

TD-1 Tone Decoder / Trigger

Version 1.0

Document Version: 1.00 • 01 MAR 2013

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DESCRIPTION

The TD-1 is a member of EFX-TEK's family of "amigo" boards: user-friendly, plug-and-play solutions to common prop and display circuit interfacing challenges. The TD-1 can be used to convert an audio source into a trigger input for prop controllers, or be used for direct control of 12-24VDC devices.

PRODUCT APPLICATIONS

- Museum and educational exhibits
- Holiday props and displays
- Film/TV/Theater effects and prop control

FEATURES & BENEFITS

- Plug-and-Play connection to most EFX-TEK controllers
- Set-and-forget frequency input using a precision, multi-turn potentiometer
 - range is ~500Hz to ~19kHz
 - factory preset to 1kHz
 - LED indicates frequency detection and lock
- Mono (RCA) and stereo (3.5mm) inputs from audio source
 - headers to share single audio input with additional TD-1s
- Active-high and active-low trigger outputs (3-pin male header)
 - using Internal power mode, host controller provides 5VDC power to TD-1
- MOSFET for controlling 12-24VDC devices, up to 1A
 - requires 12-24VDC input (External Power)
- Compact size: 2.1" x 2.2" (53.3mm x 55.9mm); 0.15" (3.8mm) mounting holes

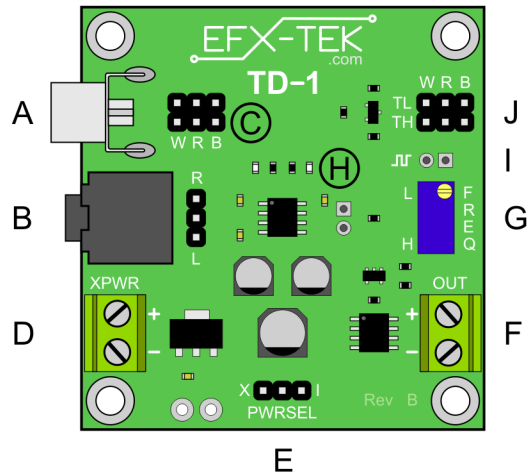
OPERATIONAL MODES

The design of the TD-1 provides for two distinct operational modes, though they may in fact be used at the same time:

- Trigger Mode
 - provides TTL (5v) level trigger output to host controller (e.g., Prop-1)
- Control Mode
 - switches 12-24VDC output

The TD-1 uses the popular LM567 tone decoder to detect a specific frequency on the audio input; the TD-1 is set to the desired frequency using a potentiometer. When the target frequency is detected a green LED will light, the trigger outputs will change state and, if external power is available, power will be routed to the OUT terminal block.

TD-1 CONNECTIONS & CONTROLS



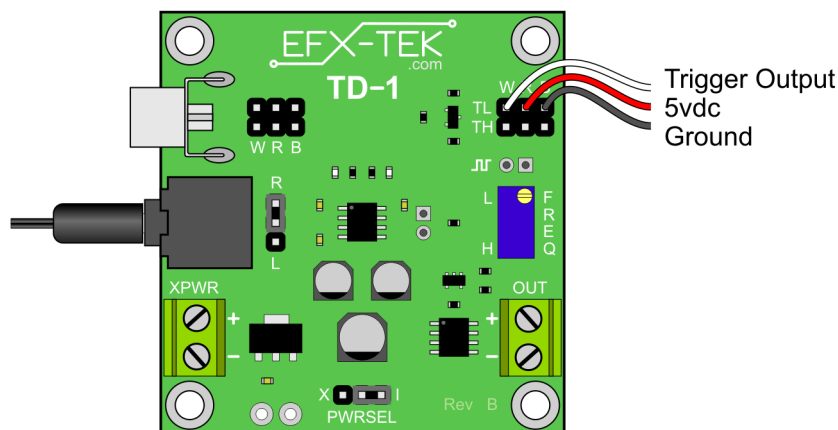
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|--|---|
| <ul style="list-style-type: none"> A. Mono audio input: RCA female B. Stereo audio input: 3.5mm female C. Audio buss D. External power input E. Power selection (eXternal / Internal) | <ul style="list-style-type: none"> F. Device power output G. Frequency adjustment potentiometer H. Frequency detect LED (green) I. Frequency test port J. Trigger output headers |
|--|---|



WARNING: Do not connect audio sources to the mono (A) and stereo (B) input connections at the same time. Doing so could result in damage to audio equipment and TD-1. Use only one input.

TRIGGER MODE

In this configuration the TD-1 will provide a TTL-level trigger signal to the host controller through the trigger output headers (J). Both active-high (TH) and active-low (TL) headers are available. When using the Prop-1 or other EFX-TEK controller you may connect the desired trigger output header to an input on the controller using a 3-wire extension cable (#805-00035). Move the PWRSEL jumper (E) to the I (internal) position to enable the host controller to provide 5vdc to the TD-1.

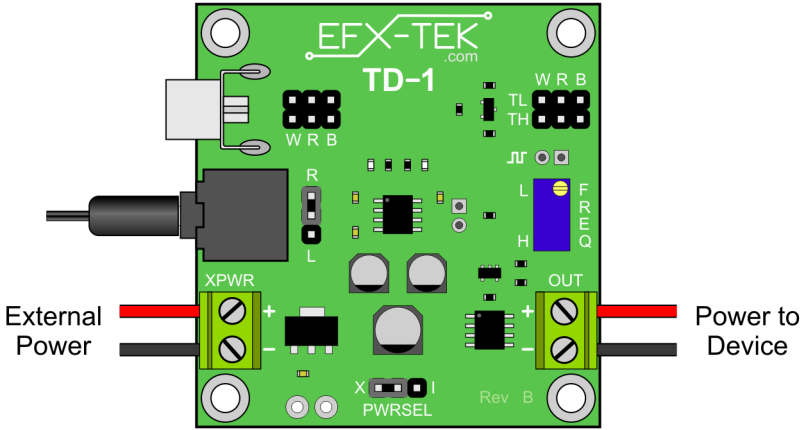




NOTE: When using the stereo input connector (B) as shown, the channel select jumper must be in place for audio to be routed to the LM567 tone detector circuitry.

CONTROL MODE

In this configuration the TD-1 will provide a control voltage a device such as a valve, relay, or DC lamp. Connect external power (12-24vdc) to the XPWR (D) terminal block, move the PWRSEL jumper (E) to the X (eXternal) position, and connect a compatible device to the OUT (F) terminal block.



NOTE: Trigger outputs are active in control mode. You may connect a controller to trigger a complex program while the OUT terminal follows tone detection/lock.

FREQUENCY SETTING

The TD-1 is factory set to 1kHz, a standard test tone in the audio industry. In control applications where multiple tones are in the audio track, each TD-1 would be set to respond to the desired frequency. A precision, multi-turn potentiometer is used set the target frequency.

Using a Multimeter

Many digital multimeters have a frequency measurement setting. Place the red meter lead on the round pad of the frequency test port (I); place the black meter lead (ground) on the square pad of the frequency test port. Apply power to the TD-1 and the frequency will be displayed on the meter. Using a small screwdriver, turn the frequency adjustment potentiometer clockwise to increase the target frequency, counter-clockwise to decrease.



NOTE: When multiple TD-1s are used with the same audio source you should maintain a 200Hz gap between target frequencies; for example, 800Hz, 1kHz, 1.2kHz, etc.

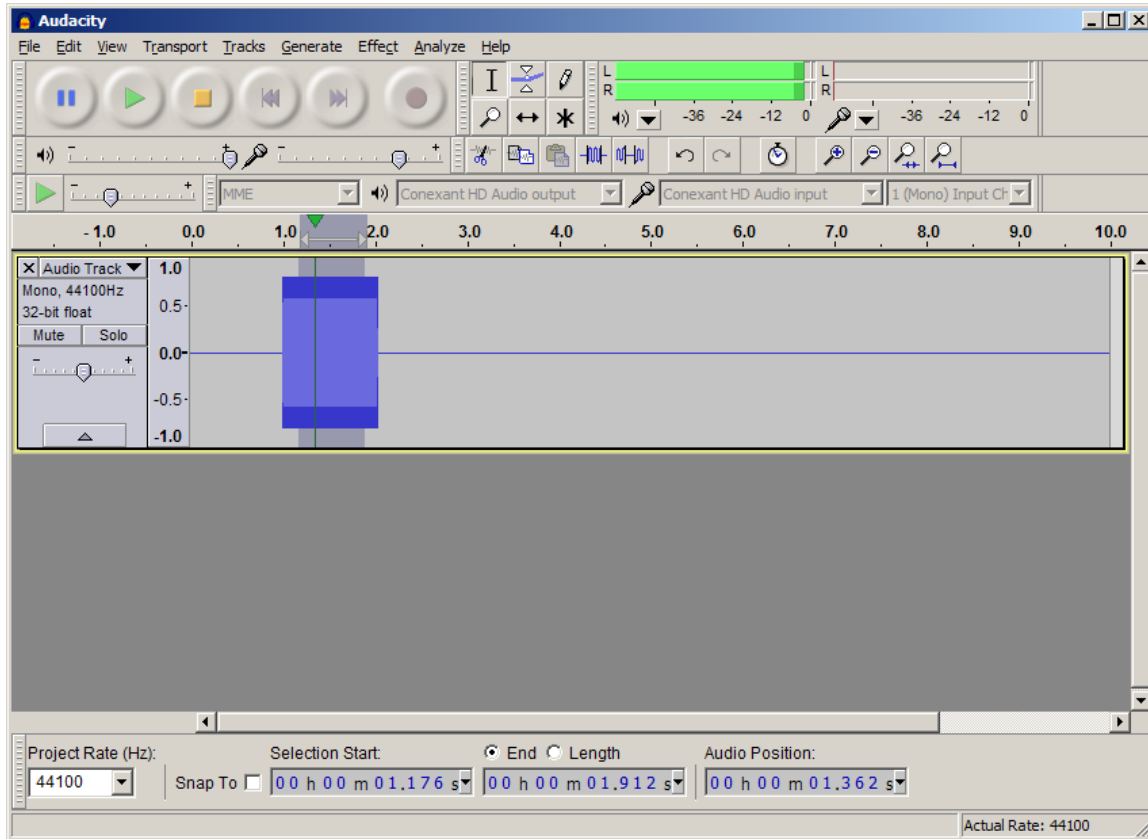
Using Audio Software

Popular audio editing programs like Audacity can be used to create and play a test tone into the TD-1 through its headphone jack; the TD-1 is adjusted until the frequency detection LED (H) lights. The following steps apply to Audacity, and should be similar in other audio editing tools (consult program documentation for specifics).

Start with a blank track. From the **Generate** menu select **Silence**. Set the duration to 10 seconds and click OK.

Drag select a small portion – about one second – of the (silent) audio track. From the **Generate** menu select **Tone**. Use these settings: Waveform = Sine, Frequency = 1200Hz (or your target), Amplitude = 0.8. Click OK.

Your project will look something like this



Drag-select a portion of the tone. Press and hold the SHIFT key and then press the Play button; this will play the selected segment of the tone in loop mode, allowing you to adjust the TD-1 for the new frequency.



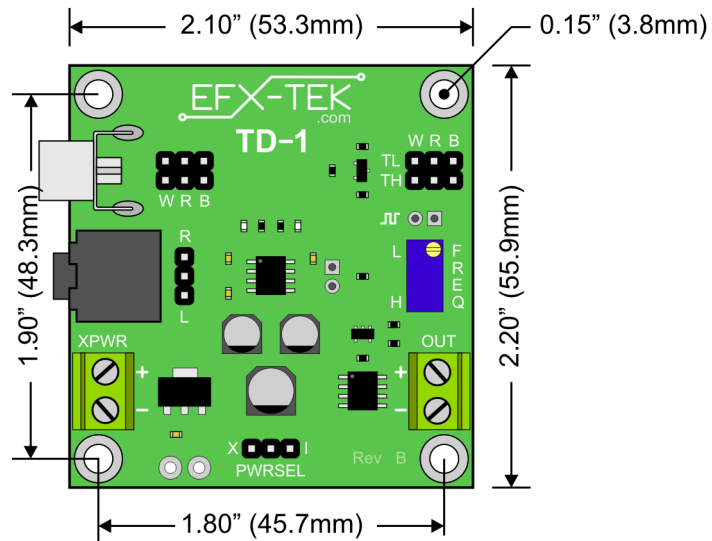
NOTE: Turn the potentiometer until the frequency detection LED lights, noting the position of the potentiometer. Continue turning until the frequency detection LED extinguishes. Now turn the potentiometer back to the midpoint of these two positions for best performance.

Press Stop when the adjustment is complete. Your TD-1 is now ready for prop control.

SHARING AUDIO

Two or more TD-1s may share an audio source by connecting them through the audio buss headers (C) using a 3-wire extension cable. In this configuration, audio from your source connects to just one TD-1. For power control applications, each TD-1 that will have a powered output must have input power connected.

MECHANICAL SPECIFICATIONS



ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Specification			Unit
		Min.	Typical	Max.	
Supply Voltage (Internal Mode)	V_{IN}	4.5	5	5.25	VDC
Supply Voltage (eXternal Mode)	V_{IN}	9.0	12	24	VDC
Supply Current	I_{IN}			150	mA
Trigger Output Voltage	V_{TOUT}	4	5	5.25	VDC
OUT Control Terminal Current	I_{COUT}			1	A

PRODUCT CHANGES

01 MAR 2013 First production release.
PCB marked **Rev B**