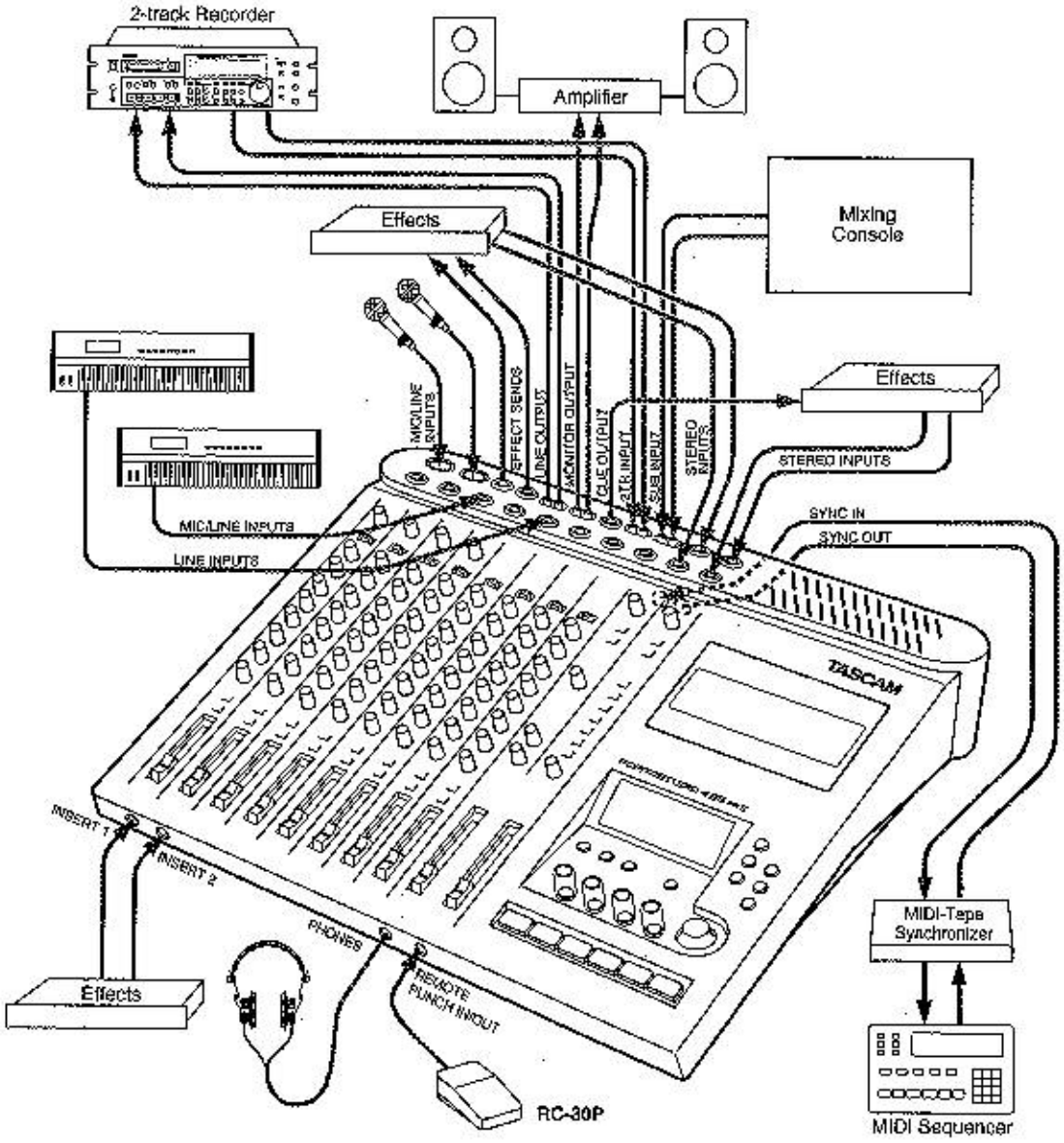
The Recording System

The PORTASTUDIO 488 is a complete audio production facility in a single box. It is divided into two major sections: a full-function mixer and an 8-channel, multitrack cassette recorder. To complete the recording system, you'll additionally need these: Input devices (microphones, instruments), Output devices (headphones), 2-track recorder, Effects processors, etc.

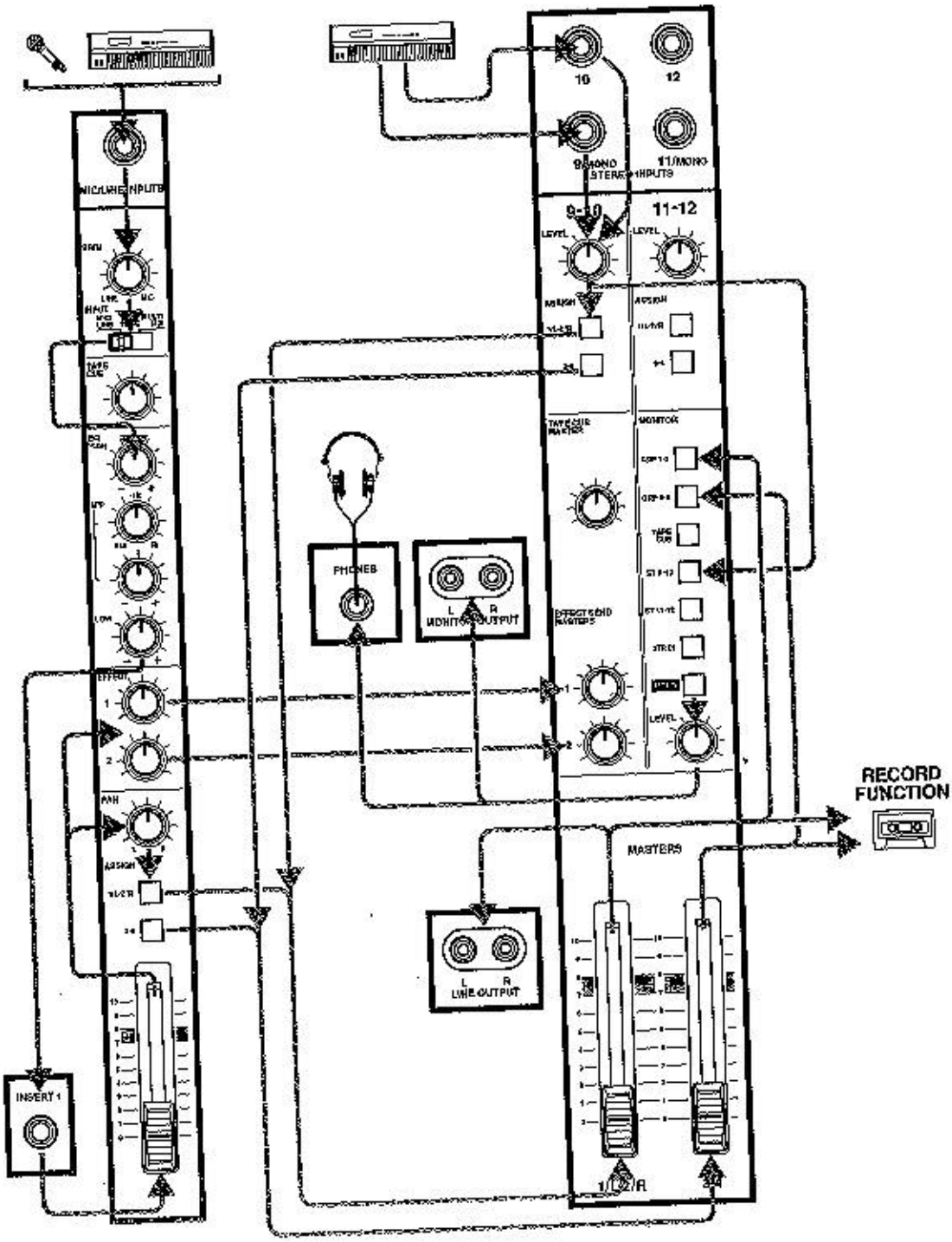


The Three Steps to Multitrack

In TRACKING and Overdubbing, the mixer inputs are usually microphones or instruments, going to different tracks of the recorder.
In OVERDUBBING, the MONITOR section and TAPE CUE of the mixer must be used to listen to previous tracks while you record new ones, so there is a two-way flow through the console.
In MIXDOWN, signal comes from the multitrack and is sent to an external 2-track recorder.

Signal Flow in the 488 mixer

The illustration below shows how the input signal passes through the 488 Mixer section. After the MASTERS faders they go to the LINE OUTPUT jacks and the multitrack recorder (not shown). This is the most important signal route in the mixer and is called "Main Mix".



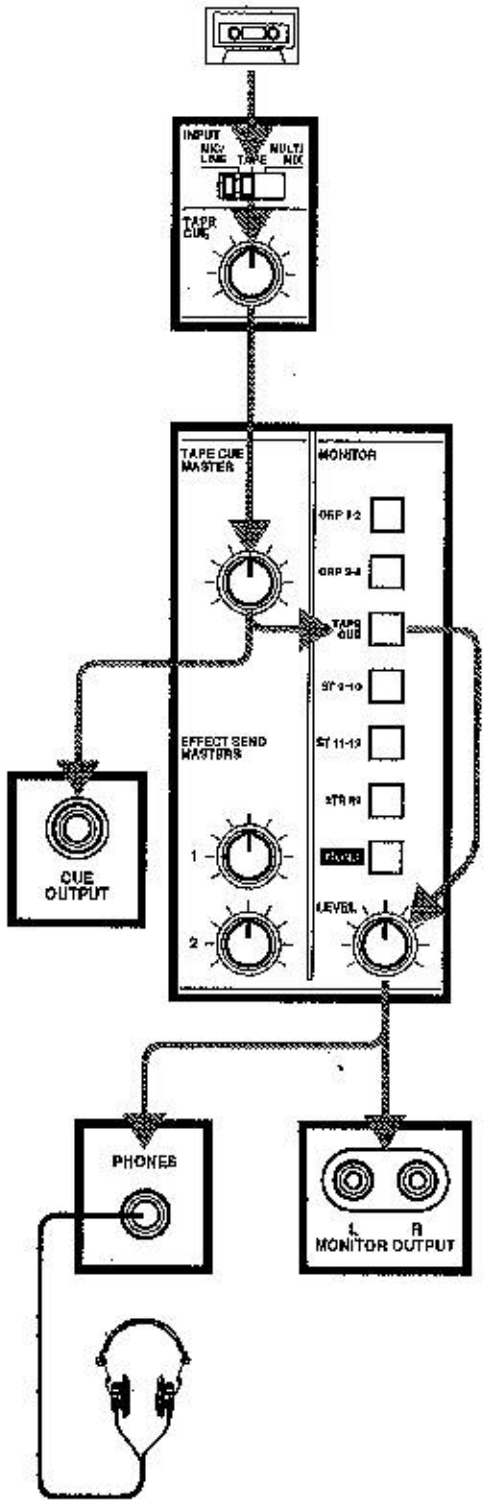
Cue Monitor System

The CUE mix and MONITOR switches are also crucial for successful multitrack recording, because they control what you hear in the headphones. This CUE mix is totally independent from the Main Mix going to tape. *If you don't use the CUE mix, you run the risk of accidentally "bouncing tracks" every time you record new material.*

The TAPE CUE control in each of the first 8 channels gets its signal from the multitrack recorder, and sends playback to the TAPE CUE Monitor.
Settings of these controls don't affect the mix going to tape. When any of the TAPE CUE controls and the TAPE CUE MASTER control are turned to the right, TAPE CUE is pressed in the MONITOR switch, and the MONITOR LEVEL control is turned up, you can hear tape playback in the headphones. You can adjust the monitor level of each track by adjusting its TAPE CUE control. The channels of the Main Mix remain free to handle external inputs for recording.

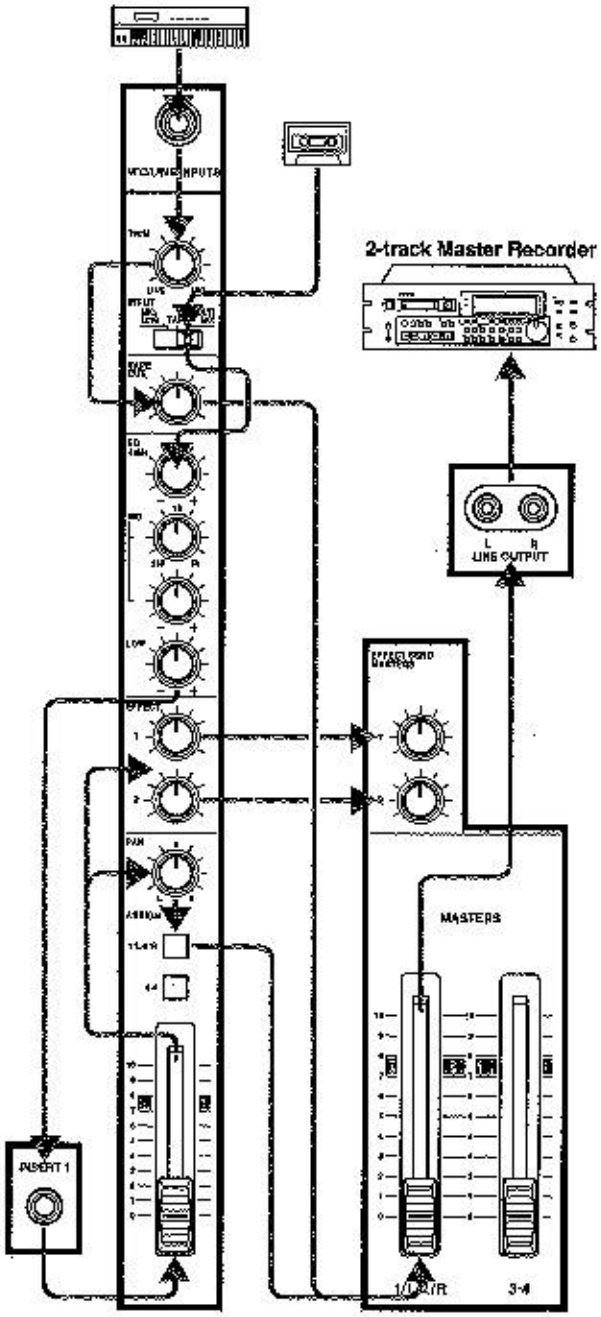
If you can hear tape playback in your headphones when TAPE CUE is not pressed, it means you're hearing tape through the Main Mix. This is correct for mixdown and bouncing tracks, but during overdubbing it can cause previous tracks to be mixed together with new tracks, instead of each part remaining separate. Use the TAPE CUE to avoid this.

Use the seven MONITOR switches to choose which mix(es) to hear via headphones/monitor speakers: The GRP 1-2 and GRP 3-4 to monitor the signal coming from either 1-2 or 3-4 groups; TAPE CUE for monaural signal adjusted using the TAPE CUE MASTER control. ST 9-10 and ST 11-12 to monitor signal input to the stereo input jacks after adjustment using LEVEL controls; and 2TR IN for the left and right signals input to the 2TR INPUT jacks. You can even monitor the stereo signal in mixed monaural sound using the MONO switch.



Multi Mix operation

The MULTI MIX position of the INPUT assign switch is especially convenient when an additional track is required during mix-down. With the switch in this position, the tape playback signal (in which your previous recordings have been made) returns to the main channel, while the additional track signal is supplied to the TAPE CUE section. Therefore, you can record the signal from a MIDI sequencer, etc. plugged into the MIC/LINE jack together with the main channel signal onto the 2-track Master Recorder. In such a case, you can adjust the level of the additional input using the TAPE CUE control, although the TAPE CUE control does not adjust tape playback signal as in normal operation.



Multitrack Cassette Recorder

The 488 records on readily available standard (Philips) Compact Cassette tape, high bias Type II. The recorder has 8 tracks while the mixer has 4 group outs; you can record a maximum of 4 tracks at one time. For more details, see "How to Record Multiple Tracks Simultaneously", page 21.

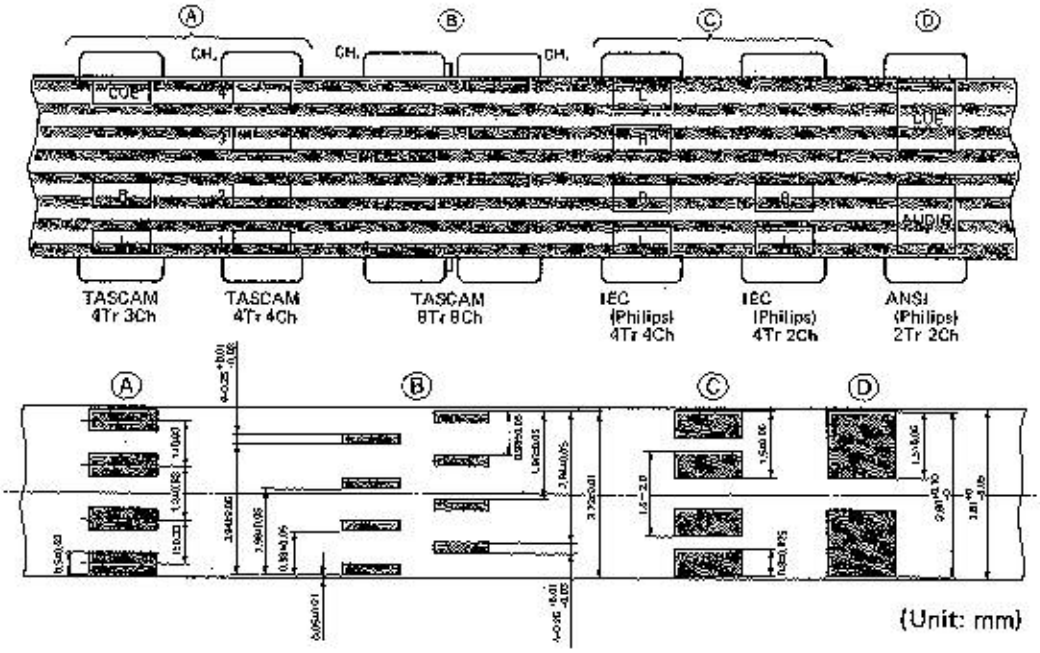
The 488's dbx Noise Reduction virtually eliminates unwanted tape noise. A special SYNC feature turns off the dbx on track 8 separately, making it possible to record and play back the MIDI sync tones or SMPTE/EBU time code without being affected by the dbx encode/decode. This ensures that the sync tones/code are recorded and played back without unnecessary processing. With proper operating techniques, it is not necessary to leave a guard band between music and sync tone tracks because of the low crosstalk of the TASCAM heads.

The transport controls of the 488 are microprocessor operated, allowing highly reliable functions that make the unit easier to use:

- A three position autolocator (MEMO 1 and 2 and Zero) allows key positions to be located automatically.
- REPEAT allows a section to be played over and over between the MEMO1 and MEMO2 points for rehearsal.
- REHEARSAL programs the 488 to repeat a punch-in/out sequence as many times as you wish, and AUTO IN/OUT actually executes it on tape exactly as you "previewed" in REHEARSAL.
- The tape speed can be increased or decreased with the PITCH CONTROL dial in both playback and record, to match pitch or for special effects.
- Punch-in and Punch-out can be engaged using the optional RC-30P footswitch, which gives you an "extra hand" in the recording process.

Track Format and Tape Recommendations

The Portastudio 488 uses a basic speed of 9.5 cm/sec. (3-3/4 ips) which is two times (2X) the normal speed of a standard audio cassette. It also employs a discrete 8-channel format developed especially by TEAC for TASCAM multitrack cassette recorders. Here is a comparision of various cassette formats:

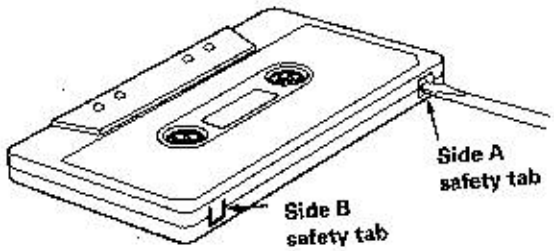


Tapes recorded on stereo cassette recorders will not playback properly on the 488 because of the differences in the track format and tape speed. For the same reasons, tapes recorded on the Portastudio 488 will not playback properly on stereo cassette recorders. Material recorded on the 488 must be mixed down to stereo for final distribution.

The 488 needs the entire width of the tape to record its eight tracks, eliminating the option of recording on both sides (actually, it's both directions). Therefore, you should decide which side (side "A" or side "B") you want to use and use that side exclusively. It's a good idea to get into habit of consistently using the same side on all multitrack tapes.

Tape Type
The Portastudio 488 is internally adjusted for HIGH BIAS "Type II" tape. For best results, you should only use tapes of this type. TDK SA, Maxell XL-II or equivalent formulations are recommended. We strongly suggest that you select one good quality brand and use it exclusively. The time you spend creating your multitrack master is much more valuable than the money you save by buying inferior tape. The cassette shell essentially becomes a part of the 488's transport. Poor quality shells can cause wrinkles, snarls and shredding of the edges of the tape with use. Even small scratches on the tape oxide can cause "dropouts" (temporary loss of signal) on one or more tracks. High quality tapes are less likely to cause problems in the long run.

Accidental Erase/Record Protection
To protect a finished master tape, it is necessary to punch out both record protect tabs. Even though you are recording in only one direction, the 488 uses the entire width of the tape, as mentioned above. If, for example, you remove only one of the tabs, you could accidentally insert the cassette into the 488 backwards and erase all eight tracks of the master.



Tape Length
Use the shortest possible tape for a given work. It is not unusual to play a tape 100 times before you are finished, so select a cassette length that is as close as possible to the length of the program you plan to record. Cassettes C-60 length and shorter are often made from thicker stock than longer cassettes.

The tape used in C-120 cassettes is extremely thin and can cause winding problems, crimping, wrinkling, and other damage to the oxide coating of the tape which will destroy your work. Don't use C-120s in the 488.

Remember that at 2X normal speed, and the "one-side-only" 8-track single direction format means that you have only 1/4X normal play time:

	(approx.)
C-30	7.5 min
C-46	11.5 min
C-60	15 min
C-90	22.5 min

The Tape Counter is Not a Clock
The tape counter reading is based on reel tables whose rotation depends on tape length, cassette hub diameter and other mechanical factors. The running tape counter is not as accurate as a wrist watch or wall clock. The table below shows approximate ranges of running time discrepancy for varying lengths of tape making a one-way run from beginning to end.

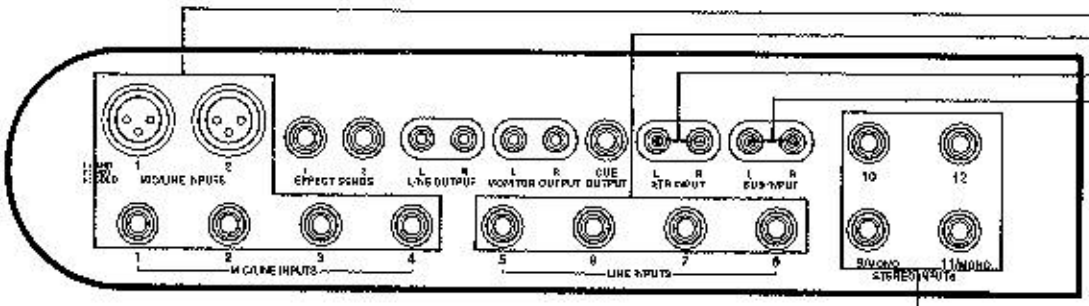
C-46	+30" to +1'30"
C-60	–30" to +30"
C-90	–1'00" to 0"

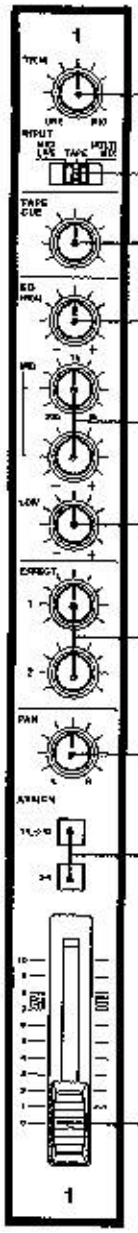
NOTE:
Tapes of the same type fabricated by different manufacturers offer different numbers.

- When you need to measure a particular program's length correctly, use a stop watch.
- Information above regarding tape counter reading applies only to elapsed time as read from a watch or clock, not to the accuracy of the Auto Punch-In/Out functions.
- When power is turned off, the tape counter resets to zero.

For detailed information on each feature, see "Features and Controls", pp. 39 - 46 of the supplied manual.

Input Selection and Adjustment





TRIM : This is used to set preamplification level on the MIC/LINE INPUTS. Turn to the right if the signal needs amplification, to the left if the signal is so loud it is distorting the mixer electronics.

INPUT : This is used to control where the MIC/LINE INPUTS jack signal is sent:
MIC/LINE : For sending signal through the mixer channel controls.
TAPE : Mixer source is tape playback from the multitrack.
MULTI MIX : The source of the mixer channel is still tape playback from the multitrack, but the MIC/LINE INPUTS source signal flows into the TAPE CUE section.

TAPE CUE : This allows you to adjust the tape playback signal level sent to the TAPE CUE MASTER control. When the INPUT switch is assigned to the MULTI MIX position, this control adjusts the signal level from the MIC/LINE INPUTS jack to be supplied to the stereo buss (group buss 1 and 2).

EQ HIGH : Cuts or boosts treble frequencies. Shelving point is at 10 kHz.

EQ MID : The upper control sets the frequency range that will be cut or boosted by the lower control, centered from 250 Hz to 5 kHz.

EQ LOW : Cuts or boosts bass frequencies. Shelving point is at 100 Hz.

EFFECT : These get their signal from a point just after the channel fader (i.e., "post fader send") and route the corresponding channel signal to the EFFECT SEND MASTERS.

PAN : This control allows you to create stereo mixes by sending the signal from the channel feder in continuously variable degrees to the odd or even groups (or to the left or right sides of the stereo mix at mixdown time).

ASSIGN switches : These route signals coming from the PAN control to the corresponding MASTERS faders, for recording onto multitracks.

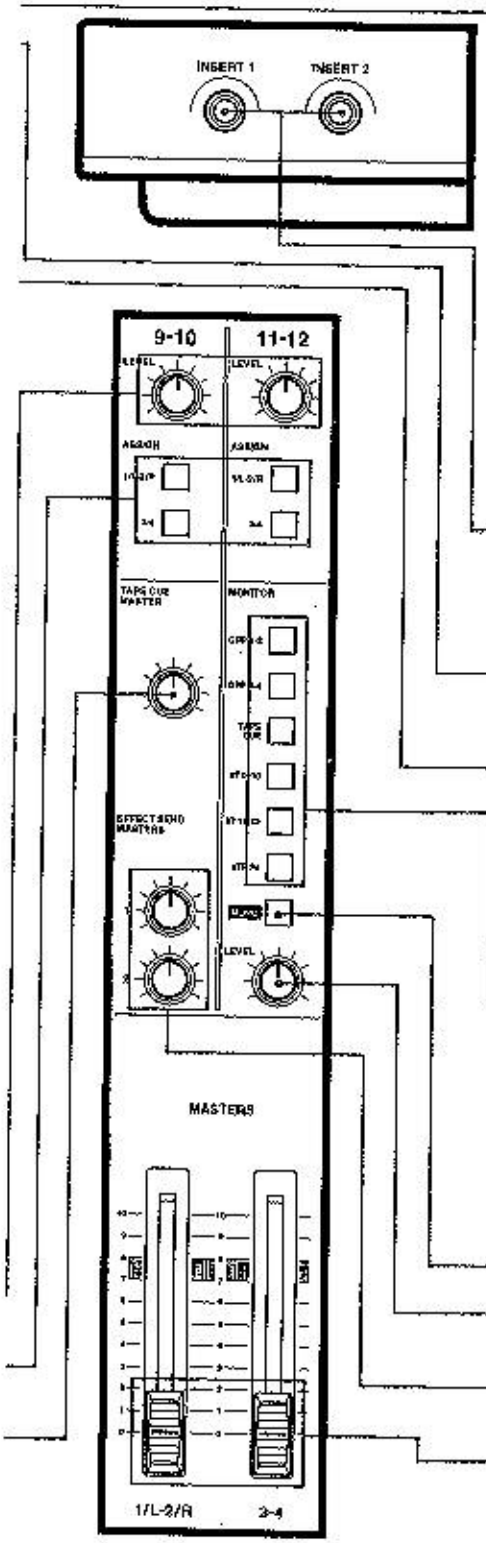
Channel fader : This linear control varies the level feeding the Master section. The nominal setting position is between 7 and 8 (shaded area).

STEREO INPUTS : Connect the outputs of your effects devices to these 1/4" jacks, which can also be used as line level inputs in any way you wish.

LEVEL : This rotary control varies the level feeding the Master section. The nominal setting position is about 2 o'clock.

ASSIGN switches : These route signals coming from the LEVEL control to the corresponding MASTERS faders, for multitrack recording.

TAPE CUE MASTER : This gets its signal from tape via the TAPE CUE control in channels 1-8.



MIC/LINE INPUTS [CH. 1 - 4] : These are the input jacks for the mixer channels. Primarily, the 3-contact, XLR-type connectors (CH. 1, 2) are for connection to balanced microphones, and the 1/4" jacks (CH. 1 - 4) are for line-level, unbalanced signal sources (such as electronic instruments). But you can also connect lower-level signals (down to -50 dBV) to these 1/4" jacks and use the TRIM control to amplify them.

NOTES

- DO NOT use both the XLR-type and 1/4" phone jacks for connection to channel 1 and/or 2 at the same time.
- Be sure to set the PHANTOM POWER switch on the rear to OFF: (1) if you don't connect any condenser-type microphones requiring external power (DC +48 V) to the XLR-type connector in channel 1 or 2 ; or (2) if unbalanced signals are connected to either of or both channels 1 and 2.

LINE INPUTS [CH. 5 - 8] : These 1/4" jacks are for connection of unbalanced line level signals. The nominal input sensitivity is -10 dBV (0.3 V). The LINE input has no trim control and directly reaches the INPUT assign switch.

INSERT [1/2] : Lets you insert an external signal processor (typically a compressor or equalizer) in the input channel signal path between the EQ section and the channel fader. If nothing is plugged into these jacks, it has no effect ; signal will go down the channel normally. Use the TASCAM PW-2Y/4Y insertion cable.

2TR INPUT [L/R] : These jacks connect directly to the MONITOR select 2TR IN switch. They are typically connected to the -10 dBV unbalanced outputs of a two-track mastering recorder.

SUB INPUT [L/R] : These jacks are for cascade connection of an outboard mixer, etc. The signal input to these jacks is supplied directly to the stereo buss (group buss 1 and 2). The nominal input level is -10 dBV (0.3 V).

Master Section

MONITOR switches : These control headphone/monitor speaker signals, and can be used in combination with each other.
GRP 1-2 : The signal adjusted by the MASTERS fader 1/L-2/R is heard.
GRP 3-4 : The signal adjusted by the MASTERS fader 3/4 is heard.
TAPE CUE : The monaural signal adjusted by the TAPE CUE MASTER control is heard.
ST 9-10/ST 11-12 : The signal adjusted by the LEVEL control in the stereo input section is heard.
2TR IN : The left- and right-channel signals input to the 2TR IN L/R jacks are heard from the headphones/monitor speakers.

MONO : For monaural monitoring of stereo-input signal.

MONITOR LEVEL : This affects signal from the MONITOR select switch and sets the level you'll hear in the headphones/monitor speakers.

EFFECTS SEND MASTERS : These are the master volume controls for the EFFECT 1 and EFFECT 2 mixes.

MASTERS faders : These faders adjust the output levels of the groups.

Recorder Controls

Transport keys : Principally these work the same as on any cassette recorder.

PITCH CONTROL : Increases or decreases the speed of the transport in both Record or Play mode, within 12% range (approx.).

RECORD FUNCTION switches : These switches put the respective tracks into Rec Ready, or directly into Record mode if the master RECORD and PLAY keys have already been pressed. The 488 has four group outputs, so up to four tracks can be recorded at once. Only one of each track pair can be selected at a time (1 or 5, 2 or 6, 3 or 7, 4 or 8).

AUTO IN/OUT : Automates the punch-in/out sequence (Preroll, Punch-in, Punch-out and Postroll) you programmed in REHEARSAL mode.

REHEARSAL : Helps you rehearse a punch-in without erasing anything until you are ready to actually record.

TRACK REC indicators : They show the individual track's status as selected by the RECORD FUNCTION switches.

Meters : The meters numbered 1-8 show the recorded level of the respective tape tracks. The average level should be in the center (0), but occasional peaks up to +8 scale are acceptable.
The monitor meters show the level of mixes selected by the MONITOR switches.

Tape counter : This electronic counter displays "real time" in minutes and seconds for your reference.

Other indicators : Lights up or blinks depending on the selected mode and condition of your 488.

COUNTER RESET : This resets the COUNTER to "00M 00S" so you can assign any point on the tape as a starting location. Pressing RTZ gets you back to that location.

CLEAR key : Turns off the REHEARSAL and AUTO IN/OUT functions.

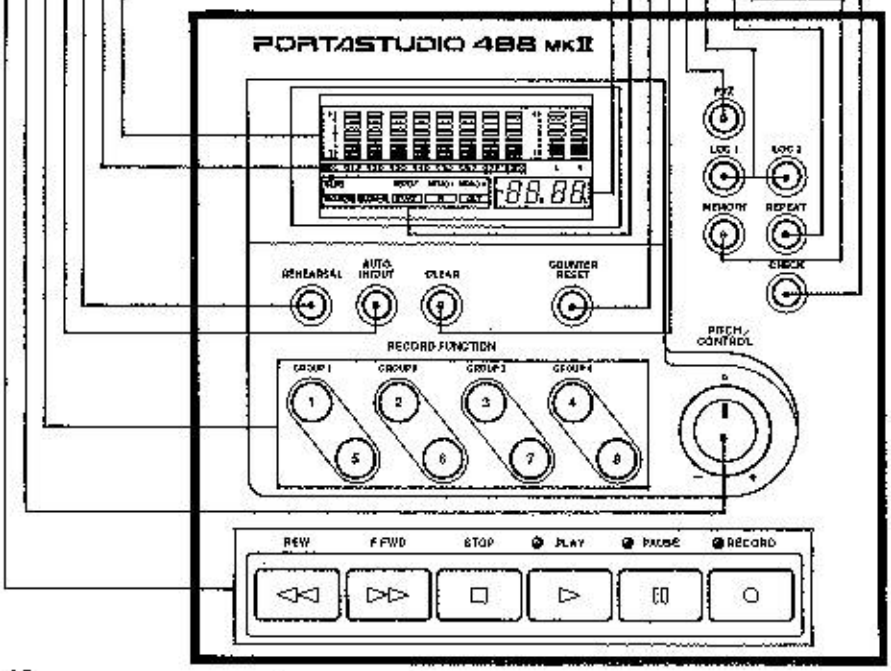
RTZ (Return-To-Zero) : When this key is pressed in any transport mode, the tape will fast wind to the counter's zero (00M 00S) point.

LOC 1 and 2 : When used together with MEMO IN, these keys let you load the current counter location into memory. If the sole LOC 1 or 2 is pressed, the tape will be located to the MEMO 1 or 2 point.

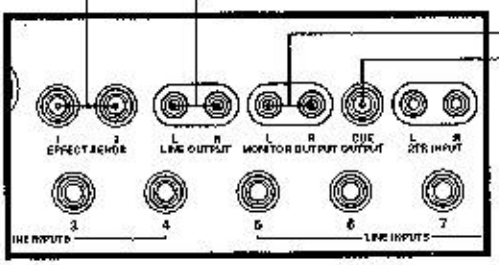
REPEAT : This provides a "playback loop" or "block repeat" between MEMO 1 and MEMO 2 points.

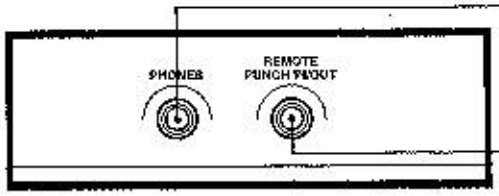
MEMO IN : Used together with the LOC 1 and LOC 2 keys to load the current tape location into memory.

CHECK : Lets you see the time location you have loaded into MEMO 1/2 or punch-in/out point.



Output Section





EFFECT SENDS [1/2] : Connect these to the inputs of effect devices.

LINE OUTPUT [L/R] : Normally, connect these jacks to the Left and Right inputs of your mixdown deck.

MONITOR OUTPUT [L/R] : These provide a line level version of the same signal that feeds the PHONES jack and may be connected to your control room speaker amplifier.

CUE OUTPUT : This jack carries tape playback signal and may be connected to the input of a studio speaker amplifier.

PHONES : Connect any stereo headphones with a 1/4" stereo TRS 3-conductor plug to this jack.

REMOTE PUNCH IN/OUT : For connection to an optional RC-30P remote footswitch.

Rear Panel

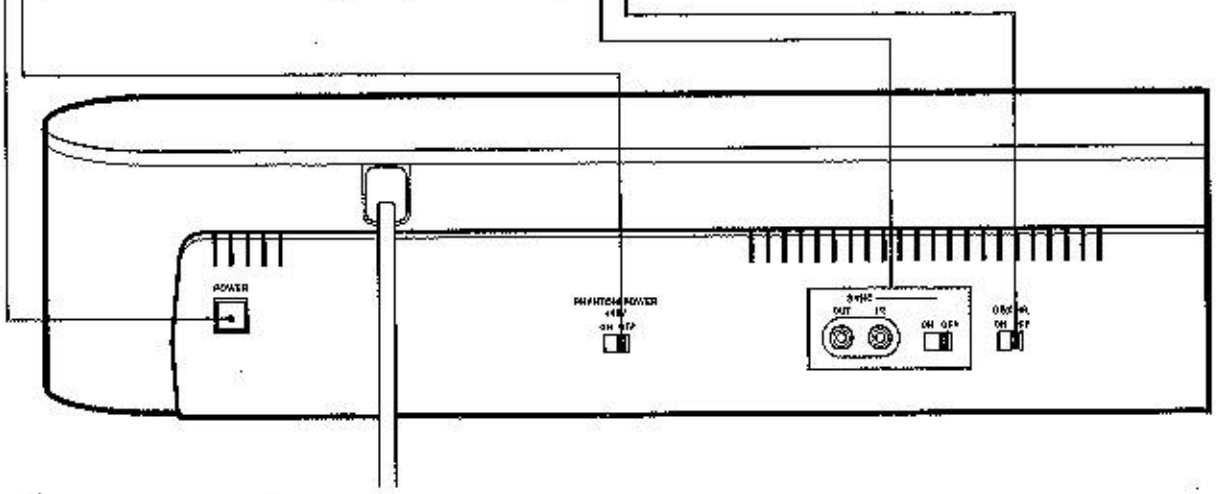
POWER switch : Turns the 488 on and off.

PHANTOM POWER switch : This switch is used to turn the built-in phantom power (DC +48 V) on and off. When the condenser microphone requiring phantom power is used, check the microphone specifications and power requirements, then plug it into the MIC/LINE INPUTS jack and set this switch ON. With this switch ON, the DC +48 V power is supplied to the MIC/LINE INPUTS 2 and 3 pins. Make sure this switch is OFF when phantom power is not required.

NOTE
- BE SURE to set this switch to OFF when an unbalanced connection is made for channel 1/2.

SYNC, IN and OUT jacks and ON/OFF switch : Connect the output of a MIDI sync or SMPTE time code generator to the SYNC IN jack, and the SYNC OUT jack to the input of a MIDI or SMPTE time code reader.
When track 8 is put into the record mode and the SYNC switch is set to ON, the track connects directly to the SYNC IN jack. The SYNC OUT jack always gets signal directly from track 8.

DBX NR ON/OFF switch : Setting this switch to ON position turns on the built-in dbx noise reduction system for all 8 tracks. If the SYNC switch is at the ON position, track 8 is disconnected from the dbx system, in which case the system does not affect sync signals going to and from track 8.

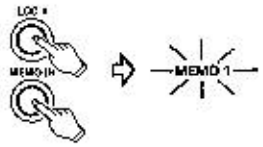


Using Memory Location Points

Loading MEMO points

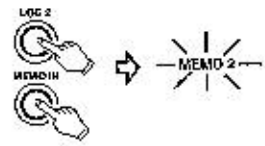
2 autolocation points can be established in the 488's memory system.

MEMO 1



At the desired moment, hold the MEMO IN key and press the LOC 1 key. The MEMO 1 indicator will turn on, showing that the current tape location is loaded into that register.

MEMO 2



Similarly, if you hold MEMO IN and press LOC 2, the current tape location is loaded as memory point 2 into that register

Establishing new MEMOs

Each time LOC 1 or 2 is pressed while MEMO IN is held down, a new memory point is established, and the previous memory point is erased.

A blinking MEMO indicator shown in the meter when the MEMO IN key is held down shows the corresponding register already contains a location memory.

MEMO points can't be entered while the tape is locating to either MEMO point or during REPEAT.

Recalculation of MEMOs

If the COUNTER RESET button is pressed, both MEMO points are automatically recalculated, so they stay the same relative to their original tape positions.

Checking MEMO points

When the tape is stopped, hold CHECK and press the desired LOC key. As long as the LOC key is held down, the content of the corresponding MEMO register will be displayed in the counter window.

Erasing

Both MEMO points are erased when the cassette is taken out from the compartment or the power is turned off.

Locating the tape

To zero

Press the RTZ key to fast wind the tape to the counter zero point.

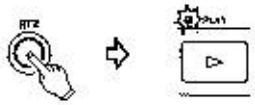
To MEMO 1

Press the LOC 1 key to fast wind the tape to the MEMO 1 point.

To MEMO 2

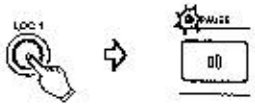
Press the LOC 2 key to fast wind the tape to the MEMO 2 point.

Auto play



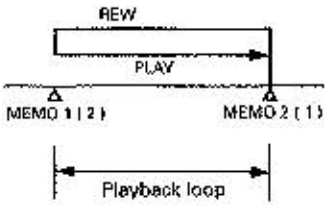
If PLAY is pressed after RTZ, LOC 1 or LOC 2, the tape will automatically start playing when the location point is reached.

Auto pause



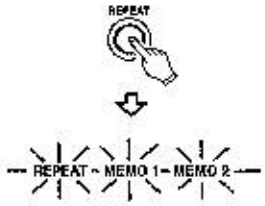
If PAUSE is pressed after RTZ, LOC 1 or LOC 2, the tape will enter Pause mode after the search operation.

Repeat Play



The REPEAT function provides a "Playback Loop" or "Block Repeat" between the two programmed MEMO points. The 488 understands the lower MEMO point as the start point of the loop, and the higher point as the end.

Operating procedure



1. Use MEMO IN and LOC 1 and LOC 2 (as explained above) to establish the beginning and the end of loop.
2. Press the REPEAT key. The tape will fast wind to the lower MEMO point.
3. As soon as that location is reached, the tape will automatically start playing to the higher MEMO location.
4. When the tape reaches the end of the loop, it will automatically rewind to the lower MEMO location and start over.

To interrupt REPEAT sequence

Press any transport keys (except Play). The function pressed will be activated. If the tape is wound outside the repeat loop points, the REPEAT LED that was on solid will start blinking.

To resume the REPEAT sequence –;

- Press the LOC 1 or LOC 2 key.

  OR

- If you are now within the loop or shortly behind the lower MEMO point, press PLAY.

Note

Repeat Play does not work while the 488 is in Record mode (REC LED is blinking or lights on solid).

PUNCH-IN or INSERT Recording

"Punching in" or "insert recording" is recording over a small section of previously recorded track to correct or improve a performance, while keeping the rest of the track intact. The mixer settings should be exactly the same as they were during the original recording.

Punch-in manually on the 488 using the RECORD (●) key, the RECORD FUNCTION switches, or the optional RC-30P footswitch.

In the following, we'll use track 2 as the punch-in track as an example.

Preliminary

1. As the punch-in track is track 2, your input must be assigned to GROUP 2. To do so, turn the PAN control of the channel which your source instrument is plugged into all the way to the right, and press the channel's 1/L-2/R ASSIGN switch.

   Keep all other channels' ASSIGN switches off.

2. TAPE CUE signal path is used to hear the tape, so turn each TAPE CUE control to the right and press the TAPE CUE switch in the MONITOR switch rack.

3. To hear the instrument, press the MONITOR GRP 1-2 switch.

4. Press PLAY to play the tape, adjust the TAPE CUE MASTER control until the monitor level meters peak between 0 to +3, and adjust the MONITOR LEVEL control for the desired headphone listening level.

5. Play the instrument. You'll hear it together with the tape signals through the headphones. Stop the tape, and you hear only the instrument being played.

6. Press the RECORD FUNCTION "2" switch. The REC 2 indicator will start blinking in the meter window, and meter 2 will show your instrument's output level. Adjust channel fader and MASTER 1/L-2/R fader for the proper recording level.

Selecting in and out points

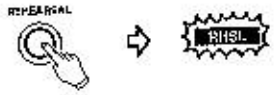
For both musical and technical reasons, when punching in or out of a track, you must select points that are "in the points clear", i.e., in pauses between phrases or notes. Sound seems unnatural and inserts are noticeable if a new note is recorded before the old one has ended, or a note is held as you punch in or out. Making smooth inserts requires practice. Spacing between the erase and record heads requires that you anticipate in/out points by a fraction of a second for extremely tight cues. Use the following procedures with the REHEARSAL switch on.

Rehearsing Punch-in (Insert) recording

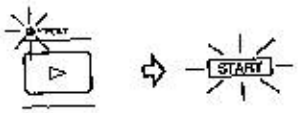
You can rehearse your punch-in as many times needed without affecting the existing recording. During rehearsal, what you hear in the monitor mix and read on the level meters will be the same as during recording, but signal won't be recorded on tape.

Storing the punch-in and out points into memory

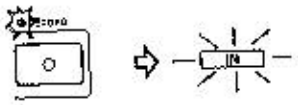
1. Cue the tape up a few seconds before you reach the expected punch-in point.



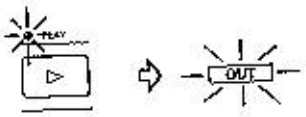
2. Press the REHEARSAL switch. The "RHSL" indicator will start blinking in the display.



3. Press PLAY to start playing ("preroll"). The "START" indicator will glow on the display. The counter readout at which the key is pressed is stored as the START point. Then the MEMO 1 or 2 indicator that was steadily indicated goes out.



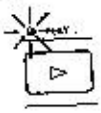
4. When you reach JUST BEFORE the error, press RECORD to start recording (punch in). The "IN" indicator will glow on the display and an LED will start flashing above the RECORD button. The counter readout at which the key is pressed is stored as the PUNCH-IN point.



5. When the tape reaches the expected punch-out point, press PLAY. The "OUT" indicator will turn on, and the "IN" indicator and the LED above the RECORD button will turn off. The counter readout at which the key is pressed is stored as the PUNCH-OUT point.

6. The tape will play for about 3 seconds ("postroll"), then will automatically rewind, stopping at the START point. The "RHSL" indicator that blinked will glow steadily in the display.

Rehearsal



7. Press PLAY. When the tape reaches the preset punch-in point, the monitor will switch from tape to "live" instrument on the punch-in track (in our example, on track 2).

   The RECORD LED will blink to indicate that you are "rehearsing" punch-in recording, not actually recording.

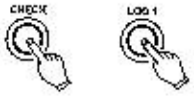
   When the tape reaches the preset punch-out point, you will be able to hear the old material existing on track 2, letting you check that the new material is smoothly followed by the old one. The RECORD LED will turn off, indicating that the "dry-run" record is over.

After 3 seconds of play ("postroll") the tape will automatically rewind, stopping at the START point, so you can again go through the rehearsal procedure.

- To change the punch-in and out points, press CLEAR, and restart from the beginning.
- If you want to quit Rehearsal mode for any reason, press CLEAR. "RHSL" goes out and the start, punch-in and out points are cleared from memory.

■ Practice the performance until you are sure that you will get it right when actually recording. Remember, punching-in over existing material erases the original signal.

Confirmation of counter readouts at Punch-In/Out points



You can confirm counter readouts at the Punch-In and Punch-Out points. To confirm the counter readout of Punch-In point, press LOC 1 while holding down the CHECK key. Likewise, to confirm Punch-Out point counter readout, press LOC 2 while holding down the CHECK key.

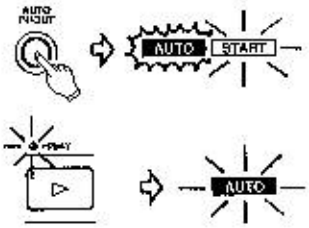
The Punch-In/Out point appears in the display as long as the keys are depressed.

- ■ When the REHEARSAL key is pressed during playback, the counter readout at which the key is pressed is stored as the START point.
- ■ You can store the Punch-In/Out or Rehearsal point also using the optional remote footswitch (RC-30P).
- ■ Rehearsal function is not available while the 488 is in the locate, repeat or record mode.
- ■ Locate or repeat function is not available while storing Punch-In/Out points in memory.
- ■ After the Punch-In/Out points have been stored in memory, the 488 cannot enter the record mode (whereby RECORD LED blinks or glows).
- ■ If you press any of the transport keys during storage of the Rehearsal (Punch-In/Out) points, the 488 will start operation corresponding to the key pressed. However, only when the REW or FF key is pressed after the Start point has been initiated will the tape stop at that Start point (if the Start point is at a position before or after the current position on the tape).

Actual, Auto Punch In/Out

Once you're sure your performance and the in/out points selected are correct, you're ready to actually record the insert using the Auto Punch-In/Out feature.

Before proceeding to the next step, #8, check to see that the RHSL indicator is on solid in the display, showing that your punch-in and out points are in memory, and that all REC indicators beneath the meters are off (except the one for the punch-in track), showing that all non-punch-in tracks are in Safe mode.



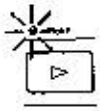
8. Press the AUTO IN/OUT switch. "RHSL" will turn off and "AUTO" will start blinking in the display.

9. Press PLAY.

   What you have anticipated in REHEARSAL will automatically occur in sequence: preroll, punch in, punch out, postroll, rewind, and stop.

   "AUTO" will be solidly displayed when the 488 punches out of record.

Auto Review



10. Press PLAY (or the optional footswitch). The tape will play the entire length of insert and rewind to the START point.

- **To Disable AUTO IN/OUT Mode,** press CLEAR. The memory points will be cleared and "AUTO" will turn off in the display.

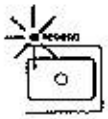
Manual Punch-In

The 488 lets you manually punch in, too. There are 3 ways to initiate the punch-in recording. The first is with the transport RECORD button, the second is with the track RECORD FUNCTION switch, and the third is with the optional footswitch.

We continuously use track 2 as the punch-in track in the following example.

Perform the "Preliminary" on page 27, if you haven't yet done so.

Punching-in/out with RECORD



1. Check to see that the REC 2 indicator is blinks showing track 2 is in Rec Ready mode. Locate the tape a little behind the expected punch-in point. Then press PLAY.

2. When you reach JUST BEFORE the error, press RECORD. The REC 2 indicator that was blinking will be solidly displayed and track 2 enters Record mode.

3. To punch-out of record, press PLAY. The REC 2 indicator that was solidly displayed again blinks to indicate that recording is over.

4. To stop the tape, press STOP.

Using the RECORD FUNCTION switch

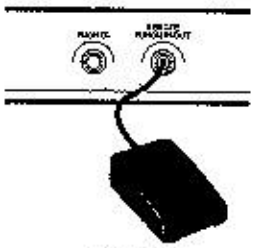
1. Check to see that the REC indicators are off, especially the indicator for the punch-in track, track 2 in our example. Locate the tape to a point a little behind the error, then hold RECORD and press PLAY. The tape will start running in Rec Ready mode. The LED above the RECORD key will blink.

2. When you reach JUST BEFORE the error, press the RECORD FUNCTION switch for track 2. The REC 2 indicator will be solidly displayed in the meter window and record starts on track 2.

3. To punch-out of record, press the RECORD FUNCTION switch for track 2 again, or press PLAY. The REC 2 indicator turns off and track 2 enters Play mode.

4. To stop the tape, press STOP.

Using the remote footswitch (RC-30P)



RC-30P

If you are recording alone and are too busy playing an instrument to push the switches, the optional remote footswitch really comes in handy.

1. Plug the RC-30P into the REMOTE PUNCH IN/OUT jack on the front of the 488.

2. Check that the REC 2 indicator is blinking, and locate the tape to a point a little before the error, then press PLAY.

3. When you reach JUST BEFORE the error, press the footswitch. This has the same effect as pressing RECORD, and the REC 2 indicator that was blinking will glow steadily to indicate track 2 is in Record mode.

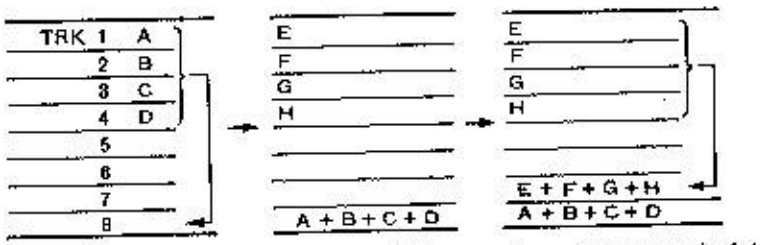
4. To punch-out of record, press the footswitch again. It has the same effect as pressing PLAY. The REC 2 indicator will start blinking again.

5. To stop the tape press STOP.

Bouncing Tracks (Ping-Pong)

The recording capability of the PORTASTUDIO 488 is not limited to eight tracks. You can "bounce" or combine tracks you have recorded to an empty track, and then replace the original tracks with new material. A bounce is like a mixdown, except you are recording to one of the tracks of the 488 instead to an external recorder.

The following diagrams depict the process.



Bouncing tracks 1-4 onto track 8

Tracks 1-4 available for recording new parts

Bouncing new tracks 1-4 onto track 7

Also, while you are bouncing, you can add live sources to the combination of the prerecorded tracks, by setting both the INPUT assign switch to MULTI MIX position. (See the signal flowing chart on page 6.)

Ping-pong procedure

In this example, we will combine material from tracks 1-4 onto track 8.

1. Set all the channels' INPUT assign switches to the center/TAPE position.
2. Turn the channels' PAN controls all the way to the right/R.
3. Press the ASSIGN "3-4" switch on channels 1-4.
4. Raise the MASTER "3-4" fader to 7.
5. Press the MONITOR "GRP 3-4" switch, and make sure all other MONITOR switches (TAPE CUE, GRP 1-2) are OFF.
6. Press the RECORD FUNCTION switch for track 8. The REC 8 indicator will start blinking in the meter window, indicating the track is in Rec Ready mode.
7. Press PLAY. The tape will start playing.
8. Use channel faders 1 through 4 to make any necessary level adjustments. You may want to repeat this step several times to get the balance correct.

9. When the balance is right and the level is peaking at no more than +6 on the TRACK 8 meter, stop and rewind the tape to the beginning of the track.

10. Hold RECORD and press PLAY. The REC 8 indicator that was blinking will turn on solid and track 8 will record a copy of what is on tracks 1-4.

11. You'll hear the mix being recorded on track 8 in the headphones.

12. Once the recording is done, press STOP.

13. The REC 8 indicator will now be blinking as before. Turn that off by pressing the RECORD FUNCTION switch for track 8.

Ping-pong in stereo procedure

It is also common to bounce six channels to two tracks (for example, tracks 1-6 to 7 & 8) as a stereo pair.

1. Set all the channels' INPUT assign switches to the center/TAPE position.

2. Simply arrange the PAN controls for channels 1-6 as disired — some left, some right, some in the middle.

3. Press the RECORD FUNCTION switch for both tracks 7 and 8.

4. Continue as the above example.

The 488 has a SYNC feature that allows you to have your electronic instruments play in sync with the tape. MIDI clocks are themselves a computer type digital language and cannot be recorded on analog tape ; it is necessary to convert them to recordable FSK (Frequency Shift Keying) signals using an appropriate converter, such as the MIDI-Tape Synchronizer.

It is not a mere MIDI-FSK converter but translates MIDI clocks into a FSK sync signal containing score "bar" information or "Song Position Pointer", allowing the associated MIDI equipment to stay in sync and follow the tape no matter where you move the tape within a given song. The maximum stability or resolution of the synchronization is ensured by a TEAC-exclusive error correction circuit in the MIDI-Tape Synchronizer.

Connections

The 488 has dedicated jacks for SYNC tones and can directly record and read them without passing through the 488 mixer. A direct connection between the sync tone generator and the 488 recorder ensures that FSK won't accidentally leak into the audio, and unwanted audio won't leak into the FSK tone.

1. Locate the SYNC ON/OFF switch to the 488's rear panel and set it to ON. This defeats the dbx encode/decode for track 8 only.

2. Connect the TAPE OUT of the MIDI-Tape Synchronizer to the SYNC IN of the 488, and the SYNC OUT of the 488 to the TAPE IN of the MIDI-Tape Synchronizer.

Meter 8 function during SYNC

When the SYNC ON/OFF switch is set to ON, the level meter for track 8 is switched to the SYNC IN jack and is active only when track 8 is in Record or Record ready modes. In playback, the meter 8 will not display.

Specifications

Mechanical Characteristics

Tape:	Compact Cassette (C-30 to 90), High-Bias (Type II, CrO2)
Track Format:	8-track/8-channel, single directional record/play
Head Configuration:	8-channel record/play (hard permalloy) x 1 8-channel erase (ferrite) x 1
Motor:	DC servo capstan motor x 1 DC reel motor x 1 DC ancillary motor x 1
Tape Speed:	9.5 cm/sec.(3-3/4 ips), ± 1%
Pitch Control:	± 12 % (approx.)
Wow and Flutter:	0.04% WRMS, ± 0.06 % W.Peak
Fast Winding Time:	80 sec. (approx.) with C-60
Dimension (W × H × D)	528.4 x 128 x 437 mm (20-13/16" x 5-1/16" x 17-3/16")
Weight:	7.1 kg (15-10/16 lbs.)

Electrical Characteristics

Mixer Section

MIC/LINE INPUTS [CH1, CH2]	
(XLR type connector x 2)	
Input Impedance:	2.8k ohms
Nominal Input Level:	–60 dBV (1mV) (MIC position) –20 dBV (0.1 V) (LINE position)
Maximum Input Level:	+5 dBV (1.8 V) at Trim Min.
MIC/LINE INPUTS [CH1, CH2]	
(1/4" phone jack x 2)	
Input Impedance:	5.8k ohms
Nominal Input Level:	–50 dBV (3mV) (MIC position) –10 dBV (0.3 V) (LINE position)
Maximum Input Level:	+5 dBV (1.8 V) at Trim Min.
MIC/LINE INPUTS [CH3, CH4]	
(1/4" phone jack x 2)	
Input Impedance:	50k ohms
Nominal Input Level:	–50 dBV (3 mV) (MIC position) –10 dBV (0.3 V) (LINE position)
Maximum Input Level:	+5 dBV (1.8 V) at Trim Min.
LINE INPUTS [CH5 — CH8]	
(1/4" phone jack x 4)	
Input Impedance:	50k ohms
Nominal Input Level:	–10 dBV (0.3 V)
Maximum Input Level:	+5 dBV (1.8 V)
STEREO INPUTS [CH9 — CH12]	
(1/4" phone jack x 4)	
Input Impedance:	10k ohms
Nominal Input Level:	–10 dBV (0.3 V)
Maximum Input Level:	+5 dBV (1.8 V)
INSERT [CH1, CH2]	
Input Impedance:	10k ohms
Nominal Input Level:	–10 dBV (0.3 V)
Maximum Input Level:	+5 dBV (1.8 V)
Output Impedance:	10k ohms
Minimum Load Impedance:	2k ohms
Nominal Output Level:	–10 dBV (0.3 V)

2TR INPUT (RCA jack x 2)	
Input Impedance:	47k ohms
Nominal Input Level:	−10 dBV (0.3 V)
Maximum Input Level:	+5 dBV (1.8 V)
SUB NPUT (RCA jack x 2)	
Input Impedance:	47k ohms
Nominal Input Level:	−10 dBV (0.3 V)
Maximum Input Level:	+5 dBV (1.8 V)
LINE OUTPUT (RCA jack x 2)	
Output Impedance:	100 ohms
Minimum Load Impedance:	2k ohms
Nominal Output Level:	−10 dBV (0.3 V)
EFFECT SENDS [1, 2] (RCA jack x 2)	
Output Impedance:	100 ohms
Minimum Load Impedance:	2k ohms
Nominal Output Level:	−10 dBV (0.3 V)
MONITOR OUTPUT (RCA jack x 2)	
Output Impedance:	100 ohms
Minimum Load Impedance:	2k ohms
Nominal Output Level:	−10 dBV (0.3 V)
CUE OUTPUT (RCA jack x 1)	
Output Impedance:	100 ohms
Minimum Load Impedance:	2k ohms
Nominal Output Level:	−10 dBV (0.3 V)
SYNC IN (RCA jack x 1)	
Input Impedance:	10k ohms
Nominal Input Level:	−10 dBV (0.3 V)
SYNC OUT (RCA jack x 1)	
Output Impedance:	100 ohms
Minimum Load Impedance:	2k ohms
Nominal Output Level:	−10 dBV (0.3 V)
PHONES (1/4" stereo phone jack x 1)	
Nominal Load Impedance:	30 ohms
Maximum Output Level:	100 mW (approx.)
Equalizer	
HIGH (Shelving):	10 kHz, ±12 dB
MID (Parametric):	250 Hz to 5 kHz, ±12 dB
LOW (Shelving):	100 Hz, ±12 dB
Frequency Response:	20 Hz to 22 kHz, +1/−2 dB
Signal-to-Noise Ratio	
(at Nominal Input/Output Level):	UNWTD(20 Hz to 20 kHz)/IHF A WTD
1 MIC INPUT — LINE OUTPUT	65 dB / 68 dB
4 MIC INPUTS — LINE OUTPUT	60 dB / 63 dB
1 LINE INPUT — LINE OUTPUT	79 dB / 83 dB
8 LINE INPUT — LINE OUTPUT	76 dB / 79 dB
Distortion	
1 MIC INPUT — LINE OUTPUT	0.05% (at 1 kHz, 20 dB above nominal input level with 30 kHz low-pass filter inserted)
1 LINE INPUT — LINE OUTPUT	0.05% (at 1 kHz, nominal input level)
Crosstalk:	55 dB (at 1 kHz, nominal input level with 30 kHz low-pass filter inserted)

Recorder Section

Frequency Response (overall):	40 Hz to 14 kHz, ±3 dB (without dbx)
Signal-to-Noise Ratio (overall):	UNWTD (20 Hz to 20 kHz)/IHF A WTD (at 3% distortion) 54 dB/58 dB (without dbx) 90 dB/95 dB (with dbx)
Total Harmonic Distortion:	1.3% (at 400 Hz, 0 dB level)
Crosstalk (Channel Separation):	50 dB (without dbx, at 1 kHz, 0 dB level) 70 dB (with dbx, at 1 kHz, 0 dB level)
Erasure:	65 dB (at 1 kHz, +10 dB level)

Others

Power Requirements	
USA/CANADA:	120 V AC, 60 Hz
EUROPE:	230 V AC, 50 Hz
U.K./AUSTRALIA:	240 V AC, 50 Hz
Power Consumption:	39 W

In these specifications, 0 dBV is referenced to 1 Volt. Actual voltage levels are also given in parenthesis (0.316 V for -10 dBV rounded off to 0.3 V).

* dbx is a registered trademark of dbx Incorporated.

■ *Changes in specifications and features may be made without notice or obligation.*