repro
input
sync
output selector
record level


Record/Reproduce Unit for Tape 3, Channels 1 and 2
repro level
VU meter
ready
record
indicator lights
safe
sel-sync
record selector
repro
input
bias
output selector
record level

## Ampex AG 440 Operations

### PRE-OPERATION

1. Patch tape outputs (at patch bay) into:
   a) desired mixer inputs for monitoring or mixing, or
   b) inputs of another tape recorder for dubbing
2. Patch into tape inputs (at patch bay):
   a) desired mixer outputs, or
   b) outputs of another tape recorder for dubbing
3. Turn **power** on.
4. Select:
   a) **reel size** for both supply reel and take-up reel (usually **small** or 7")
   b) **tape speed** (usually **high** or 15 ips)
5. Place tail-out reel of tape on take-up spindle and thread onto empty supply reel (see diagram for tape path).
6. Press **rewind** to spool tape onto the supply reel.
7. Use **fast forward** or **rewind** to position the tape for playback or record.

### PLAYBACK

1. Do pre-operations 1-7.
2. Set **output selector** switches to **repro**.
3. Set **record selector** switches to **safe**.
4. Set **output** control knobs to 3 o'clock.
5. Press **play** button to begin tape playback.
6. Press **stop** button to stop tape playback.

### RECORDING

1. Do pre-operations 1-7.
2. Set **output selector** switch of channel to be recorded to **input**.
3. Set **record selector** switch for the channel to be recorded to **ready** (amber indicator light on).
4. Set **repro level** control knob for the channel to be recorded to 3 o'clock.
5. Set **record level** control knob for the channel to be recorded for 0 dB VU level.
6. Press and hold **record** button. Hold down record button and press **play** (red record indicator light on).
7. Press **stop** button to stop recording.

### SYNC RECORDING

1. Do pre-operations 1-7.
2. For Ampex Tape 2: Set **output selector** switch to **sync** for the channel used for playback.
   For Ampex Tape 3: Set **record selector** switch to **sel-sync** for the channel used for playback.
3. Do playback operations 3-4 for channel used for playback.
4. Do record operations 2-7 for channel to be recorded.

### EDITING

1. Do pre-operations 1-7.
2. Do playback operations 1-4.
3. Press **edit** to release reel brakes.
4. Move reels manually to locate desired section.