



The Channel Strip

512c - 527 - 550A - 325



All-Discrete Complete Input Module Operator's Manual

Written for Automated Processes, Inc.
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Table of Contents

- 1.0 Overview**
 - 1.1 The Channel Strip Features and Introduction
- 2.0 Signal Flow and Block Diagrams**
 - 2.1 Default Signal Flow
 - 2.2 Alternate Routing
 - 2.2.1 Compressor Post EQ
 - 2.2.2 Compressor Bypass
 - 2.2.3 Equalizer Bypass
 - 2.2.4 Insert
 - 2.3 Default Signal Flow Block Diagram
 - 2.4 Compressor Post EQ Block Diagram
 - 2.5 512C Preamp Block Diagram
 - 2.6 325 Output Section Block Diagram
 - 2.7 Rear Panel Signal Flow
- 3.0 Input Section: 512C Microphone/Instrument/Line Preamplifier**
 - 3.1 512C Preamp Overview and Features
 - 3.2 Preamp Controls
 - 3.3 Input Selection
 - 3.3.1 Input Switch
 - 3.3.2 Microphone Input
 - 3.3.3 Instrument Input
 - 3.3.4 Line Input
 - 3.4 Polarity Inverter
 - 3.5 Level Indication
 - 3.6.1 VU Meter
 - 3.6.2 Peak Indicator
 - 3.6 Preamp Output
 - 3.7 512C Preamp Block Diagram
- 4.0 Dynamic Processing: 527 Compressor**
 - 4.1 527 Compressor Overview and Features
 - 4.2 Compressor Controls
 - 4.2.1 Threshold
 - 4.2.2 Attack and Release
 - 4.2.3 Ratio
 - 4.2.4 Type
 - 4.2.4.1 OLD: Feed-Back Compression
 - 4.2.4.2 NEW: Feed-Forward Compression
 - 4.2.5 Knee
 - 4.2.5.1 Soft Knee Compression
 - 4.2.5.2 Hard Knee Compression
 - 4.2.6 *THRUST*®
 - 4.2.7 Gain Reduction Meter
 - 4.3 Compressor Routing
 - 4.3.1 Compressor Pre Equalizer (Default Signal Flow)
 - 4.3.2 Compressor Post Equalizer
 - 4.3.3 Compressor Bypass
 - 4.3.4 Compressor Side Chain
 - 4.4 DC Link
 - 4.5 Side Chain Input
- 5.0 Spectral Processing: 550A Equalizer**
 - 5.1 550A Equalizer Overview and Features
 - 5.2 Equalizer Controls
 - 5.2.1 Low Frequency Band
 - 5.2.2 Mid Frequency Band
 - 5.2.3 High Frequency Band
 - 5.2.4 Band-Pass Filter

- 5.3 Equalizer Routing
 - 5.3.1 Equalizer Post Compressor (Default Signal Flow)
 - 5.3.2 Equalizer Pre Compressor
 - 5.3.3 Equalizer Bypass
 - 5.3.3.2 EQ Bypass
 - 5.3.3.1 EQ IN Switch

6.0 Output Section: 325 Line-Driver

- 6.1 325 Output Section Overview and Features
- 6.2 Controls
 - 6.2.1 Output
 - 6.2.2 Soft Mute
 - 6.2.2.1 Remote Mute Control
 - 6.2.3 VU Meter
- 6.3 Output Section Routing
 - 6.3.1 Insert
- 6.4 325 Output Section Block Diagram

7.0 Rear Panel Interface

- 7.1 Audio Path Inputs
- 7.2 Audio Path Outputs
- 7.3 Rear Panel Half-Normals
- 7.4 527 Compressor Side Chain and DC Link Connections
 - 7.4.1 Side Chain Input
 - 7.4.2 DC Link
- 7.5 Remote Mute Control
- 7.6 Rear Panel Signal Flow

8.0 AC Power

Appendix

- i. 512C Preamplifier Specifications
- ii. 527 Compressor Specifications
- iii. 550A Equalizer Specifications
- iv. 325 Line-Driver Specifications

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1.0 Overview

The Channel Strip (TCS) is a complete input module with microphone preamplifier, dynamics processing, precision EQ, and output level control. With extensive signal metering, multiple balanced insert points and an output mute switch, The Channel Strip contains the best features of a large console input channel in a single rack space. It's the perfect choice for anyone looking for that high-performance API console sound.



1.1 The Channel Strip Features and Introduction

Features

- API 512C Preamplifier
- API 527 Compressor
- API 550A Equalizer
- API 325 Line-Driver
- Internal routing supports multiple configurations
- Comprehensive rear panel interface with multiple insert points
- Two 10-segment LED VU displays
- Output clips at +30dBm
- API's all discrete signal path
- Transformer outputs

The result of thoughtful engineering, The Channel Strip includes everything needed to record an audio signal. It all starts with the famed 512C Preamplifier, which includes the benefit of additional Mic, Line or Instrument input switching. Next is the 527 multi-mode compressor with fully adjustable Threshold, Attack, Release, and Ratio controls on detented pots. The patented **THRUST**® circuit in the 527 Compressor gives your track the "in-your-face" punch that has made this circuit an award winner. Also included in The Channel Strip is probably the most recognized and revered API EQ of all time, the 550A three-band equalizer with its switchable frequencies and 12dB of boost or cut. The 550A Equalizer's High and Low frequency bands can be individually switched to be shelving EQs, and the "B.P. Filter" switch inserts a 50Hz to 15kHz Band-Pass filter.

At the output of the unit is the 325 Line-Driver, taken directly from API console designs with an output level pot and 10-segment VU meter. The meter can also be switched to show the output level of the preamp. Each of The Channel Strip's processing pieces can be switched in or bypassed individually, while a flip switch internally routes the compressor after the EQ if desired. Additional features include a side-chain input and the famous API 2520/transformer combination.

2.0 Signal Flow and Block Diagrams

2.1 Default Signal Flow

With no routing switches engaged, the default signal flow through The Channel Strip is illustrated by the left-to-right order of the unit's front panel:

512C Preamp -----> 527 Compressor -----> 550A Equalizer---> Insert --> Output



2.2 Alternate Routing

The default signal flow can be modified in four (4) ways:

- The 527 Compressor can be moved after the 550A Equalizer
- The 527 Compressor can be hard bypassed
- The 550A Equalizer can be hard bypassed
- Insert Return can be engaged

Since each of these routing functions are independent of each other, multiple signal flow configurations are possible. Combined with the open interfacing available on the rear panel, comprehensive and flexible routing possibilities are available to meet most production needs.

2.2.1 Compressor Post EQ

Engaging the POST EQ switch will move the 527 Compressor to after the 550A Equalizer. When the POST EQ switch is engaged, the signal flow will be as follows:

512C Preamp -----> 550A Equalizer -----> 527 Compressor -----> Insert -----> Output



POST EQ: Moves the 527 Compressor to after the 550A Equalizer

- 527 will use Second Effect rear panel interface jacks
- Illuminates when engaged

2.2.2 Compressor Bypass

Engaging the COMP BYPASS switch will completely remove the 527 Compressor from the signal path using a relay-based hard bypass. The 527 Compressor will be bypassed regardless of its assigned position in the signal flow. When the COMP BYPASS switch is engaged, the signal flow will be as follows:

512C Preamp -----> 550A Equalizer -----> Insert -----> Output



COMP BYPASS: Removes the 527 Compressor from the signal flow

- 527 will not be accessible via rear panel interface jacks
- Illuminates when engaged

2.2.3 Equalizer Bypass

Engaging the EQ BYPASS switch will completely remove the 550A Equalizer from the signal path using a relay-based hard bypass. When the COMP BYPASS switch is engaged, the signal flow will be as follows:

512C Preamp -----> 527 Compressor -----> Insert -----> Output



EQ BYPASS: Removes the 550A Equalizer from the signal flow

- 550A Equalizer will not be accessible via rear panel interface jacks
- Illuminates when engaged

IMPORTANT NOTE: The 550A Equalizer has an "IN" switch that must be engaged in order for the equalizer to affect the signal when the EQ BYPASS switch is not engaged.

2.2.4 Insert

Engaging the INSERT switch will route the signal present at the INSERT RETURN jack to the input of the 325 Line-Driver. When the INSERT switch is engaged, the signal flow will be as follows:

Insert -----> Output



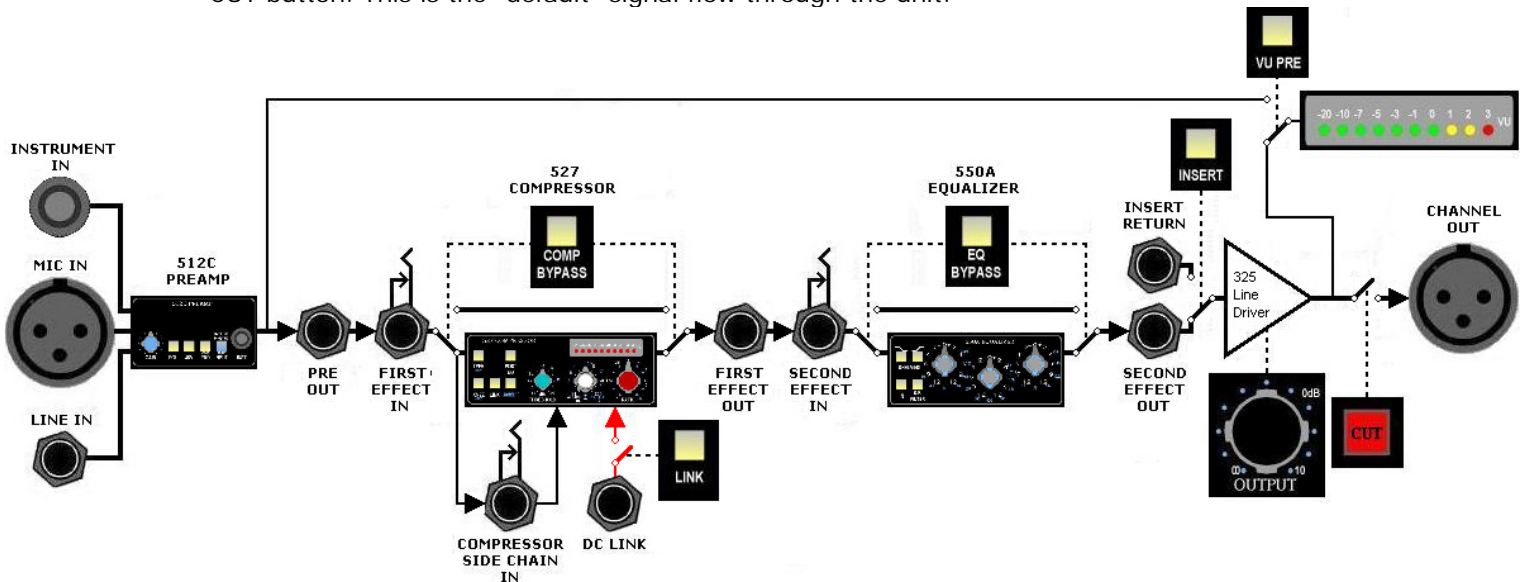
INSERT: Routes the signal present at the INSERT RETURN jack to the 325 Line-Driver input

- Replaces the Second Effect output as the input to the 325 Line-Driver
- Illuminates when engaged

NOTE: Since the signal can be externalized at multiple points in the audio path, The Channel Strip does not have a dedicated "insert send" output. PRE OUT, FIRST EFFECT OUT, and SECOND EFFECT OUT are intended to be used as "insert sends" as needed.

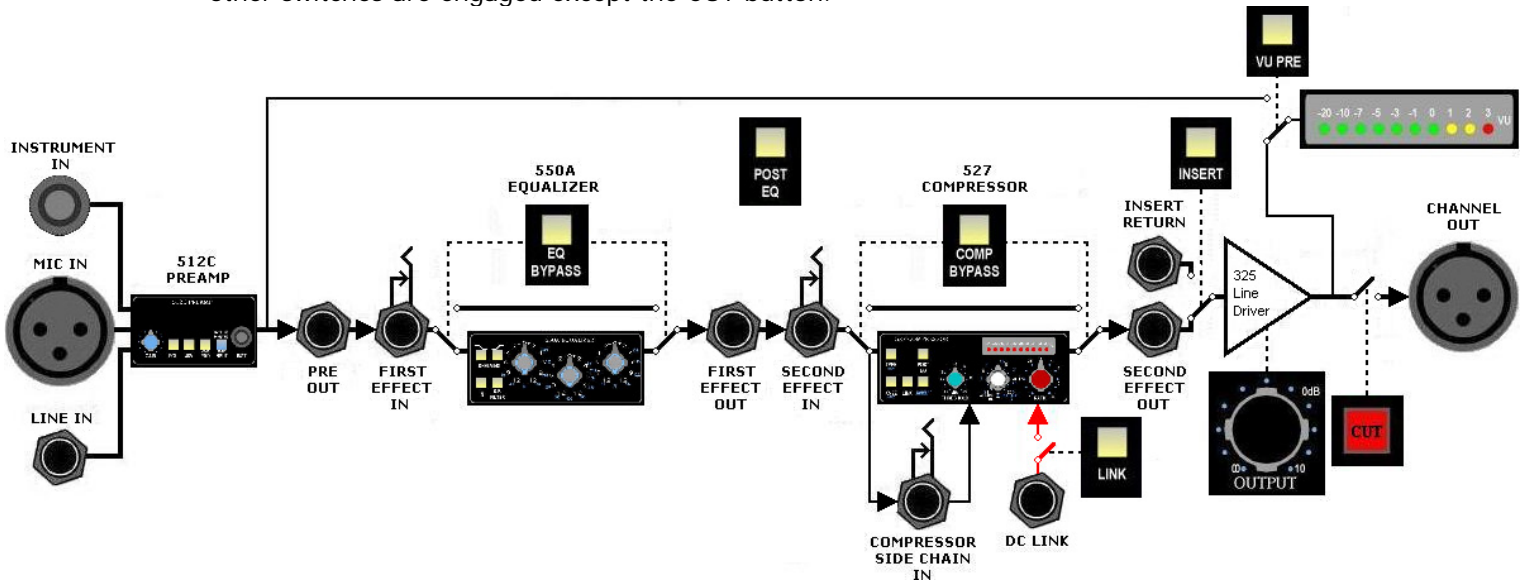
2.3 Default Signal Flow Block Diagram

The block diagram below illustrates The Channel Strip signal flow with no switches engaged except the CUT button. This is the "default" signal flow through the unit.



2.4 Compressor Post EQ Block Diagram

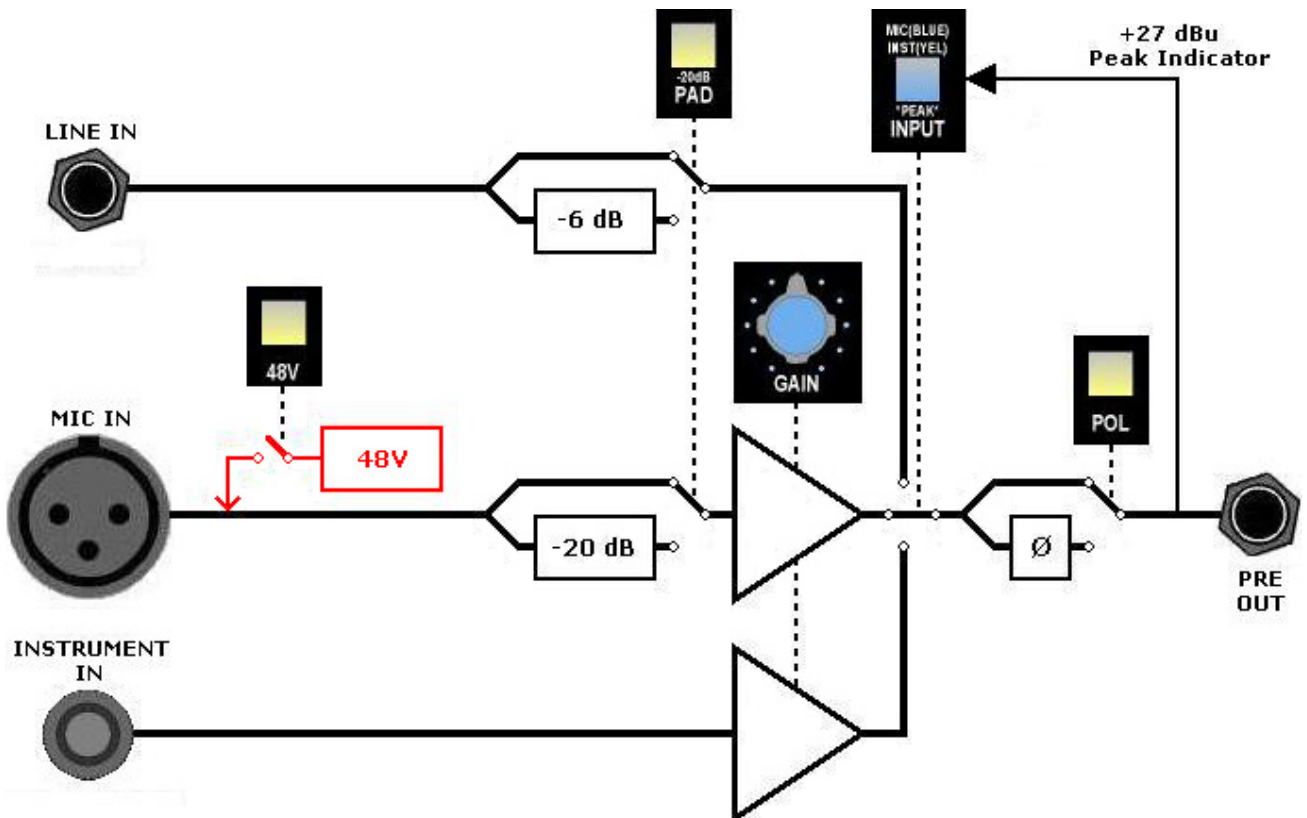
The block diagram below illustrates The Channel Strip signal flow with the POST EQ switch engaged. No other switches are engaged except the CUT button.



NOTE: The order of the First and Second Effect jacks on the rear panel does not change with the compressor when the POST EQ switch is engaged.

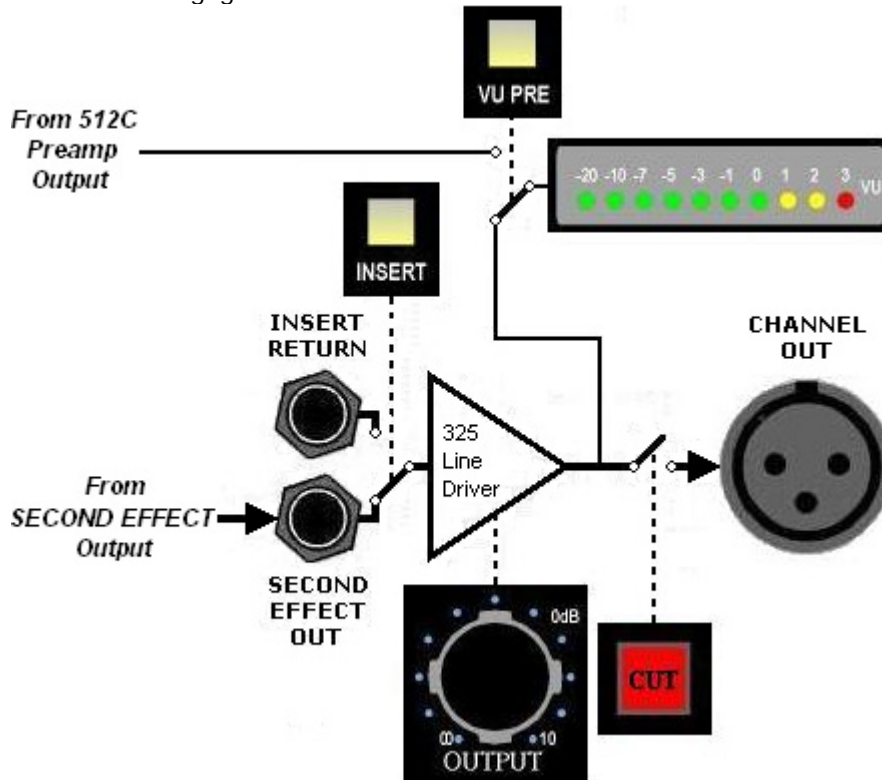
2.5 512C Preamp Block Diagram

The block diagram below illustrates signal flow through the 512C Preamp section of The Channel Strip with no switches engaged.



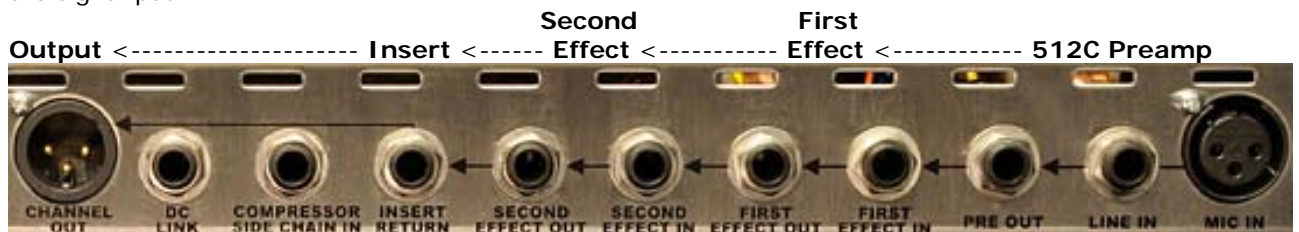
2.6 325 Output Section Block Diagram

The block diagram below illustrates signal flow through the 325 output section of The Channel Strip with no switches engaged.



2.7 Rear Panel Signal Flow

The Channel Strip signal flow is illustrated by the right-to-left order of the unit's rear panel. This order of these interfaces remains constant, regardless of the order of the 527 Compressor and 550A Equalizer in the signal path.



- The PRE OUT is "half-normalled" to feed the FIRST EFFECT IN
- The FIRST EFFECT IN feeds the first processor in the audio path (normally the 527 Compressor*)
- The FIRST EFFECT OUT is "half-normalled" to feed the SECOND EFFECT IN
- The SECOND EFFECT IN feeds the second processor in the audio path (normally the 550A Equalizer*)
- The SECOND EFFECT OUT is "half-normalled" to feed the 325 Line-Driver input

* Engaging the POST EQ switch will move the 527 Compressor to after the 550A Equalizer, reversing the order of these effects in the audio path.

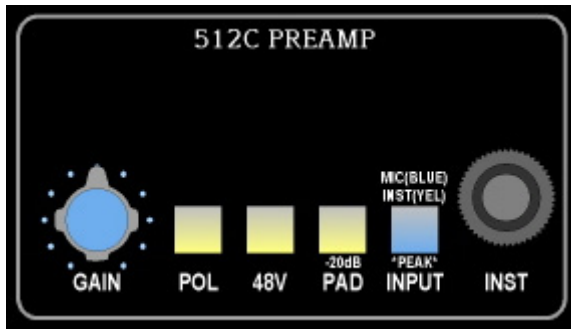
The PRE OUT, FIRST EFFECT OUT, and SECOND EFFECT OUT jacks are all splitting outputs. This means the connection to the input they're normalled to will not be broken when a plug is inserted.

The FIRST EFFECT IN and SECOND EFFECT IN jacks are all switching jacks. This means the connection with the output they're normalled to is broken when a plug is inserted. The input is instead fed with the signal present on the inserted plug.

The INSERT RETURN is only active when the INSERT switch on the front panel is engaged.

3.0 Input Section: 512C Microphone/Instrument/Line Preamp

3.1 512C Preamp Overview and Feature



The 512C is an all-discrete microphone / instrument / line preamplifier designed to provide an unusually good sounding front-end for all types of audio recording applications. Sonically, it offers the distinct API sound, high quality performance, and low noise.

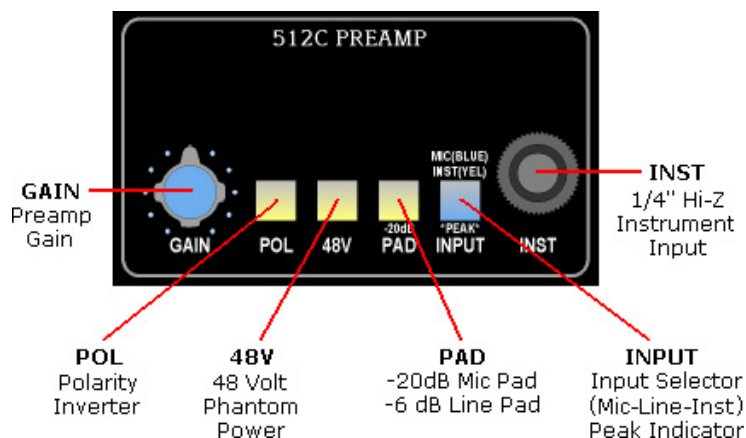
The 512C Preamp remains faithful to the circuit designs of API's founder, Saul Walker. Fully featured, it carefully preserves the original sound character that made it so much a part of the early days of recording.

Offering high headroom and a wide variety of inputs and input access points, it is equally at home in the commercial recording studio as it is in the home project studio. The 512C Preamp makes use of the 2510 and 2520 op-amps and therefore exhibits the reliability, long life, and uniformity which are characteristic of all API products.

Features

- Microphone preamp with 68dB of gain
- Line preamp at unity gain
- Instrument preamp with 50dB of gain
- -6dB line pad
- -20dB microphone pad
- Switchable 48V phantom power
- Polarity inverter
- +27dBu preamp output peak indicator
- LED VU meter can monitor preamp output level
- XLR rear panel MIC input
- ¼" -10dBu front panel instrument (INST) input
- ¼" TRS +4dBu rear panel LINE input
- ¼" TRS +4dBu rear panel LINE output
- Low noise (-129dBm EIN)
- Fully discrete API circuit design
- Famous API 2510 and 2520 op-amps

3.2 Preamp Controls



The 512C Preamp provides a comprehensive suite of controls:

- GAIN: Microphone and instrument preamp gain
- POL: Preamp output polarity inverter
- 48V: Phantom Power
- PAD: -20dB microphone pad / -6dB line pad
- INPUT / PEAK: Mic-Line-Instrument input selector and +27dBu output Peak Indicator
- INST: ¼" high-impedance instrument input

3.3 Input Selection

The 512C Preamp can receive three (3) input sources:

- MIC (Microphone): Rear panel female XLR microphone input with switchable 48V phantom power
- INST (Instrument): Front panel ¼" unbalanced -10dBu instrument level input
- LINE: Rear panel ¼" TRS balanced +4dBu line level input

3.3.1 Input Switch



The INPUT switch is used to select the input source. It is a momentary selector which cycles through the three input sources, Mic-Instrument-Line. It changes color to indicate which source is currently selected.

- MIC (Microphone): Illuminated in blue
- INST (Instrument): Illuminated (yellow)
- Line: Not illuminated (white)

The INPUT switch also serves as a peak indicator when the output of the preamp exceeds +27dBu. The INPUT switch will change color as follows to indicate peak levels:

- MIC (Microphone): Changes from blue to violet
- INST (Instrument): Changes from yellow to orange
- Line: Changes from white to red

3.3.2 Microphone Input



Select the microphone input (MIC) by pressing the INPUT switch until it illuminates in blue. The MIC IN connection on the rear panel will be the active input.

- Female XLR microphone input
- 48v phantom power
- -20dB pad
- INPUT switch illuminates in blue when engaged
- Violet peak indication when output exceeds +27dBu



48V: Provides 48 volt phantom power to the MIC IN female XLR connector

- Illuminates when engaged

IMPORTANT: Caution should be exercised when engaging phantom power! Damage can occur if phantom power is applied to some audio devices, including most ribbon microphones. The Channel Strip output should also be muted (CUT) when engaging the 48V switch.



-20dB PAD: Inserts a -20dB attenuator after the microphone input

- Illuminates when engaged



GAIN: Microphone preamp level control

- 34dB nominal gain
- 68dB maximum gain
- 14dB minimum gain with -20dB pad engaged

3.3.3 Instrument Input



Select the instrument input (INST) by pressing the INPUT switch until it illuminates. The ¼" INST jack on the front panel will be the active input.

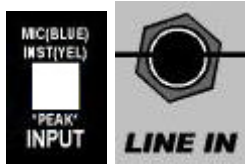
- -10dBu instrument level input
- Unbalanced, high-impedance input (¼" tip-sleeve)
- INPUT switch illuminates (yellow) when engaged
- Orange peak indication when output exceeds +27dBu



GAIN: Instrument preamp level control

- 14dB minimum
- 50dB maximum gain
- No pad

3.3.4 Line Input



Select the line input by pressing the INPUT switch until it is not illuminated. The ¼" LINE IN jack on the rear panel will be the active input.

- +4dBu live level input
- Balanced, low-impedance input (¼" tip-ring-sleeve)
- -6dB pad
- Unity gain
- INPUT switch is not illuminated when engaged (white)
- Red peak indication when output exceeds +27dBu



PAD: Inserts a -6dB attenuator after the line input

- Illuminates when engaged

3.4 Polarity Inverter

A polarity inverter (sometimes referred to as a "phase reverse") is available at the output of the 512C Preamp.



POL (Polarity): Inverts the polarity of the signal at the output of the preamp

- Illuminates when engaged

3.5 Level Indication

The output level of the 512C Preamp can be monitored in two (2) ways:

- VU Meter: The VU meter in the output section can display the preamp output level
- Peak Indicator: The INPUT switch doubles as a peak indicator

3.5.1 VU Meter



The output of the 512C Preamp will be displayed on the VU meter when the VU PRE switch is engaged



VU PRE (VU Preamp): Routes the output of the 512C Preamp to the VU meter input

- Illuminates when engaged

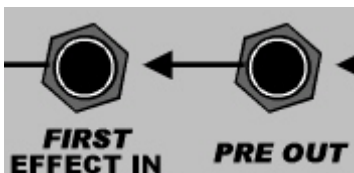
3.5.2 Peak Indicator



The INPUT switch also serves as a peak indicator when the output of the 512C Preamp exceeds +27dBu. The INPUT switch will change color as follows to indicate peak levels:

- MIC (Microphone): Changes from blue to violet
- INST (Instrument): Changes from yellow to orange
- Line: Changes from white to red

3.6 Preamp Output

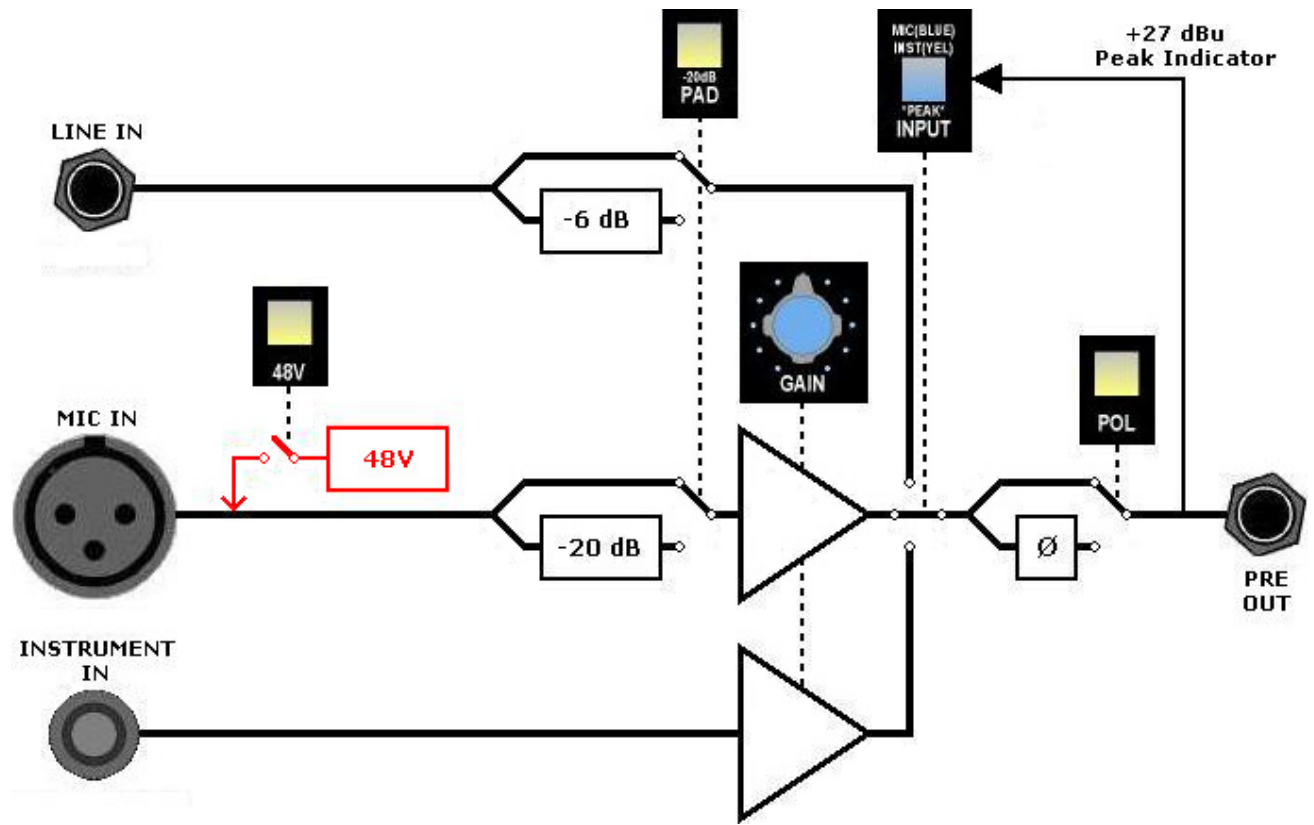


The output of the 512C Preamp is available at the PRE OUT jack on the rear panel. That jack is "half-normalled" to the FIRST EFFECT IN jack on the rear panel.

- Balanced, low-impedance, +4dBu line level output
- ¼" tip-ring-sleeve jack
- Plugging into the PRE OUT jack does not break the connection to the FIRST EFFECT IN jack.

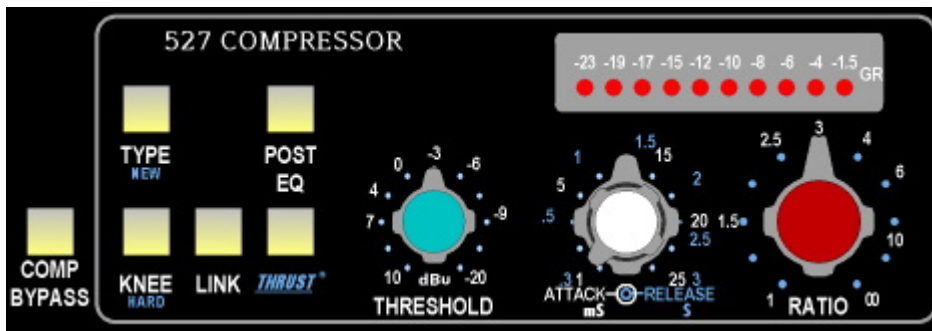
3.7 512C Preamp Block Diagram

The block diagram below illustrates signal flow through the 512C Preamp section of The Channel Strip with no switches engaged.



4.0 Dynamic Processing: 527 Compressor

4.1 527 Compressor Overview and Features



The API 527 Compressor takes its place alongside the family of API VCA based compressors, the 225L and the 2500 Stereo Bus Compressor. Anyone familiar with those units will immediately be at home with the 527.

Features common to the line like "feed forward" (NEW) and "feed back" (OLD) gain reduction methods selectable on the front panel, provide a choice of "that old way", or "the new way" of compression, for the highest level of flexibility in signal gain control. The "old way" or Feed-Back method is what most of the classic compressors used for the gain control circuit. The "new way" gain reduction is more typical of the newer VCA type compressors that rely on RMS detectors for the gain control voltage.

There is a "SOFT"/"HARD" KNEE switch for an "over-easy" type compression resulting in a very natural, uncompressed sound or a typical sharp knee type that lends itself to a much more severe limiting effect.

The patented *THRUST*[®] function can be switched in and out via the front panel as well, applying a high pass filter before the RMS detector circuit that preserves that punchy bottom end.

A SIDE CHAIN input is provided for keying and external detector path processing.

The 527 Compressor sections of two or more Channel Strips can be linked together via a DC link allowing multiple units to be combined for stereo and multichannel applications.

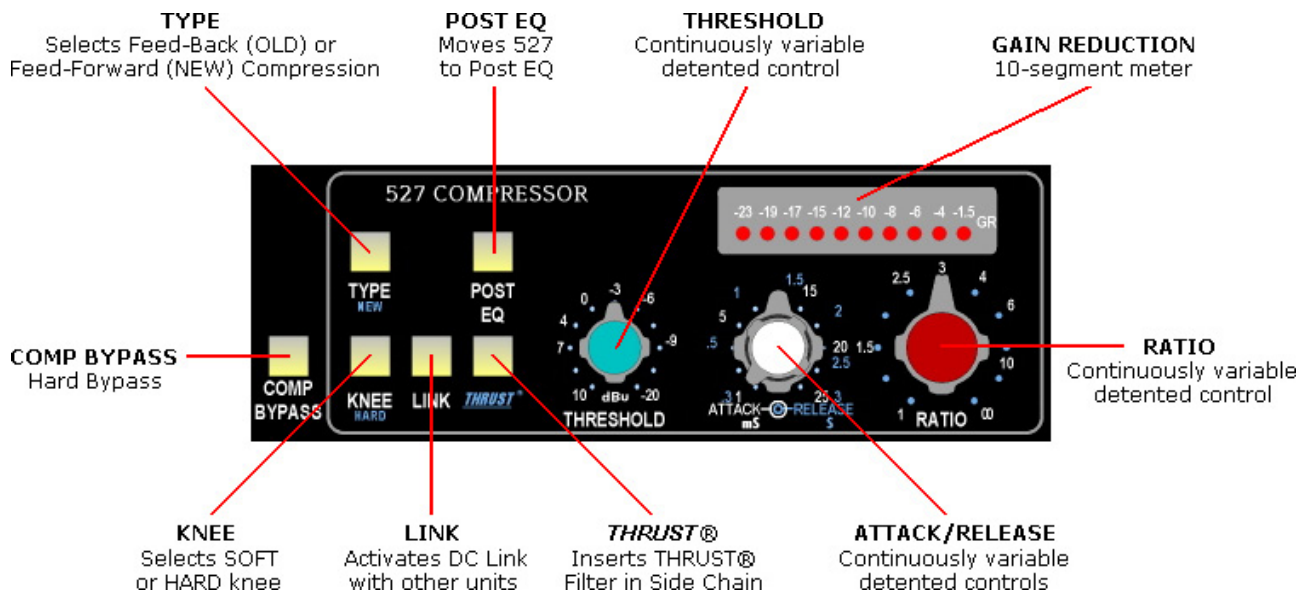
The output level remains fairly constant regardless of the threshold or ratio control, much like the "more/less" Ceiling control on the API 525 Compressor. This allows for live adjustments without any noticeable gain changes in the program level.

The 527 Compressor makes use of the 2510 and 2520 discrete op-amps and exhibits the reliability, long life, and signature sound which are characteristic of API products.

Features

- Feed-forward or feed-back compression
- Hard or soft knee compression
- Patented *THRUST*[®] switch for frequency dependent side chain control
- Continuously variable detented THRESHOLD control
- Continuously variable detented ATTACK and RELEASE controls
- Continuously variable detented RATIO control
- 10 segment gain reduction (GR) meter
- Side chain input
- LINK switch for multiple unit interdependent compression linking (stereo compression)
- COMP BYPASS switch with hard relay bypass when in the "Out" position
- Can be moved to POST EQ
- Audio circuit uses the 2510 and 2520 discrete op-amps

4.2 Compressor Controls



The 527 Compressor provides a comprehensive suite of controls:

- **THRESHOLD**: The level at which compression begins
- **ATTACK**: The time it takes for the compressor to respond
- **RELEASE**: The time it takes the compressor to return to unity gain
- **RATIO**: The amount of compression applied after threshold
- **TYPE**: NEW or OLD detection path topology
- **KNEE**: The characteristic of the response curve at the onset of compression.
- **THRUST®**: Patented circuit that inserts a high-pass filter before the RMS detector
- **GR Meter (GAIN REDUCTION)**: 10 LED gain reduction meter
- **LINK**: Activates the DC LINK for stereo/multichannel processing with other TCS units
- **COMP BYPASS (Compressor Bypass)**: Completely removes the 527 Compressor from
- **POST EQ**: Moves the 527 Compressor to post the 550A Equalizer in the audio path

4.2.1 Threshold



THRESHOLD: Sets the level at which compression begins

- Continuously variable between +10dBu and -20dBu
- Detented rotary pot for easy recall

4.2.2 Attack and Release



Attack and Release times are fully variable on the 527 Compressor and share a dual-concentric potentiometer for control. Attack time is adjusted using the outer ring of the pot and Release time is adjusted using the inner knob.



ATTACK: Sets the time it takes the compressor to react when the level exceeds the set THRESHOLD

- Continuously variable between 1 and 25 ms (milliseconds)
- Detented rotary pot for easy recall



RELEASE: Sets the time it takes the compressor to recover to unity gain after the level falls below the set THRESHOLD

- Continuously variable between .3 and 3 seconds (S)
- Detented rotary pot for easy recall

4.2.3 Ratio



RATIO: Sets the ratio of input vs. output levels for signals that fall above the set THRESHOLD

- Continuously variable between 1:1 and ∞ :1
- A Ratio of 10:1 or greater is generally considered to be a limiter
- Detented rotary pot for easy recall

4.2.4 Compression Type

The 527 Compressor can be set to operate in two circuit topologies:

- **OLD:** Feed-Back topology: The RMS detector receives the signal from after the VCA
- **NEW:** Feed-Forward topology: The RMS detector receives the signal from before the VCA

The compressor circuit topology is selected using the TYPE switch.



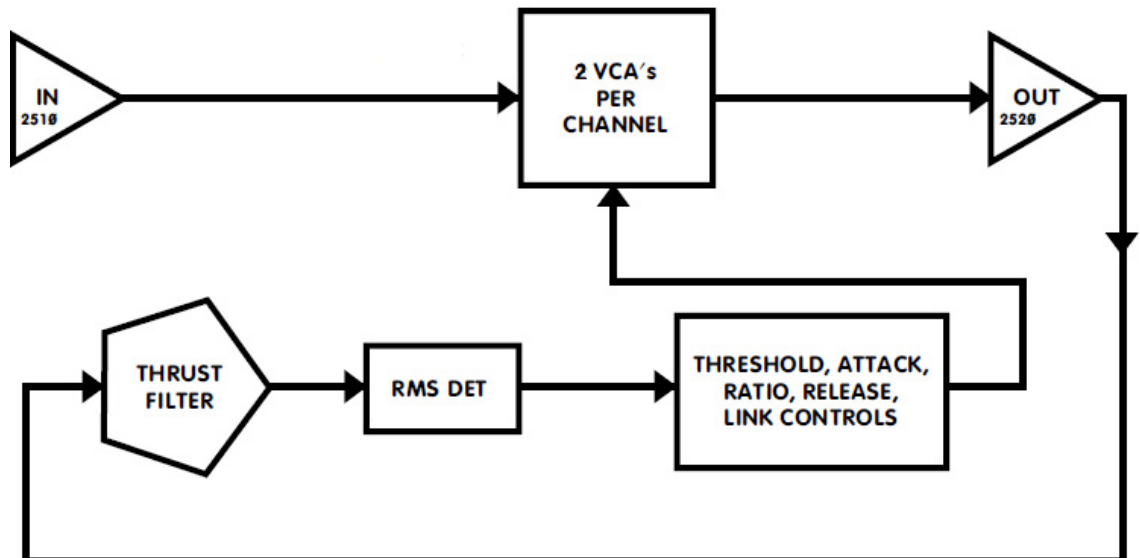
TYPE: Selects the compressor circuit topology

- **OLD:** Feed-back topology (default setting with switch disengaged)
- **NEW:** Feed-forward topology (switch engaged)
- Illuminates when engaged

4.2.4.1 OLD: Feed-Back Compression

In a feed-back compressor, the RMS detector gets its signal from the output of the gain reduction device (VCA). This is how older API 525, 1176 type, and 660 type compressors work. This yields a smoother, softer, more transparent sound.

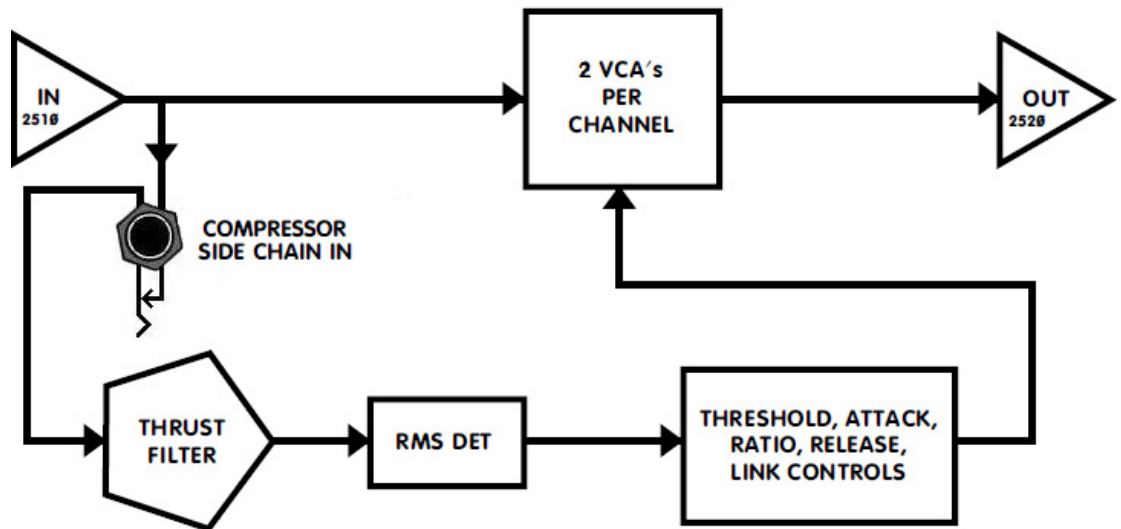
"OLD" or FEED BACK type COMPRESSION



4.2.4.2 NEW: Feed-Forward Compression

In a feed-forward compressor, the RMS detector normally gets its signal from a split of the input signal. (The detector path can alternately get its signal from a Side Chain Input.) With this method, the RMS detector sends a signal to the VCA that is an exact ratio of the desired compression set by the RATIO control. This is how many new VCA based compressors work. This can yield more aggressive compression and a harder, more affected sound.

"NEW" or FEED FORWARD type COMPRESSION



4.2.5 Knee

Knee determines the 527 Compressor's response curve at the onset of compression.

The 527 Compressor has two (2) knee settings that control how the compressor transitions into compression:

- SOFT: Rounded response curve
- HARD: Sharp response curve

The knee of the compressor is selected using the KNEE switch.



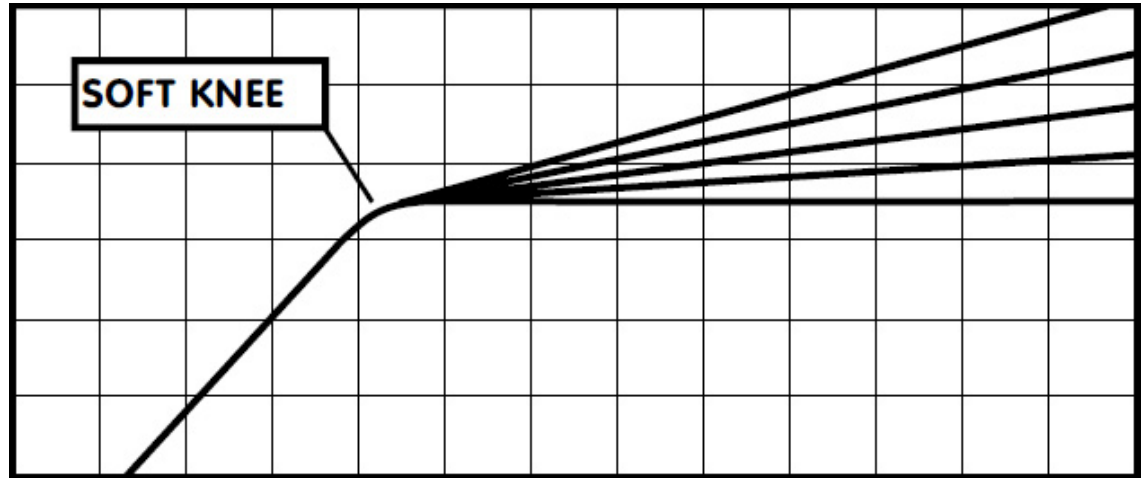
KNEE: Selects the response curve at the onset of compression.

- SOFT: Rounded response curve (default setting with switch disengaged)
- HARD: Sharp response curve (switch engaged)
- Illuminates when engaged

4.2.5.1 Soft Knee Compression

SOFT: Rounded response curve

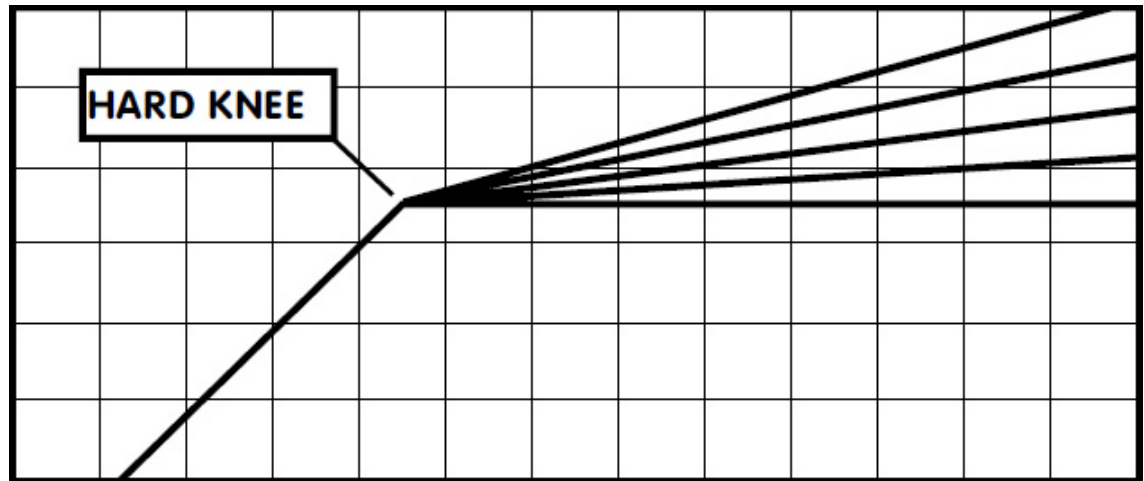
- Gradual onset of compression (fade-in up to the set ratio)
- Similar to an “over-easy” type knee
- More transparent



4.2.5.2 Hard Knee Compression

HARD: Sharp response curve

- Immediate onset of compression (sudden transition to set ratio)
- More aggressive and noticeable



4.2.6 THRUST®

The 527 Compressor includes API's patented **THRUST®** circuit that can be switched in or out as needed. This places the **THRUST®** filter before the RMS detector that decreases the compressor's reaction to low frequency content. The result is a noticeable increase of punch and low frequencies, but a uniformly compressed signal. It's the “little more punch” switch!

The **THRUST®** circuit can be engaged using the **THRUST®** switch.

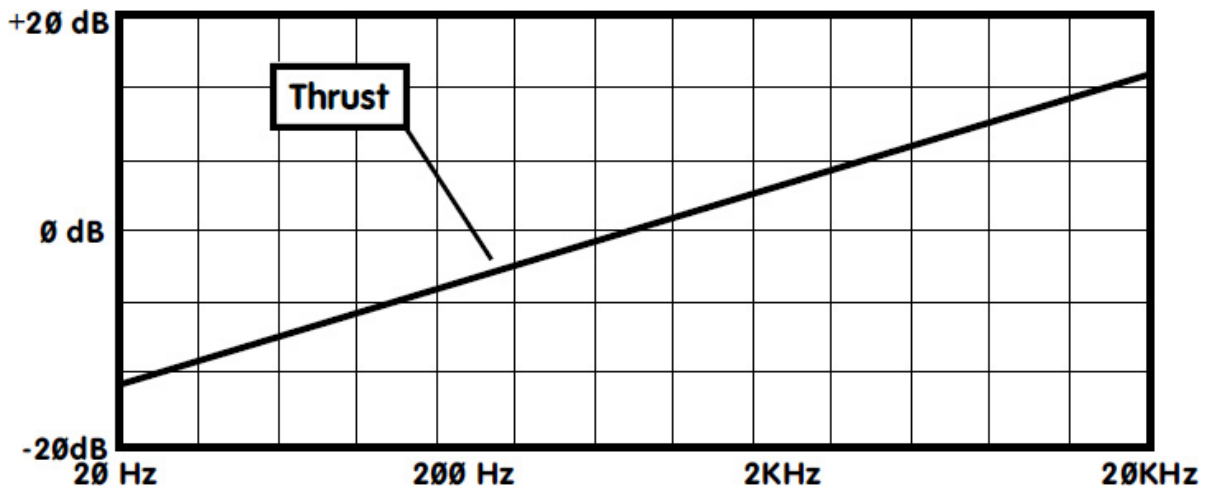


THRUST®: Inserts the **THRUST®** filter before the RMS detector

- Illuminates when engaged

The patented **THRUST**[®] circuit has been used for many years in the famed API 2500 Stereo Compressor, ATI Paragon and Paragon II consoles, as well as the Pro-6 Input Strip. This circuit places a filter in front of the RMS detector with a slope of 10dB per decade (-3dB/8va), which is the inverse of the pink noise energy curve. In acoustics, the pink noise curve is used to equalize energy vs. frequency over the audio spectrum, as sound requires more low frequency energy than high frequency energy to sound correct to your ear. In Hi-fi equipment, a "LOUDNESS" contour is used to equalize the music at lower levels so it sounds correct. Even with this curve, there is still a substantial amount of low frequency information compared to high frequency information in the audio signal path. When that signal is fed into the RMS detector, the detector will process the signal into a DC control voltage based upon the those louder low frequencies, resulting in a control voltage that favors the low frequencies of the signal, causing pumping and a loss of punch. Sometimes, this is not desirable. By engaging the **THRUST**[®] switch, this inverse filter is placed in front of the RMS detector, evening out the energy by lowering the energy in the low frequencies and increasing the energy in the high frequencies, so each octave has the same energy instead of each octave having half the energy as the one lower. This creates a unique compression effect that still reduces the overall gain, but the sound is much more punchy and the signal actually sounds less compressed.

THRUST[®] filter response



4.2.7 Gain Reduction Meter

A gain reduction (GR) meter is provided to indicate the amount of compression being applied.



When no gain reduction is being applied, all LED's are lit on the Gain Reduction meter (GR). When compression occurs, the corresponding LED's extinguish to indicate the amount of gain reduction. The following gain reduction increments are provided:

- -1.5 dB
- -4 dB
- -6 dB
- -8 dB
- -10 dB
- -12 dB
- -15 dB
- -17 dB
- -19 dB
- -23 dB

4.3 Compressor Routing

There are four (4) routing options for 527 Compressor:

- Pre EQ: The 527 Compressor is located after the preamp and before the EQ (default signal flow)
- Post EQ: The 527 Compressor is located after the EQ and before the output section
- Hard Bypassed: The 527 Compressor is removed completely from the audio path
- Side Chain Input: An external signal can replace the normal detector path input

4.3.1 Compressor Pre Equalizer (Default Signal Flow)

In the default signal flow (no routing switches engaged), the 527 Compressor receives the output of the 512C Preamp.

- 527 Compressor will interface via the FIRST EFFECT jacks on the rear panel
- 550A Equalizer will interface via the SECOND EFFECT jacks on the rear panel

4.3.2 Compressor Post Equalizer

When the POST EQ switch is engaged, the 527 Compressor receives the output of the 550A Equalizer and is interfaced via the SECOND EFFECT jacks on the rear panel.



POST EQ: Moves the 527 Compressor to post the 550A Equalizer in the audio path

- 527 Compressor will interface via the SECOND EFFECT jacks on the rear panel
- 550A Equalizer will interface via the FIRST EFFECT jacks on the rear panel
- Illuminates when engaged

4.3.3 Compressor Bypass

When the COMP BYPASS switch is engaged, the 527 Compressor is completely removed from the audio path via a hard relay-based bypass.



COMP BYPASS (Compressor Bypass): Completely removes the 527 Compressor from the audio path

- Relay hard bypass
- Illuminates when engaged

4.3.4 Compressor Side Chain

The 527 Compressor Side Chain (detector path) is accessible via a balanced ¼" input on the rear panel.

When the compressor type is set to NEW, the 527 Compressor Side Chain is fed by a split of the input to the compressor. The detection path signal can be replaced by an external source by inserting a plug in the COMPRESSOR SIDE CHAIN IN jack on the rear panel.



COMPRESSOR SIDE CHAIN IN: Replaces the signal to compressor detector path with the inserted signal

- Only effective when compressor is set to NEW type
- Balanced, low-impedance +4dBu line level input
- Switching ¼" TRS jack

4.4 DC Link

The 527 Compressor in The Channel Strip can be linked with 527 Compressors in other units for stereo and multichannel applications. When connected together and the LINK switches are engaged, the DC control voltages from all units are summed together. This results in the same control changes being applied to all compressors. While this is not a "Master/Slave" configuration, the Threshold, Attack/Release Times, and Ratio of all units should be set to the same value to prevent one channel from generating a disproportionate contribution to the summed control voltage.



DC LINK: Control voltage input/output jack for the 527 Compressor

- Active only when LINK switch is engaged

All DC LINK cables are ¼" TRS phone plugs wired tip-to-tip, ring-to-ring, and sleeve-to-sleeve

- Stereo: Cable with a ¼" TRS on each end
- Multichannel: Cable with multiple ¼" TRS plugs



LINK: Activates the DC control voltage summing with other units

- Illuminates when engaged

4.5 Side Chain Input

The compressor Side Chain is the detector path that contains the **THRUST**[®] filter and RMS detector. When the compressor type is set to NEW, the Side Chain is fed from a split of the 527 Compressor input signal. When the NEW type is selected, the Side Chain signal can alternately be fed from an external signal via the COMPRESSOR SIDE CHAIN IN jack on the rear panel.

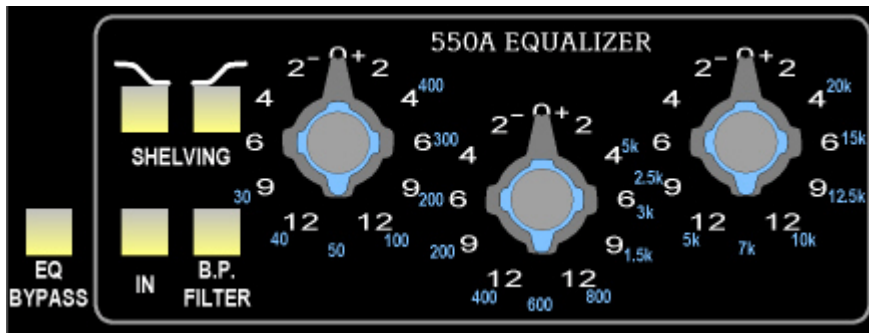


COMPRESSOR SIDE CHAIN IN: Input to the 527 Compressor detector path

- Inserting a plug will replace the Side Chain signal
- Only available when the NEW compressor type is selected
- Balanced, low-impedance, +4dBu line level input
- Switching ¼" tip-ring-sleeve jack

5.0 Spectral Processing: 550A Equalizer

5.1 550A Equalizer Overview and Features



Few equalizers enjoy the respect and admiration of the coveted API 550A Equalizer. Designed by the now-legendary Saul Walker in the late '60s, the discrete 550A Equalizer was first used as a modular OEM equalizer.

As the industry rapidly embraced the sonic quality of

the 550A Equalizer, it quickly found its way into many custom console designs by Frank DeMedio and other leading engineers. Many of these consoles are still in use today.

Forty years later, the 550A Equalizer remains the standard against which other EQs are measured, and it has played a major role in the recording industry for decades. Still copied but never duplicated, the 550A Equalizer became API's standard channel module EQ when the company began manufacturing consoles in 1971. With virtually all existing units spoken for, popular demand for this EQ resulted in API finally resuming production in 2004.

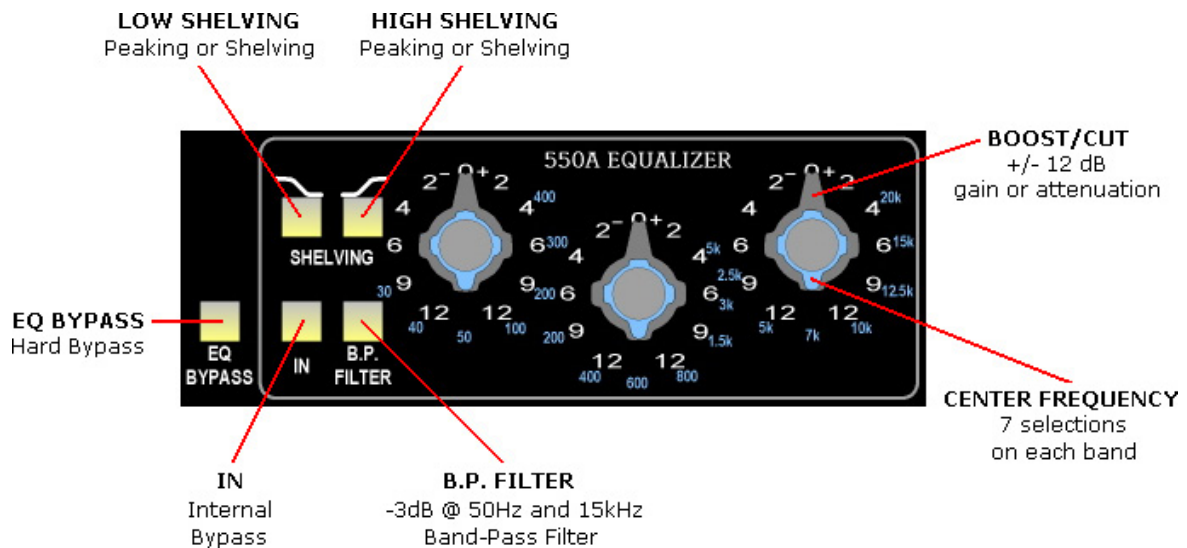
The 550A Equalizer provides reciprocal equalization at 21 points in 7 steps of boost to a maximum of 12dB of gain or attenuation at each point. The fifteen equalization points are divided into three overlapping ranges. The high and low frequency ranges are individually selectable as either peaking or shelving, and a band-pass filter may be inserted independently of all other selected equalization settings. Frequency ranges and boost/cut are selected by three dual-concentric switches, and a pushbutton "IN" switch allows the EQ to be silently introduced into the signal path. A small toggle switch is used to insert the band-pass filter into the 550A Equalizer.

The combination of Walker's incomparable 2520 op-amp and his "Proportional Q" circuitry gives the 550A Equalizer user an uncomplicated way to generate acoustically superior equalization. With the long-awaited reissue of this unit, an EQ that has had such a part in the history of recording is continuing to make history in today's music.

Features

- 3 bands of classic API equalization
- Each band offers seven (7) API selected frequency centers
- Reciprocal and repeatable filtering
- Maximum 12dB of boost/cut per band
- Low and High EQ bands offer shelf/peak switching
- "Proportional Q" narrows filter Q at extremes
- Band-pass filter (-3dB @ 50Hz and 15kHz)
- High headroom +30dB clip level
- Traditional API fully discrete circuit design
- Audio circuit uses the 2520 discrete op-amps

5.2 Equalizer Controls



The 550A Equalizer provides three (3) bands of equalization and a band-pass filter.

- **IN:** Activates/deactivates the 550A Equalizer internal bypass
- **CENTER FREQUENCY (Knob):** Seven (7) center frequencies indicated in blue numbers
- **BOOST/CUT (Ring):** +/- 12dB indicated in white numbers
- **HIGH SHELIVING:** High band peaking/shelving switch
- **LOW SHELIVING:** Low band peaking/shelving switch
- **B.P. Filter:** Band-pass Filter IN/OUT
- **POST EQ:** Moves the 527 Compressor to post the 550A Equalizer in the audio path
- **EQ BYPASS (Equalizer Bypass):** Completely removes the 550A Equalizer from

5.2.1 Low Frequency Band



Low Frequency:

- **Center Frequency (knob):** 30Hz, 40Hz, 50Hz, 100Hz, 200Hz, 300Hz, 400Hz
- **Boost/Cut (ring):** +/- 12dB
- Switchable shelving



Low Frequency Shelving: Changes the low frequency band from a peaking EQ to a shelving EQ

- All frequencies below the selected center frequency will be boost or cut
- Illuminates when engaged

5.2.2 Mid Frequency Band



Mid Frequency:

- **Center Frequency (knob):** sets 200Hz, 400Hz, 600Hz, 800Hz, 1.5kHz, 3kHz, 5kHz
- **Boost/Cut (ring):** +/- 12dB

5.2.3 High Frequency Band



High Frequency:

- Center Frequency (knob): 2.5kHz, 5kHz, 7kHz, 10kHz, 12.5kHz, 15kHz, 20kHz
- Boost/Cut (ring): +/- 12dB
- Switchable shelving



High Frequency Shelving: Changes the high frequency band from a peaking EQ to a shelving EQ

- All frequencies above the selected center frequency will be boost or cut
- Illuminates when engaged

5.2.4 Band-Pass Filter

A -3dB @ 50Hz to 15kHz band-pass filter can be inserted in the 550A Equalizer circuit by engaging the B.P. FILTER switch.



B. P. FILTER: Activates the band-pass filter

- Illuminates when engaged

5.3 Equalizer Routing

There are three (3) routing options for 550A Equalizer:

- Post Compressor: The 550A Equalizer is located after the compressor and before the output section (default signal flow)
- Pre Compressor: The 550A Equalizer is located after the preamp and before the compressor
- Hard Bypassed: The 550A Equalizer is removed completely from the audio path

5.3.1 Equalizer Post Compressor (Default Signal Flow)

In the default signal flow (no routing switches engaged), the 550A Equalizer receives the output of the 527 Compressor.

- 550A Equalizer will interface via the SECOND EFFECT jacks on the rear panel
- 527 Compressor will interface via the FIRST EFFECT jacks on the rear panel

5.3.2 Equalizer Pre Compressor

When the POST EQ switch is engaged, the 550A Equalizer receives the output of the 527 Compressor and is interfaced via the FIRST EFFECT jacks on the rear panel.



POST EQ: Moves the 527 Compressor to post the 550A Equalizer in the audio path

- 550A Equalizer will interface via the FIRST EFFECT jacks on the rear panel
- 527 Compressor will interface via the SECOND EFFECT jacks on the rear panel
- Illuminates when engaged

5.3.3 Equalizer Bypass

The 550A Equalizer can be removed from the audio path in two (2) ways:

- EQ BYPASS: Hard relay-based bypass
- IN (switch): Internal bypass within the 550A Equalizer

5.3.3.1 EQ Bypass

When the EQ BYPASS switch is engaged, the 550A Equalizer is completely removed from the audio path via a hard relay-based bypass.



EQ BYPASS (Compressor Bypass): Completely removes the 550A Equalizer from the audio path

- Relay hard bypass
- Illuminates when engaged

5.3.3.2 EQ IN Switch

In addition to the EQ BYPASS, the 550A Equalizer has its own IN switch, which must be engaged for the EQ to be heard. If the IN switch is not engaged, the EQ is still in the audio path, but is bypassed within the 550A Equalizer.

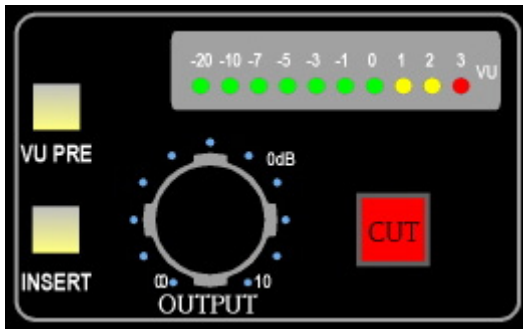


IN: Activates the 550A Equalizer internal bypass

- Silent operation
- Illuminates when engaged

6.0 Output Section: 325 Line-Driver

6.1 325 Output Section Overview and Features



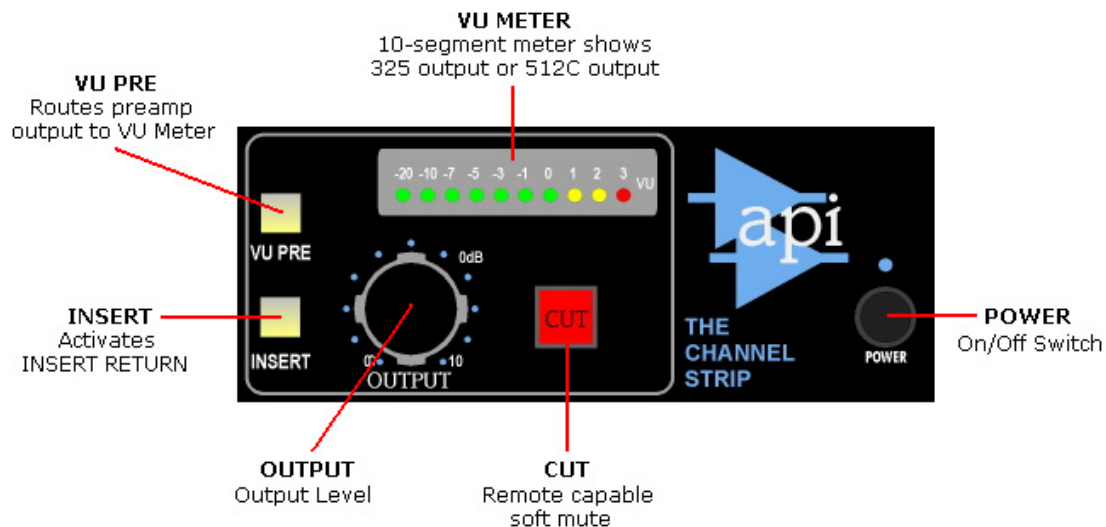
The output section of The Channel Strip includes an Insert, output fader, soft mute (CUT), and the API 325 Line-Driver output circuit (a 2520 and 1:3 output transformer) taken directly from API console designs.

The 10-segment LED VU meter can be switched to monitor the output level of The Channel Strip or the output of the 512C Preamp.

Features

- Switchable Insert Return
- Remote controllable soft mute (CUT)
- Full attenuation to +10dB of gain
- 10-segment LED VU Meter
- High headroom +30dB clip level
- Traditional API fully discrete circuit design
- API 2520 discrete op-amp with transformer output

6.2 Output Section Controls



The 325 Line-Driver provides the following controls:

- OUTPUT: Output level control
- CUT: Remote controllable soft mute
- INSERT: Replaces the output of the Second Effect with the signal at Insert Return as the input to the 325 Line-Driver section
- VU Meter: Switchable between main output and preamp output
- Power: AC power switch

6.2.1 Output



OUTPUT: Main output fader

- Full attenuation ($-\infty$) to +10dB of gain
- Detented rotary pot for easy recall



CHANNEL OUT: Main Channel Strip output

- Fed from 325 Line-Driver
- Balanced, low-impedance +10dBu line level
- Male XLR connector

6.2.2 Soft Mute



CUT: Mutes main output

- Silent soft mute
- Remote control via 9-pin D-sub connector on the rear panel
- Illuminates in red when engaged

6.2.2.1 Remote Mute Control

The soft mute (CUT) can be remotely controlled via the EXT. MUTE COMMANDS connector on the rear panel. The remote circuit operates in parallel with the on-board CUT switch, but overrides the on-board CUT switch when activated.



EXT. MUTE COMMANDS (External Mute Commands): Control port for the soft mute (CUT) switch

- Overrides on-board CUT switch when activated
- 9-pin D-sub connector

9-pin D-sub pin-out for remote mute control:

- Pin 1 – 5V gnd
- Pin 6 - +5V
- Pin 9 – Cut switch output active low
- Pin 5 – External mute command input active +5V high

6.2.3 VU Meter



The VU meter will normally display the output of the 325 Line-Driver.

The output of the 512C Preamp will be displayed the when the VU PRE switch is engaged.



VU PRE (VU Preamp): Routes the output of the 512C Preamp to the VU meter input

- Illuminates when engaged

6.3 Output Section Routing

The output section is the last stage in the audio path and provides the Insert, VU Meter, 325 Line-Driver, and main CHANNEL OUTPUT XLR interface.

The 325 Line-Driver can be fed from two (2) sources:

- **SECOND EFFECT OUT:** The signal present at the SECOND EFFECT OUT jack is normalled to the 325 Line-Driver input.
- **INSERT RETURN:** The signal present at the INSERT RETURN jack will be routed to the 325 Line-Driver input when the INSERT switch is engaged.

The output of the Second Effect (normally the 550A Equalizer) is sent to the input to the 325 Line-Driver, as well as the SECOND EFFECT OUT jack on the rear panel. This signal can be replaced by the signal present at the INSERT RETURN jack on the rear panel by engaging the INSERT switch.

6.3.1 Insert

Engaging the INSERT switch will route the signal present at the INSERT RETURN jack to the input of the 325 Line-Driver. When the INSERT switch engaged, the signal flow will be as follows:



INSERT: Activates the INSERT RETURN input

- Routes the signal present at the INSERT RETURN jack to the 325 Line-Driver
- Replaces the Second Effect output as the input to the 325 Line-Driver
- Illuminates when engaged



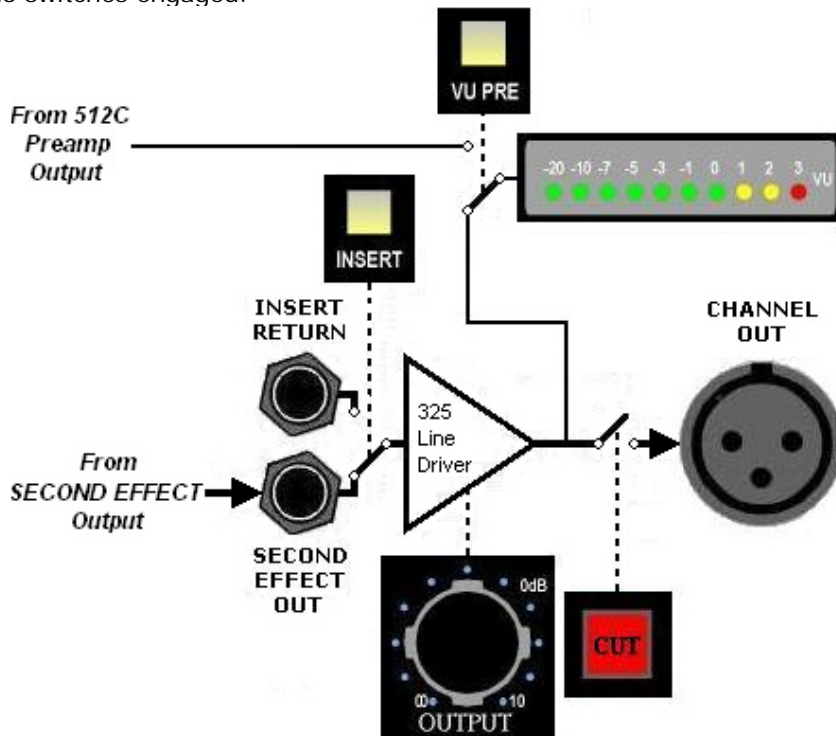
INSERT RETURN: Replaces the input to 325 Line-Driver when the INSERT switch is engaged

- Only active when INSERT switch is engaged
- Balanced, low-impedance, +4dBu line level input
- ¼" tip-ring-sleeve jack

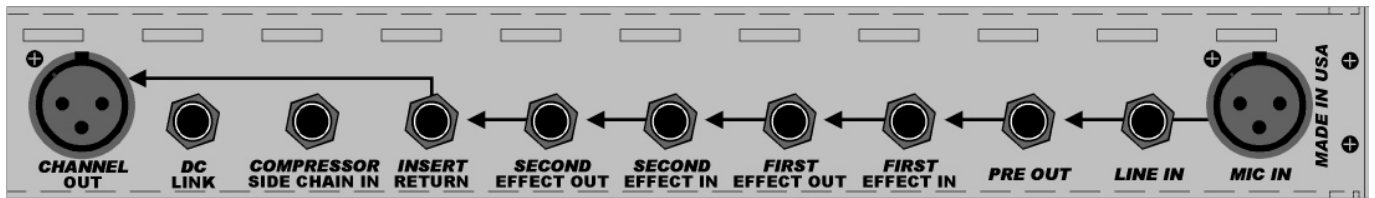
NOTE: Since the signal can be externalized at multiple points in the audio path, The Channel Strip does not have a dedicated "insert send" output. PRE OUT, FIRST EFFECT OUT, and SECOND EFFECT OUT are intended to be used as "insert sends" as needed.

6.4 325 Output Section Block Diagram

The block diagram below illustrates signal flow through the 325 output section of The Channel Strip with no switches engaged.



7.0 Rear Panel Interface



The rear panel of The Channel Strip provides a comprehensive package of interfacing options.

With the exception of the microphone and instrument inputs, all audio inputs and outputs are balanced, low impedance +4dBu line level connections. All 1/4" connectors are tip, ring, sleeve phone jacks.

7.1 Audio Path Inputs

The Channel Strip provides multiple audio inputs at various points in the audio path:



INST (Instrument): Instrument level input to the 512C Preamp (front panel)

- 1/4" tip, sleeve jack
- -10dBu
- Unbalanced, high-impedance instrument input



MIC IN: microphone input to the 512C Preamp

- Female XLR
- Balanced, low-impedance input



LINE IN: Line level input to the 512C Preamp

- 1/4" tip, ring, sleeve jack
- +4dBu
- Balanced, low-impedance input



FIRST EFFECT IN: Line level input to the first signal processor in audio path

- Fed from the 512C Preamp output (PRE OUT)
- Inserted signal will break the normal from the 512C Preamp output
- Switching 1/4" tip, ring, sleeve jack
- +4dBu
- Balanced, low-impedance input



SECOND EFFECT IN: Line level input to the second signal processor in audio path

- Fed from the FIRST EFFECT OUT
- Inserted signal will break the normal from the FIRST EFFECT OUT
- Switching 1/4" tip, ring, sleeve jack
- +4dBu
- Balanced, low-impedance input



INSERT RETURN: The signal present at this jack will replace the input to the 325 Line-Driver when the INSERT switch is engaged

- The output section is normally fed from the SECOND EFFECT OUT
- Engaging the INSERT switch will break the normal from the SECOND EFFECT OUT
- 1/4" tip, ring, sleeve jack
- +4dBu
- Balanced, low-impedance input

7.2 Audio Path Outputs

The Channel Strip provides multiple audio outputs at various points in the audio path. All ¼" outputs are non-switching jacks so inserting a plug will not break the connection with the input it feeds.



PRE OUT (Preamplifier Output): Line level output from the 512C Preamp

- Feeds the FIRST EFFECT IN
- ¼" tip, ring, sleeve jack
- +4dBu
- Balanced, low-impedance output



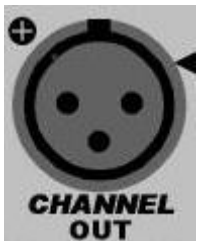
FIRST EFFECT OUT: Line level output from the first signal processor in audio path

- Feeds the SECOND EFFECT IN
- ¼" tip, ring, sleeve jack
- +4 dBu
- Balanced, low-impedance output



SECOND EFFECT OUT: Line level output from the second signal processor in audio path

- Feeds the input to the 325 Line-Driver
- ¼" tip, ring, sleeve jack
- +4 dBu
- Balanced, low-impedance output

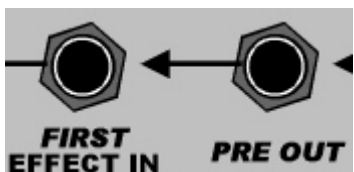


CHANNEL OUT: Line level output from the 325 Line-Driver

- Main TCS output
- Male XLR
- +4 dBu
- Balanced, low-impedance output

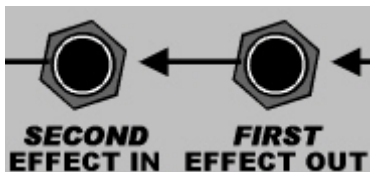
7.3 Rear Panel Half-Normals

There are three "half-normalled" connections on the rear panel. Switching jacks are used on the FIRST EFFECT IN and SECOND EFFECT IN, so the signal fed from the normal will be broken when a plug is inserted.



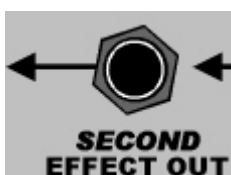
PRE OUT to FIRST EFFECT IN: (Normally 512C output to 527 input)

- PRE OUT is a splitting jack and the signal will not be broken when a plug is inserted
- FIRST EFFECT IN is a switching jack and feed from PRE OUT will be broken when a plug is inserted



FIRST EFFECT OUT to SECOND EFFECT IN: (Normally 527 output to 550A Equalizer input)

- FIRST EFFECT OUT is a splitting jack and the signal will not be broken when a plug is inserted
- SECOND EFFECT IN is a switching jack and feed from FIRST EFFECT OUT will be broken when a plug is inserted



SECOND EFFECT OUT to 325 Line-Driver In: (Normally 550A Equalizer output to 325 input)

- SECOND EFFECT OUT is a splitting jack and the signal will not be broken when a plug is inserted
- INSERT RETURN will replace the input to the 325 Line-Driver when the INSERT switch is engaged

7.4 527 Compressor Side Chain and DC Link Connections

The 527 Compressor provides two methods of external control:

- [Side Chain Input](#)
- [DC Link](#)

7.4.1 Side Chain Input

The compressor Side Chain is the detector path that contains the **THRUST**® filter and RMS detector. When the compressor type is set to NEW, the Side Chain is fed from a split of the 527 Compressor input signal. When the NEW type is selected, the Side Chain signal can alternately be fed from an external signal via the COMPRESSOR SIDE CHAIN IN jack on the rear panel.



COMPRESSOR SIDE CHAIN IN: Input to the 527 Compressor detector path

- Inserting a plug will replace the Side Chain signal
- Only available when the NEW compressor type is selected
- Switching 1/4" tip-ring-sleeve jack
- +4 dBu line level input
- Balanced, low-impedance

7.4.2 DC Link

The 527 Compressor in The Channel Strip can be linked with 527 Compressors in other units for stereo and multichannel applications. When connected together and the LINK switches are engaged, the DC control voltages from all units are summed together. This results in the same control changes being applied to all compressors. While this is not a "Master/Slave" configuration, the Threshold, Attack/Release Times, and Ratio of all units should be set to the same value to prevent one channel from generating a disproportionate contribution to the summed control voltage.



DC LINK: Control voltage input/output jack for the 527 Compressor

- Active only when LINK switch is engaged

All DC LINK cables are 1/4" TRS phone plugs wired tip-to-tip, ring-to-ring, and sleeve-to-sleeve

- **Stereo:** Cable with a 1/4" TRS on each end
- **Multichannel:** Cable with multiple 1/4" TRS plugs



LINK: Activates the DC control voltage summing with other units

- Illuminates when engaged

7.5 Remote Mute Control

The soft mute (CUT) can be remotely controlled via the EXT. MUTE COMMANDS connector on the rear panel. The remote circuit operates in parallel with the on-board CUT switch, but overrides the on-board CUT switch when activated.



EXT. MUTE COMMANDS (External Mute Commands): Control port for the soft mute (CUT) switch

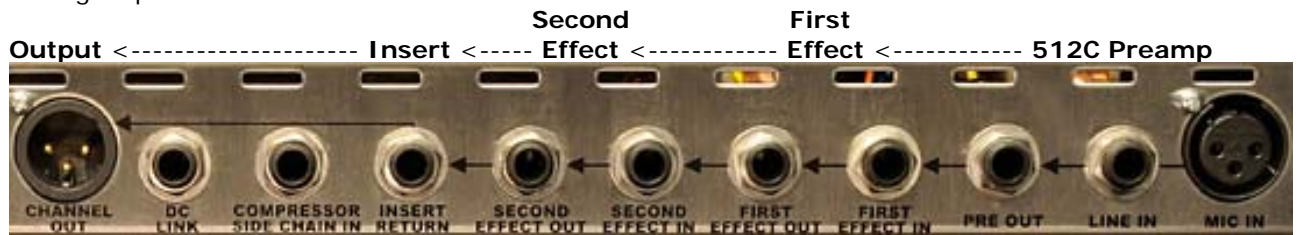
- Overrides on-board CUT switch when activated
- 9-pin D-sub connector

9-pin D-sub pin-out for remote mute control:

- Pin 1 – 5V gnd
- Pin 6 – +5V
- Pin 9 – Cut switch output active low
- Pin 5 – External mute command input active +5V high

7.6 Rear Panel Signal Flow

The Channel Strip signal flow is illustrated by the right-to-left order of the unit's rear panel. The order of these interfaces remains constant regardless of the order of the 527 Compressor and 550A Equalizer in the signal path.



- The PRE OUT is "half-normalled" to feed the FIRST EFFECT IN
- The FIRST EFFECT IN feeds the first processor in the audio path (normally the 527 Compressor*)
- The FIRST EFFECT OUT is "half-normalled" to feed the SECOND EFFECT IN
- The SECOND EFFECT IN feeds the second processor in the audio path (normally the 550A Equalizer*)
- The SECOND EFFECT OUT is "half-normalled" to feed the 325 Line-Driver input

* Engaging the POST EQ switch will move the 527 Compressor to after the 550A Equalizer, reversing the order of these effects in the audio path.

The PRE OUT, FIRST EFFECT OUT, and SECOND EFFECT OUT jacks are all splitting outputs. This means the connection to the input they're normalled to will not be broken when a plug is inserted.

The FIRST EFFECT IN and SECOND EFFECT IN jacks are all switching jacks. This means the connection with the output they're normalled to is broken when a plug is inserted. The input is instead fed with the signal present on the inserted plug.

The INSERT RETURN is only active when the INSERT switch on the front panel is engaged.

8.0 AC Power

The Channel Strip can operate on either 115volt or 230volt 50-60Hz AC power.



The AC power is supplied via the IEC connector on the rear panel.

Operating voltage is determined by the Voltage Selector switch.



Voltage Selector Switch: Selects operating voltage

- 115 volts
- 230 volts



The fuse holder is located on the rear panel.

- 0.5A/0.25A 250V



The AC power switch for The Channel Strip is located at the lower right of the API logo on the front panel.

- A blue LED indicator illuminates when the unit is on.

APPENDIX

- i. 512C Preamplifier Specifications
- ii 527 Compressor Specifications
- iii. 550A Equalizer Specifications
- iv. 325 Line-Driver Specifications

i. 512C Preamplifier Specifications

Rear Connector:	XLR MIC Input Balanced ¼" TRS LINE Input
Front Connector:	HI-Z ¼" Unbalanced Instrument Input (INST)
Gain Range:	MIC: 14dB min. 68dB max. INST: 14dB min. 50dB max.
Maximum Input Levels:	MIC: +8dBu INST: +36dBu
Input Impedance:	MIC: 1500 Ohms (150 Ohm mic) INST: 20 K Ohms
Clipping Level:	+30dBu
Output Peak Indication:	+27dBu
Frequency Response:	+0, -.3, 30Hz to 20kHz
Noise:	Equivalent Input Noise: MIC: -129dBm; INST: -125dBm Actual Metered Noise: MIC: -95dBm; INST: -90dBm
Distortion:	Less than .05% @ +4dBu out, Less than .1% @ +28dBu out

ii. 527 Compressor Specifications

Attack Times:	1 millisecond to 25 milliseconds (typical)
Release Times:	0.3 seconds to 3 seconds (typical)
Compression Ratios:	1:1 to ∞:1
Threshold Control Range:	+10dBu to -20dBu
THRUST® Filter:	-10dB/Decade slope, unity @ 1kHz
Frequency Response:	+/- 1dB 20Hz to 20kHz
Total Harmonic Distortion:	< .2% THD, any level below clipping, any compression setting
Signal to Noise:	Unweighted -100dB below clipping (+26dBu@0.1% distortion, no compression)
Metering:	10-segment red LED: Gain Reduction scale; -1.5dB to -23dB (negative illumination indicator)

iii. 550A Equalizer Specifications

Insertion Loss:	None (bridging)
Frequency Response: (Unequalized)	±0.5dB 30Hz to 20kHz
Noise:	Unequalized output noise of –90dBm high level strapping –98dBm low level strapping 20Hz to 20kHz unweighted
Distortion:	.05% THD max, 30Hz to 20kHz @ +4dBm .07% THD max, 30Hz to 20kHz @ +18dBm

iv. 325 Line-Driver Specifications

Output Fader Control Gain:	-∞ to +10dB
Clipping Level:	+30dBu
Channel Output:	+4dBu, Balanced, Low-impedance, Male XLR
Output Impedance:	Less than 75 Ohms, Transformer Balanced
Metering:	10-segment red LED: VU scale; -20VU to +3VU (positive illumination indicator) Switchable between 512C Preamp and 325 Line-Driver outputs



Automated Processes, Inc.