Owner's Manual

Model

460

RECORDER/MIXER

FOSTEX ®

TABLE OF CONTENTS

WARNING: To avoid possible electric shock hazard, do not expose this appliance to rain or moisture. There are no user serviceable parts inside. Refer servicing to qualified service personnel.

SECTION 1. INTRODUCTION

Thank you for purchasing the Fostex 460 Multitrack Recorder/Mixer. It is a sophisticated example of modern technology and each of the two main functions may be accessed separately, if desired.

The 2-speed 4-track cassette recorder features a microprocessor controlled transport with an autolocate function, the mixer features balanced XLR phantom powered mic inputs, thus accepting a wide variety of professional microphones, and so it is very well suited for sound reinforcement applications as well as multitrack recording.

In order to ensure years of trouble-free operation, please take the time to read through these operating instructions. If you are very familiar with this kind of hardware, an analysis of the block diagram on page 13 and the specifications on page 2 should suffice. Otherwise, please read through the various sections of the manual so that you will know how to use this remarkable instrument to your very best advantage.

CONNECTING THE POWER SUPPLY

The power supply unit included is designed specifically and exclusively for the Model 460. Do not attempt to operate either unit independently. No other power supply unit will function properly with the 460. Standard 120 V AC operation is anticipated and line frequencies of both 50 Hz and 60 Hz may be used without any switching procedures. Please consult your Fostex dealer or service center for any other power interface requirement.

1. Connect the cable from the power supply unit to the 460.
2. Plug the AC cord into an AC line.
3. Turn the power switch on.
4. The LED indicates that DC power is properly supplied to the 460.

PRELIMINARY INFORMATION

Format. The diagram below shows the difference between the multitrack format (4 tracks in one direction) and the standard Hi-Fi format (2 tracks in two directions). Tracks 1 & 2, LOW speed, are the only compatible tracks between the two formats.

STANDARD RECORDER   MULTI TRACK RECORDER
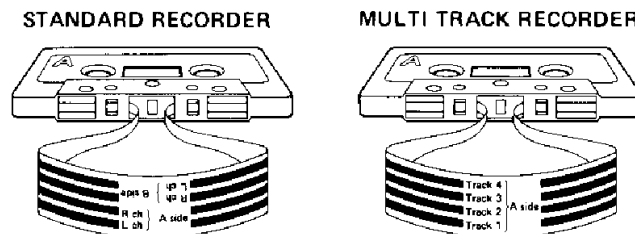
Speed. The 460 features a 2-speed transport. Standard Hi-Fi is 1-7/8 ips(4.75 cm/s); professional multitrack is twice that, 3-3/4 ips (9.5 cm/s). C-60s, therefore, offer about 30 minutes of recording time at the LOW (standard) speed, and about 15 minutes at the HIGH (professional) speed.

Bias. Use only high bias 70 μsec EQ tapes, maxell UD-XL-II, TDK SA or equivalent. C-60s or C-90s only. Never C-120s.

Impedance. This is an inherent characteristic of all electronic circuitry and is particulary important when you're trying to connect an output of one device to the input of another. Where there's a mis-match, there's a problem. Often, the connectors will carry clues: if you try to connect a phone plug to a pin jack, via an adaptor, you may be disappointed in the extreme.

Cables. They are not all the same. Bad ones act like antennae and pick up your least favorite radio station along with the lead vocal. Good ones are of low capacitance and high quality. Smart operators keep their cable runs as short as practical.

SECTION 2. **SPECIFICATIONS**

INPUT (×8)

Mic impedance	Less than 10kΩ
Input impedance	10kΩ, bal. XLR
	40kΩ, unbal, phone jack
Nominal input level	MIC −60dBV(1mV)
	LINE −10dBV(0.3V)
Min. input level	MIC −70dBV(0.3mV)
Max. input level	LINE +15dBV(5.6V)

LINE IN (×8)/ACCESSORY RCV (×8)

Input impedance	10kΩ
Nominal input level	−10dBV(0.3V)
Min. input level	−20dBV(0.1V)
Max. input level	+25dBV(17.8V)

4 CHAN BUSS IN (×4)

Input impedance	20kΩ
Nominal input level	−10dBV(0.3V)
Max. input level	+15dBV(5.6V)

AUX 1 and AUX 2 (×2) BUSS IN

Input impedance	20kΩ
Nominal input level	−10dBV(0.3V)
Max. input level	+15dBV(5.6V)

4 CHAN BUSS OUT (×4)/STEREO OUT

Output Load impedance	Higher than 10kΩ
Nominal output level	−10dBV(0.3V)
Max. output level	+15dBV(5.6V)

AUX 1 and AUX 2 (X2) BUSS Output

Output load impedance	Higher than 10kΩ
Nominal output level	−10dBV(0.3V)
Max. output level	+15dBV(5.6V)

MONITOR OUT(×2)

Output load impedance	Higher than 10kΩ
Nominal output level	−10dBV(0.3V)
Max. output level	+10dBV(3V)

HEADPHONE OUTPUT (stereo)

Output load impedance	8Ω~40Ω
Max. output	100mW

ACCESS SEND (×8)

Output load impedance	Higher than 10kΩ
Nominal output level	−10dBV(0.3V)
Max. output level	+15dBV(5.6V)

PARAMETRIC EQUALIZER

	60Hz~1kHz±15dB
	400Hz~6kHz±15dB
SHELVING EQUALIZER	10kHz±15dB
RECORDING TAPE	Compact cassette, C-60 or C-90. Use a gamma-ferric oxide tape that requires high bias level and 70 microsecond EQ (Maxell UD-XL-II, TDK SA or equivalent).
RECORD TRACKS	4 track, one direction (Special format)

RECORD/PLAYBACK CHANNELS

	4 with Dolby NR B/C type in encode mode throughout (encode/decode switchable).
NORMAL TAPE SPEED	9.5cm/sec(HIGH), 4.75cm/sec(LOW)
PITCH CONTROL	±12% of normal tape speed
RECORDING TIME	15min/HIGH, 30 min/LOW for C-60
HEAD	4 channel erase (ferrite)
	4 channel record/playback (Permalloy)
MOTORS	One DC Servo
WOW AND FLUTTER	±0.1% (IEC/ANSI weighted) measured with flutter test tape.
FAST WIND TIME	100sec±10% for C-60

FREQUENCY RESPONSE

Mixer section	MIC 20Hz~20kHz
	LINE 20Hz~20kHz
	HEADPHONE 80Hz~20kHz
Recorder section	40Hz~18kHz

T.H.D.

Mixer section	0.05% at 1KHz
Recorder section	2.0% at 1KHz, 0dB level (overall)

S/N

Mixer section	One mic in overall 66dB weighted 64dB unweighted
	One line in overall 82dB weighted 80dB unweighted
Recorder section	57 dB weighted
	51 dB unweighted
	Referenced to 3.0% T.H.D. level.

CROSSTALK

|	
Mixer section	MIC 60dB at 1KHz
Recorder section	50dB at 1KHz
ERASURE	70dB at 1KHz
POWER REQUIREMENTS	120VAC, 50/60Hz, 30W
DIMENSIONS	119(H)×550(W)×390(D)mm
	[4-5/8(H)×21-5/8(W)×15-3/8(D)in]
WEIGHT	10kg (22lbs)

Specifications subject to change without notice.

*Dolby noise reduction manufactured under license from Dolby Laboratories Licensing Corporation. "Dolby" and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation.

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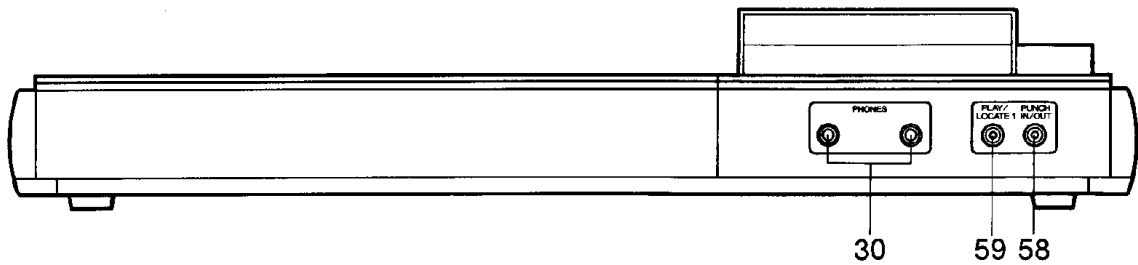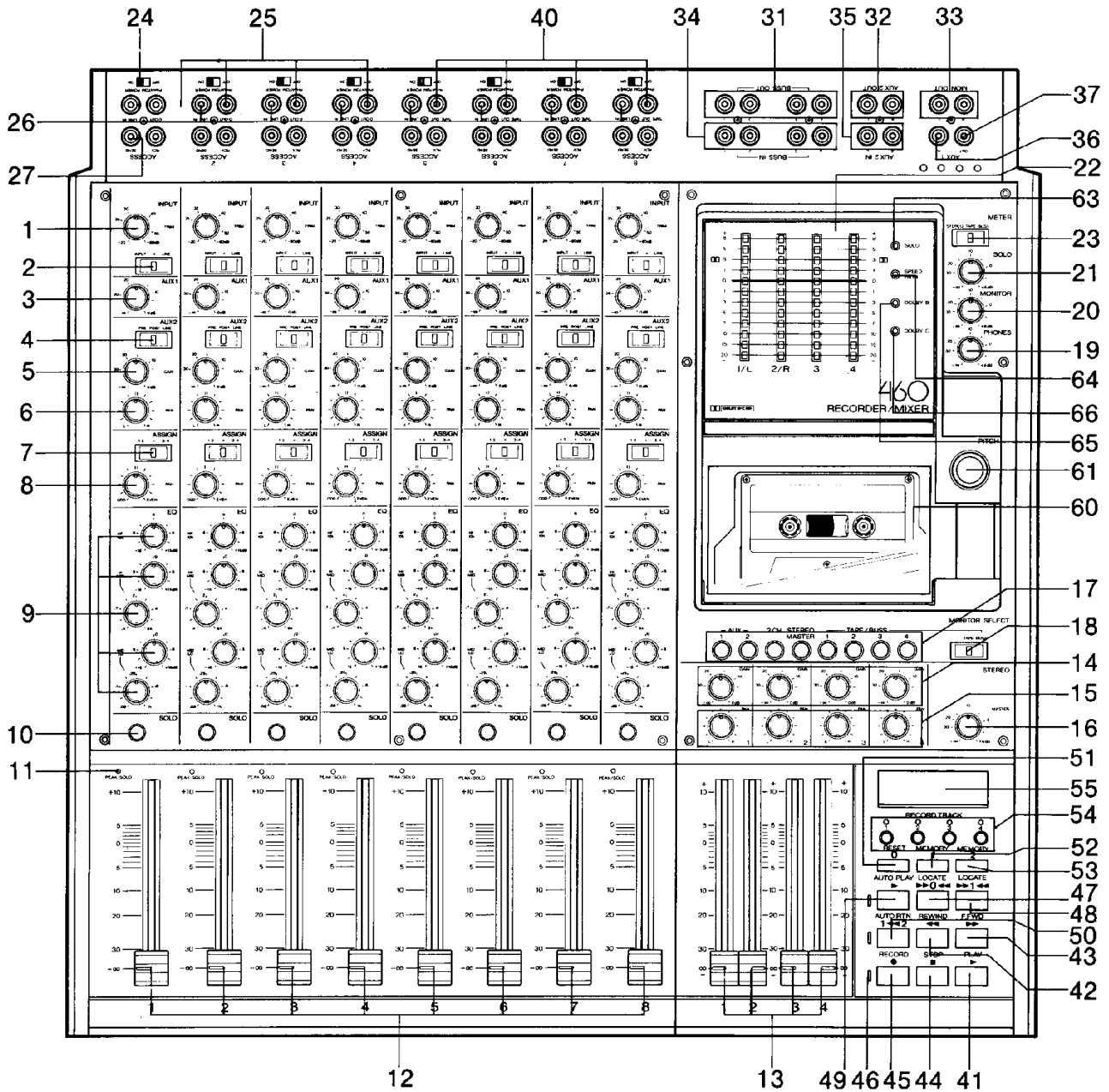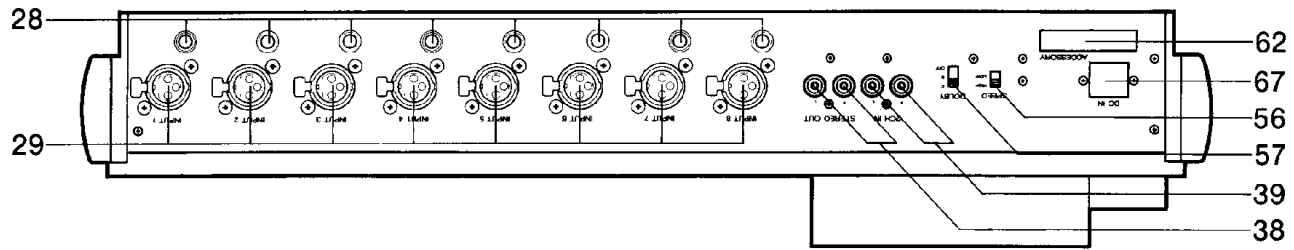
SECTION 3. THE CONTROLS, THEIR FUNCTIONS AND OPERATION

MIXER SECTION

1. INPUT TRIM (TRIM)
This control helps you set the proper level for input signals from either the balanced XLR connector (29) or unbalanced 1/4" phone jack (28). It covers a wide range from mic level (−60 dB) to line level (−20 dB).
Note that signals from the line input jack (26) are not affected by this control.

2. INPUT SELECTOR (INPUT/■/LINE)
Signals applied to the input faders (12) of each channel are selected by this control.
INPUT is for either the balanced XLR (29) or the unbalanced 1/4" phone (28), which has priority.
■ is Off, no input signal applied.
LINE is for the RCA Line In jack (26).

3. AUX 1
Level control for a mono send, post EQ (9) and fader (12).

4. AUX 2 SELECTOR (PRE/POST/LINE)
Selects the signal sent to AUX 2 Gain (5) of each channel.
PRE is before the fader (12) and equalizer;
POST is after the fader and equalizer;
LINE is the signal from the Line In jacks (26).

***NOTE:** Tape Out 1 ~ 4 are jumpered to Line in 5 ~ 8 as a means of independent tape monitoring.*

5. AUX 2 GAIN
Adjusts the level for this stereo send.

6. AUX 2 PAN
Adjusts the Left/Right positioning of this stereo signal.

7. 4-CHANNEL BUSS SELECTOR (ASSIGN)
The 4-Channel Buss is internally connected to the recorder, 1 ~ 4.
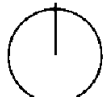In the left position (1-2) signals are assigned by the placement of the Pan control (8), in the following way:

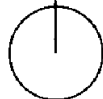Track 1   Track 2   Tracks 1 & 2

In the right position (3-4) signals are assigned in the same manner.

Track 3   Track 4   Tracks 3 & 4

The center position (●) is off.

8. 4-CHANNEL BUSS PAN POT (PAN)
Input signals are placed (assigned) as explained above.

9. PARAMETRIC EQUALIZER (EQ)
The high band is fixed at 10 kHz, shelving. The mid band is continuously variable from 400 Hz to 6 kHz, ±15 dB. The low band is continuously variable from 60 Hz to 1 kHz, ±15 dB.

10. SOLO BUTTON (SOLO)
When this button is pressed, the post fader signal for that channel only will be heard, all other audio will be muted. Signals from the MON OUT jack (33), PHONES jack (30) and BUSS OUT jack (31) will not be affected.

11. PEAK/SOLO LED (PEAK/SOLO)
This LED has two functions, it remains lit when Solo is engaged; when Solo is not engaged, it functions as the peak level indicator. Flashing status indicates that the mic preamp is being overdriven and the trim control (1) needs adjusting.

12. INPUT FADER
This output level control for each channel is best positioned in the zero range (±5). Further adjust nominal operating levels with the trim control (1).

13. 4-CHANNEL BUSS MASTER FADERS
Each of these faders corresponds to the output channels of the mixer and the tracks of the recorder. The best nominal operating range is zero ±5.

14. STEREO MASTER GAIN CONTROLS (STEREO GAIN)
Individual level controls for the 4-channel buss (13) signals sent to the Stereo Out jack (38).

15. STEREO MASTER PAN CONTROLS (STEREO PAN)
Individual left/right imaging of the 4-channel signals sent to the Stereo Out jack (38).

16. STEREO MASTER LEVEL CONTROL (STEREO MASTER)
Sets the overall output level of the stereo signal as mixed by (14) and (15) above.

17. MONITOR SELECTOR (MONITOR SELECT)
Determines the signal to be sent to the Mon Out jack (33) and the Phones jack (30).
AUX 1: the mono signal is monitored in the center.
AUX 2: the stereo signal is monitored.
2 CH: normally the playback signal of the stereo master recorder, connected to 2 CH In jack (39).
STEREO MASTER:
the signal present at the stereo out jack (38) is monitored.
TAPE/BUSS 1 ~ 4:
either tape playback or buss out is monitored, as determined by the setting of the TAPE/BUSS selectors (18). These selectors are individually set, so signals may be mixed or grouped as desired.

18. TAPE/BUSS SELECTORS (TAPE/BUSS)
These buttons correspond to Tracks 1 ~ 4 in the TAPE or **Up** position and to Channels 1 ~ 4 in the BUSS or **Down** position. Any combination of Tape/Buss signals may be selected to appear on the 4-Channel Buss outputs.

19. HEADPHONE LEVEL CONTROL (PHONES)
Independent level control for the headphones (30).

20. MONITOR LEVEL CONTROL (MONITOR)
Independent level control for the signal selected by the Monitor Selector (17) or Solo (21), present at the Mon Out jack (33).

4

21. SOLO LEVEL CONTROL (SOLO)
Independent level control for the Solo signal, normally adjusted after setting (19) and (20) above.

22. LED BARGRAPH METERS
The four 12-point bargraph meters correspond to tracks/channels 1–4. In the stereo mode, meters 1 and 2 will be Left and Right respectively.

23. METER SELECTOR (STEREO/TAPE/BUSS)
Determines the signal to be displayed by the LED Bargraph Meters (22).
STEREO: the signal present at the Stereo Out jacks (38).
TAPE: the signal present at the Tape Out jacks (40).
BUSS: the signal present at the Buss Out jacks (31).

24. PHANTOM POWER SUPPLY SWITCH (PHANTOM POWER ON/OFF)
48 VDC power supply for certain condenser mics. Use only as needed (see mic specifications); otherwise, turn off.

INPUT/OUTPUT JACKS

25. DIRECT OUT JACK (D OUT)
Each input chnnel has a Direct Out jack which carries the input signal post fader (12) and EQ (9), but pre-mix or before the summing amplifiers. You can use these as effects sends or feeds to another recorder, etc.

26. LINE IN JACK (LINE IN)
Accepts −10 dBv signals when the Input Selector (4) is set to Line in.

27. ACCESSORY SEND/RECEIVE JACKS (ACCESS SEND/REC)
These are convenient patch points for connecting signal processors such as compressor/limiters, noise gates, reverb units, etc. When not in use, be sure the jumper plug is seated.

28. PHONE INPUT JACK (INPUT)
An unbalanced input which can accept a wide variety of signals — from low level mics to line level instruments. This input has priority over the XLR-type connector (29) below.

29. XLR-TYPE INPUT CONNECTOR (INPUT)
A **balanced** input normally used for mics, but can also be used for line level sources. When an **unbalanced** line input is connected here, pins 1 & 2 must be ground (GND) and the Phantom Power switch (24) must be off. Note that the Phone Jack (28) has priority over this input.

30. HEADPHONE JACKS (PHONES 1 & 2)
Parallel outputs for standard headphones, 8 ~ 40Ω impedance.

31. 4-CHANNEL BUSS OUT JACKS (BUSS OUT 1 − 4)
Line level outputs of the 4-Channel Buss.

32. AUX 2 OUTPUT JACKS (AUX 2 OUT L/R)
Stereo outputs of the Aux 2 buss.

33. MONITOR OUT JACKS (MON OUT L/R)
The signal selected by the Monitor selector (17) is present here, except when any solo button is engaged, in which case that signal preempts the normal monitor buss setting.

34. 4-CHANNEL BUSS IN JACKS (BUSS IN 1 ~ 4)
Line level inputs to the 4-Channel buss, typically from signal processors (returns), another mixer (cascades), etc.

35. AUX 2 IN JACKS (AUX 2 IN L/R)
Line level inputs to the Aux 2 stereo buss, useful for processing an additional stereo signal.

36. AUX 1 IN JACK (AUX 1 IN)
Line level input to the Aux 1 mono buss.

37. AUX 1 OUT JACK (AUX 1 OUT)
Mono output of the Aux 1 buss, often used as an additional cue for the musicians' headphones.

38. STEREO OUT JACKS (STEREO OUT L/R)
The stereo signal of the 4-channel buss as mixed by the Gain (14) and Pan (8) controls, normally the feed to the stereo master recorder.

39. 2 CHANNEL IN JACKS (2 CH IN L/R)
Convenient stereo input to the 460 monitor buss, normally the output from the stereo master recorder.

RECORDER SECTION

40. TAPE OUT JACKS (TAPE OUT)
Line level outputs of the recorder, Tracks 1 − 4. The recommended patch is to the Line In jacks 5 − 8 (26) for mixing and monitoring.

41. PLAY BUTTON (PLAY >)

42. REWIND BUTTON (REWIND <<)

43. FAST FORWARD BUTTON (F.FWD >>)

> **Note:** Cueing in Fast Forward and Rewind modes is accomplished by engaging Play as well.

44. STOP BUTTON (STOP ■)

45. RECORD BUTTON (RECORD ●)
This is a multi-function button. Of course its primary function is to place the recorder in the record mode. Additionally, it affects the monitor status of the input signal, especially important for punching- in/out. Please refer to Section 4 Page 8 for details.

46. RECORD LED
Indicates the status of the record electronics in the following way:
UNLIT: Safe
GREEN: Record Ready
BLINKING: Input Monitor
RED: Recording in progress
Please refer to Section 4, Page 7 for details.

47. LOCATE >>0<<
Please refer to Section 9, Page 16 for details.

48. LOCATE >>1<<
Please refer to Section 9, Page 16 for details.

49. AUTO PLAY >
Please refer to Section 9, Page 16 for details.

50. AUTO RTN 1<<2
Please refer to Section 9, Page 16 for details.

51. RESET 0
Please refer to Section 9, Page 16 for details.

52. MEMORY 1
Please refer to Section 9, Page 16 for details.

53. MEMORY 2
Please refer to Section 9, Page 16 for details.

54. RECORD TRACK SELECTORS (RECORD TRACK 1 ~ 4)
These buttons determine which track(s) will be placed in the record mode. When pressed, the LED above the button will blink (red), indicating record ready status, and will remain on when recording is in progress. When a track selector button is engaged, pressing the record button once will allow you to monitor the input signal, except as noted below.

Note: When the speed selector (56) is set to LOW, the input monitor function will not be operative for track 3.

55. TAPE COUNTER LED 4-DIGIT DISPLAY

56. TAPE SPEED SELECTOR (SPEED HIGH/LOW)
HIGH: 3-3/4 ips (9.5 cm/sec). This is the recommended speed for multitrack recording.
LOW: 1-7/8 ips (4.75 cm/sec). This is standard Hi-Fi speed. Tracks 1 & 2 are compatible with tapes made on regular home decks.
Note the following points at this low speed setting:
A. You can not record or reproduce on track 3 — it acts as a guard band.
B. Track 4 is a dedicated data track for various sync pulses; noise reduction is cancelled and the bandwidth is restricted to 40 Hz — 40 kHz, ±2 dB at 0 VU.

57. NOISE REDUCTION SELECTOR (DOLBY C/B/OFF)
C: C-type system, recommended for HIGH speed operation.
B: B-type system, for compatibility with home tapes. When LOW speed is selected, noise reduction is automatically cancelled for track 4.
OFF: For calibration and alignment.

58. REMOTE PUNCH-IN/OUT JACK (PUNCH IN/OUT)
The optional footswitch, Fostex Model 8051, is plugged in here. Please refer to Section 4, Page 8 for details.

59. PLAY/LOCATE 1 JACK (PLAY/LOCATE 1)
The optional footswitch, Fostex Model 8051, is plugged in here. When the footswitch is engaged in the stop mode, the recorder will enter Play; in all other modes, engaging the footswitch has the same effect as pressing the LOCATE 1 button (48).

60. CASSETTE DECK TRANSPORT
When loading the tape, make sure the clip at the side is securely holding the cassette. Never remove the tape while the transport is in motion.

61. PITCH CONTROL (PITCH)
This control changes the tape speed ±15%. Use it to tune to various instruments as well as for creative effects.

62. ACCESSORY CONNECTOR (ACCESSORY)
The optional remote control unit, Fostex Model 8031, is connected here.

. OTHER FUNCTIONS

63. SOLO LED (SOLO)
Lights whenever any Solo button is engaged.

64. TAPE SPEED LED (SPEED HIGH)
Lights when the Speed Selector (56) is set to the HIGH position.

65. DOLBY B LED (DOLBY B NR)
Lights when the B-type noise reduction system is selected.

66. DOLBY C LED (DOLBY C NR)
Lights when the C-type noise reduction system is selected.

67. POWER SUPPLY CABLE CONNECTOR (DC IN)

SECTION 4. **MULTITRACK RECORDING**

For purposes of explanation, a representative example will be used:

- First, stereo rhythm (basic track) will be recorded on tracks 1 & 2.
- Second, solo/lead instruments will be overdubbed.
- Third, the vocal will be overdubbed.
- Fourth, the multitrack recording will be mixed to stereo.

Initial settings are as follows:

- Speed selector: High
- Dolby NR Selector: C
- Tape Out jacks 1 ~ 4 jumpered to Line in jacks 5 ~ 8

The procedures and accompanying figures are:

1. Record the electric bass, electric guitar, electronic keyboard and acoustic drums in stereo on Tracks 1 & 2, while processing the kick/snare drums and the bass guitar with a compressor/limiter, and adding overall ambience with an outboard reverb — all in real time.
2. The electric guitar solo is overdubbed on Track 3, and the synth solo is inserted via punch-in/out techniques.
3. The lead vocal is then overdubbed on Track 4.
4. The multitrack master tape is finally mixed to stereo.

Procedure 1 Recording the Basic Rhythm Track

One of the oddities in recording jargon is that "track" in its singular form often refers to more than one "stripe" on the tape. When used in the sense of reference track or "basic", it is almost always rhythmic, however orchestrated, because all subsequent parts will be overdubbed according to this timing reference.

1. Connect the equipment as shown in Fig. 1. Always be sure the Phantom Power switches are correctly set, and if not needed, be sure they are OFF before plugging in a mic or instrument.

2. Use the appropriate accessory SEND/RCV jacks to connect the compressor/limiter(s) for the kick and snare drums and bass.

3. Set all input Selectors to INPUT.

4. Set all assign switches to 1-2 and use the PAN controls to determine stereo placement between channels 1 & 2.

5. Set the TRIM control for each channel in conjunction with the Input Fader such that the PEAK LED lights at the loudest passages. For best results, the fader settings should be between 5 and −5.

6. Set the send level to the recorder by the Meter readings. Select BUSS on the Meter Selector and meters 1 & 2 will display busses 1 & 2. The best setting is when several red LEDs light at peak volume levels.

7. Press 1 & 2 RECORD TRACK Selector buttons. Their corresponding LEDs will blink, indicating record ready status. Press TAPE/BUSS 1 & 2 of the MONITOR Selector and Buss on the TAPE/BUSS Selector. The Monitor outputs and Headphone output have independent level controls.

8. Now is a good time for the musicians to rehearse.

Re-check your level settings above for the optimum balance; make sure each musician hears what he needs to hear in order to play his part well. Now is also a good time to set the EQ. The SOLO buttons are useful in this operation because you can isolate each channel as you make EQ adjustments.

9. Next, use the AUX 1 buss to send selected amounts of each channel to reverb channels, and connect the returns to Buss in 1 & 2.

10. You are now ready to begin recording. You might want to save yourself and the players some grief by making a trial recording of 30 seconds or so, just to be sure all the connections are sound and all the settings are O.K. Begin recording by setting the counter to zero and pressing PLAY and RECORD simultaneously. Recording-in-progress LEDs will now light in red.

11. At the end of the take, release the RECORD TRACK Selector buttons press STOP then LOCATE O, and the transport will automatically return to the beginning. To check the performance, set the TAPE/BUSS Selector and the METER Selector to TAPE and you will be able to both see and hear the recording on Tracks 1 & 2.

NOTE: *Musicians obviously can't be programmed as MIDI insturments, and someone might stop in the middle of a take, dissatisfied, wanting to start over. In this case, the easiest operating procedure is simply to reset the tape counter to zero and start another take with tape rolling.*

Fig. 1
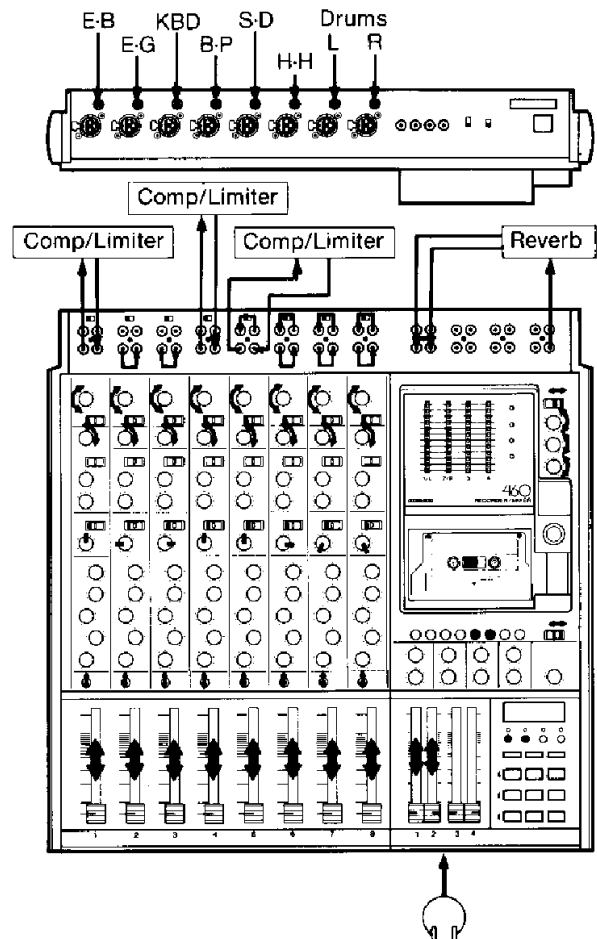
Procedure 2 Overdubbing the guitar, punching-in the synth on track 3.

1. Depending on several factors, including the guitar, the amp, the mic and the room, you may wish to (a) plug the guitar directly into the mixer, (b) mic the guitar amp, or (c) both of the above. In the case of (c), use two input channels and mix them onto one track.

2. Set the Input Selector of Channel 1 to INPUT and the ASSIGN switch to 3-4. Then rotate the PAN control to the full CCW position. The signal from this input channel will now be routed to Track 3 only.

3. Set the Meter Selector to BUSS and the BUSS/TAPE Selector to BUSS. Now set the Input Fader to its nominal operating range and adjust the trim control so that only the loudest passages trigger the PEAK LED.

4. There are several methods of monitoring the overdub. Here we'll use the AUX 2 buss. Set the AUX 2 Input Selectors for channels 5-8 to LINE, and the Gain controls will act as level controls for signals on channels 1-4, respectively. Now select AUX 2 on the Monitor Selector and adjust its level with the Monitor Level Control. the same signal is sent to the headphone jack which has its own level control.

5. Press RECORD TRACK Selector 3 and the blinking LED will indicate record ready status. The RECORD button itself now has a dual function. Press it once and the signal present at the Monitor Outputs and the headphones is the input signal. Press it again and the signal changes to tape. Thus you can rehearse with the track before recording in order to get the proper feel.

6. When you're ready to make the overdub, press PLAY and RECORD simultaneously and the recording-in-progress LEDs will light in red.

7. Press STOP when you finish. Release RECORD TRACK selector 3, press LOCATE O; select TAPE on the BUSS/TAPE and MONITOR Selectors; then press PLAY and listen to tape playback of Tracks 1, 2 & 3.

NOTE: *The assumption here is that the guitar on Track 3 is not playing throughout the entire piece. Further, where there are blank parts on this track, a synth will be inserted using one of the two punch-in recording methods outlined below:*

CAUTION: *Punching-in and -out requires a fairly keen sense of timing. Many bands ask either the drummer or the bass player to operate the controls. If you punch-in too early or punch-out too late, you erase the part that's there, in this case, the solo guitar.*

How to punch-in

	RECORD TRACK SELECTOR	RECORDER FUNCTION	RECORD LED	8051 FOOT SW.
Method ① Depress RECORD TRACK selector	Blink ☼ 3 ● Push	PLAY ▶	RECORD ● ⎍ LED OFF: Tape Monitor Blink: Input Monitor	PLAY
PLAY Punch-in	LED ON ● 3 ●	RECORD PLAY ● ▶ +	RECORD ● LED ON in Red █	↓ Push
Punch-out	Blink ☼ 3 ●	STOP ■	RECORD ● LED OFF	↓ Push PLAY
Method ② RECORD TRACK selector not depressed	LED OFF 1 2 3 4 ○ ○ ○ ○			
PLAY (Punch-in ready state)		RECORD PLAY ● ▶ +	RECORD ● Green LED ON ▨	
Punch-in	LED ON ● 3 ● Push		RECORD ● Red LED ON █	
Punch-out	LED OFF ○ 3 ○ Push		RECORD ● Green LED ON ▨	

Procedure 3 Overdubbing the vocal on Track 4

The settings are the same for the overdub procedure 2, explained above, with the obvious exceptions of changing track designations to 4 and rotating the Pan control to the extreme CW (Even) position.

Procedure 4 Mixdown

With the numerous inputs and outputs of the 460, mixing is readily if not easily accomplished. You have tremendous flexibility over the signal flow and you may connect a wide variety of external signal processors to help tailor the sound to your exact requirements.

1. Connect the master mixdown deck as shown in Fig. 2. Use the Aux 1 buss for the send to the reverb, and use Line in 1 & 2 for the returns.

2. Set the Input Selectors to LINE for Channels 1 & 2 (Reverb Returns) and Channels 5-8 (Tape Playback). Then set the ASSIGN controls to 1-2.

3. Adjust the STEREO GAIN and STEREO PAN controls from the 4-channel buss according to the desired mix, and set the overall level of the mix with the Stereo Master level control. Set the Meter Selector switch to STEREO and Channels 1 & 2 will provide a visual reference for the stereo mix.

4. Use STEREO MASTER for the Monitor Selector and adjust the level with the Monitor Control. Always use the best speakers you can buy, beg or borrow. These are your means of determining what's good and what needs to be re-recorded.

5. Use the AUX 1 buss for the send to the reverb and input channels 1 & 2 for the returns, whose PAN controls should be set fully toward ODD and EVEN, respectively.

6. Adjust EQ according to your preference. The SOLO buttons are very useful for making EQ adjustments for each desired part of the mix.

7. When you have set an initial balance of all the elements for mixdown, it's always a good idea to make a rough mix, just to re-check levels and the gain stages

between the output of the 460 and tape playback from the master deck.

8. The output of the mixdown machine can be monitored by selecting CH 2 of the Monitor Selector.

NOTE: Mixing is never an automatic procedure. You'll probably end up with a whole tape full of mixes for one or two tunes. Use the memory functions of the 460 transport to "bracket" each selection on the multitrack master for additional help.

Fig. 2
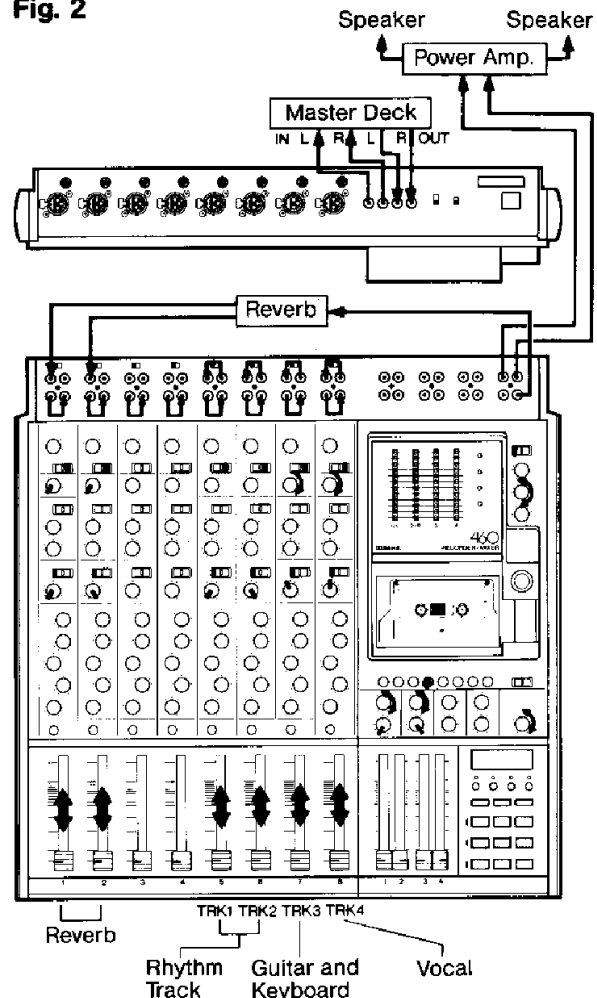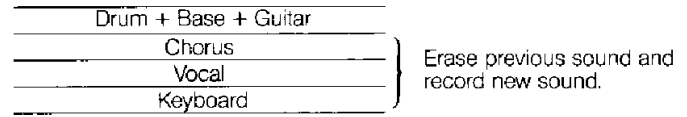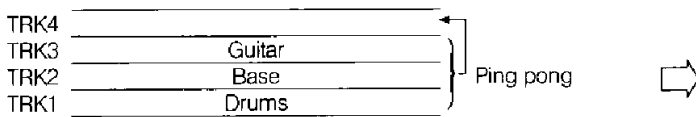

SECTION 5. **PING PONG RECORDING**

This is an indispensible technique for recording more parts than you have tracks. It's also called "track bouncing." The following chart shows how tracks are combined and then transferred to an open track, thereby enabling you to record over the original tracks.

In the process of ping-ponging, you can even add additional parts, as follows:
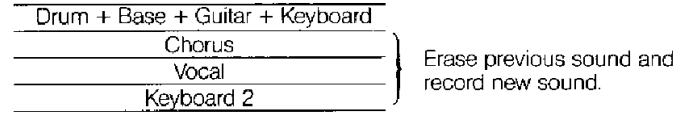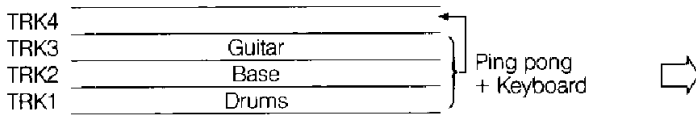
1. Make sure the jumper plugs are correctly seated.

2. Set the Input Selector to INPUT for the channel on which the recording is to be made, and to LINE for Channels 5-7.

3. Set the Input ASSIGN switches to 3-4 and PAN to EVEN.

4. Press RECORD TRACK Selector 4; TAPE/BUSS Selector to TAPE, and either AUX 2 or TAPE on the monitor Selector.

5. Press the PLAY button and adjust the input Faders and 4-channel buss faders for the proper level balance.

6. Several rehearsals will probably be necessary until you achieve the exact balance/mix between the pre-recorded tracks and the new part. The RECORD button alternately changes the monitor status from input to tape in order to assist you in this regard. When you are ready for the final transfer, press RECORD and PLAY simultaneously.
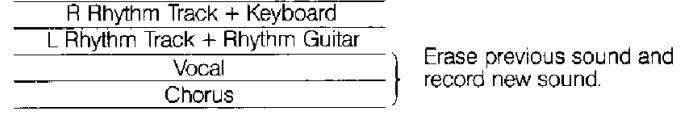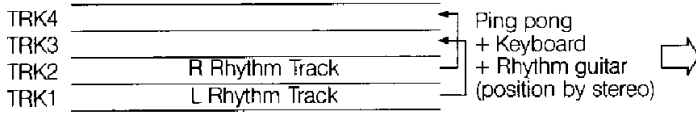
Example: Ping pong recording of tracks 1 ~ 3 onto track 4

TRK4	
TRK3	Guitar
TRK2	Base
TRK1	Drums

Ping pong ⇨

| Drum + Base + Guitar |
| Chorus |
| Vocal |
| Keyboard |

Erase previous sound and record new sound.

● Plus-one together with ping pong of tracks 1 ~ 3 onto track 4

TRK4	
TRK3	Guitar
TRK2	Base
TRK1	Drums

Ping pong + Keyboard ⇨

| Drum + Base + Guitar + Keyboard |
| Chorus |
| Vocal |
| Keyboard 2 |

Erase previous sound and record new sound.

● Stereo ping pong + plus recording

TRK4	
TRK3	
TRK2	R Rhythm Track
TRK1	L Rhythm Track

Ping pong + Keyboard + Rhythm guitar (position by stereo) ⇨

| R Rhythm Track + Keyboard |
| L Rhythm Track + Rhythm Guitar |
| Vocal |
| Chorus |

Erase previous sound and record new sound.

7. When the recording is finished, rewind and check the balance/mix of Track 4. If the results are satisfactory, you can now erase the material on Tracks 1, 2, & 3 and replace them with new parts.

NOTE: *The inherent nature of the recorder is such that high frequencies are attenuated and low frequencies are accentuated by this process. A certain amount of compensation can be planned with the addition of EQ, but it is not recommended to ping-pong a given source more than twice.*

SECTION 6. **SPECIAL OPERATING TECHNIQUES**

I. Live Reinforcement, Example 1.

A smaller group can generate a much bigger concert sound by taking advantage of the 460's integrated mixer/recorder. By using a tape with a reference click track and pre-recorded parts, the musicians on stage can coordinate their arrangements so that their live performance closely resembles the music they multitrack in the studio.

One such set-up is shown in Fig. 3.

Tape playback is mixed with the AUX2 Gain and Pan controls and AUX 2 outputs are patched to BUSS In 1 & 2 so that the pre-recorded sounds on the tape can be fed directly to the program faders 1 & 2 and mixed together with the live performance.

The reference click track is on Track 4. Selected by the TAPE/BUSS selector switch and the MONITOR selector, the signal is then sent to the PHONES track so that the musicians will play in sync.

II. Live Reinforcement, Example 2.

In this example, the click track will be replaced by a sync signal from a MIDI sequencer using the Fostex TS-15 FSK interface unit. MIDI digital information is largely unreadable by tape recorders. Frequency Shift Keying devices (FSKs) translate the MIDI 0s and 1s into frequencies which tape recorders can easily handle.

Thus a small combo with MIDI instruments can painstakingly program them before the concert, and then use the sequencer to trigger/cue on-stage performance of a three-way blend of sound sources: pre-programmed MIDI instruments, playing "live" in real time, pre-recorded tape tracks and live instruments/vocals.

Fig. 3

10
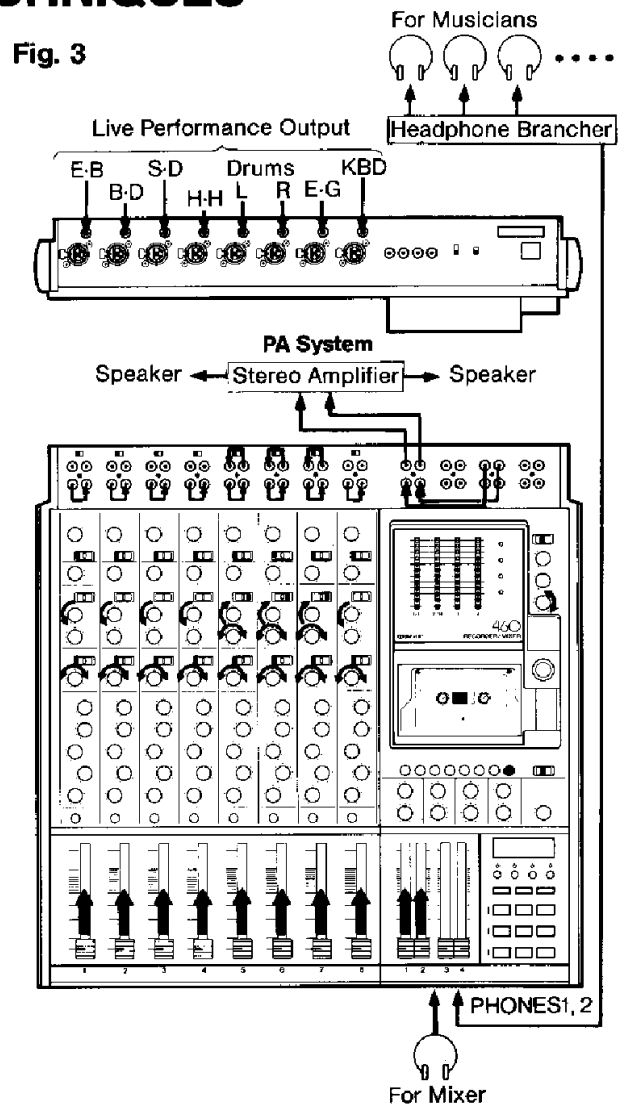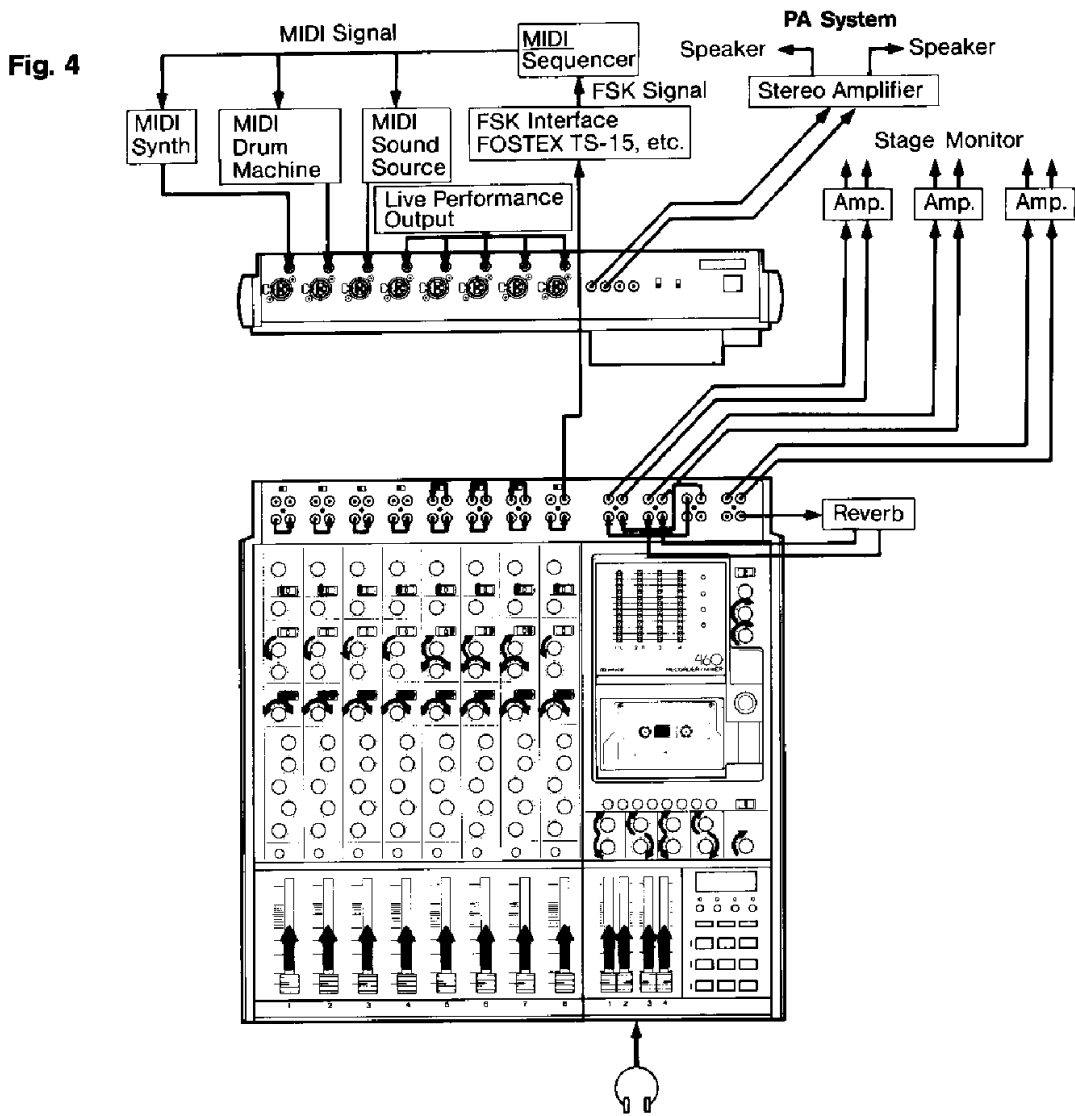
Fig. 4

Set up the equipment as shown in Fig. 4.
The signal from the STEREO OUT jacks is sent to the PA amplifier for the house mains, and overall level is set by the Stereo Master level control. BUSS OUT and MON OUT jacks are used for sends to the stage monitors, and levels may be separately adjusted by the 4-channel buss master faders and the Monitor level control. Given the multiple selection capability of the Monitor Selector, several different patterns of stage monitoring signals can be programmed to suit the needs of the musicians and the peculiarities of the stage environment.
Additionally, the AUX 1 Buss may be used to send selected signals to a reverb unit for further enhancement of strings, vocals, etc.

SECTION 7. **ROUTINE MAINTENANCE**

Common sense says to keep your Model 460 dry and clean, free of dust, to avoid shocks and extremes in temperature/humidity. What you may not know is that all tape recorders require routine cleaning. It's just a matter of physics: as the tape passes over the heads & guides, a little magnetism and some oxide are deposited.

After a short while, you will be able to see the oxide residue, but not the increased magnetism. Each requires its own cleaning procedure. Because if the build-up of oxide and magnetism is left unchecked, the recorder degenerates from impaired to permanently damaged.

Just a few minutes a day of routine cleaning will keep your Model 460 working in top operating condition, giving you all the sound you paid for.
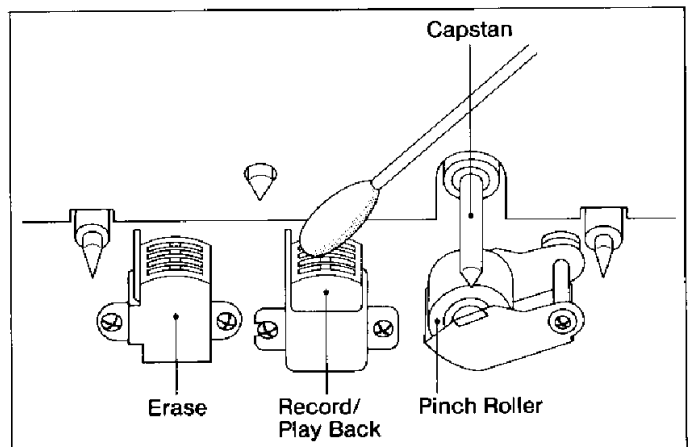
Use Fostex Cleaners 9600 or isopropyl alcohol on the heads, guides and capstan shaft. Cotton swabs are great. Use Fostex 9600 or an equivalent rubber cleaner on the pinch roller. Never use isopropyl alcohol on rubber parts because they then might dry and crack.

Clean all parts indicated. Be careful with the heads. You don't want to scratch them.

After cleaning, allow the surfaces to dry before inserting a cassette. A canister of compressed air is a great way to keep the cassette compartment dry and dust free.

To demagnetize (degauss) you need a unit like the Fostex HD-10. Follow the instructions that come with the unit. The following process is fairly standard:

1. Turn the Model 460 Off and remove any tape from the area.

2. Turn the demagnetizer on at a distance of three feet (one meter) from the Model 460.
3. Slowly bring the probe close to the head, begin moving the probe up and down, increasing the arc as you gradually pull away.
4. Turn the demagnetizer off at a distance of three feet (one meter) from the Model 460.
5. Repeat the process for all other metal parts in the tape path.

Do yourself a favor and set aside a time for cleaning and demagnetizing your Model 460. Do it every day — every four hours if you're really using it hard. With a schedule like this, you'll never have to spend more than a few minutes each time, and your Model 460 will always be ready to perform its best.

If schedules make you sad, then just remember to clean and demagnetize before any recording or mixing session.

SECTION 8. TROUBLESHOOTING

The following list of problems/solutions are common "pilot error" situations. Before you take the time and trouble to have your 460 serviced, check these items:

The power doesn't turn on — check the power supply cables; are they securely connected? This is not a silly problem. It happens with alarming frequency.

The tape won't play properly — is the cassette loaded properly? Push it all the way in so that the clip positions it in place.

Tape playback is too slow/too fast — is the pitch control on? How about the speed selector, is it set properly?

The high frequency response sounds thin/funny- are the heads clean? Dirty heads account for more unnecessary trips to service departments than any other reason. Other factors that effect high frequency response are tape formulations (use high bias 70 μsec EQ only) and the Dolby NR settings.

No sound in the monitors/phones — is a solo button engaged? Are the MONITOR and TAPE/BUSS Selectors correctly set?

A signal cannot be sent to the desired track — is the Input Selector, Assign Switch and Pan Control each correctly set? Also, remember that the 4-channel buss outputs 1 - 4 are automatically routed to tracks 1 - 4.

AUX 1/AUX 2 feedback — check the input/output connections to the signal processor. See page 15 for details.

Feedback when a track is switched to input monitor — is that track's tape out connected to its buss in? Also check the Assign Switches and Pan Controls.

(Recommend that we delete the After Service section. The warranty card should suffice.)
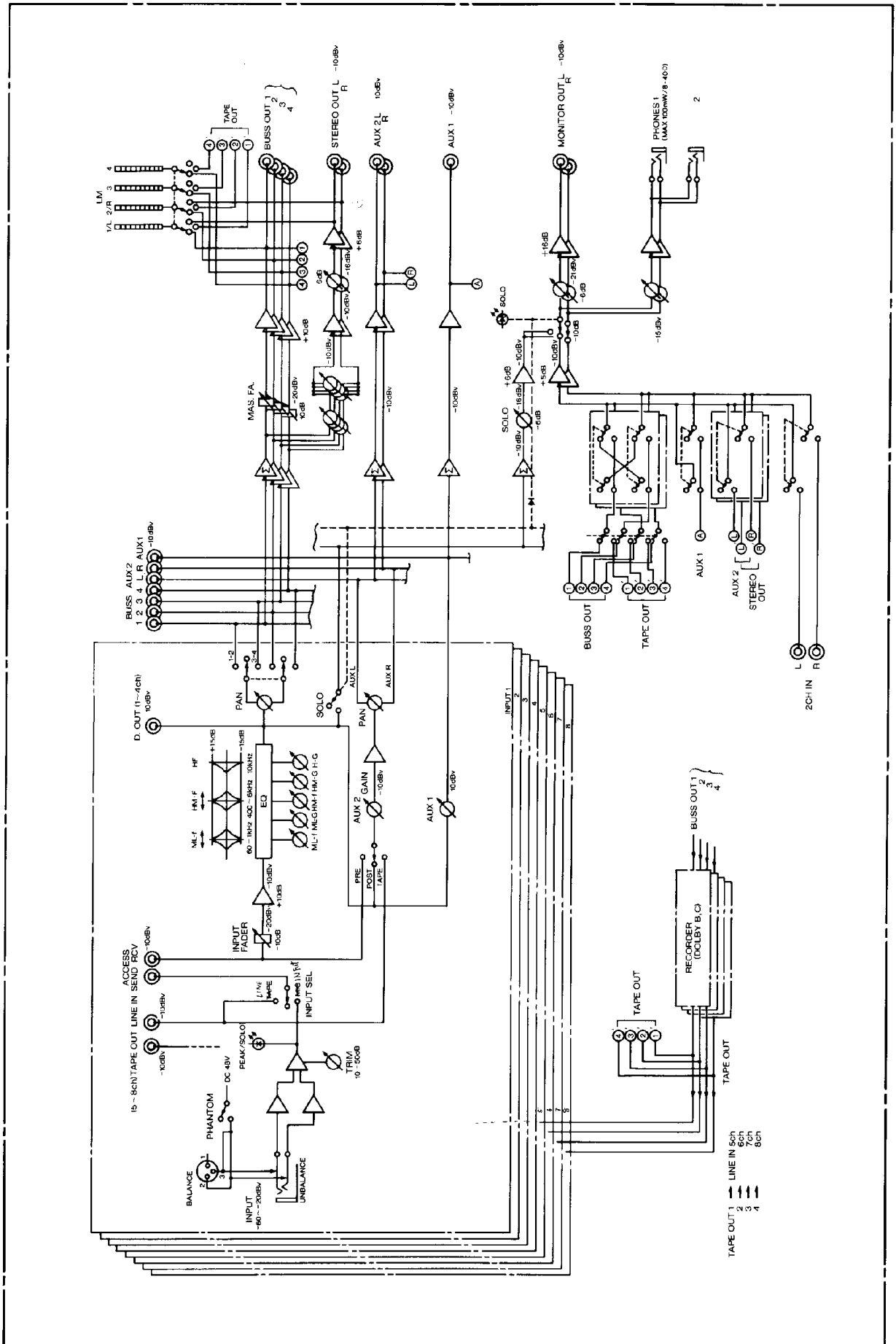
Notes on the equalizers:

The 10 kHz fixed shelving type equalizer and the 2-band parametrics on each input channel are very effective in compensating for microphone irregularities as well as the peculiarities of room acoustics. They are not intended, however, to replace microphone technique. Experiment both with different types of microphones as well as different placements of a given mic. Try to get as close to the sound you want with mic selection and placement, then the equalizers will serve to enhance the sound,. Too much EQ can destroy the natural timbre of the instruments.

Sound range of various musical instruments
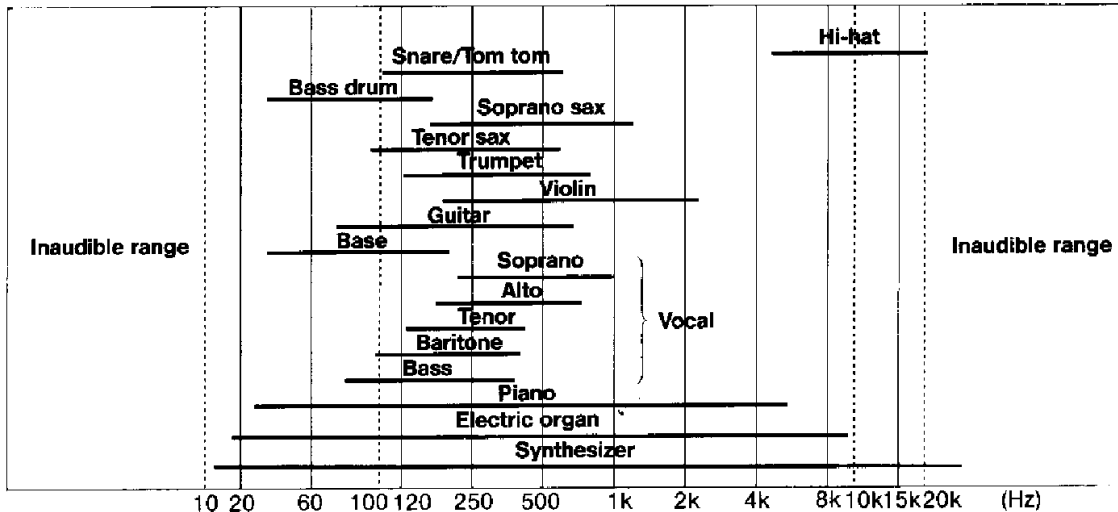
TYPICAL EQUALIZATION RESPONSE GRAPH

INSTRUMENT	CUTTING	BOOSTING	OTHER COMMENTS
Human Voice	Scratchy at 2kHz Nasal at 1kHz Popping p's below 80Hz	Hot at 8 or 12kHz Clarity above 3kHz Body at 200 – 400Hz	Tend towards thin when blending many voices.
Piano	Tinny at 1 – 2kHz Boomy at 320Hz	Presence at 5kHz Bass at 125Hz	Not too much bass when mixing with rhythm section.
Electric Guitar	Muddy below 80Hz	Clarity at 3.2kHz Bass at 125Hz	
Acoustic Guitar	Tinny at 2 – 3.2kHz Boomy at 200Hz	Sparkle above 5kHz Full at 125Hz	
Electric Bass	Tinny at 1kHz Boomy at 125Hz	Growl at 620Hz Bass below 80Hz	Sound varies greatly with strings used.
String Bass	Hollow at 620Hz Boomy at 200Hz	Slap at 3.2 – 5kHz Bass below 200Hz	
Snare Drum	Annoying at 1kHz	Crisp above 2kHz Full at 125Hz Deep at 80Hz	Also try adjusting lightness of snare wires.
Bass Drum	Floppy at 620Hz Boomy below 80Hz	Slap at 3.2 – 5kHz Bass at 80 – 125Hz	Usually record with front drum head off Put blanket inside of drum resting against the head.

● Depth of sound by controlling frequency around 100Hz ● Add character by controlling frequency around 1kHz
● Voluminous sound by boosting 2 ~ 4kHz ● Clarity by boosting around 6kHz
● Sound brilliancy by boosting above 8kHz

Connecting signal processors

Various signal processors such as reverbs, delays, compressors, etc., are indispensible tools for the modern recordist. In many cases, they are absolutely necessary to achieve a desired effect. Your 460 is very well equipped with inputs/outputs and patch points which allow these devices to be connected in a variety of configurations.

As with most aspects of modern recording, flexibility is the key. The 460 has direct outputs and send/receive patch points on each input channel. In addition, the AUX 1 buss can be used for a post-fader mono mix of all input channels, and the AUX 2 stereo buss can be set as follows:

PRE: signals before the input fader and equalizers are mixed
**POST:** signals after the input fader and equalizers are mixed
LINE: used for tape monitoring during overdubs

Normally the BUSS IN jacks are used for signal processor returns. When multiple units are being used, you might want to consider a line mixer like the Fostex 2050 for even greater signal flow flexibility. Refer to Page 15 for details on connection.

Connecting individual processors to input channels

This type of connection is for direct processing units such as noise gates, compressor/limiters, chorus, etc.
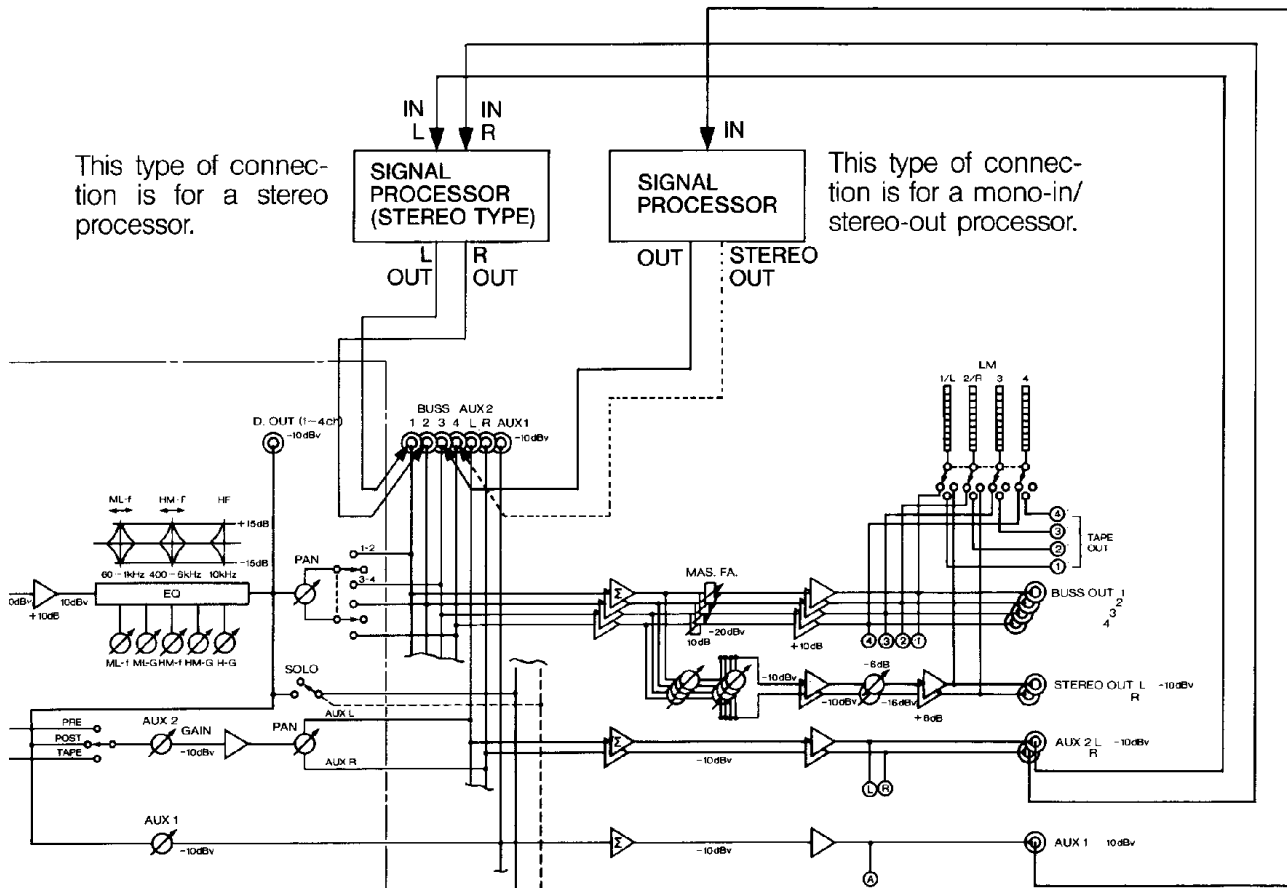
This type of connection is for adding the processed sound to the original signal — digital delay and reverb.
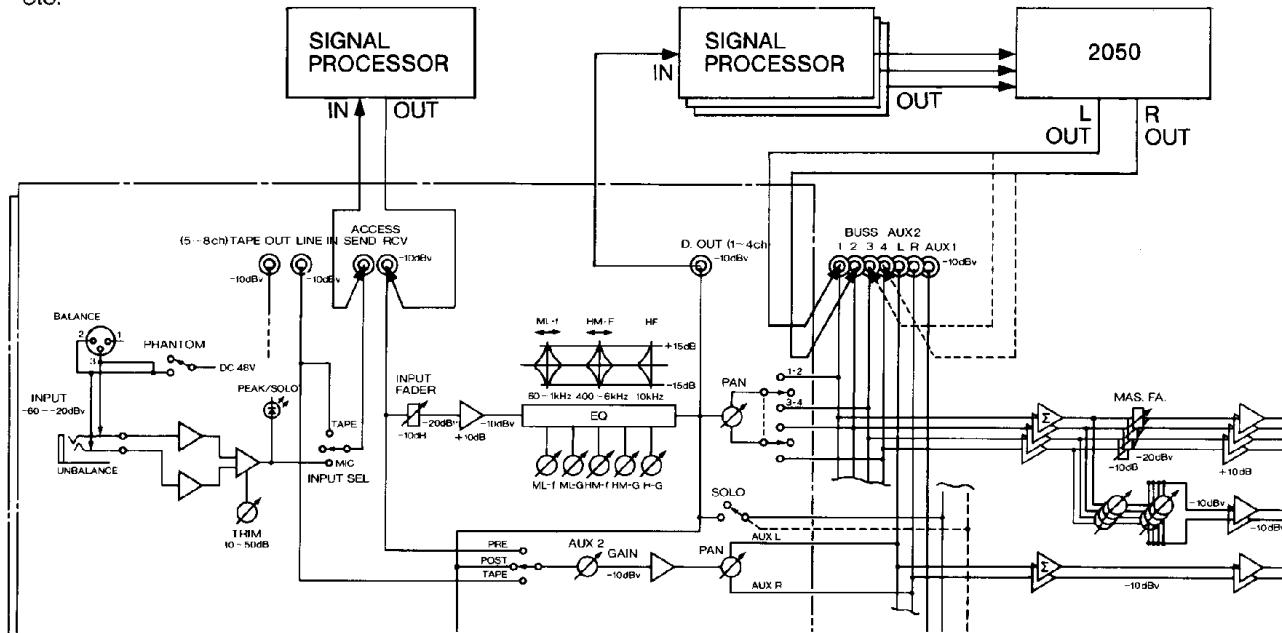
Connecting processors to AUX 1 and AUX 2 Busses

This type of connection is for a stereo processor.

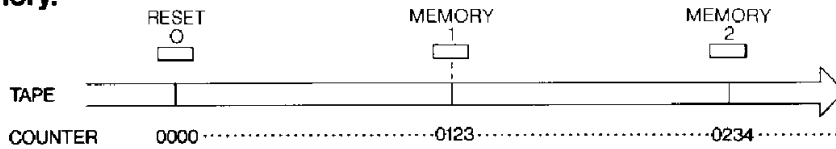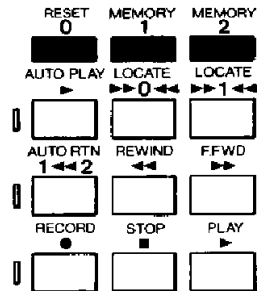This type of connection is for a mono-in/stereo-out processor.

The Locate function

A convenient locate function gives you greater control over the 460's tape handling abilities. The memory functions are particularly convenient when you are overdubbing multiple parts.
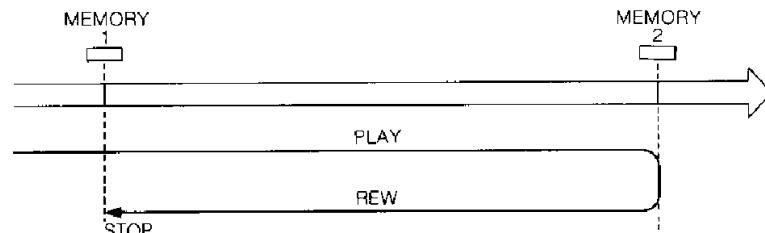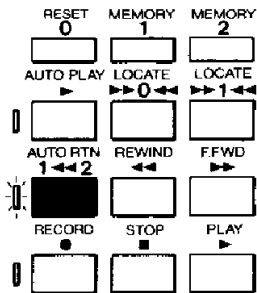
1. Programming the memory.

When the transport is in PLAY, REW, FF or STOP, pressing either MEMORY button stores the counter number, and pressing RESET changes the counter to 0000.
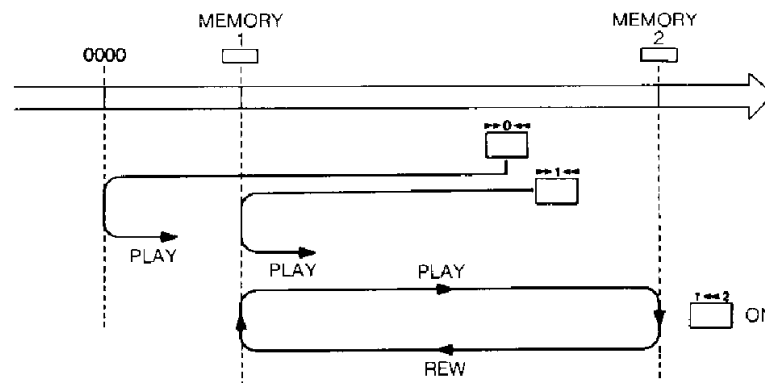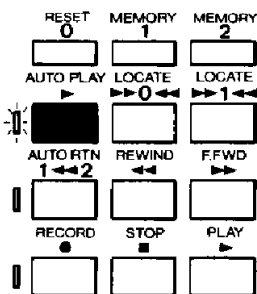
2. Locate
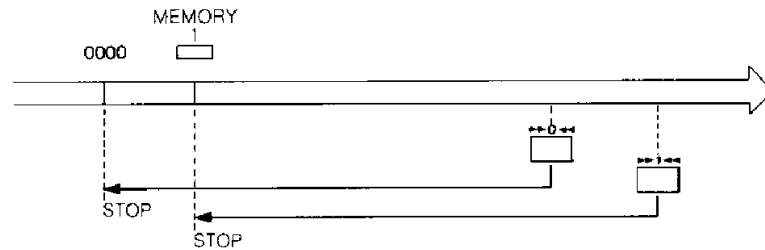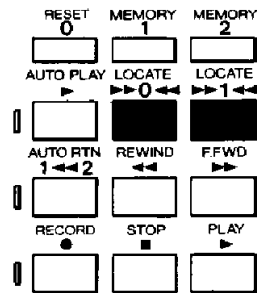
When these two buttons are pressed, the transport will automatically seek the 0000 or MEMORY 1 position.

3. Auto Return

When PLAY is entered with this button engaged, the tape will rewind automatically when the MEMORY 2 is reached and stop at MEMORY 1. (Be sure the counter numbers are stored MEMORY 2 > MEMORY 1 — if another condition exists, the counter will blink, indicating an error.)

4. Auto Play, Shuttle Repeat

The transport will automatically enter PLAY after locate when this button is ON. When auto return (1 << 2) is also engaged, the transport will shuttle back and forth between MEMORY 1 and 2.

Figure Blank track sheet for reproduction

TAPE No.:	SONG/TITLE:	START DATE:	END DATE:	NOTE ALL PERFORMERS ON BACK OF THIS SHEET

INITIAL TAKE & OVERDUBS						
REF. NO.	TAPE INDEX COUNT	PROGRAM ON EACH TRACK OF TAPE				COMMENTS/NOTES
		TRACK 1	TRACK 2	TRACK 3	TRACK 4	

TRANSFERS/TRACK COMBINATION						
REF. No.	INDEX COUNT	PROGRAM TRANSFERRED ONTO EACH TRACK OF TAPE				COMMENTS/NOTES
		TRACK 1	TRACK 2	TRACK 3	TRACK 4	

SETUP FOR REMIX TO STEREO (OR MONO)							
TRACK No.	CHAN. FADER	EQUAL		2 CHAN (1-2) PAN	EFFECTS PATCH AUX OUT	BUSS IN	COMMENTS
		H	L				

17

SAFETY INSTRUCTIONS

WARNING
"READ BEFORE OPERATING"

1. Read Instructions—All the safety and operating instructions should be read before the appliance is operated.

2. Retain Instructions—The safety and operating instructions should be retained for future reference.

3. Heed Warnings—All warnings on the appliance and in the operating instructions should be adhered to.

4. Follow Instructions—All operating and use instructions should be followed.

5. Water and Moisture—The appliance should not be used near water—for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.

6. Ventilation—The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

7. Heat—The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.

8. Power Sources—The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

9. Power-Cord Protection—Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

10. Cleaning—The appliance should be cleaned only as recommended by the manufacturer.

11. Nonuse Periods—The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

12. Object and Liquid Entry—Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

13. Damage Requiring Service—The appliance should be serviced by qualified service personnel when:

    A. The power-supply cord or the plug has been damaged; or

    B. Objects have fallen, or liquid has been spilled into the appliance; or

    C. The appliance has been exposed to rain; or

    D. The appliance does not appear to operate normally or exhibits a marked change in performance; or

    E. The appliance has been dropped, or the enclosure damaged.

14. Servicing—The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.