EMT 140 UPGRADE
Installation Guide

Martinsound

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MARTECH EMT 140 UPGRADE

The Martech EMT 140 Upgrade dramatically enhances the depth and clarity of the original Echo Plate, while preserving the untimely richness for which the EMT 140 is famous. Wide bandwidth pickups, spectacular dynamic range, and extremely low noise electronics eliminate the coloration, noise, and distortion of the original, but ultimate benefit of the Martech EMT 140 Upgrade is the holy grail of digital effects: the perfect plate reverb.

IMPORTANT: READ ALL INSTRCTIONS BEFORE BEGINNING INSTALLATION!

PRE INSTALLATION CHECKS

VERIFY THE EMT HAS A DRIVE COIL WOUND OVER AN ALUMINUM CORE

The earliest EMT 140 units used a Drive Coil wound over a heavy brass core. The core was later changed to lightweight aluminum for improved frequency response and damping. The Martech Upgrade is optimized for use with aluminum cores. Using a brass core with will result in excessive low frequencies. New replacement Drive Coils are available from Martech.

STEREO CONVERSIONS REQUIRE AN ADDITIONAL CROSSBAR

The Martech EMT 140 Upgrade requires mounting Preamps to the crossbars near the Transducers. Converting a mono unit to stereo requires installing a second crossbar for the second (i.e. stereo) transducer at the opposite end of the EMT to the original crossbar. Please contact Martinsound Sales if the EMT needs a second crossbar.

TENSION AND ALIGN

The Martech Upgrade Kit provides all new electronics and wiring for an EMT 140. To achieve ultimate performance requires the reverberation plate suspension and Drive Coil alignment be set correctly. Refer to your EMT service manual for instructions on tensioning the plate and check the settings. If you do not have documentation for your EMT 140, refer the tune-Up procedure to a qualified technician.

Heavy-duty spring clips are supplied for the ‘tune-up’ as the original springs break easily. A Perspex Alignment Disk is also included with the Martech Upgrade Kit for realigning the Driver Coil magnet mounting plate before remounting the Driver Coil magnet. The diagram on the next page shows the proper realignment position. Verify that the damper is parallel to the plate to assure that decay is even across the plate, assuring an even stereo spread and decay. Measure the gap between the plate and damper at all four corners of the plate. Adjust the damper swing arms as required.

INSTALLATION INSTRUCTIONS

DISASSEMBLE THE EMT 140

Viewing the EMT from the end with electronics:

- Disconnect the audio cables and AC power from the EMT.
- Remove the damper wheel or remote control motor from the damper control shaft.
- Unscrew all screws from the left side panel of the EMT case and remove it.
- Pull the connectors straight out from the back of the amplifier module and remove it.
- Remove the microphone shrouds and unscrew the old microphones from their mounting screws. If a screwdriver is required to unseat the microphones remove the three screws along the top edge of the right side panel and remove the top cover to access the backside of the plate. Do not remove any screws from the top cover. Swing the damper to it’s furthest position and carefully reach behind the plate with a short screwdriver.
- Use a soldering iron to unsolder the drive cable and then remove all internal audio cables.

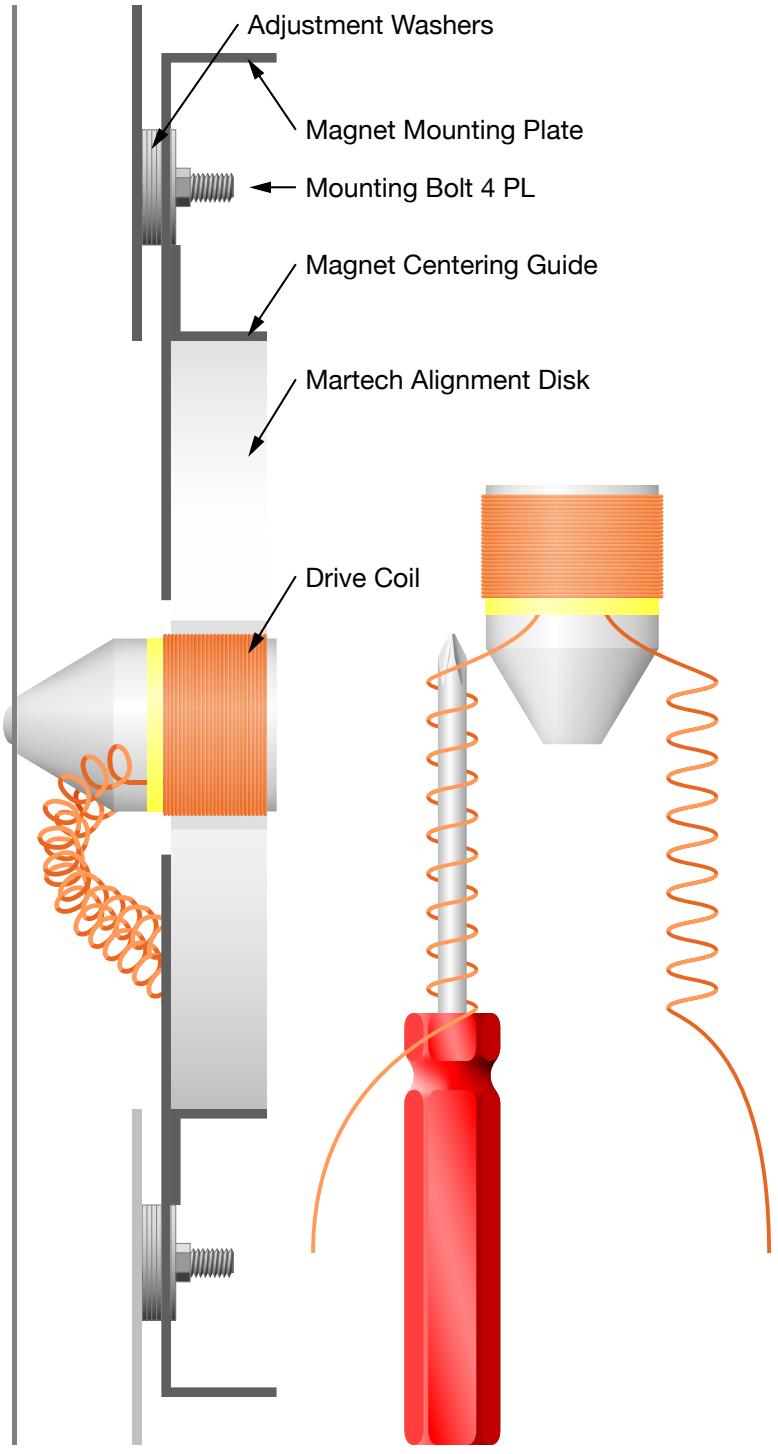
OPTIONAL: INSTALL THE STEREO CROSSBAR

Skip this section if the EMT is not being retrofitted with a Martech Stereo Crossbar.

OPTIONAL: INSTALL THE REPLACEMENT DRIVE COIL

Skip this section if the EMT is not being retrofitted with a Martech Replacement Drive Coil.

- Unscrew the driver magnet from the Magnet Centering Guides.
- Use a soldering iron to unsolder the Drive Coil leads from the solder tabs.
- Unscrew the Drive Coil from the plate. Be Careful! If the mounting screw attachment has failed use needle nose pliers to prevent it from falling through the plate
- Screw the Martch Replacement Drive Coil unto the mounting screw. Martinsound has encountered some EMT units that use a non-standard thread size. A new screw is provided for if required. To avoid removing the Damper Plate to replace the screw, we have succeeded using the following technique: Tie polyester thread to the old screw and then push it out of the plate. When the screw falls to the bottom of the unit, replace the old screw with the new screw. Tie it securely near the tip of the thread. Pull the new screw back into position using the thread. If the knot is small, the tip of the screw should easily pull through the hole. Hold the screw with needle nose pliers while screwing on the new Drive Coil. When the needle nose pliers start interfering, simply tilt the Drive Coil slightly to cause the screw to bind in the hole and finish screwing the Drive Coil on.
- Use a very small Phillips screwdriver or a 16 penny nail as a form to spring coil the leads from the Drive Coil (see diagram).
- Use a soldering iron to solder the Drive Coil leads to the solder tabs.
- Carefully place the Martech Alignment Disk over the Drive Coil. Loosen the screws holding the Magnet Mounting Plate if the disk is too far off center to slide over the Drive Coil.
- Check that the front of the alignment disk is even with the outermost winding of the Drive Coil.
- Add or remove washers on the bolts behind the Magnet Mounting Plate until the alignment disk is even with the outermost winding of the Drive Coil.
- Place any extra washers on the bolts in front of the Magnet Mounting Plate and refasten the plate so that the alignment disk is centered to the driver coil.
- Screw the driver magnet unto the Magnet Centering Guides.
- The polarity of the drive coil to the pick-ups is important to the sound of the plate. When finished, listen to the plate with the polarity normal and then reversed on the return channels. If the plate sounds richer, fuller, and better when reversed, then reverse the amplifier leads at the Drive Coil solder tabs.



MOUNT THE TRANSDUCERS

Follow the adhesive package directions if different than following.

- A clean, rust-free surface is essential for bonding the new Transducers to the plate.
- Clean a small area with steel wool 1.5 inches below both of the old microphone mounting holes. (An application of Naval Jelly may be required for stubborn rust)
- Prep the areas with alcohol after cleaning.
- Carefully remove the Transducers from their protective plastic containers and apply the activator from the supplied Rear-View Mirror Adhesive Pack to the cleaned areas on the plate and the back of each Transducer.
- When dry, place one drop of adhesive on the back of each Transducer and firmly press each Transducer into place. Allow a minimum of 30 minutes for the adhesive to set before pulling on the Transducer leads.

IMPORTANT: WAIT THE FULL 5 MINUTES FOR THE ACTIVATOR TO DRY!

MOUNT THE PREAMPS AND CABLE THE SYSTEM

- Mount the Preamps near each Transducer using the supplied hardware to the lower pair of holes on the adjacent crossbars. The electronic components should face away from the plate.
- Connect the Transducers to the Preamps after the adhesive is dry.
- The Preamp Cables have bright red connectors that mate with the Preamps. Plug the cables onto the Preamps, using the longer cable for the furthest run, and run the cables along the frame and through the amplifier cutout.
- Use a soldering iron to attach the supplied Drive Cable to the Drive Coil and run the cable along the frame and through the amplifier cutout.
- Firmly tie wrap the cables to the crossbars and frame, spacing the Preamp Cables away from the Drive Cable as much as possible.
- Mount the Martech Amplifier Module in the EMT endplate using the original screws.

IMPORTANT! DO NOT PLUG ANY CABLES INTO THE ELECTRONICS!

LINE AND SYSTEM CHECK

The Amplifier Module has dual inputs, but use of both inputs is not required for operation.

- Mute any inputs or Echo Returns associated with the EMT 140 Echo Return lines.
- Plug the associated Echo Sends directly into the Echo Returns at the EMT.
- Send a 1kHz tone at +4dBu from the console into the Echo Sends and verify that the level is approximately 0VU for the Echo Returns at the console. Check for any polarity reversals in each of the Send and Return lines.
- Attach the IEC power cord to AC power and the Martech Amplifier Module. The lower LED should turn on.
- Plug the left Echo Send into Input 1 and set the DRIVE ADJ trim so that both LEDs are on.
  Skip the next step if only one Echo Send is to be used.
- Swap the left Echo Send for the right Echo Send and check that both LEDs are on.
- Connect an oscilloscope or voltmeter to the Drive Test BNC. With both LEDs on, the level should be approximately +2 dBu (0.975 V RMS) with no more than a few millivolts of DC offset.

DO NOT PROCEED IF EXCESSIVE LEVEL OR DC OFFSET IS DETECTED!

CONTACT MARTINSOUND FOR TECHNICAL SUPPORT

It is important to check signal at the Drive Test BNC to verify that the power amplifier is functioning correctly. Malfunction due to shipping damage could result in 30VDC at the Drive Output, destroying the Drive Coil.

FINAL CONNECTIONS

- Remove AC power from the Amplifier Module. Plug the Preamp Cables into the back of the Amplifier Module paying attention to the cable IDs. Reconnect AC power.
- Plug the left and right Echo Return lines into the Amplifier Module line outputs.
- Check the operation of the Transducers by listening to the Echo Return lines at the console while someone talks at a normal level facing the plate. If a co-worker is unavailable, place a radio near the plate as a sound source. Verify that the residual hum level is low, no RF is detected, and that the noise level (hiss) is low.
- Again, mute any inputs or Echo Returns associated with the EMT 140 Echo Return lines. Remove AC power from the Amplifier Module. Plug the Drive Coil cable into the back of the Amplifier Module. Reconnect AC power.

FINAL ALIGNMENT

An LED level detector and a warble tone oscillator have been included in the Martech EMT 140 Upgrade to facilitate level calibration and performance verification.

The level detector is a simple "voltmeter" which illuminates both LEDs whenever the signal source is within a 0.25dB of the optimized level. Levels below or above this window illuminate only the lower or upper LED respectively. An unusually long time constant provides stable readings. Allow at least 10 seconds of settling time before adjusting the level pots.

The oscillator generates a rapidly modulated 1kHz sine wave or warble tone that disperses standing waves. This provides a response similar to the original EMT 1/3 octave noise tapes used to align the EMT 140. The oscillator is normally off. Pushing the CAL button mutes the Inputs, activates the oscillator, and reassigns the LED level detector to one of the two outputs, as determined by the LEFT/RIGHT switch position.

SET THE DAMPER FOR 2 SECONDS OF DECAY BEFORE CALIBRATING LEVELS

A single Echo Send should still be plugged into the Amplifier Module feeding a 1kHz tone at +4dBu.

- Check that both LEDs are still lit with the Drive Coil attached. Trim the DRIVE ADJ if needed.
- Press and hold the CAL button. A warble tone will be heard coming from the plate acoustically.
- Wait 10 seconds before for the plate to settle before proceeding.
- With the output switch set to LEFT, adjust the LEFT OUTPUT trim so both LEDs are on.
- With the output switch set to RIGHT, adjust the RIGHT OUTPUT trim so both LEDs are on.
- Remove the tone from the Echo Send line(s) and connect the second Echo Send line if utilized.

NEVER USE A TONE FROM THE CONSOLE FOR CALIBRATING THE OUTPUT! STANDING WAVES ON THE PLATE CAN CAUSE APPARENT LEVEL ERRORS AS LARGE AS 10 dB WITH A SINGLE FREQUENCY TONE

The polarity of the drive coil to the pick-ups is important to the sound of the plate. Listen to the plate with the polarity normal and then reversed on the return channels. If the plate sounds richer, fuller, and better when reversed, then reverse the amplifier leads at the Drive Coil solder tabs.

This completes installation of the retrofit Kit. Before reassembling the EMT cabinet panels, test the unit with an assortment of music sources to verify satisfactory performance.

PRODUCT DESCRIPTION

The Martech EMT 140 Upgrade is a complete electronics system for metal plate reverberation devices such as the EMT 140. The Upgrade consists of a main electronics package with input buffers, drive coil amplifier, and output line drivers, along with two new transducer pickups with preamps. Features include active balanced differential inputs and outputs, vastly improved headroom, lower noise and distortion, built-in level detection and test oscillator for calibration, and variable highpass filter with half octave steps.

INPUT CHAIN

A balanced differential summing amplifier buffers source Inputs 1 (left) and 2 (right). Operating at a gain of -6 dB, the buffer assures adequate headroom for summed input levels up to approximately +28 dBu. The gain of the buffer can be changed to accommodate systems operating at other than +4 dBm by simply replacing one quad single inline package (SIP) resistor pack.

An adjustable two-pole, highpass filter follows the input buffer. The filter response characteristic mimics two simple R-C filters in series, providing adequate low frequency rolloff without the peaking and ringing associated with Butterworth or other sharp filters. The -3 dB rolloff point is selectable in half-octave steps from 350 Hz down to 90 Hz with an extra step for flat (10 Hz) low end.

A hybrid, power amplifier module provides up to 60 watts peak power for the plate Drive Coil with high frequency pre-emphasis to complement the rolloff characteristics of the echo plate. A front panel BNC connector paralleled across the Drive Coil terminals provides convenient waveform monitoring during testing and calibration.

Operating the drive amplifier while not attached to the chassis may result in failure of the amplifier module

OUTPUT CHAIN

Two FET-input preamps mounted adjacent to each pickup transducer provide impedance conversion with high and low frequency equalization. A discrete transistor output stage drives the cables connecting the preamps to the main chassis.

The preamp returns are buffered at the main chassis. The buffer stages have a differential output with gain adjustment. Line drivers follow the buffers, providing current to drive external loads. The design allows either leg of the output to be grounded for unbalanced operation, but the maximum output will be reduced 6 dB.

TONE OSCILLATOR

The unit is shipped set for a reference level of +4 dBu. Contact Martinsound Technical Support regarding other reference levels.

POWER SUPPLY

An unregulated supply provides ±38V for the hybrid, power amplifier module, and a regulated supply provides ±15V for the opamps.

Operating the regulators while not attached to the chassis will cause them to overheat and shut down.

OPTIONAL INPUT AND OUTPUT TRANSFORMERS

For troublesome installations that require more common mode range than can be tolerated by an active input circuit, transformers can be added to the inputs and outputs. Mounting and wiring provisions are included on

the chassis for two input and two output transformers. Winding ratios of 1:l provide the necessary isolation without any appreciable change in operating specifications.

SERVICING NOTES

Stable circuits allow operation without connection to the EMT plate, making bench servicing possible.

POWER AMPLIFIER MODULE OR REGULATOR REPLACEMENT

- Remove the top cover and rear panel (and bottom cover if a regulator is to be replaced).
- Dismount the power amplifier module and regulators from the end panel and then remove the panel. This provides convenient access to the components without obstructions.
- To replace power amplifier module, first apply heatsink compound to the rear of the module. Next, insert the module leads into the inline socket, using a pair of longnose pliers to firmly insert each lead individually. This step is easily accomplished with the end panel removed, but is extremely difficult otherwise.
- To install a replacement regulator, remove the old regulator and install the new unit. Note that the height of the regulator must match with the mounting hole in the end panel. Apply heatsink compound to the regulator, then install the thin insulating sheet if the sheet did not stay attached to the endplate when the old unit was removed. Heatsink compound must be applied to both surfaces of the insulating sheet.
- Smooth the heatsink compound on the end panel and remount the end panel to the components and chassis. Note that insulating shouldered washers are used between the regulator mounting tabs and the nuts on the mounting screws. The objective is a thin uniform layer of heatsink compound covering each component mounting surface.
- Test the unit, then reassemble the top, rear, and bottom covers.

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